Final Engineer's Report for South Innisfil Creek Drain 2019 Improvement

Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

AMENDED REPORT
as per the Court of Revision and Tribunal

R.J. Burnside and Associates Limited
449 Josephine Street P.O. Box 10
Wingham ON   N0G 2W0 CANADA

February 13, 2019
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Rev.	Date	Description
Draft	August 3, 2018	"DRAFT" Report for Council and Staff
D2	February 5, 2019	"Final Draft" Report for Town Staff to review
3	February 13, 2019	File the Final Engineer's Report
4	July 23 and 24, 2019	As Revised by the Court of Revision
5	October 22, 2019	As Ordered by the Tribunal

R.J. Burnside and Associates Limited

Report Prepared By:

LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

J.R. (Jeff) Dickson, P.Eng.
Project Engineer
JRD/NC:jm/jb

Report Prepared By:

Natalie Connell, EIT
Engineer Assistant

Report Reviewed By:

Don McNalty, P.Eng.
Senior Municipal Engineer

Executive Summary

Authorization

The appointment for the preparation of this Report by R.J. Burnside and Associates Limited (Burnside) was authorized by Council Resolution CR-083-05.16 at a Meeting on April 20, 2016 and as instructed by the Manager of Operations for the Town of Innisfil (Town) in accordance with Section 78 of the Drainage Act (Act), RSO, Chapter D17.

Objectives

The Objectives of this Report are to authorize the following:

1. A downstream extension (approximately 1,200 m) of the South Innisfil Creek Drain (SICD) Main Drain from the west side of the 5 Sideroad right-of-way (ROW) to the south side of the 15th Line right-of-way. This extension is intended to incorporate portions of the channel downstream of 5 Sideroad as a Municipal Drain that have become (and are) obstructed by deadfalls and debris such that future maintenance can be readily and easily performed when necessary by the Town's Drainage Superintendent.

2. A minor upstream extension (approximately 20 m) of the SICD Main Drain from the south side to the north side of the 5th Line right-of-way; this extension is to incorporate the road crossing (bridge) of 5th Line as part of the SICD.

3. Various improvements to the SICD Main Drain between 15th Line and 5th Line.

4. Improvements to the SICD Main Drain crossings under Highway 400 and Reive Boulevard (by others).

5. Improvements to the SICD Main Drain crossings under other Town roads.

6. Improvements to the South Innisfil Drain Branch A west of Highway 400.

7. Improvements to the 10 Sideroad Branch Drain.

8. Improvements to the 3rd Line Branch Drain.

9. Improvements to the 3rd Line Spur Branch Drain.

Recommendations Summary

The following are the recommendations for this Municipal Drainage Project:

1. The outlet for the SICD Main Drain shall be Innisfil Creek at Station (Sta.) 0+000 in the north half of Lot 5, Concession (Conc.) 14 at the south side of the 15th Line right-of-way (ROW).

2. The improvements to the SICD Main Drain shall commence at approximately Sta. 0+026, in the north half of Lot 5, Conc. 14 just upstream of 15th Line, and extend upstream (north and east) to approximately Sta. 9+898 in the north half of Lot 12, Conc. 4 just downstream of 5th Line.

3. A new crossing for the SICD Main Drain under Highway 400 to accommodate a lower drain invert and the unrestricted conveyance of the design flows for the drain which may proceed as an interim solution with additional pipes under the road or as an ultimate solution which will provide for the total replacement of the crossing to MTO design criteria.

4. A new crossing for the SICD Main Drain under Reive Boulevard to accommodate a lower drain invert and the unrestricted conveyance of the design flows for the drain. The new crossing may proceed as an interim solution with additional pipes under the road or as an ultimate solution which will provide for the total replacement of the crossing to Town’s design criteria.

5. The improvements to the South Innisfil Drain Branch A which will be known as Branch A shall commence at Sta. 0+000, in the south half of Lot 6, Conc. 1 at its outlet into the Main Drain at approximately Sta. 1+715 and extend upstream (south and east) to approximately Sta. 0+650 in the south half of Lot 7, Conc. 1.

6. The improvements to the 10 Sideroad Branch Drain shall commence at Sta. 0+000, in the north half of Lot 10, Conc. 2 at its outlet into the Main Drain at approximately Sta. 6+134 and extend upstream (north) to approximately Sta. 1+448 in the south half of Lot 10, Conc. 4.

7. The improvements to the 3rd Line Branch Drain shall commence at Sta. 0+000, in the north half of Lot 11, Conc. 2 at its outlet into the Main Drain at approximately Sta. 6+328 and extend upstream (east) to approximately Sta. 1+660 at the lot line between Lots 13 and 14, Conc. 2.

8. The improvements to the 3rd Line Spur Branch Drain shall commence at Sta. 0+000, in the north half of Lot 12, Conc. 2 at its outlet into the 3rd Line Branch Drain at approximately Sta. 0+985 and extend upstream (east) to approximately Sta. 0+780 at the lot line between Lots 13 and 14, Conc. 3.

9. The improved portions of the Main Drain are intended to accommodate the 2-year standard rainfall event; some portions, primarily the Market Garden, are designed to accommodate the 2-year standard rainfall event with some additional freeboard for climate change. The various crossings of the Main Drain not under Town roadways shall remain private and the responsibility of the respective landowner.

10. The improvements to Branch A, the 10 Sideroad Branch Drain, the 3rd Line Branch Drain and the 3rd Line Spur Branch Drain are minor in nature and can be considered drain maintenance; the various crossings of these drains not under Town roadways shall remain private and the responsibility of the respective landowner.

A summary of the Assessments, as estimated by the engineer (and as per Column 1 of the Ontario Ministry of Agriculture, Food and Rural Affairs [OMAFRA] *Application for a Grant for Municipal Drain Construction or Improvement* form), for this Project are as follows:

1.	Canada-Owned Lands	$0
2.	Ontario Lands	$107,898
3.	Municipal Lands	$1,373,451
4.	Privately-Owned Non-Agricultural	$844,442
5.	Privately-Owned Agricultural (grantable)	$2,158,519
6.	Special Non-Pro-Ratable Assessments (Section 26)	$876,590
	Project Total	**$5,360,900**

Acknowledgements

Burnside would like to acknowledge the assistance, patience, understanding and cooperation of all stakeholders involved with this project, especially the affected landowners. The role provided by the Public Liaison Committee was quite beneficial and Burnside appreciates those who served on the Committee.

Also, to be recognized is the support and/or assistance of the Town's Council, Clerk and staff, Operations staff and the Town Drainage Superintendent.

Staff from the Department of Fisheries and Oceans Canada (DFO), the Ministry of Transportation (MTO) the Ministry of Natural Resources and Forestry (MNRF) and the Nottawasaga Valley Conservation Authority (NVCA) provided additional input.

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** ***Drawings' scales are based on an 'A2' sheet (approx. 23 ½" x 16 ½"); Drawings bound within this Report have been provided for ease-of-reference and have NOT been produced to scale.***

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Most of the survey data used to prepare this Report and the various Drawings contained herein, was originally collect by Dillon Consulting Limited (Dillon) in 2005 as part of their Preliminary Report. Dillon also surveyed the existing bottom of the natural watercourse from County Road 89 downstream to County Road 27. In September 2011 and as part of the preparation of their Final Report, subsequent data was collected by Dillon including survey spot checks and periodic examinations of the SICD Main Drain and branches to verify drain-bottom elevations, to review general site conditions at that time and to record any obvious drain feature changes or additions since 2005. All this data was subsequently released to Burnside.

Accordingly, and although Burnside did collect more recent (but limited) data to facilitate the preparation of this Report, it is recognized and expected that there may be portions of the SICD in the field that may no longer accurately reflect the data collected by Dillon in 2005 and 2011 and that indicated on the various Drawings. Furthermore, and since the hydrological modelling was based on this same data, it too may not necessarily exactly reflect current site conditions.

Finally, and although not adopted by By-Law, the August 15, 2013 Final Report prepared by Dillon, supported by the February 24, 2006 Preliminary Report, were examined and referenced in the preparation of this Burnside Report.

NOMENCLATURE

ac	acre (0.4047 ha)
BJB	buried junction box
CB	catchbasin
CDT	concrete drain tile
CSP	corrugated steel pipe
c/w	complete with
dia.	diameter
DICB	ditch inlet catchbasin
D/S	downstream
ea.	each
FL	fence line
FPPDT	filtered perforated plastic drainage tubing
FTCB	flat top catchbasin
H	horizontal
ha	hectare (2.471 ac)
HDPE	high-density polyethylene
JB	junction box
km	kilometre
l.s.	lump sum
m	metre
mm	millimetre
m^2	square metre
m^3	cubic metre
MTO	Ministry of Transportation
OB	observation box
O/H	overhead
O/S	offset
PDT	plastic drainage tubing
PL	property line
PPDT	perforated plastic drainage tubing
RCSP	riveted corrugated steel pipe
ROW	right-of-way
S and I	supply and install
SPDT	solid plastic drainage tubing
Sta.	station (chainage)
SWI	surface water inlet
SWRSP	smooth-wall rigid sewer pipe
SWWSP	smooth-wall welded steel pipe
T	tonne (2,205 pounds)
U/G	underground
U/S	upstream
V	vertical

1.0 Chronology of Previous Reports and Maintenance

1. Records indicate that the SICD was created under a report dated February 1903, prepared by M. Gaviller, O.L.S.; he recommended that certain work of “straightening and removing obstructions be undertaken from Conc. 1 to 6 in Innisfil Township.”

2. Two (2) new branches of the South Innisfil Drain; namely, Branch A and Branch B, located in Conc. 1, were constructed under a report by D.H. Weir, P.Eng. in 1954.

3. The Township of Innisfil, upon the receipt of a petition from a number of owners in the area of the drainage basin, authorized improvements to the SICD pursuant to a report prepared by D.H. Weir, P.Eng., dated November 9, 1956. This report was adopted under By-Law No. A 40, finally passed the 23rd day of September 1957. In addition to improvements to the Main Drain, three (3) additional branch drains were constructed; namely, 10 Sideroad, 3rd Line and 3rd Line Spur.

4. According to Town records, maintenance work was undertaken by the Township of Innisfil during 1974, and a subsequent cleanout was completed in 1976.

5. In 1977, 1981 and 1983, studies with respect to the South Innisfil Creek Drain watershed were completed under the direction of the NVCA.

6. On January 1, 1991, by virtue of the South Simcoe Act, the Township of Innisfil, a northern section of the Township of West Gwillimbury, and the Village of Cookstown, were amalgamated and incorporated as the Town of Innisfil.

7. In 1996 an Administrative Report was completed by Town staff in response to requests for a cleanout from stakeholders within the watershed of the SICD.

8. Maintenance work was again undertaken by the Town on the 3rd Line and 10th Sideroad Branches in 2001 and 2002 and a spot cleanout on the Main Drain in 2004.

9. On March 31, 2005 an order was issued by the Court of the Drainage Referee of Ontario (Referee) in Barrie, that the Town forthwith appoint an engineer pursuant to Section 78 of the Drainage Act.

10. As a result of the Order, on May 9, 2005 the Town appointed Dillon as the engineer to prepare, complete and file a preliminary report and a final report in accordance with Section 78 of the Act to “improve” the SICD and, in particular, to address concerns with flooding in the area known as the “Market Garden” which is adjacent to the drain primarily in Conc. 2.

11. On February 24, 2006 a Preliminary Report was submitted, and on July 24, 2006 the report was presented to the Referee by Tim R. Oliver, P.Eng. of Dillon; three options or solutions were presented in the report.

12. On August 31, 2006, as contained in Court File No. 04-B7552, in the matter of the appeal before the Referee, a Court Order was issued giving specific direction to the engineer regarding the report and to the Town as to consideration of said report.

13. A Final Report dated August 15, 2013, prepared by Mr. Tom H. Marentette, P.Eng., of Dillon, was filed with the Town based on the observations and recommendations in the Preliminary Report. The recommendations in the final report were the result of detailed analysis and geotechnical investigations referenced in the Appendices; a review of the hydraulic model provided by the NVCA; the topographic survey carried out for the Preliminary Report; and the recommended works included in the Order(s) by the Referee contained in Court File No. 04-B7552.

14. At the Meeting to Consider the Report on October 2, 2013, the Council deferred acceptance of the final report and directed staff to commence an application to the Referee for reconsideration, clarification and direction.

15. On November 4, 2014, the Referee issued a subsequent Order giving specific direction to the Town that it was no longer bound by the March 31, 2005 Order and that it was to retain the services of an engineer to review the August 15, 2013 Dillon report and to suggest alternatives to alleviate the flooding.

16. In response to the Referee's Order issued on November 4, 2014, the Town of Innisfil requested R.J. Burnside and Associates Limited (Burnside) to undertake a peer review of the Dillon report and proposed work as well as the comments received by the Town from various stakeholders. The peer review was completed in two Phases with the Phase 1 Report being issued on August 7, 2015, and the Phase 2 Report being issued on November 17, 2015. The reports provided a summary of the findings and recommendations.

17. The Town of Innisfil requested Dillon to undertake a revised design and to prepare a Drainage Report which incorporated the recommendations derived from the peer review; however, correspondence of January 15, 2016, stated that Dillon was not in a position to undertake this work.

18. Burnside was requested by the Town to submit a proposal to undertake a revised design and to prepare a new Report; Burnside ultimately received an appointment in accordance with Section 78 of the Act as Drainage Engineer for the South Innisfil Creek Drain on June 1, 2016.

2.0 History, Studies, Existing Conditions

2.1 History

The M. Gaviller report and subsequent By-Law created the SICD in 1903 and subsequently it is well over 100 years old. The South Innisfil Drain Branch A and Branch B were created under a 1954 D. H. Weir report. Under a subsequent report prepared by P.W. Ainley, P.Eng., in 1963, the course of the drainage works in Innisfil Township was altered when a new drain was constructed to carry water to the north along the east side of the service road (Reive Boulevard), outletting into the creek on the east side of Highway 400. Branch A of the South Innisfil Drain exists only within the south part of Lots 6 and 7, Conc. 1 starting at the upstream end of the large culvert under and on the east side of Reive Boulevard; it flows west and then north to its outlet into the SICD Main Drain and is approximately 650 m in length. The various drains that form the Hnydczak system only exist east of Highway 400 on south part of Lots 7 to 11 inclusive in Conc. 1 and 15.

The current Report for the SICD (Main Drain and branches) was prepared by D.H. Weir in 1956. The petitioners requested the repair and the improvement of the South Innisfil Creek (Creek) to relieve wet farms; they also requested that the "… Creek be cleaned out, deepened and straightened, and the certain branches be constructed." Weir recommended "… the cleaning out, straightening and improving the Creek from the rear of Conc. 4 to a sufficient outlet at the sideroad between Lots 5 and 6 in Conc. 1 ...". Accordingly, the Main Drain extended from the road allowance between Conc. 4 and 5 opposite Lot 12, continued through Conc. 4, 3, 2 and 1 to a sufficient outlet at the Moir Bridge on 5 Sideroad in Conc. 1. Under that same report, an additional three branch drains of the SICD were constructed; namely, the Third Line Branch Drain (consisting of two spurs) and the 10 Sideroad Branch.

The 10 Sideroad Branch Drain flows from north to south along the west side of 10 Sideroad from the north side of the 4th Line to its outlet into the SICD Main Drain on the south side of the 3rd Line, is approximately 1,450 metres in length.

The 3rd Line Branch Drain flows from east to west along the south side of the 3rd Line from the line between Lots 13 and 14, Conc. 2 to its outlet into the SICD Main Drain in the west half of Lot 11, Conc. 2, approximately 1,660 metres in length. The 3rd Line Spur Branch Drain flows from east to west along the north side of the 3rd Line from the line between Lots 13 and 14, Conc. 3 to its outlet into the 3rd Line Branch Drain in the east half of Lot 12, Conc. 2, is approximately 780 metres in length. All the above drains were entirely situated within the geographic Township of Innisfil.

Drainage reports and subsequent By-Laws by McGeorge and Ainley in 1958 and 1963 respectively made improvements to Branch A, created additional drains upstream, diverted the drainage from Branch A along the east side of Reive Boulevard and renamed the drainage system situated east of Reive Boulevard to the Hnydczak Drain. Subsequent reports by McNalty in 1978 and Young in 1990 made further improvements and changes to the Hnydczak Drain but Branch A from the outlet into the SICD to the east side of Reive Boulevard remains under the authority of the 1954 Weir report and subsequent By-Law.

Downstream of Conc. 1 in the Town of Innisfil, the outlet for the SICD is a natural watercourse being the Innisfil Creek, an upper tributary of the Nottawasaga River. The Creek continues downstream to the south and west through Conc. 15, 14 and 13 within the Town of Innisfil, crossing into and through Conc. 13, 12 and 11 within the Town of Bradford West Gwillimbury to County Road 27. Beyond this point, it enters the Town of New Tecumseth, where several sections are municipal drains under different by-laws. Innisfil Creek eventually reaches its outlet into the Nottawasaga River in Conc. 12 in the Town of New Tecumseth.

The SICD has been realigned, cleaned and enlarged over the past century. The most recent major work was under the 1956 engineer's report. Maintenance work has occurred since, with a clean out of almost the entire drain in the mid 1970's and partial cleanouts and repairs since. These works have resulted in the SICD through the marsh or Market Garden becoming wider and more linear than the naturalized drain downstream of 2nd Line and upstream of 3rd Line. Material has been deposited along the drain banks, creating berms or dykes on both sides of the SICD. These berms vary in height and some are not contiguous, so it is uncertain as to the extent of the flood protection they provide. It is possible that some berms impede flow and contribute to the buildup of sediment in the SICD.

Despite the past maintenance and repairs to the drain, flooding of the Market Garden persists. Some of the long-time landowners believe that the Highway 400 and Reive Boulevard drain crossings have aggravated the situation by restricting the free flow of drainage beyond that point. Although the degree to which these crossings have aggravated flooding within the Market Garden has been debatable, the existing closed-bottom culverts do impose a limitation on the ability to lower the drain bottom and possibly increase gradients to facilitate increased flow capacity.

2.2 Previous Studies

It is our understanding that there have been studies undertaken by consultants to investigate the more significant flooding events that occurred in the 1970's and early 1980's, and the impact of those events on the SICD. These studies were conducted under the direction of, and largely funded by the NVCA.

It is believed that the first study on the SICD was a hydrological modelling analysis undertaken by Dillon in 1977. The study was primarily a floodplain and fill line study for the NVCA's Flood Plain Management Program that remains useful for planning and development purposes within the watershed. Subsequent studies in 1981 and 1983 by Ainley and Associates Limited (Ainley) and Triton Engineering Services Limited (Triton) respectively, suggested that the construction of one or more stormwater detention facilities to capture excess runoff within the SICD watershed and basin under larger events may provide better protection to the lands, roads and buildings. However, it was also recognized that more detailed analysis in the form of hydrological modelling was required to support and determine where and what stormwater management features would offer the best level of protection. The 1981 Ainley study resulted in a recommendation of the Master Drainage Plan for the SICD and watershed or basin.

2.3 Existing Conditions

2.3.1 General

Since being appointed, Burnside staff have attended the site of the SICD on a number of occasions, made investigations, taken an extensive number of photographs and recorded observations of various areas within the watershed as well as the condition of the Main Drain and its branch drains. The SICD Main Drain was walked from 5 Sideroad to 5th Line, and the various branch drains were inspected, especially those included as part of the work proposed in this Report.

As noted elsewhere, the majority of the existing condition information used in the preparation of this Report was based on survey data collected by Dillon in 2005 and 2011. However, there are features that were not part of the SICD back in 2005 including new road and private drain crossings. Several features have also been removed. Further, it is also quite likely that some of the existing conditions of the SICD, such as the actual elevation of the drain bottom, erosion sites, fallen trees and debris jams have either moved or shifted since 2005. Burnside collected current data for some of the new crossings and for some of the other features since being appointed.

As described herein, the SICD drainage system is comprised of an open Main Drain as well as several open Branch Drains; there are no known closed portions to the SICD. The current outlet for the Main Drain is at the boundary between Lots 5 and 6, Conc. 1 at the existing crossing of 5 Sideroad (Burnside Station 1+210) into Innisfil Creek.

The Main Drain extends upstream to the north and east from its current outlet approximately 8,700 m through Highway 400, Reive Boulevard, 2nd Line, 10 Sideroad, 3rd Line and 4th Line to the south side of the bridge on 5th Line. Forming part of the SICD network are several Branch Drains and three separate and distinct Municipal Drains, each which confluence with the Main Drain. In addition, there are a number of natural watercourses and private drains that outlet into the Main Drain.

The SICD Main Drain has over 11 metres of elevation difference over the almost 9 kilometre length. The average drain bottom gradient in the reach upstream of 10 Sideroad is approximately 0.24%; however, the reach between 5 Sideroad and 10 Sideroad has a much flatter drain bottom gradient of between 0.04% and 0.05%.

It is also well known and documented that regular flooding occurs in the SICD watershed, primarily on the low-lying portions of the drainage basin which abut the drain. This flooding has adverse impacts on the affected lands, buildings and roads. The sizeable Market Garden area, located predominantly in Conc. 1, 2 and 3, has historically been heavily impacted. The flooding has resulted in significant losses of vegetable crops as well as damages to buildings and private property.

2.3.2 Main Drain Tributaries

Commencing at 5 Sideroad and moving upstream, the following is a listing of the various tributaries that outlet into the SICD based on the Burnside Stationing (see Table 1 below).

Table 1 Main Drain Tributary Stationing

Station (Sta.)	Description
1+710	a natural watercourse from the left
1+715	in Lot 6, Conc. 1; the outlet for South Innisfil Drain Branch A from the right
1+890	a natural watercourse from the left
2+280	in Lot 7, Conc. 1; the outlet for the Hnydczak Drain Innisfil Section from the right
2+550	a natural watercourse from the left
3+060	in Lot 8, Conc. 1; the outlet for South Innisfil Drain Branch B from the right
3+350	in Lot 8, Conc. 1; the outlet for the South Branch of the 2nd Concession Drain which was constructed pursuant to a report prepared by D.H. Weir, P.Eng. in 1959 from the right
3+375	in Lot 8, Conc. 2; the outlet for the North Branch of the 2nd Concession Drain which was constructed pursuant to a report prepared by D.H. Weir, P.Eng. in 1959 from the right
3+588	Bethesda Creek, a natural watercourse from the left
3+690	a tributary drain (presumed private) from the left

Station (Sta.)	Description
3+895	a tributary drain (presumed private) from the left
3+895	a tributary drain (presumed private) and an abandoned culvert from the right – this channel now outlets to the North Branch of the 2nd Concession Drain
4+210	a tributary drain (presumed private and cut off) from the right; this channel now outlets to the North Branch of the 2nd Concession Drain
4+290	a tributary drain (presumed private and cut off) from the right; this channel now outlets to the North Branch of the 2nd Concession Drain
4+370	a tributary drain (presumed private and cut off) from the left
4+875	a tributary drain (presumed private) from the left
4+875	a tributary drain (presumed private and cut off) from the right
5+450	in Lot 10, Conc. 2; the outlet for the Prokopchuk Drain, which according to Town files, was constructed pursuant to a report prepared and subsequently adopted under By-Law A-184 in September 1965 from the right
6+134	in Lot 10, Conc. 2; the outlet for the 10 Sideroad Branch Drain from the left
6+328	in Lot 11, Conc. 2; the outlet for the 3rd Line Branch Drain and the 3rd Line Spur Branch Drain from the right
7+080	a tributary drain (presumed private and cut off) from the right
8+245	a natural watercourse (perhaps a private drain) from the right

In addition to the various municipal drains, private ditches and natural watercourses, there are many roadside ditches that outlet directly and indirectly via branches and tributaries into the SICD Main Drain.

Finally, there are a number of private drainage systems serving the agricultural lands within the SICD watershed; these private tile drains outlet directly to the SICD Main Drain or to a Branch Drain. A practice, primarily in the Market Garden, is for those private drainage systems (either systematic or random) to be collected by a header or headers and connected into a precast vertical cistern or well. The cistern is offset from the open drain in the headland area along the end of the respective field. These cisterns are usually served by a large electric vertical pump which is used to transfer the runoff and groundwater collected in the private drainage system from the cistern into the municipal drain via either rigid or flexible piping.

2.3.3 Main Drain – Private Bridges and Crossings

Commencing at the outlet and moving upstream, the following is a listing of the various private bridges or crossings over the SICD Main Drain based on the Burnside Stationing (see Table 2 overleaf).

Table 2 Main Drain Private Bridges and Crossings Stationing

Station (Sta.)	Description
2+333	golf cart bridge
2+449	golf cart bridge
2+697	golf cart bridge
2+822	golf cart bridge
4+057	private agricultural bridge
4+295	hydro cable over Main Drain
4+359	new private agricultural bridge which is understood to have been installed to replace the structure removed from Station 4+327
4+414	private agricultural bridge
4+550	steel beam supporting hydro cable
5+205	private wooden foot bridge

All of the above-noted private crossings (and any that may not be listed which are not under roads) shall remain private and the responsibility of the respective landowner.

2.3.4 Main Drain – Road Bridges and Crossings

There are ten locations where the SICD Main Drain crosses a municipal, regional or provincial roadway. The affected roadways are presented in Table 3 below.

Table 3 Main Drain Road Bridges and Crossings Stationing

Station (Sta.)	Description
0+000 – 0+026	15th Line (bridge)
0+541 – 0+576	Highway 89 (bridge)
1+190 – 1+224	5 Sideroad (County Road 53) (bridge)
2+165 – 2+245	Highway 400 (two arches and one culvert)
2+245 – 2+280	Reive Boulevard (two arches and one culvert
3+350 – 3+375	2nd Line (bridge)
6+134 – 6+161	10 Sideroad (bridge)
6+328 – 6+355	3rd Line (bridge)
7+928 – 7+950	4th Line (two culverts – to be replaced as part of the work on this Project; see Section 9.0)
9+898 – 9+918	5th Line (bridge)

Since the Dillon 2005 and 2011 surveys, the following structures have been improved or replaced on the SICD Main Drain as follows:

- Improvements were made to the bridge on 15th Line;
- A new bridge was constructed on Highway 89 (Glass Bridge);
- A new bridge was constructed on 5 Sideroad; and
- As per a November 2016 AECOM report, re-lining work was completed on the culverts under Highway 400 in approximately 2010. It included placing a concrete base slab along the floor of the culverts and a 100 mm thick shotcrete liner on the barrel walls. Concrete riffles filled with smooth rock were also constructed as part of the work and assumed to be for fish passage and aquatic enhancement.

There are also private and municipal road crossings on Branch A, the 10 Sideroad Branch Drain, the 3rd Line Branch Drain and the 3rd Line Spur Branch Drain.

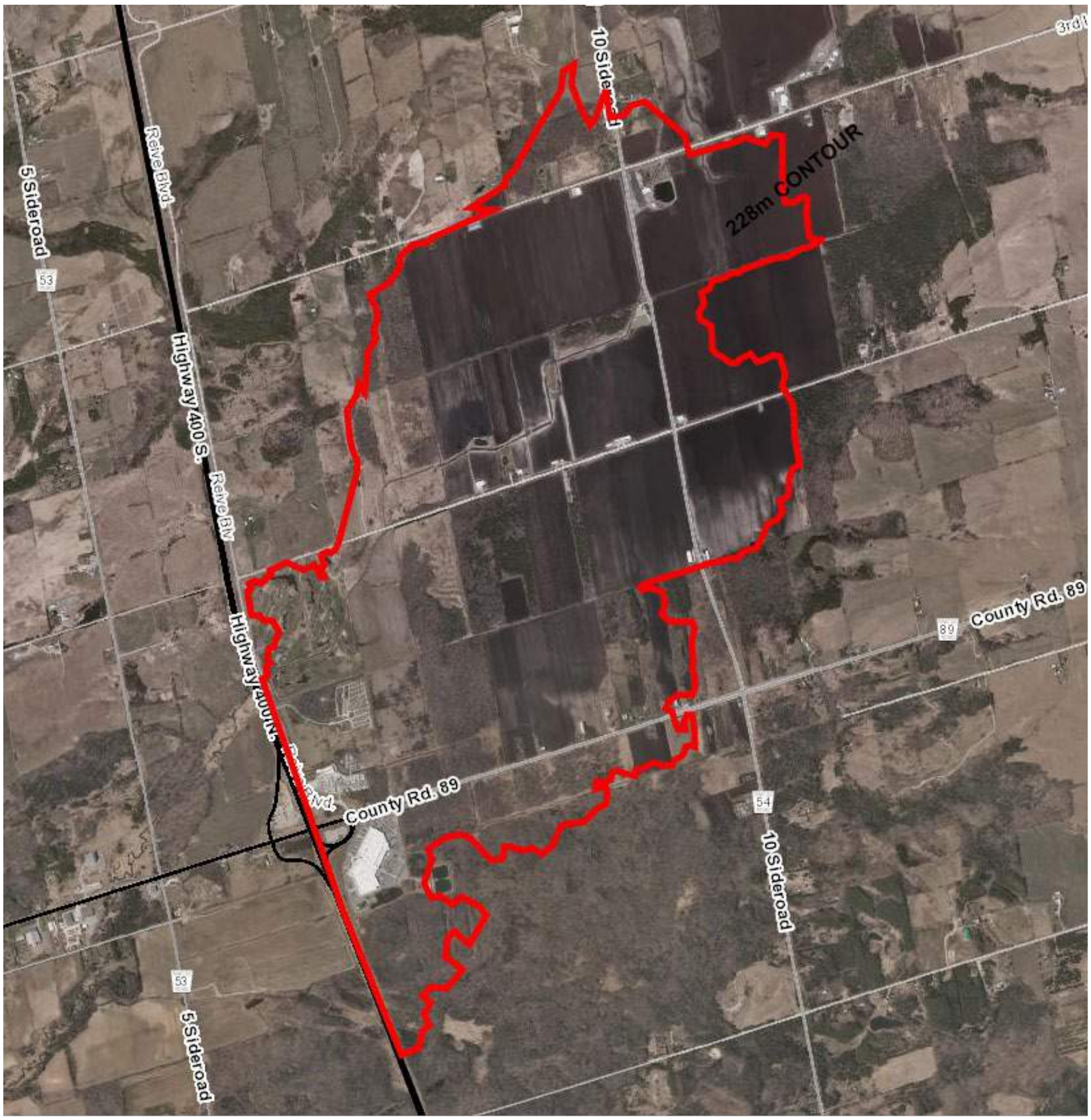
The removal and replacement of the crossing of 4th Line on the Main Drain is proposed as part of the work on the Main Drain. Two crossings are proposed for removal and replacement as part of the work on the Branch Drains: the 10 Sideroad Branch Drain crossing of 3rd Line and a private crossing on Branch A. Details on these replacements are outlined in Section 9.0. The remaining crossings, although not detailed herein, are referenced on the respective Branch Drain Profiles. Furthermore, although they are not being removed and replaced as part of the SICD Improvement project, Burnside has provided the Town with a recommended minimum size for potential future replacement of all other private and municipal road crossings on the 10 Sideroad Branch Drain, the 3rd Line Branch Drain and the 3rd Line Spur Branch Drain. Refer to Drawing 22 for the proposed culvert sizes.

2.3.5 The 228.00 m Contour

There is an area within the lowlands of the SICD watershed, primarily upstream of Highway 400, that is referred to in this Report as the “228.00 m Contour”. Generally, it is most of the area bound by 3rd Line in the north, County Road 89 in the south, the approximate line between Lots 11 and 12 in the east, and Highway 400 in the west (excluding Lot 11 and part of Lot 12 in Conc. 2). The area contained within or below this contour encompasses the majority of the Market Garden and is generally comparable to the glacial lake bottom referenced as part of the Quaternary Geology. Figure 1 (overleaf) shows the approximate location of this contour based on Simcoe County data.

As described in the Hydrology and Hydraulics reports, and as delineated on the drawings, the existing culverts under Highway 400 and Reive Boulevard are undersized and perched; this existing condition significantly and regularly impacts the portion of the SICD watershed from this location to upstream of the 3rd Line. Under the influence of a rainfall event (or a combined rainfall and snow melt) exceeding the capacity of the existing drain (which is currently less than a 2-year return period), the banks of the SICD Main Drain east of Highway 400 and Reive Boulevard typically experience overtopping. That overflow spills out into the floodplain in either direction perpendicular to and adjacent to the drain. In the flood prone zone, more especially the Market Garden due to its very flat topography, this “spilling-out” can result in the flooding of hundreds of hectares of land (see Photos overleaf). The area of the SICD watershed which falls within the 228.00 m contour is approximately 700 ha.

Figure 1[1] 228.00 m Contour



[1] Source: Simcoe County Maps

Photo 1 Flooding in the Market Garden (Spring 2017)

Photo 2 Looking East at Roll No. 001-194700 (February 2018)

Photo 3 Looking Northeast from 2nd Line (February 2018)

3.0 Meetings

3.1 On-Site Meeting

In accordance with Section 9 of the Act, an On-Site Meeting is required before the engineer makes an examination and report. Typically, a notice for this meeting shall be sent to each owner of land within the *"area requiring drainage as described in the petition";* therefore, a drain initiated in accordance with Section 4. It is also an accepted practice for such a notice to be sent for an appointment under Section 78 of the Act.

The initial On-Site Meeting was the responsibility of Dillion, as documented in their August 15, 2013, report, and was held on August 3, 2005. Although Burnside was also appointed by the Town in accordance with Section 78 of the Act, a second On-Site Meeting was not scheduled. This matter was discussed with staff from OMAFRA, and it was implied that Burnside was appointed to complete the project started by Dillon; therefore, Burnside could be considered a "change" of the engineer to move the project forward to completion.

However, upon appointing Burnside, Town staff indicated that there was still a need to engage and update stakeholders on project progress and proceedings. To address this need, Burnside formed a Public Liaison Committee (PLC). The purpose of the PLC was to provide a forum for Agencies and Owners to provide input and feedback to the Town and Burnside, not only regarding the engineering and design work, but also to arrive at a drainage solution that was as acceptable to as many stakeholders as possible while at the same time satisfying all the necessary regulatory protocol and environmental requirements. The PLC was perceived to be a benefit in keeping stakeholders informed throughout the process under the Act for this sizeable drainage project. It also allowed Burnside to establish accountability and transparency with all stakeholders.

It was decided to have the PLC made up of representatives of the Town, the Agencies, Burnside and the landowners (or public) affected by this Municipal Drain; it was formed over a period of months following Burnside's appointment.

3.2 Public Liaison Committee Meeting No. 1

The PLC held its inaugural meeting on April 27, 2017 with 16 members present. An Agenda was prepared, distributed and approved at the start of the meeting. The goals of the PLC were discussed, and it was agreed that it would *"review additional details regarding work completed to date and obtain feedback and input from agencies and property owners in an effort to move the project to a satisfactory solution."* It was noted that input from the group will be key to it being successful and that the members of the PLC can hopefully channel the information coming from the meeting(s) back to the residents involved within the watershed; it was also suggested that members may even be able to assist in fielding questions and phone calls. Information would continue to be posted on the Town's website.

Discussions followed regarding the project in general and of the drain in particular. The information discussed included but was not necessarily limited to the following topics: the Burnside investigations and reviews of the Dillon documentation and data since appointment; the lack of agency approvals; the Highway 400 crossing; possible settlement of new agricultural crossings as proposed by Dillion; preliminary discussions with some of the agencies; the capacity of the drain; proposed rural stormwater facilities as per the Referee's Order; and the drain bottom gradient (slope).

Burnside staff provided an overview of the hydrology and the hydraulics for the watershed and the drain; an overall Watershed Plan was distributed to facilitate the discussions. Some of the items discussed included: providing evidence to MTO that the culverts under Highway 400 need to be lowered and enlarged; the protocol regarding municipal drains and private crossings as determined by the Act, who is the owner and who is responsible for this type of infrastructure; the minimum design criteria/standard for open municipal drains; the hydrology model that Burnside has developed and resulting flows/output; the concern with global warming and what appears to be larger, more intense and more frequent rainfall events, and incorporating this into a model; and coordination and working with the local Conservation Authority.

The gradient (slope of the bottom) and capacity of the drain was also reviewed and discussed; however, unless the drain is extended further downstream, there is probably limited opportunity to improve the existing gradients of 0.04% and 0.05% as established in the 1956 Weir report. Some drain improvement projects propose the drain to be deepened and the gradient steepened to increase the capacity; however, due to the very low SICD drain gradients, the capacity may need to be increased by widening the existing drain cross-section.

The impact of the existing private landowner's dyke system was also discussed and needs to be addressed in the final engineer's report regarding who is responsible to get flood waters that top the existing dykes back into the Main Drain. Other aspects of the dykes that also need to be resolved: the impact on the storm water management areas identified in the Referee's Order; cost implications; maintenance in the future; and design details if they are part of the drain.

Committee members were given an opportunity to bring forth issues and concerns about the drain itself. The information discussed and exchanged during this part of the meeting included, but was not necessarily limited to, the following: the farm crossings as proposed in the Dillon report; the Highway 400 crossings need to be addressed in the Burnside report; the Dillon proposed two-stage ditch; the inadequacy of the proposed allowances; there only being a need of a drain cleanout upstream of the 3rd Line; the proposed work as well as the private access crossings on the 3rd Line Branch Drain, the 3rd Line Spur Branch Drain and the 10 Sideroad Branch Drain.

There was also a discussion regarding the SICD project in general and some of the concerns expressed were as follows: the major public concern to date related to the significant cost of the overall project and the need for Burnside to consider this moving forward; the need for more consultation with the affected landowners, especially those in the Market Garden; not to propose the undertaking of unnecessary work that would add to the overall project cost; if possible take into consideration a design that can accommodate larger rainfall/runoff events; the involvement of DFO and the sensitive fish habitat; having face-to-face time with affected landowners; ongoing communication is key via update reports, memorandums, etcetera; moving forward the discussions with MTO regarding the Highway 400 crossings.

At the conclusion of the Meeting, attendees were informed that they would be kept apprised of the Burnside progress as well as next steps. The next meeting was proposed for later in the year.

3.3 Public Liaison Committee Meeting No. 2

The second PLC meeting was held on November 29, 2017 with 11 members of the committee present. An Agenda was prepared, distributed and approved at the start of the meeting. The start of the meeting included a review of the main objectives for the project; namely: improvements to drain capacity and removal of obstructions including the Highway 400 crossings; the replacement of the Highway 400 crossings; the mitigation of flooding in the Market Garden; and the reduction of the overall cost of the Dillon project.

The next major item of discussion was regarding the Highway 400 crossings and information that has been made available since the April 27, 2017 PLC meeting. The discussions included but were not necessarily limited to the following: an AECOM “draft” Drainage Report; the proposed Highway 400 and Highway 89 Interchange; a proposed SWM facility as part of the interchange; liaison with Morrison Hershfield (MTO Interchange consultant); correspondence sent to MTO; and a Notice of Completion for the Highway 400 Environmental Assessment. Most of these items can also be found detailed in a project update Memorandum to the Mayor, Deputy Mayor and Members of Council dated January 17, 2018 and posted on the Town’s website.

Discussions then followed regarding the hydrology and the hydraulics as well as the results of some of the Burnside modelling. Information discussed included: a summary of the variation in flows generated using the Burnside model in comparison to those identified in the Dillon report; the proposed design flow and cross section for the drain in comparison of to the existing conditions; information and a comparison between the 2-year standard rainfall and the 2-year climate change rainfall; QA/QC efforts; and the Burnside need to “calibrate” the model.

There were a few questions for the Burnside team regarding the modelled flows and the capacity of the drain; it was recommended that it is better to compare the proposed capacity of the drain to its existing capacity and translate that into terms of the amount of improvement or increase and not necessarily to a design storm. The discussions also involved the increase in cost of the project with the increase in the drain capacity. Clarification was also requested regarding the need for a low flow channel; it was explained that this was to address base and low flow conditions as well as to attempt to reduce laminar flow in the drain which is a major concern of DFO. A low flow channel tends to create higher flow velocities in that portion of the drain and assists in the movement and transport of sediment; the much wider upper second stage or tier of the channel conveys flows the result after rainfall events. The effective transport and movement of sediment along the course of the drain normally creates better habitat that is in turn supported by DFO. The above type of system also hopefully requires less maintenance.

There was further discussion regarding the crossings on Reive Boulevard and if they would be considered part of the Highway 400 MTO work; Reive Boulevard is owned by the Town; regardless, the crossings under this road also need to be replaced. Other road crossings were discussed such as 2nd Line; it was explained that it was hoped to salvage the existing 2nd Line bridge.

Also discussed: berms or dykes along the course of the drain as per the Dillon report; the need to confirm in the Burnside report who is responsible to maintain the berms or dykes (existing as well as if new ones are proposed); is the lower stormwater pond prescribed by the Referee required; what are or will be the variations in drain cross section along the course of the existing drain; and has there been any communication with the staff at the NVCA regarding a permit for the work.

After the Meeting, attendees were again informed that they would be kept apprised of the Burnside progress, the next steps, and the date of the next meeting.

3.4 Pubic Information Centre

A Public Information Center (PIC) was held on Friday, February 23, 2018 from 4:00 until 7:00 p.m. in the Town Hall Community Room of the Municipal Building at 2101 Innisfil Beach Road. A notice for the PIC was sent by the Town to all potentially affected landowners and Utility Companies within the watershed. The Notice provided contact information for those who were not able to attend the PIC but wished to offer input.

The purpose of the PIC was to allow all stakeholders to join Burnside and Town staff in an "Open House" format to receive an update on the status of the South Innisfil Creek Drain Improvement project and to offer an opportunity for stakeholders to ask questions and/or provide input to Burnside and Town staff and to receive feedback.

There were a number of items that were prepared for the PIC which included but were not necessarily limited to the following:

- Sign-In sheets for the Attendees (it is known that not all attendees signed in)
- Display Boards (large format) depicting various aspects of the SICD project such as: a Drainage Act Section 78 Flowchart; a colour-coded Watershed Plan; Existing and Proposed Drain Capacity information; Peak Flow tables; Drain Profiles and Cross Sections; Photos of the Existing Conditions; Highway 400 crossing information; Aquatic and Terrestrial Species information; etcetera. A digital copy of the Display Boards was posted on the Town's website
- Handout sized copies of the Watershed Plan and the Drainage Act Flowchart
- Comment Cards for attendees who wished to receive a written answer to a question or who required follow-up by either Burnside or Town staff to information that was not readily available at the PIC

Burnside and Town staff were available during the three-hour Open House to discuss aspects of the project with stakeholders as well as answer as many questions as possible; some stakeholders were requested to put their question in writing on a Comment Card and informed that Burnside would get back to them with an answer.

3.5 Public Liaison Committee Meeting No. 3

A third PLC meeting was held on July 23, 2018 with 12 in attendance. An Agenda was distributed and approved after the start of the meeting. Like the previous meetings, attendees were brought up-to-date with a review of the main objectives of the project. The next major item of discussion was an update regarding the Highway 400 crossings. The discussions included but were not necessarily limited to the following:

- Correspondence and documents prepared by Burnside and sent to the Ministry of Transportation (MTO) (Hydrology Report first issued on May 17, 2018; re-issued on July 12, 2018);
- Meetings with the MTO Project Team; and
- Correspondence and presentations by the Town to MTO; and a pending delegation with the new Minister of Transportation at the upcoming AMO AGM and Annual Conference.

It was noted that to date that there has been no formal response received from MTO regarding the Burnside Hydrology Report issued in May.

Discussions then followed regarding the hydrology and the hydraulics as well as a general overview of the Burnside reports for each. Information presented included: the Hydrology Report published and distributed (as noted); a review of the variation in flows generated by Burnside in comparison to those by Dillon and the calibration of the Burnside model; the design flows (2-year standard, 2-year climate change and 2-year hybrid) and the resulting cross section for the drain; the on-going work on a Hydraulics Report; etcetera. It was indicated that the Hydraulics Report would complement the Hydrology Report and that each would be referenced in the Drainage Engineer's Report as well as form an Appendix therein; however, since these are stand-alone reports, it is not anticipated that there would be a lot of information repeated in the engineer's report.

The attendees were informed by the Burnside Team that although berms or dykes along the course of the Main Drain (as per the Dillon report) were considered, it is unlikely that they will form part of the proposed work under the engineer's report. The primary reason is due to the implications of Section 74 regarding their maintenance by the Town, the variance in the standard to which some have been constructed and that they are "all" currently private. Accordingly, there are also implications with respect to costs to either build them and or provide adequate allowances to incorporated them as part of the SICD Main Drain.

It was confirmed, that at this time, there is no proposal by Burnside or the Town to include or incorporate any stormwater management facilities as once directed by the Referee; the final Order dated November 4, 2014, relieved the Town from being bound by the March 31, 2005 Order. The removal of the two facilities proposed by Dillon is also supported in the hydrology and hydraulic modelling performed by Burnside.

It was also confirmed that although there would be reference in the engineer's report regarding the crossing(s) under Highway 400 and Reive Boulevard in so far as related to capacity and maximum invert (if any) elevation, these crossings will not be considered part of the project. It is anticipated that the MTO and the Town can work cooperatively on this infrastructure.

A representative from the NVCA was present and offered the following regarding this subject matter: *"NVCA engineering staff have completed a review of the hydrology report, NVCA will be providing comments that we will issued separately; accordingly, NVCA would like to report that it is in general agreement with the conclusions"*.

The next topic of discussion was a presentation regarding the various features being considered as part of the proposed work to hopefully satisfy the concerns of the DFO as well as to eventually obtain a necessary "Authorization" for the proposed work. To that end, attendees were informed that a formal Request for Review was submitted to the DFO earlier in July accompanied by a detailed and extensive Technical Memorandum. The concept and need for a "low-flow channel" was again explained; this is to minimize laminar flow in the drain, to attempt to create higher flow velocities and assist in the movement and transport of sediment; the proposed Main Drain profile and some drain cross sections were review and expanded upon.

Before the meeting concluded, attendees were provided with some information concerning a preliminary estimated cost for the project for the construction, allowances, contingencies, administration and financing and engineering. There was also a brief discussion regarding the approach being considered for the calculation of the various allowances under Sections 29 to 33 inclusive of the Act.

At the end of the Meeting, attendees were informed that Burnside will be presenting a project status update and the highlights of a "Draft" Drainage Report for the SICD Improvement to the Council and Staff on Wednesday, August 8, 2018. They will also be kept apprised of the Burnside progress, next steps and another meeting (if necessary).

3.6 Landowner Meetings

Burnside staff met with several landowners who have a portion of the SICD on one (or more) of their properties. The particulars of the project were discussed in general as well as some of the impacts to their respective property in particular; a meeting was held with the following:

1. Succession Financial Group Inc. (Roll No. 001-19400)
2. Cohn Farms Inc. (Roll No. 001-20000 and 001-20100)
3. Marques Gardens Ltd. (Roll No. 001-20300, 001-20600 and 001-20800)
4. N. Tasca (Roll No. 001-20400 and 001-20500)
5. Horodynsky Farms Inc. (Roll No. 001-20900)
6. 1281597 Ontario Inc. (Roll No. 002-12900)
7. 9847723 Canada Corporation (Roll No. 002-20600)
8. Kell Farms Ltd. (Roll No. 002-20700)

3.7 Landowner Discussions

A number of landowners were also contacted via telephone or email. For those that Burnside staff were able to reach, aspects of the project were discussed in general as well as the impact to their respective property in particular; the following were contacted:

1. 1523566 Ontario Ltd. (Roll No. 001-19200) – telephone and email
2. A. and M. Filice (Roll No. 001-19800) – voicemail
3. M. and G. Bordon (Roll No. 001-20200) – telephone
4. J. Chow (Roll No. 001-24200) – telephone
5. 1665328 Ontario Ltd. (Roll No. 002-26300) – email

4.0 Final Engineer's Report

The content of this Report, the proposed work and the associated costs contained herein are intended to reflect the wishes of most of the stakeholders and take into account the input and requests brought forward during the various PLC meetings, the PIC, and the stakeholder meetings and discussions. Details of the proposed drainage system are described in this Report, its Appendices and on the Drawings.

An extensive amount of information was collected during the various meetings, additional existing condition data was collected within the watershed in general and along the course of the drain in particular during the various site visits; this data was required to supplement the 2005 Dillion survey.

There were discussions with the affected landowners, the Town and representatives of the several agencies. Taking all the stakeholders' concerns and discussions into consideration, this engineer's report for the South Innisfil Creek Drain 2019 Improvement proposes a final drainage system which consists of the following:

- a Main Drain commencing at Sta. 0+000 in the north half of Lot 5, Conc. 14 and the downstream side of bridge on 15th Line, extending upstream to Sta. 9+918 at the south limit of Lot 12, Conc. 5 and the upstream side of the bridge on 5th Line;
- a Branch A (formerly the South Innisfil Drain Branch A) commencing at Sta. 0+000 in the south half of Lot 6, Conc. 1 and its outlet into the Main Drain at Sta. 1+715, extending upstream to Sta. 0+650 in the south half of Lot 7, Conc. 1 and the upstream side of the overflow culvert under Reive Boulevard (see Drawing No. 15);
- a 10 Sideroad Branch Drain commencing at Sta. 0+000 in the north half of Lot 10, Conc. 2 at its outlet into the Main Drain at Sta. 6+134 and the downstream side of the bridge on 10 Sideroad, extending upstream to Sta. 1+448 at the south limit of Lot 10, Conc. 4 and the upstream side of the culvert under the 4th Line;
- a 3rd Line Branch Drain commencing at Sta. 0+000 in the north half of Lot 11, Conc. 2 at its outlet into the Main Drain at Sta. 6+328 and the downstream side of the bridge on 3rd Line, extending upstream to Sta. 1+660 at the line between Lots 13 and 14, Conc. 2; and,
- a 3rd Line Spur Branch Drain commencing at Sta. 0+000 in the north half of Lot 12, Conc. 2 at its outlet into the 3rd Line Branch Drain at Sta. 0+895 and the downstream side of the culvert under 3rd Line, extending upstream to Sta. 0+780 at the line between Lots 13 and 14, Conc. 3.

5.0 Description of the Watershed

5.1 General

The sizeable watershed of the SICD can best be described as "bowl-shaped". The watershed basin can also be characterized as having sandy loam soils in the uplands, draining into a productive agricultural area on very flat, marshy lowlands. These lowlands support a sizeable Market Garden operation, especially in the area north of County Road 89, south of 3rd Line, east of Highway 400 and west of Yonge Street. The marshy lowland area is valued for farming, but being at a lower elevation as well as quite flat, it is also quite prone to flooding. A flood prone zone has been identified by Burnside as the lands (and roads) lying within (or below) the 228 metres above sea level (masl) contour. Flood damage to private property and crops has occurred after storms when flows in the drain exceed the capacity of the banks; this flooding can also be quite widespread because of the flat topography of the Market Garden.

The watershed of the SICD is complex, not only from the perspective of topography, but particularly in regard to drainage patterns. There are a significant number of tributaries and branch drains contributing to the drainage flows and complexity of the watershed. Unlike most watersheds, which have predominant downstream direction, SICD has sub-watersheds that start in one direction and then flow in a very different direction on their way to the Main Drain. This is most common in the lower watershed near Highway 400. Tributaries originating west of the highway cross to the east side, empty into the SICD, and then drain westerly under the highway again. There are two such tributaries draining land just upstream of Highway 400 and near 2nd Line.

Another tributary, called the Hnydczak Drain, services lands and roads to the south of County Road 89 and empties into the SICD immediately upstream of the Highway 400 culverts. Years ago, this Drain was redirected from under Highway 400, to the north along the east side of Reive Boulevard to the SICD Main Drain. This increased the amount of lands and roads contributing flow into the SICD upstream of Highway 400.

5.2 Location

The SICD is located within the Town and services most of the lands and roads in the southwest section. The Main Drain is generally located near the middle of this watershed and flows in a northeast to southwest direction from its crossing under 5th Line at its upstream limit (Sta. 9+918) to the crossing under 15th Line at its downstream limit and the proposed outlet (Sta. 0+000).

At its widest north-south extent, the watershed stretches approximately 14 km from the area north of 7th Line to 12th Line. At its widest east-west extent, it stretches approximately 10 km from the area east of Yonge Street to just east of County Road 27.

The lower portion of the SICD Main Drain passes under Highway 89 less than three kilometres east of Cookstown. The villages of Churchill and Fennel's Corner are also located within the watershed. The midpoint of the watershed is approximately 9 kilometres east of Cook's Bay and approximately 16 kilometres south of Kempenfelt Bay, both of which are part of Lake Simcoe.

The approximate drain locations are shown on the enclosed Plans.

5.3 Boundary

The exterior and interior watershed boundaries of the SICD are indicated on the various Watershed Plans and has been confirmed as part of the work undertaken. Prior to the preparation of this drainage engineer's report, an extensive Hydrology Report was issued on May 17, 2018. As part of the preparation of that Hydrology Report, a Burnside GIS terrain model was created using photogrammetric data acquired during an orthophoto collection mission. The drainage limits and surface flow analysis calculations for the catchment were delineated using ArcHydro/ArcGIS software. Further, field reconnaissance was undertaken, and existing drainage reports were reviewed and examined. Accordingly, Burnside was able to adjust the GIS terrain model to closely replicate the existing field conditions. The final watershed boundary delineated on the Plans in this report is a direct result of the model created for the Hydrology Report.

5.4 Area

The SICD watershed area has been determined to be 8,021.47 ha as illustrated on Plans within this Report as well as detailed in May 2018 Burnside Hydrology Report.

In the Dillon final drainage report, it was indicated that the existing watershed, as defined within the Town of Bradford West Gwillimbury and a portion within the Town, appeared to outlet into Innisfil Creek downstream of the existing municipal drain and was therefore not part of the SICD watershed and within the Dillon study area. However, Dillon also acknowledged that the area in question was included in a Hnydczak Drain Report prepared by J.K. Young Company in 1990. Regardless, the area and corresponding lands were not included nor were they assessed any costs as part of the Dillon final drainage report. The area not included in the Town of Bradford West Gwillimbury was approximately 279 hectares, and the area not included in the Town of Innisfil was approximately 250 hectares.

As detailed in Section 5.1 of the Hydrology Report, Burnside and Town staff completed field reconnaissance during a thaw period in January 2018 in an attempt to delineate and verify the drainage boundaries in this area of the watershed. These investigations allowed Burnside to characterize the low-lying area located to the southeast of the Tanger Outlet Mall. It is quite flat, widespread and contains tall vegetation, fallen trees and pockets of stagnant water. Given the relatively flat nature of this portion of the drainage area, we would anticipate the direction of outlet flows in this region to be quite sensitive to small alterations in topography, fallen trees, beaver dams, etcetera.

Accordingly, Burnside has verified that the runoff from this southern drainage area does in fact flow north towards the SICD, as shown in Figures 8, 9 and 10 respectively in the Hydrology Report. Furthermore, this is supported by a 1978 drainage engineer's report prepared by Ainley; they identified and included this approximately 450 ha area as entering the Hnydczak Drain and therefore, within the watershed of the SICD.

5.5 Length of Drains

The following are the lengths of the portions of the SICD that form part of this report:

- the Main Drain is approximately 9,918 m;
- the Branch A is approximately 650 m;
- the 10 Sideroad Branch Drain is approximately 1,448 m;
- the 3rd Line Branch Drain is approximately 1,660 m; and
- the 3rd Line Spur Branch Drain is approximately 780 m.

5.6 Soils Information

Surficial Soils

In addition to the following, Section 5.0 of the Hydrology Report also has information regarding the soils conditions and how they were part of the hydrological modelling. The Quaternary geology mapping for Simcoe County records the surficial soils within the watershed primarily as either Kettleby Till (a silt and clayey silt) or Newmarket Till (a sand to silty sand). The Market Garden area is mapped primarily as swamp and organic deposits of muck and peat. There are also other areas of coarse grained glaciolacustrine deposits, which consist of sand, gravel and minor silt gravel as well as areas of fine grained glaciolacustrine deposits, which consist of silt, clay, minor sand and diamicton mapped within the watershed.

Geotechnical

The Final Drainage Report prepared by Dillon included a copy of a Golder Associates Ltd. geotechnical investigation dated February 2007. This Geotechnical Investigation was consulted in the preparation of this Burnside Report.

Agricultural Soils

The Soil Map of Simcoe County (Soil Survey Report No. 29) published by the Canadian Department of Agriculture in 1959 was examined to determine the soil composition present with the SICD watershed. It indicates the major soil types as follows.

Uplands

- Bondhead loam (Bl) = a light grey, calcareous, loam and sandy till; good natural drain; smooth, moderately to steeply sloping topography; slightly to very stony.

There are pockets of other soils which include but may not necessarily be limited to: Bondhead sandy loam – steep phase (Bs-s); Dundonald fine sandy loam (Df); Dundonald sandy loam (Ds); Guerin loam (Gul); Sargent gravelly sandy loam (Stsl);

Smithfield silt loam (Sms); Smithfield silty clay loam (Smsc); Tioga loamy sand (Tis); and Tioga sandy loam (Tisl).

Lowlands

- Alliston sandy loam (Ans) = a grey, calcareous outwash sand; imperfect drainage; smooth, very gently sloping topography; stone free to moderately stony.
- Muck (M) = a well decomposed organic material over 1 foot deep underlain by rock, sand, silt or clay; with very poor drainage; with depressional topography; stonefree.

There are also pockets of other soils which include but may not necessarily be limited to: Schomberg silty clay loam (Shsc); and Simcoe silty clay loam (Sisc);

Agricultural Capability Ratings

Uplands

The Bondhead loam (Bl) soils in the uplands have an agricultural capability rating of 80% Class 1 with 20% Class 4 with a “T” limitation which denotes Topography; this subclass is made up of soils where topography is a limitation. Both the percent of slope and the pattern or frequency of slopes in different directions affect the cost of farming and the uniformity of growth and maturity of crops as well as the hazard of erosion.

Lowlands

The Alliston sandy loam (Ans) soils in the lowlands have an agricultural capability rating of 100% Class 3 with a “C” limitation which denotes Adverse Climate; this subclass denotes a significant adverse climate for crop production as 'median' climate which is defined as one with sufficiently high growing-season temperatures to bring crops to maturity.

The Muck (M) soils in the in the lowland Market Garden area have an agricultural capability rating of 100% Class 0 and are described as “Organic Soils (not placed in capability classes)”.

5.7 Land Use and Topography

The majority of the Market Garden is contained within the lowlands consisting primarily of a workable muck soil which is very productive for the various crops that are grown there, such as carrots, onions and potatoes. The muck soil by area represents approximately 10% of the total SICD watershed. Other workable agricultural land on non-muck soil which is also used for the production of cash crops (such as beans, corn, grain and sod) represents approximately 45% of the watershed. Approximately 35% of the watershed consists of a mix of pasture, forage type crops, marshy lands and partially forested areas. Roads and residential areas represent the remaining approximately 10% of the watershed.

The majority of the agricultural land within this watershed is privately owned. Further, and based on an examination of the available County of Simcoe aerial photography, it would appear as if the strongly undulating to rolling topography of the uplands does have some restriction on agricultural operations.

The elevation of the land on the perimeter of the watershed ranges from 60 metres to 80 metres higher than the lands near to or abutting the SICD Main Drain just east of Reive Boulevard; in the south near 12th Line there is an area approximately 90 metres higher (or at an elevation of 316 masl). These uplands slope moderately at gradients ranging from 4% to 6% before reaching the lowlands or the bottom of the watershed bowl, which are quite flat.

The elevation difference of the lowlands is quite small compared to the uplands; it ranges from a higher elevation of approximately 228 masl to a lower elevation of approximately 226 masl. Along the course of the SICD Main Drain, the lowlands extend from north of 3rd Line (Sta. 6+500) to east of Reive Boulevard (Sta. 2+300). Based on a review of Quaternary Geologic Mapping, the lowlands are a former glacial lake bottom which explains why this area is so flat and has very little overall relief in elevation.

5.8 Property Lines

Please note that the property lines/boundaries superimposed over the aerial photography and delineated on the Watershed Plan(s) contained in this Report were obtained from the Town's GIS Department. This data is quite accurate; however, it is not reproduced from a legal survey plan nor was it obtained from an Ontario Land Surveyor. Accordingly, the location of all property lines/boundaries are approximate and should only be used for reference purposes.

6.0 The Drainage Act, RSO, 1990, Chapter D.17

As indicated, a downstream extension of approximately 1,200 m is proposed for the SICD Main Drain from the crossing (bridge) on 5 Sideroad to the south side of the crossing (bridge) on 15th Line. This extension was considered appropriate by Burnside and the Town, as it would allow the incorporation of a portion of the channel downstream of 5 Sideroad that is obstructed by deadfalls and debris.

An examination of aerial photography of the area downstream of 15th Line reveals a well-established mature meandering watercourse with several oxbows developing throughout its course. The surrounding agricultural land also appears to be reasonably well buffered from the watercourse with plenty of meadows or pasture lands and wooded areas. Although there is some workable agricultural land near the watercourse, it was presumed to be on higher ground. This is supported in the Dillon Report in that the channel was observed by its survey team to be consistent in cross section (depth and width), supporting a noticeably higher base flow and higher velocity of flow compared to most of the drain upstream of Highway 89. Further, and although there were partial obstructions like log jams, smaller woody debris blockages and remnant beaver dams, Dillon indicated these obstructions were not significantly restricting flow in the watercourse. It was suggested by Dillon that major storm flows that overwhelm the watercourse periodically were likely buffered by the permeable sandy soils (during the non-winter months) and the visibly evident adjacent floodplain.

It was also noted Dillon was of the opinion that the cost to extend the Main Drain section at 5 Sideroad and link it with the next available municipal drain section downstream of County Road 27 would be substantial. The task of clearing a working space for the approximately 9 km long reach to allow for future access for drain maintenance, in addition to the providing adequate allowances for use (right-of-way), buffers and damages, would likely outweigh the benefits gained by surrounding agricultural lands. Based on discussions with stakeholders, Burnside is of a similar opinion.

In accordance with Section 15 of the Act, Burnside determined the south side of the bridge on 15th Line at Sta. 0+000 to be a sufficient outlet for the SICD and its respective branch drains and tributaries.

There was no petition submitted for the SICD in accordance with Section 4 of the Act, accordingly, there was no investigation of an area requiring drainage in accordance with Sections 8 or 9.

This Report has been prepared in accordance with Section 78 of the Act.

7.0 Design Criteria

The applicable sections of the *Design and Construction Guidelines for Work Under the Drainage Act*, as prepared by the Government of Ontario, and the applicable sections of the *Drainage Guide for Ontario*, OMAFRA Publication 29, are used for the design and construction of municipal drains.

A more recent 2018 document entitled *A Guide for Engineers working under the Drainage Act in Ontario, OMAFRA Publication 852* (Pub852) was also consulted.

Based on these guidelines, the recommended minimum design criterion for an open municipal drain is the 2-year return period storm. Accordingly, the various portions of the SICD that are proposed for improvement by deepening and/or widening were designed for a 2-year return period (referred to as standard peak flow in the Burnside

Hydrology and Hydraulics reports). Details of the design criteria for the SICD can be found in the Burnside Hydrology Report and the Hydraulics Report. A copy of each Report is contained in Appendix H.

8.0 Design Considerations

8.1 General

Details of the design considerations for the SICD can be found in the Burnside Hydrology Report and the Hydraulics Report (see Appendix H).

However, there are other considerations that the engineer should bear in mind during the design of a drainage system as referenced in Pub852; these include but are not necessarily limited to freeboard, climate change and alternative designs.

In Pub852 it is stated that *"The engineer should consider climate change when designing drainage works."* Freeboard is also referenced in Pub852 as a design safety factor; it is defined as the difference between the water surface elevation (for a design or specific hydrological event) within a drain and the surrounding land. Pub852 recommends a minimum freeboard of between 0.1 to 0.3 m.

The above was taken into consideration during the significant modelling exercise undertaken by Burnside. The analysis concluded that the existing drain geometry does not have the capacity to convey the 2-year standard peak flow in accordance with the design and construction guidelines. The 2-year standard flow could not be contained within the existing drain geometry as it (in the model) would spill out of the drain in many locations. Furthermore, due to the very flat topography in the Market Garden, the 2-year floodplain was challenging to quantify. Regardless, it became apparent that the existing drain geometry was insufficient to convey the 2-year standard flow; this is supported by the resulting historical flooding of the adjacent lands on either side of the drain.

Accordingly, detailed design of conveyance alternatives was examined including: revising the gradient of the existing drain bottom; deepening the existing drain; increasing the cross-sectional width; creating a low flow channel to support aquatic habitat; and proposing alterations to drain crossings that would not impede the 2-year flow. Based on the preferred design, the proposed conveyance improvements were analyzed hydraulically using HEC-RAS. The results of the proposed HEC-RAS analysis confirmed the containment of the 2-year standard peak flows, in accordance with the design and construction guidelines, while providing freeboard to accommodate future climate change impacts.

It is cited in Section 7.3 of the Hydraulics Report that the climate change 2-year peak flow was nearly double the standard flow. Accordingly, the geometry of a drain designed for climate change would have been significantly larger than that proposed; this would have been cost prohibitive.

Also referenced in Pub852 as an alternative design compared to a traditionally straight trapezoidal drain is a two-stage channel; such a design is more likely to mimic a channel that exists naturally. As recommended by the members of the Burnside Drain Team, as well as discussions with staff from DFO and NVCA, a two-stage channel has been selected as the preferred alternative for the portions of the SICD Main Drain proposed for improvement by deepening and widening. The reader is asked to refer to the applicable sections of this Report as well as the drawings for details.

8.2 Water Quantity

8.2.1 Main Drain

In discussions with the various stakeholders, members of the PLC and some of the affected landowners, it was indicated that the existing (sediment laden) Main Drain was lacking capacity. This lack of capacity was also referenced in the Dillon reports and supported by the both the Dillon and the Burnside modeling. Furthermore, discussions and concerns regarding the capacity of the drain have been well documented as part of the various meetings during the process being followed for this municipal drain in accordance with the Act.

The final design for this project is intended to respect the habitat within the existing drain as well as provide enhanced drainage for the lands and the roads within the SICD watershed by authorizing the proposed improvements to the Main Drain and the affected branches. Please refer to Section 9.0 – Proposed Work for specific details. Recognizing that the proposed design, geometry, hydrology and hydraulics are based on the Dillon survey data (2005 or 2011), the proposed improvements that should affect the capacity of the various sections or reaches of the Main Drain are as follows:

Sta. 0+000 to Sta. 1+224

There is no proposed widening, deepening or excavation in the existing Main Drain in Lot 5, Conc. 15 or the south part of Lot 5, Conc. 1 except upstream of Sta. 1+100 where it is intended to remove a large sediment bar. The capacity will remain as it is.

Sta. 1+224 to Sta. 2+165

A full length widening of the existing Main Drain in Lot 6, Conc. 2. The proposed capacity of the new drain should be adequate to convey a 2-year storm. Based on the specified gradient, there will also be some improvements made to the existing drain by removing the areas of sediment that are above the proposed drain bottom.

Sta. 2+165 to Sta. 2+280 (Highway 400 and Reive Boulevard)

The cleaning and flushing of any sediment and debris from the existing perched culverts under these roads as well as deepening the existing drain bottom to the proposed gradient line. The respective road authority for Reive Boulevard (Town) and Highway 400 (MTO) will be responsible for the installation/replacement/improvement of these crossings. Each authority will have the option to design and install an "interim" crossing capable of conveying at least the 2-year standard flow while maintaining a free-flowing condition under their roadway and not increasing water levels nor overtopping of the existing banks of the SICD Main Drain upstream. Alternatively, they have the option to design and install an "ultimate" crossing capable of conveying the flows as determined by their respective preferred design criteria events.

Sta. 2+280 to Sta. 3+350

A full length widening of the existing Main Drain in north part of Lots 7 and 8, Conc. 1. The capacity of the new drain will be based on the 2-year storm with some free board intended to accommodate future climate change impacts. Based on the specified gradient, there will also be significant improvement made to the existing drain by deepening the existing drain bottom to the proposed gradient line. However, it is also noted that until the perched culverts under Highway 400 and Reive Boulevard are lowered below the proposed gradient line, sediment is likely to accumulate in this reach of the drain to at least the elevation of the existing invert of those culverts.

Sta. 3+350 to Sta. 3+588

See the description for Sta. 2+280 to Sta. 3+350 as it applies to the Main Drain in the south part of Lot 8, Conc. 2. Similarly, and until the perched culverts under Highway 400 and Reive Boulevard are lowered below the proposed gradient line it is anticipated that sediment is also likely to accumulate in this reach to at least the elevation of the existing invert of those culverts.

Sta. 3+588 to Sta. 5+449

See the description for Sta. 2+280 to Sta. 3+350 as it applies to the Main Drain in south part of Lots 8, 9, and 10, Conc. 2. The perched culverts under Highway 400 and Reive Boulevard need to be lowered below the proposed gradient line so that sediment does not also accumulate in this reach to at least the elevation of the existing invert of those culverts; this corresponds to the proposed drain bottom elevation at approximately Sta. 4+000 which is 1,800 m upstream and extends over 400 m into this reach.

Sta. 5+449 to Sta. 6+355

See the description for Sta. 2+280 to Sta. 3+350 as it applies to the Main Drain in the north part of Lot 10 upstream to Sta. 6+134. For the portion of the Main Drain in the north part of Lot 11, Conc. 2 from Sta. 6+161 to Sta. 6+328, some widening of the existing Main Drain is proposed, and the capacity of the new drain should be adequate to convey a 2-year storm. The cleaning and flushing of any sediment and debris from under the existing bridges on these roads to the proposed gradient line is also required. All proposed drain bottom elevations for this reach are above the perched culverts under Highway 400 and Reive Boulevard.

Sta. 6+355 to Sta. 7+928

Some widening of the existing Main Drain in Lot 11, Conc. 3. The proposed capacity of the new drain should be adequate to convey a 2-year storm. Based on the specified gradient, there will also be improvements made to the existing drain by removing the areas of sediment that are above the proposed drain bottom.

Sta. 7+928 to Sta. 7+950 (4th Line)

The removal and replacement of the existing road crossing; the new crossing should have capacity to convey a 25-year storm as defined by MTO Directive B-100.

Sta. 7+950 to Sta. 9+950

Some spot cleanouts of the existing Main Drain in Lots 11 and 12, Conc. 4. The proposed capacity of the new drain should be adequate to convey a 2-year storm. Based on the specified gradient, there will also be improvements made to the existing drain by removing the areas of sediment that are above the proposed drain bottom.

8.2.2 The Two-Stage Channel and Base Flow

As discussed during some of the Public meetings, as well as brought forward in email correspondence and meetings with staff from the NVCA, there was meaningful dialogue regarding a two-stage channel. Furthermore, Burnside gave extensive consideration to the concept of and the applicability of a two-stage channel as the design solution for the improvement to the SICD Main Drain. Although the concept of a two-stage drain was acceptable as a solution, there were concerns relative to the capacity and geometry of the low flow portion of the drain in general. Of particular interest was an estimate of the base flow in the proposed low flow portion of the SICD and how it related to the overall channel geometry.

Burnside initially proposed a 4 m bottom for the low flow portion of the drain with 2H:1V side slopes, a depth of 0.6 m and a capacity of 0.84 m^3/s with a gradient of 0.05%; this drain geometry was discussed with staff from both DFO and NVCA. However, more recently, base flow was examined in more detail and the reader is referred to Section 7.2.5.1 of the Hydraulics Report for a complete analysis. When comparing the maximum capacity of a low flow channel with a 4 m bottom to one with a 3 m bottom and the other geometry identical to that described above, the smaller channel conveys 0.18 m^3/s (approximately 21%) less flow. However, this decrease in flow is minimal in comparison to the capacity of the SICD Main Drain under bank full flow.

Accordingly, it was decided that the "final" geometry of the low flow portion of the drain would be 3 m in width to address NVCA concerns regarding base flow (also see Appendix C). This 25% narrower width should also reduce the potential for laminar flow compared to a 4 m wide bottom thus being more satisfactory to both DFO and NVCA.

8.2.3 Tile Drains

There are no closed portions or tile drains that form part of the SICD; either the Main Drain, or any of the branch drains. Outlets from private tile drainage systems (random or systematic) into the SICD Main Drain and branches are existing and are permitted; however, they must be approved by the Town or its Drainage Superintendent. Further, it is recommended that the following measures be undertaken by the landowner:

- Each outlet shall be corrugated steel pipe or other acceptable rigid pipe, equipped with a rodent grate;
- Each outlet shall have a sufficient amount of adequately sized riprap placed on the drain bank on approved geotextile; the riprap shall extend a minimum of 1 m on each side of the outlet pipe and below the outlet pipe down to the toe of the slope on which it is located and to the drain bottom; size shall be sufficient with withstand the flow velocities in the drain under bank full flow conditions; and,
- Each outlet must be identified by an approved Tile Drain Outlet Marker; the marker must be of sufficient height to be seen above summer vegetation and growth.

Any outlet into the SICD Main Drain or any of the branch drains not approved by the Town or its Drainage Superintendent may be removed at the expense of the owner of the land upon which the outlet was made.

It is also recommended that filter sock be installed on any new perforated plastic drainage tubing used for any private random or systematic drainage. This should assist and minimize sediment entry into the private tiles and subsequent accumulation in the portions of the SICD Main Drain and branches.

8.3 Water Quality

8.3.1 General

Water quality in the drain should be addressed during construction due to the incorporation of various sediment controls. The quality of runoff entering the drain off the adjacent lands should be improved after construction because a permanent buffer strip will be established on each side of the SICD Main Drain and the four (4) branches; it should also continue to be addressed in the drain due to permanent sediment basins.

Other features or measures intended to address and improve water quality within and adjacent to the course of the SICD Main drain and branches as well as protect (and enhance) aquatic and terrestrial habitat during and after construction are as follows:

- Working within the various timing windows for the aquatic and terrestrial species that may exist in the drain or within the working space adjacent thereto;
- Removing log jams, deadfalls and remnant beaver dams;
- Removing and/or manipulating and placing woody debris to attempt to improve flow in the drain, to improve bank stability and to also address the sediment load and sediment deposition;
- Using sod mats (matting) during construction to help to stabilize part of the low flow channel bank and the outer edge of the floodplain bench;
- Using live stakes during construction to help to stabilize the outside bends of the overflow channel bank in combination with other protection measures;
- Increasing the drain bottom gradient in the Main Drain by twenty (20) percent from the 0.04% as per the 1956 Weir report to 0.05% from the upstream side of Reive Boulevard (Sta. 2+300) to downstream of the 10 Sideroad and 3rd Line (Sta. 6+120);
- Incorporating riffle features at locations to be determined upstream of Sta. 6+160;
- Salvaging and re-using and/or incorporating suitable substrate material for fish spawning at locations to be determined upstream of Sta. 6+355;
- Planting trees in designated (riparian) areas for bank shading; and
- All in-water aquatic features and measures installed by the Contractor shall be approved by and under the direct supervision of the Burnside Aquatic Ecologist.

8.3.2 Two-Stage Channel

As referenced in Pub852, an alternative to a traditionally straight trapezoidal drain is a two-stage channel; such a channel is not only more likely to mimic one that exists naturally, it also has several other advantages that can mitigate water quality impacts. A two-stage channel complete with a low flow portion to accommodate the base flow can promote higher flow velocity and the transport of sediment, reduce laminar flow and sediment deposition as well as decrease the frequency of drain maintenance. Stability can be improved by distributing the more erosive velocity of larger flows onto the wider floodplain bench. Vegetation (where possible) on the bench can provide shade for the low flow portion, reduce water temperature and provide terrestrial habitat. Aquatic habitat can be improved in the low flow portion as it allows for variation in the bed and some of the above features create refuge and cover. The vegetated benches also slow the velocity of larger flows and allow sedimentation to occur on the bench; this can reduce loading in the drain for nutrients bound to the sediment particles as well as provide uptake for the vegetation on the bench.

8.3.3 Sediment Controls

Erosion and sediment control measures are specified in this Report and will be incorporated before, during and after the construction of the drainage system.

Before any work is undertaken in a reach of the Main Drain, a temporary rock flow check dam will be installed at the upstream limit and at the downstream limit; the reaches are identified in Section 8.2.1. The dams are described in the Special Provisions and will remain in place for the duration of the construction in that reach.

During and after construction, the sediment basins that will be constructed along the course of the SICD Main Drain are also intended to address the sediment load within it.

During construction, the erosion and sediment controls are to be inspected and maintained by the Contractor on a regular basis and after each significant rainfall event; after construction, they will be maintained by the Town. The “temporary” measures are to remain in place until construction is complete and a permanent vegetative cover has been established. The temporary controls may be removed only when and as directed by the engineer or the Town.

The “permanent” measures are to remain in place after all of the construction has been completed and may not be removed.

8.3.4 Buffer Strips

A minimum 3 m wide buffer strip shall now be deemed to exist on each side of the various portions of the SICD from the top of the existing bank or the new drain bank (whichever is applicable), perpendicular to it and inland from it, along the entire length; on the Main Drain from Sta. 0+026 to Sta. 9+898 and along the entire length of each Branch Drain (see Section 5.5).

Sediment should have some opportunity to settle out of the overland flow and surface runoff within the buffer before entering the drain, helping to decrease pollution and silting problems in the downstream portions; crop residue, trash and debris should also have time to settle out and remain on the surface of the ground.

Should it be deemed necessary, or at the discretion of the Town or its Drainage Superintendent, steel T-bars or other suitable markers (painted in fluorescent orange or approved equal) may be set by the Town or its designate to delineate any part of any buffer strip at necessary intervals along the length of the drains described above.

8.3.5 4th Line Concrete Box Culvert

A Barefoot Box Culvert™ has been designed to promote groundwater upwelling while maintaining thermal conditions which is an acceptable precast replacement for watercourse crossings. Based on the ecological sensitivity of the site, both the form and function of the watercourse can be replicated, as well as the existing conditions. The culvert was designed to promote groundwater upwelling and discharge through strategically placed perforations in the bottom slab of the boxes. In addition, the design can incorporate strategically placed river stone simulating natural substrate and accommodating a meandering low flow channel within the structure. Some features of the Barefoot Box Culvert™ are: no footing that forms a barrier that blocks lateral ground water input; an end cut-off wall that promotes ground water upwelling into the perforations; an end cut-off wall that creates the required hydro-static pressure to promote groundwater upwelling; and the speed of construction, substantial cost savings, and ease of construction compare to a cast-in-place structure.

The existing pipes under the 4th Line on the SICD Main Drain will be remove and replaced with a Barefoot Box Culvert™.

8.4 Road Crossings

8.4.1 General

As part of this project, there are a number of road crossings on the **Main Drain**; the various crossings have been identified in Section 2.3 – Existing Conditions. Normal protocol governing municipal drain crossings of provincially and municipally-owned roads will be adhered to. Locates will be completed by the Contractor before any construction. The following are the road crossings affected by this drainage improvement project.

8.4.2 Highway 400 and Reive Boulevard

One of “major” goals of this municipal drain improvement project since inception was to address the impact of the crossings under Highway 400 and Reive Boulevard on the flows and the capacity of the SICD. To that end, there have been several studies completed by different consultants regarding the capacity, elevation and proposed designs for the replacement of these culvert crossings. The following description of the existing condition of the Highway 400 and the Reive Boulevard culverts has been extracted from a report entitled “Draft Drainage and Hydrology Report Preliminary Design Highway400 -1 km south of Highway 89 to the Junction of Highway 11” as prepared by AECOM and dated November 2016;

> *“Highway 400 Innisfil crossing (Culvert 44) consists of 3 CSPs - 2 arch pipes (4.4 m span and 2.6 m rise) and 1 circular pipe with a diameter of 1,800 mm, and total length of 46 m. The 1,800 mm diameter pipe carries the main drain of Innisfil Creek from the east to the west, while 2 arch pipes operate as relief culverts with the invert higher than the main drain by approximately 0.9 m. The original date of construction is 1946, and the culverts were rehabilitated under Contract 2010-2027, which included placing a concrete base slab along the floor of the culverts and a 100 mm thick shotcrete liner on the barrel walls. Innisfil Creek crosses a municipal road (Reive Boulevard) immediately upstream of Culvert 44. The Reive Boulevard culvert consists of a system of 2 large arch culverts (6.03 m*3.05 m) and 1 circular culvert (2,300 mm diameter). The configuration of the culverts under the 2 roadways is similar but not aligned. Current culverts have sufficient hydraulic conveyance capacity for all the storms up to and including the Regional storm, according to NVCA’s information. As it is proposed to widen Highway 400, the existing Culvert 44 under Highway 400 must be extended. The extension triggers the culvert set under Highway 400 and the culvert set under Reive Road to be connected. Highway widening also require this culvert to be extended westerly by 25 m.*
>
> *AECOM Ministry of Transportation Ontario Drainage and Hydrology Report Highway 400 from Highway 89 to Highway 11 Environmental Assessment and Planning and Preliminary Design 033017551_Hwy400_89_11_ Drn Hydrology Report _Draft_Final_11112016 With Draft Watermark .Docx 27Given that the total extension length (44 m) would have similar length of the existing culvert and the original CSP culverts were constructed 70 year ago, replacing the existing 2 sets of culverts with 1 concrete open footing culvert is recommended. The recommended hydraulic opening size is 12 m span and 2.8 m rise. The proposed structure will cross under Reive Boulevard (a municipal road). Further coordination with the Town of Innisfil and other stakeholders is required in the detail design stage. In the proposed condition, Reive Boulevard will follow a new alignment which would require the municipal drain to be realigned as well. The municipal drain design will be done by others. This realignment and potential impacts should be specifically addressed in the detail design stage.”*

8.4.3 Highway 400

Highway 400 is classified as a (rural) Freeway; accordingly, MTO policy (Directive B-100) indicates that the design flow for this crossing should be the 100-year storm. It was an Objective in the DRAFT engineer's report that the MTO improve the existing crossings as well as a Recommendation that the improved portions of the Main Drain accommodate the 2-year standard rainfall event; some portions (primarily the Market Garden) were intended to accommodate the 2-year but with freeboard for climate change. There are currently three (3) existing pipes (one CSP and two CSPA's) on the SICD under Highway 400, which already have a total combined span over 6.0 metres. However, the higher CSPA's are not always utilized due to perched inverts and two of the three pipes are at a reverse gradient.

As a result of various discussions and meetings with representatives from MTO on November 30, 2018, Burnside was requested to complete the necessary modelling to determine the sizing for a possible "interim" crossing(s) under Highway 400 capable of conveying the minimum design flows for the SICD Improvement project in accordance with its appointment under Section 78 of the Act, as governed by the applicable Guidelines, and as found in the Hydrology and Hydraulics Reports.

As requested, Burnside generated results for an interim solution capable of conveying the 2-year standard flow while maintaining a free-flowing condition and not increasing upstream water levels. The result was an additional four (4) - 2.40 m diameter CSP's, each with 0.36 m of bury; this is equivalent to a total end area of approximately 18 m^2. Four pipes are required in order to have a free-flowing condition under Highway 400 as well as to avoid any overtopping of the existing banks of the SICD Main Drain upstream. If overtopping was to occur, it would result in flood water spilling out into the floodplain in either direction perpendicular and adjacent to the drain.

As indicated in earlier Burnside correspondence, as well as incorporated into the modelling routines, the "maximum elevation" for the proposed drain bottom at the approximate centerline of any new crossing or structure under Highway 400 has been set at a geodetic elevation of 222.96; accordingly, a culvert(s) would need to be installed below this elevation.

As noted within the Hydrology, Hydraulics and engineer's reports, the SICD was designed to convey the 2-year standard flow but with some free board to address potential future climate change. Accordingly, and after constructed, the drain cross section upstream and downstream of Highway 400 is proposed to be capable of conveying flow in excess of the 2-year standard event; therefore, the interim solution may need to be larger than indicated.

Furthermore, it is unknown as to the when either the interim or an ultimate solution (presumably of a capacity based on MTO Directive B100) will be designed and constructed. Regardless, attention is drawn to two separate sections of the Drainage Act; namely, Section 26 “Increased cost, how borne …” as well as Section 69 “Road Authority, option to construct …”.

It is anticipated that this area of the SICD watershed upstream of this freeway will be less impacted once either an interim or ultimate structure is installed under both the Highway 400 and Reive Boulevard. Based on the proposed design criteria, either structure should allow the free-flow of accumulated runoff to pass under these two roadways and under the 2-year event and thereby reducing the number of nuisance flooding events from the more minor storms.

8.4.4 Reive Boulevard

As indicated by staff during various discussions and meetings, the Town may not be interested in an interim solution for the SICD crossing under Reive Boulevard. As requested, Burnside undertook preliminary design and modelling for a future “ultimate” structure or crossing under Reive Boulevard for the 25-year and the 100-year events.

It is noted that the Burnside model for the SICD was set up and configured for the 2-year event; as such, flows more than that would overtop the existing banks of the Main Drain and spill out into the floodplain which extends for some distance in either direction. To counter this, Burnside incorporated fictitious vertical walls on each side of the affected cross-sections to prevent overtopping thereby artificially increasing the resulting water elevation within the respective reach. Hence, the structure opening size that the model produced for both the 25-year and the 100-year event will probably be “conservative” as the model was not able to contain either event within the true cross-sections.

Accordingly, and on the assumption that the ultimate Highway 400 crossing(s) would not be a restriction, the model generated the following results for Reive Boulevard:

1. 25-year design = 17 m span x 3.7 m rise structure (which translates to a total end area of approximately 63 m^2); and

2. 100-year design = 20 m span x 4.5 m rise structure (which translates to a total end area of approximately 90 m^2).

The dimensions above would be subject to change based on a detailed engineering design; however, it is noted that the openings for each are less than the existing structure recently installed on Highway 89 (i.e., the Glass Bridge). It should be noted that if the Town choose to undertake an interim solution, four (4) additional culverts similar to the those proposed under Highway 400 would probably be required.

8.4.5 4th Line

The two existing CSP's under 4th Line and part of the Main Drain are proposed for removal and replacement as part of the improvement project. The design standard was the 25-year event and the resulting structure is proposed to be a 6.0 m wide x 2.5 m high x 19.0 m long precast concrete box culvert. A box was selected due to the existing 4th Line road profile and limited available cover over the new structure; it also significantly reduced the need to rebuild the two approaches for some distance both east and west of the proposed centerline of the new structure.

Furthermore, and in an effort to enhance the aquatic habitat through the proposed structure, as well as take advantage of any ground water upwellings in the area, a customized precast concrete box culvert has been designed as an acceptable replacement for existing watercourse crossings (see Section 8.3.5).

8.4.6 3rd Line

The existing CSPA under 3rd Line that is part of the 10 Sideroad Branch Drain is also proposed for removal and replacement as part of the improvement project. The design standard was the 10-year event and the resulting structure is proposed to be a 1.6 m diameter x 12.5 m long CSP culvert complete with a minimum of 160 mm of bury.

8.5 Berms and Dykes

It is known that material has been deposited along the existing drain banks on both sides of the of the SICD creating berms or dykes; they vary in height, are not contiguous and the extent of the flood protection they provide was not investigated. The impact of the existing private landowner's berm/dyke system was also discussed at various meetings and Burnside respects the landowner's right to protect their respective property(s).

It has been determined, that any existing berms or dykes will not be part of the SICD; accordingly, they will not be maintained by the Town or its Drainage Superintendent and shall remain private infrastructure. Furthermore, any berm or dyke removed as a result of the widening of the SICD will not be replaced or rebuilt.

9.0 Proposed Work

In accordance with Section 8.(1)(a) of the Act, the Specifications, Details, Plans and Profiles of the proposed work are contained in Appendices of this Report and provide complete details of the entire project. This Section is intended to provide only a brief description of the proposed work to be performed on the various reaches or sections of the Main Drain and the Branch drains.

9.1 Main Drain

9.1.1 Sta. 0+000 to Sta. 1+224

- Install temporary measures at Sta. 0+000 and Sta. 1+224 to catch floating debris.
- Remove deadfalls and debris from drain; brush and trim bank.
- Woody debris manipulation and placement as directed from Sta. 0+000 to Sta. 0+540.
- Excavate and remove sediment from Sta. 1+100 to Sta. 1+200; level spoil and seed.
- Plant trees as directed.
- Construct sediment basin as directed.

9.1.2 Sta. 1+224 to Sta. 2+165

- Install temporary measures at Sta. 1+224 and Sta. 2+165 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Clear the working space on north side from Sta. 1+224 to Sta. 1+650.
- Remove deadfalls and debris from drain; brush and trim bank.
- Excavate, deepen and widen the drain c/w grubbing and spoil treatment.
- Apply sod mats and seed as directed.
- Excavate a transition for the NWC at Sta. 1+710 left, for Branch A at Sta. 1+715 right and for the NWC at Sta. 1+890 left; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Place rip-rap complete with geotextile on two outside bends.
- Woody debris manipulation and placement as directed.
- Plant trees as directed.
- Construct sediment basins as directed.

9.1.3 Sta. 2+165 to Sta. 2+280 (Highway 400 and Reive Boulevard)

- Clean, flush and dispose of sediment and debris from the existing arches and culvert and install an interim crossing under Highway 400 **OR** remove and replace the existing crossings with an ultimate solution under Highway 400.
- Clean, flush and dispose of sediment and debris from the existing arches and culvert and install an interim crossing under Reive Boulevard **OR** remove and replace the existing crossings with an ultimate solution under Reive Boulevard.
- Excavate, deepen and widen the drain downstream of Highway 400, between Highway 400 and Reive Boulevard, and upstream of Reive Boulevard c/w spoil treatment; apply sod mats and seed as directed.

9.1.4 Sta. 2+280 to Sta. 3+350

- Install temporary measures at Sta. 2+280 and Sta. 3+350 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Trim existing trees; remove deadfalls and debris from drain; brush and trim bank.
- Excavate, deepen and widen the drain and stockpile spoil from Sta. 2+280 to Sta. 2+948.
- Excavate transition for the Hnydczak Drain Innisfil Section at Sta. 2+290 right and for the NWC at Sta. 2+550 left; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Excavate, deepen and widen the drain and stockpile spoil from Sta. 2+948 to Sta. 3+350.
- Excavate transition for Branch B at Sta. 3+060 right and for the 2nd Concession (south) Drain at Sta. 3+345 right; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Trim existing trees and dispose of debris; brush and trim banks if necessary; remove remnant beaver dams.
- Apply sod mats and seed as directed.
- Woody debris manipulation and placement as directed.
- Construct sediment basins as directed.

9.1.5 Sta. 3+350 to Sta. 3+588

- Install temporary measures at Sta. 3+375 and 3+588 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Clean, flush and dispose of sediment and debris from under existing bridge on 2nd Line.
- Excavate, deepen and widen the drain c/w spoil treatment from Sta. 3+375 to Sta. 3+588.
- Excavate a transition for the 2nd Concession (north) Drain at Sta. 3+375 right and for the NWC at Sta. 3+585 left; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Apply sod mats and seed as directed.
- Plant trees as directed.
- Construct sediment basins as directed.

9.1.6 Sta. 3+588 to Sta. 5+449

- Install temporary measures at Sta. 3+588 and 5+449 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Trim existing trees; remove deadfalls and debris from drain; brush and trim bank.
- Excavate, deepen and widen the drain c/w spoil treatment from Sta. 3+588 to Sta. 3+895.
- Clear an additional working space on north side from Sta. 4+880 to Sta. 5+320.
- Excavate, deepen and widen the drain and stockpile spoil from Sta. 3+895 to Sta. 5+449.
- Excavate transition for the tributary drains at Sta. 3+690 left, Sta. 3+895 left, Sta. 4+875 left and for the Prokopchuk Drain at Sta. 5+449 right; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Apply sod mats and seed as directed.
- Tree planting as directed from Sta. 3+590 to Sta. 3+880 and from Sta. 4+700 to Sta. 4+820.
- Place rip-rap complete with geotextile on two outside bends; install live stakes as directed.
- Woody debris manipulation and placement as directed.
- Construct sediment basins as directed.

9.1.7 Sta. 5+449 to Sta. 6+355

- Install temporary measures at Sta. 5+449 and 6+355 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Trim existing trees and dispose of debris from Sta. 5+450 to Sta. 5+460.
- Remove rap asphalt from Sta. 5+460 to Sta. 6+130 and stockpile as directed.
- Excavate, deepen and widen the drain and stockpile spoil from Sta. 5+449 to Sta. 6+134.
- Excavate the drain and load and haul spoil from Sta. 6+161 to Sta. 6+328.
- Excavate transition for the 3rd Line Branch Drain at Sta. 6+328 right; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Place riprap complete with geotextile on outside bend from Sta. 5+490 to Sta. 5+520, from Sta. 6+125 to Sta. 6+135 and from Sta. 6+320 to Sta. 6+330.
- Clean, flush and dispose of sediment and debris from under existing bridge on 10 Sideroad and 3rd Line.
- Apply sod mats and seed as directed.
- Woody debris manipulation and placement as directed.
- Construct sediment basins as directed.
- Construct riffle(s) from Sta. 6+161 to Sta. 6+355 as directed.

9.1.8 Sta. 6+355 to Sta. 7+928

- Install temporary measures at Sta. 6+355 and 7+928 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Trim existing trees; remove deadfalls and debris from drain; brush and trim bank.
- Excavate and pull back the work side bank and remove drain bottom high points from Sta. 6+355 to Sta. 7+298; spoil treatment and seeding.
- Excavate transition for the NWC at Sta. 7+080 right; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Place rip-rap complete with geotextile on outside bend from Sta. 7+180 to Sta. 7+210.
- Install new tile drain outlets completed with rip-rap and a marker.
- Apply sod mats and seed as directed.
- Woody debris manipulation and placement as directed.
- Construct sediment basins as directed.
- Construct riffles from Sta. 6+355 to Sta. 7+928 as directed.
- Construct gravel substrate areas from Sta. 6+355 to Sta. 7+928 as directed.

9.1.9 Sta. 7+928 to Sta. 7+950

- Remove and replace existing 4th Line road crossing pipes with a new precast concrete box culvert.

9.1.10 Sta. 7+950 to Sta. 9+918

- Install temporary measures at Sta. 7+950 and 9+918 to catch floating debris.
- Install a Temporary Rock Flow Check Dam at each end of the reach/section.
- Trim existing trees and dispose of debris; remove deadfalls and debris from drain; remove remnant beaver dams; brush and trim bank.
- Excavate and pull back the work side bank and remove drain bottom high points from Sta. 7+950 to Sta. 9+950; spoil treatment and seeding.
- Excavate transition for the NWC at Sta. 8+245 right; place rip-rap complete with geotextile on the transition; spoil treatment and seeding.
- Place riprap c/w geotextile on outside bend from Sta. 8+315 to Sta. 8+325; from Sta. 8+505 to Sta. 8+515; from Sta. 8+545 to Sta. 8+555; and from Sta. 9+040 to Sta. 9+050; install live stakes as directed.
- Install new tile drain outlets complete with rip-rap and a marker.
- Apply sod mats and seed as directed.
- Tree planting from Sta. 8+900 to Sta. 9+040 as directed.

- Woody debris manipulation and placement as directed.
- Construct sediment basins as directed.
- Construct riffles from Sta. 7+950 to Sta. 9+950 as directed.
- Construct gravel substrate areas from Sta. 7+950 to Sta. 9+950 as directed.

9.2 Branch A

- Install a Temporary Rock Flow Check Dam at downstream end of the Branch.
- Clear the left drain bank from Sta. 0+000 to Sta. 0+500 as directed; trim existing trees, remove deadfalls and debris from drain; brush and trim bank.
- Excavate and deepen (and if necessary widen) the Branch from Sta. 0+000 to Sta. 0+500; spoil treatment and seeding.
- Remove and replace existing crossing with new CSP at Sta. 0+222.
- Place rip-rap complete with geotextile on outside bend from Sta. 0+230 to Sta. 0+240.

9.3 10 Sideroad Branch Drain

- Install a Temporary Rock Flow Check Dam at downstream end of the Branch.
- Remove and replace existing 3rd Line road crossing pipe with a new CSP.
- Complete a ditch bottom only cleanout of the Branch from Sta. 0+031 to Sta. 0+371; load and haul spoil; and seed.
- Clean, flush and dispose of sediment and debris from three existing residential crossings.
- Complete a ditch bottom only cleanout of the Branch from Sta. 0+371 to Sta. 1+000; spoil treatment and seeding.
- Excavate and deepen (and if necessary widen) the Branch from Sta. 1+000 to Sta. 1+425; spoil treatment and seeding.
- Clean, flush and level sediment and debris from three existing agricultural crossings.
- Clean, flush and level sediment and debris from 4th Line road crossing.

9.4 3rd Line Branch Drain

- Install a Temporary Rock Flow Check Dam at downstream end of the Branch.
- Complete a ditch bottom only cleanout of the Branch from Sta. 0+000 to Sta. 0+895; spoil treatment and seeding.
- Clean, flush and level sediment and debris from 8 existing crossings from Sta. 0+000 to Sta. 0+895.
- Complete a ditch bottom only cleanout of the Branch from Sta. 0+895 to Sta. 1+660; load and haul spoil; and seed.
- Clean, flush and dispose of sediment and debris from seven existing crossings from Sta. 0+895 to Sta. 1+660.

9.5 3rd Line Spur Branch Drain

- Install a Temporary Rock Flow Check Dam at downstream end of the Branch.
- Clear the working space on left side of the Branch from Sta. 0+172 to Sta. 0+430.
- Complete a ditch bottom only cleanout of the Branch from Sta. 0+000 to Sta. 0+780; spoil treatment and seeding.
- Clean, flush and level sediment and debris from two existing crossings.

9.6 Working Spaces and Access Routes

The working space and the access routes being provided to the Contractor to undertake the construction of this drain are described in Appendix F – Special Provisions and on the Table entitled “Working Space and Access Routes”. This working space and the access routes shall also be available for future maintenance in accordance with Section 74 of the Act when undertaken by the Town or its Drainage Superintendent. Access to the working space via the various routes shall be confirmed by the Contractor with the engineer or Drainage Superintendent prior to commencement of construction. In accordance with Sections 29 and 30 of the Act, allowances for the working space and the access routes have been provided to the affected properties. Access to the various parts of the drain (also see the Access Routes Plan) shall be as follows:

9.6.1 Main Drain

The various access routes being provided for the work on the SICD Main Drain are listed and described as indicated above. There are three locations where there is no existing entrance (to a field or a lane) off of one of the existing road rights-of-way. For the three locations, and based on an investigation, there is no significant roadside ditch to cross in order to gain entry into the designated field where the access route has been proposed; accordingly, it is hoped the locations are acceptable to the Town and there will not be any concerns which cannot be mitigated.

9.6.2 Branch A

The working space for the portion of this Branch Drain from approximately Sta. 0+000 to approximately Sta. 0+500 shall be from the left side. The single access route AR3 for the Main Drain shall also be used for the proposed work on this Branch Drain.

9.6.3 10 Sideroad Branch Drain

The working space for the portion of this Branch Drain from approximately Sta. 0+031 to approximately Sta. 0+371 shall be from the west shoulder of 10 Sideroad (County Road 54). The Contractor shall be governed by all applicable Traffic Controls, obtain all necessary Permits and undertake all of the work in this section of this branch drain as directed by the County of Simcoe.

The working space for the portion of this Branch Drain from approximately Sta. 0+371 to approximately Sta. 1+425 shall be from the left side and is on only one private property. Accordingly, three access routes being provided to get to the working space shall be via the three existing field entrances off of the west side of the 10 Sideroad at Sta. 0+412, Sta. 0+660, Sta. 1+228, and the fourth access shall be off of the Town's right-of-way on the south side of the 4th Line.

9.6.4 3rd Line Branch Drain

The working space for the portion of this Branch Drain from approximately Sta. 0+000 to approximately Sta. 0+895 shall be from the right side and several private properties. Accordingly, the various access routes being provided to get to the working space shall be via the existing field entrances off of the south side of the 3rd Line. There will be no access allowed via the residential driveway to Roll No. 002-12400.

The working space for the portion of this Branch Drain from approximately Sta. 0+895 to approximately Sta. 1+660 shall be from the south shoulder of 3rd Line. The Contractor shall be governed by all applicable Traffic Controls, obtain all necessary Permits and undertake the work as directed by the Town.

9.6.5 3rd Line Spur Drain

The working space for the portion of this Branch Drain from approximately Sta. 0+019 to approximately Sta. 0+780 shall be from the left side and two private properties. Accordingly, the two access routes being provided to get to the working space shall be via the two existing entrances off of the north side of the 3rd Line.

9.7 Benchmarks

There were a limited number of benchmarks (only five) provided by Dillon and listed on their drawing set. Accordingly, Burnside will complete the necessary field work to establish a complete and extensive Benchmark Database, tied to geodetic datum, prior to the construction of the proposed works. The new benchmarks should allow the Contractor to construct the works as specified herein. Furthermore, and in accordance with Section 13 of the Act, every attempt will be made to *"establish sufficient benchmarks or permanent levels"* such that the Drainage Superintendent can properly maintain the drain in the future; Burnside will include the Drainage Superintendent in the establishment of the Benchmark Database.

9.8 Change Orders

As described in the Disclaimer, there may be portions of the SICD in the field that may no longer be accurately represented by the data collected by Dillon. As a result, the proposed stationing and amount of some of the habitat enhancement features and proposed work required during the construction of the SICD may not be entirely as specified in this Report or as indicated on the various Drawings. If unexpected conditions are encountered after the adoption of this Report, Burnside staff may make modifications in the field and/or issue Change Orders as required to have the works on the drain properly constructed to meet the established design criteria and agency approvals. A Change Order shall be considered a revision such as the location or station of the removal or placement of and/or the amount or extent of (but not necessarily limited to the) the following: fallen trees; riprap; woody debris; sedimentation basin; gravel substrate; riffle structure; temporary rock flow check dam; etcetera.

Furthermore, all necessary Approvals, Authorizations and Permits have not been obtained from the Agencies so there may be a need to make some revisions to the Special Provisions that govern the work so that the successful Contractor can undertake it in compliance with the Approvals, Authorizations and Permits. Accordingly, any such required revisions shall be considered to fall under this heading.

Any revisions and resulting Change Orders authorized under this Section of this Report would not affect the overall design gradient or the cross sections or the design capacity of the proposed improvements.

10.0 Environmental Agencies

10.1 General

With any Municipal Drain project, consideration must be given as to whether the drainage works has the potential to affect the environment. Various items of the work, as proposed within this Report are intended to mitigate and offset, wherever possible, potential construction and improvement impacts to the existing aquatic and terrestrial habitat within the SICD Main Drain and Branches as well as the adjacent working space. After the completion of this project, it is Burnside's desire and intent to have designed and constructed a drainage system that respected and hopefully enhanced the existing natural environment while at the same time provided improved drainage for the affected lands and roads within the watershed.

DFO, MNRF and NVCA were each notified and contacted regarding the various aspects of the drainage works under their respective jurisdiction. Some of the details of the liaison with each agency is outlined in the following sub-sections.

Although Burnside is awaiting a formal response from DFO and MNRF, the necessary Authorization or Letter of Advice (LOA) will be procured from both DFO and MNRF before commencing any of the proposed construction work.

10.1.1 Department of Fisheries and Oceans (DFO) Canada

It was known from the outset of this project that the SICD was classified as fish habitat. Furthermore, the impact zone and the receiving watercourse for the drain and its outlet is a natural watercourse known as the Innisfil Creek, which is an upper tributary of the Nottawasaga River.

At the beginning of the project by Dillon, the NVCA had a Fish Habitat Agreement with DFO, and NVCA was therefore the first point of contact regarding matters involving a fishery and habitat. After changes to the Fisheries Act, DFO dissolved its agreements with the conservation authorities in the province near the end of 2013. Thereafter, it became necessary to contact DFO directly about municipal drainage projects and any impact they might have on a local fishery and fish habitat.

An inspection of the entire Main Drain was completed in April and May 2018 by the Burnside Aquatic Team, the Town Drainage Superintendent and members of the Burnside Engineering Team as were discussions regarding the proposed work. Burnside is proposing to implement some natural channel design techniques; namely, woody debris manipulation and placement, constructing sediment basins, constructing riffles, and constructing or placing gravel substrate, sod matting and live staking in various areas under the direction of the Engineer. It is also proposed to incorporate the use of woody debris to improve drainage, as well as address and satisfy the concerns regarding the fishery and habitat.

On July 11, 2018, Burnside submitted a formal written “Request for Review” in order to move the project forward towards eventually procuring either an Authorization or a LOA from DFO. Burnside received a formal reply from the DFO Fisheries Protection Biologist assigned to review the file on August 31, 2018 as well as confirmation the project had been given DFO File No. 18-HCAA-00950.

After several discussions and emails, an On-Site meeting was conducted with the assigned DFO Biologist on October 2, 2018; a second Biologist was in attendance as was the Burnside Aquatic Ecologist, the Town Drainage Superintendent and the engineer. Various portions of the SICD Main Drain were inspected to observe the existing conditions; at each location the proposed work was discussed as well as the proposed mitigation and offsetting measures.

At the end of the meeting there was an understanding that the Biologist would respond to Burnside identifying the acceptable offsetting measures discussed that day and those proposed in Burnside "Request for Review" and accompanying Technical Memorandum submitted back in July. The DFO Biologist was requested to: outline any other practical and implementable offsetting measures; provide specific comments and concerns regarding the various portions of the drain that were inspected; and provide a proposed date for a conference call with the Burnside SICD Drain Team as well as the DFO Supervisor to discuss the project and offsetting measures.

A meeting with two DFO Biologists was held on November 26, 2018 in Burlington and three members of the Burnside team to further review the file and to determine, in principal, if the Burnside team was in alignment with DFO regarding the implementation of the proposed work and the various offsetting measures such that an Application for Authorization could be submitted to DFO for review and subsequent approval.

Since the November meeting with DFO, there were further discussions regarding the offsetting measures and a GIS Referenced Plan was created to submit to DFO as part of the Application; two additional techniques known as live plantings and sod matting were also considered to offset some of the proposed work. A meeting was held with a Contractor that specializes in restoring natural waterways, who pioneered the technique of sod matting and is quite familiar with the implementation of live plantings.

Taking all of the above into consideration, Burnside is confident that the various offsetting measures proposed and submitted as part of an Application for Authorization to DFO on January 31, 2019 will be deemed acceptable to the Fisheries Biologist assigned to review and approve the file. Burnside is awaiting a formal response, will satisfy and address al DFO concerns and comments and will procure the necessary Authorization prior to commencing the construction.

Furthermore, and where applicable, reference has been made to the DFO document entitled "Guidance for Maintaining and Repairing Municipal Drains in Ontario", Version 1.1, May 23, 2017 by R.J. Kavanagh, L. Wren and C.T. Hoggarth, Central and Arctic Region. This document shall be considered to form part of this Report and the Special Provisions.

10.1.2 Ministry of Natural Resources and Forestry (MNRF)

The MNRF Midhurst District was contacted in late 2018 regarding the project and its potential to impact Species at Risk (SAR) protected under the Endangered Species Act, 2007 (ESA) that have the potential to be located within the study area. The Management Biologist was initially contacted by phone to discuss: the project; the proposed work; the SAR potentially located within the study area and the existing habitat conditions therein, developed based on a review of available background and database information; as well as previous field observations within the area of the SICD and reporting completed by Dillon in 2010-2012.

Via email correspondence dated December 20, 2018, the MNRF Biologist was requested to provide feedback and advice as to whether there would be SAR concerns within the "working space" required to undertake the proposed improvements to the SICD. The working space (and access routes to it), as outlined in Section 9.6 of this report, will extend into adjacent agricultural lands, a golf course, meadows, rural residential property and wooded areas adjacent to but beyond the drain. The Biologist was asked if some intrusion into the meadowland and wooded habitat would represent an impact to identified SAR and a subsequent need for mitigation planning under the drainage act exemption of O.Reg. 242/08 or if potential impact to SAR might be avoided with the implementation of appropriate timing for work to be completed outside of the active season for the identified SAR.

Prior to the filing of this Report, an email response was received from the MNRF Management Biologist dated January 25, 2019. It is anticipated that the work may require registration with the MNRF under the exemption in O.Reg. 242/08 – Section 23.9 Drainage Works, including a description of the activity, potential impacts, the threatened or endangered species involved and development of a Mitigation Plan.

Prior to construction, it is presumed that Burnside will be required to undertake additional ground truthing along the route of the SICD and the adjacent working spaces to assess the presence of SAR in order to prepare a Mitigation Plan complete with strategies to address the impact to SAR that may potentially be located within the study area.

Based on the communication with the MNRF Management Biologist, recommended mitigation measures include; that vegetation clearing (including grubbing) and/or structure works (construction) be avoided during the period between April 1 to October 31 to reduce the risk of potential impact to wildlife during the active window for the following.

- breeding birds (broadly from April 1 to August 31);
- turtle (Mid-May to end of July);
- monarch (end of May through end of August); and,
- bat (broadly from April 1 to October 31).

Accordingly, and considering there are multiple timing windows; namely, those for the in-water work respecting aquatic habitat and species, and those for the vegetation clearing respecting terrestrial habitat and species, all construction related activities will need to be coordinated to work within acceptable timing restrictions and recommendations. Site preparation may need to be completed earlier in accordance with the vegetation clearing timing restriction or additional mitigation planning may be required, in consultation with the MNRF. Future communication with the MNRF is anticipated.

10.1.3 Nottawasaga Valley Conservation Authority (NVCA)

Members of the Burnside team first met with staff from NVCA on February 21, 2018 to present the concept of a two-stage channel for the proposed improvement to the existing SICD for discussion and to solicit feedback as to its acceptability. There were also discussions regarding some of the initial mitigation measures Burnside was considering as well as the forthcoming Hydrology Report that would be issued for formal review and comment. The final Hydrology Report was completed and submitted to NVCA (and others) on May 17, 2018.

A second meeting was held on June 7, 2018 to review and discuss the progress made on the design as well as various other aspects of the project. The status of the NVCA review of the Hydrology Report was also discussed as well as the progress Burnside was making regarding fisheries and habitat and a formal submission to DFO. As a courtesy, a copy of the "Request for Review" submitted to DFO was also issued to NVCA via email on July 11, 2018 for their review and general information.

Prior to the July 23, 2018 PLC Meeting, Burnside received an email on July 20, 2018 indicating NVCA engineering staff had completed a review of the Hydrology Report and, although NVCA would have a few comments that would be issued separately, NVCA was in general agreement with the conclusions. A representative from the NVCA then attended the July 23, 2018 PLC Meeting. During the meeting, the representative commented on their general acceptance of the Burnside Hydrology Report.

The Draft Hydraulics Report was completed and submitted to the Town on August 21, 2018 via email, complete with a downloadable link; it is understood that a copy of this Draft Report was forwarded to NVCA (and MTO) for review and comment.

On December 14, 2018, Burnside received a written response from NVCA. The NVCA letter included six comments regarding the review of the Hydrology and the Hydraulics Reports, and Burnside issued a reply dated February 6, 2019; see copies in Appendix C. Once the comments from NVCA have been satisfied, Burnside will procure the necessary Permit for the proposed work prior to commencing the construction.

The final Hydraulics Report was completed and submitted to stakeholders on February 1, 2019 in a manner similar to that for the draft.

11.0 Description of Appendices

11.1 Appendix A – Cost Estimate and Allowances

11.1.1 General

In accordance with Section 8(1)(b) of the Act, this Appendix provides a breakdown of the total estimated cost of **$5,265,000.00** for the proposed work, including all labour, materials, construction, contingencies, engineering, administration and allowances.

Included in the overall cost of the project, and as provided to Burnside, are costs for Dillon Consulting which have been carried by the Town in the amount of $1,025,087.03. The reader is requested to refer to the schedule entitled "Assessments; Dillon Consulting Fees" in Appendix B for a breakdown of the portion of these fees to be levied to the lands and roads within the watershed of the SICD Main Drain; the fees have been levied on an equivalent area basis to the entire watershed. This portion is intended to reflect the value of the services provided by the previous engineering consultant that can be considered recoverable or useful to the watershed for the purposes of the preparation of this Report. The balance not to be borne by the watershed has been levied to the Town.

In accordance with Section 8(1)(d) of the Act, this Appendix also provides a breakdown of the allowances provided under Sections 29, 30 and 33 of the Act. Allowances will be deducted from total assessments in accordance with Section 62(3) of the Act. The land and crop values used for these calculations were determined based on available assessed land values data provided by the Town and a general understanding of the crops produced in the geographic area in general and in this watershed in particular. Additional sources were also consulted including OMAFRA Publications, other drainage practitioners and landowners. A summary of the allowances provided under each Section of the Act is included in this Appendix. The detailed allowance calculations regarding any clearing, the drain widening, the working space, the buffers, the spoil treatment zone and the access routes are included in Appendix D.

11.1.2 Section 29 – Right-of-Way (Use)

The Act states:

> *"The engineer in the report shall estimate and allow in money to the owner of any land that it is necessary to use,*
>
> *[1] for the construction or improvement of a drainage works;*
>
> *[2] for the disposal of material removed from drainage works;*
>
> *[3] as a site for a pumping station to be used in connection with a drainage works; or*

> *[4] as a means of access to any such pumping station, if, in the opinion of the engineer, such right of way is sufficient for the purposes of the drainage works,*
>
> *the value of any such land or the damages, if any, thereto, and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works R.S.O. 1990, s. 29."*

In this Report, depending on the predominant use of the affected property, a base value in dollars per hectare has been applied to the calculation of the allowances for all land it is necessary to "use" for "right-of-way" for the construction and for the future maintenance of this drain. Where applicable, a "right-of-way" allowance has been provided for the widening of the drain (one side only), a 3 m buffer on each side of the drain, a working space beyond the buffer (working side only) and where necessary a spoil treatment zone beyond the working space on the side of the drain where the work is to be undertaken. Full value has been applied to the areas taken out of production for the widening; however, the areas still available to the owner had a reduced equivalency factor applied. The various base values for the predominant uses are detailed at the top of the respective worksheet and the equivalency factors are at the bottom.

A right-of-way allowance was also calculated for the land that will be necessary to use for the access routes to the drain for both the construction and for future maintenance.

No permanent buildings, structures or plantings will be allowed to be erected or installed within the right-of-way or working space areas. In addition to the respective worksheet, the reader is referred to Section 9.6 of the Report and to Drawing 2.

11.1.3 Section 30 – Damage

Section 30 of the Act states:

> *"The engineer shall determine the amount to be paid to persons entitled thereto for damage, if any, to ornamental trees, lawns, fences, lands and crops occasioned by the disposal of material removed from a drainage works and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works, R.S.O. 1990, c. D.17, s. 30."*

In this Report and depending on the predominant use of the affected property, a base value in dollars per hectare has been applied to the calculation of the allowances for all land it has been determined that it may be necessary to "damage" during the construction of this drain. Complete loss of the crop has been assumed on only the working side of the drain for the year of the construction for the specified width of the area. Where applicable, a "damage" allowance has been provided for the widening of the drain, the 3 m buffer, the working space beyond the buffer and where necessary the spoil treatment zone beyond the working space where the work is to be undertaken. The various base values for the predominant uses are detailed at the top of the respective worksheet and the equivalency factors are at the bottom.

There are three (3) known cisterns that are deemed necessary to be removed and relocated because of the proposed work or the widening of the drain; the respective owner has been provided with a "damage" allowance under Section 30 of the Act. The cistern allowance is intended to compensate the owner for the necessary work to remove and reinstall the cistern at a suitable offset (as provided by the engineer) from the new top of the drain bank including the realignment of any header or lateral tile(s) and any associated (underground or overhead) electrical work. It is recommended that these cisterns be removed and relocated by the owner prior to the construction of the drain; accordingly, each owner shall contact the engineer to determine the adequate offset distance and have it confirmed and established on each affected property.

For the known fences that are deemed necessary to be removed and relocated because of the proposed work or due to the widening of the drain, the respective owner (using the 1979 Line Fences Act "right-hand rule" as a guide) has been provided with a "damage" allowance under Section 30 of the Act. Any existing fence that crosses the drain will be removed by the Contractor at the time of construction and the allowance is intended to compensate that owner for reinstalling it.

11.1.4 Section 33 – Loss of Access

Section 33 of the Act states:

> *"Where the engineer thinks it expedient to make an allowance for loss of access to an owner instead of providing for the construction or the replacement, enlargement or other improvement of a bridge, the engineer shall in the report provide for payment to the owner of such amount as appears just by way of allowance for loss of access and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works. R.S.O. 1990, c. D.17, s. 33."*

In this Report, review and regard was given to providing an allowance for loss of access to the properties along the length of the Main Drain and along the various Branch Drains. Firstly, the OMAFRA Agricultural Drainage Infrastructure Program Administrative Policies were consulted and reviewed, particularly Section 2.3.i.vi. Secondly, and in determining such an allowance, the use of the land was taken into consideration either based on observations from the other site visits or available data. To that end, and taking the above into consideration, the allowances for loss of access are as indicated in Appendix A and D.

It is to be noted that the two (2) crossings on the south part of Lot 9, Conc. 2 and on the two properties identified by Roll No. 001-20000 and by Roll No. 001-20400 shall be installed within 2 years of the completion of the construction of the SICD Main Drain (or earlier if the owner elects to do so).

11.2 Appendices B and D – Assessments and Assessment Details

11.2.1 General

In accordance with Section 8(1)(c) of the Act, these Appendices show the distribution of the total estimated cost over the lands and roads involved and are in accordance with Sections 21, 22, 23, 24, 25, 26 and 28 of the Act. Affected private lands that are agricultural, within the meaning of the Act, should be eligible for any grants that may be available through OMAFRA. The engineering and administration costs have been assessed out over the entire drain.

In accordance with Section 8(1)(c) of the Act, these Appendices show the distribution of the total estimated cost over the lands and roads within the watershed. Assessments under the auspices of the Act are levied by the engineer in accordance with Sections 21 to 28 inclusive. The sections of the Act that apply to this drainage project are described as follows. Affected private lands that are agricultural, within the meaning of the Act, should be eligible for any grants that may be available through OMAFRA. The engineering and administration costs have been assessed out over the entire drain.

11.2.2 Sections 21, 22 and 23

Section 21 of the Act states:

> *The **engineer** in the report shall assess for benefit, outlet liability and injuring liability, and shall insert in an assessment schedule, in separate columns, the sums assessed for each opposite each parcel of land and road liable therefor. R.S.O. 1990, c. D.17, s. 21.*

Section 22 of the Act states:

> *Lands, roads, buildings, utilities or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit. R.S.O. 1990, c. D.17, s. 22.*

Section 23 of the Act states:

[1] Lands and roads that use a drainage works as an outlet, or for which, when the drainage works is constructed or improved, an improved outlet is provided either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek or watercourse, may be assessed for outlet liability.

[2] If, from any land or road, water is artificially caused by any means to flow upon and injure any other land or road, the land or road from which the water is caused to flow may be assessed for injuring liability with respect to a drainage works to relieve the injury so caused to such other land or road.

[3] The assessment for outlet liability and injuring liability provided for in subsections (1) and (2) shall be based upon the volume and rate of flow of the water artificially caused to flow upon the injured land or road or into the drainage works from the lands and roads liable for such assessments.

[4] The owners of the lands and roads made liable to assessment only under subsection (1) or (2) shall neither count for nor against the petition required by section 4 unless within the area therein described R.S.O. 1990, c. D.17, s. 23."

As is the case with most municipal drains, there will be a Section 22 and/or Section 23 assessment levied to the lands and roads within the watershed of this drain. In addition, there will be specific costs assigned to some owners/lands for any item or works specific to that property; see the definition in Section 11.2.7.

There have been Specific Benefit assessments (denoted as flood reduction benefit) levied to the lands and roads within the flood prone area. Defined as being below the 228.00 m contour, these lands should experience less flooding from the smaller rainfall events following construction. These lowlands are heavily impacted by the Main Drain's current lack of capacity to convey the 2-year standard flow. The proposed design and improvements will increase the capacity of the Main Drain to convey the 2-year standard flow with additional freeboard in most locations thus mitigating flows from spilling out and onto the adjacent lands, predominantly the Market Garden with its very flat topography.

11.2.3 Section 24

Section 24 of the Act states:

> *"The engineer may assess for special benefit any lands for which special benefits have been provided by the drainage works. R.S.O. 1990, c. D.17, s. 24."*

There were no Section 24 assessments levied in this Report.

11.2.4 Section 25

Section 25 of the Act states

> *[1] The council of the local municipality may direct the engineer to assess as a block, a built-up area designated by the council, and the sum assessed therefor may be levied against all the rateable properties in the designated area proportionately on the basis of the assessed value of the land and buildings. R.S.O. 1990, c. D.17, s. 25 (1).*
>
> *[2] (2) Where the engineer makes a block assessment under subsection (1), the engineer shall designate the proportion of the assessment to be charged against the public roads in the designated area. R.S.O. 1990, c. D.17, s. 25 (2)."*

There were Section 25 assessments levied in the Dillon Report to the Village of Churchill. There was no direction of the Town Council to do so as part of the preparation of this Report; accordingly, there are no Section 25 Assessments herein.

11.2.5 Section 26

Section 26 of the Act states:

> *"In addition to all other sums lawfully assessed against the property of a public utility or road authority under this Act, and despite the fact that the public utility or road authority is not otherwise assessable under this Act, the public utility or road authority shall be assessed for and shall pay all the increase of cost of such drainage works caused by the existence of the works of the public utility or road authority R.S.O. 1990, c. D.17, s. 26."*

A Section 26 increased cost assessment has been levied to the Ontario Ministry of Transportation for the crossing(s) under Highway No. 400 and likewise to the Town for the crossing(s) under Reive Boulevard. A significant amount of time and effort was spent on communication, hydrologic modelling and meetings with the MTO and Town staff regarding the existing condition of these crossings, their impact on the existing free flowing condition of the SICD Main Drain and the proposed improvements required. At the time of writing this Report, there has been no proposed design for any crossing under these roads; this will be undertaken by the respective road authority. Accordingly, the increased cost does not relate to any estimated construction and is only an estimate of the engineering. This Section 26 assessment will not be adjusted.

A Section 26 increased cost assessment has also been levied to the crossing under the 4th Line on the Main Drain and the crossing under the 3rd Line on the 10 Sideroad Branch Drain as detailed within this Report. The increased cost for installing each road crossing has been assessed to the Town, as well as an estimated administrative charge for the onsite inspection of the construction. The remaining administrative and engineering costs for the crossing have been charged to the Town as Specific Benefit under Section 22 of the Act and will be prorated. This Section 26 assessment will be adjusted to reflect the actual cost of the works after construction.

11.2.6 Section 28

Section 28 of the Act states:

> *"Where any lands or roads in or under the jurisdiction of a local municipality, other than the local municipalities into or through which the drainage works passes, are, in the opinion of the engineer of the initiating or other municipality doing the work or part thereof, benefited by the drainage works or provided with an improved outlet or relieved from injuring liability, the engineer may assess the cost of the construction, improvement, maintenance or repair of the drainage works in the same manner as is provided in section 27. R.S.O. 1990, c. D.17, s. 28."*

There will be Section 28 assessments levied in this Report to the Town of Bradford West Gwillimbury.

11.2.7 Todgham Method Explained

The estimated costs have been assessed to all affected lands and roads in accordance with the appropriate Sections of the Act, and in general following what is commonly referred to as the *"Todgham Method"*. This is a manner or system of determining assessments that is generally accepted by the drainage engineering community as being fair and equitable. The basics of this method are explained here, whereas the details of the assessments for this Drain are included in Appendix D.

a) **Equivalent Areas** – In order to conform to Section 23(3) of the Act, an "equivalent area factor" is applied to all lands and roads within the drainage area. This factor is established for each parcel of land within the drainage area and is dependent on the particular characteristics of that land; the prime characteristics being land use and topography. In this way *"... the volume and rate of flow of the water artificially caused to flow ... into the drainage works ..."* is established on a relative basis for *"... the lands and roads liable for such assessments."* The equivalent area factors for this Drain are shown in Appendix D and using this information, a Section Data Table is prepared for the drainage area for each part of the Drain.

b) **Sections of the Drain** – Based on sub-drainage areas and property lines, the subject Drain or Drains are divided into various Sections for assessment purposes, normally with Section 1 being at the downstream end. These Sections are shown on the Section Data Table. The equivalent areas within and upstream of each Section are also determined and are shown on this Table.

c) **Costs for Each Section** – A total cost for each Section is calculated and includes all costs, such as materials, construction, allowances, engineering and administration. The total of these sectional costs must equal the total project cost including any special assessments made in accordance with Sections 24 and 26 of the Act. The Section Costs table for this project is shown in Appendix D.

d) **Assessment for Benefit**– To completely understand the assessment process, the reader must be aware of the definition of "benefit" contained in Section 1 of the Act. Standard practice is to make an assessment for benefit only to those properties upon which the work is actually done or to those properties adjacent to where the work is actually done, when the drain is located on or near the boundary between 1 or more properties.

e) **Outlet Liability Assessment** – An understanding of "outlet liability", as defined in Section 1 of the Act, is also required to comprehend the assessment process. Standard practice is to also make an assessment for outlet liability to any and all lands and roads that are within the drainage area since, in some manner, runoff from those lands will use all or part of the Drain as an outlet.

f) **Direct Outlet Assessment** – This term is used to describe the assessment for outlet made to those lands within each section of the Drain that outlet directly into that section. For example, if there are 15 equivalent hectares within the sub-drainage area of Section 3 of the Drain, these 15 equivalent hectares gain direct outlet to the Drain somewhere within the length of Section 3 and can be assessed for the outlet obtained within that section. This assessment is not separately defined in the Act and is usually included with benefit when assessments are calculated.

g) **Variation of Assessments throughout the Length of the Drain** – When engineers calculate assessments, they must decide; (1) what portion of the cost of each section will be assessed as benefit and direct outlet to the land upon which the Drain is being constructed, and (2) what portion will be assessed as outlet to the lands and roads upstream of that section. It is generally accepted that the benefit and direct outlet portion of a downstream section is comparatively low, since most of the capacity of the Drain is being provided as outlet for the upstream lands. Conversely then, the benefit and direct outlet portion of an upstream section is normally high, since most of the capacity there is being provided for the land upon which the Drain is being constructed. Normally; therefore, for a downstream section of the Drain, the portion of the cost assessed as benefit and direct outlet is low, and the portion assessed as outlet is high while, for an upstream section of the Drain, the portion of the cost assessed as benefit and direct outlet is high, and the portion assessed as outlet is low. Taken to the extreme, that is to the last upstream property in the drainage area, all of the cost of any work done on that property would be assessed to it as benefit and direct outlet, since there are no other lands upstream thereof that can be assessed for outlet.

h) **Actual Assessment Calculations for a Typical Section of the Drain** – The process used for the calculation of the assessments for each section of the Drain is generally the same. A brief description of this process follows. Reference to a typical "Sectional Assessment Worksheet" should assist the reader with this description by matching the numbers in the square brackets (i.e., [#]).

[1] ***Cost/Eq. Ha. from D/S*** – This figure is the cumulative outlet assessment per equivalent hectare that is brought forward from the previous section (where applicable).

[2] ***Total Section Cost*** – This is the total sectional cost, as previously explained.

[3] ***Specific Costs*** – These are costs for specific items that are considered to apply only to a particular property or road and not to all the lands within the drainage area. These costs can be Section 24 Assessments, Section 26 Assessments or "specific" benefit assessments. The total of all specific costs is calculated and deducted from the Total Section Cost to leave the "Remainder to Assess". These specific assessments are then posted to the particular property or road in the Summary Table.

[4] ***Normal Outlet*** – At this point in the process, the engineer uses professional judgment and experience to establish the percentage of this "Remainder to Assess" that should be assessed as Normal Outlet to the lands and roads upstream of this section. The balance will then be the amount to be assessed as Normal Benefit and Direct Outlet to the lands and roads in this section.

[5] ***Equivalent Area Drained*** – This is the equivalent area that is upstream of the subject section of the Drain. The portion of the cost that has been determined to be assessed as outlet for this section is then divided by this equivalent area. This results in the amount per equivalent hectare that is to be assessed as outlet to those upstream lands and roads for this section. This amount is then

transferred to the "Cumulative Cost/Eq. Ha. carried U/S" item at the bottom of the worksheet.

[6] ***Remaining for Normal Benefit and Direct Outlet*** – This figure is the amount remaining to be assessed after subtracting the outlet assessment amount.

[7] ***Direct Outlet*** – At this stage, the engineer uses professional judgment and experience to establish the length of this section of the Drain that is used by each parcel of land within the section. The calculation, as shown on the worksheet, is then made to determine the "Direct Outlet" assessment for each of these parcels. These "Direct Outlet" assessments are then transferred to the Summary Table. The "Total of Direct Outlet" amount is then subtracted from the previous sub-total to provide the amount "Remaining for Normal Benefit".

[8] ***Remaining for Normal Benefit*** – This figure is the Normal Benefit assessment levied against the lands within this section. It is then transferred to the appropriate location in the Summary Table.

[9] ***Summary Table - In Section*** – This is the listing of the parcels of land within this section of the Drain. The assessments determined for each of these parcels are posted in this Table.

[10] ***Summary Table - U/S of Section*** – This is where the properties that use only this section of the Drain, and outlet through those downstream, are listed and the outlet assessments applicable to each are posted. These assessments are calculated by multiplying the equivalent area of each property listed by the Cumulative Cost/Eq. Ha. carried U/S.

[11] ***Sub-Total*** – This is the total of the assessments levied within this section of the Drain.

[12] ***Cumulative Total*** – This is the total of all the assessments levied to this point on the Drain.

i) **Initial Reconciliation of Total Assessments –** When all sectional assessments have been completed, they are reconciled, and the totals established per property.

j) **Final Fairness Test –** The engineer then reviews the reconciled totals from above, comparing each one with all of the others, to ensure that, in his/her opinion, each property has been dealt with fairly as compared with every other property. If any unfairness appears, this is adjusted out until the engineer is satisfied that all assessments are fair and in balance, having in mind the actual conditions in the field.

k) **Schedule of Assessments –** When the engineer is satisfied with the final assessments, the Schedule of Assessments is prepared. The Schedule of Assessments for Main Drain, Branch 'A', 10 Sideroad Branch Drain, 3rd Line Branch Drain, 3rd Line Spur Branch Drain, Dillon Consulting Fees (Main Drain) and the Main Drain and Branches are provided in Appendix B.

11.3 Appendix C – Agency Correspondence

The Burnside correspondence with MTO, MNRF and NVCA has been provided in Appendix C.

11.4 Appendix E – Standard Drain Specifications

In accordance with Section 8(1)(a) of the Act, this Appendix contains the Standard Drain Specifications that have been provided and that will govern the work described herein.

11.5 Appendix F – Special Provisions

In accordance with Section 8(1)(a) of the Act, this Appendix provides the Special Provisions which are the specific directions to the Contractor(s) for this project in particular and detail those requirements not encompassed in Appendix E – Standard Drain Specifications. Special Provisions shall take precedence over the Standard Drain Specifications where a conflict between the two documents may exist.

11.6 Appendix G – DFO Correspondence and Related Documentation

The Burnside correspondence with DFO has been provided in Appendix G.

11.7 Appendix H – Hydrology and Hydraulics

The Burnside Hydrology and Hydraulics Reports have been provided in Appendix H.

11.8 Appendix I – Drawings

In accordance with Section 8(1)(d) of the Act, this Appendix provides the various Drawings that have been included within this Report and which generally consist of an Access Routes Plan, various Watershed Plans, Culvert Drawings and Details, various Profiles, various drain Cross Sections and Municipal Drain Details, all pertinent to the future construction of the SICD 2019 Improvement.

12.0 DFO Monitoring Program

In accordance with the various discussions and meetings with the DFO as well as requested by the staff at the DFO, a Monitoring Program is required and is likely to be a condition of the (subsequent) Authorization to be received under the Fisheries Act 2013.

Post construction monitoring, and any required repair or remediation work, will take place after the construction of the SICD Drain. Monitoring will be performed as described in the Monitoring Plan in Section 9.4 of the South Innisfil Creek Municipal Drain Improvements, DFO Authorization Report (DFO File No. 18-HCAA-00950) contained in Appendix G of this report. Burnside proposes to monitor conditions after the spring freshet, during extreme low-flow periods in the summer and in the fall.

Burnside will monitor the conditions with regards to the proposed offsetting measures listed including but not necessarily limited to the following: sod-matting, seeding and live staking; woody debris; river stone; sediment basins; riffle-pool structures; bank erosion; and tree plantings. Also, to be monitored will be fish usage of features added to the Drain, including spawning habitat and fish passage through culverts.

Burnside will monitor the above conditions over a period of 5 years. Burnside is proposing to monitor 1 and 2 years after construction and then again in year 5. This monitoring schedule is subject to change if there are any issues with the offsetting measures. Please also see Section 9.6 of the DFO Authorization Report for contingency measures that are in place in case the offsetting measures do not function as intended.

13.0 Maintenance

13.1 General

While the Town shall be responsible for the maintenance of the South Innisfil Creek Drain 2019 Improvement after the construction is complete, the sections of the Act dealing with obstruction of and damage or injury to a municipal drain, namely Sections 80 and 82 respectively, are brought to the attention of the landowners. As can be seen from these Sections, both the landowners and the Town have responsibilities to ensure that a Municipal Drain is properly maintained and not abused.

Proper maintenance of the existing and proposed works described herein will be necessary to ensure that all parts continue to function properly. The maintenance and integrity of open drains are especially important since these conduits often provide an outlet for either the closed portions of a municipal drain or private drainage systems.

This maintenance should include regular inspections and any subsequent and necessary work along the entire length of the SICD Main Drain and the four Branch drains. Inspections should ensure that all open drains, sediment basins, permanent sediment control measures, aquatic features, drain bank protection, splash pads, outlet pipes and rodent grates, spillways, surface water inlets and private tile drains remain unobstructed by trash, debris or sediment and are cleaned on a regular basis. As well, any areas of washout, drain bank and/or bottom erosion, settlement or slumping should be attended to immediately.

Landowners involved with this Drain should make regular inspections of the portion(s) on their property and immediately report any problems to the Town so that the Drainage Superintendent can take proper action. It will also be necessary to maintain any permanent sediment control measures that form part of the drainage works.

13.2 Maintenance Assessments

Future maintenance costs incurred on the various portions of the South Innisfil Creek Drain 2019 Improvement; namely, the Main Drain, Branch 'A', the 10 Sideroad Branch Drain, the 3rd Line Branch Drain and the 3rd Line Spur Branch Drain shall be distributed in accordance with the terms of the Drainage Act and at the expense of all of the lands and roads assessed **using <u>ONLY</u> the total of the Section 22 Benefit Assessments and the Section 23 Outlet Assessments from the appropriate Schedule of Assessments for Construction as contained in Appendix B** and in the same relative portions until such time as they are varied in accordance with the Drainage Act. Please note that Section 26 assessments and Dillon Consulting Fees assessments are not to and do ***<u>NOT</u>*** form part of the future maintenance costs.

An exception to the above is that the MTO shall be entirely responsible for the maintenance of the portions of the South Innisfil Creek Drain 2019 Improvement and the various crossings (bridges and/or culverts) located within and under its ROWs; namely; Highway 400 and Highway 89.

Further to the above, the County of Simcoe shall be entirely responsible for the maintenance of the portions of the South Innisfil Creek Drain 2019 Improvement and the various crossings (bridges and/or culverts) located within and under its ROWs; namely, 5 Sideroad (County Road 53) and 10 Sideroad (County Road 54).

Lastly, the Town shall be entirely responsible for the maintenance of the portions of the South Innisfil Creek Drain 2019 Improvement and the various crossings (bridges and/or culverts) located within and under the Town's various ROWs.

13.3 Future Connections to the Municipal Drain

Any future connections and/or outlets into the SICD Main Drain and the four Branch drains must be made in a manner acceptable to the Town. Direct connections and/or outlets by the owners or their Contractors may not be permitted unless approved by the Town or its Drainage Superintendent; connections not approved may be removed and at the expense of the owner of the land from which the connection and/or outlet was made.

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Appendix A

Allowances and Cost Estimate

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Appendix A1

Allowances

APPENDIX A1 - ALLOWANCES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot	Owner	Roll No.	Right of Way (Sect.29)	Damages (Sect.30)	Loss of Access (Sect.33)	Total
		Main Drain					
15	Pt Lot 5	1833044 Ontario Ltd	072-15900	4,570	730	500	5,800
1	S Pt Lot 5	Ministry Of Transportation	001-01100	220	-	-	220
1	S Pt Lot 5	1665328 Ontario Ltd	001-01200	3,130	350	500	3,980
1	Pt Lot 6	A. Moir & H. Minns	001-01400	18,270	6,310	1,000	25,580
1	N Pt Lot 6	2367808 Ontario Inc	001-02800	3,540	1,090	500	5,130
1	N Pt Lot 7	Succession Financial Group Inc	001-19400	28,250	38,130	137,500	203,880
1	N Pt Lot 8	1523566 Ontario Ltd	001-19200	18,700	4,280	-	22,980
2	S Pt Lot 8	P. Chiodo	001-19700	6,020	3,220	300	9,540
2	S Pt Lot 8	A. & M. Filice	001-19800	10,340	4,770	15,000	30,110
2	S Pt Lot 9	Cohn Farms Inc	001-20000	7,810	4,030	45,000	56,840
2	S Pt Lot 9	Cohn Farms Inc	001-20100	8,870	14,090	-	22,960
2	Pt Lot 9	Marques Gardens Ltd	001-20300	8,870	14,240	45,000	68,110
2	S Pt Lot 9	L. & N. Tasca	001-20400	7,220	3,830	45,000	56,050
2	S Pt Lot 10	L. & N. Tasca	001-20500	16,600	18,600	-	35,200
2	Pt W1/2 Lot 10	Marques Gardens Ltd	001-20600	10,440	5,610	15,000	31,050
2	Pt Lot 10	Marques Gardens Ltd	001-20800	15,050	8,060	-	23,110
2	N Pt Lot 10	Horodynsky Farms Inc	001-20900	37,580	18,930	-	56,510
2	N Pt Lot 11	1281597 Ontario Inc	002-12900	3,040	1,760	-	4,800
3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis	002-13700	3,670	2,040	-	5,710
3	S Pt Lot 11	E. Carbone	002-13600	1,930	470	200	2,600
3	S Pt Lot 11	K. Costain & D. Goodwin	002-13500	1,960	470	200	2,630
3	S Pt Lot 11	N. & M. Makrigiorgos	002-13400	1,840	440	200	2,480
3	S Pt Lot 11	S. Scholten & D. Ransom	002-13300	1,860	440	200	2,500
3	N Pt Lot 11	9847723 Canada Corporation	002-20600	15,800	3,640	-	19,440
4	Pt S1/2 Lot 11	D. & K. Gray	002-20910	1,730	300	-	2,030
4	Pt S1/2 Lot 11	M. & M. Alves	002-20912	3,080	940	-	4,020
4	S Pt Lot 11	Kell Farms Ltd	002-20700	8,770	2,570	-	11,340
4	N Pt Lot 11	1665328 Ontario Ltd	002-26400	130	100	-	230
4	Pt S1/2 Lot 12	M. & L. Valente	002-20918	200	10	-	210
4	Pt S1/2 Lot 12	Innisfil Churchill Investment	002-20920	210	10	-	220
4	Pt S1/2 Lot 12	A. Tuzi	002-20922	170	10	-	180
4	N Pt Lot 12	1665328 Ontario Ltd	002-26300	6,570	1,560	100	8,230
			Total - Main Drain	**256,440**	**161,030**	**306,200**	**723,670**
		Branch 'A'					
1	Pt Lot 6	A. Moir & H. Minns	001-01400	3,050	920	-	3,970
1	Pt Lot 6	Ministry Of Transportation	001-02100	1,760	540	-	2,300
			Total - Branch 'A'	**4,810**	**1,460**	**-**	**6,270**
		10 Sideroad Branch Drain					
3	Pt Lot 10	A. Fox & B. Scott	001-23800	-	-	100	100
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	001-23900	-	-	100	100
3	S Pt Lot 10	Y. Cil	001-24100	-	-	100	100
3	Pt Lot 10	J. Chow	001-24200	7,350	2,630	100	10,080
			Total - 10 Sideroad Branch	**7,350**	**2,630**	**400**	**10,380**

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

APPENDIX A1 - ALLOWANCES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot	Owner	Roll No.	Right of Way (Sect.29)	Damages (Sect.30)	Loss of Access (Sect.33)	Total
		3rd Line Branch Drain					
2	N Pt Lot 11	1281597 Ontario Inc	002-12900	1,720	1,470	100	3,290
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	002-12800	2,000	1,760	100	3,860
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	002-12700	2,000	1,760	100	3,860
2	N Pt Lot 12	P. & K. Horodynsky	002-12600	2,020	1,770	100	3,890
2	N Pt Lot 12	Horodynsky Farms Inc	002-12500	2,020	1,770	100	3,890
2	N Pt Lot 12	1281597 Ontario Inc	002-12400	1,220	1,270	100	2,590
2	N Pt Lot 12	J. Horodynsky	002-12300	820	740	100	1,660
2	N Pt Lot 12	S. Sharma	002-12200	-	-	100	100
2	N Pt Lot 12	D. & I. Chouryguine	002-12100	-	-	100	100
2	N Pt Lot 13	K. Yamamoto	002-12000	-	-	100	100
2	N Pt Lot 13	O. & R. Goncalves	002-11900	-	-	100	100
2	N Pt Lot 13	T., Q. & M. Palmieri	002-11800	-	-	100	100
2	N Pt Lot 13	T. Risi	002-11700	-	-	100	100
2	N Pt Lot 13	D. Evers	002-11600	-	-	100	100
			Total - 3rd Line Branch Drain	**11,800**	**10,540**	**1,400**	**23,740**
		3rd Line Spur Branch Drain					
3	S Pt Lot 12	T. & C. Xenophontos	002-14300	860	290	100	1,250
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	002-14400	3,550	2,650	100	6,300
			Total - 3rd Line Spur Branch Drain	**4,410**	**2,940**	**200**	**7,550**
			TOTAL ALLOWANCES	**284,810**	**178,600**	**308,200**	**771,610**

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Appendix A2

Cost Estimate

APPENDIX A2 - PROJECT COST ESTIMATE
South Innisfil Creek Drain - 2019 Improvement

The estimate of the cost of all labour, equipment and material required to construct this project is as follows:

Note **SP** refers to the **Special Provisions** (in Appendix F) to reference for additional details of work.

SP Item	Description	Approx. Quantity	Cost Estimate
Main Drain			
9.1	**Sta. 0+000 to Sta. 1+224**		
	Install permanent rock flow check dam	1 ea.	15,750
	Install block nets for fish exclusion	L.S.	3,150
	Removal of fallen trees and debris	4 ea.	1,050
	Clearing and brushing along drain	15 hr	1,580
	Sediment removal and spoil treatment	70 m	2,310
	Woody debris manipulation and placement	L.S.	7,480
	Permanent sediment basin construction	1 ea.	2,630
	Tree plantings along drain	140 m	740
	Seed disturbed areas	450 sq.m	470
9.2	**Sta. 1+224 to Sta. 2+165**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Removal of fallen trees and debris	10 ea.	2,630
	Clearing and brushing along drain	8520 sq.m	17,890
	Topsoil stripping	4410 cu.m	9,260
	Channel excavation	16790 cu.m	105,780
	Spoil treatment	16700 cu.m	6,400
	Confluence excavation and bank stabilization	5 ea.	32,760
	Place sod mats	930 sq.m	14,650
	Woody debris manipulation and placement	L.S.	14,970
	Permanent sediment basin construction	3 ea.	7,880
	Tree plantings along drain	260 m	1,360
	Seed disturbed areas	10500 sq.m	11,030
	Miscellaneous construction costs	L.S.	1,310
9.3	**Sta. 2+165 to Sta. 2+280**		
	Road crossing cleanout	6 ea.	12,600
	Channel excavation	200 cu.m	1,260
	Spoil treatment	260 cu.m	2,730
	Place sod mats	10 sq.m	160
	Seed disturbed areas	120 sq.m	130

SP Item	Description	Approx. Quantity	Cost Estimate
9.4	**Sta. 2+280 to Sta. 3+350**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Removal of fallen trees and debris	5 ea.	2,090
	Topsoil stripping	3660 cu.m	7,690
	Channel excavation	24370 cu.m	153,530
	Spoil treatment	24400 cu.m	6,410
	Confluence excavation and bank stabilization	4 ea.	11,460
	Place sod mats	1070 sq.m	16,850
	Woody debris manipulation and placement	L.S.	9,980
	Permanent sediment basin construction	5 ea.	13,130
	Seed disturbed areas	60 sq.m	12,770
9.5	**Sta. 3+350 to Sta. 3+588**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Road crossing cleanout	1 ea.	3,150
	Topsoil stripping	1110 cu.m	2,330
	Channel excavation	5760 cu.m	36,290
	Spoil treatment	5760 cu.m	1,510
	Confluence excavation and bank stabilization	2 ea.	4,420
	Place sod mats	230 sq.m	3,620
	Permanent sediment basin construction	1 ea.	2,630
	Tree plantings along drain	205 m	130
	Seed disturbed areas	2750 sq.m	2,890
9.6	**Sta. 3+588 to Sta. 5+449**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Clearing and brushing along drain	2200 sq.m	4,620
	Topsoil stripping	3630 cu.m	7,620
	Channel excavation	37540 cu.m	236,500
	Spoil treatment	47 cu.m	14,500
	Confluence excavation and bank stabilization	6 ea.	22,760
	Live stake on drain bends	200 m	1,060
	Place sod mats	1350 sq.m	21,260
	Woody debris manipulation and placement	L.S.	9,980
	Permanent sediment basin construction	6 ea.	15,750
	Tree plantings along drain	410 m	270
	Seed disturbed areas	21020 sq.m	22,070
9.7	**Sta. 5+449 to Sta. 6+355**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Clearing and brushing along drain	100 sq.m	210

SP Item	Description	Approx. Quantity	Cost Estimate
9.7	**Sta. 5+449 to Sta. 6+355 (cont'd)**		
	Topsoil stripping	580 cu.m	1,220
	Road crossing cleanout	2 ea.	6,300
	Channel excavation	13890 cu.m	87,510
	Spoil treatment	890 cu.m	3,640
	Confluence excavation and bank stabilization	3 ea.	12,220
	Place sod mats	890 sq.m	14,020
	Woody debris manipulation and placement	L.S.	2,490
	Permanent sediment basin construction	2 ea.	5,250
	Seed disturbed areas	7410 sq.m	7,780
	Miscellaneous construction costs	L.S.	2,810
9.8	**Sta. 6+355 to 7+928**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Removal of fallen trees and debris	2 ea.	520
	Topsoil stripping	1420 cu.m	2,980
	Channel improvements	1573 m	12,390
	Spoil treatment	1573 m	2,640
	Confluence excavation and bank stabilization	2 ea.	11,440
	Place sod mats	160 sq.m	2,520
	Woody debris manipulation and placement	L.S.	14,970
	Permanent sediment basin construction	1 ea.	2,630
	Riffle structure construction	5 ea.	13,130
	Gravel substrate area construction	9 ea.	9,450
	Seed disturbed areas	7620 sq.m	8,000
	Miscellaneous construction costs	L.S.	1,260
9.9	**Sta. 7+928 to Sta. 7+950**		
	4th Line culvert replacement	L.S.	500,000
	Related appurtnenances	L.S.	70,000
9.10	**Sta. 7+950 to Sta. 9+918**		
	Install block nets for fish exclusion	L.S.	3,150
	Install temporary rock flow check dam	2 ea.	10,500
	Removal of fallen trees and debris	37 ea.	9,710
	Topsoil stripping	1780 cu.m	3,740
	Road crossing cleanout	1 ea.	3,150
	Channel improvements	1973 m	15,540
	Spoil treatment	1958 m	2,610
	Confluence excavation and bank stabilization	12 ea.	37,900
	Live stake on drain bends	110 m	580
	Place sod mats	100 sq.m	1,580
	Woody debris manipulation and placement	L.S.	14,970
	Riffle structure construction	6 ea.	15,750

SP Item	Description	Approx. Quantity	Cost Estimate
9.10	**Sta. 7+950 to Sta. 9+918 (cont'd)**		
	Gravel substrate area construction	11 ea.	11,550
	Tree plantings along drain	80 m	430
	Seed disturbed areas	6310 sq.m	6,630
Total Estimated Cost of Construction - Main Drain			**$1,940,300**
Branch 'A'			
10.0	**Sta. 0+000 to Sta. 0+650**		
	Install temporary rock flow check dam	1 ea.	5,250
	Clearing and brushing along drain	860 sq.m	1,810
	Channel deepening and excavation	500 m	5,250
	Spoil treatment	500 m	420
	Road crossing cleanout	1 ea.	6,300
	Private crossing replacement	L.S.	7,700
Total Estimated Cost of Construction - Branch 'A'			**$26,730**
10 Sideroad Branch Drain			
11.0	**Sta. 0+000 to Sta. 1+448**		
	Install temporary rock flow check dam	1 ea.	5,250
	3rd Line culvert replacement	L.S.	115,250
	Channel deepening and cleanout	1394 m	13,750
	Spoil treatment	L.S.	3,210
	Road crossing cleanout	1 ea.	4,730
	Private crossing cleanout	6 ea.	7,560
Total Estimated Cost of Construction - 10 Sideroad Branch Drain			**$149,750**
3rd Line Branch Drain			
12.0	**Sta. 0+000 to Sta. 1+660**		
	Install temporary rock flow check dam	1 ea.	5,250
	Outlet splashpad and stabilization	L.S.	790
	Channel deepening and cleanout	1660 m	13,070
	Spoil treatment	L.S.	9,530
	Private crossing cleanout	15 ea.	28,350
Total Estimated Cost of Construction - 3rd Line Branch Drain			**$56,990**

Item	Description	Approx. Quantity	Cost Estimate
3rd Line Spur Branch Drain			
13.0	**Sta. 0+000 to Sta. 0+780**		
	Install temporary rock flow check dam	1 ea.	5,250
	Clearing and brushing along drain	2580 sq.m	5,420
	Outlet splashpad and stabilization	L.S.	2,100
	Channel deepening and cleanout	760 m	5,990
	Spoil treatment	L.S.	1,280
	Road crossing cleanout	1 ea.	3,150
	Private crossing cleanout	1 ea.	1,890
Total Estimated Cost of Construction - 3rd Line Spur Branch Drain			**$25,080**
14.0	**Construction Contingencies and Overhead**		
	Mobilization/demobilization	L.S.	63,000
	Traffic control	L.S.	15,750
	Channel construction	L.S.	46,970
	Aquatics and offsetting	L.S.	31,780
	4th Line culvert replacement	L.S.	50,000
	Lump sum contingency	L.S.	200,000
Total Construction Overhead and Contingencies			**$407,500**
Total Estimated Cost of Construction South Innisfil Creek Drain 2019 Improvement			**$2,606,350**

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

SUMMARY OF COSTS

Total Estimated Cost of Construction		**2,606,350**
Allowances to Owners (Sections 29, 30 & 33)		**771,610**
Engineering		**742,000**
Engineering	500,000	
Aquatic and Terrestrial (SARA)	30,000	
Attendance at Meetings	30,000	
Reproduce/Collate Report	30,000	
Meeting to Consider	5,000	
Tendering	15,000	
Contract Award	5,000	
Licence to Collect Fish, Correspondence and Reporting	2,000	
Contract Administration	75,000	
Road Crossing Inspection	5,000	
Agency Concerns (DFO, MNRF, NVCA)	20,000	
DFO Monitoring	25,000	
Administration and Financing		**215,853**
H.S.T.	59,000	
NVCA Fee	2,500	
Interest	117,200	
Contingency	37,153	
Previous Engineering Fees - Dillon Consulting		**1,025,087**
Total Estimated Project Cost South Innisfil Creek Drain - 2019 Improvement		**$ 5,360,900**

NOTE: The above summary contains estimates of cost only. It is emphasized that these estimates do NOT include costs to defend the drainage report should appeals be filed with the Court of Revision, the Drainage Tribunal and/or the Drainage Referee. Should additional costs be incurred, unless otherwise directed, the additional costs would be distributed in a prorata fashion over the assessments contained in the Schedule of Assessment and as may be varied under the Act.

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Schedules of Assessments for Construction

B1

Appendix B1

Assessment for Construction
Main Drain

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement**
DATE : **October 22, 2019 - Amended by the Tribunal**

TOWN: **Town of Innisfil**
PROJECT #: **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
			Innisfil Lands						
1	S Pt Lot 2		Letizia Homes Ltd	001-00500	13.21	50	360	-	410
1	S Pt Lot 3		2492140 Ontario Ltd	001-00600	16.27	50	440	-	490
1	S Pt Lot 3		S. & P. Prim	001-00700	4.04	50	100	-	150
1	S Pt Lot 4		D. Corbo	001-00800	40.62	50	700	-	750
1	S Pt Lot 4	*	G. Snedden & L. D'aoust	001-00900	0.44	50	-	-	50
1	S Pt Lot 5	*	Ministry Of Transportation	001-01100	6.59	130	70	-	200
1	S Pt Lot 5	*	1665328 Ontario Ltd	001-01200	33.40	1,470	200	-	1,670
1	Pt Lot 6	*	H. & G. White	001-01300	0.23	50	-	-	50
1	Pt Lot 6		A. Moir & H. Minns	001-01400	35.06	34,350	660	-	35,010
1	S Pt Lot 6	*	H. Wallace	001-01500	0.39	50	-	-	50
1	S Pt Lot 6	*	H. Dinh	001-01700	0.25	50	-	-	50
1	S Pt Lot 6	*	T. Pham	001-01800	0.13	50	-	-	50
1	S Pt Lot 6	*	Bell Canada	001-01900	0.09	50	-	-	50
1	Pt Lot 6	*	Ministry Of Transportation	001-02100	3.30	50	90	-	140
1	Pt Lot 7		A. Moir & H. Minns	001-02200	0.86	50	30	-	80
1	Pt Lot 7	*	Ministry Of Transportation	001-02400	1.40	50	110	-	160
1	N Pt Lot 6	*	F. Rohani & R. Ghorabi	001-02600	0.28	50	10	-	60
1	N Pt Lot 6		2367808 Ontario Inc	001-02800	40.56	7,400	1,850	-	9,250
1	N Pt Lot 5		A. Posius	001-03000	40.52	50	1,540	-	1,590
1	N Pt Lot 5	*	A. & M. Beattie	001-03010	0.54	50	10	-	60
1	Pt Lot 4		Tack 2016 Ltd & 1442422 Ontario Ltd	001-03100	40.36	50	2,280	-	2,330
1	Pt Lot 4	*	M. Lang	001-03110	0.48	50	30	-	80
1	N Pt Lot 3		Tack 2016 Ltd	001-03200	26.50	50	840	-	890
1	Pt Lot 3		G. & B. Faggion	001-03300	13.30	50	360	-	410
2	S Pt Lot 2		A. & D. Tamburino	001-04100	1.07	50	60	-	110
2	S Pt Lot 3		White Horse Investments Corp, Fresco Estates Ltd & 2088464 Ontario Ltd	001-04200	40.98	50	2,390	-	2,440
2	Pt Lot 3	*	A. & N. Marcuzzi	001-04400	0.28	50	20	-	70
2	S Pt Lot 4	*	674569 Ontario Ltd	001-04500	16.18	50	820	-	870
2	S Pt Lot 4		D. & L. Mazanik	001-04600	24.83	50	1,310	-	1,360
2	Pt Lot 4	*	V. Astrauskas & P. Spedaliere	001-04620	0.37	50	20	-	70
2	S Pt Lot 5		H. & Y. Yoo	001-04700	40.52	50	2,290	-	2,340
2	S Pt Lot 5	*	J. Quishpe Barros & V. Leon Pinos	001-04900	0.21	50	20	-	70
2	Pt Lot 6		P S K Holdings Inc	001-05200	20.78	50	1,230	-	1,280
2	Pt Lot 6		The Simpson/Elson Group	001-05220	19.72	50	1,170	-	1,220
2	N Pt Lot 6	*	S. & I. Hussain	001-05300	13.35	50	690	-	740
2	N Pt Lot 6	*	S. Pressey & H. Money	001-05400	7.61	50	440	-	490
2	Pt Lot 6	*	Y. Tran & D. & L. Nguyen	001-05500	4.40	50	260	-	310
2	N Pt Lot 6	*	L. & M. Barbosa	001-05600	4.41	50	250	-	300
2	N Pt Lot 6	*	C. & A. Carpino	001-05700	8.49	50	390	-	440
2	N Pt Lot 5	*	H. & M. Yoon	001-05800	4.04	50	220	-	270
2	N Pt Lot 5	*	G. & A. Caubang	001-05900	4.05	50	140	-	190
2	N Pt Lot 5	*	A. Krebs Est., H. Krebs & I. Krebs-Wickens	001-06000	4.03	50	210	-	260
2	N Pt Lot 5	*	G. & Z. Grigoroff	001-06100	4.04	50	220	-	270
2	N Pt Lot 5	*	H. Sieber	001-06200	3.89	50	160	-	210
2	N Pt Lot 5	*	C. Nothrop	001-06300	3.98	50	230	-	280
2	N Pt Lot 5		G. & S. Reilly	001-06400	4.11	50	130	-	180
2	N Pt Lot 5	*	A. Scorziello	001-06500	4.06	50	240	-	290
2	N Pt Lot 5		D. & C. Wilson	001-06600	4.66	50	280	-	330
2	N Pt Lot 5	*	A. & D. Watt	001-06700	4.62	50	270	-	320
2	N Pt Lot 4		P. & D. Meneguzzi	001-06800	41.26	50	2,180	-	2,230
2	N Pt Lot 3		Farisland Ltd	001-06900	22.30	50	1,320	-	1,370
2	N Pt Lots 2		J. & C. Faris	001-07000	4.10	50	220	-	270
3	S Pt Lot 1		K. & V. Wardlaw	001-07400	2.10	50	80	-	130
3	S Pt Lot 2		P. Wardlaw	001-07600	14.16	50	820	-	870
3	S Pt Lot 3		J. Lukovits & A. Radocsai	001-07700	42.71	50	2,290	-	2,340
3	S Pt Lot 4	*	M. Turner & J. Goncalves	001-07900	10.54	50	610	-	660
3	S Pt Lot 4		Chapter Homes Inc	001-08000	10.68	50	570	-	620
3	S Pt Lot 5		A. & D. Henry	001-08100	41.25	50	3,350	-	3,400
3	S Pt Lot 5	*	H. La Page	001-08110	1.41	50	100	-	150
3	S Pt Lot 6	*	S. Wheeler	001-08300	0.28	50	30	-	80
3	S Pt Lot 6		E., E. & J. Rainey	001-08400	38.86	50	3,310	-	3,360
3	N Pt Lot 6;		S., T., M., & N. Ferrazzo	001-08500	12.46	50	1,360	-	1,410
3	N Pt Lot 6;		Armking & Company Ltd	001-08700	3.95	50	430	-	480
3	N Pt Lot 6	*	L. Taylor	001-08800	0.40	50	40	-	90
3	Pt Lot 6	*	A. & O. Posterniak	001-08900	4.28	50	470	-	520
3	Pt Lot 6	*	G. & M. Ioannou	001-09000	6.08	50	660	-	710
3	Pt Lot 6		J. Rampodarat & T. Tirbeni	001-09100	6.14	50	670	-	720
3	Pt Lot 6		M. Frasca	001-09200	6.18	50	590	-	640
3	N Pt Lot 5	*	M. Gelfand & E. Kull	001-09400	0.32	50	30	-	80
3	N Pt Lot 5	*	United Bethesda Cemetery	001-09500	0.38	50	30	-	80
3	N Pt Lot 5	*	S. & L. Hill	001-09700	0.23	50	50	-	100
3	N Pt Lot 5	*	L. Hill	001-09705	0.21	50	20	-	70
3	N Pt Lot 5		1665328 Ontario Ltd	001-09800	41.27	50	3,530	-	3,580
3	N Pt Lot 4		P. Wardlaw	001-09900	64.33	50	3,480	-	3,530
3	N Pt Lot 4	*	G. Dougherty & J. Shortt	001-09901	0.41	50	20	-	70
3	N Pt Lot 3		M., M., P. & M. Klymiuk	001-10000	42.89	50	2,540	-	2,590
3	N Pt Lot 2	*	8325235 Canada Inc	001-10100	42.16	50	2,500	-	2,550
3	N Pt Lot 1		P. Wardlaw	001-10200	21.52	50	1,280	-	1,330
4	S Pt Lot 1	*	1553037 Ontario Ltd	001-10500	3.56	50	210	-	260
4	S Pt Lot 1	*	N. Voutt	001-10600	1.74	50	100	-	150

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
4	S Pt Lot 1		G. & C. Van Horne	001-10700	3.18	50	190	-	240
4	S Pt Lot 1		L. & M. Camacho	001-10800	1.91	50	110	-	160
4	S Pt Lot 1		P. Spring	001-10900	9.76	50	510	-	560
4	S Pt Lot 1		A. Guido	001-11000	9.76	50	430	-	480
4	S Pt Lot 2		M. & J. Spataro & J. Pontieri	001-11100	9.98	50	540	-	590
4	S Pt Lot 2		4090 4th Line Inc	001-11200	29.61	50	1,760	-	1,810
4	S Pt Lot 2	*	D. Congiusti	001-11400	0.40	50	20	-	70
4	Pt Lot 3	*	E. Kippers & G. Merrall	001-11600	1.75	50	100	-	150
4	Pt Lot 3		4090 4th Line Inc	001-11700	74.01	50	4,190	-	4,240
4	S Pt Lot 4		D. & B. Marling	001-11900	39.65	50	2,260	-	2,310
4	S Pt Lot 5	*	A. & A. Persico	001-12000	40.15	50	3,360	-	3,410
4	S Pt Lot 6		1665328 Ontario Ltd	001-12100	35.95	50	3,910	-	3,960
4	S Pt Lot 6	*	J. Metcalfe	001-12300	0.77	50	80	-	130
4	Pt Lot 6	*	Ministry Of Transportation	001-12400	35.54	50	5,080	-	5,130
4	Pt Lot 6	*	Town of Innisfil	001-12402	0.09	50	10	-	60
4	N Pt Lot 5		S. & S. Jones	001-12500	39.11	50	3,630	-	3,680
4	N Pt Lot 5	*	W. & L. Jones	001-12501	0.65	50	70	-	120
4	N Pt Lot 4		1402802 Ontario Inc & 2462228 Ontario Ltd	001-12600	38.76	50	2,900	-	2,950
4	N Pt Lot 2		4090 4th Line Inc	001-13000	30.03	50	1,780	-	1,830
4	N Pt Lot 2	*	R. Laforge	001-13100	0.19	50	20	-	70
4	N Pt Lot 2	*	W. Laforge	001-13200	0.39	50	20	-	70
4	N Pt Lot 1		J. & J. McCague	001-13300	10.31	50	530	-	580
5	Pt Lots 3 & 4		1715573 Ontario Ltd	001-14600	2.26	50	270	-	320
5	S Pt Lot 5		1715573 Ontario Ltd	001-14800	16.76	50	2,280	-	2,330
5	Pt S1/2 Lot 5	*	G. & L. Kenyon & M. & K. Slessor	001-14802	0.18	50	40	-	90
5	S Pt Lot 6		S. & J. Pearson & E. McLachlin	001-14900	11.53	50	1,220	-	1,270
5	S Pt Lot 6		1715573 Ontario Inc. Trustee	001-15000	50.11	50	11,610	-	11,660
5	N Pt Lot 6	*	D. Swain & K. Archibald	001-15100	0.41	50	120	-	170
5	N Pt Lot 5	*	R. & S. Eyers	001-15300	0.54	50	160	-	210
5	N Pt Lot 5		1715573 Ontario Ltd	001-15500	57.75	50	14,190	-	14,240
1	S Pt Lot 7	*	Aqua-Gem Investments Ltd	001-16600	24.00	21,300	1,000	-	22,300
1	S Pt Lot 7	*	1045901 Ontario Ltd	001-16700	0.92	2,810	130	-	2,940
1	S Pt Lot 8	*	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	001-16900	41.53	18,780	1,430	-	20,210
1	Pt Lot 9		G., M. & W. Kemeny	001-17000	23.78	13,230	1,330	-	14,560
1	Pt Lot 9		G. Kemeny	001-17200	11.66	11,710	990	-	12,700
1	S Pt Lot 9		1409563 Ontario Ltd	001-17300	23.96	23,820	2,090	-	25,910
1	S Pt Lot 9	*	J. Yonge & R. Lee	001-17400	6.70	6,750	570	-	7,320
1	S Pt Lot 10	*	S. Rudnisky	001-17500	5.48	4,140	350	-	4,490
1	S Pt Lot 10		C. & S. Toich	001-17600	5.90	2,930	240	-	3,170
1	S Pt Lot 10	*	L. & C. Fabiano	001-17700	5.11	3,300	270	-	3,570
1	S Pt Lot 10		M. Toich	001-17800	6.88	6,930	580	-	7,510
1	S Pt Lot 10	*	Y. Mark Est.	001-17900	4.83	1,300	210	-	1,510
1	S Pt Lot 10	*	Y. Mark Est. & M. Maehara Est.	001-18000	4.15	950	250	-	1,200
1	Pt Lots 10 & 11	*	M. Riley	001-18100	9.21	50	560	-	610
1	Pt Lot 10		2204277 Ontario Ltd	001-18300	11.50	11,550	1,080	-	12,630
1	Pt Lot 10		L & L Gardens Inc	001-18350	1.48	1,530	140	-	1,670
1	Pt Lot 10		Marques Gardens Ltd	001-18400	12.13	12,180	1,120	-	13,300
1	N Pt Lot 10		L. Radvanyi	001-18500	11.93	11,980	1,110	-	13,090
1	N Pt Lot 10	*	S. Rudnisky	001-18600	2.02	800	70	-	870
1	N Pt Lot 10	*	F. & M. Santos	001-18700	2.00	900	80	-	980
1	N Pt Lot 9		Horodynsky Farms Inc	001-18800	4.87	4,920	450	-	5,370
1	N Pt Lot 9		M. Kemeny	001-19000	12.26	3,020	470	-	3,490
1	N Pt Lot 8		J. Walewski & D. Kopec	001-19100	20.22	4,350	770	-	5,120
1	N Pt Lot 8	*	1523566 Ontario Ltd	001-19200	20.32	79,760	1,770	-	81,530
1	N Pt Lot 7	*	Succession Financial Group Inc	001-19400	34.15	112,360	2,110	-	114,470
2	S Pt Lot 7		J. Armstrong	001-19500	35.12	50	1,970	-	2,020
2	S Pt Lot 7	*	T. Armstrong	001-19510	0.61	50	40	-	90
2	S Pt Lot 8		S. Handy	001-19600	10.34	50	1,080	-	1,130
2	S Pt Lot 8	*	P. Chiodo	001-19700	10.53	57,430	990	-	58,420
2	S Pt Lot 8	*	A. & M. Filice	001-19800	21.05	82,570	1,760	-	84,330
2	S Pt Lot 9		Cohn Farms Inc	001-20000	10.03	45,970	1,180	-	47,150
2	S Pt Lot 9		Cohn Farms Inc	001-20100	10.14	43,230	1,270	-	44,500
2	Pt Lot 9	*	M. & G. Bordon	001-20200	1.43	10,230	160	-	10,390
2	Pt Lot 9		Marques Gardens Ltd	001-20300	8.82	43,440	1,230	-	44,670
2	S Pt Lot 9		L. & N. Tasca	001-20400	10.29	78,390	1,380	-	79,770
2	S Pt Lot 10		L. & N. Tasca	001-20500	5.27	49,300	750	-	50,050
2	Pt W1/2 Lot 10		Marques Gardens Ltd	001-20600	15.14	62,920	1,940	-	64,860
2	Pt Lot 10		Marques Gardens Ltd	001-20800	20.65	94,280	2,830	-	97,110
2	N Pt Lot 10		Horodynsky Farms Inc	001-20900	10.23	81,560	2,190	-	83,750
2	Pt Lot 10		1409563 Ontario Ltd	001-21000	10.19	10,240	2,070	-	12,310
2	W Pt Lot 10		Horodynsky Farms Inc	001-21100	11.42	11,470	1,990	-	13,460
2	N Pt Lot 10		G. & R. Sciara & P. & L. Digiantomasso	001-21200	8.97	9,020	1,570	-	10,590
2	N Pt Lot 9		B. Horodynsky	001-21400	10.10	10,150	1,760	-	11,910
2	N Pt Lot 9		1409563 Ontario Ltd	001-21500	19.88	19,930	3,470	-	23,400
2	Pt Lot 9	*	J. & S. Cestaric	001-21602	0.34	390	60	-	450
2	N Pt Lot 9		I. Canton & L. & E. Trevisan	001-21700	10.12	10,170	1,770	-	11,940
2	N Pt Lot 8	*	I. & H. Mora	001-21800	10.23	5,060	870	-	5,930
2	N Pt Lot 8	*	M., H. & S. Fernandes	001-21900	5.11	2,310	790	-	3,100
2	N Pt Lot 8	*	C. & C. Zylstra	001-22000	4.99	550	440	-	990
2	N Pt Lot 8	*	Elbertain Corporation	001-22100	21.13	50	2,560	-	2,610
2	Pt Lot 7	*	B. Jolie	001-22300	0.24	50	50	-	100
2	N Pt Lot 7	*	J. & D. Lacroix	001-22400	0.24	50	40	-	90
2	N Pt Lot 7	*	Gmb Property Holding Company Ltd	001-22600	35.35	50	2,800	-	2,850

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
3	S Pt Lot 7		1665328 Ontario Ltd	001-22900	35.70	50	4,570	-	4,620
3	S Pt Lot 8	*	J. Petropoulos	001-23000	0.79	50	120	-	170
3	W Pt Lot 8	*	D. Oshell & D. McLachlan	001-23001	0.37	50	70	-	120
3	S Pt Lot 8	*	G. Dermott	001-23200	0.18	50	60	-	110
3	Pt Lot 9	*	A. & J. Mormile	001-23400	20.52	50	4,600	-	4,650
3	Pt Lot 9		M. Assadian & L. Desroche	001-23500	22.67	50	5,000	-	5,050
3	Pt Lot 9		1409563 Ontario Ltd	001-23600	20.18	1,900	4,310	-	6,210
3	S Pt Lot 10	*	K. Levy	001-23700	4.05	2,800	640	-	3,440
3	Pt Lot 10		A. Fox & B. Scott	001-23800	4.42	4,470	1,030	-	5,500
3	S Pt Lot 10	*	J. Phaneuf & C. Aguiar	001-23900	6.05	2,030	510	-	2,540
3	S Pt Lot 10	*	Y. Cil	001-24100	6.03	1,300	490	-	1,790
3	Pt Lot 10		J. Chow	001-24200	54.13	5,340	12,350	-	17,690
3	N Pt Lot 10	*	H. & A. Perkins	001-24300	1.21	50	250	-	300
3	Pt Lot 10	*	H. Squibb	001-24301	8.40	50	1,810	-	1,860
3	N Pt Lot 9		J. & P. Wilson	001-24400	10.64	50	1,960	-	2,010
3	N Pt Lot 9	*	C. & M. Cialone	001-24500	10.02	50	1,940	-	1,990
3	Pt Lot 8		P. & C. Woods	001-24600	10.05	50	2,350	-	2,400
3	Pt Lot 8		1665328 Ontario Ltd	001-24800	31.73	50	6,220	-	6,270
3	Pt Lot 8	*	G. & M. Reynolds	001-24801	1.00	50	230	-	280
3	Pt Lot 8	*	B. & V. Cestaric	001-24810	0.29	50	70	-	120
3	W Pt Lot 8		1665328 Ontario Ltd	001-24900	41.57	50	6,850	-	6,900
3	N Pt Lot 7		J. & M. Albanese	001-25000	21.40	50	2,880	-	2,930
3	N Pt Lot 7		M. & U. Mauti	001-25100	15.69	50	1,640	-	1,690
4	S Pt Lot 7		Gdm Terraco Inc	001-25400	12.11	50	1,500	-	1,550
4	S Pt Lot 7		Franline Investments Ltd	001-25500	12.77	50	2,360	-	2,410
4	S Pt Lot 7		F. & N. Grillo	001-25600	10.11	50	2,310	-	2,360
4	Pt Lots 8 & 9		V. & D. Posius	001-25800	59.20	50	12,990	-	13,040
4	Pt Lot 8	*	S. Khan	001-25801	0.23	50	50	-	100
4	S Pt Lot 9		Sil Developments Inc, R. Zaretsky & S. Soudack	001-25900	19.33	50	4,510	-	4,560
4	S Pt Lot 9	*	J. & D. Thew	001-25910	0.40	50	90	-	140
4	S Pt Lot 10	*	P. Pillitteri	001-26000	38.95	50	9,170	-	9,220
4	N Pt Lot 10	*	P. Pillitteri	001-26100	38.83	50	10,620	-	10,670
4	N Pt Lot 10	*	D. Jonkman	001-26110	0.24	50	70	-	120
4	N Pt Lot 9		D. Lucas	001-26200	39.03	50	9,530	-	9,580
4	N Pt Lot 9	*	K. Jayaseelan & M. Thayalan	001-26201	0.18	50	90	-	140
4	N Pt Lot 8		Franline Investments Ltd	001-26300	39.69	50	9,980	-	10,030
4	N Pt Lot 7		1665328 Ontario Ltd	001-26400	37.42	50	7,610	-	7,660
5	S Pt Lot 7		H. & C. Van Der Mast	001-26700	41.32	50	10,110	-	10,160
5	S Pt Lot 8	*	G. & N. Bray	001-26900	20.18	50	3,370	-	3,420
5	S Pt Lot 9		V. Trombley	001-27000	30.32	50	7,810	-	7,860
5	S Pt Lot 10		G. Taylor & I. Wagner	001-27100	10.14	50	2,450	-	2,500
5	S Pt Lot 10		G., F., M., & A. Troiano	001-27200	10.15	50	2,450	-	2,500
5	S Pt Lot 10		1409563 Ontario Ltd	001-27300	20.40	50	5,700	-	5,750
5	N Pt Lot 10		G. & S. Sawyer	001-27400	41.86	50	11,940	-	11,990
5	N Pt Lot 9	*	G. Lecce Holdings (1994) Inc & D. B. Lecce Holdings	001-27500	41.76	50	11,850	-	11,900
5	N Pt Lot 9	*	J. Farris	001-27600	0.14	50	80	-	130
5	N Pt Lot 8		M. Vandermast	001-27700	74.24	50	20,850	-	20,900
5	N Pt Lot 7		1720121 Ontario Ltd	001-27900	40.58	50	8,220	-	8,270
1	Pt Lots 10 & 11	*	S. Malik & B. Awan	002-00100	4.78	50	280	-	330
1	S Pt Lot 11	*	S. Elfassy	002-00200	8.67	50	350	-	400
1	Pt Lot 11	*	R. & M. Burrows	002-00300	5.85	50	230	-	280
1	Pt Lot 11	*	P., D., J., & M. Kosinec	002-00400	5.69	50	240	-	290
1	S Pt Lot 11		G. & C. Zielke	002-00500	17.06	50	840	-	890
1	S Pt Lot 11	*	K. & M. Zielke	002-00700	0.41	50	20	-	70
1	S Pt Lot 12	*	E. Matchett	002-00800	0.19	50	20	-	70
1	S Pt Lot 12	*	E. Matchett	002-00900	0.16	50	10	-	60
1	S Pt Lot 12		K. & J. Matchett	002-01100	42.40	50	2,990	-	3,040
1	S Pt Lot 13		J. & S. Kell	002-01200	43.01	50	3,850	-	3,900
1	S Pt Lot 13	*	S. & S. Iemsisanith	002-01300	0.22	50	40	-	90
1	S Pt Lot 14	*	R. & D. Long	002-01500	0.19	50	40	-	90
1	S Pt Lot 14		D. Rose & B. Kell-Rose	002-01600	21.15	50	2,060	-	2,110
1	S Pt Lot 15		K. & H. Kell	002-01800	1.52	50	150	-	200
1	S Pt Lot 15	*	B. Kell-Rose & D. Rose	002-01801	0.24	50	50	-	100
1	N Pt Lot 17		J. Drybrough	002-04700	8.14	50	1,900	-	1,950
1	N Pt Lot 16	*	Clements Cemetary	002-04900	0.20	50	90	-	140
1	N Pt Lot 16		Kell Farms Ltd	002-05200	14.35	50	3,350	-	3,400
1	N Pt Lot 15		Kell Farms Ltd	002-05400	34.16	50	4,690	-	4,740
1	Pt Lot 14		Kell Farms Ltd	002-05600	40.71	50	3,890	-	3,940
1	N Pt Lot 13		D. Sawyer	002-05800	64.57	50	5,770	-	5,820
1	N Pt Lot 12		D., B. & W. Sawyer	002-05900	42.23	50	2,410	-	2,460
1	N Pt Lot 11		L. & N. Tasca	002-06000	22.14	22,150	2,140	-	24,290
1	N Pt Lot 11		L & L Gardens Inc	002-06300	19.93	19,980	1,890	-	21,870
2	S Pt Lot 11		Horodynsky Farms Inc	002-06400	20.17	18,240	4,050	-	22,290
2	Pt Lots 11 & 12		1409563 Ontario Ltd	002-06600	40.60	6,340	8,150	-	14,490
2	S Pt Lot 12	*	M. Galloro	002-06700	10.35	50	450	-	500
2	S Pt Lot 12	*	F. Galloro	002-06800	5.04	50	380	-	430
2	S Pt Lot 12	*	M. Tesic	002-06900	5.03	50	290	-	340
2	S Pt Lot 13	*	F. Gammicchia	002-07000	10.11	50	540	-	590
2	S Pt Lot 13	*	B. Watman	002-07100	4.89	50	370	-	420
2	S Pt Lot 13	*	R. & B. Badstober	002-07200	4.94	50	460	-	510
2	S Pt Lot 13		K. Kell	002-07400	20.16	50	2,120	-	2,170
2	Lot 14		Innis Properties Ltd	002-07600	81.22	50	12,690	-	12,740
2	S Pt Lot15		E. Rosenberg	002-07700	24.70	50	5,350	-	5,400

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
2	S Pt Lot 15	*	1916013 Ontario Inc	002-07800	15.18	50	3,540	-	3,590
2	S Pt Lot 15	*	G. Kalcic & L. Esau	002-08000	0.29	50	140	-	190
2	S Pt Lot 16	*	K. & L. Sparrow	002-08200	0.62	50	140	-	190
2	S Pt Lot 16	*	A. Giaconelli & H. Luzius	002-08300	0.63	50	150	-	200
2	S Pt Lot 16		R. Simpson	002-08500	38.24	50	8,390	-	8,440
2	Pt Lot 16	*	L. Rumble	002-08520	0.23	50	110	-	160
2	S Pt Lot 17		N. & G. Sturgeon	002-08700	9.74	50	720	-	770
2	Pt Lot 17 & N Pt Lot 18		Kell Farms Ltd	002-10000	44.28	50	9,870	-	9,920
2	Pt Lot 16	*	I. & M. Campbell	002-10200	0.19	50	40	-	90
2	N Pt Lot 16		I. & M. Campbell	002-10400	33.85	50	7,780	-	7,830
2	N Pt Lot 16	*	D. Cuneen	002-10500	0.26	50	120	-	170
2	N Pt Lot 16	*	B. & R. Zendelek	002-10600	6.06	50	1,140	-	1,190
2	N Pt Lot 15		G. & M. Thompson	002-10900	19.65	50	4,010	-	4,060
2	Pt Lot 15	*	K. Kent	002-10901	0.34	50	80	-	130
2	N Pt Lot 15	*	A. & P. Budd	002-11000	0.22	50	100	-	150
2	Pt Lot 15	*	Ministry Of Transportation	002-11100	0.11	50	30	-	80
2	N Pt Lot 15		I. Campbell	002-11300	19.55	50	4,470	-	4,520
2	N Pt Lot 13	*	D. Evers	002-11600	6.05	50	850	-	900
2	N Pt Lot 13	*	T. Risi	002-11700	4.06	50	650	-	700
2	N Pt Lot 13	*	T., Q. & M. Palmieri	002-11800	7.03	50	960	-	1,010
2	N Pt Lot 13	*	O. & R. Goncalves	002-11900	8.30	50	810	-	860
2	N Pt Lot 13	*	K. Yamamoto	002-12000	15.46	50	1,430	-	1,480
2	N Pt Lot 12	*	D. & I. Chouryguine	002-12100	5.98	50	410	-	460
2	N Pt Lot 12	*	S. Sharma	002-12200	4.00	50	430	-	480
2	N Pt Lot 12		J. Horodynsky	002-12300	4.00	50	880	-	930
2	N Pt Lot 12		1281597 Ontario Inc	002-12400	5.96	50	1,300	-	1,350
2	N Pt Lot 12		Horodynsky Farms Inc	002-12500	10.04	5,190	2,180	-	7,370
2	N Pt Lot 12		P. & K. Horodynsky	002-12600	9.97	10,020	2,150	-	12,170
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12700	10.30	10,350	2,210	-	12,560
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12800	10.00	10,050	2,140	-	12,190
2	N Pt Lot 11		1281597 Ontario Inc	002-12900	20.34	38,430	4,320	-	42,750
3	S Pt Lot 11	*	S. Scholten & D. Ransom	002-13300	3.89	9,730	950	-	10,680
3	S Pt Lot 11	*	N. & M. Makrigiorgos	002-13400	4.07	9,660	990	-	10,650
3	S Pt Lot 11	*	K. Costain & D. Goodwin	002-13500	4.07	10,290	980	-	11,270
3	S Pt Lot 11	*	E. Carbone	002-13600	4.07	12,190	970	-	13,160
3	S Pt Lot 11	*	L. Martinovski & P. & D. Efstathiadis	002-13700	4.07	14,780	960	-	15,740
3	S Pt Lot 11	*	H. & M. Yoon	002-13800	5.43	570	1,250	-	1,820
3	S Pt Lot 11		1409563 Ontario Ltd	002-13900	5.43	50	1,160	-	1,210
3	S Pt Lot 11		1281597 Ontario Inc	002-14000	10.76	50	1,970	-	2,020
3	Pt Lot 12		J. & E. Horodynsky	002-14100	37.82	50	11,140	-	11,190
3	S Pt Lot 12	*	T. & C. Xenophontos	002-14300	4.01	50	550	-	600
3	S Pt Lot 13		H. & K. Yamamoto & S. Yamamoto Est.	002-14400	41.39	50	7,910	-	7,960
3	S Pt Lot 14		L. & E. Kell	002-14500	41.57	50	9,410	-	9,460
3	S Pt Lot 15		M. Campbell	002-14600	20.77	50	3,830	-	3,880
3	S Pt Lot 15	*	Alpine Peaks (Churchill) Development	002-14700	20.11	50	4,300	-	4,350
3	S Pt Lot 16		C. Campbell & S. Todd	002-15000	40.18	50	8,940	-	8,990
3	S Pt Lot 16	*	M. Ledlie & V. Kerr	002-15200	0.28	50	70	-	120
3	S Pt Lot 17		J. Kell	002-15300	10.48	50	2,260	-	2,310
3	S Pt Lot 17		D. Kell	002-15400	9.35	50	2,120	-	2,170
3	S Pt Lot 17		J. Kell	002-15500	0.84	50	200	-	250
3	N Pt Lot 17		Kell Farms Ltd	002-20000	16.52	50	3,680	-	3,730
3	N Pt Lots 1		Top Hill View Estates Inc	002-20200	53.70	50	11,950	-	12,000
3	Plan 51M604	*	First View Homes (Scarborough)	002-20204	0.18	50	100	-	150
3	Plan 51M604	*	First View Homes (Scarborough)	002-20208	0.18	50	100	-	150
3	Plan 51M604	*	First View Homes (Scarborough)	002-20212	0.18	50	100	-	150
3	Plan 51M604	*	First View Homes (Scarborough)	002-20216	0.18	50	100	-	150
3	Plan 51M604	*	First View Homes (Scarborough)	002-20220	0.18	50	100	-	150
3	Plan 51M604	*	First View Homes (Scarborough)	002-20224	0.19	50	100	-	150
3	Plan 51M604	*	First View Homes (Scarborough)	002-20228	0.20	50	110	-	160
3	Plan 51M604	*	First View Homes (Scarborough)	002-20229	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20230	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20233	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20234	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20237	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20238	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20241	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20242	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20243	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20246	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20247	0.16	50	90	-	140
3	Plan 51M604	*	D. & T. Garofalo	002-20250	0.16	50	90	-	140
3	Plan 51M604	*	First View Homes (Scarborough)	002-20251	0.15	50	70	-	120
3	N Pt Lot 13		Crestrail Investments Inc	002-20300	40.82	50	10,480	-	10,530
3	N Pt Lot 13	*	Town of Innisfil	002-20320	0.50	50	130	-	180
3	N Pt Lot 12		S. & O. Pylypiak	002-20400	20.69	50	4,760	-	4,810
3	N Pt Lot 12		C. Wolfond	002-20500	20.67	50	4,290	-	4,340
3	N Pt Lot 11		9847723 Canada Corporation	002-20600	41.96	59,310	9,330	-	68,640
4	S Pt Lot 11		Kell Farms Ltd	002-20700	19.76	24,620	5,230	-	29,850
4	Pt S1/2 Lot 11	*	G., A. & P. Tuzi & M. Tersigni	002-20900	2.19	50	510	-	560
4	Pt S1/2 Lot 11		A. Tuzi	002-20902	2.18	50	510	-	560
4	Pt S1/2 Lot 11		A. Gargaro	002-20904	2.18	50	510	-	560
4	Pt S1/2 Lot 11		G. Tuzi	002-20906	2.17	50	520	-	570
4	Pt S1/2 Lot 11	*	K. Collins & L. Marjadsingh	002-20908	2.18	50	570	-	620

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN:** Town of Innisfil
DATE : October 22, 2019 - Amended by the Tribunal | **PROJECT #:** 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
4	Pt S1/2 Lot 11	*	D. & K. Gray	002-20910	2.18	17,470	570	-	18,040
4	Pt S1/2 Lot 11	*	M. & M. Alves	002-20912	2.18	13,150	580	-	13,730
4	Pt S1/2 Lot 11	*	J. & G. Rodrigues	002-20914	2.18	1,280	590	-	1,870
4	Pt S1/2 Lot 11	*	J. & E. Fernandes	002-20916	2.20	1,280	600	-	1,880
4	Pt S1/2 Lot 12		M. & L. Valente	002-20918	4.08	9,030	1,130	-	10,160
4	Pt S1/2 Lot 12		Innisfil Churchill Investment	002-20920	4.08	1,700	1,130	-	2,830
4	Pt S1/2 Lot 12		A. Tuzi	002-20922	4.08	1,120	1,140	-	2,260
4	Pt S1/2 Lot 12		E. De Santis	002-20924	4.08	50	1,110	-	1,160
4	Pt S1/2 Lot 12		G. Tuzi	002-20926	4.08	50	1,110	-	1,160
4	Pt S1/2 Lot 12		M. Tersigni	002-20928	4.08	50	1,110	-	1,160
4	Pt Lot 12		A. Kerkhof & C. Davidson	002-20930	10.62	50	2,830	-	2,880
4	Pt S1/2 Lot 12		Innisfil Churchill Investment	002-20932	3.97	50	1,020	-	1,070
4	Pt Lot 13		2177217 Ontario Ltd	002-21000	40.24	50	10,580	-	10,630
4	S Pt Lot 14		2177217 Ontario Ltd	002-21100	40.10	50	10,490	-	10,540
4	S Pt Lot 14	*	J. Jambor	002-21300	0.55	50	290	-	340
4	S Pt Lot 14	*	D. & S. Mann	002-21400	0.55	50	290	-	340
4	N Pt Lot 17		S. Kell	002-24000	8.22	50	2,190	-	2,240
4	N Pt Lot 16	*	Simcoe County District School Board	002-24200	3.72	50	770	-	820
4	N Pt Lot 16	*	G. Hill	002-24300	0.38	50	100	-	150
4	N Pt Lot 16		Barnstable Park Realty Corp	002-24400	23.10	50	5,590	-	5,640
4	N Pt Lot 16	*	M. Shamshiri	002-24700	0.43	50	110	-	160
4	N Pt Lot 16	*	A. Dunn & D. Ruegg	002-24800	0.15	50	80	-	130
4	N Pt Lot 16	*	K. & T. Austin	002-24801	0.75	50	200	-	250
4	N Pt Lot 16	*	C. Pokulok & R. Hannah	002-24802	0.74	50	200	-	250
4	N Pt Lot 16	*	M. Demarco	002-25000	13.18	50	2,960	-	3,010
4	N Pt Lot 15	*	A. Smith & C. Ford	002-25200	2.39	50	550	-	600
4	N Pt Lot 15	*	L. Gialedakis	002-25210	2.21	50	1,720	-	1,770
4	N Pt Lot 15	*	2765870 Canada Inc	002-25300	0.18	50	100	-	150
4	N Pt Lot 15	*	E. & M. Van Den Elzen	002-25500	0.28	50	70	-	120
4	Pt Lot 15		1636574 Ontario Inc	002-25700	35.31	50	8,810	-	8,860
4	N Pt Lot 15	*	J. & R. Moody	002-25800	0.22	50	120	-	170
4	N Pt Lot 14		G. & C. Favret	002-26000	40.53	50	9,930	-	9,980
4	Pt Lot 14	*	R. & M. Johnson	002-26001	0.42	50	120	-	170
4	N Pt Lot 13		1665328 Ontario Ltd	002-26100	40.78	50	10,900	-	10,950
4	N Pt Lot 12		1665328 Ontario Ltd	002-26300	39.11	71,033	8,890	-	79,923
4	N Pt Lot 11	*	1665328 Ontario Ltd	002-26400	38.69	50	8,280	-	8,330
5	S Pt Lot 11	*	L. Kuhn & J. Hettmann	002-26700	7.80	50	1,880	-	1,930
5	S Pt Lot 11	*	B. Graham	002-26725	0.82	50	240	-	290
5	S Pt Lot 11	*	M. Li & H. Zhang	002-26800	8.62	50	1,070	-	1,120
5	S Pt Lot 11		T. & V. Van Kuik	002-26900	5.83	50	1,710	-	1,760
5	S Pt Lot 11	*	D. & L. Street	002-27000	5.13	50	1,280	-	1,330
5	S Pt Lot 11	*	T. & J. Treloar	002-27100	4.05	50	780	-	830
5	S Pt Lot 11	*	D. & K. Adams	002-27200	4.36	50	630	-	680
5	S Pt Lot 11	*	L. Smith	002-27300	4.12	50	490	-	540
5	S Pt Lot 12	*	S. Wasylyk	002-27500	9.93	50	970	-	1,020
5	S Pt Lot 12	*	N. Nguyen	002-27600	5.41	50	490	-	540
5	S Pt Lot 12	*	C. Rainford & B. Hitchen	002-27700	5.42	50	550	-	600
5	Pt Lot 13		2462228 Ontario Ltd	002-27900	39.05	50	8,250	-	8,300
5	Pt Lot 13	*	C. & R. Kniazeff	002-27910	0.37	50	110	-	160
5	Pt Lot 14		1665328 Ontario Ltd	002-28000	53.16	50	15,240	-	15,290
5	S Pt Lot 15	*	D. Scythes	002-28200	0.04	50	20	-	70
5	S Pt Lot 15	*	C. Browne	002-28300	0.20	50	110	-	160
5	S Pt Lot 15	*	G. & O. De Araujo	002-28400	0.13	50	70	-	120
5	S Pt Lot 15	*	D. & M. Coulter	002-28500	0.14	50	70	-	120
5	S Pt Lot 15	*	T. Laurin	002-28600	0.21	50	110	-	160
5	S Pt Lot 15	*	P. & V. Chornenki	002-28700	0.14	50	70	-	120
5	Pt Lot 15		Kell Farms Ltd	002-29000	77.21	50	21,200	-	21,250
5	S Pt Lot 16		882022 Ontario Ltd	002-29100	40.04	50	9,190	-	9,240
5	S Pt Lot 17		K. Tse	002-29200	11.53	50	2,220	-	2,270
5	N Pt Lot 16		1589114 Ontario Ltd	002-31300	4.96	50	1,130	-	1,180
6	N Pt Lot 15	*	Sixth Line Cemetery	002-31500	2.94	50	710	-	760
5	N Pt Lots 1		1665328 Ontario Ltd	002-31900	69.80	50	18,890	-	18,940
5	N Pt Lot 12		2462228 Ontario Ltd	002-32000	61.67	50	16,560	-	16,610
5	N Pt Lot 12	*	B. Neeb & L. Smith	002-32001	0.29	50	80	-	130
5	N Pt Lot 11	*	AFMM Innisfil Ltd	002-32200	41.33	50	11,330	-	11,380
5	Pt Lot 11	*	T. Prosser	002-32201	0.20	50	120	-	170
3	N Pt Lot 16	*	J. Leblanc	003-00100	0.21	50	100	-	150
3	N Pt Lot 16	*	G. Ciccone	003-00200	0.13	50	60	-	110
3	N Pt Lot 16	*	M. Baker	003-00300	0.13	50	60	-	110
3	N Pt Lot 16	*	United Church	003-00400	0.14	50	70	-	120
3	N Pt Lot 16		10187526 Canada Corp	003-00500	39.70	50	8,710	-	8,760
3	N Pt Lot 15	*	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	003-00600	3.98	50	710	-	760
3	N Pt Lot 15	*	Fernbrook Homes (Churchill) Ltd	003-00700	12.23	50	5,710	-	5,760
3	Pt Lot 15	*	B. Doughty	003-00800	0.14	50	70	-	120
3	N Pt Lot 15	*	A. Dawson	003-00900	0.11	50	50	-	100
3	Pt Lot 15	*	T. Borscevski & B. Hill	003-01000	0.12	50	60	-	110
3	Pt Lot 15	*	C. Mount	003-01100	0.38	50	180	-	230
3	N Pt Lot 15	*	S. Simpson	003-01200	0.38	50	180	-	230
3	N Pt Lot 15	*	Anglican Church	003-01300	1.02	50	490	-	540
3	N Pt Lot 15	*	A. & C. Martins	003-01400	0.08	50	40	-	90
3	Pt Lot 15	*	J. Simpson	003-01500	0.15	50	70	-	120
3	Pt Lot 15	*	P S K Holdings Inc	003-01510	0.14	50	70	-	120
3	N Pt Lot 15	*	E. & K. Pivetta	003-01600	0.19	50	100	-	150

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
3	N Pt Lot 15	*	T. & S. Alderson	003-01700	0.19	50	90	-	140
3	N Pt Lot 15	*	J. Smith & C. Gauvin	003-01800	0.14	50	70	-	120
3	N Pt Lot 15	*	P. Chiavatti	003-01900	0.14	50	70	-	120
3	N Pt Lot 15	*	C. & A. Cutler	003-02000	0.15	50	80	-	130
3	Pt NE1/4 Lot 15	*	D. & R. Koekkoek	003-02100	0.32	50	170	-	220
3	Pt Lot 15	*	D. Wood & R. Bellar	003-02101	0.20	50	90	-	140
3	N Pt Lot 15	*	A. Fazelipour	003-02200	0.27	50	130	-	180
3	N Pt Lot 15	*	Town of Innisfil	003-02300	0.23	50	110	-	160
3	Plan 1194	*	M. & M. Alves	003-02400	0.19	50	90	-	140
3	Lot 14	*	J. & R. Carvalho	003-02500	0.14	50	70	-	120
3	Plan 1194	*	T. Cooley & O. Oliveira	003-02600	0.14	50	70	-	120
3	Lot 12	*	A. & L. Daniels	003-02700	0.14	50	70	-	120
3	Plan 1194	*	A. & K. Demarco	003-02800	0.28	50	150	-	200
3	Lot 9	*	R. Wilcox	003-02900	0.15	50	80	-	130
3	Lot 8	*	B. Cutler & P. Smith	003-03000	0.14	50	70	-	120
3	Lot 7	*	W. French	003-03100	0.14	50	70	-	120
3	Lot 6	*	D. Saunders	003-03200	0.14	50	70	-	120
3	Lot 5	*	N. Mason	003-03300	0.14	50	70	-	120
3	Lot 4	*	A. & R. West	003-03400	0.14	50	70	-	120
3	Plan 1194	*	B. & K. Bourget	003-03500	0.14	50	70	-	120
3	Lot 2	*	S. Simpson	003-03600	0.14	50	70	-	120
3	Lot 1	*	E. Waite	003-03700	0.17	50	90	-	140
3	Lot 16	*	A. & J. Asselstine	003-03800	0.20	50	110	-	160
3	Lot 17	*	M. Brown	003-03900	0.14	50	70	-	120
3	Lot 18	*	S. & K. Bowen	003-04000	0.14	50	70	-	120
3	Plan 1194	*	D. & C. Bell	003-04100	0.14	50	70	-	120
3	Plan 1194	*	K. & A. Wright	003-04200	0.14	50	70	-	120
3	Lot 21	*	C. Bell	003-04300	0.14	50	70	-	120
3	Lot 22	*	N. Gundert & R. Grant	003-04400	0.17	50	80	-	130
4	Plan M319	*	D. Dare	003-04600	0.20	50	110	-	160
4	Plan M319	*	P.Boer & S. Forsythe	003-04602	0.23	50	120	-	170
4	Plan M319	*	S. Small & L. Henderson	003-04604	0.27	50	140	-	190
4	Plan M319	*	M. & A. Dicesare	003-04606	0.24	50	130	-	180
4	Plan M319	*	R. Flemming	003-04608	0.22	50	120	-	170
4	Plan M319	*	M. Simpson & S. Roberts	003-04610	0.17	50	90	-	140
4	Plan M319	*	S. De Beaucamp	003-04614	0.17	50	90	-	140
4	Plan M319	*	R. & E. Moore	003-04616	0.28	50	150	-	200
4	Plan M319	*	M. Chabrzynski & S. Henderson	003-04618	0.22	50	120	-	170
4	Plan M319	*	R. & J. Lenehan	003-04620	0.18	50	100	-	150
4	Plan M319	*	G. & K. Farr	003-04622	0.21	50	110	-	160
4	Plan M319	*	N. & J. Stacey	003-04624	0.24	50	130	-	180
4	Plan M319	*	T. & E. Roomere	003-04626	0.31	50	170	-	220
4	Plan M319	*	D. & D. Wittick	003-04628	0.19	50	100	-	150
4	Plan M319	*	J. Philp & P. Murphy	003-04630	0.18	50	100	-	150
4	Plan M319	*	A. & J. Domenegato	003-04632	0.17	50	90	-	140
4	Plan M319	*	D. Veitch & R. Hopkins	003-04634	0.18	50	100	-	150
4	Plan M319	*	P. & L. Demers	003-04636	0.18	50	100	-	150
4	Plan M319	*	J. Quinn, J. Rabot & M. Quinn-Rabot	003-04638	0.19	50	100	-	150
4	Plan M319	*	J. & U. Zubrzycka	003-04640	0.20	50	110	-	160
4	Plan M319	*	T. & L. Moroz	003-04642	0.17	50	90	-	140
4	Plan M319	*	P. Whissell & H. Lostchuck	003-04644	0.22	50	120	-	170
4	Plan M319	*	R. & S. Laird	003-04646	0.19	50	100	-	150
4	Plan M319	*	B. & M. Rutledge	003-04648	0.19	50	100	-	150
4	Plan M319	*	L. & S. Smith	003-04650	0.18	50	100	-	150
4	Plan M319	*	W. & D. Mann	003-04652	0.17	50	90	-	140
4	Plan M319	*	T. & S. Breen	003-04654	0.17	50	90	-	140
4	Plan M319	*	W. & V. Toole	003-04656	0.20	50	110	-	160
4	Plan M319	*	R. & D. Sloan	003-04658	0.17	50	90	-	140
4	Plan M319	*	M. & I. Fruhstuck	003-04660	0.19	50	100	-	150
4	Plan M319	*	W. & D. Mayerhofer	003-04662	0.18	50	100	-	150
4	Plan M319	*	Town of Innisfil	003-04664	0.11	50	60	-	110
4	Plan M319	*	Town of Innisfil	003-04666	0.00	50	-	-	50
4	Lot 4	*	E. & C. Hawkes	003-04700	0.18	50	100	-	150
4	Lot 3	*	J. & J. Calvert	003-04800	0.19	50	100	-	150
4	Plan 1683	*	R. & C. Thew	003-04900	0.18	50	100	-	150
4	Plan 1683	*	P. & S. Hrynyk	003-05000	0.20	50	110	-	160
4	Plan 1683	*	R. & T. Kirkwood	003-05100	0.21	50	110	-	160
4	Plan 1683	*	J. & W. Campbell	003-05200	0.19	50	100	-	150
4	Lot 31	*	S. & L. Manley	003-05300	0.19	50	100	-	150
4	Lot 30	*	C. Schreider & A. Teskey	003-05400	0.19	50	100	-	150
4	Lot 29	*	D. Greenman & E. Stuart	003-05500	0.31	50	170	-	220
4	Plan 1683	*	G. & D. Adair	003-05600	0.36	50	190	-	240
4	Plan 1683	*	L. Mendrek	003-05700	0.19	50	100	-	150
4	Lot 26	*	M. & J. Cristicini	003-05800	0.19	50	100	-	150
4	Lot 10	*	K. Wisch	003-05900	0.20	50	110	-	160
4	Plan 1683	*	W. & P. Simpson	003-06000	0.20	50	110	-	160
4	Lot 8	*	A. & L. Kamrath	003-06100	0.19	50	100	-	150
4	Plan 1683	*	M. Sallach	003-06200	0.19	50	100	-	150
4	Plan 1683	*	E. Madden	003-06300	0.20	50	110	-	160
4	Plan 1683	*	R. & L. Cuggy	003-06400	0.22	50	120	-	170
4	Plan 1683	*	P. & W. Belgue	003-06500	0.19	50	100	-	150
4	Plan 1683	*	J. & D. Van Donkelaar	003-06600	0.19	50	100	-	150
4	Lot 18	*	Town of Innisfil	003-06700	0.19	50	100	-	150

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
4	Lot 17	*	G. Roesler	003-06800	0.20	50	110	-	160
4	Plan 1683	*	A. & S. Gismondi	003-06900	0.20	50	110	-	160
4	Lot 15	*	L. & J. Columbus	003-07000	0.19	50	100	-	150
4	Lot 14	*	U. Agarunov	003-07100	0.19	50	100	-	150
4	Lot 13	*	J. MacEachern	003-07200	0.19	50	100	-	150
4	Plan 1683	*	W. Vankempen & D. Williamson	003-07300	0.21	50	110	-	160
4	Lot 11	*	K. & C. Mortelliti	003-07400	0.20	50	110	-	160
4	Plan 1683	*	K. Russel & J. Johnson	003-07500	0.19	50	100	-	150
4	Plan 1683	*	Town of Innisfil	003-07600	0.99	50	530	-	580
4	Lot 24	*	B. & R. Witkowski	003-07700	0.19	50	100	-	150
4	Lot 23	*	C. Moore	003-07800	0.19	50	100	-	150
4	Lot 22	*	B. & B. Pearce	003-07900	0.19	50	100	-	150
4	Lot 21	*	C. & G. Prospero & A. Volpe	003-08000	0.21	50	110	-	160
4	Plan 1683	*	K. Humphris & N. Upham	003-08100	0.19	50	100	-	150
4	Lot 19	*	D. & L. MacDonell	003-08200	0.24	50	130	-	180
4	S Pt Lot 15	*	D. & D. Scott	003-08300	0.25	50	130	-	180
4	Pt Lot 15	*	J. & A. Calderon	003-08301	0.14	50	70	-	120
4	S Pt Lot 15	*	Woodsview Property Management	003-08400	0.12	50	60	-	110
4	S Pt Lot 15	*	A. Azan	003-08500	0.08	50	40	-	90
4	S Pt Lot 15	*	R. Drennan & M. Schell	003-08600	0.26	50	140	-	190
4	S Pt Lot 15	*	2367633 Ontario Inc	003-08700	0.26	50	140	-	190
4	S Pt Lot 15	*	S. Sanderson	003-08800	0.30	50	160	-	210
4	S Pt Lot 5	*	United Church	003-08900	0.41	50	220	-	270
4	Plan 162	*	Town of Innisfil	003-09000	0.57	50	300	-	350
4	Plan 162	*	D. Hogarth	003-09100	0.47	50	250	-	300
4	S Pt Lot 16	*	Town of Innisfil	003-09200	0.00	50	-	-	50
4	Pt Lots 5	*	S. Mark	003-09400	0.46	50	250	-	300
4	Pt Lots 5	*	A. Drugovic & G. Jenkinson	003-09500	0.14	50	70	-	120
4	Plan 162	*	S. Mikkola & K. Lamonday	003-09600	0.12	50	60	-	110
4	Plan 162	*	M. MacPhail & T. Nolan	003-09700	0.13	50	70	-	120
4	N Pt Lot 41	*	R. & P. Sampaio	003-09900	1.16	50	620	-	670
4	Plan 162	*	B. Deputat & C. Braney	003-10000	0.97	50	470	-	520
4	Plan 162	*	A. & M. Stepanova	003-10010	0.23	50	110	-	160
4	Plan 162	*	C. Radulovici	003-10100	1.72	50	800	-	850
4	Pt Lots 3	*	H. Rahimimoghadam	003-10200	0.40	50	190	-	240
4	Plan 162	*	M. Slocombe	003-10300	0.60	50	280	-	330
4	Plan 162	*	S. & R. Thomas	003-10400	0.18	50	80	-	130
4	Lot 30	*	A. Zlender	003-10500	0.26	50	120	-	170
4	Plan 162	*	C. & T. Asselstine	003-10600	1.07	50	500	-	550
4	Lot 24	*	B. Hoseman & K. Hoseman	003-10700	0.20	50	90	-	140
4	Plan 162	*	L. Burke	003-10800	0.17	50	80	-	130
4	Plan 162	*	S. & L. Gucciardi	003-10900	0.06	50	30	-	80
4	S Pt Lot 23	*	Renaissance Nouveau Design Inc	003-11000	0.06	50	30	-	80
4	Pt Lots 1	*	A. & D. Whiteside	003-11100	0.17	50	80	-	130
4	Plan 162	*	D. Napper	003-11200	0.39	50	180	-	230
4	Plan 162	*	V. & Z. Iacob	003-11300	0.72	50	340	-	390
4	S Pt Lot 16		K. & R. Sinclair	003-11400	16.28	50	2,370	-	2,420
4	Pt Lots 6 & 7	*	C. & T. Asselstine	003-11500	0.22	50	100	-	150
4	Plan 162	*	C. Mark	003-11600	0.13	50	60	-	110
4	Plan 162	*	R. Schweymaier	003-11700	0.85	50	400	-	450
4	Pt Lots 2	*	D. & M. Wilson	003-11800	0.15	50	70	-	120
4	Lot 1	*	C. Cheganças	003-11900	0.15	50	70	-	120
4	Pt Lot 16	*	D. & L. Fairhead	003-12000	1.03	50	480	-	530
4	Lot 61	*	F. Minici	003-12100	0.24	50	110	-	160
4	Plan 162	*	E. & I. Gyorfi	003-12200	0.19	50	90	-	140
4	Plan 162	*	P. Savard	003-12300	0.17	50	80	-	130
4	Plan 162	*	D. & M. Bowen	003-12400	0.11	50	50	-	100
4	Plan 162	*	J. Giannitti & M. Giannitti Est.	003-12500	0.18	50	80	-	130
4	Plan 162	*	C. Asselstine & M. Marshall	003-12600	0.18	50	80	-	130
4	Pt Lot 16	*	P. & D. McMillan	003-12700	1.41	50	660	-	710
4	Pt Lot 16	*	M. Mindle & E. Gulyas	003-12800	0.71	50	330	-	380
4	Plan M448	*	Town of Innisfil	003-25600	0.18	50	100	-	150
4	Plan M448	*	J. & C. Ang	003-25602	0.29	50	150	-	200
4	Plan M448	*	P. & S. Kubas	003-25604	0.22	50	120	-	170
4	Plan M448	*	S. & T. Smith	003-25606	0.20	50	110	-	160
4	Plan M448	*	R. & C. Cavaco	003-25608	0.20	50	110	-	160
4	Plan M448	*	S. & W. Mays	003-25610	0.20	50	110	-	160
4	Plan M448	*	N. Geddes	003-25612	0.21	50	110	-	160
4	Plan M448	*	S. & N. Gill	003-25614	0.26	50	140	-	190
4	Plan M448	*	D. & T. Carlson	003-25616	0.26	50	140	-	190
4	Plan M448	*	S. & T. Chatland	003-25618	0.29	50	150	-	200
4	Plan M448	*	L. Truong	003-25620	0.30	50	160	-	210
4	Plan M448	*	Town of Innisfil	003-25622	0.53	50	280	-	330
4	Plan 51M448	*	J. Stubbs	003-25624	1.96	50	1,050	-	1,100
4	Plan M448	*	J. & C. Fabing	003-25626	0.29	50	150	-	200
4	Plan M448	*	R. & E. Stukas	003-25628	0.26	50	140	-	190
4	Plan M448	*	M. Iammatteo	003-25630	0.26	50	140	-	190
4	Plan M448	*	D. & L. Ficher	003-25632	0.26	50	140	-	190
4	Plan M448	*	D. & S. Cake	003-25634	0.29	50	150	-	200
4	Plan M448	*	L. Philipp	003-25636	0.30	50	160	-	210
4	Plan M448	*	R. & D. Yonge	003-25638	0.32	50	170	-	220
4	Plan M448	*	A. & N. Bell	003-25640	0.21	50	110	-	160
4	Plan M448	*	A. Buttrum	003-25642	0.26	50	140	-	190

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
4	Plan M448	*	A. & A. Simpson	003-25644	0.22	50	120	-	170
4	Plan M448	*	C. & J. Van Nispen	003-25646	0.18	50	100	-	150
4	Plan M448	*	G. Clubine	003-25648	0.18	50	100	-	150
4	Plan M448	*	C. & C. Kidd	003-25650	0.21	50	110	-	160
4	Plan M448	*	K. & M. Moores	003-25652	0.24	50	130	-	180
4	Plan M448	*	F. Guttridge & L. Etherton	003-25654	0.24	50	130	-	180
4	Plan M448	*	D. & E. Ciccia	003-25656	0.24	50	130	-	180
4	Plan M448	*	B. & J. Laval	003-25658	0.24	50	130	-	180
4	Plan M448	*	J. & C. Molenhuis	003-25660	0.24	50	130	-	180
4	Plan M448	*	C. Damianakis & R. Cooper	003-25662	0.22	50	120	-	170
4	Plan M448	*	M. & D. Twardowski	003-25664	0.28	50	150	-	200
4	Plan M448	*	M. & L. Snowball	003-25666	0.20	50	110	-	160
4	Plan M448	*	R. Mateus	003-25668	0.24	50	130	-	180
4	Plan M448	*	M. & S. Davenport	003-25670	0.26	50	140	-	190
4	Plan M448	*	B. & S. Bingley	003-25672	0.24	50	130	-	180
4	Plan M448	*	S. Jenssen-Brown	003-25674	0.21	50	110	-	160
4	Plan M448	*	D. Lajoie	003-25676	0.17	50	90	-	140
4	Plan M448	*	R. & K. Carlin	003-25678	0.18	50	100	-	150
4	Plan M448	*	E. & B. Rideout	003-25680	0.18	50	100	-	150
4	Plan M448	*	R. Cressman	003-25682	0.20	50	110	-	160
4	Plan M448	*	C. & L. Vitale	003-25684	0.22	50	120	-	170
4	Plan M448	*	E. & F. Arantes	003-25686	0.21	50	110	-	160
4	Plan M448	*	A. & A. Takacs	003-25688	0.20	50	110	-	160
4	Plan M448	*	N. & P. Blanchet	003-25690	0.20	50	110	-	160
4	Plan M448	*	J. & C. Conti	003-25692	0.20	50	110	-	160
4	Plan M448	*	C. Douglas	003-25694	0.19	50	100	-	150
4	Plan M448	*	T. & M. Tokarski	003-25696	0.19	50	100	-	150
4	Plan M448	*	G. Werth	003-25698	0.20	50	110	-	160
4	Plan M448	*	J. & L. Knox	003-25702	0.21	50	110	-	160
4	Plan M448	*	M. & M. Goodchild	003-25704	0.21	50	110	-	160
4	Plan M448	*	G. Gogos	003-25706	0.18	50	100	-	150
4	Plan M448	*	J. Reindl	003-25708	0.18	50	100	-	150
4	Plan M448	*	D. & A. Stopyra	003-25710	0.20	50	110	-	160
4	Plan M448	*	D. & E. Magri	003-25712	0.21	50	110	-	160
4	Plan M448	*	V. & K. Hamilton	003-25714	0.21	50	110	-	160
4	Plan M448	*	M. Doyle & S. McInnis	003-25716	0.21	50	110	-	160
4	Plan M448	*	R. Weeks	003-25718	0.21	50	110	-	160
4	Plan M448	*	A. & S. Ginzburg	003-25720	0.20	50	110	-	160
4	Plan M448	*	E. & S. Ernest	003-25722	0.19	50	100	-	150
4	Plan M448	*	Town of Innisfil	003-25724	0.83	50	440	-	490
6	S Pt Lot 3		1045990 Ontario Inc	018-00900	8.47	50	2,440	-	2,490
6	S Pt Lot 4		T. & R. Ruch & 10454990 Ontario Inc	018-01300	12.20	50	3,030	-	3,080
6	S Pt Lot 4		J. Robson	018-01400	20.75	50	4,980	-	5,030
6	S Pt Lot 5		M. Vandermast	018-01500	61.32	50	16,150	-	16,200
6	S Pt Lot 5	*	W. & B. Baguley	018-01600	0.20	50	90	-	140
6	S Pt Lot 6		J. & P. Hilverda	018-01800	0.23	50	70	-	120
6	Pt Lot 6		J. & P. Hilverda	018-01900	21.31	50	4,010	-	4,060
6	Pt Lot 6	*	Town of Innisfil	018-01902	7.24	50	2,120	-	2,170
6	N Pt Lot 6		1665328 Ontario Ltd	018-02000	13.13	50	3,530	-	3,580
6	N Pt Lot 6	*	V. & J. Parravano	018-02010	0.18	50	50	-	100
6	N Pt Lot 5		1057595 Ontario Ltd	018-02500	20.38	50	5,290	-	5,340
6	N Pt Lot 4	*	D. & J. Rice	018-02600	9.98	50	1,040	-	1,090
6	N Pt Lot 4		L. Peterson	018-02800	31.95	50	7,830	-	7,880
6	N Pt Lot 3		G. & J. McLean	018-02900	38.17	50	11,170	-	11,220
6	N Pt Lot 3		G. McLean	018-02901	0.21	50	60	-	110
7	N Pt Lots 1		P. Wardlaw	018-03100	0.81	50	230	-	280
7	S Pt Lot 3		D. & D. Oakley	018-03900	23.56	50	6,270	-	6,320
7	S Pt Lot 3	*	M. & D. Purnell	018-04000	0.21	50	120	-	170
7	W Pt Lot 4	*	Ben Capelas Landscaping & Snow Removal	018-04100	4.64	50	1,360	-	1,410
7	S Pt Lot 4		M. Haourt & J. See	018-04200	20.02	50	5,770	-	5,820
7	S Pt Lot 5		R. & K. Webb	018-04300	8.56	50	2,480	-	2,530
7	S Pt Lot 5		922952 Ontario Inc	018-04400	8.69	50	2,470	-	2,520
7	Pt Lots 4 & 5		R. Arbour	018-05000	9.37	50	2,450	-	2,500
7	W Pt Lot 4		Rix Farms Ltd	018-05100	15.55	50	2,990	-	3,040
6	Lot 7		751518 Ontario Ltd	020-00100	40.25	50	11,780	-	11,830
6	Pt Lot 7		Town of Innisfil	020-00104	5.40	50	1,580	-	1,630
6	S Pt Lot 10		1536315 Ontario Ltd	020-00400	8.97	50	2,620	-	2,670
6	N Pt Lot 13	*	J. & V. Aquino	021-03800	2.66	50	190	-	240
6	N Pt Lot 13	*	J. Horodynsky	021-04000	1.65	50	120	-	170
6	N Pt Lot 12	*	A. & L. Obidin	021-04101	3.49	50	260	-	310
6	N Pt Lot 11		2154016 Ontario Ltd	021-04200	12.89	50	2,950	-	3,000
6	S Pt Lot 11		C. Hall	021-04300	20.39	50	4,590	-	4,640
6	S Pt Lot 11	*	K. & R. Winter	021-04400	20.49	50	4,870	-	4,920
6	S Pt Lot 12	*	O. & K. Awrey	021-04500	12.47	50	1,190	-	1,240
6	S Pt Lot 12	*	K. Bernt	021-04600	12.46	50	1,730	-	1,780
6	S Pt Lot 12	*	G. & G. Kent	021-04700	16.51	50	2,810	-	2,860
6	S Pt Lot 13	*	A. Zlender	021-04800	19.68	50	1,440	-	1,490
6	S Pt Lot 13	*	M. Slaby	021-04900	19.44	50	1,890	-	1,940
6	S Pt Lot 14		W. Pratt	021-05000	39.45	50	7,140	-	7,190
6	S Pt Lot 15	*	Ministry Of Transportation	021-05100	0.80	50	180	-	230
6	S Pt Lot 15		J. & E. Cole	021-05200	18.65	50	5,050	-	5,100
6	S Pt Lot 15	*	D. Huisman	021-05300	0.26	50	80	-	130
6	Pt Lot 15	*	Sunset International Speedway Inc	021-05400	11.77	50	2,430	-	2,480

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Main Drain

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Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
6	S Pt Lot 15	*	Sunset International Speedway Inc	021-05500	6.41	50	5,630	-	5,680
6	Plan 1120	*	1625057 Ontario Corporation	021-05600	0.17	50	150	-	200
6	Pt Lots 14 & 15		2215570 Ontario Inc	021-06100	14.68	50	1,400	-	1,450
6	N Pt Lot 13	*	C. Scenna	021-06101	5.92	50	430	-	480
6	N Pt Lot 13	*	1281597 Ontario Inc	021-06102	4.86	50	360	-	410
15	Pt Lot 6	*	Suncor Energy Inc	072-15602	0.40	50	-	-	50
15	Pt Lot 6	*	Suncor Energy Inc	072-15604	2.31	50	10	-	60
15	Pt Lot 6	*	J. Bucko	072-15700	0.19	50	-	-	50
15	Pt Lot 5	*	1833044 Ontario Ltd	072-15900	7.37	1,300	10	-	1,310
15	Pt Lot 6	*	C. & M. Carra	072-15901	5.22	50	10	-	60
15	Pt Lot 5	*	2537878 Ontario Ltd	072-15902	2.02	50	20	-	70
15	Pt Lot 5	*	Resquip Inc	072-15903	2.40	50	20	-	70
15	Pt Lot 6	*	Suncor Energy Inc	072-15905	0.43	50	-	-	50
15	Pt Lot 6	*	C. & M. Carra	072-15910	0.89	50	10	-	60
15	W Pt Lot 5	*	ADF Investments Ltd	072-16000	1.28	50	10	-	60
15	W Pt Lot 4	*	K. & S. Lotton	072-16200	0.23	50	-	-	50
15	W Pt Lot 4	*	J. Lemoine	072-16300	1.23	50	-	-	50
15	W Pt Lot 4	*	N. Ahmed & Q. Majoka	072-16301	0.64	50	-	-	50
15	Pt Lot 4	*	M. & M. Pedneault	072-16302	0.38	50	-	-	50
15	Pt Lot 4	*	G. & M. Cruz	072-16402	0.81	50	-	-	50
15	Pt Lot 4	*	C. Kulesza	072-16410	0.49	50	-	-	50
15	Plan M480	*	M. Colabella & D. Bravo	072-16420	0.64	50	-	-	50
15	Plan M480	*	Ontario Stockyards Inc	072-16430	4.20	50	40	-	90
13	N Pt Lot 10	*	W. & T. Chen	073-32500	12.99	50	180	-	230
13	N Pt Lot 10	*	G. & D. Kruger	073-32600	0.36	50	10	-	60
13	N Pt Lot 10	*	P. & L. Plavic	073-32610	0.21	50	20	-	70
13	N Pt Lot 10	*	A. Smith	073-32700	5.56	50	170	-	220
13	N Pt Lot 10	*	J. & E. Blake	073-32701	0.81	50	30	-	80
13	N Pt Lot 10	*	D. Decaro	073-32800	7.83	50	220	-	270
13	N Pt Lot 11		P. & S. Silverthorne	073-32900	10.51	50	450	-	500
13	N Pt Lot 11	*	A. Martin	073-33000	7.14	50	220	-	270
13	N Pt Lot 11	*	R. White & D. Miedema	073-33001	1.22	50	40	-	90
13	N Pt Lot 11	*	S. & L. McGuire	073-33002	0.48	50	20	-	70
13	N Pt Lot 11	*	M. & D. Ridout	073-33003	0.48	50	20	-	70
13	N Pt Lot 11	*	A. & C. Galati	073-33010	0.51	50	20	-	70
13	N Pt Lot 11	*	W. Kapralik & M. Janz Est.	073-33015	0.51	50	10	-	60
13	Pt Lot 11	*	S. Tustin & T. Ross	073-33100	10.20	50	400	-	450
13	N Pt Lot 11	*	D. McGeachy	073-33110	0.32	50	10	-	60
13	N Pt Lot 11	*	Y. Liao & Z. Li	073-33200	7.66	50	310	-	360
13	N Pt Lot 12	*	S. & H. White	073-33201	0.78	50	20	-	70
13	N Pt Lot 11	*	A. & P. Clitherow	073-33202	1.53	50	60	-	110
13	Pt Lot 11	*	J. & R. Carvalhais	073-33203	0.66	50	20	-	70
13	Pt Lot 11	*	P. & A. Clitherow	073-33204	0.46	50	20	-	70
13	Pt Lot 12	*	M. Milekic	073-33300	19.87	50	490	-	540
13	Pt Lot 12	*	M. & O. Milekic	073-33302	1.32	50	30	-	80
13	N Pt Lot 12	*	R. Vandrie & R. Walsh	073-33320	0.49	50	20	-	70
13	N Pt Lot 12		F. Semiao	073-33400	17.86	50	520	-	570
13	N Pt Lot 12	*	R. Sturgeon	073-33401	1.74	50	80	-	130
13	N Pt Lot 12		Beacon Street Entertainment	073-33500	4.59	50	210	-	260
13	N 1/2 Lot 13	*	D. & R. Mattingley	073-33501	0.99	50	50	-	100
13	N Pt Lot 13		Hasbrooke Holdings Ltd	073-33510	15.41	50	690	-	740
14	S Pt Lot 15		W. & C. Procter	073-34400	7.30	50	340	-	390
14	S Pt Lot 14		P & A Timbers & Sons	073-34901	9.26	50	430	-	480
14	Pt Lot 14		E. & J. Samios	073-35202	17.31	50	670	-	720
14	S Pt Lot 13		T. Sturgeon	073-35300	42.53	50	1,870	-	1,920
14	S Pt Lot 12		H. Nunes	073-35400	43.25	50	1,610	-	1,660
14	S Pt Lot 11	*	V. & R. Ibrajev	073-35500	20.61	50	640	-	690
14	W Pt Lot 11	*	R. & S. Batsch	073-35600	4.23	50	130	-	180
14	W Pt Lot 11	*	D. Kennedy Est. & G. Kennedy	073-35601	1.69	50	50	-	100
14	W Pt Lot 11	*	D. & N. Forget	073-35700	2.55	50	70	-	120
14	W Pt Lot 11	*	M. & B. Markowitz	073-35800	4.20	50	140	-	190
14	W Pt Lot 11	*	C. Sun & P. Pov	073-35900	3.62	50	110	-	160
14	Pt Lot 11	*	A. & D. Cianfarani	073-35901	0.74	50	20	-	70
14	W Pt Lot 11	*	H., Z., & M. Tesic	073-36000	4.25	50	150	-	200
14	S Pt Lot 10	*	D. & B. Jebb	073-36100	41.44	50	900	-	950
14	S Pt Lot 10	*	P. & M. Barreira	073-36101	0.44	50	10	-	60
14	S Pt Lot 9	*	J. Marques	073-36200	7.58	50	90	-	140
14	S Pt Lot 9	*	2031430 Ontario Ltd	073-36300	6.89	50	100	-	150
14	N Pt Lot 16	*	A. Lacquaniti	074-12400	0.14	50	10	-	60
14	N Pt Lot 16	*	L. Webster	074-12500	0.12	50	10	-	60
14	N Pt Lot 16	*	B. Kneeshaw	074-12600	0.18	50	20	-	70
14	N Pt Lot 16	*	B. & J. Kneeshaw	074-12601	0.19	50	20	-	70
14	N Pt Lot 16	*	L., R. & J. Kell	074-12700	1.38	50	60	-	110
14	N Pt Lot 16	*	C. & L. Stovold	074-12710	0.99	50	50	-	100
14	N Pt Lot 16		1402802 Ontario Inc	074-12720	18.34	50	860	-	910
14	N Pt Lot 15		1402802 Ontario Inc	074-12900	41.13	50	1,920	-	1,970
14	N Pt Lot 15	*	L. & M. Parsons	074-12901	0.20	50	20	-	70
14	Pt N1/2 Lot 15	*	F. & K. Zielke	074-12902	0.21	50	20	-	70
14	N Pt Lot 14		D. Zielke	074-13000	42.52	50	1,980	-	2,030
14	N Pt Lot 13		L. & E. Kell	074-13100	42.24	50	1,840	-	1,890
14	N Pt Lot 13	*		074-13101	0.23	50	20	-	70
14	N Pt Lot 12	*	S. & K. Thavakumar & S. Janani	074-13200	0.62	50	30	-	80
14	N Pt Lot 12		W. Steimle	074-13201	42.23	50	1,380	-	1,430

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14	Pt Lot 11	*	D. & A. Ostojic	074-13300	21.63	50	730	-	780
14	N Pt Lot 11	*	K. & O. Kanevsky	074-13301	8.46	50	120	-	170
14	W Pt Lot 11	*	S. Heinemann & C. Kim	074-13400	4.24	50	100	-	150
14	W Pt Lot 11	*	J. & C. Evans	074-13500	4.26	50	130	-	180
14	W Pt Lot 11	*	K. & S. MacRae	074-13600	4.27	50	100	-	150
14	N Pt Lot 10	*	C. & V. Grande	074-13700	10.26	50	290	-	340
14	Pt Lot 10	*	P. & L. Fenz & D. Leithwood	074-13701	0.40	50	20	-	70
14	N Pt Lot 10	*	R. & C. Colonna & F. & V. Corbo	074-13800	21.35	50	300	-	350
14	N Pt Lot 10	*	E. & A. Spina	074-13900	10.69	50	320	-	370
14	N Pt Lot 9	*	C. Schiafone & A. Britton	074-14000	10.88	50	130	-	180
14	N Pt Lot 9	*	G., G. & A. Gatti	074-14100	11.20	50	130	-	180
14	N Pt Lot 9	*	J. & J. Waz	074-14200	8.64	50	100	-	150
14	N Pt Lot 9	*	D., L., & T. Galati & A. Granato	074-14300	6.30	50	70	-	120
14	N Pt Lot 8	*	M. & I De Sao Jose	074-14400	3.37	50	40	-	90
14	N Pt Lot 8	*	A. & M. Cesta & R. & A. Babusci	074-14500	6.05	50	70	-	120
14	Pt Lots 7 & 8	*	Riocan Holdings (Tiy) Inc & 1633272 Alberta Ulc	074-14900	6.80	50	160	-	210
15	Pt Lot 8	*	I. & M. De Sao Jose	074-15000	7.88	50	80	-	130
15	Pt Lot 8	*	Sisters Of Our Lady Mount	074-15100	1.11	730	30	-	760
15	Pt Lot 8	*	Town of Innisfil	074-15101	0.71	550	30	-	580
15	Pt Lot 8	*	Sisters Of Our Lady Mount	074-15200	2.12	980	40	-	1,020
15	Pt Lot 8	*	L. Lorusso	074-15201	2.12	1,960	90	-	2,050
15	Pt Lot 9	*	Q. Woods	074-15300	4.65	1,750	130	-	1,880
15	W Pt Lot 9	*	Fairview Farms Holdings Inc	074-15400	10.15	4,160	240	-	4,400
15	Pt Lot 10		M. Toich	074-15500	4.82	4,870	220	-	5,090
15	Pt Lot 10		T. Delahunt	074-15600	3.26	2,660	150	-	2,810
15	Pt Lot 10	*	T. Kingsly	074-15700	1.20	650	60	-	710
15	Pt Lot 10	*	J. Barber & D. Furtado	074-15800	1.61	50	80	-	130
15	Pt Lot 10	*	Barbay Holdings Incorporated	074-15900	2.12	50	100	-	150
15	Pt Lot 10	*	H. Ju	074-16000	1.82	50	80	-	130
15	Pt Lot 11	*	Q. & A. Alam	074-16100	8.74	50	250	-	300
15	Pt Lot 11	*	M. Fenech	074-16101	0.22	50	20	-	70
15	Pt Lot 11	*	G. Bell	074-16102	0.27	50	10	-	60
15	Pt Lot 11	*	S. & R. Kuzmyk	074-16110	0.25	50	10	-	60
15	Pt Lot 11	*	V. Fava & D. Lombardi	074-16200	1.84	50	70	-	120
15	Pt Lot 11	*	P. Hajdukiewicz	074-16210	0.26	50	10	-	60
15	Pt Lot 11	*	B. Nemeth	074-16300	1.98	50	80	-	130
15	Pt Lots 11 & 12	*	B. Arnold & M. Foley	074-16400	1.46	50	60	-	110
15	Pt Lots 11 & 12	*	B. Bondi	074-16401	0.85	50	40	-	90
15	Pt Lot 12	*	J. & T. Rautiainen	074-16500	3.96	50	150	-	200
15	Pt Lot 12	*	F. & H. Pereira	074-16501	2.12	50	70	-	120
15	Pt Lot 12	*	N. & J. Palazzo	074-16520	0.34	50	10	-	60
15	Pt Lot 12		G. & R. Zielke	074-16600	7.86	50	300	-	350
15	Pt Lot 13		Apoca Carpenters Ltd	074-16700	10.24	50	440	-	490
15	W Pt Lot 13	*	F. & K. Commisso & J. Raposo	074-16701	0.37	50	20	-	70
15	Pt Lot 13	*	A. & E. Auciello	074-16702	0.89	50	30	-	80
15	Pt Lot 13	*	K. & B. Adams	074-16710	0.27	50	10	-	60
15	Pt Lot 13	*	A. Venroy & D. Pagnan-Venroy	074-16720	0.27	50	10	-	60
15	Pt Lots 13 & 14		L. & E. Kell	074-16800	11.50	50	540	-	590
15	Pt Lot 14	*	N. & W. Harris	074-16801	0.22	50	20	-	70
15	Pt Lots 13 & 14	*	Hydro One Networks Inc	074-16900	0.18	50	10	-	60
15	Pt Lots 14 & 15		R. & D. Zielke	074-17000	11.24	50	520	-	570
15	Pt Lot 15	*	R. & W. Graham	074-17001	0.19	50	20	-	70
15	Pt Lots 14 & 15	*	R. Zielke	074-17040	0.28	50	10	-	60
15	Pt Lot 15	*	J. McCullough	074-17100	0.19	50	20	-	70
15	Pt Lot 15		K. & H. Kell	074-17200	7.40	50	350	-	400
15	Pt Lot 15	*	Innpower Corporation	074-17300	0.11	50	10	-	60
15	Pt Lot 15	*	2430683 Ontario Inc	074-17400	0.43	50	20	-	70
15	Pt Lot 15	*	S. & B. Kim	074-17500	0.37	50	20	-	70
15	Pt Lot 15	*	E. Ciotti	074-17600	0.42	50	20	-	70
15	Pt Lot 15	*	Town of Innisfil	074-17700	1.10	50	50	-	100
15	Pt Lot 15	*	Town of Innisfil	074-17800	0.99	50	50	-	100
15	Pt Lot 15	*	J. & M. Read	074-17901	0.19	50	20	-	70
15	Pt Lot 16	*	M. & V. Caporiccio	074-18000	0.15	50	10	-	60
15	Pt Lot 16	*	1728299 Ontario Inc	074-18001	0.09	50	10	-	60
15	Pt Lot 16	*	1385385 Ontario Inc	074-18100	0.11	50	10	-	60
15	Pt Lot 16	*	Z. & E. Meir	074-18200	0.20	50	20	-	70
				Total on Innisfil Lands	**7,071.55**	**$ 1,604,673**	**$ 1,072,290**	**$ -**	**$ 2,676,963**

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN: Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #: 300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
			Bradford-West Gwillimbury Lands						
12	Pt S1/2 Lot 12	*	Simcoe County	003-25000	31.19	50	950	-	1,000
12	S Pt Lot 11		I. & Z. Bloch	003-25500	6.68	50	240	-	290
12	N Pt Lot 11	*	T. & B. Berneche	003-27500	1.01	50	40	-	90
12	N Pt Lot 11		J. Koperwas	003-27503	23.48	50	1,090	-	1,140
12	N Pt Lot 11	*	Simcoe County	003-27505	6.36	50	290	-	340
12	N Pt Lot 12		M. Sheikh & A. Chaudary	003-27800	40.59	50	1,500	-	1,550
12	N Pt Lot 12	*	M. & M. Grishaber	003-27801	0.53	50	20	-	70
12	N Pt Lot 12	*	M. Goldenberg & S. Burns	003-27802	0.37	50	20	-	70
12	N Pt Lot 13	*	Simcoe County	003-27804	3.87	50	90	-	140
12	N Pt Lot 13	*	H. Boucher	003-27900	0.79	50	30	-	80
12	N Pt Lot 13	*	C. & V. Duraes	003-27901	0.65	50	30	-	80
12	N Pt Lot 13	*	R. & Y. Fortune	003-27902	0.92	50	30	-	80
12	N Pt Lot 13	*	A. & M. Amaral	003-27903	1.11	50	50	-	100
12	N Pt Lot 13		R. Whillier	003-27905	1.46	50	50	-	100
12	Pt Lot 13	*	D. & N. Soldiuk	003-27906	0.46	50	20	-	70
12	N Pt Lot 13		C. & M. Conceicao	003-28004	6.75	50	190	-	240
13	S Pt Lot 13	*	M. & R. Fresco	003-30201	1.66	50	80	-	130
13	S Pt Lot 13	*	Steiner Tree Farms Ltd	003-30215	4.09	50	190	-	240
13	S Pt Lot 13	*	R. McKaigue	003-30300	18.90	50	560	-	610
13	Pt Lot 13	*	Y. Dement	003-30301	0.70	50	20	-	70
13	S Pt Lot 13	*	Eric's Right World of Scouting	003-30320	4.15	50	110	-	160
13	S Pt Lot 13	*	J. & T. Lefler	003-30400	0.72	50	30	-	80
13	S Pt Lot 13	*	T. Callacott & U. Walton	003-30500	0.74	50	30	-	80
13	S Pt Lot 13	*	B. Ferguson	003-30600	0.37	50	20	-	70
13	S Pt Lot 13	*	J. & K. Van Lierop	003-30601	0.37	50	20	-	70
13	S Pt Lot 13	*	W. & D. Lawrence	003-30700	0.39	50	20	-	70
13	S Pt Lot 11		M. Boddy	003-30800	62.13	50	2,470	-	2,520
13	S Pt Lot 12	*	P. Abercrombie & S. Bruin	003-30801	0.46	50	20	-	70
13	Pt Lot 11	*	J. Reilly & S. Tolley	003-31000	8.02	50	340	-	390
13	Pt Lot 11	*	N. & K. Sears	003-31061	2.85	50	100	-	150
13	Pt Lot 11	*	Y. Guo	003-31001	10.13	50	470	-	520
13	Plan M649	*	Town of Bradford West Gwillimbury	003-31100	0.69	50	30	-	80
13	Plan M649	*	R. & J. Burns	003-31104	0.65	50	30	-	80
13	Plan M649	*	G. Gallo	003-31108	0.71	50	30	-	80
13	Plan M649	*	M. & R. Zimmer	003-31112	0.83	50	30	-	80
13	Plan M649	*	B. & M. Gentile	003-31116	0.73	50	30	-	80
13	Plan M649	*	F. & P. Giusti	003-31120	0.84	50	30	-	80
13	Plan M649	*	K. Brown	003-31124	0.96	50	30	-	80
13	Plan M649	*	L. Gross	003-31128	1.03	50	40	-	90
13	Plan 51M6	*	Q. Zhu Zhi & Y. Tang	003-31136	1.11	50	30	-	80
13	Plan 51M6	*	J. & D. Taylor	003-31138	1.11	50	30	-	80
13	Plan M649	*	S. & U. Kostuch	003-31142	0.76	50	30	-	80
13	Plan M649	*	N. & A. Barroso	003-31146	0.80	50	40	-	90
13	Plan M649	*	L. & P. Wade	003-31150	0.69	50	30	-	80
13	Plan M649	*	D. & J. Ferragine	003-31170	0.66	50	30	-	80
13	Plan M649	*	M. & T. Capuano	003-31174	0.60	50	30	-	80
13	Plan M649	*	B. Ahmed	003-31178	0.49	50	20	-	70
13	Plan M649	*	J. Muir-Birtles & G. Birtles	003-31182	0.62	50	30	-	80
13	Plan M649	*	R. & N. Jackson	003-31186	0.92	50	40	-	90
13	Plan M649	*	R. Sorbera-Colivas	003-31190	0.57	50	30	-	80
13	Plan M649	*	C. Alarie	003-31194	0.53	50	20	-	70
13	Plan M649	*	P. & Z. Zanet	003-31198	0.63	50	30	-	80
13	Pt Lot 10	*	A. Man	003-31410	6.69	50	190	-	240
				Total on Bradford-West Gwillimbury Lands	**264.52**	**$ 2,650**	**$ 9,950**	**$ -**	**$ 12,600**
				TOTAL ON LANDS	**7336.07**	**$ 1,607,323**	**$ 1,082,240**	**$ -**	**$ 2,689,563**

APPENDIX B1 - ASSESSMENTS for CONSTRUCTION
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN:** Town of Innisfil
DATE : October 22, 2019 - Amended by the Tribunal | **PROJECT #:** 300038790

Conc.	Lot or Plan	Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Totals
		Town of Innisfil Roads						
7th Line		Town of Innisfil		3.30	-	3,860	-	3,860
6th Line		Town of Innisfil		14.24	-	18,380	-	18,380
5th Line		Town of Innisfil		15.13	11,290	15,530	-	26,820
4th Line		Town of Innisfil		20.03	127,930	15,540	663,660	807,130
3rd Line		Town of Innisfil		17.60	9,250	11,370	-	20,620
2nd Line		Town of Innisfil		17.58	21,430	7,160	-	28,590
15th Line		Town of Innisfil		1.40	60	-	-	60
Gilford Road		Town of Innisfil		10.24	-	1,010	-	1,010
14th Line		Town of Innisfil		5.20	-	920	-	920
Churchill Unnamed Road 1		Town of Innisfil		0.44	-	410	-	410
Churchill Unnamed Road 2		Town of Innisfil		0.91	-	850	-	850
Churchill Unnamed Road 3		Town of Innisfil		0.21	-	200	-	200
John Street		Town of Innisfil		0.46	-	490	-	490
Allan Street		Town of Innisfil		0.45	-	460	-	460
Sloan Circle Drive		Town of Innisfil		1.30	-	1,390	-	1,390
Cairns Gate		Town of Innisfil		0.22	-	230	-	230
Valley View Drive		Town of Innisfil		1.38	-	1,470	-	1,470
Gimby Crescent		Town of Innisfil		1.06	-	1,130	-	1,130
Meadowland Street		Town of Innisfil		1.54	-	1,640	-	1,640
Reive Blvd		Town of Innisfil		21.76	9,000	7,030	19,000	35,030
			Total on Town of Innisfil Roads	**134.45**	**$ 178,960**	**$ 89,070**	**$ 682,660**	**$ 950,690**
		Town of Bradford West Gwillimbury Roads						
Line 13		Bradford West Gwillimbury		3.35	-	620	-	620
Line 12		Bradford West Gwillimbury		0.23	-	40	-	40
Kilkenny Trail		Bradford West Gwillimbury		1.30	-	240	-	240
			Total on Town of Bradford West Gwillimbury Roads	**4.88**	**$ -**	**$ 900**	**$ -**	**$ 900**
		Other Roads						
5 Sideroad (CR 53)		Simcoe County		20.17	80	9,200	-	9,280
10 Sideroad (CR 54)		Simcoe County		26.44	98,050	16,100	-	114,150
County Road 89		Simcoe County		16.14	5,250	3,340	-	8,590
County Road 4 (Yonge Street)		Simcoe County		26.04	-	29,260	-	29,260
Hwy 89		Ministry of Transportation		6.76	90	120	-	210
Hwy 400		Ministry of Transportation		74.69	12,670	48,270	56,000	116,940
			Total on Other Roads	**170.24**	**$ 116,140**	**$ 106,290**	**$ 56,000**	**$ 278,430**
			TOTAL ON ROADS	**309.57**	**$ 295,100**	**$ 196,260**	**$ 738,660**	**$ 1,230,020**
			ALL LANDS AND ROADS	**7645.64**	**$ 1,902,423**	**$ 1,278,500**	**$ 738,660**	**$ 3,919,583**

Notes:
(1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

B2

Appendix B2

Assessment for Construction
Branch A

APPENDIX B2 - ASSESSMENTS for CONSTRUCTION
Branch 'A'

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.26)	Totals
			Innisfil Lands						
1	Pt Lot 6		A. Moir & H. Minns	001-01400	6.47	7,800	490		8,290
1	Pt Lot 6	*	Ministry Of Transportation	001-02100	2.81	1,550	470		2,020
1	Pt Lot 7	*	Ministry Of Transportation	001-02400	1.40	350	340		690
14	Pt Lots 7 & 8	*	Riocan Holdings (Tiy) Inc & 1633272	074-14900	6.80	-	1,790		1,790
15	Pt Lot 8	*	I. & M. De Sao Jose	074-15000	1.58	-	120		120
				TOTAL ON LANDS	**19.06**	**$ 9,700**	**$ 3,210**	**$ -**	**$ 12,910**
			Town of Innisfil Roads						
Reive Blvd			Town of Innisfil		3.37	500	3,890	-	4,390
				Total on Town of Innisfil Roads	**3.37**	**$ 500**	**$ 3,890**	**$ -**	**$ 4,390**
			Other Roads						
County Road 89			Simcoe County		0.24	-	290	-	290
Hwy 400			Ministry of Transportation		12.89	8,840	17,610	-	26,450
				Total on Other Roads	**13.13**	**$ 8,840**	**$ 17,900**	**$ -**	**$ 26,740**
				TOTAL ON ROADS	**16.50**	**$ 9,340**	**$ 21,790**	**$ -**	**$ 31,130**
				ALL LANDS AND ROADS	**35.56**	**$ 19,040**	**$ 25,000**	**$ -**	**$ 44,040**

Notes: (1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

Appendix B3

Assessment for Construction
10 Sideroad Branch Drain

B3

APPENDIX B3 - ASSESSMENTS for CONSTRUCTION
10 Sideroad Branch Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.26)	Totals
			Innisfil Lands						
3	S Pt Lot 7		1665328 Ontario Ltd	001-22900	9.28	-	270	-	270
3	S Pt Lot 8	*	J. Petropoulos	001-23000	0.79	-	20	-	20
3	W Pt Lot 8	*	D. Oshell & D. McLachlan	001-23001	0.37	-	10	-	10
3	S Pt Lot 8	*	G. Dermott	001-23200	0.18	-	10	-	10
3	Pt Lot 9	*	A. & J. Mormile	001-23400	20.52	-	890	-	890
3	Pt Lot 9		M. Assadian & L. Desroche	001-23500	22.67	-	1,020	-	1,020
3	Pt Lot 9		1409563 Ontario Ltd	001-23600	20.18	-	1,080	-	1,080
3	S Pt Lot 10	*	K. Levy	001-23700	4.05	-	90	-	90
3	Pt Lot 10		A. Fox & B. Scott	001-23800	4.42	770	160	-	930
3	S Pt Lot 10	*	J. Phaneuf & C. Aguiar	001-23900	6.05	550	80	-	630
3	S Pt Lot 10	*	Y. Cil	001-24100	6.03	540	110	-	650
3	Pt Lot 10		J. Chow	001-24200	54.13	6,320	4,940	-	11,260
3	N Pt Lot 10	*	H. & A. Perkins	001-24300	1.21	-	120	-	120
3	Pt Lot 10	*	H. Squibb	001-24301	8.40	-	890	-	890
3	N Pt Lot 9		J. & P. Wilson	001-24400	10.64	-	960	-	960
3	N Pt Lot 9	*	C. & M. Cialone	001-24500	10.02	-	950	-	950
3	Pt Lot 8		P. & C. Woods	001-24600	10.05	-	1,150	-	1,150
3	Pt Lot 8		1665328 Ontario Ltd	001-24800	30.14	-	1,760	-	1,760
3	Pt Lot 8	*	G. & M. Reynolds	001-24801	1.00	-	110	-	110
3	Pt Lot 8	*	B. & V. Cestaric	001-24810	0.29	-	10	-	10
3	W Pt Lot 8		1665328 Ontario Ltd	001-24900	24.11	-	1,740	-	1,740
3	N Pt Lot 7		J. & M. Albanese	001-25000	6.42	-	730	-	730
4	S Pt Lot 7		Gdm Terraco Inc	001-25400	1.45	-	170	-	170
4	S Pt Lot 7		Franline Investments Ltd	001-25500	7.79	-	890	-	890
4	S Pt Lot 7		F. & N. Grillo	001-25600	10.11	-	1,130	-	1,130
4	Pt Lots 8 & 9		V. & D. Posius	001-25800	59.20	-	6,360	-	6,360
4	Pt Lot 8	*	S. Khan	001-25801	0.23	-	30	-	30
4	S Pt Lot 9		Sil Developments Inc, R. Zaretsky & S. Soudack	001-25900	19.33	-	2,940	-	2,940
4	S Pt Lot 9	*	J. & D. Thew	001-25910	0.40	-	60	-	60
4	S Pt Lot 10	*	P. Pillitteri	001-26000	37.00	320	5,630	-	5,950
4	N Pt Lot 10	*	P. Pillitteri	001-26100	2.72	-	410	-	410
4	N Pt Lot 9		D. Lucas	001-26200	21.13	-	2,990	-	2,990
4	N Pt Lot 8		Franline Investments Ltd	001-26300	16.67	-	1,880	-	1,880
4	N Pt Lot 7		1665328 Ontario Ltd	001-26400	1.51	-	170	-	170
4	S Pt Lot 11		Kell Farms Ltd	002-20700	3.36	-	510	-	510
4	Pt S1/2 Lot 11	*	G., A. & P. Tuzi & M. Tersigni	002-20900	2.19	-	330	-	330
4	Pt S1/2 Lot 11		A. Tuzi	002-20902	2.18	-	330	-	330
4	Pt S1/2 Lot 11		A. Gargaro	002-20904	2.18	-	330	-	330
4	Pt S1/2 Lot 11		G. Tuzi	002-20906	1.63	-	250	-	250
				TOTAL ON LANDS	**440.03**	**$ 8,500**	**$ 41,510**	**$ -**	**$ 50,010**
			Town of Innisfil Roads						
4th Line			Town of Innisfil		5.72	6,600	3,480	-	10,080
3rd Line			Town of Innisfil		2.34	12,010	230	137,930	150,170
10 Sideroad (CR 54)			Simcoe County		2.64	8,290	1,480	-	9,770
				TOTAL ON TOWN OF INNISFIL ROADS	**10.70**	**$ 26,900**	**$ 5,190**	**$ 137,930**	**$ 170,020**
				ALL LANDS AND ROADS	**450.73**	**$ 35,400**	**$ 46,700**	**$ 137,930**	**$ 220,030**

Notes:
(1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

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Appendix B4

Assessment for Construction
3rd Line Branch Drain

B4

APPENDIX B4 - ASSESSMENTS for CONSTRUCTION
3rd Line Branch Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN:** Town of Innisfil
DATE : October 22, 2019 - Amended by the Tribunal | **PROJECT #:** 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.26)	Totals
			Innisfil Lands						
1	N Pt Lot 17		J. Drybrough	002-04700	8.14	-	1,220		1,220
1	N Pt Lot 16	*	Clements Cemetary	002-04900	0.20	-	60		60
1	N Pt Lot 16		Kell Farms Ltd	002-05200	14.35	-	2,150		2,150
1	N Pt Lot 15		Kell Farms Ltd	002-05400	13.00	-	1,950		1,950
2	Lot 14		Innis Properties Ltd	002-07600	30.05	270	3,880		4,150
2	S Pt Lot15		E. Rosenberg	002-07700	21.98	-	3,300		3,300
2	S Pt Lot 15	*	1916013 Ontario Inc	002-07800	15.18	-	2,280		2,280
2	S Pt Lot 15	*	G. Kalcic & L. Esau	002-08000	0.29	-	90		90
2	S Pt Lot 16	*	K. & L. Sparrow	002-08200	0.62	-	90		90
2	S Pt Lot 16	*	A. Giaconelli & H. Luzius	002-08300	0.63	-	90		90
2	S Pt Lot 16		R. Simpson	002-08500	38.24	-	5,390		5,390
2	Pt Lot 16	*	L. Rumble	002-08520	0.23	-	70		70
2	S Pt Lot 17		N. & G. Sturgeon	002-08700	9.74	-	460		460
2	Lot 17 & N Pt Lot		Kell Farms Ltd	002-10000	44.28	-	6,350		6,350
2	Pt Lot 16	*	I. & M. Campbell	002-10200	0.19	-	30		30
2	N Pt Lot 16		I. & M. Campbell	002-10400	33.85	-	5,000		5,000
2	N Pt Lot 16	*	D. Cuneen	002-10500	0.26	-	80		80
2	N Pt Lot 16	*	B. & R. Zendelek	002-10600	6.06	-	730		730
2	N Pt Lot 15		G. & M. Thompson	002-10900	19.65	-	2,580		2,580
2	Pt Lot 15	*	K. Kent	002-10901	0.34	-	50		50
2	N Pt Lot 15	*	A. & P. Budd	002-11000	0.22	-	70		70
2	Pt Lot 15	*	Ministry Of Transportation	002-11100	0.11	-	20		20
2	N Pt Lot 15		I. Campbell	002-11300	19.55	-	2,870		2,870
2	N Pt Lot 13	*	D. Evers	002-11600	4.05	670	470		1,140
2	N Pt Lot 13	*	T. Risi	002-11700	2.56	430	320		750
2	N Pt Lot 13	*	T., Q. & M. Palmieri	002-11800	4.36	750	400		1,150
2	N Pt Lot 13	*	O. & R. Goncalves	002-11900	5.06	870	320		1,190
2	N Pt Lot 13	*	K. Yamamoto	002-12000	8.81	1,620	480		2,100
2	N Pt Lot 12	*	D. & I. Chouryguine	002-12100	3.23	650	110		760
2	N Pt Lot 12	*	S. Sharma	002-12200	2.12	440	120		560
2	N Pt Lot 12		J. Horodynsky	002-12300	2.04	420	150		570
2	N Pt Lot 12		1281597 Ontario Inc	002-12400	2.98	630	210		840
2	N Pt Lot 12		Horodynsky Farms Inc	002-12500	4.72	1,060	280		1,340
2	N Pt Lot 12		P. & K. Horodynsky	002-12600	4.33	1,060	190		1,250
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12700	4.12	1,060	130		1,190
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12800	3.70	1,060	70		1,130
2	N Pt Lot 11		1281597 Ontario Inc	002-12900	1.83	930	10		940
3	S Pt Lot 12	*	T. & C. Xenophontos	002-14300	3.05	-	160		160
3	S Pt Lot 13		H. & K. Yamamoto & S. Yamamoto Est.	002-14400	37.62	-	2,390		2,390
3	S Pt Lot 14		L. & E. Kell	002-14500	41.57	-	3,130		3,130
3	S Pt Lot 15		M. Campbell	002-14600	20.77	-	1,280		1,280
3	S Pt Lot 15	*	Alpine Peaks (Churchill) Development	002-14700	20.11	-	1,720		1,720
3	S Pt Lot 16		C. Campbell & S. Todd	002-15000	40.18	-	4,080		4,080
3	S Pt Lot 16	*	M. Ledlie & V. Kerr	002-15200	0.28	-	80		80
3	S Pt Lot 17		J. Kell	002-15300	10.48	-	1,120		1,120
3	S Pt Lot 17		D. Kell	002-15400	9.35	-	950		950
3	S Pt Lot 17		J. Kell	002-15500	0.84	-	130		130
3	N Pt Lot 17		Kell Farms Ltd	002-20000	16.52	-	1,230		1,230
3	N Pt Lots 1		Top Hill View Estates Inc	002-20200	29.00	-	1,800		1,800
3	Plan 51M604	*	First View Homes (Scarborough)	002-20251	0.15	-	20		20
3	N Pt Lot 13		Crestrail Investments Inc	002-20300	5.71	-	410		410
4	N Pt Lot 16	*	M. Demarco	002-25000	5.26	-	280		280
3	N Pt Lot 16	*	J. Leblanc	003-00100	0.21	-	30		30
3	N Pt Lot 16	*	G. Ciccone	003-00200	0.13	-	20		20
3	N Pt Lot 16	*	M. Baker	003-00300	0.13	-	20		20
3	N Pt Lot 16	*	United Church	003-00400	0.14	-	20		20
3	N Pt Lot 16		10187526 Canada Corp	003-00500	39.70	-	2,900		2,900
3	N Pt Lot 15	*	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	003-00600	3.98	-	240		240
3	N Pt Lot 15	*	Fernbrook Homes (Churchill) Ltd	003-00700	12.23	-	1,900		1,900
3	Pt Lot 15	*	B. Doughty	003-00800	0.14	-	20		20
3	N Pt Lot 15	*	A. Dawson	003-00900	0.11	-	20		20
3	Pt Lot 15	*	T. Borscevski & B. Hill	003-01000	0.12	-	20		20
3	Pt Lot 15	*	C. Mount	003-01100	0.38	-	60		60
3	N Pt Lot 15	*	S. Simpson	003-01200	0.38	-	60		60
3	N Pt Lot 15	*	Anglican Church	003-01300	0.83	-	130		130
3	N Pt Lot 15	*	A. & C. Martins	003-01400	0.08	-	10		10
3	Pt Lot 15	*	J. Simpson	003-01500	0.15	-	20		20
3	Pt Lot 15	*	P S K Holdings Inc	003-01510	0.14	-	20		20
3	N Pt Lot 15	*	T. & S. Alderson	003-01700	0.19	-	30		30
3	Pt Lot 15	*	D. Wood & R. Bellar	003-02101	0.20	-	30		30
3	N Pt Lot 15	*	A. Fazelipour	003-02200	0.27	-	40		40
3	N Pt Lot 15	*	Town of Innisfil	003-02300	0.23	-	40		40
3	Plan 1194	*	M. & M. Alves	003-02400	0.19	-	30		30

APPENDIX B4 - ASSESSMENTS for CONSTRUCTION
3rd Line Branch Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement — **TOWN:** Town of Innisfil
DATE : October 22, 2019 - Amended by the Tribunal — **PROJECT #:** 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.26)	Totals
3	Lot 14	*	J. & R. Carvalho	003-02500	0.14	-	20		20
3	Plan 1194	*	T. Cooley & O. Oliveira	003-02600	0.14	-	20		20
3	Lot 12	*	A. & L. Daniels	003-02700	0.08	-	10		10
3	Lot 21	*	C. Bell	003-04300	0.07	-	10		10
3	Lot 22	*	N. Gundert & R. Grant	003-04400	0.17	-	30		30
4	Plan 162	*	B. Deputat & C. Braney	003-10000	0.61	-	90		90
4	Plan 162	*	A. & M. Stepanova	003-10010	0.23	-	40		40
4	Plan 162	*	C. Radulovici	003-10100	1.72	-	270		270
4	Pt Lots 3	*	H. Rahimimoghadam	003-10200	0.40	-	60		60
4	Plan 162	*	M. Slocombe	003-10300	0.60	-	90		90
4	Plan 162	*	S. & R. Thomas	003-10400	0.18	-	30		30
4	Lot 30	*	A. Zlender	003-10500	0.26	-	40		40
4	Plan 162	*	C. & T. Asselstine	003-10600	1.07	-	170		170
4	Lot 24	*	B. Hoseman & K. Hoseman	003-10700	0.20	-	30		30
4	Plan 162	*	L. Burke	003-10800	0.17	-	30		30
4	Plan 162	*	S. & L. Gucciardi	003-10900	0.06	-	10		10
4	S Pt Lot 23	*	Renaissance Nouveau Design Inc	003-11000	0.06	-	10		10
4	Pt Lots 1	*	A. & D. Whiteside	003-11100	0.17	-	30		30
4	Plan 162	*	D. Napper	003-11200	0.39	-	60		60
4	Plan 162	*	V. & Z. Iacob	003-11300	0.72	-	110		110
4	S Pt Lot 16		K. & R. Sinclair	003-11400	16.28	-	790		790
4	Pt Lots 6 & 7	*	C. & T. Asselstine	003-11500	0.22	-	30		30
4	Plan 162	*	C. Mark	003-11600	0.13	-	20		20
4	Plan 162	*	R. Schweymaier	003-11700	0.85	-	130		130
4	Pt Lots 2	*	D. & M. Wilson	003-11800	0.15	-	20		20
4	Lot 1	*	C. Cheganacas	003-11900	0.15	-	20		20
4	Pt Lot 16	*	D. & L. Fairhead	003-12000	1.03	-	160		160
4	Lot 61	*	F. Minici	003-12100	0.24	-	40		40
4	Plan 162	*	E. & I. Gyorfi	003-12200	0.19	-	30		30
4	Plan 162	*	P. Savard	003-12300	0.17	-	30		30
4	Plan 162	*	D. & M. Bowen	003-12400	0.11	-	20		20
4	Plan 162	*	J. Giannitti & M. Giannitti Est.	003-12500	0.18	-	30		30
4	Plan 162	*	C. Asselstine & M. Marshall	003-12600	0.18	-	30		30
4	Pt Lot 16	*	P. & D. McMillan	003-12700	1.41	-	220		220
4	Pt Lot 16	*	M. Mindle & E. Gulyas	003-12800	0.71	-	110		110
				TOTAL ON LANDS	**661.33**	**$ 11,920**	**$ 69,350**	**$ -**	**$ 81,270**
			Town of Innisfil Roads						
4th Line			Town of Innisfil		1.72	-	530	-	530
3rd Line			Town of Innisfil		7.09	11,690	3,690	-	15,380
2nd Line			Town of Innisfil		3.06	-	1,840	-	1,840
Churchill Unnamed Road 1			Town of Innisfil		0.44	-	140	-	140
Churchill Unnamed Road 2			Town of Innisfil		0.91	-	280	-	280
Churchill Unnamed Road 3			Town of Innisfil		0.21	-	70	-	70
Allan Street			Town of Innisfil		0.19	-	60	-	60
10 Sideroad (CR 54)			Simcoe County		0.14	-	40	-	40
County Road 4 (Yonge Street)			Simcoe County		14.06	-	8,540	-	8,540
				TOTAL ON TOWN OF INNISFIL ROADS	**27.82**	**$ 11,690**	**$ 15,190**	**$ -**	**$ 26,880**
				ALL LANDS AND ROADS	**689.15**	**$ 23,610**	**$ 84,540**	**$ -**	**$ 108,150**

Notes:
(1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B5

Assessment for Construction
3rd Line Spur Branch Drain

B5

APPENDIX B5 - ASSESSMENTS for CONSTRUCTION
3rd Line Spur Branch Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** | **TOWN:** **Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal | **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.26)	Totals
			Innisfil Lands						
3	S Pt Lot 12	*	T. & C. Xenophontos	002-14300	3.05	530	20		550
3	S Pt Lot 13		H. & K. Yamamoto & S. Yamamoto Est.	002-14400	37.62	2,120	2,270		4,390
3	S Pt Lot 14		L. & E. Kell	002-14500	41.57	-	4,260		4,260
3	S Pt Lot 15		M. Campbell	002-14600	20.77	-	1,730		1,730
3	S Pt Lot 15	*	Alpine Peaks (Churchill) Development	002-14700	16.09	-	1,520		1,520
3	S Pt Lot 16		C. Campbell & S. Todd	002-15000	24.91	-	2,430		2,430
3	S Pt Lot 17		J. Kell	002-15300	5.42	-	490		490
3	S Pt Lot 17		D. Kell	002-15400	6.00	-	610		610
3	N Pt Lot 17		Kell Farms Ltd	002-20000	16.52	-	1,670		1,670
3	N Pt Lots 1		Top Hill View Estates Inc	002-20200	29.00	-	2,450		2,450
3	Plan 51M604	*	First View Homes (Scarborough)	002-20251	0.15	-	30		30
3	N Pt Lot 13		Crestrail Investments Inc	002-20300	5.71	-	560		560
4	N Pt Lot 16	*	M. Demarco	002-25000	5.26	-	380		380
3	N Pt Lot 16	*	J. Leblanc	003-00100	0.21	-	40		40
3	N Pt Lot 16	*	G. Ciccone	003-00200	0.13	-	30		30
3	N Pt Lot 16	*	M. Baker	003-00300	0.13	-	30		30
3	N Pt Lot 16	*	United Church	003-00400	0.14	-	30		30
3	N Pt Lot 16		10187526 Canada Corp	003-00500	39.70	-	3,940		3,940
3	N Pt Lot 15	*	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	003-00600	3.98	-	320		320
3	N Pt Lot 15	*	Fernbrook Homes (Churchill) Ltd	003-00700	12.23	-	2,580		2,580
3	Pt Lot 15	*	B. Doughty	003-00800	0.14	-	30		30
3	N Pt Lot 15	*	A. Dawson	003-00900	0.11	-	20		20
3	Pt Lot 15	*	T. Borscevski & B. Hill	003-01000	0.12	-	30		30
3	Pt Lot 15	*	C. Mount	003-01100	0.38	-	80		80
3	N Pt Lot 15	*	S. Simpson	003-01200	0.38	-	80		80
3	N Pt Lot 15	*	Anglican Church	003-01300	0.83	-	180		180
3	N Pt Lot 15	*	A. & C. Martins	003-01400	0.08	-	20		20
3	Pt Lot 15	*	J. Simpson	003-01500	0.15	-	30		30
3	Pt Lot 15	*	P S K Holdings Inc	003-01510	0.14	-	30		30
3	N Pt Lot 15	*	T. & S. Alderson	003-01700	0.19	-	40		40
3	Pt Lot 15	*	D. Wood & R. Bellar	003-02101	0.20	-	40		40
3	N Pt Lot 15	*	A. Fazelipour	003-02200	0.27	-	60		60
3	N Pt Lot 15	*	Town of Innisfil	003-02300	0.23	-	50		50
3	Plan 1194	*	M. & M. Alves	003-02400	0.19	-	40		40
3	Lot 14	*	J. & R. Carvalho	003-02500	0.14	-	30		30
3	Plan 1194	*	T. Cooley & O. Oliveira	003-02600	0.14	-	30		30
3	Lot 12	*	A. & L. Daniels	003-02700	0.08	-	20		20
3	Lot 21	*	C. Bell	003-04300	0.07	-	10		10
3	Lot 22	*	N. Gundert & R. Grant	003-04400	0.17	-	40		40
4	Plan 162	*	B. Deputat & C. Braney	003-10000	0.61	-	130		130
4	Plan 162	*	A. & M. Stepanova	003-10010	0.23	-	50		50
4	Plan 162	*	C. Radulovici	003-10100	1.72	-	360		360
4	Pt Lots 3	*	H. Rahimimoghadam	003-10200	0.40	-	80		80
4	Plan 162	*	M. Slocombe	003-10300	0.60	-	130		130
4	Plan 162	*	S. & R. Thomas	003-10400	0.18	-	40		40
4	Lot 30	*	A. Zlender	003-10500	0.26	-	50		50
4	Plan 162	*	C. & T. Asselstine	003-10600	1.07	-	230		230
4	Lot 24	*	B. Hoseman & K. Hoseman	003-10700	0.20	-	40		40
4	Plan 162	*	L. Burke	003-10800	0.17	-	40		40
4	Plan 162	*	S. & L. Gucciardi	003-10900	0.06	-	10		10
4	S Pt Lot 23	*	Renaissance Nouveau Design Inc	003-11000	0.06	-	10		10
4	Pt Lots 1	*	A. & D. Whiteside	003-11100	0.17	-	40		40
4	Plan 162	*	D. Napper	003-11200	0.39	-	80		80
4	Plan 162	*	V. & Z. Iacob	003-11300	0.72	-	150		150
4	S Pt Lot 16		K. & R. Sinclair	003-11400	16.28	-	1,070		1,070
4	Pt Lots 6 & 7	*	C. & T. Asselstine	003-11500	0.22	-	50		50
4	Plan 162	*	C. Mark	003-11600	0.13	-	30		30
4	Plan 162	*	R. Schweymaier	003-11700	0.85	-	180		180
4	Pt Lots 2	*	D. & M. Wilson	003-11800	0.15	-	30		30
4	Lot 1	*	C. Chegancas	003-11900	0.15	-	30		30
4	Pt Lot 16	*	D. & L. Fairhead	003-12000	1.03	-	220		220
4	Lot 61	*	F. Minici	003-12100	0.24	-	50		50

APPENDIX B5 - ASSESSMENTS for CONSTRUCTION
3rd Line Spur Branch Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** | **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** | **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.26)	Totals
4	Plan 162	*	E. & I. Gyorfi	003-12200	0.19	-	40		40
4	Plan 162	*	P. Savard	003-12300	0.17	-	40		40
4	Plan 162	*	D. & M. Bowen	003-12400	0.11	-	20		20
4	Plan 162	*	J. Giannitti & M. Giannitti Est.	003-12500	0.18	-	40		40
4	Plan 162	*	C. Asselstine & M. Marshall	003-12600	0.18	-	40		40
4	Pt Lot 16	*	P. & D. McMillan	003-12700	1.41	-	300		300
4	Pt Lot 16	*	M. Mindle & E. Gulyas	003-12800	0.71	-	150		150
			TOTAL ON LANDS		**301.44**	**$ 2,650**	**$ 29,980**	**$ -**	**$ 32,630**
			Town of Innisfli Roads						
4th Line			Town of Innisfil		1.72	-	730	-	730
3rd Line			Town of Innisfil		1.13	6,650	360	-	7,010
Churchill Unnamed Road 1			Town of Innisfil		0.44	-	190	-	190
Churchill Unnamed Road 2			Town of Innisfil		0.91	-	380	-	380
Churchill Unnamed Road 3			Town of Innisfil		0.21	-	90	-	90
Allan Street			Town of Innisfil		0.19	-	80	-	80
County Road 4 (Yonge Street)			Simcoe County		5.49	-	2,900	-	2,900
			TOTAL ON TOWN OF INNISFIL ROADS		**10.09**	**$ 6,650**	**$ 4,730**	**$ -**	**$ 11,380**
			ALL LANDS AND ROADS		**311.53**	**$ 9,300**	**$ 34,710**	**$ -**	**$ 44,010**

Notes:
(1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

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Appendix B6

Assessment for
Dillon Consulting Limited Fees

B6

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN: Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #: 300038790**

Total Dillon Consulting Fees =	*$*	*1,025,087.03*
Portion of the Fees to be Levied to the Watershed =	*$*	*190,000.00*
Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
			Innisfil Lands			
1	S Pt Lot 2		Letizia Homes Ltd	001-00500	13.21	321
1	S Pt Lot 3		2492140 Ontario Ltd	001-00600	16.27	395
1	S Pt Lot 3		S. & P. Prim	001-00700	3.58	87
1	S Pt Lot 4		D. Corbo	001-00800	32.86	798
1	S Pt Lot 4	*	G. Snedden & L. D'aoust	001-00900	0.44	11
1	S Pt Lot 5	*	Ministry Of Transportation	001-01100	17.40	423
1	S Pt Lot 5	*	1665328 Ontario Ltd	001-01200	15.78	383
1	Pt Lot 6	*	H. & G. White	001-01300	0.33	8
1	Pt Lot 6		A. Moir & H. Minns	001-01400	28.46	691
1	S Pt Lot 6	*	H. Wallace	001-01500	0.35	9
1	S Pt Lot 6	*	H. Dinh	001-01700	0.25	6
1	S Pt Lot 6	*	T. Pham	001-01800	0.26	6
1	S Pt Lot 6	*	Bell Canada	001-01900	0.09	2
1	Pt Lot 6	*	Ministry Of Transportation	001-02100	3.30	80
1	Pt Lot 7		A. Moir & H. Minns	001-02200	0.86	21
1	Pt Lot 7	*	Ministry Of Transportation	001-02400	4.20	102
1	N Pt Lot 6	*	F. Rohani & R. Ghorabi	001-02600	0.28	7
1	N Pt Lot 6		2367808 Ontario Inc	001-02800	38.63	939
1	N Pt Lot 5		A. Posius	001-03000	37.48	911
1	N Pt Lot 5	*	A. & M. Beattie	001-03010	0.54	13
1	Pt Lot 4		Tack 2016 Ltd & 1442422 Ontario Ltd	001-03100	40.31	979
1	Pt Lot 4	*	M. Lang	001-03110	0.48	12
1	N Pt Lot 3		Tack 2016 Ltd	001-03200	26.06	633
1	Pt Lot 3		G. & B. Faggion	001-03300	13.30	323
2	S Pt Lot 2		A. & D. Tamburino	001-04100	1.07	26
2	S Pt Lot 3		White Horse Investments Corp, Fresco Estates Ltd & 2088464 Ontario Ltd	001-04200	40.37	981
2	Pt Lot 3	*	A. & N. Marcuzzi	001-04400	0.28	7
2	S Pt Lot 4	*	674569 Ontario Ltd	001-04500	13.80	335
2	S Pt Lot 4		D. & L. Mazanik	001-04600	22.10	537
2	Pt Lot 4	*	V. Astrauskas & P. Spedaliere	001-04620	0.37	9
2	S Pt Lot 5		H. & Y. Yoo	001-04700	38.70	940
2	S Pt Lot 5	*	J. Quishpe Barros & V. Leon Pinos	001-04900	0.42	10
2	Pt Lot 6		P S K Holdings Inc	001-05200	20.78	505
2	Pt Lot 6		The Simpson/Elson Group	001-05220	19.72	479
2	N Pt Lot 6	*	S. & I. Hussain	001-05300	9.81	238
2	N Pt Lot 6	*	S. Pressey & H. Money	001-05400	7.38	179
2	Pt Lot 6	*	Y. Tran & D. & L. Nguyen	001-05500	4.31	105
2	N Pt Lot 6	*	L. & M. Barbosa	001-05600	4.24	103
2	N Pt Lot 6	*	C. & A. Carpino	001-05700	6.62	161
2	N Pt Lot 5	*	H. & M. Yoon	001-05800	3.71	90
2	N Pt Lot 5	*	G. & A. Caubang	001-05900	2.36	57
2	N Pt Lot 5	*	A. Krebs Est., H. Krebs & I. Krebs-Wickens	001-06000	3.55	86
2	N Pt Lot 5	*	G. & Z. Grigoroff	001-06100	3.77	92
2	N Pt Lot 5	*	H. Sieber	001-06200	2.71	66
2	N Pt Lot 5	*	C. Nothrop	001-06300	3.86	94
2	N Pt Lot 5		G. & S. Reilly	001-06400	2.16	52
2	N Pt Lot 5	*	A. Scorziello	001-06500	4.02	98
2	N Pt Lot 5		D. & C. Wilson	001-06600	4.66	113
2	N Pt Lot 5	*	A. & D. Watt	001-06700	4.62	112
2	N Pt Lot 4		P. & D. Meneguzzi	001-06800	36.72	892
2	N Pt Lot 3		Farisland Ltd	001-06900	22.30	542
2	N Pt Lots 2		J. & C. Faris	001-07000	3.67	89
3	S Pt Lot 1		K. & V. Wardlaw	001-07400	1.31	32
3	S Pt Lot 2		P. Wardlaw	001-07600	13.81	336
3	S Pt Lot 3		J. Lukovits & A. Radocsai	001-07700	38.66	939
3	S Pt Lot 4	*	M. Turner & J. Goncalves	001-07900	10.28	250
3	S Pt Lot 4		Chapter Homes Inc	001-08000	9.56	232
3	S Pt Lot 5		A. & D. Henry	001-08100	40.32	980
3	S Pt Lot 5	*	H. La Page	001-08110	0.90	22
3	S Pt Lot 6	*	S. Wheeler	001-08300	0.28	7
3	S Pt Lot 6		E., E. & J. Rainey	001-08400	35.11	853
3	N Pt Lot 6;		S., T., M., & N. Ferrazzo	001-08500	12.46	303
3	N Pt Lot 6;		Armking & Company Ltd	001-08700	3.95	96
3	N Pt Lot 6	*	L. Taylor	001-08800	0.40	10
3	Pt Lot 6	*	A. & O. Posterniak	001-08900	4.28	104
3	Pt Lot 6	*	G. & M. Ioannou	001-09000	6.08	148
3	Pt Lot 6		J. Rampodarat & T. Tirbeni	001-09100	6.14	149
3	Pt Lot 6		M. Frasca	001-09200	5.38	131
3	N Pt Lot 5	*	M. Gelfand & E. Kull	001-09400	0.30	7
3	N Pt Lot 5	*	United Bethesda Cemetery	001-09500	0.32	8

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Total Dillon Consulting Fees = $ *1,025,087.03*
Portion of the Fees to be Levied to the Watershed = $ *190,000.00*
Remaining Fees to be Levied to the Town of Innisfil = $ *835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
3	N Pt Lot 5	*	S. & L. Hill	001-09700	0.46	11
3	N Pt Lot 5	*	L. Hill	001-09705	0.21	5
3	N Pt Lot 5		1665328 Ontario Ltd	001-09800	36.15	878
3	N Pt Lot 4		P. Wardlaw	001-09900	58.76	1,428
3	N Pt Lot 4	*	G. Dougherty & J. Shortt	001-09901	0.41	10
3	N Pt Lot 3		M., M., P. & M. Klymiuk	001-10000	42.89	1,042
3	N Pt Lot 2	*	8325235 Canada Inc	001-10100	42.16	1,024
3	N Pt Lot 1		P. Wardlaw	001-10200	21.52	523
4	S Pt Lot 1	*	1553037 Ontario Ltd	001-10500	3.56	86
4	S Pt Lot 1	*	N. Voutt	001-10600	1.74	42
4	S Pt Lot 1		G. & C. Van Horne	001-10700	3.18	77
4	S Pt Lot 1		L. & M. Camacho	001-10800	1.91	46
4	S Pt Lot 1		P. Spring	001-10900	8.53	207
4	S Pt Lot 1		A. Guido	001-11000	7.27	177
4	S Pt Lot 2		M. & J. Spataro & J. Pontieri	001-11100	9.08	221
4	S Pt Lot 2		4090 4th Line Inc	001-11200	29.61	719
4	S Pt Lot 2	*	D. Congiusti	001-11400	0.40	10
4	Pt Lot 3	*	E. Kippers & G. Merrall	001-11600	1.75	43
4	Pt Lot 3		4090 4th Line Inc	001-11700	70.68	1,717
4	S Pt Lot 4		D. & B. Marling	001-11900	38.07	925
4	S Pt Lot 5	*	A. & A. Persico	001-12000	39.19	952
4	S Pt Lot 6		1665328 Ontario Ltd	001-12100	35.95	873
4	S Pt Lot 6	*	J. Metcalfe	001-12300	0.77	19
4	Pt Lot 6	*	Ministry Of Transportation	001-12400	46.70	1,135
4	Pt Lot 6	*	Town of Innisfil	001-12402	0.10	2
4	N Pt Lot 5		S. & S. Jones	001-12500	34.15	830
4	N Pt Lot 5	*	W. & L. Jones	001-12501	0.64	16
4	N Pt Lot 4		1402802 Ontario Inc & 2462228 Ontario Ltd	001-12600	37.50	911
4	N Pt Lot 2		4090 4th Line Inc	001-13000	30.03	730
4	N Pt Lot 2	*	R. Laforge	001-13100	0.38	9
4	N Pt Lot 2	*	W. Laforge	001-13200	0.39	9
4	N Pt Lot 1		J. & J. McCague	001-13300	8.92	217
5	Pt Lots 3 & 4		1715573 Ontario Ltd	001-14600	1.96	48
5	S Pt Lot 5		1715573 Ontario Ltd	001-14800	16.51	401
5	Pt S1/2 Lot 5	*	G. & L. Kenyon & M. & K. Slessor	001-14802	0.35	9
5	S Pt Lot 6		S. & J. Pearson & E. McLachlin	001-14900	11.24	273
5	S Pt Lot 6		1715573 Ontario Inc. Trustee	001-15000	46.59	1,132
5	N Pt Lot 6	*	D. Swain & K. Archibald	001-15100	0.41	10
5	N Pt Lot 5	*	R. & S. Eyers	001-15300	0.54	13
5	N Pt Lot 5		1715573 Ontario Ltd	001-15500	48.51	1,179
1	S Pt Lot 7	*	Aqua-Gem Investments Ltd	001-16600	21.40	520
1	S Pt Lot 7	*	1045901 Ontario Ltd	001-16700	2.76	67
1	S Pt Lot 8	*	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	001-16900	24.42	593
1	Pt Lot 9		G., M. & W. Kemeny	001-17000	15.83	385
1	Pt Lot 9		G. Kemeny	001-17200	11.66	283
1	S Pt Lot 9		1409563 Ontario Ltd	001-17300	23.77	578
1	S Pt Lot 9	*	J. Yonge & R. Lee	001-17400	6.70	163
1	S Pt Lot 10	*	S. Rudnisky	001-17500	4.09	99
1	S Pt Lot 10		C. & S. Toich	001-17600	3.87	70
1	S Pt Lot 10	*	L. & C. Fabiano	001-17700	3.25	79
1	S Pt Lot 10		M. Toich	001-17800	6.88	167
1	S Pt Lot 10	*	Y. Mark Est.	001-17900	2.50	61
1	S Pt Lot 10	*	Y. Mark Est. & M. Maehara Est.	001-18000	3.00	73
1	Pt Lots 10 & 11	*	M. Riley	001-18100	6.59	160
1	Pt Lot 10		2204277 Ontario Ltd	001-18300	11.50	279
1	Pt Lot 10		L & L Gardens Inc	001-18350	1.48	36
1	Pt Lot 10		Marques Gardens Ltd	001-18400	12.13	295
1	N Pt Lot 10		L. Radvanyi	001-18500	11.93	290
1	N Pt Lot 10	*	S. Rudnisky	001-18600	0.75	18
1	N Pt Lot 10	*	F. & M. Santos	001-18700	0.85	21
1	N Pt Lot 9		Horodynsky Farms Inc	001-18800	4.87	118
1	N Pt Lot 9		M. Kemeny	001-19000	5.34	130
1	N Pt Lot 8		J. Walewski & D. Kopec	001-19100	8.45	205
1	N Pt Lot 8	*	1523566 Ontario Ltd	001-19200	20.32	494
1	N Pt Lot 7	*	Succession Financial Group Inc	001-19400	34.15	830
2	S Pt Lot 7		J. Armstrong	001-19500	29.37	714
2	S Pt Lot 7	*	T. Armstrong	001-19510	0.61	15
2	S Pt Lot 8		S. Handy	001-19600	9.93	241
2	S Pt Lot 8	*	P. Chiodo	001-19700	9.53	232
2	S Pt Lot 8	*	A. & M. Filice	001-19800	15.34	373
2	S Pt Lot 9		Cohn Farms Inc	001-20000	10.03	244
2	S Pt Lot 9		Cohn Farms Inc	001-20100	10.14	246
2	Pt Lot 9	*	M. & G. Bordon	001-20200	1.43	35

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Portion of the Fees to be Levied to the Watershed =	*$*	*190,000.00*
Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
2	Pt Lot 9		Marques Gardens Ltd	001-20300	8.82	214
2	S Pt Lot 9		L. & N. Tasca	001-20400	10.29	250
2	S Pt Lot 10		L. & N. Tasca	001-20500	5.27	128
2	Pt W1/2 Lot 10		Marques Gardens Ltd	001-20600	13.42	326
2	Pt Lot 10		Marques Gardens Ltd	001-20800	19.17	466
2	N Pt Lot 10		Horodynsky Farms Inc	001-20900	10.23	249
2	Pt Lot 10		1409563 Ontario Ltd	001-21000	10.19	248
2	W Pt Lot 10		Horodynsky Farms Inc	001-21100	11.42	277
2	N Pt Lot 10		G. & R. Sciara & P. & L. Digiantomasso	001-21200	8.97	218
2	N Pt Lot 9		B. Horodynsky	001-21400	10.10	245
2	N Pt Lot 9		1409563 Ontario Ltd	001-21500	19.88	483
2	Pt Lot 9	*	J. & S. Cestaric	001-21602	0.34	8
2	N Pt Lot 9		I. Canton & L. & E. Trevisan	001-21700	10.12	246
2	N Pt Lot 8	*	I. & H. Mora	001-21800	5.01	122
2	N Pt Lot 8	*	M., H. & S. Fernandes	001-21900	4.51	110
2	N Pt Lot 8	*	C. & C. Zylstra	001-22000	2.52	61
2	N Pt Lot 8	*	Elbertain Corporation	001-22100	19.86	483
2	Pt Lot 7	*	B. Jolie	001-22300	0.48	12
2	N Pt Lot 7	*	J. & D. Lacroix	001-22400	0.39	9
2	N Pt Lot 7	*	Gmb Property Holding Company Ltd	001-22600	27.89	678
3	S Pt Lot 7		1665328 Ontario Ltd	001-22900	32.27	784
3	S Pt Lot 8	*	J. Petropoulos	001-23000	0.52	13
3	W Pt Lot 8	*	D. Oshell & D. McLachlan	001-23001	0.28	7
3	S Pt Lot 8	*	G. Dermott	001-23200	0.27	7
3	Pt Lot 9	*	A. & J. Mormile	001-23400	19.70	479
3	Pt Lot 9		M. Assadian & L. Desroche	001-23500	21.43	521
3	Pt Lot 9		1409563 Ontario Ltd	001-23600	18.47	449
3	S Pt Lot 10	*	K. Levy	001-23700	2.75	67
3	Pt Lot 10		A. Fox & B. Scott	001-23800	4.42	107
3	S Pt Lot 10	*	J. Phaneuf & C. Aguiar	001-23900	2.20	53
3	S Pt Lot 10	*	Y. Cil	001-24100	2.09	51
3	Pt Lot 10		J. Chow	001-24200	52.92	1,286
3	N Pt Lot 10	*	H. & A. Perkins	001-24300	1.06	26
3	Pt Lot 10	*	H. Squibb	001-24301	7.77	189
3	N Pt Lot 9		J. & P. Wilson	001-24400	8.41	204
3	N Pt Lot 9	*	C. & M. Cialone	001-24500	8.32	202
3	Pt Lot 8		P. & C. Woods	001-24600	10.05	244
3	Pt Lot 8		1665328 Ontario Ltd	001-24800	27.48	668
3	Pt Lot 8	*	G. & M. Reynolds	001-24801	1.00	24
3	Pt Lot 8	*	B. & V. Cestaric	001-24810	0.29	7
3	W Pt Lot 8		1665328 Ontario Ltd	001-24900	38.54	936
3	N Pt Lot 7		J. & M. Albanese	001-25000	19.08	464
3	N Pt Lot 7		M. & U. Mauti	001-25100	15.06	366
4	S Pt Lot 7		Gdm Terraco Inc	001-25400	12.11	294
4	S Pt Lot 7		Franline Investments Ltd	001-25500	12.77	310
4	S Pt Lot 7		F. & N. Grillo	001-25600	9.91	241
4	Pt Lots 8 & 9		V. & D. Posius	001-25800	55.65	1,352
4	Pt Lot 8	*	S. Khan	001-25801	0.23	6
4	S Pt Lot 9		Sil Developments Inc, R. Zaretsky & S. Soudack	001-25900	19.33	470
4	S Pt Lot 9	*	J. & D. Thew	001-25910	0.40	10
4	S Pt Lot 10	*	P. Pillitteri	001-26000	38.95	946
4	N Pt Lot 10	*	P. Pillitteri	001-26100	38.25	929
4	N Pt Lot 10	*	D. Jonkman	001-26110	0.24	6
4	N Pt Lot 9		D. Lucas	001-26200	36.92	897
4	N Pt Lot 9	*	K. Jayaseelan & M. Thayalan	001-26201	0.32	8
4	N Pt Lot 8		Franline Investments Ltd	001-26300	37.43	909
4	N Pt Lot 7		1665328 Ontario Ltd	001-26400	36.63	890
5	S Pt Lot 7		H. & C. Van Der Mast	001-26700	37.69	916
5	S Pt Lot 8	*	G. & N. Bray	001-26900	11.50	279
5	S Pt Lot 9		V. Trombley	001-27000	26.68	648
5	S Pt Lot 10		G. Taylor & I. Wagner	001-27100	8.37	203
5	S Pt Lot 10		G., F., M., & A. Troiano	001-27200	8.38	204
5	S Pt Lot 10		1409563 Ontario Ltd	001-27300	19.48	473
5	N Pt Lot 10		G. & S. Sawyer	001-27400	40.82	992
5	N Pt Lot 9	*	G. Lecce Holdings (1994) Inc & D. B. Lecce Holdings	001-27500	40.51	984
5	N Pt Lot 9	*	J. Farris	001-27600	0.28	7
5	N Pt Lot 8		M. Vandermast	001-27700	71.27	1,732
5	N Pt Lot 7		1720121 Ontario Ltd	001-27900	28.08	682
1	Pt Lots 10 & 11	*	S. Malik & B. Awan	002-00100	3.35	81
1	S Pt Lot 11	*	S. Elfassy	002-00200	4.19	102
1	Pt Lot 11	*	R. & M. Burrows	002-00300	2.95	72
1	Pt Lot 11	*	P., D., J., & M. Kosinec	002-00400	2.86	69
1	S Pt Lot 11		G. & C. Zielke	002-00500	11.16	271

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1	S Pt Lot 11	*	K. & M. Zielke	002-00700	0.41	10
1	S Pt Lot 12	*	E. Matchett	002-00800	0.38	9
1	S Pt Lot 12	*	E. Matchett	002-00900	0.32	8
1	S Pt Lot 12		K. & J. Matchett	002-01100	37.77	918
1	S Pt Lot 13		J. & S. Kell	002-01200	41.68	1,013
1	S Pt Lot 13	*	S. & S. Iemsisanith	002-01300	0.44	11
1	S Pt Lot 14	*	R. & D. Long	002-01500	0.38	9
1	S Pt Lot 14		D. Rose & B. Kell-Rose	002-01600	21.15	514
1	S Pt Lot 15		K. & H. Kell	002-01800	1.52	37
1	S Pt Lot 15	*	B. Kell-Rose & D. Rose	002-01801	0.48	12
1	N Pt Lot 17		J. Drybrough	002-04700	8.14	198
1	N Pt Lot 16	*	Clements Cemetary	002-04900	0.40	10
1	N Pt Lot 16		Kell Farms Ltd	002-05200	14.35	349
1	N Pt Lot 15		Kell Farms Ltd	002-05400	30.09	731
1	Pt Lot 14		Kell Farms Ltd	002-05600	40.02	972
1	N Pt Lot 13		D. Sawyer	002-05800	59.40	1,443
1	N Pt Lot 12		D., B. & W. Sawyer	002-05900	24.81	603
1	N Pt Lot 11		L. & N. Tasca	002-06000	22.10	537
1	N Pt Lot 11		L & L Gardens Inc	002-06300	19.93	484
2	S Pt Lot 11		Horodynsky Farms Inc	002-06400	20.17	490
2	Pt Lots 11 & 12		1409563 Ontario Ltd	002-06600	**40.60**	986
2	S Pt Lot 12	*	M. Galloro	002-06700	2.59	63
2	S Pt Lot 12	*	F. Galloro	002-06800	3.25	79
2	S Pt Lot 12	*	M. Tesic	002-06900	2.17	53
2	S Pt Lot 13	*	F. Gammicchia	002-07000	3.53	86
2	S Pt Lot 13	*	B. Watman	002-07100	2.53	61
2	S Pt Lot 13	*	R. & B. Badstober	002-07200	3.14	76
2	S Pt Lot 13		K. Kell	002-07400	14.90	362
2	Lot 14		Innis Properties Ltd	002-07600	73.91	1,796
2	S Pt Lot15		E. Rosenberg	002-07700	24.24	589
2	S Pt Lot 15	*	1916013 Ontario Inc	002-07800	15.18	369
2	S Pt Lot 15	*	G. Kalcic & L. Esau	002-08000	0.58	14
2	S Pt Lot 16	*	K. & L. Sparrow	002-08200	0.62	15
2	S Pt Lot 16	*	A. Giaconelli & H. Luzius	002-08300	0.63	15
2	S Pt Lot 16		R. Simpson	002-08500	35.95	873
2	Pt Lot 16	*	L. Rumble	002-08520	0.46	11
2	S Pt Lot 17		N. & G. Sturgeon	002-08700	9.55	75
2	Pt Lot 17 & N Pt Lot 18		Kell Farms Ltd	002-10000	42.29	1,028
2	Pt Lot 16	*	I. & M. Campbell	002-10200	0.19	5
2	N Pt Lot 16		I. & M. Campbell	002-10400	33.34	810
2	N Pt Lot 16	*	D. Cuneen	002-10500	0.52	13
2	N Pt Lot 16	*	B. & R. Zendelek	002-10600	4.88	119
2	N Pt Lot 15		G. & M. Thompson	002-10900	17.20	418
2	Pt Lot 15	*	K. Kent	002-10901	0.34	8
2	N Pt Lot 15	*	A. & P. Budd	002-11000	0.44	11
2	Pt Lot 15	*	Ministry Of Transportation	002-11100	0.12	3
2	N Pt Lot 15		I. Campbell	002-11300	19.16	466
2	N Pt Lot 13	*	D. Evers	002-11600	3.70	90
2	N Pt Lot 13	*	T. Risi	002-11700	2.86	69
2	N Pt Lot 13	*	T., Q. & M. Palmieri	002-11800	4.26	104
2	N Pt Lot 13	*	O. & R. Goncalves	002-11900	3.59	87
2	N Pt Lot 13	*	K. Yamamoto	002-12000	6.31	153
2	N Pt Lot 12	*	D. & I. Chouryguine	002-12100	1.86	45
2	N Pt Lot 12	*	S. Sharma	002-12200	1.89	46
2	N Pt Lot 12		J. Horodynsky	002-12300	**4.00**	97
2	N Pt Lot 12		1281597 Ontario Inc	002-12400	5.96	145
2	N Pt Lot 12		Horodynsky Farms Inc	002-12500	10.04	244
2	N Pt Lot 12		P. & K. Horodynsky	002-12600	9.97	242
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12700	10.30	250
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12800	10.00	243
2	N Pt Lot 11		1281597 Ontario Inc	002-12900	21.00	510
3	S Pt Lot 11	*	S. Scholten & D. Ransom	002-13300	3.89	95
3	S Pt Lot 11	*	N. & M. Makrigiorgos	002-13400	4.07	99
3	S Pt Lot 11	*	K. Costain & D. Goodwin	002-13500	4.07	99
3	S Pt Lot 11	*	E. Carbone	002-13600	4.07	99
3	S Pt Lot 11	*	L. Martinovski & P. & D. Efstathiadis	002-13700	4.07	99
3	S Pt Lot 11	*	H. & M. Yoon	002-13800	5.18	126
3	S Pt Lot 11		1409563 Ontario Ltd	002-13900	4.82	117
3	S Pt Lot 11		1281597 Ontario Inc	002-14000	8.02	195
3	Pt Lot 12		J. & E. Horodynsky	002-14100	46.12	1,121
3	S Pt Lot 12	*	T. & C. Xenophontos	002-14300	2.34	57
3	S Pt Lot 13		H. & K. Yamamoto & S. Yamamoto Est.	002-14400	33.89	823
3	S Pt Lot 14		L. & E. Kell	002-14500	40.33	980

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3	S Pt Lot 15		M. Campbell	002-14600	16.41	399
3	S Pt Lot 15	*	Alpine Peaks (Churchill) Development	002-14700	18.42	448
3	S Pt Lot 16		C. Campbell & S. Todd	002-15000	38.31	931
3	S Pt Lot 16	*	M. Ledlie & V. Kerr	002-15200	0.28	7
3	S Pt Lot 17		J. Kell	002-15300	9.69	235
3	S Pt Lot 17		D. Kell	002-15400	9.09	221
3	S Pt Lot 17		J. Kell	002-15500	0.84	20
3	N Pt Lot 17		Kell Farms Ltd	002-20000	15.78	383
3	N Pt Lots 1		Top Hill View Estates Inc	002-20200	47.90	1,164
3	Plan 51M604	*	First View Homes (Scarborough)	002-20204	0.36	9
3	Plan 51M604	*	First View Homes (Scarborough)	002-20208	0.36	9
3	Plan 51M604	*	First View Homes (Scarborough)	002-20212	0.36	9
3	Plan 51M604	*	First View Homes (Scarborough)	002-20216	0.36	9
3	Plan 51M604	*	First View Homes (Scarborough)	002-20220	0.36	9
3	Plan 51M604	*	First View Homes (Scarborough)	002-20224	0.38	9
3	Plan 51M604	*	First View Homes (Scarborough)	002-20228	0.40	10
3	Plan 51M604	*	First View Homes (Scarborough)	002-20229	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20230	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20233	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20234	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20237	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20238	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20241	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20242	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20243	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20246	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20247	0.32	8
3	Plan 51M604	*	D. & T. Garofalo	002-20250	0.32	8
3	Plan 51M604	*	First View Homes (Scarborough)	002-20251	0.30	7
3	N Pt Lot 13		Crestrail Investments Inc	002-20300	40.45	983
3	N Pt Lot 13	*	Town of Innisfil	002-20320	0.50	12
3	N Pt Lot 12		S. & O. Pylypiak	002-20400	18.57	451
3	N Pt Lot 12		C. Wolfond	002-20500	16.70	398
3	N Pt Lot 11		9847723 Canada Corporation	002-20600	36.61	890
4	S Pt Lot 11		Kell Farms Ltd	002-20700	19.76	480
4	Pt S1/2 Lot 11	*	G., A. & P. Tuzi & M. Tersigni	002-20900	2.19	53
4	Pt S1/2 Lot 11		A. Tuzi	002-20902	2.18	53
4	Pt S1/2 Lot 11		A. Gargaro	002-20904	2.18	53
4	Pt S1/2 Lot 11		G. Tuzi	002-20906	2.17	53
4	Pt S1/2 Lot 11	*	K. Collins & L. Marjadsingh	002-20908	2.18	53
4	Pt S1/2 Lot 11	*	D. & K. Gray	002-20910	2.18	53
4	Pt S1/2 Lot 11	*	M. & M. Alves	002-20912	2.18	53
4	Pt S1/2 Lot 11	*	J. & G. Rodrigues	002-20914	2.18	53
4	Pt S1/2 Lot 11	*	J. & E. Fernandes	002-20916	2.20	53
4	Pt S1/2 Lot 12		M. & L. Valente	002-20918	4.08	99
4	Pt S1/2 Lot 12		Innisfil Churchill Investment	002-20920	4.08	99
4	Pt S1/2 Lot 12		A. Tuzi	002-20922	4.08	99
4	Pt S1/2 Lot 12		E. De Santis	002-20924	4.08	99
4	Pt S1/2 Lot 12		G. Tuzi	002-20926	4.08	99
4	Pt S1/2 Lot 12		M. Tersigni	002-20928	4.08	99
4	Pt Lot 12		A. Kerkhof & C. Davidson	002-20930	10.52	256
4	Pt S1/2 Lot 12		Innisfil Churchill Investment	002-20932	3.84	93
4	Pt Lot 13		2177217 Ontario Ltd	002-21000	39.64	963
4	S Pt Lot 14		2177217 Ontario Ltd	002-21100	39.30	955
4	S Pt Lot 14	*	J. Jambor	002-21300	1.10	27
4	S Pt Lot 14	*	D. & S. Mann	002-21400	1.10	27
4	N Pt Lot 17		S. Kell	002-24000	8.22	200
4	N Pt Lot 16	*	Simcoe County District School Board	002-24200	2.89	70
4	N Pt Lot 16	*	G. Hill	002-24300	0.38	9
4	N Pt Lot 16		Barnstable Park Realty Corp	002-24400	20.93	509
4	N Pt Lot 16	*	M. Shamshiri	002-24700	0.43	10
4	N Pt Lot 16	*	A. Dunn & D. Ruegg	002-24800	0.30	7
4	N Pt Lot 16	*	K. & T. Austin	002-24801	0.75	18
4	N Pt Lot 16	*	C. Pokulok & R. Hannah	002-24802	0.74	18
4	N Pt Lot 16	*	M. Demarco	002-25000	11.55	281
4	N Pt Lot 15	*	A. Smith & C. Ford	002-25200	2.05	50
4	N Pt Lot 15	*	L. Gialedakis	002-25210	6.46	157
4	N Pt Lot 15	*	2765870 Canada Inc	002-25300	0.36	9
4	N Pt Lot 15	*	E. & M. Van Den Elzen	002-25500	0.28	7
4	Pt Lot 15		1636574 Ontario Inc	002-25700	33.02	802
4	N Pt Lot 15	*	J. & R. Moody	002-25800	0.44	11
4	N Pt Lot 14		G. & C. Favret	002-26000	36.66	891
4	Pt Lot 14	*	R. & M. Johnson	002-26001	0.42	10

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN: Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #: 300038790**

Total Dillon Consulting Fees = $ 1,025,087.03
Portion of the Fees to be Levied to the Watershed = $ 190,000.00
Remaining Fees to be Levied to the Town of Innisfil = $ 835,087.03

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
4	N Pt Lot 13		1665328 Ontario Ltd	002-26100	39.44	958
4	N Pt Lot 12		1665328 Ontario Ltd	002-26300	31.19	758
4	N Pt Lot 11	*	1665328 Ontario Ltd	002-26400	29.89	726
5	S Pt Lot 11	*	L. Kuhn & J. Hettmann	002-26700	6.42	156
5	S Pt Lot 11	*	B. Graham	002-26725	0.82	20
5	S Pt Lot 11	*	M. Li & H. Zhang	002-26800	3.66	89
5	S Pt Lot 11		T. & V. Van Kuik	002-26900	5.83	142
5	S Pt Lot 11	*	D. & L. Street	002-27000	4.37	106
5	S Pt Lot 11	*	T. & J. Treloar	002-27100	2.67	65
5	S Pt Lot 11	*	D. & K. Adams	002-27200	2.17	53
5	S Pt Lot 11	*	L. Smith	002-27300	1.68	41
5	S Pt Lot 12	*	S. Wasylyk	002-27500	3.30	80
5	S Pt Lot 12	*	N. Nguyen	002-27600	1.68	41
5	S Pt Lot 12	*	C. Rainford & B. Hitchen	002-27700	1.88	46
5	Pt Lot 13		2462228 Ontario Ltd	002-27900	28.21	685
5	Pt Lot 13	*	C. & R. Kniazeff	002-27910	0.36	9
5	Pt Lot 14		1665328 Ontario Ltd	002-28000	52.10	1,266
5	S Pt Lot 15	*	D. Scythes	002-28200	0.08	2
5	S Pt Lot 15	*	C. Browne	002-28300	0.40	10
5	S Pt Lot 15	*	G. & O. De Araujo	002-28400	0.26	6
5	S Pt Lot 15	*	D. & M. Coulter	002-28500	0.28	7
5	S Pt Lot 15	*	T. Laurin	002-28600	0.42	10
5	S Pt Lot 15	*	P. & V. Chornenki	002-28700	0.28	7
5	Pt Lot 15		Kell Farms Ltd	002-29000	72.86	1,770
5	S Pt Lot 16		882022 Ontario Ltd	002-29100	32.55	791
5	S Pt Lot 17		K. Tse	002-29200	8.13	198
5	N Pt Lot 16		1589114 Ontario Ltd	002-31300	3.87	94
6	N Pt Lot 15	*	Sixth Line Cemetery	002-31500	2.43	59
5	N Pt Lots 1		1665328 Ontario Ltd	002-31900	64.57	1,569
5	N Pt Lot 12		2462228 Ontario Ltd	002-32000	56.59	1,375
5	N Pt Lot 12	*	B. Neeb & L. Smith	002-32001	0.29	7
5	N Pt Lot 11	*	AFMM Innisfil Ltd	002-32200	38.74	941
5	Pt Lot 11	*	T. Prosser	002-32201	0.40	10
3	N Pt Lot 16	*	J. Leblanc	003-00100	0.42	10
3	N Pt Lot 16	*	G. Ciccone	003-00200	0.26	6
3	N Pt Lot 16	*	M. Baker	003-00300	0.26	6
3	N Pt Lot 16	*	United Church	003-00400	0.28	7
3	N Pt Lot 16		10187526 Canada Corp	003-00500	37.34	907
3	N Pt Lot 15	*	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	003-00600	3.03	74
3	N Pt Lot 15	*	Fernbrook Homes (Churchill) Ltd	003-00700	24.46	594
3	Pt Lot 15	*	B. Doughty	003-00800	0.28	7
3	N Pt Lot 15	*	A. Dawson	003-00900	0.22	5
3	Pt Lot 15	*	T. Borscevski & B. Hill	003-01000	0.24	6
3	Pt Lot 15	*	C. Mount	003-01100	0.76	18
3	N Pt Lot 15	*	S. Simpson	003-01200	0.76	18
3	N Pt Lot 15	*	Anglican Church	003-01300	2.04	50
3	N Pt Lot 15	*	A. & C. Martins	003-01400	0.16	4
3	Pt Lot 15	*	J. Simpson	003-01500	0.30	7
3	Pt Lot 15	*	P S K Holdings Inc	003-01510	0.28	7
3	N Pt Lot 15	*	E. & K. Pivetta	003-01600	0.38	9
3	N Pt Lot 15	*	T. & S. Alderson	003-01700	0.38	9
3	N Pt Lot 15	*	J. Smith & C. Gauvin	003-01800	0.28	7
3	N Pt Lot 15	*	P. Chiavatti	003-01900	0.28	7
3	N Pt Lot 15	*	C. & A. Cutler	003-02000	0.30	7
3	Pt NE1/4 Lot 15	*	D. & R. Koekkoek	003-02100	0.64	16
3	Pt Lot 15	*	D. Wood & R. Bellar	003-02101	0.40	10
3	N Pt Lot 15	*	A. Fazelipour	003-02200	0.54	13
3	N Pt Lot 15	*	Town of Innisfil	003-02300	0.46	11
3	Plan 1194	*	M. & M. Alves	003-02400	0.38	9
3	Lot 14	*	J. & R. Carvalho	003-02500	0.28	7
3	Plan 1194	*	T. Cooley & O. Oliveira	003-02600	0.28	7
3	Lot 12	*	A. & L. Daniels	003-02700	0.28	7
3	Plan 1194	*	A. & K. Demarco	003-02800	0.56	14
3	Lot 9	*	R. Wilcox	003-02900	0.30	7
3	Lot 8	*	B. Cutler & P. Smith	003-03000	0.28	7
3	Lot 7	*	W. French	003-03100	0.28	7
3	Lot 6	*	D. Saunders	003-03200	0.28	7
3	Lot 5	*	N. Mason	003-03300	0.28	7
3	Lot 4	*	A. & R. West	003-03400	0.28	7
3	Plan 1194	*	B. & K. Bourget	003-03500	0.28	7
3	Lot 2	*	S. Simpson	003-03600	0.28	7
3	Lot 1	*	E. Waite	003-03700	0.34	8
3	Lot 16	*	A. & J. Asselstine	003-03800	0.40	10

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN: Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal | **PROJECT #: 300038790**

Total Dillon Consulting Fees =	*$*	*1,025,087.03*
Portion of the Fees to be Levied to the Watershed =	*$*	*190,000.00*
Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
3	Lot 17	*	M. Brown	003-03900	0.28	7
3	Lot 18	*	S. & K. Bowen	003-04000	0.28	7
3	Plan 1194	*	D. & C. Bell	003-04100	0.28	7
3	Plan 1194	*	K. & A. Wright	003-04200	0.28	7
3	Lot 21	*	C. Bell	003-04300	0.28	7
3	Lot 22	*	N. Gundert & R. Grant	003-04400	0.34	8
4	Plan M319	*	D. Dare	003-04600	0.40	10
4	Plan M319	*	P.Boer & S. Forsythe	003-04602	0.46	11
4	Plan M319	*	S. Small & L. Henderson	003-04604	0.54	13
4	Plan M319	*	M. & A. Dicesare	003-04606	0.48	12
4	Plan M319	*	R. Flemming	003-04608	0.44	11
4	Plan M319	*	M. Simpson & S. Roberts	003-04610	0.34	8
4	Plan M319	*	S. De Beaucamp	003-04614	0.34	8
4	Plan M319	*	R. & E. Moore	003-04616	0.56	14
4	Plan M319	*	M. Chabrzynski & S. Henderson	003-04618	0.44	11
4	Plan M319	*	R. & J. Lenehan	003-04620	0.36	9
4	Plan M319	*	G. & K. Farr	003-04622	0.42	10
4	Plan M319	*	N. & J. Stacey	003-04624	0.48	12
4	Plan M319	*	T. & E. Roomere	003-04626	0.62	15
4	Plan M319	*	D. & D. Wittick	003-04628	0.38	9
4	Plan M319	*	J. Philp & P. Murphy	003-04630	0.36	9
4	Plan M319	*	A. & J. Domenegato	003-04632	0.34	8
4	Plan M319	*	D. Veitch & R. Hopkins	003-04634	0.36	9
4	Plan M319	*	P. & L. Demers	003-04636	0.36	9
4	Plan M319	*	J. Quinn, J. Rabot & M. Quinn-Rabot	003-04638	0.38	9
4	Plan M319	*	J. & U. Zubrzycka	003-04640	0.40	10
4	Plan M319	*	T. & L. Moroz	003-04642	0.34	8
4	Plan M319	*	P. Whissell & H. Lostchuck	003-04644	0.44	11
4	Plan M319	*	R. & S. Laird	003-04646	0.38	9
4	Plan M319	*	B. & M. Rutledge	003-04648	0.38	9
4	Plan M319	*	L. & S. Smith	003-04650	0.36	9
4	Plan M319	*	W. & D. Mann	003-04652	0.34	8
4	Plan M319	*	T. & S. Breen	003-04654	0.34	8
4	Plan M319	*	W. & V. Toole	003-04656	0.40	10
4	Plan M319	*	R. & D. Sloan	003-04658	0.34	8
4	Plan M319	*	M. & I. Fruhstuck	003-04660	0.38	9
4	Plan M319	*	W. & D. Mayerhofer	003-04662	0.36	9
4	Plan M319	*	Town of Innisfil	003-04664	0.22	5
4	Plan M319	*	Town of Innisfil	003-04666	0.00	-
4	Lot 4	*	E. & C. Hawkes	003-04700	0.36	9
4	Lot 3	*	J. & J. Calvert	003-04800	0.38	9
4	Plan 1683	*	R. & C. Thew	003-04900	0.36	9
4	Plan 1683	*	P. & S. Hrynyk	003-05000	0.40	10
4	Plan 1683	*	R. & T. Kirkwood	003-05100	0.42	10
4	Plan 1683	*	J. & W. Campbell	003-05200	0.38	9
4	Lot 31	*	S. & L. Manley	003-05300	0.38	9
4	Lot 30	*	C. Schreider & A. Teskey	003-05400	0.38	9
4	Lot 29	*	D. Greenman & E. Stuart	003-05500	0.62	15
4	Plan 1683	*	G. & D. Adair	003-05600	0.72	17
4	Plan 1683	*	L. Mendrek	003-05700	0.38	9
4	Lot 26	*	M. & J. Cristicini	003-05800	0.38	9
4	Lot 10	*	K. Wisch	003-05900	0.40	10
4	Plan 1683	*	W. & P. Simpson	003-06000	0.40	10
4	Lot 8	*	A. & L. Kamrath	003-06100	0.38	9
4	Plan 1683	*	M. Sallach	003-06200	0.38	9
4	Plan 1683	*	E. Madden	003-06300	0.40	10
4	Plan 1683	*	R. & L. Cuggy	003-06400	0.44	11
4	Plan 1683	*	P. & W. Belgue	003-06500	0.38	9
4	Plan 1683	*	J. & D. Van Donkelaar	003-06600	0.38	9
4	Lot 18	*	Town of Innisfil	003-06700	0.38	9
4	Lot 17	*	G. Roesler	003-06800	0.40	10
4	Plan 1683	*	A. & S. Gismondi	003-06900	0.40	10
4	Lot 15	*	L. & J. Columbus	003-07000	0.38	9
4	Lot 14	*	U. Agarunov	003-07100	0.38	9
4	Lot 13	*	J. MacEachern	003-07200	0.38	9
4	Plan 1683	*	W. Vankempen & D. Williamson	003-07300	0.42	10
4	Lot 11	*	K. & C. Mortelliti	003-07400	0.40	10
4	Plan 1683	*	K. Russel & J. Johnson	003-07500	0.38	9
4	Plan 1683	*	Town of Innisfil	003-07600	1.98	48
4	Lot 24	*	B. & R. Witkowski	003-07700	0.38	9
4	Lot 23	*	C. Moore	003-07800	0.38	9
4	Lot 22	*	B. & B. Pearce	003-07900	0.38	9
4	Lot 21	*	C. & G. Prospero & A. Volpe	003-08000	0.42	10

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Remaining Fees to be Levied to the Town of Innisfil = $ *835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
4	Plan 1683	*	K. Humphris & N. Upham	003-08100	0.38	9
4	Lot 19	*	D. & L. MacDonell	003-08200	0.48	12
4	S Pt Lot 15	*	D. & D. Scott	003-08300	0.50	12
4	Pt Lot 15	*	J. & A. Calderon	003-08301	0.28	7
4	S Pt Lot 15	*	Woodsview Property Management	003-08400	0.24	6
4	S Pt Lot 15	*	A. Azan	003-08500	0.16	4
4	S Pt Lot 15	*	R. Drennan & M. Schell	003-08600	0.52	13
4	S Pt Lot 15	*	2367633 Ontario Inc	003-08700	0.52	13
4	S Pt Lot 15	*	S. Sanderson	003-08800	0.60	15
4	S Pt Lot 5	*	United Church	003-08900	0.82	20
4	Plan 162	*	Town of Innisfil	003-09000	1.14	28
4	Plan 162	*	D. Hogarth	003-09100	0.94	23
4	S Pt Lot 16	*	Town of Innisfil	003-09200	0.00	-
4	Pt Lots 5	*	S. Mark	003-09400	0.92	22
4	Pt Lots 5	*	A. Drugovic & G. Jenkinson	003-09500	0.28	7
4	Plan 162	*	S. Mikkola & K. Lamonday	003-09600	0.24	6
4	Plan 162	*	M. MacPhail & T. Nolan	003-09700	0.26	6
4	N Pt Lot 41	*	R. & P. Sampaio	003-09900	2.32	56
4	Plan 162	*	B. Deputat & C. Braney	003-10000	1.94	47
4	Plan 162	*	A. & M. Stepanova	003-10010	0.46	11
4	Plan 162	*	C. Radulovici	003-10100	3.44	84
4	Pt Lots 3	*	H. Rahimimoghadam	003-10200	0.80	19
4	Plan 162	*	M. Slocombe	003-10300	1.20	29
4	Plan 162	*	S. & R. Thomas	003-10400	0.36	9
4	Lot 30	*	A. Zlender	003-10500	0.52	13
4	Plan 162	*	C. & T. Asselstine	003-10600	2.14	52
4	Lot 24	*	B. Hoseman & K. Hoseman	003-10700	0.40	10
4	Plan 162	*	L. Burke	003-10800	0.34	8
4	Plan 162	*	S. & L. Gucciardi	003-10900	0.12	3
4	S Pt Lot 23	*	Renaissance Nouveau Design Inc	003-11000	0.12	3
4	Pt Lots 1	*	A. & D. Whiteside	003-11100	0.34	8
4	Plan 162	*	D. Napper	003-11200	0.78	19
4	Plan 162	*	V. & Z. Iacob	003-11300	1.44	35
4	S Pt Lot 16		K. & R. Sinclair	003-11400	10.16	247
4	Pt Lots 6 & 7	*	C. & T. Asselstine	003-11500	0.44	11
4	Plan 162	*	C. Mark	003-11600	0.26	6
4	Plan 162	*	R. Schweymaier	003-11700	1.70	41
4	Pt Lots 2	*	D. & M. Wilson	003-11800	0.30	7
4	Lot 1	*	C. Chegancas	003-11900	0.30	7
4	Pt Lot 16	*	D. & L. Fairhead	003-12000	2.06	50
4	Lot 61	*	F. Minici	003-12100	0.48	12
4	Plan 162	*	E. & I. Gyorfi	003-12200	0.38	9
4	Plan 162	*	P. Savard	003-12300	0.34	8
4	Plan 162	*	D. & M. Bowen	003-12400	0.22	5
4	Plan 162	*	J. Giannitti & M. Giannitti Est.	003-12500	0.36	9
4	Plan 162	*	C. Asselstine & M. Marshall	003-12600	0.36	9
4	Pt Lot 16	*	P. & D. McMillan	003-12700	2.82	69
4	Pt Lot 16	*	M. Mindle & E. Gulyas	003-12800	1.42	35
4	Plan M448	*	Town of Innisfil	003-25600	0.36	9
4	Plan M448	*	J. & C. Ang	003-25602	0.58	14
4	Plan M448	*	P. & S. Kubas	003-25604	0.44	11
4	Plan M448	*	S. & T. Smith	003-25606	0.40	10
4	Plan M448	*	R. & C. Cavaco	003-25608	0.40	10
4	Plan M448	*	S. & W. Mays	003-25610	0.40	10
4	Plan M448	*	N. Geddes	003-25612	0.42	10
4	Plan M448	*	S. & N. Gill	003-25614	0.52	13
4	Plan M448	*	D. & T. Carlson	003-25616	0.52	13
4	Plan M448	*	S. & T. Chatland	003-25618	0.58	14
4	Plan M448	*	L. Truong	003-25620	0.60	15
4	Plan M448	*	Town of Innisfil	003-25622	1.06	26
4	Plan 51M448	*	J. Stubbs	003-25624	3.92	95
4	Plan M448	*	J. & C. Fabing	003-25626	0.58	14
4	Plan M448	*	R. & E. Stukas	003-25628	0.52	13
4	Plan M448	*	M. Iammatteo	003-25630	0.52	13
4	Plan M448	*	D. & L. Ficher	003-25632	0.52	13
4	Plan M448	*	D. & S. Cake	003-25634	0.58	14
4	Plan M448	*	L. Philipp	003-25636	0.60	15
4	Plan M448	*	R. & D. Yonge	003-25638	0.64	16
4	Plan M448	*	A. & N. Bell	003-25640	0.42	10
4	Plan M448	*	A. Buttrum	003-25642	0.52	13
4	Plan M448	*	A. & A. Simpson	003-25644	0.44	11
4	Plan M448	*	C. & J. Van Nispen	003-25646	0.36	9
4	Plan M448	*	G. Clubine	003-25648	0.36	9

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Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
4	Plan M448	*	C. & C. Kidd	003-25650	0.42	10
4	Plan M448	*	K. & M. Moores	003-25652	0.48	12
4	Plan M448	*	F. Guttridge & L. Etherton	003-25654	0.48	12
4	Plan M448	*	D. & E. Ciccia	003-25656	0.48	12
4	Plan M448	*	B. & J. Laval	003-25658	0.48	12
4	Plan M448	*	J. & C. Molenhuis	003-25660	0.48	12
4	Plan M448	*	C. Damianakis & R. Cooper	003-25662	0.44	11
4	Plan M448	*	M. & D. Twardowski	003-25664	0.56	14
4	Plan M448	*	M. & L. Snowball	003-25666	0.40	10
4	Plan M448	*	R. Mateus	003-25668	0.48	12
4	Plan M448	*	M. & S. Davenport	003-25670	0.52	13
4	Plan M448	*	B. & S. Bingley	003-25672	0.48	12
4	Plan M448	*	S. Jenssen-Brown	003-25674	0.42	10
4	Plan M448	*	D. Lajoie	003-25676	0.34	8
4	Plan M448	*	R. & K. Carlin	003-25678	0.36	9
4	Plan M448	*	E. & B. Rideout	003-25680	0.36	9
4	Plan M448	*	R. Cressman	003-25682	0.40	10
4	Plan M448	*	C. & L. Vitale	003-25684	0.44	11
4	Plan M448	*	E. & F. Arantes	003-25686	0.42	10
4	Plan M448	*	A. & A. Takacs	003-25688	0.40	10
4	Plan M448	*	N. & P. Blanchet	003-25690	0.40	10
4	Plan M448	*	J. & C. Conti	003-25692	0.40	10
4	Plan M448	*	C. Douglas	003-25694	0.38	9
4	Plan M448	*	T. & M. Tokarski	003-25696	0.38	9
4	Plan M448	*	G. Werth	003-25698	0.40	10
4	Plan M448	*	J. & L. Knox	003-25702	0.42	10
4	Plan M448	*	M. & M. Goodchild	003-25704	0.42	10
4	Plan M448	*	G. Gogos	003-25706	0.36	9
4	Plan M448	*	J. Reindl	003-25708	0.36	9
4	Plan M448	*	D. & A. Stopyra	003-25710	0.40	10
4	Plan M448	*	D. & E. Magri	003-25712	0.42	10
4	Plan M448	*	V. & K. Hamilton	003-25714	0.42	10
4	Plan M448	*	M. Doyle & S. McInnis	003-25716	0.42	10
4	Plan M448	*	R. Weeks	003-25718	0.42	10
4	Plan M448	*	A. & S. Ginzburg	003-25720	0.40	10
4	Plan M448	*	E. & S. Ernest	003-25722	0.38	9
4	Plan M448	*	Town of Innisfil	003-25724	1.66	40
6	S Pt Lot 3		1045990 Ontario Inc	018-00900	8.35	203
6	S Pt Lot 4		T. & R. Ruch & 10454990 Ontario Inc	018-01300	10.37	252
6	S Pt Lot 4		J. Robson	018-01400	17.02	414
6	S Pt Lot 5		M. Vandermast	018-01500	55.19	1,341
6	S Pt Lot 5	*	W. & B. Baguley	018-01600	0.30	7
6	S Pt Lot 6		J. & P. Hilverda	018-01800	0.23	6
6	Pt Lot 6		J. & P. Hilverda	018-01900	19.52	333
6	Pt Lot 6	*	Town of Innisfil	018-01902	7.24	176
6	N Pt Lot 6		1665328 Ontario Ltd	018-02000	12.08	294
6	N Pt Lot 6	*	V. & J. Parravano	018-02010	0.18	4
6	N Pt Lot 5		1057595 Ontario Ltd	018-02500	18.09	440
6	N Pt Lot 4	*	D. & J. Rice	018-02600	3.55	86
6	N Pt Lot 4		L. Peterson	018-02800	26.76	650
6	N Pt Lot 3		G. & J. McLean	018-02900	38.17	927
6	N Pt Lot 3		G. McLean	018-02901	0.21	5
7	N Pt Lots 1		P. Wardlaw	018-03100	0.77	19
7	S Pt Lot 3		D. & D. Oakley	018-03900	21.44	521
7	S Pt Lot 3	*	M. & D. Purnell	018-04000	0.42	10
7	W Pt Lot 4	*	Ben Capelas Landscaping & Snow Removal	018-04100	4.64	113
7	S Pt Lot 4		M. Haourt & J. See	018-04200	19.72	479
7	S Pt Lot 5		R. & K. Webb	018-04300	8.48	206
7	S Pt Lot 5		922952 Ontario Inc	018-04400	8.43	205
7	Pt Lots 4 & 5		R. Arbour	018-05000	8.39	204
7	W Pt Lot 4		Rix Farms Ltd	018-05100	10.23	249
6	Lot 7		751518 Ontario Ltd	020-00100	40.25	978
6	Pt Lot 7		Town of Innisfil	020-00104	5.40	131
6	S Pt Lot 10		1536315 Ontario Ltd	020-00400	8.97	218
6	N Pt Lot 13	*	J. & V. Aquino	021-03800	0.67	16
6	N Pt Lot 13	*	J. Horodynsky	021-04000	0.41	10
6	N Pt Lot 12	*	A. & L. Obidin	021-04101	0.87	21
6	N Pt Lot 11		2154016 Ontario Ltd	021-04200	10.09	245
6	S Pt Lot 11		C. Hall	021-04300	15.70	381
6	S Pt Lot 11	*	K. & R. Winter	021-04400	16.65	405
6	S Pt Lot 12	*	O. & K. Awrey	021-04500	4.06	99
6	S Pt Lot 12	*	K. Bernt	021-04600	5.92	144
6	S Pt Lot 12	*	G. & G. Kent	021-04700	9.62	234

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Total Dillon Consulting Fees =	*$*	*1,025,087.03*
Portion of the Fees to be Levied to the Watershed =	*$*	*190,000.00*
Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
6	S Pt Lot 13	*	A. Zlender	021-04800	4.92	120
6	S Pt Lot 13	*	M. Slaby	021-04900	6.47	157
6	S Pt Lot 14		W. Pratt	021-05000	24.41	593
6	S Pt Lot 15	*	Ministry Of Transportation	021-05100	0.63	15
6	S Pt Lot 15		J. & E. Cole	021-05200	17.25	419
6	S Pt Lot 15	*	D. Huisman	021-05300	0.26	6
6	Pt Lot 15	*	Sunset International Speedway Inc	021-05400	8.30	202
6	S Pt Lot 15	*	Sunset International Speedway Inc	021-05500	19.23	467
6	Plan 1120	*	1625057 Ontario Corporation	021-05600	0.51	12
6	Pt Lots 14 & 15		2215570 Ontario Inc	021-06100	4.77	116
6	N Pt Lot 13	*	C. Scenna	021-06101	1.48	36
6	N Pt Lot 13	*	1281597 Ontario Inc	021-06102	1.22	30
15	Pt Lot 6	*	Suncor Energy Inc	072-15602	0.40	10
15	Pt Lot 6	*	Suncor Energy Inc	072-15604	2.31	56
15	Pt Lot 6	*	J. Bucko	072-15700	0.57	14
15	Pt Lot 5	*	1833044 Ontario Ltd	072-15900	4.94	120
15	Pt Lot 6	*	C. & M. Carra	072-15901	2.70	66
15	Pt Lot 5	*	2537878 Ontario Ltd	072-15902	5.91	144
15	Pt Lot 5	*	Resquip Inc	072-15903	7.20	175
15	Pt Lot 6	*	Suncor Energy Inc	072-15905	0.11	3
15	Pt Lot 6	*	C. & M. Carra	072-15910	2.67	65
15	W Pt Lot 5	*	ADF Investments Ltd	072-16000	3.84	93
15	W Pt Lot 4	*	K. & S. Lotton	072-16200	0.46	11
15	W Pt Lot 4	*	J. Lemoine	072-16300	1.23	30
15	W Pt Lot 4	*	N. Ahmed & Q. Majoka	072-16301	0.64	16
15	Pt Lot 4	*	M. & M. Pedneault	072-16302	0.38	9
15	Pt Lot 4	*	G. & M. Cruz	072-16402	0.81	20
15	Pt Lot 4	*	C. Kulesza	072-16410	0.49	12
15	Plan M480	*	M. Colabella & D. Bravo	072-16420	0.64	16
15	Plan M480	*	Ontario Stockyards Inc	072-16430	12.60	306
13	N Pt Lot 10	*	W. & T. Chen	073-32500	3.87	94
13	N Pt Lot 10	*	G. & D. Kruger	073-32600	0.23	6
13	N Pt Lot 10	*	P. & L. Plavic	073-32610	0.42	10
13	N Pt Lot 10	*	A. Smith	073-32700	3.61	88
13	N Pt Lot 10	*	J. & E. Blake	073-32701	0.67	16
13	N Pt Lot 10	*	D. Decaro	073-32800	4.62	112
13	N Pt Lot 11		P. & S. Silverthorne	073-32900	9.62	234
13	N Pt Lot 11	*	A. Martin	073-33000	4.71	114
13	N Pt Lot 11	*	R. White & D. Miedema	073-33001	0.94	23
13	N Pt Lot 11	*	S. & L. McGuire	073-33002	0.35	9
13	N Pt Lot 11	*	M. & D. Ridout	073-33003	0.39	9
13	N Pt Lot 11	*	A. & C. Galati	073-33010	0.34	8
13	N Pt Lot 11	*	W. Kapralik & M. Janz Est.	073-33015	0.32	8
13	Pt Lot 11	*	S. Tustin & T. Ross	073-33100	8.64	210
13	N Pt Lot 11	*	D. McGeachy	073-33110	0.32	8
13	N Pt Lot 11	*	Y. Liao & Z. Li	073-33200	6.59	160
13	N Pt Lot 12	*	S. & H. White	073-33201	0.51	12
13	N Pt Lot 11	*	A. & P. Clitherow	073-33202	1.25	30
13	Pt Lot 11	*	J. & R. Carvalhais	073-33203	0.33	8
13	Pt Lot 11	*	P. & A. Clitherow	073-33204	0.42	10
13	Pt Lot 12	*	M. Milekic	073-33300	10.61	258
13	Pt Lot 12	*	M. & O. Milekic	073-33302	0.73	18
13	N Pt Lot 12	*	R. Vandrie & R. Walsh	073-33320	0.39	9
13	N Pt Lot 12		F. Semiao	073-33400	11.08	269
13	N Pt Lot 12	*	R. Sturgeon	073-33401	1.71	42
13	N Pt Lot 12		Beacon Street Entertainment	073-33500	4.59	112
13	N 1/2 Lot 13	*	D. & R. Mattingley	073-33501	0.99	24
13	N Pt Lot 13		Hasbrooke Holdings Ltd	073-33510	14.72	358
14	S Pt Lot 15		W. & C. Procter	073-34400	7.30	177
14	S Pt Lot 14		P & A Timbers & Sons	073-34901	9.26	225
14	Pt Lot 14		E. & J. Samios	073-35202	14.33	348
14	S Pt Lot 13		T. Sturgeon	073-35300	40.19	976
14	S Pt Lot 12		H. Nunes	073-35400	34.60	841
14	S Pt Lot 11	*	V. & R. Ibrajev	073-35500	13.81	336
14	W Pt Lot 11	*	R. & S. Batsch	073-35600	2.88	70
14	W Pt Lot 11	*	D. Kennedy Est. & G. Kennedy	073-35601	1.01	25
14	W Pt Lot 11	*	D. & N. Forget	073-35700	1.46	35
14	W Pt Lot 11	*	M. & B. Markowitz	073-35800	2.96	72
14	W Pt Lot 11	*	C. Sun & P. Pov	073-35900	2.41	59
14	Pt Lot 11	*	A. & D. Cianfarani	073-35901	0.49	12
14	W Pt Lot 11	*	H., Z., & M. Tesic	073-36000	3.21	78
14	S Pt Lot 10	*	D. & B. Jebb	073-36100	19.38	471
14	S Pt Lot 10	*	P. & M. Barreira	073-36101	0.11	3

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN: Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #: 300038790**

Total Dillon Consulting Fees =	*$*	*1,025,087.03*
Portion of the Fees to be Levied to the Watershed =	*$*	*190,000.00*
Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
14	S Pt Lot 9	*	J. Marques	073-36200	1.90	46
14	S Pt Lot 9	*	2031430 Ontario Ltd	073-36300	2.14	52
14	N Pt Lot 16	*	A. Lacquaniti	074-12400	0.28	7
14	N Pt Lot 16	*	L. Webster	074-12500	0.24	6
14	N Pt Lot 16	*	B. Kneeshaw	074-12600	0.36	9
14	N Pt Lot 16	*	B. & J. Kneeshaw	074-12601	0.38	9
14	N Pt Lot 16	*	L., R. & J. Kell	074-12700	1.38	34
14	N Pt Lot 16	*	C. & L. Stovold	074-12710	0.99	24
14	N Pt Lot 16		1402802 Ontario Inc	074-12720	18.34	446
14	N Pt Lot 15		1402802 Ontario Inc	074-12900	41.13	999
14	N Pt Lot 15	*	L. & M. Parsons	074-12901	0.40	10
14	Pt N1/2 Lot 15	*	F. & K. Zielke	074-12902	0.42	10
14	N Pt Lot 14		D. Zielke	074-13000	42.52	1,033
14	N Pt Lot 13		L. & E. Kell	074-13100	39.50	960
14	N Pt Lot 13	*		074-13101	0.46	11
14	N Pt Lot 12	*	S. & K. Thavakumar & S. Janani	074-13200	0.61	15
14	N Pt Lot 12		W. Steimle	074-13201	29.56	718
14	Pt Lot 11	*	D. & A. Ostojic	074-13300	15.74	382
14	N Pt Lot 11	*	K. & O. Kanevsky	074-13301	2.56	62
14	W Pt Lot 11	*	S. Heinemann & C. Kim	074-13400	2.17	53
14	W Pt Lot 11	*	J. & C. Evans	074-13500	2.71	66
14	W Pt Lot 11	*	K. & S. MacRae	074-13600	2.14	52
14	N Pt Lot 10	*	C. & V. Grande	074-13700	6.26	152
14	Pt Lot 10	*	P. & L. Fenz & D. Leithwood	074-13701	0.40	10
14	N Pt Lot 10	*	R. & C. Colonna & F. & V. Corbo	074-13800	6.46	157
14	N Pt Lot 10	*	E. & A. Spina	074-13900	6.84	166
14	N Pt Lot 9	*	C. Schiafone & A. Britton	074-14000	2.72	66
14	N Pt Lot 9	*	G., G. & A. Gatti	074-14100	2.80	68
14	N Pt Lot 9	*	J. & J. Waz	074-14200	2.16	52
14	N Pt Lot 9	*	D., L., & T. Galati & A. Granato	074-14300	1.58	38
14	N Pt Lot 8	*	M. & I De Sao Jose	074-14400	0.84	20
14	N Pt Lot 8	*	A. & M. Cesta & R. & A. Babusci	074-14500	1.51	37
14	Pt Lots 7 & 8	*	Riocan Holdings (Tiy) Inc & 1633272 Alberta Ulc	074-14900	5.88	143
15	Pt Lot 8	*	I. & M. De Sao Jose	074-15000	1.98	48
15	Pt Lot 8	*	Sisters Of Our Lady Mount	074-15100	0.68	17
15	Pt Lot 8	*	Town of Innisfil	074-15101	0.55	13
15	Pt Lot 8	*	Sisters Of Our Lady Mount	074-15200	0.93	23
15	Pt Lot 8	*	L. Lorusso	074-15201	1.91	46
15	Pt Lot 9	*	Q. Woods	074-15300	2.70	66
15	W Pt Lot 9	*	Fairview Farms Holdings Inc	074-15400	5.13	125
15	Pt Lot 10		M. Toich	074-15500	4.82	117
15	Pt Lot 10		T. Delahunt	074-15600	3.26	79
15	Pt Lot 10	*	T. Kingsly	074-15700	1.20	29
15	Pt Lot 10	*	J. Barber & D. Furtado	074-15800	1.61	39
15	Pt Lot 10	*	Barbay Holdings Incorporated	074-15900	2.12	52
15	Pt Lot 10	*	H. Ju	074-16000	1.82	44
15	Pt Lot 11	*	Q. & A. Alam	074-16100	5.40	131
15	Pt Lot 11	*	M. Fenech	074-16101	0.43	10
15	Pt Lot 11	*	G. Bell	074-16102	0.27	7
15	Pt Lot 11	*	S. & R. Kuzmyk	074-16110	0.25	6
15	Pt Lot 11	*	V. Fava & D. Lombardi	074-16200	1.48	36
15	Pt Lot 11	*	P. Hajdukiewicz	074-16210	0.26	6
15	Pt Lot 11	*	B. Nemeth	074-16300	1.66	40
15	Pt Lots 11 & 12	*	B. Arnold & M. Foley	074-16400	1.30	32
15	Pt Lots 11 & 12	*	B. Bondi	074-16401	0.81	20
15	Pt Lot 12	*	J. & T. Rautiainen	074-16500	3.25	79
15	Pt Lot 12	*	F. & H. Pereira	074-16501	1.41	34
15	Pt Lot 12	*	N. & J. Palazzo	074-16520	0.28	7
15	Pt Lot 12		G. & R. Zielke	074-16600	6.45	157
15	Pt Lot 13		Apoca Carpenters Ltd	074-16700	9.38	228
15	W Pt Lot 13	*	F. & K. Commisso & J. Raposo	074-16701	0.37	9
15	Pt Lot 13	*	A. & E. Auciello	074-16702	0.69	17
15	Pt Lot 13	*	K. & B. Adams	074-16710	0.27	7
15	Pt Lot 13	*	A. Venroy & D. Pagnan-Venroy	074-16720	0.27	7
15	Pt Lots 13 & 14		L. & E. Kell	074-16800	11.50	279
15	Pt Lot 14	*	N. & W. Harris	074-16801	0.44	11
15	Pt Lots 13 & 14	*	Hydro One Networks Inc	074-16900	0.18	4
15	Pt Lots 14 & 15		R. & D. Zielke	074-17000	11.24	273
15	Pt Lot 15	*	R. & W. Graham	074-17001	0.38	9
15	Pt Lots 14 & 15	*	R. Zielke	074-17040	0.28	7
15	Pt Lot 15	*	J. McCullough	074-17100	0.38	9
15	Pt Lot 15		K. & H. Kell	074-17200	7.40	180
15	Pt Lot 15	*	Innpower Corporation	074-17300	0.22	5

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN: Town of Innisfil**
DATE : October 22, 2019 - Amended by the Tribunal | **PROJECT #: 300038790**

Total Dillon Consulting Fees = $ *1,025,087.03*
Portion of the Fees to be Levied to the Watershed = $ *190,000.00*
Remaining Fees to be Levied to the Town of Innisfil = $ *835,087.03*

Conc.	Lot or Plan		Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
15	Pt Lot 15	*	2430683 Ontario Inc	074-17400	0.43	10
15	Pt Lot 15	*	S. & B. Kim	074-17500	0.37	9
15	Pt Lot 15	*	E. Ciotti	074-17600	0.42	10
15	Pt Lot 15	*	Town of Innisfil	074-17700	1.10	27
15	Pt Lot 15	*	Town of Innisfil	074-17800	0.99	24
15	Pt Lot 15	*	J. & M. Read	074-17901	0.38	9
15	Pt Lot 16	*	M. & V. Caporiccio	074-18000	0.30	7
15	Pt Lot 16	*	1728299 Ontario Inc	074-18001	0.18	4
15	Pt Lot 16	*	1385385 Ontario Inc	074-18100	0.22	5
15	Pt Lot 16	*	Z. & E. Meir	074-18200	0.40	10
				Total on Innisfil Lands	**6,302.93**	**$ 152,835**
			Bradford-West Gwillimbury Lands			
12	Pt S1/2 Lot 12	*	Simcoe County	003-25000	20.28	493
12	S Pt Lot 11		I. & Z. Bloch	003-25500	5.05	123
12	N Pt Lot 11	*	T. & B. Berneche	003-27500	0.96	23
12	N Pt Lot 11		J. Koperwas	003-27503	23.48	570
12	N Pt Lot 11	*	Simcoe County	003-27505	6.30	153
12	N Pt Lot 12		M. Sheikh & A. Chaudary	003-27800	32.27	784
12	N Pt Lot 12	*	M. & M. Grishaber	003-27801	0.53	13
12	N Pt Lot 12	*	M. Goldenberg & S. Burns	003-27802	0.37	9
12	N Pt Lot 13	*	Simcoe County	003-27804	2.00	49
12	N Pt Lot 13	*	H. Boucher	003-27900	0.73	18
12	N Pt Lot 13	*	C. & V. Duraes	003-27901	0.55	13
12	N Pt Lot 13	*	R. & Y. Fortune	003-27902	0.73	18
12	N Pt Lot 13	*	A. & M. Amaral	003-27903	1.02	25
12	N Pt Lot 13		R. Whillier	003-27905	1.10	27
12	Pt Lot 13	*	D. & N. Soldiuk	003-27906	0.38	9
12	N Pt Lot 13		C. & M. Conceicao	003-28004	4.02	98
13	S Pt Lot 13	*	M. & R. Fresco	003-30201	1.63	40
13	S Pt Lot 13	*	Steiner Tree Farms Ltd	003-30215	4.09	99
13	S Pt Lot 13	*	R. McKaigue	003-30300	11.91	289
13	Pt Lot 13	*	Y. Dement	003-30301	0.52	13
13	S Pt Lot 13	*	Eric's Right World of Scouting	003-30320	2.41	59
13	S Pt Lot 13	*	J. & T. Lefler	003-30400	0.72	17
13	S Pt Lot 13	*	T. Callacott & U. Walton	003-30500	0.72	17
13	S Pt Lot 13	*	B. Ferguson	003-30600	0.37	9
13	S Pt Lot 13	*	J. & K. Van Lierop	003-30601	0.37	9
13	S Pt Lot 13	*	W. & D. Lawrence	003-30700	0.35	9
13	S Pt Lot 11		M. Boddy	003-30800	53.03	1,288
13	S Pt Lot 12	*	P. Abercrombie & S. Bruin	003-30801	0.37	9
13	Pt Lot 11	*	J. Reilly & S. Tolley	003-31000	8.02	195
13	Pt Lot 11	*	N. & K. Sears	003-31061	2.53	61
13	Pt Lot 11	*	Y. Guo	003-31001	10.13	246
13	Plan M649	*	Town of Bradford West Gwillimbury	003-31100	0.69	17
13	Plan M649	*	R. & J. Burns	003-31104	0.64	16
13	Plan M649	*	G. Gallo	003-31108	0.64	16
13	Plan M649	*	M. & R. Zimmer	003-31112	0.65	16
13	Plan M649	*	B. & M. Gentile	003-31116	0.56	14
13	Plan M649	*	F. & P. Giusti	003-31120	0.65	16
13	Plan M649	*	K. Brown	003-31124	0.75	18
13	Plan M649	*	L. Gross	003-31128	0.83	20
13	Plan 51M6	*	Q. Zhu Zhi & Y. Tang	003-31136	0.69	17
13	Plan 51M6	*	J. & D. Taylor	003-31138	0.70	17
13	Plan M649	*	S. & U. Kostuch	003-31142	0.73	18
13	Plan M649	*	N. & A. Barroso	003-31146	0.76	18
13	Plan M649	*	L. & P. Wade	003-31150	0.64	16
13	Plan M649	*	D. & J. Ferragine	003-31170	0.66	16
13	Plan M649	*	M. & T. Capuano	003-31174	0.60	15
13	Plan M649	*	B. Ahmed	003-31178	0.49	12
13	Plan M649	*	J. Muir-Birtles & G. Birtles	003-31182	0.62	15
13	Plan M649	*	R. & N. Jackson	003-31186	0.92	22
13	Plan M649	*	R. Sorbera-Colivas	003-31190	0.57	14
13	Plan M649	*	C. Alarie	003-31194	0.53	13
13	Plan M649	*	P. & Z. Zanet	003-31198	0.63	15
13	Pt Lot 10	*	A. Man	003-31410	4.02	98
				Total on Bradford-West Gwillimbury Lands	**214.91**	**$ 5,224**
				TOTAL ON LANDS	**6,517.84**	**$ 158,059**

APPENDIX B6 - ASSESSMENTS for DILLON CONSULTING FEES
Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** | **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** | **PROJECT #:** **300038790**

Total Dillon Consulting Fees =	*$*	*1,025,087.03*
Portion of the Fees to be Levied to the Watershed =	*$*	*190,000.00*
Remaining Fees to be Levied to the Town of Innisfil =	*$*	*835,087.03*

Conc.	Lot or Plan	Owner	Roll No.	Equivalent Area (Ha.)	Assesment of Dillon Fees
		Town of Innisfil Roads			
7th Line		Town of Innisfil		13.20	321
6th Line		Town of Innisfil		56.97	1,526
5th Line		Town of Innisfil		60.52	1,470
4th Line		Town of Innisfil		84.76	2,067
3rd Line		Town of Innisfil		52.79	1,440
2nd Line		Town of Innisfil		52.74	1,482
15th Line		Town of Innisfil		5.60	136
Gilford Road		Town of Innisfil		21.66	526
14th Line		Town of Innisfil		19.67	478
Churchill Unnamed Road 1		Town of Innisfil		1.76	43
Churchill Unnamed Road 2		Town of Innisfil		3.64	88
Churchill Unnamed Road 3		Town of Innisfil		0.84	20
John Street		Town of Innisfil		1.84	45
Allan Street		Town of Innisfil		1.80	44
Sloan Circle Drive		Town of Innisfil		5.20	126
Cairns Gate		Town of Innisfil		0.88	21
Valley View Drive		Town of Innisfil		5.52	134
Gimby Crescent		Town of Innisfil		4.24	103
Meadowland Street		Town of Innisfil		6.16	150
Reive Blvd		Town of Innisfil		87.04	2,115
			Total on Town of Innsifil Roads	**486.83**	**$ 12,335**
		Town of Bradford West Gwillimbury Roads			
Line 13		Bradford West Gwillimbury		13.40	326
Line 12		Bradford West Gwillimbury		0.92	22
Kilkenny Trail		Bradford West Gwillimbury		5.20	126
			Total on Town of Bradford West Gwillimbury Roads	**19.52**	**$ 474**
		Other Roads			
5 Sideroad (CR 53)		Simcoe County		80.68	1,960
10 Sideroad (CR 54)		Simcoe County		105.76	2,570
County Road 89		Simcoe County		64.56	1,569
County Road 4 (Yonge Street)		Simcoe County		130.20	3,163
Hwy 89		Ministry of Transportation		33.80	821
Hwy 400		Ministry of Transportation		373.45	9,049
			Total on Other Roads	**788.45**	**$ 19,132**
			TOTAL ON ROADS	**1,294.80**	**$ 31,941**
			ALL LANDS AND ROADS	**7,812.64**	**$ 190,000**

Notes: (1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *

(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B7

Assessment for Construction
Entire Drain

B7

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
			Innisfil Lands								
1	S Pt Lot 2		Letizia Homes Ltd	001-00500	13.21	50	360	-	410	321	731
1	S Pt Lot 3		2492140 Ontario Ltd	001-00600	16.27	50	440	-	490	395	885
1	S Pt Lot 3		S. & P. Prim	001-00700	4.04	50	100	-	150	87	237
1	S Pt Lot 4		D. Corbo	001-00800	40.62	50	700	-	750	798	1,548
1	S Pt Lot 4	*	G. Snedden & L. D'aoust	001-00900	0.44	50	-	-	50	11	61
1	S Pt Lot 5	*	Ministry Of Transportation	001-01100	6.59	130	70	-	200	423	623
1	S Pt Lot 5	*	1665328 Ontario Ltd	001-01200	33.40	1,470	200	-	1,670	383	2,053
1	Pt Lot 6	*	H. & G. White	001-01300	0.23	50	-	-	50	8	58
1	Pt Lot 6		A. Moir & H. Minns	001-01400	35.06	42,150	1,150	-	43,300	691	43,991
1	S Pt Lot 6	*	H. Wallace	001-01500	0.39	50	-	-	50	9	59
1	S Pt Lot 6	*	H. Dinh	001-01700	0.25	50	-	-	50	6	56
1	S Pt Lot 6	*	T. Pham	001-01800	0.13	50	-	-	50	6	56
1	S Pt Lot 6	*	Bell Canada	001-01900	0.09	50	-	-	50	2	52
1	Pt Lot 6	*	Ministry Of Transportation	001-02100	3.30	1,600	560	-	2,160	80	2,240
1	Pt Lot 7		A. Moir & H. Minns	001-02200	0.86	50	30	-	80	21	101
1	Pt Lot 7	*	Ministry Of Transportation	001-02400	1.40	400	450	-	850	102	952
1	N Pt Lot 6	*	F. Rohani & R. Ghorabi	001-02600	0.28	50	10	-	60	7	67
1	N Pt Lot 6		2367808 Ontario Inc	001-02800	40.56	7,400	1,850	-	9,250	939	10,189
1	N Pt Lot 5		A. Posius	001-03000	40.52	50	1,540	-	1,590	911	2,501
1	N Pt Lot 5	*	A. & M. Beattie	001-03010	0.54	50	10	-	60	13	73
1	Pt Lot 4		Tack 2016 Ltd & 1442422 Ontario Ltd	001-03100	40.36	50	2,280	-	2,330	979	3,309
1	Pt Lot 4	*	M. Lang	001-03110	0.48	50	30	-	80	12	92
1	N Pt Lot 3		Tack 2016 Ltd	001-03200	26.50	50	840	-	890	633	1,523
1	Pt Lot 3		G. & B. Faggion	001-03300	13.30	50	360	-	410	323	733
2	S Pt Lot 2		A. & D. Tamburino	001-04100	1.07	50	60	-	110	26	136
2	S Pt Lot 3		White Horse Investments Corp, Fresco Estates Ltd & 2088464 Ontario Ltd	001-04200	40.98	50	2,390	-	2,440	981	3,421
2	Pt Lot 3	*	A. & N. Marcuzzi	001-04400	0.28	50	20	-	70	7	77
2	S Pt Lot 4	*	674569 Ontario Ltd	001-04500	16.18	50	820	-	870	335	1,205
2	S Pt Lot 4		D. & L. Mazanik	001-04600	24.83	50	1,310	-	1,360	537	1,897
2	Pt Lot 4	*	V. Astrauskas & P. Spedaliere	001-04620	0.37	50	20	-	70	9	79
2	S Pt Lot 5		H. & Y. Yoo	001-04700	40.52	50	2,290	-	2,340	940	3,280
2	S Pt Lot 5	*	J. Quishpe Barros & V. Leon Pinos	001-04900	0.21	50	20	-	70	10	80
2	Pt Lot 6		P S K Holdings Inc	001-05200	20.78	50	1,230	-	1,280	505	1,785
2	Pt Lot 6		The Simpson/Elson Group	001-05220	19.72	50	1,170	-	1,220	479	1,699
2	N Pt Lot 6	*	S. & I. Hussain	001-05300	13.35	50	690	-	740	238	978
2	N Pt Lot 6	*	S. Pressey & H. Money	001-05400	7.61	50	440	-	490	179	669
2	Pt Lot 6	*	Y. Tran & D. & L. Nguyen	001-05500	4.40	50	260	-	310	105	415
2	N Pt Lot 6	*	L. & M. Barbosa	001-05600	4.41	50	250	-	300	103	403
2	N Pt Lot 6	*	C. & A. Carpino	001-05700	8.49	50	390	-	440	161	601
2	N Pt Lot 5	*	H. & M. Yoon	001-05800	4.04	50	220	-	270	90	360
2	N Pt Lot 5	*	G. & A. Caubang	001-05900	4.05	50	140	-	190	57	247
2	N Pt Lot 5	*	A. Krebs Est., H. Krebs & I. Krebs-Wickens	001-06000	4.03	50	210	-	260	86	346
2	N Pt Lot 5	*	G. & Z. Grigoroff	001-06100	4.04	50	220	-	270	92	362
2	N Pt Lot 5	*	H. Sieber	001-06200	3.89	50	160	-	210	66	276
2	N Pt Lot 5	*	C. Nothrop	001-06300	3.98	50	230	-	280	94	374
2	N Pt Lot 5		G. & S. Reilly	001-06400	4.11	50	130	-	180	52	232
2	N Pt Lot 5	*	A. Scorziello	001-06500	4.06	50	240	-	290	98	388
2	N Pt Lot 5		D. & C. Wilson	001-06600	4.66	50	280	-	330	113	443
2	N Pt Lot 5	*	A. & D. Watt	001-06700	4.62	50	270	-	320	112	432
2	N Pt Lot 4		P. & D. Meneguzzi	001-06800	41.26	50	2,180	-	2,230	892	3,122
2	N Pt Lot 3		Farisland Ltd	001-06900	22.30	50	1,320	-	1,370	542	1,912
2	N Pt Lots 2		J. & C. Faris	001-07000	4.10	50	220	-	270	89	359
3	S Pt Lot 1		K. & V. Wardlaw	001-07400	2.10	50	80	-	130	32	162
3	S Pt Lot 2		P. Wardlaw	001-07600	14.16	50	820	-	870	336	1,206
3	S Pt Lot 3		J. Lukovits & A. Radocsai	001-07700	42.71	50	2,290	-	2,340	939	3,279
3	S Pt Lot 4	*	M. Turner & J. Goncalves	001-07900	10.54	50	610	-	660	250	910
3	S Pt Lot 4		Chapter Homes Inc	001-08000	10.68	50	570	-	620	232	852
3	S Pt Lot 5		A. & D. Henry	001-08100	41.25	50	3,350	-	3,400	980	4,380
3	S Pt Lot 5	*	H. La Page	001-08110	1.41	50	100	-	150	22	172
3	S Pt Lot 6	*	S. Wheeler	001-08300	0.28	50	30	-	80	7	87
3	S Pt Lot 6		E., E. & J. Rainey	001-08400	38.86	50	3,310	-	3,360	853	4,213
3	N Pt Lot 6;		S., T., M., & N. Ferrazzo	001-08500	12.46	50	1,360	-	1,410	303	1,713
3	N Pt Lot 6;		Armking & Company Ltd	001-08700	3.95	50	430	-	480	96	576
3	N Pt Lot 6	*	L. Taylor	001-08800	0.40	50	40	-	90	10	100
3	Pt Lot 6	*	A. & O. Posterniak	001-08900	4.28	50	470	-	520	104	624
3	Pt Lot 6	*	G. & M. Ioannou	001-09000	6.08	50	660	-	710	148	858
3	Pt Lot 6		J. Rampodarat & T. Tirbeni	001-09100	6.14	50	670	-	720	149	869
3	Pt Lot 6		M. Frasca	001-09200	6.18	50	590	-	640	131	771
3	N Pt Lot 5	*	M. Gelfand & E. Kull	001-09400	0.32	50	30	-	80	7	87
3	N Pt Lot 5	*	United Bethesda Cemetery	001-09500	0.38	50	30	-	80	8	88
3	N Pt Lot 5	*	S. & L. Hill	001-09700	0.23	50	50	-	100	11	111
3	N Pt Lot 5	*	L. Hill	001-09705	0.21	50	20	-	70	5	75
3	N Pt Lot 5		1665328 Ontario Ltd	001-09800	41.27	50	3,530	-	3,580	878	4,458
3	N Pt Lot 4		P. Wardlaw	001-09900	64.33	50	3,480	-	3,530	1,428	4,958
3	N Pt Lot 4	*	G. Dougherty & J. Shortt	001-09901	0.41	50	20	-	70	10	80
3	N Pt Lot 3		M., M., P. & M. Klymiuk	001-10000	42.89	50	2,540	-	2,590	1,042	3,632
3	N Pt Lot 2	*	8325235 Canada Inc	001-10100	42.16	50	2,500	-	2,550	1,024	3,574
3	N Pt Lot 1		P. Wardlaw	001-10200	21.52	50	1,280	-	1,330	523	1,853
4	S Pt Lot 1	*	1553037 Ontario Ltd	001-10500	3.56	50	210	-	260	86	346
4	S Pt Lot 1	*	N. Voutt	001-10600	1.74	50	100	-	150	42	192
4	S Pt Lot 1		G. & C. Van Horne	001-10700	3.18	50	190	-	240	77	317
4	S Pt Lot 1		L. & M. Camacho	001-10800	1.91	50	110	-	160	46	206
4	S Pt Lot 1		P. Spring	001-10900	9.76	50	510	-	560	207	767
4	S Pt Lot 1		A. Guido	001-11000	9.76	50	430	-	480	177	657
4	S Pt Lot 2		M. & J. Spataro & J. Pontieri	001-11100	9.98	50	540	-	590	221	811
4	S Pt Lot 2		4090 4th Line Inc	001-11200	29.61	50	1,760	-	1,810	719	2,529
4	S Pt Lot 2	*	D. Congiusti	001-11400	0.40	50	20	-	70	10	80
4	Pt Lot 3	*	E. Kippers & G. Merrall	001-11600	1.75	50	100	-	150	43	193
4	Pt Lot 3		4090 4th Line Inc	001-11700	74.01	50	4,190	-	4,240	1,717	5,957
4	S Pt Lot 4		D. & B. Marling	001-11900	39.65	50	2,260	-	2,310	925	3,235
4	S Pt Lot 5	*	A. & A. Persico	001-12000	40.15	50	3,360	-	3,410	952	4,362

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
4	S Pt Lot 6		1665328 Ontario Ltd	001-12100	35.95	50	3,910	-	3,960	873	4,833
4	S Pt Lot 6	*	J. Metcalfe	001-12300	0.77	50	80	-	130	19	149
4	Pt Lot 6	*	Ministry Of Transportation	001-12400	35.54	50	5,080	-	5,130	1,135	6,265
4	Pt Lot 6	*	Town of Innisfil	001-12402	0.09	50	10	-	60	2	62
4	N Pt Lot 5		S. & S. Jones	001-12500	39.11	50	3,630	-	3,680	830	4,510
4	N Pt Lot 5	*	W. & L. Jones	001-12501	0.65	50	70	-	120	16	136
4	N Pt Lot 4		1402802 Ontario Inc & 2462228 Ontario Ltd	001-12600	38.76	50	2,900	-	2,950	911	3,861
4	N Pt Lot 2		4090 4th Line Inc	001-13000	30.03	50	1,780	-	1,830	730	2,560
4	N Pt Lot 2	*	R. Laforge	001-13100	0.19	50	20	-	70	9	79
4	N Pt Lot 2	*	W. Laforge	001-13200	0.39	50	20	-	70	9	79
4	N Pt Lot 1		J. & J. McCague	001-13300	10.31	50	530	-	580	217	797
5	Pt Lots 3 & 4		1715573 Ontario Ltd	001-14600	2.26	50	270	-	320	48	368
5	S Pt Lot 5		1715573 Ontario Ltd	001-14800	16.76	50	2,280	-	2,330	401	2,731
5	Pt S1/2 Lot 5	*	G. & L. Kenyon & M. & K. Slessor	001-14802	0.18	50	40	-	90	9	99
5	S Pt Lot 6		S. & J. Pearson & E. McLachlin	001-14900	11.53	50	1,220	-	1,270	273	1,543
5	S Pt Lot 6		1715573 Ontario Inc. Trustee	001-15000	50.11	50	11,610	-	11,660	1,132	12,792
5	N Pt Lot 6	*	D. Swain & K. Archibald	001-15100	0.41	50	120	-	170	10	180
5	N Pt Lot 5	*	R. & S. Eyers	001-15300	0.54	50	160	-	210	13	223
5	N Pt Lot 5		1715573 Ontario Ltd	001-15500	57.75	50	14,190	-	14,240	1,179	15,419
1	S Pt Lot 7	*	Aqua-Gem Investments Ltd	001-16600	24.00	21,300	1,000	-	22,300	520	22,820
1	S Pt Lot 7	*	1045901 Ontario Ltd	001-16700	0.92	2,810	130	-	2,940	67	3,007
1	S Pt Lot 8	*	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	001-16900	41.53	18,780	1,430	-	20,210	593	20,803
1	Pt Lot 9		G., M. & W. Kemeny	001-17000	23.78	13,230	1,330	-	14,560	385	14,945
1	Pt Lot 9		G. Kemeny	001-17200	11.66	11,710	990	-	12,700	283	12,983
1	S Pt Lot 9		1409563 Ontario Ltd	001-17300	23.96	23,820	2,090	-	25,910	578	26,488
1	S Pt Lot 9	*	J. Yonge & R. Lee	001-17400	6.70	6,750	570	-	7,320	163	7,483
1	S Pt Lot 10	*	S. Rudnisky	001-17500	5.48	4,140	350	-	4,490	99	4,589
1	S Pt Lot 10		C. & S. Toich	001-17600	5.90	2,930	240	-	3,170	70	3,240
1	S Pt Lot 10	*	L. & C. Fabiano	001-17700	5.11	3,300	270	-	3,570	79	3,649
1	S Pt Lot 10		M. Toich	001-17800	6.88	6,930	580	-	7,510	167	7,677
1	S Pt Lot 10	*	Y. Mark Est.	001-17900	4.83	1,300	210	-	1,510	61	1,571
1	S Pt Lot 10	*	Y. Mark Est. & M. Maehara Est.	001-18000	4.15	950	250	-	1,200	73	1,273
1	Pt Lots 10 & 11	*	M. Riley	001-18100	9.21	50	560	-	610	160	770
1	Pt Lot 10		2204277 Ontario Ltd	001-18300	11.50	11,550	1,080	-	12,630	279	12,909
1	Pt Lot 10		L & L Gardens Inc	001-18350	1.48	1,530	140	-	1,670	36	1,706
1	Pt Lot 10		Marques Gardens Ltd	001-18400	12.13	12,180	1,120	-	13,300	295	13,595
1	N Pt Lot 10		L. Radvanyi	001-18500	11.93	11,980	1,110	-	13,090	290	13,380
1	N Pt Lot 10	*	S. Rudnisky	001-18600	2.02	800	70	-	870	18	888
1	N Pt Lot 10	*	F. & M. Santos	001-18700	2.00	900	80	-	980	21	1,001
1	N Pt Lot 9		Horodynsky Farms Inc	001-18800	4.87	4,920	450	-	5,370	118	5,488
1	N Pt Lot 9		M. Kemeny	001-19000	12.26	3,020	470	-	3,490	130	3,620
1	N Pt Lot 8		J. Walewski & D. Kopec	001-19100	20.22	4,350	770	-	5,120	205	5,325
1	N Pt Lot 8	*	1523566 Ontario Ltd	001-19200	20.32	79,760	1,770	-	81,530	494	82,024
1	N Pt Lot 7	*	Succession Financial Group Inc	001-19400	34.15	112,360	2,110	-	114,470	830	115,300
2	S Pt Lot 7		J. Armstrong	001-19500	35.12	50	1,970	-	2,020	714	2,734
2	S Pt Lot 7	*	T. Armstrong	001-19510	0.61	50	40	-	90	15	105
2	S Pt Lot 8		S. Handy	001-19600	10.34	50	1,080	-	1,130	241	1,371
2	S Pt Lot 8	*	P. Chiodo	001-19700	10.53	57,430	990	-	58,420	232	58,652
2	S Pt Lot 8	*	A. & M. Filice	001-19800	21.05	82,570	1,760	-	84,330	373	84,703
2	S Pt Lot 9		Cohn Farms Inc	001-20000	10.03	45,970	1,180	-	47,150	244	47,394
2	S Pt Lot 9		Cohn Farms Inc	001-20100	10.14	43,230	1,270	-	44,500	246	44,746
2	Pt Lot 9	*	M. & G. Bordon	001-20200	1.43	10,230	160	-	10,390	35	10,425
2	Pt Lot 9		Marques Gardens Ltd	001-20300	8.82	43,440	1,230	-	44,670	214	44,884
2	S Pt Lot 9		L. & N. Tasca	001-20400	10.29	78,390	1,380	-	79,770	250	80,020
2	S Pt Lot 10		L. & N. Tasca	001-20500	5.27	49,300	750	-	50,050	128	50,178
2	Pt W1/2 Lot 10		Marques Gardens Ltd	001-20600	15.14	62,920	1,940	-	64,860	326	65,186
2	Pt Lot 10		Marques Gardens Ltd	001-20800	20.65	94,280	2,830	-	97,110	466	97,576
2	N Pt Lot 10		Horodynsky Farms Inc	001-20900	10.23	81,560	2,190	-	83,750	249	83,999
2	Pt Lot 10		1409563 Ontario Ltd	001-21000	10.19	10,240	2,070	-	12,310	248	12,558
2	W Pt Lot 10		Horodynsky Farms Inc	001-21100	11.42	11,470	1,990	-	13,460	277	13,737
2	N Pt Lot 10		G. & R. Sciara & P. & L. Digiantomasso	001-21200	8.97	9,020	1,570	-	10,590	218	10,808
2	N Pt Lot 9		B. Horodynsky	001-21400	10.10	10,150	1,760	-	11,910	245	12,155
2	N Pt Lot 9		1409563 Ontario Ltd	001-21500	19.88	19,930	3,470	-	23,400	483	23,883
2	Pt Lot 9	*	J. & S. Cestaric	001-21602	0.34	390	60	-	450	8	458
2	N Pt Lot 9		I. Canton & L. & E. Trevisan	001-21700	10.12	10,170	1,770	-	11,940	246	12,186
2	N Pt Lot 8	*	I. & H. Mora	001-21800	10.23	5,060	870	-	5,930	122	6,052
2	N Pt Lot 8	*	M., H. & S. Fernandes	001-21900	5.11	2,310	790	-	3,100	110	3,210
2	N Pt Lot 8	*	C. & C. Zylstra	001-22000	4.99	550	440	-	990	61	1,051
2	N Pt Lot 8	*	Elbertain Corporation	001-22100	21.13	50	2,560	-	2,610	483	3,093
2	Pt Lot 7	*	B. Jolie	001-22300	0.24	50	50	-	100	12	112
2	N Pt Lot 7	*	J. & D. Lacroix	001-22400	0.24	50	40	-	90	9	99
2	N Pt Lot 7	*	Gmb Property Holding Company Ltd	001-22600	35.35	50	2,800	-	2,850	678	3,528
3	S Pt Lot 7		1665328 Ontario Ltd	001-22900	35.70	50	4,840	-	4,890	784	5,674
3	S Pt Lot 8	*	J. Petropoulos	001-23000	0.79	50	140	-	190	13	203
3	W Pt Lot 8	*	D. Oshell & D. McLachlan	001-23001	0.37	50	80	-	130	7	137
3	S Pt Lot 8	*	G. Dermott	001-23200	0.18	50	70	-	120	7	127
3	Pt Lot 9	*	A. & J. Mormile	001-23400	20.52	50	5,490	-	5,540	479	6,019
3	Pt Lot 9		M. Assadian & L. Desroche	001-23500	22.67	50	6,020	-	6,070	521	6,591
3	Pt Lot 9		1409563 Ontario Ltd	001-23600	20.18	1,900	5,390	-	7,290	449	7,739
3	S Pt Lot 10	*	K. Levy	001-23700	4.05	2,800	730	-	3,530	67	3,597
3	Pt Lot 10		A. Fox & B. Scott	001-23800	4.42	5,240	1,190	-	6,430	107	6,537
3	S Pt Lot 10	*	J. Phaneuf & C. Aguiar	001-23900	6.05	2,580	590	-	3,170	53	3,223
3	S Pt Lot 10	*	Y. Cil	001-24100	6.03	1,840	600	-	2,440	51	2,491
3	Pt Lot 10		J. Chow	001-24200	54.13	11,660	17,290	-	28,950	1,286	30,236
3	N Pt Lot 10	*	H. & A. Perkins	001-24300	1.21	50	370	-	420	26	446
3	Pt Lot 10	*	H. Squibb	001-24301	8.40	50	2,700	-	2,750	189	2,939
3	N Pt Lot 9		J. & P. Wilson	001-24400	10.64	50	2,920	-	2,970	204	3,174
3	N Pt Lot 9	*	C. & M. Cialone	001-24500	10.02	50	2,890	-	2,940	202	3,142
3	Pt Lot 8		P. & C. Woods	001-24600	10.05	50	3,500	-	3,550	244	3,794
3	Pt Lot 8		1665328 Ontario Ltd	001-24800	31.73	50	7,980	-	8,030	668	8,698
3	Pt Lot 8	*	G. & M. Reynolds	001-24801	1.00	50	340	-	390	24	414
3	Pt Lot 8	*	B. & V. Cestaric	001-24810	0.29	50	80	-	130	7	137
3	W Pt Lot 8		1665328 Ontario Ltd	001-24900	41.57	50	8,590	-	8,640	936	9,576
3	N Pt Lot 7		J. & M. Albanese	001-25000	21.40	50	3,610	-	3,660	464	4,124
3	N Pt Lot 7		M. & U. Mauti	001-25100	15.69	50	1,640	-	1,690	366	2,056

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal
TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
4	S Pt Lot 7		Gdm Terraco Inc	001-25400	12.11	50	1,670	-	1,720	294	2,014
4	S Pt Lot 7		Franline Investments Ltd	001-25500	12.77	50	3,250	-	3,300	310	3,610
4	S Pt Lot 7		F. & N. Grillo	001-25600	10.11	50	3,440	-	3,490	241	3,731
4	Pt Lots 8 & 9		V. & D. Posius	001-25800	59.20	50	19,350	-	19,400	1,352	20,752
4	Pt Lot 8	*	S. Khan	001-25801	0.23	50	80	-	130	6	136
4	S Pt Lot 9		Sil Developments Inc, R. Zaretsky & S. Soudack	001-25900	19.33	50	7,450	-	7,500	470	7,970
4	S Pt Lot 9	*	J. & D. Thew	001-25910	0.40	50	150	-	200	10	210
4	S Pt Lot 10	*	P. Pillitteri	001-26000	38.95	370	14,800	-	15,170	946	16,116
4	N Pt Lot 10	*	P. Pillitteri	001-26100	38.83	50	11,030	-	11,080	929	12,009
4	N Pt Lot 10	*	D. Jonkman	001-26110	0.24	50	70	-	120	6	126
4	N Pt Lot 9		D. Lucas	001-26200	39.03	50	12,520	-	12,570	897	13,467
4	N Pt Lot 9	*	K. Jayaseelan & M. Thayalan	001-26201	0.18	50	90	-	140	8	148
4	N Pt Lot 8		Franline Investments Ltd	001-26300	39.69	50	11,860	-	11,910	909	12,819
4	N Pt Lot 7		1665328 Ontario Ltd	001-26400	37.42	50	7,780	-	7,830	890	8,720
5	S Pt Lot 7		H. & C. Van Der Mast	001-26700	41.32	50	10,110	-	10,160	916	11,076
5	S Pt Lot 8	*	G. & N. Bray	001-26900	20.18	50	3,370	-	3,420	279	3,699
5	S Pt Lot 9		V. Trombley	001-27000	30.32	50	7,810	-	7,860	648	8,508
5	S Pt Lot 10		G. Taylor & I. Wagner	001-27100	10.14	50	2,450	-	2,500	203	2,703
5	S Pt Lot 10		G., F., M., & A. Troiano	001-27200	10.15	50	2,450	-	2,500	204	2,704
5	S Pt Lot 10		1409563 Ontario Ltd	001-27300	20.40	50	5,700	-	5,750	473	6,223
5	N Pt Lot 10		G. & S. Sawyer	001-27400	41.86	50	11,940	-	11,990	992	12,982
5	N Pt Lot 9	*	G. Lecce Holdings (1994) Inc & D. B. Lecce Holdings	001-27500	41.76	50	11,850	-	11,900	984	12,884
5	N Pt Lot 9	*	J. Farris	001-27600	0.14	50	80	-	130	7	137
5	N Pt Lot 8		M. Vandermast	001-27700	74.24	50	20,850	-	20,900	1,732	22,632
5	N Pt Lot 7		1720121 Ontario Ltd	001-27900	40.58	50	8,220	-	8,270	682	8,952
1	Pt Lots 10 & 11	*	S. Malik & B. Awan	002-00100	4.78	50	280	-	330	81	411
1	S Pt Lot 11	*	S. Elfassy	002-00200	8.67	50	350	-	400	102	502
1	Pt Lot 11	*	R. & M. Burrows	002-00300	5.85	50	230	-	280	72	352
1	Pt Lot 11	*	P., D., J., & M. Kosinec	002-00400	5.69	50	240	-	290	69	359
1	S Pt Lot 11		G. & C. Zielke	002-00500	17.06	50	840	-	890	271	1,161
1	S Pt Lot 11	*	K. & M. Zielke	002-00700	0.41	50	20	-	70	10	80
1	S Pt Lot 12	*	E. Matchett	002-00800	0.19	50	20	-	70	9	79
1	S Pt Lot 12	*	E. Matchett	002-00900	0.16	50	10	-	60	8	68
1	S Pt Lot 12		K. & J. Matchett	002-01100	42.40	50	2,990	-	3,040	918	3,958
1	S Pt Lot 13		J. & S. Kell	002-01200	43.01	50	3,850	-	3,900	1,013	4,913
1	S Pt Lot 13	*	S. & S. Iemsisanith	002-01300	0.22	50	40	-	90	11	101
1	S Pt Lot 14	*	R. & D. Long	002-01500	0.19	50	40	-	90	9	99
1	S Pt Lot 14		D. Rose & B. Kell-Rose	002-01600	21.15	50	2,060	-	2,110	514	2,624
1	S Pt Lot 15		K. & H. Kell	002-01800	1.52	50	150	-	200	37	237
1	S Pt Lot 15	*	B. Kell-Rose & D. Rose	002-01801	0.24	50	50	-	100	12	112
1	N Pt Lot 17		J. Drybrough	002-04700	8.14	50	3,120	-	3,170	198	3,368
1	N Pt Lot 16	*	Clements Cemetary	002-04900	0.20	50	150	-	200	10	210
1	N Pt Lot 16		Kell Farms Ltd	002-05200	14.35	50	5,500	-	5,550	349	5,899
1	N Pt Lot 15		Kell Farms Ltd	002-05400	34.16	50	6,640	-	6,690	731	7,421
1	Pt Lot 14		Kell Farms Ltd	002-05600	40.71	50	3,890	-	3,940	972	4,912
1	N Pt Lot 13		D. Sawyer	002-05800	64.57	50	5,770	-	5,820	1,443	7,263
1	N Pt Lot 12		D., B. & W. Sawyer	002-05900	42.23	50	2,410	-	2,460	603	3,063
1	N Pt Lot 11		L. & N. Tasca	002-06000	22.14	22,150	2,140	-	24,290	537	24,827
1	N Pt Lot 11		L & L Gardens Inc	002-06300	19.93	19,980	1,890	-	21,870	484	22,354
2	S Pt Lot 11		Horodynsky Farms Inc	002-06400	20.17	18,240	4,050	-	22,290	490	22,780
2	Pt Lots 11 & 12		1409563 Ontario Ltd	002-06600	40.60	6,340	8,150	-	14,490	986	15,476
2	S Pt Lot 12	*	M. Galloro	002-06700	10.35	50	450	-	500	63	563
2	S Pt Lot 12	*	F. Galloro	002-06800	5.04	50	380	-	430	79	509
2	S Pt Lot 12	*	M. Tesic	002-06900	5.03	50	290	-	340	53	393
2	S Pt Lot 13	*	F. Gammicchia	002-07000	10.11	50	540	-	590	86	676
2	S Pt Lot 13	*	B. Watman	002-07100	4.89	50	370	-	420	61	481
2	S Pt Lot 13	*	R. & B. Badstober	002-07200	4.94	50	460	-	510	76	586
2	S Pt Lot 13		K. Kell	002-07400	20.16	50	2,120	-	2,170	362	2,532
2	Lot 14		Innis Properties Ltd	002-07600	81.22	320	16,570	-	16,890	1,796	18,686
2	S Pt Lot15		E. Rosenberg	002-07700	24.70	50	8,650	-	8,700	589	9,289
2	S Pt Lot 15	*	1916013 Ontario Inc	002-07800	15.18	50	5,820	-	5,870	369	6,239
2	S Pt Lot 15	*	G. Kalcic & L. Esau	002-08000	0.29	50	230	-	280	14	294
2	S Pt Lot 16	*	K. & L. Sparrow	002-08200	0.62	50	230	-	280	15	295
2	S Pt Lot 16	*	A. Giaconelli & H. Luzius	002-08300	0.63	50	240	-	290	15	305
2	S Pt Lot 16		R. Simpson	002-08500	38.24	50	13,780	-	13,830	873	14,703
2	Pt Lot 16	*	L. Rumble	002-08520	0.23	50	180	-	230	11	241
2	S Pt Lot 17		N. & G. Sturgeon	002-08700	9.74	50	1,180	-	1,230	75	1,305
2	Pt Lot 17 & N Pt Lot 18		Kell Farms Ltd	002-10000	44.28	50	16,220	-	16,270	1,028	17,298
2	Pt Lot 16	*	I. & M. Campbell	002-10200	0.19	50	70	-	120	5	125
2	N Pt Lot 16		I. & M. Campbell	002-10400	33.85	50	12,780	-	12,830	810	13,640
2	N Pt Lot 16	*	D. Cuneen	002-10500	0.26	50	200	-	250	13	263
2	N Pt Lot 16	*	B. & R. Zendelek	002-10600	6.06	50	1,870	-	1,920	119	2,039
2	N Pt Lot 15		G. & M. Thompson	002-10900	19.65	50	6,590	-	6,640	418	7,058
2	Pt Lot 15	*	K. Kent	002-10901	0.34	50	130	-	180	8	188
2	N Pt Lot 15	*	A. & P. Budd	002-11000	0.22	50	170	-	220	11	231
2	Pt Lot 15	*	Ministry Of Transportation	002-11100	0.11	50	50	-	100	3	103
2	N Pt Lot 15		I. Campbell	002-11300	19.55	50	7,340	-	7,390	466	7,856
2	N Pt Lot 13	*	D. Evers	002-11600	6.05	720	1,320	-	2,040	90	2,130
2	N Pt Lot 13	*	T. Risi	002-11700	4.06	480	970	-	1,450	69	1,519
2	N Pt Lot 13	*	T., Q. & M. Palmieri	002-11800	7.03	800	1,360	-	2,160	104	2,264
2	N Pt Lot 13	*	O. & R. Goncalves	002-11900	8.30	920	1,130	-	2,050	87	2,137
2	N Pt Lot 13	*	K. Yamamoto	002-12000	15.46	1,670	1,910	-	3,580	153	3,733
2	N Pt Lot 12	*	D. & I. Chouryguine	002-12100	5.98	700	520	-	1,220	45	1,265
2	N Pt Lot 12	*	S. Sharma	002-12200	4.00	490	550	-	1,040	46	1,086
2	N Pt Lot 12		J. Horodynsky	002-12300	4.00	470	1,030	-	1,500	97	1,597
2	N Pt Lot 12		1281597 Ontario Inc	002-12400	5.96	680	1,510	-	2,190	145	2,335
2	N Pt Lot 12		Horodynsky Farms Inc	002-12500	10.04	6,250	2,460	-	8,710	244	8,954
2	N Pt Lot 12		P. & K. Horodynsky	002-12600	9.97	11,080	2,340	-	13,420	242	13,662
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12700	10.30	11,410	2,340	-	13,750	250	14,000
2	N Pt Lot 11		K. Yamamoto & S. Yamamoto Est.	002-12800	10.00	11,110	2,210	-	13,320	243	13,563
2	N Pt Lot 11		1281597 Ontario Inc	002-12900	20.34	39,360	4,330	-	43,690	510	44,200
3	S Pt Lot 11	*	S. Scholten & D. Ransom	002-13300	3.89	9,730	950	-	10,680	95	10,775
3	S Pt Lot 11	*	N. & M. Makrigiorgos	002-13400	4.07	9,660	990	-	10,650	99	10,749
3	S Pt Lot 11	*	K. Costain & D. Goodwin	002-13500	4.07	10,290	980	-	11,270	99	11,369
3	S Pt Lot 11	*	E. Carbone	002-13600	4.07	12,190	970	-	13,160	99	13,259

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
3	S Pt Lot 11	*	L. Martinovski & P. & D. Efstathiadis	002-13700	4.07	14,780	960	-	15,740	99	15,839
3	S Pt Lot 11	*	H. & M. Yoon	002-13800	5.43	570	1,250	-	1,820	126	1,946
3	S Pt Lot 11		1409563 Ontario Ltd	002-13900	5.43	50	1,160	-	1,210	117	1,327
3	S Pt Lot 11		1281597 Ontario Inc	002-14000	10.76	50	1,970	-	2,020	195	2,215
3	Pt Lot 12		J. & E. Horodynsky	002-14100	37.82	50	11,140	-	11,190	1,121	12,311
3	S Pt Lot 12	*	T. & C. Xenophontos	002-14300	4.01	580	730	-	1,310	57	1,367
3	S Pt Lot 13		H. & K. Yamamoto & S. Yamamoto Est.	002-14400	41.39	2,170	12,570	-	14,740	823	15,563
3	S Pt Lot 14		L. & E. Kell	002-14500	41.57	50	16,800	-	16,850	980	17,830
3	S Pt Lot 15		M. Campbell	002-14600	20.77	50	6,840	-	6,890	399	7,289
3	S Pt Lot 15	*	Alpine Peaks (Churchill) Development	002-14700	20.11	50	7,540	-	7,590	448	8,038
3	S Pt Lot 16		C. Campbell & S. Todd	002-15000	40.18	50	15,450	-	15,500	931	16,431
3	S Pt Lot 16	*	M. Ledlie & V. Kerr	002-15200	0.28	50	150	-	200	7	207
3	S Pt Lot 17		J. Kell	002-15300	10.48	50	3,870	-	3,920	235	4,155
3	S Pt Lot 17		D. Kell	002-15400	9.35	50	3,680	-	3,730	221	3,951
3	S Pt Lot 17		J. Kell	002-15500	0.84	50	330	-	380	20	400
3	N Pt Lot 17		Kell Farms Ltd	002-20000	16.52	50	6,580	-	6,630	383	7,013
3	N Pt Lots 1		Top Hill View Estates Inc	002-20200	53.70	50	16,200	-	16,250	1,164	17,414
3	Plan 51M604	*	First View Homes (Scarborough)	002-20204	0.18	50	100	-	150	9	159
3	Plan 51M604	*	First View Homes (Scarborough)	002-20208	0.18	50	100	-	150	9	159
3	Plan 51M604	*	First View Homes (Scarborough)	002-20212	0.18	50	100	-	150	9	159
3	Plan 51M604	*	First View Homes (Scarborough)	002-20216	0.18	50	100	-	150	9	159
3	Plan 51M604	*	First View Homes (Scarborough)	002-20220	0.18	50	100	-	150	9	159
3	Plan 51M604	*	First View Homes (Scarborough)	002-20224	0.19	50	100	-	150	9	159
3	Plan 51M604	*	First View Homes (Scarborough)	002-20228	0.20	50	110	-	160	10	170
3	Plan 51M604	*	First View Homes (Scarborough)	002-20229	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20230	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20233	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20234	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20237	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20238	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20241	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20242	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20243	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20246	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20247	0.16	50	90	-	140	8	148
3	Plan 51M604	*	D. & T. Garofalo	002-20250	0.16	50	90	-	140	8	148
3	Plan 51M604	*	First View Homes (Scarborough)	002-20251	0.15	50	120	-	170	7	177
3	N Pt Lot 13		Crestrail Investments Inc	002-20300	40.82	50	11,450	-	11,500	983	12,483
3	N Pt Lot 13	*	Town of Innisfil	002-20320	0.50	50	130	-	180	12	192
3	N Pt Lot 12		S. & O. Pylypiak	002-20400	20.69	50	4,760	-	4,810	451	5,261
3	N Pt Lot 12		C. Wolfond	002-20500	20.67	50	4,290	-	4,340	398	4,738
3	N Pt Lot 11		9847723 Canada Corporation	002-20600	41.96	59,310	9,330	-	68,640	890	69,530
4	S Pt Lot 11		Kell Farms Ltd	002-20700	19.76	24,620	5,740	-	30,360	480	30,840
4	Pt S1/2 Lot 11	*	G., A. & P. Tuzi & M. Tersigni	002-20900	2.19	50	840	-	890	53	943
4	Pt S1/2 Lot 11		A. Tuzi	002-20902	2.18	50	840	-	890	53	943
4	Pt S1/2 Lot 11		A. Gargaro	002-20904	2.18	50	840	-	890	53	943
4	Pt S1/2 Lot 11		G. Tuzi	002-20906	2.17	50	770	-	820	53	873
4	Pt S1/2 Lot 11	*	K. Collins & L. Marjadsingh	002-20908	2.18	50	570	-	620	53	673
4	Pt S1/2 Lot 11	*	D. & K. Gray	002-20910	2.18	17,470	570	-	18,040	53	18,093
4	Pt S1/2 Lot 11	*	M. & M. Alves	002-20912	2.18	13,150	580	-	13,730	53	13,783
4	Pt S1/2 Lot 11	*	J. & G. Rodrigues	002-20914	2.18	1,280	590	-	1,870	53	1,923
4	Pt S1/2 Lot 11	*	J. & E. Fernandes	002-20916	2.20	1,280	600	-	1,880	53	1,933
4	Pt S1/2 Lot 12		M. & L. Valente	002-20918	4.08	9,030	1,130	-	10,160	99	10,259
4	Pt S1/2 Lot 12		Innisfil Churchill Investment	002-20920	4.08	1,700	1,130	-	2,830	99	2,929
4	Pt S1/2 Lot 12		A. Tuzi	002-20922	4.08	1,120	1,140	-	2,260	99	2,359
4	Pt S1/2 Lot 12		E. De Santis	002-20924	4.08	50	1,110	-	1,160	99	1,259
4	Pt S1/2 Lot 12		G. Tuzi	002-20926	4.08	50	1,110	-	1,160	99	1,259
4	Pt S1/2 Lot 12		M. Tersigni	002-20928	4.08	50	1,110	-	1,160	99	1,259
4	Pt Lot 12		A. Kerkhof & C. Davidson	002-20930	10.62	50	2,830	-	2,880	256	3,136
4	Pt S1/2 Lot 12		Innisfil Churchill Investment	002-20932	3.97	50	1,020	-	1,070	93	1,163
4	Pt Lot 13		2177217 Ontario Ltd	002-21000	40.24	50	10,580	-	10,630	963	11,593
4	S Pt Lot 14		2177217 Ontario Ltd	002-21100	40.10	50	10,490	-	10,540	955	11,495
4	S Pt Lot 14	*	J. Jambor	002-21300	0.55	50	290	-	340	27	367
4	S Pt Lot 14	*	D. & S. Mann	002-21400	0.55	50	290	-	340	27	367
4	N Pt Lot 17		S. Kell	002-24000	8.22	50	2,190	-	2,240	200	2,440
4	N Pt Lot 16	*	Simcoe County District School Board	002-24200	3.72	50	770	-	820	70	890
4	N Pt Lot 16	*	G. Hill	002-24300	0.38	50	100	-	150	9	159
4	N Pt Lot 16		Barnstable Park Realty Corp	002-24400	23.10	50	5,590	-	5,640	509	6,149
4	N Pt Lot 16	*	M. Shamshiri	002-24700	0.43	50	110	-	160	10	170
4	N Pt Lot 16	*	A. Dunn & D. Ruegg	002-24800	0.15	50	80	-	130	7	137
4	N Pt Lot 16	*	K. & T. Austin	002-24801	0.75	50	200	-	250	18	268
4	N Pt Lot 16	*	C. Pokulok & R. Hannah	002-24802	0.74	50	200	-	250	18	268
4	N Pt Lot 16	*	M. Demarco	002-25000	13.18	50	3,620	-	3,670	281	3,951
4	N Pt Lot 15	*	A. Smith & C. Ford	002-25200	2.39	50	550	-	600	50	650
4	N Pt Lot 15	*	L. Gialedakis	002-25210	2.21	50	1,720	-	1,770	157	1,927
4	N Pt Lot 15	*	2765870 Canada Inc	002-25300	0.18	50	100	-	150	9	159
4	N Pt Lot 15	*	E. & M. Van Den Elzen	002-25500	0.28	50	70	-	120	7	127
4	Pt Lot 15		1636574 Ontario Inc	002-25700	35.31	50	8,810	-	8,860	802	9,662
4	N Pt Lot 15	*	J. & R. Moody	002-25800	0.22	50	120	-	170	11	181
4	N Pt Lot 14		G. & C. Favret	002-26000	40.53	50	9,930	-	9,980	891	10,871
4	Pt Lot 14	*	R. & M. Johnson	002-26001	0.42	50	120	-	170	10	180
4	N Pt Lot 13		1665328 Ontario Ltd	002-26100	40.78	50	10,900	-	10,950	958	11,908
4	N Pt Lot 12		1665328 Ontario Ltd	002-26300	39.11	71,033	8,890	-	79,923	758	80,681
4	N Pt Lot 11	*	1665328 Ontario Ltd	002-26400	38.69	50	8,280	-	8,330	726	9,056
5	S Pt Lot 11	*	L. Kuhn & J. Hettmann	002-26700	7.80	50	1,880	-	1,930	156	2,086
5	S Pt Lot 11	*	B. Graham	002-26725	0.82	50	240	-	290	20	310
5	S Pt Lot 11	*	M. Li & H. Zhang	002-26800	8.62	50	1,070	-	1,120	89	1,209
5	S Pt Lot 11		T. & V. Van Kuik	002-26900	5.83	50	1,710	-	1,760	142	1,902
5	S Pt Lot 11	*	D. & L. Street	002-27000	5.13	50	1,280	-	1,330	106	1,436
5	S Pt Lot 11	*	T. & J. Treloar	002-27100	4.05	50	780	-	830	65	895
5	S Pt Lot 11	*	D. & K. Adams	002-27200	4.36	50	630	-	680	53	733
5	S Pt Lot 11	*	L. Smith	002-27300	4.12	50	490	-	540	41	581
5	S Pt Lot 12	*	S. Wasylyk	002-27500	9.93	50	970	-	1,020	80	1,100
5	S Pt Lot 12	*	N. Nguyen	002-27600	5.41	50	490	-	540	41	581

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
5	S Pt Lot 12	*	C. Rainford & B. Hitchen	002-27700	5.42	50	550	-	600	46	646
5	Pt Lot 13		2462228 Ontario Ltd	002-27900	39.05	50	8,250	-	8,300	685	8,985
5	Pt Lot 13	*	C. & R. Kniazeff	002-27910	0.37	50	110	-	160	9	169
5	Pt Lot 14		1665328 Ontario Ltd	002-28000	53.16	50	15,240	-	15,290	1,266	16,556
5	S Pt Lot 15	*	D. Scythes	002-28200	0.04	50	20	-	70	2	72
5	S Pt Lot 15	*	C. Browne	002-28300	0.20	50	110	-	160	10	170
5	S Pt Lot 15	*	G. & O. De Araujo	002-28400	0.13	50	70	-	120	6	126
5	S Pt Lot 15	*	D. & M. Coulter	002-28500	0.14	50	70	-	120	7	127
5	S Pt Lot 15	*	T. Laurin	002-28600	0.21	50	110	-	160	10	170
5	S Pt Lot 15	*	P. & V. Chornenki	002-28700	0.14	50	70	-	120	7	127
5	Pt Lot 15		Kell Farms Ltd	002-29000	77.21	50	21,200	-	21,250	1,770	23,020
5	S Pt Lot 16		882022 Ontario Ltd	002-29100	40.04	50	9,190	-	9,240	791	10,031
5	S Pt Lot 17		K. Tse	002-29200	11.53	50	2,220	-	2,270	198	2,468
5	N Pt Lot 16		1589114 Ontario Ltd	002-31300	4.96	50	1,130	-	1,180	94	1,274
6	N Pt Lot 15	*	Sixth Line Cemetery	002-31500	2.94	50	710	-	760	59	819
5	N Pt Lots 1		1665328 Ontario Ltd	002-31900	69.80	50	18,890	-	18,940	1,569	20,509
5	N Pt Lot 12		2462228 Ontario Ltd	002-32000	61.67	50	16,560	-	16,610	1,375	17,985
5	N Pt Lot 12	*	B. Neeb & L. Smith	002-32001	0.29	50	80	-	130	7	137
5	N Pt Lot 11	*	AFMM Innisfil Ltd	002-32200	41.33	50	11,330	-	11,380	941	12,321
5	Pt Lot 11	*	T. Prosser	002-32201	0.20	50	120	-	170	10	180
3	N Pt Lot 16	*	J. Leblanc	003-00100	0.21	50	170	-	220	10	230
3	N Pt Lot 16	*	G. Ciccone	003-00200	0.13	50	110	-	160	6	166
3	N Pt Lot 16	*	M. Baker	003-00300	0.13	50	110	-	160	6	166
3	N Pt Lot 16	*	United Church	003-00400	0.14	50	120	-	170	7	177
3	N Pt Lot 16		10187526 Canada Corp	003-00500	39.70	50	15,550	-	15,600	907	16,507
3	N Pt Lot 15	*	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	003-00600	3.98	50	1,270	-	1,320	74	1,394
3	N Pt Lot 15	*	Fernbrook Homes (Churchill) Ltd	003-00700	12.23	50	10,190	-	10,240	594	10,834
3	Pt Lot 15	*	B. Doughty	003-00800	0.14	50	120	-	170	7	177
3	N Pt Lot 15	*	A. Dawson	003-00900	0.11	50	90	-	140	5	145
3	Pt Lot 15	*	T. Borscevski & B. Hill	003-01000	0.12	50	110	-	160	6	166
3	Pt Lot 15	*	C. Mount	003-01100	0.38	50	320	-	370	18	388
3	N Pt Lot 15	*	S. Simpson	003-01200	0.38	50	320	-	370	18	388
3	N Pt Lot 15	*	Anglican Church	003-01300	1.02	50	800	-	850	50	900
3	N Pt Lot 15	*	A. & C. Martins	003-01400	0.08	50	70	-	120	4	124
3	Pt Lot 15	*	J. Simpson	003-01500	0.15	50	120	-	170	7	177
3	Pt Lot 15	*	P S K Holdings Inc	003-01510	0.14	50	120	-	170	7	177
3	N Pt Lot 15	*	E. & K. Pivetta	003-01600	0.19	50	100	-	150	9	159
3	N Pt Lot 15	*	T. & S. Alderson	003-01700	0.19	50	160	-	210	9	219
3	N Pt Lot 15	*	J. Smith & C. Gauvin	003-01800	0.14	50	70	-	120	7	127
3	N Pt Lot 15	*	P. Chiavatti	003-01900	0.14	50	70	-	120	7	127
3	N Pt Lot 15	*	C. & A. Cutler	003-02000	0.15	50	80	-	130	7	137
3	Pt NE1/4 Lot 15	*	D. & R. Koekkoek	003-02100	0.32	50	170	-	220	16	236
3	Pt Lot 15	*	D. Wood & R. Bellar	003-02101	0.20	50	160	-	210	10	220
3	N Pt Lot 15	*	A. Fazelipour	003-02200	0.27	50	230	-	280	13	293
3	N Pt Lot 15	*	Town of Innisfil	003-02300	0.23	50	200	-	250	11	261
3	Plan 1194	*	M. & M. Alves	003-02400	0.19	50	160	-	210	9	219
3	Lot 14	*	J. & R. Carvalho	003-02500	0.14	50	120	-	170	7	177
3	Plan 1194	*	T. Cooley & O. Oliveira	003-02600	0.14	50	120	-	170	7	177
3	Lot 12	*	A. & L. Daniels	003-02700	0.14	50	100	-	150	7	157
3	Plan 1194	*	A. & K. Demarco	003-02800	0.28	50	150	-	200	14	214
3	Lot 9	*	R. Wilcox	003-02900	0.15	50	80	-	130	7	137
3	Lot 8	*	B. Cutler & P. Smith	003-03000	0.14	50	70	-	120	7	127
3	Lot 7	*	W. French	003-03100	0.14	50	70	-	120	7	127
3	Lot 6	*	D. Saunders	003-03200	0.14	50	70	-	120	7	127
3	Lot 5	*	N. Mason	003-03300	0.14	50	70	-	120	7	127
3	Lot 4	*	A. & R. West	003-03400	0.14	50	70	-	120	7	127
3	Plan 1194	*	B. & K. Bourget	003-03500	0.14	50	70	-	120	7	127
3	Lot 2	*	S. Simpson	003-03600	0.14	50	70	-	120	7	127
3	Lot 1	*	E. Waite	003-03700	0.17	50	90	-	140	8	148
3	Lot 16	*	A. & J. Asselstine	003-03800	0.20	50	110	-	160	10	170
3	Lot 17	*	M. Brown	003-03900	0.14	50	70	-	120	7	127
3	Lot 18	*	S. & K. Bowen	003-04000	0.14	50	70	-	120	7	127
3	Plan 1194	*	D. & C. Bell	003-04100	0.14	50	70	-	120	7	127
3	Plan 1194	*	K. & A. Wright	003-04200	0.14	50	70	-	120	7	127
3	Lot 21	*	C. Bell	003-04300	0.14	50	90	-	140	7	147
3	Lot 22	*	N. Gundert & R. Grant	003-04400	0.17	50	150	-	200	8	208
4	Plan M319	*	D. Dare	003-04600	0.20	50	110	-	160	10	170
4	Plan M319	*	P.Boer & S. Forsythe	003-04602	0.23	50	120	-	170	11	181
4	Plan M319	*	S. Small & L. Henderson	003-04604	0.27	50	140	-	190	13	203
4	Plan M319	*	M. & A. Dicesare	003-04606	0.24	50	130	-	180	12	192
4	Plan M319	*	R. Flemming	003-04608	0.22	50	120	-	170	11	181
4	Plan M319	*	M. Simpson & S. Roberts	003-04610	0.17	50	90	-	140	8	148
4	Plan M319	*	S. De Beaucamp	003-04614	0.17	50	90	-	140	8	148
4	Plan M319	*	R. & E. Moore	003-04616	0.28	50	150	-	200	14	214
4	Plan M319	*	M. Chabrzynski & S. Henderson	003-04618	0.22	50	120	-	170	11	181
4	Plan M319	*	R. & J. Lenehan	003-04620	0.18	50	100	-	150	9	159
4	Plan M319	*	G. & K. Farr	003-04622	0.21	50	110	-	160	10	170
4	Plan M319	*	N. & J. Stacey	003-04624	0.24	50	130	-	180	12	192
4	Plan M319	*	T. & E. Roomere	003-04626	0.31	50	170	-	220	15	235
4	Plan M319	*	D. & D. Wittick	003-04628	0.19	50	100	-	150	9	159
4	Plan M319	*	J. Philp & P. Murphy	003-04630	0.18	50	100	-	150	9	159
4	Plan M319	*	A. & J. Domenegato	003-04632	0.17	50	90	-	140	8	148
4	Plan M319	*	D. Veitch & R. Hopkins	003-04634	0.18	50	100	-	150	9	159
4	Plan M319	*	P. & L. Demers	003-04636	0.18	50	100	-	150	9	159
4	Plan M319	*	J. Quinn, J. Rabot & M. Quinn-Rabot	003-04638	0.19	50	100	-	150	9	159
4	Plan M319	*	J. & U. Zubrzycka	003-04640	0.20	50	110	-	160	10	170
4	Plan M319	*	T. & L. Moroz	003-04642	0.17	50	90	-	140	8	148
4	Plan M319	*	P. Whissell & H. Lostchuck	003-04644	0.22	50	120	-	170	11	181
4	Plan M319	*	R. & S. Laird	003-04646	0.19	50	100	-	150	9	159
4	Plan M319	*	B. & M. Rutledge	003-04648	0.19	50	100	-	150	9	159
4	Plan M319	*	L. & S. Smith	003-04650	0.18	50	100	-	150	9	159
4	Plan M319	*	W. & D. Mann	003-04652	0.17	50	90	-	140	8	148
4	Plan M319	*	T. & S. Breen	003-04654	0.17	50	90	-	140	8	148
4	Plan M319	*	W. & V. Toole	003-04656	0.20	50	110	-	160	10	170
4	Plan M319	*	R. & D. Sloan	003-04658	0.17	50	90	-	140	8	148

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal
TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
4	Plan M319	*	M. & I. Fruhstuck	003-04660	0.19	50	100	-	150	9	159
4	Plan M319	*	W. & D. Mayerhofer	003-04662	0.18	50	100	-	150	9	159
4	Plan M319	*	Town of Innisfil	003-04664	0.11	50	60	-	110	5	115
4	Plan M319	*	Town of Innisfil	003-04666	0.00	50	-	-	50	-	50
4	Lot 4	*	E. & C. Hawkes	003-04700	0.18	50	100	-	150	9	159
4	Lot 3	*	J. & J. Calvert	003-04800	0.19	50	100	-	150	9	159
4	Plan 1683	*	R. & C. Thew	003-04900	0.18	50	100	-	150	9	159
4	Plan 1683	*	P. & S. Hrynyk	003-05000	0.20	50	110	-	160	10	170
4	Plan 1683	*	R. & T. Kirkwood	003-05100	0.21	50	110	-	160	10	170
4	Plan 1683	*	J. & W. Campbell	003-05200	0.19	50	100	-	150	9	159
4	Lot 31	*	S. & L. Manley	003-05300	0.19	50	100	-	150	9	159
4	Lot 30	*	C. Schreider & A. Teskey	003-05400	0.19	50	100	-	150	9	159
4	Lot 29	*	D. Greenman & E. Stuart	003-05500	0.31	50	170	-	220	15	235
4	Plan 1683	*	G. & D. Adair	003-05600	0.36	50	190	-	240	17	257
4	Plan 1683	*	L. Mendrek	003-05700	0.19	50	100	-	150	9	159
4	Lot 26	*	M. & J. Cristicini	003-05800	0.19	50	100	-	150	9	159
4	Lot 10	*	K. Wisch	003-05900	0.20	50	110	-	160	10	170
4	Plan 1683	*	W. & P. Simpson	003-06000	0.20	50	110	-	160	10	170
4	Lot 8	*	A. & L. Kamrath	003-06100	0.19	50	100	-	150	9	159
4	Plan 1683	*	M. Sallach	003-06200	0.19	50	100	-	150	9	159
4	Plan 1683	*	E. Madden	003-06300	0.20	50	110	-	160	10	170
4	Plan 1683	*	R. & L. Cuggy	003-06400	0.22	50	120	-	170	11	181
4	Plan 1683	*	P. & W. Belgue	003-06500	0.19	50	100	-	150	9	159
4	Plan 1683	*	J. & D. Van Donkelaar	003-06600	0.19	50	100	-	150	9	159
4	Lot 18	*	Town of Innisfil	003-06700	0.19	50	100	-	150	9	159
4	Lot 17	*	G. Roesler	003-06800	0.20	50	110	-	160	10	170
4	Plan 1683	*	A. & S. Gismondi	003-06900	0.20	50	110	-	160	10	170
4	Lot 15	*	L. & J. Columbus	003-07000	0.19	50	100	-	150	9	159
4	Lot 14	*	U. Agarunov	003-07100	0.19	50	100	-	150	9	159
4	Lot 13	*	J. MacEachern	003-07200	0.19	50	100	-	150	9	159
4	Plan 1683	*	W. Vankempen & D. Williamson	003-07300	0.21	50	110	-	160	10	170
4	Lot 11	*	K. & C. Mortelliti	003-07400	0.20	50	110	-	160	10	170
4	Plan 1683	*	K. Russel & J. Johnson	003-07500	0.19	50	100	-	150	9	159
4	Plan 1683	*	Town of Innisfil	003-07600	0.99	50	530	-	580	48	628
4	Lot 24	*	B. & R. Witkowski	003-07700	0.19	50	100	-	150	9	159
4	Lot 23	*	C. Moore	003-07800	0.19	50	100	-	150	9	159
4	Lot 22	*	B. & B. Pearce	003-07900	0.19	50	100	-	150	9	159
4	Lot 21	*	C. & G. Prospero & A. Volpe	003-08000	0.21	50	110	-	160	10	170
4	Plan 1683	*	K. Humphris & N. Upham	003-08100	0.19	50	100	-	150	9	159
4	Lot 19	*	D. & L. MacDonell	003-08200	0.24	50	130	-	180	12	192
4	S Pt Lot 15	*	D. & D. Scott	003-08300	0.25	50	130	-	180	12	192
4	Pt Lot 15	*	J. & A. Calderon	003-08301	0.14	50	70	-	120	7	127
4	S Pt Lot 15	*	Woodsview Property Management	003-08400	0.12	50	60	-	110	6	116
4	S Pt Lot 15	*	A. Azan	003-08500	0.08	50	40	-	90	4	94
4	S Pt Lot 15	*	R. Drennan & M. Schell	003-08600	0.26	50	140	-	190	13	203
4	S Pt Lot 15	*	2367633 Ontario Inc	003-08700	0.26	50	140	-	190	13	203
4	S Pt Lot 15	*	S. Sanderson	003-08800	0.30	50	160	-	210	15	225
4	S Pt Lot 5	*	United Church	003-08900	0.41	50	220	-	270	20	290
4	Plan 162	*	Town of Innisfil	003-09000	0.57	50	300	-	350	28	378
4	Plan 162	*	D. Hogarth	003-09100	0.47	50	250	-	300	23	323
4	S Pt Lot 16	*	Town of Innisfil	003-09200	0.00	50	-	-	50	-	50
4	Pt Lots 5	*	S. Mark	003-09400	0.46	50	250	-	300	22	322
4	Pt Lots 5	*	A. Drugovic & G. Jenkinson	003-09500	0.14	50	70	-	120	7	127
4	Plan 162	*	S. Mikkola & K. Lamonday	003-09600	0.12	50	60	-	110	6	116
4	Plan 162	*	M. MacPhail & T. Nolan	003-09700	0.13	50	70	-	120	6	126
4	N Pt Lot 41	*	R. & P. Sampaio	003-09900	1.16	50	620	-	670	56	726
4	Plan 162	*	B. Deputat & C. Braney	003-10000	0.97	50	690	-	740	47	787
4	Plan 162	*	A. & M. Stepanova	003-10010	0.23	50	200	-	250	11	261
4	Plan 162	*	C. Radulovici	003-10100	1.72	50	1,430	-	1,480	84	1,564
4	Pt Lots 3	*	H. Rahimimoghadam	003-10200	0.40	50	330	-	380	19	399
4	Plan 162	*	M. Slocombe	003-10300	0.60	50	500	-	550	29	579
4	Plan 162	*	S. & R. Thomas	003-10400	0.18	50	150	-	200	9	209
4	Lot 30	*	A. Zlender	003-10500	0.26	50	210	-	260	13	273
4	Plan 162	*	C. & T. Asselstine	003-10600	1.07	50	900	-	950	52	1,002
4	Lot 24	*	B. Hoseman & K. Hoseman	003-10700	0.20	50	160	-	210	10	220
4	Plan 162	*	L. Burke	003-10800	0.17	50	150	-	200	8	208
4	Plan 162	*	S. & L. Gucciardi	003-10900	0.06	50	50	-	100	3	103
4	S Pt Lot 23	*	Renaissance Nouveau Design Inc	003-11000	0.06	50	50	-	100	3	103
4	Pt Lots 1	*	A. & D. Whiteside	003-11100	0.17	50	150	-	200	8	208
4	Plan 162	*	D. Napper	003-11200	0.39	50	320	-	370	19	389
4	Plan 162	*	V. & Z. Iacob	003-11300	0.72	50	600	-	650	35	685
4	S Pt Lot 16		K. & R. Sinclair	003-11400	16.28	50	4,230	-	4,280	247	4,527
4	Pt Lots 6 & 7	*	C. & T. Asselstine	003-11500	0.22	50	180	-	230	11	241
4	Plan 162	*	C. Mark	003-11600	0.13	50	110	-	160	6	166
4	Plan 162	*	R. Schweymaier	003-11700	0.85	50	710	-	760	41	801
4	Pt Lots 2	*	D. & M. Wilson	003-11800	0.15	50	120	-	170	7	177
4	Lot 1	*	C. Chegancas	003-11900	0.15	50	120	-	170	7	177
4	Pt Lot 16	*	D. & L. Fairhead	003-12000	1.03	50	860	-	910	50	960
4	Lot 61	*	F. Minici	003-12100	0.24	50	200	-	250	12	262
4	Plan 162	*	E. & I. Gyorfi	003-12200	0.19	50	160	-	210	9	219
4	Plan 162	*	P. Savard	003-12300	0.17	50	150	-	200	8	208
4	Plan 162	*	D. & M. Bowen	003-12400	0.11	50	90	-	140	5	145
4	Plan 162	*	J. Giannitti & M. Giannitti Est.	003-12500	0.18	50	150	-	200	9	209
4	Plan 162	*	C. Asselstine & M. Marshall	003-12600	0.18	50	150	-	200	9	209
4	Pt Lot 16	*	P. & D. McMillan	003-12700	1.41	50	1,180	-	1,230	69	1,299
4	Pt Lot 16	*	M. Mindle & E. Gulyas	003-12800	0.71	50	590	-	640	35	675
4	Plan M448	*	Town of Innisfil	003-25600	0.18	50	100	-	150	9	159
4	Plan M448	*	J. & C. Ang	003-25602	0.29	50	150	-	200	14	214
4	Plan M448	*	P. & S. Kubas	003-25604	0.22	50	120	-	170	11	181
4	Plan M448	*	S. & T. Smith	003-25606	0.20	50	110	-	160	10	170
4	Plan M448	*	R. & C. Cavaco	003-25608	0.20	50	110	-	160	10	170
4	Plan M448	*	S. & W. Mays	003-25610	0.20	50	110	-	160	10	170
4	Plan M448	*	N. Geddes	003-25612	0.21	50	110	-	160	10	170
4	Plan M448	*	S. & N. Gill	003-25614	0.26	50	140	-	190	13	203
4	Plan M448	*	D. & T. Carlson	003-25616	0.26	50	140	-	190	13	203

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
4	Plan M448	*	S. & T. Chatland	003-25618	0.29	50	150	-	200	14	214
4	Plan M448	*	L. Truong	003-25620	0.30	50	160	-	210	15	225
4	Plan M448	*	Town of Innisfil	003-25622	0.53	50	280	-	330	26	356
4	Plan 51M448	*	J. Stubbs	003-25624	1.96	50	1,050	-	1,100	95	1,195
4	Plan M448	*	J. & C. Fabing	003-25626	0.29	50	150	-	200	14	214
4	Plan M448	*	R. & E. Stukas	003-25628	0.26	50	140	-	190	13	203
4	Plan M448	*	M. Iammatteo	003-25630	0.26	50	140	-	190	13	203
4	Plan M448	*	D. & L. Ficher	003-25632	0.26	50	140	-	190	13	203
4	Plan M448	*	D. & S. Cake	003-25634	0.29	50	150	-	200	14	214
4	Plan M448	*	L. Philipp	003-25636	0.30	50	160	-	210	15	225
4	Plan M448	*	R. & D. Yonge	003-25638	0.32	50	170	-	220	16	236
4	Plan M448	*	A. & N. Bell	003-25640	0.21	50	110	-	160	10	170
4	Plan M448	*	A. Buttrum	003-25642	0.26	50	140	-	190	13	203
4	Plan M448	*	A. & A. Simpson	003-25644	0.22	50	120	-	170	11	181
4	Plan M448	*	C. & J. Van Nispen	003-25646	0.18	50	100	-	150	9	159
4	Plan M448	*	G. Clubine	003-25648	0.18	50	100	-	150	9	159
4	Plan M448	*	C. & C. Kidd	003-25650	0.21	50	110	-	160	10	170
4	Plan M448	*	K. & M. Moores	003-25652	0.24	50	130	-	180	12	192
4	Plan M448	*	F. Guttridge & L. Etherton	003-25654	0.24	50	130	-	180	12	192
4	Plan M448	*	D. & E. Ciccia	003-25656	0.24	50	130	-	180	12	192
4	Plan M448	*	B. & J. Laval	003-25658	0.24	50	130	-	180	12	192
4	Plan M448	*	J. & C. Molenhuis	003-25660	0.24	50	130	-	180	12	192
4	Plan M448	*	C. Damianakis & R. Cooper	003-25662	0.22	50	120	-	170	11	181
4	Plan M448	*	M. & D. Twardowski	003-25664	0.28	50	150	-	200	14	214
4	Plan M448	*	M. & L. Snowball	003-25666	0.20	50	110	-	160	10	170
4	Plan M448	*	R. Mateus	003-25668	0.24	50	130	-	180	12	192
4	Plan M448	*	M. & S. Davenport	003-25670	0.26	50	140	-	190	13	203
4	Plan M448	*	B. & S. Bingley	003-25672	0.24	50	130	-	180	12	192
4	Plan M448	*	S. Jenssen-Brown	003-25674	0.21	50	110	-	160	10	170
4	Plan M448	*	D. Lajoie	003-25676	0.17	50	90	-	140	8	148
4	Plan M448	*	R. & K. Carlin	003-25678	0.18	50	100	-	150	9	159
4	Plan M448	*	E. & B. Rideout	003-25680	0.18	50	100	-	150	9	159
4	Plan M448	*	R. Cressman	003-25682	0.20	50	110	-	160	10	170
4	Plan M448	*	C. & L. Vitale	003-25684	0.22	50	120	-	170	11	181
4	Plan M448	*	E. & F. Arantes	003-25686	0.21	50	110	-	160	10	170
4	Plan M448	*	A. & A. Takacs	003-25688	0.20	50	110	-	160	10	170
4	Plan M448	*	N. & P. Blanchet	003-25690	0.20	50	110	-	160	10	170
4	Plan M448	*	J. & C. Conti	003-25692	0.20	50	110	-	160	10	170
4	Plan M448	*	C. Douglas	003-25694	0.19	50	100	-	150	9	159
4	Plan M448	*	T. & M. Tokarski	003-25696	0.19	50	100	-	150	9	159
4	Plan M448	*	G. Werth	003-25698	0.20	50	110	-	160	10	170
4	Plan M448	*	J. & L. Knox	003-25702	0.21	50	110	-	160	10	170
4	Plan M448	*	M. & M. Goodchild	003-25704	0.21	50	110	-	160	10	170
4	Plan M448	*	G. Gogos	003-25706	0.18	50	100	-	150	9	159
4	Plan M448	*	J. Reindl	003-25708	0.18	50	100	-	150	9	159
4	Plan M448	*	D. & A. Stopyra	003-25710	0.20	50	110	-	160	10	170
4	Plan M448	*	D. & E. Magri	003-25712	0.21	50	110	-	160	10	170
4	Plan M448	*	V. & K. Hamilton	003-25714	0.21	50	110	-	160	10	170
4	Plan M448	*	M. Doyle & S. McInnis	003-25716	0.21	50	110	-	160	10	170
4	Plan M448	*	R. Weeks	003-25718	0.21	50	110	-	160	10	170
4	Plan M448	*	A. & S. Ginzburg	003-25720	0.20	50	110	-	160	10	170
4	Plan M448	*	E. & S. Ernest	003-25722	0.19	50	100	-	150	9	159
4	Plan M448	*	Town of Innisfil	003-25724	0.83	50	440	-	490	40	530
6	S Pt Lot 3		1045990 Ontario Inc	018-00900	8.47	50	2,440	-	2,490	203	2,693
6	S Pt Lot 4		T. & R. Ruch & 10454990 Ontario Inc	018-01300	12.20	50	3,030	-	3,080	252	3,332
6	S Pt Lot 4		J. Robson	018-01400	20.75	50	4,980	-	5,030	414	5,444
6	S Pt Lot 5		M. Vandermast	018-01500	61.32	50	16,150	-	16,200	1,341	17,541
6	S Pt Lot 5	*	W. & B. Baguley	018-01600	0.20	50	90	-	140	7	147
6	S Pt Lot 6		J. & P. Hilverda	018-01800	0.23	50	70	-	120	6	126
6	Pt Lot 6		J. & P. Hilverda	018-01900	21.31	50	4,010	-	4,060	333	4,393
6	Pt Lot 6	*	Town of Innisfil	018-01902	7.24	50	2,120	-	2,170	176	2,346
6	N Pt Lot 6		1665328 Ontario Ltd	018-02000	13.13	50	3,530	-	3,580	294	3,874
6	N Pt Lot 6	*	V. & J. Parravano	018-02010	0.18	50	50	-	100	4	104
6	N Pt Lot 5		1057595 Ontario Ltd	018-02500	20.38	50	5,290	-	5,340	440	5,780
6	N Pt Lot 4	*	D. & J. Rice	018-02600	9.98	50	1,040	-	1,090	86	1,176
6	N Pt Lot 4		L. Peterson	018-02800	31.95	50	7,830	-	7,880	650	8,530
6	N Pt Lot 3		G. & J. McLean	018-02900	38.17	50	11,170	-	11,220	927	12,147
6	N Pt Lot 3		G. McLean	018-02901	0.21	50	60	-	110	5	115
7	N Pt Lots 1		P. Wardlaw	018-03100	0.81	50	230	-	280	19	299
7	S Pt Lot 3		D. & D. Oakley	018-03900	23.56	50	6,270	-	6,320	521	6,841
7	S Pt Lot 3	*	M. & D. Purnell	018-04000	0.21	50	120	-	170	10	180
7	W Pt Lot 4	*	Ben Capelas Landscaping & Snow Removal	018-04100	4.64	50	1,360	-	1,410	113	1,523
7	S Pt Lot 4		M. Haourt & J. See	018-04200	20.02	50	5,770	-	5,820	479	6,299
7	S Pt Lot 5		R. & K. Webb	018-04300	8.56	50	2,480	-	2,530	206	2,736
7	S Pt Lot 5		922952 Ontario Inc	018-04400	8.69	50	2,470	-	2,520	205	2,725
7	Pt Lots 4 & 5		R. Arbour	018-05000	9.37	50	2,450	-	2,500	204	2,704
7	W Pt Lot 4		Rix Farms Ltd	018-05100	15.55	50	2,990	-	3,040	249	3,289
6	Lot 7		751518 Ontario Ltd	020-00100	40.25	50	11,780	-	11,830	978	12,808
6	Pt Lot 7		Town of Innisfil	020-00104	5.40	50	1,580	-	1,630	131	1,761
6	S Pt Lot 10		1536315 Ontario Ltd	020-00400	8.97	50	2,620	-	2,670	218	2,888
6	N Pt Lot 13	*	J. & V. Aquino	021-03800	2.66	50	190	-	240	16	256
6	N Pt Lot 13	*	J. Horodynsky	021-04000	1.65	50	120	-	170	10	180
6	N Pt Lot 12	*	A. & L. Obidin	021-04101	3.49	50	260	-	310	21	331
6	N Pt Lot 11		2154016 Ontario Ltd	021-04200	12.89	50	2,950	-	3,000	245	3,245
6	S Pt Lot 11		C. Hall	021-04300	20.39	50	4,590	-	4,640	381	5,021
6	S Pt Lot 11	*	K. & R. Winter	021-04400	20.49	50	4,870	-	4,920	405	5,325
6	S Pt Lot 12	*	O. & K. Awrey	021-04500	12.47	50	1,190	-	1,240	99	1,339
6	S Pt Lot 12	*	K. Bernt	021-04600	12.46	50	1,730	-	1,780	144	1,924
6	S Pt Lot 12	*	G. & G. Kent	021-04700	16.51	50	2,810	-	2,860	234	3,094
6	S Pt Lot 13	*	A. Zlender	021-04800	19.68	50	1,440	-	1,490	120	1,610
6	S Pt Lot 13	*	M. Slaby	021-04900	19.44	50	1,890	-	1,940	157	2,097
6	S Pt Lot 14		W. Pratt	021-05000	39.45	50	7,140	-	7,190	593	7,783
6	S Pt Lot 15	*	Ministry Of Transportation	021-05100	0.80	50	180	-	230	15	245
6	S Pt Lot 15		J. & E. Cole	021-05200	18.65	50	5,050	-	5,100	419	5,519

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038790**

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
6	S Pt Lot 15	*	D. Huisman	021-05300	0.26	50	80	-	130	6	136
6	Pt Lot 15	*	Sunset International Speedway Inc	021-05400	11.77	50	2,430	-	2,480	202	2,682
6	S Pt Lot 15	*	Sunset International Speedway Inc	021-05500	6.41	50	5,630	-	5,680	467	6,147
6	Plan 1120	*	1625057 Ontario Corporation	021-05600	0.17	50	150	-	200	12	212
6	Pt Lots 14 & 15		2215570 Ontario Inc	021-06100	14.68	50	1,400	-	1,450	116	1,566
6	N Pt Lot 13	*	C. Scenna	021-06101	5.92	50	430	-	480	36	516
6	N Pt Lot 13	*	1281597 Ontario Inc	021-06102	4.86	50	360	-	410	30	440
15	Pt Lot 6	*	Suncor Energy Inc	072-15602	0.40	50	-	-	50	10	60
15	Pt Lot 6	*	Suncor Energy Inc	072-15604	2.31	50	10	-	60	56	116
15	Pt Lot 6	*	J. Bucko	072-15700	0.19	50	-	-	50	14	64
15	Pt Lot 5	*	1833044 Ontario Ltd	072-15900	7.37	1,300	10	-	1,310	120	1,430
15	Pt Lot 6	*	C. & M. Carra	072-15901	5.22	50	10	-	60	66	126
15	Pt Lot 5	*	2537878 Ontario Ltd	072-15902	2.02	50	20	-	70	144	214
15	Pt Lot 5	*	Resquip Inc	072-15903	2.40	50	20	-	70	175	245
15	Pt Lot 6	*	Suncor Energy Inc	072-15905	0.43	50	-	-	50	3	53
15	Pt Lot 6	*	C. & M. Carra	072-15910	0.89	50	10	-	60	65	125
15	W Pt Lot 5	*	ADF Investments Ltd	072-16000	1.28	50	10	-	60	93	153
15	W Pt Lot 4	*	K. & S. Lotton	072-16200	0.23	50	-	-	50	11	61
15	W Pt Lot 4	*	J. Lemoine	072-16300	1.23	50	-	-	50	30	80
15	W Pt Lot 4	*	N. Ahmed & Q. Majoka	072-16301	0.64	50	-	-	50	16	66
15	Pt Lot 4	*	M. & M. Pedneault	072-16302	0.38	50	-	-	50	9	59
15	Pt Lot 4	*	G. & M. Cruz	072-16402	0.81	50	-	-	50	20	70
15	Pt Lot 4	*	C. Kulesza	072-16410	0.49	50	-	-	50	12	62
15	Plan M480	*	M. Colabella & D. Bravo	072-16420	0.64	50	-	-	50	16	66
15	Plan M480	*	Ontario Stockyards Inc	072-16430	4.20	50	40	-	90	306	396
13	N Pt Lot 10	*	W. & T. Chen	073-32500	12.99	50	180	-	230	94	324
13	N Pt Lot 10	*	G. & D. Kruger	073-32600	0.36	50	10	-	60	6	66
13	N Pt Lot 10	*	P. & L. Plavic	073-32610	0.21	50	20	-	70	10	80
13	N Pt Lot 10	*	A. Smith	073-32700	5.56	50	170	-	220	88	308
13	N Pt Lot 10	*	J. & E. Blake	073-32701	0.81	50	30	-	80	16	96
13	N Pt Lot 10	*	D. Decaro	073-32800	7.83	50	220	-	270	112	382
13	N Pt Lot 11		P. & S. Silverthorne	073-32900	10.51	50	450	-	500	234	734
13	N Pt Lot 11	*	A. Martin	073-33000	7.14	50	220	-	270	114	384
13	N Pt Lot 11	*	R. White & D. Miedema	073-33001	1.22	50	40	-	90	23	113
13	N Pt Lot 11	*	S. & L. McGuire	073-33002	0.48	50	20	-	70	9	79
13	N Pt Lot 11	*	M. & D. Ridout	073-33003	0.48	50	20	-	70	9	79
13	N Pt Lot 11	*	A. & C. Galati	073-33010	0.51	50	20	-	70	8	78
13	N Pt Lot 11	*	W. Kapralik & M. Janz Est.	073-33015	0.51	50	10	-	60	8	68
13	Pt Lot 11	*	S. Tustin & T. Ross	073-33100	10.20	50	400	-	450	210	660
13	N Pt Lot 11	*	D. McGeachy	073-33110	0.32	50	10	-	60	8	68
13	N Pt Lot 11	*	Y. Liao & Z. Li	073-33200	7.66	50	310	-	360	160	520
13	N Pt Lot 12	*	S. & H. White	073-33201	0.78	50	20	-	70	12	82
13	N Pt Lot 11	*	A. & P. Clitherow	073-33202	1.53	50	60	-	110	30	140
13	Pt Lot 11	*	J. & R. Carvalhais	073-33203	0.66	50	20	-	70	8	78
13	Pt Lot 11	*	P. & A. Clitherow	073-33204	0.46	50	20	-	70	10	80
13	Pt Lot 12	*	M. Milekic	073-33300	19.87	50	490	-	540	258	798
13	Pt Lot 12	*	M. & O. Milekic	073-33302	1.32	50	30	-	80	18	98
13	N Pt Lot 12	*	R. Vandrie & R. Walsh	073-33320	0.49	50	20	-	70	9	79
13	N Pt Lot 12		F. Semiao	073-33400	17.86	50	520	-	570	269	839
13	N Pt Lot 12	*	R. Sturgeon	073-33401	1.74	50	80	-	130	42	172
13	N Pt Lot 12		Beacon Street Entertainment	073-33500	4.59	50	210	-	260	112	372
13	N 1/2 Lot 13	*	D. & R. Mattingley	073-33501	0.99	50	50	-	100	24	124
13	N Pt Lot 13		Hasbrooke Holdings Ltd	073-33510	15.41	50	690	-	740	358	1,098
14	S Pt Lot 15		W. & C. Procter	073-34400	7.30	50	340	-	390	177	567
14	S Pt Lot 14		P & A Timbers & Sons	073-34901	9.26	50	430	-	480	225	705
14	Pt Lot 14		E. & J. Samios	073-35202	17.31	50	670	-	720	348	1,068
14	S Pt Lot 13		T. Sturgeon	073-35300	42.53	50	1,870	-	1,920	976	2,896
14	S Pt Lot 12		H. Nunes	073-35400	43.25	50	1,610	-	1,660	841	2,501
14	S Pt Lot 11	*	V. & R. Ibrajev	073-35500	20.61	50	640	-	690	336	1,026
14	W Pt Lot 11	*	R. & S. Batsch	073-35600	4.23	50	130	-	180	70	250
14	W Pt Lot 11	*	D. Kennedy Est. & G. Kennedy	073-35601	1.69	50	50	-	100	25	125
14	W Pt Lot 11	*	D. & N. Forget	073-35700	2.55	50	70	-	120	35	155
14	W Pt Lot 11	*	M. & B. Markowitz	073-35800	4.20	50	140	-	190	72	262
14	W Pt Lot 11	*	C. Sun & P. Pov	073-35900	3.62	50	110	-	160	59	219
14	Pt Lot 11	*	A. & D. Cianfarani	073-35901	0.74	50	20	-	70	12	82
14	W Pt Lot 11	*	H., Z., & M. Tesic	073-36000	4.25	50	150	-	200	78	278
14	S Pt Lot 10	*	D. & B. Jebb	073-36100	41.44	50	900	-	950	471	1,421
14	S Pt Lot 10	*	P. & M. Barreira	073-36101	0.44	50	10	-	60	3	63
14	S Pt Lot 9	*	J. Marques	073-36200	7.58	50	90	-	140	46	186
14	S Pt Lot 9	*	2031430 Ontario Ltd	073-36300	6.89	50	100	-	150	52	202
14	N Pt Lot 16	*	A. Lacquaniti	074-12400	0.14	50	10	-	60	7	67
14	N Pt Lot 16	*	L. Webster	074-12500	0.12	50	10	-	60	6	66
14	N Pt Lot 16	*	B. Kneeshaw	074-12600	0.18	50	20	-	70	9	79
14	N Pt Lot 16	*	B. & J. Kneeshaw	074-12601	0.19	50	20	-	70	9	79
14	N Pt Lot 16	*	L., R. & J. Kell	074-12700	1.38	50	60	-	110	34	144
14	N Pt Lot 16	*	C. & L. Stovold	074-12710	0.99	50	50	-	100	24	124
14	N Pt Lot 16		1402802 Ontario Inc	074-12720	18.34	50	860	-	910	446	1,356
14	N Pt Lot 15		1402802 Ontario Inc	074-12900	41.13	50	1,920	-	1,970	999	2,969
14	N Pt Lot 15	*	L. & M. Parsons	074-12901	0.20	50	20	-	70	10	80
14	Pt N1/2 Lot 15	*	F. & K. Zielke	074-12902	0.21	50	20	-	70	10	80
14	N Pt Lot 14		D. Zielke	074-13000	42.52	50	1,980	-	2,030	1,033	3,063
14	N Pt Lot 13		L. & E. Kell	074-13100	42.24	50	1,840	-	1,890	960	2,850
14	N Pt Lot 13	*		074-13101	0.23	50	20	-	70	11	81
14	N Pt Lot 12	*	S. & K. Thavakumar & S. Janani	074-13200	0.62	50	30	-	80	15	95
14	N Pt Lot 12		W. Steimle	074-13201	42.23	50	1,380	-	1,430	718	2,148
14	Pt Lot 11	*	D. & A. Ostojic	074-13300	21.63	50	730	-	780	382	1,162
14	N Pt Lot 11	*	K. & O. Kanevsky	074-13301	8.46	50	120	-	170	62	232
14	W Pt Lot 11	*	S. Heinemann & C. Kim	074-13400	4.24	50	100	-	150	53	203
14	W Pt Lot 11	*	J. & C. Evans	074-13500	4.26	50	130	-	180	66	246
14	W Pt Lot 11	*	K. & S. MacRae	074-13600	4.27	50	100	-	150	52	202
14	N Pt Lot 10	*	C. & V. Grande	074-13700	10.26	50	290	-	340	152	492
14	Pt Lot 10	*	P. & L. Fenz & D. Leithwood	074-13701	0.40	50	20	-	70	10	80
14	N Pt Lot 10	*	R. & C. Colonna & F. & V. Corbo	074-13800	21.35	50	300	-	350	157	507
14	N Pt Lot 10	*	E. & A. Spina	074-13900	10.69	50	320	-	370	166	536
14	N Pt Lot 9	*	C. Schiafone & A. Britton	074-14000	10.88	50	130	-	180	66	246

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Town of Innisfil
PROJECT #: 300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
14	N Pt Lot 9	*	G., G. & A. Gatti	074-14100	11.20	50	130	-	180	68	248
14	N Pt Lot 9	*	J. & J. Waz	074-14200	8.64	50	100	-	150	52	202
14	N Pt Lot 9	*	D., L., & T. Galati & A. Granato	074-14300	6.30	50	70	-	120	38	158
14	N Pt Lot 8	*	M. & I De Sao Jose	074-14400	3.37	50	40	-	90	20	110
14	N Pt Lot 8	*	A. & M. Cesta & R. & A. Babusci	074-14500	6.05	50	70	-	120	37	157
14	Pt Lots 7 & 8	*	Riocan Holdings (Tiy) Inc & 1633272 Alberta Ulc	074-14900	6.80	50	1,950	-	2,000	143	2,143
15	Pt Lot 8	*	I. & M. De Sao Jose	074-15000	7.88	50	200	-	250	48	298
15	Pt Lot 8	*	Sisters Of Our Lady Mount	074-15100	1.11	730	30	-	760	17	777
15	Pt Lot 8	*	Town of Innisfil	074-15101	0.71	550	30	-	580	13	593
15	Pt Lot 8	*	Sisters Of Our Lady Mount	074-15200	2.12	980	40	-	1,020	23	1,043
15	Pt Lot 8	*	L. Lorusso	074-15201	2.12	1,960	90	-	2,050	46	2,096
15	Pt Lot 9	*	Q. Woods	074-15300	4.65	1,750	130	-	1,880	66	1,946
15	W Pt Lot 9	*	Fairview Farms Holdings Inc	074-15400	10.15	4,160	240	-	4,400	125	4,525
15	Pt Lot 10		M. Toich	074-15500	4.82	4,870	220	-	5,090	117	5,207
15	Pt Lot 10		T. Delahunt	074-15600	3.26	2,660	150	-	2,810	79	2,889
15	Pt Lot 10	*	T. Kingsly	074-15700	1.20	650	60	-	710	29	739
15	Pt Lot 10	*	J. Barber & D. Furtado	074-15800	1.61	50	80	-	130	39	169
15	Pt Lot 10	*	Barbay Holdings Incorporated	074-15900	2.12	50	100	-	150	52	202
15	Pt Lot 10	*	H. Ju	074-16000	1.82	50	80	-	130	44	174
15	Pt Lot 11	*	Q. & A. Alam	074-16100	8.74	50	250	-	300	131	431
15	Pt Lot 11	*	M. Fenech	074-16101	0.22	50	20	-	70	10	80
15	Pt Lot 11	*	G. Bell	074-16102	0.27	50	10	-	60	7	67
15	Pt Lot 11	*	S. & R. Kuzmyk	074-16110	0.25	50	10	-	60	6	66
15	Pt Lot 11	*	V. Fava & D. Lombardi	074-16200	1.84	50	70	-	120	36	156
15	Pt Lot 11	*	P. Hajdukiewicz	074-16210	0.26	50	10	-	60	6	66
15	Pt Lot 11	*	B. Nemeth	074-16300	1.98	50	80	-	130	40	170
15	Pt Lots 11 & 12	*	B. Arnold & M. Foley	074-16400	1.46	50	60	-	110	32	142
15	Pt Lots 11 & 12	*	B. Bondi	074-16401	0.85	50	40	-	90	20	110
15	Pt Lot 12	*	J. & T. Rautiainen	074-16500	3.96	50	150	-	200	79	279
15	Pt Lot 12	*	F. & H. Pereira	074-16501	2.12	50	70	-	120	34	154
15	Pt Lot 12	*	N. & J. Palazzo	074-16520	0.34	50	10	-	60	7	67
15	Pt Lot 12		G. & R. Zielke	074-16600	7.86	50	300	-	350	157	507
15	Pt Lot 13		Apoca Carpenters Ltd	074-16700	10.24	50	440	-	490	228	718
15	W Pt Lot 13	*	F. & K. Commisso & J. Raposo	074-16701	0.37	50	20	-	70	9	79
15	Pt Lot 13	*	A. & E. Auciello	074-16702	0.89	50	30	-	80	17	97
15	Pt Lot 13	*	K. & B. Adams	074-16710	0.27	50	10	-	60	7	67
15	Pt Lot 13	*	A. Venroy & D. Pagnan-Venroy	074-16720	0.27	50	10	-	60	7	67
15	Pt Lots 13 & 14		L. & E. Kell	074-16800	11.50	50	540	-	590	279	869
15	Pt Lot 14	*	N. & W. Harris	074-16801	0.22	50	20	-	70	11	81
15	Pt Lots 13 & 14	*	Hydro One Networks Inc	074-16900	0.18	50	10	-	60	4	64
15	Pt Lots 14 & 15		R. & D. Zielke	074-17000	11.24	50	520	-	570	273	843
15	Pt Lot 15	*	R. & W. Graham	074-17001	0.19	50	20	-	70	9	79
15	Pt Lots 14 & 15	*	R. Zielke	074-17040	0.28	50	10	-	60	7	67
15	Pt Lot 15	*	J. McCullough	074-17100	0.19	50	20	-	70	9	79
15	Pt Lot 15		K. & H. Kell	074-17200	7.40	50	350	-	400	180	580
15	Pt Lot 15	*	Innpower Corporation	074-17300	0.11	50	10	-	60	5	65
15	Pt Lot 15	*	2430683 Ontario Inc	074-17400	0.43	50	20	-	70	10	80
15	Pt Lot 15	*	S. & B. Kim	074-17500	0.37	50	20	-	70	9	79
15	Pt Lot 15	*	E. Ciotti	074-17600	0.42	50	20	-	70	10	80
15	Pt Lot 15	*	Town of Innisfil	074-17700	1.10	50	50	-	100	27	127
15	Pt Lot 15	*	Town of Innisfil	074-17800	0.99	50	50	-	100	24	124
15	Pt Lot 15	*	J. & M. Read	074-17901	0.19	50	20	-	70	9	79
15	Pt Lot 16	*	M. & V. Caporiccio	074-18000	0.15	50	10	-	60	7	67
15	Pt Lot 16	*	1728299 Ontario Inc	074-18001	0.09	50	10	-	60	4	64
15	Pt Lot 16	*	1385385 Ontario Inc	074-18100	0.11	50	10	-	60	5	65
15	Pt Lot 16	*	Z. & E. Meir	074-18200	0.20	50	20	-	70	10	80
				Total on Innisfil Lands	**7,071.55**	**$ 1,637,443**	**$ 1,216,340**	**$ -**	**$ 2,853,783**	**$ 152,835**	**$ 3,006,618**
			Bradford-West Gwillimbury Lands								
12	Pt S1/2 Lot 12	*	Simcoe County	003-25000	31.19	50	950	-	1,000	493	1,493
12	S Pt Lot 11		I. & Z. Bloch	003-25500	6.68	50	240	-	290	123	413
12	N Pt Lot 11	*	T. & B. Berneche	003-27500	1.01	50	40	-	90	23	113
12	N Pt Lot 11		J. Koperwas	003-27503	23.48	50	1,090	-	1,140	570	1,710
12	N Pt Lot 11	*	Simcoe County	003-27505	6.36	50	290	-	340	153	493
12	N Pt Lot 12		M. Sheikh & A. Chaudary	003-27800	40.59	50	1,500	-	1,550	784	2,334
12	N Pt Lot 12	*	M. & M. Grishaber	003-27801	0.53	50	20	-	70	13	83
12	N Pt Lot 12	*	M. Goldenberg & S. Burns	003-27802	0.37	50	20	-	70	9	79
12	N Pt Lot 13	*	Simcoe County	003-27804	3.87	50	90	-	140	49	189
12	N Pt Lot 13	*	H. Boucher	003-27900	0.79	50	30	-	80	18	98
12	N Pt Lot 13	*	C. & V. Duraes	003-27901	0.65	50	30	-	80	13	93
12	N Pt Lot 13	*	R. & Y. Fortune	003-27902	0.92	50	30	-	80	18	98
12	N Pt Lot 13	*	A. & M. Amaral	003-27903	1.11	50	50	-	100	25	125
12	N Pt Lot 13		R. Whillier	003-27905	1.46	50	50	-	100	27	127
12	Pt Lot 13	*	D. & N. Soldiuk	003-27906	0.46	50	20	-	70	9	79
12	N Pt Lot 13		C. & M. Conceicao	003-28004	6.75	50	190	-	240	98	338
13	S Pt Lot 13	*	M. & R. Fresco	003-30201	1.66	50	80	-	130	40	170
13	S Pt Lot 13	*	Steiner Tree Farms Ltd	003-30215	4.09	50	190	-	240	99	339
13	S Pt Lot 13	*	R. McKaigue	003-30300	18.90	50	560	-	610	289	899
13	Pt Lot 13	*	Y. Dement	003-30301	0.70	50	20	-	70	13	83
13	S Pt Lot 13	*	Eric's Right World of Scouting	003-30320	4.15	50	110	-	160	59	219
13	S Pt Lot 13	*	J. & T. Lefler	003-30400	0.72	50	30	-	80	17	97
13	S Pt Lot 13	*	T. Callacott & U. Walton	003-30500	0.74	50	30	-	80	17	97
13	S Pt Lot 13	*	B. Ferguson	003-30600	0.37	50	20	-	70	9	79
13	S Pt Lot 13	*	J. & K. Van Lierop	003-30601	0.37	50	20	-	70	9	79
13	S Pt Lot 13	*	W. & D. Lawrence	003-30700	0.39	50	20	-	70	9	79
13	S Pt Lot 11		M. Boddy	003-30800	62.13	50	2,470	-	2,520	1,288	3,808
13	S Pt Lot 12	*	P. Abercrombie & S. Bruin	003-30801	0.46	50	20	-	70	9	79
13	Pt Lot 11	*	J. Reilly & S. Tolley	003-31000	8.02	50	340	-	390	195	585
13	Pt Lot 11	*	N. & K. Sears	003-31061	2.85	50	100	-	150	61	211
13	Pt Lot 11	*	Y. Guo	003-31001	10.13	50	470	-	520	246	766
13	Plan M649	*	Town of Bradford West Gwillimbury	003-31100	0.69	50	30	-	80	17	97

APPENDIX B7 - ASSESSMENTS for CONSTRUCTION
MAIN DRAIN AND BRANCHES

PROJECT:	South Innisfil Creek Drain - 2019 Improvement	TOWN:	Town of Innisfil
DATE :	October 22, 2019 - Amended by the Tribunal	PROJECT #:	300038790

Conc.	Lot or Plan		Owner	Roll No.	Affected Area (Ha.)	Benefit Assess't (Sect.22)	Outlet Assess't (Sect.23)	Special Assess't (Sect.24/26)	Subtotal	Assessment of Dillon Fees	Total
13	Plan M649	*	R. & J. Burns	003-31104	0.65	50	30	-	80	16	96
13	Plan M649	*	G. Gallo	003-31108	0.71	50	30	-	80	16	96
13	Plan M649	*	M. & R. Zimmer	003-31112	0.83	50	30	-	80	16	96
13	Plan M649	*	B. & M. Gentile	003-31116	0.73	50	30	-	80	14	94
13	Plan M649	*	F. & P. Giusti	003-31120	0.84	50	30	-	80	16	96
13	Plan M649	*	K. Brown	003-31124	0.96	50	30	-	80	18	98
13	Plan M649	*	L. Gross	003-31128	1.03	50	40	-	90	20	110
13	Plan 51M6	*	Q. Zhu Zhi & Y. Tang	003-31136	1.11	50	30	-	80	17	97
13	Plan 51M6	*	J. & D. Taylor	003-31138	1.11	50	30	-	80	17	97
13	Plan M649	*	S. & U. Kostuch	003-31142	0.76	50	30	-	80	18	98
13	Plan M649	*	N. & A. Barroso	003-31146	0.80	50	40	-	90	18	108
13	Plan M649	*	L. & P. Wade	003-31150	0.69	50	30	-	80	16	96
13	Plan M649	*	D. & J. Ferragine	003-31170	0.66	50	30	-	80	16	96
13	Plan M649	*	M. & T. Capuano	003-31174	0.60	50	30	-	80	15	95
13	Plan M649	*	B. Ahmed	003-31178	0.49	50	20	-	70	12	82
13	Plan M649	*	J. Muir-Birtles & G. Birtles	003-31182	0.62	50	30	-	80	15	95
13	Plan M649	*	R. & N. Jackson	003-31186	0.92	50	40	-	90	22	112
13	Plan M649	*	R. Sorbera-Colivas	003-31190	0.57	50	30	-	80	14	94
13	Plan M649	*	C. Alarie	003-31194	0.53	50	20	-	70	13	83
13	Plan M649	*	P. & Z. Zanet	003-31198	0.63	50	30	-	80	15	95
13	Pt Lot 10	*	A. Man	003-31410	6.69	50	190	-	240	98	338
			Total on Bradford-West Gwillimbury Lands		**264.52**	**$ 2,650**	**$ 9,950**	**$ -**	**$ 12,600**	**$ 5,224**	**$ 17,824**
			TOTAL ON LANDS		**7,336.07**	**$ 1,640,093**	**$ 1,226,290**	**$ -**	**$ 2,866,383**	**$ 158,059**	**$ 3,024,442**
			Town of Innisfil Roads								
7th Line			Town of Innisfil		3.30	-	3,860	-	3,860	321	4,181
6th Line			Town of Innisfil		14.24	-	18,380	-	18,380	1,526	19,906
5th Line			Town of Innisfil		15.13	11,290	15,530	-	26,820	1,470	28,290
4th Line			Town of Innisfil		20.03	134,530	20,280	663,660	818,470	2,067	820,537
3rd Line			Town of Innisfil		17.60	39,600	15,650	137,930	193,180	1,440	194,620
2nd Line			Town of Innisfil		17.58	21,430	9,000	-	30,430	1,482	31,912
15th Line			Town of Innisfil		1.40	60	-	-	60	136	196
Gilford Road			Town of Innisfil		10.24	-	1,010	-	1,010	526	1,536
14th Line			Town of Innisfil		5.20	-	920	-	920	478	1,398
Churchill Unnamed Road 1			Town of Innisfil		0.44	-	740	-	740	43	783
Churchill Unnamed Road 2			Town of Innisfil		0.91	-	1,510	-	1,510	88	1,598
Churchill Unnamed Road 3			Town of Innisfil		0.21	-	360	-	360	20	380
John Street			Town of Innisfil		0.46	-	490	-	490	45	535
Allan Street			Town of Innisfil		0.45	-	600	-	600	44	644
Sloan Circle Drive			Town of Innisfil		1.30	-	1,390	-	1,390	126	1,516
Cairns Gate			Town of Innisfil		0.22	-	230	-	230	21	251
Valley View Drive			Town of Innisfil		1.38	-	1,470	-	1,470	134	1,604
Gimby Crescent			Town of Innisfil		1.06	-	1,130	-	1,130	103	1,233
Meadowland Street			Town of Innisfil		1.54	-	1,640	-	1,640	150	1,790
Reive Blvd			Town of Innisfil		21.76	9,500	10,920	19,000	39,420	2,115	41,535
			Total on Town of Innisfil Roads		**134.45**	**$ 216,410**	**$ 105,110**	**$ 820,590**	**$ 1,142,110**	**$ 12,335**	**$ 1,154,445**
			Town of Bradford West Gwillimbury Roads								
Line 13			Bradford West Gwillimbury		3.35	-	620	-	620	326	946
Line 12			Bradford West Gwillimbury		0.23	-	40	-	40	22	62
Kilkenny Trail			Bradford West Gwillimbury		1.30	-	240	-	240	126	366
			Total on Town of Bradford West Gwillimbury Roads		**4.88**	**$ -**	**$ 900**	**$ -**	**$ 900**	**$ 474**	**$ 1,374**
			Other Roads								
5 Sideroad (CR 53)			Simcoe County		20.17	80	9,200	-	9,280	1,960	11,240
10 Sideroad (CR 54)			Simcoe County		26.44	106,340	17,620	-	123,960	2,570	126,530
County Road 89			Simcoe County		16.14	5,250	3,630	-	8,880	1,569	10,449
County Road 4 (Yonge Street)			Simcoe County		26.04	-	40,700	-	40,700	3,163	43,863
Hwy 89			Ministry of Transportation		6.76	90	120	-	210	821	1,031
Hwy 400			Ministry of Transportation		74.69	21,510	65,880	56,000	143,390	9,049	152,439
			Total on Other Roads		**170.24**	**$ 133,270**	**$ 137,150**	**$ 56,000**	**$ 326,420**	**$ 19,132**	**$ 345,552**
			TOTAL ON ROADS		**309.57**	**$ 349,680**	**$ 243,160**	**$ 876,590**	**$ 1,469,430**	**$ 31,941**	**$ 1,501,371**
			Dillon Consulting Fees to be Assessed to the Town of Innisfil							**$ 835,087**	**$ 835,087**
			ALL LANDS AND ROADS		**7,645.64**	**$ 1,989,773**	**$ 1,469,450**	**$ 876,590**	**$ 4,335,813**	**$ 1,025,087**	**$ 5,360,900**

Notes: (1) It is presumed that all private lands are Agricultural, within the meaning of the Drainage Act except properties denoted with *
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAF grant as eligibility has not been confirmed as part of the preparation of this report.

Appendix C

Agency Correspondence

Burnside
[The Difference is our People]

C1

Appendix C1

Ministry of Transportation (MTO)

South Innisfil Creek Drain & Branches Improvements 300039790

DM

Don McNalty

Wed 2016-11-16, 1:57 PM

Robert.Vandenberg@ontario.ca; Tom Pridham;

Sent Items

Robert:

Burnside & Associates Ltd (Burnside) has been retained under the Drainage Act to consider improvements under section 78 of that Act to the South Innisfil Creek Drain & Branches. This Municipal Drain crosses Highway 400 just north of the Highway 89 interchange which is in the early stages of planning and design for which we have had an opportunity to review the preliminary concepts for that interchange. There is one existing culvert crossing of Hwy 400 within the interchange area and an existing pair of culverts just north of the planned interchange.

A previous report prepared by Dillon Consulting in 2013 addressed these crossings and noted that eventually the crossing were anticipated to be replaced but in the interim the culverts would remain. Direction was not provided in the report prepared under the Drainage act by Dillon for the Hwy 400 crossing culverts to be replaced.

We note that the hydrologic/hydraulic modelling completed to date does show that the existing crossings do impede the passing of the design storm for the Drain (1 in 2 year event) and it is anticipated that the crossings have deficient capacity for the larger storm events. We are in the process of carrying out additional modelling in this regard and ask if the Ministry has completed any modelling of the crossings as part of the Hwy 400 improvement project to date.

More significant than the capacity of the crossings is the existing culvert inverts are perched above the design grade of the South Innisfil Creek Drain as established by the current By-Law which incorporates the 1956 report of DH Weir. Further, additional capacity in the upstream channel could be achieved if the grade established by the current By-Law at the Hwy 400 crossings was lowered to maintain a consistent gradient from the downstream outlet. Consequently, we need to consider the potential benefits to the Municipal Drain of having the existing crossing(s) replaced to accommodate design storm events and to allow the grade of the Drain to be lowered.

Acknowledging that we have not completed our modelling of this drainage system but in light of the planning that is currently being done for the interchange improvements, we ask if we could meet with Ministry representatives to discuss the anticipated changes to the crossings required to provide an adequate drainage outlet for upstream lands and any potential benefits to the Drain and the Ministry on coordinating the overall work efforts in this area. We would look forward to your direction in this regard.

We are prepared to attend your office to meet on this matter but also note that a Steering Committee is being formed for this Drainage project and input from the Ministry at a Steering Committee meeting would also be beneficial

We do note that Tom Pridham of our office did have a preliminary discussion with Mr John VanVoorst of MTO earlier this year on this matter

Thanks, Don

Don McNalty

From:	Jeremy Nyenhuis <jnyenhuis@innisfil.ca>
Sent:	Tuesday, June 20, 2017 4:14 PM
To:	Cooper, Karen
Cc:	Van Voorst, John (MTO); rdharamdial@morrisonhershfield.com; Jason Inwood; Kristi Williams; Don McNalty
Subject:	FW: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Good afternoon Karen,

As indicated in my past email, I forwarded your email regarding the above to Don McNalty from Burnside as he is the Drainage Engineer currently working on the Section 78 Report for the South Innisfil Creek Drain for the Town of Innisfil. The Municipal Drain that the proposed pond is outletting to is Branch A of that drain and is commonly referred to as the Hnydczak Relief Drain.

Attached below are his comments regarding your proposed design. As indicated in his email, we are also currently in discussions with Morrison Hershfield regarding the detailed design of the interchange. Mr. Ram Dharamdial, Senior Engineer from Morrison Hershfield has scheduled a meeting this Friday June 23 at 11:00 o'clock at the Town's Operations Centre (7253 Yonge Street, Innisfil). I think it would be greatly beneficial if you could attend that meeting.

If you have any additional questions, please do not hesitate to contact me.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Don McNalty [mailto:Don.McNalty@rjburnside.com]
Sent: June 20, 2017 11:15 AM
To: Jeremy Nyenhuis
Cc: Kristi Williams; Jason Inwood; Tim Lozon; Natalie Connell; Tom Pridham
Subject: RE: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Jeremy:

As we have discussed we have reviewed the email correspondence and attachments from Karen Cooper of Aecom regarding the proposed Storm Water management facilities for the new Hwy 400/89 interchange. As you know we have also had a telephone discussion with a representative of Morrison Hershfield who we believe has been retained by MTO to complete the detailed design for the intersection and there has been a meeting arranged for Friday June 23 to further discuss details with respect to the existing municipal drains that are in the vicinity of the intersection and the anticipated flows generated by the upstream catchment area. We are not sure of the division of responsibility between Aecom and

Morrison Hershfield for the intersection design but note that their current requests for comment and information are very much interrelated and we suggest open communications by all parties would be beneficial to the Hwy 400/89 interchange project as well as the pending South Innisfil Creek Drain Improvement project. We suggest that any response to Karen Cooper at Aecom be copied to Ram at Morrrison Hershfield as well as John VanVoorst at MTO. As you know we recently forwarded information to Morrison Hershfield and copied these parties.

We note that Branch A of the South Innisfil Creek Drain and what was referred to as the Hnydczak Relief Drain in the Dillon Engineer's report for the South Innisfil Creek Drain are the same channel. The Town would still have an obligation to maintain and repair Branch A under the current By-Law in accordance with the specifications in the original engineer's report. The current By-law also continues to give the Town the "right of access" to carry out that maintenance. It follows that a clean out of the existing drain downstream of the MTO property and proposed pond is possible. The difficulty would be determining how the cost of the maintenance would be distributed as it is anticipated that the original assessment schedule for Branch A is no longer appropriate as a result of the diversion of the flows in the Hnydczak Drain from this channel to flow north along the east side of Reive Blvd to discharge directly into the South Innisfil Creek Drain. In summary the physical cleanout is possible but the distribution of cost under the current By-law would not be appropriate. It is anticipated that Branch A will be incorporated into the engineer's report for the South Innisfil Creek Drain Improvements. Cleaning out Branch A with the Town or MTO absorbing the cost (so there was not attempt to distribute costs to upstream property owners) may be a consideration.

The realignment of Branch A would theoretically require a new engineer's report specific to the proposed realignment prior to implementation. This would of course take time to follow through the process required by the Drainage Act and would not fit with the schedule proposed by the MTO for the reconstruction of this interchange in 2018. The realignment could be addressed in the pending engineer's report for the South Innisfil Creek Drain which will not be completed for a number of months and it could be many month after the report before a final By-law is passed to authorize the construction of the realigned channel. It is noted that the channel is only a relief flow outlet for upstream runoff as the flows have been diverted many years ago to flow north to the Souh Innisfil Creek Drain along the east side of Reive Blvd as described above. Consequently the proposed realignment would have minimal physical detrimental effect to the drainage in the area and it is really he administrative details of the Drainage Act and the cost distribution that need to be addressed. The Town may consider allowing the Ministry to undertake the physical realignment at their cost with the opportunity to review and accept the final design details and with the anticipation that the engineer's report will incorporate the realigned channel after the fact. This of course comes with the acknowledgement that this contravenes the intent of the Drainage Act with respect to changes to a Drain.

As we have discussed an a number of occasions we note that from a municipal drain perspective, if the South Innisfil Creek crossing of Hwy 400 (at crossing No. 44 in Aecom reports) was replaced with a larger structure at a lower invert elevation, it is possible that Branch A (Hyndczak Relief Drain) would no longer be required as a relief flow outlet. Consequently Branch A would only need to accept the flow from the Hwy 400/89 intersection with virtually no flows from upstream being outlet through the intersection (culvert No. 43 in Aecom reports). Reive Blvd could become the drainage boundary between flows in Branch A and flows to the South Innisfil Creek Drain. In this case we suggest that the portion of Branch A situated within the intersection and on MTO property (the pond site) could be abandoned allowing the Ministry to undertake the realignment of the channel without any report under the Drainage Act. Branch A downstream of the MTO property should remain and be part of the engineer's report for the South Innisfil Creek Drain Improvements. However, such a proposal is time sensitive and depends on the phasing for the Hwy 400 crossing replacements in this area. Until such time that the South Innisfil Creek Crossing is replaced the relief flow culverts discharging to Branch A must remain in place. It may be determined through the hydrology/hydraulic analysis for the design criteria storm event through the Hwy 400 right of way that the relief flow culverts would have to be even larger than they currently are. It is noted that from a Municipal Drain perspective the design criteria will be a relatively small storm event compared to the design criteria required for the Hwy crossings.

In summary we believe that phasing of the 2 crossings can be significant. We anticipate that if culvert crossing No.44 (South Innisfil Creek) was done first (or concurrently) that culvert crossing No.43 (Branch A) could be almost eliminated for upstream flows but if the phasing occurs the other way that the culvert crossing No.43 may need to be even larger

than currently exist while still not reducing the need to replace the culvert No. 44 crossing. Of course all of this would need to be analyzed through detailed modelling by the Ministry's consultants for the design criteria storm events which must be accommodated by Hwy 400 in this area.

The only other minor comment is it appears from the drawing provided by Aecom that some of the intersection drainage from the southeast quadrant is being brought through the intersection to ultimately discharge into Branch A whereas this area outlet into another crossing of Hwy 400 south of the intersection previously. We believe this is proposed so the runoff can be treated in the same facility. This will require some adjustment to the catchment area for the south Innisfil Creek Drain.

Please call if you have any questions in regard to the above

Don

Don McNalty, P.Eng | R.J. Burnside & Associates Limited | www.rjburnside.com
Senior Engineer | Office: 800-265-9662 Direct: 705-797-4262

From: Jeremy Nyenhuis [mailto:jnyenhuis@innisfil.ca]
Sent: Monday, June 05, 2017 2:45 PM
To: Don McNalty; Jason Inwood
Cc: Kristi Williams
Subject: FW: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Don,

I hope all is well.

Last week we received the below correspondence from Karen Cooper from the MTO. They are looking at designing a dry pond for stormwater captured by the new HWY 89 interchange. They are proposing a clean-out of Branch A (of the South Innisfil Drain Branches Report completed in 1956) in order to facility the proposed design. However they are designing the outlet elevation of the pond to the proposed grades in Dillon's 2014 report.

From Karen's design sketch it looks like they are hoping to relocate the branch drain around the north side of the dry pond on their property as part of the proposed work. I know this will require a new engineers report.

I did digging and in 1958 a report by W.G. McGeorge was completed on the Hnydczak Drain from the east side of HWY 400 to the 10th Sideroad. In 1963 a report by P.W. Ainley by-passed the HWY crossings and took flows to the north to gain grade. The Branch A drain was never abandoned in this process.

Is Branch A still going to be completed as part of the new report?

Could you please provide some comments that I can forward back to Karen. Maybe include the process that the MTO will need to follow to make this relocation possible under the Act.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Cooper, Karen [mailto:karen.cooper@aecom.com]
Sent: June 1, 2017 2:17 PM
To: Jeremy Nyenhuis
Cc: Carolina Cautillo; Meredith Goodwin; Ristic, Serge; Dai, Jenny; Sorochinsky, Tim; Vandenberg, Robert (MTO); Sieradzki, Susan (MTO); Van Voorst, John (MTO); Drygas, Tyler; Schmied, Sarah
Subject: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Jeremy,

Please find attached a sketch illustrating the preferred alternative for the configuration of a proposed dry pond in the vicinity of the Highway 89 interchange. This dry pond would provide storage for Highway 400 and interchange run-off.

In association with construction of this improvement, AECOM notes that outletting to the adjacent municipal drain would require drain clean out for positive drainage. A profile drawing of the municipal drain is included with the sketch.

Please provide your comments on this proposed design.

If you have any questions, please do not hesitate to contact me.

Regards,
Karen

Karen Cooper, P.Eng., AVS
Project Manager, Transportation Planning & Design, DCS Americas
D +1-905-747-1854
M +1-416-816-4151
karen.cooper@aecom.com

AECOM
30 Leek Crescent
4th Floor
Richmond Hill, ON L4B 4N4, Canada
T +1-905-882-4401
aecom.com

RE: Hwy 400/89 Interchange/South Innisfil Creek Drain

JN

Jeremy Nyenhuis <jnyenhuis@innisfil.ca>
Tue 2017-06-20 1:13 PM

To: Don McNalty

You replied on 2017-06-20 1:15 PM.

Don,

I was reviewing this email and I noticed that Karen does not appear to be cc.

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Don McNalty [mailto:Don.McNalty@rjburnside.com]
Sent: June 20, 2017 11:19 AM
To: rdharamdial@morrisonhershfield.com
Cc: Jason Inwood; Jeremy Nyenhuis; Tim Lozon; John.VanVoorst@ontario.ca; Tom Pridham; Natalie Connell
Subject: Hwy 400/89 Interchange/South Innisfil Creek Drain

Ram:

We appreciate the opportunity to have preliminary discussions with you during our telephone conversation and we look forward to the meeting arranged for Friday, June 23 on this matter.

As you requested we are attaching a copy of the overall Drainage Plan from the Dillon Engineer's report for the South Innisfil Creek Drain. This report was not adopted by a provisional By-Law and we are currently in the process of revising the design parameters for the drain, investigating a deepening of the drain to improve the capacity, taking advantage of the benefits to drainage created by the anticipated future replacement of the Hwy 400 crossings as well as a number of

other features related to the Drain. It is anticipated that the revised Final Engineer's Report will be submitted in the spring of 2018 and it will be based on the replacement of the Hwy 400 crossings with a larger structure with a lower channel invert elevation. For clarity, the South Innisfil Creek crossing is immediately north of the current north limits of the Hwy 89/400 interchange project. We believe this was referenced as crossing No. 44 in the Aecom reports. As we discussed the timing for the replacement of the South Innisfil Creek crossings may have a significant impact on the requirements for the Hnydczak Relief Drain (as identified in the Dillon report and which is the same outlet identified as Branch A of the South Innisfil Creek Drain in the current By-Laws) which crosses Hwy 400 within the interchange (Crossing No. 43 in the Aecom report).
We have also enclosed a drainage catchment area plan created by our office.

We have also attached a **"draft"** technical memorandum dated March 2017 which we prepared to summarize the hydrologic modelling we had completed. This memorandum identifies some significant discrepancies in the flows used in the Aecom Drainage report which has relied on the regulatory flows adopted by the Conservation Authority compared to the modelling results determined by Dillon and Burnside as it related to the South Innisfil Creek Drain. This memorandum and the supporting documentation was forwarded to the Conservation Authority for review and comment. We have not received a response in this regard from the Conservation Authority to date. As we discussed the design criteria for the South Innisfil Creek Drain will be a lower storm return event in the order of a 1 in 2 year storm event whereas the Hwy 400 crossing will have a significantly greater criteria. As noted in the memorandum the modelling results were comparable for the lower storm events but were significantly different for the larger events. We reiterate that the memorandum was sent to the CA in draft for information and review but does not have any official status as we have not received any comments to date.

We also not that we have recently received information and questions from Karen Cooper of Aecom related to the proposed Storm Water Management faciltity for the intersection to be located in the north west quadrant of the intersection. The proposal would require a clean out and realignment of Branch A of the South Innisfil Creek Drain or what is referred to the Hyndczak Relief Drain in the Dillon report. We note that the determination of flows crossing Hwy 400 in this area, the ultimate proposal for the South Innisfil Creek Drain Improvements and the realignment and cleanout of Branch A are all very much inter-related. Although we are unaware of the division of responsibility between Aecom and Morrison Hershfield for the intersection design we believe it would be beneficial to have open communications amongst all parties. As a result we have copied Karen Cooper of Aecom on this email.

We will be providing comments to the Town of Innisfil with regard to the proposed Storm Water management facility and will suggest that you be copied on those comments

See you Friday
Don

Don McNalty, P.Eng
Senior Engineer

R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario L9Y 4J6
Office: 800-265-9662 Direct: 705-797-4262
www.rjburnside.com

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

June 23, 2017

Via: Email (john.vanvoorst@ontario.ca)

Mr. John Van Voorst
Senior Drainage Engineer
Drainage and Hydrology Engineering
Ministry of Transportation of Ontario
Building D, 159 Sir William Hearst Avenue
Toronto ON M3M 0B7

Dear Mr. Van Voorst:

Re: South Innisfil Creek Drain Improvements
Highway 400 Crossings
Project No.: 300038790.0000

We are writing the following on behalf of the Town of Innisfil (Town) and further to our meeting a number of weeks ago in regard to the South Innsifil Creek Drain Improvements in relation to the Highway 400 Improvement Project. In addition, we have had recent correspondence and communications with Aecom Engineering, who we understand is finalizing the Environmental Assessment and Preliminary Design for the Highway 400 Improvements, as well as Morrison Hershfield, who we believe has been retained by the Ministry of Transportation (MTO) to carry out the final detailed design of the Highway 400/89 Interchange Project. We note that we have recently copied you on communications with Morrison Hershfield, and the Town has copied you on recent communications with Aecom Engineering.

As per the discussions at the meeting held at the Town office on March 27, 2017, Burnside has been appointed by the Town as Drainage Engineer under the Drainage Act to consider potential revisions to the Engineer's Report for the South Innisfil Creek Drain Improvements. Part of those considerations will be the proposed replacement of the Highway 400 South Innisfil Creek Drain Crossing with a structure of larger capacity at a lower invert elevation. Concurrently, it has been established through the preliminary engineering carried out on behalf of the MTO by Aecom, that the Highway 400 South Innisfil Creek Crossing needs to be replaced to meet the design criteria for the Highway 400 Improvement Project.

As noted above, we have had recent communications from Aecom Engineering in regard to the proposed Stormwater Management Pond Facility situated in the northwest quadrant of the Highway 400/89 intersection. The proposed pond requires a clean-out of the existing Branch A downstream of the MTO property, which discharges into the South Innisfil Creek Drain between Highway 400 and 5th Sideroad. It also requires a realignment of that Branch to accommodate the construction of the Stormwater Management Pond. A copy of the email communication between the Town and Aecom in this regard is attached for your convenience.

We have also had communications with Morrison Hershfield in regard to the hydrology/hydraulic analysis of the culvert crossings in this area. We believe principally this relates to the requirements for the relief flow channel, which outlets into Branch A and which has been previously described in the Dillion Engineer's Report as the Hyndczak Relief Drain. A copy of that email communication between Burnside and Morrison Hershfield is also attached for your convenience.

We confirm that the replacement of the Highway 400 Crossing Culverts on the South Innisfil Creek Drain with a larger structure at a lower invert elevation will be proposed/required in our final Engineer's Report, which is scheduled to be completed in the spring of 2018. We note that the design criteria for the Municipal Drain will be in the order of a 1:2 year Storm Event. Consequently, any hydraulic sizing of a crossing required by the Ministry to meet the design criteria for Highway 400 will significantly exceed the design criteria for the Municipal Drain.

It is acknowledged that currently the South Innisfil Creek Drain Crossing is not included within the Highway 400/89 Interchange Reconstruction Project scheduled for 2018. It is further acknowledged that to date, there is no anticipated schedule as to when that crossing would be replaced to meet the Ministry's scheduled phasing for the Highway 400 Improvements.

As per the email communications attached, it is noted however that, from a drainage perspective, it would be possible that the Hyndczak Relief Drain culverts situated within the Highway 89 Project would not be required to accept relief flows from upstream of the interchange if the South Innisfil Creek Drain Crossing was replaced concurrently with the Highway 400/89 Interchange Project. In that case, Branch A, being the discharge point for the Stormwater Management Facility, would only be required to accept drainage from the intersection watershed itself, with no flow coming in to the intersection from upstream. Further, it is anticipated that, for the Highway 400/89 Project to meet the design criteria for the passing of flows from upstream, the Hyndczak Relief Drain Culverts may actually have to be larger than the existing culverts to accommodate the total flows if the South Innisfil Creek Drain Crossings remain as they are. Please note that we make these comments for larger Storm Events from a Municipal Drain perspective. It is anticipated that the hydrology/hydraulic analysis for the Highway 400 Crossings would be carried out as part of the detailed design for Highway 400/89 Project.

As noted in our email communications with Morrison Hershfield, we have forwarded some information relative to the drainage catchment areas, as well as the Draft Memo which we discussed at the meeting at the Town office regarding the discrepancy in flows, particularly at the higher Storm Events, in the various models. We note that Morrisison Hershfield has asked the Town, through Burnside, to consider releasing the hydrologic model created by Burnside for the South Innisfil Creek Drain. This will be a matter for which we have further discussion with Morrison Hershfield.

We provide the above to provide an update to the MTO in regard to our involvement in this Project, and would undertake to continue to provide copies to you of any communications with Aecom or Morrison Hershfield in this regard.

Please contact our office if you have any questions in this regard

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Senior Municipal Engineer
DMN:jm

Enclosure(s) Email from Don McNalty (Burnside) Re: Hwy 400/89 Interchange/ South Innisfil Creek Drain, dated June 20, 2017 at 1:19 PM.
Email from Jeremy Nyenhuis (Innisfil) Re: Hwy 400/89 Interchange/ South Innisfil Creek Drain, dated June 20, 2017 at 4:14 PM.

cc: Robert Vandenburg, MTO (Via: Email – robert.vanderburg@ontario.ca)
Jeremy Nyenhuis, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Jason Inwood, Town of Innisfil (Via: Email – jinwood@innisfil.ca)

170623_Letter_VanVoorst MTO_038790.docx
23/06/2017 9:49 AM

Don McNalty

From: Don McNalty
Sent: Tuesday, June 20, 2017 1:19 PM
To: 'rdharamdial@morrisonhershfield.com'
Cc: 'Jason Inwood'; 'Jeremy Nyenhuis'; Tim Lozon; 'John.VanVoorst@ontario.ca'; Tom Pridham; Natalie Connell; 'Cooper, Karen'
Subject: RE: Hwy 400/89 Interchange/South Innisfil Creek Drain

I am resending this email as my intent was to cc Karen Cooper of Aecom and it was noted by Jeremy Nyenhuis that the cc to her was not included.

From: Don McNalty
Sent: Tuesday, June 20, 2017 11:18 AM
To: 'rdharamdial@morrisonhershfield.com'
Cc: Jason Inwood; 'Jeremy Nyenhuis'; Tim Lozon; 'John.VanVoorst@ontario.ca'; Tom Pridham; Natalie Connell
Subject: Hwy 400/89 Interchange/South Innisfil Creek Drain

Ram:

We appreciate the opportunity to have preliminary discussions with you during our telephone conversation and we look forward to the meeting arranged for Friday, June 23 on this matter.

As you requested we are attaching a copy of the overall Drainage Plan from the Dillon Engineer's report for the South Innisfil Creek Drain. This report was not adopted by a provisional By-Law and we are currently in the process of revising the design parameters for the drain, investigating a deepening of the drain to improve the capacity, taking advantage of the benefits to drainage created by the anticipated future replacement of the Hwy 400 crossings as well as a number of other features related to the Drain. It is anticipated that the revised Final Engineer's Report will be submitted in the spring of 2018 and it will be based on the replacement of the Hwy 400 crossings with a larger structure with a lower channel invert elevation. For clarity, the South Innisfil Creek crossing is immediately north of the current north limits of the Hwy 89/400 interchange project. We believe this was referenced as crossing No. 44 in the Aecom reports. As we discussed the timing for the replacement of the South Innisfil Creek crossings may have a significant impact on the requirements for the Hnydczak Relief Drain (as identified in the Dillon report and which is the same outlet identified as Branch A of the South Innisfil Creek Drain in the current By-Laws) which crosses Hwy 400 within the interchange (Crossing No. 43 in the Aecom report).
We have also enclosed a drainage catchment area plan created by our office.

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We will be providing comments to the Town of Innisfil with regard to the proposed Storm Water management facility and will suggest that you be copied on those comments

See you Friday
Don

Don McNalty

From: Jeremy Nyenhuis <jnyenhuis@innisfil.ca>
Sent: Tuesday, June 20, 2017 4:14 PM
To: Cooper, Karen
Cc: Van Voorst, John (MTO); rdharamdial@morrisonhershfield.com; Jason Inwood; Kristi Williams; Don McNalty
Subject: FW: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Good afternoon Karen,

As indicated in my past email, I forwarded your email regarding the above to Don McNalty from Burnside as he is the Drainage Engineer currently working on the Section 78 Report for the South Innisfil Creek Drain for the Town of Innisfil. The Municipal Drain that the proposed pond is outletting to is Branch A of that drain and is commonly referred to as the Hnydczak Relief Drain.

Attached below are his comments regarding your proposed design. As indicated in his email, we are also currently in discussions with Morrison Hershfield regarding the detailed design of the interchange. Mr. Ram Dharamdial, Senior Engineer from Morrison Hershfield has scheduled a meeting this Friday June 23 at 11:00 o'clock at the Town's Operations Centre (7253 Yonge Street, Innisfil). I think it would be greatly beneficial if you could attend that meeting.

If you have any additional questions, please do not hesitate to contact me.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Don McNalty [mailto:Don.McNalty@rjburnside.com]
Sent: June 20, 2017 11:15 AM
To: Jeremy Nyenhuis
Cc: Kristi Williams; Jason Inwood; Tim Lozon; Natalie Connell; Tom Pridham
Subject: RE: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Jeremy:

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Morrison Hershfield for the intersection design but note that their current requests for comment and information are very much interrelated and we suggest open communications by all parties would be beneficial to the Hwy 400/89 interchange project as well as the pending South Innisfil Creek Drain Improvement project. We suggest that any response to Karen Cooper at Aecom be copied to Ram at Morrrison Hershfield as well as John VanVoorst at MTO. As you know we recently forwarded information to Morrison Hershfield and copied these parties.

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As we have discussed an a number of occasions we note that from a municipal drain perspective, if the South Innisfil Creek crossing of Hwy 400 (at crossing No. 44 in Aecom reports) was replaced with a larger structure at a lower invert elevation, it is possible that Branch A (Hyndczak Relief Drain) would no longer be required as a relief flow outlet. Consequently Branch A would only need to accept the flow from the Hwy 400/89 intersection with virtually no flows from upstream being outlet through the intersection (culvert No. 43 in Aecom reports). Reive Blvd could become the drainage boundary between flows in Branch A and flows to the South Innisfil Creek Drain. In this case we suggest that the portion of Branch A situated within the intersection and on MTO property (the pond site) could be abandoned allowing the Ministry to undertake the realignment of the channel without any report under the Drainage Act. Branch A downstream of the MTO property should remain and be part of the engineer's report for the South Innisfil Creek Drain Improvements. However, such a proposal is time sensitive and depends on the phasing for the Hwy 400 crossing replacements in this area. Until such time that the South Innisfil Creek Crossing is replaced the relief flow culverts discharging to Branch A must remain in place. It may be determined through the hydrology/hydraulic analysis for the design criteria storm event through the Hwy 400 right of way that the relief flow culverts would have to be even larger than they currently are. It is noted that from a Municipal Drain perspective the design criteria will be a relatively small storm event compared to the design criteria required for the Hwy crossings.

In summary we believe that phasing of the 2 crossings can be significant. We anticipate that if culvert crossing No.44 (South Innisfil Creek) was done first (or concurrently) that culvert crossing No.43 (Branch A) could be almost eliminated for upstream flows but if the phasing occurs the other way that the culvert crossing No.43 may need to be even larger

than currently exist while still not reducing the need to replace the culvert No. 44 crossing. Of course all of this would need to be analyzed through detailed modelling by the Ministry's consultants for the design criteria storm events which must be accommodated by Hwy 400 in this area.

The only other minor comment is it appears from the drawing provided by Aecom that some of the intersection drainage from the southeast quadrant is being brought through the intersection to ultimately discharge into Branch A whereas this area outlet into another crossing of Hwy 400 south of the intersection previously. We believe this is proposed so the runoff can be treated in the same facility. This will require some adjustment to the catchment area for the south Innisfil Creek Drain.

Please call if you have any questions in regard to the above

Don

Don McNalty, P.Eng | R.J. Burnside & Associates Limited | www.rjburnside.com
Senior Engineer | Office: 800-265-9662 Direct: 705-797-4262

From: Jeremy Nyenhuis [mailto:jnyenhuis@innisfil.ca]
Sent: Monday, June 05, 2017 2:45 PM
To: Don McNalty; Jason Inwood
Cc: Kristi Williams
Subject: FW: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Don,

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Last week we received the below correspondence from Karen Cooper from the MTO. They are looking at designing a dry pond for stormwater captured by the new HWY 89 interchange. They are proposing a clean-out of Branch A (of the South Innisfil Drain Branches Report completed in 1956) in order to facility the proposed design. However they are designing the outlet elevation of the pond to the proposed grades in Dillon's 2014 report.

From Karen's design sketch it looks like they are hoping to relocate the branch drain around the north side of the dry pond on their property as part of the proposed work. I know this will require a new engineers report.

I did digging and in 1958 a report by W.G. McGeorge was completed on the Hnydczak Drain from the east side of HWY 400 to the 10th Sideroad. In 1963 a report by P.W. Ainley by-passed the HWY crossings and took flows to the north to gain grade. The Branch A drain was never abandoned in this process.

Is Branch A still going to be completed as part of the new report?

Could you please provide some comments that I can forward back to Karen. Maybe include the process that the MTO will need to follow to make this relocation possible under the Act.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Cooper, Karen [mailto:karen.cooper@aecom.com]
Sent: June 1, 2017 2:17 PM
To: Jeremy Nyenhuis
Cc: Carolina Cautillo; Meredith Goodwin; Ristic, Serge; Dai, Jenny; Sorochinsky, Tim; Vandenberg, Robert (MTO); Sieradzki, Susan (MTO); Van Voorst, John (MTO); Drygas, Tyler; Schmied, Sarah
Subject: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Jeremy,

Please find attached a sketch illustrating the preferred alternative for the configuration of a proposed dry pond in the vicinity of the Highway 89 interchange. This dry pond would provide storage for Highway 400 and interchange run-off.

In association with construction of this improvement, AECOM notes that outletting to the adjacent municipal drain would require drain clean out for positive drainage. A profile drawing of the municipal drain is included with the sketch.

Please provide your comments on this proposed design.

If you have any questions, please do not hesitate to contact me.

Regards,
Karen

Karen Cooper, P.Eng., AVS
Project Manager, Transportation Planning & Design, DCS Americas
D +1-905-747-1854
M +1-416-816-4151
karen.cooper@aecom.com

AECOM
30 Leek Crescent
4th Floor
Richmond Hill, ON L4B 4N4, Canada
T +1-905-882-4401
aecom.com

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
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July 27, 2017

Via: Email (john.vanvoorst@ontario.ca)

Mr. John VanVoorst
Senior Drainage Engineer
Drainage and Hydrology Engineering
Ministry of Transportation of Ontario
Building D, 159 Sir William Hearst Avenue
Toronto ON M3M 0B7

Dear Mr. VanVoorst:

Re: South Innisfil Creek Drain Improvements
Highway 400 Crossings
Project No.: 300038790.0000

On behalf of the Town of Innisfil (Town) and further to our correspondence of June 23, 2017 we provide the following update relative to the South Innisfil Creek Drain improvements and in particular the proposed replacement of the Highway 400 South Innisfil Creek Drain crossing with a structure of larger capacity at a lower invert elevation.

We have continued conversations and email communications with the Ministry's consultants. This has included further communications with Aecom Engineering in regard to the proposed stormwater management pond facility situated in the northwest quadrant of the Highway 400/ 89 intersection as well as determining the status of the final drainage report for the Highway 400 Improvements. We have also had communications with Morrison Hershfield relative to the interim design of the Highway 400/89 Intersection including a meeting with Morrison Hershfield and Town staff and the provision of background information including our Hydrology Model (for reference purposes only) for the watershed.

Our review of the original field survey completed by Dillion as well as 'as-built' information documents for the various structures and our own field survey undertaken earlier this year raised some concerns relative to the consistency of the information. We have recently completed additional field survey which has resolved those concerns and provided confirmation of the creek inverts, soffit elevations, centerline of road elevations, invert and obvert elevations for the culverts and structures situated at the 15th Line, Highway 89, 5th Sideroad, Highway 400, Reive Road, and 2nd Line. The information as confirmed is now consistent with the historic field information and the 'as-built' drawings.

With this additional effort we have been able to proceed to establish a grade line for the proposed South Inisfil Creek Drain Improvements. We have used the new Highway 89 structure as a starting point with a stream invert elevation of 222.0. We have extended the grades upstream and downstream from that point and have now established that the channel/stream invert at the Highway 400 crossing will be 222.66. This proposed grade is 0.5 below the grade proposed in the Dillion Report which had been previously circulated to the Ministry and the public.

It is noted that in the Dillion Report that the proposed grade line was below the existing culvert invert elevations on Highway 400 and would have required lowering of the stream invert. The additional half meter of depth in the channel at this point will allow a significant increase in channel capacity upstream of the crossing. The material to be removed from the channel downstream of the crossing will be part of the South Innisfil Creek Drain Improvements and continues to be minimal.

Please contact our office if you have any questions in this regard.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Senior Municipal Engineer
DMN:lw

cc: Jeremy Nyenhuis, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Jason Inwood, Town of Innisfil (Via: Email – jinwood@innisfil.ca)
Karen Cooper, Aecom (Via: Email – Karen.cooper@aecom.com)
Ram Dharamdid, Morrison Hershfield (Via: Email – rdharamdid@morrisonhershfield.com)

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28/07/2017 4:00 PM

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
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October 18, 2017

Via: Email (john.vanvoorst@ontario.ca)

Mr. John VanVoorst
Senior Drainage Engineer
Drainage and Hydrology Engineering
Ministry of Transportation of Ontario
Building D, 159 Sir William Hearst Avenue
Toronto ON M3M 0B7

Dear Mr. VanVoorst:

Re: South Innisfil Creek Drain Improvements
Highway 400 Crossings
Project No.: 300038790.0000

On behalf of the Town of Innisfil (Town) and further to our correspondence of June 23, 2017 and July 27, 2017, we submit the following request for an update with respect to the status of the Highway 400/Highway 89 interchange and in particular the inclusion of the Highway 400/South Innisfil Creek Drain crossing as part of that interchange project.

We believe it has been acknowledged that the Highway 400 South Innisfil Creek Drain crossing will need to be replaced as part of the overall Highway 400 improvements. We acknowledge that this came from a draft Drainage Report as prepared by Aecom Engineering for the Ministry of Transportation which identified this crossing as Culvert 44. We also believe the consensus has been that the crossing will require replacement to meet the design criteria for a 400 series highway. We request a copy of the final Aecom Drainage Report if same is available.

As previously noted, it is anticipated that if the Highway 400/South Innisfil Creek Drain crossings were replaced to meet the required MTO design criteria that there is potential that the existing culvert crossing Highway 400 which is on the original Branch A which became the Hnydczak Drain and is referenced as the Hnydczak Outlet Relief Drain in the Dillon Report could be eliminated as an overflow structure for flows coming to Highway 400 from the east. This crossing is referenced as Culvert 43 in the Aecom Drainage Report. It is likely that a small local drainage culvert would be required but that the culvert of significant size to accommodate the design criteria storm event from lands to the east may not be required.

As per our previous correspondence, we are working on the basis that a stream invert for the South Innisfil Creek Drain at Highway 400 of 222.66 can be achieved and we are proceeding with the design of the upstream channel on that basis.

It is also noted through previous correspondence that the downstream end of Branch A (Hnydczak Outlet Relief Drain) may need to be cleaned out to accommodate the stormwater management facility proposed for the intersection improvements. The Town would like confirmation on this matter as it may affect their 2018 budget, if it is required as part of the Highway 400/Highway 89 2018 construction project.

In summary, we submit the following:

- We request a copy of the final Drainage Report as prepared by Aecom relative to the Highway 400 improvements.
- We reiterate our request the Ministry consider moving the construction limits of the Highway 400/89 interchange project northerly so that the South Innisfil Creek Drain crossing is within those construction limits.
- We suggest that the hydrology/hydraulic analysis for the Highway 400 crossings consider the benefit of accommodating all of the flows reaching 400 from the east through the South Innisfil Creek crossing and therefore mitigating the culvert requirements at Culvert 43.
- We ask that the Town be provided with some confirmation with respect to the required cleanout of Branch A (Hnydczak Outlet Relief Drain) downstream of the proposed stormwater management facility.
- We confirm that we are proceeding with the design of the South Innisfil Creek Drain upstream of the Highway 400 crossing on the basis that an invert elevation of 222.66 can be achieved at the Highway 400 crossing.

If you have any questions in regard to the above, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Senior Municipal Engineer
DMcN:sj

cc: Jeremy Nyenhuis, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Jason Inwood, Town of Innisfil (Via: Email – jinwood@innisfil.ca)
Karen Cooper, Aecom (Via: Email – Karen.cooper@aecom.com)
Ramlakhan Dharamdial, Morrison Hershfield
(Via: Email – RDharamdial@morrisonhershfield.com)

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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December 8, 2017

Via: Email (projectteam@highway400improvements89to11.com)

Tim Sorochinsky, P.Eng.
Consultant Senior Project Manager
AECOM
4th Flooor, 30 Leek Crescent
Richmond Hill ON L4B 4N4

Tyler Drygas, B.A.A.
Consultant Senior Environmental Planner
AECOM
4th Floor, 30 Leek Crescent
Richmond Hill ON L4B 4N4

Robert Vandenberg, P.Eng.
Project Manager
Highway Engineering, York Simcoe
Ministry of Transportation, Central Region
159 Sir William Hearst Avenue, 4th Floor
Toronto ON M3M 0B7

Dear Project Team:

Re: South Innisfil Creek Drain Improvements
Notice of Transportation Environmental Study Report Addendum Submission
Comments Regarding the Replacement and Timing of Highway 400 Structures C44 and C43 Relative to the South Innisfil Creek Drain Section 78 Report
Project No.: 300038790.0000

We have reviewed the Notice of Transportation Environmental Study Report Addendum Submission for the Highway 400 Improvements from Hwy. 89 to Hwy. 11. This included a review of various support documents attached to the Addendum Submission. We provide the following comments specifically related to the replacement of Structure C44 (South Innisfil Creek Drain) and Structure C43 (Hnydczak Relief Drain).

R.J. Burnside & Associates Limited (Burnside) has been appointed by the Town of Innisfil to complete an Improvement Report for the South Innisfil Creek Drain and Branches under Section 78 of the Drainage Act. An investigation to consider improvements to the South Innisfil Creek Drain and Branches was originally ordered by the Ontario Drainage Referee in March of 2005. The process under the Drainage Act has been complex and over an extended period of time and was influenced by a subsequent Ontario Drainage Referee in 2006, followed by a latest Order from the Referee in 2014. Dillon Engineering was originally appointed to carryout this work and submitted a Final Report in August of 2013. Burnside has been appointed to reconsider certain aspects of the proposed work including the most recent Order from the Drainage Referee and to submit an amended Report under Section 78 of the Drainage Act.

We reference recent correspondence submitted in response to the Notice of Transportation Environmental Study Report Addendum submission from the Town of Innisfil dated December 7th, 2017. That correspondence provides an excellent description of the history of this project and recent discussions and correspondence between the Town, Burnside, Ministry of Transportation of Ontario and the Ministry's Consultants, AECOM relative to the Environmental Study and Morrision Hershfield with respect to the Hwy. 400/Hwy. 89 interchange project. We have also submitted formal correspondence to Mr. John Van Voorst, Senior Drainage Engineer, with the Ministry of Transportation of Ontario on June 23rd, 2017, July 27th, 2017 and October 18th, 2017 with respect to the South Innisfil Creek Drain Improvements and specifically the Hwy. 400 Crossings. Copies of the above noted correspondence including the recent correspondence from the Town of Innisfil is attached for your convenience.

Any improvements to the South Innisfil Creek Drain will have an impact on the Hwy. 400 Crossing (C44) on the South Innisfil Creek Drain and the Hwy. 400 Crossing (C43) on the Hnydczak Relief Drain.

The Final Engineer's Report prepared under Section 78 of the Drainage Act is scheduled to be submitted to the Town in the Spring of 2018. The report will require the replacement of the Hwy. 400 South Innisfil Creek Crossing at a lower invert elevation to facilitate improvements to upstream drainage. The required invert elevation of 222.66 was set out in the above noted correspondence.

It is noted that the background reports attached to the Notice of Transportation Environmental Study Report Addendum submission indicate that both the Hwy. 400/South Innisfil Creek Crossing (C44), as well as the Hwy. 400/Hnydczak Relief Drain Crossing (C43) will need to be replaced as part of the overall Hwy. 400 Improvement Project. As anticipated and as confirmed in meetings between MTO and the Town, any replacement of structures within the Hwy. 400 corridor will be undertaken and completed by the Ministry of Transportation and their consultants and contractors. It is also understood that the Hwy. 400 Improvement Project will be undertaken in various phases and contracts over the next 20 or more years, and consequently the issue of timing for the replacement of the Hwy. 400 South Innisfil Creek Crossing becomes of a significant concern relative to the South Innisfil Creek Drain Improvements We are aware that one of those phases, being the Interim Improvements to the Hwy. 400/Hwy. 89 interchange, is anticipated to be undertaken in the very near future and that the current north limit of construction for that interchange project falls just short of the South Innisfil Creek Crossing by a few metres.

As described in our previous correspondence to Mr. John Van Voorst, we believe that there could be significant advantages to both the Town of Innisfil, the upstream property owners affected by the South Innisfil Creek Drain, and the Ministry of Transportation Ontario if the South Innisfil Creek Drain Crossing could be included in the overall Hwy. 89 interchange project. As previously described in the above noted correspondence, the South Innisfil Creek Drain Crossing (C44) was replaced it may make the Hnydczak Relief Drain Crossing (C43) almost redundant. However, it is anticipated that without the placement of C44 that any replacement of C43 will have increased capacity to allow upstream design flows to be accommodated between the two crossings.

In summary, our comments to the Addendum submission are:

- That the South Innisfil Creek Drain Crossing (C44) will be replaced as part of the Hwy. 400 Improvements and needs to be installed at a lower invert elevation, this is to facilitate upstream improvements to the South Innisfil Creek Drain.
- The Final Engineer's Report is anticipated to be submitted in the Spring of 2018 and will require the replacement of that Crossing at a lower elevation.
- There would be significant benefits to all parties affected to address the South Innisfil Creek Drain Crossing in conjunction with the Hwy. 400/Hwy. 89 Interchange project both from a timing and financial perspective.

We look forward to some communications in this regard as the Ministry's anticipated schedule for the both crossing replacements will have a significant impact on how we address these crossings within the Final Engineer's Report.

If you have any questions in regard to the above, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Senior Municipal Engineer
DMcN:sj

cc: Jason Inwood, Operations, Town of Innisfil (Via: Email – jinwood@innisfil.ca)
Jeremy Nyenhuis, Operations, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Robert Vandenberg, Ministry of Transportation (Via: Email – Robert.vandenberg@ontairo.ca)
John Van Voorst, Ministry of Transportation (Via: Email – john.vanvoorst@ontario.ca)

Innisfil

OPERATIONS DEPARTMENT

December 7, 2017

Tim Sorochinsky, P. Eng.
Consultant Senior Project Manager
AECOM
4th Floor, 30 Leek Crescent
Richmond Hill, ON
L4B 4N4

Tyler Drygas, B.A.A.
Consultant Senior Environmental Planner
AECOM
4th Floor, 30 Leek Crescent
Richmond Hill, ON
L4B 4N4

Robert Vandenberg, P. Eng.
Project Manager
Highway Engineering, York Simcoe
Ministry of Transportation, Central Region
159 Sir William Hearst Avenue, 4th Floor
Toronto, ON
M3M 0B7

Dear Project Team,

Subject: Notice of Transportation Environmental Study Report Addendum Submission - Town of Innisfil Comments Regarding the Replacement and Timing of Highway 400 Structures C44 and C43 and the South Innisfil Creek Drain Section 78 Report

After review of the above Addendum Submission the Town of Innisfil would like to provide the following letter as history and comments to the replacement of Structure C44 (South Innisfil Creek Drain) and Structure C43 (Hnydczak Relief Drain).

South Innisfil Creek Drain Improvements – Section 78 Report

As you are aware the Town of Innisfil retained the services of R.J. Burnside and Associates Limited (Burnside) to complete an Improvement Report under Section 78 of the Drainage Act on the South Innisfil Creek Drain as ordered by the Ontario Drainage Referee in March 2005. This report is scheduled to be presented to Council in the spring of 2018. To date the Town of Innisfil and Burnside have been very transparent with the desire to work with the Ontario Ministry of Transportation (MTO) and their Consultants to design a solution for the Highway 400 crossing (C44) on the South Innisfil Creek Drain and Highway 400 crossing (C43) on the Hnydczak Relief Drain as the replacement of C44 will be required under the new Improvement Drainage Report.

The South Innisfil Creek Drain is a major municipal drain network comprising of 14.6 km of open drain and has a watershed area of 7,200 Ha (17,790 Ac). The main drain of the South Innisfil Creek Drain commences at the bridge crossing on Highway 89 (west of the 5th Sideroad) heading upstream in a north east direction underneath Highway 400 corridor to approximately the 3rd Line. The direction of the drain continues north to terminate at the 5th Line (west of the 10th Sideroad). The South Innisfil Creek Drain has 4 branch drains and 3 additional municipal drains flowing directly into the main drain upstream of the Highway 400 crossing (C44).

Transportation Environmental Study Report Addendum Submission Recommendations Affecting the South Innisfil Creek Drain Improvements

The South Innisfil Creek Drain runs under Highway 400 through Structure C44 which has been recommended to be replaced under this submission. Branch A of the South Innisfil Creek Drain or as commonly referred to as the Hnydczak Relief Drain runs under Highway 400 through Structure C43 which has also been recommended to be replaced under this submission.

Burnside Investigation

Early into Burnside's investigation, it was determined that additional grade downstream of the Highway 400 crossing (C44) could be used to help relieve the flooding issues that were experienced upstream in the garden market area as well as provide a lower grade upstream to help minimize the amount of agricultural land required to convey the design storm flows. The existing Highway crossing (C44) consists of two large perched high flow structures above grade and a smaller low flow culvert. This combined system currently is perched above the original design grade set back in 1954 and lacks the desired capacity to pass the design storm in their existing state.

Structure C43 was originally Branch A of the South Innisfil Creek Drain. In 1963, a report redirected flows north to Structure C44 for additional depth for the Hnydczak Drain. Now Structure C43 serves only as the relief drain crossing for the Hnydczak Drain. Therefore C43 can be resized accordingly for replacement. Representatives from Burnside have indicated to the MTO and their Consultants that there is a possibility for cost savings as Structure C43 could be replaced with a smaller structure as Structure C44 currently receives all flows from the Hnydczak Drain. However this is only possible if Structure C44 is sized accordingly and the works completed at the same time.

Aecom's Draft Drainage and Hydrology Report dated November 2016 outlined the works that would need to be completed before the widening and improvements of Highway 400. Structure C44 was flagged as being constructed over 70 years ago and that replacing the existing culverts with one concrete open footing culvert is recommended as the extension length would have a similar length to the existing structure. It was also recommended that because of this, a new replacement structure would pass under Reive Boulevard (Municipal Road) due to its close location and that coordination with the Town would be required in the detail design stage.

Discussions and Meetings with MTO Representative and Consultants to Date

After initial discussions with the MTO and Aecom, Burnside organized a meeting in March 2017 with members of the MTO and Aecom staff in hopes that all parties could work together in the design stage towards a solution of replacing the existing crossing (C44) at a lower elevation. This was good timing as the MTO and their Consultants were starting the interim design stage for the replacement of the Highway 89 interchange directly south of the South Innisfil Creek Drain crossing and the construction limits for the 2018 replacement would be within metres of the drain crossing.

The results of the draft Drainage and Hydrology Report were discussed at this March meeting and the Town was informed that a final report was in the works and should be completed in a few months. It was also the hope of the Town that from this meeting the MTO would look at the option of moving the construction limits of the Highway 89 interchange improvements north to include the replacement of both drain crossings and include this in their interim design to be completed within the 2018 construction. It was discussed in this meeting that the Town hopes to have this Section 78 Report to Council in the spring of 2018 and a key element of this improvement is the replacement of the Highway 400 crossing (C44) at a lower elevation.

In mid-June, talks between Morrison Hershfield Limited Senior Engineer Ram Dharamdail, the Town and Burnside began in regards to the interim design of the Highway 89 interchange design. On June 23, 2017 Burnside organized a meeting with members of the Morrison Hershfield (MTO Design Consultant) and the Town so that a collaborative approach on the interchange design and hopefully Highway crossing replacement would be achieved. As part of this meeting, Morrison Hershfield requested the draft hydrology report and supporting modelling from Burnside so that it could review and consider the replacement of the Highway 400 crossing. Subsequently Burnside did forward the model to Morrison Hershfield.

In July, the Town requested from the MTO and Aecom a copy of the Final Drainage and Hydrology Report to determine what the final report recommended to address Structure C44. Aecom staff indicated that the report was submitted to MTO however neither the MTO nor Aecom provided the final report to the Town or Burnside.

Additionally in July, Burnside provided a letter to the MTO and their Consultants that outlined the work that had been completed on the municipal drain project since their June letter. This letter also provided the design invert elevation for the C44 crossing replacement so that it could be used in the Ministry's interim design.

Town of Innisfil Requests and Comments

Recently the Town received the Notice of Transportation Environmental Study Report Addendum Submission for review of the Highway 400 Improvement Project. The submission confirms that the Highway 400 crossings labelled as C44 (South Innisfil Creek Drain Crossing) and C43 (Hnydczak Relief Drain Crossing) will need to be replaced as part of the Highway 400 Improvement Project. However there was no indication as to when this replacement would take place.

The Section 78 Report will be requiring structure C44 to be replaced at a lower elevation to accommodate the improvement to the drain and reduce annual flooding upstream. The Town strongly encourages the MTO to upgrade C44 to the specified elevation under an MTO contract in the short-term. It is up to the MTO if the proposed extensions be completed as part of the work now or if they be completed as part of the Highway 400 widening. The Town also understands that the replacement structure that is to be installed under the Highway will need to be mirrored upstream for the replacement structure of Reive Boulevard at the same time at the expense of the Town. Therefore coordination and possible collaboration are strongly encouraged.

The Town of Innisfil would also like to see some written communication and financial delegation to replace Structure C44 under the Highway 400 as part of Section 78 Drain Report or proactively as part of 2018 Highway 89 Interchange replacement work.

As indicated earlier in this letter, the Town of Innisfil plans to have the Section 78 Report in front of Council in the spring of 2018. As this deadline is quickly approaching the Town of Innisfil respectfully request a response from the Ministry regarding the history and comments outlined above.

We look forward to a response from the Ministry.

Yours truly,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent
705-436-3740 Ext. 4222
jnyenhuis@innisfil.ca

cc: Gord Wauchope, Mayor – Town of Innisfil
Jason Reynar, Chief Administrative Officer – Town of Innisfil
Karen Shea, Executive Assistant – CAO, Mayor & Council – Town of Innisfil
Jason Inwood, Strategic Leader – Operations – Town of Innisfil
Don McNalty, Senior Engineer – RJ Burnside & Associated Limited

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
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June 23, 2017

Via: Email (john.vanvoorst@ontario.ca)

Mr. John Van Voorst
Senior Drainage Engineer
Drainage and Hydrology Engineering
Ministry of Transportation of Ontario
Building D, 159 Sir William Hearst Avenue
Toronto ON M3M 0B7

Dear Mr. Van Voorst:

Re: South Innisfil Creek Drain Improvements
Highway 400 Crossings
Project No.: 300038790.0000

We are writing the following on behalf of the Town of Innisfil (Town) and further to our meeting a number of weeks ago in regard to the South Innsifil Creek Drain Improvements in relation to the Highway 400 Improvement Project. In addition, we have had recent correspondence and communications with Aecom Engineering, who we understand is finalizing the Environmental Assessment and Preliminary Design for the Highway 400 Improvements, as well as Morrison Hershfield, who we believe has been retained by the Ministry of Transportation (MTO) to carry out the final detailed design of the Highway 400/89 Interchange Project. We note that we have recently copied you on communications with Morrison Hershfield, and the Town has copied you on recent communications with Aecom Engineering.

As per the discussions at the meeting held at the Town office on March 27, 2017, Burnside has been appointed by the Town as Drainage Engineer under the Drainage Act to consider potential revisions to the Engineer's Report for the South Innisfil Creek Drain Improvements. Part of those considerations will be the proposed replacement of the Highway 400 South Innisfil Creek Drain Crossing with a structure of larger capacity at a lower invert elevation. Concurrently, it has been established through the preliminary engineering carried out on behalf of the MTO by Aecom, that the Highway 400 South Innisfil Creek Crossing needs to be replaced to meet the design criteria for the Highway 400 Improvement Project.

As noted above, we have had recent communications from Aecom Engineering in regard to the proposed Stormwater Management Pond Facility situated in the northwest quadrant of the Highway 400/89 intersection. The proposed pond requires a clean-out of the existing Branch A downstream of the MTO property, which discharges into the South Innisfil Creek Drain between Highway 400 and 5th Sideroad. It also requires a realignment of that Branch to accommodate the construction of the Stormwater Management Pond. A copy of the email communication between the Town and Aecom in this regard is attached for your convenience.

We have also had communications with Morrison Hershfield in regard to the hydrology/hydraulic analysis of the culvert crossings in this area. We believe principally this relates to the requirements for the relief flow channel, which outlets into Branch A and which has been previously described in the Dillion Engineer's Report as the Hyndczak Relief Drain. A copy of that email communication between Burnside and Morrison Hershfield is also attached for your convenience.

We confirm that the replacement of the Highway 400 Crossing Culverts on the South Innisfil Creek Drain with a larger structure at a lower invert elevation will be proposed/required in our final Engineer's Report, which is scheduled to be completed in the spring of 2018. We note that the design criteria for the Municipal Drain will be in the order of a 1:2 year Storm Event. Consequently, any hydraulic sizing of a crossing required by the Ministry to meet the design criteria for Highway 400 will significantly exceed the design criteria for the Municipal Drain.

It is acknowledged that currently the South Innisfil Creek Drain Crossing is not included within the Highway 400/89 Interchange Reconstruction Project scheduled for 2018. It is further acknowledged that to date, there is no anticipated schedule as to when that crossing would be replaced to meet the Ministry's scheduled phasing for the Highway 400 Improvements.

As per the email communications attached, it is noted however that, from a drainage perspective, it would be possible that the Hyndczak Relief Drain culverts situated within the Highway 89 Project would not be required to accept relief flows from upstream of the interchange if the South Innisfil Creek Drain Crossing was replaced concurrently with the Highway 400/89 Interchange Project. In that case, Branch A, being the discharge point for the Stormwater Management Facility, would only be required to accept drainage from the intersection watershed itself, with no flow coming in to the intersection from upstream. Further, it is anticipated that, for the Highway 400/89 Project to meet the design criteria for the passing of flows from upstream, the Hyndczak Relief Drain Culverts may actually have to be larger than the existing culverts to accommodate the total flows if the South Innisfil Creek Drain Crossings remain as they are. Please note that we make these comments for larger Storm Events from a Municipal Drain perspective. It is anticipated that the hydrology/hydraulic analysis for the Highway 400 Crossings would be carried out as part of the detailed design for Highway 400/89 Project.

As noted in our email communications with Morrison Hershfield, we have forwarded some information relative to the drainage catchment areas, as well as the Draft Memo which we discussed at the meeting at the Town office regarding the discrepancy in flows, particularly at the higher Storm Events, in the various models. We note that Morrisison Hershfield has asked the Town, through Burnside, to consider releasing the hydrologic model created by Burnside for the South Innisfil Creek Drain. This will be a matter for which we have further discussion with Morrison Hershfield.

We provide the above to provide an update to the MTO in regard to our involvement in this Project, and would undertake to continue to provide copies to you of any communications with Aecom or Morrison Hershfield in this regard.

Please contact our office if you have any questions in this regard

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Senior Municipal Engineer
DMN:jm

Enclosure(s) Email from Don McNalty (Burnside) Re: Hwy 400/89 Interchange/ South Innisfil Creek Drain, dated June 20, 2017 at 1:19 PM.
Email from Jeremy Nyenhuis (Innisfil) Re: Hwy 400/89 Interchange/ South Innisfil Creek Drain, dated June 20, 2017 at 4:14 PM.

cc: Robert Vandenburg, MTO (Via: Email – robert.vanderburg@ontario.ca)
Jeremy Nyenhuis, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Jason Inwood, Town of Innisfil (Via: Email – jinwood@innisfil.ca)

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23/06/2017 9:49 AM

Don McNalty

From: Don McNalty
Sent: Tuesday, June 20, 2017 1:19 PM
To: 'rdharamdial@morrisonhershfield.com'
Cc: 'Jason Inwood'; 'Jeremy Nyenhuis'; Tim Lozon; 'John.VanVoorst@ontario.ca'; Tom Pridham; Natalie Connell; 'Cooper, Karen'
Subject: RE: Hwy 400/89 Interchange/South Innisfil Creek Drain

I am resending this email as my intent was to cc Karen Cooper of Aecom and it was noted by Jeremy Nyenhuis that the cc to her was not included.

From: Don McNalty
Sent: Tuesday, June 20, 2017 11:18 AM
To: 'rdharamdial@morrisonhershfield.com'
Cc: Jason Inwood; 'Jeremy Nyenhuis'; Tim Lozon; 'John.VanVoorst@ontario.ca'; Tom Pridham; Natalie Connell
Subject: Hwy 400/89 Interchange/South Innisfil Creek Drain

Ram:

We appreciate the opportunity to have preliminary discussions with you during our telephone conversation and we look forward to the meeting arranged for Friday, June 23 on this matter.

As you requested we are attaching a copy of the overall Drainage Plan from the Dillon Engineer's report for the South Innisfil Creek Drain. This report was not adopted by a provisional By-Law and we are currently in the process of revising the design parameters for the drain, investigating a deepening of the drain to improve the capacity, taking advantage of the benefits to drainage created by the anticipated future replacement of the Hwy 400 crossings as well as a number of other features related to the Drain. It is anticipated that the revised Final Engineer's Report will be submitted in the spring of 2018 and it will be based on the replacement of the Hwy 400 crossings with a larger structure with a lower channel invert elevation. For clarity, the South Innisfil Creek crossing is immediately north of the current north limits of the Hwy 89/400 interchange project. We believe this was referenced as crossing No. 44 in the Aecom reports. As we discussed the timing for the replacement of the South Innisfil Creek crossings may have a significant impact on the requirements for the Hnydczak Relief Drain (as identified in the Dillon report and which is the same outlet identified as Branch A of the South Innisfil Creek Drain in the current By-Laws) which crosses Hwy 400 within the interchange (Crossing No. 43 in the Aecom report).
We have also enclosed a drainage catchment area plan created by our office.

We have also attached a **"draft"** technical memorandum dated March 2017 which we prepared to summarize the hydrologic modelling we had completed. This memorandum identifies some significant discrepancies in the flows used in the Aecom Drainage report which has relied on the regulatory flows adopted by the Conservation Authority compared to the modelling results determined by Dillon and Burnside as it related to the South Innisfil Creek Drain. This memorandum and the supporting documentation was forwarded to the Conservation Authority for review and comment. We have not received a response in this regard from the Conservation Authority to date. As we discussed the design criteria for the South Innisfil Creek Drain will be a lower storm return event in the order of a 1 in 2 year storm event whereas the Hwy 400 crossing will have a significantly greater criteria. As noted in the memorandum the modelling results were comparable for the lower storm events but were significantly different for the larger events. We reiterate that the memorandum was sent to the CA in draft for information and review but does not have any official status as we have not received any comments to date.

We also not that we have recently received information and questions from Karen Cooper of Aecom related to the proposed Storm Water Management faciltity for the intersection to be located in the north west quadrant of the intersection. The proposal would require a clean out and realignment of Branch A of the South Innisfil Creek Drain or what is referred to the Hyndczak Relief Drain in the Dillon report. We note that the determination of flows crossing Hwy 400 in this area, the ultimate proposal for the South Innisfil Creek Drain Improvements and the realignment and cleanout of Branch A are all very much inter-related. Although we are unaware of the division of responsibility between Aecom and Morrison Hershfield for the intersection design we believe it would be beneficial to have open communications amongst all parties. As a result we have copied Karen Cooper of Aecom on this email.

We will be providing comments to the Town of Innisfil with regard to the proposed Storm Water management facility and will suggest that you be copied on those comments

See you Friday
Don

Don McNalty

From: Jeremy Nyenhuis <jnyenhuis@innisfil.ca>
Sent: Tuesday, June 20, 2017 4:14 PM
To: Cooper, Karen
Cc: Van Voorst, John (MTO); rdharamdial@morrisonhershfield.com; Jason Inwood; Kristi Williams; Don McNalty
Subject: FW: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Good afternoon Karen,

As indicated in my past email, I forwarded your email regarding the above to Don McNalty from Burnside as he is the Drainage Engineer currently working on the Section 78 Report for the South Innisfil Creek Drain for the Town of Innisfil. The Municipal Drain that the proposed pond is outletting to is Branch A of that drain and is commonly referred to as the Hnydczak Relief Drain.

Attached below are his comments regarding your proposed design. As indicated in his email, we are also currently in discussions with Morrison Hershfield regarding the detailed design of the interchange. Mr. Ram Dharamdial, Senior Engineer from Morrison Hershfield has scheduled a meeting this Friday June 23 at 11:00 o'clock at the Town's Operations Centre (7253 Yonge Street, Innisfil). I think it would be greatly beneficial if you could attend that meeting.

If you have any additional questions, please do not hesitate to contact me.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Don McNalty [mailto:Don.McNalty@rjburnside.com]
Sent: June 20, 2017 11:15 AM
To: Jeremy Nyenhuis
Cc: Kristi Williams; Jason Inwood; Tim Lozon; Natalie Connell; Tom Pridham
Subject: RE: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Jeremy:

As we have discussed we have reviewed the email correspondence and attachments from Karen Cooper of Aecom regarding the proposed Storm Water management facilities for the new Hwy 400/89 interchange. As you know we have also had a telephone discussion with a representative of Morrison Hershfield who we believe has been retained by MTO to complete the detailed design for the intersection and there has been a meeting arranged for Friday June 23 to further discuss details with respect to the existing municipal drains that are in the vicinity of the intersection and the anticipated flows generated by the upstream catchment area. We are not sure of the division of responsibility between Aecom and

Morrison Hershfield for the intersection design but note that their current requests for comment and information are very much interrelated and we suggest open communications by all parties would be beneficial to the Hwy 400/89 interchange project as well as the pending South Innisfil Creek Drain Improvement project. We suggest that any response to Karen Cooper at Aecom be copied to Ram at Morrrison Hershfield as well as John VanVoorst at MTO. As you know we recently forwarded information to Morrison Hershfield and copied these parties.

We note that Branch A of the South Innisfil Creek Drain and what was referred to as the Hnydczak Relief Drain in the Dillon Engineer's report for the South Innisfil Creek Drain are the same channel. The Town would still have an obligation to maintain and repair Branch A under the current By-Law in accordance with the specifications in the original engineer's report. The current By-law also continues to give the Town the "right of access" to carry out that maintenance. It follows that a clean out of the existing drain downstream of the MTO property and proposed pond is possible. The difficulty would be determining how the cost of the maintenance would be distributed as it is anticipated that the original assessment schedule for Branch A is no longer appropriate as a result of the diversion of the flows in the Hnydczak Drain from this channel to flow north along the east side of Reive Blvd to discharge directly into the South Innisfil Creek Drain. In summary the physical cleanout is possible but the distribution of cost under the current By-law would not be appropriate. It is anticipated that Branch A will be incorporated into the engineer's report for the South Innisfil Creek Drain Improvements. Cleaning out Branch A with the Town or MTO absorbing the cost (so there was not attempt to distribute costs to upstream property owners) may be a consideration.

The realignment of Branch A would theoretically require a new engineer's report specific to the proposed realignment prior to implementation. This would of course take time to follow through the process required by the Drainage Act and would not fit with the schedule proposed by the MTO for the reconstruction of this interchange in 2018. The realignment could be addressed in the pending engineer's report for the South Innisfil Creek Drain which will not be completed for a number of months and it could be many month after the report before a final By-law is passed to authorize the construction of the realigned channel. It is noted that the channel is only a relief flow outlet for upstream runoff as the flows have been diverted many years ago to flow north to the Souh Innisfil Creek Drain along the east side of Reive Blvd as described above. Consequently the proposed realignment would have minimal physical detrimental effect to the drainage in the area and it is really he administrative details of the Drainage Act and the cost distribution that need to be addressed. The Town may consider allowing the Ministry to undertake the physical realignment at their cost with the opportunity to review and accept the final design details and with the anticipation that the engineer's report will incorporate the realigned channel after the fact. This of course comes with the acknowledgement that this contravenes the intent of the Drainage Act with respect to changes to a Drain.

As we have discussed an a number of occasions we note that from a municipal drain perspective, if the South Innisfil Creek crossing of Hwy 400 (at crossing No. 44 in Aecom reports) was replaced with a larger structure at a lower invert elevation, it is possible that Branch A (Hyndczak Relief Drain) would no longer be required as a relief flow outlet. Consequently Branch A would only need to accept the flow from the Hwy 400/89 intersection with virtually no flows from upstream being outlet through the intersection (culvert No. 43 in Aecom reports). Reive Blvd could become the drainage boundary between flows in Branch A and flows to the South Innisfil Creek Drain. In this case we suggest that the portion of Branch A situated within the intersection and on MTO property (the pond site) could be abandoned allowing the Ministry to undertake the realignment of the channel without any report under the Drainage Act. Branch A downstream of the MTO property should remain and be part of the engineer's report for the South Innisfil Creek Drain Improvements. However, such a proposal is time sensitive and depends on the phasing for the Hwy 400 crossing replacements in this area. Until such time that the South Innisfil Creek Crossing is replaced the relief flow culverts discharging to Branch A must remain in place. It may be determined through the hydrology/hydraulic analysis for the design criteria storm event through the Hwy 400 right of way that the relief flow culverts would have to be even larger than they currently are. It is noted that from a Municipal Drain perspective the design criteria will be a relatively small storm event compared to the design criteria required for the Hwy crossings.

In summary we believe that phasing of the 2 crossings can be significant. We anticipate that if culvert crossing No.44 (South Innisfil Creek) was done first (or concurrently) that culvert crossing No.43 (Branch A) could be almost eliminated for upstream flows but if the phasing occurs the other way that the culvert crossing No.43 may need to be even larger

than currently exist while still not reducing the need to replace the culvert No. 44 crossing. Of course all of this would need to be analyzed through detailed modelling by the Ministry's consultants for the design criteria storm events which must be accommodated by Hwy 400 in this area.

The only other minor comment is it appears from the drawing provided by Aecom that some of the intersection drainage from the southeast quadrant is being brought through the intersection to ultimately discharge into Branch A whereas this area outlet into another crossing of Hwy 400 south of the intersection previously. We believe this is proposed so the runoff can be treated in the same facility. This will require some adjustment to the catchment area for the south Innisfil Creek Drain.

Please call if you have any questions in regard to the above

Don

Don McNalty, P.Eng | R.J. Burnside & Associates Limited | www.rjburnside.com
Senior Engineer | Office: 800-265-9662 Direct: 705-797-4262

From: Jeremy Nyenhuis [mailto:jnyenhuis@innisfil.ca]
Sent: Monday, June 05, 2017 2:45 PM
To: Don McNalty; Jason Inwood
Cc: Kristi Williams
Subject: FW: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Don,

I hope all is well.

Last week we received the below correspondence from Karen Cooper from the MTO. They are looking at designing a dry pond for stormwater captured by the new HWY 89 interchange. They are proposing a clean-out of Branch A (of the South Innisfil Drain Branches Report completed in 1956) in order to facility the proposed design. However they are designing the outlet elevation of the pond to the proposed grades in Dillon's 2014 report.

From Karen's design sketch it looks like they are hoping to relocate the branch drain around the north side of the dry pond on their property as part of the proposed work. I know this will require a new engineers report.

I did digging and in 1958 a report by W.G. McGeorge was completed on the Hnydczak Drain from the east side of HWY 400 to the 10th Sideroad. In 1963 a report by P.W. Ainley by-passed the HWY crossings and took flows to the north to gain grade. The Branch A drain was never abandoned in this process.

Is Branch A still going to be completed as part of the new report?

Could you please provide some comments that I can forward back to Karen. Maybe include the process that the MTO will need to follow to make this relocation possible under the Act.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Cooper, Karen [mailto:karen.cooper@aecom.com]
Sent: June 1, 2017 2:17 PM
To: Jeremy Nyenhuis
Cc: Carolina Cautillo; Meredith Goodwin; Ristic, Serge; Dai, Jenny; Sorochinsky, Tim; Vandenberg, Robert (MTO); Sieradzki, Susan (MTO); Van Voorst, John (MTO); Drygas, Tyler; Schmied, Sarah
Subject: 06-20016 - Hwy 400 - Hwy 89 to Hwy 11 - Proposed Dry Pond North of Hwy 89

Jeremy,

Please find attached a sketch illustrating the preferred alternative for the configuration of a proposed dry pond in the vicinity of the Highway 89 interchange. This dry pond would provide storage for Highway 400 and interchange run-off.

In association with construction of this improvement, AECOM notes that outletting to the adjacent municipal drain would require drain clean out for positive drainage. A profile drawing of the municipal drain is included with the sketch.

Please provide your comments on this proposed design.

If you have any questions, please do not hesitate to contact me.

Regards,
Karen

Karen Cooper, P.Eng., AVS
Project Manager, Transportation Planning & Design, DCS Americas
D +1-905-747-1854
M +1-416-816-4151
karen.cooper@aecom.com

AECOM
30 Leek Crescent
4th Floor
Richmond Hill, ON L4B 4N4, Canada
T +1-905-882-4401
aecom.com

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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July 27, 2017

Via: Email (john.vanvoorst@ontario.ca)

Mr. John VanVoorst
Senior Drainage Engineer
Drainage and Hydrology Engineering
Ministry of Transportation of Ontario
Building D, 159 Sir William Hearst Avenue
Toronto ON M3M 0B7

Dear Mr. VanVoorst:

Re: South Innisfil Creek Drain Improvements
Highway 400 Crossings
Project No.: 300038790.0000

On behalf of the Town of Innisfil (Town) and further to our correspondence of June 23, 2017 we provide the following update relative to the South Innisfil Creek Drain improvements and in particular the proposed replacement of the Highway 400 South Innisfil Creek Drain crossing with a structure of larger capacity at a lower invert elevation.

We have continued conversations and email communications with the Ministry's consultants. This has included further communications with Aecom Engineering in regard to the proposed stormwater management pond facility situated in the northwest quadrant of the Highway 400/ 89 intersection as well as determining the status of the final drainage report for the Highway 400 Improvements. We have also had communications with Morrison Hershfield relative to the interim design of the Highway 400/89 Intersection including a meeting with Morrison Hershfield and Town staff and the provision of background information including our Hydrology Model (for reference purposes only) for the watershed.

Our review of the original field survey completed by Dillion as well as 'as-built' information documents for the various structures and our own field survey undertaken earlier this year raised some concerns relative to the consistency of the information. We have recently completed additional field survey which has resolved those concerns and provided confirmation of the creek inverts, soffit elevations, centerline of road elevations, invert and obvert elevations for the culverts and structures situated at the 15th Line, Highway 89, 5th Sideroad, Highway 400, Reive Road, and 2nd Line. The information as confirmed is now consistent with the historic field information and the 'as-built' drawings.

With this additional effort we have been able to proceed to establish a grade line for the proposed South Inisfil Creek Drain Improvements. We have used the new Highway 89 structure as a starting point with a stream invert elevation of 222.0. We have extended the grades upstream and downstream from that point and have now established that the channel/stream invert at the Highway 400 crossing will be 222.66. This proposed grade is 0.5 below the grade proposed in the Dillion Report which had been previously circulated to the Ministry and the public.

It is noted that in the Dillion Report that the proposed grade line was below the existing culvert invert elevations on Highway 400 and would have required lowering of the stream invert. The additional half meter of depth in the channel at this point will allow a significant increase in channel capacity upstream of the crossing. The material to be removed from the channel downstream of the crossing will be part of the South Innisfil Creek Drain Improvements and continues to be minimal.

Please contact our office if you have any questions in this regard.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty

Don McNalty, P.Eng.
Senior Municipal Engineer
DMN:lw

cc: Jeremy Nyenhuis, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Jason Inwood, Town of Innisfil (Via: Email – jinwood@innisfil.ca)
Karen Cooper, Aecom (Via: Email – Karen.cooper@aecom.com)
Ram Dharamdid, Morrison Hershfield (Via: Email – rdharamdid@morrisonhershfield.com)

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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October 18, 2017

Via: Email (john.vanvoorst@ontario.ca)

Mr. John VanVoorst
Senior Drainage Engineer
Drainage and Hydrology Engineering
Ministry of Transportation of Ontario
Building D, 159 Sir William Hearst Avenue
Toronto ON M3M 0B7

Dear Mr. VanVoorst:

Re: South Innisfil Creek Drain Improvements
Highway 400 Crossings
Project No.: 300038790.0000

On behalf of the Town of Innisfil (Town) and further to our correspondence of June 23, 2017 and July 27, 2017, we submit the following request for an update with respect to the status of the Highway 400/Highway 89 interchange and in particular the inclusion of the Highway 400/South Innisfil Creek Drain crossing as part of that interchange project.

We believe it has been acknowledged that the Highway 400 South Innisfil Creek Drain crossing will need to be replaced as part of the overall Highway 400 improvements. We acknowledge that this came from a draft Drainage Report as prepared by Aecom Engineering for the Ministry of Transportation which identified this crossing as Culvert 44. We also believe the consensus has been that the crossing will require replacement to meet the design criteria for a 400 series highway. We request a copy of the final Aecom Drainage Report if same is available.

As previously noted, it is anticipated that if the Highway 400/South Innisfil Creek Drain crossings were replaced to meet the required MTO design criteria that there is potential that the existing culvert crossing Highway 400 which is on the original Branch A which became the Hnydczak Drain and is referenced as the Hnydczak Outlet Relief Drain in the Dillon Report could be eliminated as an overflow structure for flows coming to Highway 400 from the east. This crossing is referenced as Culvert 43 in the Aecom Drainage Report. It is likely that a small local drainage culvert would be required but that the culvert of significant size to accommodate the design criteria storm event from lands to the east may not be required.

As per our previous correspondence, we are working on the basis that a stream invert for the South Innisfil Creek Drain at Highway 400 of 222.66 can be achieved and we are proceeding with the design of the upstream channel on that basis.

It is also noted through previous correspondence that the downstream end of Branch A (Hnydczak Outlet Relief Drain) may need to be cleaned out to accommodate the stormwater management facility proposed for the intersection improvements. The Town would like confirmation on this matter as it may affect their 2018 budget, if it is required as part of the Highway 400/Highway 89 2018 construction project.

In summary, we submit the following:

- We request a copy of the final Drainage Report as prepared by Aecom relative to the Highway 400 improvements.
- We reiterate our request the Ministry consider moving the construction limits of the Highway 400/89 interchange project northerly so that the South Innisfil Creek Drain crossing is within those construction limits.
- We suggest that the hydrology/hydraulic analysis for the Highway 400 crossings consider the benefit of accommodating all of the flows reaching 400 from the east through the South Innisfil Creek crossing and therefore mitigating the culvert requirements at Culvert 43.
- We ask that the Town be provided with some confirmation with respect to the required cleanout of Branch A (Hnydczak Outlet Relief Drain) downstream of the proposed stormwater management facility.
- We confirm that we are proceeding with the design of the South Innisfil Creek Drain upstream of the Highway 400 crossing on the basis that an invert elevation of 222.66 can be achieved at the Highway 400 crossing.

If you have any questions in regard to the above, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don M Nalty

Don McNalty, P.Eng.
Senior Municipal Engineer
DMcN:sj

cc: Jeremy Nyenhuis, Town of Innisfil (Via: Email – jnyenhuis@innisfil.ca)
Jason Inwood, Town of Innisfil (Via: Email – jinwood@innisfil.ca)
Karen Cooper, Aecom (Via: Email – Karen.cooper@aecom.com)
Ramlakhan Dharamdial, Morrison Hershfield
(Via: Email – RDharamdial@morrisonhershfield.com)

Innisfil

OPERATIONS DEPARTMENT

January 18, 2018

Robert Vandenberg, P. Eng.
Project Manager
Highway Engineering, York Simcoe
Ministry of Transportation, Central Region
159 Sir William Hearst Avenue, 4th Floor
Toronto, ON
M3M 0B7

Dear Mr. Vandenberg,

Subject: Notice of Transportation Environmental Study Report Addendum Submission - Town of Innisfil Comments Regarding the Replacement and Timing of Highway 400 Structures C44 and C43 and the South Innisfil Creek Drain Section 78 Report

The Town of Innisfil is in receipt of your email correspondence of December 8, 2017 as it relates to the Town's request to complete the replacement of the South Innisfil Creek Drain (C44) in collaboration with the MTO. Please note that we are very disappointed with the Ministry's stance on this matter as we have been trying to be proactive and inclusive with the Ministry with these and future works. The Town and Burnside have reached out to MTO staff and their consultants numerous times throughout 2017 regarding working collaboratively together on this project and will continue to do so moving forward.

For clarification the Town is still requesting written communication and financial delegation to replace Structure C44 under the Highway 400 as part of Section 78 Drain Report or proactively as part of 2018 Highway 89 Interchange replacement work which has not yet been received.

The Ministry of Transportation, through their consultants, have recommended multiple times the required replacement of C44 and C43 (Branch A of the South Innisfil Creek Drain - Hnydczak Relief Drain) and is currently in the process of a design to do work directly south of this location.

The Town fails to see the reasoning as to why the MTO is not working collaboratively with the Town of Innisfil and thus supporting to misuse tax payers' dollars when we are both working towards a solution to address a known issue. If the MTO is wanting the Town to complete the process of a Section 78 Report under the Drainage Act prior to wanting any involvement with the project, then the Town will do so.

The Town through Burnside will continue to send the MTO information relating to the South Innisfil Creek Drain Improvements around the Highway 400 crossing. This will allow the Ministry to respond or provide comments as the process is completed, if they decide to change their stance outlined in the email, and collaborate with the process.

With that being said, the Town of Innisfil's Drainage Superintendent would also like to be and requesting as part of this correspondence to be included in the design process around the Highway 89 Interchange replacement project. As discussions earlier this year indicated that the MTO would be requiring some maintenance and possible relocation of the Branch A of the South Innisfil Creek Drain (Hnydczak Relief Drain).

The Drainage Act speaks specifically to the maintenance procedure (Section 74), the relocation of a municipal drain (Section 78), the subsequent connection of land (Section 65(3) & Section 65(5)) and the abandonment of a municipal drain (Section 84). As processes under these sections of the Drainage Act can take time, it would be in the best interest of the MTO to cooperate with the Town of Innisfil so that work on the interchange is not delayed.

The MTO is reminded that Branch A of the South Innisfil Creek Drain (Hnydczak Relief Drain) including its crossings under the Highway 400 and its off ramps are protected under Municipal By-law under the Drainage Act. Section 82 of the Drainage Act give the Town of Innisfil the authority to take legal action against any person who damages a Municipal Drain.

The Town will continue to request the cooperation of MTO through this process as we strongly believe it will be a great benefit for all parties involved if we can work together on both the South Innisfil Creek Drain Improvements, the Highway 89 Interchange replacement project and the overall Highway 400 Improvements.

Lastly, for your information the Town of Innisfil has requested a Municipal Delegation with Mrs. Kathryn McGarry, Minister of Transportation to discuss the South Innisfil Creek Drain Improvement and the Highway 400 Improvements, more specifically the Highway 400 crossing replacement at the OGRA conference in February. The Town also requested for the Minister of Agriculture, Food and Rural Affairs, or a representative from OMAFRA, be present at this delegation as an expert to speak to the Drainage Act. It is the Town's hope that the Minister will detect the strong need to work collaboratively towards a solution and possibly give written confirmation and financial delegation to replace Structure C44 under the Highway 400 under an MTO contract in the short-term.

Yours truly,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent
705-436-3740 Ext. 4222
jnyenhuis@innisfil.ca

cc: Gord Wauchope, Mayor – Town of Innisfil
Jason Reynar, Chief Administrative Officer – Town of Innisfil
Karen Shea, Executive Assistant – CAO, Mayor & Council – Town of Innisfil
Lee Parkin, Manager of Legal & Clerk Services – Town of Innisfil

Jason Inwood, Strategic Leader – Operations – Town of Innisfil
Don McNalty, Senior Engineer – RJ Burnside & Associated Limited
Sid Vander Veen, Drainage Coordinator – OMAFRA
John Van Voorst, Senior Drainage Engineer – Ministry of Transportation
Susan Sieradzki, Ministry of Transportation
Tim Sorochinsky, Manager, Planning and Preliminary Design – Aecom
Karen Cooper, Project Manager – Aecom
Sarah Schmied, Environmental Planner – Aecom

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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November 19, 2018

Via: Email – jnyenhuis@innisfil.ca

Jeremy Nyenhuis, P.Eng.
Drainage Superintendent
Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

Dear Jeremy:

Re: South Innisfil Creek Drain and Branches Improvements
Morrison Hershfield Stormwater Management Report Review, Culvert 44
Project No.: 300038790.0000

Further to our email correspondence of November 19, 2018 in which we provided our comments based on our general review of the Morrison Hershfield (MH) Report, Tim Lozon of our office has completed a more detailed technical review of the MH report. Tim Lozon is our water resource engineer who completed the hydrologic and hydraulic modelling of the South Innisfil Creek Drain (SICD) and authored the Hydrology Report and Draft Hydraulic Report for the Drain.

The emphasis of our technical review of the report was to review the flows determined by MH for Culvert 44 (South Innisfil Creek Drain Crossing of HWY 400) and to provide any information that would support our findings.

We have formalized our general review comments sent previously by email as noted above and incorporated our technical review comments as follows:

1. **Project Intent**

   It is clear from the report that the intent is not to replace the Hwy 400 centre-line culverts until the Ultimate Design Phase but rather culvert extensions and headwalls will be constructed as part of the Interim Design Phase.

2. **Drain/Crossing Elevation**

   We have clearly identified in past meetings and correspondence (meeting on March 27, 2018, letter dated June 23, 2017 which enclosed previous emails circulated on June 20, 2017, letter dated June 27, 2017, and letter dated October 18, 2017) that the proposed work on the South Innisfil Creek Drain (SICD) will lower the grade at the Culvert 44 site.

The inverts of the existing Culvert 44 (A, B and C) are in fact perched above the existing drain bottom as established by the current By-Law. Although acknowledged that the MTO/MH principle concern relates to the hydraulic capacity of the culverts relative to the anticipated flows, the lowering of the SICD profile and the invert elevation of the Hwy 400 crossing is the most significant criteria for the SICD Improvement.

3. **Ultimate Design**

Although it is acknowledged that MH design is to address the Interim Phase for the Hwy 400/89 intersection, the report indicates that requirements for the Ultimate Design for this intersection will be addressed. As previously highlighted in our correspondence to the MTO and MH, the future replacement of Culvert 43 with a crossing of similar size to the existing could be avoided if the size of Culvert 44 is sufficient to accommodate the upstream flows from the SICD and Hnydczak Drain catchment areas.

4. **MH Design Approach**

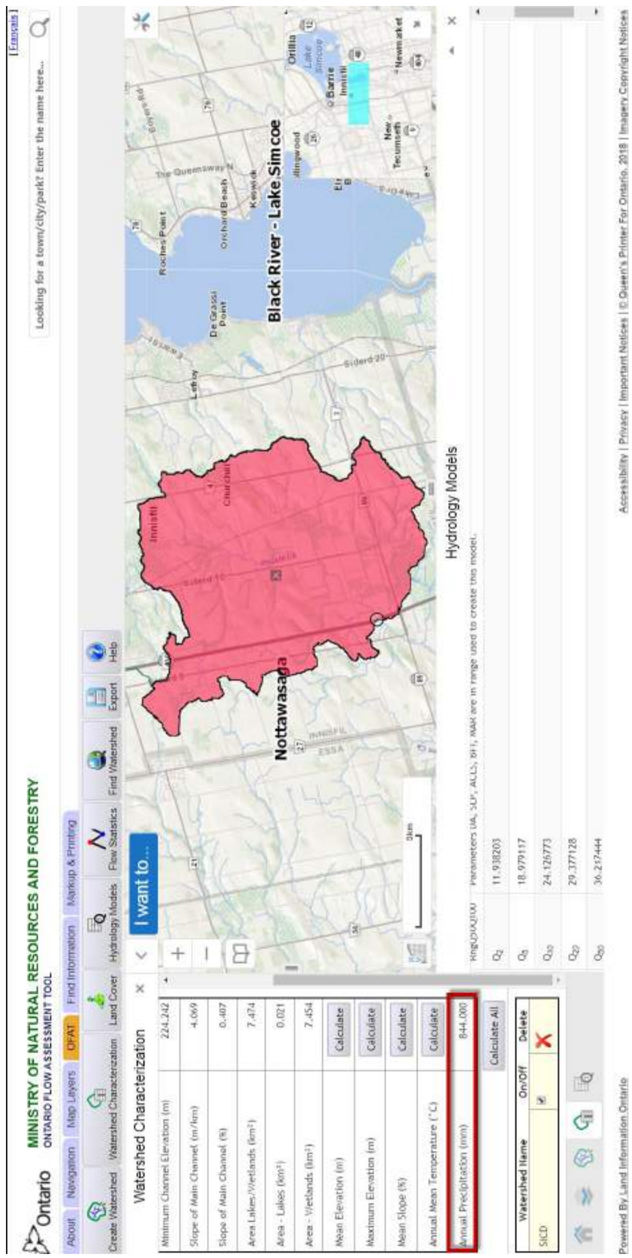
Morrison Hershfield (MH) has used a series of regression analysis to calculate flows to Culvert 44. Specifically, MH has used the following methods as outlined in Table 19 (p.37 or the report, p.43 of the pdf).

- AECOM Report 2017, with climate Change
- Index Flood Method
- Modified Index Flood Method (MIF)
- Unified Index Flood Method (UIFM)

Based on the findings of the report, the Unified Index Flood Method produced the highest 100-year peak flow rate of 34.41 m^3/s. Flows from the NE Ditch were added to this value to produce a 100-year cumulative peak flow of 38.94 m^3/s. We note that only the regression analysis was completed for this watershed and not deterministic modelling (SWMHYMO). Based on historical spring freshet flows (discussed further later in this letter), we believe that the 100-year peak flows calculated to Culvert 44 are low and do not reflect field conditions.

5. **Application of Climate Change Factors**

The report states that the flows for the various structures account for Climate Change over the anticipated 75-year service life of the infrastructure. However, impacts of climate change have not been considered by the regression analytics for Culvert 44. The Unified Index Flood Method uses an Annual Precipitation Amount of 844 mm as outlined in the Ontario Flow Assessment Tool (OFAT). A screen shot of the OFAT tool for the SICD has been shown below:



6. **Design Criteria/Flows**

From our general review we would note that the design criteria set out in the report requires that the HWY 400 crossings must have 1.0 metre of freeboard (from high water level to the road surface) and that the Check flow (1.3 times the calculated flow) would not reach the edge of pavement. Subsequent information in the report suggests that the free board at Culvert 44 would be 1.9 metres. We note the existing cover over the culverts is less than 1.9 metres which would mean the culverts are not surcharged under the MH 100 yr design flow conditions based on the MH analysis

Based on a 100-year cumulative peak flow of 38.94 m³/s, we have been able to confirm that the Highway 400 crossings would have sufficient freeboard. The screen shot below illustrates the Burnside HEC-RAS model of the Highway 400 crossings with the MH 100-year UIFM peak flow:

While our hydraulic results slightly differ from the MH numbers, based on a MH flow of 38.94 m³/s, we agree that Highway 400 Crossings would not surcharge. However, based on pictorial evidence of spring freshets and major storm events which would be anticipated to be less than the 100 yr design flow, Burnside believes that the MH 100-year peak flows are low and do not represent field conditions. This will be further expanded on below.

7. Regulatory Flood Consideration

It is noted (and also stated in the MH report) that for watercourses with a catchment area over 125 ha that the Regulatory Flows are to be calculated to determine if there would be any increase in Regulatory Flood levels compared to existing conditions. Although it is anticipated that there will not be a change in the Hwy 400 road profile elevation for the Interim Phase, the future road profile of the final design is not known. We would note that previous works completed on Hwy 400 to construct a continuous centre barrier between the southbound and northbound lanes should be investigated with respect to the potential impact on Regulatory Flood Levels in anticipation that the Ministry intends to maintain the current continuous barrier.

Under section 4.8.1 the MH report (p.32 of the report, p.39 of the pdf), MH acknowledges that they have reviewed the existing NVCA floodplain mapping and have knowledge of flooding issues east of Highway 400 and north of Highway 89. The following is a direct quote from (p.33 of the report, p.40 of the pdf).

“It should be noted that NVCA does not recommend that their floodplain mapping be used to establish floodplain limits as they recognize the need for a revision of their hydraulic model. Hence, no consideration was given to the extent of the Regional flooding.”

It is standard NVCA requirement to determine the impacts of roadway crossings in the Regional Event. The NVCA would require consideration of the Regional Event to be a requirement as the drainage area of the SICD is over 125 ha.

8. Drainage Area

The MH report states that the drainage area contributing to Culvert 44 from the SICD is 6130.43 ha, as well as 763.94 ha from the Hnydczak Drain. Our determined total catchment area for Culvert 44 is 7720 ha. The MH report used the OFAT tool to calculate a total drainage area to Culvert 44. This drainage area has been calculated at 6130 ha. Further, this drainage area does not include the drainage area from the Hnydczak Drain. Burnside has calculated a drainage area of 6290.78 ha or approximately 2.6% larger without the Hnydczak Drain. Therefore, on this basis, the drainage areas are similar.

The design of the SICD completed by Burnside has assumed that the full extent of the 1430.10 ha Hnydczak Drain is conveyed to the upstream inlet of the Culvert 44. This assumption is valid in the 2-year event as the drain flows would be contained within the drain itself. The total 2-year drainage area as outlined in the Burnside report to the inlet of Culvert 44 is 7720.88 ha. We note that the southerly area contributing to the SICD through the Hnydczak Drain, some of which is in the Town of West Gwillimbury, is not included in the MH drainage area. From field work completed by Burnside and the Town, it has been confirmed that the additional area must be included.

The MW report has completed an analysis on the NE ditch and have determined that peak flows up to and including the 25-year event would be contained within the ditch without flows being conveyed west through culvert 43. This analysis confirms that Culvert 43 would act as a relief culvert for major system flow conveyance. We note that the MH 100-year peak flow within the NE ditch to Culvert 43 is 5.71 m^3/s as outlined in Table 13. The cumulative flows for Culvert 44 as outlined in Table 21 indicates the MH has accounted for 4.53 m^3/s or 79% of the flows within the NE to be conveyed to the inlet of Culvert 44 whereby producing a total calculated 100-yr peak flow of 38.94 m^3/s to Culvert 44. We agree with the approach as presented. However, as noted previously, Burnside believes that the 100-year peak flows do not represent field conditions.

It is unclear how MH has completed the split flow hydraulics between Culvert 43 and Culvert 44 in major system events. We would respectfully request MH to provide justification supporting the split flow hydraulics between Culvert 43 and Culvert 44 in major system events.

9. **Circulation of Final Hydrology Report**

We note that MH has relied on Burnside's draft produced in 2017. The final report was forwarded to the MTO on May 17, 2018, and again on July 12, 2018. We also forwarded our hydrologic model to MH along with our draft report in 2017. We would suggest that the statement made in the MH report that "details of hydrology for the flows were not available" is not accurate.

10. **Subsequent Connection of Drainage**

The proposed drainage plan redirects drainage from the southwest quadrant of the intersection from flowing westerly along the south side of Hwy 89 to northerly across Hwy 89 (in proposed culvert 21) to outlet through Branch A into the SICD upstream of the 5th Sideroad. If the Town was not in the midst of preparing a new report under Section 78 of the Drainage Act, we believe that the proposed diversion of flows would have required a report under section 65(3) for the "Subsequent Connection to Drainage works". Cooperation of efforts between the MTO and the Town would allow this to be resolved under the Section 78 report.

11. **2-year Peak Flows**

Burnside notes the calculated 2-yr peak flows in the MH report generally are consistent with the findings within the Burnside Hydrology report.

12. **5th Sideroad and the Spring 2008 Historical Flooding Event**

Burnside was retained by the County of Simcoe in 2008 to complete a design to replace the 5th Sideroad Bridge. The bridge was replaced in 2010. The replacement structure was designed with a larger span than existing conditions. A detailed hydrologic analysis was not completed for this design, rather the NVCA McLaren flows were used. The bridge was designed in accordance with the MTO B-100 directive for rural roads with spans larger than 6 m. Accordingly, the 25-year peak flow was used for design. For reference the 25-year McLaren flows at this location are 12.8 m^3/s while the 100-year McLaren flows are 17.3 m^3/s. The McLaren flows are less than the flows proposed by Morrison Hershfield; however, the NVCA acknowledges that the Maclaren flows do not represent field conditions within the South Innisfil Creek Drain.

Burnside notes the following with regards to the peak flows observed in 2008 at the 5th Sideroad bridge.

We have witnessed and documented a peak runoff event during the spring of 2008. The table shown below provides a few photos taken at that time along with the rainfall depths and assumed depths of snow based on the Egbert and Barrie rainfall gages. As noted, there was some snowmelt at that time followed by 14 mm – 24 mm of rain. Based on light snow pack, thawing temperatures and rainfall, we would anticipate flows to be elevated during this time within the drain.

300038790 South Innisfil Creek Drain
Photo - Rainfall Event Comparison

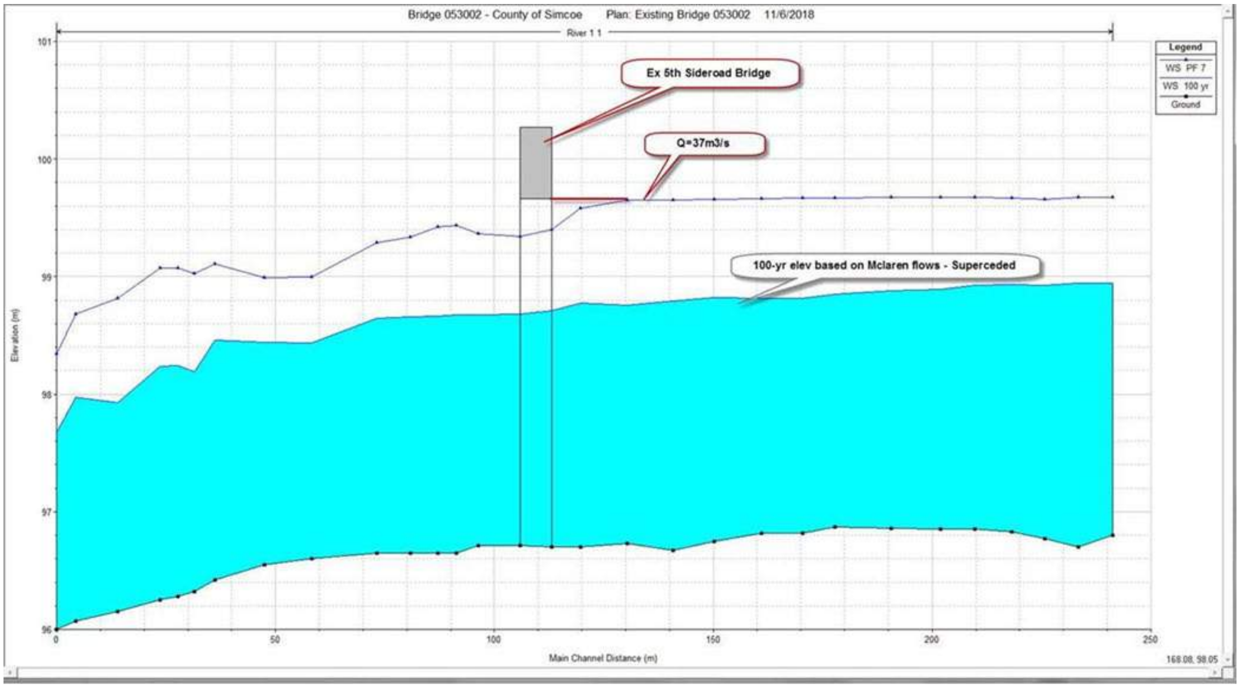
October, 2[illegible]

Photo Date	Station	Possible Rainfall Event Date	Rainfall (mm)	Notes	Photo(s)	Link
Spring 2008 (April 3-4, 2008)	611E001 (Egbert CS)	2008-Mar-31	8.1	- 190mm of snowmelt March 31-April 3 '-14mm of rainfall March 31-April 1	 	http://climate.weather.gc.ca/climate_data/daily_data_e.html?hlyRange=2000-08-18%7C2017-09-28&dlyRange=2000-08-17%7C2017-09-28&mlyRange=2003-10-01%7C2006-12-01&StationID=27604&Prov=ON&urlExtension=_e.html&searchType=stnProx&optLimit=yearRange&StartYear=2007&EndYear=2011&selRowPerPage=25&Line=1&txtRadius=25&optProxType=custom&selCity=&selPark=&txtCentralLatDeg=44&txtCentralLatMin=12&txtCentralLatSec=28&txtCentralLongDeg=79&txtCentralLongMin=39&txtCentralLongSec=28&timeframe=2&Day=1&Year=2008&Month=3
	6110557 (Barrie WPCC)	2008-Mar-31	24.0	- 24mm of rain March 31 - snowmelt data inconsistent		http://climate.weather.gc.ca/climate_data/daily_data_e.html?hlyRange=%7C&dlyRange=1968-05-01%7C2009-06-28&mlyRange=1968-01-01%7C2006-12-01&StationID=4408&Prov=ON&urlExtension=_e.html&searchType=stnProx&optLimit=specDate&Month=3&Day=1&StartYear=2007&EndYear=2011&Year=2008&selRowPerPage=25&Line=2&txtRadius=25&optProxType=navLink&selCity=&selPark=&txtCentralLatDeg=44&txtCentralLatMin=12&txtCentralLatSec=28&txtCentralLongDeg=79&txtCentralLongMin=39&txtCentralLongSec=28&txtLatDecDeg=44.2333333333333&txtLongDecDeg=79.7833333333333&timeframe=2

The photo below was taken at the upstream limits of the 5th Sideroad bridge on April 2, 2008 during the spring freshet flow event. This photo was taken prior to the replacement that was completed in 2010.

The existing bridge was an 8.90 m clear span bridge and was replaced with a 13.5 m clear span bridge in 2010. Roadway elevation increases resulted in a larger span bridge at that time to ensure there was no net impact on water surface elevations upstream of the bridge. At a clear span of 13.5 m, the bridge located at the 5th Sideroad has more capacity than the current triple cell Highway No 400 crossings.

The screen shot below shows the “existing conditions” HEC-RAS model completed for the existing 5th Sideroad bridge prior to replacement based on the span of 8.90 m.



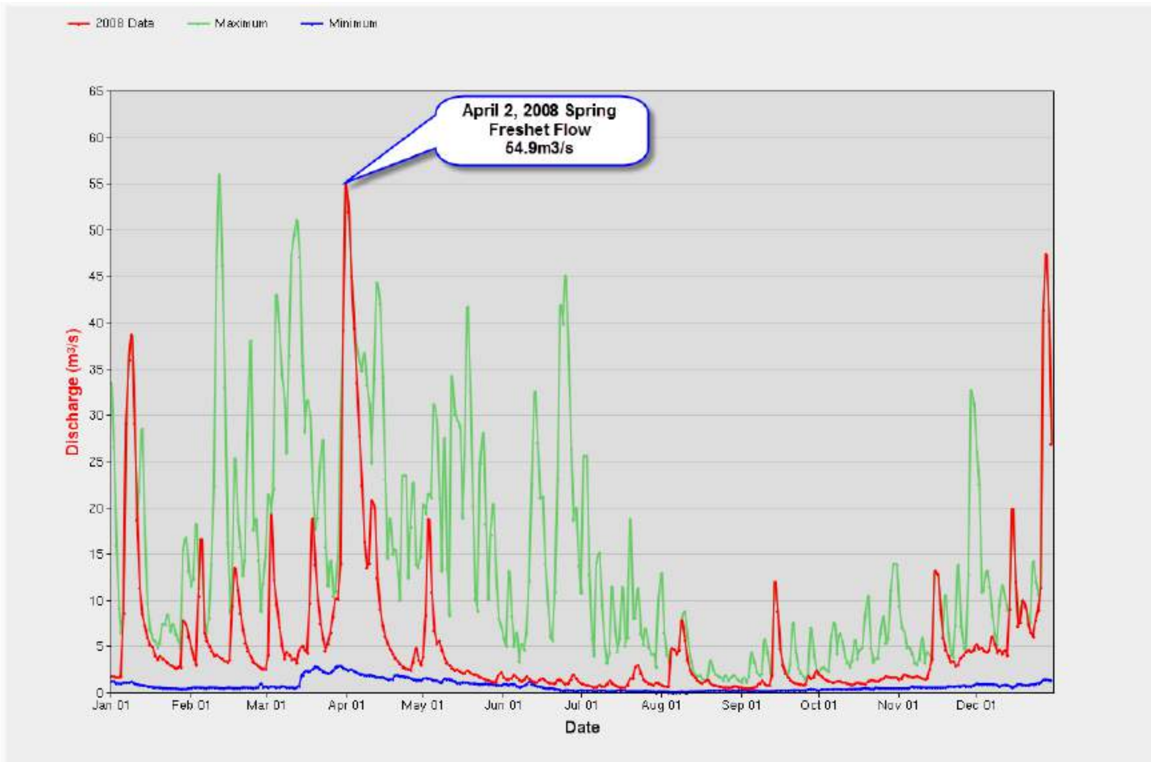
As the spring 2008 flows overtopped the banks of the SICD, Burnside completed an iterative hydraulic analysis at the 5th Sideroad Bridge where by increasing the flows in the HEC-RAS model to produce head water elevations at the upstream side of the bridge to reflect field conditions as witnessed by the photo as noted above. Through this analysis we have determined that an approximate peak flow of 37 m^3/s would have touched the soffit of the bridge as shown above. This flow was witnessed in the field during a spring freshet event and not the 100-year event.

This iterated spring freshet peak flow of 37 m^3/s is similar to the 100-year flow of 38.94 m^3/s as outlined in the Morrison Hershfield report. Burnside would not expect a spring freshet flow to produce similar flow magnitudes to a 100-year event. Burnside would expect the 100-year peak flow to be in order of magnitudes higher than a spring freshet flow.

We would respectfully request MH to provide justification supporting the accuracy of the calculated 100-year peak flows as the drain has seen this peak flow in the past outside of a peak rainfall event.

13. Innisfil Creek Near Alliston (02ED029) Hydrometric Data

The screen shot below illustrates the 2008 recorded daily flow data for the Innisfil Creek Near Alliston (02ED029) Flow Gage as referenced from the wateroffice.ec.gc.ca website.

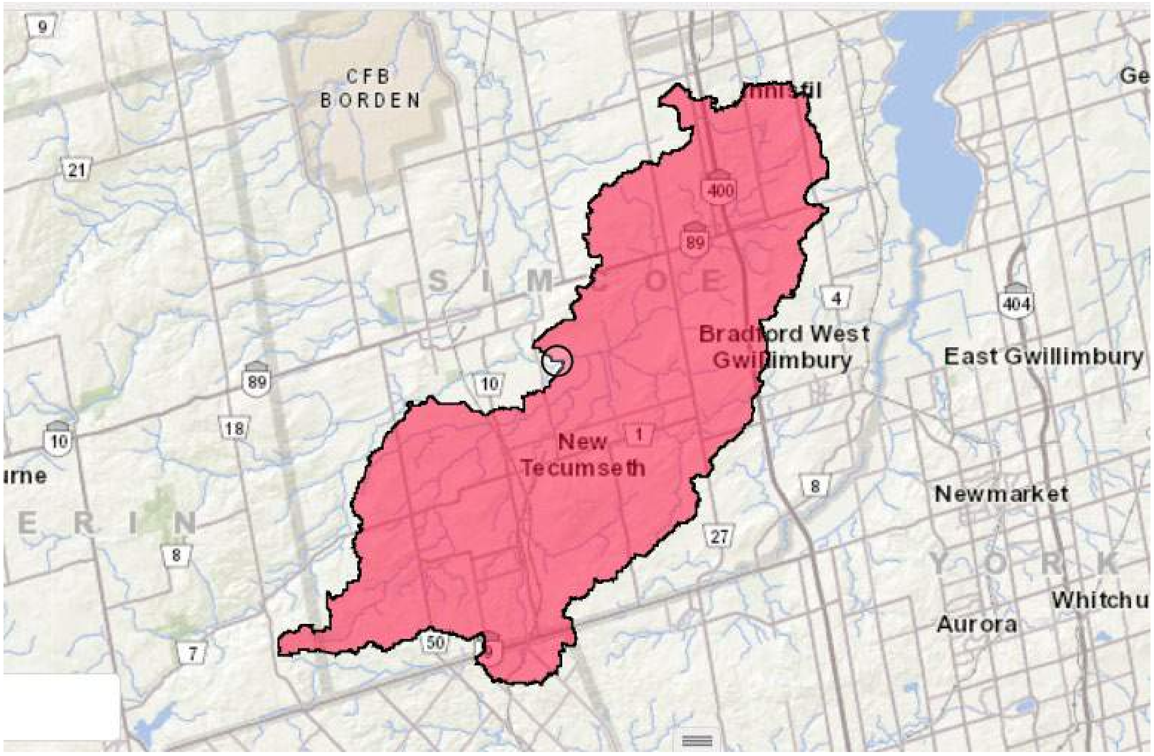


The recorded peak flow at the Innisfil Creek Near Alliston (02ED029) Flow Gage on April 2, 2008 was recorded at 54.9 m³/s. Using the OFAT tool, Burnside has reviewed the Hydrologic Characteristics of the Innisfil Creek drainage area contributing flows to the 02ED029) Flow Gage as outlined below:

Innisfil Creek Near Alliston (02ED029) -

Drainage Area characteristics by the MTO OFAT tool:

Drainage Area (km²)	478.054
Shape Factor ()	4.943
Length of Main Channel (km)	48.611
Maximum Channel Elevation (m)	426.716
Minimum Channel Elevation (m)	207.896
Slope of Main Channel (m/km)	4.501
Slope of Main Channel (%)	0.450
Area Lakes/Wetlands (km²)	34.663
Area - Lakes (km²)	0.944
Area - Wetlands (km²)	33.718
Mean Elevation (m)	257.847
Maximum Elevation (m)	427.358
Mean Slope (%)	3.628
Annual Mean Temperature (°C)	7.014
Annual Precipitation (mm)	828.000



The table below summarizes the Primary Multiple Regression Analysis and Index Flood Method hydrologic modelling results from OFAT site for the Innisfil Creek Near Alliston (02ED029) Flow Gage:

Flow	Regression Analysis Procedure	
	Primary Multiple Regression (Moin & Shaw 1985)	Index Flood Method with EPA (Moin & Shaw 1985)
	Results (m^3/s)	Results (m^3/s)
Q_2	78.66	73.33
Q_5	119.79	96.58
Q_{10}	147.79	119.75
Q_{20}	177.06	144.24
Q_{50}	211.37	175.99
Q_{100}	241.29	202.9

The recorded peak flow at the Innisfil Creek Near Alliston (02ED029) Flow Gage on April 2, 2008 was recorded at 54.9 m^3/s. Based on the Primary Multiple Regression Analysis and Index Flood Method, the 2-year peak flows are summarized at 78.66 m^3/s and 73.33 m^3/s. This would imply that the April 2, 2008 peak flow was under a 2-year flow event.

We would again respectfully request MH to provide justification supporting the accuracy of the calculated 100-year peak flows to Culvert 44, as the recorded peak flows at the Innisfil Creek Near Alliston (02ED029) Flow Gage and flows witnessed in the field at the 5th sideroad bridge on April 2, 2008 do not support the calculated 100-year peak flows as being presented in the MH report.

14. **Highway 89 Glass Bridge**

Burnside has reviewed the Highway 89 (Glass Bridge) drawings issued October 21, 2014. We note that the replacement structure is a 25 m clear span bridge. The hydraulic capacity of this bridge would be in excess of the capacity of the existing Highway 400 crossings. To date, although requested, Burnside has not received supporting hydraulic or hydrologic modelling for this bridge.

We would respectfully request MH to provide justification supporting the statements in support of the existing Highway 400 crossings meeting the 100-year conveyance requirements as the two downstream structures have been replaced between 2010 and current day with larger structures than the existing Highway 400 crossings.

If you have any questions regarding the above comments, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
DMcN:sj

Tim Lozon, P.Eng.
Water Resources Engineer

Enclosure(s) None

cc: Jason Inwood, Town of Innisfil, (Via: Email - jinwood@innisfil.ca)
Natalie Connell, Burnside, (Via: Email – natalie.connell@rjburnside.com)
Jeff Dickson, Burnside, (Via: Email – jeff.dickson@rjburnside.com)

Innisfil

OPERATIONS DEPARTMENT

November 23, 2018

John Van Voorst
Senior Drainage Engineer
Planning and Design – Central Region
Ministry of Transportation
5th Floor, Building D
1201 Wilson Avenue
Downsview, ON
M3M 1J8

James Scale
Senior Project Manager, Transportation
Department Manager, Roads and Highways
Morrison Hershfield
Suite 175
1005 Skyview Drive
Burlington, ON
L7P 5B1

Dear Mr. Van Voorst and Mr. Scale,

Subject: Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement – Town of Innisfil Comments

As per our meeting of August 30th, 2018, the Ministry of Transportation (MTO) indicated that they would forward the Stormwater Management Report for the Highway 400 and Highway 89 Interchange project to the Town of Innisfil (Town) for review and comment. On November 2, 2018 the Town received a copy of the *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement* dated October 30, 2018 authored by Morrison Hershfield.

As indicated at the August meeting and again in subsequent communication, the Town is still in dismay that the proposed design includes details and plans for work on the Highway 400 crossings C44 (South Innisfil Creek Drain (SICD) crossings) as the Town has been told numerous times by MTO staff that no work would be completed on these crossings under this interchange project. More so because the Town has tried on many occasions to work with the MTO and their consultants on the design and replacement of this structure as recommended to be replaced by MTO consultants in 2017 and will be required to be replaced and lowered under the new Section 78 Engineer's Report for the SICD that is estimated to be in front of Council in early 2019. Any work performed under this interchange project on structure C44 will be required to be removed with the new Section 78 Engineer's Report and will result in wasted design time and tax payers' dollars that could have been used for the design and replacement of the crossing.

On August 20th, 2018, the Town was informed by Teepu Khawja, Regional Director – Central Region, Provincial Highways Management Division, Ministry of Transportation, at a delegation at the Association of Municipalities of Ontario (AMO) Conference that the South Innisfil Creek Drain crossings under Highway 400 would not be included in the interchange work and that the construction limits for this project ended 30 metres south of the crossings. The Town received the same information at a delegation with the then-Minister of Transportation, Kathryn McGarry and Teepu Khawja, at the Ontario Good Roads Association (OGRA) Conference on February 26th, 2018.

The Town would like to respectfully request that the proposed design of the interchange not include any work on crossing C44, unless it is for the replacement with a larger structure at a lower elevation as recommended by MTO consultants and will be required by the Section 78 report under the *Drainage Act*. Any work on or over the existing structures at this point in time would be viewed by tax payers as a waste of tax payers' money.

As you are aware, R.J. Burnside & Associates Limited (Burnside) have been appointed under *the Drainage Act* by the Town to prepare an engineer's report under Section 78 for the South Innisfil Creek Drain Improvements. As part of the drain improvements, Burnside has spent a considerable amount of time and money modelling the drain and all its crossings and have, to date, completed a Hydrology Report and a draft Hydraulic Report. As this work at the interchange now effects the SICD and one of its major crossings, the Town has requested Burnside to also review and comment on the Morrison Hershfield's *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement*, specifically a technical review around structure C44. The Town has received Burnside's technical review and will forward with their own comments.

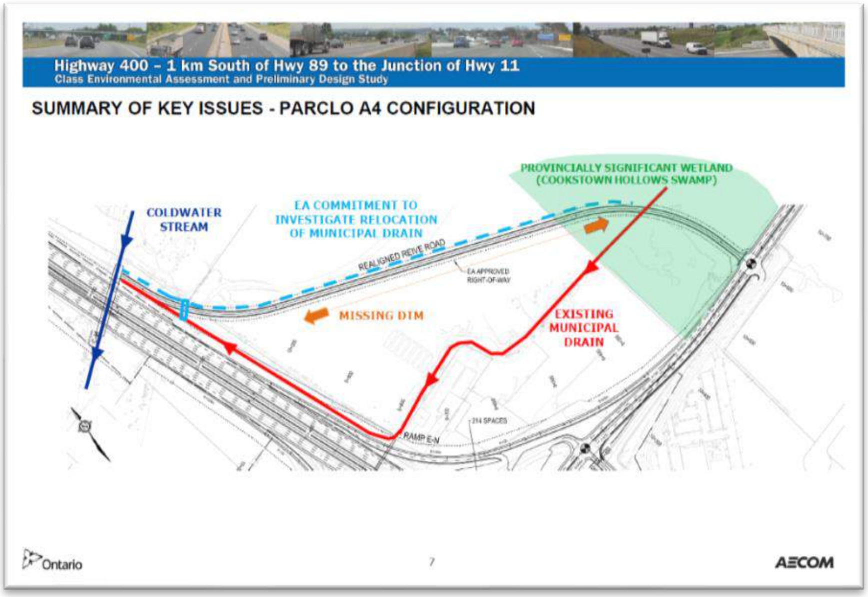
It should be emphasized in the *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement* that the ultimate outlet for this project is Innisfil Creek which, at this location, is a Municipal Drain governed under By-law by the Town. Accordingly, the creek shall be treated as a municipal drain. As indicated in previous correspondence, any modifications, subsequent connections or subsequent disconnections to the municipal drain will need to be address and approved by Council under the processes outlined in *the Drainage Act.*

The Ultimate Proposed Highway 400 Reconstruction

The *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement* does not take the ultimate proposed Highway 400 Improvements into account as stated multiple times with the document. There is a major flaw when it comes to the design flows calculated to bypass through structure C44, more specifically the flows that will be coming in upstream of the structures from the relocation of the Hnydczak Drain.

The MTO have indicated that the overall Highway 400 Improvements plans includes the realignment of Reive Boulevard and the Hnydczak Drain. Therefore, larger design flows from the Hnydczak Drain will not be able to pass through the existing relief structure (C43) as stated in the *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement*.

As shown in the figure below, MTO consultant Aecom, made a presentation to the Town, City of Barrie and County of Simcoe in November 2016, regarding the Highway 400 Improvements and the Highway 400 and Highway 89 Interchange. Within this presentation, Aecom revealed the proposed location for the realignment of Reive Boulevard and indicated that the Hnydczak Drain will be realigned on the east side of the proposed location.



With the proposed realignments, the existing relief structure C43 should not be used as a relief structure for structure C44 for design storms greater than the 25-yr as this structure will no longer be receiving any flows from the Hnydczak Drain after the ultimate Highway 400 Improvements are completed. This puts in question the reliance on Highway 400 crossing C43 for relief/overflow flows and the need to increase the capacity of structure C44.

Design Flows for Structure C44

As indicated in the *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement*, the current flows calculated for structure C44 shown in Table 21 for the 2-yr design storm is 14.52 m^3/s. In the May 2018 Hydrology Report authored by Burnside, the 2-yr design storm was calculated and calibrated to be 13.64 m^3/s. These design storms are within 94% of each other. However, this is where the similarities stop.

Table 21 indicated that Morrison Hershfield's 10-yr, 50-yr and 100-yr design flows are 26.35 m^3/s, 35.20 m^3/s and 38.94 m^3/s respectively. The corresponding design storms calculated by Burnside were 39.41 m^3/s, 77.70 m^3/s and 93.92 m^3/s, respectively. This means that the 100-yr design flow that is required to pass through structure C44 shown in the Morrison Hershfield report is equivalent to the 10-yr design flow calculated by Burnside.

Morrison Hershfield listed in the background documents, Burnside's Draft Hydrology Report dated March 2017 which they have relied on for their Drainage and Hydrology Report. As requested at a meeting on June 23, 2017, Burnside forwarded their hydrologic model to Morrison Hershfield along with their draft report in 2017. Burnside submitted/provided the final Hydrology Report on May 17, 2018 and again on July 12, 2018 to the MTO and Morrison Hershfield. Therefore, the Town suggests that the statement made in the Morrison Hershfield report that "details of hydrology for the flows were not available" is not accurate.

Design Criteria

The design criteria specified in the Morrison Hershfield's report suggest that for Highway 400 (arterial road), it is a requirement to have 1.0 m of freeboard (from high water level to the road surface) for each crossing. It further specifies that the Check Flow (1.3 times the calculated flow) shall not exceed the elevation of the edge of the travelled lane. Subsequent information in the report suggests that the freeboard at structure C44 will be 1.9 m. As seen in the photo taken below of the Highway 400 crossing C44, we note the existing cover over the Highway culverts making up C44 is less than 1.9 m which would mean the culverts are not surcharged under the 100-yr design flow conditions. Based on pictorial evidence of spring freshets and major storm events which would be anticipated to be less than the 100-yr design flow, it is reinforced that the 100-yr design flow may be low.

MTO Consultants Recommended Replacement Structure C44

Aecom's *Drainage and hydrology report, preliminary design highway 400 – 1km south of highway 89 to the Junction of Highway* 11 dated July 2017 recommended the replacement of structure C44 with a 12 metre span, 2.8 metre rise, 106 metre long concrete box structure with the inverts of downstream 223.70m and upstream 224.00m. The MTO and their consultants have repeatedly been informed by Burnside - in July 2017, October 2017, and December 2017 - that the new design of the SICD will require the downstream inlet of the new structure to be a minimum of 222.66m. The Town has also indicated repeatedly that the structures under Reive Boulevard will also be required to be replaced with a structure similar to the Highway crossing. These requirement is why there has been such a push from the Town to work collaboratively with the MTO and their consultants on this project.

Structure C44 Design Watershed

The watershed or total drainage area in Table 3 of the Morrison Hershfield Report, will need to be adjusted for structure C43 and C44. The total drainage area for structure C43 is currently 770.03 ha in the report and should be corrected to 1,430 ha. A detailed field investigation was completed by Burnside and the Town in the spring of 2018 and it has been confirmed that the additional area from the Town of Bradford West Gwillimbury must be included in the watershed. These lands are included within the *Hnydczak Drain Report* dated January 24, 1990 authored by J.K. Young. The total drainage area for structure C44 is currently 6,130.43 ha in the report and should be corrected to 7,720 ha as this is the watershed delineated in the SICD upstream of the Highway crossings.

Morrison Hershfield Data

It should be noted that in Morrison Hershfield's *Drainage and Hydrology Report – Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement*, Table 1 represents the site inspections completed by Morrison Hershfield staff. It indicates that there were only minor flows through the low-flow crossing of structure C44. We believe this is an input error as there is constantly a deep, base flow through the low-flow crossing.

Outlined in the table below is information taken from Table 2: Existing Culvert Data from Morrison Hershfield Report for the upstream and downstream inverts of the three-barrel crossing for structure C44.

Morrison Hershfield – Table 2 Existing Culvert Data					
Structure	**Upstream Invert (m)**	**Downstream Invert (m)**	**Length (m)**	**Culvert Slope (%)**	**Culvert Fall (m)**
C44A	224.524	224.338	42.23	0.44	0.186
C44B	224.526	224.339	42.24	0.44	0.187
C44C	223.550	224.153	60.69	-0.99	-0.603

Below is the Burnside survey information on the same structures that can be found in the Appendix I of the *Engineer's Report for South Innisfil Creek Drain – 2018 Improvement- Draft* dated August 3, 2018.

Burnside Survey Information					
Structure	**Upstream Invert (m)**	**Downstream Invert (m)**	**Length (m)**	**Culvert Slope (%)**	**Culvert Fall (m)**
C44A	224.50	224.25	42.1	0.59	0.25
C44B	224.28	224.44	42.2	-0.38	-0.16
C44C	223.38	223.73	60.4	-0.58	-0.35

The Town noticed the large discrepancy in the survey information resulting in the culverts slope and fall and is recommending that this information be double checked by Morrison Hershfield as changes to the inverts of the crossings comprising of structure C44 would result in different results with the hydraulics calculations.

Proposed Drainage Plan and the *Drainage Act*

The proposed drainage plan redirects drainage flows from the southeast and southwest quadrants of the interchange from flowing westerly along the south side of Highway 89 to northerly across Highway 89 under the proposed new overpass (in proposed Culvert 21) to outlet through Branch A, which outlets into the SICD upstream of the 5 Sideroad.

The proposed drainage plan will also redirect the drainage from Branch A (the Hnydczak 'A' Drain Outlet) to the north along the west side of the proposed new location of the off-ramp. This is due to the condition of Branch A which is referred to as poorly graded in the Morrison Hershfield report.

If the Town was not in the midst of preparing a new engineer's report under Section 78 of the *Drainage Act*, we believe that the proposed diversion of flows north under Highway 89 would have required a report under Section 65(3) for the "Subsequent Connection to Drainage works". Cooperation of efforts between the MTO and the Town would allow this to be resolved under the Section 78 report however a formal request under Section 65 of the *Drainage Act* will be required.

It should be noted that the *Section 78 South Innisfil Creek Drainage Improvement report* that Burnside will be filing with the Town and bringing to Council in the new year will include works to the Branch A as request by Aecom, in the summer 2017, during discussions around the proposed stormwater management pond in the northwest quadrant. Therefore, the proposed redirection of all flows along the west side of Highway 400 to the SICD are not required as these lands currently have a municipal drain outlet that will be improved as requested. Ditching to the north, as proposed, would be considered a subsequent disconnection to drainage works. The MTO will be required to go through Section 65 of *the Drainage Act*, for the "Subsequent Disconnection from Drainage Works". As stated in Section 65(5) of *the Drainage Act*, "No person shall connect to or disconnect from a drainage works without the approval of council of the municipality." This proposed diversion of flows away from its drainage works will require the approval from Town Council and required a report under the *Drainage Act*.

Recent Replacement Structures Downstream of Highway 400 Crossing

Directly downstream of the Highway 400 crossing C44, bridges on 5 Sideroad (County of Simcoe) and Highway 89 (MTO) have recently been replaced. Below are photos taken of the new structures on 5 sideroad (Left) and Highway 89 (Right).

The 5 Sideroad structure was increased to a 13.50 m clear span structure. While, Highway 89 structure was increased to a 25 m clear span structure. As both structures would have been designed for flows less than the 100-yr event, one could assume that the span for the replacement structure for structure C44 would be much larger.

Clarification on the South Innisfil Creek Drain Improvements Report

It should further be noted that the *South Innisfil Creek Drain and Branches Report* prepared by Dillon Consulting on March 2013 was never adopted by the Town. Updated information on the municipal drain including watershed details were updated in the South Innisfil Creek Drain Improvements Hydrology Report authored by Burnside in May 2017.

Conclusion

In conclusion, the Town of Innisfil would like to make the following comments to the Drainage and Hydrology Report dated November 2018 authored by Morrison Hershfield.

1. The Town has been consistently informed by Ministry of Transportations staff in past correspondence and at two delegations that the Highway 400 crossings C44 were not going to be included as part of the interchange improvements and that the project's construction limits stopped 30 metres south of the South Innisfil Creek Drain crossings.

2. The Town would recommend that no work be completed on or above the existing Highway 400 crossing C44 unless it is the replacement of this structure as work on or over the existing structure at this point in time would be an inappropriate use of tax payers' money.

3. The Town would recommend the need for Morrison Hershfield to recalculate the design storm flows and reassess performance of the existing Highway 400 crossing C44, as the Town feels that the design storms are severely undersized.

4. The Town would recommend that the MTO and their consultants follow provisions outlined under *the Drainage Act* for the subsequent connection and subsequent disconnection of land to a municipal drain if this is their intentions.

5. The Town would like to indicate that A Drain of the South Innisfil Creek Drain will be maintained as requested under the Section 78 report to provide outlet for the proposed SWM facility in the northwest quadrant of the interchange, thus resulting in no need for creating a ditch along the west side of the new offramp.

The Town of Innisfil would still like to work collaboratively with the Ministry of Transportation and their consultants on the design and construction of a new crossing to accommodate the South Innisfil Creek Drain Improvements and the Highway 400 Improvements. The Town believes that now that the construction limits have shifted to the north to include work on the Highway 400 crossing C44, now is the perfect time to work together on a final solution that will benefit both Highway 400 and the South Innisfil Creek Drain Improvements.

Yours truly,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent
705-436-3740 Ext. 4222
jnyenhuis@innisfil.ca

cc: Robert Vandenberg, Project Engineer – MTO
Teepu Khawja, Regional Director – Central Region – MTO
Jason Reynar, Chief Administrative Officer – Town of Innisfil
Karen Shea, Executive Assistant – CAO, Mayor & Council – Town of Innisfil
Jason Inwood, Strategic Leader – Operations – Town of Innisfil
Jessica Jenkins, Capital Engineering Leader – Town of Innisfil
Carolina Cautillo, Project Manager, Roads, Traffic & Transportation – Town of Innisfil
Magdalena Koehler, Capital Project Manager – Town of Innisfil
Don McNalty, Senior Engineer – Burnside
Jeff Dickson, Project Engineer – Burnside
Tim Lozon, Water Resource Engineer – Burnside

Ministry of Transportation/Town of Innisfil

Agenda

Date and Time: Friday, November 30, 2018 at 10:00 a.m.

Project Name: South Innisfil Creek Drain - Highway 400 Crossing (MTO Culvert 44)

Meeting Subject: Technical/Coordination Meeting

Meeting Location: MTO Office

Items

1. Welcome/Introductions

2. MTO/Morrison Hershfield – Highway 89/400 Interchange (10 min)
   - Project Scope
   - Current Status/Schedule

3. Town/Burnside – South Innisfil Creek Drain (SICD) (10 min)
   - Background
   - Proposed Improvements
   - Documents Submitted
   - Current Status/Schedule

4. Burnside – SICD/HWY 400 Crossing – Culvert 44 (10 min)
   - Invert Elevation
   - Hydrology
   - Town/Burnside Comments

5. Open discussion regarding hydrology for Culvert 44 (20 min)

6. MTO/MH – Additional information required from Town/Burnside (10 min)

7. Recap/Next Steps/Action Items

8. Adjournment

BURNSIDE   Ontario MINISTRY OF TRANSPORTATION   Innisfil

South Innisfil Creek Drain
Highway 400 Crossing C44 Replacement
MTO Technical Meeting Minutes

Minutes

DATE: November 30, 2018 **TIME:** 10:00 am to 11:50 am

LOCATION: Ministry of Transportation
159 Sir William Hearst Avenue, Executive Boardroom

ATTENDANCE:

Teepu Khawja (MTO)
Jason White (MTO)
Bob Stephenson (MTO)
John Van Voorst (MTO)
John MacKinnon (MTO)
Robert Vandenberg (MTO)
Don McNalty (RJB)
Tim Lozon (RJB)
Jeff Dickson (RJB)
Jason Inwood (TOI)
Jeremy Nyenhuis (TOI)
Rebecca Timm (TOI)

Items:	Notes:
1. Welcome & Introductions	• Jason Inwood welcomed the group and requested everyone to introduce themselves. • Everyone shared their name, position and organization/company. • The purpose of the meeting was to bring together members of Burnside Drainage Team (RJB) working on the South Innisfil Creek Drain (SICD) and members for the Ministry of Transportation (MTO) working on the Highway 400 Improvements and Highway 89/400 Interchange Replacement to discuss the projects and more specifically the Highway 400 crossing being identified by the MTO as Culvert 44 (C44).
2. MTO – Highway 89/400 Interchange	• Teepu Khawja reviewed the power point presentation used during the November 20th conference call between MTO staff and Town staff, outlining the current construction plan for Highway 89/400 interchange project. • MTO stated they can not stop/delay the current project to meet the timeline of SICD improvements as MTO could run the possible risk of losing funding for the project if delayed. • Completion date for construction of Interim Highway 89/400 interchange is scheduled for June 30th, 2021.

	• The current design includes work on the west end of C44, with proposed extensions and headwalls to accommodate the north west off ramp on Highway 400. • MTO would need extra funding to include the replacement of C44. • MTO staff indicated that in order to replace C44, it would require a 3-stage construction staging plan in order to keep the required 6 lanes of traffic open at all times. • MTO stated that the request from the Town for the replacement of C44 "as soon as possible" is off the table. • MTO has $40 million budget approved for the Interim Highway 89/400 interchange project and is unsure if money would be available next year if they had to defer the project with the new government.

3. Town/RJB– South Innisfil Creek Drain (SICD) Improvements	• Jason Inwood clarified that it was not the Town's intention to stop the Highway 89/400 project as the Town sees the needs and resulting benefits from the interchange improvements.
	• Jeff Dickson outlined the Section 78 Engineer's Report process (outlined in the *Drainage Act)* for the MTO staff:
	    o Engineer/RJB will file the final report with the Town starting the clock on the process outlined in the *Drainage Act.*
	    o A notice and copy of the final report will be sent out to all landowners within the watershed (including MTO) with a date for the Consideration of the Report.
	    o Council will provisionally adopt the final report under By-law starting the process for any appeals.
	    o Appeals – Options to appeal to the Court of Revision, Ontario Drainage Tribunal or the Drainage Referee depending on type of appeal.
	    o Once all appeals have been settled, Town Council will pass a third reading of the by-law and the tendering process for construction can begin.
	• RJB is scheduled to file the Engineers Final Report with the Town at the end of January 2019.
	• The Town has committed timelines with stakeholders and it was noted there are over 850 landowners in both the Town of Innisfil and Town of Bradford West Gwillimbury.
	• The Town's interest is to mitigate the cost while achieving the required drainage improvement and for the MTO to complete the Highway 400 crossing replacement.
	• The typical design rainfall event for a municipal drain is a 2-year storm event whereas the design criteria for the Highway 400 crossing will be a much larger storm event (100-year).

4. RJB – SICD/Highway	• As per RJB's extensive modelling and hydrology work, the existing Highway 400 crossing C44 will not be able to handle the flows

400 Crossing – Culvert 44	expected during a 100-year storm event as per their Hydrology Report. • Existing structures under Highway 400 making up the Culvert 44 crossing are perched above the 1954 Municipal Drain grade line. • The Hydrology Report and the Draft Hydraulic Report have been submitted to Nottawasaga Valley Conservation Authority (NVCA) – RJB has not received any official comments back. • RJB is hoping to finalize the Hydraulic Report shortly once NVCA's comments are received. • Both the Culvert 44 and the Reive Boulevard crossing will need to be replaced in order to accommodate the drainage improvements. • Having Culvert 44 replaced with the Highway 400 improvements would significantly improve the drainage for the upstream lands and accommodate a higher design storm event. • The draft engineer's report has proposed a new grade starting downstream of the Highway and will require the existing structures to be lowered/replaced. This has been communicated to the MTO since June 2017 and is why the Town has been requesting collaboration with the MTO. • If nothing is done with C44, the proposed improvements will create a 4 km long settling pond due to the extremely flat upstream gradient.
5. Open Discussion Regarding Hydrology for Culvert 44	• MTO stated they have no problem lowering the Culvert 44 when the ultimate widening on the Highway is completed. • MTO can not do the work immediately but indicated a willingness to work collaboratively on a solution. The problem is the timing and funding. • MTO has done an EA study and is looking for a cost-effective interim solution (for C44) until they are able to do the ultimate widening and improvements to Highway 400 (10-20 years). • MTO stated there is still more expected life left in the existing Highway structures to last until the ultimate widening and improvements of the Highway are completed and that the MTO would be more open to an interim solution for now. • MTO stated they do not want to connect the structures between Highway 400 and Reive Boulevard as this would cause issues in the future as to who is required to maintain the structure.
6. MTO – Additional Information Required from Town/RJB	• John Van Voorst indicated that Robert Vandenberg and himself will be the main contacts on this work and all correspondence should be directed through them. • John indicated that for the Holland Marsh project, K. Smart provided the design opening that would be required for both the north and south structures and that the MTO took on the design, construction and staging portions of the project. • John indicated that the MTO still required more information, specifically they require a Hydraulics Report, specifying an

	alternative interim solution to the replacement of the Highway 400 crossings C44. • The MTO is looking for an interim solution that will pass the SICD design flows without adversely affecting landowners upstream. • John needs the Hydrology and Hydraulics Reports and the Final Engineer's Report (drafts) with 30-60 days to review and provide comments prior to the final report being submitted to the Town. • Both RJB and the Town indicated that they would have the Hydraulics Report finalized with the additional interim solution for the Highway 400 crossing, as requested for review by the MTO. • Jason Inwood indicated that the date for the final Section 78 report to the Town could not be extended and the MTO would be required to expediate their review. • Jason Inwood went on to emphasis that this is why the Town has been continuously requesting the MTO to collaborate and why RJB has sent numerous correspondence as this improvement has been in the works since the mid-2000's.
7. Recap/Next Steps/Action Items	• RJB will complete the additional design work regarding an interim solution to the Highway 400 crossing C44 in order to pass the SICD design storm through a lower structure. • RJB to finalize their Hydraulic Report and the section of Final Engineer's report for the SICD relating to the Highway 400 right-of-way and submit to MTO as soon as possible. • MTO to review documents above and Hydrology Report and provide any comments to the Town/RJB.
8. Adjournment	11:50 am

Don McNalty

From:	Jeremy Nyenhuis <jnyenhuis@innisfil.ca>
Sent:	Friday, January 04, 2019 2:13 PM
To:	Jeff Dickson; Don McNalty; Tim Lozon
Cc:	Rebecca Timm; Jason Inwood
Subject:	FW: South Innisfil Creek Drain (SICD) Hydraulic Report.

Jeff/Don/Tim,

Please see email before from John Van Voorst regarding MTO review of Hydraulic Report.

Thanks,

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Van Voorst, John (MTO) <John.VanVoorst@ontario.ca>
Sent: January 4, 2019 1:38 PM
To: Jeremy Nyenhuis <jnyenhuis@innisfil.ca>; Jason Inwood <jinwood@innisfil.ca>
Cc: Khawja, Teepu (MTO) <Teepu.Khawja@ontario.ca>; White, Jason (MTO) <Jason.White@ontario.ca>; Stephenson, Bob (MTO) <Bob.Stephenson@ontario.ca>; MacKinnon, John (MTO) <John.MacKinnon@ontario.ca>; Singh, Christian (MTO) <Christian.Singh@ontario.ca>; Vandenberg, Robert (MTO) <Robert.Vandenberg@ontario.ca>
Subject: South Innisfil Creek Drain (SICD) Hydraulic Report.

Hi Jeremy,

Thank you for giving us the opportunity to review the Town's Hydraulic Report. We have comments that we'd like to pass on to you and your consultant.

At this point we can confirm that the ministry is in general agreement with the new solution presented in the Hydraulic Report which will address the municipal drain requirements under Highway 400 and, pending Council approval of the Engineer's Report, we will pursue opportunities to proceed with detail design of the alternative culvert configuration presented in the report.

Below is a list of our technical comments on the Hydraulic Report:

1. To facilitate our current review of the Highway 400 culvert alternative that includes trenchless installation of four new culverts, we request electronic copies of the HEC-RAS files for proposed conditions.

2. The Hydraulic Report examined Option 1 and 3 proposed by Dillon Engineering in 2013. Table 18 of the report presents peak flow rates evaluated for option 1 and 3 at 15th Line using the current hydrology model. Based on the results, it looks like storage facilities associated with option 1 and 3 have some measurable

positive impact on peak flow rates within the drain at 15th Line. We request that a similar table be prepared which shows the impact of option 3 on the drain within the Market Garden lands and downstream at the Highway 400 right of way.

3. The report is not clear as to whether or not option 1 and/or option 3 will be implemented as part of the municipal drain work.

The final culvert configuration will be based on the results of the detail design, taking into account the current and future needs of the Ministry. Once detailed design has been completed, construction can proceed pending funding. Our detail design will not be complete prior to the scheduled award of our contract, however it is a 3-yr contract and we are anticipating on completing the design by the end of the first construction season and determining the most cost-effective and timely way of proceeding with construction (funding pending).

We of course will be cognizant of the town's timelines for implementing the municipal aspects of the drainage works. I would suggest a follow-up call between MTO (myself, Teepu, Rob, John, Jason, Bob) and yourself and Jason, not only to provide any clarifications as to my comments but also to discuss current status and next steps of our overall rehab project for your awareness. If you agree, please suggest a couple of dates/times over the next few weeks and we will try to schedule accordingly.

Thanks, John.

South Innisfil Creek Drain and Branches Improvements
Morrison Hershfield Stormwater Management Report Review
Burnside Project No.: 300038790.0000
Morrison Hershfield Project No.: 1170121

Section #	Letter Section Content (Note: when ….. is at end of section please refer to letter dated Nov. 19, 2018)	Responses
1	**Project Intent** - It is clear from the report that the intent is not to replace the Hwy 400 centre-line culverts until the Ultimate Design Phase but rather culvert extensions and headwalls will be constructed as part of the Interim Design Phase.	Noted.
2	**Drain/Crossing Elevation** - We have clearly identified in past meetings and correspondence (meeting on March 27, 2018, letter dated June 23, 2017 which enclosed previous emails circulated on June 20, 2017, letter dated June 27, 2017, and letter dated October 18, 2017) that the proposed work on the South Innisfil Creek Drain (SICD) will lower the grade at the Culvert 44 site.....	Further to previous consultations between MTO and the Town, we acknowledge the intent to lower the invert(s) of Culvert 44 in the ultimate development scenario in accordance with recommendations from the Section 78 South Innisfil Creek Drainage Improvement Report [SICD Report]. We note that no aspects of the works proposed under the current MTO contract would prevent the implementation of the plans to lower the crossing.
3	**Ultimate Design** - Although it is acknowledged that MH design is to address the Interim Phase for the Hwy 400/89 intersection, the report indicates that requirements for the Ultimate Design for this intersection will be addressed. As previously highlighted in our correspondence to the MTO and MH, the future replacement of Culvert 43 with a crossing of similar size to the existing could be avoided if the size of Culvert 44 is sufficient to accommodate the upstream flows from the SICD and Hnydczak Drain catchment areas.	Noted. We acknowledge that the current spill mechanism between Culvert 43 and Culvert 44 is likely more complex than considered for the purpose of the current MTO contract. Regardless, the works proposed under the current MTO contract allow for a more conservative approach to designing Culvert 43 in the interim scenario. Considering the differential in inverts between Cuvert 44 and Culvert 43, it is highly unlikely that the capacity of Culvert 43 will be exceeded in the interim and particularly in the ultimate widening scenario.
4	**MH Design Approach** - Morrison Hershfield (MH) has used a series of regression analysis to calculate flows to Culvert 44. Specifically, MH has used the following methods as outlined in Table 19 (p.37 or the report, p.43 of the pdf)……	Noted. In view of the relatively minor changes proposed for Culvert 44 in the interim scenario, a more detailed hydrologic model for the large contributing watershed is considered outside the scope of the current contract. We reiterate the commitment to use the results of the South Innisfil Creek model in the ultimate development scenario.
5	**Application of Climate Change Factors** - The report states that the flows for the various structures account for Climate Change over the anticipated 75-year service life of the infrastructure. However, impacts of climate change have not been considered by the regression analytics for Culvert 44. The Unified Index Flood Method uses an Annual Precipitation Amount of 844 mm as outlined in the Ontario Flow Assessment Tool (OFAT).....	Noted. It is emphasized that the impacts on Culvert 44 in the interim scenario are considered in relative terms only due to relatively minor changes.
6	**Design Criteria/Flows** - From our general review we would note that the design criteria set out in the report requires that the HWY 400 crossings must have 1.0 metre of freeboard (from high water level to the road surface) and that the Check flow (1.3 times the calculated flow) would not reach the edge of pavement. Subsequent information in the report suggests that the free board at Culvert 44 would be 1.9 metres. We note the existing cover over the culverts is less than 1.9 metres which would mean the culverts are not surcharged under the MH 100 yr design flow conditions based on the MH analysis.....	The changes proposed for Culvert 44 in the interim scenario are relatively minor, and in fact less than what was proposed at the prelimoinary design stage. The intent of these changes is not to bring Culvert 44 up to the current MTO design standard. Such considerations will be provided in the ultimate widening scenario.
7	**Regulatory Flood Consideration** - It is noted (and also stated in the MH report) that for watercourses with a catchment area over 125 ha that the Regulatory Flows are to be calculated to determine if there would be any increase in Regulatory Flood levels compared to existing conditions. Although it is anticipated that there will not be a change in the Hwy 400 road profile elevation for the Interim Phase, the future road profile of the final design is not known. We would note that previous works completed on Hwy 400 to construct a continuous centre barrier between the southbound and northbound lanes should be investigated with respect to the potential impact on Regulatory Flood Levels in anticipation that the Ministry intends to maintain the current continuous barrier.....	Noted. The highway profile and Culvert 44 represent tke key hydraulic control for the South Innisfil Creek. The changes to Culvert 44 in the interim scenario will not have any appreciable impacts on th extend of the floodplain. The ultimate functioning of the South Innisfil Creek crossing will be investigated in the ultimate widening scenario.

South Innisfil Creek Drain and Branches Improvements
Morrison Hershfield Stormwater Management Report Review
Burnside Project No.: 300038790.0000
Morrison Hershfield Project No.: 1170121

Section #	Letter Section Content	Responses
8	**Drainage Area** - The MH report states that the drainage area contributing to Culvert 44 from the SICD is 6130.43 ha, as well as 763.94 ha from the Hnydczak Drain. Our determined total catchment area for Culvert 44 is 7720 ha. The MH report used the OFAT tool to calculate a total drainage area to Culvert 44. This drainage area has been calculated at 6130 ha. Further, this drainage area does not include the drainage area from the Hnydczak Drain. Burnside has calculated a drainage area of 6290.78 ha or approximately 2.6% larger without the Hnydczak Drain. Therefore, on this basis, the drainage areas are similar......	Noted. It is recognized that the more detailed and accurate study currently being completed by Burnside may lead to more accurate flow estimates. Considering the relative insignificance of absolute design flows at this stage, this is not considered to have any major design implications at this stage.
9	**Circulation of Final Hydrology Report** - We note that MH has relied on Burnside's draft produced in 2017. The final report was forwarded to the MTO on May 17, 2018, and again on July 12, 2018. We also forwarded our hydrologic model to MH along with our draft report in 2017. We would suggest that the statement made in the MH report that "details of hydrology for the flows were not available" is not accurate.	For the purpose of the current MTO contract, the reports and other information from the Town were considered to the extent practical, and primary for the purpose of ensuring that the improvements planned for the South Innisfil Creek are not impacted by the current MTO contract. With respect to the status of the report, our understanding is that they cannot be considered final until the Section 75 Report has been adopted by the Council.
10	**Subsequent Connection of Drainage** - The proposed drainage plan redirects drainage from the southwest quadrant of the intersection from flowing westerly along the south side of Hwy 89 to northerly across Hwy 89 (in proposed culvert 21) to outlet through Branch A into the SICD upstream of the 5th Sideroad. If the Town was not in the midst of preparing a new report under Section 78 of the Drainage Act, we believe that the proposed diversion of flows would have required a report under section 65(3) for the "Subsequent Connection to Drainage works". Cooperation of efforts between the MTO and the Town would allow this to be resolved under the Section 78 report.	We note that the proposed changes relate to the interchange area only, and would result in flows being both diverted from and sent to Branch A, implying that the net impact would be minimal. It is also emphasized that such impacts would be further reduced in the ultimate widening scenario. However, MTO remains supportive of considering the proposed modification under the Section 75 Report currently prepared by the Town.
11	**2-year Peak Flows** - Burnside notes the calculated 2-yr peak flows in the MH report generally are consistent with the findings within the Burnside Hydrology report.	Noted.
12	**5th Sideroad and the Spring 2008 Historical Flooding Event** - Burnside was retained by the County of Simcoe in 2008 to complete a design to replace the 5th Sideroad Bridge. The bridge was replaced in 2010. The replacement structure was designed with a larger span than existing conditions. A detailed hydrologic analysis was not completed for this design, rather the NVCA McLaren flows were used. The bridge was designed in accordance with the MTO B-100 directive for rural roads with spans larger than 6 m. Accordingly, the 25-year peak flow was used for design. For reference the 25-year McLaren flows at this location are 12.8 m^3/s while the 100-year McLaren flows are 17.3 m^3/s. The McLaren flows are less than the flows proposed by Morrison Hershfield; however, the NVCA acknowledges that the Maclaren flows do not represent field conditions within the South Innisfil Creek Drain.....	Noted. This issue does not have any impacts on the work proposed under the current MTO contract.
13	**Innisfil Creek Near Alliston (02ED029) Hydrometric Data** - the 2008 recorded daily flow data for the Innisfil Creek Near Alliston (02ED029) Flow Gage as referenced from the wateroffice.ec.gc.ca website.....	Noted. While it is acknowledged that existing and future studies undertaken in support of the Section 75 Report will likely result in more accurate flow estimates, in this instance this is not considered critical in view of minor changes proposed to Culvert 44 in the interim scenario. As such, it is considered appropriate to consider impacts on the hydraulics in relative terms.
14	Highway 89 Glass Bridge - Burnside has reviewed the Highway 89 (Glass Bridge) drawings issued October 21, 2014. We note that the replacement structure is a 25 m clear span bridge. The hydraulic capacity of this bridge would be in excess of the capacity of the existing Highway 400 crossings. To date, although requested, Burnside has not received supporting hydraulic or hydrologic modelling for this bridge....	In general terms, the span of a bridge cannot be used exclusively to determine hydraulic characteristics at a crossing. While the Highway 89 does represent a hydraulic control in the South Innisfil Creek system, in this instance it has no design implications as they related to the works under the current MTO contract.

Ministry of Transportation

Planning and Design Section
York West/Simcoe
Central Region - Engineering

4th Floor, Building D
159 Sir William Hearst Avenue
Toronto ON M3M 0B7
Tel: (416) 235-5533
Fax: (416) 235-3576

Ministère des Transports

Section de planification et de conception
York Ouest/Simcoe
Région du Centre – Ingénierie

4e étage, édifice D
159, avenue Sir William Hearst
Toronto ON M3M 0B7
Tel : (416) 235-5533
Téléc: (416) 235-3576

5 February 2019

Jeremy Nyenhuis, P.Eng.
Drainage Superintendent
Town of Innisfil
2101 Innisfil Beach Road
Innisfil, ON L9S 1A1

Dear Mr. Nyenhuis:

Re: Drainage and Hydrology Report, Reconstruction of Highway 400 and 89 Interchange and Bridge Replacement, Town of Innisfil Comments.

Further to the letter from the Town of Innisfil [Town] dated November 23, 2018 and accompanying letter from R.J. Burnside & Associates Limited [RJB] dated November 19, 2018, we would like to thank you for the supplementary information and provided comments.

Our responses to the comments captured in the letters from the Town and RJB are offered below and in the attached table, respectively.

Introduction

The Ministry remains committed to work closely with the Town and other stakeholders in an effort to address various drainage issues in the area potentially affected by the current and future plans for improvements along the Highway 400 corridor. As part of this commitment, we acknowledge the need for a constant and positive dialogue.

We believe that it is nevertheless also important to recognize that timing of various studies conducted by MTO and the Town may not necessarily coincide to the extent required to integrate all the study results at different stages of MTO contracts. As such, the approach adopted by MTO has been to (a) review the design information in the context of its formal acceptance under applicable laws and regulations; and (b) consider design implications of design information without a formal status for the purpose of ultimate highway improvement plans.

Previous Consultations

In addition to the existing MTO contract, the preliminary design for the overall Highway 400 corridor improvements was addressed in studies completed in 2003, 2016 and 2017, where the Town was included in the consultation process.

In this regard, we appreciate the constructive and valuable feedback received from the Town through our formal correspondence. While we also encourage less formal communication in an effort to maintain this positive dialogue, please note that the discussions occurred at industry events do not form part of the consultation record.

The focus of the current project is the replacement of the Highway 400 and Highway 89 underpass bridge due to its age and deteriorated condition, in advance of the ultimate ten (10) lane widening of Highway 400. The works include realignment of Highway 89 to facilitate the replacement of the bridge and reconfiguration of the interchange. The proposed works will tie into the existing Highway 400 six (6) lane cross-section.

The proposed works are consistent with the recommendations of the Highway *400 and Highway 89 Interchange - Interim Improvements Transportation Environmental Study Report (TESR) Addendum*, (March 2017), which was as presented and discussed with the Town of Innisfil at the June 23, 2017 meeting. The preliminary design recommendations included the westerly extension of the two (2) southerly CSP arch culverts at culvert structures C44 to accommodate the widening for the Highway 400 southbound N-E/W exit ramp speed change lane. This design has been modified to include installation of a retaining wall to essentially maintain the existing culvert lengths and limit the culvert work to replacement of the existing tapered end sections with square end sections.

While it is recognized that the current Town study will result in more detailed and accurate flow estimates, the minor modifications to culvert structures C44 at Innisfil Creek will not adversely impact the performance or capacity of the crossing irrespective of the design flows established. As indicated in the TESR Addendum, realignment of Reive Boulevard and construction of the Highway 89 E-N ramp are not currently warranted and will be completed in conjunction with the future ten (10) lane expansion of Highway 400 or as warranted by future traffic demands. As such, relocation of the Hnydczak Drain will be completed as part of the future Highway 400 expansion and the existing culvert structure C43 will continue to operate as a relief structure for culvert structure C44 at Innisfil Creek until such time as the Hnydczak Drain is relocated and the South Innisfil Creek crossing is replaced.

Status of South Innisfil Creek Drainage Improvement Report

As you are aware, MTO has maintained the position that any improvements to South Innisfil Creek Drain (SICD) under the Drainage Act will be accommodated to the greatest extent practical, following a formal acceptance of the recommendations by the Town.

Your letter (Page 6) states that the *Section 78 South Innisfil Creek Drainage Improvement Report* [Report] would be filed to the Town and presented to the Council at some point in 2019. This would suggest that this document does not have a formal status at this time. Based on the Ministry Directive PLNG-B012 (2010), please note that there are no legal or procedural requirements to consider draft documents when determining applicability of works under the Drainage Act.

We acknowledge that the *Report* is well under way, and we continue to review related information as it becomes available. At this time there are no indicators that any of the design elements incorporated in the interim scenario would prevent the Town from implementing your recommendations in the ultimate scenario. This includes, but it is not limited, to the need to lower the channel elevation at the Hwy 400 crossing.

Impacts of Hydrologic and Hydraulic Analysis

With respect to the considerations given to the *Hydrology Report* (Burnside, 2018), we note that the final version of the report was provided when the MTO design efforts had been substantially advanced (Jul 2018). Our understanding is that the corresponding hydraulic study has not been finalized at this time. As such, we feel that hydrologic updates cannot be properly considered in isolation of hydraulic updates, or indeed the *Drainage Improvement Report* itself.

In providing commentary on the *Hydrology Report* (Morrison Hershfield, October 2018), your letter states (Page 2) that "…*there is a major flaw when it comes to the design flows calculated to bypass through structure C44, more specifically the flows that will be coming in upstream of the structures from the relocation of the Hnydczak Drain*…". This comment appears to be largely related to the approach to calculating split flows between Culvert 43 and Culvert 44. We are aware that this split mechanism is relatively complex, as the spill would likely be divided between Culvert 43 and a wider floodplain on the east side of Highway 400 once the capacity of the ditch is exceeded. As indicated above, existing culvert structure C43 will continue to operate as a relief structure for culvert structure C44 at Innisfil Creek until such time as the Hnydczak Drain is relocated and the Innisfil Creek crossing is replaced.

We also acknowledge that previously completed hydrologic studies resulted in a wide range of values, implying a high degree of uncertainty. We recognize that the hydrologic and hydraulic studies currently being undertaken by RJB on behalf of the Town rely on more accurate topographic and land use information than previously available, and conceivably result in more accurate estimates in flows and water surface elevations. In this instance, even relatively significant fluctuations in estimated split flows will have negligible design implications. In recognition of the long term strategy that the final configuration of the crossing would be determined at the ultimate widening stage, only replacement of the west side tapered end sections has been proposed for Culvert 44 in the interim works for the replacement of the Highway 400 underpass structure at Highway 89.

Since there is no intent to alter the crossing characteristics in terms of key hydraulic parameters (e.g. culvert size and material, upstream and downstream inverts, minimum road elevations, flow diversions), we find it appropriate to consider the functioning of Culvert 44 only in relative terms at this time.

Branch A and Interchange Drainage

Flow patterns within the interchange will be modified both in the interim and ultimate widening scenario. The interchange area currently drains in several directions, including westerly along Highway 89 and northerly towards Branch A. Due to the very flat terrain, nevertheless, a certain portion of this area may not have a defined surface outlet.

In the interim scenario, surface runoff will be both diverted to and away from Branch A, resulting in essentially net zero change in peak flows. Although the ultimate outlet will be changed once the SWM facility is completed, we acknowledge that in the interim this may represent a temporary disconnection as defined under the *Drainage Act*. This has been discussed further in this letter.

Impacts of Hydraulic Structures Downstream of Highway 400

Your letter (Page 7) also makes several references to the crossings of the 5th Sideroad and Highway 89 downstream from Highway 400. We acknowledge that these structures represent significant hydraulic controls in the overall South Innisfil Creek system, and indeed will serve as the boundary condition for the future replacement of Culvert 44. At this time, however, there are no design implications associated with these two structures as it relates to the current MTO contract.

In Closing

In conclusion, MTO offers the following:

1. The current plans to replace the underpass are consistent with the previously approved *Addendum*, and in keeping with the strategy presented earlier to the Town. While very minor modifications to Culvert 44 have become necessary to accommodate the speed change lane, such modifications (a) will not have any appreciable impacts on the crossing characteristics in terms of hydraulics; and (b) will not preclude the Town from implementing improvements to the South Innisfil Creek Drain as contemplated at this time;
2. The proposed minor modifications to Culvert 44 are necessary to establish appropriate road geometry and address highway design requirements, including safety. While MTO welcomes input from stakeholders in the study area, the cost effectiveness of highway improvement projects is normally considered as part of larger capital programs.
3. Further to the discussion provided in this letter and the attached response table, MTO is satisfied that the current design information is sufficient and adequate for the purpose of the current contract;
4. MTO remains committed to collaborate with the Town on various drainage issues. We acknowledge that some of the drainage modifications under the current contract may constitute a temporary disconnection and require consideration under the Section 65 of the *Drainage Act*. Given the ongoing effort to prepare the *Section 78 Report,* we are in support of integrating this element in the overall *Section 78 Report*; and
5. We believe that it is reasonable to conclude that the *Section 78* report will be adopted by the Town, and we confirm the intent to follow its recommendations in the ultimate widening scenario. In the interim scenario, regardless, the proposed modifications to drainage patterns within MTO right-of-way remain necessary. As emphasized before, these modifications will not preclude the Town from implementing the anticipated recommendation of the *Section 78 Report*.

Thank you,

Rob Vandenberg, P.Eng.
Project Engineer, Highway Engineering, York West/Simcoe
Central Region

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

C2

Appendix C2

Ministry of Natural Resources and Forestry (MNRF)

Sylvia Radovic

From: Deanna De Forest
Sent: Thursday, December 20, 2018 2:32 PM
To: Findlay, Graham (MNRF)
Cc: Sylvia Radovic
Subject: RE: South Innisfil Creek Drain Improvements and SAR
Attachments: 038790 SICD - Offsetting Markup and ELC - 181218.pdf

Hello Graham,

Thank you for taking the time to talk with us yesterday.

To follow up on our discussion regarding the planned improvements to the South Innisfil Creek Drain (SICD), below is a summary of the proposed work, Species At Risk (SAR) potentially located within the study area and habitat conditions developed based on a review of available background and database information as well as previous field observations of the area and reporting completed by Dillon in 2010-2012.

We would like to request an assessment from the MNRF as to whether there are species at risk concerns within the study area related to possible impacts of the proposed improvements into adjacent meadow areas and wooded areas.

The area of interest includes the SICD from of Hwy #89 to 5th Line and is a combination of undeveloped deciduous and mixed forest areas, mixed meadow, agricultural crop lands, a golf course and rural residential lots. An illustration of the drain route and the proposed work is attached for your reference, along with ELC mapping overlay.

Proposed work consists of improvements to drain capacity, remove restrictions to the flow and mitigate flooding in Market Garden Area and prepare a report in accordance with Section 78 of the Drainage Act, RSO, Chapter D17. The improvements are anticipated to include:

- In-channel excavation to remove sediment, deepen and widen in select areas with a combination of spoil levelling and spoil offsite disposal
- Removal of fallen trees, debris and remnant beaver dams within the drain channel
- Excavation to install private tile outlet pipes
- Tree clearing, grubbing and brush trimming in select areas
- Clean-out of culverts, bridge, private laneway culverts and crossing
- Bank repair and stabilization using rip-rap in select areas, including Main Drain / 3rd Line Branch Drain
- Creation of sediment pools, riffle structures and gravel substrate areas and placement of large woody debris

In an effort to characterize the potential for SAR and associated habitat in the study area, Burnside reviewed the following existing data sources:

- Aerial photography.
- Natural heritage GIS data layers made public by Land Information Ontario (LIO).
- Ontario Breeding Bird Atlas -atlas squares 17NJ08 and 17NJ09
- Ontario Reptile and Amphibian Atlas (ORAA) (Square 18PK).
- Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) online map viewer/database (17PK0803; 17PK0804 and 17PK0904).

- South Innisfil Creek Drain Species At Risk Information Gathering Form, Dillon Consulting, 2012.

Based on the information review, the following SAR have the potential to be located within the study area:

Common Name	Scientific Name	SARO Status
Bank Swallow	*Riparia riparia*	Threatened
Barn Swallow	*Hirundo rustica*	Threatened
Bobolink	*Dolichonyx oryzivorus*	Threatened
Eastern Meadowlark	*Sturnella magna*	Threatened
Common Nighthawk	*Chordeiles minot*	Special Concern
Olive-sided Flycatcher	*Hylocichla mustelina*	Special Concern
Wood Thrush	*Hylocichla mustelina*	Special Concern
Snapping Turtle	*Chelydra serpentina*	Special Concern
Northern Myotis	*Myotis septentrionalis*	Endangered
Little Brown Myotis	*Myotis lucifugus*	Endangered
Tri-colored Bat	*Perimyotis subflavus*	Endangered
Monarch	*Danaus plexippus*	Special Concern
Butternut	*Juglans cinerea*	Endangered
American Ginseng	*Panax quinquefolius*	Endangered

According to the findings of the Dillon report, the following SAR were observed in the Study Area:

Common Name	Scientific Name	SARO Status
Barn Swallow	*Hirundo rustica*	Threatened
Bobolink	*Dolichonyx oryzivorus*	Threatened
Eastern Meadowlark	*Sturnella magna*	Threatened

Butternut and Ginseng (Threatened)

The Dillon report of 2012 included surveys of the vegetative communities through site visits conducted on July 21, 2010 and on August 10, 2010. Dillon reported that habitats that could potentially support Butternut and American Ginseng were surveyed including, for Ginseng, the Sugar Maple Deciduous Forest Community located adjacent to Option 1 Overflow Area (Option 1 Overflow area previously planned for north west corner of intersection of Highway 89 and Sidroad 5). The entire length of drain between the Option 1 and Option 3 Overflow Areas (previously planned for the north limit of the study area south of 5th Line) was surveyed for Butternut. Neither of these species were observed during the field investigation. A description of the field work conducted during these site visits is provided below:

Botanical surveys consisted of wandering transects to determine species' presence within each ELC community. Due to the season of the survey, the vegetation list is not considered exhaustive. Vegetation studies involved identifying the dominant species in each vegetation community type based on visual estimates of species abundances and biomass, or in the case of accessible forest stands, by quantitative sampling using a factor 2-wedge prism. Species nomenclature is based on the Ontario Plant List (Newmaster et al. 1998). Moreover, the botanical survey included specific searches for the Species at Risk (SAR) that have the potential to occur within the Study Area as identified by the Ontario Ministry of Natural Resources.

Species at Risk Birds (Bank Swallow, Barn Swallow, Bobolink and Meadowlark (Threatened))

Potential habitat for Bank Swallow in the form of eroded and exposed banks was observed in select areas along the corridor during the aquatic assessment completed by Burnside in 2018. While the presence of Bank

Swallow was not specifically surveyed, incidental observations by Burnside staff did not indicate the presence of Bank Swallow, such as nest burrows in the side of the banks, at the time of assessment.

A targeted breeding bird survey was completed and reported by Dillon (2012). Meadowlark and Bobolink were observed in mixed meadow areas adjacent to the drain corridor. Incidental observations of Barn Swallow were also reported with 5 to 6 nests observed under a farm access bridge crossing the drain.

The proposed works do not include alteration of the access bridges along the drain and are therefore not anticipated to impact nesting habitat for Barn Swallow.

Based on the ELC observations, the estimated area of potential mixed meadow habitat located adjacent to the corridor is a total area of approximately 34.01 ha. Proposed improvements will include vegetation removal in fringe areas of meadow habitat located adjacent to the corridor to accommodate the widening of the drain channel with an increase in width ranging from 10 metres to 15 metres, for an estimated total removal of meadow edge of approximately 1 ha along the study area corridor. The locations and extent of the improvement in areas of potential Bobolink and Meadowlark habitat are estimated in the table below.

Location along Main Drain	**Length (m)**	**Width (m)**	**Area of proposed works (ha)**	**Available Potential Habitat (ha)**	**Location of Improvements (Bank Side)**	**Mixed Meadow removal (Y/N)**
Sta. 3+375 to 3+588	213	15	0.32	3.55	west	Yes
Sta. 3+588 to 3+895	*307*	*15*	*0.46*	*5.81*	*south*	*No*
Sta. 6+650 to 7+000	350	10	0.35	3.55	east	Yes
Sta. 9+000 to 9+046	46	10	0.05	21.1	south/east	Yes
Sta. 9+046 to 9+320	274	10	0.28	(part of 21.1)	north/west	Yes
		Total	**1.46**	**34.01**		

Bats (Threatened)

A bat habitat assessment has not be completed to confirm the potential for bat maternity roosting habitat or quality. Based on the ELC observations, the estimated area of potential bat habitat located adjacent to the corridor is a total area of 34.65 ha. Proposed improvements will include tree removal in select linear areas adjacent to the corridor to accommodate the widening of the drain channel with an increase in width ranging from 7.5 metres to 15 metres, for an estimated total removal of treed area of approximately 1.37 ha. The locations and extent of the improvement in areas of potential bat habitat are estimated in the table below.

Location	**Length (m)**	**Width (m)**	**Area of proposed works (ha)**	**Available Potential Habitat (ha)**	**Location of Improvements (Bank Side)**	**Tree Removal (Y/N)**
Main Drain Sta. 1+224 to 1+650	426	7.5	0.32	1.74	North	Yes
Main Drain Sta. 4+880 to 5+449	569	15	0.85	5.46	north	Yes
Main Drain Sta. 7+077 to 7+928	*851*	*10*	*0.85*	*21.05*	*west*	*No*
3rd Line Spur Sta. 0+172 to	258	8	0.21	25.4	north	Yes
		TOTAL	**(2.3)**	**34.65**		**1.37 ha**

Special Concern Species

While Special Concern species are not afforded protection under Ontario's ESA (2007) or the federal SARA (2002), they may receive protection by some agencies, such as provincial and national parks, or other acts, such as the *Ontario Fish and Wildlife Conservation Act*, and the *Migratory Birds Convention Act* (MBCA), which prohibits the killing, capturing injuring, harassment and trapping of specially protected species.

To reduce the risk of potential impact to wildlife, timing constraints will be recommended to avoid vegetation clearing (including grubbing) and/or structure works (construction) during the active window for breeding birds - broadly from April 1 to August 31 and SAR turtle (May 15 to July) and the active egg laying and larval stages of Monarch (end of May through end of August) as well as species at risk (SAR) bat (April 1 to October 31) active season, consolidated as a timing restriction from April 1 to Oct 31.

We would like to request an assessment from the MNRF as to whether there are species at risk concerns within the study area related to possible impacts of the proposed improvements into adjacent meadow areas and wooded areas. Would some intrusion into the meadowland and wooded habitat represent an impact to identified SAR and a subsequent need for mitigation planning under the drainage exemption of O.Reg 242/08? If so, how does the drainage exemption under O.Reg. 242/08 apply?

Would potential impact to SAR be avoided with the implementation of appropriate timing for work to be completed outside of the active season for the identified SAR?

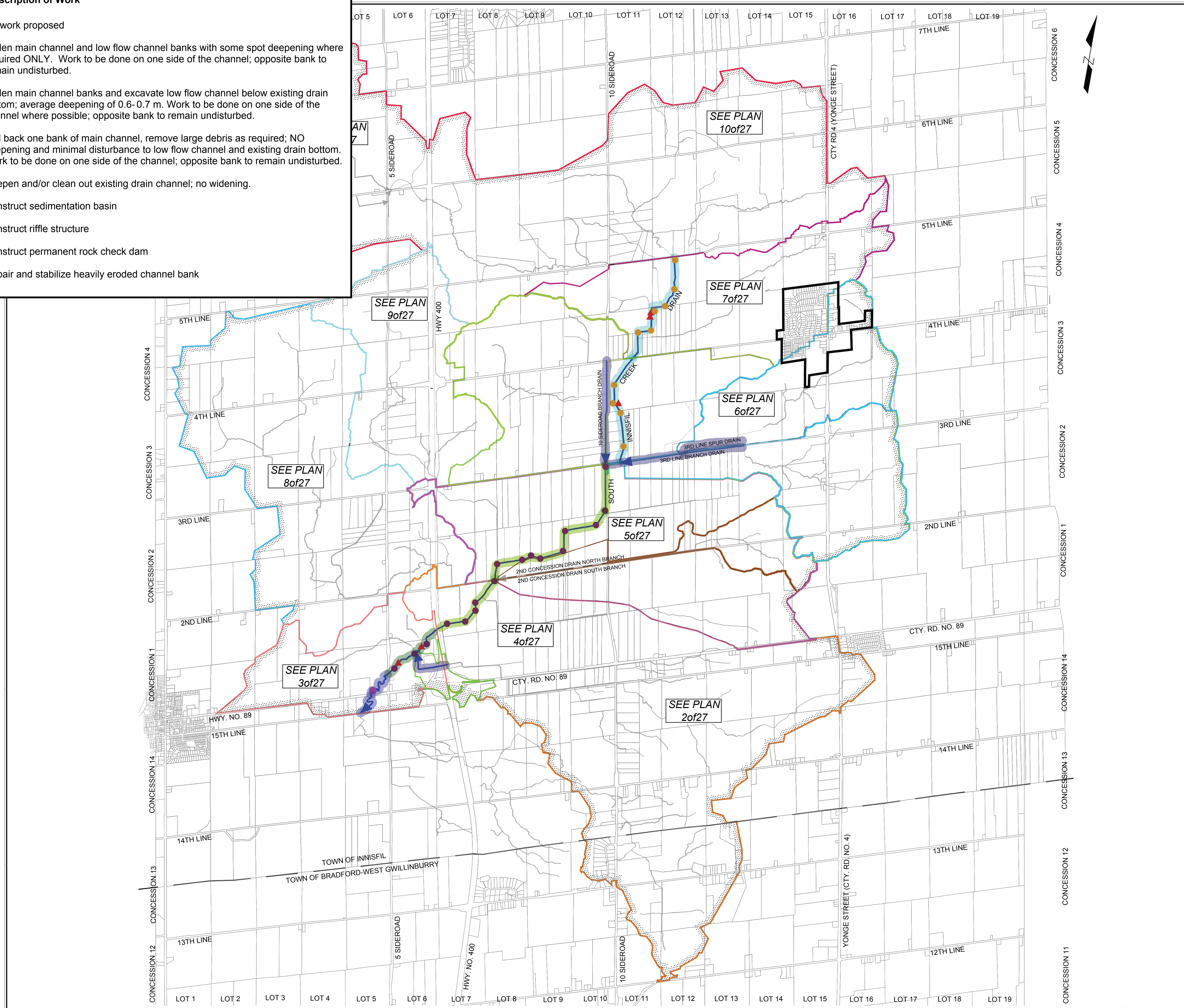
Thanks very much for your efforts in responding to our request. Please contact me should you need any additional information.

Regards,

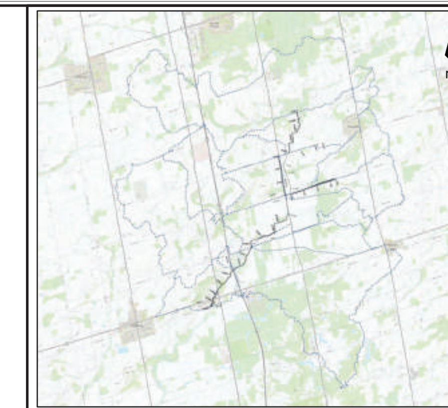
Deanna

Legend / Description of Work

- No work proposed
- Widen main channel and low flow channel banks with some spot deepening where required ONLY. Work to be done on one side of the channel; opposite bank to remain undisturbed.
- Widen main channel banks and excavate low flow channel below existing drain bottom; average deepening of 0.6- 0.7 m. Work to be done on one side of the channel where possible; opposite bank to remain undisturbed.
- Pull back one bank of main channel, remove large debris as required; NO deepening and minimal disturbance to low flow channel and existing drain bottom. Work to be done on one side of the channel; opposite bank to remain undisturbed.
- Deepen and/or clean out existing drain channel; no widening.
- Construct sedimentation basin
- Construct riffle structure
- Construct permanent rock check dam
- Repair and stabilize heavily eroded channel bank



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

Notes

1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.
4. All property lines are approximate and for information purposes only.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
1	PRELIMINARY DISCUSSIONS WITH NVCA	06/20/2018	JRD
2	DFO REQUEST FOR REVIEW	07/10/2018	JRD
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JDR

BURNSIDE
R.J. Burnside & Associates Limited
15 Townline
Orangeville, Ontario, L9W 3R4
telephone (519) 941-5331 **fax** (519) 941-8120
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2018 IMPROVEMENT
MASTER WATERSHED PLAN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DMcN	TR/AB	DMcN	1of 26
Date: 10/02/2018		Project No.: 300038790.0000		
Scale: 1:5,000	0 50 100 200 300m			

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN.dwg   Date Plotted: November 7, 2018 - 1:27 PM

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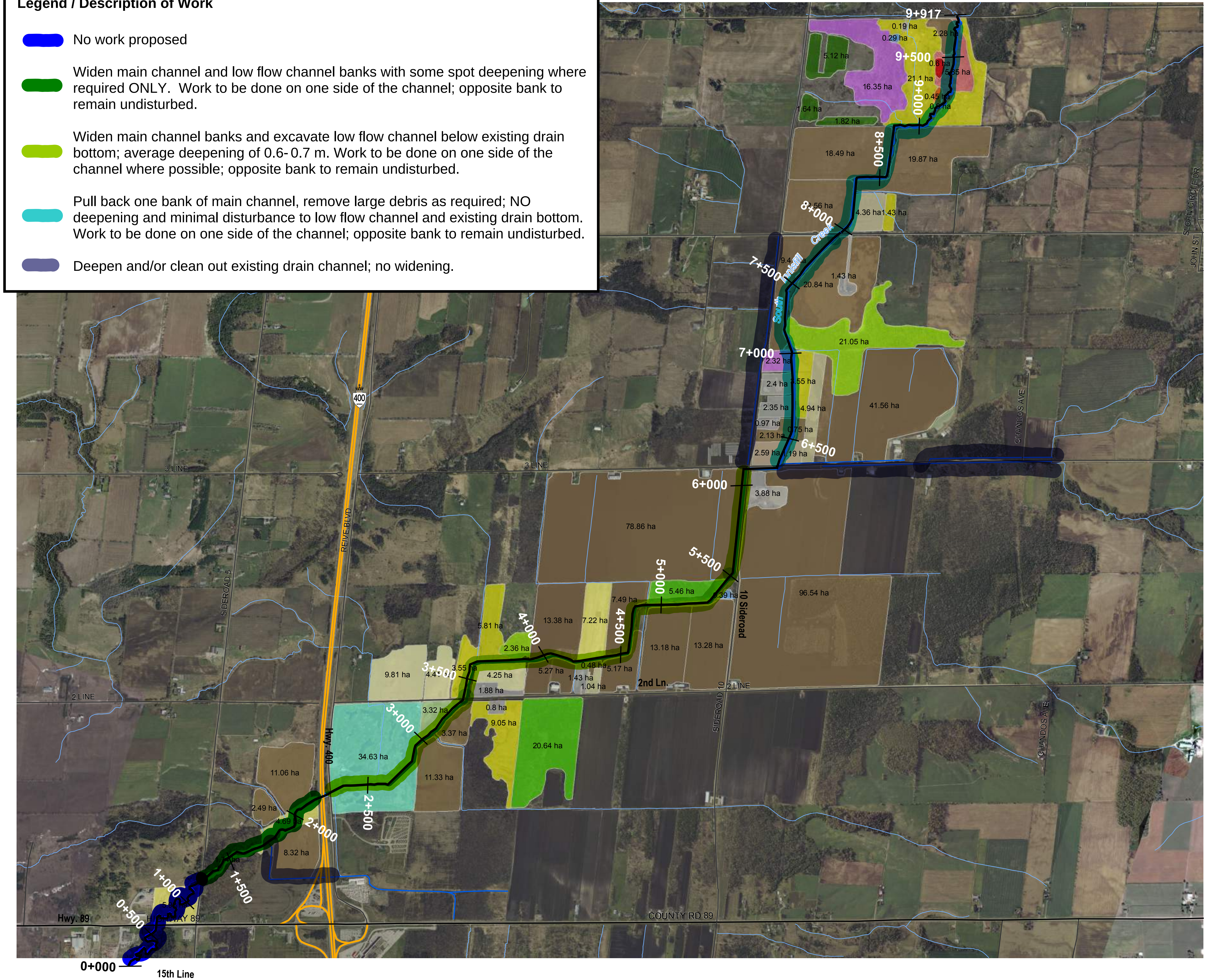

TOWN OF INNISFIL
SOUTH INNISFIL CREEK DRAIN

ECOLOGICAL LAND CLASSIFICATION
FIGURE 4

- HIGHWAY
- MAJOR ROAD
- MINOR ROAD
- SOUTH INNISFIL CREEK DRAIN
- WATER BODY
- CGL_1: Golf Course
- CUC: Annual Crop
- CVR_4: Rural Property
- FOCM6: Naturalized Coniferous Plantation
- FOD: Deciduous Forest
- FOM: Mixed Forest
- Fallow Field
- MAM: Meadow Marsh
- MEG: Graminoid Meadow
- MEM: Mixed Meadow
- Mowed Grass
- OAGM2: Perennial Cover Crop
- OAGM4: Open Pasture
- OAO: Open Aquatic Area
- SWD: Deciduous Swamp
- SWM: Mixed Swamp
- THD: Deciduous Thicket

1:22,000

0 250 500 1,000 m

MAP DRAWING INFORMATION:
DATA PROVIDED BY THE TOWN OF INNISFILL AND NVCA

MAP CREATED BY: GM
MAP CHECKED BY: NT
MAP PROJECTION: NAD 1984 UTM Zone 17N

FILE LOCATION: I:\GIS\054787 - South Innisfil Creek Drain\Mapping

DILLON CONSULTING

PROJECT: 05-4787
STATUS: DRAFT
DATE: 31 JULY 2012

Sylvia Radovic

From: Deanna De Forest
Sent: Wednesday, January 09, 2019 12:31 PM
To: Findlay, Graham (MNRF)
Cc: Sylvia Radovic; Jeff Dickson
Subject: FW: South Innisfil Creek Drain Improvements and SAR
Attachments: 038790 SICD - Offsetting Markup and ELC - 181218.pdf

Hi Graham,
Happy new year, hope you had a good holiday.
I wanted to follow up with you to see if you have had the opportunity to review and consider our correspondence below regarding an assessment of the potential for concerns related to possible impact to Species at Risk in relation to the planned improvements to the South Innisfil Creek Drain.
If you require additional details or other information, perhaps we could discuss the project with you via conference call sometime over the next few days, at your convenience.

Thanks,
Deanna

Deanna De Forest, B.Sc. E.P
Environmental Assessment
R.J. Burnside and Associates Limited
Phone 705-797-4357
Deanna.Deforest@RJBurnside.com

From: Deanna De Forest
Sent: Thursday, December 20, 2018 2:32 PM
To: 'Findlay, Graham (MNRF)' <graham.findlay@ontario.ca>
Cc: Sylvia Radovic <Sylvia.Radovic@rjburnside.com>
Subject: RE: South Innisfil Creek Drain Improvements and SAR

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Based on the information review, the following SAR have the potential to be located within the study area:

Common Name	Scientific Name	SARO Status
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According to the findings of the Dillon report, the following SAR were observed in the Study Area:

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Species at Risk Birds (Bank Swallow, Barn Swallow, Bobolink and Meadowlark (Threatened))

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The proposed works do not include alteration of the access bridges along the drain and are therefore not anticipated to impact nesting habitat for Barn Swallow.

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Thanks very much for your efforts in responding to our request. Please contact me should you need any additional information.

Regards,

Deanna

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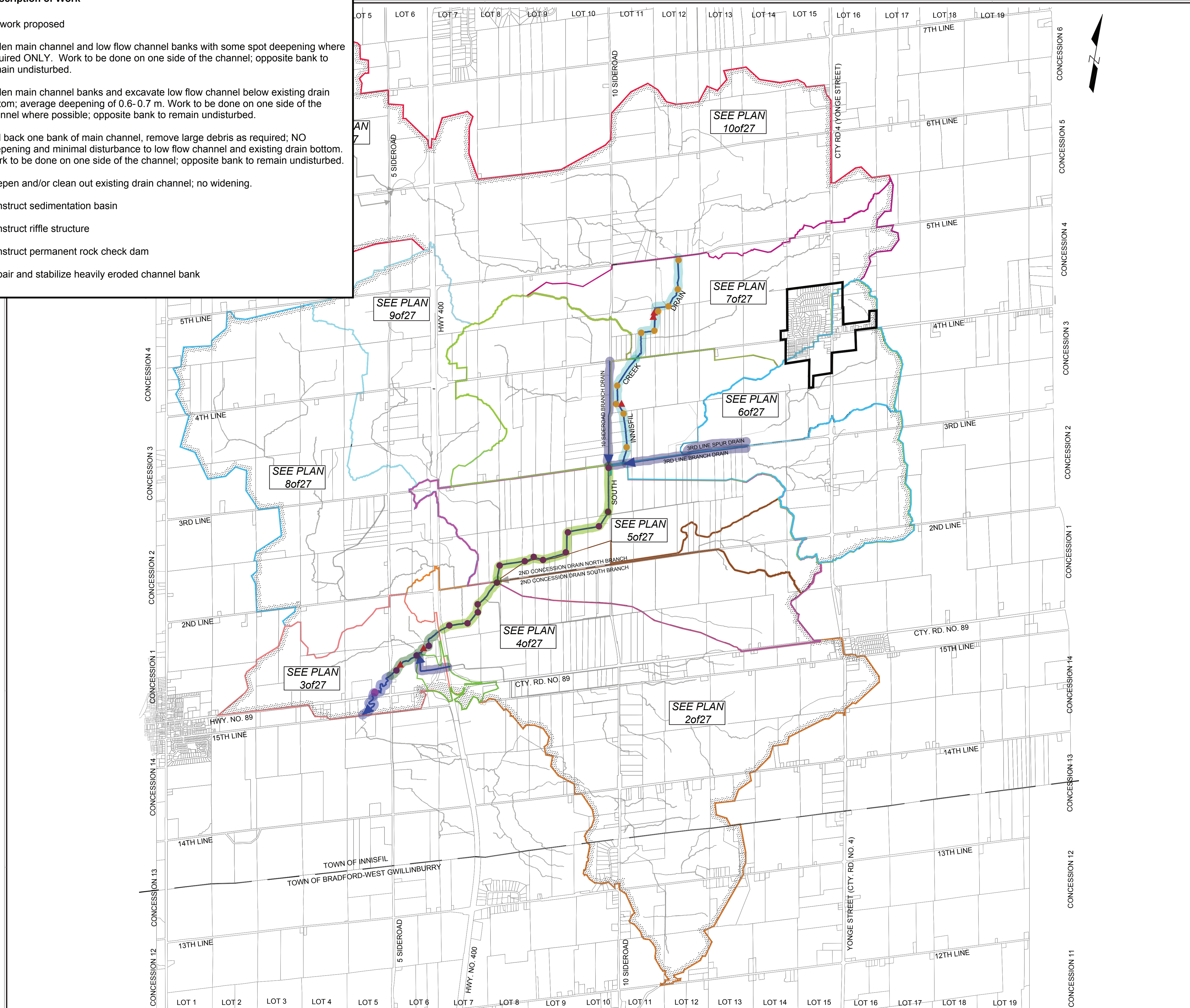
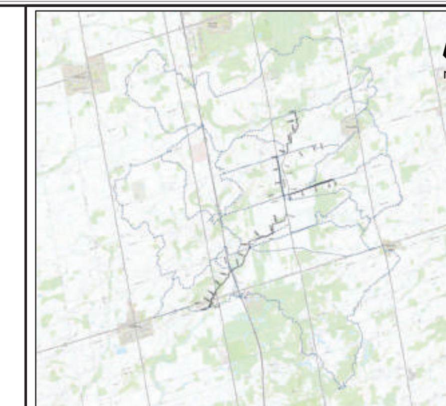
- Widen main channel and low flow channel banks with some spot deepening where required ONLY. Work to be done on one side of the channel; opposite bank to remain undisturbed.
- Widen main channel banks and excavate low flow channel below existing drain bottom; average deepening of 0.6- 0.7 m. Work to be done on one side of the channel where possible; opposite bank to remain undisturbed.
- Pull back one bank of main channel, remove large debris as required; NO deepening and minimal disturbance to low flow channel and existing drain bottom. Work to be done on one side of the channel; opposite bank to remain undisturbed.
- Deepen and/or clean out existing drain channel; no widening.
- Construct sedimentation basin
- Construct riffle structure
- Construct permanent rock check dam
- Repair and stabilize heavily eroded channel bank



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER	001-23414
LANDOWNER	M. VAN DER MAST

Notes

1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.
4. All property lines are approximate and for information purposes only.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
1	PRELIMINARY DISCUSSIONS WITH NVCA	06/20/2018	JRD
2	DFO REQUEST FOR REVIEW	07/10/2018	JRD
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JDR

BURNSIDE

R.J. Burnside & Associates Limited
15 Townline
Orangeville, Ontario, L9W 3R4
telephone (519) 941-5331 **fax** (519) 941-8120
web www.rjburnside.com

Client

TOWN OF INNISFIL

2101 INNISFIL BEACH ROAD
INNSIFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN 2018 IMPROVEMENT

MASTER WATERSHED PLAN

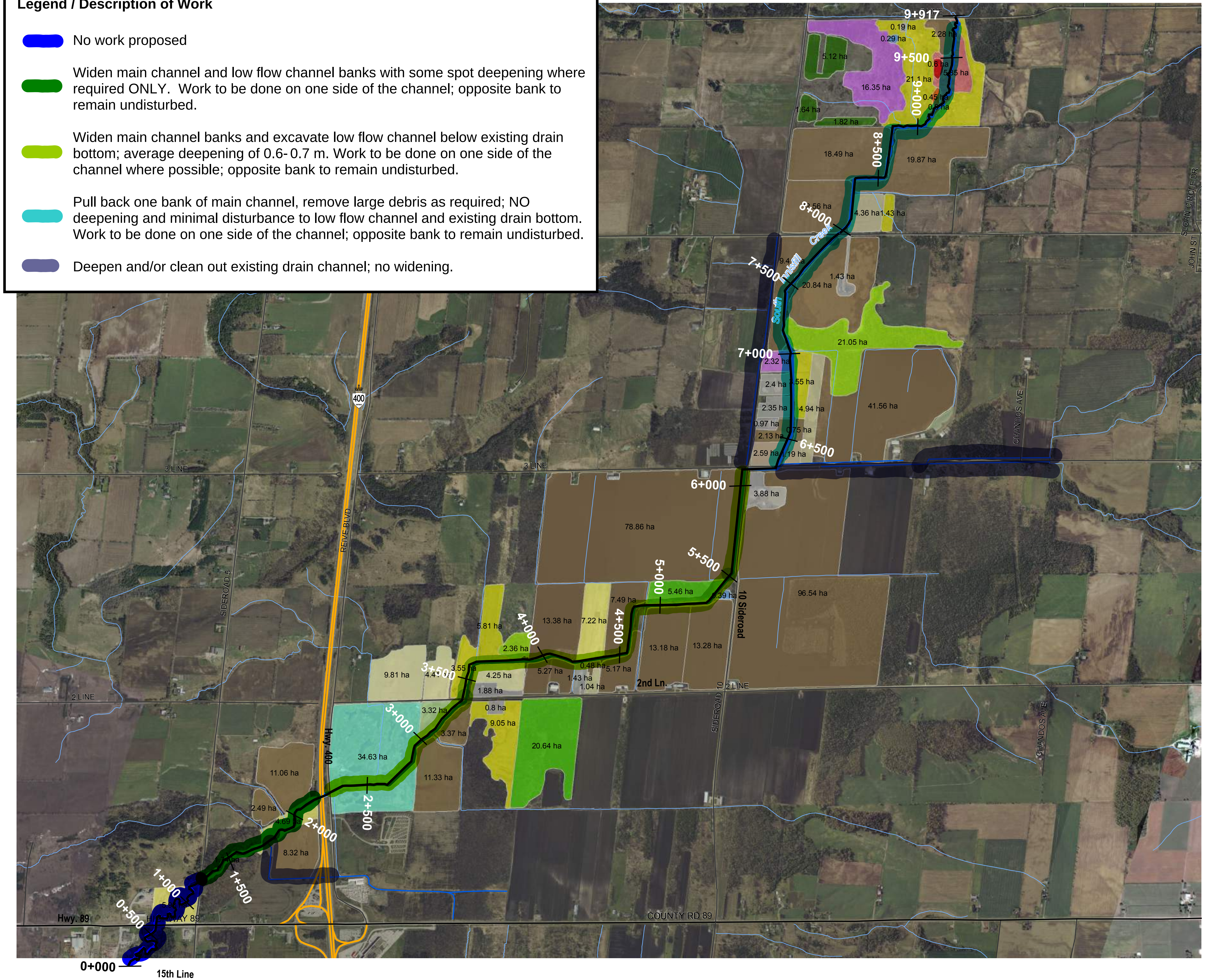
Designed	Checked	Drawn	Checked	Drawing No.
TL	DMcN	TR/AB	DMcN	1of 26
Date: 10/02/2018		Project No.: 300038790.0000		
Scale: 1:5,000				

Date Plotted: November 7, 2018 - 1:27 PM

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_ProductionDwg\038790_WATERSHED PLAN.dwg

Legend / Description of Work

- No work proposed
- Widen main channel and low flow channel banks with some spot deepening where required ONLY. Work to be done on one side of the channel; opposite bank to remain undisturbed.
- Widen main channel banks and excavate low flow channel below existing drain bottom; average deepening of 0.6- 0.7 m. Work to be done on one side of the channel where possible; opposite bank to remain undisturbed.
- Pull back one bank of main channel, remove large debris as required; NO deepening and minimal disturbance to low flow channel and existing drain bottom. Work to be done on one side of the channel; opposite bank to remain undisturbed.
- Deepen and/or clean out existing drain channel; no widening.



TOWN OF INNISFIL
SOUTH INNISFIL CREEK DRAIN

ECOLOGICAL LAND CLASSIFICATION
FIGURE 4

- HIGHWAY
- MAJOR ROAD
- MINOR ROAD
- SOUTH INNISFIL CREEK DRAIN
- WATER BODY
- CGL_1: Golf Course
- CUC: Annual Crop
- CVR_4: Rural Property
- FOCM6: Naturalized Coniferous Plantation
- FOD: Deciduous Forest
- FOM: Mixed Forest
- Fallow Field
- MAM: Meadow Marsh
- MEG: Graminoid Meadow
- MEM: Mixed Meadow
- Mowed Grass
- OAGM2: Perennial Cover Crop
- OAGM4: Open Pasture
- OAO: Open Aquatic Area
- SWD: Deciduous Swamp
- SWM: Mixed Swamp
- THD: Deciduous Thicket

1:22,000

0 250 500 1,000 m

MAP DRAWING INFORMATION:
DATA PROVIDED BY THE TOWN OF INNISFILL AND NVCA

MAP CREATED BY: GM
MAP CHECKED BY: NT
MAP PROJECTION: NAD 1984 UTM Zone 17N

FILE LOCATION: I:\GIS\054787 - South Innisfil Creek Drain\Mapping

DILLON CONSULTING

PROJECT: 05-4787
STATUS: DRAFT
DATE: 31 JULY 2012

Sylvia Radovic

From: Findlay, Graham (MNRF) <graham.findlay@ontario.ca>
Sent: Friday, January 25, 2019 3:48 PM
To: Deanna De Forest
Cc: Sylvia Radovic
Subject: RE: South Innisfil Creek Drain Improvements and SAR

Hi Deanna we have given your submission some thought and provide the following for your consideration.

You provided a brief summary of the past survey work (species and habitat evaluations), including your preliminary measurements of potential loss of species at risk (SAR) birds and bats habitats, and ask for us to interpret potential impacts. It is our expectations that interpretation and conclusions on impact assessment should come from the proponent and not be requested from the Ministry of Natural Resources and Forestry (MNRF). We are available to provide technical advice on SAR, habitats, survey approaches, the *Endangered Species Act, 2007* (ESA) and regulations, and we can comment on your conclusions and rationale for deciding there are potential impacts or not, however, again interpreting results and drawing conclusions should come first from the proponent's team.

However to your request, the exemption under O.Reg 242/08 – Section 23.9 Drainage Works, assuming the subject drain meets one of the definitions under sub-section (1), provides for impacting SAR or their habitats in the course of improving, maintaining or repairing a drainage works or ditch. In such cases the activity, potential impacts, threatened or endangered species involved, and proposed mitigations are to be submitted in a notice to the Minister (now for the Ministry of Environment, Conservation and Parks - MECP). In the event no SAR or habitats will be impacted, obviously there would be no reason to register the activity.

For your project the level of detail provided regarding species and habitat surveys was limited and dated. At face value the proposed activity likely presents a low degree of impacts to SAR or their habitats. However, at the time of the last breeding bird surveys (2012) eastern meadowlark (threatened species - T) and bobolink (T) were confirmed in suitable habitats adjacent to the subject drainage corridor. Observations for bank swallows (T) were negative however suitable habitats might not have been appropriately surveyed. Barn swallow (T) were documented associated with a water crossing. Although the nests might not be physically impacted the activity could potentially impact use of that habitat, and thus may require mitigation. Surveys for butternut (Endangered - E) were negative in 2010, however with the passage of time there is the potential that butternut seed from trees in adjacent habitats if present regenerated in the study area. Finally you have identified a small area of potential habitat for SAR bats (E) could be lost to tree clearing for the proposed drainage works.

There are a couple ways to approach project planning.

1. Perhaps submitting a notice to the registry speaking to the identified SAR and a mitigation plan with strategies to address potential impacts – for example: reduce as much as possible the footprint of disturbance; vegetation protection fencing to prevent disturbing areas beyond the work zones; appropriate timing window for work requiring vegetation removal (potential habitat components), etc.. Your proposed consolidated timing restriction (no vegetation removal between April 1 and October 31) would be appropriate. Or,
2. Update the species and habitat surveys in areas of potential habitats and confirm if SAR are present, registering the activity if necessary (i.e. T/E species confirmed present).

A note concerning butternut if found and potentially impacted by the proposed activity, clarification may be required, however the mitigation plan requirements in the Drainage Works exemption are unclear on how a species like butternut could be mitigated for if impacts are anticipated. MNRF general habitat (protective guidance) for butternut trees includes suitable areas within a 50 metre radius centred on the trunk or stem of each Butternut tree in Ontario (regardless of its size). This area is intended to protect:

- Category 1 habitat: The critical root zone of individual trees - the immediate habitat conditions surrounding the tree that support the growth and persistence of the tree over its lifetime (0-25m); and,
- Category 2 habitat: The surrounding habitat conditions supporting the core nut dispersal and seedling establishment areas out to 50m from a parent tree.

Any butternut trees within 50 metres of the work zone limit would need to be evaluated in accordance to the *Endangered Species Act, 2007* (ESA) against the potential to kill, harm, and harass a member of the species (Section 9, *ESA*) or for damage or destruction of habitats (Section 10, *ESA*).

Do not hesitate to contact me with any further questions.

Regards,

Graham Findlay
Management Biologist
Huronia Resources Management Team,
Midhurst, MNRF
705-725-7530
705-725-7584 (fax)
graham.findlay@ontario.ca

From: Deanna De Forest <Deanna.DeForest@rjburnside.com>
Sent: December 20, 2018 2:32 PM
To: Findlay, Graham (MNRF) <graham.findlay@ontario.ca>
Cc: Sylvia Radovic <Sylvia.Radovic@rjburnside.com>
Subject: RE: South Innisfil Creek Drain Improvements and SAR

Hello Graham,

Thank you for taking the time to talk with us yesterday.

To follow up on our discussion regarding the planned improvements to the South Innisfil Creek Drain (SICD), below is a summary of the proposed work, Species At Risk (SAR) potentially located within the study area and habitat conditions developed based on a review of available background and database information as well as previous field observations of the area and reporting completed by Dillon in 2010-2012.

We would like to request an assessment from the MNRF as to whether there are species at risk concerns within the study area related to possible impacts of the proposed improvements into adjacent meadow areas and wooded areas.

The area of interest includes the SICD from of Hwy #89 to 5th Line and is a combination of undeveloped deciduous and mixed forest areas, mixed meadow, agricultural crop lands, a golf course and rural residential lots. An illustration of the drain route and the proposed work is attached for your reference, along with ELC mapping overlay.

Proposed work consists of improvements to drain capacity, remove restrictions to the flow and mitigate flooding in Market Garden Area and prepare a report in accordance with Section 78 of the Drainage Act, RSO, Chapter D17. The improvements are anticipated to include:

- In-channel excavation to remove sediment, deepen and widen in select areas with a combination of spoil levelling and spoil offsite disposal
- Removal of fallen trees, debris and remnant beaver dams within the drain channel
- Excavation to install private tile outlet pipes
- Tree clearing, grubbing and brush trimming in select areas
- Clean-out of culverts, bridge, private laneway culverts and crossing
- Bank repair and stabilization using rip-rap in select areas, including Main Drain / 3rd Line Branch Drain
- Creation of sediment pools, riffle structures and gravel substrate areas and placement of large woody debris

In an effort to characterize the potential for SAR and associated habitat in the study area, Burnside reviewed the following existing data sources:

- Aerial photography.
- Natural heritage GIS data layers made public by Land Information Ontario (LIO).
- Ontario Breeding Bird Atlas -atlas squares 17NJ08 and 17NJ09
- Ontario Reptile and Amphibian Atlas (ORAA) (Square 18PK).
- Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) online map viewer/database (17PK0803; 17PK0804 and 17PK0904).
- South Innisfil Creek Drain Species At Risk Information Gathering Form, Dillon Consulting, 2012.

Based on the information review, the following SAR have the potential to be located within the study area:

Common Name	Scientific Name	SARO Status
Bank Swallow	*Riparia riparia*	Threatened
Barn Swallow	*Hirundo rustica*	Threatened
Bobolink	*Dolichonyx oryzivorus*	Threatened
Eastern Meadowlark	*Sturnella magna*	Threatened
Common Nighthawk	*Chordeiles minot*	Special Concern
Olive-sided Flycatcher	*Hylocichla mustelina*	Special Concern
Wood Thrush	*Hylocichla mustelina*	Special Concern
Snapping Turtle	*Chelydra serpentina*	Special Concern
Northern Myotis	*Myotis septentrionalis*	Endangered
Little Brown Myotis	*Myotis lucifugus*	Endangered
Tri-colored Bat	*Perimyotis subflavus*	Endangered
Monarch	*Danaus plexippus*	Special Concern
Butternut	*Juglans cinerea*	Endangered
American Ginseng	*Panax quinquefolius*	Endangered

According to the findings of the Dillon report, the following SAR were observed in the Study Area:

Common Name	Scientific Name	SARO Status
Barn Swallow	*Hirundo rustica*	Threatened
Bobolink	*Dolichonyx oryzivorus*	Threatened
Eastern Meadowlark	*Sturnella magna*	Threatened

<u>Butternut and Ginseng (Threatened)</u>

The Dillon report of 2012 included surveys of the vegetative communities through site visits conducted on July 21, 2010 and on August 10, 2010. Dillon reported that habitats that could potentially support Butternut and American Ginseng were surveyed including, for Ginseng, the Sugar Maple Deciduous Forest Community located adjacent to Option 1 Overflow Area (Option 1 Overflow area previously planned for north west corner of intersection of Highway 89 and Sidroad 5). The entire length of drain between the Option 1 and Option 3 Overflow Areas (previously planned for the north limit of the study area south of 5th Line) was surveyed for Butternut. Neither of these species were observed during the field investigation. A description of the field work conducted during these site visits is provided below:

Botanical surveys consisted of wandering transects to determine species' presence within each ELC community. Due to the season of the survey, the vegetation list is not considered exhaustive. Vegetation studies involved identifying the dominant species in each vegetation community type based on visual estimates of species abundances and biomass, or in the case of accessible forest stands, by quantitative sampling using a factor 2-wedge prism. Species nomenclature is based on the Ontario Plant List (Newmaster et al. 1998). Moreover, the botanical survey included specific searches for the Species at Risk (SAR) that have the potential to occur within the Study Area as identified by the Ontario Ministry of Natural Resources.

Species at Risk Birds (Bank Swallow, Barn Swallow, Bobolink and Meadowlark (Threatened))

Potential habitat for Bank Swallow in the form of eroded and exposed banks was observed in select areas along the corridor during the aquatic assessment completed by Burnside in 2018. While the presence of Bank Swallow was not specifically surveyed, incidental observations by Burnside staff did not indicate the presence of Bank Swallow, such as nest burrows in the side of the banks, at the time of assessment.

A targeted breeding bird survey was completed and reported by Dillon (2012). Meadowlark and Bobolink were observed in mixed meadow areas adjacent to the drain corridor. Incidental observations of Barn Swallow were also reported with 5 to 6 nests observed under a farm access bridge crossing the drain.

The proposed works do not include alteration of the access bridges along the drain and are therefore not anticipated to impact nesting habitat for Barn Swallow.

Based on the ELC observations, the estimated area of potential mixed meadow habitat located adjacent to the corridor is a total area of approximately 34.01 ha. Proposed improvements will include vegetation removal in fringe areas of meadow habitat located adjacent to the corridor to accommodate the widening of the drain channel with an increase in width ranging from 10 metres to 15 metres, for an estimated total removal of meadow edge of approximately 1 ha along the study area corridor. The locations and extent of the improvement in areas of potential Bobolink and Meadowlark habitat are estimated in the table below.

Location along Main Drain	**Length (m)**	**Width (m)**	**Area of proposed works (ha)**	**Available Potential Habitat (ha)**	**Location of Improvements (Bank Side)**	**Mixed Meadow removal (Y/N)**
Sta. 3+375 to 3+588	213	15	0.32	3.55	west	Yes
Sta. 3+588 to 3+895	*307*	*15*	*0.46*	*5.81*	*south*	*No*
Sta. 6+650 to 7+000	350	10	0.35	3.55	east	Yes
Sta. 9+000 to 9+046	46	10	0.05	21.1	south/east	Yes
Sta. 9+046 to 9+320	274	10	0.28	(part of 21.1)	north/west	Yes
		Total	**1.46**	**34.01**		

Bats (Threatened)

A bat habitat assessment has not be completed to confirm the potential for bat maternity roosting habitat or quality. Based on the ELC observations, the estimated area of potential bat habitat located adjacent to the corridor is a total area of 34.65 ha. Proposed improvements will include tree removal in select linear areas adjacent to the corridor to accommodate the widening of the drain channel with an increase in width ranging from 7.5 metres to 15 metres, for an estimated total removal of treed area of approximately 1.37 ha. The locations and extent of the improvement in areas of potential bat habitat are estimated in the table below.

Location	**Length (m)**	**Width (m)**	**Area of proposed works (ha)**	**Available Potential Habitat (ha)**	**Location of Improvements (Bank Side)**	**Tree Removal (Y/N)**
Main Drain Sta. 1+224 to 1+650	426	7.5	0.32	1.74	North	Yes
Main Drain Sta. 4+880 to 5+449	569	15	0.85	5.46	north	Yes
Main Drain Sta. 7+077 to 7+928	*851*	*10*	*0.85*	*21.05*	*west*	*No*
3rd Line Spur Sta. 0+172 to	258	8	0.21	25.4	north	Yes
		TOTAL	**(2.3)**	**34.65**		**1.37 ha**

<u>Special Concern Species</u>

While Special Concern species are not afforded protection under Ontario's ESA (2007) or the federal SARA (2002), they may receive protection by some agencies, such as provincial and national parks, or other acts, such as the *Ontario Fish and Wildlife Conservation Act*, and the *Migratory Birds Convention Act* (MBCA), which prohibits the killing, capturing injuring, harassment and trapping of specially protected species.

To reduce the risk of potential impact to wildlife, timing constraints will be recommended to avoid vegetation clearing (including grubbing) and/or structure works (construction) during the active window for breeding birds - broadly from April 1 to August 31 and SAR turtle (May 15 to July) and the active egg laying and larval stages of Monarch (end of May through end of August) as well as species at risk (SAR) bat (April 1 to October 31) active season, consolidated as a timing restriction from April 1 to Oct 31.

We would like to request an assessment from the MNRF as to whether there are species at risk concerns within the study area related to possible impacts of the proposed improvements into adjacent meadow areas and wooded areas. Would some intrusion into the meadowland and wooded habitat represent an impact to identified SAR and a subsequent need for mitigation planning under the drainage exemption of O.Reg 242/08? If so, how does the drainage exemption under O.Reg. 242/08 apply?

Would potential impact to SAR be avoided with the implementation of appropriate timing for work to be completed outside of the active season for the identified SAR?

Thanks very much for your efforts in responding to our request. Please contact me should you need any additional information.

Regards,

Deanna

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Appendix C3

C3

Nottawasaga Valley Conservation Authority (NVCA)

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

August 7, 2015

Via: Email (acampbell@innisfil.ca)

Mr. Andrew Campbell
Deputy CAO and Town Engineer
Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

Dear Mr. Campbell:

Re: South Innisfil Creek Drain Peer Review
Project No.: 300037163.0000

As directed through our meetings, telephone conversations and email correspondence and in accordance with our proposal to carry out a Peer Review of the documentation for the South Innisfil Creek Drain dated April 7, 2015, we provide the following report.

It is noted that the writer has considerable familiarity with the South Innisfil Creek Drain and Branches extending over the period from the late 1970's to 2005 including past maintenance and repair work on the South Innisfil Creek Drain through to assisting the Town of Innisfil with procuring the engineering services to undertake a new engineer's report under Section 78 of the Drainage Act to consider improvements to the South Innisfil Creek and Branches.

As detailed in our proposal it was recommended that the Peer Review proceed in two phases with the first phase providing comments on the documentation, the process and the general concepts as set out in the report as well as general compliance with the Drainage Referee's Orders, including our interpretation of those Orders. The following report will provide our comments and recommendation which result from the document review. It was proposed that the second phase, which we would carry out subject to the Town's direction, would be the technical review including the hydrologic and hydraulic modeling as well as a review of the estimated cost of the work to consider possible alterations to the work to mitigate the capital costs of the proposed improvement. The second phase would be more technically orientated.

Generally our document review has included the various Orders issued by the Ontario Drainage Referee, the Preliminary Drainage Report for the South Innisfil Creek Drain and Branches, the Final Drainage Report for the South Innisfil Creek Drain and Branches, correspondence received from Dillon Consulting as well as from representation of the property owners within the South Innisfil Creek catchment area. We have also had verbal discussions with representatives of Dillon, representatives of the property owners and involved agencies.

1.0 Background – Document Review

1.1 Drainage History

The South Innisfil Creek Drain was first created over 100 years ago under a report prepared by M. Gaviller, OLS in February 1903. The last major report for the repair and improvement to the Drain was prepared by D.H. Weir, P.Eng., dated November 9, 1956. The work included cleanouts, bridge crossings, straightening and improvements of the South Innisfil Creek Drain from the 5th Line road bridge downstream to the 5th Sideroad bridge. In that same report three branches were constructed, namely the 10th Sideroad Branch, the 3rd Line Branch Drain and the 3rd Line Branch Drain Spur. Branch A and Branch B of the South Innisfil Creek Drain located in Concession 1 were created under a separate report by D.H. Weir, P.Eng. in 1954. The outlet of the South Innisfil Creek Drain is a natural watercourse known locally as the Innisfil Creek which is a tributary of the Nottawasaga River.

The Township of Innisfil and later the Town of Innisfil carried out significant maintenance on the South Innisfil Creek Drain in the late 1970's and in 2004 respectively with the removal of obstructions and a bottom cleanout. Other minor repairs were completed throughout that time period to remove obstructions or beaver dams as required.

Although the drain provided an outlet for upstream runoff, the drain had insufficient capacity to contain larger storm events that exceeded the original design criteria of the existing drain. Specific large rainfall events resulted in flooding of the market garden lands and the loss of crops. These events contributed to the affected property owners requesting an improvement to the Drain which was a matter placed before the Ontario Drainage Referee in 2004.

1.2 Ontario Drainage Referee Order – March 31, 2005

The initial Order of the Ontario Drainage Referee which appears to be dated the 31st day of March 2005 and which was a result of a hearing which commenced in November 2004 and was concluded in March 2005 was quite specific in its direction to the Town of Innisfil. The court ordered that the Town of Innisfil forthwith appoint an Engineer acceptable to the applicants pursuant to Section 78 of the Drainage Act in order to carry out the activities and reports contemplated by the Order.

The Engineer being appointed was to prepare and complete preliminary and final reports under The Act in order to alter, improve and/or extend the South Innisfil Creek Drain and in particular to address the concerns of flooding in the area known as the Market Garden Lands area which is adjacent to the Drain. The Order further requested that the Engineer "consider" in the preparation of both the preliminary and final reports the incorporation and repair/improvement as required of the channel joining the Drain and the Innisfil Creek and Nottawasaga River drainage works situated downstream, the repair and improvement of the Drain to provide the required capacity and the addition of one or more stormwater management facilities to the Drain. Further, that incorporation/improvement as required be considered of the original outlet (Branch A of the Drain) of the Hnydczak Drain, the incorporation improvement replacement or removal of all crossings on the Drain and the necessity of additional crossings and the requirements of the Nottawasaga Valley Conservation Authority (NVCA) and the Department of Fisheries and Oceans (DFO). The Order set out that once the preliminary report was prepared that a hearing date would be set for the Court to review the preliminary report. There were a number of other interim requirements within the March 2005 Order for the removal of obstructions or work to improve the inlet capacity of specific road crossing culverts.

In general, the Order was very specific with respect to the actions required by the Town of Innisfil around the appointment of an Engineer to prepare a report and specific with respect to the matters to which the Engineer was to "consider" in the preparation of the preliminary and final reports.

1.3 Preliminary Engineers Report

Pursuant to the March 31, 2005 Order the Town of Innisfil appointed the engineering firm of Dillon Consulting Limited to prepare the Preliminary Drainage Report. As the Preliminary Drainage Report for the South Innisfil Creek and Branches as prepared by Dillon Consulting Limited dated February 2006 is part of the public record we will not go into a detailed description of the content but rather note a few highlights.

The preliminary report provided a reasonable history of the Drain including previous studies undertaken for this drainage system as well as a description of the watershed and the observations noted by the Drainage Engineer during his inspection of the drainage system. The review included the South Innisfil Creek Drain as well as the South Innisfil Creek Branches (3rd Line Branches and 10th Sideroad Branch) as well as the Hnydczak Outlet Relief Drain. The preliminary report set out three options for the proposed drain improvements which provided varying levels of flood protection for storm events. There was no specific work proposed downstream of Highway 89. It was clearly set out and justified in the report that the objective was to provide protection for a one in two year return period storm.

Generally Option No. 1 in the Preliminary Engineer's Report required improvements to the South Innisfil Creek Drain and Branches accomplished by widening, deepening and increasing the drain side slopes where possible. Option No. 1 recommended a drain overflow area adjacent to the South Innisfil Creek Drain between County Road 89 and the 5th Sideroad. The total estimated cost for Option No. 1 as set out in the February 2006 Preliminary Engineer's Report was approximately $2.2 M. It is noted that Dillon went through a cost benefit analysis based on the cost set out in that Preliminary Report and determined that the benefit cost analysis was positive.

The Preliminary Report went on to describe Option No. 2 and No. 3 which were the addition of alternative overflow areas situated upstream of the Market Garden Land area. Option No. 2 was the addition of an overflow area located immediately upstream of the benefit area and muck soil region that is south of the 4th Line. Option No. 3 included the construction of an overflow area in the vicinity of the 5th Line. The additional cost of Option No. 2 and Option No. 3 was approximately $3.0 M and $2.7 M respectively as per the Preliminary Engineers Report. A cost benefit analysis was also carried out for Option No. 2 and Option No. 3 in the report as well as a description of the level of flood protection that would be provided by each.

The Preliminary Report indicated that the final Engineer's Report would follow with one of those options or variation thereof following the outcome of the hearings, meetings and decision from the Court of the Drainage Referee.

1.4 Ontario Drainage Referee Order – August 31, 2006

Once prepared and as set out in the initial Order the presentation of the Preliminary Report was heard by the Court of the Drainage Referee on the 24th day of July, 2006.

The Preliminary Report set out three options for recommended improvements to the South Innisfil Creek Drain and Branches. It is noted that Option No. 2 was the recommended option by the Drainage Engineer during the hearing although there was acknowledgement that some of the costs relative to Option No. 2 were somewhat uncertain.

The Drainage Referee heard from various affected property owners as well as agents of the owners. The Drainage Referee provided a judgment indicating the options to be pursued in the complete (final) report were Option No. 1 and Option No. 3. The actual Order went on to require the Town of Innisfil to retain the engineering firm of Dillon Consulting Limited to prepare a complete Drainage Report adopting Option No. 1 and Option No. 3 of the Preliminary Report including a full assessment schedule and an allowance schedule following which the Municipality was to conduct a public meeting of Council to consider the report.

It is noted that the total anticipated cost to implement Option No 1 and Option No 3 as described in the 2006 Preliminary Engineers report would have been approximately $4.9 M.

The Order of the Drainage Referee dated August 31, 2006 was considerably more specific in its direction to the Engineer than the initial Order dated March 31, 2005. Whereas the initial Order indicated that certain matters should be "considered", the second Order provided clear direction that the Drainage Report was to adopt Option No. 1 and Option No. 3 as set out in the Preliminary Report thereby virtually dictating to the Drainage Engineer how the works would proceed from that point forward.

1.5 Final Engineers Report

Following the Order of the Ontario Drainage Referee issued on August 31, 2006 which provided very specific direction to the Drainage Engineer and the Municipality and which allowed for very limited change in the scope of work, the Final Engineer's Report was prepared as submitted in August, 2013 by Dillon Consulting. As with the Preliminary Engineer's Report the Final Engineer's Report is part of the public record and we will not go through the details of the report but rather address a number of highlights.

The Final Engineer's Report provides a brief description of the background as well as summarized the content of the Preliminary Report. It also provided details with respect to the Drainage Referee's decision and Order which set out that the Municipality was to retain Dillon Consulting Limited to prepare a complete Drainage Report adopting Option No. 1 and Option No. 3 of the Preliminary Report. The report also addressed and included the history of this drainage system, previous studies, description of the watershed, a survey of the existing conditions and various design considerations that went into the preparation of the report. The report provided a general description of the hydrologic and hydraulic analysis that was undertaken as part of the preparation of the report to meet the objective of controlling a one in two year event for this drainage system.

The recommended improvements to the Drain were set out within the report and included on the drawings and specifications attached to the report. This included improvements to the South Innisfil Creek Drain commencing at the 15th Line and extending upstream to the 5th Line, the Hnydczak Outlet Relief Drain, the 3rd Line Branch Drain, the 3rd Line Branch Drain Spur, and Overflow Area No. 1 all of which were generally proposed as Option No. 1 in the Preliminary Engineers Report. The Final Engineers Report also included the overflow area in the vicinity of the 5th Line which was anticipated as Option No. 3 in the Preliminary Report. The updated cost estimates provided in the Final Engineer's Report for Option No. 1 and Option No. 3 was approximately $6.7 M.

The rationale for the assessment schedule was set out within the Engineer's Report as well as direction relative to future maintenance of the Drain. The drawings included an overall plan of the Drain as well as a detailed profile and typical cross sections of the Drain as well as details of the proposed culvert and bridge crossings.

1.6 Concerns of the Public

By the time the Final Engineers Report was completed in August 2013 it was apparent that there were a number of problems with the wording of the Referee's Order of 2006, that the estimated costs of the work had exceeded expectations and there were issues with the extent of work proposed. Council held a public meeting to consider the report on October 2, 2013 at which time the concerns of the public were clearly reinforced. Council deferred the consideration of the report and directed staff to commence an application to the Referee for reconsideration of the previous Order.

Generally the comments from the property owners can be categorized around the overall increase in cost from the Preliminary Report as prepared in 2006 to the 2013 Final Report, the construction of Overflow Area No. 1 and Overflow Area No. 3 as set out in the Engineer's Report and the level of protection that would be provided as well as the proposed work on the 10th Sideroad and 3rd Line Branches. It is apparent that there was some concern relative to the extent of communications between the Drainage Engineer and the property owners during the time period that the Final Engineer's Report was being prepared. We note again that in defense of the Final Engineer's Report that the Ontario Drainage Referee's decision of 2006 left very little room for considering alternate courses of action.

We have reviewed those comments and taken those comments into consideration in the preparation of our review comments which will follow in this report.

1.7 Ontario Drainage Referee Order – November 14, 2014

This matter went before the Ontario Drainage Referee in November 2014 with a subsequent Order being issued by the Drainage Referee on November 4, 2014 which ordered that as a result of the unforeseen cost increases occurring between the Order of the Referee O'Brien dated August 31, 2006 which set out the requirements that Option No. 1 and No. 3 be adhered to as contained in the Final Engineers Report dated August 15, 2013 are to no longer bind the Town of Innisfil or its Engineers appointed from time to time and further that the Town of Innisfil is ordered to retain the services of a Drainage Engineer to review the said report of August 15, 2013 and to suggest alternatives including but not limited to improvements to alleviate flooding and options that may provide for phasing, maintenance and repair and that the

Order of Referee O'Brien dated August 31, 2006 is thereby amended accordingly. As a result of this latest Order of the Referee, the Town of Innisfil and appointed Drainage Engineer are no longer bound by the very specific Order as issued by Referee O'Brien dated August 31, 2006.

1.8 Current Status of Drain

The Order of the Ontario Drainage Referee of November 4, 2014 provided direction that the Town of Innisfil or its Engineers were no longer bound by the decision of the Order of the Referee O'Brien dated August 31, 2006. With Council's decision to defer consideration of the Engineer's Report, the Referee's decision of November 14, 2014, supplementary information from the public and the consultants and Council's direction to staff to have this Peer Review completed, a decision on a course of action is pending.

We are aware that Town staff met with some of the major stake holders on the South Innisfil Creek Drain in February, 2015 from which a list of concerns, comments and recommendations were developed relative to this project moving forward.

The alternatives available to Council will include referring the report back to the Engineer (Dillon) for their reconsideration with or without specific requests to have certain issues considered or the appointment of a new Drainage Engineer with respect to preparing a new Engineers Report on this matter.

It is noted that the combined effect of the Orders of the Ontario Drainage Referee are that a new report and By-Law for the South Innisfil Creek Drain and Branches is still required. We would also note that from a practical and logistic perspective a new report and By-Law are necessary to facilitate future maintenance and repairs of the South Innisfil Creek Drain and Branches. Consequently, the matter eventually must lead to a new report and By-Law.

2.0 Supplementary Correspondence and Communications

2.1 Dillon Consulting

We contacted Dillon Consulting in June to provide notice that we had been retained by the Town of Innisfil to carry out the Peer Review on this project. A message was left for Mr. Dennis McCready in this regard.

Memorandums were provided by Dillon Consulting to the Town of Innisfil all dated February 3, 2015 which provided further design detail and recommendations and possible alternative considerations to the Town relative to this matter. Included were comments on the limits and the maximum assessment to maintain a positive cost benefit ratio and further identified that the maximum assessment as set out in the August 15, 2013 report was still below the calculated limit. Also included were the results of modifying the typical cross sections of the proposed channel to reduce the width and to remove the 0.4 m free board which was provided in the original design which accommodated the 1:2 year storm event. Providing low flow crossings for some of the field crossings, having properties share crossings and phasing the project were also suggested as possible cost saving measures. We note that the estimates provided in the memorandum for a reduced channel cross section and the use of low flow crossings reduced the cost to approximately $5.0 M which is very close to the estimated cost set out in the Preliminary Engineers Report of $4.9M for Option No. 1 and Option No. 3 and prepared several years earlier.

A second memorandum of February 3, 2015 provided information relative to the Highway 400 culverts and the effect on the flood levels if the culverts were completely removed and replaced with an open Drain. A third memo provided specific responses to comments made by one of the major benefitting property owners on the Drain.

Correspondence from Dillon Consulting to the Town of Innisfil dated February 25, 2015 provided some of the chronology of the project as well as provided a general response to some of the comments provided by Mr. John Kuntze, P.Eng., of K. Smart & Associates as a representative of one of the property owners.

We arranged and participated in a teleconference with Dennis McCready, P.Eng., and Jerome Trudell, P.Eng., of Dillon Consulting to review some of the details of the Final Engineer's Report. We were able to discuss in more detail some of the cost saving options they had presented in their February 3, 2015 memorandums including specific discussions regarding the reduced channel cross section, shared use of bridges, reducing foundation costs for bridges, the Highway 400 culvert crossings and agency requirements associated with the proposed work.

2.2 K. Smart & Associates, J Kuntze, P.Eng.

We also note that John Kuntze, P.Eng., of K Smart & Associates a Drainage Engineer practicing in the Province of Ontario was retained by one of the property owners and provided comments dated February 18, 2015.

Mr. Kuntze provided comments regarding the extension of the Main Drain to Concession 15, the cross section and design grades of the drain, overflow areas No. 1 and No. 3, the Highway 400 culverts, farm crossings and the proposed work on the 10th Sideroad and 3rd Line Branches.

We contacted Mr. John Kuntze and had a verbal discussion around his numerous comments on the Final Engineer's Report and his recommendations with respect to future steps on this Municipal Drain. This provided an opportunity to better understand the comments provided and as he is representing one of the larger benefitting property owners, have a clearer awareness of the property owner's concerns.

2.3 Dianne Hogarth

We were contacted independently by Dianne Hogarth who we understand has maintained an interest in the South Innisfil Creek Drain and the history of the Drain at least over the last decade. Ms. Hogarth provided extensive verbal comments in regard to the history of the project.

3.0 Contact with Agencies

As part of our review we contacted Sarah Schmied, Environmental Planner of the Sustainable Transportation Group URS Canada Inc. Consulting Engineers and Geoscientists who have been retained by the Ministry of Transportation of Ontario to undertake the study for the future improvements to the Highway 400 Corridor from 1 kilometre south of Highway 89 to the junction of Highway 11. We discussed with Ms. Schmied what the timing for future improvements may be for the Highway 400 Improvements and what specifics might be planned around the various water crossings that cross Highway 400 within this study area. At this point in time we understand that this is a preliminary study which will only address the conceptual details of future work on this section of Highway 400.

It was apparent through our review of the report that considerable liaison had occurred between the NVCA and Dillon Consulting. We have contacted Mr. Glenn Switzer at the NVCA to have discussions around the NVCA's view relative to the modeling and hydraulic characteristics of this drainage system. Specifically we discussed with Mr. Switzer the overflow areas and the Highway 400 crossings. Although the NVCA has reviewed the modeling it is now some time ago and it was resolved that we should look at the modeling to satisfy ourselves on the merits of the overflow areas and the influence of the Highway 400 crossings on upstream flood levels.

4.0 Review Comments and Recommendations

Our review of the documentation forwarded regarding this matter as described above as well as our verbal discussions and our past knowledge of this drainage area have generated the following comments and recommendations for the Town of Innisfil's consideration. We have categorized our comments and recommendations around the principle components of the proposed work in the following sections.

4.1 Drain Cross Section

Based on the information provided by Dillon we note that the proposed reduction in the channel cross section as described in their memorandum of February 3, 2015 reduces the cost of the Main Drain improvement by approximately $500,000. The proposed reduction in cross section removes the 0.4 m of freeboard which was included in the original design which provided some margin of safety. We understand the reduced cross section will still accommodate the 1 in 2 year storm event which has been the established design criteria for this drainage system.

We would note that the 0.4 m of freeboard provided a margin of safety against flooding for the 1 in 2 year event storm and provided additional capacity within the channel for larger storm events. Removal of the freeboard removes the margin of safety and would theoretically result in any storm larger than the 1 in 2 year event overtopping the banks of the drain and potentially causing flooding of the adjoining lands.

A detailed review of the modeling inputs and the model will allow Burnside to confirm the capacity of the proposed channel and to determine if further cost savings can be found in this regard. It is also noted that the reduced cross section impacts less land on either side off the existing drain. Considering the nature and value of the crops being grown in the market garden farm area, all efforts to minimize the land required should be considered.

On the basis of the information provided by Dillon, we recommend that efforts be made to reduce the channel cross section as proposed by Dillon and the modeling be reviewed to provide confirmation.

4.2 Overflow Area No. 1

Burnside would like to better understand the benefits of Overflow Area No. 1 and the need for that area to provide "sufficient outlet" for this Municipal Drain. We believe a review of the model may provide some clarity in this regard. It is noted however that the creation of a flood storage area is being provided by the construction of Overflow Area No. 1 and yet the report requires that lands immediately upstream which are currently being flooded and therefore providing flood storage are being bermed to prevent the flooding of adjoining lands. Specifically we note that lands which currently flood between the 5th Sideroad and Highway 400 are being bermed to contain the flood water within the channel. This applies to the lands immediately above Hwy 400 as well.

Without the benefit of reviewing the model to date this seems to be a contradiction. The speculation is that there would be merit in allowing flood storage to continue where it currently occurs and avoid the construction of storage in one area and constraining berms in another.

We recommend that Phase 2 of our review be authorized to allow Burnside to confirm the need for Overflow Area No. 1.

4.3 Highway 400 Crossings

The Highway 400 and Reive Road culvert crossing have been long considered by the upstream owners as a significant restriction to the outlet capacity of the Drain. We understand that the hydraulic model for the drain indicates that for a 2-year storm event that the backwater levels only extend to the 2nd Line. If the culverts were completely removed the water levels upstream of the 2nd Line would be unaffected. However, we understand the perception that from a practical logistic perspective that lowering of these culverts or at least providing a supplementary lower culvert may benefit the upstream lands.

Obviously as the Hwy 400 culvert crossings are of prime concern to the property owners, a technical review of the model in regard to these crossings is warranted. It is noted that Dillon suggested that consideration could be given to boring a small diameter culvert (800 mm diameter was suggested) at the grade of the proposed drain bottom. We support that this should be modeled as an option to determine the benefit.

We note that any work on the Hwy 400 and Reive Road crossings will be very expensive and although such work if required by the Final Engineers Report would be included in the overall total cost of the project, that Section 26 requires the cost of road crossings to be assessed to the respective road authority and therefore inclusion of this work would not adversely affect the cost assessed to the property owners on the Drain.

As the cost of any work will be significant, there will need to be strong technical evidence provided to the MTO to satisfy them that the work is required as any proposal to adjust the crossings will be heavily scrutinized by the Ministry.

4.4 Sharing Farm Crossings

There are four major farm crossings on the Main Drain portion of the South Innisfil Creek Drain which are to be replaced within the Engineers Report as currently written. For the most part these crossings serve the Market Garden Lands. An option has been presented by Dillon since the Final Engineers Report was submitted to consider low flow crossings rather than the larger and more expensive bridge crossings to reduce the overall cost. There has been general feedback that low flow crossings would not provide the required level of service for the frequent crossing required by the Market Garden Land. Dillon had also proposed that "shared" crossings be considered where one crossing would serve 2 properties with the anticipation that the crossings would be placed on the property lines and hence accessible to both owners.

We support and recommend that efforts need to be made to reduce the number of bridge replacements on private property. This will require some discussions with the adjoining owners and possible access agreements to address the very minor encroachments on the adjoining land to make use of the full width of the crossing. It is also noted that the general response was that low flow crossing would not be acceptable. In the past and based on the latest available imagery for the area, there was/is a property on the downstream edge of the Market Garden area which is not used extensively. This raises a question whether a reduced standard of crossing (low flow crossing) could be considered for this property.

We believe that efforts should be made to reduce the number of crossings and type of crossings which would have a positive impact on the overall cost of the Drain. It is noted that reducing the number of crossings may have a positive effect on the hydraulic capacity of the Drain as well.

4.5 Farm Crossing Foundations

The original geotechnical investigation and subsequent report dated February 19, 2007 as prepared by Golder Associates provided a general description of the proposed farm crossings. Each crossing was proposed to consist of a low profile 8350 mm span x 3300 mm rise corrugated steel pipe bottomless arch supported on a concrete slab extending 600 mm wider than the culvert spans with the slab embedded a minimum of 600 mm below the drain bottom. It was further recommended that the native materials be sub-excavated a minimum of 0.5 m below the proposed founding elevations and replaced with compacted granular fill.

Additional field investigation was carried out and a report dated February 2013 prepared by Golder pertaining to the construction of the proposed farm crossings. It is stated in the second report that "*the subsurface conditions are not capable of supporting the shallow raft foundations originally proposed by Dillon without inducing unacceptable settlements (greater than 25 mm)*". It is further stated that "*if settlement of the crossing structures is not acceptable, the structures should be supported on deep foundations extending into the hard clayey till and dense to very dense silt and silty sand deposits*".

As a result of the above, the design of the proposed farm crossings as set out in the Final Engineers Report include deep pile foundations to support the 8052 x 3049 corrugated steel pipe bottomless arch structures.

The geotechnical reports have not quantified the anticipated maximum settlement that may occur but have only stated it may be greater than 25 mm. If the anticipated settlement was in the order of magnitude of 25 mm we believe that this amount of settlement could be acceptable for a farm crossing. It may not be acceptable for a road crossing but for a farm crossing we believe settlement in this order can be accommodated.

Burnside recommends that Golder be approached to determine the maximum anticipated settlement for the proposed crossings and that consideration be given to accommodating the anticipated settlement in the design to remove the need for the deep foundations for the proposed structures.

4.6 Proposed Grade Line

It was noted through our review and was also identified by representatives of the property owners that the proposed grade line downstream of Hwy 89 is actually below the existing bottom of the watercourse. However, there was no work proposed in the Engineers Report on this section of the Drain.

We also note that the original Drain grade from 400 culverts upstream was at a profile of 0.04% and downstream of 400 was 0.05% to the 5th Sideroad. Although these grades are not consistent with the proposed grades as shown in the report drawings it is acknowledged that the hydraulic modeling may have dictated the optimum grades in this area.

We concur and recommend that if the Drain is to extend downstream to the 15th Line and if the existing channel bottom is indeed above the proposed grade line that work to correct this should be undertaken concurrently with the rest of the improvements. The alternative could place the Town in the position that maintenance would be required immediately after the rest of the work is completed. It would seem much more efficient to have it done concurrently with the rest of the work.

With regard to the profile grade, it is anticipated that the technical review of the modeling will assist in determining the optimum profile grade line for the Drain.

4.7 Overflow Area No. 3

This overflow area is located immediately south of the 5th Line and west of the South Innisfil Creek Drain. It is to provide detention storage during the 1 in 2 year storm to attenuate the flows and increase the downstream conveyance capacity. It is approximately 6 hectares and would provide approximately 50,000 cubic metres of storage. The Engineers Report states that "*the 5th Line Overflow Area* (Overflow area No 3) *reduces the magnitude of the drain improvements downstream and lessens the severity of possible flooding from larger storm events exceeding the 1 in 2 year storm.*"

We recommend that Phase 2 of our review be authorized to allow the technical review of the hydraulic modeling and for Burnside to provide technical comments on the merits of constructing Overflow Area No. 3.

4.8 3rd Line Branch Drain

We note that the Engineers Report requires significant improvements to the 3rd Line Branch Drain and the 3rd Line Branch Drain Spur including deepening and the replacement of the majority of crossing culverts. It is noted that the public have suggested that there has not been any specific and identified problems with the 3rd Line Branches as they currently exist. We expect that the 3rd Line Branches do require cleaning as to the best of our knowledge they have not been maintained in recent history. As they are part of the current By-Law which adopted D. H. Weir's 1954 report, there is limited documentation available to provide direction relative to any future maintenance.

Although there has been suggestions that the 3rd Line Branches could be addressed in a separate future Engineers Report under Section 78 of the Drainage Act, we believe this would place the Town in a position where they would not be able to maintain the 3rd Line Branches until such a report was prepared and the subsequent By-Law passed. As the 3rd Line Branches were part of the original drainage system and included in the current By-Law A40, we recommend that it would be more efficient and practical to include in the new report and By-Law for the South Innisfil Creek Drain and Branches.

We have noted that there are approximately a dozen new replacement crossing culverts proposed on the 3rd Line Branches. Many of the culvert replacements proposed are a result of lowering the grade of the Drain bottom and are providing significantly longer structures thereby providing much wider platform widths on the crossings. We would raise the question whether providing a design that may more closely represent a maintenance project but inclusion in the report to facilitate the cleanout and future maintenance may be an appropriate course of action.

We recommend that the proposed profile grade for the 3rd Line Branches be revisited in an effort to reduce the number of replacement culverts required, that the required platform width of the crossings be reviewed and that similar to the Main Drain crossing that opportunities to share crossings between property owners be considered. Any reductions in the number of culvert replacements and the extent of deepening of the drain would facilitate a reduction in the overall cost

4.9 10th Sideroad Branch

There are less crossings existing and proposed on the 10th Sideroad Branch although a significant change in drain depth and cross section is proposed. Based on our document review with specific reference to comments from the public, we note very little communication with respect to this Branch.

Our comments above regarding to the 3rd Line Branches related to the inclusion of the Drain Branches in the new report and By-Law apply to the 10th Sideroad Branch as well.

We recommend that communications with the property owners affected by the 10th Sideroad Branch be undertaken to further determine the level of improvement required on this Branch and that possible revisions to the scope of the required improvement be considered towards reducing the amount of work required. Further that the 10th Sideroad Branch continue to be part of the Engineers Report for the South Innisfil Creek Drain and Branches.

4.10 Hnydczak Outlet Relief Drain

A significant deepening of the channel downstream of the Hwy 400 crossing culverts is proposed in the Engineers Report which we anticipate will improve the capacity of the Hnydczak Outlet Relief Drain. It is anticipated that this will hydraulically allow more of the runoff flows from the upstream Hnydzcak Drain to be directed through the Relief Drain and hence provide more capacity for the South Innisfil Creek Drain to accommodate upstream flows. It is anticipated that the model demonstrates the effect of the proposed work on the Hnydzcak Outlet Relief Drain.

The effect of providing a low flow culvert at the lower elevation of the upstream Hnydzcak Drain under the Hwy 400 and Reive Road has not been addressed within the Engineers Report although we expect this analysis could be easily undertaken within the hydraulic model.

We recommend that Burnside be authorized to proceed with Phase 2 of this review which will allow confirmation of the positive affect of the proposed work and to complete an analysis of the influence of placing a small culvert at a lower elevation to supplement the existing crossings.

5.0 Summary

The initial March 31, 2005 Order of the Ontario Drainage Referee set out clear direction for the appointment of a Drainage Engineer to prepare a new Engineers Report under Section 78 of the Drainage Act to contemplate improvements to the South Innisfil Creek Drain and Branches and to consider specific improvements and/or changes to the Drain. The Preliminary Engineers Report of 2006 set out proposed works and provided estimated costs based on the preliminary engineering completed to date. The second Order of the Ontario Drainage Referee was very specific regarding the works that were to be included and required the Engineer to include Option No. 1 and Option No. 3 as set out in the Preliminary Report to be implemented. The estimated cost for the anticipated work based on the 2006 estimates (Options No. 1 and No. 3) was approximately $4.9 M.

The Final Engineers Report followed the Order of the Referee to implement Option No. 1 and Option No. 3. As a result of inflation affecting the cost of construction, work required to address agency requirements around fisheries and the natural environment, unanticipated foundation costs for structure foundations and the rise in land value which affected the amount of allowances to be paid, the cost estimate in the 2013 report increased to $6.7 M. To some extent such a cost increase should not be unexpected considering the contributing factors. It is noted that some preliminary analysis of possible cost saving measures actually completed by Dillon produced a preliminary cost estimate of approximately $5.0 M which is only marginally over the 2006 estimate of $4.9 M.

We acknowledge that any of the above cost estimates place a heavy financial burden on the affected property owners even though the cost benefit ratio as calculated by Dillon is still positive. We believe that there should be continued efforts to reduce the scope of the work that affects the individual property assessments and yet maintains the level of service established by the 1 in 2 year storm event design criteria. Further, Burnside is optimistic that through the specific analysis of the drain components described in the previous sections that some cost savings can be found to make the South Innisfil Creek Drain and Branches improvement project more palatable.

There are recommendations included above that identify the need to carry out Phase 2 of the review which is the technical review of the hydrologic and hydraulic modeling of the Drain and the review of the details cost estimates for the proposed work.

As an aside, we would note that the desire to have the South Innisfil Creek Drain improved was driven by a number of storm events that were centered over this drainage area and exceeded the capacity of the Drain. Those storm events were in fact larger than the design criteria of a 1 in 2 year storm event which is the design criteria for this drain and the typical design criteria used for Municipal Drains across Ontario. The improvements proposed will assist to mitigate the effect of larger storm events larger than the design criteria. The area to the best of our knowledge has escaped any recent storm events that have caused similar damage. It should be anticipated that such a similar event may occur again at some point and consequently we caution that lowering the level of service relative to the drain capacity would not be appropriate.

If you have any questions or require clarification in regard to matters discussed above, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Vice President, Public Sector
DMcN:lm

Enclosure(s) None

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

November 17, 2015

Via: Email (jinwood@innisfil.ca)

Mr. Jason Inwood
Manager of Operations
Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

Dear Mr. Inwood:

Re: Town of Innisfil
South Innisfil Creek Drain Peer Review - Phase 2
Project No.: 300037163.0000

As described in our letter report dated August 7, 2015, addressed to Mr. Andrew Campbell of the Town of Innisfil, R.J. Burnside & Associates Limited (Burnside) was retained by the Town of Innisfil to carry out a peer review of the documentation for the South Innisfil Creek Drain. As noted in the earlier correspondence, it was agreed that the peer review would proceed in two phases with the first phase providing comments on the documentation, the process and the general concepts as set out in the report, as well as general compliance with the Drainage Referee's Orders including our interpretation of those orders. The second phase of our peer review was intended to be a more technical review including the hydrologic and hydraulic modeling, as well as the estimated cost of the work.

Our letter report of August 7, 2015 provided our findings, comments and recommendations resulting from the document review carried out in Phase 1 of this peer review process. The Phase 1 correspondence provided a summary of the documents reviewed including the Preliminary and Final Engineer's Reports for the South Innisfil Creek Drain and Branches, the Orders issued by the Ontario Drainage Referee with regard to this Drain, identified concerns of the public, as well as correspondence and communications from the consultants, the public, representatives of the public and agencies which was generated after the Final Engineer's report was submitted.

The Phase 1 review and report also identified a number of areas where possible reduction in costs may be considered although for the most part it became clear through the Phase 1 review that confirmation on any alterations to the proposed work to mitigate the costs would require the review of the hydrologic and hydraulic modelling completed for this project. Consequently, proceeding with Phase 2 of the peer review was recommended.

As noted in the summary of our Phase 1 Report, the desire to have improvements completed on the South Innisfil Creek Drain resulted from weather events that generated flood occurrences resulting in crop damage. Those weather (storm) events were, in fact, larger than a 1 in 2-year storm event, which is the design criteria applied to the proposed work on the South Innisfil Creek Drain and Branches and the typical design criteria used for Municipal Drains across Ontario. It must be anticipated that similar larger events may occur in the future and there will continue to be a risk of flooding resulting from higher frequency storm events. The improvements will assist to mitigate the effect of larger storm events but will not eliminate the potential for future flooding.

The following provides the results of our Phase 2 review in regard to the proposed upgrades of the South Innisfil Creek Drain and Branches. The emphasis of our review has been on the hydrologic and hydraulic modelling and the overall design criteria for the proposed work.

Overall Modelling Comments

Burnside has reviewed the HEC-RAS modelling for the Innisfil Creek Drain and offers the following general comments:

- The Drainage report refers to the topographic data referenced from field survey as well as DEM data provided by the NVCA. It should be confirmed that the base map created has been "ground truthed" in comparison to topographic survey data.
- Cross Section locations in the vicinity of roadway crossings have been observed to be spaced at large distances. These larger distances may play a role in the accuracy in the calculation of headwater elevations throughout the reach. It is recommended that additional cross sections be added to the model to reduce the large reach lengths in the vicinity of culvert crossings in accordance with standard HEC-RAS methodology.
- Calculated water surface elevations in excess of the 2-year peak flows have been observed to exceed the station and elevation data of a majority of cross sections within the model. Accordingly, the SICD_DILLON HEC RAS model is assumed to be valid for only return intervals up to and including the 2-year event.
- The Manning's roughness values provided in the HEC-RAS modelling have been observed at 0.04 for the left and right overbanks as well as the channel section. The VO2 hydrology modelling shows Manning's roughness values of 0.04 – 0.06. The manning's coefficients should be consistent between models.

Downstream Limits of the Study Area

Burnside has noted that the Engineer's report proposes that the South Innisfil Creek Drain will be extended downstream to the 15th Line. The proposed drain improvements on this section of drain located between Highway 89 and the 15th Line are outlined on Drawing 26. It appears as though the profile grade through this section of the drain is proposed to be lowered for future maintenance purposes although no physical work is proposed.

Burnside offers the following observations/comments:

- The HEC-RAS hydraulic modelling provided to Burnside for review does not include modelling at the downstream end of the Drain to the 15th Line crossing.

- Burnside has local knowledge of Innisfil Creek Drain and is aware that the 15th Line bridge crossing has a smaller geometry in comparison with other structures upstream and hence may be a flow restriction. If it is a restriction to flow, it should be included in the modelling as it may dictate back water elevations for the channel upstream.
- The MTO is currently in the process of replacing the Highway 89 crossing. This structure replacement is larger than the existing crossing which may impact the calculated water surface elevations for the downstream portion of the drain.
- Burnside has observed a difference in water surface elevations between existing and proposed conditions within the model. As the flow volume remains at the 2-year event, a better understanding of the reasons for the flow depth change would be beneficial Given that the channel geometry and flows downstream of Highway 89 remain constant in existing and proposed conditions within the model, the calculated water surface elevations downstream of Highway 89 should also remain constant. Accordingly, additional cross sections should be added to the model downstream of Highway 89 to establish a static 2-year water surface elevation. This static water surface elevation would provide a benchmark whereby calculated water surface elevations between existing and proposed conditions could be directly compared.

Overflow Area No. 1

From the Final Drainage report, Burnside notes the following statements:

- "The overflow area and modifications to the drain will assist in regulating flows passing through the overflow area such that storms to the 1:2 year return period will be attenuated in the Innisfil Creek downstream watercourse compared to existing conditions"
- "Further the overflow area is to reduce flow capacities without sacrificing drain capacity and furthermore promote colloidal sediment transport."

The Dillon report suggests that there will be a marginal increase in conveyance capacity of the upstream drain as a result of the proposed channel improvements during smaller event storms up to and including the 2-year event.

Burnside has reviewed the methodology of Overflow Area No 1 and offers the following comments/observations:

- Overflow Area No 1 is to be constructed via a cut within approximately 6ha of land located between the 5th Sideroad and Highway 89 and will provide approximately 50,000 m^3 of storage.
- The final drainage report calls for berming to be placed between the 5th Sideroad and Highway 400 to contain the 2-year peak flows. As noted in the Phase 1 report it appears that storage between Highway 89 and the 5th Sideroad is being created and yet the proposed berm construction upstream may be reducing existing storage between the 5th Sideroad and Highway 400.
- Burnside acknowledges that there may be potential for attenuation of flows as a result of the excavation associated with Overflow Area No 1. However, the Dillon report focuses on drain improvements north/upstream of Highway 89. Further, there is an absence of discussions concerning the drain downstream of Highway 89.

- Attenuation of flows via the proposed SWM facility may provide a hydraulic benefit in minor system flows to the receiving watercourse, however there has not been a rationale/justification provided on an analysis of the downstream drain suggesting that there is a conveyance issue in minor system events.
- There has been no provision in the design for any physical control of the discharge from Pond Area 1 but rather only an increase in storage volume through the excavation. With the combination of a new Highway 89 bridge, uncertain channel characteristics downstream of Highway 89 and the absence of any calculation to determine potential tail water elevations and the effect of the 15th Line Bridge on tail water, Burnside feels that the benefit of constructing Pond Area 1 to downstream flows is uncertain.

Highway No. 400 Crossings

The Highway 400 and Reive Road culvert crossings have been long considered by the upstream owners as a significant restriction to the outlet capacity of the Drain. We believe there is concern about the overall cross sectional area of the culvert crossings but it is also recognized that the culvert inverts are perched higher than the upstream channel invert which impedes the base flow through the structures. Dillon has indicated in correspondence to the Town that the hydraulic model for the drain indicates that, for a 2-year storm event, that the backwater levels only extend to the 2nd Line and further, if the culverts were completely removed, the water levels upstream of the 2nd Line would be unaffected. It is noted that Dillon suggested that consideration could be given to boring a small diameter culvert (800 mm diameter was suggested) at the grade of the proposed drain bottom.

We note that any work on the Highway 400 and Reive Road crossings will be very expensive and although such work, if required by the Final Engineer's Report, would be included in the overall total cost of the project, that Section 26 of the Drainage Act requires the cost of road crossings to be assessed to the respective road authority and therefore would not adversely affect the cost assessed to the property owners on the Drain.

As the cost of any work will be significant, there would need to be extremely strong technical evidence provided to the MTO to satisfy them that the work is required as any proposal to adjust the crossings will be heavily scrutinized by the Ministry.

We believe, from a practical/logistic perspective, that lowering of these culverts or at least providing a supplementary lower culvert, may benefit the upstream lands.

Burnside has reviewed the drain hydraulic model in the vicinity of the Highway 400 crossings and offers the following observations/comments:

- The water surface elevation profiles for both existing and proposed conditions is relatively flat upstream of Highway 400 crossings with profile grades of 0.03-0.04%. The water surface profile grades are slightly less (0.01%) than the profile grade of the drain. This would suggest that there is a slight restriction in flows at the Highway 400 crossing.
- Burnside has observed a 0.40 m (226.55 m – 226.55 m) difference in water surface elevations from the downstream to upstream limits of Highway 400. This elevation difference may provide an opportunity for future conveyance improvements. Burnside has explored the option of an increased culvert sizing at Highway 400 and noted that calculated water surface elevation reductions may be possible as far upstream as the 3rd Line.

To determine the impacts of the Highway 400 crossing on water surface elevations located between Highway 400 and the 2nd Line, a HEC-RAS geometry file was created whereby the lower Highway 400 2400 mm diameter CSP culvert was replaced with a 5 m span x 3 m rise concrete box culvert. The size of the concrete box culvert was not calculated but rather the size was selected to be notably larger in size than the existing culvert to determine the influence of additional conveyance under the highway.

The proposed 5 m span x 3 m rise concrete culvert has been observed to reduce water surface elevations by up to 0.4 m depending on location. Reductions in water surface elevations have been observed as far upstream as the 3rd line.

In summary, we believe upgrades to the Highway 400 culvert crossings would provide a hydraulic benefit to the 2-year water surface elevations upstream. Comments regarding potential benefits from adjusting the grade line through the Highway 400 culverts will be addressed in the following section.

Proposed Grade Line

It was noted through our review and was also identified by representatives of the property owners that the proposed grade line downstream of Highway 89 is actually below the existing bottom of the watercourse. However, there was no immediate work proposed in the engineers report on this section of the Drain. This could place the Town in the position that maintenance would be required immediately after the rest of the work is completed. It is Burnside's position that if the proposed profile grade is below the existing grade of the channel that the work required to meet the proposed grade should be undertaken as part of the physical Drain improvements.

It is noted that if the grade downstream of Highway 89 was consistent with the grade upstream of Highway 89 (0.05%) that there would be very little excavation required on this section. A further reduction to 0.04% from the 5th Sideroad downstream would remove almost any required excavation downstream of Highway 89.

It is noted that approximately 300 metres of drain in the vicinity of the Highway 400 crossings is proposed at 0.22% grade. This would seem to reflect the need to adjust the invert elevation from a deeper invert downstream of the Highway 400 crossing to a shallower invert upstream of Highway 400. Outside of this section, the drain downstream and upstream is at 0.04%. Flattening this section of Drain from 0.22% grade to 0.04% grade would lower the drain invert upstream of Highway 400 by approximately 0.5 meters. Adding this increased depth to the channel cross sections would definitely increase the upstream drain capacity. Although, subject to foundation depths of the new Highway 89 bridge and the relatively new bridge on the 5th Sideroad, we note a 0.04% grade on the drain from the 5th Line to Highway 400 would generate an additional 0.5 meters of potential depth. As the existing Highway 400 culvert crossings are already perched above the existing Drain, either adjustment to the grade would generate the need for the Highway 400 crossing replacement.

The effect of such a change in profile grade on the capacity of the Drain would be significant but would need to be quantified and confirmed through revisions to the hydraulic model.

Overflow Area No 3

Key design characteristics of the proposed SWM facility located south of the 5th Line and west of the Innisfil Creek Drain have been outlined below for reference:

- Pond block of 6 ha.
- Provide approximately 50,000 m^3 of storage. This storage has been created by placing berming around the perimeter of the pond as shown on Drawing 52 and 53 in the Engineers Report.
- Provides attenuation of 2-year flows.
- Inflows into the pond provided via a lateral weir structure.
- Capture approximately 75% of the 2-year peak flows at depths above 1.5 m.

Burnside has reviewed the VO2 hydrologic model and agrees that the proposed SWM facility provides a reduction in flows (approximately 5 m^3/s) to the downstream reach. The proposed channel cross section as designed has been observed to contain the attenuated 2-year peak flows.

Design Criteria

Burnside is of the belief that the original focal point of the proposed drainage improvements was to protect the valuable market garden lands from frequent flooding events.

Burnside notes the design criteria for the proposed drainage improvements to contain the 2-year peak flows. To accommodate this design criteria, berming, drain cross section and profile revisions are proposed within the Engineer's Report. While Burnside agrees that these measures may contain the 2-year flows, Burnside has concerns about the drainage capabilities of individual lands when peak flows from larger than 2-year storm events overtop the proposed berming. The Drainage report speaks to the requirement of pipe outlets with flap gates. Given that the proposed berming will be a barrier to localized sheet flow to the drain, sizing of individual outlet drains and long term maintenance of these drains would be required to mitigate additional flooding on private lands.

Based on the information provided by Dillon, we note that the proposed reduction in the channel cross section as described in their memorandum of February 3, 2015, reduces the cost of the Main Drain improvement by $500,000. The proposed reduction in cross section removes the 0.4 m of freeboard which was included in the original design which provided some margin of safety. We understand the reduced cross section will still accommodate the 1 in 2-year storm event which has been the established design criteria for this drainage system.

We would note that the 0.4 m of freeboard provided a margin of safety against flooding in the 1 in 2-year event storm and provided additional capacity within the channel for larger storm events. Removal of the freeboard removes the margin of safety and would theoretically result in any storm larger than the 1 in 2-year event overtopping the banks of the drain.

It is also noted that the reduced cross section impacts less land on either side off the existing drain. Considering the nature and value of the crops being grown in the market garden farm area, all efforts to minimize the land required should be considered.

On the basis of the information provided by Dillon, we recommend that efforts be made to reduce the channel cross section as proposed by Dillon and the modeling be reviewed to provide confirmation.

Hnydczak Outlet Relief Drain

As noted in our Phase 1 report a significant deepening of the Hnydczak Outlet Relief Drain channel downstream of the Highway 400 crossing culverts is proposed in the Engineer's report which we anticipate will improve the capacity of the Hnydczak Outlet Relief Drain. It is anticipated that this will hydraulically allow more of the runoff flows from the upstream Hnydzcak Drain to be directed through the Relief Drain and hence provide more capacity for the South Innisfil Creek Drain to accommodate upstream flows.

The effect of providing a low flow culvert at the lower elevation of the upstream Hnydzcak Drain under the Highway 400 and Reive Road was not addressed within the Engineer's Report. We expect that such a culvert may further reduce the pressure on the South Innisfil Creek Drain.

It appears, however, that modelling of the proposed improvements to the Hnydczak Outlet Relief Drain was not undertaken and consequently any of the proposed improvements to this outlet are not supported by the modelling. We believe from a practical perspective that the proposed work will provide some benefits to the overall watershed and that some work is required on the Hnydczak Outlet Relief Drain unless the Highway 400 culverts on the South Innisfil Creek Drain are replaced.

Review of Cost Estimates

We have undertaken a very cursory review of the cost estimates within the Engineer's Report which were based on the proposed work. At this time we believe that the most positive effect on the total cost of the proposed work will not be found in the minor adjustment of unit prices for various components of the work but rather in adjustment of the design criteria for the components of the work or the removal of certain works. The unit costs within the report generally seem reasonable considering the report submission date of 2013. As the report is dated 2013, it should be expected that the unit costs for various works may have increased as well as the required allowances.

Summary of Recommendations

The following will provide Burnside's recommendations to the Town of Innisfil which result from our documentation review completed in Phase 1 as well as the review of the hydrologic and hydraulic modelling carried out as Phase 2 of the peer review process. We have attached our Phase 1 report to facilitate reference to the details of particular items.

- Additional channel cross sections, details and characteristics for the reach of the proposed Drain situated between Highway 89 and the 15th Line, including the existing structure at the 15th Line and the new structure currently being constructed on Highway 89, should be obtained through additional field work followed by detailed modelling analysis of the 2-year flows under existing and proposed conditions. The objective of this exercise would be to more accurately establish the merits of constructing Pond Area 1 and/or provide some technical rationale for the removal of Pond Area 1 from the proposed work.

- Reconsider the design criteria for the portion of the drain situated downstream of Highway 400 and, in particular, remove the provision of the 0.4 metre freeboard through this portion of the drain, with the objective to remove the construction of berms downstream of Highway 400. In support of this objective, over bank flooding in this area, which currently would be experienced, appears to be onto less sensitive land uses and has not been raised as a concern to our knowledge through the public's involvement as an issue.
- Liaison with the Ministry of Transportation in regard to the Highway 400 crossing should be undertaken to determine the timing for improvements to the South Innisfil Creek and Hnydczak Drain crossings. It is acknowledged that any improvements to these crossings have in the past been considered unlikely. However, considering the impedance to the flows and the fact that they are perched above the proposed drain invert and that any increase in Drain cost is attributable to the Province under Section 26 of the Drainage Act, we believe this matter must be addressed again with the Town participating in those discussions. Over and above the potential capacity deficiencies at these crossings, we note that adjustments to the invert elevations of the drain bottom by revisiting the grade of the downstream channel and the replacement of the Highway 400 crossings provides for significant potential to increase the upstream drain capacity. We note that part of the discussions with the MTO may include a better understanding by the Town of the effect of the recently constructed solid concrete median barrier during larger storm events and in particular the design storm events for the crossings themselves to determine if the median has adversely affected the potential for flooding in the Town of Innisfil.
- The Drain grade line from Highway 400 downstream be reinvestigated to reduce the need for excavation work in the downstream reaches or alternatively to determine the potential to provide a lower outlet elevation at Highway 400 and therefore a deeper channel with more hydraulic capacity upstream of Highway 400.
- The inclusion of the Hnydczak Relief Outlet Drain in the hydrologic and hydraulic modelling should be considered although the need may be affected by the recommended discussions with the MTO. If crossing improvements were being considered by the Ministry the design criteria for the crossing would be significantly greater than the 1 in 2-year event. The larger consideration may be the invert elevation of the crossing. We believe the modelling should be included but this should occur after the liaison with the MTO.
- We believe the proposed improvements to South Innisfil Drain and branches were originally driven by storm events that produced significant flooding of the lands within the Innisfil Market Garden area and recognized that those storm events were greater (more intense) than the proposed 1 in 2-year storm design criteria. Although we concur with the design criteria for this drain and note that it is a more or less accepted criteria for Municipal Drains in the province, there seems to be some merit and support from the public for a reduced criteria on the 3rd Line Branch and the 10th Sideroad Branch of the South Innisfil Creek Drain. Hence we recommend consideration of including the branches in the Engineer's report for the purpose of creating plans, specifications and an assessment schedule but the proposed work be reduced to more closely resemble a maintenance and repair of the branches.
- We note that the construction of berms along the drain are beneficial to increase the capacity of the drain to meet the 1 in 2-year storm criteria, but in more intense storm events, overtopping of the berms should be expected which would be similar to the occurrences which initiated the drain improvements. Although culverts and flap gates are referenced in the report as a method to remove flood waters from behind the berm it is unclear from our perspective in the report who will be responsible for those discharge facilities. The more traditional method on Municipal Drains is for flood waters to discharge from the adjoining

lands after the storm events through swales provided through the excavated material spoil banks. This would be a contradiction to the provision of berms to increase the capacity. It is possible that increasing the depth of the drain, which may be possible if the grade of the drain is adjusted downstream of Highway 400, may reduce the need for the berms. If berms are to be placed, the report needs to clearly identify that removal of floodwater from the land behind the berm will be the property owner's responsibility and that the time to remove those flood waters will be contingent on the storm event, the care and maintenance of floodwater discharge facilities through the berm or the number and capacity of pump discharge systems used by the property owners.

- As set out in our Phase 1 report, we believe there is some potential to share the Farm Crossings required on the South Innisfil Creek Drain and note that Dillon also presented revisions in this regard to help mitigate the overall cost of the Drain Improvements. Please reference Section 4.4 of our Phase 1 report.
- Also as set out in our Phase 1 report, we propose that the foundations of the proposed farm crossings should be revisited to reduce the complexity and cost of these crossings. The need for deep pile foundations was driven by the potential for some settlement of the proposed crossings. We suggest that, providing the settlement does not adversely affect the structural integrity of the structures, minor settlement of the structures is not a serviceability issue. Details of this can be found in Section 4.5 of our Phase 1 report. We recommend that the amount of settlement be addressed by the geotechnical sub consultant and consideration be given to reduce the foundation requirements for these structures.
- Considering our findings generated from our peer review of this South Innisfil Creek Drain and Branches as well as the above noted recommendations, our closing recommendation would be to send the report back to the consultants for consideration of the above noted comments and recommendations.

If you have any questions or require clarification in regard to matters discussed above, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
Vice President, Public Sector
DMcN:sj

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R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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November 15, 2016

Via: Email

Mr. Glenn Switzer, P.Eng.
Director, Engineering & Technical Services
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia ON L0M 1T0

Dear Glenn:

Re: Town of Innisfil
South Innisfil Creek Drain
Project No.: 300038790.0000

As you know R.J. Burnside & Associates Limited (Burnside) has been appointed under the Drainage Act to prepare a revised report for the South Innisfil Creek Drain and Branches Improvements. Further, you will recall that a Final Engineer's Drainage Report for this Drain was prepared by Dillon Consulting dated August 15, 2013 and submitted to the Town of Innisfil for consideration and a public meeting to consider the report was held with the affected property owners. Through considerable deliberation in regard to this matter it has been determined that some aspects of this project should be reconsidered in an attempt to mitigate the cost of the project to the property owners. As you know Burnside prepared a Peer Review Report with regard to the South Innisfil Creek Drain and Branches Final Engineers Report and provided that report to the Town of Innisfil dated November 17, 2015. A copy of the report is attached and we draw your attention to the Summary of Recommendations set out at the end of that report.

As we discussed in our meeting in late September we believe that the existing Highway 400 crossings need to be further addressed in the preparation of a revised report. There is definitely a perception by the upstream property owners that the Highway 400 crossings are a constraint to the flow of water in the drain. From our review of the modelling carried out by Dillon, we believe that there is a restriction of the design flows at this major crossing but more importantly there is the potential of increasing the capacity and depth of the upstream channel by lowering the invert grade of the South Innisfil Creek Drain through the Highway 400 crossing. Deepening a channel to obtain additional capacity would be a typical approach for municipal drainage in the Province of Ontario.

We note that with the invert elevation as it exists at the Highway 400 crossing, substantial dyking on either side of the proposed ditch cross section was proposed in Dillon's report to achieve the design capacity of the channel. As we discussed, we have significant concern on behalf of the Town of Innisfil with respect to the potential future liability of the construction of the dykes and the potential of storm events greater than the designed events exceeding the capacity of the channel causing flooding of the lands outside the dykes. There was no clear indication within the Dillon Report as to who would hold the responsibility for removal of those flood waters for storm events greater than the design storm. Further, we believe additional flood line analysis needs to be completed within the drainage catchment area to illustrate the effect of the existing 400 crossings on the flood conditions upstream.

As discussed, it would be helpful if we could obtain past correspondence issued by the Minister of Transportation to Dillon and/or to NVCA and/or the Town of Innisfil with respect to the Highway 400 crossings. You indicated during our meeting that the NVCA had copies of correspondence relative to this matter. Please accept this as our request to obtain copies of that correspondence from the NVCA at your earliest convenience.

Also as discussed at our recent meeting, we wish to open discussions with the NVCA and DFO with respect to the consideration of deepening the upstream channel and how any fisheries or environmental/ecology concerns could be addressed to implement this revised design criteria. We will forward correspondence to Dave Featherstone of NVCA in this regard to open those communications.

If you have any questions, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
DMcN:sj

Enclosure Letter Report

cc: Jason Inwood, Manager of Operations, Town of Innisfil, (enc.) (Via: Email)
Kristi Williams, Town of Innisfil, (enc.) Via: Email)
Tom Pridham, Burnside, (enc.) (Via: Email)
Tim Lozon, Burnside, (enc.) (Via: Email)

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16/11/2016 3:19 PM

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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November 15, 2016

Via: Email

Mr. David Featherstone
Manager, Watershed Monitoring
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia ON L0M 1T0

Dear David:

Re: Town of Innisfil
South Innisfil Creek Drain and Branches Improvements
Project No.: 300038790.0000

We have been appointed by the Town of Innisfil under the Drainage Act to prepare a revised Final Engineers Report with respect to the South Innisfil Creek Drain and Branches Improvements. A previous report prepared by Dillon Consulting had been prepared and submitted to the Town of Innisfil dated August 15, 2013. We believe that considerable liaison occurred between Dillon Consulting and the Nottawasaga Valley Conservation Authority with respect to some of the ecology, environmental constraints related to the design of the proposed drain improvements prior to the submission of that report. Of course as considerable time has lapsed since the Conservation Authority's original input and as there is no longer an agreement between DFO and the Conservation Authority, it is anticipated that some of the constraint issues will have to be re-addressed. Further, Burnside wishes to look at some revisions to the design criteria which we will describe in the following paragraphs.

Due to the existing invert elevation of the Highway 400 crossings and the decision by Dillon to retain the crossings as they exist, the proposed upstream channel profile was more or less the same as the design profile established the last report for this Drain by D.H. Weir in 1956. Although it is anticipated that the original design of the channel may have provided capacity for a one and two year storm event, it is anticipated that as a result of changes within the watershed that the original design cross section is now deficient. Dillon in the preparation of their report and with the constraint that the invert elevation was more or less the same as the original design, additional capacity was gained by widening of the ditch cross section and the construction of earth dykes along the Drain to achieve that capacity.

On behalf of the Town of Innisfil we have significant concern with respect to the construction of continuous dykes on either side of this Drain considering that it is only designed for a one in two year storm event. It must be accepted that more significant larger storms will be experienced within this drainage area and consequently it should be anticipated that the dykes will be overtopped flooding the lands behind the dykes. The Dillon Report of August 2013 did not provide whose responsibility the removal of water from the lands outside of the dykes would be and we strongly believe that this must be addressed in the revised report.

We are advancing discussions the Ministry of Transportation Ontario with respect to the Highway 400 crossings and the potential of replacement of those crossings to achieve increased capacity across Highway 400 as well as to lower the existing constraining invert. This would allow the increasing the capacity of the upstream channel by deepening of the channel which would be the more typical methodology of improving the drainage characteristics and capacity of an outlet. It is of course understood that lowering the channel bottom may generate some new or additional ecology and environmental constraints or concerns.

The purpose of this correspondence is to ask the NVCA to have some initial consideration of the consequences of lowering the channel on the ecological and environmental issues related to improvements to the Municipal Drain.

As an aside, we are also reviewing the hydrologic analysis and modelling for the South Innisfil Creek Drain downstream of the Fifth Sideroad to the 15th Line in consideration of the new Highway 89 bridge. We wish to review the feasibility of construction of Pond Area No. 1 as described in the 2013 Dillon Report and look towards the potential for removing that Pond Area as one of the design changes.

We hope the above forms some basis for some consideration on the part of the NVCA in this regard. We would look forward to an opportunity to meet with the NVCA to further discuss.

We also note that a Steering Committee is being formed as a forum for communications with the property owners and to facilitate agency input. It would be very useful after you have considered the above if you could attend a Steering Committee Meeting likely in conjunction with the attendance of Mr. Glenn Switzer representing the engineering aspects of this Municipal Drain project.

If you have any questions in regard to the above, please contact our office.

Yours truly,

R.J. Burnside & Associates Limited

Don McNalty, P.Eng.
DMcN:sj

cc: Jason Inwood, Manager of Operations, Town of Innisfil (Via: Email)
Kristi Williams, Town of Innisfil (Via: Email)
Tom Pridham, Burnside (Via: Email)
Tim Lozon, Burnside (Via: Email)
Glenn Switzer, NVCA (Via: Email)

FW: South Innisfil Creek Drain and Branches Improvements

JN

Jeremy Nyenhuis <jnyenhuis@innisfil.ca>
Fri 2017-04-21 3:12 PM

To: Don McNalty

Cc: Jason Inwood <jinwood@innisfil.ca>

This message was sent with high importance.

161115 Featherstone 03...
753 KB

Show all 2 attachments (3 MB) Download all Save all to OneDrive - RJB

Don,

Please see below comments from Gayle Wood, CAO NVCA.

Thanks and have a great weekend.

Jeremy Nyenhuis, P. Eng.
Stormwater Project Manager/Drainage Superintendent

705-436-3740 Ext. 4222
1-888-436-3710 (toll free)

From: Gayle Wood [mailto:gwood@nvca.on.ca]
Sent: April 21, 2017 2:02 PM
To: Jason Reynar; Jeremy Nyenhuis
Cc: Doug Lougheed; Glenn Switzer; Dave Featherstone
Subject: FW: South Innisfil Creek Drain and Branches Improvements
Importance: High

Good afternoon Jason and Jeremy:

Thank you again for the reminder to provide comments on the South Innisfil Creek Drain Improvements. Again, we apologize for the delay in responding.

In general, the Burnside letter (which is attached) requests us to identify any road blocks from an environmental perspective that would make it difficult to lower the Highway 400 culverts. There are no such road blocks, however during detailed design we would like to work with you/Burnside to ensure environmental impacts are minimized.

More specifically, we have been asked to consider a potential lowering of the channel in the vicinity of Hwy 400 to assist with improving capacity. Since Innisfil Creek on either side of the highway is a municipal drain, we will work closely with you and your consultants and MTO to develop a design which accomplishes drain/conveyance objectives while minimizing potential impacts on aquatic habitat and adjacent riparian areas.

The reach of Innisfil Creek is identified as coldwater habitat due to presence of spawning rainbow trout and presence of juvenile rainbow trout through the summer months. Instream temperatures are marginal for rainbow trout and we hypothesize that discrete areas of groundwater discharge are supporting trout production. Stream health through this reach is considered impaired due to nutrient inputs, limited riparian habitat and past stream alterations. Though not specifically discussed, the municipal drain flowing northward to Innisfil Creek along the east side of Reive Road/400 is considered permanent warmwater baitfish habitat. Proposed lowering of Innisfil Creek may require works along the downstream reach of this municipal drain – our approach to this work would be the same as per Innisfil Creek itself.

The Burnside letter also notes potential to remove Pond Area No. 1 (as described in 2013 Dillon report). This is likely a positive proposal from an environmental perspective.

Should you have any questions regarding our comments, please contact:

David Featherstone, B.Sc.
Manager, Watershed Monitoring Program
(705) 424-1479 Ext. 242
dfeatherstone@nvca.on.ca

Once again, please accept our apologizes for a tardy response.

D. Gayle Wood | **Chief Administrative Officer**

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479, ext. 225 | **F** 705-424-2115
gwood@nvca.on.ca | **nvca.on.ca**

Jeff Dickson

Subject:	FW: South Innisfil Creek Municipal Drain Proposed Improvements Meeting
Location:	John Hix Conservation Administration Centre, 8195 8th Line, Utopia
Start:	Wed 2/21/2018 2:00 PM
End:	Wed 2/21/2018 4:00 PM
Recurrence:	(none)
Meeting Status:	Accepted
Organizer:	Matthew Moote
Required Attendees:	Matthew Moote; Don McNalty; Natalie Connell; Chris Pfohl; fdobbs@nvca.on.ca; c.hibberd@nvca.on.ca; sstephens@nvca.on.ca
Optional Attendees:	Jeff Dickson

-----Original Appointment-----
From: Matthew Moote
Sent: Thursday, February 15, 2018 1:53 PM
To: Matthew Moote; Don McNalty; Natalie Connell; Chris Pfohl; fdobbs@nvca.on.ca; c.hibberd@nvca.on.ca; sstephens@nvca.on.ca
Subject: South Innisfil Creek Municipal Drain Proposed Improvements Meeting
When: Wednesday, February 21, 2018 2:00 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: John Hix Conservation Administration Centre, 8195 8th Line, Utopia

Good Afternoon Fred, Shannon and Chris,

Chris, Don, Natalie and I are looking forward to meeting next week to discuss the potential improvements for the South Innisfil Creek Municipal Drain. See everyone next Wednesday afternoon at 2pm. I hope everyone enjoys the upcoming Family Day Long Weekend!

Thank you for your time,

Matt Moote

BURNSIDE
Matthew Moote, H.B.Sc.
Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20, Guelph, Ontario N1H 1C4
Office: 800-265-9662 Direct: 226-486-1556
www.rjburnside.com

Jeff Dickson

From:	Matthew Moote
Sent:	Wednesday, February 21, 2018 12:12 PM
To:	Don McNalty; Natalie Connell; Chris Pfohl; fdobbs@nvca.on.ca; c.hibberd@nvca.on.ca; sstephens@nvca.on.ca
Cc:	Jeff Dickson
Subject:	RE: South Innisfil Creek Municipal Drain Proposed Improvements Meeting
Attachments:	038790_South Innisfil Creek Drain Improvements_Feb 21-2018 NVCA-RJB Meeting Agenda.docx

Hi everyone,

There were some minor updates for the agenda today.

See everyone shortly.

Thanks,

Matt

Matthew Moote, H.B.Sc.
Aquatic Ecologist

R.J. Burnside & Associates Limited | www.rjburnside.com
Office: 800-265-9662 Direct: 226-486-1556

From: Matthew Moote
Sent: Wednesday, February 21, 2018 9:49 AM
To: Don McNalty <Don.McNalty@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Chris Pfohl <Chris.Pfohl@rjburnside.com>; 'fdobbs@nvca.on.ca' <fdobbs@nvca.on.ca>; 'c.hibberd@nvca.on.ca' <c.hibberd@nvca.on.ca>; 'sstephens@nvca.on.ca' <sstephens@nvca.on.ca>
Cc: Jeff Dickson <Jeff.Dickson@rjburnside.com>
Subject: South Innisfil Creek Municipal Drain Proposed Improvements Meeting

Good Morning Everyone,

Attached is a brief agenda for the South Innisfil Creek Municipal Drain Proposed Improvements Meeting. If anyone has anything else they would like discussed please let me know or feel free to bring it up at the meeting.

See everyone this afternoon.

Thanks,

Matt

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Agenda

Date and Time: February 21, 2018 at 2:00pm **Project No.:** 300038790

Project Name: South Innisfil Creek Municipal Drain

Meeting Subject: South Innisfil Creek Municipal Drain - Proposed Improvements

Meeting Location: John Hix Conservation Administration Centre, 8195 8th Line, Utopia ON

Items

1. Background of the South Innisfil Creek Municipal Drain
   - Previous report completed by Dillon.
   - Aquatic ecology background information review, preliminary aquatic habitat assessment.
2. Low-flow channel design
   - Conceptual design of the channel.
3. Public information Centre - Friday, February 23 from 4:00 until 7:00 p.m.
   - Natalie and Jeff discuss upcoming PIC. NVCA feedback regarding public attitude surrounding South Innisfil Creek Drain.
4. NVCA previous involvement with the drain and potential stewardship opportunities.
5. Future work going forward with the project
   - Spring aquatic habitat assessment.
   - Request for review submission to DFO.

Jeff Dickson

From: Matthew Moote
Sent: Thursday, March 29, 2018 12:56 PM
To: Chris Pfohl; Jeff Dickson; Natalie Connell; fdobbs@nvca.on.ca; sstephens@nvca.on.ca; c.hibberd@nvca.on.ca; afera@nvca.on.ca
Subject: R.J. Burnside- NVCA South Innisfil Creek Drain- Meeting Minutes
Attachments: 038790_South Innisfil Creek Drain_RJB-NVCA Meeting Minutes.pdf

Good Afternoon Everyone,

Attached are the meeting minutes from the February 21, 2018 meeting regarding the South Innisfil Creek Drain. I would like to thank Nottawasaga Valley Conservation Authority on behalf of R.J. Burnside for taking the time to meet with us back in February. If anyone has any questions or concerns please feel free to get in contact with myself or anyone from Burnside.

I hope everyone enjoys the long weekend.

Sincerely,

Matt Moote

BURNSIDE
Matthew Moote, H.B.Sc.
Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20, Guelph, Ontario N1H 1C4
Office: 800-265-9662 Direct: 226-486-1556
www.rjburnside.com

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Minutes of Meeting

Meeting Date: February 21, 2018 **Project No.:** 300038790.0000

Project Name: South Innisfil Creek Drain

Meeting Subject: South Innisfil Creek Drain Proposed Improvements and Channel Design

Meeting Location: John Hix Conservation Administration Centre, Utopia, Ontario

Date Prepared: February 26, 2018

Those in attendance were:

Jeff Dickson	R.J. Burnside & Associates Limited (Burnside)	Jeff.Dickson@rjburnside.com
Chris Pfohl	Burnside	Chris.Pfohl@rjburnside.com
Matthew Moote	Burnside	Matthew.moote@rjburnside.com
Natalie Connell	Burnside	Natalie.Connell@rjburnside.com
Shannon Stephens	Nottawasaga Valley Conservation Authority (NVCA)	sstephens@nvca.on.ca
Fred Dobbs	NVCA	fdobbs@nvca.on.ca
Chris Hibberd	NVCA	c.hibberd@nvca.on.ca
Andrew Fera	NVCA	afera@nvca.on.ca

The following items were discussed		Action by
1.	**Background of the South Innisfil Creek Drain (SICD)**	
1.1	Modelling from R.J. Burnside & Associates Limited (Burnside) proves that the Highway 400 culvert needs realignment. Jeff Dickson stated that currently less than a 2-year storm event passes through the culverts. Burnside considered two designs when modelling for the proposed drain improvements. 2-year storm and 2-year with climate change (which is approx. equivalent to the 5-year storm).	

The following items were discussed		Action by
	Regardless of what the final design for the drain is, it must be “buildable” and it must be “affordable”.	
	The existing (and proposed) gradient is quite flat at 0.04% throughout the bottom section of the drain downstream of 3rd Line.	
	Fred Dobbs and Shannon Stephens stated that potato growers and sod farmers are major takers of surface water during the growing season, particularly during the summer potato fattening season.	
	Fred Dobbs stated that NVCA generally uses a 2 L/second discharge of groundwater per KM^2 of catchment for trout streams and that Innisfil Creek does contain juvenile rainbow trout and young of the year brook trout.	
1.2	Chris Hibberd indicated that previous contact with MTO regarding the Highway 400 culvert has not resulted in much traction.	
	Fred Dobbs and Shannon Stephens indicated that previous drainage work within Beeton and Bailey Creeks are similar and could be useful for the SICD. Shannon or Fred to forward example projection from Bailey and Beeton Creeks.	Shannon/Fred.
2.	**Low-Flow Channel Design**	
2.1	Chris Pfohl presented the potential design of the meandering low-flow channel for SICD. Chris Pfohl stated that the proposed design would be created with vegetated banks, potentially constructed from sod mats. Due to the sandy soil of the SICD it may be hard to construct the design without some sloughing in of the banks resulting.	
	Fred Dobbs stated that the Beeton and Bailey Creek case studies could be used for the construction of the SICD channel as they were constructed in an area of similar soil structure. Shrubs and vegetation were used for buffers on these projects as they can withstand inundation. Shannon Stephens stated that the soil texture of the SICD is likely clay due to historic wetlands in the area.	
	Chris Hibberd stated that the Beeton case study would show working examples of live stakings and these examples are close to the SICD so landowners could see examples of these stakings. Chris Hibberd also asked about the creation of vernal pools and	

The following items were discussed		Action by
	other water retention methods within the floodplain and if a fluvial geomorphologist has been involved in the project.	
	Shannon Stephens stated there is low water quality in the SICD and she asked about buffering plans for the drain. Combine passes will be necessary through the buffered area and thus "squared off" buffers are more appealing to landowners	
3.	**SICD- Public Information Centre (PIC) meeting- February 23, 2018 4:00 – 7:00 pm.**	
3.1	Burnside will be hosting a PIC. Jeff and Natalie will be attending it along with other Burnside staff and will forward PIC boards to the NVCA.	Jeff/Natalie
	NVCA will not be attending. It was stated that when working with the public there are several projects in the area that can be used as examples to show that the necessary fisheries protection included as part of the SICD improvements are not a one-time event and are typical for similar projects in the area.	
4.	**NVCA Previous Involvement with South Innisfil Creek Drain and Potential Stewardship**	
4.1	Fred Dobbs stated how NVCA handles a typical Brook Trout stream may not apply in this case as the drain receives an inflow of cold water and the warm "old" base flow is removed for agricultural purposes. Currently there is a neutral or slightly positive inflow of groundwater. There are brook trout found down to the 3rd Line and juvenile Rainbow Trout have been found in the drain as well.	
	NVCA stated there is a grant from Forests Ontario that could be applicable if tree planting is not included in the drainage report. The grant provides a subsidy of $1.44 per tree. Landowners see this as a benefit and better than growing seed as trees do not grow as weeds that can be in seed mix. NVCA has a professional forester on staff who can assist with projects on land greater than 2 ha.	
	NVCA also stated there could be some potential uses for the soil generated through construction of the proposed channel. Potential uses included topsoil for agricultural uses, fill for lots, use as berms.	

The following items were discussed		Action by
5.	**Future Work in the Project**	
5.1	Matthew Moote and Chris Pfohl will visit the drain during the spring to look for possible use of the watercourse by Rainbow Trout and in the summer Chris and Matt will conduct a detailed aquatic habitat assessment. A DFO request for project review will be submitted after the design is near completion and the habitat assessment has been completed. NCVA indicated they would support Burnside in submitting to the DFO and stating the improvements to the drain would be a net benefit in terms of improving fish habitat (increasing the buffer on the drain banks, increased groundwater contribution from high surface elevation of groundwater, etcetera). Fred Dobbs indicated it may be worthwhile to perform a cost-benefit analysis for the potential presence of fish within the SICD as the potential absence of fish species within the drain could result in an extended timing window for in-water works.	

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise Burnside within seven days of issuance. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

R.J. Burnside & Associates Limited

Matthew Moote

Matthew Moote, H.B.Sc.
Aquatic Ecologist
MM:sd

Distribution:

All Attendees

Matthew Moote	Burnside	Via: Email
Chris Pfohl	Burnside	Via: Email
Jeff Dickson	Burnside	Via: Email

Natalie Connell	Burnside	Via: Email
Fred Dobbs	NVCA	Via: Email
Chris Hibberd	NVCA	Via: Email
Shannon Stephens	NVCA	Via: Email
Andrew Fera	NVCA	Via: Email

Document1
3/28/2018 2:20 PM

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

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Transmittal

Date: May 18, 2018 **Project No.:** 300038790.0000

Re: South Innisfil Creek Drain - Hydrology Report

To: **Attention:** Mark Hartley, P.Eng.

Company: Nottawasaga Valley Conservation Authority **Address:** John Hix Conservation Administration Centre
8195 8th Line
Utopia ON L0M 1T0

From: **Name:** Tim Lozon, P.Eng.

Sent Via: Courier

Enclosed items

1 Copy	South Innisfil Creek Drain Improvements Hydrology Report, dated: May 2018.

Please find the enclosed paper copy of the South Innisfil Creek Drain Improvements Hydrology Report for your review and comment.

Please feel free to contact Tim Lozon directly at 705-797-4300 if you have any questions.

TL:lw

cc: Jeremy Nyenhuis, Town of Innisfil, Via: Email (jnyenhuis@innisfil.ca) and Hardcopy (2)
Teepu Khawja, Ministry of Transportation, Via: Email (teepu.kahawja@ontario.ca) and Hardcopy (to be forwarded by Town of Innisfil)
Don McNalty, R.J. Burnside & Associates Limited, Via: Email (Don.McNalty@rjburnside.com)
Jeff Dickson, R.J. Burnside & Associates Limited, Via: Email (Jeff.Dickson@rjburnside.com)

Jeff Dickson

Subject:	FW: SICD Meeting with NVCA Staff
Location:	NVCA
Start:	Thu 6/7/2018 11:30 AM
End:	Thu 6/7/2018 2:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Jeff Dickson
Importance:	High

-----Original Appointment-----
From: Jeff Dickson
Sent: Monday, June 04, 2018 2:28 PM
To: Jeff Dickson; Don McNalty; Chris Pfohl; Natalie Connell
Cc: Tim Lozon; Jen Koen; Matthew Moote
Subject: SICD Meeting with NVCA Staff
When: Thursday, June 07, 2018 11:30 AM-2:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: NVCA
Importance: High

The NVCA Address is:
8195 8th Line
Utopia ON
L0M 1T0

Don, Nat & Chris: this Meeting will be over the lunch period (the Board Room is booked until 2:00 p.m. if necessary) with (currently) Fred Dobbs & Mark Harley (perhaps others); to that end … Mark indicated lunch so **IF** you have any dietary restrictions … please let me know – thanx!

This meeting is the result of a request during a Hartley/Dickson telecon on Friday afternoon. I will "***TRY***" to draft an Agenda before Thursday! Topics for discussion will include but not necessarily be limited to:

1. Existing conditions – hydrologic and aquatic;
2. Section 78 of the Act and what are considered "improvements"; Burnside tasks & duties
3. Proposed (preliminary) design – quantity and quality;
4. Aquatic enhancements to compliment the design and "improve" the habitat;
5. Possible assistance wrt Item 4 from NVCA staff (Mark and I discussed this possibility);
6. Other agenda items ???

Tim & Jen & Matt: *Optional Attendee* to keep you "in the loop"

Thanx, Jeff

Jeff Dickson

From:	Shannon Stephens <sstephens@nvca.on.ca>
Sent:	Monday, July 16, 2018 9:46 AM
To:	Jeff Dickson
Cc:	Fred Dobbs
Subject:	Native seed mix sources - riparian / wetland / prairie-meadonw
Attachments:	Conserving Native Pollinators in Ontario.pdf; native plants.PDF
Follow Up Flag:	Follow up
Flag Status:	Flagged
Categories:	Drainage

Hi Jeff,

Sorry for the delay a stomach bug took me out for a few days.

Here are a number of nurseries that can provide native mixes (stock and custom).
Large orders are best booked very early, as extra collection the year before maybe necessary.

I've also attached a copy of a native plants of Ontario chart (growing conditions, ecozone). It's not all native species, but it's most of what you'd be able to find in native plant nurseries.

Also, the **The Green Pages: Watershed Stewardship Business Directory** has a listing of native plant nurseries if you can't find seed. (Typically, woodland wildflowers are harder to grow – you may want to buy these). Pg 85 has tips on planting native plants, followed by nurseries that carry native seed and plants.

Native Seed Sources (meadow, riparian, wetland, wet meadow, wildflowers, prairie):

- Quality Seeds
- Ontario Seed
- St Williams Nursery
- Wildflower Farm
- Pterophylla Native Plants & Seeds* 519-586-3985 gartcar@kwic.com (prairie specialist)

Tips:

1. Site conditions (sun, soil and most importantly moisture will determine the right species) The nurseries offer stock mixes, but can also custom mix.
2. Thorough site preparation to remove competition is critical to good set and survival
3. Canada & Riverbank Rye are good components to help with cover in the early few years, but not so competitive that the longer lived native perennials can't get established.
4. Cover crops and crimping light straw onto the site can help with establishment
5. If the site has a high weed seed bank, cutting twice to about a foot will help establishment of the native species by suppressing aggressive annual/short-lived weeds

Seeding rates:
Wetland/ Riparian Grass, Sedge and Wildflower mix: as per nursery recommendations (depends on species mix)

Native grass mix (Indian Grass, Big Bluestem, little Bluestem and Switchgrass): 10kg/ha (this will vary depending on species and the mix)
Cover Crop (for large areas): 10-20kg/ha (more on slopes, or if hand broadcast) (annual fall rye, oats) (avoid clover if aiming for prairie species, which don't like the extra nitrogen)

Plant spacing:

- Kg/ha – seed (Per nursery recommendation, and seeding method – seed drill uses about ½ compared to broadcasting)
- 30cm - 50cm most grasses and wildflowers plugs
- 2-3m – shrubs
- 3-5m - trees (bare-root/ small potted 1-2 gallons)

All the best,

Shannon Stephens, MSc│**Healthy Waters Program Coordinator**

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext. 239 │**F** 705-424-2115
sstephens@nvca.on.ca │**nvca.on.ca**

Jeff Dickson

From:	Mark Hartley <mhartley@nvca.on.ca>
Sent:	Friday, July 20, 2018 4:38 PM
To:	Jeff Dickson; Tim Lozon
Cc:	Don McNalty
Subject:	South Innisfil Creek Drain - Hydrology Report
Follow Up Flag:	Follow up
Flag Status:	Completed

Hello,
NVCA Engineering staff have completed a review of the hydrology report. We have a few comments that we will issue separately. We understand there is a Public Liaison Meeting on Monday July 23 and would like to report that we are in general agreement with the conclusions.
Respectfully,
Mark

Mark Hartley, B.Sc.,M.Sc.,P.Eng. | **Senior Engineer**

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext. 247 | **F** 705-424-2115
mhartley@nvca.on.ca | **nvca.on.ca**

Jeff Dickson

From:	Mark Hartley <mhartley@nvca.on.ca>
Sent:	Friday, December 14, 2018 2:03 PM
To:	Jeff Dickson; Jeremy Nyenhuis (jnyenhuis@innisfil.ca)
Cc:	Andrew Fera
Subject:	South Innisfil Creek Drain - NVCA comments
Attachments:	NVCA ltr to Burnside 14-DEC-2018_v2.pdf

Hello Jeff,
Please find attached a letter with NVCA comments for the Hydrology and Hydraulic Reports.
Respectfully,
Mark

Mark Hartley, B.Sc.,M.Sc.,P.Eng. | **Senior Engineer**

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext. 247 | **F** 705-424-2115
mhartley@nvca.on.ca | **nvca.on.ca**

December 14, 2018

Jeff Dickson, P.Eng.
Drainage Engineer
R.J. Burnside & Associates Limited
3 Ronell Crescent
Collingwood, ON L9Y 4J6

Dear Mr. Dickson;

RE: South Innisfil Creek Drainage Improvements
NVCA ID#: 21480

Nottawasaga Valley Conservation Authority [NVCA] staff has reviewed the information presented in the following documents related to the design of the proposed drainage improvements for the South Innisfil Creek.

- R.J. Burnside & Associates Limited "Hydrology Report" dated May 2018; and
- R.J. Burnside & Associates Limited "Hydraulic Report" dated August 2018.

NVCA is of the understanding that the Town of Innisfil has appointed R.J. Burnside & Associates Limited (Burnside) as Engineer pursuant to Section 8(1) of the Drainage Act. Further, the Town of Innisfil and has requested Burnside to prepare a revised Engineers Report for the engineering and improvements to the South Innisfil Creek Drain (SICD) and Branches in accordance with Section 78 the Drainage Act.

Study Area

The proposed improvements are to take place between Highway 89 and 5th Line in the Town of Innisfil. The study area comprises of lands from the 15th Line south of Highway 89 (east of Cookstown, referred to as Station 0+000) and extends north to the 5th Line northwest of the Village of Churchill (referred to as Station 9+917).

Engineering Comments

The Hydrology Report contained a thorough review of recent hydrologic studies. Burnside conducted a hydrologic and frequency analysis of Innisfil Creek as well as built, calibrated and verified a hydrologic model (SWMHYMO) all in an effort to determine the 1:2 year return period flow for use in the design of the SICD. The report was detailed, thorough and well presented. NVCA staff are in agreement with the conclusion that the 1:2 year return period flow near Station 0+000 of the SICD was estimated to be 13.6 m3/s.

Information within the Hydrology report was used for the Hydraulic Report to determine the elevation of the water surface profile in the SICD study area. The NVCA has the following comments for consideration:

1. Please include a column in Table 1 (Section 2.1) identified the corresponding station (ie 1+200).

2. It is understood that a number of different data sources were used to generate a topographic surface for the study area. Please provide a detailed description, including data sets, of how the different data sets were assembled. Staff recommend that Burnside demonstrate that the entire surface is contiguous with minimal topographic discrepancies. Lastly, please provide a list (location and elevation) of temporary and permanent benchmarks used in the analysis.

3. It is understood that a relatively high Manning's roughness coefficient has been used which is in keeping with applicable types of vegetation whether adjacent to the low flow channel or the bottom/sides of the main channel. Please confirm the type and location of vegetation communities proposed and if a vegetation planting plan will be provided in future submissions.

4. There are seven "reaches" listed in Table 5 which correlate well to Sections 7.2.1, 7.2.2, 7.2.3 and 7.2.4. Please advise where in the report a section describing the last line in Table 5 namely 7+950 to 9+918?

5. The concept of a "low flow channel" as described in Section 7.2.2 and illustrated in Figures 7, 10, 11 and 13 is supported by the NVCA. Please provide a rational for the dimensions proposed (bottom width of 4m or 2m and side slopes of 2:1 or 1:1) and an estimate of the flow capacity of this low flow section. How frequently is the overbank expected to be inundated (3-4 times per year)?

6. There are three tributaries of importance that release coldwater to the drain and confluences with the SICD are located at 3+588 (Bethesda Creek), 6+134 and 9+917. These watercourses, in particular 3+588, may be impacted by the adjustment of the SICD profile. Please confirm if these watercourses are considered as "branches" in this work and how these confluences will be accommodated (ie, some grading works in the lower sections of these "branches")?

<u>Conclusion</u>

We note that these comments are related to this submission and the information provided within this submission. We thank you for the opportunity to provide comments at this stage in the process and look forward to working with you on this matter.

Please feel free to contact the undersigned at extension 247 or mhartley@nvca.on.ca should you require any further information or clarification on any matters contained herein.

Respectfully Submitted,

Mark Hartley

Mark Hartley, P.Eng.
Senior Engineer

Jeff Dickson

From: Shannon Stephens <sstephens@nvca.on.ca>
Sent: Monday, January 07, 2019 1:34 PM
To: Jeff Dickson
Cc: Natalie Connell; Matthew Moote; Chris Pfohl; Don McNalty; Fred Dobbs; Mark Hartley
Subject: RE: South Innisfil Creek Drain (SICD) - Tree Plantings
Attachments: Frequently Asked Questions.doc; 1 NVCA Healthy Waters Program Application.doc; HWP project guidelines - Streamside tree planting.pdf; 4b Zhang_2009_BMP review - buffer P removal slope and vegetation.pdf; 3-approval letter-landowner agreement-tree plants.docx

Hey Jeff,

I've attached the NVCA's Healthy Waters Grant Program (there's also the Forestry Program if any planting on a single property >2.5ac):

1. Application form
2. Guidelines
3. Frequently asked questions

- **Maximum grant amounts and/or grant rates (see attached guidelines);**

  - Volunteer plants: 100% up to $1,000 (NVCA orders the bareroot trees, biodegradable mulch blankets, sod staples, tubex tree tubes, and stakes on behalf of the landowner) – we also provide planting planning, species selection, volunteer recruitment and coordination, as well as shovels
    - Landowners typically help on the day, and provide snacks/refreshments to thank the volunteers
    - If they choose this option, they don't typically file out an application – just sign the landowner agreement, once we agree on a planting plan and budget

  - Landowner coordinated plants (e.g. self-planted or if they higher planters) (grant back after completion):
    - 50% up to $1,000 for potted stock (caps at $10/plant)
    - 85% up to $6,000

  - NVCA professional tree plants: (grant varies year to year, and with individual plant, but typically 60-87% - at the highest rate, the landowner just pays tax).
    - Minimum 2.5 acres (1ha)
    - NVCA forestry team does the planting (machine or hand-planted depending on the site)

  - Note: funding isn't guaranteed, and depends on availability (however, we have a good history of raising funds for tree planting).

- Who can the applicant be?;
  - **Anyone** (e.g. landowner, tenant farmer, etc. - on behalf of landowner)

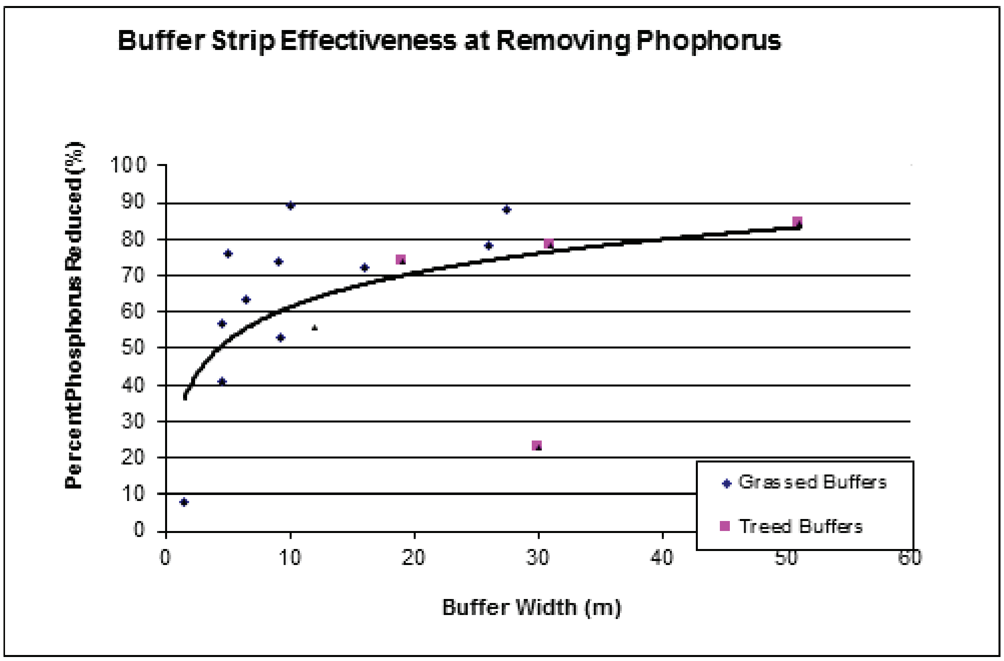
- Is there sign off required by the actual landowner?;
  - **Yes (see typical landowner agreement for volunteer tree plants)**
  - **We could waive the 'assist during the day', though we'll ask because they typically take better care of the trees if they help out**

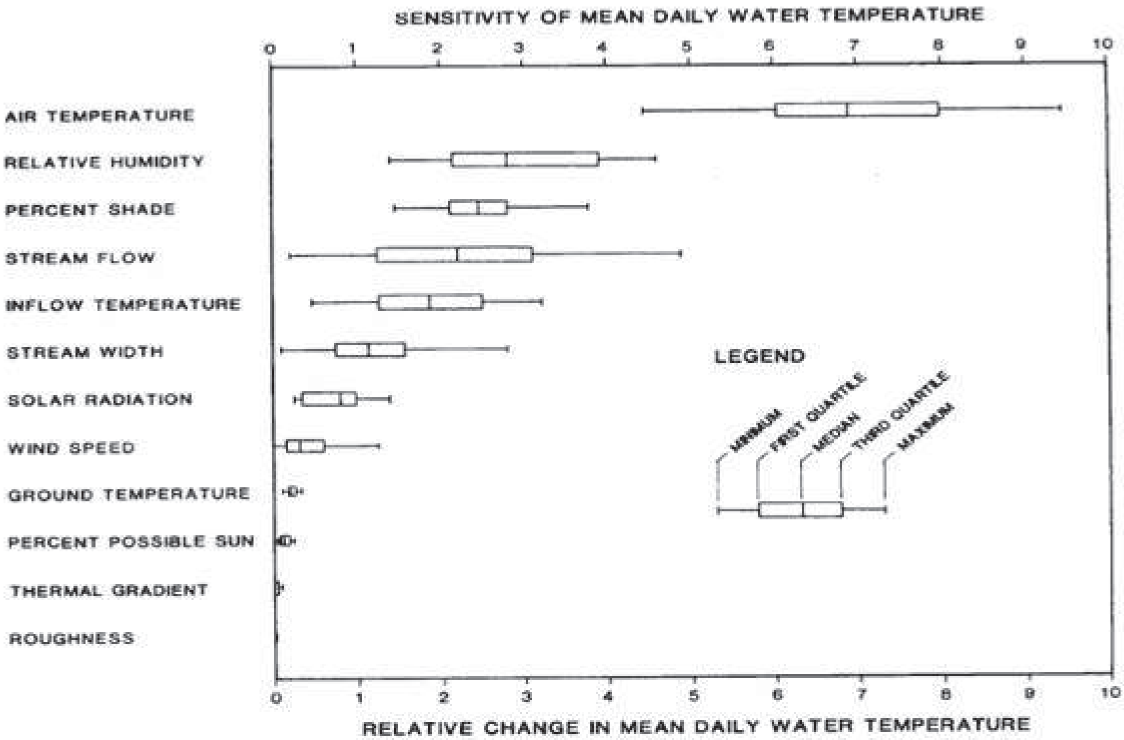
- Minimum preferred areas (either acre of hectare) … or minimum recommended planting widths (there will be a 3m buffer on each side of the SICD for its entire approx. 10km length);
    - **Minimum 100 native trees/shrubs (depending on spacing, that's a bit under 0.1ha or 0.2ac).**
    - **To get 2 rows from top of bank with 2.5-3m spacing, you'll need about 5m buffer**
    - **We generally keep back from the top of bank by 1m to avoid the trees to slumping inward, and to prevent the roots to be badly impacted during future cleanouts. As well as for safety since we're using volunteers for the planting.**
    - **If you're trying for temperature - 2 or more rows is recommend, since the shade density of a single row isn't likely to be great, especially if any mortality. Plus wider plantings see additional declines in air temperature (not just shade).**
    - **If you're trying for some phosphorus/sediment removal, below 5m is really unpredictable due to short-circuiting (see attached). But this benefit would only be seen if you're are retiring farmland, since pre-existing grass/shrub buffer would already be providing filtering.**

- Type of species to plant (for the SICD watershed as per the plan) … and planting densities;
    - **Planting density: spacing 2.5m – 3m typical**
    - **Timing: Bareroot plants – last week of April, first 3 weeks of May**
    - **Eligible species: Under the grant any bareroot/ small potted (1-2gal) native trees and shrubs are eligible (see attached master list – under the South and North Great Lakes Zones).**
    - **But, in practice for spring bareroot plants we use these, since Somerville Nursery carries them in bareroot (availability changes year to year):**
    -

Conifers – get mulch blankets	white pine
	white spruce
	white cedar
	tamarack
Deciduous - Need tubex tree tubes or survival is very low	Red Oak
	White Oak
	Swamp White Oak
	Bur Oak
	Pin Oak
	Silver Maple
	Red Maple
	Freeman Maple
	Sugar Maple
	Bitternut Hickory
	Black Cherry
	Black Walnut
	Shagbark Hickory
	White Birch
	Hackberry

	Sycamore
Shrubs	Highbush Cranberry
	Nannyberry
	Red Oiser Dogwood
	Staghorn Sumac





http://www.krisweb.com/biblio/gen_usfws_bartholow_1989_br8917.pdf

Shannon Stephens, MSc | **Healthy Waters Program Coordinator**

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext. 239 | **F** 705-424-2115
sstephens@nvca.on.ca | **nvca.on.ca**

From: Jeff Dickson [mailto:Jeff.Dickson@rjburnside.com]
Sent: January 2, 2019 1:32 PM
To: Shannon Stephens <sstephens@nvca.on.ca>
Cc: Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Chris Pfohl <Chris.Pfohl@rjburnside.com>; Don McNalty <Don.McNalty@rjburnside.com>
Subject: RE: South Innisfil Creek Drain (SICD) - Tree Plantings

Shannon: (attempt 2 as first attachment was too large).

Thanx for the chat; my email address for you to reply to wrt more information regarding the possible **Tree Planting Program(s).**

Some areas (as per the attached SICD zipped file) … ***pending land owner permission(s)*** … where we are ***considering/proposing*** plantings for shading to the DFO are as follows:

1. Between stations 0+500 & 1+100
2. Between stations 1+700 & 2+200

3. Between stations 2+300 & 2+900 (the Golf Course property)
4. Between stations 3+400 & 3+900 (only the non-active vacant farm land immediately upstream of 2nd Line)
5. POSSIBLY Between stations 6+800 & 7+100
6. Between stations 9+000 & 10+000

We are also after the specific conditions of any NVCA tree planting program(s) such as:

- Who can the applicant be?;
- Is there sign off required by the actual landowner?;
- Minimum preferred areas (either acre of hectare) … or minimum recommended planting widths (there will be a 3m buffer on each side of the SICD for its entire approx. 10km length);
- Type of species to plant (for the SICD watershed as per the plan) … and planting densities;
- Maximum grant amounts and/or grant rates;
- Etcetera.

We would also appreciate some suggestions wrt the various species that we could incorporate if we were to do some "live plantings" on some of the more erosion susceptible outside bends along the course of the SICD.

Thanking you in advance for your assistance and response.

Regards,

BURNSIDE
Jeff Dickson, P.Eng.
Project Engineer

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10, Wingham, Ontario N0G 2W0
Office: +1 800-265-9662 Direct: +1 226-476-3113
www.rjburnside.com

Nottawasaga Valley Conservation Authority

Healthy Waters Program

Application for Funding

Need application forms, guidelines, online mapping or measuring tools? Visit www.nvca.on.ca

Applicant Contact Information

Name(s): ______________________________

Phone Number(s): ______________ Cell: ______________

Mailing Address: ______________________________

Town: ______________ Postal Code: ______________

E-mail: ______________________________

☐ *YES! Please subscribe me to the NVCA's monthly e-newsletter.*

Property Owner Information if different from above (☐ Same as above.)

Name(s): ______________________________

Phone Number(s): ______________ Cell: ______________

Mailing Address: ______________________________

Town: ______________ Postal Code: ______________

E-mail: ______________________________

Project Location (☐ Same as above.)

Street Address: ______________________________

Lot: __________ Con: __________ Township: ______________

Property Description

Location: ☐ Rural ☐ Urban Year-round residence: ☐ Yes ☐ No

Residence adjacent to watercourse (or lake): ☐ Yes ☐ No

Property Size (circle): <1 acre 1-5 acres 10-50 acres 50-100 acres >100acres

Property Use (e.g. hobby farm, leased for agriculture, home, cottage): ______________

____

Description of Project (attach additional sheet if required, benefit to environment)

____

____

____

____

Project Cost (use lowest competitive quote, attach both)

- ☐ Livestock Restriction Fencing from stream, lake, wetland $__________
  - ☐ Alternative Watering Source (With livestock fencing) $__________
  - ☐ Livestock Stream Crossing (With livestock fencing) $__________
- ☐ Streamside Tree Planting $__________
- ☐ Community / Priority Tree Planting $__________
- ☐ Community Action Projects (stream restoration, planting) $__________
- ☐ Grassed/Meadow Stream/Wetland Buffers $__________
- ☐ Agriculture Erosion Control Structures: Grassed Waterways, WASCOBS, etc. $__________
- ☐ Clean Water Diversions: Eavestroughing & Berms $__________
- ☐ Manure Storage $__________
  - ☐ Nutrient Management Plan/Strategy Development $__________
- ☐ Runoff Treatment (Type: __________) $__________
- ☐ Tile Drain Control Structures $__________
- ☐ On-Stream Pond Mitigation (fish passage, temperature) $__________
  - ☐ Decommissioning, Bypass, Fishway, Bottom-draw $__________
- ☐ Advanced Treatment Septic System (<30m to water) $__________
- ☐ Well Decommissioning by Licensed Contractor $__________
- ☐ Fuel, Chemical and Pesticide Storage/ Spill Prevention $__________
- ☐ Other: ____________________ $__________

Are you receiving or applying to any other grant programs for this work?

Program: __________ Amount: __________ ☐ Applied ☐ Confirmed

Program: __________ Amount: __________ ☐ Applied ☐ Confirmed

Program: __________ Amount: __________ ☐ Applied ☐ Confirmed

Program: __________ Amount: __________ ☐ Applied ☐ Confirmed

Application Check List

Project Start Date: ______________________________

Finish Date (estimate if necessary): ______________________________

Remember

• 2 Competitive Quotes attached?	YES	NO
• Map & Project Design	YES	NO
• Project Description (plus supporting materials, photos, design, etc),	YES	NO
• Deposit $150 (Community Tree Plants exempt. *Deposits are returned on project completion.*)	YES	NO
• Environmental Farm Plan done?	YES	NO
• Permit Required*?	YES	NO

Permit details:______________________________

*If permits are required, they need to be submitted prior to the grant being issued.

Map & Site Plan

- Attach a propose project map *(bird's eye view of property)*
  - *S*how detailed measurements
  - Can be drawn on airphoto/satellite image
  - This drawing must clearly show the location and extent of proposed works, existing structures and ecological features (ie. lake, pond, wetland, watercourse etc). It should also demonstrate the location of relevant projects features (e.g. the septic system, well, etc) and property boundary.

Current Conditions

1. Which natural features/values are on the property?

- ☐ Wetland
- ☐ Stream/River
- ☐ Seasonal Stream or Ditch
- ☐ Pond
- ☐ Lake shore
- ☐ Other ________________________

Special Designations

- ☐ NEC (Niagara Escarpment Commission)
- ☐ ORM (Oak Ridges Moraine)
- ☐ ANSI (Area of Natural & Scientific Interest)
- ☐ Habitat of Endangered Species
- ☐ Managed Forest Plan

2. Current land uses or activities on the property:

- ☐ Agricultural
  - ☐ Crop
  - ☐ Forage (Hay, alfalfa, etc.)
  - ☐ Livestock (type & #:)

    _________# of__________
    _________# of__________
    _________# of__________
- ☐ Urban
- ☐ Rural Residential
- ☐ Natural
- ☐ Development (i.e. Intent for subdivision)
- ☐ Recreational (i.e. Golf course)
- ☐ Commercial (i.e. Gravel pits)
- ☐ Other ___________________________

3. What conservation issues are expected to be improved by the project?

Project grants are based there being a benefit to public health and the environment.

Pollutants

- ☐ Bacteria
- ☐ Pathogens (viruses, prions, etc.)
- ☐ Nutrients (ammonia, phosphates, etc.)
- ☐ Toxins
- ☐ Organics
- ☐ Other __________________________

Erosion

- ☐ Stream bank
- ☐ Hill side/upland
- ☐ Other ___________________________

Fish Habitat

- ☐ Feeding
- ☐ Cover
- ☐ Reproductive nursery
- ☐ Migratory (i.e. fish ladder)

Wildlife Habitat

- ☐ Riparian (stream side)
- ☐ Wetland
- ☐ Expanding area
- ☐ Corridor / edge
- ☐ “Rare” species
- ☐ Joining habitat fragments
- ☐ Other ___________________________

Other Considerations

- ☐ Recharge areas
- ☐ Water conservation
- ☐ Participation
- ☐ Awareness
- ☐ Research / innovation
- ☐ Cost effectiveness
- ☐ Other ___________________________

Agreements and Signature

I hereby declare that the information contained in this form is true and accurate and that I have read, understood, and agreed with the above disclaimer.

Although the Nottawasaga Valley Conservation Authority, member municipalities, it's staff, Program Representatives and members of the Healthy Waters Project Review Committee may provide information regarding the practices and structures eligible for funding through the Healthy Waters Project, it is the responsibility of the applicant, in cooperation with their contractor, engineer and/or consultant to ensure that the practices and structures undertaken are suitable to the applicant's operation and are technically and structurally adequate. Each applicant must also ensure that all approvals, permits or other requirements under applicable laws, regulations and by-laws have been obtained prior to construction.

I intend to implement the project detailed in this application and wish to be considered for cost sharing under the NVCA's Healthy Waters Project. I authorize the use of the information in this plan for technical review purposes. I understand that if approved, I am responsible for completing and paying for the project in full, prior to receiving any grant for the project. I understand that project information from approved projects may be made public for the purposes of promotion or reporting.

If approved, I will maintain this project for the intended purposes for which it was designed, for a period of not less than 10 years. I understand that any modification(s) to the approved design, without written authorization from the review committee, could lead to a violation of this agreement and cancellation or repayment of the grant provided by the NVCA's Healthy Waters Project. I understand that projects completed prior to receiving confirmation of grant approval are not eligible for a HWP incentive grant.

Information about the project may be shared with funding and project partners, and municipal members. The Nottawasaga Valley Conservation Authority may feature outstanding projects in promotional materials, and promote good watershed stewardship.

Applicant Signature:______________________________ **Date:** __________________
❑ Same as landowner

Landowner Authorization: I hereby authorize the above noted person to submit application for funding application for works that will occur on my property.

Property Owner Signature: ________________________ **Date:** __________________

Please mail, fax or email this completed form and attachments to:

Shannon Stephens, Healthy Waters Program
Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON, L0M 1T0
Phone: 705-424-1479 – Fax: 705-424-2115
sstephens@nvca.on.ca

Help Us Make Our Programs Better

I feel that protecting water and the environment is:	Very Important ☐	☐	☐	☐	Not Important ☐
My knowledge of how to prevent water pollution is:	Excellent ☐	Above Average ☐	Average ☐	Below Average ☐	Poor ☐
I feel the efforts to let me know what programs are:	Excellent ☐	Above Average ☐	Average ☐	Below Average ☐	Poor ☐

How did you find out about this program? Select all that apply.

❑ letter
❑ newspaper
❑ radio / TV
❑ contractor
❑ word-of-mouth
❑ website
❑ Facebook / Twitter
❑ NVCA e-newsletter
❑ other:________________

Have you participated in environmental stewardship programs and projects before?

Details: ____

What types of other environmental projects you're interested in?

____

What were/are the main issues preventing you from undertaking these projects? Check all that apply.

❑ Financial
❑ Lack of knowledge of options
❑ Time-constraints
❑ Need more information
❑ Lack of contractors / professionals
❑ Feel it is not important at this time
❑ Other: ___________________________

How would you prefer to be contacted about similar programs?

____

Would you like to be kept up to date about programs and activities offered in your watershed? If so, provide your email: ______________________________________

Other comments:____

____

____

____

NVCA–Eligible Healthy Waters Projects

Eligible Projects	Grant Rate*	Max. Grant
Streamside Tree Planting		
Community Tree Planting	100%	$ 1,000
Streamside/Lakeside tree planting*** - bareroot stock	85%	$ 6000
Streamside/Lakeside tree planting – container stock	50%	$ 1,000 $ 10/plant
River Restoration		
Agricultural Erosion Control Structures	30%	$ 4,000
On-stream Ponds: Decommissioning, Bypasses, Fish-ladders & Bottom-draws	50%	$ 7,000
Community Action Projects	75%	$ 7,500
Livestock & Fish		
Livestock exclusion fencing from streams, lakes & wetlands: • Self-installed • Contractor installed	 100% 75%	 $10,000 Up to $12/m
Livestock stream crossing (w/ exclusion fencing)	75%	$ 2,000
Alternative watering source (w/ exclusion fencing)	75%	$ 2,000
Clean Water Diversions: Livestock Yard Eaves & Diversion Berms	50%	$ 2,500
Manure Storages	30%	$ 5,000
Milkhouse Wash Water Treatment/ Storage	50%	$ 2,500
Runoff Treatment: • Vegetated Filter Strips (engineered), Dispersion Sandwiches, Treatment Wetlands (engineered)	50%	$ 5,000
Crops & Fish		
Conservation Tillage & No Till	30%	$ 2,000
Grassed Waterways (engineered)	50%	$ 2,500
Grass-Meadow Buffer Strips around Streams / Wetlands	75%	$ 1,000
Tile Drain Control Boxes****	60%	$2,000
Nutrient Management Plan/Strategy Development	50%	$ 1,000
Drinking Water Protection		
Septic System Upgrade to Advanced Systems (current system <30m to natural permanent river or lake)	30%	$ 2,000
Fuel, Chemical & Pesticide Storage & Handling	50%	$ 1,000
Well Decommissioning	75%	$ 1,000

NVCA Permit fee waived for eligible HWP projects!

* HWP grants can be stacked with other grants, such as Environmental Farm Plan (EFP), up to 100%.
** 100% coverage of materials and supplies (self-installation labour is not eligible).
*** Tree planting project > 1000 trees, about 2 acres, can qualify for NVCA professional planting services
**** Tile drain control boxes let you control of your water level, reduce pollution runoff and increase yield (tile drains not eligible)

Special Notes:

- Maximum grant allowed $20,000 / property (landowner) per year.
- Projects may be declined based on project and stream reach priority and available funds.

Eligible Area: Healthy Waters Program

Streamside & Wetland Tree Planting

Project	Grant Rate	Max. Grant
Bareroot Tree-stock	**85%**	**$6,000**
Potted Tree-stock	**50%**	**$1,000 up to $10/plant**
Volunteer Planting (no deposit required)	**100%**	**$1,000 up to $10/plant**

Rationale:

- To increase the amount of riparian vegetation in order to improve water quality, stabilize stream banks, filter excess nutrients and create habitat corridors to permit the migration of native wildlife.
- Streamside buffers are among the most effective runoff reduction techniques, and provide critical fish and wildlife habitat.
- The NVCA watershed restoration target is to have an over 30m wide natural cover buffer along 75% of the watersheds streams and rivers.

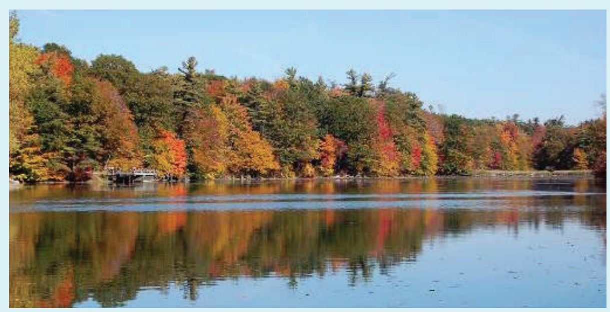
Eligible Projects:

- Reforestation of stream-sides with any permanent strip of native grasses, trees, and shrubs)
- Up to 30m wide on each side of the water-body.
- Projects may be done rural and urban properties (e.g. rural residential, agricultural, commercial and public lands).

Conditions:

- Projects need to be designed to improve water quality and overall stream health.
- Written permission of the landowner(s), where the project will take place, must be given on the grant application and a landowner agreement signed if the grant is approved.
- Protect plantings for at least 10 years.

The NVCA offers professional tree planting services to watershed residents. Since 1964, we've helped landowners plant 3 million trees and counting!



Stream and lake-side trees help filter water and provide critical habitats for birds, fish and other wildlife.

Windbreaks save topsoil, increase crop productivity, as well as reduce blowing and drifting snow.

Eligible Costs

- Purchased materials and supplies (i.e. native trees and shrubs, tree shelters, weed control mats)
- Contract labour (from registered company)
- Profession fees (consulting) for design, construction and supervision.

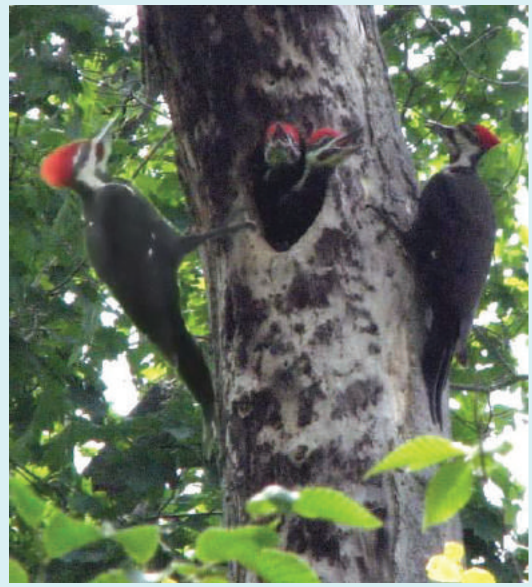
Ineligible Costs:

- Purchase of equipment and machinery (may be decided on an individual basis).
- Continual operating costs
- Labour and equipment use of the applicant
- Grants will not be provided for costs of in-kind labour and machine time, and personal expenses of the applicant(s), the applicant(s) business, or family members

Volunteer Plants:

- If you are interested in having a volunteers help plant at your property let us know!
- The deposit is waived for volunteer plantings
- We will develop a planting plan for your property
- We will order trees and materials on your behalf
- We will try to find a school, scout, guide or other group of volunteers to help you.
- We ask that the landowner benefiting from the volunteers provide snacks and beverages to the planters.

These community volunteers are having a great day out helping a landowner restore their stream.



Cavity trees provide nesting habitats. These Pileated Woodpecker parents are kept busy feeding their young!

The best time to plant a tree is twenty-years ago.
The next best time is today!

Healthy Water Program

Frequently Asked Questions

Who can apply?

- Community groups, urban and rural landowners

What is eligible?

- Projects that directly improve stream and groundwater health.
- Please refer to eligible projects guidelines for specific details.
- The lowest bid, from a registered Business (needs a GST/PST/HST number).

What is ineligible?

- Labour, materials donated by yourself, friends, and relatives.
- (We'll give you our thanks, but unfortunately can't financially compensate you for it!)

Why is this program needed?

Stream monitoring has shown that the health of our streams have been degraded by urban and rural non-point source pollution. Changing to Best Management Practices in both urban and rural lands is an effective and proven method of improving and protecting our water quality. By helping landowners and sharing the cost, we are able to increase the uptake of these practices. This can improve water quality far more than the legal minimum standard.

Ultimately, by working together to improve water quality for the public benefit, we can improve residents' access to safe, clean waters where they can swim, paddle, fish, drink and enjoy!

When are these grants available?

- Applications for each program year will be accepted throughout the year.
- Funding is limited and grants are not guaranteed.
- No retro-active grants are permitted in this program. (Get your approval in writing, before you start your project.)

What if I don't receive approval?

- In the event your application was declined, because the project was considered ineligible:
    1. Stewardship staff will contact you to explain the decision and:
        - May suggest changes that would make the project eligible.
        - Ask if you wish to withdraw your application, and return your deposit.

- If your project is deferred due to lack of funds, stewardship staff will contact you with the following options:
    1. Cancel your application, and return your deposit.
    2. Opt to leave your application in the queue. (This can be beneficial, because the NVCA actively solicits additional funding for our stewardship programs throughout the year on applicants behalf.)

When do I need to complete my project?

- Typically, projects must be completed by November 31st of each project year:
    - Final site visit complete, receipts and proof of payment submitted.
- In special cases, arrangements may be made for a multi-year projects.
    - (Projects that require planning, have seasonal constraints, or require permits).
- If you feel you can't meet the deadline, contact our staff as soon as you know.

RE: SICD - Channel cross sections and proposed bench/terrace

FD

Fred Dobbs <fdobbs@nvca.on.ca>
Wed 2019-01-23 5:09 PM

To: Jeff Dickson Mark Hartley <mhartley@nvca.on.ca>

Cc: Natalie Connell Matthew Moote Chris Pfohl Don McNalty Tim Lozon Jen Koen

Hi all,

I am trying to remember if the full design capacity of the proposed channel (we could call it the bankful channel) is approximately the 2 year return period storm or an average spring runoff.

The flow of 0.5m3/s in the memo below would not actually be baseflow but is something larger that would correspond to approximately a 0.5 year return period which is about the channel capacity of a typical wet meadow stream or Chris may be familiar with the term "E Channel" from the Rosgen manual.

The term baseflow is usually used to describe a mid-summer flow scenario that would occur at least 2 weeks after the most recent rain event. Describing baseflow for Innisfil Creek is difficult because of irrigation but I can give you a rough estimate for an order of magnitude. For a permanently trout stream in our NVCA watershed but not a super high groundwater input stream expect about 2 L/s of flow per km2 of drainage area. For example if the drainage area to a certain point along the drain was 30km2 then a rough order of magnitude for baseflow would be 30km2 X 2L/s/km2 = 60L/s of 0.06 cubic meters/s.

Managing this small flow in a compact channel with some depth would be achieved through creating a v-shaped bottom on the 4m wide channel or even a smaller width notch.

Based on some of the work we have done on Beeton Creek, I would recommend looking at reducing the height of the 4m wide channel.

7Q 20 Flow is the lowest mean flow of 7 consecutive lowest flow days in a 20 year period (an engineer could do a better explanation).

Fred

From: Jeff Dickson [mailto:Jeff.Dickson@rjburnside.com]
Sent: Wednesday, January 23, 2019 7:28 AM
To: Mark Hartley <mhartley@nvca.on.ca>; Fred Dobbs <fdobbs@nvca.on.ca>
Cc: Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Chris Pfohl <Chris.Pfohl@rjburnside.com>; Don McNalty <Don.McNalty@rjburnside.com>; Tim Lozon <Tim.Lozon@rjburnside.com>; Jen Koen <Jen.Koen@rjburnside.com>
Subject: RE: SICD - Channel cross sections and proposed bench/terrace

Mark & Fred:

My recollection as to base flow (I would request Tim Lozon to please confirm) is as follows:

- The low flow channel is as Mark H indicated wrt bottom width and side slopes but it is proposed to be a **minimum** of **0.60 m** deep
- This 0.60 m deep low flow channel has a capacity of approximately 0.81 m^3/sec
- Base flow was estimated to be approximately 0.50 m^3/sec (again, Tim can confirm the data used to determine it)
- Therefore the base flow in the low flow channel would be approximately 0.45 m deep
- The above flows in m^3/sec correspond to the portions of channel with a 0.05 % bottom gradient which is the design from Reive Boulevard (Station 2+300) to 10 Sideroad (Station 6+100) and through the entire Market Garden

Lastly … I am not familiar with the term 7Q20 … sorry … presumably Tim is (or Don).

Regards,

Jeff Dickson, P.Eng. R.J. Burnside & Associates Limited | www.rjburnside.com
Project Engineer Office: +1 800-265-9662 Direct: +1 226-476-3113

From: Mark Hartley <mhartley@nvca.on.ca>
Sent: Tuesday, January 22, 2019 7:43 PM
To: Fred Dobbs <fdobbs@nvca.on.ca>; Chris Pfohl <Chris.Pfohl@rjburnside.com>
Cc: Jeff Dickson <Jeff.Dickson@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>
Subject: RE: SICD - Channel cross sections and proposed bench/terrace

Chris,
I concur with all of Freds comments….my two cents to add relate to the size of the low flow channel. The diagram illustrates a bottom width of 4m, side slopes of 2:1 and an approx. depth of 0.5m. Any sense as to what's the design flow? Is there an estimate of baseflow or 7Q20 for these reaches? Can it be sized to reduce the occurrence of very wide, shallow flow?
Regards,
Mark

Mark Hartley, B.Sc.,M.Sc.,P.Eng. | **Senior Engineer**

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext. 247 | **F** 705-424-2115
mhartley@nvca.on.ca | **nvca.on.ca**

From: Fred Dobbs
Sent: Tuesday, January 22, 2019 5:25 PM
To: 'Chris Pfohl' <Chris.Pfohl@rjburnside.com>
Cc: Mark Hartley <mhartley@nvca.on.ca>; Jeff Dickson <Jeff.Dickson@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>
Subject: RE: SICD - Channel cross sections and proposed bench/terrace

Hi Chris,

The NVCA supports the principle of grading the floodplain shelf bank only and not disturbing the existing stable bank on the opposite side to grade a 1.2m wide bench. This support would not apply where the opposite bank was unstable.

The NVCA supports leaving the southern and western banks intact for shade and grading the northern and eastern banks to create the proposed floodplains.

NVCA supports the use of on-site vegetated sod mats to stabilize the new graded floodplain adjacent to the low flow channel. The sod mats can be partially draped down overbank into the low flow channel to enhance stability.

I recommend that you consult with DFO to confirm their requirements regarding the channel grading and stabilization plan.

Sincerely,

Fred

From: Chris Pfohl [mailto:Chris.Pfohl@rjburnside.com]
Sent: Tuesday, January 15, 2019 2:41 PM
To: Fred Dobbs <fdobbs@nvca.on.ca>
Cc: Mark Hartley <mhartley@nvca.on.ca>; Jeff Dickson <Jeff.Dickson@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>
Subject: RE: SICD - Channel cross sections and proposed bench/terrace

Good afternoon all!

I wanted to follow-up wrt this email since it greatly affects our costing and construction approach. Just to clarify, we will not be working on the opposite bank to avoid further disturbance to a stable bank condition. Please advise that we are in agreement to avoid additional work and need for the 1.2m offset on the opposite bank if we are creating a 2 stage channel (low flow, terraced area and overbank). I know the channel terms get tossed around so correct me for clarification and consistency.

We are submitting the Final Drainage Report this week to the Town of Innisfil and this aspect has major implications to cost and constructability. Why impact and disturb the opposite bank if there is no need to, other than stabilization for eroded areas already identified in our assessment and proposed improvements?

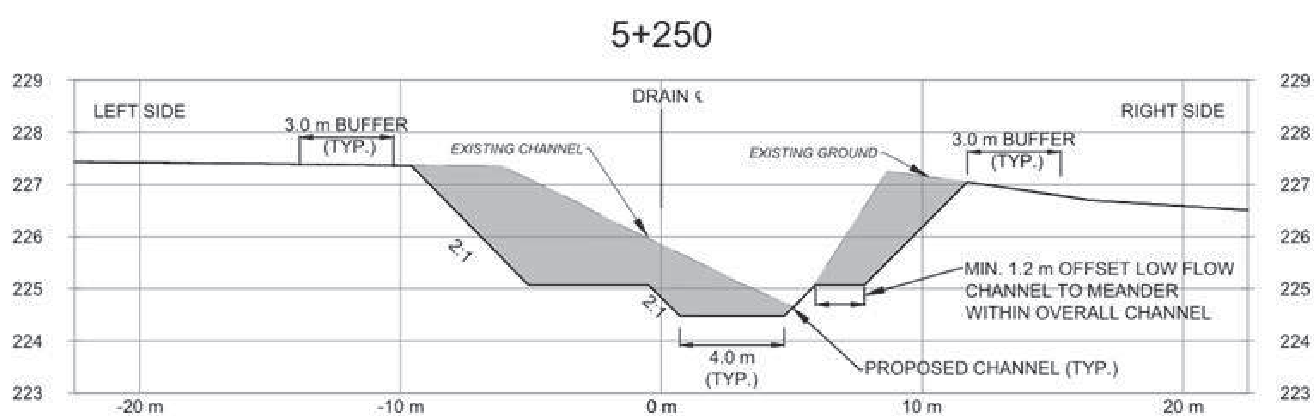
Sincerely, the aquatics middle man…

Chris

From: Chris Pfohl
Sent: Thursday, January 10, 2019 4:28 PM
To: Fred Dobbs (fdobbs@nvca.on.ca) <fdobbs@nvca.on.ca>
Cc: Mark Hartley (mhartley@nvca.on.ca) <mhartley@nvca.on.ca>; Jeff Dickson <Jeff.Dickson@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>
Subject: SICD - Channel cross sections and proposed bench/terrace

HI Fred/Mark!

Hope both of you and your families had a great holiday! We are working through the fine details on our channel design for the SICD and it was brought up at our last meeting that a minimum 1.2 to 1.5m bench on the bank opposite of the terraced side is preferred. Our thoughts are that the opposite bank would not be disturbed other than minor deepening (base of channel) and that the terraced side would be used for the increased riparian area adjacent from the low flow channel and banks. By not disturbing the opposite bank we would then reduce the amount of in-water works required (avoiding both low flow banks needing to be stabilized and planted) and only need to stabilize one low flow channel bank, terraced area and “overbank” within the overall channel cross section.



By taking this approach it reduces the amount of disturbance to the existing channel, amount of excavation and time required to do the in-water work. It is preferred by DFO to work from one side in all cases and sod matting is being considered where existing material is available for low flow bank construction. Areas above the low flow channel and banks will be planted and seeded as discussed.

Just wanted to confirm that there is not a requirement for the minimum 1.2 to 1.5m bench on the opposite bank from the terraced cross section.

Please confirm,

cheers,

Chris

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Ave West, Guelph, ON N1H1C4
Office: 800-265-9662 Direct:226-486-1543 Cell:519-827-8306
www.rjburnside.com

BURNSIDE

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Ave West, Guelph, ON N1H1C4
Office: 800-265-9662 Direct:226-486-1543 Cell:519-827-8306
www.rjburnside.com

South Innisfil Creek Drain Improvements Hydraulic Report - Response to NVCA Comments (Project No. 300038790)

JM

Jody McNabb
Thu 2019-02-07 11:00 AM

To: mhartley@nvca.on.ca

Cc: Tim Lozon Jeff Dickson

190206_NVCA-Hartley_...
138 KB

Show all 1 attachments (138 KB) Download Save to OneDrive - RJB

Hello Mark,

On behalf of Tim Lozon and Jeff Dickson, please find attached Burnside's response to comments provided, as referenced above.

Should you have any questions or concerns, please contact Tim directly.

Kind regards,

BURNSIDE

Jody McNabb
Administrative Assistant

R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario L9Y 4J6
Office: +1 800-265-9662 Direct: +1 705-797-4261
www.rjburnside.com

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

February 6, 2019

Via: Email (mhartley@nvca.on.ca)

Mark Hartley, P.Eng.
Senior Engineer
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia ON L0M 1T0

Dear Mr. Hartley:

Re: South Innisfil Creek Drainage Improvements - NVCA ID No. 21480
Response to Comments
Project No.: 300038790.0000

The following are Burnside's responses to NVCA comments received in correspondence dated December 14, 2018 and via email dated January 23, 2019 respectively. For clarity, your comments are listed in the order they appear in your original letter and subsequent email and are in italics. Our responses follow each comment.

December 14, 2018 Engineering Comments

1. ***Please include a column in Table 1 (Section 2.1) identified the corresponding Station (i.e., 1+200).***

   Table 1 in Section 2.1 of the Report has been revised.

2. ***It is understood that a number of different data sources were used to generate a topographic surface for the study area. Please provide a detailed description, including data sets, of how the different data sets were assembled. Staff recommend that Burnside demonstrate that the entire surface is contiguous with minimal topographic discrepancies. Lastly, please provide a list (location and elevation) of temporary and permanent benchmarks used in the analysis.***

   We have summarized all the topographic data sources used in the preparation of the final design and have included references to them in Appendix A of the Report. In summary, two Dillon topographic surveys and the NVCA DEM data were the primary data sources for the design of the SICD. Burnside has completed three independent topographic spot check surveys of isolated areas of the Dillon Survey. In the preparation of our (Burnside) topographic surveys, we used Dillon's benchmarks to ensure both data sets were contiguous. We have provided a list of available benchmarks as well in Appendix A of the Report. The independent surveys we have completed were primarily used to refine the hydraulic model specifically within the vicinity of the Highway 400 crossings and downstream of Highway 89, and to complete spot checks of the drain cross-section at other random locations within or along the course of the drain.

3. ***It is understood that a relatively high Manning's roughness coefficient has been used which is in keeping with applicable types of vegetation whether adjacent to the low flow channel or the bottom/sides of the main channel. Please confirm the type and location of vegetation communities proposed and if a vegetation planting plan will be provided in future submissions.***

   The Detailed Design Drawings, included within the SICD 2019 Improvement Engineer's Report, contain some information relating to the proposed vegetation planting within the drain, or more particularly, along the drain banks. Furthermore, GIS enabled Offsetting Measures information has been forwarded to DFO as part of the Application package submitted to DFO to procure an Authorization for the proposed improvement project. A copy of this information will be forwarded to your office.

   Regarding specific plantings, there were discussions with and information was procured from Shannon Stephens, Healthy Waters Program Coordinator for NVCA. Unfortunately, and due to the timeline for the filing of the report, Burnside staff have not had an opportunity to investigate the types of plantings to date; however, there will be opportunity to do so after the report is filed and before any of the construction begins.

4. ***There are seven "reaches" listed in Table 5 which correlate well to Sections 7.2.1, 7.2.2, 7.2.3 and 7.2.4. Please advise where in the report a section describing the last line in Table 5 namely 7+950 to 9+918?***

   The section of the SICD between Sta. 7+950 and 9+918 has been omitted from detailed discussions in the Report as this section of the drain is intended to be more representative of a ditch-bottom only clean out (removal of the high points in the existing channel that are above the proposed drain bottom gradient profile) and will not be subject to the same capacity expansions as the other downstream sections of the drain. Commentary has been added below Table 5 outlining the above.

5. ***The concept of a "low flow channel" as described in Section 7.2.2 and illustrated in Figures 7, 10, 11 and 13 is supported by the NVCA. Please provide a rational for the dimensions proposed (bottom width of 4 m or 2 m and side slopes of 2:1 or 1:1) and an estimate of the flow capacity of this low flow section. How frequently is the overbank expected to be inundated (3-4 times per year)?***

   Burnside has provided detailed commentary in support of the proposed low flow channel in Section 7.2.5.1 – SICD Base Flow and Low Flow Channel Commentary in the South Innisfil Creek Drainage Improvements Hydraulic Report.

6. ***There are three tributaries of importance that release cold water to the drain and confluences with the SICD are located at 3+588 (Bethesda Creek), 6+134 and 9+917. These watercourses, in particular 3+588, may be impacted by the adjustment of the SICD profile. Please confirm if these watercourses are considered as "branches" in this work and how these confluences will be accommodated (i.e., some grading works in the lower sections of these "branches")?***

   Grading works and erosion protection have been proposed at the confluence of the various connecting branch drains, tributary natural watercourses and private drains with the SICD Main Drain. These confluences have been identified in the Engineer's Report as well as on the final Design Drawings.

January 23, 2018 Engineering Comments

"The flow of 0.5 m³/s in the memo below would not actually be baseflow but is something larger that would correspond to approximately a 0.5 year return period which is about the channel capacity of a typical wet meadow stream or Chris may be familiar with the term "E Channel" from the Rosgen manual.

The term baseflow is usually used to describe a mid-summer flow scenario that would occur at least 2 weeks after the most recent rain event. Describing baseflow for Innisfil Creek is difficult because of irrigation but I can give you a rough estimate for an order of magnitude. For a permanently trout stream in our NVCA watershed but not a super high groundwater input stream, expect about 2 L/s of flow per km² of drainage area. For example, if the drainage area to a certain point along the drain was 30 km² then a rough order of magnitude for baseflow would be 30 km² X 2 L/s/km² = 60L/s of 0.06 m³/s.

Managing this small flow in a compact channel with some depth would be achieved through creating a v-shaped bottom on the 4 m wide channel or even a smaller width notch.

Based on some of the work we have done on Beeton Creek, I would recommend looking at reducing the height of the 4 m wide channel."

Burnside has completed further review of the low flow channel within the SICD with regards to the following;

- anticipated base flows;
- low-flow channel capacity;
- low-flow channel capacity as it relates to anticipated base flows: and;
- base flow behavior within the low-flow channel.

Based on the above we have reduced the bottom width of the low flow channel from 4 metres to 3 metres. This adjustment has a minor impact on channel capacity (less than 6%) but will improve flow conditions during periods of base flows

Burnside has provided detailed commentary in support of the proposed low flow channel in Section 7.2.5.1 – SICD Base Flow and Low Flow Channel Commentary in the South Innisfil Creek Drainage Improvements Hydraulic Report

We trust the following responses have addressed all NVCA comments. Please contact the undersigned should you have any additional questions or comments.

Yours truly,

R.J. Burnside & Associates Limited

Jeff Dickson, P.Eng.	Tim Lozon, P.Eng
Drainage Engineer	Water Resource Engineer

TL:jm

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BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

Assessment Details

Appendix D

APPENDIX D1 - SECTION 29 ALLOWANCE CALCULATIONS

Right-of-Way

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN: Town of Innisfil**
DATE: February 13, 2019 | **PROJECT #: 300038790**

RA	Regular Ag Land	$ / acre	8,093.72	$ / hectare	20,000
GC	Golf Course	$ / acre	10,117.15	$ / hectare	25,000
PA	Prime Ag Land	$ / acre	14,164.01	$ / hectare	35,000
UA	Uncultivated Ag Land	$ / acre	6,070.29	$ / hectare	15,000

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
			Main Drain Open									
MO1					**0+000**	**1+224**						
	15	Pt Lot 5	1833044 Ontario Ltd	existing drain	0+026	0+541	515	-	0.00	-	**4,570**	
				drain widening	0+026	0+541	515	-	1.00	-		
				work space	0+026	0+541	515	5.0	0.33	1,290		
				spoil treatment zone	0+026	0+541	515	3.0	0.33	770		
				establish 2 x 3m buffers	0+026	0+541	515	6.0	0.33	1,550		
MD-AR0				access route to drain			100	5.0	0.33	580		
MD-AR0				access route to drain			150	5.0	0.33	380		
	1	S Pt Lot 5	Ministry Of Transportation	existing drain	0+576	0+607	31	-	0.00	-	**220**	
				drain widening	0+576	0+607	31	-	1.00	-		
				work space	0+576	0+607	31	5.0	0.33	80		
				spoil treatment zone	0+576	0+607	31	3.0	0.33	50		
				establish 2 x 3m buffers	0+576	0+607	31	6.0	0.33	90		
	1	S Pt Lot 5	1665328 Ontario Ltd	existing drain	0+607	1+190	583	-	0.00	-	**3,130**	
				drain widening	0+607	1+190	583	-	1.00	-		
				work space	1+100	1+190	90	5.0	0.33	230		
				spoil treatment zone	1+100	1+190	90	3.0	0.33	140		
				establish 2 x 3m buffers	0+607	1+190	583	6.0	0.33	1,750		
MD-AR1C				access route to drain			150	5.0	0.33	380		
MD-AR1M				access route to drain			250	5.0	0.33	630		**7,920**
MO2					**1+224**	**2+165**						
	1	Pt Lot 6	A. Moir & H. Minns	existing drain	1+224	1+999	775	12.3	0.00	-	**18,270**	
				drain widening	1+224	1+999	775	9.3	1.00	10,750		
				work space	1+224	1+999	775	5.0	0.33	1,940		
				Additional Clearing Width	1+224	1+650	426	5.0	0.33	1,070		
				spoil treatment zone	1+224	1+999	775	-	0.33	-		
				establish 2 x 3m buffers	1+224	1+999	775	6.0	0.33	2,330		
MD-AR2				access route to drain			170	5.0	0.33	430		
MD-AR3	**Part**			access route to drain			300	5.0	0.33	750		
MD-AR3	**Part**			access route to drain			300	5.0	0.33	1,000		
	1	N Pt Lot 6	2367808 Ontario Inc	existing drain	1+999	2+165	166	13.0	0.00	-	**3,540**	
				drain widening	1+999	2+165	166	9.5	1.00	2,370		
				work space	1+999	2+165	166	5.0	0.33	420		
				spoil treatment zone	1+999	2+165	166	3.0	0.33	250		
				establish 2 x 3m buffers	1+999	2+165	166	6.0	0.33	500		**21,810**
MO3					**2+165**	**2+280**						
MO4					**2+280**	**3+350**						
	1	N Pt Lot 7	Succession Financial Group Inc	existing drain	2+280	2+948	668	10.7	0.00	-	**28,250**	
				drain widening	2+280	2+832	552	11.6	1.00	16,010		
				drain widening	2+832	2+948	116	3.6	1.00	1,040		
				work space	2+280	2+832	552	5.0	0.33	2,300		
				spoil treatment zone	2+280	2+832	552	10.0	0.33	4,600		
				establish 2 x 3m buffers	2+280	2+832	552	6.0	0.33	2,760		
				establish 1 x 3m buffer	2+832	2+948	116	3.0	0.33	290		
MD-AR4				access route to drain			100	5.0	1.00	1,250		
	1	N Pt Lot 8	1523566 Ontario Ltd	existing drain	2+948	3+350	402	8.2	0.00	-	**18,700**	
				drain widening	2+832	2+948	116	8.0	1.00	1,860		
				drain widening	2+948	3+350	402	11.1	1.00	8,920		
				work space	2+832	3+350	518	5.0	0.33	1,730		
				spoil treatment zone	2+832	3+350	518	10.0	0.33	3,450		
				establish 1 x 3m buffer	2+832	2+948	116	3.0	0.33	230		
				establish 2 x 3m buffers	2+948	3+350	402	6.0	0.33	1,610		
MD-AR5				access route to drain			270	5.0	0.33	900		**46,950**
MO5					**3+350**	**3+588**						
	2	S Pt Lot 8	P. Chiodo	existing drain	3+375	3+588	213	15.0	0.00	-	**6,020**	
				drain widening	3+375	3+588	213	6.9	1.00	2,940		
				work space	3+375	3+588	213	5.0	0.33	710		
				spoil treatment zone	3+375	3+588	213	10.0	0.33	1,420		
				establish 2 x 3m buffers	3+375	3+588	213	6.0	0.33	850		
MD-AR6	**Part**			access route to drain			30	5.0	0.33	100		**6,020**
MO6					**3+588**	**5+449**						
	2	S Pt Lot 8	A. & M. Filice	existing drain	3+588	3+895	307	14.4	0.00	-	**10,340**	
				drain widening	3+588	3+895	307	9.3	1.00	5,710		
				work space	3+588	3+895	307	5.0	0.33	1,020		
				spoil treatment zone	3+588	3+895	307	10.0	0.33	2,050		
				establish 2 x 3m buffers	3+588	3+895	307	6.0	0.33	1,230		
MD-AR6	**Part**			access route to drain			100	5.0	0.33	330		

APPENDIX D1 - SECTION 29 ALLOWANCE CALCULATIONS

Right-of-Way

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Town of Innisfil
DATE: February 13, 2019 **PROJECT #:** 300038790

RA	Regular Ag Land	$ / acre	8,093.72	$ / hectare	20,000
GC	Golf Course	$ / acre	10,117.15	$ / hectare	25,000
PA	Prime Ag Land	$ / acre	14,164.01	$ / hectare	35,000
UA	Uncultivated Ag Land	$ / acre	6,070.29	$ / hectare	15,000

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	2	S Pt Lot 9	Cohn Farms Inc	existing drain	3+895	4+059	164	16.1	0.00	-	**7,810**	
				drain widening	3+895	4+059	164	6.6	1.00	3,790		
				work space	3+895	4+059	164	5.0	0.33	960		
				spoil treatment zone	3+895	4+059	164	10.0	0.33	1,910		
				establish 2 x 3m buffers	3+895	4+059	164	6.0	0.33	1,150		
	2	S Pt Lot 9	Cohn Farms Inc	existing drain	4+059	4+210	151	16.1	0.00	-	**8,870**	
				drain widening	4+059	4+210	151	6.8	1.00	3,590		
				work space	4+059	4+210	151	5.0	0.33	880		
				spoil treatment zone	4+059	4+210	151	10.0	0.33	1,760		
				establish 2 x 3m buffers	4+059	4+210	151	6.0	0.33	1,060		
MD-AR7				access route to drain			270	5.0	0.33	1,580		
	2	Pt Lot 9	Marques Gardens Ltd	existing drain	4+210	4+368	158	16.8	0.00	-	**8,870**	
				drain widening	4+210	4+368	158	6.8	1.00	3,760		
				work space	4+210	4+368	158	5.0	0.33	920		
				spoil treatment zone	4+210	4+368	158	10.0	0.33	1,840		
				establish 2 x 3m buffers	4+210	4+368	158	6.0	0.33	830		
MD-AR8				access route to drain			260	5.0	0.33	1,520		
	2	S Pt Lot 9	L. & N. Tasca	existing drain	4+368	4+529	161	15.9	0.00	-	**7,220**	
				drain widening	4+368	4+529	161	5.8	1.00	3,270		
				work space	4+368	4+529	161	5.0	0.33	940		
				spoil treatment zone	4+368	4+529	161	10.0	0.33	1,880		
				establish 2 x 3m buffers	4+368	4+529	161	6.0	0.33	1,130		
	2	S Pt Lot 10	L. & N. Tasca	existing drain	4+529	4+880	351	14.9	0.00	-	**16,600**	
				drain widening	4+529	4+880	351	6.5	1.00	7,990		
				work space	4+529	4+880	351	5.0	0.33	2,050		
				spoil treatment zone	4+529	4+880	351	10.0	0.33	4,100		
				establish 2 x 3m buffers	4+529	4+880	351	6.0	0.33	2,460		
	2	Pt W1/2 Lot 10	Marques Gardens Ltd	existing drain	4+880	5+106	226	15.4	0.00	-	**10,440**	
				drain widening	4+880	5+106	226	6.2	1.00	4,900		
				work space	4+880	5+106	226	5.0	0.33	1,320		
				spoil treatment zone	4+880	5+106	226	10.0	0.33	2,640		
				establish 2 x 3m buffers	4+880	5+106	226	6.0	0.33	1,580		
	2	Pt Lot 10	Marques Gardens Ltd	existing drain	5+106	5+449	343	13.0	0.00	-	**15,050**	
				drain widening	5+106	5+449	343	5.3	1.00	6,360		
				work space	5+106	5+449	343	5.0	0.33	2,000		
				spoil treatment zone	5+106	5+449	343	10.0	0.33	4,000		
				establish 2 x 3m buffers	5+106	5+449	343	6.0	0.33	2,400		
MD-AR9				access route to drain			50	5.0	0.33	290		**85,200**
MO7					**5+449**	**6+355**						
	2	N Pt Lot 10	Horodynsky Farms Inc	existing drain	5+449	6+134	685	11.2	0.00	-	**37,580**	
				drain widening	5+449	6+134	685	9.5	1.00	22,780		
				work space	5+449	6+134	685	5.0	0.33	4,000		
				spoil treatment zone	5+449	6+134	685	10.0	0.33	7,990		
				establish 1 x 3m buffer	5+449	6+134	685	3.0	0.33	2,400		
MD-AR10				access route to drain			70	5.0	0.33	410		
	2	N Pt Lot 11	1281597 Ontario Inc	existing drain	6+161	6+328	167	8.2	0.00	-	**3,040**	
				drain widening	6+161	6+328	167	2.0	1.00	1,170		
				work space	6+161	6+328	167	5.0	0.33	970		
				spoil treatment zone	6+161	6+328	167	-	0.33	-		
				establish 1 x 3m buffer	6+161	6+328	167	3.0	0.33	580		
MD-AR11				access route to drain			55	5.0	0.33	320		**40,620**
MO8					**6+355**	**7+928**						
	3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis	existing drain	6+355	6+508	153		0.00	-	**3,670**	
				drain widening	6+355	6+508	153	2.0	1.00	1,070		
				work space	6+355	6+508	153	5.0	0.33	890		
				spoil treatment zone	6+355	6+508	153	3.0	0.33	540		
				establish 2 x 3m buffers	6+355	6+508	153	6.0	0.33	1,070		
MD-AR12				access route to drain			30	5.0	0.33	100		
	3	S Pt Lot 11	E. Carbone	existing drain	6+508	6+653	145		0.00	-	**1,930**	
				drain widening	6+508	6+653	145	2.0	1.00	580		
				work space	6+508	6+653	145	5.0	0.33	480		
				spoil treatment zone	6+508	6+653	145	3.0	0.33	290		
				establish 2 x 3m buffers	6+508	6+653	145	6.0	0.33	580		
	3	S Pt Lot 11	K. Costain & D. Goodwin	existing drain	6+653	6+800	147		0.00	-	**1,960**	
				drain widening	6+653	6+800	147	2.0	1.00	590		
				work space	6+653	6+800	147	5.0	0.33	490		
				spoil treatment zone	6+653	6+800	147	3.0	0.33	290		
				establish 2 x 3m buffers	6+653	6+800	147	6.0	0.33	590		
	3	S Pt Lot 11	N. & M. Makrigiorgos	existing drain	6+800	6+938	138		0.00	-	**1,840**	
				drain widening	6+800	6+938	138	2.0	1.00	550		
				work space	6+800	6+938	138	5.0	0.33	460		
				spoil treatment zone	6+800	6+938	138	3.0	0.33	280		
				establish 2 x 3m buffers	6+800	6+938	138	6.0	0.33	550		

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UA	Uncultivated Ag Land	$ / acre 6,070.29	$ / hectare 15,000

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	3	S Pt Lot 11	S. Scholten & D. Ransom	existing drain	6+938	7+077	139		0.00	-	1,860	
				drain widening	6+938	7+077	139	2.0	1.00	560		
				work space	6+938	7+077	139	5.0	0.33	460		
				spoil treatment zone	6+938	7+077	139	3.0	0.33	280		
				establish 2 x 3m buffers	6+938	7+077	139	6.0	0.33	560		
	3	N Pt Lot 11	9847723 Canada Corporation	existing drain	7+077	7+928	851		0.00	-	15,800	
				drain widening	7+077	7+928	851	2.0	1.00	3,400		
				work space	7+077	7+928	851	5.0	0.33	2,840		
				spoil treatment zone	7+077	7+928	851	3.0	0.33	1,700		
				establish 2 x 3m buffers	7+077	7+928	851	6.0	0.33	3,400		
MD-AR13				access route to drain			250	5.0	0.33	830		
MD-AR14				access route to drain			130	5.0	0.33	430		
				Culvert Realignment - new channel			40	40.0	1.00	3,200		**27,060**
MO9					**7+928**	**7+950**						-
MO10					**7+950**	**9+917**						
	4	Pt S1/2 Lot 11	D. & K. Gray	existing drain	7+950	8+036	86		0.00	-	1,730	
				drain widening	7+950	8+036	86	1.5	1.00	260		
				work space	7+950	8+036	86	5.0	0.33	290		
				spoil treatment zone	7+950	8+036	86	3.0	0.33	170		
				establish 2 x 3m buffers	7+950	8+036	86	6.0	0.33	340		
				establish 1 x 3m buffer	8+036	8+322	286	3.0	0.33	570		
MD-AR15	**Part**			access route to drain			30	5.0	0.33	100		
	4	Pt S1/2 Lot 11	M. & M. Alves	existing drain	8+036	8+322	286		0.00	-	3,080	
				drain widening	8+036	8+322	286	1.5	1.00	860		
				work space	8+036	8+322	286	5.0	0.33	950		
				spoil treatment zone	8+036	8+322	286	3.0	0.33	570		
				establish 1 x 3m buffer	8+036	8+322	286	3.0	0.33	570		
MD-AR15	**Part**			access route to drain			40	5.0	0.33	130		
	4	S Pt Lot 11	Kell Farms Ltd	existing drain	8+322	8+852	530		0.00	-	8,770	
				drain widening	8+322	8+852	530	1.5	1.00	1,590		
				work space	8+322	8+852	530	5.0	0.33	1,770		
				spoil treatment zone	8+322	8+852	530	3.0	0.33	1,060		
				establish 2 x 3m buffers	8+322	8+852	480	6.0	0.33	1,920		
MD-AR16				access route to drain			730	5.0	0.33	2,430		
MD-AR16	4	N Pt Lot 11	1665328 Ontario Ltd	access route to drain			50	5.0	0.33	130	130	
	4	Pt S1/2 Lot 12	M. & L. Valente	existing drain	8+852	8+919	67		0.00	-	200	
				drain widening	8+852	8+919	67	0.5	1.00	70		
				work space	8+852	8+919	67	-	0.33	-		
				spoil treatment zone	8+852	8+919	67	-	0.33	-		
				establish south 1 x 3m buffer	8+852	8+919	67	3.0	0.33	130		
	4	Pt S1/2 Lot 12	Innisfil Churchill Investment	existing drain	8+919	8+989	70		0.00	-	210	
				drain widening	8+919	8+989	70	0.5	1.00	70		
				work space	8+919	8+989	70	-	0.33	-		
				spoil treatment zone	8+919	8+989	70	-	0.33	-		
				establish south 1 x 3m buffer	8+919	8+989	70	3.0	0.33	140		
	4	Pt S1/2 Lot 12	A. Tuzi	existing drain	8+989	9+046	57		0.00	-	170	
				drain widening	8+989	9+046	57	0.5	1.00	60		
				work space	8+989	9+046	57	-	0.33	-		
				spoil treatment zone	8+989	9+046	57	-	0.33	-		
				establish south 1 x 3m buffer	8+989	9+046	57	3.0	0.33	110		
	4	N Pt Lot 12	1665328 Ontario Ltd	existing drain	8+852	9+898	1046		0.00	-	6,570	
				drain widening	8+852	9+046	194	1.0	1.00	290		
				drain widening	9+046	9+898	852	-	1.00	-		
				work space	8+852	9+898	1046	5.0	0.33	2,620		
				spoil treatment zone	8+852	9+898	1046	-	0.33	-		
				establish north 1 x 3m buffer	8+852	9+046	194	3.0	0.33	290		
				establish 2 x 3m buffers	9+046	9+898	852	6.0	0.33	2,560		
MD-AR17	**Part**			access route to drain			150	5.0	0.33	380		
MD-AR17	**Part**			access route to drain			100	5.0	0.33	330		
MD-AR18				access route to drain			40	5.0	0.33	100		**20,860**
						Total - Main Drain						**$ 256,440**
			3rd Line Branch Drain									
3RD BR1					**0+000**	**0+895**						
	2	N Pt Lot 11	1281597 Ontario Inc	existing drain	0+000	0+134	134	-	0.00	-	1,720	
				drain widening	0+000	0+134	134	-	1.00	-		
				work space	0+000	0+134	134	5.0	0.33	780		
				spoil treatment zone	0+000	0+134	134	3.0	0.33	470		
				1 x 3m buffer	0+000	0+134	134	3.0	0.33	470		
3RD-AR				access route to drain			0	-	0.33	-		

APPENDIX D1 - SECTION 29 ALLOWANCE CALCULATIONS

Right-of-Way

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN: Town of Innisfil**
DATE: February 13, 2019 **PROJECT #: 300038790**

RA	Regular Ag Land	$ / acre 8,093.72	$ / hectare 20,000
GC	Golf Course	$ / acre 10,117.15	$ / hectare 25,000
PA	Prime Ag Land	$ / acre 14,164.01	$ / hectare 35,000
UA	Uncultivated Ag Land	$ / acre 6,070.29	$ / hectare 15,000

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	existing drain	0+134	0+286	152	-	0.00	-	**2,000**	
				drain widening	0+134	0+286	152	-	1.00	-		
				work space	0+134	0+286	152	5.0	0.33	890		
				spoil treatment zone	0+134	0+286	152	3.0	0.33	530		
				1 x 3m buffer	0+134	0+286	152	3.0	0.33	530		
3RD-AR				access route to drain			15	5.0	0.33	50		
	2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	existing drain	0+286	0+438	152	-	0.00	-	**2,000**	
				drain widening	0+286	0+438	152	-	1.00	-		
				work space	0+286	0+438	152	5.0	0.33	890		
				spoil treatment zone	0+286	0+438	152	3.0	0.33	530		
				1 x 3m buffer	0+286	0+438	152	3.0	0.33	530		
3RD-AR				access route to drain			15	5.0	0.33	50		
	2	N Pt Lot 12	P. & K. Horodynsky	existing drain	0+438	0+591	153	-	0.00	-	**2,020**	
				drain widening	0+438	0+591	153	-	1.00	-		
				work space	0+438	0+591	153	5.0	0.33	890		
				spoil treatment zone	0+438	0+591	153	3.0	0.33	540		
				1 x 3m buffer	0+438	0+591	153	3.0	0.33	540		
3RD-AR				access route to drain			15	5.0	0.33	50		
	2	N Pt Lot 12	Horodynsky Farms Inc	existing drain	0+591	0+744	153	-	0.00	-	**2,020**	
				drain widening	0+591	0+744	153	-	1.00	-		
				work space	0+591	0+744	153	5.0	0.33	890		
				spoil treatment zone	0+591	0+744	153	3.0	0.33	540		
				1 x 3m buffer	0+591	0+744	153	3.0	0.33	540		
3RD-AR				access route to drain			15	5.0	0.33	50		
	2	N Pt Lot 12	1281597 Ontario Inc	existing drain	0+744	0+835	91	-	0.00	-	**1,220**	
				drain widening	0+744	0+835	91	-	1.00	-		
				work space	0+744	0+835	91	5.0	0.33	530		
				spoil treatment zone	0+744	0+835	91	3.0	0.33	320		
				1 x 3m buffer	0+744	0+835	91	3.0	0.33	320		
3RD-AR				access route to drain			15	5.0	0.33	50		
	2	N Pt Lot 12	J. Horodynsky	existing drain	0+835	0+895	60	-	0.00	-	**820**	
				drain widening	0+835	0+895	60	-	1.00	-		
				work space	0+835	0+895	60	5.0	0.33	350		
				spoil treatment zone	0+835	0+895	60	3.0	0.33	210		
				1 x 3m buffer	0+835	0+895	60	3.0	0.33	210		
3RD-AR				access route to drain			15	5.0	0.33	50		**11,800**
3RD BR2					**0+895**	**1+660**						
								TOTAL - 3RD LINE BRANCH				**$ 11,800**
			3rd Line Spur Drain									
3RD SP					**0+000**	**0+779**						
	3	S Pt Lot 12	T. & C. Xenophontos	existing drain	0+019	0+172	153	-	0.00	-	**860**	
				drain widening	0+019	0+172	153	-	1.00	-		
				work space	0+019	0+172	153	5.0	0.33	380		
				spoil treatment zone	0+019	0+172	153	-	0.33	-		
				1 x 3m buffer	0+019	0+172	153	3.0	0.33	230		
3RD Spur-AR				access route to drain			100	5.0	0.33	250		
	3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	existing drain	0+172	0+500	328	-	0.00	-	**3,550**	
			wooded section	drain widening	0+172	0+500	328	-	1.00	-		
				work space	0+172	0+500	328	5.0	0.33	820		
				spoil treatment zone	0+172	0+500	328	-	0.33	-		
				1 x 3m buffer	0+172	0+500	328	3.0	0.33	490		
				existing drain	0+500	0+780	280	-	0.00	-		
			agricultural section	drain widening	0+500	0+780	280	-	1.00	-		
				work space	0+500	0+780	280	5.0	0.33	1,630		
				spoil treatment zone	0+500	0+780	280	-	0.33	-		
				1 x 3m buffer	0+500	0+780	280	3.0	0.33	560		
3RD Spur-AR				access route to drain			15	5.0	0.33	50		**4,410**
								TOTAL - 3RD LINE SPUR DRAIN				**$ 4,410**
			10 Sideroad Branch									
10 SR					**0+000**	**1+448**						
	2	N Pt Lot 10	Horodynsky Farms Inc	existing drain	0+000	0+007	7	-	0.00	-	**-**	
				drain widening	0+000	0+007	7	-	1.00	-		
				work space	0+000	0+007	7	-	0.33	-		
				spoil treatment zone	0+000	0+007	7	-	0.33	-		
				1 x 3m buffer	0+000	0+007	7	-	0.33	-		
10SR-AR				access route to drain			0	-	0.33	-		
	3	Pt Lot 10	A. Fox & B. Scott	existing drain	0+031	0+172	141		0.00	-	**-**	
				drain widening	0+031	0+172	141	-	1.00	-		
				work space	0+031	0+172	141	-	0.33	-		
				1 x 3m buffer	0+031	0+172	141	-	0.33	-		

APPENDIX D1 - SECTION 29 ALLOWANCE CALCULATIONS

Right-of-Way

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN:** Town of Innisfil
DATE: February 13, 2019 | **PROJECT #:** 300038790

RA	Regular Ag Land	$ / acre 8,093.72	$ / hectare 20,000
GC	Golf Course	$ / acre 10,117.15	$ / hectare 25,000
PA	Prime Ag Land	$ / acre 14,164.01	$ / hectare 35,000
UA	Uncultivated Ag Land	$ / acre 6,070.29	$ / hectare 15,000

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	3	S Pt Lot 10	J. Phaneuf & C. Aguiar	existing drain	0+172	0+272	100	-	0.00	-	-	
				drain widening	0+172	0+272	100	-	1.00	-		
				work space	0+172	0+272	100	-	0.33	-		
				1 x 3m buffer	0+172	0+272	100	-	0.33	-		
	3	S Pt Lot 10	Y. Cil	existing drain	0+272	0+371	99	-	0.00	-	-	
				drain widening	0+272	0+371	99	-	1.00	-		
				work space	0+272	0+371	99	-	0.33	-		
				1 x 3m buffer	0+272	0+371	99	-	0.33	-		
	3	Pt Lot 10	J. Chow	existing drain	0+371	1+425	1054	-	0.00	-	7,350	
				drain widening	0+371	1+425	1054	-	1.00	-		
				work space	0+371	1+425	1054	5.0	0.33	3,510		
				spoil treatment zone	0+371	1+425	1054	3.0	0.33	2,110		
				1 x 3m buffer	0+371	1+425	1054	3.0	0.33	1,580		
10SR-AR				access route to drain		0+410	15	5.0	0.33	50		
10SR-AR				access route to drain		0+660	15	5.0	0.33	50		
10SR-AR				access route to drain		1+225	15	5.0	0.33	50		7,350
TOTAL - 10 SIDEROAD BRANCH												**$ 7,350**
			Branch 'A'									
BR-A					**0+000**	**0+650**						
	1	Pt Lot 6	A. Moir & H. Minns	existing drain	0+000	0+316	316	-	0.00	-	3,050	
				drain widening	0+000	0+316	316	-	1.00	-		
				work space	0+000	0+316	316	5.0	0.33	1,050		
				spoil treatment zone	0+000	0+316	316	5.0	0.33	1,050		
				establish 2 x 3m buffers	0+000	0+316	316	6.0	0.33	950		
			See AR3 Main Drain	access route to drain			0	5.0	0.33	-		
	1	Pt Lot 6	Ministry Of Transportation	existing drain	0+316	0+482	166	-	0.00	-	1,760	
				drain widening	0+316	0+482	166	-	1.00	-		
				work space	0+316	0+482	166	5.0	0.33	550		
				spoil treatment zone	0+316	0+482	166	5.0	0.33	550		
				establish 2 x 3m buffers	0+316	0+482	166	6.0	0.33	660		4,810
TOTAL - BRANCH 'A'												**$ 4,810**
TOTAL SECTION 29 ALLOWANCES												**$ 284,810**

	Open Drain Factors:	
Agricultural (Ag) Land	existing drain	0.00
	drain widening	1.00
	work space	0.33
	spoil treatment zone	0.33
	establish 2 x 3m buffers	0.33
	access route to drain	0.33
Uncultivated Ag Land/Wetland	existing drain	0.00
	drain widening	1.00
	work space	0.33
	spoil treatment zone	0.33
	establish 2 x 3m buffers	0.33
	access route to drain	0.33
Other	road allowances	0.00

APPENDIX D2 - SECTION 30 ALLOWANCE CALCULATIONS

Damages

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innis**

DATE: **February 13, 2019** **PROJECT #:** **300038790**

RA	Regular Ag Land	$ / acre 1,011.72	$ / hectare 2,500.00
GC	Golf Course	$ / acre 2,023.43	$ / hectare 5,000.00
PA	Prime (MG) Ag Land	$ / acre 4,046.86	$ / hectare 10,000.00
UA	Uncultivated Ag Land	$ / acre 505.86	$ / hectare 1,250.00

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
			Main Drain Open									
MO1					**0+000**	**1+224**						
	15	Pt Lot 5	1833044 Ontario Ltd	existing drain	0+026	0+541	515	-	0.00	-	**730**	
				drain widening	0+026	0+541	515	-	1.00	-		
				work space	0+026	0+541	515	5.0	1.00	320		
				spoil treatment zone	0+026	0+541	515	-	1.00	-		
				the work space 3m buffer	0+026	0+541	515	3.0	1.00	190		
AR0				access route to drain			100	5.0	1.00	130		
AR0				access route to drain			150	5.0	1.00	90		
	1	S Pt Lot 5	Ministry Of Transportation	existing drain	0+576	0+607	31	-	0.00	-	**-**	
				drain widening	0+576	0+607	31	-	0.00	-		
				work space	0+576	0+607	31	5.0	0.00	-		
				spoil treatment zone	0+576	0+607	31	-	0.00	-		
				the work space 3m buffer	0+576	0+607	31	3.0	0.00	-		
	1	S Pt Lot 5	1665328 Ontario Ltd	existing drain	0+607	1+190	583	-	0.00	-	**350**	
				drain widening	0+607	1+190	583	-	1.00	-		
				work space	1+000	1+190	190	5.0	1.00	120		
				spoil treatment zone	1+000	1+190	190	3.0	1.00	70		
				the work space 3m buffer	1+000	1+190	190	3.0	1.00	70		
AR1C				access route to drain			150	5.0	1.00	90		**1,080**
MO2					**1+224**	**2+165**						
	1	Pt Lot 6	A. Moir & H. Minns	existing drain	1+224	1+999	775	12.3	0.00	-	**6,310**	
				drain widening	1+224	1+999	775	9.3	1.00	900		
				work space	1+224	1+999	775	5.0	1.00	480		
				Clearing Width	1+224	1+650	426	15.0	1.00	800		
				spoil treatment zone	1+224	1+999	775	30.0	1.00	2,910		
				the work space 3m buffer	1+224	1+999	775	3.0	1.00	290		
				fence allowance						250		
AR2				access route to drain			170	5.0	1.00	110		
AR3	**Part**			access route to drain			300	5.0	1.00	190		
AR3	**Part**			access route to drain			300	5.0	1.00	380		
	1	N Pt Lot 6	2367808 Ontario Inc	existing drain	1+999	2+165	166	13.0	0.00	-	**1,090**	
				drain widening	1+999	2+165	166	9.5	1.00	200		
				work space	1+999	2+165	166	5.0	1.00	100		
				spoil treatment zone	1+999	2+165	166	35.0	1.00	730		
				the work space 3m buffer	1+999	2+165	166	3.0	1.00	60		**7,400**
MO3					**2+165**	**2+280**						
MO4					**2+280**	**3+350**						
	1	N Pt Lot 7	Succession Financial Group Inc	existing drain	2+280	2+948	668	10.7	0.00	-	**38,130**	
				drain widening	2+280	2+832	552	11.6	1.00	3,200		
				drain widening	2+832	2+948	116	3.6	1.00	210		
				work space	2+280	2+832	552	5.0	1.00	1,380		
				spoil treatment zone	2+280	2+832	552	10.0	1.00	2,760		
				the work space 3m buffer	2+280	2+832	552	3.0	1.00	830		
				Estimate to Re-Route Holes, Plant Trees, etc.	2+280	2+832	552			29,500		
AR4				access route to drain			100	5.0	1.00	250		
	1	N Pt Lot 8	1523566 Ontario Ltd	existing drain	2+948	3+350	402	8.2	0.00	-	**4,280**	
				drain widening	2+832	2+948	116	8.0	1.00	230		
				drain widening	2+948	3+350	402	11.1	1.00	1,120		
				work space	2+832	3+350	518	5.0	1.00	650		
				spoil treatment zone	2+832	3+350	518	10.0	1.00	1,300		
				the work space 3m buffer	2+832	3+350	518	3.0	1.00	390		
				fence allowance						250		
AR5				access route to drain			270	5.0	1.00	340		**42,410**
MO5					**3+350**	**3+588**						
	2	S Pt Lot 8	P. Chiodo	existing drain	3+375	3+588	213	15.0	0.0	-	**3,220**	
				drain widening	3+375	3+588	213	6.9	1.0	370		
				work space	3+375	3+588	213	5.0	1.0	270		
				spoil treatment zone	3+375	3+588	213	40.0	1.0	2,130		
				the work space 3m buffer	3+375	3+588	213	3.0	1.0	160		
				fence allowance						250		
AR6	**Part**			access route to drain			30	5.0	1.00	40		**3,220**
MO6					**3+588**	**5+449**						
	2	S Pt Lot 8	A. & M. Filice	existing drain	3+588	3+895	307	14.4	0.00	-	**4,770**	
				drain widening	3+588	3+895	307	9.3	1.00	710		
				work space	3+588	3+895	307	5.0	1.00	380		
				spoil treatment zone	3+588	3+895	307	40.0	1.00	3,070		
				the work space 3m buffer	3+588	3+895	307	3.0	1.00	230		
				fence allowance						250		
AR6	**Part**			access route to drain			100	5.0	1.00	130		

APPENDIX D2 - SECTION 30 ALLOWANCE CALCULATIONS

Damages

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innis**
DATE: **February 13, 2019** **PROJECT #:** **300038790**

RA	Regular Ag Land	$ / acre 1,011.72	$ / hectare 2,500.00
GC	Golf Course	$ / acre 2,023.43	$ / hectare 5,000.00
PA	Prime (MG) Ag Land	$ / acre 4,046.86	$ / hectare 10,000.00
UA	Uncultivated Ag Land	$ / acre 505.86	$ / hectare 1,250.00

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	2	S Pt Lot 9	Cohn Farms Inc	existing drain	3+895	4+059	164	16.1	0.00	-	**4,030**	
				drain widening	3+895	4+059	164	6.6	1.00	1,080		
				work space	3+895	4+059	164	5.0	1.00	820		
				spoil treatment zone	3+895	4+059	164	10.0	1.00	1,640		
				the work space 3m buffer	3+895	4+059	164	3.0	1.00	490		
	2	S Pt Lot 9	Cohn Farms Inc	existing drain	4+059	4+210	151	16.1	0.00	-	**14,090**	
				drain widening	4+059	4+210	151	6.8	1.00	1,030		
				work space	4+059	4+210	151	5.0	1.00	760		
				spoil treatment zone	4+059	4+210	151	10.0	1.00	1,510		
				the work space 3m buffer	4+059	4+210	151	3.0	1.00	450		
AR7				access route to drain			270	5.0	1.00	340		
				relocate existing cistern	south & u/s	4+059			LS	10,000		
	2	Pt Lot 9	Marques Gardens Ltd	existing drain	4+210	4+368	158	16.8	0.00	-	**14,240**	
				drain widening	4+210	4+368	158	6.8	1.00	1,070		
				work space	4+210	4+368	158	5.0	1.00	790		
				spoil treatment zone	4+210	4+368	158	10.0	1.00	1,580		
				the work space 3m buffer	4+210	4+368	158	3.0	1.00	470		
AR8			existing entrance & laneway (north) off 2nd Line	access route to drain			260	5.0	1.00	330		
				relocate existing cistern	north & u/s	4+290			LS	10,000		
	2	S Pt Lot 9	L. & N. Tasca	existing drain	4+368	4+529	161	15.9	0.00	-	**3,830**	
				drain widening	4+368	4+529	161	5.8	1.00	930		
				work space	4+368	4+529	161	5.0	1.00	810		
				spoil treatment zone	4+368	4+529	161	10.0	1.00	1,610		
				the work space 3m buffer	4+368	4+529	161	3.0	1.00	480		
	2	S Pt Lot 10	L. & N. Tasca	existing drain	4+529	4+880	351	14.9	0.00	-	**18,600**	
				drain widening	4+529	4+880	351	6.5	1.00	2,280		
				work space	4+529	4+880	351	5.0	1.00	1,760		
				spoil treatment zone	4+529	4+880	351	10.0	1.00	3,510		
				the work space 3m buffer	4+529	4+880	351	3.0	1.00	1,050		
				relocate existing cistern	north & u/s	4+290			LS	10,000		
	2	Pt W1/2 Lot 10	Marques Gardens Ltd	existing drain	4+880	5+106	226	15.4	0.00	-	**5,610**	
				drain widening	4+880	5+106	226	6.8	1.00	1,540		
				work space	4+880	5+106	226	5.0	1.00	1,130		
				spoil treatment zone	4+880	5+106	226	10.0	1.00	2,260		
				the work space 3m buffer	4+880	5+106	226	3.0	1.00	680		
	2	Pt Lot 10	Marques Gardens Ltd	existing drain	5+106	5+449	343	13.0	0.00	-	**8,060**	
				drain widening	5+106	5+449	343	5.3	1.00	1,820		
				work space	5+106	5+449	343	5.0	1.00	1,720		
				spoil treatment zone	5+106	5+449	343	10.0	1.00	3,430		
				the work space 3m buffer	5+106	5+449	343	3.0	1.00	1,030		
AR9				access route to drain			50	5.0	1.00	60		**73,230**
MO7					**5+449**	**6+355**						
	2	N Pt Lot 10	Horodynsky Farms Inc	existing drain	5+449	6+134	685	11.2	0.00	-	**18,930**	
				drain widening	5+449	6+134	685	9.5	1.00	6,510		
				work space	5+449	6+134	685	5.0	1.00	3,430		
				spoil treatment zone	5+449	6+134	685	10.0	1.00	6,850		
				the work space 3m buffer	5+449	6+134	685	3.0	1.00	2,060		
AR10				access route to drain			65	5.0	1.00	80		
	2	N Pt Lot 11	1281597 Ontario Inc	existing drain	6+161	6+328	167	8.2	0.00	-	**1,760**	
				drain widening	6+161	6+328	167	2.1	1.00	350		
				work space	6+161	6+328	167	5.0	1.00	840		
				spoil treatment zone	6+161	6+328	167	-	1.00	-		
				the work space 3m buffer	6+161	6+328	167	3.0	1.00	500		
AR11				access route to drain			55	5.0	1.00	70		**20,690**
MO8					**6+355**	**7+928**						
	3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis	existing drain	6+355	6+508	153		0.00	-	**2,040**	
				drain widening	6+355	6+508	153	2.0	1.00	310		
				work space	6+355	6+508	153	5.0	1.00	770		
				spoil treatment zone	6+355	6+508	153	3.0	1.00	460		
				the work space 3m buffer	6+355	6+508	153	3.0	1.00	460		
AR12				access route to drain			30	5.0	1.00	40		
	3	S Pt Lot 11	E. Carbone	existing drain	6+508	6+653	145		0.00	-	**470**	
				drain widening	6+508	6+653	145	2.0	1.00	70		
				work space	6+508	6+653	145	5.0	1.00	180		
				spoil treatment zone	6+508	6+653	145	3.0	1.00	110		
				the work space 3m buffer	6+508	6+653	145	3.0	1.00	110		
	3	S Pt Lot 11	K. Costain & D. Goodwin	existing drain	6+653	6+800	147		0.00	-	**470**	
				drain widening	6+653	6+800	147	2.0	1.00	70		
				work space	6+653	6+800	147	5.0	1.00	180		
				spoil treatment zone	6+653	6+800	147	3.0	1.00	110		
				the work space 3m buffer	6+653	6+800	147	3.0	1.00	110		

APPENDIX D2 - SECTION 30 ALLOWANCE CALCULATIONS

Damages

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** | **TOWN:** **Town of Innis**

DATE: **February 13, 2019** | **PROJECT #:** **300038790**

RA	Regular Ag Land	$ / acre 1,011.72	$ / hectare 2,500.00
GC	Golf Course	$ / acre 2,023.43	$ / hectare 5,000.00
PA	Prime (MG) Ag Land	$ / acre 4,046.86	$ / hectare 10,000.00
UA	Uncultivated Ag Land	$ / acre 505.86	$ / hectare 1,250.00

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	3	S Pt Lot 11	N. & M. Makrigiorgos	existing drain	6+800	6+938	138		0.00	-	440	
				drain widening	6+800	6+938	138	2.0	1.00	70		
				work space	6+800	6+938	138	5.0	1.00	170		
				spoil treatment zone	6+800	6+938	138	3.0	1.00	100		
				the work space 3m buffer	6+800	6+938	138	3.0	1.00	100		
	3	S Pt Lot 11	S. Scholten & D. Ransom	existing drain	6+938	7+077	139		0.00	-	440	
				drain widening	6+938	7+077	139	2.0	1.00	70		
				work space	6+938	7+077	139	5.0	1.00	170		
				spoil treatment zone	6+938	7+077	139	3.0	1.00	100		
				the work space 3m buffer	6+938	7+077	139	3.0	1.00	100		
	3	N Pt Lot 11	9847723 Canada Corporation	existing drain	7+077	7+928	851		0.00	-	3,640	
				drain widening	7+077	7+928	851	2.0	1.00	430		
				work space	7+077	7+928	851	5.0	1.00	1,060		
				spoil treatment zone	7+077	7+928	851	3.0	1.00	640		
				the work space 3m buffer	7+077	7+928	851	3.0	1.00	640		
AR13				access route to drain			250	5.0	1.00	310		
AR14				access route to drain			130	5.0	1.00	160		
				Culvert Realignment - new channel			40	40.0	1.00	400		7,500
MO9					7+928	7+950						
MO10					7+950	9+917						
	4	Pt S1/2 Lot 11	D. & K. Gray	existing drain	7+950	8+036	86		0.00	-	300	
				drain widening	7+950	8+036	86	1.5	1.00	30		
				work space	7+950	8+036	86	5.0	1.00	110		
				spoil treatment zone	7+950	8+036	86	3.0	1.00	60		
				the work space 3m buffer	7+950	8+036	86	3.0	1.00	60		
AR15	Part			access route to drain			30	5.0	1.00	40		
	4	Pt S1/2 Lot 11	M. & M. Alves	existing drain	8+036	8+322	286		0.00	-	940	
				drain widening	8+036	8+322	286	1.5	1.00	110		
				work space	8+036	8+322	286	5.0	1.00	360		
				spoil treatment zone	8+036	8+322	286	3.0	1.00	210		
				the work space 3m buffer	8+036	8+322	286	3.0	1.00	210		
AR15	Part			access route to drain			40	5.0	1.00	50		
	4	S Pt Lot 11	Kell Farms Ltd	existing drain	8+322	8+852	530		0.00	-	2,570	
				drain widening	8+322	8+852	530	1.5	1.00	200		
				work space	8+322	8+852	530	5.0	1.00	660		
				spoil treatment zone	8+322	8+852	530	3.0	1.00	400		
				the work space 3m buffer	8+322	8+852	530	3.0	1.00	400		
AR16				access route to drain			730	5.0	1.00	910		
AR16	4	N Pt Lot 11	1665328 Ontario Ltd	Part of AR 16						100	100	
	4	Pt S1/2 Lot 12	M. & L. Valente	existing drain	8+852	8+919	67	-	0.00	-	10	
				drain widening	8+852	8+919	67	0.5	1.00	10		
				work space	8+852	8+919	67	-	1.00	-		
				spoil treatment zone	8+852	8+919	67	-	1.00	-		
				the work space 3m buffer	8+852	8+919	67	-	1.00	-		
	4	Pt S1/2 Lot 12	Innisfil Churchill Investment	existing drain	8+919	8+989	70	-	0.00	-	10	
				drain widening	8+919	8+989	70	0.5	1.00	10		
				work space	8+919	8+989	70	-	1.00	-		
				spoil treatment zone	8+919	8+989	70	-	1.00	-		
				the work space 3m buffer	8+919	8+989	70	-	1.00	-		
	4	Pt S1/2 Lot 12	A. Tuzi	existing drain	8+989	9+046	57	-	0.00	-	10	
				drain widening	8+989	9+046	57	0.5	1.00	10		
				work space	8+989	9+046	57	-	1.00	-		
				spoil treatment zone	8+989	9+046	57	-	1.00	-		
				the work space 3m buffer	8+989	9+046	57	-	1.00	-		
	4	N Pt Lot 12	1665328 Ontario Ltd	existing drain	8+852	9+898	1046	-	0.00	-	1,560	
				drain widening	8+852	9+046	194	1.0	1.00	20		
				drain widening	9+046	9+898	852	-	1.00	-		
				work space	8+852	9+898	1046	5.0	1.00	650		
				spoil treatment zone	8+852	9+046	194	-	1.00	-		
				the work space 3m buffer	8+852	9+898	1046	3.0	1.00	390		
				fence allowance						250		
AR17	Part			access route to drain			190	5.0	1.00	120		
AR17	Part			access route to drain			80	5.0	1.00	100		
AR18				access route to drain			40	5.0	1.00	30		5,500
									TOTAL - MAIN DRAIN			$ 161,030
			3rd Line Branch Drain									
3RD BR1					0+000	0+895						
	2	N Pt Lot 11	1281597 Ontario Inc	existing drain	0+000	0+134	134		0.00	-	1,470	
				drain widening	0+000	0+134	134		1.00	-		
				work space	0+000	0+134	134	5.0	1.00	670		
				spoil treatment zone	0+000	0+134	134	3.0	1.00	400		
				the work space 3m buffer	0+000	0+134	134	3.0	1.00	400		
AR			See AR11 Main Drain	access route to drain			0	-	1.00	-		

APPENDIX D2 - SECTION 30 ALLOWANCE CALCULATIONS

Damages

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Town of Innis**
DATE: **February 13, 2019** **PROJECT #:** **300038790**

RA	Regular Ag Land	$ / acre 1,011.72	$ / hectare 2,500.00
GC	Golf Course	$ / acre 2,023.43	$ / hectare 5,000.00
PA	Prime (MG) Ag Land	$ / acre 4,046.86	$ / hectare 10,000.00
UA	Uncultivated Ag Land	$ / acre 505.86	$ / hectare 1,250.00

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	existing drain	0+134	0+286	152		0.00	-	**1,760**	
				drain widening	0+134	0+286	152		1.00	-		
				work space	0+134	0+286	152	5.0	1.00	760		
				spoil treatment zone	0+134	0+286	152	3.0	1.00	460		
				the work space 3m buffer	0+134	0+286	152	3.0	1.00	460		
AR				access route to drain			15	5.0	1.00	80		
	2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	existing drain	0+286	0+438	152		0.00	-	**1,760**	
				drain widening	0+286	0+438	152		1.00	-		
				work space	0+286	0+438	152	5.0	1.00	760		
				spoil treatment zone	0+286	0+438	152	3.0	1.00	460		
				the work space 3m buffer	0+286	0+438	152	3.0	1.00	460		
AR				access route to drain			15	5.0	1.00	80		
	2	N Pt Lot 12	P. & K. Horodynsky	existing drain	0+438	0+591	153		0.00	-	**1,770**	
				drain widening	0+438	0+591	153		1.00	-		
				work space	0+438	0+591	153	5.0	1.00	770		
				spoil treatment zone	0+438	0+591	153	3.0	1.00	460		
				the work space 3m buffer	0+438	0+591	153	3.0	1.00	460		
AR				access route to drain			15	5.0	1.00	80		
	2	N Pt Lot 12	Horodynsky Farms Inc	existing drain	0+591	0+744	153		0.00	-	**1,770**	
				drain widening	0+591	0+744	153		1.00	-		
				work space	0+591	0+744	153	5.0	1.00	770		
				spoil treatment zone	0+591	0+744	153	3.0	1.00	460		
				the work space 3m buffer	0+591	0+744	153	3.0	1.00	460		
AR				access route to drain			15	5.0	1.00	80		
	2	N Pt Lot 12	1281597 Ontario Inc	existing drain	0+744	0+835	91		0.00	-	**1,270**	
				drain widening	0+744	0+835	91		1.00	-		
				work space	0+744	0+835	91	5.0	1.00	460		
				spoil treatment zone	0+744	0+835	91	3.0	1.00	270		
				the work space 3m buffer	0+744	0+835	91	5.0	1.00	460		
AR				access route to drain			15	5.0	1.00	80		
	2	N Pt Lot 12	J. Horodynsky	existing drain	0+835	0+895	60		0.00	-	**740**	
				drain widening	0+835	0+895	60		1.00	-		
				work space	0+835	0+895	60	5.0	1.00	300		
				spoil treatment zone	0+835	0+895	60	3.0	1.00	180		
				the work space 3m buffer	0+835	0+895	60	3.0	1.00	180		
AR				access route to drain			15	5.0	1.00	80		**10,540**
3RD BR2					**0+895**	**1+660**						
	2	N Pt Lot 12	S. Sharma	existing drain	0+895	0+957	62		0.00	-	**-**	
				drain widening	0+895	0+957	62		1.00	-		
				1 x 3m buffer	0+895	0+957	62	3.0	0.00	-		
	2	N Pt Lot 12	D. & I. Chouryguine	existing drain	0+957	1+048	91		0.00	-	**-**	
				drain widening	0+957	1+048	91		1.00	-		
				1 x 3m buffer	0+957	1+048	91	3.0	0.00	-		
	2	N Pt Lot 13	K. Yamamoto	existing drain	1+048	1+276	228		0.00	-	**-**	
				drain widening	1+048	1+276	228		1.00	-		
				1 x 3m buffer	1+048	1+276	228	3.0	0.00	-		
	2	N Pt Lot 13	O. & R. Goncalves	existing drain	1+276	1+398	122		0.00	-	**-**	
				drain widening	1+276	1+398	122		1.00	-		
				1 x 3m buffer	1+276	1+398	122	3.0	0.00	-		
	2	N Pt Lot 13	T., Q. & M. Palmieri	existing drain	1+398	1+504	106		0.00	-	**-**	
				drain widening	1+398	1+504	106		1.00	-		
				1 x 3m buffer	1+398	1+504	106	3.0	0.00	-		
	2	N Pt Lot 13	T. Risi	existing drain	1+504	1+565	61		0.00	-	**-**	
				drain widening	1+504	1+565	61		1.00	-		
				1 x 3m buffer	1+504	1+565	61	3.0	0.00	-		
	2	N Pt Lot 13	D. Evers	existing drain	1+565	1+660	95		0.00	-	**-**	
				drain widening	1+565	1+660	95		1.00	-		
				1 x 3m buffer	1+565	1+660	95	3.0	0.00	-		**-**
								TOTAL - 3RD LINE BRANCH DRAIN				**$ 10,540**
			3rd Line Spur Branch Drain									
3RD SP					**0+000**	**0+779**						
	3	S Pt Lot 12	T. & C. Xenophontos	existing drain	0+019	0+172	153		0.00	-	**290**	
				drain widening	0+019	0+172	153		1.00	-		
				work space	0+019	0+172	153	5.0	1.00	100		
				spoil treatment zone	0+019	0+172	153	-	1.00	-		
				the work space 3m buffer	0+019	0+172	153	3.0	1.00	60		
AR				access route to drain			155	5.0	1.00	100		
AR				access route to drain			25	5.0	1.00	30		
	3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	existing drain	0+172	0+500	328		0.00	-	**2,650**	
			wooded area	drain widening	0+172	0+500	328		1.00	-		
				work space	0+172	0+500	328	5.0	1.00	210		
				spoil treatment zone	0+172	0+500	328	-	1.00	-		
				the work space 3m buffer	0+172	0+500	328	3.0	1.00	120	*330*	

APPENDIX D2 - SECTION 30 ALLOWANCE CALCULATIONS

Damages

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** | **TOWN:** **Town of Innis**
DATE: **February 13, 2019** | **PROJECT #:** **300038790**

RA	Regular Ag Land		$ / acre 1,011.72	$ / hectare 2,500.00
GC	Golf Course		$ / acre 2,023.43	$ / hectare 5,000.00
PA	Prime (MG) Ag Land		$ / acre 4,046.86	$ / hectare 10,000.00
UA	Uncultivated Ag Land		$ / acre 505.86	$ / hectare 1,250.00

Section	Conc.	Lot	Owner	Description	Station (m)	Station (m)	Length (m)	Width (m)	Factor	Allow ($)	Owner Sub-Total	Section Sub-Total
	3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	existing drain	0+500	0+780	280		0.00	-		
			agricultural area	drain widening	0+500	0+780	280		1.00	-		
				work space	0+500	0+780	280	5.0	1.00	1,400		
				spoil treatment zone	0+500	0+780	280	-	1.00	-		
				the work space 3m buffer	0+500	0+780	280	3.0	1.00	840		-
AR				access route to drain			15	5.0	1.00	80	*2,320*	**2,940**
						TOTAL - 3RD LINE SPUR BRANCH DRAIN						**$ 2,940**
			10 Sideroad Branch Drain									
10 SR					**0+000**	**0+031**						
	2	N Pt Lot 10	Horodynsky Farms Inc	existing drain	0+000	0+007	7		0.00	-	**-**	
				drain widening	0+000	0+007	7	-	1.00	-		
				work space	0+000	0+007	7	-	1.00	-		
				spoil treatment zone	0+000	0+007	7	-	1.00	-		
				the work space 3m buffer	0+000	0+007	7	-	1.00	-		
AR			See AR10 Main Drain	access route to drain			0	-	1.00	-		
	3	Pt Lot 10	A. Fox & B. Scott	existing drain	0+031	0+172	141		0.00	-	**-**	
				drain widening	0+031	0+172	141	-	1.00	-		
				work space	0+031	0+172	141	-	1.00	-		
				the work space 3m buffer	0+031	0+172	141	-	1.00	-		
AR				access route to drain			15	-	1.00	-		
	3	S Pt Lot 10	J. Phaneuf & C. Aguiar	existing drain	0+172	0+272	100		0.00	-	**-**	
				drain widening	0+172	0+272	100	-	1.00	-		
				work space	0+172	0+272	100	-	1.00	-		
				the work space 3m buffer	0+172	0+272	100	-	1.00	-		
AR				access route to drain			15	-	1.00	-		
	3	S Pt Lot 10	Y. Cil	existing drain	0+272	0+371	99		0.00	-	**-**	
				drain widening	0+272	0+371	99	-	1.00	-		
				work space	0+272	0+371	99	-	1.00	-		
				the work space 3m buffer	0+272	0+371	99	-	1.00	-		
AR				access route to drain			15	-	1.00	-		
	3	Pt Lot 10	J. Chow	existing drain	0+371	1+425	1054		0.00	-	**2,630**	
				drain widening	0+371	1+425	1054	-	1.00	-		
				work space	0+371	1+425	1054	5.0	1.00	1,320		
				spoil treatment zone	0+371	1+425	1054	3.0	1.00	790		
				the work space 3m buffer	0+371	1+425	1054	3.0	1.00	400		
AR				access route to drain		0+410	15	5.0	1.00	40		
AR				access route to drain		0+660	15	5.0	1.00	40		
AR				access route to drain		1+225	15	5.0	1.00	40		
AR				access route to drain			0	-	1.00	-		**2,630**
						TOTAL - 10 SIDEROAD BRANCH DRAIN						**$ 2,630**
			Branch 'A'									
BR-A					**0+000**	**0+650**						
	1	Pt Lot 6	A. Moir & H. Minns	existing drain	0+000	0+316	316		0.00	-	**920**	
				drain widening	0+000	0+316	316		1.00	-		
				work space	0+000	0+316	316	5.0	1.00	400		
				spoil treatment zone	0+000	0+316	316	5.0	1.00	400		
				the work space 3m buffer	0+000	0+316	316	3.0	1.00	120		
			See AR3 Main Drain	access route to drain			0	5.0	1.00	-		
	1	Pt Lot 6	Ministry Of Transportation	existing drain	0+316	0+482	166		0.00	-	**540**	
				drain widening	0+316	0+482	166		1.00	-		
				work space	0+316	0+482	166	5.0	1.00	210		
				spoil treatment zone	0+316	0+482	166	5.0	1.00	210		
				the work space 3m buffer	0+316	0+482	166	3.0	1.00	120		**1,460**
									TOTAL - BRANCH 'A'			**$ 1,460**
									TOTAL SECTION 30 ALLOWANCES			**$ 178,600**

Open Drain Factors:

Agricultural (Ag) Land	existing drain	0.00
	drain widening	1.00
	work space	1.00
	spoil treatment zone	1.00
	the work space 3m buffer	1.00
	access route to drain	1.00
Uncultivated Ag Land/Wetland	existing drain	0.00
	drain widening	1.00
	work space	1.00
	spoil treatment zone	1.00
	the work space 3m buffer	1.00
	access route to drain	1.00
Other	road allowances	0.00

APPENDIX D3 - SECTION 33 ALLOWANCE CALCULATIONS

Loss of Access

PROJECT: South Innisfil Creek Drain - 2019 Improvement | **TOWN:** Town of Innisfil
DATE: October 22, 2019 - Amended by the Tribunal | **PROJECT #:** 300038790

Section	Conc.	Lot	Owner	Description	Station (m)	Allow ($)	Owner Sub-Total	Section Sub-Total
			Main Drain					
MO1								
	15	Pt Lot 5	1833044 Ontario Ltd			500	500	
	1	S Pt Lot 5	1665328 Ontario Ltd			500	500	1,000
MO2								
	1	Pt Lot 6	A. Moir & H. Minns			1,000	1,000	
	1	N Pt Lot 6	2367808 Ontario Inc			500	500	1,500
MO4								
	1	N Pt Lot 7	Succession Financial Group Inc	Golf Cart Bridge 1	2+333	137,500	137,500	137,500
MO5								
	2	S Pt Lot 8	P. Chiodo			300	300	300
MO6								
	2	S Pt Lot 8	A. & M. Filice	New crossing	3+588	15,000	15,000	
	2	S Pt Lot 9	Cohn Farms Inc	Concrete Farm Crossing	4+057	45,000	45,000	
	2	Pt Lot 9	Marques Gardens Ltd	Concrete Farm Crossing	4+359	45,000	45,000	
	2	S Pt Lot 9	L. & N. Tasca	Wood/steel Farm Crossing	4+414	45,000	45,000	
	2	Pt W1/2 Lot 10	Marques Gardens Ltd	New crossing	5+106	15,000	15,000	165,000
MO7								
							-	-
MO8								
	3	S Pt Lot 11	E. Carbone	New crossing	6+508	200	200	
	3	S Pt Lot 11	K. Costain & D. Goodwin	New crossing	6+653	200	200	
	3	S Pt Lot 11	N. & M. Makrigiorgos	New crossing	6+800	200	200	
	3	S Pt Lot 11	S. Scholten & D. Ransom	New crossing	6+938	200	200	800
MO10								
	4	N Pt Lot 12	1665328 Ontario Ltd			100	100	100
						TOTAL - MAIN DRAIN		**$ 306,200**
			3rd Line Branch Drain					
3RD BR1								
	2	N Pt Lot 11	1281597 Ontario Inc			100	100	
	2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.			100	100	
	2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.			100	100	
	2	N Pt Lot 12	P. & K. Horodynsky			100	100	
	2	N Pt Lot 12	Horodynsky Farms Inc			100	100	
	2	N Pt Lot 12	1281597 Ontario Inc			100	100	
	2	N Pt Lot 12	J. Horodynsky			100	100	700
3RD BR2								
	2	N Pt Lot 12	S. Sharma			100	100	
	2	N Pt Lot 12	D. & I. Chouryguine			100	100	
	2	N Pt Lot 13	K. Yamamoto			100	100	
	2	N Pt Lot 13	O. & R. Goncalves			100	100	
	2	N Pt Lot 13	T., Q. & M. Palmieri			100	100	
	2	N Pt Lot 13	T. Risi			100	100	
	2	N Pt Lot 13	D. Evers			100	100	700
						TOTAL - 3RD LINE BRANCH DRAIN		**$ 1,400**

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

APPENDIX D3 - SECTION 33 ALLOWANCE CALCULATIONS

Loss of Access

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Town of Innisfil
DATE: October 22, 2019 - Amended by the Tribunal **PROJECT #:** 300038790

Section	Conc.	Lot	Owner	Description	Station (m)	Allow ($)	Owner Sub-Total	Section Sub-Total
			3rd Line Spur Branch Drain					
3RD SP								
	3	S Pt Lot 12	T. & C. Xenophontos			100	**100**	
	3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.			100	**100**	**200**
					TOTAL - 3RD LINE SPUR BRANCH DRAIN			**$ 200**
			10 Sideroad Branch Drain					
10 SR								
	3	Pt Lot 10	A. Fox & B. Scott			100	**100**	
	3	S Pt Lot 10	J. Phaneuf & C. Aguiar			100	**100**	
	3	S Pt Lot 10	Y. Cil			100	**100**	
	3	Pt Lot 10	J. Chow			100	**100**	**400**
					TOTAL - 10 SIDEROAD BRANCH DRAIN			**$ 400**
			Branch 'A'					
BR-A								
								-
					TOTAL - BRANCH 'A'			**$ -**
					TOTAL SECTION 33 ALLOWANCES			**$ 308,200**

APPENDIX D4 - SUMMARY OF PROJECT COSTS

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Town of Innisfil
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #:** 300038790

Section	Construction	Contingency + Overhead	Allowances	Sub-Total Cons & Allow	Admin. Costs	SECTION TOTALS	Admin Benefit Reduction	SECTION TOTAL TO PRORATE
MAIN OPEN								
MO1 0+000 1+224	35,160	8,560	10,000	53,720	13,970	67,690	*(1,170)*	66,520
MO2 1+224 2+165	239,570	58,330	30,710	328,610	65,440	394,050	*(810)*	393,240
MO3 2+165 2+280	16,880	4,110	-	20,990	85,000	105,990	*(8,510)*	97,480
MO4 2+280 3+350	247,560	60,280	**226,860**	534,700	159,030	693,730	*(5,850)*	687,880
MO5 3+350 3+588	70,620	17,200	9,540	97,360	25,310	122,670	*(2,070)*	120,600
MO6 3+588 5+449	370,040	90,090	323,430	783,560	223,753	1,007,313	*(1,980)*	1,005,333
MO7 5+449 6+355	157,100	38,250	61,310	256,660	76,730	333,390	*(6,800)*	326,590
MO8 6+355 7+928	95,580	23,270	35,360	154,210	40,100	194,310	*(680)*	193,630
MO9 7+928 7+950	570,000	50,000	-	620,000	161,210	781,210	*(90)*	781,120
MO10 7+950 9+917	137,790	33,560	26,460	197,810	21,420	219,230	*(15,130)*	204,100
SUBTOTALS	**$ 1,940,300**	**$ 383,650**	**$ 723,670**	**$ 3,047,620**	**$ 871,963**	**$ 3,919,583**	**$ 43,090**	**$ 3,876,493**
10 SIDEROAD								
10 SR 0+000 0+031	120,500	10,000	-	130,500	33,930	164,430	-	164,430
10SR-2 0+031 0+371	8,780	1,000	300	10,080	2,620	12,700	-	12,700
10SR-3 0+371 1+448	20,470	3,500	10,080	34,050	8,850	42,900	-	42,900
SUBTOTALS	**$ 149,750**	**$ 14,500**	**$ 10,380**	**$ 174,630**	**$ 45,400**	**$ 220,030**	**$ -**	**$ 220,030**
3RD LINE								
3RD BR1 0+000 0+895	29,710	2,750	23,040	55,500	14,430	69,930	-	69,930
3RD BR2 0+895 1+660	27,280	2,350	700	30,330	7,890	38,220	-	38,220
SUBTOTALS	**$ 56,990**	**$ 5,100**	**$ 23,740**	**$ 85,830**	**$ 22,320**	**$ 108,150**	**$ -**	**$ 108,150**
3RD LINE SPUR								
3RD SP 0+000 0+780	25,080	2,300	7,550	34,930	9,080	44,010	-	44,010
SUBTOTALS	**$ 25,080**	**$ 2,300**	**$ 7,550**	**$ 34,930**	**$ 9,080**	**$ 44,010**	**$ -**	**$ 44,010**
BRANCH 'A'								
BR-A 0+000 0+650	26,730	1,950	6,270	34,950	9,090	44,040	-	44,040
SUBTOTALS	**$ 26,730**	**$ 1,950**	**$ 6,270**	**$ 34,950**	**$ 9,090**	**$ 44,040**	**$ -**	**$ 44,040**
Previous Dillon Consulting Fees to be Assessed to Entire Watershed						**$ 1,025,087**		
TOTALS	**$ 2,198,850**	**$ 407,500**	**$ 771,610**	**$ 3,377,960**	**$ 957,863**	**$ 5,360,900**	**$ 43,090**	**$ 4,292,723**

Appendix D4 — Special Assessments (Section 26)

South Innisfil Creek Drain - 2019 Improvement

Pursuant to Section 26 of the Drainage Act the following Special Assessments are made:

1. Main Drain — Hwy. 400 (Ministry of Transportation) (Sta. 2+165 to 2+245)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road and is calculated as follows:

Engineering/ Administration	=	Special Assessment
Consisting of: Additional hydrologic & hydraulic modelling, meetings, communication and associated administrative time to arrive at a solution		
$ 56,000	=	**$ 56,000**

2. Main Drain — Reive Boulevard (Town of Innisfil) (Sta. 2+245 to 2+280)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road and is calculated as follows:

Engineering/ Administration	=	Special Assessment
Consisting of: Additional hydrologic & hydraulic modelling, meetings, communication and associated administrative time to arrive at a solution		
$ 19,000	=	**$ 19,000**

3. Main Drain — 4th Line (Town of Innisfil) (Sta. 7+928 to 7+950)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road and is calculated as follows:

Construction Costs	-	Equivalent Drain	+	Engineering/ Administration	=	Special Assessment
Consisting of: **Replacement of the 4th Line culvert crossing with 6.0 m x 2.5 m concrete box culvert including contingency**		Consisting of: 22 m of open channel improvements		Consisting of: Design, drawing production, construction layout and inspection.		
$ 620,000	-	$ 1,340	+	$ 45,000	=	**$ 663,660**

Whether or not the Town of Innisfil elects to do work on their property 4th Line, they shall be assessed the actual cost of the work incurred (estimated as $ 620,000), minus the actual cost of an equivalent drain (estimated as $ 1,340), plus engineering/administration (estimated as $ 45,000) as a Special Assessment.

4. 10 Sideroad Branch Drain — 3rd Line (Town of Innisfil) (Sta. 0+011 to 0+031)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road and is calculated as follows:

Construction Costs	-	Equivalent Drain	+	Engineering/ Administration	=	Special Assessment
Consisting of: **Replacement of the 3rd Line culvert crossing with 1,600 mm CSP including contingency**		Consisting of: 23 m of open channel improvements		Consisting of: Design, drawing production, construction layout and inspection.		
$ 120,000	-	$ 2,070	+	$ 20,000	=	**$ 137,930**

Whether or not the Town of Innisfil elects to do work on their property 10 Sideroad, they shall be assessed the actual cost of the work incurred (estimated as $ 120,000), minus the actual cost of an equivalent drain (estimated as $ 2,070), plus engineering/administration (estimated as $ 20,000) as a Special Assessment.

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
		Innisfil Lands								
1	S Pt Lot 2	Letizia Homes Ltd	001-00500	11.49	-	-	-	-	1.72	13.21
1	S Pt Lot 3	2492140 Ontario Ltd	001-00600	14.97	-	-	-	-	1.30	16.27
1	S Pt Lot 3	S. & P. Prim	001-00700	2.46	-	0.93	-	-	0.65	4.04
1	S Pt Lot 4	D. Corbo	001-00800	19.12	-	15.53	-	-	5.97	40.62
1	S Pt Lot 4	G. Snedden & L. D'aoust	001-00900	-	-	-	-	-	0.44	0.44
1	S Pt Lot 5	Ministry Of Transportation	001-01100	-	0.39	0.52	-	5.68	-	6.59
1	S Pt Lot 5	1665328 Ontario Ltd	001-01200	-	3.67	29.73	-	-	-	33.40
1	Pt Lot 6	H. & G. White	001-01300	-	-	0.09	0.14	-	-	0.23
1	Pt Lot 6	A. Moir & H. Minns	001-01400	17.94	-	13.20	-	-	3.92	35.06
1	S Pt Lot 6	H. Wallace	001-01500	-	-	0.08	-	-	0.31	0.39
1	S Pt Lot 6	H. Dinh	001-01700	-	-	-	-	-	0.25	0.25
1	S Pt Lot 6	T. Pham	001-01800	-	-	-	0.13	-	-	0.13
1	S Pt Lot 6	Bell Canada	001-01900	0.09	-	-	-	-	-	0.09
1	Pt Lot 6	Ministry Of Transportation	001-02100	3.30	-	-	-	-	-	3.30
1	Pt Lot 7	A. Moir & H. Minns	001-02200	0.86	-	-	-	-	-	0.86
1	Pt Lot 7	Ministry Of Transportation	001-02400	-	-	-	-	1.40	-	1.40
1	N Pt Lot 6	F. Rohani & R. Ghorabi	001-02600	-	-	-	-	-	0.28	0.28
1	N Pt Lot 6	2367808 Ontario Inc	001-02800	30.28	0.55	3.03	-	-	6.70	40.56
1	N Pt Lot 5	A. Posius	001-03000	33.63	-	6.08	-	-	0.81	40.52
1	N Pt Lot 5	A. & M. Beattie	001-03010	-	-	-	-	-	0.54	0.54
1	Pt Lot 4	Tack 2016 Ltd & 1442422 Ontario Ltd	001-03100	38.53	-	0.11	-	-	1.72	40.36
1	Pt Lot 4	M. Lang	001-03110	0.46	-	-	-	-	0.02	0.48
1	N Pt Lot 3	Tack 2016 Ltd	001-03200	22.93	-	0.89	-	-	2.68	26.50
1	Pt Lot 3	G. & B. Faggion	001-03300	13.30	-	-	-	-	-	13.30
2	S Pt Lot 2	A. & D. Tamburino	001-04100	1.07	-	-	-	-	-	1.07
2	S Pt Lot 3	White Horse Investments Corp, Fresco	001-04200	36.06	-	1.23	-	-	3.69	40.98
2	Pt Lot 3	A. & N. Marcuzzi	001-04400	0.02	-	-	-	-	0.26	0.28
2	S Pt Lot 4	674569 Ontario Ltd	001-04500	4.37	2.10	1.62	-	-	8.09	16.18
2	S Pt Lot 4	D. & L. Mazanik	001-04600	6.46	0.99	3.97	-	-	13.41	24.83
2	Pt Lot 4	V. Astrauskas & P. Spedaliere	001-04620	-	-	-	-	-	0.37	0.37
2	S Pt Lot 5	H. & Y. Yoo	001-04700	31.60	-	3.65	-	-	5.27	40.52
2	S Pt Lot 5	J. Quishpe Barros & V. Leon Pinos	001-04900	-	-	-	0.21	-	-	0.21
2	Pt Lot 6	P S K Holdings Inc	001-05200	15.34	-	-	-	-	5.44	20.78
2	Pt Lot 6	The Simpson/Elson Group	001-05220	16.41	-	-	-	-	3.31	19.72
2	N Pt Lot 6	S. & I. Hussain	001-05300	0.55	-	7.09	-	-	5.71	13.35
2	N Pt Lot 6	S. Pressey & H. Money	001-05400	1.90	-	0.46	-	-	5.25	7.61
2	Pt Lot 6	Y. Tran & D. & L. Nguyen	001-05500	1.01	-	0.18	-	-	3.21	4.40
2	N Pt Lot 6	L. & M. Barbosa	001-05600	1.68	-	0.35	-	-	2.38	4.41
2	N Pt Lot 6	C. & A. Carpino	001-05700	-	-	3.74	-	-	4.75	8.49
2	N Pt Lot 5	H. & M. Yoon	001-05800	-	0.44	-	-	-	3.60	4.04
2	N Pt Lot 5	G. & A. Caubang	001-05900	-	1.74	0.77	-	-	1.54	4.05
2	N Pt Lot 5	A. Krebs Est., H. Krebs & I. Krebs-Wick	001-06000	-	0.08	0.85	-	-	3.10	4.03
2	N Pt Lot 5	G. & Z. Grigoroff	001-06100	-	0.12	0.36	-	-	3.56	4.04
2	N Pt Lot 5	H. Sieber	001-06200	0.08	1.18	0.59	-	-	2.04	3.89
2	N Pt Lot 5	C. Nothrop	001-06300	2.40	0.16	-	-	-	1.42	3.98
2	N Pt Lot 5	G. & S. Reilly	001-06400	0.45	1.71	1.34	-	-	0.61	4.11
2	N Pt Lot 5	A. Scorziello	001-06500	3.98	-	0.08	-	-	-	4.06
2	N Pt Lot 5	D. & C. Wilson	001-06600	3.63	-	-	-	-	1.03	4.66
2	N Pt Lot 5	A. & D. Watt	001-06700	2.86	-	-	-	-	1.76	4.62
2	N Pt Lot 4	P. & D. Meneguzzi	001-06800	30.53	0.83	7.84	-	-	2.06	41.26
2	N Pt Lot 3	Farisland Ltd	001-06900	21.63	-	-	-	-	0.67	22.30
2	N Pt Lots 2	J. & C. Faris	001-07000	1.72	-	0.86	-	-	1.52	4.10

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Innisfil

DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #:** 300038970

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
3	S Pt Lot 1	K. & V. Wardlaw	001-07400	1.05	1.05	-	-	-	-	2.10
3	S Pt Lot 2	P. Wardlaw	001-07600	13.45	-	0.71	-	-	-	14.16
3	S Pt Lot 3	J. Lukovits & A. Radocsai	001-07700	35.88	2.56	4.27	-	-	-	42.71
3	S Pt Lot 4	M. Turner & J. Goncalves	001-07900	6.18	-	0.53	-	-	3.83	10.54
3	S Pt Lot 4	Chapter Homes Inc	001-08000	8.01	-	2.24	-	-	0.43	10.68
3	S Pt Lot 5	A. & D. Henry	001-08100	30.82	-	1.88	-	-	8.55	41.25
3	S Pt Lot 5	H. La Page	001-08110	-	-	1.02	-	-	0.39	1.41
3	S Pt Lot 6	S. Wheeler	001-08300	-	-	-	-	-	0.28	0.28
3	S Pt Lot 6	E., E. & J. Rainey	001-08400	29.81	-	7.50	-	-	1.55	38.86
3	N Pt Lot 6;	S., T., M., & N. Ferrazzo	001-08500	12.46	-	-	-	-	-	12.46
3	N Pt Lot 6;	Armking & Company Ltd	001-08700	2.37	-	-	-	-	1.58	3.95
3	N Pt Lot 6	L. Taylor	001-08800	-	-	-	-	-	0.40	0.40
3	Pt Lot 6	A. & O. Posterniak	001-08900	0.56	-	-	-	-	3.72	4.28
3	Pt Lot 6	G. & M. Ioannou	001-09000	3.34	-	-	-	-	2.74	6.08
3	Pt Lot 6	J. Rampodarat & T. Tirbeni	001-09100	5.46	-	-	-	-	0.68	6.14
3	Pt Lot 6	M. Frasca	001-09200	4.57	-	1.61	-	-	-	6.18
3	N Pt Lot 5	M. Gelfand & E. Kull	001-09400	-	-	0.05	-	-	0.27	0.32
3	N Pt Lot 5	United Bethesda Cemetery	001-09500	0.23	-	0.12	-	-	0.03	0.38
3	N Pt Lot 5	S. & L. Hill	001-09700	-	-	-	0.23	-	-	0.23
3	N Pt Lot 5	L. Hill	001-09705	0.21	-	-	-	-	-	0.21
3	N Pt Lot 5	1665328 Ontario Ltd	001-09800	30.04	-	10.24	-	-	0.99	41.27
3	N Pt Lot 4	P. Wardlaw	001-09900	54.14	1.91	8.28	-	-	-	64.33
3	N Pt Lot 4	G. Dougherty & J. Shortt	001-09901	-	-	-	-	-	0.41	0.41
3	N Pt Lot 3	M., M., P. & M. Klymiuk	001-10000	42.03	-	-	-	-	0.86	42.89
3	N Pt Lot 2	8325235 Canada Inc	001-10100	37.94	-	-	-	-	4.22	42.16
3	N Pt Lot 1	P. Wardlaw	001-10200	21.52	-	-	-	-	-	21.52
4	S Pt Lot 1	1553037 Ontario Ltd	001-10500	3.42	-	-	-	-	0.14	3.56
4	S Pt Lot 1	N. Voutt	001-10600	0.09	-	-	-	-	1.65	1.74
4	S Pt Lot 1	G. & C. Van Horne	001-10700	3.18	-	-	-	-	-	3.18
4	S Pt Lot 1	L. & M. Camacho	001-10800	1.01	-	-	-	-	0.90	1.91
4	S Pt Lot 1	P. Spring	001-10900	7.64	1.64	-	-	-	0.48	9.76
4	S Pt Lot 1	A. Guido	001-11000	6.44	3.32	-	-	-	-	9.76
4	S Pt Lot 2	M. & J. Spataro & J. Pontieri	001-11100	8.78	1.20	-	-	-	-	9.98
4	S Pt Lot 2	4090 4th Line Inc	001-11200	19.54	-	-	-	-	10.07	29.61
4	S Pt Lot 2	D. Congiusti	001-11400	-	-	-	-	-	0.40	0.40
4	Pt Lot 3	E. Kippers & G. Merrall	001-11600	-	-	-	-	-	1.75	1.75
4	Pt Lot 3	4090 4th Line Inc	001-11700	62.91	4.44	-	-	-	6.66	74.01
4	S Pt Lot 4	D. & B. Marling	001-11900	35.29	0.79	1.98	-	-	1.59	39.65
4	S Pt Lot 5	A. & A. Persico	001-12000	35.76	-	1.93	-	-	2.46	40.15
4	S Pt Lot 6	1665328 Ontario Ltd	001-12100	34.51	-	-	-	-	1.44	35.95
4	S Pt Lot 6	J. Metcalfe	001-12300	-	-	-	-	-	0.77	0.77
4	Pt Lot 6	Ministry Of Transportation	001-12400	29.96	-	-	-	5.58	-	35.54
4	Pt Lot 6	Town of Innisfil	001-12402	0.08	-	-	0.01	-	-	0.09
4	N Pt Lot 5	S. & S. Jones	001-12500	27.92	3.27	5.02	-	-	2.90	39.11
4	N Pt Lot 5	W. & L. Jones	001-12501	-	-	0.03	-	-	0.62	0.65
4	N Pt Lot 4	1402802 Ontario Inc & 2462228 Ontario	001-12600	34.20	1.50	0.28	-	-	2.78	38.76
4	N Pt Lot 2	4090 4th Line Inc	001-13000	30.03	-	-	-	-	-	30.03
4	N Pt Lot 2	R. Laforge	001-13100	-	-	-	0.19	-	-	0.19
4	N Pt Lot 2	W. Laforge	001-13200	-	-	-	-	-	0.39	0.39
4	N Pt Lot 1	J. & J. McCague	001-13300	8.45	1.86	-	-	-	-	10.31
5	Pt Lots 3 & 4	1715573 Ontario Ltd	001-14600	1.66	-	0.60	-	-	-	2.26
5	S Pt Lot 5	1715573 Ontario Ltd	001-14800	12.66	-	0.50	-	-	3.60	16.76
5	Pt S1/2 Lot 5	G. & L. Kenyon & M. & K. Slessor	001-14802	-	-	0.01	0.17	-	-	0.18
5	S Pt Lot 6	S. & J. Pearson & E. McLachlin	001-14900	10.95	-	0.58	-	-	-	11.53
5	S Pt Lot 6	1715573 Ontario Inc. Trustee	001-15000	42.73	-	7.05	-	-	0.33	50.11

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Innisfil
PROJECT #: 300038970

Factors Applied to Lands
Agricultural Land @ 1.00
Bush @ 0.50
Residential @ 2.00
Wetland @ 0.25
Industrial/Commercial @ 3.00
Other @ 1.00

Factors Applied to Roads
Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
5	N Pt Lot 6	D. Swain & K. Archibald	001-15100	-	-	-	-	-	0.41	0.41
5	N Pt Lot 5	R. & S. Eyers	001-15300	0.10	-	-	-	-	0.44	0.54
5	N Pt Lot 5	1715573 Ontario Ltd	001-15500	41.58	8.09	6.35	-	-	1.73	57.75
1	S Pt Lot 7	Aqua-Gem Investments Ltd	001-16600	-	1.98	2.23	-	-	19.79	24.00
1	S Pt Lot 7	1045901 Ontario Ltd	001-16700	-	-	-	-	0.92	-	0.92
1	S Pt Lot 8	S. DiCarlo, C. Vincenzo & Amalfi Constr	001-16900	12.48	22.81	-	-	-	6.24	41.53
1	Pt Lot 9	G., M. & W. Kemeny	001-17000	11.85	10.60	-	-	-	1.34	23.78
1	Pt Lot 9	G. Kemeny	001-17200	11.43	-	-	-	-	0.23	11.66
1	S Pt Lot 9	1409563 Ontario Ltd	001-17300	23.00	0.26	-	-	-	0.70	23.96
1	S Pt Lot 9	J. Yonge & R. Lee	001-17400	6.70	-	-	-	-	-	6.70
1	S Pt Lot 10	S. Rudnisky	001-17500	2.25	1.86	-	-	-	1.37	5.48
1	S Pt Lot 10	C. & S. Toich	001-17600	1.89	2.71	-	-	-	1.30	5.90
1	S Pt Lot 10	L. & C. Fabiano	001-17700	1.96	2.48	-	-	-	0.67	5.11
1	S Pt Lot 10	M. Toich	001-17800	6.88	-	-	-	-	-	6.88
1	S Pt Lot 10	Y. Mark Est.	001-17900	0.91	3.11	-	-	-	0.81	4.83
1	S Pt Lot 10	Y. Mark Est. & M. Maehara Est.	001-18000	2.03	1.54	-	-	-	0.58	4.15
1	Pt Lots 10 & 11	M. Riley	001-18100	-	3.50	-	-	-	5.71	9.21
1	Pt Lot 10	2204277 Ontario Ltd	001-18300	11.18	-	-	-	-	0.32	11.50
1	Pt Lot 10	L & L Gardens Inc	001-18350	1.48	-	-	-	-	-	1.48
1	Pt Lot 10	Marques Gardens Ltd	001-18400	12.13	-	-	-	-	-	12.13
1	N Pt Lot 10	L. Radvanyi	001-18500	11.93	-	-	-	-	-	11.93
1	N Pt Lot 10	S. Rudnisky	001-18600	0.33	1.69	-	-	-	-	2.02
1	N Pt Lot 10	F. & M. Santos	001-18700	0.30	1.54	-	-	-	0.16	2.00
1	N Pt Lot 9	Horodynsky Farms Inc	001-18800	4.87	-	-	-	-	-	4.87
1	N Pt Lot 9	M. Kemeny	001-19000	2.83	9.23	-	-	-	0.20	12.26
1	N Pt Lot 8	J. Walewski & D. Kopec	001-19100	0.61	9.22	-	-	-	10.39	20.22
1	N Pt Lot 8	1523566 Ontario Ltd	001-19200	20.32	-	-	-	-	-	20.32
1	N Pt Lot 7	Succession Financial Group Inc	001-19400	-	-	-	-	-	34.15	34.15
2	S Pt Lot 7	J. Armstrong	001-19500	24.74	4.37	4.96	-	-	1.05	35.12
2	S Pt Lot 7	T. Armstrong	001-19510	-	-	-	-	-	0.61	0.61
2	S Pt Lot 8	S. Handy	001-19600	3.93	-	0.83	-	-	5.58	10.34
2	S Pt Lot 8	P. Chiodo	001-19700	-	-	2.00	-	-	8.53	10.53
2	S Pt Lot 8	A. & M. Filice	001-19800	8.01	2.28	8.00	-	-	2.76	21.05
2	S Pt Lot 9	Cohn Farms Inc	001-20000	9.79	-	-	-	-	0.24	10.03
2	S Pt Lot 9	Cohn Farms Inc	001-20100	9.62	-	-	-	-	0.52	10.14
2	Pt Lot 9	M. & G. Bordon	001-20200	0.17	-	-	-	-	1.26	1.43
2	Pt Lot 9	Marques Gardens Ltd	001-20300	8.02	-	-	-	-	0.80	8.82
2	S Pt Lot 9	L. & N. Tasca	001-20400	10.10	-	-	-	-	0.19	10.29
2	S Pt Lot 10	L. & N. Tasca	001-20500	5.15	-	-	-	-	0.12	5.27
2	Pt W1/2 Lot 10	Marques Gardens Ltd	001-20600	12.68	2.29	-	-	-	0.17	15.14
2	Pt Lot 10	Marques Gardens Ltd	001-20800	17.74	1.97	-	-	-	0.94	20.65
2	N Pt Lot 10	Horodynsky Farms Inc	001-20900	10.23	-	-	-	-	-	10.23
2	Pt Lot 10	1409563 Ontario Ltd	001-21000	9.78	-	-	-	-	0.41	10.19
2	W Pt Lot 10	Horodynsky Farms Inc	001-21100	11.42	-	-	-	-	-	11.42
2	N Pt Lot 10	G. & R. Sciara & P. & L. Digiantomasso	001-21200	8.97	-	-	-	-	-	8.97
2	N Pt Lot 9	B. Horodynsky	001-21400	10.10	-	-	-	-	-	10.10
2	N Pt Lot 9	1409563 Ontario Ltd	001-21500	19.19	-	-	-	-	0.69	19.88
2	Pt Lot 9	J. & S. Cestaric	001-21602	-	-	-	-	-	0.34	0.34
2	N Pt Lot 9	I. Canton & L. & E. Trevisan	001-21700	10.12	-	-	-	-	-	10.12
2	N Pt Lot 8	I. & H. Mora	001-21800	0.51	1.84	7.68	-	-	0.20	10.23
2	N Pt Lot 8	M., H. & S. Fernandes	001-21900	-	0.15	0.97	-	-	3.99	5.11
2	N Pt Lot 8	C. & C. Zylstra	001-22000	-	1.50	2.69	-	-	0.80	4.99
2	N Pt Lot 8	Elbertain Corporation	001-22100	17.75	-	2.54	-	-	0.85	21.13
2	Pt Lot 7	B. Jolie	001-22300	-	-	-	0.24	-	-	0.24
2	N Pt Lot 7	J. & D. Lacroix	001-22400	-	-	0.06	0.18	-	-	0.24

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** — **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** — **PROJECT #:** **300038970**

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
2	N Pt Lot 7	Gmb Property Holding Company Ltd	001-22600	-	-	14.93	-	-	20.42	35.35
3	S Pt Lot 7	1665328 Ontario Ltd	001-22900	22.03	-	6.86	-	-	6.81	35.70
3	S Pt Lot 8	J. Petropoulos	001-23000	-	-	0.55	-	-	0.24	0.79
3	W Pt Lot 8	D. Oshell & D. McLachlan	001-23001	-	-	0.18	-	-	0.19	0.37
3	S Pt Lot 8	G. Dermott	001-23200	-	-	0.06	0.12	-	-	0.18
3	Pt Lot 9	A. & J. Mormile	001-23400	9.85	-	1.64	-	-	9.03	20.52
3	Pt Lot 9	M. Assadian & L. Desroche	001-23500	12.93	-	2.49	-	-	7.25	22.67
3	Pt Lot 9	1409563 Ontario Ltd	001-23600	9.28	-	3.43	-	-	7.47	20.18
3	S Pt Lot 10	K. Levy	001-23700	-	1.74	-	-	-	2.31	4.05
3	Pt Lot 10	A. Fox & B. Scott	001-23800	3.85	-	-	-	-	0.57	4.42
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	001-23900	-	5.14	-	-	-	0.91	6.05
3	S Pt Lot 10	Y. Cil	001-24100	0.18	5.25	-	-	-	0.60	6.03
3	Pt Lot 10	J. Chow	001-24200	44.39	1.62	-	-	-	8.12	54.13
3	N Pt Lot 10	H. & A. Perkins	001-24300	-	-	0.30	-	-	0.91	1.21
3	Pt Lot 10	H. Squibb	001-24301	3.11	-	1.26	-	-	4.03	8.40
3	N Pt Lot 9	J. & P. Wilson	001-24400	3.94	-	4.47	-	-	2.23	10.64
3	N Pt Lot 9	C. & M. Cialone	001-24500	1.60	-	3.41	-	-	5.01	10.02
3	Pt Lot 8	P. & C. Woods	001-24600	10.05	-	-	-	-	-	10.05
3	Pt Lot 8	1665328 Ontario Ltd	001-24800	21.42	-	8.50	-	-	1.81	31.73
3	Pt Lot 8	G. & M. Reynolds	001-24801	-	-	-	-	-	1.00	1.00
3	Pt Lot 8	B. & V. Cestaric	001-24810	-	-	-	-	-	0.29	0.29
3	W Pt Lot 8	1665328 Ontario Ltd	001-24900	33.24	-	6.07	-	-	2.26	41.57
3	N Pt Lot 7	J. & M. Albanese	001-25000	16.76	-	4.64	-	-	-	21.40
3	N Pt Lot 7	M. & U. Mauti	001-25100	14.43	-	1.26	-	-	-	15.69
4	S Pt Lot 7	Gdm Terraco Inc	001-25400	12.11	-	-	-	-	-	12.11
4	S Pt Lot 7	Franline Investments Ltd	001-25500	11.33	-	-	-	-	1.44	12.77
4	S Pt Lot 7	F. & N. Grillo	001-25600	9.71	-	0.40	-	-	-	10.11
4	Pt Lots 8 & 9	V. & D. Posius	001-25800	47.36	-	7.10	-	-	4.74	59.20
4	Pt Lot 8	S. Khan	001-25801	0.23	-	-	-	-	-	0.23
4	S Pt Lot 9	Sil Developments Inc, R. Zaretsky & S.	001-25900	18.94	-	-	-	-	0.39	19.33
4	S Pt Lot 9	J. & D. Thew	001-25910	0.02	-	-	-	-	0.38	0.40
4	S Pt Lot 10	P. Pillitteri	001-26000	33.03	-	-	-	-	5.92	38.95
4	N Pt Lot 10	P. Pillitteri	001-26100	37.31	-	1.17	-	-	0.35	38.83
4	N Pt Lot 10	D. Jonkman	001-26110	0.24	-	-	-	-	-	0.24
4	N Pt Lot 9	D. Lucas	001-26200	33.64	-	4.23	-	-	1.16	39.03
4	N Pt Lot 9	K. Jayaseelan & M. Thayalan	001-26201	-	-	0.03	0.15	-	-	0.18
4	N Pt Lot 8	Franline Investments Ltd	001-26300	34.36	1.61	2.11	-	-	1.61	39.69
4	N Pt Lot 7	1665328 Ontario Ltd	001-26400	35.59	1.05	-	-	-	0.78	37.42
5	S Pt Lot 7	H. & C. Van Der Mast	001-26700	33.32	-	7.27	-	-	0.73	41.32
5	S Pt Lot 8	G. & N. Bray	001-26900	-	0.81	16.14	-	-	3.23	20.18
5	S Pt Lot 9	V. Trombley	001-27000	15.16	-	7.28	-	-	7.88	30.32
5	S Pt Lot 10	G. Taylor & I. Wagner	001-27100	3.04	-	3.55	-	-	3.55	10.14
5	S Pt Lot 10	G., F., M., & A. Troiano	001-27200	2.74	-	3.55	-	-	3.86	10.15
5	S Pt Lot 10	1409563 Ontario Ltd	001-27300	12.24	-	1.84	-	-	6.32	20.40
5	N Pt Lot 10	G. & S. Sawyer	001-27400	38.51	-	2.09	-	-	1.26	41.86
5	N Pt Lot 9	G. Lecce Holdings (1994) Inc & D. B. Le	001-27500	34.24	-	2.51	-	-	5.01	41.76
5	N Pt Lot 9	J. Farris	001-27600	-	-	-	0.14	-	-	0.14
5	N Pt Lot 8	M. Vandermast	001-27700	66.82	-	5.94	-	-	1.48	74.24
5	N Pt Lot 7	1720121 Ontario Ltd	001-27900	13.94	-	25.00	-	-	1.64	40.58
1	Pt Lots 10 & 11	S. Malik & B. Awan	002-00100	-	1.91	-	-	-	2.87	4.78
1	S Pt Lot 11	S. Elfassy	002-00200	-	5.98	-	-	-	2.69	8.67
1	Pt Lot 11	R. & M. Burrows	002-00300	-	3.86	-	-	-	1.99	5.85
1	Pt Lot 11	P., D., J., & M. Kosinec	002-00400	-	0.20	5.37	-	-	0.12	5.69
1	S Pt Lot 11	G. & C. Zielke	002-00500	6.49	3.56	6.45	-	-	0.55	17.06
1	S Pt Lot 11	K. & M. Zielke	002-00700	-	-	-	-	-	0.41	0.41

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Innisfil
PROJECT #: 300038970

Factors Applied to Lands

Agricultural Land @ 1.00
Bush @ 0.50
Residential @ 2.00
Wetland @ 0.25
Industrial/Commercial @ 3.00
Other @ 1.00

Factors Applied to Roads

Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
1	S Pt Lot 12	E. Matchett	002-00800	-	-	-	0.19	-	-	0.19
1	S Pt Lot 12	E. Matchett	002-00900	-	-	-	0.16	-	-	0.16
1	S Pt Lot 12	K. & J. Matchett	002-01100	32.45	-	9.26	-	-	0.69	42.40
1	S Pt Lot 13	J. & S. Kell	002-01200	39.85	-	2.66	-	-	0.50	43.01
1	S Pt Lot 13	S. & S. Iemsisanith	002-01300	-	-	-	0.22	-	-	0.22
1	S Pt Lot 14	R. & D. Long	002-01500	-	-	-	0.19	-	-	0.19
1	S Pt Lot 14	D. Rose & B. Kell-Rose	002-01600	20.30	-	-	-	-	0.85	21.15
1	S Pt Lot 15	K. & H. Kell	002-01800	1.52	-	-	-	-	-	1.52
1	S Pt Lot 15	B. Kell-Rose & D. Rose	002-01801	-	-	-	0.24	-	-	0.24
1	N Pt Lot 17	J. Drybrough	002-04700	7.57	-	-	-	-	0.57	8.14
1	N Pt Lot 16	Clements Cemetary	002-04900	-	-	-	0.20	-	-	0.20
1	N Pt Lot 16	Kell Farms Ltd	002-05200	10.91	-	-	-	-	3.44	14.35
1	N Pt Lot 15	Kell Farms Ltd	002-05400	21.82	-	8.14	-	-	4.20	34.16
1	Pt Lot 14	Kell Farms Ltd	002-05600	35.55	-	1.39	-	-	3.77	40.71
1	N Pt Lot 13	D. Sawyer	002-05800	53.28	-	10.35	-	-	0.94	64.57
1	N Pt Lot 12	D., B. & W. Sawyer	002-05900	11.40	14.78	12.67	-	-	3.38	42.23
1	N Pt Lot 11	L. & N. Tasca	002-06000	19.17	0.06	-	-	-	2.91	22.14
1	N Pt Lot 11	L & L Gardens Inc	002-06300	19.63	-	-	-	-	0.30	19.93
2	S Pt Lot 11	Horodynsky Farms Inc	002-06400	20.15	-	-	-	-	0.02	20.17
2	Pt Lots 11 & 12	1409563 Ontario Ltd	002-06600	**40.60**	-	-	-	-	-	**40.60**
2	S Pt Lot 12	M. Galloro	002-06700	-	10.35	-	-	-	-	10.35
2	S Pt Lot 12	F. Galloro	002-06800	1.49	2.39	-	-	-	1.16	5.04
2	S Pt Lot 12	M. Tesic	002-06900	-	3.81	-	-	-	1.22	5.03
2	S Pt Lot 13	F. Gammicchia	002-07000	0.59	8.78	-	-	-	0.74	10.11
2	S Pt Lot 13	B. Watman	002-07100	-	2.97	0.26	-	-	1.66	4.89
2	S Pt Lot 13	R. & B. Badstober	002-07200	-	1.70	1.06	-	-	2.18	4.94
2	S Pt Lot 13	K. Kell	002-07400	11.58	3.86	4.72	-	-	-	20.16
2	Lot 14	Innis Properties Ltd	002-07600	63.99	4.79	7.44	-	-	5.00	81.22
2	S Pt Lot15	E. Rosenberg	002-07700	23.78	-	0.92	-	-	-	24.70
2	S Pt Lot 15	1916013 Ontario Inc	002-07800	13.05	-	-	-	-	2.13	15.18
2	S Pt Lot 15	G. Kalcic & L. Esau	002-08000	-	-	-	0.29	-	-	0.29
2	S Pt Lot 16	K. & L. Sparrow	002-08200	-	-	-	-	-	0.62	0.62
2	S Pt Lot 16	A. Giaconelli & H. Luzius	002-08300	-	-	-	-	-	0.63	0.63
2	S Pt Lot 16	R. Simpson	002-08500	32.50	-	4.59	-	-	1.15	38.24
2	Pt Lot 16	L. Rumble	002-08520	-	-	-	0.23	-	-	0.23
2	S Pt Lot 17	N. & G. Sturgeon	002-08700	8.67	-	0.39	-	-	0.68	9.74
2	Pt Lot 17 & N Pt	Kell Farms Ltd	002-10000	31.88	-	3.99	-	-	8.41	44.28
2	Pt Lot 16	I. & M. Campbell	002-10200	0.19	-	-	-	-	-	0.19
2	N Pt Lot 16	I. & M. Campbell	002-10400	30.12	-	1.02	-	-	2.71	33.85
2	N Pt Lot 16	D. Cuneen	002-10500	-	-	-	0.26	-	-	0.26
2	N Pt Lot 16	B. & R. Zendelek	002-10600	-	-	2.36	-	-	3.70	6.06
2	N Pt Lot 15	G. & M. Thompson	002-10900	11.99	-	4.91	-	-	2.75	19.65
2	Pt Lot 15	K. Kent	002-10901	-	-	-	-	-	0.34	0.34
2	N Pt Lot 15	A. & P. Budd	002-11000	-	-	-	0.22	-	-	0.22
2	Pt Lot 15	Ministry Of Transportation	002-11100	0.10	-	-	0.01	-	-	0.11
2	N Pt Lot 15	I. Campbell	002-11300	17.97	-	0.79	-	-	0.79	19.55
2	N Pt Lot 13	D. Evers	002-11600	-	3.07	0.10	-	-	2.88	6.05
2	N Pt Lot 13	T. Risi	002-11700	-	1.61	-	-	-	2.45	4.06
2	N Pt Lot 13	T., Q. & M. Palmieri	002-11800	-	3.70	-	-	-	3.33	7.03
2	N Pt Lot 13	O. & R. Goncalves	002-11900	-	6.28	-	-	-	2.02	8.30
2	N Pt Lot 13	K. Yamamoto	002-12000	-	12.20	-	-	-	3.26	15.46
2	N Pt Lot 12	D. & I. Chouryguine	002-12100	-	5.50	-	-	-	0.48	5.98
2	N Pt Lot 12	S. Sharma	002-12200	-	2.81	-	-	-	1.19	4.00
2	N Pt Lot 12	J. Horodynsky	002-12300	**4.00**	-	-	-	-	-	**4.00**
2	N Pt Lot 12	1281597 Ontario Inc	002-12400	5.60	-	-	-	-	0.36	5.96

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands		**Factors Applied to Roads**
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
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Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
2	N Pt Lot 12	Horodynsky Farms Inc	002-12500	10.04	-	-	-	-	-	10.04
2	N Pt Lot 12	P. & K. Horodynsky	002-12600	9.71	-	-	-	-	0.26	9.97
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	002-12700	10.05	-	-	-	-	0.25	10.30
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	002-12800	9.89	-	-	-	-	0.11	10.00
2	N Pt Lot 11	1281597 Ontario Inc	002-12900	16.86	-	-	-	3.48	-	20.34
3	S Pt Lot 11	S. Scholten & D. Ransom	002-13300	-	-	-	-	-	3.89	3.89
3	S Pt Lot 11	N. & M. Makrigiorgos	002-13400	3.17	-	-	-	-	0.90	4.07
3	S Pt Lot 11	K. Costain & D. Goodwin	002-13500	2.93	-	-	-	-	1.14	4.07
3	S Pt Lot 11	E. Carbone	002-13600	2.89	-	-	-	-	1.18	4.07
3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis	002-13700	3.54	-	-	-	-	0.53	4.07
3	S Pt Lot 11	H. & M. Yoon	002-13800	4.50	0.34	-	-	-	0.59	5.43
3	S Pt Lot 11	1409563 Ontario Ltd	002-13900	4.62	0.81	-	-	-	-	5.43
3	S Pt Lot 11	1281597 Ontario Inc	002-14000	7.10	3.66	-	-	-	-	10.76
3	Pt Lot 12	J. & E. Horodynsky	002-14100	33.67	-	-	-	4.15	-	37.82
3	S Pt Lot 12	T. & C. Xenophontos	002-14300	-	2.23	-	-	-	1.78	4.01
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	002-14400	25.68	9.12	1.32	-	-	5.27	41.39
3	S Pt Lot 14	L. & E. Kell	002-14500	39.08	-	2.49	-	-	-	41.57
3	S Pt Lot 15	M. Campbell	002-14600	8.31	-	8.72	-	-	3.74	20.77
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	002-14700	16.13	-	3.38	-	-	0.60	20.11
3	S Pt Lot 16	C. Campbell & S. Todd	002-15000	33.39	-	3.74	-	-	3.05	40.18
3	S Pt Lot 16	M. Ledlie & V. Kerr	002-15200	-	-	-	0.28	-	-	0.28
3	S Pt Lot 17	J. Kell	002-15300	7.25	-	1.59	-	-	1.64	10.48
3	S Pt Lot 17	D. Kell	002-15400	8.52	-	0.53	-	-	0.30	9.35
3	S Pt Lot 17	J. Kell	002-15500	0.84	-	-	-	-	-	0.84
3	N Pt Lot 17	Kell Farms Ltd	002-20000	15.03	-	1.49	-	-	-	16.52
3	N Pt Lots 1	Top Hill View Estates Inc	002-20200	27.84	-	11.60	-	-	14.26	53.70
3	Plan 51M604	First View Homes (Scarborough)	002-20204	-	-	-	0.18	-	-	0.18
3	Plan 51M604	First View Homes (Scarborough)	002-20208	0.01	-	-	0.17	-	-	0.18
3	Plan 51M604	First View Homes (Scarborough)	002-20212	0.06	-	-	0.12	-	-	0.18
3	Plan 51M604	First View Homes (Scarborough)	002-20216	0.06	-	-	0.12	-	-	0.18
3	Plan 51M604	First View Homes (Scarborough)	002-20220	0.01	-	-	0.17	-	-	0.18
3	Plan 51M604	First View Homes (Scarborough)	002-20224	-	-	-	0.19	-	-	0.19
3	Plan 51M604	First View Homes (Scarborough)	002-20228	-	-	-	0.20	-	-	0.20
3	Plan 51M604	First View Homes (Scarborough)	002-20229	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20230	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20233	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20234	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20237	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20238	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20241	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20242	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20243	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20246	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20247	-	-	-	0.16	-	-	0.16
3	Plan 51M604	D. & T. Garofalo	002-20250	-	-	-	0.16	-	-	0.16
3	Plan 51M604	First View Homes (Scarborough)	002-20251	-	-	-	0.15	-	-	0.15
3	N Pt Lot 13	Crestrail Investments Inc	002-20300	40.08	-	0.74	-	-	-	40.82
3	N Pt Lot 13	Town of Innisfil	002-20320	0.50	-	-	-	-	-	0.50
3	N Pt Lot 12	S. & O. Pylypiak	002-20400	12.83	0.62	3.31	-	-	3.93	20.69
3	N Pt Lot 12	C. Wolfond	002-20500	15.24	5.01	0.42	-	-	-	20.67
3	N Pt Lot 11	9847723 Canada Corporation	002-20600	33.57	7.13	-	-	-	1.26	41.96
4	S Pt Lot 11	Kell Farms Ltd	002-20700	19.43	-	-	-	-	0.33	19.76
4	Pt S1/2 Lot 11	G., A. & P. Tuzi & M. Tersigni	002-20900	2.19	-	-	-	-	-	2.19
4	Pt S1/2 Lot 11	A. Tuzi	002-20902	2.18	-	-	-	-	-	2.18
4	Pt S1/2 Lot 11	A. Gargaro	002-20904	2.18	-	-	-	-	-	2.18

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands
Agricultural Land @ 1.00 Wetland @ 0.25
Bush @ 0.50 Industrial/Commercial @ 3.00
Residential @ 2.00 Other @ 1.00

Factors Applied to Roads
Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
4	Pt S1/2 Lot 11	G. Tuzi	002-20906	2.17	-	-	-	-	-	2.17
4	Pt S1/2 Lot 11	K. Collins & L. Marjadsingh	002-20908	2.18	-	-	-	-	-	2.18
4	Pt S1/2 Lot 11	D. & K. Gray	002-20910	1.98	-	-	-	-	0.20	2.18
4	Pt S1/2 Lot 11	M. & M. Alves	002-20912	1.70	-	-	-	-	0.48	2.18
4	Pt S1/2 Lot 11	J. & G. Rodrigues	002-20914	2.11	-	-	-	-	0.07	2.18
4	Pt S1/2 Lot 11	J. & E. Fernandes	002-20916	2.20	-	-	-	-	-	2.20
4	Pt S1/2 Lot 12	M. & L. Valente	002-20918	4.08	-	-	-	-	-	4.08
4	Pt S1/2 Lot 12	Innisfil Churchill Investment	002-20920	4.08	-	-	-	-	-	4.08
4	Pt S1/2 Lot 12	A. Tuzi	002-20922	4.08	-	-	-	-	-	4.08
4	Pt S1/2 Lot 12	E. De Santis	002-20924	4.08	-	-	-	-	-	4.08
4	Pt S1/2 Lot 12	G. Tuzi	002-20926	4.08	-	-	-	-	-	4.08
4	Pt S1/2 Lot 12	M. Tersigni	002-20928	4.08	-	-	-	-	-	4.08
4	Pt Lot 12	A. Kerkhof & C. Davidson	002-20930	7.12	-	0.21	-	-	3.29	10.62
4	Pt S1/2 Lot 12	Innisfil Churchill Investment	002-20932	3.70	-	0.27	-	-	-	3.97
4	Pt Lot 13	2177217 Ontario Ltd	002-21000	39.03	-	1.21	-	-	-	40.24
4	S Pt Lot 14	2177217 Ontario Ltd	002-21100	38.50	-	1.60	-	-	-	40.10
4	S Pt Lot 14	J. Jambor	002-21300	-	-	-	0.55	-	-	0.55
4	S Pt Lot 14	D. & S. Mann	002-21400	-	-	-	0.55	-	-	0.55
4	N Pt Lot 17	S. Kell	002-24000	8.22	-	-	-	-	-	8.22
4	N Pt Lot 16	Simcoe County District School Board	002-24200	-	-	1.67	-	-	2.05	3.72
4	N Pt Lot 16	G. Hill	002-24300	-	-	-	-	-	0.38	0.38
4	N Pt Lot 16	Barnstable Park Realty Corp	002-24400	18.76	-	4.34	-	-	-	23.10
4	N Pt Lot 16	M. Shamshiri	002-24700	-	-	-	-	-	0.43	0.43
4	N Pt Lot 16	A. Dunn & D. Ruegg	002-24800	-	-	-	0.15	-	-	0.15
4	N Pt Lot 16	K. & T. Austin	002-24801	-	-	-	-	-	0.75	0.75
4	N Pt Lot 16	C. Pokulok & R. Hannah	002-24802	-	-	-	-	-	0.74	0.74
4	N Pt Lot 16	M. Demarco	002-25000	6.75	-	3.26	-	-	3.17	13.18
4	N Pt Lot 15	A. Smith & C. Ford	002-25200	-	-	0.69	-	-	1.70	2.39
4	N Pt Lot 15	L. Gialedakis	002-25210	-	-	0.07	-	2.14	-	2.21
4	N Pt Lot 15	2765870 Canada Inc	002-25300	-	-	-	0.18	-	-	0.18
4	N Pt Lot 15	E. & M. Van Den Elzen	002-25500	-	-	-	-	-	0.28	0.28
4	Pt Lot 15	1636574 Ontario Inc	002-25700	30.72	-	4.59	-	-	-	35.31
4	N Pt Lot 15	J. & R. Moody	002-25800	-	-	-	0.22	-	-	0.22
4	N Pt Lot 14	G. & C. Favret	002-26000	31.51	-	7.74	-	-	1.28	40.53
4	Pt Lot 14	R. & M. Johnson	002-26001	-	-	-	-	-	0.42	0.42
4	N Pt Lot 13	1665328 Ontario Ltd	002-26100	38.07	1.79	-	-	-	0.92	40.78
4	N Pt Lot 12	1665328 Ontario Ltd	002-26300	28.55	10.56	-	-	-	-	39.11
4	N Pt Lot 11	1665328 Ontario Ltd	002-26400	-	4.26	11.22	-	-	23.21	38.69
5	S Pt Lot 11	L. Kuhn & J. Hettmann	002-26700	-	1.17	1.01	-	-	5.62	7.80
5	S Pt Lot 11	B. Graham	002-26725	-	-	-	-	-	0.82	0.82
5	S Pt Lot 11	M. Li & H. Zhang	002-26800	-	2.59	6.03	-	-	-	8.62
5	S Pt Lot 11	T. & V. Van Kuik	002-26900	5.83	-	-	-	-	-	5.83
5	S Pt Lot 11	D. & L. Street	002-27000	1.54	0.87	0.21	-	-	2.51	5.13
5	S Pt Lot 11	T. & J. Treloar	002-27100	-	0.97	1.30	-	-	1.78	4.05
5	S Pt Lot 11	D. & K. Adams	002-27200	-	2.92	-	-	-	1.44	4.36
5	S Pt Lot 11	L. Smith	002-27300	-	3.25	-	-	-	0.87	4.12
5	S Pt Lot 12	S. Wasylyk	002-27500	-	8.84	-	-	-	1.09	9.93
5	S Pt Lot 12	N. Nguyen	002-27600	-	4.98	-	-	-	0.43	5.41
5	S Pt Lot 12	C. Rainford & B. Hitchen	002-27700	-	4.72	-	-	-	0.70	5.42
5	Pt Lot 13	2462228 Ontario Ltd	002-27900	7.03	14.45	-	-	-	17.57	39.05
5	Pt Lot 13	C. & R. Kniazeff	002-27910	-	0.01	-	-	-	0.36	0.37
5	Pt Lot 14	1665328 Ontario Ltd	002-28000	48.90	-	2.13	-	-	2.13	53.16
5	S Pt Lot 15	D. Scythes	002-28200	-	-	-	0.04	-	-	0.04
5	S Pt Lot 15	C. Browne	002-28300	-	-	-	0.20	-	-	0.20
5	S Pt Lot 15	G. & O. De Araujo	002-28400	-	-	-	0.13	-	-	0.13

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands		**Factors Applied to Roads**
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
5	S Pt Lot 15	D. & M. Coulter	002-28500	-	-	-	0.14	-	-	0.14
5	S Pt Lot 15	T. Laurin	002-28600	-	-	-	0.21	-	-	0.21
5	S Pt Lot 15	P. & V. Chornenki	002-28700	-	-	-	0.14	-	-	0.14
5	Pt Lot 15	Kell Farms Ltd	002-29000	66.32	-	8.71	-	-	2.18	77.21
5	S Pt Lot 16	882022 Ontario Ltd	002-29100	25.06	4.36	8.44	-	-	2.18	40.04
5	S Pt Lot 17	K. Tse	002-29200	5.81	2.17	3.55	-	-	-	11.53
5	N Pt Lot 16	1589114 Ontario Ltd	002-31300	-	-	2.18	-	-	2.78	4.96
6	N Pt Lot 15	Sixth Line Cemetery	002-31500	-	-	1.03	-	-	1.91	2.94
5	N Pt Lots 1	1665328 Ontario Ltd	002-31900	55.14	-	10.47	-	-	4.19	69.80
5	N Pt Lot 12	2462228 Ontario Ltd	002-32000	43.79	6.78	-	-	-	11.10	61.67
5	N Pt Lot 12	B. Neeb & L. Smith	002-32001	0.03	-	-	-	-	0.26	0.29
5	N Pt Lot 11	AFMM Innisfil Ltd	002-32200	33.47	2.07	2.07	-	-	3.72	41.33
5	Pt Lot 11	T. Prosser	002-32201	-	-	-	0.20	-	-	0.20
3	N Pt Lot 16	J. Leblanc	003-00100	0.16	-	-	0.05	-	-	0.21
3	N Pt Lot 16	G. Ciccone	003-00200	-	-	-	0.13	-	-	0.13
3	N Pt Lot 16	M. Baker	003-00300	-	-	-	0.13	-	-	0.13
3	N Pt Lot 16	United Church	003-00400	-	-	-	0.14	-	-	0.14
3	N Pt Lot 16	10187526 Canada Corp	003-00500	31.44	-	4.72	-	-	3.54	39.70
3	N Pt Lot 15	S. Johnson, G. & M. Dilipkimar & P. Pra	003-00600	1.00	-	1.91	-	-	1.07	3.98
3	N Pt Lot 15	Fernbrook Homes (Churchill) Ltd	003-00700	-	-	9.66	2.57	-	-	12.23
3	Pt Lot 15	B. Doughty	003-00800	-	-	0.05	0.09	-	-	0.14
3	N Pt Lot 15	A. Dawson	003-00900	-	-	0.01	0.10	-	-	0.11
3	Pt Lot 15	T. Borscevski & B. Hill	003-01000	-	-	-	0.12	-	-	0.12
3	Pt Lot 15	C. Mount	003-01100	-	-	0.14	0.24	-	-	0.38
3	N Pt Lot 15	S. Simpson	003-01200	-	-	0.20	0.18	-	-	0.38
3	N Pt Lot 15	Anglican Church	003-01300	-	-	0.29	0.73	-	-	1.02
3	N Pt Lot 15	A. & C. Martins	003-01400	-	-	-	0.08	-	-	0.08
3	Pt Lot 15	J. Simpson	003-01500	-	-	-	0.15	-	-	0.15
3	Pt Lot 15	P S K Holdings Inc	003-01510	-	-	-	0.14	-	-	0.14
3	N Pt Lot 15	E. & K. Pivetta	003-01600	-	-	-	0.19	-	-	0.19
3	N Pt Lot 15	T. & S. Alderson	003-01700	-	-	-	0.19	-	-	0.19
3	N Pt Lot 15	J. Smith & C. Gauvin	003-01800	-	-	0.04	0.10	-	-	0.14
3	N Pt Lot 15	P. Chiavatti	003-01900	-	-	-	0.14	-	-	0.14
3	N Pt Lot 15	C. & A. Cutler	003-02000	-	-	-	0.15	-	-	0.15
3	Pt NE1/4 Lot 15	D. & R. Koekkoek	003-02100	-	-	0.04	0.28	-	-	0.32
3	Pt Lot 15	D. Wood & R. Bellar	003-02101	-	-	-	0.20	-	-	0.20
3	N Pt Lot 15	A. Fazelipour	003-02200	-	-	0.10	0.17	-	-	0.27
3	N Pt Lot 15	Town of Innisfil	003-02300	-	-	-	0.23	-	-	0.23
3	Plan 1194	M. & M. Alves	003-02400	-	-	-	0.19	-	-	0.19
3	Lot 14	J. & R. Carvalho	003-02500	-	-	-	0.14	-	-	0.14
3	Plan 1194	T. Cooley & O. Oliveira	003-02600	-	-	-	0.14	-	-	0.14
3	Lot 12	A. & L. Daniels	003-02700	-	-	-	0.14	-	-	0.14
3	Plan 1194	A. & K. Demarco	003-02800	-	-	-	0.28	-	-	0.28
3	Lot 9	R. Wilcox	003-02900	-	-	-	0.15	-	-	0.15
3	Lot 8	B. Cutler & P. Smith	003-03000	-	-	-	0.14	-	-	0.14
3	Lot 7	W. French	003-03100	-	-	-	0.14	-	-	0.14
3	Lot 6	D. Saunders	003-03200	-	-	-	0.14	-	-	0.14
3	Lot 5	N. Mason	003-03300	-	-	-	0.14	-	-	0.14
3	Lot 4	A. & R. West	003-03400	-	-	-	0.14	-	-	0.14
3	Plan 1194	B. & K. Bourget	003-03500	-	-	-	0.14	-	-	0.14
3	Lot 2	S. Simpson	003-03600	-	-	-	0.14	-	-	0.14
3	Lot 1	E. Waite	003-03700	-	-	-	0.17	-	-	0.17
3	Lot 16	A. & J. Asselstine	003-03800	-	-	-	0.20	-	-	0.20
3	Lot 17	M. Brown	003-03900	-	-	-	0.14	-	-	0.14
3	Lot 18	S. & K. Bowen	003-04000	-	-	-	0.14	-	-	0.14

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Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Innisfil
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3	Plan 1194	D. & C. Bell	003-04100	-	-	-	0.14	-	-	0.14
3	Plan 1194	K. & A. Wright	003-04200	-	-	-	0.14	-	-	0.14
3	Lot 21	C. Bell	003-04300	-	-	-	0.14	-	-	0.14
3	Lot 22	N. Gundert & R. Grant	003-04400	-	-	-	0.17	-	-	0.17
4	Plan M319	D. Dare	003-04600	-	-	-	0.20	-	-	0.20
4	Plan M319	P.Boer & S. Forsythe	003-04602	-	-	-	0.23	-	-	0.23
4	Plan M319	S. Small & L. Henderson	003-04604	-	-	-	0.27	-	-	0.27
4	Plan M319	M. & A. Dicesare	003-04606	-	-	-	0.24	-	-	0.24
4	Plan M319	R. Flemming	003-04608	-	-	-	0.22	-	-	0.22
4	Plan M319	M. Simpson & S. Roberts	003-04610	-	-	-	0.17	-	-	0.17
4	Plan M319	S. De Beaucamp	003-04614	-	-	-	0.17	-	-	0.17
4	Plan M319	R. & E. Moore	003-04616	-	-	-	0.28	-	-	0.28
4	Plan M319	M. Chabrzynski & S. Henderson	003-04618	-	-	-	0.22	-	-	0.22
4	Plan M319	R. & J. Lenehan	003-04620	-	-	-	0.18	-	-	0.18
4	Plan M319	G. & K. Farr	003-04622	-	-	-	0.21	-	-	0.21
4	Plan M319	N. & J. Stacey	003-04624	-	-	-	0.24	-	-	0.24
4	Plan M319	T. & E. Roomere	003-04626	-	-	-	0.31	-	-	0.31
4	Plan M319	D. & D. Wittick	003-04628	-	-	-	0.19	-	-	0.19
4	Plan M319	J. Philp & P. Murphy	003-04630	-	-	-	0.18	-	-	0.18
4	Plan M319	A. & J. Domenegato	003-04632	-	-	-	0.17	-	-	0.17
4	Plan M319	D. Veitch & R. Hopkins	003-04634	-	-	-	0.18	-	-	0.18
4	Plan M319	P. & L. Demers	003-04636	-	-	-	0.18	-	-	0.18
4	Plan M319	J. Quinn, J. Rabot & M. Quinn-Rabot	003-04638	-	-	-	0.19	-	-	0.19
4	Plan M319	J. & U. Zubrzycka	003-04640	-	-	-	0.20	-	-	0.20
4	Plan M319	T. & L. Moroz	003-04642	-	-	-	0.17	-	-	0.17
4	Plan M319	P. Whissell & H. Lostchuck	003-04644	-	-	-	0.22	-	-	0.22
4	Plan M319	R. & S. Laird	003-04646	-	-	-	0.19	-	-	0.19
4	Plan M319	B. & M. Rutledge	003-04648	-	-	-	0.19	-	-	0.19
4	Plan M319	L. & S. Smith	003-04650	-	-	-	0.18	-	-	0.18
4	Plan M319	W. & D. Mann	003-04652	-	-	-	0.17	-	-	0.17
4	Plan M319	T. & S. Breen	003-04654	-	-	-	0.17	-	-	0.17
4	Plan M319	W. & V. Toole	003-04656	-	-	-	0.20	-	-	0.20
4	Plan M319	R. & D. Sloan	003-04658	-	-	-	0.17	-	-	0.17
4	Plan M319	M. & I. Fruhstuck	003-04660	-	-	-	0.19	-	-	0.19
4	Plan M319	W. & D. Mayerhofer	003-04662	-	-	-	0.18	-	-	0.18
4	Plan M319	Town of Innisfil	003-04664	-	-	-	0.11	-	-	0.11
4	Plan M319	Town of Innisfil	003-04666	-	-	-	-	-	0.01	0.01
4	Lot 4	E. & C. Hawkes	003-04700	-	-	-	0.18	-	-	0.18
4	Lot 3	J. & J. Calvert	003-04800	-	-	-	0.19	-	-	0.19
4	Plan 1683	R. & C. Thew	003-04900	-	-	-	0.18	-	-	0.18
4	Plan 1683	P. & S. Hrynyk	003-05000	-	-	-	0.20	-	-	0.20
4	Plan 1683	R. & T. Kirkwood	003-05100	-	-	-	0.21	-	-	0.21
4	Plan 1683	J. & W. Campbell	003-05200	-	-	-	0.19	-	-	0.19
4	Lot 31	S. & L. Manley	003-05300	-	-	-	0.19	-	-	0.19
4	Lot 30	C. Schreider & A. Teskey	003-05400	-	-	-	0.19	-	-	0.19
4	Lot 29	D. Greenman & E. Stuart	003-05500	-	-	-	0.31	-	-	0.31
4	Plan 1683	G. & D. Adair	003-05600	-	-	-	0.36	-	-	0.36
4	Plan 1683	L. Mendrek	003-05700	-	-	-	0.19	-	-	0.19
4	Lot 26	M. & J. Cristicini	003-05800	-	-	-	0.19	-	-	0.19
4	Lot 10	K. Wisch	003-05900	-	-	-	0.20	-	-	0.20
4	Plan 1683	W. & P. Simpson	003-06000	-	-	-	0.20	-	-	0.20
4	Lot 8	A. & L. Kamrath	003-06100	-	-	-	0.19	-	-	0.19
4	Plan 1683	M. Sallach	003-06200	-	-	-	0.19	-	-	0.19
4	Plan 1683	E. Madden	003-06300	-	-	-	0.20	-	-	0.20
4	Plan 1683	R. & L. Cuggy	003-06400	-	-	-	0.22	-	-	0.22

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Innisfil
PROJECT #: 300038970

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
4	Plan 1683	P. & W. Belgue	003-06500	-	-	-	0.19	-	-	0.19
4	Plan 1683	J. & D. Van Donkelaar	003-06600	-	-	-	0.19	-	-	0.19
4	Lot 18	Town of Innisfil	003-06700	-	-	-	0.19	-	-	0.19
4	Lot 17	G. Roesler	003-06800	-	-	-	0.20	-	-	0.20
4	Plan 1683	A. & S. Gismondi	003-06900	-	-	-	0.20	-	-	0.20
4	Lot 15	L. & J. Columbus	003-07000	-	-	-	0.19	-	-	0.19
4	Lot 14	U. Agarunov	003-07100	-	-	-	0.19	-	-	0.19
4	Lot 13	J. MacEachern	003-07200	-	-	-	0.19	-	-	0.19
4	Plan 1683	W. Vankempen & D. Williamson	003-07300	-	-	-	0.21	-	-	0.21
4	Lot 11	K. & C. Mortelliti	003-07400	-	-	-	0.20	-	-	0.20
4	Plan 1683	K. Russel & J. Johnson	003-07500	-	-	-	0.19	-	-	0.19
4	Plan 1683	Town of Innisfil	003-07600	-	-	-	0.99	-	-	0.99
4	Lot 24	B. & R. Witkowski	003-07700	-	-	-	0.19	-	-	0.19
4	Lot 23	C. Moore	003-07800	-	-	-	0.19	-	-	0.19
4	Lot 22	B. & B. Pearce	003-07900	-	-	-	0.19	-	-	0.19
4	Lot 21	C. & G. Prospero & A. Volpe	003-08000	-	-	-	0.21	-	-	0.21
4	Plan 1683	K. Humphris & N. Upham	003-08100	-	-	-	0.19	-	-	0.19
4	Lot 19	D. & L. MacDonell	003-08200	-	-	-	0.24	-	-	0.24
4	S Pt Lot 15	D. & D. Scott	003-08300	-	-	-	0.25	-	-	0.25
4	Pt Lot 15	J. & A. Calderon	003-08301	-	-	-	0.14	-	-	0.14
4	S Pt Lot 15	Woodsview Property Management	003-08400	-	-	-	0.12	-	-	0.12
4	S Pt Lot 15	A. Azan	003-08500	-	-	-	0.08	-	-	0.08
4	S Pt Lot 15	R. Drennan & M. Schell	003-08600	-	-	-	0.26	-	-	0.26
4	S Pt Lot 15	2367633 Ontario Inc	003-08700	-	-	-	0.26	-	-	0.26
4	S Pt Lot 15	S. Sanderson	003-08800	-	-	-	0.30	-	-	0.30
4	S Pt Lot 5	United Church	003-08900	-	-	-	0.41	-	-	0.41
4	Plan 162	Town of Innisfil	003-09000	-	-	-	0.57	-	-	0.57
4	Plan 162	D. Hogarth	003-09100	-	-	-	0.47	-	-	0.47
4	S Pt Lot 16	Town of Innisfil	003-09200	-	-	-	-	-	0.01	0.01
4	Pt Lots 5	S. Mark	003-09400	-	-	-	0.46	-	-	0.46
4	Pt Lots 5	A. Drugovic & G. Jenkinson	003-09500	-	-	-	0.14	-	-	0.14
4	Plan 162	S. Mikkola & K. Lamonday	003-09600	-	-	-	0.12	-	-	0.12
4	Plan 162	M. MacPhail & T. Nolan	003-09700	-	-	-	0.13	-	-	0.13
4	N Pt Lot 41	R. & P. Sampaio	003-09900	-	-	-	1.16	-	-	1.16
4	Plan 162	B. Deputat & C. Braney	003-10000	-	-	-	0.97	-	-	0.97
4	Plan 162	A. & M. Stepanova	003-10010	-	-	-	0.23	-	-	0.23
4	Plan 162	C. Radulovici	003-10100	-	1.03	-	0.69	-	-	1.72
4	Pt Lots 3	H. Rahimimoghadam	003-10200	-	0.24	-	0.16	-	-	0.40
4	Plan 162	M. Slocombe	003-10300	-	-	0.60	-	-	-	0.60
4	Plan 162	S. & R. Thomas	003-10400	-	-	-	0.18	-	-	0.18
4	Lot 30	A. Zlender	003-10500	-	-	0.18	0.08	-	-	0.26
4	Plan 162	C. & T. Asselstine	003-10600	-	-	0.44	0.63	-	-	1.07
4	Lot 24	B. Hoseman & K. Hoseman	003-10700	-	-	-	0.20	-	-	0.20
4	Plan 162	L. Burke	003-10800	-	-	-	0.17	-	-	0.17
4	Plan 162	S. & L. Gucciardi	003-10900	-	-	-	0.06	-	-	0.06
4	S Pt Lot 23	Renaissance Nouveau Design Inc	003-11000	-	-	-	0.06	-	-	0.06
4	Pt Lots 1	A. & D. Whiteside	003-11100	-	-	0.01	0.16	-	-	0.17
4	Plan 162	D. Napper	003-11200	-	-	0.12	0.27	-	-	0.39
4	Plan 162	V. & Z. Iacob	003-11300	-	-	0.48	0.24	-	-	0.72
4	S Pt Lot 16	K. & R. Sinclair	003-11400	2.96	0.82	11.02	-	-	1.48	16.28
4	Pt Lots 6 & 7	C. & T. Asselstine	003-11500	-	-	0.16	0.06	-	-	0.22
4	Plan 162	C. Mark	003-11600	-	-	0.03	0.10	-	-	0.13
4	Plan 162	R. Schweymaier	003-11700	-	-	0.33	0.52	-	-	0.85
4	Pt Lots 2	D. & M. Wilson	003-11800	-	-	-	0.15	-	-	0.15
4	Lot 1	C. Chegancas	003-11900	-	-	-	0.15	-	-	0.15

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Main Drain

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PROJECT #: 300038970

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Agricultural Land @ 1.00
Bush @ 0.50
Residential @ 2.00
Wetland @ 0.25
Industrial/Commercial @ 3.00
Other @ 1.00

Factors Applied to Roads
Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
4	Pt Lot 16	D. & L. Fairhead	003-12000	-	-	1.03	-	-	-	1.03
4	Lot 61	F. Minici	003-12100	-	-	0.13	0.11	-	-	0.24
4	Plan 162	E. & I. Gyorfi	003-12200	-	-	0.17	0.02	-	-	0.19
4	Plan 162	P. Savard	003-12300	-	-	0.14	0.03	-	-	0.17
4	Plan 162	D. & M. Bowen	003-12400	-	-	0.06	0.05	-	-	0.11
4	Plan 162	J. Giannitti & M. Giannitti Est.	003-12500	-	-	0.08	0.10	-	-	0.18
4	Plan 162	C. Asselstine & M. Marshall	003-12600	-	-	0.11	0.07	-	-	0.18
4	Pt Lot 16	P. & D. McMillan	003-12700	-	-	1.33	0.08	-	-	1.41
4	Pt Lot 16	M. Mindle & E. Gulyas	003-12800	-	-	0.35	0.36	-	-	0.71
4	Plan M448	Town of Innisfil	003-25600	-	-	-	0.18	-	-	0.18
4	Plan M448	J. & C. Ang	003-25602	-	-	-	0.29	-	-	0.29
4	Plan M448	P. & S. Kubas	003-25604	-	-	-	0.22	-	-	0.22
4	Plan M448	S. & T. Smith	003-25606	-	-	-	0.20	-	-	0.20
4	Plan M448	R. & C. Cavaco	003-25608	-	-	-	0.20	-	-	0.20
4	Plan M448	S. & W. Mays	003-25610	-	-	-	0.20	-	-	0.20
4	Plan M448	N. Geddes	003-25612	-	-	-	0.21	-	-	0.21
4	Plan M448	S. & N. Gill	003-25614	-	-	-	0.26	-	-	0.26
4	Plan M448	D. & T. Carlson	003-25616	-	-	-	0.26	-	-	0.26
4	Plan M448	S. & T. Chatland	003-25618	-	-	-	0.29	-	-	0.29
4	Plan M448	L. Truong	003-25620	-	-	-	0.30	-	-	0.30
4	Plan M448	Town of Innisfil	003-25622	-	-	0.02	0.51	-	-	0.53
4	Plan 51M448	J. Stubbs	003-25624	-	-	1.47	0.49	-	-	1.96
4	Plan M448	J. & C. Fabing	003-25626	-	-	-	0.29	-	-	0.29
4	Plan M448	R. & E. Stukas	003-25628	-	-	-	0.26	-	-	0.26
4	Plan M448	M. Iammatteo	003-25630	-	-	-	0.26	-	-	0.26
4	Plan M448	D. & L. Ficher	003-25632	-	-	-	0.26	-	-	0.26
4	Plan M448	D. & S. Cake	003-25634	-	-	-	0.29	-	-	0.29
4	Plan M448	L. Philipp	003-25636	-	-	-	0.30	-	-	0.30
4	Plan M448	R. & D. Yonge	003-25638	-	-	-	0.32	-	-	0.32
4	Plan M448	A. & N. Bell	003-25640	-	-	-	0.21	-	-	0.21
4	Plan M448	A. Buttrum	003-25642	-	-	-	0.26	-	-	0.26
4	Plan M448	A. & A. Simpson	003-25644	-	-	-	0.22	-	-	0.22
4	Plan M448	C. & J. Van Nispen	003-25646	-	-	-	0.18	-	-	0.18
4	Plan M448	G. Clubine	003-25648	-	-	-	0.18	-	-	0.18
4	Plan M448	C. & C. Kidd	003-25650	-	-	-	0.21	-	-	0.21
4	Plan M448	K. & M. Moores	003-25652	-	-	-	0.24	-	-	0.24
4	Plan M448	F. Guttridge & L. Etherton	003-25654	-	-	-	0.24	-	-	0.24
4	Plan M448	D. & E. Ciccia	003-25656	-	-	-	0.24	-	-	0.24
4	Plan M448	B. & J. Laval	003-25658	-	-	-	0.24	-	-	0.24
4	Plan M448	J. & C. Molenhuis	003-25660	-	-	-	0.24	-	-	0.24
4	Plan M448	C. Damianakis & R. Cooper	003-25662	-	-	-	0.22	-	-	0.22
4	Plan M448	M. & D. Twardowski	003-25664	-	-	-	0.28	-	-	0.28
4	Plan M448	M. & L. Snowball	003-25666	-	-	-	0.20	-	-	0.20
4	Plan M448	R. Mateus	003-25668	-	-	-	0.24	-	-	0.24
4	Plan M448	M. & S. Davenport	003-25670	-	-	-	0.26	-	-	0.26
4	Plan M448	B. & S. Bingley	003-25672	-	-	-	0.24	-	-	0.24
4	Plan M448	S. Jenssen-Brown	003-25674	-	-	-	0.21	-	-	0.21
4	Plan M448	D. Lajoie	003-25676	-	-	-	0.17	-	-	0.17
4	Plan M448	R. & K. Carlin	003-25678	-	-	-	0.18	-	-	0.18
4	Plan M448	E. & B. Rideout	003-25680	-	-	-	0.18	-	-	0.18
4	Plan M448	R. Cressman	003-25682	-	-	-	0.20	-	-	0.20
4	Plan M448	C. & L. Vitale	003-25684	-	-	-	0.22	-	-	0.22
4	Plan M448	E. & F. Arantes	003-25686	-	-	-	0.21	-	-	0.21
4	Plan M448	A. & A. Takacs	003-25688	-	-	-	0.20	-	-	0.20
4	Plan M448	N. & P. Blanchet	003-25690	-	-	-	0.20	-	-	0.20

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4	Plan M448	J. & C. Conti	003-25692	-	-	-	0.20	-	-	0.20
4	Plan M448	C. Douglas	003-25694	-	-	-	0.19	-	-	0.19
4	Plan M448	T. & M. Tokarski	003-25696	-	-	-	0.19	-	-	0.19
4	Plan M448	G. Werth	003-25698	-	-	-	0.20	-	-	0.20
4	Plan M448	J. & L. Knox	003-25702	-	-	-	0.21	-	-	0.21
4	Plan M448	M. & M. Goodchild	003-25704	-	-	-	0.21	-	-	0.21
4	Plan M448	G. Gogos	003-25706	-	-	-	0.18	-	-	0.18
4	Plan M448	J. Reindl	003-25708	-	-	-	0.18	-	-	0.18
4	Plan M448	D. & A. Stopyra	003-25710	-	-	-	0.20	-	-	0.20
4	Plan M448	D. & E. Magri	003-25712	-	-	-	0.21	-	-	0.21
4	Plan M448	V. & K. Hamilton	003-25714	-	-	-	0.21	-	-	0.21
4	Plan M448	M. Doyle & S. McInnis	003-25716	-	-	-	0.21	-	-	0.21
4	Plan M448	R. Weeks	003-25718	-	-	-	0.21	-	-	0.21
4	Plan M448	A. & S. Ginzburg	003-25720	-	-	-	0.20	-	-	0.20
4	Plan M448	E. & S. Ernest	003-25722	-	-	-	0.19	-	-	0.19
4	Plan M448	Town of Innisfil	003-25724	-	-	-	0.83	-	-	0.83
6	S Pt Lot 3	1045990 Ontario Inc	018-00900	8.22	-	0.25	-	-	-	8.47
6	S Pt Lot 4	T. & R. Ruch & 10454990 Ontario Inc	018-01300	8.54	-	3.66	-	-	-	12.20
6	S Pt Lot 4	J. Robson	018-01400	12.24	-	7.47	-	-	1.04	20.75
6	S Pt Lot 5	M. Vandermast	018-01500	52.73	7.36	1.23	-	-	-	61.32
6	S Pt Lot 5	W. & B. Baguley	018-01600	0.10	-	-	0.10	-	-	0.20
6	S Pt Lot 6	J. & P. Hilverda	018-01800	0.23	-	-	-	-	-	0.23
6	Pt Lot 6	J. & P. Hilverda	018-01900	17.73	-	3.58	-	-	-	21.31
6	Pt Lot 6	Town of Innisfil	018-01902	7.24	-	-	-	-	-	7.24
6	N Pt Lot 6	1665328 Ontario Ltd	018-02000	10.77	-	2.10	-	-	0.26	13.13
6	N Pt Lot 6	V. & J. Parravano	018-02010	0.18	-	-	-	-	-	0.18
6	N Pt Lot 5	1057595 Ontario Ltd	018-02500	16.10	3.06	-	-	-	1.22	20.38
6	N Pt Lot 4	D. & J. Rice	018-02600	-	8.58	-	-	-	1.40	9.98
6	N Pt Lot 4	L. Peterson	018-02800	20.45	4.15	4.15	-	-	3.20	31.95
6	N Pt Lot 3	G. & J. McLean	018-02900	37.02	-	-	-	-	1.15	38.17
6	N Pt Lot 3	G. McLean	018-02901	0.20	-	0.01	-	-	-	0.21
7	N Pt Lots 1	P. Wardlaw	018-03100	0.73	-	0.08	-	-	-	0.81
7	S Pt Lot 3	D. & D. Oakley	018-03900	15.08	2.83	-	-	-	5.65	23.56
7	S Pt Lot 3	M. & D. Purnell	018-04000	-	-	-	0.21	-	-	0.21
7	W Pt Lot 4	Ben Capelas Landscaping & Snow Rem	018-04100	3.57	-	-	-	-	1.07	4.64
7	S Pt Lot 4	M. Haourt & J. See	018-04200	13.21	-	0.60	-	-	6.21	20.02
7	S Pt Lot 5	R. & K. Webb	018-04300	8.39	-	0.17	-	-	-	8.56
7	S Pt Lot 5	922952 Ontario Inc	018-04400	8.17	-	0.52	-	-	-	8.69
7	Pt Lots 4 & 5	R. Arbour	018-05000	7.40	-	1.97	-	-	-	9.37
7	W Pt Lot 4	Rix Farms Ltd	018-05100	4.35	2.02	7.62	-	-	1.56	15.55
6	Lot 7	751518 Ontario Ltd	020-00100	34.77	-	-	-	-	5.48	40.25
6	Pt Lot 7	Town of Innisfil	020-00104	5.40	-	-	-	-	-	5.40
6	S Pt Lot 10	1536315 Ontario Ltd	020-00400	8.97	-	-	-	-	-	8.97
6	N Pt Lot 13	J. & V. Aquino	021-03800	-	2.66	-	-	-	-	2.66
6	N Pt Lot 13	J. Horodynsky	021-04000	-	1.65	-	-	-	-	1.65
6	N Pt Lot 12	A. & L. Obidin	021-04101	-	3.49	-	-	-	-	3.49
6	N Pt Lot 11	2154016 Ontario Ltd	021-04200	9.02	3.48	0.39	-	-	-	12.89
6	S Pt Lot 11	C. Hall	021-04300	12.23	5.71	0.82	-	-	1.63	20.39
6	S Pt Lot 11	K. & R. Winter	021-04400	2.46	5.12	-	-	-	12.91	20.49
6	S Pt Lot 12	O. & K. Awrey	021-04500	-	11.22	-	-	-	1.25	12.47
6	S Pt Lot 12	K. Bernt	021-04600	-	8.72	-	-	-	3.74	12.46
6	S Pt Lot 12	G. & G. Kent	021-04700	-	8.75	0.66	-	-	7.10	16.51
6	S Pt Lot 13	A. Zlender	021-04800	-	19.68	-	-	-	-	19.68
6	S Pt Lot 13	M. Slaby	021-04900	-	17.30	-	-	-	2.14	19.44
6	S Pt Lot 14	W. Pratt	021-05000	16.02	18.75	1.95	-	-	2.73	39.45

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

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6	S Pt Lot 15	Ministry Of Transportation	021-05100	-	-	0.35	-	-	0.45	0.80
6	S Pt Lot 15	J. & E. Cole	021-05200	14.36	-	2.80	-	-	1.49	18.65
6	S Pt Lot 15	D. Huisman	021-05300	0.26	-	-	-	-	-	0.26
6	Pt Lot 15	Sunset International Speedway Inc	021-05400	-	1.88	4.12	-	-	5.77	11.77
6	S Pt Lot 15	Sunset International Speedway Inc	021-05500	-	-	-	-	6.41	-	6.41
6	Plan 1120	1625057 Ontario Corporation	021-05600	-	-	-	-	0.17	-	0.17
6	Pt Lots 14 & 15	2215570 Ontario Inc	021-06100	-	13.21	-	-	-	1.47	14.68
6	N Pt Lot 13	C. Scenna	021-06101	-	5.92	-	-	-	-	5.92
6	N Pt Lot 13	1281597 Ontario Inc	021-06102	-	4.86	-	-	-	-	4.86
15	Pt Lot 6	Suncor Energy Inc	072-15602	0.22	-	-	-	-	0.18	0.40
15	Pt Lot 6	Suncor Energy Inc	072-15604	2.31	-	-	-	-	-	2.31
15	Pt Lot 6	J. Bucko	072-15700	-	-	-	-	0.19	-	0.19
15	Pt Lot 5	1833044 Ontario Ltd	072-15900	-	-	6.87	-	0.50	-	7.37
15	Pt Lot 6	C. & M. Carra	072-15901	-	3.36	-	-	-	1.86	5.22
15	Pt Lot 5	2537878 Ontario Ltd	072-15902	-	-	0.06	-	1.96	-	2.02
15	Pt Lot 5	Resquip Inc	072-15903	-	-	-	-	2.40	-	2.40
15	Pt Lot 6	Suncor Energy Inc	072-15905	-	0.43	-	-	-	-	0.43
15	Pt Lot 6	C. & M. Carra	072-15910	-	-	-	-	0.89	-	0.89
15	W Pt Lot 5	ADF Investments Ltd	072-16000	-	-	-	-	1.28	-	1.28
15	W Pt Lot 4	K. & S. Lotton	072-16200	-	-	-	0.23	-	-	0.23
15	W Pt Lot 4	J. Lemoine	072-16300	-	-	-	-	-	1.23	1.23
15	W Pt Lot 4	N. Ahmed & Q. Majoka	072-16301	-	-	-	-	-	0.64	0.64
15	Pt Lot 4	M. & M. Pedneault	072-16302	-	-	-	-	-	0.38	0.38
15	Pt Lot 4	G. & M. Cruz	072-16402	-	-	-	-	-	0.81	0.81
15	Pt Lot 4	C. Kulesza	072-16410	-	-	-	-	-	0.49	0.49
15	Plan M480	M. Colabella & D. Bravo	072-16420	-	-	-	-	-	0.64	0.64
15	Plan M480	Ontario Stockyards Inc	072-16430	-	-	-	-	4.20	-	4.20
13	N Pt Lot 10	W. & T. Chen	073-32500	-	10.52	2.47	-	-	-	12.99
13	N Pt Lot 10	G. & D. Kruger	073-32600	-	0.18	-	-	-	0.18	0.36
13	N Pt Lot 10	P. & L. Plavic	073-32610	-	-	-	0.21	-	-	0.21
13	N Pt Lot 10	A. Smith	073-32700	-	0.89	2.56	-	-	2.11	5.56
13	N Pt Lot 10	J. & E. Blake	073-32701	-	-	0.28	-	-	0.53	0.81
13	N Pt Lot 10	D. Decaro	073-32800	-	-	6.42	-	-	1.41	7.83
13	N Pt Lot 11	P. & S. Silverthorne	073-32900	5.36	-	1.79	-	-	3.36	10.51
13	N Pt Lot 11	A. Martin	073-33000	-	-	4.86	-	-	2.28	7.14
13	N Pt Lot 11	R. White & D. Miedema	073-33001	-	-	0.56	-	-	0.66	1.22
13	N Pt Lot 11	S. & L. McGuire	073-33002	-	-	0.26	-	-	0.22	0.48
13	N Pt Lot 11	M. & D. Ridout	073-33003	-	-	0.18	-	-	0.30	0.48
13	N Pt Lot 11	A. & C. Galati	073-33010	-	-	0.35	-	-	0.16	0.51
13	N Pt Lot 11	W. Kapralik & M. Janz Est.	073-33015	-	-	0.39	-	-	0.12	0.51
13	Pt Lot 11	S. Tustin & T. Ross	073-33100	2.12	-	3.13	-	-	4.95	10.20
13	N Pt Lot 11	D. McGeachy	073-33110	-	-	-	-	-	0.32	0.32
13	N Pt Lot 11	Y. Liao & Z. Li	073-33200	-	-	2.14	-	-	5.52	7.66
13	N Pt Lot 12	S. & H. White	073-33201	-	-	0.54	-	-	0.24	0.78
13	N Pt Lot 11	A. & P. Clitherow	073-33202	-	-	0.57	-	-	0.96	1.53
13	Pt Lot 11	J. & R. Carvalhais	073-33203	-	-	0.66	-	-	-	0.66
13	Pt Lot 11	P. & A. Clitherow	073-33204	-	-	0.09	-	-	0.37	0.46
13	Pt Lot 12	M. Milekic	073-33300	-	-	18.53	-	-	1.34	19.87
13	Pt Lot 12	M. & O. Milekic	073-33302	-	-	1.18	-	-	0.14	1.32
13	N Pt Lot 12	R. Vandrie & R. Walsh	073-33320	-	-	0.20	-	-	0.29	0.49
13	N Pt Lot 12	F. Semiao	073-33400	2.86	-	13.57	-	-	1.43	17.86
13	N Pt Lot 12	R. Sturgeon	073-33401	0.24	-	0.07	-	-	1.43	1.74
13	N Pt Lot 12	Beacon Street Entertainment	073-33500	-	-	-	-	-	4.59	4.59
13	N 1/2 Lot 13	D. & R. Mattingley	073-33501	-	-	-	-	-	0.99	0.99
13	N Pt Lot 13	Hasbrooke Holdings Ltd	073-33510	4.16	-	1.39	-	-	9.86	15.41

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Innisfil
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #:** 300038970

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
14	S Pt Lot 15	W. & C. Procter	073-34400	7.30	-	-	-	-	-	7.30
14	S Pt Lot 14	P & A Timbers & Sons	073-34901	9.26	-	-	-	-	-	9.26
14	Pt Lot 14	E. & J. Samios	073-35202	13.33	3.98	-	-	-	-	17.31
14	S Pt Lot 13	T. Sturgeon	073-35300	32.32	-	4.68	-	-	5.53	42.53
14	S Pt Lot 12	H. Nunes	073-35400	21.19	-	17.30	-	-	4.76	43.25
14	S Pt Lot 11	V. & R. Ibrajev	073-35500	-	-	13.60	-	-	7.01	20.61
14	W Pt Lot 11	R. & S. Batsch	073-35600	-	-	2.71	-	-	1.52	4.23
14	W Pt Lot 11	D. Kennedy Est. & G. Kennedy	073-35601	-	-	1.37	-	-	0.32	1.69
14	W Pt Lot 11	D. & N. Forget	073-35700	-	-	2.19	-	-	0.36	2.55
14	W Pt Lot 11	M. & B. Markowitz	073-35800	-	-	2.48	-	-	1.72	4.20
14	W Pt Lot 11	C. Sun & P. Pov	073-35900	-	-	2.43	-	-	1.19	3.62
14	Pt Lot 11	A. & D. Cianfarani	073-35901	-	-	0.51	-	-	0.23	0.74
14	W Pt Lot 11	H., Z., & M. Tesic	073-36000	-	-	2.08	-	-	2.17	4.25
14	S Pt Lot 10	D. & B. Jebb	073-36100	-	29.42	-	-	-	12.02	41.44
14	S Pt Lot 10	P. & M. Barreira	073-36101	-	0.44	-	-	-	-	0.44
14	S Pt Lot 9	J. Marques	073-36200	-	7.58	-	-	-	-	7.58
14	S Pt Lot 9	2031430 Ontario Ltd	073-36300	-	6.34	-	-	-	0.55	6.89
14	N Pt Lot 16	A. Lacquaniti	074-12400	-	-	-	0.14	-	-	0.14
14	N Pt Lot 16	L. Webster	074-12500	-	-	-	0.12	-	-	0.12
14	N Pt Lot 16	B. Kneeshaw	074-12600	-	-	-	0.18	-	-	0.18
14	N Pt Lot 16	B. & J. Kneeshaw	074-12601	-	-	-	0.19	-	-	0.19
14	N Pt Lot 16	L., R. & J. Kell	074-12700	-	-	-	-	-	1.38	1.38
14	N Pt Lot 16	C. & L. Stovold	074-12710	-	-	-	-	-	0.99	0.99
14	N Pt Lot 16	1402802 Ontario Inc	074-12720	18.34	-	-	-	-	-	18.34
14	N Pt Lot 15	1402802 Ontario Inc	074-12900	41.13	-	-	-	-	-	41.13
14	N Pt Lot 15	L. & M. Parsons	074-12901	-	-	-	0.20	-	-	0.20
14	Pt N1/2 Lot 15	F. & K. Zielke	074-12902	-	-	-	0.21	-	-	0.21
14	N Pt Lot 14	D. Zielke	074-13000	39.54	-	-	-	-	2.98	42.52
14	N Pt Lot 13	L. & E. Kell	074-13100	35.48	-	5.49	-	-	1.27	42.24
14	N Pt Lot 13		074-13101	-	-	-	0.23	-	-	0.23
14	N Pt Lot 12	S. & K. Thavakumar & S. Janani	074-13200	-	-	0.03	-	-	0.59	0.62
14	N Pt Lot 12	W. Steimle	074-13201	-	-	25.34	-	-	16.89	42.23
14	Pt Lot 11	D. & A. Ostojic	074-13300	-	1.08	10.17	-	-	10.38	21.63
14	N Pt Lot 11	K. & O. Kanevsky	074-13301	-	7.87	-	-	-	0.59	8.46
14	W Pt Lot 11	S. Heinemann & C. Kim	074-13400	-	2.76	-	-	-	1.48	4.24
14	W Pt Lot 11	J. & C. Evans	074-13500	-	0.68	2.09	-	-	1.49	4.26
14	W Pt Lot 11	K. & S. MacRae	074-13600	-	-	4.27	-	-	-	4.27
14	N Pt Lot 10	C. & V. Grande	074-13700	3.90	5.33	-	-	-	1.03	10.26
14	Pt Lot 10	P. & L. Fenz & D. Leithwood	074-13701	-	-	-	-	-	0.40	0.40
14	N Pt Lot 10	R. & C. Colonna & F. & V. Corbo	074-13800	-	19.86	-	-	-	1.49	21.35
14	N Pt Lot 10	E. & A. Spina	074-13900	5.56	5.13	-	-	-	-	10.69
14	N Pt Lot 9	C. Schiafone & A. Britton	074-14000	-	10.88	-	-	-	-	10.88
14	N Pt Lot 9	G., G. & A. Gatti	074-14100	-	11.20	-	-	-	-	11.20
14	N Pt Lot 9	J. & J. Waz	074-14200	-	8.64	-	-	-	-	8.64
14	N Pt Lot 9	D., L., & T. Galati & A. Granato	074-14300	-	6.30	-	-	-	-	6.30
14	N Pt Lot 8	M. & I De Sao Jose	074-14400	-	3.37	-	-	-	-	3.37
14	N Pt Lot 8	A. & M. Cesta & R. & A. Babusci	074-14500	-	6.05	-	-	-	-	6.05
14	Pt Lots 7 & 8	Riocan Holdings (Tiy) Inc & 1633272 Al	074-14900	-	1.23	-	-	-	5.57	6.80
15	Pt Lot 8	I. & M. De Sao Jose	074-15000	-	7.88	-	-	-	-	7.88
15	Pt Lot 8	Sisters Of Our Lady Mount	074-15100	-	0.58	-	-	-	0.53	1.11
15	Pt Lot 8	Town of Innisfil	074-15101	-	0.22	-	-	-	0.49	0.71
15	Pt Lot 8	Sisters Of Our Lady Mount	074-15200	-	1.59	-	-	-	0.53	2.12
15	Pt Lot 8	L. Lorusso	074-15201	-	0.28	-	-	-	1.84	2.12
15	Pt Lot 9	Q. Woods	074-15300	-	2.60	-	-	-	2.05	4.65
15	W Pt Lot 9	Fairview Farms Holdings Inc	074-15400	-	6.70	-	-	-	3.45	10.15

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement
DATE : October 22, 2019 - Amended by the Tribunal

TOWN: Innisfil
PROJECT #: 300038970

Factors Applied to Lands

Agricultural Land @ 1.00
Bush @ 0.50
Residential @ 2.00
Wetland @ 0.25
Industrial/Commercial @ 3.00
Other @ 1.00

Factors Applied to Roads

Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
15	Pt Lot 10	M. Toich	074-15500	4.82	-	-	-	-	-	4.82
15	Pt Lot 10	T. Delahunt	074-15600	2.35	-	-	-	-	0.91	3.26
15	Pt Lot 10	T. Kingsly	074-15700	0.02	-	-	-	-	1.18	1.20
15	Pt Lot 10	J. Barber & D. Furtado	074-15800	1.16	-	-	-	-	0.45	1.61
15	Pt Lot 10	Barbay Holdings Incorporated	074-15900	1.99	-	-	-	-	0.13	2.12
15	Pt Lot 10	H. Ju	074-16000	1.31	-	-	-	-	0.51	1.82
15	Pt Lot 11	Q. & A. Alam	074-16100	-	4.46	-	-	-	4.28	8.74
15	Pt Lot 11	M. Fenech	074-16101	-	-	0.01	0.21	-	-	0.22
15	Pt Lot 11	G. Bell	074-16102	-	-	-	-	-	0.27	0.27
15	Pt Lot 11	S. & R. Kuzmyk	074-16110	-	-	-	-	-	0.25	0.25
15	Pt Lot 11	V. Fava & D. Lombardi	074-16200	-	-	0.72	-	-	1.12	1.84
15	Pt Lot 11	P. Hajdukiewicz	074-16210	-	-	0.01	-	-	0.25	0.26
15	Pt Lot 11	B. Nemeth	074-16300	-	-	0.65	-	-	1.33	1.98
15	Pt Lots 11 & 12	B. Arnold & M. Foley	074-16400	-	-	0.32	-	-	1.14	1.46
15	Pt Lots 11 & 12	B. Bondi	074-16401	-	-	0.08	-	-	0.77	0.85
15	Pt Lot 12	J. & T. Rautiainen	074-16500	-	-	1.43	-	-	2.53	3.96
15	Pt Lot 12	F. & H. Pereira	074-16501	-	-	1.42	-	-	0.70	2.12
15	Pt Lot 12	N. & J. Palazzo	074-16520	-	-	0.12	-	-	0.22	0.34
15	Pt Lot 12	G. & R. Zielke	074-16600	3.38	-	2.83	-	-	1.65	7.86
15	Pt Lot 13	Apoca Carpenters Ltd	074-16700	8.01	-	1.72	-	-	0.51	10.24
15	W Pt Lot 13	F. & K. Commisso & J. Raposo	074-16701	-	-	-	-	-	0.37	0.37
15	Pt Lot 13	A. & E. Auciello	074-16702	0.04	-	0.41	-	-	0.44	0.89
15	Pt Lot 13	K. & B. Adams	074-16710	0.26	-	-	-	-	0.01	0.27
15	Pt Lot 13	A. Venroy & D. Pagnan-Venroy	074-16720	-	-	-	-	-	0.27	0.27
15	Pt Lots 13 & 14	L. & E. Kell	074-16800	11.50	-	-	-	-	-	11.50
15	Pt Lot 14	N. & W. Harris	074-16801	-	-	-	0.22	-	-	0.22
15	Pt Lots 13 & 14	Hydro One Networks Inc	074-16900	0.18	-	-	-	-	-	0.18
15	Pt Lots 14 & 15	R. & D. Zielke	074-17000	11.24	-	-	-	-	-	11.24
15	Pt Lot 15	R. & W. Graham	074-17001	-	-	-	0.19	-	-	0.19
15	Pt Lots 14 & 15	R. Zielke	074-17040	-	-	-	-	-	0.28	0.28
15	Pt Lot 15	J. McCullough	074-17100	-	-	-	0.19	-	-	0.19
15	Pt Lot 15	K. & H. Kell	074-17200	7.40	-	-	-	-	-	7.40
15	Pt Lot 15	Innpower Corporation	074-17300	-	-	-	0.11	-	-	0.11
15	Pt Lot 15	2430683 Ontario Inc	074-17400	-	-	-	-	-	0.43	0.43
15	Pt Lot 15	S. & B. Kim	074-17500	-	-	-	-	-	0.37	0.37
15	Pt Lot 15	E. Ciotti	074-17600	-	-	-	-	-	0.42	0.42
15	Pt Lot 15	Town of Innisfil	074-17700	-	-	-	-	-	1.10	1.10
15	Pt Lot 15	Town of Innisfil	074-17800	-	-	-	-	-	0.99	0.99
15	Pt Lot 15	J. & M. Read	074-17901	-	-	-	0.19	-	-	0.19
15	Pt Lot 16	M. & V. Caporiccio	074-18000	-	-	-	0.15	-	-	0.15
15	Pt Lot 16	1728299 Ontario Inc	074-18001	-	-	-	0.09	-	-	0.09
15	Pt Lot 16	1385385 Ontario Inc	074-18100	-	-	-	0.11	-	-	0.11
15	Pt Lot 16	Z. & E. Meir	074-18200	-	-	-	0.20	-	-	0.20
			Total Innisfil Lands	**4,546.62**	**699.91**	**817.82**	**64.11**	**41.35**	**901.75**	**7,071.57**
		Bradford-West Gwillimbury Lands								
12	Pt S1/2 Lot 12	Simcoe County	003-25000	-	-	21.83	-	-	9.36	31.19
12	S Pt Lot 11	I. & Z. Bloch	003-25500	3.41	-	3.27	-	-	-	6.68
12	N Pt Lot 11	T. & B. Berneche	003-27500	-	-	0.11	-	-	0.90	1.01
12	N Pt Lot 11	J. Koperwas	003-27503	19.49	-	-	-	-	3.99	23.48
12	N Pt Lot 11	Simcoe County	003-27505	3.37	-	0.13	-	-	2.86	6.36

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**

DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands

Agricultural Land @ 1.00
Bush @ 0.50
Residential @ 2.00
Wetland @ 0.25
Industrial/Commercial @ 3.00
Other @ 1.00

Factors Applied to Roads

Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
12	N Pt Lot 12	M. Sheikh & A. Chaudary	003-27800	13.80	-	16.64	-	-	10.15	40.59
12	N Pt Lot 12	M. & M. Grishaber	003-27801	-	-	-	-	-	0.53	0.53
12	N Pt Lot 12	M. Goldenberg & S. Burns	003-27802	-	-	-	-	-	0.37	0.37
12	N Pt Lot 13	Simcoe County	003-27804	0.12	-	3.75	-	-	-	3.87
12	N Pt Lot 13	H. Boucher	003-27900	-	-	0.13	-	-	0.66	0.79
12	N Pt Lot 13	C. & V. Duraes	003-27901	-	-	0.21	-	-	0.44	0.65
12	N Pt Lot 13	R. & Y. Fortune	003-27902	-	-	0.38	-	-	0.54	0.92
12	N Pt Lot 13	A. & M. Amaral	003-27903	-	-	0.18	-	-	0.93	1.11
12	N Pt Lot 13	R. Whillier	003-27905	-	-	0.73	-	-	0.73	1.46
12	Pt Lot 13	D. & N. Soldiuk	003-27906	-	-	0.16	-	-	0.30	0.46
12	N Pt Lot 13	C. & M. Conceicao	003-28004	1.28	-	5.47	-	-	-	6.75
13	S Pt Lot 13	M. & R. Fresco	003-30201	-	-	0.07	-	-	1.59	1.66
13	S Pt Lot 13	Steiner Tree Farms Ltd	003-30215	1.88	-	-	-	-	2.21	4.09
13	S Pt Lot 13	R. McKaigue	003-30300	-	-	13.99	-	-	4.91	18.90
13	Pt Lot 13	Y. Dement	003-30301	-	-	0.36	-	-	0.34	0.70
13	S Pt Lot 13	Eric's Right World of Scouting	003-30320	0.50	-	3.48	-	-	0.17	4.15
13	S Pt Lot 13	J. & T. Lefler	003-30400	-	-	0.01	-	-	0.71	0.72
13	S Pt Lot 13	T. Callacott & U. Walton	003-30500	-	-	0.05	-	-	0.69	0.74
13	S Pt Lot 13	B. Ferguson	003-30600	-	-	-	-	-	0.37	0.37
13	S Pt Lot 13	J. & K. Van Lierop	003-30601	-	-	-	-	-	0.37	0.37
13	S Pt Lot 13	W. & D. Lawrence	003-30700	-	-	0.08	-	-	0.31	0.39
13	S Pt Lot 11	M. Boddy	003-30800	25.73	-	18.20	-	-	18.20	62.13
13	S Pt Lot 12	P. Abercrombie & S. Bruin	003-30801	-	-	0.18	-	-	0.28	0.46
13	Pt Lot 11	J. Reilly & S. Tolley	003-31000		-	-	-	-	8.02	8.02
13	Pt Lot 11	N. & K. Sears	003-31061	-	-	0.65	-	-	2.20	2.85
13	Pt Lot 11	Y. Guo	003-31001	-	-	-	-	-	10.13	10.13
13	Plan M649	Town of Bradford West Gwillimbury	003-31100	-	-	-	-	-	0.69	0.69
13	Plan M649	R. & J. Burns	003-31104	-	-	0.03	-	-	0.62	0.65
13	Plan M649	G. Gallo	003-31108	-	-	0.14	-	-	0.57	0.71
13	Plan M649	M. & R. Zimmer	003-31112	-	-	0.37	-	-	0.46	0.83
13	Plan M649	B. & M. Gentile	003-31116	-	-	0.35	-	-	0.38	0.73
13	Plan M649	F. & P. Giusti	003-31120	-	-	0.39	-	-	0.45	0.84
13	Plan M649	K. Brown	003-31124	-	-	0.42	-	-	0.54	0.96
13	Plan M649	L. Gross	003-31128	-	-	0.40	-	-	0.63	1.03
13	Plan 51M6	Q. Zhu Zhi & Y. Tang	003-31136	-	-	0.84	-	-	0.27	1.11
13	Plan 51M6	J. & D. Taylor	003-31138	-	-	0.82	-	-	0.29	1.11
13	Plan M649	S. & U. Kostuch	003-31142	-	-	0.07	-	-	0.69	0.76
13	Plan M649	N. & A. Barroso	003-31146	-	-	0.08	-	-	0.72	0.80
13	Plan M649	L. & P. Wade	003-31150	-	-	0.10	-	-	0.59	0.69
13	Plan M649	D. & J. Ferragine	003-31170	-	-	-	-	-	0.66	0.66
13	Plan M649	M. & T. Capuano	003-31174	-	-	-	-	-	0.60	0.60
13	Plan M649	B. Ahmed	003-31178	-	-	-	-	-	0.49	0.49
13	Plan M649	J. Muir-Birtles & G. Birtles	003-31182	-	-	-	-	-	0.62	0.62
13	Plan M649	R. & N. Jackson	003-31186	-	-	-	-	-	0.92	0.92
13	Plan M649	R. Sorbera-Colivas	003-31190	-	-	-	-	-	0.57	0.57
13	Plan M649	C. Alarie	003-31194	-	-	-	-	-	0.53	0.53
13	Plan M649	P. & Z. Zanet	003-31198	-	-	-	-	-	0.63	0.63
13	Pt Lot 10	A. Man	003-31410	-	-	5.35	-	-	1.34	6.69
		Total Bradford-West Gwillimbury Lands		**69.58**	**-**	**99.42**	**-**	**-**	**95.52**	**264.52**
			Total Lands	**4,616.20**	**699.91**	**917.24**	**64.11**	**41.35**	**997.27**	**7,336.09**

APPENDIX D5 - SUMMARY of AREAS by LAND USE

Main Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands

Agricultural Land @ 1.00 Wetland @ 0.25
Bush @ 0.50 Industrial/Commercial @ 3.00
Residential @ 2.00 Other @ 1.00

Factors Applied to Roads

Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Roads	Owner	Road Classification	Total Affected Area (ha)
7th Line	Town of Innisfil	Paved Road	3.30
6th Line	Town of Innisfil	Paved Road	14.24
5th Line	Town of Innisfil	Paved Road	15.13
4th Line	Town of Innisfil	Paved Road	20.03
3rd Line	Town of Innisfil	Gravel Road	17.60
2nd Line	Town of Innisfil	Gravel/Paved Road	17.58
15th Line	Town of Innisfil	Paved Road	1.40
Gilford Road	Town of Innisfil	Gravel Road	10.24
14th Line	Town of Innisfil	Gravel/Paved Road	5.20
Churchill Unnamed Road 1	Town of Innisfil	Paved Road	0.44
Churchill Unnamed Road 2	Town of Innisfil	Paved Road	0.91
Churchill Unnamed Road 3	Town of Innisfil	Paved Road	0.21
John Street	Town of Innisfil	Paved Road	0.46
Allan Street	Town of Innisfil	Paved Road	0.45
Sloan Circle Drive	Town of Innisfil	Paved Road	1.30
Cairns Gate	Town of Innisfil	Paved Road	0.22
Valley View Drive	Town of Innisfil	Paved Road	1.38
Gimby Crescent	Town of Innisfil	Paved Road	1.06
Meadowland Street	Town of Innisfil	Paved Road	1.54
Reive Blvd	Town of Innisfil	Paved Road	21.76
Line 13	Bradford-West Gwillumbury	Paved Road	3.35
Line 12	Bradford-West Gwillumbury	Paved Road	0.23
Kilkenny Trail	Bradford-West Gwillumbury	Paved Road	1.30
5 Sideroad (CR 53)	Simcoe County	Paved Road	20.17
10 Sideroad (CR 54)	Simcoe County	Paved Road	26.44
County Road 89	Simcoe County	Paved Road	16.14
County Road 4 (Yonge Street)	Simcoe County	Paved Arterial Road	26.04
Hwy 89	Ministry of Transportation	Paved Arterial Road	6.76
Hwy 400	Ministry of Transportation	Paved Arterial Road	74.69
		Total Roads to be Assessed	**309.57**
		TOTAL AFFECTED LANDS AND ROADS	**7,645.66**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # : **300038790**

Section Number = **MO1**
[1] Cost/Eq. Ha. from D/S = -
[2] Total Section Cost = $ 66,930

[3] Specific Costs and Flood Reduction Benefit

Total Specific Costs = -

Remainder to Assess = 66,930

[4] Normal Outlet 95 %

Normal Benefit and Direct Outlet 5 %

[5] Equiv't Area Drained = 7,682.00 Ha. @ $ 8.28 per Eq. Ha. for Normal Outlet = 63,580

[6] Remaining for Normal Benefit and Direct Outlet = 3,350

[7] Direct Outlet

15	Pt Lot 5	1833044 Ontario Ltd	uses 25%	10
1	S Pt Lot 5	Ministry Of Transportation	uses 50%	70
1	S Pt Lot 5	1665328 Ontario Ltd	uses 75%	70
15th Line		Town of Innisfil	uses 5%	-
Hwy 89		Ministry of Transportation	uses 45%	130
5 Sideroad (CR 53)		Simcoe County	uses 100%	80

Total of Direct Outlet = 360

[8] Remaining for Normal Benefit = 2,990

SUMMARY TABLE

CONC.	LOT	OWNER	Length Factor (LF)	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section										
15	Pt Lot 5	1833044 Ontario Ltd		4.94	-	1,260	-	10	-	1,270
1	S Pt Lot 5	Ministry Of Transportation		17.40	-	80	-	70	-	150
1	S Pt Lot 5	1665328 Ontario Ltd		11.15	-	1,420	-	70	-	1,490
15th Line		Town of Innisfil		5.60	-	60	-	-	-	60
Hwy 89		Ministry of Transportation		33.80	-	90	-	130	-	220
5 Sideroad (CR 53)		Simcoe County		9.20	-	80	-	80	-	160
[10] U/S of Section Lands										
1	S Pt Lot 4	D. Corbo	0.5	9.63	-	-	-	-	40	40
1	S Pt Lot 4	G. Snedden & L. D'aoust	0.5	0.44	-	-	-	-	-	-
1	Pt Lot 6	H. & G. White	0.5	0.33	-	-	-	-	-	-
1	S Pt Lot 6	H. Wallace	0.5	0.35	-	-	-	-	-	-
1	S Pt Lot 6	H. Dinh	0.5	0.25	-	-	-	-	-	-
1	S Pt Lot 6	T. Pham	0.4	0.26	-	-	-	-	-	-
1	S Pt Lot 6	Bell Canada	0.4	0.09	-	-	-	-	-	-
15	Pt Lot 6	Suncor Energy Inc	0.4	0.40	-	-	-	-	-	-
15	Pt Lot 6	J. Bucko	0.4	0.57	-	-	-	-	-	-
15	Pt Lot 6	C. & M. Carra	0.4	2.70	-	-	-	-	10	10
15	Pt Lot 5	2537878 Ontario Ltd	0.4	5.91	-	-	-	-	20	20
15	Pt Lot 5	Resquip Inc	0.4	7.20	-	-	-	-	20	20
15	Pt Lot 6	C. & M. Carra	0.4	2.67	-	-	-	-	10	10
15	W Pt Lot 5	ADF Investments Ltd	0.4	3.84	-	-	-	-	10	10
15	W Pt Lot 4	K. & S. Lotton	0.4	0.46	-	-	-	-	-	-
15	W Pt Lot 4	J. Lemoine	0.4	1.23	-	-	-	-	-	-
15	W Pt Lot 4	N. Ahmed & Q. Majoka	0.4	0.64	-	-	-	-	-	-
15	Pt Lot 4	M. & M. Pedneault	0.4	0.38	-	-	-	-	-	-
15	Pt Lot 4	G. & M. Cruz	0.4	0.81	-	-	-	-	-	-
15	Pt Lot 4	C. Kulesza	0.4	0.49	-	-	-	-	-	-
15	Plan M480	M. Colabella & D. Bravo	0.4	0.64	-	-	-	-	-	-
15	Plan M480	Ontario Stockyards Inc	0.4	12.60	-	-	-	-	40	40
15	Pt Lot 6	Suncor Energy Inc	0.4	2.31	-	-	-	-	10	10
15	Pt Lot 6	Suncor Energy Inc	0.4	0.11	-	-	-	-	-	-

[11] Sub - Total = $ 3,510
[12] Cumulative Total = $ 3,510
Cumulative Cost/Eq. Ha. carried U/S = **$ 8.28**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # : **300038790**

Section Number = **MO2**
[1] Cost/Eq. Ha. from D/S = 8.28
[2] Total Section Cost = $ 395,760

[3] Specific Costs	
Benefit for Lands with Flood Reduction in MO3	60,590
Total Specific Costs =	60,590

Remainder to Assess = 335,170

[4] Normal Outlet	85 %
Normal Benefit and Direct Outlet	15 %

[5] Equiv't Area Drained = 7463.47 Ha. @ $ 38.17 per Eq. Ha. for Normal Outlet = 284,890

[6] Remaining for Normal Benefit and Direct Outlet = 50,280

[7] Direct Outlet				
1	Pt Lot 6	A. Moir & H. Minns	uses 40%	430
1	N Pt Lot 6	2367808 Ontario Inc	uses 90%	880
Hwy 400		Ministry of Transporation	uses 100%	2,820
			Total of Direct Outlet =	4,130

*LF = length factor to be applied to per hectare rate of $ as calculated in [5]

[8] Remaining for Normal Benefit = 46,150

SUMMARY TABLE

CONC.	LOT	OWNER	Length Factor (LF)	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section										
1	Pt Lot 6	A. Moir & H. Minns		28.46	-	34,550	-	430	240	35,220
1	N Pt Lot 6	2367808 Ontario Inc		25.65	-	7,400	-	880	210	8,490
Hwy 400		Ministry of Transporation		73.85	-	4,200	-	2,820	610	7,630
[10] U/S of Section Lands										
1	S Pt Lot 2	Letizia Homes Ltd	0.5	13.21	-	-	-	-	360	360
1	S Pt Lot 3	2492140 Ontario Ltd	0.5	16.27	-	-	-	-	450	450
1	S Pt Lot 3	S. & P. Prim	0.5	3.58	-	-	-	-	100	100
1	S Pt Lot 4	D. Corbo	0.5	22.42	-	-	-	-	610	610
1	S Pt Lot 5	1665328 Ontario Ltd	0.5	4.63	-	-	-	-	130	130
1	Pt Lot 6	Ministry Of Transportation	0.5	3.30	-	-	-	-	90	90
1	Pt Lot 7	A. Moir & H. Minns	0.7	0.86	-	-	-	-	30	30
1	Pt Lot 7	Ministry Of Transportation	0.5	4.20	-	-	-	-	110	110
1	N Pt Lot 6	F. Rohani & R. Ghorabi	0.5	0.28	-	-	-	-	10	10
1	N Pt Lot 5	A. Posius	0.5	21.27	-	-	-	-	580	580
1	N Pt Lot 5	A. & M. Beattie	0.5	0.54	-	-	-	-	10	10
1	Pt Lot 4	Tack 2016 Ltd & 1442422 Ontario Ltd	0.5	3.61	-	-	-	-	100	100
1	N Pt Lot 3	Tack 2016 Ltd	0.5	22.09	-	-	-	-	600	600
1	Pt Lot 3	G. & B. Faggion	0.5	13.30	-	-	-	-	360	360
14	Pt Lots 7 & 8	Riocan Holdings (Tiy) Inc & 1633272 Alberta Ulc	0.5	5.88	-	-	-	-	160	160
15	Pt Lot 8	I. & M. De Sao Jose	0.5	0.40	-	-	-	-	10	10
Roads										
2nd Line		Town of Innisfil	1	0.66	-	-	-	-	30	30
5 Sideroad (CR 53)		Simcoe County	1	8.80	-	-	-	-	410	410
Reive Blvd		Town of Innisfil	1	13.48	-	-	-	-	630	630
County Road 89		Simcoe County	1	0.96	-	-	-	-	40	40

[11] Sub - Total = $ 56,160
[12] Cumulative Total = $ 59,670
Cumulative Cost/Eq. Ha. carried U/S = **$ 46.45**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project :	**South Innisfil Creek Drain - 2019 Improvement**	Section Number =	**MO3**
DATE :	**February 13, 2019**	**[1] Cost/Eq. Ha. from D/S =**	**46.45**
Project # :	**300038790**	**[2] Total Section Cost =**	**$ 97,480**

[3] Specific Costs and Flood Reduction Benefit

Clean out Hwy 400 Culvert (1) - 100% to MTO	**6,300**
Admin associated with Hwy 400 culvert cleanout	1,690
Clean out Reive Blvd. Culverts (3) - 100% to Town	**6,300**
Admin associated with Reive Blvd culvert cleanout	1,690
(Section 26) Additional Admin associated with Hydrologic and Hydraulic Modelling - MTO (Hwy 400)	**56,000**
(Section 26) Additional Admin associated with Hydrologic and Hydraulic Modelling - Town (Reive Blvd)	**19,000**

Lands with Flood Reduction Benefit Assessed in MO2 — Flood Reduction Benefit = **$ 1,000** / affected eq.ha

15	Pt Lot 8	I. & M. De Sao Jose	1.58	Lands Completely in PSW	-
1	S Pt Lot 7	Aqua-Gem Investments Ltd	21.40	Lands Partially in PSW	21,250
1	S Pt Lot 7	1045901 Ontario Ltd	2.76		2,760
14	N Pt Lot 9	G., G. & A. Gatti	2.80	Lands Completely in PSW	-
14	N Pt Lot 9	J. & J. Waz	2.16	Lands Completely in PSW	-
14	N Pt Lot 9	D., L., & T. Galati & A. Granato	1.58	Lands Completely in PSW	-
14	N Pt Lot 8	M. & I De Sao Jose	0.84	Lands Completely in PSW	-
14	N Pt Lot 8	A. & M. Cesta & R. & A. Babusci	1.51	Lands Completely in PSW	-
15	Pt Lot 8	Sisters Of Our Lady Mount	0.68		680
15	Pt Lot 8	Town of Innisfil	0.55	Lands Partially in PSW	500
15	Pt Lot 8	Sisters Of Our Lady Mount	0.93		930
15	Pt Lot 8	L. Lorusso	1.91		1,910
15	Pt Lot 9	Q. Woods	2.70	Lands Partially in PSW	1,700
15	W Pt Lot 9	Fairview Farms Holdings Inc	5.13	Lands Partially in PSW	4,110
15	Pt Lot 10	M. Toich	4.82		4,820
15	Pt Lot 10	T. Delahunt	3.26		2,610
15	Pt Lot 10	T. Kingsly	1.20		600
1	S Pt Lot 8	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	16.61	Lands Partially in PSW	12,740
1	Pt Lot 9	G., M. & W. Kemeny	0.73		730

Roads with Flood Reduction Benefit

Gilford Road	Town of Innisfil	2.47	Lands Completely in PSW	-
County Road 89	Simcoe County	5.25		5,250

Total Flood Benefit Assessed in MO2 =	60,590
Total Specific Costs =	151,570
Remainder to Assess in MO3 =	6,500

[4] Normal Outlet 75 %

Normal Benefit and Direct Outlet 25 %

[5] Equiv't Area Drained = 7,347.99 Ha. @ $ 0.66 per Eq. Ha. for Normal Outlet = 4,880

[6] Remaining for Normal Benefit and Direct Outlet = 1,620

[7] Direct Outlet

Reive Blvd	Town of Innisfil	uses 100%	10
Hwy 400	Ministry of Transporation	uses 75%	10
		Total of Direct Outlet =	20

[8] Remaining for Normal Benefit = 1,600

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
Reive Blvd		Town of Innisfil	13.04	7,990	1,040	**19,000**	10	610	28,650
Hwy 400		Ministry of Transporation	10.45	7,990	560	**56,000**	10	490	65,050
[10] U/S of Section Lands									
12	Pt S1/2 Lot 12	Simcoe County	20.28	-	-	-	-	960	960
12	S Pt Lot 11	I. & Z. Bloch	5.05	-	-	-	-	240	240
12	N Pt Lot 11	T. & B. Berneche	0.96	-	-	-	-	50	50
12	N Pt Lot 11	J. Koperwas	23.48	-	-	-	-	1,110	1,110
12	N Pt Lot 11	Simcoe County	6.30	-	-	-	-	300	300
12	N Pt Lot 12	M. Sheikh & A. Chaudary	32.27	-	-	-	-	1,520	1,520
12	N Pt Lot 12	M. & M. Grishaber	0.53	-	-	-	-	20	20
12	N Pt Lot 12	M. Goldenberg & S. Burns	0.37	-	-	-	-	20	20
12	N Pt Lot 13	Simcoe County	2.00	-	-	-	-	90	90
12	N Pt Lot 13	H. Boucher	0.73	-	-	-	-	30	30
12	N Pt Lot 13	C. & V. Duraes	0.55	-	-	-	-	30	30
12	N Pt Lot 13	R. & Y. Fortune	0.73	-	-	-	-	30	30
12	N Pt Lot 13	A. & M. Amaral	1.02	-	-	-	-	50	50
12	N Pt Lot 13	R. Whillier	1.10	-	-	-	-	50	50
12	Pt Lot 13	D. & N. Soldiuk	0.38	-	-	-	-	20	20
12	N Pt Lot 13	C. & M. Conceicao	4.02	-	-	-	-	190	190
13	S Pt Lot 13	M. & R. Fresco	1.63	-	-	-	-	80	80
13	S Pt Lot 13	Steiner Tree Farms Ltd	4.09	-	-	-	-	190	190
13	S Pt Lot 13	R. McKaigue	11.91	-	-	-	-	560	560
13	Pt Lot 13	Y. Dement	0.52	-	-	-	-	20	20
13	S Pt Lot 13	Eric's Right World of Scouting	2.41	-	-	-	-	110	110
13	S Pt Lot 13	J. & T. Lefler	0.72	-	-	-	-	30	30
13	S Pt Lot 13	T. Callacott & U. Walton	0.72	-	-	-	-	30	30
13	S Pt Lot 13	B. Ferguson	0.37	-	-	-	-	20	20
13	S Pt Lot 13	J. & K. Van Lierop	0.37	-	-	-	-	20	20
13	S Pt Lot 13	W. & D. Lawrence	0.35	-	-	-	-	20	20
13	S Pt Lot 11	M. Boddy	53.03	-	-	-	-	2,500	2,500
13	S Pt Lot 12	P. Abercrombie & S. Bruin	0.37	-	-	-	-	20	20
13	Pt Lot 11	J. Reilly & S. Tolley	10.55	-	-	-	-	500	500
13	Pt Lot 11	Y. Guo	10.13	-	-	-	-	480	480
13	Plan M649	Town of Bradford West Gwillimbury	0.69	-	-	-	-	30	30
13	Plan M649	R. & J. Burns	0.64	-	-	-	-	30	30
13	Plan M649	G. Gallo	0.64	-	-	-	-	30	30
13	Plan M649	M. & R. Zimmer	0.65	-	-	-	-	30	30
13	Plan M649	B. & M. Gentile	0.56	-	-	-	-	30	30
13	Plan M649	F. & P. Giusti	0.65	-	-	-	-	30	30
13	Plan M649	K. Brown	0.75	-	-	-	-	40	40
13	Plan M649	L. Gross	0.83	-	-	-	-	40	40
13	Plan 51M6	Q. Zhu Zhi & Y. Tang	0.69	-	-	-	-	30	30
13	Plan 51M6	J. & D. Taylor	0.70	-	-	-	-	30	30
13	Plan M649	S. & U. Kostuch	0.73	-	-	-	-	30	30
13	Plan M649	N. & A. Barroso	0.76	-	-	-	-	40	40
13	Plan M649	L. & P. Wade	0.64	-	-	-	-	30	30
13	Plan M649	D. & J. Ferragine	0.66	-	-	-	-	30	30
13	Plan M649	M. & T. Capuano	0.60	-	-	-	-	30	30
13	Plan M649	B. Ahmed	0.49	-	-	-	-	20	20
13	Plan M649	J. Muir-Birtles & G. Birtles	0.62	-	-	-	-	30	30
13	Plan M649	R. & N. Jackson	0.92	-	-	-	-	40	40
13	Plan M649	R. Sorbera-Colivas	0.57	-	-	-	-	30	30
13	Plan M649	C. Alarie	0.53	-	-	-	-	20	20
13	Plan M649	P. & Z. Zanet	0.63	-	-	-	-	30	30
13	Pt Lot 10	A. Man	4.02	-	-	-	-	190	190
1	S Pt Lot 7	Aqua-Gem Investments Ltd	21.40	21,250	-	-	-	1,010	22,260
1	S Pt Lot 7	1045901 Ontario Ltd	2.76	2,760	-	-	-	130	2,890
1	S Pt Lot 8	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	16.61	12,740	-	-	-	780	13,520
1	Pt Lot 9	G., M. & W. Kemeny	0.73	730	-	-	-	30	760
1	Pt Lot 11	R. & M. Burrows	0.29	-	-	-	-	10	10
1	Pt Lot 11	P., D., J., & M. Kosinec	0.17	-	-	-	-	10	10
1	S Pt Lot 11	G. & C. Zielke	3.45	-	-	-	-	160	160
1	S Pt Lot 11	K. & M. Zielke	0.41	-	-	-	-	20	20
1	S Pt Lot 12	E. Matchett	0.38	-	-	-	-	20	20
1	S Pt Lot 12	E. Matchett	0.32	-	-	-	-	20	20
1	S Pt Lot 12	K. & J. Matchett	10.86	-	-	-	-	510	510

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
1	S Pt Lot 13	J. & S. Kell	3.34	-	-	-	-	160	160
13	N Pt Lot 10	W. & T. Chen	3.87	-	-	-	-	180	180
13	N Pt Lot 10	G. & D. Kruger	0.23	-	-	-	-	10	10
13	N Pt Lot 10	P. & L. Plavic	0.42	-	-	-	-	20	20
13	N Pt Lot 10	A. Smith	3.61	-	-	-	-	170	170
13	N Pt Lot 10	J. & E. Blake	0.67	-	-	-	-	30	30
13	N Pt Lot 10	D. Decaro	4.62	-	-	-	-	220	220
13	N Pt Lot 11	P. & S. Silverthorne	9.62	-	-	-	-	450	450
13	N Pt Lot 11	A. Martin	4.71	-	-	-	-	220	220
13	N Pt Lot 11	R. White & D. Miedema	0.94	-	-	-	-	40	40
13	N Pt Lot 11	S. & L. McGuire	0.35	-	-	-	-	20	20
13	N Pt Lot 11	M. & D. Ridout	0.39	-	-	-	-	20	20
13	N Pt Lot 11	A. & C. Galati	0.34	-	-	-	-	20	20
13	N Pt Lot 11	W. Kapralik & M. Janz Est.	0.32	-	-	-	-	20	20
13	Pt Lot 11	S. Tustin & T. Ross	8.64	-	-	-	-	410	410
13	N Pt Lot 11	D. McGeachy	0.32	-	-	-	-	20	20
13	N Pt Lot 11	Y. Liao & Z. Li	6.59	-	-	-	-	310	310
13	N Pt Lot 12	S. & H. White	0.51	-	-	-	-	20	20
13	N Pt Lot 11	A. & P. Clitherow	1.25	-	-	-	-	60	60
13	Pt Lot 11	J. & R. Carvalhais	0.33	-	-	-	-	20	20
13	Pt Lot 11	P. & A. Clitherow	0.42	-	-	-	-	20	20
13	Pt Lot 12	M. Milekic	10.61	-	-	-	-	500	500
13	Pt Lot 12	M. & O. Milekic	0.73	-	-	-	-	30	30
13	N Pt Lot 12	R. Vandrie & R. Walsh	0.39	-	-	-	-	20	20
13	N Pt Lot 12	F. Semiao	11.08	-	-	-	-	520	520
13	N Pt Lot 12	R. Sturgeon	1.71	-	-	-	-	80	80
13	N Pt Lot 12	Beacon Street Entertainment	4.59	-	-	-	-	220	220
13	N 1/2 Lot 13	D. & R. Mattingley	0.99	-	-	-	-	50	50
13	N Pt Lot 13	Hasbrooke Holdings Ltd	14.72	-	-	-	-	690	690
14	S Pt Lot 15	W. & C. Procter	7.30	-	-	-	-	340	340
14	S Pt Lot 14	P & A Timbers & Sons	9.26	-	-	-	-	440	440
14	Pt Lot 14	E. & J. Samios	14.33	-	-	-	-	680	680
14	S Pt Lot 13	T. Sturgeon	40.19	-	-	-	-	1,890	1,890
14	S Pt Lot 12	H. Nunes	34.60	-	-	-	-	1,630	1,630
14	S Pt Lot 11	V. & R. Ibrajev	13.81	-	-	-	-	650	650
14	W Pt Lot 11	R. & S. Batsch	2.88	-	-	-	-	140	140
14	W Pt Lot 11	D. Kennedy Est. & G. Kennedy	1.01	-	-	-	-	50	50
14	W Pt Lot 11	D. & N. Forget	1.46	-	-	-	-	70	70
14	W Pt Lot 11	M. & B. Markowitz	2.96	-	-	-	-	140	140
14	W Pt Lot 11	C. Sun & P. Pov	2.41	-	-	-	-	110	110
14	Pt Lot 11	A. & D. Cianfarani	0.49	-	-	-	-	20	20
14	W Pt Lot 11	H., Z., & M. Tesic	3.21	-	-	-	-	150	150
14	S Pt Lot 10	D. & B. Jebb	19.38	-	-	-	-	910	910
14	S Pt Lot 10	P. & M. Barreira	0.11	-	-	-	-	10	10
14	S Pt Lot 9	J. Marques	1.90	-	-	-	-	90	90
14	S Pt Lot 9	2031430 Ontario Ltd	2.14	-	-	-	-	100	100
14	N Pt Lot 16	A. Lacquaniti	0.28	-	-	-	-	10	10
14	N Pt Lot 16	L. Webster	0.24	-	-	-	-	10	10
14	N Pt Lot 16	B. Kneeshaw	0.36	-	-	-	-	20	20
14	N Pt Lot 16	B. & J. Kneeshaw	0.38	-	-	-	-	20	20
14	N Pt Lot 16	L., R. & J. Kell	1.38	-	-	-	-	70	70
14	N Pt Lot 16	C. & L. Stovold	0.99	-	-	-	-	50	50
14	N Pt Lot 16	1402802 Ontario Inc	18.34	-	-	-	-	860	860
14	N Pt Lot 15	1402802 Ontario Inc	41.13	-	-	-	-	1,940	1,940
14	N Pt Lot 15	L. & M. Parsons	0.40	-	-	-	-	20	20
14	Pt N1/2 Lot 15	F. & K. Zielke	0.42	-	-	-	-	20	20
14	N Pt Lot 14	D. Zielke	42.52	-	-	-	-	2,000	2,000
14	N Pt Lot 13	L. & E. Kell	39.50	-	-	-	-	1,860	1,860
14	N Pt Lot 13	C. Kneeshaw	0.46	-	-	-	-	20	20
14	N Pt Lot 12	S. & K. Thavakumar & S. Janani	0.61	-	-	-	-	30	30
14	N Pt Lot 12	W. Steimle	29.56	-	-	-	-	1,390	1,390
14	Pt Lot 11	D. & A. Ostojic	15.74	-	-	-	-	740	740
14	N Pt Lot 11	K. & O. Kanevsky	2.56	-	-	-	-	120	120
14	W Pt Lot 11	S. Heinemann & C. Kim	2.17	-	-	-	-	100	100
14	W Pt Lot 11	J. & C. Evans	2.71	-	-	-	-	130	130
14	W Pt Lot 11	K. & S. MacRae	2.14	-	-	-	-	100	100
14	N Pt Lot 10	C. & V. Grande	6.26	-	-	-	-	290	290
14	Pt Lot 10	P. & L. Fenz & D. Leithwood	0.40	-	-	-	-	20	20
14	N Pt Lot 10	R. & C. Colonna & F. & V. Corbo	6.46	-	-	-	-	300	300
14	N Pt Lot 10	E. & A. Spina	6.84	-	-	-	-	320	320
14	N Pt Lot 9	C. Schiafone & A. Britton	2.72	-	-	-	-	130	130

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
14	N Pt Lot 9	G., G. & A. Gatti	2.80	-	-	-	-	130	130
14	N Pt Lot 9	J. & J. Waz	2.16	-	-	-	-	100	100
14	N Pt Lot 9	D., L., & T. Galati & A. Granato	1.58	-	-	-	-	70	70
14	N Pt Lot 8	M. & I De Sao Jose	0.84	-	-	-	-	40	40
14	N Pt Lot 8	A. & M. Cesta & R. & A. Babusci	1.51	-	-	-	-	70	70
15	Pt Lot 8	I. & M. De Sao Jose	1.58	-	-	-	-	70	70
15	Pt Lot 8	Sisters Of Our Lady Mount	0.68	680	-	-	-	30	710
15	Pt Lot 8	Town of Innisfil	0.55	500	-	-	-	30	530
15	Pt Lot 8	Sisters Of Our Lady Mount	0.93	930	-	-	-	40	970
15	Pt Lot 8	L. Lorusso	1.91	1,910	-	-	-	90	2,000
15	Pt Lot 9	Q. Woods	2.70	1,700	-	-	-	130	1,830
15	W Pt Lot 9	Fairview Farms Holdings Inc	5.13	4,110	-	-	-	240	4,350
15	Pt Lot 10	M. Toich	4.82	4,820	-	-	-	230	5,050
15	Pt Lot 10	T. Delahunt	3.26	2,610	-	-	-	150	2,760
15	Pt Lot 10	T. Kingsly	1.20	600	-	-	-	60	660
15	Pt Lot 10	J. Barber & D. Furtado	1.61	-	-	-	-	80	80
15	Pt Lot 10	Barbay Holdings Incorporated	2.12	-	-	-	-	100	100
15	Pt Lot 10	H. Ju	1.82	-	-	-	-	90	90
15	Pt Lot 11	Q. & A. Alam	5.40	-	-	-	-	250	250
15	Pt Lot 11	M. Fenech	0.43	-	-	-	-	20	20
15	Pt Lot 11	G. Bell	0.27	-	-	-	-	10	10
15	Pt Lot 11	S. & R. Kuzmyk	0.25	-	-	-	-	10	10
15	Pt Lot 11	V. Fava & D. Lombardi	1.48	-	-	-	-	70	70
15	Pt Lot 11	P. Hajdukiewicz	0.26	-	-	-	-	10	10
15	Pt Lot 11	B. Nemeth	1.66	-	-	-	-	80	80
15	Pt Lots 11 & 12	B. Arnold & M. Foley	1.30	-	-	-	-	60	60
15	Pt Lots 11 & 12	B. Bondi	0.81	-	-	-	-	40	40
15	Pt Lot 12	J. & T. Rautiainen	3.25	-	-	-	-	150	150
15	Pt Lot 12	F. & H. Pereira	1.41	-	-	-	-	70	70
15	Pt Lot 12	N. & J. Palazzo	0.28	-	-	-	-	10	10
15	Pt Lot 12	G. & R. Zielke	6.45	-	-	-	-	300	300
15	Pt Lot 13	Apoca Carpenters Ltd	9.38	-	-	-	-	440	440
15	W Pt Lot 13	F. & K. Commisso & J. Raposo	0.37	-	-	-	-	20	20
15	Pt Lot 13	A. & E. Auciello	0.69	-	-	-	-	30	30
15	Pt Lot 13	K. & B. Adams	0.27	-	-	-	-	10	10
15	Pt Lot 13	A. Venroy & D. Pagnan-Venroy	0.27	-	-	-	-	10	10
15	Pt Lots 13 & 14	L. & E. Kell	11.50	-	-	-	-	540	540
15	Pt Lot 14	N. & W. Harris	0.44	-	-	-	-	20	20
15	Pt Lots 13 & 14	Hydro One Networks Inc	0.18	-	-	-	-	10	10
15	Pt Lots 14 & 15	R. & D. Zielke	11.24	-	-	-	-	530	530
15	Pt Lot 15	R. & W. Graham	0.38	-	-	-	-	20	20
15	Pt Lots 14 & 15	R. Zielke	0.28	-	-	-	-	10	10
15	Pt Lot 15	J. McCullough	0.38	-	-	-	-	20	20
15	Pt Lot 15	K. & H. Kell	7.40	-	-	-	-	350	350
15	Pt Lot 15	Innpower Corporation	0.22	-	-	-	-	10	10
15	Pt Lot 15	2430683 Ontario Inc	0.43	-	-	-	-	20	20
15	Pt Lot 15	S. & B. Kim	0.37	-	-	-	-	20	20
15	Pt Lot 15	E. Ciotti	0.42	-	-	-	-	20	20
15	Pt Lot 15	Town of Innisfil	1.10	-	-	-	-	50	50
15	Pt Lot 15	Town of Innisfil	0.99	-	-	-	-	50	50
15	Pt Lot 15	J. & M. Read	0.38	-	-	-	-	20	20
15	Pt Lot 16	M. & V. Caporiccio	0.30	-	-	-	-	10	10
15	Pt Lot 16	1728299 Ontario Inc	0.18	-	-	-	-	10	10
15	Pt Lot 16	1385385 Ontario Inc	0.22	-	-	-	-	10	10
15	Pt Lot 16	Z. & E. Meir	0.40	-	-	-	-	20	20
Roads									
Gilford Road		Town of Innisfil	21.66	-	-	-	-	1,020	1,020
14th Line		Town of Innisfil	19.67	-	-	-	-	930	930
Line 13		Town of Bradford-West Gwillimbury	13.40	-	-	-	-	630	630
Line 12		Town of Bradford-West Gwillimbury	0.92	-	-	-	-	40	40
Kilkenny Trail		Town of Bradford-West Gwillimbury	5.20	-	-	-	-	250	250
10 Sideroad (CR 54)		Simcoe County	38.24	-	-	-	-	1,800	1,800
County Road 89		Simcoe County	57.16	5,250	-	-	-	2,690	7,940
County Road 4 (Yonge Stree		Simcoe County	16.50	-	-	-	-	780	780

[11] Sub - Total = $ 202,880

[12] Cumulative Total = $ 262,550

Cumulative Cost/Eq. Ha. carried U/S = **$ 47.12**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project : South Innisfil Creek Drain - 2019 Improvement — Section Number = **MO4**

DATE : February 13, 2019 — **[1] Cost/Eq. Ha. from D/S = 47.12**

Project # : 300038790 — **[2] Total Section Cost = $ 570,400**

[3] Specific Costs and Flood Reduction Benefit

Flood Reduction Benefit

Flood Reduction Benefit = **$ 1,000** / affected eq.ha

1	S Pt Lot 8	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	7.81	Lands Partially in PSW	5,990
1	Pt Lot 9	G., M. & W. Kemeny	15.10	Lands Partially in PSW	12,450
1	Pt Lot 9	G. Kemeny	11.66		11,660
1	S Pt Lot 9	1409563 Ontario Ltd	23.77		23,770
1	S Pt Lot 9	J. Yonge & R. Lee	6.70		6,700
1	S Pt Lot 10	S. Rudnisky	4.09		4,090
1	S Pt Lot 10	C. & S. Toich	3.87		3,870
1	Pt Lot 10	2204277 Ontario Ltd	11.50		11,500
1	Pt Lot 10	L & L Gardens Inc	1.48		1,480
1	Pt Lot 10	Marques Gardens Ltd	12.13		12,130
1	N Pt Lot 10	L. Radvanyi	11.93		11,930
1	N Pt Lot 10	S. Rudnisky	0.75		750
1	N Pt Lot 10	F. & M. Santos	0.85		850
1	N Pt Lot 9	Horodynsky Farms Inc	4.87		4,870
1	N Pt Lot 9	M. Kemeny	5.34	Lands Partially in PSW	2,970
1	N Pt Lot 8	J. Walewski & D. Kopec	8.45	Lands Partially in PSW	4,300
1	N Pt Lot 11	L & L Gardens Inc	19.93		19,930
1	S Pt Lot 10	L. & C. Fabiano	3.25		3,250
1	S Pt Lot 10	M. Toich	6.88		6,880
1	S Pt Lot 10	Y. Mark Est.	2.50		1,250
1	S Pt Lot 10	Y. Mark Est. & M. Maehara Est.	3.00		900
1	N Pt Lot 8	1523566 Ontario Ltd	20.32		20,320
1	N Pt Lot 7	Succession Financial Group Inc	34.15		34,150
1	N Pt Lot 11	L. & N. Tasca	22.10		22,100
2	S Pt Lot 8	A. & M. Filice	2.96		2,960
2	S Pt Lot 9	Cohn Farms Inc	3.01		3,010
2	S Pt Lot 9	Cohn Farms Inc	3.04		3,040
2	Pt Lot 9	M. & G. Bordon	1.40		1,400
2	Pt Lot 9	Marques Gardens Ltd	1.41		1,410
2	S Pt Lot 9	L. & N. Tasca	3.19		3,190
2	S Pt Lot 10	L. & N. Tasca	1.74		1,740
2	Pt W1/2 Lot 10	Marques Gardens Ltd	5.60		5,600
2	Pt Lot 10	Marques Gardens Ltd	9.08		9,080
2	S Pt Lot 11	Horodynsky Farms Inc	0.40		400
2	Pt Lots 11 & 12	1409563 Ontario Ltd	0.81		320

Roads with Flood Reduction Benefit

2nd Line	4.96	4,960
10 Sideroad (CR 54)	2.12	2,120

Total Specific Costs = 267,320

Remainder to Assess = 303,080

[4] Normal Outlet 65 %

Normal Benefit and Direct Outlet 35 %

[5] Equiv't Area Drained = 5402.16 Ha. @ $ 36.47 per Eq. Ha. for Normal Outlet = 197,000

[6] Remaining for Normal Benefit and Direct Outlet = 106,080

[7] Direct Outlet

1	N Pt Lot 7	Succession Financial Group Inc	uses 30%	370
1	N Pt Lot 8	1523566 Ontario Ltd	uses 80%	590
2nd Line		Town of Innisfil	uses 100%	970

Total of Direct Outlet = 1,930

*LF = length factor to be applied to per hectare rate of $ as calculated in [5]

[8] Remaining for Normal Benefit = 104,150

SUMMARY TABLE

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.25	Eq. A (ha) @ LF = 0.75	Eq. A (ha) @ LF = 1	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section												
1	N Pt Lot 7	Succession Financial Group Inc				34.15	34,150	56,360	-	370	1,610	92,490
1	N Pt Lot 8	1523566 Ontario Ltd				20.32	20,320	42,830	-	590	960	64,700
2nd Line		Town of Innisfil				26.73	4,960	4,960	-	970	1,260	12,150
[10] U/S of Section Lands												
1	S Pt Lot 8	S. DiCarlo, C. Vincenzo & Amalfi Construction Ltd	-	7.81	-	7.81	5,990	-	-	-	580	6,570
1	Pt Lot 9	G., M. & W. Kemeny	-	13.67	1.44	15.10	12,450	-	-	-	1,140	13,590
1	Pt Lot 11	R. & M. Burrows	-	2.66	-	2.66	-	-	-	-	200	200

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.25	Eq. A (ha) @ LF = 0.75	Eq. A (ha) @ LF = 1	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
1	Pt Lot 11	P., D., J., & M. Kosinec	-	2.69	-	2.69	-	-	-	-	200	200
1	S Pt Lot 11	G. & C. Zielke	-	5.71	2.00	7.71	-	-	-	-	590	590
1	S Pt Lot 12	K. & J. Matchett	-	10.77	16.14	26.91	-	-	-	-	2,150	2,150
1	S Pt Lot 13	J. & S. Kell	-	2.88	35.47	38.34	-	-	-	-	3,180	3,180
1	S Pt Lot 4	D. Corbo	0.81	-	-	0.81	-	-	-	-	50	50
1	N Pt Lot 6	2367808 Ontario Inc	12.98	-	-	12.98	-	-	-	-	730	730
1	N Pt Lot 5	A. Posius	16.21	-	-	16.21	-	-	-	-	910	910
1	Pt Lot 4	Tack 2016 Ltd & 1442422 Ontario Ltd	36.70	-	-	36.70	-	-	-	-	2,060	2,060
1	Pt Lot 4	M. Lang	0.48	-	-	0.48	-	-	-	-	30	30
1	N Pt Lot 3	Tack 2016 Ltd	3.97	-	-	3.97	-	-	-	-	220	220
2	S Pt Lot 2	A. & D. Tamburino	1.07	-	-	1.07	-	-	-	-	60	60
2	S Pt Lot 3	White Horse Investments Corp, Fresco Estates Ltd & 2088464 Ontario Ltd	40.37	-	-	40.37	-	-	-	-	2,270	2,270
2	Pt Lot 3	A. & N. Marcuzzi	0.28	-	-	0.28	-	-	-	-	20	20
2	S Pt Lot 4	674569 Ontario Ltd	13.80	-	-	13.80	-	-	-	-	780	780
2	S Pt Lot 4	D. & L. Mazanik	22.10	-	-	22.10	-	-	-	-	1,240	1,240
2	Pt Lot 4	V. Astrauskas & P. Spedaliere	0.37	-	-	0.37	-	-	-	-	20	20
2	S Pt Lot 5	H. & Y. Yoo	38.70	-	-	38.70	-	-	-	-	2,180	2,180
2	S Pt Lot 5	J. Quishpe Barros & V. Leon Pinos	0.42	-	-	0.42	-	-	-	-	20	20
2	Pt Lot 6	P S K Holdings Inc	20.78	-	-	20.78	-	-	-	-	1,170	1,170
2	Pt Lot 6	The Simpson/Elson Group	19.72	-	-	19.72	-	-	-	-	1,110	1,110
2	N Pt Lot 6	S. & I. Hussain	7.63	-	-	7.63	-	-	-	-	430	430
2	N Pt Lot 6	S. Pressey & H. Money	7.38	-	-	7.38	-	-	-	-	420	420
2	Pt Lot 6	Y. Tran & D. & L. Nguyen	4.31	-	-	4.31	-	-	-	-	240	240
2	N Pt Lot 6	L. & M. Barbosa	4.24	-	-	4.24	-	-	-	-	240	240
2	N Pt Lot 6	C. & A. Carpino	6.62	-	-	6.62	-	-	-	-	370	370
2	N Pt Lot 5	H. & M. Yoon	3.71	-	-	3.71	-	-	-	-	210	210
2	N Pt Lot 5	G. & A. Caubang	2.36	-	-	2.36	-	-	-	-	130	130
2	N Pt Lot 5	A. Krebs Est., H. Krebs & I. Krebs-Wickens	3.55	-	-	3.55	-	-	-	-	200	200
2	N Pt Lot 5	G. & Z. Grigoroff	3.77	-	-	3.77	-	-	-	-	210	210
2	N Pt Lot 5	H. Sieber	2.71	-	-	2.71	-	-	-	-	150	150
2	N Pt Lot 5	C. Nothrop	3.86	-	-	3.86	-	-	-	-	220	220
2	N Pt Lot 5	G. & S. Reilly	2.16	-	-	2.16	-	-	-	-	120	120
2	N Pt Lot 5	A. Scorziello	4.02	-	-	4.02	-	-	-	-	230	230
2	N Pt Lot 5	D. & C. Wilson	4.66	-	-	4.66	-	-	-	-	260	260
2	N Pt Lot 5	A. & D. Watt	4.62	-	-	4.62	-	-	-	-	260	260
2	N Pt Lot 4	P. & D. Meneguzzi	36.72	-	-	36.72	-	-	-	-	2,060	2,060
2	N Pt Lot 3	Farisland Ltd	22.30	-	-	22.30	-	-	-	-	1,250	1,250
2	N Pt Lots 2	J. & C. Faris	3.67	-	-	3.67	-	-	-	-	210	210
3	S Pt Lot 1	K. & V. Wardlaw	1.31	-	-	1.31	-	-	-	-	70	70
3	S Pt Lot 2	P. Wardlaw	13.81	-	-	13.81	-	-	-	-	780	780
3	S Pt Lot 3	J. Lukovits & A. Radocsai	38.66	-	-	38.66	-	-	-	-	2,170	2,170
3	S Pt Lot 4	M. Turner & J. Goncalves	10.28	-	-	10.28	-	-	-	-	580	580
3	S Pt Lot 4	Chapter Homes Inc	9.56	-	-	9.56	-	-	-	-	540	540
3	S Pt Lot 5	A. & D. Henry	20.81	-	-	20.81	-	-	-	-	1,170	1,170
3	S Pt Lot 6	E., E. & J. Rainey	10.42	-	-	10.42	-	-	-	-	590	590
3	N Pt Lot 5	1665328 Ontario Ltd	8.25	-	-	8.25	-	-	-	-	460	460
3	N Pt Lot 4	P. Wardlaw	58.76	-	-	58.76	-	-	-	-	3,300	3,300
3	N Pt Lot 4	G. Dougherty & J. Shortt	0.41	-	-	0.41	-	-	-	-	20	20
3	N Pt Lot 3	M., M., P. & M. Klymiuk	42.89	-	-	42.89	-	-	-	-	2,410	2,410
3	N Pt Lot 2	8325235 Canada Inc	42.16	-	-	42.16	-	-	-	-	2,370	2,370
3	N Pt Lot 1	P. Wardlaw	21.52	-	-	21.52	-	-	-	-	1,210	1,210
4	S Pt Lot 1	1553037 Ontario Ltd	3.56	-	-	3.56	-	-	-	-	200	200
4	S Pt Lot 1	N. Voutt	1.74	-	-	1.74	-	-	-	-	100	100
4	S Pt Lot 1	G. & C. Van Horne	3.18	-	-	3.18	-	-	-	-	180	180
4	S Pt Lot 1	L. & M. Camacho	1.91	-	-	1.91	-	-	-	-	110	110
4	S Pt Lot 1	P. Spring	8.53	-	-	8.53	-	-	-	-	480	480
4	S Pt Lot 1	A. Guido	7.27	-	-	7.27	-	-	-	-	410	410
4	S Pt Lot 2	M. & J. Spataro & J. Pontieri	9.08	-	-	9.08	-	-	-	-	510	510
4	S Pt Lot 2	4090 4th Line Inc	29.61	-	-	29.61	-	-	-	-	1,670	1,670
4	S Pt Lot 2	D. Congiusti	0.40	-	-	0.40	-	-	-	-	20	20
4	Pt Lot 3	E. Kippers & G. Merrall	1.75	-	-	1.75	-	-	-	-	100	100
4	Pt Lot 3	4090 4th Line Inc	70.68	-	-	70.68	-	-	-	-	3,970	3,970
4	S Pt Lot 4	D. & B. Marling	38.07	-	-	38.07	-	-	-	-	2,140	2,140
4	S Pt Lot 5	A. & A. Persico	18.31	-	-	18.31	-	-	-	-	1,030	1,030
4	N Pt Lot 5	S. & S. Jones	1.74	-	-	1.74	-	-	-	-	100	100
4	N Pt Lot 4	1402802 Ontario Inc & 2462228 Ontario Ltd	23.88	-	-	23.88	-	-	-	-	1,340	1,340
4	N Pt Lot 2	4090 4th Line Inc	30.03	-	-	30.03	-	-	-	-	1,690	1,690
4	N Pt Lot 2	R. Laforge	0.38	-	-	0.38	-	-	-	-	20	20
4	N Pt Lot 2	W. Laforge	0.39	-	-	0.39	-	-	-	-	20	20
4	N Pt Lot 1	J. & J. McCague	8.92	-	-	8.92	-	-	-	-	500	500
1	Pt Lot 9	G. Kemeny	-	11.66	-	11.66	11,660	-	-	-	870	12,530
1	S Pt Lot 9	1409563 Ontario Ltd	-	17.49	6.28	23.77	23,770	-	-	-	1,830	25,600
1	S Pt Lot 9	J. Yonge & R. Lee	-	6.70	-	6.70	6,700	-	-	-	500	7,200
1	S Pt Lot 10	S. Rudnisky	-	4.09	-	4.09	4,090	-	-	-	300	4,390
1	S Pt Lot 10	C. & S. Toich	-	3.87	-	3.87	3,870	-	-	-	290	4,160
1	S Pt Lot 10	L. & C. Fabiano	-	3.25	-	3.25	3,250	-	-	-	240	3,490
1	S Pt Lot 10	M. Toich	-	6.88	-	6.88	6,880	-	-	-	510	7,390
1	S Pt Lot 10	Y. Mark Est.	-	2.50	-	2.50	1,250	-	-	-	190	1,440
1	S Pt Lot 10	Y. Mark Est. & M. Maehara Est.	-	3.00	-	3.00	900	-	-	-	220	1,120
1	Pt Lots 10 & 11	M. Riley	-	6.59	-	6.59	-	-	-	-	490	490
1	Pt Lot 10	2204277 Ontario Ltd	-	3.22	8.28	11.50	11,500	-	-	-	930	12,430
1	Pt Lot 10	L & L Gardens Inc	-	0.34	1.14	1.48	1,480	-	-	-	120	1,600
1	Pt Lot 10	Marques Gardens Ltd	-	4.61	7.52	12.13	12,130	-	-	-	970	13,100
1	N Pt Lot 10	L. Radvanyi	-	3.94	7.99	11.93	11,930	-	-	-	960	12,890
1	N Pt Lot 10	S. Rudnisky	-	0.31	0.45	0.75	750	-	-	-	60	810
1	N Pt Lot 10	F. & M. Santos	-	0.21	0.63	0.85	850	-	-	-	70	920
1	N Pt Lot 9	Horodynsky Farms Inc	-	2.14	2.73	4.87	4,870	-	-	-	390	5,260
1	N Pt Lot 9	M. Kemeny	-	3.96	1.38	5.34	2,970	-	-	-	410	3,380
1	N Pt Lot 8	J. Walewski & D. Kopec	-	4.41	4.04	8.45	4,300	-	-	-	670	4,970
2	S Pt Lot 7	J. Armstrong	24.71	-	-	24.71	-	-	-	-	1,390	1,390
2	S Pt Lot 7	T. Armstrong	0.61	-	-	0.61	-	-	-	-	30	30
2	S Pt Lot 8	A. & M. Filice	-	-	2.96	2.96	2,960	-	-	-	250	3,210

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.25	Eq. A (ha) @ LF = 0.75	Eq. A (ha) @ LF = 1	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22)		Sec 24/26	OUTLET (Sec 23)		TOTAL
							Specific	Normal		Direct	Normal	
2	S Pt Lot 9	Cohn Farms Inc	-	-	3.01	3.01	3,010	-	-	-	250	3,260
2	S Pt Lot 9	Cohn Farms Inc	-	-	3.04	3.04	3,040	-	-	-	250	3,290
2	Pt Lot 9	M. & G. Bordon	-	-	1.40	1.40	1,400	-	-	-	120	1,520
2	Pt Lot 9	Marques Gardens Ltd	-	-	1.41	1.41	1,410	-	-	-	120	1,530
2	S Pt Lot 9	L. & N. Tasca	-	-	3.19	3.19	3,190	-	-	-	270	3,460
2	S Pt Lot 10	L. & N. Tasca	-	-	1.74	1.74	1,740	-	-	-	150	1,890
2	Pt W1/2 Lot 10	Marques Gardens Ltd	-	-	5.60	5.60	5,600	-	-	-	470	6,070
2	Pt Lot 10	Marques Gardens Ltd	-	-	9.08	9.08	9,080	-	-	-	760	9,840
2	N Pt Lot 7	Gmb Property Holding Company Ltd	4.75	-	-	4.75	-	-	-	-	270	270
1	Pt Lots 10 & 11	S. Malik & B. Awan	-	3.35	-	3.35	-	-	-	-	250	250
1	S Pt Lot 11	S. Elfassy	-	4.19	-	4.19	-	-	-	-	310	310
1	S Pt Lot 13	S. & S. Iemsisanith	-	-	0.44	0.44	-	-	-	-	40	40
1	S Pt Lot 14	R. & D. Long	-	-	0.38	0.38	-	-	-	-	30	30
1	S Pt Lot 14	D. Rose & B. Kell-Rose	-	-	21.15	21.15	-	-	-	-	1,770	1,770
1	S Pt Lot 15	K. & H. Kell	-	-	1.52	1.52	-	-	-	-	130	130
1	S Pt Lot 15	B. Kell-Rose & D. Rose	-	-	0.48	0.48	-	-	-	-	40	40
1	N Pt Lot 15	Kell Farms Ltd	-	-	17.09	17.09	-	-	-	-	1,430	1,430
1	Pt Lot 14	Kell Farms Ltd	-	-	40.02	40.02	-	-	-	-	3,340	3,340
1	N Pt Lot 13	D. Sawyer	-	-	59.40	59.40	-	-	-	-	4,960	4,960
1	N Pt Lot 12	D., B. & W. Sawyer	-	-	24.81	24.81	-	-	-	-	2,070	2,070
1	N Pt Lot 11	L. & N. Tasca	-	0.61	21.49	22.10	22,100	-	-	-	1,840	23,940
1	N Pt Lot 11	L & L Gardens Inc	-	3.79	16.14	19.93	19,930	-	-	-	1,630	21,560
2	S Pt Lot 11	Horodynsky Farms Inc	-	-	0.40	0.40	400	-	-	-	30	430
2	Pt Lots 11 & 12	1409563 Ontario Ltd	-	-	0.81	0.81	320	-	-	-	70	390
2	S Pt Lot 12	M. Galloro	-	-	0.73	0.73	-	-	-	-	60	60
2	S Pt Lot 12	F. Galloro	-	-	2.64	2.64	-	-	-	-	220	220
2	S Pt Lot 12	M. Tesic	-	-	1.43	1.43	-	-	-	-	120	120
2	S Pt Lot 13	F. Gammicchia	-	-	1.71	1.71	-	-	-	-	140	140
2	S Pt Lot 13	B. Watman	-	-	1.42	1.42	-	-	-	-	120	120
2	S Pt Lot 13	R. & B. Badstober	-	-	1.73	1.73	-	-	-	-	140	140
2	S Pt Lot 13	K. Kell	-	-	8.59	8.59	-	-	-	-	720	720
2	Lot 14	Innis Properties Ltd	-	-	29.24	29.24	-	-	-	-	2,440	2,440
2	S Pt Lot15	E. Rosenberg	-	-	2.26	2.26	-	-	-	-	190	190
Roads												
4th Line		Town of Innisfil	19.36	-	-	19.36	-	-	-	-	1,090	1,090
3rd Line		Town of Innisfil	11.90	-	-	11.90	-	-	-	-	670	670
Reive Blvd		Town of Innisfil	15.84	-	-	15.84	-	-	-	-	890	890
5 Sideroad (CR 53)		Simcoe County	21.72	-	-	21.72	-	-	-	-	1,220	1,220
10 Sideroad (CR 54)		Simcoe County	-	9.04	6.80	15.84	2,120	-	-	-	1,240	3,360
County Road 89		Simcoe County	-	-	6.44	6.44	-	-	-	-	540	540
Hwy 400		Ministry of Transporation	64.30	-	-	64.30	-	-	-	-	3,620	3,620

[11] Sub - Total = $ 481,320
[12] Cumulative Total = $ 743,870
Cumulative Cost/Eq. Ha. carried U/S = **$ 83.59**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project : **South Innisfil Creek Drain - 2019 Improvement** Section Number = **MO5**
DATE : **February 13, 2019** **[1] Cost/Eq. Ha. from D/S = 83.59**
Project # : **300038790** **[2] Total Section Cost = $ 121,350**

[3] Specific Costs and Flood Reduction Benefit

Clean out 2nd Line Bridge - 100% to Town				**3,150**
Admin associated with 2nd Line Bridge Cleanout				840
Properties with Flood Reduction Benefit			Flood Reduction Benefit = **$ 1,000** / affected eq.ha	
2 S Pt Lot 8	P. Chiodo	9.53		9,530

Total Specific Costs = 13,520

Remainder to Assess = 107,830

[4] Normal Outlet	50 %
Normal Benefit and Direct Outlet	50 %

[5] Equiv't Area Drained = 4,600.62 Ha. @ $ 11.72 per Eq. Ha. for Normal Outlet = 53,920

[6] Remaining for Normal Benefit and Direct Outlet = 53,910

[7] Direct Outlet

2	S Pt Lot 8	P. Chiodo	uses 55%	60
2nd Line		Town of Innisfil	uses 10%	20

Total of Direct Outlet = 80

[8] Remaining for Normal Benefit = 53,830

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
2	S Pt Lot 8	P. Chiodo	9.53	9,530	48,180	-	60	800	58,570
2nd Line		Town of Innisfil	16.17	3,990	5,650		20	1,350	11,010
[10] U/S of Section Lands									
2	N Pt Lot 6	S. & I. Hussain	2.18	-	-	-	-	210	210
3	S Pt Lot 5	A. & D. Henry	19.51	-	-	-	-	1,860	1,860
3	S Pt Lot 5	H. La Page	0.90	-	-	-	-	90	90
3	S Pt Lot 6	S. Wheeler	0.28	-	-	-	-	30	30
3	S Pt Lot 6	E., E. & J. Rainey	24.69	-	-	-	-	2,350	2,350
3	N Pt Lot 6;	S., T., M., & N. Ferrazzo	12.46	-	-	-	-	1,190	1,190
3	N Pt Lot 6;	Armking & Company Ltd	3.95	-	-	-	-	380	380
3	N Pt Lot 6	L. Taylor	0.40	-	-	-	-	40	40
3	Pt Lot 6	A. & O. Posterniak	4.28	-	-	-	-	410	410
3	Pt Lot 6	G. & M. Ioannou	6.08	-	-	-	-	580	580
3	Pt Lot 6	J. Rampodarat & T. Tirbeni	6.14	-	-	-	-	590	590
3	Pt Lot 6	M. Frasca	5.38	-	-	-	-	510	510
3	N Pt Lot 5	M. Gelfand & E. Kull	0.30	-	-	-	-	30	30
3	N Pt Lot 5	United Bethesda Cemetery	0.32	-	-	-	-	30	30
3	N Pt Lot 5	S. & L. Hill	0.46	-	-	-	-	40	40
3	N Pt Lot 5	L. Hill	0.21	-	-	-	-	20	20
3	N Pt Lot 5	1665328 Ontario Ltd	27.90	-	-	-	-	2,660	2,660
4	S Pt Lot 5	A. & A. Persico	20.88	-	-	-	-	1,990	1,990
4	S Pt Lot 6	1665328 Ontario Ltd	35.95	-	-	-	-	3,430	3,430
4	S Pt Lot 6	J. Metcalfe	0.77	-	-	-	-	70	70

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
4	Pt Lot 6	Ministry Of Transportation	46.70	-	-	-	-	4,450	4,450
4	Pt Lot 6	Town of Innisfil	0.10	-	-	-	-	10	10
4	N Pt Lot 5	S. & S. Jones	32.41	-	-	-	-	3,090	3,090
4	N Pt Lot 5	W. & L. Jones	0.64	-	-	-	-	60	60
4	N Pt Lot 4	02802 Ontario Inc & 2462228 Ontario I	13.62	-	-	-	-	1,300	1,300
5	Pt Lots 3 & 4	1715573 Ontario Ltd	1.66	-	-	-	-	160	160
5	S Pt Lot 5	1715573 Ontario Ltd	13.83	-	-	-	-	1,320	1,320
5	Pt S1/2 Lot 5	G. & L. Kenyon & M. & K. Slessor	0.35	-	-	-	-	30	30
5	S Pt Lot 6	S. & J. Pearson & E. McLachlin	11.24	-	-	-	-	1,070	1,070
5	S Pt Lot 6	1715573 Ontario Inc. Trustee	10.96	-	-	-	-	1,040	1,040
2	S Pt Lot 7	J. Armstrong	4.66	-	-	-	-	440	440
2	S Pt Lot 8	S. Handy	9.93	-	-	-	-	950	950
2	N Pt Lot 8	Elbertain Corporation	13.87	-	-	-	-	1,320	1,320
2	Pt Lot 7	B. Jolie	0.48	-	-	-	-	50	50
2	N Pt Lot 7	J. & D. Lacroix	0.39	-	-	-	-	40	40
2	N Pt Lot 7	Gmb Property Holding Company Ltd	23.14	-	-	-	-	2,210	2,210
3	S Pt Lot 7	1665328 Ontario Ltd	23.78	-	-	-	-	2,270	2,270
3	Pt Lot 8	1665328 Ontario Ltd	1.56	-	-	-	-	150	150
3	W Pt Lot 8	1665328 Ontario Ltd	17.20	-	-	-	-	1,640	1,640
3	N Pt Lot 7	J. & M. Albanese	12.66	-	-	-	-	1,210	1,210
3	N Pt Lot 7	M. & U. Mauti	15.06	-	-	-	-	1,440	1,440
4	S Pt Lot 7	Gdm Terraco Inc	10.66	-	-	-	-	1,020	1,020
4	S Pt Lot 7	Franline Investments Ltd	4.98	-	-	-	-	470	470
4	N Pt Lot 7	1665328 Ontario Ltd	16.46	-	-	-	-	1,570	1,570
5	S Pt Lot 7	H. & C. Van Der Mast	4.96	-	-	-	-	470	470
Roads									
5th Line		Town of Innisfil	11.84	-	-	-	-	1,130	1,130
4th Line		Town of Innisfil	13.48	-	-	-	-	1,280	1,280
3rd Line		Town of Innisfil	3.12	-	-	-	-	300	300
Reive Blvd		Town of Innisfil	44.68	-	-	-	-	4,260	4,260
5 Sideroad (CR 53)		Simcoe County	24.80	-	-	-	-	2,360	2,360
Hwy 400		Ministry of Transporation	137.20	-	-	-	-	13,080	13,080

[11] Sub - Total = $ 136,280
[12] Cumulative Total = $ 880,150
Cumulative Cost/Eq. Ha. carried U/S = **$ 95.30**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # : **300038790**

Section Number = **MO6**
[1] Cost/Eq. Ha. from D/S = 95.30
[2] Total Section Cost = $ 1,011,293

[3] Properties with Flood Reduction Benefit — Flood Reduction Benefit = **$ 1,000** / affected eq.ha

2	S Pt Lot 8	A. & M. Filice	12.38	12,380
2	S Pt Lot 9	Cohn Farms Inc	7.02	7,020
2	S Pt Lot 9	Cohn Farms Inc	7.10	7,100
2	Pt Lot 9	M. & G. Bordon	0.03	30
2	Pt Lot 9	Marques Gardens Ltd	7.41	7,410
2	S Pt Lot 9	L. & N. Tasca	7.10	7,100
2	S Pt Lot 10	L. & N. Tasca	3.53	3,530
2	Pt W1/2 Lot 10	Marques Gardens Ltd	7.82	7,820
2	Pt Lot 10	Marques Gardens Ltd	10.09	10,090
2	S Pt Lot 11	Horodynsky Farms Inc	19.77	17,790
2	Pt Lots 11 & 12	1409563 Ontario Ltd	24.87	2,490
2	Pt Lot 10	1409563 Ontario Ltd	10.19	10,190
2	W Pt Lot 10	Horodynsky Farms Inc	11.42	11,420
2	N Pt Lot 10	G. & R. Sciara & P. & L. Digiantomasso	8.97	8,970
2	N Pt Lot 9	B. Horodynsky	10.10	10,100
2	N Pt Lot 9	1409563 Ontario Ltd	19.88	19,880
2	Pt Lot 9	J. & S. Cestaric	0.34	340
2	N Pt Lot 9	I. Canton & L. & E. Trevisan	10.12	10,120
2	N Pt Lot 8	I. & H. Mora	5.01	5,010
2	N Pt Lot 8	M., H. & S. Fernandes	4.51	2,260
2	N Pt Lot 8	C. & C. Zylstra	2.52	500
2	N Pt Lot 12	Horodynsky Farms Inc	5.32	3,720
2	N Pt Lot 12	P. & K. Horodynsky	5.64	5,640
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	6.18	6,180
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	6.30	6,300
2	N Pt Lot 11	1281597 Ontario Inc	18.51	18,510

Roads with Flood Reduction Benefit

10 Sideroad (CR 54)	0.7	700

Total Specific Costs = 202,600

Remainder to Assess = 808,693

[4] Normal Outlet	45 %
Normal Benefit and Direct Outlet	55 %

[5] Equiv't Area Drained = 3,808.54 Ha. @ $ 95.55 per Eq. Ha. for Normal Outlet = 363,910

[6] Remaining for Normal Benefit and Direct Outlet = 444,780

[7] Direct Outlet

2	S Pt Lot 8	A. & M. Filice	uses 10%	120
2	S Pt Lot 9	Cohn Farms Inc	uses 20%	130
2	S Pt Lot 9	Cohn Farms Inc	uses 30%	200
2	Pt Lot 9	M. & G. Bordon	uses 35%	10
2	Pt Lot 9	Marques Gardens Ltd	uses 40%	280
2	S Pt Lot 9	L. & N. Tasca	uses 45%	310
2	S Pt Lot 10	L. & N. Tasca	uses 60%	200
2	Pt W1/2 Lot 10	Marques Gardens Ltd	uses 75%	560
2	Pt Lot 10	Marques Gardens Ltd	uses 90%	870
10 Sideroad (CR 54)		Simcoe County	uses 100%	620

Total of Direct Outlet = 3,300

*LF = length factor to be applied to per hectare rate of $ as calculated in [5]

[8] Remaining for Normal Benefit = 441,480

SUMMARY TABLE										
CONC.	LOT	OWNER	Length Factor (LF)	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section										
2	S Pt Lot 8	A. & M. Filice		12.38	12,380	67,970	-	120	1,180	81,650
2	S Pt Lot 9	Cohn Farms Inc		7.02	7,020	36,310	-	130	670	44,130
2	S Pt Lot 9	Cohn Farms Inc		7.10	7,100	33,430	-	200	680	41,410
2	Pt Lot 9	M. & G. Bordon		0.03	30	8,860	-	10	10	8,910
2	Pt Lot 9	Marques Gardens Ltd		7.41	7,410	34,980	-	280	710	43,380
2	S Pt Lot 9	L. & N. Tasca		7.10	7,100	68,850	-	310	680	76,940
2	S Pt Lot 10	L. & N. Tasca		3.53	3,530	44,500	-	200	340	48,570
2	Pt W1/2 Lot 10	Marques Gardens Ltd		7.82	7,820	50,040	-	560	750	59,170
2	Pt Lot 10	Marques Gardens Ltd		10.09	10,090	75,940	-	870	960	87,860
10 Sideroad (CR 54)		Simcoe County		6.48	700	20,600	-	620	620	22,540
[10] U/S of Section Lands										
2	Pt Lot 10	1409563 Ontario Ltd	1	10.19	10,190	-	-	-	1,940	12,130
2	W Pt Lot 10	Horodynsky Farms Inc	0.7	11.42	11,420	-	-	-	1,850	13,270
2	N Pt Lot 10	G. & R. Sciara & P. & L. Digiantomasso	0.7	8.97	8,970	-	-	-	1,450	10,420
2	N Pt Lot 9	B. Horodynsky	0.7	10.10	10,100	-	-	-	1,640	11,740
2	N Pt Lot 9	1409563 Ontario Ltd	0.7	19.88	19,880	-	-	-	3,220	23,100
2	Pt Lot 9	J. & S. Cestaric	0.7	0.34	340	-	-	-	60	400
2	N Pt Lot 9	I. Canton & L. & E. Trevisan	0.7	10.12	10,120	-	-	-	1,640	11,760
2	N Pt Lot 8	I. & H. Mora	0.7	5.01	5,010	-	-	-	810	5,820
2	N Pt Lot 8	M., H. & S. Fernandes	0.7	4.51	2,260	-	-	-	730	2,990
2	N Pt Lot 8	C. & C. Zylstra	0.7	2.52	500	-	-	-	410	910
2	N Pt Lot 8	Elbertain Corporation	0.7	5.99	-	-	-	-	970	970
2	S Pt Lot 11	Horodynsky Farms Inc	1	19.77	17,790	-	-	-	3,770	21,560
2	Pt Lots 11 & 12	1409563 Ontario Ltd	1	24.87	2,490	-	-	-	4,750	7,240
2	S Pt Lot 12	M. Galloro	1	1.86	-	-	-	-	350	350
2	S Pt Lot 12	F. Galloro	1	0.61	-	-	-	-	120	120
2	S Pt Lot 12	M. Tesic	1	0.74	-	-	-	-	140	140
2	S Pt Lot 13	F. Gammicchia	1	1.82	-	-	-	-	350	350
2	S Pt Lot 13	B. Watman	1	1.11	-	-	-	-	210	210
2	S Pt Lot 13	R. & B. Badstober	1	1.41	-	-	-	-	270	270
2	S Pt Lot 13	K. Kell	1	6.31	-	-	-	-	1,200	1,200
2	Lot 14	Innis Properties Ltd	1	18.75	-	-	-	-	3,580	3,580
2	N Pt Lot 13	D. Evers	1	0.53	-	-	-	-	100	100
2	N Pt Lot 13	T. Risi	1	0.49	-	-	-	-	90	90
2	N Pt Lot 13	T., Q. & M. Palmieri	1	0.95	-	-	-	-	180	180
2	N Pt Lot 13	O. & R. Goncalves	1	0.81	-	-	-	-	150	150
2	N Pt Lot 13	K. Yamamoto	1	1.66	-	-	-	-	320	320
2	N Pt Lot 12	D. & I. Chouryguine	1	0.69	-	-	-	-	130	130
2	N Pt Lot 12	S. Sharma	1	0.47	-	-	-	-	90	90
2	N Pt Lot 12	J. Horodynsky	1	0.54	-	-	-	-	100	100
2	N Pt Lot 12	1281597 Ontario Inc	1	2.98	-	-	-	-	570	570
2	N Pt Lot 12	Horodynsky Farms Inc	1	5.32	3,720	-	-	-	1,020	4,740
2	N Pt Lot 12	P. & K. Horodynsky	1	5.64	5,640	-	-	-	1,080	6,720
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	1	6.18	6,180	-	-	-	1,180	7,360
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	1	6.30	6,300	-	-	-	1,200	7,500
2	N Pt Lot 11	1281597 Ontario Inc	1	18.51	18,510	-	-	-	3,530	22,040

[11] Sub - Total = $ 693,180
[12] Cumulative Total = $ 1,573,330
Cumulative Cost/Eq. Ha. carried U/S = $ **190.86**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project :	**South Innisfil Creek Drain - 2019 Improvement**	Section Number =	**MO7**
DATE :	**February 13, 2019**	**[1] Cost/Eq. Ha. from D/S =**	**190.86**
Project # :	**300038790**	**[2] Total Section Cost = $**	**328,560**

[3] Specific Costs and Flood Reduction Benefit

Clean out 10 Sideroad Bridge - 100% to County				**3,150**
Admin associated with 10 Sideroad Bridge Cleanout				840
Clean out 3rd Line Bridge - 100% to Town				**3,150**
Admin associated with 3rd Line Bridge Cleanout				840

Properties with Flood Reduction Benefit — Flood Reduction Benefit = **$ 1,000** / affected eq.ha

2	N Pt Lot 12	Horodynsky Farms Inc	4.72	1,420
2	N Pt Lot 12	P. & K. Horodynsky	4.33	4,330
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	4.12	4,120
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	3.70	3,700
2	N Pt Lot 11	1281597 Ontario Inc	2.49	2,490
2	N Pt Lot 10	Horodynsky Farms Inc	10.23	10,230
3	Pt Lot 10	A. Fox & B. Scott	4.42	4,420
3	Pt Lot 9	1409563 Ontario Ltd	18.47	1,850
3	S Pt Lot 10	K. Levy	2.75	2,750
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	2.20	1,980
3	S Pt Lot 10	Y. Cil	2.09	1,250
3	Pt Lot 10	J. Chow	52.92	5,290
3	S Pt Lot 11	H. & M. Yoon	0.59	60

Roads with Flood Reduction Benefit

10 Sideroad (CR 54)	2.12	2,120
3rd Line	2.47	2,470

Total Specific Costs = 56,460

Remainder to Assess = 272,100

[4] Normal Outlet	40 %
Normal Benefit and Direct Outlet	60 %

[5] Equiv't Area Drained = 3,543.82 Ha. @ $ 30.71 per Eq. Ha. for Normal Outlet = 108,840

[6] Remaining for Normal Benefit and Direct Outlet = 163,260

[7] Direct Outlet

2	N Pt Lot 10	Horodynsky Farms Inc	uses 40%	130
2	N Pt Lot 11	1281597 Ontario Inc	uses 90%	70
10 Sideroad (CR 54)		Simcoe County	uses 50%	320
3rd Line		Town of Innisfil	uses 100%	1,160

Total of Direct Outlet = 1,680

[8] Remaining for Normal Benefit = 161,580

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
2	N Pt Lot 10	Horodynsky Farms Inc	10.23	10,230	71,870	-	130	1,950	84,180
2	N Pt Lot 11	1281597 Ontario Inc	2.49	2,490	17,520	-	70	480	20,560
10 Sideroad (CR 54)		Simcoe County	20.52	6,110	69,350	-	320	3,920	79,700
3rd Line		Town of Innisfil	37.77	6,460	2,830	-	1,160	7,210	17,660
[10] U/S of Section Lands									
2	Lot 14	Innis Properties Ltd	25.92	-	-	-	-	5,740	5,740
2	N Pt Lot 13	D. Evers	3.17	-	-	-	-	700	700
2	N Pt Lot 13	T. Risi	2.37	-	-	-	-	530	530
2	N Pt Lot 13	T., Q. & M. Palmieri	3.31	-	-	-	-	730	730
2	N Pt Lot 13	O. & R. Goncalves	2.78	-	-	-	-	620	620
2	N Pt Lot 13	K. Yamamoto	4.65	-	-	-	-	1,030	1,030
2	N Pt Lot 12	D. & I. Chouryguine	1.17	-	-	-	-	260	260
2	N Pt Lot 12	S. Sharma	1.42	-	-	-	-	310	310
2	N Pt Lot 12	J. Horodynsky	1.32	-	-	-	-	290	290
2	N Pt Lot 12	1281597 Ontario Inc	2.98	-	-	-	-	660	660
2	N Pt Lot 12	Horodynsky Farms Inc	4.72	1,420	-	-	-	1,050	2,470
2	N Pt Lot 12	P. & K. Horodynsky	4.33	4,330	-	-	-	960	5,290
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	4.12	4,120	-	-	-	910	5,030
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	3.70	3,700	-	-	-	820	4,520
3	S Pt Lot 7	1665328 Ontario Ltd	8.49	-	-	-	-	1,880	1,880
3	S Pt Lot 8	J. Petropoulos	0.52	-	-	-	-	120	120
3	W Pt Lot 8	D. Oshell & D. McLachlan	0.28	-	-	-	-	60	60
3	S Pt Lot 8	G. Dermott	0.27	-	-	-	-	60	60
3	Pt Lot 9	A. & J. Mormile	19.70	-	-	-	-	4,360	4,360
3	Pt Lot 9	M. Assadian & L. Desroche	21.43	-	-	-	-	4,750	4,750
3	Pt Lot 9	1409563 Ontario Ltd	18.47	1,850	-	-	-	4,090	5,940
3	S Pt Lot 10	K. Levy	2.75	2,750	-	-	-	610	3,360
3	Pt Lot 10	A. Fox & B. Scott	4.42	4,420	-	-	-	980	5,400
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	2.20	1,980	-	-	-	490	2,470
3	S Pt Lot 10	Y. Cil	2.09	1,250	-	-	-	460	1,710
3	Pt Lot 10	J. Chow	52.92	5,290	-	-	-	11,730	17,020
3	N Pt Lot 10	H. & A. Perkins	1.06	-	-	-	-	230	230
3	Pt Lot 10	H. Squibb	7.77	-	-	-	-	1,720	1,720
3	N Pt Lot 9	J. & P. Wilson	8.41	-	-	-	-	1,860	1,860
3	N Pt Lot 9	C. & M. Cialone	8.32	-	-	-	-	1,840	1,840
3	Pt Lot 8	P. & C. Woods	10.05	-	-	-	-	2,230	2,230
3	Pt Lot 8	1665328 Ontario Ltd	25.92	-	-	-	-	5,740	5,740
3	Pt Lot 8	G. & M. Reynolds	1.00	-	-	-	-	220	220
3	Pt Lot 8	B. & V. Cestaric	0.29	-	-	-	-	60	60
3	W Pt Lot 8	1665328 Ontario Ltd	21.34	-	-	-	-	4,730	4,730
3	N Pt Lot 7	J. & M. Albanese	6.42	-	-	-	-	1,420	1,420
4	S Pt Lot 7	Gdm Terraco Inc	1.45	-	-	-	-	320	320
4	S Pt Lot 7	Franline Investments Ltd	7.79	-	-	-	-	1,730	1,730
4	S Pt Lot 7	F. & N. Grillo	9.91	-	-	-	-	2,200	2,200
4	Pt Lots 8 & 9	V. & D. Posius	55.65	-	-	-	-	12,330	12,330
4	Pt Lot 8	S. Khan	0.23	-	-	-	-	50	50
4	S Pt Lot 9	Sil Developments Inc, R. Zaretsky & S. Soudack	19.33	-	-	-	-	4,280	4,280
4	S Pt Lot 9	J. & D. Thew	0.40	-	-	-	-	90	90
4	S Pt Lot 10	P. Pillitteri	37.00	-	-	-	-	8,200	8,200
4	N Pt Lot 10	P. Pillitteri	2.72	-	-	-	-	600	600
4	N Pt Lot 9	D. Lucas	19.65	-	-	-	-	4,350	4,350
4	N Pt Lot 8	Franline Investments Ltd	16.42	-	-	-	-	3,640	3,640
4	N Pt Lot 7	1665328 Ontario Ltd	1.45	-	-	-	-	320	320
1	N Pt Lot 17	J. Drybrough	8.14	-	-	-	-	1,800	1,800
1	N Pt Lot 16	Clements Cemetary	0.40	-	-	-	-	90	90
1	N Pt Lot 16	Kell Farms Ltd	14.35	-	-	-	-	3,180	3,180
1	N Pt Lot 15	Kell Farms Ltd	13.00	-	-	-	-	2,880	2,880
2	S Pt Lot15	E. Rosenberg	21.98	-	-	-	-	4,870	4,870
2	S Pt Lot 15	1916013 Ontario Inc	15.18	-	-	-	-	3,360	3,360
2	S Pt Lot 15	G. Kalcic & L. Esau	0.58	-	-	-	-	130	130
2	S Pt Lot 16	K. & L. Sparrow	0.62	-	-	-	-	140	140
2	S Pt Lot 16	A. Giaconelli & H. Luzius	0.63	-	-	-	-	140	140
2	S Pt Lot 16	R. Simpson	35.95	-	-	-	-	7,970	7,970
2	Pt Lot 16	L. Rumble	0.46	-	-	-	-	100	100
2	S Pt Lot 17	N. & G. Sturgeon	9.55	-	-	-	-	2,120	2,120
2	Pt Lot 17 & N Pt Lot 18	Kell Farms Ltd	42.29	-	-	-	-	9,370	9,370

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
2	Pt Lot 16	I. & M. Campbell	0.19	-	-	-	-	40	40
2	N Pt Lot 16	I. & M. Campbell	33.34	-	-	-	-	7,390	7,390
2	N Pt Lot 16	D. Cuneen	0.52	-	-	-	-	120	120
2	N Pt Lot 16	B. & R. Zendelek	4.88	-	-	-	-	1,080	1,080
2	N Pt Lot 15	G. & M. Thompson	17.20	-	-	-	-	3,810	3,810
2	Pt Lot 15	K. Kent	0.34	-	-	-	-	80	80
2	N Pt Lot 15	A. & P. Budd	0.44	-	-	-	-	100	100
2	Pt Lot 15	Ministry Of Transportation	0.12	-	-	-	-	30	30
2	N Pt Lot 15	I. Campbell	19.16	-	-	-	-	4,250	4,250
3	S Pt Lot 11	H. & M. Yoon	0.59	60	-	-	-	130	190
3	S Pt Lot 11	1409563 Ontario Ltd	0.67	-	-	-	-	150	150
3	S Pt Lot 11	1281597 Ontario Inc	1.58	-	-	-	-	350	350
3	Pt Lot 12	J. & E. Horodynsky	19.80	-	-	-	-	4,390	4,390
3	S Pt Lot 12	T. & C. Xenophontos	2.34	-	-	-	-	520	520
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	33.89	-	-	-	-	7,510	7,510
3	S Pt Lot 14	L. & E. Kell	40.33	-	-	-	-	8,940	8,940
3	S Pt Lot 15	M. Campbell	16.41	-	-	-	-	3,640	3,640
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	18.42	-	-	-	-	4,080	4,080
3	S Pt Lot 16	C. Campbell & S. Todd	38.31	-	-	-	-	8,490	8,490
3	S Pt Lot 16	M. Ledlie & V. Kerr	0.28	-	-	-	-	60	60
3	S Pt Lot 17	J. Kell	9.69	-	-	-	-	2,150	2,150
3	S Pt Lot 17	D. Kell	9.09	-	-	-	-	2,010	2,010
3	S Pt Lot 17	J. Kell	0.84	-	-	-	-	190	190
3	N Pt Lot 17	Kell Farms Ltd	15.78	-	-	-	-	3,500	3,500
3	N Pt Lots 1	Top Hill View Estates Inc	23.20	-	-	-	-	5,140	5,140
3	Plan 51M604	First View Homes (Scarborough)	0.30	-	-	-	-	70	70
3	N Pt Lot 13	Crestrail Investments Inc	5.34	-	-	-	-	1,180	1,180
4	S Pt Lot 11	Kell Farms Ltd	3.36	-	-	-	-	740	740
4	Pt S1/2 Lot 11	G., A. & P. Tuzi & M. Tersigni	2.19	-	-	-	-	490	490
4	Pt S1/2 Lot 11	A. Tuzi	2.18	-	-	-	-	480	480
4	Pt S1/2 Lot 11	A. Gargaro	2.18	-	-	-	-	480	480
4	Pt S1/2 Lot 11	G. Tuzi	1.63	-	-	-	-	360	360
4	N Pt Lot 16	M. Demarco	3.63	-	-	-	-	800	800
3	N Pt Lot 16	J. Leblanc	0.42	-	-	-	-	90	90
3	N Pt Lot 16	G. Ciccone	0.26	-	-	-	-	60	60
3	N Pt Lot 16	M. Baker	0.26	-	-	-	-	60	60
3	N Pt Lot 16	United Church	0.28	-	-	-	-	60	60
3	N Pt Lot 16	10187526 Canada Corp	37.34	-	-	-	-	8,270	8,270
3	N Pt Lot 15	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	3.03	-	-	-	-	670	670
3	N Pt Lot 15	Fernbrook Homes (Churchill) Ltd	24.46	-	-	-	-	5,420	5,420
3	Pt Lot 15	B. Doughty	0.28	-	-	-	-	60	60
3	N Pt Lot 15	A. Dawson	0.22	-	-	-	-	50	50
3	Pt Lot 15	T. Borscevski & B. Hill	0.24	-	-	-	-	50	50
3	Pt Lot 15	C. Mount	0.76	-	-	-	-	170	170
3	N Pt Lot 15	S. Simpson	0.76	-	-	-	-	170	170
3	N Pt Lot 15	Anglican Church	1.66	-	-	-	-	370	370
3	N Pt Lot 15	A. & C. Martins	0.16	-	-	-	-	40	40
3	Pt Lot 15	J. Simpson	0.30	-	-	-	-	70	70
3	Pt Lot 15	P S K Holdings Inc	0.28	-	-	-	-	60	60
3	N Pt Lot 15	T. & S. Alderson	0.38	-	-	-	-	80	80
3	Pt Lot 15	D. Wood & R. Bellar	0.40	-	-	-	-	90	90
3	N Pt Lot 15	A. Fazelipour	0.54	-	-	-	-	120	120
3	N Pt Lot 15	Town of Innisfil	0.46	-	-	-	-	100	100
3	Plan 1194	M. & M. Alves	0.38	-	-	-	-	80	80
3	Lot 14	J. & R. Carvalho	0.28	-	-	-	-	60	60
3	Plan 1194	T. Cooley & O. Oliveira	0.28	-	-	-	-	60	60
3	Lot 12	A. & L. Daniels	0.16	-	-	-	-	40	40
3	Lot 21	C. Bell	0.14	-	-	-	-	30	30
3	Lot 22	N. Gundert & R. Grant	0.34	-	-	-	-	80	80
4	Plan 162	B. Deputat & C. Braney	1.22	-	-	-	-	270	270
4	Plan 162	A. & M. Stepanova	0.46	-	-	-	-	100	100
4	Plan 162	C. Radulovici	3.44	-	-	-	-	760	760
4	Pt Lots 3	H. Rahimimoghadam	0.80	-	-	-	-	180	180
4	Plan 162	M. Slocombe	1.20	-	-	-	-	270	270
4	Plan 162	S. & R. Thomas	0.36	-	-	-	-	80	80
4	Lot 30	A. Zlender	0.52	-	-	-	-	120	120
4	Plan 162	C. & T. Asselstine	2.14	-	-	-	-	470	470
4	Lot 24	B. Hoseman & K. Hoseman	0.40	-	-	-	-	90	90
4	Plan 162	L. Burke	0.34	-	-	-	-	80	80
4	Plan 162	S. & L. Gucciardi	0.12	-	-	-	-	30	30
4	S Pt Lot 23	Renaissance Nouveau Design Inc	0.12	-	-	-	-	30	30
4	Pt Lots 1	A. & D. Whiteside	0.34	-	-	-	-	80	80
4	Plan 162	D. Napper	0.78	-	-	-	-	170	170
4	Plan 162	V. & Z. Iacob	1.44	-	-	-	-	320	320

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
4	S Pt Lot 16	K. & R. Sinclair	10.16	-	-	-	-	2,250	2,250
4	Pt Lots 6 & 7	C. & T. Asselstine	0.44	-	-	-	-	100	100
4	Plan 162	C. Mark	0.26	-	-	-	-	60	60
4	Plan 162	R. Schweymaier	1.70	-	-	-	-	380	380
4	Pt Lots 2	D. & M. Wilson	0.30	-	-	-	-	70	70
4	Lot 1	C. Chegancas	0.30	-	-	-	-	70	70
4	Pt Lot 16	D. & L. Fairhead	2.06	-	-	-	-	460	460
4	Lot 61	F. Minici	0.48	-	-	-	-	110	110
4	Plan 162	E. & I. Gyorfi	0.38	-	-	-	-	80	80
4	Plan 162	P. Savard	0.34	-	-	-	-	80	80
4	Plan 162	D. & M. Bowen	0.22	-	-	-	-	50	50
4	Plan 162	J. Giannitti & M. Giannitti Est.	0.36	-	-	-	-	80	80
4	Plan 162	C. Asselstine & M. Marshall	0.36	-	-	-	-	80	80
4	Pt Lot 16	P. & D. McMillan	2.82	-	-	-	-	620	620
4	Pt Lot 16	M. Mindle & E. Gulyas	1.42	-	-	-	-	310	310
Roads									
4th Line		Town of Innisfil	29.36	-	-	-	-	6,510	6,510
2nd Line		Town of Innisfil	9.18	-	-	-	-	2,030	2,030
Churchill Unnamed Road 1		Town of Innisfil	1.76	-	-	-	-	390	390
Churchill Unnamed Road 2		Town of Innisfil	3.64	-	-	-	-	810	810
Churchill Unnamed Road 3		Town of Innisfil	0.84	-	-	-	-	190	190
Allan Street		Town of Innisfil	0.76	-	-	-	-	170	170
County Road 4 (Yonge Street)		Simcoe County	70.30	-	-	-	-	15,580	15,580

[11] Sub - Total = $ 494,470
[12] Cumulative Total = $ 2,067,800
Cumulative Cost/Eq. Ha. carried U/S = **$ 221.55**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # : **300038790**

Section Number = **MO8**
[1] Cost/Eq. Ha. from D/S = 221.55
[2] Total Section Cost = $ 194,810

[3] Properties with Flood Reduction Benefit — Flood Reduction Benefit = **$ 1,000** / affected eq.ha

3	S Pt Lot 11	H. & M. Yoon	4.59	460
3	S Pt Lot 11	E. Carbone	4.07	2,040
3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis	4.07	4,070

Total Specific Costs = 6,570

Remainder to Assess = 188,240

[4] Normal Outlet 35 %

Normal Benefit and Direct Outlet 65 %

[5] Equiv't Area Drained = 2277.09 Ha. @ $ 28.93 per Eq. Ha. for Normal Outlet = 65,880

[6] Remaining for Normal Benefit and Direct Outlet = 122,360

[7] Direct Outlet

3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis	uses 5%	10
3	S Pt Lot 11	E. Carbone	uses 15%	20
3	S Pt Lot 11	K. Costain & D. Goodwin	uses 25%	30
3	S Pt Lot 11	N. & M. Makrigiorgos	uses 35%	40
3	S Pt Lot 11	S. Scholten & D. Ransom	uses 40%	50
3	N Pt Lot 11	9847723 Canada Corporation	uses 75%	790
4th Line		Town of Innisfil	uses 100%	150

Total of Direct Outlet = 1,090

*LF = length factor to be applied to per hectare rate of $28.93 as calculated in [5]

[8] Remaining for Normal Benefit = 121,270

SUMMARY TABLE

CONC.	LOT	OWNER	Length Factor (LF)	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section										
3	S Pt Lot 11	L. Martinovski & P. & D. Efstathiadis		4.07	4,070	10,720	-	10	900	15,700
3	S Pt Lot 11	E. Carbone		4.07	2,040	10,160	-	20	900	13,120
3	S Pt Lot 11	K. Costain & D. Goodwin		4.07	-	10,300	-	30	900	11,230
3	S Pt Lot 11	N. & M. Makrigiorgos		4.07	-	9,670	-	40	900	10,610
3	S Pt Lot 11	S. Scholten & D. Ransom		3.89	-	9,740	-	50	860	10,650
3	N Pt Lot 11	9847723 Canada Corporation		36.61	-	59,640	-	790	8,110	68,540
						-				
4th Line		Town of Innisfil		5.12	-	11,020	-	150	1,130	12,300
[10] U/S of Section Lands										
3	S Pt Lot 11	H. & M. Yoon	0.3	4.59	460	-	-	-	1,060	1,520
3	S Pt Lot 11	1409563 Ontario Ltd	0.3	4.15	-	-	-	-	960	960
3	S Pt Lot 11	1281597 Ontario Inc	0.5	6.44	-	-	-	-	1,520	1,520
3	Pt Lot 12	J. & E. Horodynsky	0.5	26.32	-	-	-	-	6,210	6,210
3	N Pt Lot 12	S. & O. Pylypiak	0.8	18.57	-	-	-	-	4,540	4,540
3	N Pt Lots 1	Top Hill View Estates Inc	1	12.35	-	-	-	-	3,090	3,090
3	N Pt Lot 13	Crestrail Investments Inc	1	29.80	-	-	-	-	7,460	7,460
3	N Pt Lot 13	Town of Innisfil	1	0.04	-	-	-	-	10	10
3	N Pt Lot 12	C. Wolfond	1	16.70	-	-	-	-	4,180	4,180

[11] Sub - Total = $ 171,640
[12] Cumulative Total = $ 2,239,440
Cumulative Cost/Eq. Ha. carried U/S = **$ 250.48**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project :	**South Innisfil Creek Drain - 2019 Improvement**	Section Number =	**MO9**
DATE :	**February 13, 2019**	**[1] Cost/Eq. Ha. from D/S =**	**250.48**
Project # :	**300038790**	**[2] Total Section Cost =**	**$ 785,860**

[3] Specific Costs

(Section 26) Replacement of 4th Line Culverts - 100% to Town less 20m equivalent drain construction	**618,660**
(Section 26) Culvert replacement design, drawing production and inspection	**45,000**
Admin associated with culvert replacement less associated engineering (as Special Benefit)	120,590
Total Specific Costs =	784,250
Remainder to Assess =	1,610

[4] Normal Outlet	30 %
Normal Benefit and Direct Outlet	70 %

[5] Equiv't Area Drained = 2,179.70 Ha. @ $ 0.22 per Eq. Ha. for Normal Outlet = 480

[6] Remaining for Normal Benefit and Direct Outlet = 1,130

[7] Direct Outlet

4th Line	Town of Innisfil	uses 100%	-
		Total of Direct Outlet =	-

[8] Remaining for Normal Benefit = 1,130

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
4th Line		Town of Innisfil	4.64	120,590	1,130	**663,660**	-	1,160	786,540
[10] U/S of Section Lands									
4	Pt S1/2 Lot 11	G. Tuzi	0.54	-	-	-	-	140	140
4	Pt S1/2 Lot 11	K. Collins & L. Marjadsingh	2.18	-	-	-	-	550	550

[11] Sub - Total = **$ 787,230**
[12] Cumulative Total = **$ 3,026,670**
Cumulative Cost/Eq. Ha. carried U/S = **$ 250.70**

APPENDIX D6 - SECTIONAL ASSESSMENT WORKSHEET

Main Drain

Project :	**South Innisfil Creek Drain - 2019 Improvement**	Section Number =	**MO10**
DATE :	**February 13, 2019**	**[1] Cost/Eq. Ha. from D/S =**	**250.70**
Project # :	**300038790**	**[2] Total Section Cost = $**	**205,620**

[3] Specific Costs

Clean out 5th Line Bridge - 100% to Town as Specific Benefit	**3,150**
Admin associated with 5th Line Bridge Cleanout	840
Total Specific Costs =	3,990
Remainder to Assess =	201,630

[4] Normal Outlet 25 %

Normal Benefit and Direct Outlet 75 %

[5] Equiv't Area Drained = 1,652.02 Ha. @ $ 30.49 per Eq. Ha. for Normal Outlet = 50,410

[6] Remaining for Normal Benefit and Direct Outlet = 151,220

[7] Direct Outlet

4	Pt S1/2 Lot 11	D. & K. Gray	uses 5%	-
4	Pt S1/2 Lot 11	M. & M. Alves	uses 10%	10
4	S Pt Lot 11	Kell Farms Ltd	uses 30%	150
4	Pt S1/2 Lot 12	M. & L. Valente	uses 45%	60
4	Pt S1/2 Lot 12	Innisfil Churchill Investment	uses 50%	60
4	Pt S1/2 Lot 12	A. Tuzi	uses 55%	70
4	N Pt Lot 12	1665328 Ontario Ltd	uses 75%	710
4	Pt S1/2 Lot 11	J. & G. Rodrigues	uses 25%	20
4	Pt S1/2 Lot 11	J. & E. Fernandes	uses 25%	20
5th Line		Town of Innisfil	uses 100%	1,480
			Total of Direct Outlet =	2,580

*LF = length factor to be applied to per hectare rate of $30.49 as calculated in [5]

[8] Remaining for Normal Benefit = 148,640

S U M M A R Y   T A B L E

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.15	Eq. A (ha) @ LF = 0.5	Eq. A (ha) @ LF = 1.0	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] Directly Outletting in Section												
4	Pt S1/2 Lot 11	D. & K. Gray				2.18	-	17,550	-	-	550	18,100
4	Pt S1/2 Lot 11	M. & M. Alves				2.18	-	13,200	-	10	550	13,760
4	Pt S1/2 Lot 11	J. & G. Rodrigues				2.18	-	1,240	-	20	550	1,810
4	Pt S1/2 Lot 11	J. & E. Fernandes				2.20	-	1,240	-	20	550	1,810
4	S Pt Lot 11	Kell Farms Ltd				16.40	-	24,750	-	150	4,110	29,010
4	Pt S1/2 Lot 12	M. & L. Valente				4.08	-	9,050	-	60	1,020	10,130
4	Pt S1/2 Lot 12	Innisfil Churchill Investment				4.08	-	1,670	-	60	1,020	2,750
4	Pt S1/2 Lot 12	A. Tuzi				4.08	-	1,080	-	70	1,020	2,170
4	N Pt Lot 12	1665328 Ontario Ltd				31.19	-	71,593	-	710	7,820	80,123
5th Line		Town of Innisfil				48.68	3,990	7,380	-	1,480	12,200	25,050
[10] Indirectly Outletting in Section Lands												
3	N Pt Lots 1	Top Hill View Estates Inc	12.35	-	-	12.35	-	-	-	-	3,150	3,150
3	N Pt Lot 13	Crestrail Investments Inc	5.31	-	-	5.31	-	-	-	-	1,360	1,360
3	N Pt Lot 13	Town of Innisfil	0.46	-	-	0.46	-	-	-	-	120	120
3	N Pt Lot 15	Anglican Church	0.38	-	-	0.38	-	-	-	-	100	100
3	N Pt Lot 15	E. & K. Pivetta	0.38	-	-	0.38	-	-	-	-	100	100
3	N Pt Lot 15	J. Smith & C. Gauvin	0.28	-	-	0.28	-	-	-	-	70	70
3	N Pt Lot 15	P. Chiavatti	0.28	-	-	0.28	-	-	-	-	70	70
3	N Pt Lot 15	C. & A. Cutler	0.30	-	-	0.30	-	-	-	-	80	80
3	Pt NE1/4 Lot 15	D. & R. Koekkoek	0.64	-	-	0.64	-	-	-	-	160	160
3	Lot 12	A. & L. Daniels	0.12	-	-	0.12	-	-	-	-	30	30
3	Plan 1194	A. & K. Demarco	0.56	-	-	0.56	-	-	-	-	140	140
3	Lot 9	R. Wilcox	0.30	-	-	0.30	-	-	-	-	80	80
3	Lot 8	B. Cutler & P. Smith	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 7	W. French	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 6	D. Saunders	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 5	N. Mason	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 4	A. & R. West	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 2	S. Simpson	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 1	E. Waite	0.34	-	-	0.34	-	-	-	-	90	90
3	Lot 16	A. & J. Asselstine	0.40	-	-	0.40	-	-	-	-	100	100
3	Lot 17	M. Brown	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 18	S. & K. Bowen	0.28	-	-	0.28	-	-	-	-	70	70
3	Lot 21	C. Bell	0.14	-	-	0.14	-	-	-	-	40	40
4	S Pt Lot 10	P. Pillitteri	-	1.95	-	1.95	-	-	-	-	520	520
4	N Pt Lot 10	P. Pillitteri	-	26.40	9.13	35.53	-	-	-	-	9,590	9,590
4	N Pt Lot 10	D. Jonkman	-	-	0.24	0.24	-	-	-	-	70	70
4	N Pt Lot 9	D. Lucas	-	7.44	9.83	17.27	-	-	-	-	4,740	4,740
4	N Pt Lot 9	K. Jayaseelan & M. Thayalan	-	-	0.32	0.32	-	-	-	-	90	90
4	N Pt Lot 8	Franline Investments Ltd	-	-	21.01	21.01	-	-	-	-	5,910	5,910
4	N Pt Lot 7	1665328 Ontario Ltd	-	-	18.72	18.72	-	-	-	-	5,260	5,260
4	Pt S1/2 Lot 12	E. De Santis	2.12	1.96	-	4.08	-	-	-	-	1,060	1,060
4	Pt S1/2 Lot 12	G. Tuzi	2.22	1.86	-	4.08	-	-	-	-	1,060	1,060
4	Pt S1/2 Lot 12	M. Tersigni	2.40	1.68	-	4.08	-	-	-	-	1,060	1,060
4	Pt Lot 12	A. Kerkhof & C. Davidson	8.24	2.28	-	10.52	-	-	-	-	2,710	2,710

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.15	Eq. A (ha) @ LF = 0.5	Eq. A (ha) @ LF = 1.0	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
4	Pt S1/2 Lot 12	Innisfil Churchill Investment	3.70	0.14	-	3.84	-	-	-	-	980	980
4	Pt Lot 13	2177217 Ontario Ltd	39.64	-	-	39.64	-	-	-	-	10,120	10,120
4	S Pt Lot 14	2177217 Ontario Ltd	39.30	-	-	39.30	-	-	-	-	10,030	10,030
4	S Pt Lot 14	J. Jambor	1.10	-	-	1.10	-	-	-	-	280	280
4	S Pt Lot 14	D. & S. Mann	1.10	-	-	1.10	-	-	-	-	280	280
4	N Pt Lot 17	S. Kell	8.22	-	-	8.22	-	-	-	-	2,100	2,100
4	N Pt Lot 16	Simcoe County District School Board	2.89	-	-	2.89	-	-	-	-	740	740
4	N Pt Lot 16	G. Hill	0.38	-	-	0.38	-	-	-	-	100	100
4	N Pt Lot 16	Barnstable Park Realty Corp	20.93	-	-	20.93	-	-	-	-	5,340	5,340
4	N Pt Lot 16	M. Shamshiri	0.43	-	-	0.43	-	-	-	-	110	110
4	N Pt Lot 16	A. Dunn & D. Ruegg	0.30	-	-	0.30	-	-	-	-	80	80
4	N Pt Lot 16	K. & T. Austin	0.75	-	-	0.75	-	-	-	-	190	190
4	N Pt Lot 16	C. Pokulok & R. Hannah	0.74	-	-	0.74	-	-	-	-	190	190
4	N Pt Lot 16	M. Demarco	7.92	-	-	7.92	-	-	-	-	2,020	2,020
4	N Pt Lot 15	A. Smith & C. Ford	2.05	-	-	2.05	-	-	-	-	520	520
4	N Pt Lot 15	L. Gialedakis	6.46	-	-	6.46	-	-	-	-	1,650	1,650
4	N Pt Lot 15	2765870 Canada Inc	0.36	-	-	0.36	-	-	-	-	90	90
4	N Pt Lot 15	E. & M. Van Den Elzen	0.28	-	-	0.28	-	-	-	-	70	70
4	Pt Lot 15	1636574 Ontario Inc	33.02	-	-	33.02	-	-	-	-	8,430	8,430
4	N Pt Lot 15	J. & R. Moody	0.16	-	0.28	0.44	-	-	-	-	120	120
4	N Pt Lot 14	G. & C. Favret	30.94	-	5.72	36.66	-	-	-	-	9,510	9,510
4	Pt Lot 14	R. & M. Johnson	0.25	-	0.17	0.42	-	-	-	-	110	110
4	N Pt Lot 13	1665328 Ontario Ltd	10.60	23.95	4.89	39.44	-	-	-	-	10,450	10,450
4	N Pt Lot 11	1665328 Ontario Ltd	1.07	28.82	-	29.89	-	-	-	-	7,940	7,940
4	Lot 4	E. & C. Hawkes	0.36	-	-	0.36	-	-	-	-	90	90
4	Lot 3	J. & J. Calvert	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	R. & C. Thew	0.36	-	-	0.36	-	-	-	-	90	90
4	Lot 31	S. & L. Manley	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 30	C. Schreider & A. Teskey	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 29	D. Greenman & E. Stuart	0.62	-	-	0.62	-	-	-	-	160	160
4	Lot 26	M. & J. Cristicini	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 10	K. Wisch	0.40	-	-	0.40	-	-	-	-	100	100
4	Lot 8	A. & L. Kamrath	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	E. Madden	0.40	-	-	0.40	-	-	-	-	100	100
4	Lot 18	Town of Innisfil	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 17	G. Roesler	0.40	-	-	0.40	-	-	-	-	100	100
4	Lot 15	L. & J. Columbus	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 14	U. Agarunov	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 13	J. MacEachern	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 11	K. & C. Mortelliti	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan 1683	Town of Innisfil	1.98	-	-	1.98	-	-	-	-	510	510
4	Lot 24	B. & R. Witkowski	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 23	C. Moore	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 22	B. & B. Pearce	0.38	-	-	0.38	-	-	-	-	100	100
4	Lot 21	C. & G. Prospero & A. Volpe	0.42	-	-	0.42	-	-	-	-	110	110
4	Lot 19	D. & L. MacDonell	0.48	-	-	0.48	-	-	-	-	120	120
4	S Pt Lot 15	D. & D. Scott	0.50	-	-	0.50	-	-	-	-	130	130
4	Pt Lot 15	J. & A. Calderon	0.28	-	-	0.28	-	-	-	-	70	70
4	S Pt Lot 15	Woodsview Property Management	0.24	-	-	0.24	-	-	-	-	60	60
4	S Pt Lot 15	A. Azan	0.16	-	-	0.16	-	-	-	-	40	40
4	S Pt Lot 15	R. Drennan & M. Schell	0.52	-	-	0.52	-	-	-	-	130	130
4	S Pt Lot 15	2367633 Ontario Inc	0.52	-	-	0.52	-	-	-	-	130	130
4	S Pt Lot 15	S. Sanderson	0.60	-	-	0.60	-	-	-	-	150	150
4	S Pt Lot 5	United Church	0.82	-	-	0.82	-	-	-	-	210	210
4	Plan 162	D. Hogarth	0.94	-	-	0.94	-	-	-	-	240	240
4	Pt Lots 5	S. Mark	0.92	-	-	0.92	-	-	-	-	230	230
4	Pt Lots 5	A. Drugovic & G. Jenkinson	0.28	-	-	0.28	-	-	-	-	70	70
4	Plan 162	M. MacPhail & T. Nolan	0.26	-	-	0.26	-	-	-	-	70	70
4	N Pt Lot 41	R. & P. Sampaio	2.32	-	-	2.32	-	-	-	-	590	590
5	Pt Lots 3 & 4	1715573 Ontario Ltd	-	-	0.30	0.30	-	-	-	-	80	80
5	S Pt Lot 5	1715573 Ontario Ltd	-	-	2.68	2.68	-	-	-	-	750	750
5	S Pt Lot 6	1715573 Ontario Inc. Trustee	-	-	35.63	35.63	-	-	-	-	10,020	10,020
5	N Pt Lot 6	D. Swain & K. Archibald	-	-	0.41	0.41	-	-	-	-	120	120
5	N Pt Lot 5	R. & S. Eyers	-	-	0.54	0.54	-	-	-	-	150	150
5	N Pt Lot 5	1715573 Ontario Ltd	-	-	48.51	48.51	-	-	-	-	13,640	13,640
5	S Pt Lot 7	H. & C. Van Der Mast	-	-	32.73	32.73	-	-	-	-	9,200	9,200
5	S Pt Lot 8	G. & N. Bray	-	-	11.50	11.50	-	-	-	-	3,230	3,230
5	S Pt Lot 9	V. Trombley	-	-	26.68	26.68	-	-	-	-	7,500	7,500
5	S Pt Lot 10	G. Taylor & I. Wagner	-	-	8.37	8.37	-	-	-	-	2,350	2,350
5	S Pt Lot 10	G., F., M., & A. Troiano	-	-	8.38	8.38	-	-	-	-	2,350	2,350
5	S Pt Lot 10	1409563 Ontario Ltd	-	-	19.48	19.48	-	-	-	-	5,480	5,480
5	N Pt Lot 10	G. & S. Sawyer	-	-	40.82	40.82	-	-	-	-	11,480	11,480
5	N Pt Lot 9	G. Lecce Holdings (1994) Inc & D. B. Lecce Holdings	-	-	40.51	40.51	-	-	-	-	11,390	11,390
5	N Pt Lot 9	J. Farris	-	-	0.28	0.28	-	-	-	-	80	80
5	N Pt Lot 8	M. Vandermast	-	-	71.27	71.27	-	-	-	-	20,040	20,040
5	N Pt Lot 7	1720121 Ontario Ltd	-	-	28.08	28.08	-	-	-	-	7,900	7,900
5	S Pt Lot 11	L. Kuhn & J. Hettmann	-	-	6.42	6.42	-	-	-	-	1,800	1,800
5	S Pt Lot 11	B. Graham	-	-	0.82	0.82	-	-	-	-	230	230
5	S Pt Lot 11	M. Li & H. Zhang	-	-	3.66	3.66	-	-	-	-	1,030	1,030
5	S Pt Lot 11	T. & V. Van Kuik	-	-	5.83	5.83	-	-	-	-	1,640	1,640
5	S Pt Lot 11	D. & L. Street	-	-	4.37	4.37	-	-	-	-	1,230	1,230
5	S Pt Lot 11	T. & J. Treloar	-	-	2.67	2.67	-	-	-	-	750	750
5	S Pt Lot 11	D. & K. Adams	-	-	2.17	2.17	-	-	-	-	610	610
5	S Pt Lot 11	L. Smith	-	-	1.68	1.68	-	-	-	-	470	470
5	S Pt Lot 12	S. Wasylyk	-	-	3.30	3.30	-	-	-	-	930	930
5	S Pt Lot 12	N. Nguyen	-	-	1.68	1.68	-	-	-	-	470	470
5	S Pt Lot 12	C. Rainford & B. Hitchen	-	-	1.88	1.88	-	-	-	-	530	530
5	Pt Lot 13	2462228 Ontario Ltd	-	-	28.21	28.21	-	-	-	-	7,930	7,930
5	Pt Lot 13	C. & R. Kniazeff	-	-	0.36	0.36	-	-	-	-	100	100
5	Pt Lot 14	1665328 Ontario Ltd	-	-	52.10	52.10	-	-	-	-	14,650	14,650
5	S Pt Lot 15	D. Scythes	0.08	-	-	0.08	-	-	-	-	20	20
5	S Pt Lot 15	C. Browne	0.40	-	-	0.40	-	-	-	-	100	100
5	S Pt Lot 15	G. & O. De Araujo	0.26	-	-	0.26	-	-	-	-	70	70

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.15	Eq. A (ha) @ LF = 0.5	Eq. A (ha) @ LF = 1.0	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	Normal	Sec 24/26	OUTLET (Sec 23) Direct	Normal	TOTAL
5	S Pt Lot 15	D. & M. Coulter	0.28	-	-	0.28	-	-	-	-	70	70
5	S Pt Lot 15	T. Laurin	0.42	-	-	0.42	-	-	-	-	110	110
5	S Pt Lot 15	P. & V. Chornenki	0.28	-	-	0.28	-	-	-	-	70	70
5	Pt Lot 15	Kell Farms Ltd	4.63	-	68.23	72.86	-	-	-	-	20,370	20,370
5	S Pt Lot 16	882022 Ontario Ltd	12.81	-	19.74	32.55	-	-	-	-	8,820	8,820
5	S Pt Lot 17	K. Tse	6.20	-	1.93	8.13	-	-	-	-	2,120	2,120
5	N Pt Lot 16	1589114 Ontario Ltd	-	-	3.87	3.87	-	-	-	-	1,090	1,090
5	N Pt Lots 1	1665328 Ontario Ltd	-	-	64.57	64.57	-	-	-	-	18,160	18,160
5	N Pt Lot 12	2462228 Ontario Ltd	-	-	56.59	56.59	-	-	-	-	15,910	15,910
5	N Pt Lot 12	B. Neeb & L. Smith	-	-	0.29	0.29	-	-	-	-	80	80
5	N Pt Lot 11	AFMM Innisfil Ltd	-	-	38.74	38.74	-	-	-	-	10,890	10,890
5	Pt Lot 11	T. Prosser	-	-	0.40	0.40	-	-	-	-	110	110
6	N Pt Lot 15	Sixth Line Cemetery	-	-	2.43	2.43	-	-	-	-	680	680
6	S Pt Lot 3	1045990 Ontario Inc	-	-	8.35	8.35	-	-	-	-	2,350	2,350
6	S Pt Lot 4	T. & R. Ruch & 10454990 Ontario Inc	-	-	10.37	10.37	-	-	-	-	2,920	2,920
6	S Pt Lot 4	J. Robson	-	-	17.02	17.02	-	-	-	-	4,780	4,780
6	S Pt Lot 5	M. Vandermast	-	-	55.19	55.19	-	-	-	-	15,520	15,520
6	S Pt Lot 5	W. & B. Baguley	-	-	0.30	0.30	-	-	-	-	80	80
6	S Pt Lot 6	J. & P. Hilverda	-	-	0.23	0.23	-	-	-	-	60	60
6	Pt Lot 6	J. & P. Hilverda	-	-	19.52	19.52	-	-	-	-	5,490	5,490
6	Pt Lot 6	Town of Innisfil	-	-	7.24	7.24	-	-	-	-	2,040	2,040
6	N Pt Lot 6	1665328 Ontario Ltd	-	-	12.08	12.08	-	-	-	-	3,400	3,400
6	N Pt Lot 6	V. & J. Parravano	-	-	0.18	0.18	-	-	-	-	50	50
6	N Pt Lot 5	1057595 Ontario Ltd	-	-	18.09	18.09	-	-	-	-	5,090	5,090
6	N Pt Lot 4	D. & J. Rice	-	-	3.55	3.55	-	-	-	-	1,000	1,000
6	N Pt Lot 4	L. Peterson	-	-	26.76	26.76	-	-	-	-	7,530	7,530
6	N Pt Lot 3	G. & J. McLean	-	-	38.17	38.17	-	-	-	-	10,730	10,730
6	N Pt Lot 3	G. McLean	-	-	0.21	0.21	-	-	-	-	60	60
6	Lot 7	751518 Ontario Ltd	-	-	40.25	40.25	-	-	-	-	11,320	11,320
6	Pt Lot 7	Town of Innisfil	-	-	5.40	5.40	-	-	-	-	1,520	1,520
6	S Pt Lot 10	1536315 Ontario Ltd	-	-	8.97	8.97	-	-	-	-	2,520	2,520
6	N Pt Lot 13	J. & V. Aquino	-	-	0.67	0.67	-	-	-	-	190	190
6	N Pt Lot 13	J. Horodynsky	-	-	0.41	0.41	-	-	-	-	120	120
6	N Pt Lot 12	A. & L. Obidin	-	-	0.87	0.87	-	-	-	-	250	250
6	N Pt Lot 11	2154016 Ontario Ltd	-	-	10.09	10.09	-	-	-	-	2,840	2,840
6	S Pt Lot 11	C. Hall	-	-	15.70	15.70	-	-	-	-	4,410	4,410
6	S Pt Lot 11	K. & R. Winter	-	-	16.65	16.65	-	-	-	-	4,680	4,680
6	S Pt Lot 12	O. & K. Awrey	-	-	4.06	4.06	-	-	-	-	1,140	1,140
6	S Pt Lot 12	K. Bernt	-	-	5.92	5.92	-	-	-	-	1,660	1,660
6	S Pt Lot 12	G. & G. Kent	-	-	9.62	9.62	-	-	-	-	2,700	2,700
6	S Pt Lot 13	A. Zlender	-	-	4.92	4.92	-	-	-	-	1,380	1,380
6	S Pt Lot 13	M. Slaby	-	-	6.47	6.47	-	-	-	-	1,820	1,820
6	S Pt Lot 14	W. Pratt	-	-	24.41	24.41	-	-	-	-	6,860	6,860
6	S Pt Lot 15	Ministry Of Transportation	-	-	0.63	0.63	-	-	-	-	180	180
6	S Pt Lot 15	J. & E. Cole	-	-	17.25	17.25	-	-	-	-	4,850	4,850
6	S Pt Lot 15	D. Huisman	-	-	0.26	0.26	-	-	-	-	70	70
6	Pt Lot 15	Sunset International Speedway Inc	-	-	8.30	8.30	-	-	-	-	2,330	2,330
6	S Pt Lot 15	Sunset International Speedway Inc	-	-	19.23	19.23	-	-	-	-	5,410	5,410
6	Pt Lots 14 & 15	2215570 Ontario Inc	-	-	4.77	4.77	-	-	-	-	1,340	1,340
6	N Pt Lot 13	C. Scenna	-	-	1.48	1.48	-	-	-	-	420	420
6	N Pt Lot 13	1281597 Ontario Inc	-	-	1.22	1.22	-	-	-	-	340	340
7	N Pt Lots 1	P. Wardlaw	-	-	0.77	0.77	-	-	-	-	220	220
7	S Pt Lot 3	D. & D. Oakley	-	-	21.44	21.44	-	-	-	-	6,030	6,030
7	S Pt Lot 3	M. & D. Purnell	-	-	0.42	0.42	-	-	-	-	120	120
7	W Pt Lot 4	Ben Capelas Landscaping & Snow Removal	-	-	4.64	4.64	-	-	-	-	1,300	1,300
7	S Pt Lot 4	M. Haourt & J. See	-	-	19.72	19.72	-	-	-	-	5,550	5,550
7	S Pt Lot 5	R. & K. Webb	-	-	8.48	8.48	-	-	-	-	2,380	2,380
7	S Pt Lot 5	922952 Ontario Inc	-	-	8.43	8.43	-	-	-	-	2,370	2,370
7	Pt Lots 4 & 5	R. Arbour	-	-	8.39	8.39	-	-	-	-	2,360	2,360
7	W Pt Lot 4	Rix Farms Ltd	-	-	10.23	10.23	-	-	-	-	2,880	2,880
6	Plan 1120	1625057 Ontario Corporation	-	-	0.51	0.51	-	-	-	-	140	140
3	Plan 1194	B. & K. Bourget	0.28	-	-	0.28	-	-	-	-	70	70
3	Plan 1194	D. & C. Bell	0.28	-	-	0.28	-	-	-	-	70	70
3	Plan 1194	K. & A. Wright	0.28	-	-	0.28	-	-	-	-	70	70
4	Plan 162	Town of Innisfil	1.14	-	-	1.14	-	-	-	-	290	290
4	Plan 162	S. Mikkola & K. Lamonday	0.24	-	-	0.24	-	-	-	-	60	60
4	Plan 162	B. Deputat & C. Braney	0.72	-	-	0.72	-	-	-	-	180	180
4	Plan 1683	P. & S. Hrynyk	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan 1683	R. & T. Kirkwood	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan 1683	J. & W. Campbell	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	G. & D. Adair	0.72	-	-	0.72	-	-	-	-	180	180
4	Plan 1683	L. Mendrek	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	W. & P. Simpson	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan 1683	M. Sallach	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	R. & L. Cuggy	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan 1683	P. & W. Belgue	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	J. & D. Van Donkelaar	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	A. & S. Gismondi	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan 1683	W. Vankempen & D. Williamson	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan 1683	K. Russel & J. Johnson	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 1683	K. Humphris & N. Upham	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan 51M448	J. Stubbs	3.92	-	-	3.92	-	-	-	-	1,000	1,000
3	Plan 51M604	First View Homes (Scarborough)	0.36	-	-	0.36	-	-	-	-	90	90
3	Plan 51M604	First View Homes (Scarborough)	0.36	-	-	0.36	-	-	-	-	90	90
3	Plan 51M604	First View Homes (Scarborough)	0.36	-	-	0.36	-	-	-	-	90	90
3	Plan 51M604	First View Homes (Scarborough)	0.36	-	-	0.36	-	-	-	-	90	90
3	Plan 51M604	First View Homes (Scarborough)	0.36	-	-	0.36	-	-	-	-	90	90
3	Plan 51M604	First View Homes (Scarborough)	0.38	-	-	0.38	-	-	-	-	100	100
3	Plan 51M604	First View Homes (Scarborough)	0.40	-	-	0.40	-	-	-	-	100	100

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.15	Eq. A (ha) @ LF = 0.5	Eq. A (ha) @ LF = 1.0	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	First View Homes (Scarborough)	0.32	-	-	0.32	-	-	-	-	80	80
3	Plan 51M604	D. & T. Garofalo	0.32	-	-	0.32	-	-	-	-	80	80
4	Plan M319	D. Dare	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M319	P.Boer & S. Forsythe	0.46	-	-	0.46	-	-	-	-	120	120
4	Plan M319	S. Small & L. Henderson	0.54	-	-	0.54	-	-	-	-	140	140
4	Plan M319	M. & A. Dicesare	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M319	R. Flemming	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M319	M. Simpson & S. Roberts	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	S. De Beaucamp	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	R. & E. Moore	0.56	-	-	0.56	-	-	-	-	140	140
4	Plan M319	M. Chabrzynski & S. Henderson	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M319	R. & J. Lenehan	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M319	G. & K. Farr	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M319	N. & J. Stacey	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M319	T. & E. Roomere	0.62	-	-	0.62	-	-	-	-	160	160
4	Plan M319	D. & D. Wittick	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M319	J. Philp & P. Murphy	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M319	A. & J. Domenegato	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	D. Veitch & R. Hopkins	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M319	P. & L. Demers	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M319	J. Quinn, J. Rabot & M. Quinn-Rabot	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M319	J. & U. Zubrzycka	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M319	T. & L. Moroz	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	P. Whissell & H. Lostchuck	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M319	R. & S. Laird	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M319	B. & M. Rutledge	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M319	L. & S. Smith	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M319	W. & D. Mann	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	T. & S. Breen	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	W. & V. Toole	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M319	R. & D. Sloan	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M319	M. & I. Fruhstuck	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M319	W. & D. Mayerhofer	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M319	Town of Innisfil	0.22	-	-	0.22	-	-	-	-	60	60
4	Plan M448	Town of Innisfil	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	J. & C. Ang	0.58	-	-	0.58	-	-	-	-	150	150
4	Plan M448	P. & S. Kubas	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M448	S. & T. Smith	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	R. & C. Cavaco	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	S. & W. Mays	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	N. Geddes	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	S. & N. Gill	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	D. & T. Carlson	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	S. & T. Chatland	0.58	-	-	0.58	-	-	-	-	150	150
4	Plan M448	L. Truong	0.60	-	-	0.60	-	-	-	-	150	150
4	Plan M448	Town of Innisfil	1.06	-	-	1.06	-	-	-	-	270	270
4	Plan M448	J. & C. Fabing	0.58	-	-	0.58	-	-	-	-	150	150
4	Plan M448	R. & E. Stukas	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	M. Iammatteo	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	D. & L. Ficher	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	D. & S. Cake	0.58	-	-	0.58	-	-	-	-	150	150
4	Plan M448	L. Philipp	0.60	-	-	0.60	-	-	-	-	150	150
4	Plan M448	R. & D. Yonge	0.64	-	-	0.64	-	-	-	-	160	160
4	Plan M448	A. & N. Bell	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	A. Buttrum	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	A. & A. Simpson	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M448	C. & J. Van Nispen	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	G. Clubine	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	C. & C. Kidd	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	K. & M. Moores	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	F. Guttridge & L. Etherton	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	D. & E. Ciccia	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	B. & J. Laval	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	J. & C. Molenhuis	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	C. Damianakis & R. Cooper	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M448	M. & D. Twardowski	0.56	-	-	0.56	-	-	-	-	140	140
4	Plan M448	M. & L. Snowball	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	R. Mateus	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	M. & S. Davenport	0.52	-	-	0.52	-	-	-	-	130	130
4	Plan M448	B. & S. Bingley	0.48	-	-	0.48	-	-	-	-	120	120
4	Plan M448	S. Jenssen-Brown	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	D. Lajoie	0.34	-	-	0.34	-	-	-	-	90	90
4	Plan M448	R. & K. Carlin	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	E. & B. Rideout	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	R. Cressman	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	C. & L. Vitale	0.44	-	-	0.44	-	-	-	-	110	110
4	Plan M448	E. & F. Arantes	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	A. & A. Takacs	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	N. & P. Blanchet	0.40	-	-	0.40	-	-	-	-	100	100

CONC.	LOT	OWNER	Eq. A (ha) @ LF = 0.15	Eq. A (ha) @ LF = 0.5	Eq. A (ha) @ LF = 1.0	TOTAL EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
4	Plan M448	J. & C. Conti	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	C. Douglas	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M448	T. & M. Tokarski	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M448	G. Werth	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	J. & L. Knox	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	M. & M. Goodchild	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	G. Gogos	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	J. Reindl	0.36	-	-	0.36	-	-	-	-	90	90
4	Plan M448	D. & A. Stopyra	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	D. & E. Magri	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	V. & K. Hamilton	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	M. Doyle & S. McInnis	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	R. Weeks	0.42	-	-	0.42	-	-	-	-	110	110
4	Plan M448	A. & S. Ginzburg	0.40	-	-	0.40	-	-	-	-	100	100
4	Plan M448	E. & S. Ernest	0.38	-	-	0.38	-	-	-	-	100	100
4	Plan M448	Town of Innisfil	1.66	-	-	1.66	-	-	-	-	420	420
Roads												
7th Line		Town of Innisfil	-	-	13.20	13.20	-	-	-	-	3,710	3,710
6th Line		Town of Innisfil	-	-	56.97	56.97	-	-	-	-	16,020	16,020
4th Line		Town of Innisfil	12.80	-	-	12.80	-	-	-	-	3,270	3,270
John Street		Town of Innisfil	1.84	-	-	1.84	-	-	-	-	470	470
Allan Street		Town of Innisfil	1.04	-	-	1.04	-	-	-	-	270	270
Sloan Circle Drive		Town of Innisfil	5.20	-	-	5.20	-	-	-	-	1,330	1,330
Cairns Gate		Town of Innisfil	0.88	-	-	0.88	-	-	-	-	220	220
Valley View Drive		Town of Innisfil	5.52	-	-	5.52	-	-	-	-	1,410	1,410
Gimby Crescent		Town of Innisfil	4.24	-	-	4.24	-	-	-	-	1,080	1,080
Meadowland Street		Town of Innisfil	6.16	-	-	6.16	-	-	-	-	1,570	1,570
5 Sideroad (CR 53)		Simcoe County	-	-	16.16	16.16	-	-	-	-	4,540	4,540
10 Sideroad (CR 54)		Simcoe County	-	7.24	17.44	24.68	-	-	-	-	6,830	6,830
County Road 4 (Yonge Street)		Simcoe County	23.55	-	19.85	43.40	-	-	-	-	11,590	11,590
Hwy 400		Ministry of Transporation	-	-	87.65	87.65	-	-	-	-	24,650	24,650

[11] Sub - Total = $ 751,383
[12] Cumulative Total = $ 3,778,053
Cumulative Cost/Eq. Ha. Applied at (LF = 1.0) = **$ 281.19**

APPENDIX D7 - SUMMARY of AREAS by LAND USE

Branch 'A'

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands

Agricultural Land @ 1.00 Wetland @ 0.25
Bush @ 0.50 Industrial/Commercial @ 3.00
Residential @ 2.00 Other @ 1.00

Factors Applied to Roads

Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
		Innisfil Lands								
1	Pt Lot 6	A. Moir & H. Minns	001-01400	6.47	-	-	-	-	-	6.47
1	Pt Lot 6	Ministry Of Transportation	001-02100	2.81	-	-	-	-	-	2.81
1	Pt Lot 7	Ministry Of Transportation	001-02400	-	-	-	-	-	1.40	1.40
14	Pt Lots 7 & 8	Riocan Holdings (Tiy) Inc & 1633272 Al	074-14900	-	1.23	-	-	-	5.57	6.80
15	Pt Lot 8	I. & M. De Sao Jose	074-15000	-	1.58	-	-	-	-	1.58
			Total Lands	**9.28**	**2.81**	**-**	**-**	**-**	**6.97**	**19.06**

Roads	Owner	Road Classification	Total Affected Area (ha)
Reive Blvd	Town of Innisfil	Paved Road	3.37
County Road 89	Simcoe County	Paved Road	0.24
Hwy 400	Ministry of Transportation	Paved Arterial Road	12.89
		Total Roads to be Assessed	**16.50**
		TOTAL AFFECTED LANDS AND ROADS	**35.56**

APPENDIX D8 - SECTIONAL ASSESSMENT WORKSHEET
Branch 'A'

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # **300038790**

Section Number = **Branch 'A'**
[1] Cost/Eq. Ha. from D/S = -
[2] Total Section Cost = $ 44,300

[3] Specific Costs

Cost of Private Crossing Assessed to Owner (001-01400)	50%	3,850
Admin associated with Private Crossing		1,030
Clean out SB off-ramp - 100% to MTO as Special Benefit		6,300
Admin associated with 2nd Line Bridge Cleanout		1,690

Total Specific Costs = 12,870

Remainder to Assess = 31,430

[4] Normal Outlet 80 %

Normal Benefit 20 %

[5] Equiv't Area Drained = 82.33 Ha. @ $ 305.34 per Eq. Ha. for Normal Outlet = 25,140

[6] Remaining for Normal Benefit = 6,290

[7] In Section

1	Pt Lot 6	A. Moir & H. Minns	uses 25%
1	Pt Lot 6	Ministry Of Transportation	uses 55%
1	Pt Lot 7	Ministry Of Transportation	uses 80%
Hwy 400		Ministry of Transporation	uses 90%
Reive Blvd		Town of Innisfil	uses 95%

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
1	Pt Lot 6	A. Moir & H. Minns	6.47	4,880	2,960	-	-	490	8,330
1	Pt Lot 6	Ministry Of Transportation	2.81	-	1,560	-	-	470	2,030
1	Pt Lot 7	Ministry Of Transportation	1.40	-	360	-	-	340	700
Hwy 400		Ministry of Transporation	64.45	7,990	910	-	-	17,710	26,610
Reive Blvd		Town of Innisfil	13.48	-	510	-	-	3,910	4,420
[10] U/S of Section Lands									
14	Pt Lots 7 & 8	Riocan Holdings (Tiy) Inc & 1633272 Alberta Ulc	5.88	-	-	-	-	1,800	1,800
15	Pt Lot 8	I. & M. De Sao Jose	0.40	-	-	-	-	120	120
Roads									
County Road 89		Simcoe County	0.96	-	-	-	-	290	290

[11] Sub - Total = $ 44,300
[12] Cumulative Total = $ 44,300
Cumulative Cost/Eq. Ha. carried U/S = **$ 305.34**

APPENDIX D9 - SUMMARY of AREAS by LAND USE

10 Sideroad Branch Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** | **TOWN:** **Innisfil**

DATE : **October 22, 2019 - Amended by the Tribunal** | **PROJECT #:** **300038970**

Factors Applied to Lands		**Factors Applied to Roads**
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
		Innisfil Lands								
3	S Pt Lot 7	1665328 Ontario Ltd	001-22900	1.95	-	1.58	-	-	5.75	9.28
3	S Pt Lot 8	J. Petropoulos	001-23000	-	-	0.55	-	-	0.24	0.79
3	W Pt Lot 8	D. Oshell & D. McLachlan	001-23001	-	-	0.18	-	-	0.19	0.37
3	S Pt Lot 8	G. Dermott	001-23200	-	-	0.06	0.12	-	-	0.18
3	Pt Lot 9	A. & J. Mormile	001-23400	9.85	-	1.64	-	-	9.03	20.52
3	Pt Lot 9	M. Assadian & L. Desroche	001-23500	12.93	-	2.49	-	-	7.25	22.67
3	Pt Lot 9	1409563 Ontario Ltd	001-23600	9.28	-	3.43	-	-	7.47	20.18
3	S Pt Lot 10	K. Levy	001-23700	-	1.74	-	-	-	2.31	4.05
3	Pt Lot 10	A. Fox & B. Scott	001-23800	3.85	-	-	-	-	0.57	4.42
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	001-23900	-	5.14	-	-	-	0.91	6.05
3	S Pt Lot 10	Y. Cil	001-24100	0.18	5.25	-	-	-	0.60	6.03
3	Pt Lot 10	J. Chow	001-24200	44.39	1.62	-	-	-	8.12	54.13
3	N Pt Lot 10	H. & A. Perkins	001-24300	-	-	0.30	-	-	0.91	1.21
3	Pt Lot 10	H. Squibb	001-24301	3.11	-	1.26	-	-	4.03	8.40
3	N Pt Lot 9	J. & P. Wilson	001-24400	3.94	-	4.47	-	-	2.23	10.64
3	N Pt Lot 9	C. & M. Cialone	001-24500	1.60	-	3.41	-	-	5.01	10.02
3	Pt Lot 8	P. & C. Woods	001-24600	10.05	-	-	-	-	-	10.05
3	Pt Lot 8	1665328 Ontario Ltd	001-24800	19.89	-	8.44	-	-	1.81	30.14
3	Pt Lot 8	G. & M. Reynolds	001-24801	-	-	-	-	-	1.00	1.00
3	Pt Lot 8	B. & V. Cestaric	001-24810	-	-	-	-	-	0.29	0.29
3	W Pt Lot 8	1665328 Ontario Ltd	001-24900	17.35	-	5.55	-	-	1.21	24.11
3	N Pt Lot 7	J. & M. Albanese	001-25000	6.42	-	-	-	-	-	6.42
4	S Pt Lot 7	Gdm Terraco Inc	001-25400	1.45	-	-	-	-	-	1.45
4	S Pt Lot 7	Franline Investments Ltd	001-25500	7.79	-	-	-	-	-	7.79
4	S Pt Lot 7	F. & N. Grillo	001-25600	9.71	-	0.40	-	-	-	10.11
4	Pt Lots 8 & 9	V. & D. Posius	001-25800	47.36	-	7.10	-	-	4.74	59.20
4	Pt Lot 8	S. Khan	001-25801	0.23	-	-	-	-	-	0.23
4	S Pt Lot 9	Sil Developments Inc, R. Zaretsky & S.	001-25900	18.94	-	-	-	-	0.39	19.33
4	S Pt Lot 9	J. & D. Thew	001-25910	0.02	-	-	-	-	0.38	0.40
4	S Pt Lot 10	P. Pillitteri	001-26000	31.08	-	-	-	-	5.92	37.00
4	N Pt Lot 10	P. Pillitteri	001-26100	2.37	-	-	-	-	0.35	2.72
4	N Pt Lot 9	D. Lucas	001-26200	18.17	-	2.96	-	-	-	21.13
4	N Pt Lot 8	Franline Investments Ltd	001-26300	16.17	-	0.50	-	-	-	16.67
4	N Pt Lot 7	1665328 Ontario Ltd	001-26400	1.43	0.08	-	-	-	-	1.51
4	S Pt Lot 11	Kell Farms Ltd	002-20700	3.36	-	-	-	-	-	3.36
4	Pt S1/2 Lot 11	G., A. & P. Tuzi & M. Tersigni	002-20900	2.19	-	-	-	-	-	2.19
4	Pt S1/2 Lot 11	A. Tuzi	002-20902	2.18	-	-	-	-	-	2.18
4	Pt S1/2 Lot 11	A. Gargaro	002-20904	2.18	-	-	-	-	-	2.18
4	Pt S1/2 Lot 11	G. Tuzi	002-20906	1.63	-	-	-	-	-	1.63
			Total Lands	**311.05**	**13.83**	**44.32**	**0.12**	**-**	**70.71**	**440.03**

Roads	Owner	Road Classification	Total Affected Area (ha)
4th Line	Town of Innisfil	Paved Road	5.72
3rd Line	Town of Innisfil	Gravel Road	2.34
10 Sideroad (CR 54)	Simcoe County	Paved Road	2.64
		Total Roads to be Assessed	**10.70**
		TOTAL AFFECTED LANDS AND ROADS	**450.73**

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

APPENDIX D10 - SECTIONAL ASSESSMENT WORKSHEET

10 Sideroad Branch Drain

Project : **South Innisfil Creek Drain - 2019 Improvement** Section Number = **10SR1**
DATE : **February 13, 2019** **[1] Cost/Eq. Ha. from D/S = -**
Project # : **300038790** **[2] Total Section Cost = $ 165,430**

[3] Specific Costs

(Section 26) Replace 3rd Line culvert - 100% to Town less 20m of open drain exc.	**117,930**
(Section 26) Culvert hydrology, design and inspection	**20,000**
Admin associated with 3rd Line Culvert Replacement (less Section 26 amount) as Specific Benefit	11,560
Total Specific Costs =	149,490

Remainder to Assess = 15,940

[4] Normal Outlet 90 %

Normal Benefit and Direct Outlet 10 %

[5] Equiv't Area Drained = 441.11 Ha. @ $ 32.53 per Eq. Ha. for Normal Outlet = 14,350

[6] Remaining for Normal Benefit and Direct Outlet = 1,590

[7] Direct Outlet

3rd Line	Town of Innisfil	uses 100%	230
		Total of Direct Outlet =	230

[8] Remaining for Normal Benefit = 1,360

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
3rd Line		Town of Innisfil	7.02	11,560	1,360	**137,930**	230	-	151,080
[10] U/S of Section Lands									
3	S Pt Lot 7	1665328 Ontario Ltd	8.49	-	-	-	-	280	280
3	S Pt Lot 8	J. Petropoulos	0.52	-	-	-	-	20	20
3	W Pt Lot 8	D. Oshell & D. McLachlan	0.28	-	-	-	-	10	10
3	S Pt Lot 8	G. Dermott	0.27	-	-	-	-	10	10
3	Pt Lot 9	A. & J. Mormile	16.60	-	-	-	-	540	540
3	Pt Lot 9	M. Assadian & L. Desroche	14.98	-	-	-	-	490	490
3	Pt Lot 9	1409563 Ontario Ltd	8.84	-	-	-	-	290	290
3	S Pt Lot 10	K. Levy	2.75	-	-	-	-	90	90
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	1.14	-	-	-	-	40	40
3	S Pt Lot 10	Y. Cil	0.24	-	-	-	-	10	10
3	Pt Lot 8	1665328 Ontario Ltd	14.74	-	-	-	-	480	480
3	Pt Lot 8	B. & V. Cestaric	0.29	-	-	-	-	10	10
3	W Pt Lot 8	1665328 Ontario Ltd	8.55	-	-	-	-	280	280

[11] Sub - Total = $ 153,630
[12] Cumulative Total = $ 153,630
Cumulative Cost/Eq. Ha. carried U/S = **$ 32.47**

APPENDIX D10 - SECTIONAL ASSESSMENT WORKSHEET

10 Sideroad Branch Drain

Project : **South Innisfil Creek Drain - 2019 Improvement** — Section Number = **10SR2**
DATE : **February 13, 2019** — **[1] Cost/Eq. Ha. from D/S = 32.47**
Project # : **300038790** — **[2] Total Section Cost = $ 12,780**

[3] Specific Costs

Total Specific Costs = -

Remainder to Assess = 12,780

[4] Normal Outlet 70 %

Normal Benefit and Direct Outlet 30 %

[5] Equiv't Area Drained = 354.76 Ha. @ $ 25.23 per Eq. Ha. for Normal Outlet = 8,950

[6] Remaining for Normal Benefit and Direct Outlet = 3,830

[7] Direct Outlet

3	Pt Lot 10	A. Fox & B. Scott	uses 20%	20
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	uses 55%	10
3	S Pt Lot 10	Y. Cil	uses 85%	40
2	10 Sideroad (CR 54)	Simcoe County	uses 100%	30

Total of Direct Outlet = 100

[8] Remaining for Normal Benefit = 3,730

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
3	Pt Lot 10	A. Fox & B. Scott	4.42	-	770	-	20	140	930
3	S Pt Lot 10	J. Phaneuf & C. Aguiar	1.06	-	550		10	30	590
3	S Pt Lot 10	Y. Cil	1.86	-	540		40	60	640
2	10 Sideroad (CR 54)	Simcoe County	1.32	-	1,870	-	30	40	1,940
[10] U/S of Section Lands									
3	Pt Lot 9	M. Assadian & L. Desroche	3.50	-	-	-	-	200	200
3	Pt Lot 9	1409563 Ontario Ltd	5.53	-	-	-	-	320	320
3	Pt Lot 10	J. Chow	12.58	-	-	-	-	730	730

[11] Sub - Total = $ 5,350
[12] Cumulative Total = $ 158,980
Cumulative Cost/Eq. Ha. carried U/S = **$ 57.69**

APPENDIX D10 - SECTIONAL ASSESSMENT WORKSHEET

10 Sideroad Branch Drain

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # : **300038790**

Section Number = **10SR3**
[1] Cost/Eq. Ha. from D/S = 57.69
[2] Total Section Cost = $ 43,160

[3] Specific Costs

Culvert cleanout on 4th Line including rip-rap as Specific Benefit	**4,730**
Admin associated with 4th Line culvert cleanout	1,270
Total Specific Costs =	6,000

Remainder to Assess = 37,160

[4] Normal Outlet 40 %

Normal Benefit and Direct Outlet 60 %

[5] Equiv't Area Drained = 155.67 Ha. @ $ 95.46 per Eq. Ha. for Normal Outlet = 14,860

[6] Remaining for Normal Benefit and Direct Outlet = 22,300

[7] Direct Outlet

3	Pt Lot 10	J. Chow	uses 50%	1,930
4	S Pt Lot 10	P. Pillitteri	uses 100%	3,530
4th Line		Town of Innisfil	uses 100%	2,180
10 Sideroad (CR 54)		Simcoe County	uses 100%	880
			Total of Direct Outlet =	8,520

*LF = length factor to be applied to per hectare rate of $95.46 as calculated in [5]

[8] Remaining for Normal Benefit = 13,780

SUMMARY TABLE

CONC.	LOT	OWNER	Length Factor (LF)	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section										
3	Pt Lot 10	J. Chow		40.34	-	6,330	-	1,930	2,330	10,590
4	S Pt Lot 10	P. Pillitteri		37.00		320		3,530	2,130	5,980
4th Line		Town of Innisfil		22.88	6,000	650	-	2,180	1,320	10,150
10 Sideroad (CR 54)		Simcoe County		9.24	-	6,470	-	880	530	7,880
[10] U/S of Section Lands										
3	Pt Lot 9	M. Assadian & L. Desroche	0.6	2.95	-	-	-	-	340	340
3	Pt Lot 9	1409563 Ontario Ltd	0.6	4.10	-	-	-	-	470	470
3	Pt Lot 9	A. & J. Mormile	0.6	3.10	-	-	-	-	360	360
3	N Pt Lot 10	H. & A. Perkins	0.6	1.06	-	-	-	-	120	120
3	Pt Lot 10	H. Squibb	0.6	7.77	-	-	-	-	890	890
3	N Pt Lot 9	J. & P. Wilson	0.6	8.41	-	-	-	-	970	970
3	N Pt Lot 9	C. & M. Cialone	0.6	8.32	-	-	-	-	960	960
3	Pt Lot 8	P. & C. Woods	0.6	10.05	-	-	-	-	1,160	1,160
3	Pt Lot 8	1665328 Ontario Ltd	0.6	11.18	-	-	-	-	1,290	1,290
3	Pt Lot 8	G. & M. Reynolds	0.6	1.00	-	-	-	-	110	110
3	W Pt Lot 8	1665328 Ontario Ltd	0.6	12.79	-	-	-	-	1,470	1,470
3	N Pt Lot 7	J. & M. Albanese	0.6	6.42	-	-	-	-	740	740
4	S Pt Lot 7	Gdm Terraco Inc	0.6	1.45	-	-	-	-	170	170
4	S Pt Lot 7	Franline Investments Ltd	0.6	7.79	-	-	-	-	900	900
4	S Pt Lot 7	F. & N. Grillo	0.6	9.91	-	-	-	-	1,140	1,140
4	Pt Lots 8 & 9	V. & D. Posius	0.6	55.65	-	-	-	-	6,400	6,400
4	Pt Lot 8	S. Khan	0.6	0.23	-	-	-	-	30	30
4	S Pt Lot 9	Sil Developments Inc, R. Zaretsky & S. Soudack	1	19.33	-	-	-	-	2,960	2,960
4	S Pt Lot 9	J. & D. Thew	1	0.40	-	-	-	-	60	60
4	N Pt Lot 10	P. Pillitteri	1	2.72	-	-	-	-	420	420
4	N Pt Lot 9	D. Lucas	1	19.65	-	-	-	-	3,010	3,010
4	N Pt Lot 8	Franline Investments Ltd	0.6	16.42	-	-	-	-	1,890	1,890
4	N Pt Lot 7	1665328 Ontario Ltd	0.6	1.45	-	-	-	-	170	170
4	S Pt Lot 11	Kell Farms Ltd	1	3.36	-	-	-	-	510	510
4	Pt S1/2 Lot 11	G., A. & P. Tuzi & M. Tersigni	1	2.19	-	-	-	-	340	340
4	Pt S1/2 Lot 11	A. Tuzi	1	2.18	-	-	-	-	330	330
4	Pt S1/2 Lot 11	A. Gargaro	1	2.18	-	-	-	-	330	330
4	Pt S1/2 Lot 11	G. Tuzi	1	1.63	-	-	-	-	250	250

[11] Sub - Total = $ 62,390
[12] Cumulative Total = $ 221,370
Cumulative Cost/Eq. Ha. carried U/S = **$ 153.15**

APPENDIX D11 - SUMMARY of AREAS by LAND USE

3rd Line Branch Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Innisfil
DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #:** 300038970

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
		Innisfil Lands								
1	N Pt Lot 17	J. Drybrough	002-04700	7.57	-	-	-	-	0.57	8.14
1	N Pt Lot 16	Clements Cemetary	002-04900	-	-	-	0.20	-	-	0.20
1	N Pt Lot 16	Kell Farms Ltd	002-05200	10.91	-	-	-	-	3.44	14.35
1	N Pt Lot 15	Kell Farms Ltd	002-05400	11.44	-	-	-	-	1.56	13.00
2	Lot 14	Innis Properties Ltd	002-07600	22.54	3.91	2.40	-	-	1.20	30.05
2	S Pt Lot15	E. Rosenberg	002-07700	21.98	-	-	-	-	-	21.98
2	S Pt Lot 15	1916013 Ontario Inc	002-07800	13.05	-	-	-	-	2.13	15.18
2	S Pt Lot 15	G. Kalcic & L. Esau	002-08000	-	-	-	0.29	-	-	0.29
2	S Pt Lot 16	K. & L. Sparrow	002-08200	-	-	-	-	-	0.62	0.62
2	S Pt Lot 16	A. Giaconelli & H. Luzius	002-08300	-	-	-	-	-	0.63	0.63
2	S Pt Lot 16	R. Simpson	002-08500	32.50	-	4.59	-	-	1.15	38.24
2	Pt Lot 16	L. Rumble	002-08520	-	-	-	0.23	-	-	0.23
2	S Pt Lot 17	N. & G. Sturgeon	002-08700	8.67	-	0.39	-	-	0.68	9.74
2	Pt Lot 17 & N Pt	Kell Farms Ltd	002-10000	31.88	-	3.99	-	-	8.41	44.28
2	Pt Lot 16	I. & M. Campbell	002-10200	0.19	-	-	-	-	-	0.19
2	N Pt Lot 16	I. & M. Campbell	002-10400	30.12	-	1.02	-	-	2.71	33.85
2	N Pt Lot 16	D. Cuneen	002-10500	-	-	-	0.26	-	-	0.26
2	N Pt Lot 16	B. & R. Zendelek	002-10600	-	-	2.36	-	-	3.70	6.06
2	N Pt Lot 15	G. & M. Thompson	002-10900	11.99	-	4.91	-	-	2.75	19.65
2	Pt Lot 15	K. Kent	002-10901	-	-	-	-	-	0.34	0.34
2	N Pt Lot 15	A. & P. Budd	002-11000	-	-	-	0.22	-	-	0.22
2	Pt Lot 15	Ministry Of Transportation	002-11100	0.10	-	-	0.01	-	-	0.11
2	N Pt Lot 15	I. Campbell	002-11300	17.97	-	0.79	-	-	0.79	19.55
2	N Pt Lot 13	D. Evers	002-11600	-	1.17	-	-	-	2.88	4.05
2	N Pt Lot 13	T. Risi	002-11700	-	0.26	-	-	-	2.30	2.56
2	N Pt Lot 13	T., Q. & M. Palmieri	002-11800	-	1.40	-	-	-	2.96	4.36
2	N Pt Lot 13	O. & R. Goncalves	002-11900	-	3.04	-	-	-	2.02	5.06
2	N Pt Lot 13	K. Yamamoto	002-12000	-	5.55	-	-	-	3.26	8.81
2	N Pt Lot 12	D. & I. Chouryguine	002-12100	-	2.75	-	-	-	0.48	3.23
2	N Pt Lot 12	S. Sharma	002-12200	-	0.93	-	-	-	1.19	2.12
2	N Pt Lot 12	J. Horodynsky	002-12300	**2.04**	-	-	-	-	-	**2.04**
2	N Pt Lot 12	1281597 Ontario Inc	002-12400	2.62	-	-	-	-	0.36	2.98
2	N Pt Lot 12	Horodynsky Farms Inc	002-12500	4.72	-	-	-	-	-	4.72
2	N Pt Lot 12	P. & K. Horodynsky	002-12600	4.07	-	-	-	-	0.26	4.33
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	002-12700	3.87	-	-	-	-	0.25	4.12
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	002-12800	3.59	-	-	-	-	0.11	3.70
2	N Pt Lot 11	1281597 Ontario Inc	002-12900	1.50	-	-	-	0.33	-	1.83
3	S Pt Lot 12	T. & C. Xenophontos	002-14300	-	1.40	-	-	-	1.65	3.05
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	002-14400	24.70	9.12	-	-	-	3.80	37.62
3	S Pt Lot 14	L. & E. Kell	002-14500	39.08	-	2.49	-	-	-	41.57
3	S Pt Lot 15	M. Campbell	002-14600	8.31	-	8.72	-	-	3.74	20.77
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	002-14700	16.13	-	3.38	-	-	0.60	20.11
3	S Pt Lot 16	C. Campbell & S. Todd	002-15000	33.39	-	3.74	-	-	3.05	40.18
3	S Pt Lot 16	M. Ledlie & V. Kerr	002-15200	-	-	-	0.28	-	-	0.28
3	S Pt Lot 17	J. Kell	002-15300	7.25	-	1.59	-	-	1.64	10.48
3	S Pt Lot 17	D. Kell	002-15400	8.52	-	0.53	-	-	0.30	9.35
3	S Pt Lot 17	J. Kell	002-15500	0.84	-	-	-	-	-	0.84
3	N Pt Lot 17	Kell Farms Ltd	002-20000	15.03	-	1.49	-	-	-	16.52
3	N Pt Lots 1	Top Hill View Estates Inc	002-20200	7.83	-	11.60	-	-	9.57	29.00
3	Plan 51M604	First View Homes (Scarborough)	002-20251	-	-	-	0.15	-	-	0.15

AS ORDERED BY THE TRIBUNAL - OCTOBER 22, 2019

APPENDIX D11 - SUMMARY of AREAS by LAND USE

3rd Line Branch Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
3	N Pt Lot 13	Crestrail Investments Inc	002-20300	4.97	-	0.74	-	-	-	5.71
4	N Pt Lot 16	M. Demarco	002-25000	0.95	-	3.26	-	-	1.05	5.26
3	N Pt Lot 16	J. Leblanc	003-00100	0.16	-	-	0.05	-	-	0.21
3	N Pt Lot 16	G. Ciccone	003-00200	-	-	-	0.13	-	-	0.13
3	N Pt Lot 16	M. Baker	003-00300	-	-	-	0.13	-	-	0.13
3	N Pt Lot 16	United Church	003-00400	-	-	-	0.14	-	-	0.14
3	N Pt Lot 16	10187526 Canada Corp	003-00500	31.44	-	4.72	-	-	3.54	39.70
3	N Pt Lot 15	S. Johnson, G. & M. Dilipkimar & P. Pra	003-00600	1.00	-	1.91	-	-	1.07	3.98
3	N Pt Lot 15	Fernbrook Homes (Churchill) Ltd	003-00700	-	-	9.66	2.57	-	-	12.23
3	Pt Lot 15	B. Doughty	003-00800	-	-	0.05	0.09	-	-	0.14
3	N Pt Lot 15	A. Dawson	003-00900	-	-	0.01	0.10	-	-	0.11
3	Pt Lot 15	T. Borscevski & B. Hill	003-01000	-	-	-	0.12	-	-	0.12
3	Pt Lot 15	C. Mount	003-01100	-	-	0.14	0.24	-	-	0.38
3	N Pt Lot 15	S. Simpson	003-01200	-	-	0.20	0.18	-	-	0.38
3	N Pt Lot 15	Anglican Church	003-01300	-	-	0.16	0.67	-	-	0.83
3	N Pt Lot 15	A. & C. Martins	003-01400	-	-	-	0.08	-	-	0.08
3	Pt Lot 15	J. Simpson	003-01500	-	-	-	0.15	-	-	0.15
3	Pt Lot 15	P S K Holdings Inc	003-01510	-	-	-	0.14	-	-	0.14
3	N Pt Lot 15	T. & S. Alderson	003-01700	-	-	-	0.19	-	-	0.19
3	Pt Lot 15	D. Wood & R. Bellar	003-02101	-	-	-	0.20	-	-	0.20
3	N Pt Lot 15	A. Fazelipour	003-02200	-	-	0.10	0.17	-	-	0.27
3	N Pt Lot 15	Town of Innisfil	003-02300	-	-	-	0.23	-	-	0.23
3	Plan 1194	M. & M. Alves	003-02400	-	-	-	0.19	-	-	0.19
3	Lot 14	J. & R. Carvalho	003-02500	-	-	-	0.14	-	-	0.14
3	Plan 1194	T. Cooley & O. Oliveira	003-02600	-	-	-	0.14	-	-	0.14
3	Lot 12	A. & L. Daniels	003-02700	-	-	-	0.08	-	-	0.08
3	Lot 21	C. Bell	003-04300	-	-	-	0.07	-	-	0.07
3	Lot 22	N. Gundert & R. Grant	003-04400	-	-	-	0.17	-	-	0.17
4	Plan 162	B. Deputat & C. Braney	003-10000	-	-	-	0.61	-	-	0.61
4	Plan 162	A. & M. Stepanova	003-10010	-	-	-	0.23	-	-	0.23
4	Plan 162	C. Radulovici	003-10100	-	1.03	-	0.69	-	-	1.72
4	Pt Lots 3	H. Rahimimoghadam	003-10200	-	0.24	-	0.16	-	-	0.40
4	Plan 162	M. Slocombe	003-10300	-	-	0.60	-	-	-	0.60
4	Plan 162	S. & R. Thomas	003-10400	-	-	-	0.18	-	-	0.18
4	Lot 30	A. Zlender	003-10500	-	-	0.18	0.08	-	-	0.26
4	Plan 162	C. & T. Asselstine	003-10600	-	-	0.44	0.63	-	-	1.07
4	Lot 24	B. Hoseman & K. Hoseman	003-10700	-	-	-	0.20	-	-	0.20
4	Plan 162	L. Burke	003-10800	-	-	-	0.17	-	-	0.17
4	Plan 162	S. & L. Gucciardi	003-10900	-	-	-	0.06	-	-	0.06
4	S Pt Lot 23	Renaissance Nouveau Design Inc	003-11000	-	-	-	0.06	-	-	0.06
4	Pt Lots 1	A. & D. Whiteside	003-11100	-	-	0.01	0.16	-	-	0.17
4	Plan 162	D. Napper	003-11200	-	-	0.12	0.27	-	-	0.39
4	Plan 162	V. & Z. Iacob	003-11300	-	-	0.48	0.24	-	-	0.72
4	S Pt Lot 16	K. & R. Sinclair	003-11400	2.96	0.82	11.02	-	-	1.48	16.28
4	Pt Lots 6 & 7	C. & T. Asselstine	003-11500	-	-	0.16	0.06	-	-	0.22
4	Plan 162	C. Mark	003-11600	-	-	0.03	0.10	-	-	0.13
4	Plan 162	R. Schweymaier	003-11700	-	-	0.33	0.52	-	-	0.85
4	Pt Lots 2	D. & M. Wilson	003-11800	-	-	-	0.15	-	-	0.15
4	Lot 1	C. Chegancas	003-11900	-	-	-	0.15	-	-	0.15
4	Pt Lot 16	D. & L. Fairhead	003-12000	-	-	1.03	-	-	-	1.03
4	Lot 61	F. Minici	003-12100	-	-	0.13	0.11	-	-	0.24
4	Plan 162	E. & I. Gyorfi	003-12200	-	-	0.17	0.02	-	-	0.19

APPENDIX D11 - SUMMARY of AREAS by LAND USE

3rd Line Branch Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands

Agricultural Land @ 1.00 Wetland @ 0.25
Bush @ 0.50 Industrial/Commercial @ 3.00
Residential @ 2.00 Other @ 1.00

Factors Applied to Roads

Arterial Paved Roads @ 5.00
Paved Roads @ 4.00
Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
4	Plan 162	P. Savard	003-12300	-	-	0.14	0.03	-	-	0.17
4	Plan 162	D. & M. Bowen	003-12400	-	-	0.06	0.05	-	-	0.11
4	Plan 162	J. Giannitti & M. Giannitti Est.	003-12500	-	-	0.08	0.10	-	-	0.18
4	Plan 162	C. Asselstine & M. Marshall	003-12600	-	-	0.11	0.07	-	-	0.18
4	Pt Lot 16	P. & D. McMillan	003-12700	-	-	1.33	0.08	-	-	1.41
4	Pt Lot 16	M. Mindle & E. Gulyas	003-12800	-	-	0.35	0.36	-	-	0.71
			Total Lands	**445.88**	**31.62**	**91.71**	**13.55**	**0.33**	**78.24**	**661.33**

Roads	Owner	Road Classification	Total Affected Area (ha)
4th Line	Town of Innisfil	Paved Road	1.72
3rd Line	Town of Innisfil	Gravel Road	7.09
2nd Line	Town of Innisfil	Gravel/Paved Road	3.06
Churchill Unnamed Road 1	Town of Innisfil	Paved Road	0.44
Churchill Unnamed Road 2	Town of Innisfil	Paved Road	0.91
Churchill Unnamed Road 3	Town of Innisfil	Paved Road	0.21
Allan Street	Town of Innisfil	Paved Road	0.19
10 Sideroad (CR 54)	Simcoe County	Paved Road	0.14
Hwy 400	Ministry of Transportation	Paved Arterial Road	14.06
		Total Roads to be Assessed	**27.82**
		TOTAL AFFECTED LANDS AND ROADS	**689.15**

APPENDIX D12 - SECTIONAL ASSESSMENT WORKSHEET

3rd Line Branch Drain

Project : **South Innisfil Creek Drain - 2019 Improvement** — Section Number = **3BR1**
DATE : **February 13, 2019** — **[1] Cost/Eq. Ha. from D/S = -**
Project # : **300038790** — **[2] Total Section Cost = $ 70,360**

[3] Specific Costs

Total Specific Costs = -

Remainder to Assess = 70,360

[4] Normal Outlet 80 %

Normal Benefit and Direct Outlet 20 %

[5] Equiv't Area Drained = 719.85 Ha. @ $ 78.20 per Eq. Ha. for Normal Outlet = 56,290

[6] Remaining for Normal Benefit and Direct Outlet = 14,070

[7] Direct Outlet

2	N Pt Lot 11	1281597 Ontario Inc	uses 10%	10
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	uses 25%	70
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	uses 40%	130
2	N Pt Lot 12	P. & K. Horodynsky	uses 55%	190
2	N Pt Lot 12	Horodynsky Farms Inc	uses 75%	280
2	N Pt Lot 12	1281597 Ontario Inc	uses 90%	210
2	N Pt Lot 12	J. Horodynsky	uses 95%	100
3rd Line		Town of Innisfil	uses 100%	510

Total of Direct Outlet = 1,500

[8] Remaining for Normal Benefit = 12,570

S U M M A R Y T A B L E

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
2	N Pt Lot 11	1281597 Ontario Inc	1.83	-	940	-	10	-	950
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	3.70	-	1,070	-	70	-	1,140
2	N Pt Lot 11	K. Yamamoto & S. Yamamoto Est.	4.12	-	1,070	-	130	-	1,200
2	N Pt Lot 12	P. & K. Horodynsky	4.33	-	1,070	-	190	-	1,260
2	N Pt Lot 12	Horodynsky Farms Inc	4.72	-	1,070	-	280	-	1,350
2	N Pt Lot 12	1281597 Ontario Inc	2.98	-	640	-	210	-	850
2	N Pt Lot 12	J. Horodynsky	1.32	-	420	-	100	-	520
3rd Line		Town of Innisfil	6.54	-	6,290	-	510	-	6,800
[10] U/S of Section Lands									
3	S Pt Lot 12	T. & C. Xenophontos	2.00	-	-	-	-	160	160
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	30.78	-	-	-	-	2,410	2,410
3	S Pt Lot 14	L. & E. Kell	40.33	-	-	-	-	3,150	3,150
3	S Pt Lot 15	M. Campbell	16.41	-	-	-	-	1,280	1,280
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	14.40	-	-	-	-	1,130	1,130
3	S Pt Lot 16	C. Campbell & S. Todd	23.04	-	-	-	-	1,800	1,800
3	S Pt Lot 17	J. Kell	4.63	-	-	-	-	360	360
3	S Pt Lot 17	D. Kell	5.74	-	-	-	-	450	450
3	N Pt Lot 17	Kell Farms Ltd	15.78	-	-	-	-	1,230	1,230
3	N Pt Lots 1	Top Hill View Estates Inc	23.20	-	-	-	-	1,810	1,810
3	Plan 51M604	First View Homes (Scarborough)	0.30	-	-	-	-	20	20
3	N Pt Lot 13	Crestrail Investments Inc	5.34	-	-	-	-	420	420
4	N Pt Lot 16	M. Demarco	3.63	-	-	-	-	280	280
3	N Pt Lot 16	J. Leblanc	0.42	-	-	-	-	30	30
3	N Pt Lot 16	G. Ciccone	0.26	-	-	-	-	20	20
3	N Pt Lot 16	M. Baker	0.26	-	-	-	-	20	20
3	N Pt Lot 16	United Church	0.28	-	-	-	-	20	20
3	N Pt Lot 16	10187526 Canada Corp	37.34	-	-	-	-	2,920	2,920
3	N Pt Lot 15	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	3.03	-	-	-	-	240	240
3	N Pt Lot 15	Fernbrook Homes (Churchill) Ltd	24.46	-	-	-	-	1,910	1,910
3	Pt Lot 15	B. Doughty	0.28	-	-	-	-	20	20

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
3	N Pt Lot 15	A. Dawson	0.22	-	-	-	-	20	20
3	Pt Lot 15	T. Borscevski & B. Hill	0.24	-	-	-	-	20	20
3	Pt Lot 15	C. Mount	0.76	-	-	-	-	60	60
3	N Pt Lot 15	S. Simpson	0.76	-	-	-	-	60	60
3	N Pt Lot 15	Anglican Church	1.66	-	-	-	-	130	130
3	N Pt Lot 15	A. & C. Martins	0.16	-	-	-	-	10	10
3	Pt Lot 15	J. Simpson	0.30	-	-	-	-	20	20
3	Pt Lot 15	P S K Holdings Inc	0.28	-	-	-	-	20	20
3	N Pt Lot 15	T. & S. Alderson	0.38	-	-	-	-	30	30
3	Pt Lot 15	D. Wood & R. Bellar	0.40	-	-	-	-	30	30
3	N Pt Lot 15	A. Fazelipour	0.54	-	-	-	-	40	40
3	N Pt Lot 15	Town of Innisfil	0.46	-	-	-	-	40	40
3	Plan 1194	M. & M. Alves	0.38	-	-	-	-	30	30
3	Lot 14	J. & R. Carvalho	0.28	-	-	-	-	20	20
3	Plan 1194	T. Cooley & O. Oliveira	0.28	-	-	-	-	20	20
3	Lot 12	A. & L. Daniels	0.16	-	-	-	-	10	10
3	Lot 21	C. Bell	0.14	-	-	-	-	10	10
3	Lot 22	N. Gundert & R. Grant	0.34	-	-	-	-	30	30
4	Plan 162	B. Deputat & C. Braney	1.22	-	-	-	-	100	100
4	Plan 162	A. & M. Stepanova	0.46	-	-	-	-	40	40
4	Plan 162	C. Radulovici	3.44	-	-	-	-	270	270
4	Pt Lots 3	H. Rahimimoghadam	0.80	-	-	-	-	60	60
4	Plan 162	M. Slocombe	1.20	-	-	-	-	90	90
4	Plan 162	S. & R. Thomas	0.36	-	-	-	-	30	30
4	Lot 30	A. Zlender	0.52	-	-	-	-	40	40
4	Plan 162	C. & T. Asselstine	2.14	-	-	-	-	170	170
4	Lot 24	B. Hoseman & K. Hoseman	0.40	-	-	-	-	30	30
4	Plan 162	L. Burke	0.34	-	-	-	-	30	30
4	Plan 162	S. & L. Gucciardi	0.12	-	-	-	-	10	10
4	S Pt Lot 23	Renaissance Nouveau Design Inc	0.12	-	-	-	-	10	10
4	Pt Lots 1	A. & D. Whiteside	0.34	-	-	-	-	30	30
4	Plan 162	D. Napper	0.78	-	-	-	-	60	60
4	Plan 162	V. & Z. Iacob	1.44	-	-	-	-	110	110
4	S Pt Lot 16	K. & R. Sinclair	10.16	-	-	-	-	790	790
4	Pt Lots 6 & 7	C. & T. Asselstine	0.44	-	-	-	-	30	30
4	Plan 162	C. Mark	0.26	-	-	-	-	20	20
4	Plan 162	R. Schweymaier	1.70	-	-	-	-	130	130
4	Pt Lots 2	D. & M. Wilson	0.30	-	-	-	-	20	20
4	Lot 1	C. Chegancas	0.30	-	-	-	-	20	20
4	Pt Lot 16	D. & L. Fairhead	2.06	-	-	-	-	160	160
4	Lot 61	F. Minici	0.48	-	-	-	-	40	40
4	Plan 162	E. & I. Gyorfi	0.38	-	-	-	-	30	30
4	Plan 162	P. Savard	0.34	-	-	-	-	30	30
4	Plan 162	D. & M. Bowen	0.22	-	-	-	-	20	20
4	Plan 162	J. Giannitti & M. Giannitti Est.	0.36	-	-	-	-	30	30
4	Plan 162	C. Asselstine & M. Marshall	0.36	-	-	-	-	30	30
4	Pt Lot 16	P. & D. McMillan	2.82	-	-	-	-	220	220
4	Pt Lot 16	M. Mindle & E. Gulyas	1.42	-	-	-	-	110	110
Roads									
4th Line		Town of Innisfil	6.88	-	-	-	-	540	540
Churchill Unnamed Road 1		Town of Innisfil	1.76	-	-	-	-	140	140
Churchill Unnamed Road 2		Town of Innisfil	3.64	-	-	-	-	280	280
Churchill Unnamed Road 3		Town of Innisfil	0.84	-	-	-	-	70	70
Allan Street		Town of Innisfil	0.76	-	-	-	-	60	60
10 Sideroad (CR 54)		Simcoe County	0.56	-	-	-	-	40	40
County Road 4 (Yonge Street)		Simcoe County	27.45	-	-	-	-	2,150	2,150

[11] Sub - Total = $ 40,390
[12] Cumulative Total = $ 40,390
Cumulative Cost/Eq. Ha. carried U/S = **$ 78.24**

APPENDIX D12 - SECTIONAL ASSESSMENT WORKSHEET

3rd Line Branch Drain

Project : **South Innisfil Creek Drain - 2019 Improvement** | Section Number = **3BR2**
DATE : **February 13, 2019** | **[1] Cost/Eq. Ha. from D/S = 78.24**
Project # : **300038790** | **[2] Total Section Cost = $ 38,450**

[3] Specific Costs

Total Specific Costs = -

Remainder to Assess = 38,450

[4] Normal Outlet	60 %
Normal Benefit and Direct Outlet	40 %

[5] Equiv't Area Drained = 323.51 Ha. @ $ 71.31 per Eq. Ha. for Normal Outlet = 23,070

[6] Remaining for Normal Benefit and Direct Outlet = 15,380

[7] Direct Outlet

2	N Pt Lot 12	S. Sharma	uses 10%	10
2	N Pt Lot 12	D. & I. Chouryguine	uses 20%	20
2	N Pt Lot 13	K. Yamamoto	uses 35%	120
2	N Pt Lot 13	O. & R. Goncalves	uses 50%	100
2	N Pt Lot 13	T., Q. & M. Palmieri	uses 60%	140
2	N Pt Lot 13	T. Risi	uses 80%	140
2	N Pt Lot 13	D. Evers	uses 95%	210
2	Lot 14	Innis Properties Ltd	uses 100%	1,850
3rd Line		Town of Innisfil	uses 100%	1,050

Total of Direct Outlet = 3,640

[8] Remaining for Normal Benefit = 11,740

S U M M A R Y T A B L E

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
2	N Pt Lot 12	S. Sharma	1.42	-	460	-	10	110	580
2	N Pt Lot 12	D. & I. Chouryguine	1.17	-	680	-	20	90	790
2	N Pt Lot 13	K. Yamamoto	4.65	-	1,710	-	120	360	2,190
2	N Pt Lot 13	O. & R. Goncalves	2.78	-	910	-	100	220	1,230
2	N Pt Lot 13	T., Q. & M. Palmieri	3.31	-	790	-	140	260	1,190
2	N Pt Lot 13	T. Risi	2.37	-	460	-	140	190	790
2	N Pt Lot 13	D. Evers	3.17	-	710	-	210	250	1,170
2	Lot 14	Innis Properties Ltd	25.92	-	290	-	1,850	2,030	4,170
3rd Line		Town of Innisfil	14.73	-	5,730	-	1,050	1,150	7,930
[10] U/S of Section Lands									
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	4.02	-	-	-	-	600	600
3	S Pt Lot 16	C. Campbell & S. Todd	15.27	-	-	-	-	2,280	2,280
3	S Pt Lot 17	J. Kell	5.06	-	-	-	-	760	760
3	S Pt Lot 17	D. Kell	3.35	-	-	-	-	500	500
1	N Pt Lot 17	J. Drybrough	8.14	-	-	-	-	1,220	1,220
1	N Pt Lot 16	Clements Cemetary	0.40	-	-	-	-	60	60
1	N Pt Lot 16	Kell Farms Ltd	14.35	-	-	-	-	2,150	2,150
1	N Pt Lot 15	Kell Farms Ltd	13.00	-	-	-	-	1,940	1,940
2	S Pt Lot15	E. Rosenberg	21.98	-	-	-	-	3,290	3,290
2	S Pt Lot 15	1916013 Ontario Inc	15.18	-	-	-	-	2,270	2,270
2	S Pt Lot 15	G. Kalcic & L. Esau	0.58	-	-	-	-	90	90
2	S Pt Lot 16	K. & L. Sparrow	0.62	-	-	-	-	90	90
2	S Pt Lot 16	A. Giaconelli & H. Luzius	0.63	-	-	-	-	90	90
2	S Pt Lot 16	R. Simpson	35.95	-	-	-	-	5,380	5,380
2	Pt Lot 16	L. Rumble	0.46	-	-	-	-	70	70

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
2	S Pt Lot 17	N. & G. Sturgeon	9.55	-	-	-	-	1,430	1,430
2	Pt Lot 17 & N Pt Lot 18	Kell Farms Ltd	42.29	-	-	-	-	6,320	6,320
2	Pt Lot 16	I. & M. Campbell	0.19	-	-	-	-	30	30
2	N Pt Lot 16	I. & M. Campbell	33.34	-	-	-	-	4,990	4,990
2	N Pt Lot 16	D. Cuneen	0.52	-	-	-	-	80	80
2	N Pt Lot 16	B. & R. Zendelek	4.88	-	-	-	-	730	730
2	N Pt Lot 15	G. & M. Thompson	17.20	-	-	-	-	2,570	2,570
2	Pt Lot 15	K. Kent	0.34	-	-	-	-	50	50
2	N Pt Lot 15	A. & P. Budd	0.44	-	-	-	-	70	70
2	Pt Lot 15	Ministry Of Transportation	0.12	-	-	-	-	20	20
2	N Pt Lot 15	I. Campbell	19.16	-	-	-	-	2,870	2,870
3	S Pt Lot 16	M. Ledlie & V. Kerr	0.56	-	-	-	-	80	80
3	S Pt Lot 17	J. Kell	0.84	-	-	-	-	130	130
Roads									
2nd Line		Town of Innisfil	12.24	-	-	-	-	1,830	1,830
County Road 4 (Yonge Street)		Simcoe County	42.85	-	-	-	-	6,390	6,390

[11] Sub - Total = $ 68,420
[12] Cumulative Total = $ 108,810
Cumulative Cost/Eq. Ha. carried U/S = **$ 149.56**

APPENDIX D13 - SUMMARY of AREAS by LAND USE

3rd Line Spur Branch Drain

PROJECT: South Innisfil Creek Drain - 2019 Improvement **TOWN:** Innisfil

DATE : October 22, 2019 - Amended by the Tribunal **PROJECT #:** 300038970

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
		Innisfil Lands								
3	S Pt Lot 12	T. & C. Xenophontos	002-14300	-	1.40	-	-	-	1.65	3.05
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	002-14400	24.70	9.12	-	-	-	3.80	37.62
3	S Pt Lot 14	L. & E. Kell	002-14500	39.08	-	2.49	-	-	-	41.57
3	S Pt Lot 15	M. Campbell	002-14600	8.31	-	8.72	-	-	3.74	20.77
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	002-14700	12.71	-	3.38	-	-	-	16.09
3	S Pt Lot 16	C. Campbell & S. Todd	002-15000	21.17	-	3.74	-	-	-	24.91
3	S Pt Lot 17	J. Kell	002-15300	2.90	-	1.59	-	-	0.93	5.42
3	S Pt Lot 17	D. Kell	002-15400	5.17	-	0.53	-	-	0.30	6.00
3	N Pt Lot 17	Kell Farms Ltd	002-20000	15.03	-	1.49	-	-	-	16.52
3	N Pt Lots 1	Top Hill View Estates Inc	002-20200	7.83	-	11.60	-	-	9.57	29.00
3	Plan 51M604	First View Homes (Scarborough)	002-20251	-	-	-	0.15	-	-	0.15
3	N Pt Lot 13	Crestrail Investments Inc	002-20300	4.97	-	0.74	-	-	-	5.71
4	N Pt Lot 16	M. Demarco	002-25000	0.95	-	3.26	-	-	1.05	5.26
3	N Pt Lot 16	J. Leblanc	003-00100	0.16	-	-	0.05	-	-	0.21
3	N Pt Lot 16	G. Ciccone	003-00200	-	-	-	0.13	-	-	0.13
3	N Pt Lot 16	M. Baker	003-00300	-	-	-	0.13	-	-	0.13
3	N Pt Lot 16	United Church	003-00400	-	-	-	0.14	-	-	0.14
3	N Pt Lot 16	10187526 Canada Corp	003-00500	31.44	-	4.72	-	-	3.54	39.70
3	N Pt Lot 15	S. Johnson, G. & M. Dilipkimar & P. Pra	003-00600	1.00	-	1.91	-	-	1.07	3.98
3	N Pt Lot 15	Fernbrook Homes (Churchill) Ltd	003-00700	-	-	9.66	2.57	-	-	12.23
3	Pt Lot 15	B. Doughty	003-00800	-	-	0.05	0.09	-	-	0.14
3	N Pt Lot 15	A. Dawson	003-00900	-	-	0.01	0.10	-	-	0.11
3	Pt Lot 15	T. Borscevski & B. Hill	003-01000	-	-	-	0.12	-	-	0.12
3	Pt Lot 15	C. Mount	003-01100	-	-	0.14	0.24	-	-	0.38
3	N Pt Lot 15	S. Simpson	003-01200	-	-	0.20	0.18	-	-	0.38
3	N Pt Lot 15	Anglican Church	003-01300	-	-	0.16	-	-	0.67	0.83
3	N Pt Lot 15	A. & C. Martins	003-01400	-	-	-	0.08	-	-	0.08
3	Pt Lot 15	J. Simpson	003-01500	-	-	-	0.15	-	-	0.15
3	Pt Lot 15	P S K Holdings Inc	003-01510	-	-	-	0.14	-	-	0.14
3	N Pt Lot 15	T. & S. Alderson	003-01700	-	-	-	0.19	-	-	0.19
3	Pt Lot 15	D. Wood & R. Bellar	003-02101	-	-	-	0.20	-	-	0.20
3	N Pt Lot 15	A. Fazelipour	003-02200	-	-	0.10	0.17	-	-	0.27
3	N Pt Lot 15	Town of Innisfil	003-02300	-	-	-	0.23	-	-	0.23
3	Plan 1194	M. & M. Alves	003-02400	-	-	-	0.19	-	-	0.19
3	Lot 14	J. & R. Carvalho	003-02500	-	-	-	0.14	-	-	0.14
3	Plan 1194	T. Cooley & O. Oliveira	003-02600	-	-	-	0.14	-	-	0.14
3	Lot 12	A. & L. Daniels	003-02700	-	-	-	0.08	-	-	0.08
3	Lot 21	C. Bell	003-04300	-	-	-	0.07	-	-	0.07
3	Lot 22	N. Gundert & R. Grant	003-04400	-	-	-	0.17	-	-	0.17
4	Plan 162	B. Deputat & C. Braney	003-10000	-	-	-	-	-	0.61	0.61
4	Plan 162	A. & M. Stepanova	003-10010	-	-	-	0.23	-	-	0.23
4	Plan 162	C. Radulovici	003-10100	-	1.03	-	-	-	0.69	1.72
4	Pt Lots 3	H. Rahimimoghadam	003-10200	-	0.24	-	-	-	0.16	0.40
4	Plan 162	M. Slocombe	003-10300	-	-	0.60	-	-	-	0.60
4	Plan 162	S. & R. Thomas	003-10400	-	-	-	0.18	-	-	0.18
4	Lot 30	A. Zlender	003-10500	-	-	0.18	-	-	0.08	0.26
4	Plan 162	C. & T. Asselstine	003-10600	-	-	0.44	-	-	0.63	1.07
4	Lot 24	B. Hoseman & K. Hoseman	003-10700	-	-	-	0.20	-	-	0.20
4	Plan 162	L. Burke	003-10800	-	-	-	0.17	-	-	0.17
4	Plan 162	S. & L. Gucciardi	003-10900	-	-	-	0.06	-	-	0.06
4	S Pt Lot 23	Renaissance Nouveau Design Inc	003-11000	-	-	-	0.06	-	-	0.06
4	Pt Lots 1	A. & D. Whiteside	003-11100	-	-	0.01	0.16	-	-	0.17

APPENDIX D13 - SUMMARY of AREAS by LAND USE

3rd Line Spur Branch Drain

PROJECT: **South Innisfil Creek Drain - 2019 Improvement** **TOWN:** **Innisfil**
DATE : **October 22, 2019 - Amended by the Tribunal** **PROJECT #:** **300038970**

Factors Applied to Lands		Factors Applied to Roads
Agricultural Land @ 1.00	Wetland @ 0.25	Arterial Paved Roads @ 5.00
Bush @ 0.50	Industrial/Commercial @ 3.00	Paved Roads @ 4.00
Residential @ 2.00	Other @ 1.00	Gravel Roadways @ 3.00

Con.	Lot or Plan	Owner	Roll No.	Ag. Area (ha)	Wetland Area (ha)	Bush Area (ha)	Res. Area (ha)	Ind. or Comm. Area (ha)	Other Area (ha)	Total Affected Area (ha)
4	Plan 162	D. Napper	003-11200	-	-	0.12	-	-	0.27	0.39
4	Plan 162	V. & Z. Iacob	003-11300	-	-	0.48	-	-	0.24	0.72
4	S Pt Lot 16	K. & R. Sinclair	003-11400	2.96	0.82	11.02	-	-	1.48	16.28
4	Pt Lots 6 & 7	C. & T. Asselstine	003-11500	-	-	0.16	-	-	0.06	0.22
4	Plan 162	C. Mark	003-11600	-	-	0.03	-	-	0.10	0.13
4	Plan 162	R. Schweymaier	003-11700	-	-	0.33	-	-	0.52	0.85
4	Pt Lots 2	D. & M. Wilson	003-11800	-	-	-	-	-	0.15	0.15
4	Lot 1	C. Chegancas	003-11900	-	-	-	0.15	-	-	0.15
4	Pt Lot 16	D. & L. Fairhead	003-12000	-	-	1.03	-	-	-	1.03
4	Lot 61	F. Minici	003-12100	-	-	0.13	-	-	0.11	0.24
4	Plan 162	E. & I. Gyorfi	003-12200	-	-	0.17	0.02	-	-	0.19
4	Plan 162	P. Savard	003-12300	-	-	0.14	-	-	0.03	0.17
4	Plan 162	D. & M. Bowen	003-12400	-	-	0.06	-	-	0.05	0.11
4	Plan 162	J. Giannitti & M. Giannitti Est.	003-12500	-	-	0.08	-	-	0.10	0.18
4	Plan 162	C. Asselstine & M. Marshall	003-12600	-	-	0.11	-	-	0.07	0.18
4	Pt Lot 16	P. & D. McMillan	003-12700	-	-	1.33	-	-	0.08	1.41
4	Pt Lot 16	M. Mindle & E. Gulyas	003-12800	-	-	0.35	0.36	-	-	0.71
			Total Lands	**178.38**	**12.61**	**71.26**	**7.44**	**-**	**31.75**	**301.44**

Roads	Owner	Road Classification	Total Affected Area (ha)
4th Line	Town of Innisfil	Paved Road	1.72
3rd Line	Town of Innisfil	Gravel Road	1.13
Churchill Unnamed Road 1	Town of Innisfil	Paved Road	0.44
Churchill Unnamed Road 2	Town of Innisfil	Paved Road	0.91
Churchill Unnamed Road 3	Town of Innisfil	Paved Road	0.21
Allan Street	Town of Innisfil	Paved Road	0.19
County Road 4 (Yonge Street)	Simcoe County	Paved Arterial Road	5.49
		Total Roads to be Assessed	**10.09**
		TOTAL AFFECTED LANDS AND ROADS	**311.53**

APPENDIX D14 - SECTIONAL ASSESSMENT WORKSHEET

3rd Line Spur Branch Drain

Project : **South Innisfil Creek Drain - 2019 Improvement**
DATE : **February 13, 2019**
Project # : **300038790**

Section Number = **3SP**
[1] Cost/Eq. Ha. from D/S = -
[2] Total Section Cost = $ 44,280

[3] Specific Costs

Culvert cleanout on 3rd Line as Specific Benefit	**3,150**
Admin associated with 3rd Line culvert cleanout	840
Total Specific Costs =	3,990

Remainder to Assess = 40,290

[4] Normal Outlet 80 %

Normal Benefit and Direct Outlet 20 %

[5] Equiv't Area Drained = 303.48 Ha. @ $ 106.20 per Eq. Ha. for Normal Outlet = 32,230

[6] Remaining for Normal Benefit and Direct Outlet = 8,060

[7] Direct Outlet

3	S Pt Lot 12	T. & C. Xenophontos	uses 10%	20
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	uses 70%	2,290
3rd Line		Town of Innisfil	uses 100%	360
			Total of Direct Outlet =	2,670

[8] Remaining for Normal Benefit = 5,390

SUMMARY TABLE

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
[9] In Section									
3	S Pt Lot 12	T. & C. Xenophontos	2.00	-	530	-	20	-	550
3	S Pt Lot 13	H. & K. Yamamoto & S. Yamamoto Est.	30.78	-	2,130	-	2,290	-	4,420
3rd Line		Town of Innisfil	3.39	3,990	2,690	-	360	-	7,040
[10] U/S of Section Lands									
3	S Pt Lot 14	L. & E. Kell	40.33	-	-	-	-	4,280	4,280
3	S Pt Lot 15	M. Campbell	16.41	-	-	-	-	1,740	1,740
3	S Pt Lot 15	Alpine Peaks (Churchill) Development	14.40	-	-	-	-	1,530	1,530
3	S Pt Lot 16	C. Campbell & S. Todd	23.04	-	-	-	-	2,450	2,450
3	S Pt Lot 17	J. Kell	4.63	-	-	-	-	490	490
3	S Pt Lot 17	D. Kell	5.74	-	-	-	-	610	610
3	N Pt Lot 17	Kell Farms Ltd	15.78	-	-	-	-	1,680	1,680
3	N Pt Lots 1	Top Hill View Estates Inc	23.20	-	-	-	-	2,460	2,460
3	Plan 51M604	First View Homes (Scarborough)	0.30	-	-	-	-	30	30
3	N Pt Lot 13	Crestrail Investments Inc	5.34	-	-	-	-	570	570
4	N Pt Lot 16	M. Demarco	3.63	-	-	-	-	390	390
3	N Pt Lot 16	J. Leblanc	0.42	-	-	-	-	40	40
3	N Pt Lot 16	G. Ciccone	0.26	-	-	-	-	30	30
3	N Pt Lot 16	M. Baker	0.26	-	-	-	-	30	30
3	N Pt Lot 16	United Church	0.28	-	-	-	-	30	30
3	N Pt Lot 16	10187526 Canada Corp	37.34	-	-	-	-	3,970	3,970
3	N Pt Lot 15	S. Johnson, G. & M. Dilipkimar & P. Pravinchandra	3.03	-	-	-	-	320	320
3	N Pt Lot 15	Fernbrook Homes (Churchill) Ltd	24.46	-	-	-	-	2,600	2,600
3	Pt Lot 15	B. Doughty	0.28	-	-	-	-	30	30
3	N Pt Lot 15	A. Dawson	0.22	-	-	-	-	20	20
3	Pt Lot 15	T. Borscevski & B. Hill	0.24	-	-	-	-	30	30
3	Pt Lot 15	C. Mount	0.76	-	-	-	-	80	80
3	N Pt Lot 15	S. Simpson	0.76	-	-	-	-	80	80
3	N Pt Lot 15	Anglican Church	1.66	-	-	-	-	180	180
3	N Pt Lot 15	A. & C. Martins	0.16	-	-	-	-	20	20
3	Pt Lot 15	J. Simpson	0.30	-	-	-	-	30	30

CONC.	LOT	OWNER	EQ. AREA (ha)	BENEFIT (Sec 22) Specific	BENEFIT (Sec 22) Normal	Sec 24/26	OUTLET (Sec 23) Direct	OUTLET (Sec 23) Normal	TOTAL
3	Pt Lot 15	P S K Holdings Inc	0.28	-	-	-	-	30	30
3	N Pt Lot 15	T. & S. Alderson	0.38	-	-	-	-	40	40
3	Pt Lot 15	D. Wood & R. Bellar	0.40	-	-	-	-	40	40
3	N Pt Lot 15	A. Fazelipour	0.54	-	-	-	-	60	60
3	N Pt Lot 15	Town of Innisfil	0.46	-	-	-	-	50	50
3	Plan 1194	M. & M. Alves	0.38	-	-	-	-	40	40
3	Lot 14	J. & R. Carvalho	0.28	-	-	-	-	30	30
3	Plan 1194	T. Cooley & O. Oliveira	0.28	-	-	-	-	30	30
3	Lot 12	A. & L. Daniels	0.16	-	-	-	-	20	20
3	Lot 21	C. Bell	0.14	-	-	-	-	10	10
3	Lot 22	N. Gundert & R. Grant	0.34	-	-	-	-	40	40
4	Plan 162	B. Deputat & C. Braney	1.22	-	-	-	-	130	130
4	Plan 162	A. & M. Stepanova	0.46	-	-	-	-	50	50
4	Plan 162	C. Radulovici	3.44	-	-	-	-	370	370
4	Pt Lots 3	H. Rahimimoghadam	0.80	-	-	-	-	80	80
4	Plan 162	M. Slocombe	1.20	-	-	-	-	130	130
4	Plan 162	S. & R. Thomas	0.36	-	-	-	-	40	40
4	Lot 30	A. Zlender	0.52	-	-	-	-	60	60
4	Plan 162	C. & T. Asselstine	2.14	-	-	-	-	230	230
4	Lot 24	B. Hoseman & K. Hoseman	0.40	-	-	-	-	40	40
4	Plan 162	L. Burke	0.34	-	-	-	-	40	40
4	Plan 162	S. & L. Gucciardi	0.12	-	-	-	-	10	10
4	S Pt Lot 23	Renaissance Nouveau Design Inc	0.12	-	-	-	-	10	10
4	Pt Lots 1	A. & D. Whiteside	0.34	-	-	-	-	40	40
4	Plan 162	D. Napper	0.78	-	-	-	-	80	80
4	Plan 162	V. & Z. Iacob	1.44	-	-	-	-	150	150
4	S Pt Lot 16	K. & R. Sinclair	10.16	-	-	-	-	1,080	1,080
4	Pt Lots 6 & 7	C. & T. Asselstine	0.44	-	-	-	-	50	50
4	Plan 162	C. Mark	0.26	-	-	-	-	30	30
4	Plan 162	R. Schweymaier	1.70	-	-	-	-	180	180
4	Pt Lots 2	D. & M. Wilson	0.30	-	-	-	-	30	30
4	Lot 1	C. Chegancas	0.30	-	-	-	-	30	30
4	Pt Lot 16	D. & L. Fairhead	2.06	-	-	-	-	220	220
4	Lot 61	F. Minici	0.48	-	-	-	-	50	50
4	Plan 162	E. & I. Gyorfi	0.38	-	-	-	-	40	40
4	Plan 162	P. Savard	0.34	-	-	-	-	40	40
4	Plan 162	D. & M. Bowen	0.22	-	-	-	-	20	20
4	Plan 162	J. Giannitti & M. Giannitti Est.	0.36	-	-	-	-	40	40
4	Plan 162	C. Asselstine & M. Marshall	0.36	-	-	-	-	40	40
4	Pt Lot 16	P. & D. McMillan	2.82	-	-	-	-	300	300
4	Pt Lot 16	M. Mindle & E. Gulyas	1.42	-	-	-	-	150	150
Roads									
4th Line		Town of Innisfil	6.88	-	-	-	-	730	730
Churchill Unnamed Road 1		Town of Innisfil	1.76	-	-	-	-	190	190
Churchill Unnamed Road 2		Town of Innisfil	3.64	-	-	-	-	390	390
Churchill Unnamed Road 3		Town of Innisfil	0.84	-	-	-	-	90	90
Allan Street		Town of Innisfil	0.76	-	-	-	-	80	80
County Road 4 (Yonge Street)		Simcoe County	27.45	-	-	-	-	2,920	2,920

[11] Sub - Total = $ 44,280

[12] Cumulative Total = $ 44,280

Cumulative Cost/Eq. Ha. carried U/S = **$ 106.20**

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Standard Drain Specifications

Appendix E

E.2.1 GENERAL DRAIN SPECIFICATIONS

E.2.1.1 SCOPE OF SPECIFICATIONS

This specification covers the general conditions governing the construction of a Municipal Drain under the most recent revision of The Drainage Act and amendments. All work shall be done in accordance with current and applicable Ontario Provincial Standard Specifications and Drawings (OPSS and OPSD).

E.2.1.2 BENCHMARKS

Benchmarks shall be set at intervals along the course of the work at locations shown on the accompanying plan and/or profile. The Contractor or landowner shall be held liable for the cost of re-establishing benchmarks destroyed. Attention is drawn to Section 13 of The Drainage Act.

E.2.1.3 STAKES/FLAGS/MARKERS

Stakes, flags or markers are typically set at intervals throughout the course of the work, at all fences and property lines. The Contractor or landowner shall be held liable for the cost of replacing any stakes removed or destroyed.

E.2.1.4 PROFILE

The drain is to be excavated or installed to regular gradient lines as shown on the profile(s). These gradients show the bottom of the finished drain (open or closed) and are governed entirely by the benchmarks. In the case of closed drains, the gradient is that of the invert of the tile. The profile(s) shows the approximate depth from the surface of the ground to the invert of the tile or ditch bottom at the point where the stations are set and from the average bottom of the open drain as taken at the time of survey. Open drains shall be brought to an even gradient in the bottom to prevent standing water. For closed drains, a variation of 25 mm (unless specified otherwise) from the gradient may be deemed sufficient reason for the work to be rejected and required to be rebuilt.

E.2.1.5 CLEARING

Clearing means the cutting of all standing trees, brush, bushes and other vegetation to a maximum height of 300 mm above original ground level as well as the removal of felled materials and windfalls. Trees measuring 150 mm or more in diameter shall be felled, delimbed, cut into lengths no longer than 4 m and stacked to the designated side of the working space. The work shall not damage or disturb the area outside the areas specified in the Contract Documents.

The work shall consist of clearing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height, and any other areas specified in the Contract Documents.

No trees, brush or bushes are to be left inside the slopes of the drain, whether they are located within the limits of the excavation or not. Brush cleared in accordance with the above shall be piled in a location and in a manner satisfactory to the Engineer for burning by the Owner. Unless otherwise specified or directed, these piles shall be a minimum of 100 m apart and shall contain only cleared material. All work shall be done in accordance with OPSS 201.

E.2.1.6 CLOSE CUT CLEARING

Close Cut Clearing means the cutting of all standing trees, stumps, brush, bushes and other vegetation at original ground level and the removal of felled materials and windfalls. Grubbing means the removal of all stumps, roots, embedded logs, debris and secondary growth. Trees measuring 150 mm or more in diameter shall be felled, delimbed, cut into lengths no longer than 4 m and stacked to the designated side of the working space. The work shall not damage or disturb the area outside the areas specified in the Contract Documents.

The work shall consist of close cut clearing all earth surfaces to be covered by embankments greater than 1.2 m in height, and any other areas specified in the Contract Documents.

No trees, stumps, brush or bushes are to be left inside the slopes of the drain whether they are located within the limits of the excavation or not. Brush cleared in accordance with the above shall be piled in a location and in a manner satisfactory to the Engineer for burning by the Owner. Unless otherwise specified or directed, these piles shall be a minimum of 100 m apart and shall contain only cleared material. All work shall be done in accordance with OPSS 201.

E.2.1.7 BRUSHING

Brushing means the grinding or chipping to ground level of vegetation in the working space under 150 mm in diameter by means of a hydraulic brushing attachment used with an excavator or approved equivalent. This includes grinding or chipping all standing trees, stumps, brush, bushes and other vegetation to original ground level.

Trees measuring 150 mm or more in diameter shall be felled, delimbed, cut into lengths no longer than 4 m and stacked to the designated side of the working space. The work shall not damage or disturb the area outside the areas specified in the Contract Documents. All work shall be done in accordance with OPSS 201.

E.2.1.8 GRUBBING

Grubbing means the removal of all stumps, roots, embedded logs, debris and secondary growth.

The work shall consist of grubbing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height and any other areas specified in the Contract Documents.

Grubbing is not required in swamps. Mechanical stump cutters are permitted, provided the entire root structure is removed. Depressions remaining after grubbing shall be backfilled with suitable earth material and compacted to avoid settlement. When clearing has been previously completed by others, all secondary growth, brush and debris shall be removed.

Piled boulders and surface boulders that are not specified in the Contract Documents for removal and lie within areas to be grubbed shall be removed. The work shall not damage or disturb the area outside the areas specified in the Contract Documents. All work shall be done in accordance with OPSS 201.

E.2.1.9 REMOVAL OF SURFACE BOULDERS & REMOVAL OF PILED BOULDERS

Piled Boulders means any cobbles, boulders or rock fragments that have been placed in fence rows or piles.

Rock means rock as defined in OPSS 206.

Surface Boulder means any boulder or rock fragment that measures 200 mm or greater in any one dimension, extends a minimum of 200 mm above original ground and can be removed without excavation.

The work shall consist of the removal of surface boulders and removal of piled boulders within the areas specified in the Contract Documents. Depressions remaining after removal shall be backfilled with suitable earth material and compacted to avoid settlement. The work shall not damage or disturb the area outside the areas specified in the Contract Documents. All work shall be done in accordance with OPSS 201.

E.2.1.10 FENCES

The Contractor will be permitted to remove fences to the extent necessary to allow the construction of the drain and to dispose of any excess material according to specifications. Any such fences shall be carefully handled so as to cause no unnecessary damage. Such fences shall be replaced by the Contractor in as good a condition as found. The Contractor shall supply all material necessary to properly reconstruct any fences. The Contractor shall not leave any fence open when he is not at work in the immediate area and shall replace the fence in a timely manner, all to the satisfaction of the Engineer.

E.2.1.11 STANDING CROPS AND LIVESTOCK

Should a property owner wish to harvest any crop along an access route or within the construction working space as set out in the Engineer's Report, then it shall be the responsibility of the property owner to do so prior to construction. Provisions for the loss of, or damage to, crops along the access route or in the construction area ("Working Space") have been made in the Report and such loss or damage shall not be the liability of the Contractor.

The Contractor shall contain construction operations to the working space and width specified. As long as the construction operations are contained within the specified working space, the Contractor shall not be responsible for damages to crops along the course of the drain.

It shall be the responsibility of the property owners to keep their livestock clear of the construction area upon receiving 24 hours advance notice by the Contractor. After receiving proper notice, the Owner of the property upon which a drain is being constructed shall be liable for any loss or damage to livestock, the drain, drain materials or the Contractor's equipment caused by their livestock.

E.2.1.12 NOTIFICATION OF AGENCIES

The Contractor shall notify the appropriate agency before performing any work affecting the land or property of the MTO, railway, telephone, pipeline or public utility or regulatory agency. The Contractor shall further agree to perform the work affecting such lands or property in accordance with the specifications and approval/permit of the applicable agency.

E.2.1.13 FINAL INSPECTIONS

After substantial completion of the work, but prior to demobilization and final removal of all equipment and materials from the site, the Contractor MUST arrange an on-site FINAL Inspection of the work with the engineer to ensure all aspects of the work have been satisfactorily completed and/or that arrangements have been made to expedite the completion of any outstanding "minor" items or deficiencies. All the work included in the contract, at the time of the Final Inspection, must have the full dimensions and cross-sections called for in the plans and specifications. Notification to the Engineer of this Final Inspection shall be provided at least 5 days prior and it shall be completed as soon as possible or as soon thereafter as weather conditions permit.

E.2.2 SPECIFICATIONS FOR OPEN DRAINS

E.2.2.1 GEOMETRY

The drain shall have the full bottom width, at the gradient, specified or shown on the accompanying plan(s), profile(s) and detail sheet(s).

E.2.2.2 ALIGNMENT

The drain shall run in straight lines throughout each course except at intersections, where it shall run on a minimum curve of 15 m radius unless otherwise specified. If the work consists of the improvement of an existing open drain, then the centre line of the existing drain may be the centre line of the finished work unless otherwise specified.

E.2.2.3 EXCAVATED MATERIAL

A clear buffer of at least 3 m shall be left between the top edge of the open drain and the excavated material. Excavated material shall be placed on the side specified or, if not specified, on the lower side of the drain or on the side opposite trees or fences. No excavated material is to be left in any low runs intended to conduct water into the open drain. It shall be deposited, spread and leveled to a maximum depth of 150 mm, unless specified otherwise and left in a manner such that the lands on which it is spread may be cultivated with adjacent lands by use of ordinary farm machinery. Material excavated in land that is timbered, may be spread to the depth specified or to a maximum depth of 300 mm. In cultivated areas, the Contractor shall remove stones and boulders on the surface greater than 100 mm diameter from the excavated material and dispose of in an approved location. Treatment of excavated material shall be to the satisfaction of the Engineer. After the excavated material has been spread and leveled, it shall be seeded as specified.

E.2.2.4 SURFACE WATER INLETS

Surface water inlets to the drain shall be provided through the leveled spoil on each property at obvious natural low runs or at other locations as specified by the Engineer on site at the time of construction. No excavated material shall be left in, or any damage done to a ditch, furrow, pipe, tile or depression that is intended to conduct water into an open drain. The ditch bank at all such inlets shall be riprapped as directed by the Engineer and reimbursed under the appropriate contract item.

E.2.2.5 OUTLETS

During the construction of an open drain, the Contractor shall guard against damaging the outlet of any tributary drain or pipes encountered. The Contactor will be reimbursed for damage to unmarked outlet pipes under the appropriate contract item.

E.2.2.6 ACCESS CULVERTS

All culverts shall be installed with the invert a minimum of 10% of its diameter or as specified below the gradient and the firm bottom of the drain.

All pipes installed under these specifications shall be carefully bedded so as to ensure uniform bearing throughout its entire length.

Except where requiring concrete cradle or encasement, all pipes shall be bedded on granular fill as specified or as shown on the contract drawings. Bedding shall be hand placed, tamped and consolidated throughout. Granular fill and bedding shall be gravel or crushed stone having no particles over 20 mm in size, except where otherwise specified.

Concrete cradle and concrete encasement shall be placed as shown on the drawings, and the concrete shall be minimum 25 MPa.

From the top of the bedding material to a point 150 mm below the existing grade of the laneway, backfill material shall be clean pit run gravel meeting O.P.S.S. Granular "B" or approved equivalent. The material shall be placed in lifts not to exceed 300 mm in depth and all granular materials shall be compacted to 100 % SPMDD and all subsoil or previously excavated material to 95 % SPMDD.

The final 150 mm of the excavation shall be filled with clean crushed gravel conforming to O.P.S.S. Granular "A" specifications. The material shall be placed in lifts not exceeding 150 mm in depth and shall be thoroughly compacted to 100 % SPMDD.

E.2.2.7 EXCAVATION AT BRIDGE SITES

The excavation at bridge sites shall be to the full depth of the drain and as nearly as possible the full width of the drain as specified for the bridge location. The excavation at a bridge site shall be made in a manner to protect the structural integrity of any permanent bridge. A temporary bridge may be carefully removed to allow excavation. The removal of a bridge is to be done in such a manner so as to cause no damage to the bridge components. Temporary bridges removed to allow excavation shall be replaced in as good a condition as found, so far as material allows. Replacing of such bridges shall be to the satisfaction of the Engineer. The Contractor shall immediately notify the Engineer if it becomes apparent that excavating to a specified gradient will endanger or underpin any culvert or bridge. The Contractor shall cease excavation at the bridge or culvert site until the Engineer instructs the Contractor to proceed.

E.2.2.8 SEEDING

Unless indicated otherwise in the Special Provisions, the Contractor shall seed all disturbed areas which includes newly excavated ditch banks and leveled spoil (where specified) with the OPSS (MTO) Standard Roadside Seed Mix, consisting of 55% Creeping Red Fescue, 27% Kentucky Bluegrass, 15% Perennial Ryegrass and 3% White Clover, at an application rate of 100 kg/10,000 m^2, plus a nurse crop of Fall Rye Grain or Winter Wheat Grain at an application rate of 60 kg/10,000 m^2, at the end of each working day.

E.2.2.9 TEMPORARY SEDIMENT CONTROLS

Unless indicated otherwise in the Special Provisions, the Contractor shall install an approved sediment control measure at the downstream end of the open drain excavation and at any other locations specified. The Contractor shall remove any accumulated sediment at regular intervals or as directed by the Engineer. The Contractor shall then remove these temporary measures, and any accumulated sediment therein, after the new open drain has stabilized and only after authorized by the Engineer or the Drainage Superintendent.

E.2.2.10 PERMANENT SEDIMENT/STILLING BASINS

The Contractor shall construct and maintain sediment control or stilling basins as specified in the Special Provisions.

E.2.2.11 RIP RAP & NON-WOVEN GEOTEXTILE

Rip Rap – The Contractor shall supply and install a 500 mm thickness of 150 mm to 300 mm (R50) diameter quarry stone rip rap with filter cloth underlayment for culvert and pipe outlets. This will include areas of the existing bank where erosion or bank slumping has occurred, as directed on-site by the Engineer. For the area surrounding catchbasins, unless noted otherwise, the contractor shall supply and install a 300 mm thickness of 100 to 150 mm (R10) diameter quarry stone rip rap with filter cloth underlayment.

Non-Woven Geotextile - All geotextile used for tile wrapping under these specifications shall be non-woven Terrafix 200R (or equivalent). All geotextile used under these specifications for heavy duty applications such as under rip-rap surrounding catchbasins, and at tile outlets in channels shall be non-woven Terrafix 270R (or equivalent).

E.2.3 SPECIFICATIONS FOR CLOSED DRAINS

E.2.3.1 MATERIALS

Tile, tubing and pipe materials supplied by the Contractor shall be approved by the Engineer prior to being incorporated in the work. The Contractor shall be responsible for the unloading and placement of all materials required for the Municipal Drain construction. Such unloading and placement shall be undertaken in a manner acceptable to the Engineer using only the specified and approved access routes and working space.

Concrete Drain Tile (CDT) - All CDT installed under these specifications shall have a circular cross section with a minimum 2000D, meeting the latest revision of CSA A257.1-14 and ASTM C412. The manufacturer shall provide the Engineer with a copy of all available test results for the materials being shipped to the project site. The Engineer shall have the right to order any additional tests he deems necessary to be performed on the tile taken from inventory prior to shipment from the manufacturer’s plant. The cost of such additional tests shall be borne by the Contractor.

Plastic Drainage Tubing (PDT) - All PDT installed under these specifications shall be manufactured in accordance with the latest revision of the Drainage Guide for Ontario, as published by the Ministry of Agriculture and Food.

Corrugated Steel Pipe (CSP) - All CSP installed under these specifications shall be galvanized spiral wound corrugated steel pipe. All corrugated steel pipe installed under these specifications shall conform to CSA G401.

- CSP tile outlet pipes shall be up to 1,200 mm in diameter and 2.0 mm in thickness and shall have 68 mm x 13 mm corrugations unless specified otherwise.
- CSP culverts shall up to 1,000 mm in diameter and 2.8 mm in thickness and shall have 68 mm x 13 mm corrugations unless specified otherwise. CSP culverts equal to and larger than 1,200 mm in diameter shall be 3.5 mm in thickness and shall have 125 mm x 25 mm corrugations unless specified otherwise.

High Density Polyethylene(HDPE) Pipe - All corrugated or dual wall smooth walled HDPE pipe (Armtec BOSS 2000 or equivalent) installed under these specifications as culverts or as part of a new closed drain shall be manufactured in accordance with the latest revision of Ontario Provincial Standard Specification 1840 and shall have a pipe stiffness of 320 kPa.

- All perforated dual-wall smoothwalled HDPE pipe joining systems shall be soil-tight split coupler unless specified otherwise, conforming to CSA B182.8. As specified, perforated pipe shall include a knitted sock or non-woven geotextile covering (Terrafix 200R or equivalent).

- All solid dual-wall smoothwalled HDPE pipe shall be soil-tight split coupler, unless specified otherwise, conforming to CSA B182.8.
- All watertight solid dual-wall HDPE pipe joining systems shall be water-tight bell and spigot, complete with gasketed connections unless specified otherwise, conforming to CSA B182.6.

Steel Reinforced Polyethylene (SRPE) Pipe - All smooth walled SRPE pipe (Armtec DuroMaxx or equivalent) installed under these specifications as culverts or as part of a new closed drain shall be manufactured in accordance with the latest revision of Ontario Provincial Standard Specification 1840. All SRPE pipe shall conform to AASHTO M294.

- All solid SRPE pipe shall be soil-tight split coupler, unless specified otherwise, conforming to CSA B182.14.
- All watertight solid SRPE pipe joining systems shall be water-tight bell and spigot, complete with gasketed connections unless specified otherwise, conforming to CSA B182.15.

Polyprolylene (PP) Pipe - All triple-wall smooth walled PP pipe (ADS HP Sanitite or equivalent) installed under these specifications as culverts or as part of a new closed drain shall be manufactured in accordance with the latest revision of Ontario Provincial Standard Specification 1843 and shall have a pipe stiffness of 320 kPa.

- All watertight solid triple-wall PP pipe joining systems shall be water-tight bell and spigot, complete with gasketed connections unless specified otherwise, conforming to CSA B182.13.

Non-Woven Geotextile - All geotextile under these specifications shall conform to OPSS 1860. All geotextile used for tile wrapping under these specifications shall be non-woven Terrafix 200R (or equivalent). All geotextile used under these specifications for heavy duty applications such as under rip-rap surrounding catchbasins, and at tile outlets in channels shall be non-woven Terrafix 270R (or equivalent).

E.2.3.2 DRAIN GRADIENT AND VERIFICATION

The proposed gradient shall be established using laser grade control equipment, cross-head boning rods together with horizontal sight-bars at stations above and below the point where the tile is being laid or other method acceptable to the Engineer.

If the Engineer has not checked the tile, inspection points shall be left at intervals of not greater than 50 m for sections with gradients less than 0.5 % and at intervals of not greater than 30 m for sections with gradients above 0.5 %. Inspection points shall also be left at all structures and all changes in gradient. Other inspections points may be required from time to time as requested by the Engineer.

E.2.3.3 TILE LAYING INCLUDING TOPSOIL STRIPPING

In the case of the installation of CDT, and unless specified otherwise in the Special Provisions, the Contractor shall strip the topsoil a full width of the trenching machine plus 0.3 m on each side prior to installing the new tile with the trencher as part of the work under the appropriate item and no extra payment will be made for this stripping. After installation, confirming gradient, blinding, and back filling of the trench, the topsoil shall be replaced throughout the entire length of the Drain. The Contractor shall take into consideration the settlement of the backfill material over the trench prior to replacing the topsoil.

All CDT shall be installed with a wheel-type trencher and each tile shall be laid firmly and carefully in a smooth bottomed trench so that successive tiles align both vertically and horizontally as tightly as possible; the maximum allowable space between successive tiles shall be 6 mm.

ALL joints of the CDT MUST be completely wrapped with geotextile (Terrafix 200R or equivalent) as part of the work under the appropriate item and no extra payment will be made for this wrapping. The wrap on each joint shall be a minimum of:

- 300 mm wide for tile sizes smaller than 450 mm diameter
- 600 mm wide for tile sizes 450 mm diameter and above

The Contractor is reminded that the widths of the tile trenches are to be kept to a minimum. It is recommended that the minimum trench width be 300 mm greater than the outside diameter of the tile or 150 mm on each side of the tile being installed. It is recommended that the maximum trench width be 600 mm greater than the outside diameter of the tile or 300 mm on each side of the tile being installed.

All PDT shall be installed with a self-propelled drainage plow.

All obstructions, dirt or foreign material shall be removed from the inside of the tile prior to laying.

Tile drains shall be constructed at an offset from, and parallel to, any existing ditch, defined watercourse or low run. The Contractor shall exercise care not to disturb any existing private or municipal tile drains which follow the same course as the new drain.

E.2.3.4 RECONNECTION OF EXISTING PRIVATE TILE

Any subsurface drain encountered by the Contractor when constructing a Municipal Drain under these specifications shall be reconnected to itself and not connected to the new Municipal Drain, unless approved otherwise by the Engineer. The accepted practice for reconnecting existing tile drains will be to compact sub-base material from the new trench bottom to the underside of the existing tile. Rigid pipe, HDPE (320 kPa) or approved equivalent, with a diameter equal or larger than the existing tile with a minimum length of 0.6 m beyond the trench width to the existing tile. This connection shall be made only where the existing tile is operable and in good condition. When completing backfilling of the Municipal Drain trench at such a location, the Contractor shall take sufficient care to ensure that the new connecting pipe is not damaged.

The Contractor shall provide a unit price per connection and the unit price shall include the supply of all material, labour and equipment necessary to make the connection. Further, the Contractor shall keep a written record of all sub-surface drains encountered. All connections completed shall be reviewed with the Engineer on a daily basis and a summary of all subdrains shall be provided to the landowner.

E.2.3.5 CONNECTION OF EXISTING PRIVATE TILES TO MUNICIPAL DRAIN

A subsurface drain encountered during construction can be connected to the Municipal Drain if requested by the landowner and approved by the Engineer prior to commencement of the connection. The drain shall be connected to the Municipal Drain either by core drilling through the CDT or a prefabricated fitting for HDPE. The core shall be drilled on-site and backfilled as per the specified detail included within the drawings. Any tile drains connected to the Municipal Drain shall have the downstream end of the tile plugged to prevent entry of foreign material into the tile.

E.2.3.6 TRENCH BACKFILLING

As the laying of the tile progresses, partial filling or blinding shall be made at the sides of the trench sufficient to hold the tiles securely in place. The Contractor shall place the remainder of the excavated material carefully when backfilling the trench. Any excess backfill material shall be mounded over the trench such that future settlement and compaction around the new tile can occur without creating a depression over the width of the trench. The Contractor shall not operate construction equipment over any backfilled trench, except as specified in Trench Crossings. Care shall be exercised in backfilling the trench to see that no stone or boulder capable of damaging the tile is used in the backfill material adjacent to the tile. In no case shall stones having a diameter greater than 150 mm be used in backfill material within 300 mm of the tile. The Contractor shall backfill any open tile trenches at the end of each working day except for inspection points as specified. The Contractor shall be entirely responsible for any damage to the new tile throughout the warranty period.

E.2.3.7 TRENCH CROSSINGS

The Contractor shall not cross any backfilled trench with any construction equipment or vehicles, except at only **ONE** designated crossing location on each property which shall be marked in an acceptable manner. The Contractor shall ensure that the bedding and backfill material at this designated crossing location is properly placed and compacted so as to adequately support the equipment and vehicles that may cross the trench. The Contractor may undertake any other approved work to ensure the integrity of the tile at the crossing location. The Contractor shall insure that no equipment or vehicles are allowed to travel along the length of any trench. The Contractor shall be entirely responsible for any damage to the new tile throughout the warranty period.

E.2.3.8 OUTLET PROTECTION

The outlet end of a tile drain shall normally consist of a 6 m length of CSP or HDPE fitted with a rodent proof grating which is hinged at the top to allow the exit of foreign material from the tile. An outlet marker shall be supplied and installed.

Unless otherwise specified, the end of the CSP or HDPE shall be protected with the type of riprap on geotextile as specified by the Engineer from a point 500 mm above the ditch bottom on the opposite side of the ditch, across the ditch bottom, and for the full height of the ditch sideslope where the pipe is located. The minimum width of this riprap shall be equal to the outside diameter of the outlet pipe plus 2 m.

E.2.3.9 PRECAST CONCRETE STRUCTURES

Junction Box (JB) means an acceptable precast concrete structure installed and buried below the surface of the ground to facilitate two or more tiles meet and connect.

Catchbasin (CB) or **Ditch Inlet Catchbasin** (DICB) means an acceptable precast concrete structure installed at or slightly below the surface of the ground where two or more tiles meet and connect and that is intended to accommodate surface water.

Observation Box (OB) means an acceptable precast concrete structure installed above the surface of the ground where two or more tiles meet and connect and that is intended to only inspect the tile connected thereto.

Unless specified otherwise, JBs, CBs, DICBs and OBs shall be supplied by a precast manufacturer meeting the Engineer's approval. An “approximate elevation of top” of each structure has been indicated on the “Structures Table”; however, each structure shall be placed onsite such that the exact horizontal and vertical location in the field is as directed by the Engineer. All structures shall have a knock out, set at a minimum of 100 mm above the elevation of the outlet or as specified, placed in ***all*** sides not used by the municipal drain. Knock outs must be of a size capable of connecting a HDPE pipe with a minimum inside diameter of 250 mm. All structures shall have a minimum 300 mm deep sump, unless specified otherwise.

Non-shrink grouting material, unless specified otherwise, shall be placed around all pipes connected to the structure. In addition, the exterior of all grouted connections shall be completely wrapped with geotextile (similar to a wrapped joint). Geotextile shall also be placed in the joints between all sections of the box and around the full perimeter of the box at these joints. For the area surrounding catchbasins, unless noted otherwise, the contractor shall supply and install a 300 mm thickness of 100 to 150 mm (R10) diameter quarry stone rip rap with filter cloth underlayment.

Hot dipped galvanized, heavy duty, three-sided protruding type bird cage grates, shall be supplied for all CBs, DICBs or OBs, unless specified otherwise. All DICBs shall have a slope of 2H:1V, unless specified otherwise. Grates shall be fastened to the structure using non-corrosive fasteners as recommended by the Ontario Farm Safety Association. JBs shall have no sump and shall have a minimum 150 mm thick solid reinforced concrete tops.

Post and sign type markers shall be supplied and installed at each at or above ground structure.

E.2.3.10 STRIPPING FOR DEEP TILE INSTALLATION

Where the tile installation depth exceeds the digging or plowing depth of the Contractor's equipment, the Contractor shall undertake any stripping that may be necessary in a manner such that when restored, the topsoil returns uncontaminated to the top of the stripped area. This would normally mean that the topsoil would be stripped and piled separately from the subsoil. The Contractor shall have regard for the working space provided for such stripping operations. Unless approved otherwise by the Engineer prior to work being undertaken, stripping shall be done using a hydraulic excavator. The cost of any stripping shall be included in the price provided for the tile installation.

E.2.3.11 STONE REMOVAL

The Contractor shall remove and dispose of any stones larger than 100 mm that remain on the surface of the working space after completion of construction.

E.2.4 SPECIFICATIONS FOR ROAD CROSSING (OPEN CUT METHOD)

E.2.4.1 GENERAL

When a drainage works crossing of a Road is to be carried out by the open cut method, the following specifications shall apply as well as OPSS 401 and 410. Under these specifications, the Contractor shall supply all labour, equipment and material unless specified otherwise in the Special Provisions.

E.2.4.2 EXCAVATED MATERIAL

All excavated material removed from the traveled portion of the road and 1.3 m or the full width of the gravel shoulder, whichever is greater, on each side of the traveled portion shall be disposed of off the site by the Contractor in a location approved by the Engineer or the Municipality. No excavated material shall be spread on the right-of-way without the written consent of the Engineer or the Municipality. The excavated material from a trench beyond a point 1.3 m from the traveled portion or beyond the outside edge of the gravel shoulder may be placed in the trench in the case of covered drains.

E.2.4.3 BEDDING

All pipes installed under these specifications shall be carefully bedded so as to ensure uniform bearing throughout its entire length.

Except where requiring concrete cradle or encasement, all pipes shall be bedded on granular fill as specified or as shown on the contract drawings. Bedding shall be hand placed, tamped and consolidated throughout. Granular fill and bedding shall be gravel or crushed stone having no particles over 20 mm in size, except where otherwise specified.

Concrete cradle and concrete encasement shall be placed as shown on the drawings, and the concrete shall be minimum 25 MPa.

E.2.4.4 BACKFILLING

The material and the method for backfilling the excavated area on the traveled portion of the right-of-way and for 1.3 m or the full shoulder width on each side shall conform to the following specifications, or as directed by the Engineer or Municipality.

From the top of the bedding material to a point 300 mm below the existing grade of the road, backfill material shall be clean pit run gravel meeting O.P.S.S. Granular "B" or approved equivalent. The material shall be placed in lifts not to exceed 300 mm in depth and all granular materials shall be compacted to 100 % SPMDD and all subsoil or previously excavated material to 95 % SPMDD.

The final 300 mm of the excavation shall be filled with clean crushed gravel conforming to O.P.S.S. Granular "A" specifications. The material shall be placed in lifts not exceeding 150 mm in depth and shall be thoroughly compacted to 100 % SPMDD.

E.2.4.5 PRECAST CONCRETE STRUCTURES

The type, location and the elevation of all structures in the right-of-way shall be as specified by the Engineer, and as indicated on the "Structures Table".

E.2.4.6 NOTICE

Before commencing work on any right-of-way, the Contractor shall furnish at least 7 days notice in writing to the Engineer and Road Authority having jurisdiction over said right-of-way. A copy of this notice shall also be sent to the Municipality's Drainage Engineer.

E.2.4.7 MAINTENANCE

The Contractor shall maintain the road surface at the road crossing until the Engineer or Road Authority has approved the work. Such maintenance shall include keeping the road surface free from pot-holes and the application of calcium chloride at the rate of two pounds per square meter to the finished surface for the entire width of the excavation.

The Contractor shall give the Engineer or Road Authority four days notice in writing that the work has been completed, and if the work has approved, the Contractor will no longer be responsible for maintenance of the said portion of the right-of-way.

E.2.4.8 PERMITS & TRAFFIC

The Contractor shall be responsible for providing the Road Authority at least 7 days notice in writing before commencing any work on any right-of-way. If the crossing is on a right-of-way that requires a Municipal or Provincial Permit, the Contractor shall ensure that the Permit is obtained before any work commences.

The Contractor shall be responsible for providing, erecting, maintaining and removing all signage and traffic control in accordance with the Ontario Traffic Manual (OTM) and the OTM Book 7 Temporary Conditions - Field Edition as noted in Document D of the Tender/Contract.

E.2.5 SPECIFICATIONS FOR ROAD CROSSING (BORING OR DIRECTIONALLY DRILLED METHOD)

E.2.5.1 GENERAL

When a drainage works crossing of a Road is to be carried out by the jacking and boring method, the following specifications shall apply as well as OPSS 416. The Contractor shall supply all labour, equipment and material unless specified otherwise in the Special Provisions.

E.2.5.2 PIPE MATERIAL

The pipe or casing used in the crossing shall be smoothwall welded steel pipe (SWWSP) with a minimum wall thickness as specified in the Special Provisions as per OPSS 1802. The pipe shall be of a sufficient length so that during placement no part of any excavation shall be closer to the edge of the gravel shoulder than 2 m and the slope of the excavation from the top to the bottom shall be 1 m vertical to 1 m horizontal (1:1).

E.2.5.3 EXTENSIONS

All extensions of the SWWSP installed via the jacking and boring shall be completed with SWWSP of identical diameter and wall thickness (either from structure to structure or to the limits of the right-of-way). Extensions of any other pipe material will not be acceptable. Pipe shall be placed on undisturbed native material with a minimum of 150 mm drainage stone bedding. Excavated material will not be permitted for use as bedding material.

E.2.5.4 INSTALLATION METHOD

The pipe or casing shall be placed by means of continuous flight augering inside the casing and simultaneous jacking to advance the casing immediately behind the tip of the auger. Complete augering of a tunnel slightly larger than the pipe and placing the entire length by pulling or jacking after completion of the tunnel WILL NOT BE ACCEPTABLE. Once a crossing is completed, the area around the outer annulus and any other openings from the jack and bore shall be grouted at the time of construction.

The Auger pit excavated to accommodate the boring machine shall be constructed such that the edge of the pit shall not be closer than 2 m to the edge of the gravel shoulder. The slope of the pit from the top edge at the shoulder to the bottom of the pit shall not be steeper than 1 m vertical to 1 m horizontal (1:1). Shoring, sheeting, etc. shall be in accordance with all governing regulations and Acts. The pit shall be left open for an absolute minimum length of time and if at all possible work should be so scheduled so that the excavation, placement of pipe and backfilling takes place in one working day.

During excavation, the existing topsoil shall be stripped and placed in a separate pile for replacement on top upon completion of the backfilling operation; a minimum of 150 mm of topsoil is required and if necessary, the Contractor shall and place imported topsoil. In either case, the topsoil area over the excavation shall be seeded with the specified grass seed mixture to the requirements of the Road Authority. The finished work shall be left in a clean and orderly condition slightly higher than the adjacent ground so that after settlement it will conform to the surrounding ground. Excess material shall NOT be spread on the road allowance or within the right-of-way without the express written consent of the Road Authority but shall be hauled away and disposed of at the expense of the Contractor.

E.2.5.5 PERMITS & TRAFFIC

The Contractor shall be responsible for providing the Road Authority at least 7 days notice in writing before commencing any work on any right-of-way. If the crossing is on a right-of-way that requires a Municipal or Provincial Permit, the Contractor shall ensure that the Permit is obtained before any work commences.

The Contractor shall be responsible for providing, erecting, maintaining and removing all signage and traffic control in accordance with the Ontario Traffic Manual (OTM) and the OTM Book 7 Temporary Conditions - Field Edition, as noted in Document D of the Tender/Contract.

Burnside

[The Difference is our People]

Appendix F

Special Provisions

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Appendix F1

South Innisfil Creek Drain – 2019 Improvement
Special Provisions

Appendix F – Special Provisions

South Innisfil Creek Drain – 2019 Improvement

1.0 Specifications

1.1 Special Provisions

These ***Special Provisions*** are specific instructions to the Contractor for this project in particular, and they detail the requirements not covered by the documentation in ***Appendix E – Standard Drain Specifications****.*

Special Provisions shall take precedence over the ***Standard Drain Specifications*** where a conflict between the two documents may exist.

1.2 Standard Drain Specifications

All work for this project shall also be governed by **Appendix E – Standard Drain Specifications**. The Contractor is fully responsible for a reasonable and prudent review of these standards and shall have a complete and clear understanding of the scope of the work.

1.3 Ontario Provincial Standard Specifications and Drawings

Where applicable, refence may be made to various Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) as part of these Special Provisions.

2.0 SICD - Location and Description

The South Innisfil Creek Drain (SICD) is in the geographic Township of Innisfil, Town of Innisfil, within the County of Simcoe. The work on the Main Drain is located on: Lot 5, Conc. 15; Lots 5 to 8 inclusive, Conc. 1; Lots 8 to 11 inclusive, Conc. 2; Lot 11, Conc. 3; and Lots 11 and 12, Conc. 4. The Hnydczak ‘A’ Drain Outlet is on Lots 6 and 7, Conc. 1; the 10 Sideroad Branch Drain is on Lot 10, Conc. 3; the 3rd Line Branch Drain is on Lots 11 to 13 inclusive, Conc. 3; and the 3rd Line Spur Branch Drain is on Lots 12 and 13 inclusive, Conc. 3.

The Main Drain is approximately 9,900 metres long and the work consists of: approximately 1,200 m (downstream of 5 Sideroad) of the removal of debris and log jams and less than 100 m of sediment and spoil treatment; approximately 7,800 m (from 5 Sideroad to the mid-point of Concession 4) of excavation and sediment removal which shall result in the widening and/or deepening of the existing drain as well as other work such as bank stabilization, spoil treatment, the creation of sediment basins, the manipulation and re-use of (available) woody debris and other aquatic improvements; and approximately 900 m (from the mid-point of Concession 4 to 5th Line) of the removal of debris and log jams, the removal of sediment and spoil treatment, the removal of remnant beaver dams and any required bank stabilization. The work on the Main Drain also includes the cleanout of several road crossings and the replacement of the culvert crossings of the 4th Line.

Work on four branch drains is also proposed: namely: the Hnydczak ‘A’ Drain Outlet; the 10 Sideroad Branch Drain; the 3rd Line Branch Drain and the 3rd Line Spur Branch Drain. Work on the Hnydczak ‘A’ consists of approximately 500 m of open drain cleanout or minor deepening and spoil treatment as well as the replacement of 1 culvert crossing. The proposed work on the 10 Sideroad, 3rd Line and 3rd Line Spur includes approximately 4,540 m of total open drain work including ditch bottom only cleanout, some drain deepening, spoil treatment as specified and the maintenance of over twenty (20) private crossings. The existing road culvert crossing of the 3rd Line on the 10 Sideroad Branch Drain will also be replaced. The total length of the improvements proposed to the SICD Main Drain and Branches under this project is approximately 14,440 m. The location of the work is shown on the enclosed Plans.

3.0 The Work

The work to be undertaken generally includes the completion of the following:

3.1 Main Drain

Sta. 0+000 to Sta. 1+224

- Install one permanent rock flow check dam prior to any work and remove after the completion of all excavation work (i.e. for the duration of the construction).
- Install temporary sediment control measures before and remove after work in this reach.
- Brush and trim trees south of Hwy. No. 89.
- Remove fallen trees and debris south of Hwy. No. 89.
- Remove sediment including spoil treatment and seeding for <100 m just west of 5 Sideroad.
- Manipulate and place Large Woody Debris (LWD).
- Plant some trees.
- The creation of one new sediment basin.

Sta. 1+224 to Sta. 2+165

- Install temporary sediment control measures before and remove after work in this reach.
- Clear approximately 426 m in wood lot.
- Remove fallen trees and debris.
- Approximately 930 m of drain widening, spoil treatment and seeding.
- Bank repair and stabilization at three locations with protection.
- Excavate and improve three (3) watercourse confluences.
- Manipulate and place Large Woody Debris (LWD).
- Install sod mats.
- Plant some trees.
- The creation of three (3) new sediment basins.

Sta. 2+165 to Sta. 2+280 (Hwy. No. 400 & Reive Boulevard)

- Cleanout the culvert crossings under Hwy. No. 400 and Reive Boulevard.
- Drain deepening, widening, spoil treatment and seeding between the road culverts.
- Combination of either an “interim and/or ultimate” solution for a crossing(s) under each road.

Sta. 2+280 to Sta. 3+350

- Install temporary sediment control measures before and remove after work in this reach.
- Remove fallen trees, debris and remnant beaver dams.
- Approximately 1,070 m of drain deepening, widening, spoil treatment and seeding.
- Excavate and improve four watercourse confluences.
- Manipulate and place Large Woody Debris (LWD).
- Install sod mats.
- The creation of five new sediment basins.

Sta. 3+350 to Sta. 3+588

- Install temporary sediment control measures before and remove after work in this reach.
- Cleanout the bridge crossing under 2nd Line.
- Approximately 219 m of drain deepening, widening, spoil treatment and seeding.
- Excavate and improve two watercourse confluences.
- Install sod mats.
- Plant some trees.
- The creation of one new sediment basin.

Sta. 3+588 to Sta. 5+449

- Install temporary sediment control measures before and remove after work in this reach.
- Brushing and tree trimming.
- Minor clearing for approximately 440 m along south side of wood lot.
- Approximately 1,861 m of drain deepening, widening, spoil treatment and seeding.
- Excavate and improve four watercourse confluences.
- Bank repair and stabilization at three locations with protection and live stakes.
- Manipulate and place Large Woody Debris (LWD).
- Plant some trees.
- Install sod mats.
- The creation of six new sediment basins.

Sta. 5+449 to Sta. 6+355

- Install temporary sediment control measures before and remove after work in this reach.
- Brushing and tree trimming.
- Remove asphalt/RAP topping from berm and stockpile.
- Approximately 685 m of drain deepening, widening, spoil treatment and seeding.
- Approximately 170 m of minor drain deepening, widening, spoil treatment and seeding.
- Excavate and improve two watercourse confluences.
- Bank repair and stabilization at three locations with protection.

- Cleanout the bridge crossing under 10 Sideroad and under 3rd Line.
- Manipulate and place Large Woody Debris (LWD).
- Install sod mats.
- The creation of two new sediment basins.

Sta. 6+355 to Sta. 7+928

- Install temporary sediment control measures before and remove after work in this reach.
- Remove fallen trees, debris and remnant beaver dams.
- Approximately 1,573 m of drain improvements including pulling back one bank, spot removal of sediment, spoil treatment and seeding.
- Excavate and improve one watercourse confluence.
- Bank repair and stabilization with protection.
- Installation of private tile outlet pipes.
- Manipulate and place Large Woody Debris (LWD).
- Construction of riffle-pool structures and gravel substrate areas.
- Install sod mats.
- The creation of three new sediment basins.

Sta. 7+928 to Sta. 7+950

- Install temporary sediment control measures before and remove after work in this reach.
- Replace the 4th Line culverts with a new concrete box culvert.

Sta. 7+950 to Sta. 9+918

- Install temporary sediment control measures before and remove after work in this reach.
- Remove fallen trees, debris and remnant beaver dams.
- Approximately 1,948 m of drain improvements including pulling back one bank, spot removal of sediment, spoil treatment and seeding.
- Bank repair and stabilization with protection and live stakes.
- Cleanout the bridge crossing under 5th Line.
- Manipulate and place Large Woody Debris (LWD).
- Construction of riffle-pool structures and gravel substrate areas.
- Install sod mats.
- The creation of one new sediment basins.

3.2 Branch 'A'

- Install temporary sediment control measures before and remove after work on this branch.
- Clear and grub as required.
- Approximately 500 m of drain deepening, spoil treatment and seeding.
- Replace one (1) culvert crossing.
- Cleanout culvert crossings under Hwy. 400 and Reive Boulevard.

3.3 10 Sideroad Branch Drain

- Install temporary sediment control measures before and remove after work on this branch.
- Stabilize drain outlet into the Main Drain with rip-rap.
- Replace the 3rd Line culvert crossing.
- Approximately 340 m of drain bottom only cleanout, load and haul spoil.
- Approximately 629 m of drain bottom only cleanout, spoil treatment and seeding.
- Approximately 425 m of drain minor deepening, spoil treatment and seeding.
- Cleanout all private laneway culverts.
- Cleanout culvert crossing under 4th Line.

3.4 3rd Line Branch Drain

- Install temporary sediment control measures before and remove after work on this branch.
- Stabilize drain outlet into the Main Drain with rip-rap.
- Approximately 895 m of drain bottom only cleanout, spoil treatment and seeding.
- Approximately 765 m of drain bottom only cleanout, load and haul spoil.
- Cleanout all private laneway culverts.

3.5 3rd Line Spur Branch Drain

- Install temporary sediment control measures before and remove after work on this branch.
- Stabilize drain outlet into the 3rd Line Branch Drain with rip-rap.
- Approximately 760 m of drain bottom only cleanout, spoil treatment and seeding.
- Cleanout all private laneway culverts.

4.0 Existing Conditions

4.1 Subsoil Conditions

Subsoil investigations were not undertaken as part of the work completed in the preparation of the engineer's drain report for this project. Furthermore, and although there was some Geotechnical Investigation completed by Dillon Consulting, it was primarily limited to the Market Garden area of the watershed.

The Contractor shall tender the installation of the culverts and other drain structures as well as the excavation, deepening and widening of the existing drain based on stable soil conditions. Additionally, as specified in the Contingency Items, the Contractor shall provide appropriate pricing for such items as rip-rap bank erosion protection where needed and as directed on-site by the Contract Administrator.

4.2 Private Drainage Systems

The Contractor is advised that at the time of submission of this Report, several random and/or systematic drainage systems were known by the Contract Administrator in the working space of the of the Main Drain and Branch drains; further, there are properties in the Market Garden with cisterns. These existing private drainage systems shall be discussed at the pre-construction meeting and existing systems affected by the drain shall be located by the Contractor and reviewed with the Contract Administrator and affected landowners prior to construction.

4.3 Utilities Investigation

It is known that there are buried underground and overhead utility lines either crossing the Main Drain and/or within the working space of the Main Drain and the various Branch drains. Furthermore, it is also presumed that there are underground and/or overhead utilities within the various road rights-of-way. Accordingly, the Contractor shall locate all utilities on both municipal lands and private lands prior to construction.

5.0 Agencies

5.1 Department of Fisheries and Oceans (DFO) Canada

Attention is drawn to the correspondence and documents issued to and received from the DFO in Appendix G. Furthermore, an Application Form for Authorization has been submitted to the DFO. Accordingly, and prior to construction, Burnside will procure the required DFO Authorization for work under the Fisheries Act and within the watercourse. The Contractor shall undertake all work in accordance with the terms and conditions of that Authorization based on the various Burnside documents submitted to and approved by the DFO.

In addition, DFO (and MNRF) has provided requirements for the in-water work on the proposed drain improvement, specifying that it be completed during the summer cold-water timing window from June 15 through to September 30; this window is due to fish spawning restrictions as portions of the SICD Main Drain are considered a Fisheries Class ‘D’ channel. Regardless, Burnside and the Contractor will comply with the approved and authorized timing window.

Furthermore, and where applicable, reference has been made to the DFO document entitled “Guidance for Maintaining and Repairing Municipal Drains in Ontario”, Version 1.1, May 23, 2017 by R.J. Kavanagh, L. Wren and C.T. Hoggarth, Central and Arctic Region; it shall be considered to form part of these Special Provisions.

5.2 Ministry of Natural Resources and Forestry (MNRF)

Attention is drawn to the correspondence issued to and received from the NVCA in Appendix C. Based on technical advice provided by the MNRF, as well as recommended best management practices (BMPs), all work is to be undertaken in accordance with the applicable BMPs. Prior to construction, it is presumed that Burnside will be required to undertake additional ground truthing along the route of the SICD and the adjacent working spaces in order to prepare and submit a Mitigation Plan complete with strategies to address the impact to any species at risk under the *Endangered Species Act, 2007* (ESA) and regulations that may potentially be located within the study area.

5.3 Nottawasaga Valley Conservation Authority (NVCA)

Attention is drawn to the correspondence and documents issued to and received from the NVCA in Appendix C. Staff at the NVCA were contacted and participated in various discussions regarding the potential impacts of the proposed works on the SICD Main Drain and branches as well as the adjacent working space. Accordingly, and prior to construction, Burnside will procure any required NVCA permit(s) for the work within the watercourse and adjacent lands. All work shall be in accordance with the terms of that permit. NVCA was also contacted regarding possible seed mixes and will be consulted prior to construction (see Section 8.7)

6.0 Pre-Construction & Construction Meeting

The Contractor MUST arrange at least one on-site Pre-Construction Meeting with the Contract Administrator, Drainage Superintendent as well as the affected landowners along the course of the Main Drain and Branch drains <u>before</u> any equipment or materials are moved onto the site and <u>before</u> any work is commenced on this project.

Due to the probable length for the construction of the proposed works and given the magnitude of the SICD Improvement, it is recommended that additional Construction Meetings be held throughout the duration of construction period for this project but with those stakeholders affected by the various shorter reaches of the SICD Main Drain or the individual branch drains prior to work commencing on that Main Drain reach or Branch. Any such Construction Meetings shall be arranged with and approved by the Contract Administrator.

Furthermore, the Contractor shall also provide notification of the commencement of the in-water work (if required) to the NVCA or any other applicable agency(s) at least (10) working days prior to the initiation of the work.

7.0 Designated Areas & Corridors

7.1 Buffer Strips

A minimum 3 m wide buffer strip exists on each drain bank from the top of the existing or the new drain bank, perpendicular to it and inland from it, along the entire length of the SICD Main Drain from Sta. 0+026 to Sta. 9+898 and along the entire length of each Branch Drain.

7.2 Working Space

The space being provided to the Contractor to undertake the work as described herein and the maximum widths thereof are specified in the following table entitled 'Working Space & Access Routes'.

7.3 Access Routes

The access routes being provided to reach the working space to construct the drain and undertake the necessary work shall be as specified in the Table entitled 'Working Space & Access Routes' as well as delineated on the Access Routes Plans (see Drawing 2). All access routes shall be restricted to a maximum width of 5 m. The Contractor shall confirm each access routes with the Contract Administrator (or the Drainage Superintendent) prior to commencing any work.

WORKING SPACE & ACCESS ROUTES		
Station	**Max. Width**	**Comments**
Main Drain		
0+000 to 0+026		No work required within the 15th Line right-of-way.
0+026 to 0+541	a 5 m working space beyond the 3 m buffer	**AR0** - Access to the portion of the **Main Drain** on Part Lot 5, Conc. 15, (Roll No. 072-15900) via existing commercial entrance to 5444 off 5 Sideroad directly to north/west corner of the parking lot then along the north side of the property adjacent to the Hwy. No. 89 road allowance to the east side of the Main Drain at Sta. 0+530; approx. 250 m. The work shall be completed from the **right side** of the drain.
0+541 to 0+576		No work required within the Hwy. 89 right-of-way.
0+576 to 1+190	8 m working space/spoil treatment zone	**AR1 Construct** - Access to this portion of the **Main Drain** on South part Lot 5, Conc. 1, (Roll No. 001-01200) via existing field entrance off 5 Sideroad directly to south side Main Drain at Sta. 1+189; approx. 150 m. The construction work shall be completed from the **right side** of the drain.
0+576 to 1+190	8 m working space/spoil treatment zone	**AR1 Maintain** = Access to this portion of the **Main Drain** on South part Lot 5, Conc. 1, (Roll No. 001-01200) via existing field entrance off 5 Sideroad thru trees on east side of the property to north side Main Drain at Sta. 1+150; approx. 250 m. Future maintenance shall be completed from the **left side** of the drain.
1+190 to 1+224		No work required within the 5 Sideroad right-of-way.
1+224 to 1+700	_ _ m working space/spoil treatment zone	**AR2** - Access to the portion of the **Main Drain** on South part Lot 6, Conc. 1, (Roll No. 001-01400) via existing field entrance off 5 Sideroad along the west side of the property adjacent to the 5 Sideroad road allowance directly to north side Main Drain at Sta. 1+230; approx. 170 m. The work shall be completed from the **left side** of the drain.
1+700 to 1+999	_ _ m working space/spoil treatment zone	**AR3** - Access to the portion of the **Main Drain** on South part Lot 6, Conc. 1, (Roll No. 001-01400) via existing main entrance off Hwy. No. 89 past buildings and along the south-east side of the woodlot to south side Main Drain at Sta. 1+700; approx. 600 m. The work shall be completed from the **right side** of the drain.

WORKING SPACE & ACCESS ROUTES		
1+999 to 2+165	_ _ m working space/spoil treatment zone	**AR3** - Access to this portion of the **Main Drain** on South part Lot 6, Conc. 1, (Roll No. 001-01400) via existing main entrance off Hwy. No. 89 past buildings and along the south-east side of the woodlot to south side Main Drain at Sta. 1+700; approx. 600 m. The work shall be completed from the **right side** of the drain by crossing the Hnydczak ‘A’ Drain outlet.
2+165 to 2+280		Work within the Hwy. No. 400 right-of-way shall be completed as directed by the MTO. Work within the Reive Boulevard right-of-way shall be completed as directed by the Town.
2+280 to 2+948	_ _ m working space/spoil hauling zone	**AR4** - Access to this portion of the **Main Drain** on North part Lot 7, Conc. 1, (Roll No. 001-19400) via existing golf course entrance off Reive Boulevard along east side of drain directly to south side Main Drain at Sta. 2+290; approx. 100 m. The work shall be completed from the **right side** of the drain.
2+948 to 3+350	_ _ m working space/spoil treatment zone	**AR5** - Access to this portion of the **Main Drain** on North part Lot 8, Conc. 1, (Roll No. 001-19200) via existing field entrance off 2nd Line along the north side of the property adjacent to the 2nd Line road allowance directly to west side Main Drain at Sta. 3+345; approx. 270 m. The work shall be completed from the **left side** of the drain.
3+350 to 3+375		Work within the 2nd Line right-of-way may be completed from either side; and as directed by the Town.
3+375 to 3+895	_ _ m working space/spoil treatment zone	**AR6** - Access to this portion of the **Main Drain** on South part Lot 8, Conc. 2, (Roll No. 001-19700 and Roll No. 001-19800) via existing field entrance to 001-19800 off 2nd Line along the south side of the properties adjacent to the 2nd Line road allowance directly to east side Main Drain at Sta. 3+380; approx. 30 m and 100 m respectively. The work shall be completed from the **right side** of the drain.
3+895 to 4+210	_ _ m working space/spoil treatment zone	**AR7** - South part Lot 9, Conc. 2, (Roll No. 001-20000 and Roll No. 001-20100) via existing main entrance to 001-20100 off 2nd Line using lane to south side Main Drain at Sta. 4+055; approx. 270 m. The work shall be completed from the **right side** of the drain.
4+210 to 5+449	_ _ m working space/spoil treatment zone	**AR8** - Access to this portion of the **Main Drain** on South part Lot 9, Conc. 2, (Roll No. 001-20300) via existing main entrance off 2nd Line using lane to south side Main Drain at Sta. 4+359; approx. 260 m. The work shall be completed from the **left side** of the drain. **AR9** - An additional access to this portion of the **Main Drain** on South part Lot 10, Conc. 2, (Roll No. 001-20800) via existing main entrance off 10 Sideroad using lane to east side Main Drain at Sta. 5+450; approx. 50 m.
5+449 to 6+134	_ _ m working space/spoil treatment zone	**AR10** - Access to this portion of the **Main Drain** on North part Lot 10, Conc. 2, (Roll No. 001-20900) via existing main entrance off 3rd Line using lane to west side Main Drain at Sta. 6+130; approx. 70 m. The work shall be completed from the **left side** of the drain.

WORKING SPACE & ACCESS ROUTES		
6+134 to 6+161		Work within the 10 Sideroad right-of-way may be completed from either side; and as directed by the County.
6+161 to 6+328	_ _ m working space/spoil hauling zone	**AR11** - Access to this portion of the **Main Drain** on North part Lot 11, Conc. 2, (Roll No. 002-12900) via existing main entrance off 3rd Line using lane to east side Main Drain at Sta. 6+328; approx. 55 m. The work shall be completed from the **right side** of the drain.
6+328 to 6+355		Work within the 3rd Line right-of-way may be completed from either side; and as directed by the Town.
6+355 to 7+077	_ _ m working space/spoil treatment zone	**AR12** - Access to this portion of the **Main Drain** on South part Lot 11, Conc. 3 (Roll No. 002-13700) via existing field entrance off 3rd Line along the south side of the property adjacent to the 3rd Line road allowance directly to east side Main Drain at Sta. 6+360; approx. 30 m. The work shall be completed from the **right side** of the drain.
7+077 to 7+928	_ _ m working space/spoil treatment zone	**AR13** - Access to this portion of the **Main Drain** on North part Lot 11, Conc. 3 (Roll No. 00-20600) via a **new** field access (see Plan) off 10 Sideroad south and east to the west side Main Drain at Sta. 7+085; approx. 250 m. **AR14** - Access to this portion of the **Main Drain** on North part Lot 11, Conc. 3 (Roll No. 00-20600) via existing field entrance off 4th Line along the north side of the property adjacent to the 4th Line road allowance directly to west side Main Drain at Sta. 7+920; approx. 130 m. The work shall be completed from the **left side** of the drain.
7+928 to 7+950		Work within the 4th Line right-of-way may be completed from either side; and as directed by the Town.
7+950 to 8+322	_ _ m working space/spoil treatment zone	**AR15** - Access to this portion of the **Main Drain** on South part Lot 11, Conc. 4 (Roll No.'s 002-20910 and 002-20912) via existing field entrance to 002-20912 off 4th Line along the south side of the properties adjacent to the 4th Line road allowance directly to east side Main Drain at Sta. 7+955; approx. 30 m and 40 m respectively. The work shall be completed from the **right side** of the drain.
8+322 to 8+852	_ _ m working space/spoil treatment zone	**AR16** - Access to this portion of the **Main Drain** on South part Lot 11, Conc. 4 (Roll No. 002-20700) via existing field entrance off 10 Sideroad north along the west side of the property adjacent to the 10 Sideroad road allowance and east along north side of property (see Plan) to the west side Main Drain at Sta. 8+545; approx. 730 m. The work shall be completed from the **left side** of the drain.
8+852 to 9+046	_ _ m working space/spoil treatment zone	**AR16** - Access to this portion of the **Main Drain** on various parts of Lot 12, Conc. 4 (under several Roll Numbers) shall be via an extension to the above noted access route AR16 which shall exist diagonally across the extreme south-east corner of the North part Lot 11, Conc. 4 (Roll No. 002-26400) to the north side Main Drain at Sta. 8+852; approx. 50 m. The work shall be completed from the **left side** of the drain.
9+046 to 9+800	_ _ m working space/spoil	**AR16** - Access to this portion of the **Main Drain** on South part Lot 11, Conc. 4 (Roll No. 00-20700) via existing field entrance off 10 Sideroad

WORKING SPACE & ACCESS ROUTES		
	treatment zone	north along the west side of the property adjacent to the 10 Sideroad road allowance and east along north side of property (see Plan) to the west side Main Drain at Sta. 8+545; approx. 730 m. **AR17** - Access to this portion of the **Main Drain** on North part Lot 12, Conc. 4 (Roll No. 002-26300) via existing field entrance off 5th Line along the north side of the property adjacent to the 5th Line road allowance to west side Main Drain at Sta. 9+800; approx. 250 m. The work shall be completed from the **left side** of the drain.
9+800 to 9+898	_ _ m working space/spoil treatment zone	**AR18** - Access to this portion of the **Main Drain** on North part Lot 12, Conc. 4 (Roll No. 002-26300) via a **new** field access off 5th Line to east side Main Drain at Sta. 9+890; approx. 40 m. The work shall be completed from the **right side** of the drain.
9+898 to 9+918		Work within the 5th Line right-of-way shall be completed from the south side; and as directed by the Town.
Branch 'A'		
0+000 to 0+500	_ _ m working space/spoil treatment zone	Access to the **Hnydczak 'A' Drain** on South part Lot 6, Conc. 1, (Roll No. 001-01400) via **Main Drain AR3** existing main entrance off Hwy. No. 89 past buildings and along the south-east side of the woodlot to south side Main Drain at Sta. 1+700; approx. 600 m. The work shall be completed from the **left side** of the branch drain.
0+500 to 0+650	No work required or proposed	
10 Sideroad Branch Drain		
0+000 to 0+031		Work within the 3rd Line right-of-way may be completed from either side; and as directed by the Town.
0+031 to 0+172 0+172 to 0+272 0+272 to 0+371	5 m working space/spoil hauling zone	Access to this portion of the **10 Sideroad Branch Drain** on the east limit of Lot 10, Conc. 3, (Roll No. 001-23800; 001-23900; and 001-24100) via the west shoulder of 10 Sideroad; the shoulder (with proper traffic control) shall be used to work, load & haul spoil from the 10 Sideroad Branch Drain between these stations. The work shall also be completed as directed by the County.
0+371 to 0+582	10 m working space/spoil treatment zone	Access to this portion of the **10 Sideroad Branch Drain** on part Lot 10, Conc. 3, (Roll No. 001-24200) via existing field entrance at approx. Sta. 0+412 off 10 Sideroad to west side of the 10 Sideroad Branch Drain and along the working space between these stations; approx. 30 m. The work shall be completed from the **left side** of the branch drain.
0+582 to 0+980	10 m working space/spoil treatment zone	Access to this portion of the **10 Sideroad Branch Drain** on part Lot 10, Conc. 3, (Roll No. 001-24200) via existing field entrance at approx. Sta. 0+660 off 10 Sideroad to west side of the 10 Sideroad Branch Drain and along the working space between these stations; approx. 30 m. The work shall be completed from the **left side** of the branch drain.
0+980 to 1+248	10 m working space/spoil	Access to this portion of the **10 Sideroad Branch Drain** on part Lot 10, Conc. 3, (Roll No. 001-24200) via existing field entrance at approx. Sta. 1+228 off 10 Sideroad to west side of the 10 Sideroad Branch Drain and

WORKING SPACE & ACCESS ROUTES		
	treatment zone	along the working space between these stations; approx. 30 m. The work shall be completed from the **left side** of the branch drain.
1+248 to 1+425	10 m working space/spoil treatment zone	Access to this portion of the **10 Sideroad Branch Drain** on part Lot 10, Conc. 3, (Roll No. 001-24200) via a **new** field access off the south side of 4th Line (there is no field entrance) to west side of the 10 Sideroad Branch Drain and along the working space between these stations; approx. 30 m. The work shall be completed from the **left side** of the branch drain.
1+425 to 1+448		Work within the 4th Line right-of-way may be completed from either side; and as directed by the Town.
3rd Line Branch Drain		
0+000 to 0+784 & 0+820 to 0+895	8 m working space/spoil treatment zone	Access to this portion of the **3rd Line Branch Drain** along the North limit of Lots 11 and 12, Conc. 2. (Roll No. 002-12900; 002-12800; 002-12700; 002-12600; 002-12500; 002-12400; and 002-12300) via **Main Drain AR10** and from any existing field/main entrance off 3rd Line to the south side of the drain; approx. 15 m each. The work shall be completed from the **right side** of the branch drain.
0+784 to 0+820	5 m working space/spoil hauling zone	Access to this portion of the **3rd Line Branch Drain** along the North limit of Lot 12, Conc. 2. (Roll No. 002-12400) via the south shoulder of 3rd Line; the shoulder (with proper traffic control) shall be used to work, load & haul spoil from the 3rd Line Branch Drain between these stations. The work shall also be completed as directed by the Town.
0+895 to 1+660	5 m working space/spoil hauling zone	Access to this portion of the **3rd Line Branch Drain** along the North limit of Lots 12 and 13, Conc. 2. (Roll No. 002-12200; 002-12100; 002-12000; 002-11900; 002-11800; 002-11700; and 002-11600) via the south shoulder of 3rd Line; the shoulder (with proper traffic control) shall be used to work, load & haul spoil from the 3rd Line Branch Drain between these stations. The work shall also be completed as directed by the Town.
3rd Line Spur Branch Drain		
0+000 to 0+019		Work within the 3rd Line right-of-way may be completed from either side; and as directed by the Town.
0+019 to 0+172	8 m working space/spoil treatment zone	Access to this portion of the **3rd Line Spur Branch Drain** on South part Lot 12, Conc. 3, (Roll No. 001-14300) via existing field entrance approx. 75 m west of the drain off 3rd Line to north side of the branch drain at Sta. 0+019; approx. 100 m. The work shall be completed from the **left side** of the branch drain.
0+172 to 0+779	8 m working space/spoil treatment zone	Access to this portion of the **3rd Line Spur Branch Drain** on South part Lot 13, Conc. 3, (Roll No. 002-14400) via existing main entrance off 3rd Line to north side of the Branch Drain at Sta. 0+600; approx. 15 m. The work shall be completed from the **left side** of the branch drain.
NOTES: (1) The Contractor shall contain their construction operations to as narrow a width as possible so as to prevent damage to lands, crops, woodlots, etcetera; however, in no case shall they exceed the widths indicated.		

WORKING SPACE & ACCESS ROUTES
(2) The Contractor shall be entirely responsible for any damage to lands, crops, etcetera, beyond the widths and locations of both the access routes and the working spaces specified, caused by the Contractor, their Subcontractors or their employees while undertaking the work.
(3) The Contract Administrator's approval MUST BE OBTAINED BEFORE exceeding the maximum widths indicated.
(4) Access to the working space shall be from public roads, farm lanes or as specified. All access routes must be reviewed with the Contract Administrator prior to construction. The Contract Administrator's approval MUST BE OBTAINED BEFORE any alteration to a proposed access route will be considered or allowed.

8.0 Construction Considerations

8.1 Existing Topsoil

Unless specified otherwise, prior to any excavation required for the deepening and widening, spot cleanout & drain maintenance or ditch bottom only cleanout on the SICD Main Drain and Branches, the Contractor shall strip the existing topsoil from the entire width of the proposed widening as well as from the spoil treatment zone. This width will vary depending on whether the excavated material is being piled (for subsequent use by the owner) or levelled; the contractor shall be responsible for ensuring adequate widths are stripped. The topsoil shall be stock piled separately from any and all native soil for subsequent re-use by the owner. The topsoil stockpile shall be furthest from the drain on the working side as indicated in the Table entitled 'Working Space & Access Routes'. Extra payment will NOT be made for this stripping and stockpiling of topsoil.

8.2 Placement of Materials

For clarification, the Contractor shall use the following arrangement of materials during the construction of the SICD Main Drain and Branches within the various working spaces. Immediately adjacent to the top of the new drain bank on the working side of the drain and progressing outward:

1. Minimum 3 m Buffer
2. Typical 5 m Working Space
3. Spoil Treatment Zone (although a width is specified, it shall also be as required on site based on the volume of the excavated material [plus bulking])
4. Topsoil stockpile or windrow

8.3 Staging of Construction

The permanent rock flow check dam at approximately Sta. 1+000 shall be installed prior to any construction on or excavation in the drain itself. The other sediment control measures throughout the various sections of the drain upstream of 5 Sideroad shall be installed prior to any construction on the drain in the affected section. The proposed sediment basins within each section shall be installed (as directed) as soon as the construction of the drain (deepening and widening) has been completed.

The Contractor shall stage the construction to ensure that the site is left each day with appropriate controls to avoid sediment transport and erosion. Any excavated material not yet levelled must be deposited well beyond the 3 m buffer in the working space and in the designated spoil treatment zone. During the construction (if and when necessary) and/or as directed by the Contract Administrator, excavated materials may need to be contained and protected with silt fence barrier or other measures to prevent re-entry into the drain. All drainage works shall be completed during periods of low or minimal flow; the Contract Administrator in communication with the Contractor, will have the final decision regarding undertaking the various works (if any) under elevated flow conditions. Additional erosion and sediment control measures shall be paid for as extra items on an as directed basis.

Various items of the proposed work are intended to mitigate and offset, wherever possible, potential construction and improvement impacts to existing aquatic and terrestrial habitat within the SICD Main Drain and Branches as well as the adjacent working space. The Contractor is reminded that there are timing windows for in-water work and vegetation clearing. All work shall be completed within the various timing windows (some of which may overlap) for the aquatic and terrestrial species that may be affected unless mitigation measures allow otherwise.

8.4 Final Inspection

After substantial completion of the work and prior to demobilization and removal of the equipment and materials from the site, the Contractor **MUST** arrange an on-site FINAL inspection of the work with the Contract Administrator. This is to ensure all aspects of the work have been satisfactorily completed and/or that arrangements have been made to expedite the completion of any outstanding minor items or deficiencies. Notification to the Contract Administrator of this Final Inspection shall be provided at least two (2) days prior.

8.5 Deficiencies

When directed by the Contract Administrator, deficient items including but not necessarily limited to such things as outlet markers, additional rip-rap, seeding, etcetera shall be remedied by the Contractor during the warranty period and paid at the Contract price. If the Contractor, in the opinion of the Contract Administrator and/or the Municipality, fails to complete the work within a reasonable timeframe, the work may be completed by a Contractor of the Contract Administrator's choosing and the cost of the work may be deducted from the Contract holdback.

8.6 Benchmarks

There were a limited number of benchmarks provided; accordingly, Burnside will complete the necessary field work to establish a complete and extensive Construction Benchmark Database, tied to geodetic datum, prior to the construction of the proposed works. The new Benchmarks should allow the Contractor to construct the works as specified herein.

8.7 General Construction Requirements

The following general construction conditions and requirements apply to this project:

- Install, maintain and remove any temporary sediment control measures as specified and/or directed by the Contract Administrator and/or Drainage Superintendent.
- Spreading and levelling of excavated material, or disposal of all waste material off-site as directed by the Contract Administrator and seed all disturbed areas with an approved seed mixture.
- The Contractor shall seed all disturbed areas which includes the newly excavated ditch banks, the overflow shelf or floodplain bench, the buffer and the levelled spoil with the OPSS (MTO) Standard Roadside Seed Mix and as per the Standard Drain Specifications (E.2.2.8) or as otherwise specified. The NVCA has been consulted regarding sources that can provide native mixes (stock and custom); accordingly, the NVCA gas advised the following: large orders are best booked very early; a native seed mix (i.e. meadow, riparian, wetland, wet meadow, wildflowers, prairie) will be required; thorough site preparation to remove competition is critical to good set and survival; Canada & Riverbank Rye are good components to help with cover in the early years; if the site has a high weed seed bank, cutting twice to about a foot will help establishment of the native species by suppressing aggressive annual/short-lived weeds; seeding rates will vary depending on the seed mix and will be based on nursery recommendations; a minimum 10-20 kg/ha cover crop will be required (more on slopes or if hand broadcast).
- Restoration and rehabilitation of all areas disturbed by the contractor and each access route to pre-construction conditions or better and to the satisfaction of the Contract Administrator.
- All in-water work for structure installations shall be in accordance with the accompanying DFO document “Guidance for Maintaining and Repairing Municipal Drains in Ontario”.

8.8 Descriptions of the Work

The items listed in the following Sections and Sub-Sections are descriptions of the various items of work listed in the Schedule of Unit Prices (Document B - Tender) and are in addition the Standard Drain Specifications (Appendix E - Report or Document E - Tender). The identifier for each item matches the corresponding item in the Schedule of Unit Prices.

9.0 South Innisfil Creek Drain - Main Drain

9.1 Station 0+000 to Station 1+224

9.1.1 Block Nets

For the unit price bid per hour, and under the direction of the Contract Administrator, the Contractor shall supply one (1) labourer outfitted with chest waders, safety gear (i.e., personal floatation device) and any other necessary equipment, to undertake and complete the following.

Burnside is proposing “fish exclusion” from the areas of the work on the drain by supplying and installing “block nets” at the upstream and downstream limits of the in-water works within each reach of the drain. Once the upstream block net is installed, the Contract Administrator with the assistance of one (1) labourer supplied by the Contractor, shall sweep downstream with a seine net to ensure fish are pushed downstream of that reach. Burnside is proposing to use a seine net that will have a float line and weighted lead line to ensure full depth coverage within the drain. The seine net will be pulled downstream with a person on each bank to push and direct fish downstream without capturing them. At the downstream limit of the reach, a second block net will be left in place to prevent fish from moving upstream into the work area. Both nets will also help capture floating debris transported downstream during the construction. This method of fish exclusion will ensure that fish are not trapped in the work area during the in-water works. This fish exclusion method will be utilized as work proceeds in each reach of the drain and along its entire length.

When necessary during construction and/or when instructed by the Contract Administrator, the Contractor shall remove and dispose of any debris that accumulates behind a block net. The block nets shall be removed only when directed by the Contract Administrator at the completion of the work in that reach. Installation, placement and operation shall be to the satisfaction of the Contract Administrator. The Contractor and/or Contract Administrator will inspect these in-water works daily and any evidence of failure or the potential for failure shall be immediately reported by the Contractor to the Contract Administrator.

9.1.2 Permanent Rock Flow Check Dam (for the duration of the construction)

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to install and maintain during the undertaking of the work one (1) Permanent Rock Flow Check Dam at approximately Sta. 1+000. This feature shall remain in place throughout the entire construction period for the SICD. This permanent dam shall be installed after the blocker nets are in place for this reach of the drain and prior to commencement of any in-water work.

The Contractor shall inspect the permanent dam daily. Any evidence of failure of this structure or potential for failure shall be immediately rectified by the Contractor at no extra cost and reported to the Contract Administrator. On a weekly basis, the Contractor shall remove (if necessary), or when and as directed by the Contract Administrator, any sediment that may have accumulated upstream of the dam; spoil shall be levelled and seeded beyond the 3 m buffer.

After the completion of the entire SICD improvement project, and only when instructed by the Contract Administrator, the permanent dam shall be removed. The excess stone can be incorporated as bank protection for the existing drain in the area of Sta. 1+000. The Contractor shall also refer to OPSS 577 and OPSD 219.211.

9.1.3 Woody Debris Manipulation and Placement

For the unit price bid per hour, and under the direction of the Contract Administrator, the Contractor shall supply a small excavator c/w operator and one (1) labourer equipped with chest waders, safety gear (i.e. personal floatation device), a chainsaw, winches and any other equipment to necessitate the removal and/or manipulation of existing log jams and available and re-useable woody debris; existing debris not deemed suitable by the Contract Administrator shall be removed from the existing drain and disposed of on the working side of the drain beyond the 3 m buffer. There may be some access restrictions that may not allow for the use of a small excavator; accordingly, an all-terrain vehicle (ATV) may be substituted to navigate the area in and around existing trees and vegetation.

The work shall consist of the removal and/or manipulation of log jams from within and across the existing drain to the sides. In addition, it shall also consist of the manipulation and placement of large woody debris (LWD) and small woody debris (SWD) in order to improve flow conditions that will naturally create a low flow channel (thalweg) and improve drain bank stability. The Contract Administrator will provide advice and direction regarding the proposed work and one (1) individual will assist the Contractor with it. The work may also entail the removal of any remnant beaver dams and sediment blockages; please refer to the profiles.

Debris removal, manipulation and placement is intended to establish a long lasting open drainage system and, if debris is properly placed, it should stabilize the drain banks and provide suitable areas for sediment deposition. LWD and SWD can be "peeled back" (meaning pulled from the middle of the drain to the banks downstream) which allows the "thalweg" (i.e., the deepest part of the low flow channel) to properly form and provide suitable velocity to convey sediment. LWD and SWD can usually be manipulated, moved around and placed using small equipment (i.e. a back hoe or excavator); however, access may be limited, so hand work may also be required by the Contractor and crew. The Contractor shall also refer to OPSS 577 and the appropriate Detail.

9.1.4 Clearing and Brushing

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to necessitate the clearing and/or brushing (whichever is applicable) of any existing trees or brush identified by the Contract Administrator from within the existing drain or along the exiting drain banks of the SICD Main Drain. This price bid for this Item shall be taken into consideration with Item 10.1.3 and shall apply to the excess material not required for LWD and/or SWD. The cleared (cut) material shall be disposed of on the working side of the drain beyond the 3 m buffer in the working space. Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum.

9.1.5 Sediment Removal and Spoil Treatment

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake minor deepening and remove sediment from the SICD Main Drain for approximately 70 m from Sta. 1+130 to 1+200 to the design gradient shown on the profile; the work shall be from the right side. The improved drain bottom shall be an extension of the existing side slopes with excavation at 2H:1V; there shall be NO disturbance of the existing side slopes unless directed otherwise by the Contract Administrator. Where possible, under the direction of Contract Administrator, a meandering low flow channel (thalweg) shall be created within the improved drain bottom. The excavated material shall be deposited and levelled beyond the 3 m buffer in the working space and in the designated spoil treatment zone.

9.1.6 Permanent Sediment Basin

For the unit price bid for each, and under the direction of the Contract Administrator, the Contractor shall construct a permanent sediment basin in the existing SICD Main Drain where specified. Where any sediment basin is to be constructed in conjunction with a temporary rock flow check dam, each basin shall be located a maximum of 3 m upstream of the dam. When necessary, during construction and/or at the completion of the project and/or when instructed by the Contract Administrator, the Contractor shall remove, spread and seed any accumulated sediment beyond the 3 m buffer in the working space and the designated spoil treatment zone.

Each permanent sediment basin shall be left in place following the construction of the SICD and thereafter shall be maintained by the Town and/or its Drainage Superintendent. The Contractor shall also refer to OPSS 577 and the appropriate Detail.

9.1.7 Tree Plantings

For the unit price bid per lineal metre of drain bank, and under the direction of the Contract Administrator, the Contractor shall replant the tree and shrub plantings that are to be supplied by others. The Contractor shall replant all tree and shrub plantings within the 3 m buffer on the side of the existing drain. The plantings shall be installed in one of two ways:

a) in 2 rows along the designated side of the drain with the inside row a minimum of 1.0 m from the edge or top of the existing drain bank. There shall be a minimum spacing of 2.5 m to 3.0 m between the two rows as well as 2.5 m to 3.0 m between each of the plantings in each row. This results in 0.8 trees per lineal metre of drain bank.

b) in a single row along the designated side of the drain with the center of the row a minimum of 1.5 m from the edge or top of the existing drain bank. There shall be a minimum spacing of 10 m between each of the plantings in the row. This results in one (1) tree per 10 lineal metres of drain bank.

9.1.8 Seeding

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake Hand Seeding, with an approved seed mix, of any excavated material (spoil) that has been levelled, of the new 3 m buffer as well any other areas disturbed by the work. Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum.

The mix design and application rates shall be as indicated in the Standard Drain Specifications or as may be recommended by the NVCA for the specific area. All Hydroseeding mixes shall include a cover or nurse crop. Prior to application, the seed mixture shall be approved by the Contract Administrator (see Section 8.6). The Contractor shall also refer to OPSS 804.

9.2 Station 1+224 to Station 2+165

9.2.1 Block Nets

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details.

9.2.2 Temporary Rock Flow Check Dam

For the unit price bid per pair of dams, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to install and maintain during the undertaking of the work in the respective reach, a Temporary Rock Flow Check Dam at the upstream limit and at the downstream limit. These dams shall remain in place throughout the construction within the reach. The temporary dams shall be installed after the blocker nets are in place and prior to commencement of any in-water work.

The Contractor shall inspect the temporary dams daily. Any evidence of failure of this structure or potential for failure shall be immediately rectified by the Contractor at no extra cost and reported to the Contract Administrator. The Contractor shall remove (if necessary), or when and as directed by the Contract Administrator, any sediment that may have accumulated upstream of the dams; the price bid shall also include the treatment of the spoil which shall be similar to that for the material excavated from the same reach of the SICD.

After the completion of the work in each reach of the SICD, and only when instructed by the Contract Administrator, the downstream temporary dam shall be removed. The excess stone can be incorporated as bank protection for the low flow channel in the area where the dam was placed or as may otherwise be directed by the Contract Administrator. The material (as much as possible) shall be salvaged from the upstream temporary dam and placed immediately downstream in the constructed reach of the drain but as close as possible so that it will serve as the downstream dam for the next upstream reach of the drain. The Contractor shall also refer to OPSS 577 and OPSD 219.211.

9.2.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.2.4 Tree Clearing

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall complete approx. 426 lineal metres of tree cutting, felling and clearing through the existing wood lot on the south part of Lot 6, Conc. 1 from approximately Sta. 1+224 to 1+650 for a width of approximately 25 m. Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum. As per the Standard Drain Specifications, trees and limbs larger than 150 mm in diameter shall be trimmed and stacked to the side of the corridor for use by the landowner. No grubbing of the cleared corridor is required under this Item; however, the corridor shall also be brushed as specified and the Contractor shall take this into consideration in the price bid for this Item.

The Contractor is advised that it may be necessary to include as part of the work under this item, the supply and installation of (size to be determined/provided) tree mounted bat houses, as distributed by Canadian Bat Houses (http://canadianbathouses.com) or equivalent; all of which would be under the direction of the Contract Administrator.

9.2.5 Brushing

The work shall be undertaken for the lump sum price bid; refer to Item 9.1.4 for details.

9.2.6 Deepening and Widening

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall excavate, deepen and widen the existing SICD Main Drain on Lot 6, Conc. 1 from Sta. 1+224 to 2+150 for approximately 926 m in accordance with the dimensions provided on the cross sections and as indicated on the drawings; all new excavated side slopes shall be at a minimum of 2H:1V. Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum.

Drain deepening shall commence at the lowest possible match point on the side slope on the far drain bank and carry down and into the new drain bottom to the proposed elevation. Excavation shall be completed across the new drain bottom and on and up the near drain bank. There shall be no excavation on the far drain bank and all existing vegetation thereon shall remain undisturbed. Where possible, the low flow channel will be allowed to meander within the bottom of the new drain.

All required work for the drain construction shall take place within the specified working space as described in the table 'Working Space and Access Routes'. The Contractor is reminded that grubbing will also be required as part of the work under this Item; stumps shall be removed and disposed of off-site by the Contractor at no additional cost. If during construction there is excavated subsoil material deemed unsuitable by the Contract Administrator for treatment in the designated spoil treatment zone, it shall be loaded and trucked off-site by the Contractor for disposal and paid as an extra at the time of construction.

The excavated material shall be deposited for levelling beyond both the 3 m buffer and the 5 m working space on the working side of the Main Drain. The topsoil shall be stripped (See Section 8.1) from the spoil treatment zone and spread back over the spoil within the right-of-way. All disturbed areas shall then be seeded as specified.

Any gravel substrate suitable for fish spawning (as determined by the Contract Administrator) shall be salvaged during the deepening and replaced in the excavated drain to finished grade. The substrate shall be kept clean of all soil contamination prior to being reinstalled.

The Contractor shall take precautions so as to not damage the existing private crossings within this reach of the Main Drain. Care shall also be taken to avoid undercutting the crossings during drain construction.

9.2.7 Sod Matting

For the unit price bid per square meter, and under the direction of the Contract Administrator, the Contractor shall salvage, place and tamp vegetated sod mats. Vegetated sod mats are the first 200 mm to 400 mm thickness of bank material which shall be salvaged (wherever available and whenever possible) from the existing working side drain bank and placed on the newly exposed bank of the low flow channel and on the outside edge of the overflow shelf once all excavation and construction has been completed; the Contractor shall refer to the Typical Channel Restoration Cross Section in the Municipal Drain Details as well as the Sod Matting Extract.

Sod mats shall consist of existing well rooted vegetation and topsoil found on the existing drain bank and from within the limits of the proposed drain widening. The sod mat material is excavated so that a "mat" of vegetation and topsoil is cut using the excavator in a size ranging from 200 mm to 400 mm thick and 1.2-1.5 m long (a minimum of 1.0 m long will be allowed) based on the width of the excavator bucket. The sod mat is then positioned by the bucket and tamped into place using the flat side of the bucket as well as to somewhat compact the sod mat. It is important that adjacent sod mats are placed so that the ends are "abutted" against each other to ensure complete, consistent and suitable coverage and stability. It is strongly recommended that an "articulating/knuckle/wrist bucket" be used for the application of all required sod matting.

Sod matting is used to immediately stabilize a portion of the low flow 2H:1V channel bank and to also create a vegetated top on the overflow shelf or floodplain bench without the need for seeding and fine grading. Sod mat salvage and placement shall be completed under the direction of the Contract Administrator. Furthermore, it is also recommended that the sod mats being placed will be salvaged from the existing drain bank and unexcavated portion immediately upstream and within the reach of the excavator so that the amount of tracking and/or movement and/or work is reduced and kept to a minimum and as efficient as possible.

9.2.8 Spoil Treatment

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil within the working space and the adjacent spoil treatment zone to a maximum depth of 300 mm to 500 mm, however, no spoil shall be levelled, spread or left within the 3 m buffer. Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

In this reach, and due to the amount of excavated material, the Contractor shall also level the spoil in the area beyond the cleared area and the working space by pushing and placing it to the maximum depth specified in and around existing mature trees but with damaging them or stripping any bark.

9.2.9 Woody Debris Manipulation and Placement

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.3 for details.

9.2.10 Drain Bank Protection

For the price bid per square meter, and under the direction of the Contract Administrator, the Contractor shall supply and install bank protection as specified in areas of instability, primarily at bends in the drain. Each installation shall consist of an approximately 450 mm thickness of 150 mm to 300 mm (R-50) diameter protection consisting of: (a) rip-rap with geotextile; (b) rip-rap without geotextile; and (c) river stone.

Generally, the rip-rap is to be installed on the upper drain bank which (as per the Cross Sections) is above the overflow shelf or floodplain bench. River stone is to be installed on the low flow channel or lower drain bank which (as per the Cross Sections) is below the overflow shelf or floodplain bench. The gradation of the river stone shall match the gradation specified for R-50 rip-rap in accordance with OPSS 1004; the Contractor shall also refer to OPSS 511 and 1001. Installation shall take place after the completion of any applicable drain excavation, construction and grading. Approximate quantities and locations shall be as specified in the 'Bank Repair' table. No concrete will be permitted.

DRAIN BANK PROTECTION			
Station	**Station**	**Bank to be Stabilized**	**Approx. Rip-rap Quantity (m^2)**
1+330	1+350	Right	140
1+820	1+850	Left	180
2+000	2+025	Left	180
4+515	4+545	Right	140
4+785	4+815	Left	140
5+490	5+520	Right	90
6+125	6+135	Left	60
6+325	6+335	Right	60
6+525	6+535	Right	30
7+180	7+210	Left	90
7+300	7+315	Right	45
8+190	8+205	Right	45
8+320	8+330	Left	60
8+512	8+522	Right	60
8+645	8+675	Left	90
8+750	8+780	Left	90
8+810	8+830	Right	60
8+900	8+935	Right	70
9+020	9+040	Right	60

9.2.11 Confluence Splashpads

For the price bid for each, and under the direction of the Contract Administrator, the Contractor shall install splash pads at the confluence of the Main Drain with tributary watercourses and branch drains. Each confluence shall be excavated to provide a smooth horizontal and vertical transition from the confluence watercourse or drain into the Main Drain. Protection shall be installed on the drain bed and banks as directed and in accordance with Item 10.2.10. Generally, rip-rap shall be installed on the transition banks and rive stone shall be installed on the transition bottom. Approximate quantities and locations shall be as specified in the 'Confluence Splashpads' table. The Contractor shall also refer to OPSS 1001 and 1004. No concrete will be permitted. The price bid shall also include the treatment of the spoil which shall be similar to that for the material excavated from the same reach of the SICD as well as the seeding of any areas not requiring protection.

CONFLUENCE SPLASHPADS		
Station	**Tributary Enters From**	**Approx. Rip-rap Quantity (m^2)**
1+710	Left	30
1+715	Right	50
1+890	Left	30
2+290	Right	60
2+550	Left	50
3+060	Right	45
3+345	Right	45
3+375	Right	45
3+585	Left	30

3+690	Left	30
3+895	Left	30
4+875	Left	30
5+449	Right	45
6+134	Left	60
6+328	Right	60
7+080	Right	30

9.2.12 Tree Plantings

This item shall be bid as a unit price per lineal metre of drain bank; refer to Item 9.1.7 for details.

9.2.13 Hydroseeding

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake Hydroseeding, with an approved seed mix, of any excavated material (spoil) that has been levelled, of the new 3 m buffer as well as any other areas disturbed by the work, including the new drain bank and the new floodplain bench. The areas of sod matting are to be excluded. Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum. Hydroseeding shall be the final construction activity performed in each reach or section of the SICD; each section shall be Hydroseeded after the construction of that section has been completed.

The mix design and application rates shall be as indicated in the Standard Drain Specifications or as may be recommended by the NVCA for the specific area. All Hydroseeding mixes shall include a cover or nurse crop. Prior to application, the seed mixture shall be approved by the Contract Administrator (see Section 8.7). The Contractor shall also refer to OPSS 804.

Hand Seeding shall be undertaken using the same seed mixture as for Hydroseeding; generally Hydroseeding shall be completed on areas that are more than 500 square metres in size.

9.2.14 Live Stakes

For the unit price bid per square metre, and under the direction of the Contract Administrator, the Contractor shall place live stakes that are to be supplied by others in the newly excavated and disturbed portion of the drain banks above the low flow channel. Live Stakes shall be placed in the locations (typically outside bends) directed by the Contract Administrator following drain excavation and construction and when no further disturbance to the bank will be required. Planting density will be approximately 1 live stake per square metre or as may be otherwise recommended by the Contract Administrator and/or the NVCA. In the locations specified, live stakes will be installed from the top of the overflow bank to 1 m below the top of bank.

Live stakes should be tamped into the ground at right angles with dead blow hammers ensuring no damage occurs. Rooting ends of the live stakes should be inserted into the hyporheic zone. Stakes should protrude approximately 100 mm aboveground and should be compacted firmly with soil. Stakes should be installed so that approximately 80% of the length of the stake is located underground and approximately 20% of the length of the stake is located aboveground.

Live stakes or cuttings shall be red-osier dogwood or an equivalent native species approved by the Contract Administrator and/or the NVCA. Live stakes or cuttings are to be taken from living, rootable woody species (i.e., red-osier dogwood) should be approximately 10 mm to 40 mm in diameter and 500 mm to 1,000 mm in length. Side branches should be removed, and the basal end should be cut on a 45° angle.

9.3 Station 2+165 to Station 2+280

9.3.1 Bridge or Culvert Cleanouts

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall clean out and remove (or flush or both) all sediment and debris from any existing bridge or culvert under the various roads along the course of the SICD Main Drain or one of the four Branch Drains. This work shall be completed using a mini-excavator, a vacuum truck or other approved equipment or method. All required work for the bridge and culvert cleanouts shall take place within the specified working space as described in the table ‘Working Space and Access Routes’.

The price bid shall also include the treatment of the spoil which shall be similar to that for the material excavated from the upstream reach of the SICD.

9.3.2 Deepening and Widening

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall excavate, deepen and widen the existing SICD Main Drain as required between Sta. 2+165 and Sta. 2+280 to fit either: (a) the existing culverts plus the interim solution; (b) the ultimate solution; or (c) a combination of (a) and (b). Although approximate areas can be provided upon request, the Contractor shall be responsible for their own calculations, there shall be no measurement for payment and the unit for payment shall be lump sum. All work shall be in accordance with the dimensions provided on the cross sections and as indicated on the drawings; all new excavated side slopes shall be at a minimum of 2H:1V. The work shall be undertaken for the lump sum price bid; refer to Item 9.2.6 for more details.

The price bid shall also include the treatment of the spoil (loading and hauling) which shall be similar to that for the material excavated from the upstream reach of the SICD.

9.3.3 Sod Matting

The work shall be undertaken for the price bid per square metre; refer to Item 9.2.7 for details.

9.3.4 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

9.4 Station 2+280 to Station 3+350

9.4.1 Block Nets

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details.

9.4.2 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per pair of dams; refer to Item 9.2.2 for details.

9.4.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.4.4 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

9.4.5 Deepening and Widening

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.6 for details.

9.4.6 Sod Matting

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.7 for details.

9.4.7 Spoil Treatment

a) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall load, haul and dispose of offsite the excavated material and resulting spoil on the north part of Lot 7, Conc. 1 from Sta. 2+280 to 2+948 for approximately 668 m. The work shall be undertaken within the width of the working space and the adjacent spoil treatment zone as specified in the Table entitled 'Working Space & Access Routes'. The topsoil shall be stripped from the along the haul route as indicated in Section 8.1.

b) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall stockpile the excavated material and resulting spoil on the north part of Lot 8, Conc. 1 from Sta. 2+948 to 3+350 for approximately 402 m. The work shall be undertaken within the width of the working space and the adjacent spoil treatment zone as specified in the Table entitled 'Working Space & Access Routes'. The stockpile shall be kept to as narrow as possible to minimize the damage to lands and existing crop.

9.4.8 Woody Debris Manipulation and Placement

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.3 for details.

9.4.9 Confluence Splashpads

The work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

9.4.10 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

9.4.11 Live Stakes

If deemed necessary, the work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.14 for details. This work shall be considered an **OPTIONAL** Item.

9.5 Station 3+350 to Station 3+588

9.5.1 Block Nets

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details.

9.5.2 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per pair of dams; refer to Item 9.2.2 for details.

9.5.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.5.4 Deepening and Widening

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.6 for details.

9.5.5 Sod Matting

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.7 for details.

9.5.6 Bridge Cleanout 2nd Line

The work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details.

9.5.7 Spoil Treatment

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil on the south part of Lot 8, Conc. 2 from Sta. 3+375 to 3+588 for approximately 213 m within the working space and the adjacent spoil treatment zone to a maximum depth of 300 mm, however, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

9.5.8 Confluence Splashpads

The work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

9.5.9 Tree Plantings

This item shall be bid as a unit price per lineal metre of drain bank; refer to Item 9.1.7 for details.

9.5.10 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

9.5.11 Live Stakes

If deemed necessary, the work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.14 for details. This work shall be considered an **OPTIONAL** Item.

9.6 Station 3+588 to Station 5+449

9.6.1 Block Nets

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details.

9.6.2 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per pair of dams; refer to Item 9.2.2 for details.

9.6.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.6.4 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

9.6.5 Deepening and Widening

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.6 for details.

The Contractor shall not disturb or damage the existing private crossings within this reach of the Main Drain. Care shall be taken to avoid undercutting the crossings during drain construction.

9.6.6 Sod Matting

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.7 for details.

9.6.7 Spoil Treatment

a) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil on the south part of Lot 8, Conc. 2 from Sta. 3+588 to 3+895 for approximately 307 m within the working space and the adjacent spoil treatment zone to a maximum depth of 300 mm; however, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

b) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall stockpile the excavated material and resulting spoil on the north part of Lot 8, Conc. 1 from Sta. 3+895 to 5+449 for approximately 402 m. The work shall be undertaken within the width of the working space and the adjacent spoil treatment zone as specified in the Table entitled 'Working Space & Access Routes'. The stockpile shall be kept to as narrow as possible to minimize the damage to lands and existing crop.

9.6.8 Woody Debris Manipulation and Placement

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.3 for details.

9.6.9 Drain Bank Protection

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.10 for details.

9.6.10 Confluence Splashpads

The work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

9.6.11 Tree Plantings

This item shall be bid as a unit price per lineal metre of drain bank; refer to Item 9.1.7 for details.

9.6.12 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

9.6.13 Live Stakes

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.14 for details.

9.7 Station 5+449 to Station 6+355

9.7.1 Block Nets

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details.

9.7.2 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per pair of dams; refer to Item 9.2.2 for details.

9.7.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.7.4 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

9.7.5 Remove and Stockpile RAP

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall load, haul and stockpile in the designated location, the existing reclaimed asphalt pavement (RAP) material from the top of the existing dyke on the west side of the Main Drain in the north part of Lot 10, Conc. 2 for approximately 685 m. The work shall be undertaken from the RAP surface of the existing dyke in a south to north direction using the remainder of the RAP surface as the haul route.

9.7.6 Deepening and Widening

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.6 for details.

9.7.7 Sod Matting

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.7 for details.

9.7.8 Bridge Cleanouts 10 Sideroad and 3rd Line

The work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details.

9.7.9 Spoil Treatment

a. For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall stockpile the excavated material and resulting spoil on the north part of Lot 10, Conc. 2 from Sta. 5+449 to 6+134 for approximately 685 m. The work shall be undertaken within the width of the working space and the adjacent spoil treatment zone as specified in the Table entitled 'Working Space & Access Routes'. The stockpile shall be kept to as narrow as possible to minimize the damage to lands and existing crop.

b. For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall load, haul and dispose of offsite the excavated material and resulting spoil on the north part of Lot 11, Conc. 2 from Sta. 6+161 to 6+328 for approximately 167 m. The work shall be undertaken using the existing laneway on the property and along the south bank of the drain; namely, AR11 as specified in the Table entitled 'Working Space & Access Routes'.

9.7.10 Woody Debris Manipulation and Placement

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.3 for details.

9.7.11 Drain Bank Protection

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.10 for details.

9.7.12 Confluence Splashpads

The work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

9.7.13 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

9.7.14 Live Stakes

If deemed necessary, the work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.14 for details. This work shall be considered an **OPTIONAL** Item.

9.8 Station 6+355 to Station 7+928

9.8.1 Block Nets

If deemed necessary, the work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details. This work shall be considered an **OPTIONAL** Item.

9.8.2 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per pair of dams; refer to Item 9.2.2 for details.

9.8.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.8.4 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

9.8.5 Spot Cleanouts and Drain Maintenance

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake the necessary spot cleanouts and drain maintenance as well as any proposed minor widen of the existing SICD Main Drain on Lot 11, Conc. 3 from Sta. 6+355 to 7+928 for approximately 1,573 m in accordance with the cross sections and drawings; all new excavated side slopes shall be at a minimum of 2H:1V.

Any excavation required to create a minimum 2 m wide drain bottom at the proposed drain bottom gradient as well as to remove debris, sediment bars and other high points shall commence at the lowest possible match point on the side slope on the far drain bank and carry down and into the new drain bottom to the proposed elevation. Excavation shall be completed across the new drain bottom and on and up the near drain bank. Any gravel substrate suitable for fish spawning (as determined by the Contract Administrator) shall be salvaged during any excavation in the drain bottom and replaced in the excavated drain to finished grade. The substrate shall be kept clean of all soil contamination prior to being reinstalled. Where there is no drain bottom excavation required, the existing low flow channel, bottom substrate and banks shall remain undisturbed.

Where minor widening it is proposed, it shall be undertaken on near bank only; there shall be no excavation on the far drain bank and all existing vegetation thereon shall remain undisturbed. The existing low flow channel shall continue to meander within the bottom of the drain.

All required work for the drain construction shall take place within the specified working space as described in the table 'Working Space and Access Routes'. If during construction there is excavated subsoil material deemed unsuitable by the Contract Administrator for treatment in the designated spoil treatment zone, it shall be loaded and trucked off-site by the Contractor for disposal and paid as an extra at the time of construction.

The excavated material shall be deposited for levelling beyond both the 3 m buffer and the 5 m working space on the working side of the Main Drain. The topsoil shall be stripped (see Section 8.1) from the spoil treatment zone and spread back over the spoil within the right-of-way. All disturbed areas shall then be seeded as specified.

9.8.6 Sod Matting

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.7 for details.

9.8.7 Spoil Treatment

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil within the working space and the adjacent spoil treatment zone to a maximum depth of 150 mm in areas that are being actively farmed; elsewhere it shall be levelled to a depth of 300 mm. However, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

9.8.8 Woody Debris Manipulation and Placement

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.3 for details.

9.8.9 Drain Bank Protection

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.10 for details.

9.8.10 Confluence Splashpads

The work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

9.8.11 Hand Seeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.1.8 for details.

9.8.12 Live Stakes

If deemed necessary, the work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.14 for details. This work shall be considered an **OPTIONAL** Item.

9.8.13 Riffle and Pool Structure

For the unit price bid for each, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to excavate for and install a riffle and pool structure as per the municipal drain details drawing and, in the locations, identified or specified on site. The resulting spoil shall be placed beyond the 3 m buffer in the spoil treatment zone in accordance with other excavation within this reach; seeding shall also be as specified for the other items of work within this reach. Each structure shall be armoured with both river stone in the drain bottom and rip-rap on the drain banks.

The riffle substrate to consist of 60% 100 mm to 150 mm round stone and 40% compacted Granular B (pit run). The riffle material must be compacted to ensure that flow is over the riffle and not through the stone that it is constructed with. Riffle thickness shall be three (3) x the diameter of the largest substrate or approx. 450 mm. The pool portion of the structure (which shall also act as an inline sediment basin) is approximately 1 metre in depth from the riffle crest and shall be constructed immediately upstream of each riffle. The work shall be completed in dry weather and in low or no flow conditions per the DFO best management practices. When necessary, during and at the completion of the project and/or when instructed by the Contract Administrator, the Contractor shall remove and treat any accumulated sediment as specified.

9.9 Station 7+928 to Station 7+950

The Contractor shall refer to South Innisfil Creek Drain – 4th Line Culvert Replacement Special Provisions, written specifically for the new 4th Line concrete box culvert and for all work within this Town right-of-way.

9.10 Station 7+950 to Station 9+918

9.10.1 Block Nets

If deemed necessary, the work shall be undertaken for the unit price bid per hour; refer to Item 9.1.1 for details. This work shall be considered an **OPTIONAL** Item.

9.10.2 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per pair of dams; refer to Item 9.2.2 for details.

9.10.3 Permanent Sediment Basin

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.6 for details.

9.10.4 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

9.10.5 Spot Cleanouts and Drain Maintenance

The work shall be undertaken for the lump sum price bid; refer to Item 9.8.5 for details.

9.10.6 Sod Matting

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.7 for details.

9.10.7 Bridge Cleanouts 5th Line

The work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details.

9.10.8 Spoil Treatment

The work shall be undertaken for the lump sum price bid; refer to Item 9.8.7 for details.

Exception: For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall stockpile the excavated material and resulting spoil on the south part of Lot 11 Conc. 4 from Sta. 8+322 to 8+852 for approximately 530 m. The work shall be undertaken within the width of the working space and the adjacent spoil treatment zone as specified in the Table entitled 'Working Space & Access Routes'. The stockpile shall be kept to as narrow as possible to minimize the damage to lands and existing crop.

9.10.9 Woody Debris Manipulation and Placement

The work shall be undertaken for the unit price bid per hour; refer to Item 9.1.3 for details.

9.10.10 Drain Bank Protection

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.10 for details.

9.10.11 Confluence Splashpads

The work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

9.10.12 Tree Plantings

This item shall be bid as a unit price per lineal metre of drain bank; refer to Item 9.1.7 for details.

9.10.13 Hand Seeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.1.8 for details.

9.10.14 Live Stakes

The work shall be undertaken for the unit price bid per square metre; refer to Item 9.2.14 for details.

9.10.15 Riffle and Pool Structure

The work shall be undertaken for the unit price bid for each; refer to Item 9.8.12 for details.

10.0 Branch 'A'

10.1 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per each dam; refer to Item 9.2.2 for details.

10.2 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

10.3 Deepening

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall excavate and deepen Branch ‘A’ on Lot 6, Conc. 1 from Sta. 0+000 to Sta. 0+500 for approximately 500 m in accordance with the and as indicated on the drawings; all new excavated side slopes shall be at a minimum of 2H:1V. Drain deepening shall commence at the lowest possible match point on the side slope on the far drain bank and carry down to the new drain bottom proposed elevation. Excavation shall be completed by creating a new “V” shaped drain bottom then continuing up the near drain bank. There shall be no excavation on the far drain bank and all existing vegetation thereon shall remain undisturbed.

All required work for the drain construction shall take place within the specified working space as described in the table ‘Working Space and Access Routes’. If during construction there is excavated subsoil material deemed unsuitable by the Contract Administrator for treatment in the designated spoil treatment zone, it shall be loaded and trucked off-site by the Contractor for disposal and paid as an extra at the time of construction.

The excavated material shall be deposited for levelling beyond both the 3 m buffer and the 5 m working space on the working side of the Main Drain. The topsoil shall be stripped (see 8.1) from the spoil treatment zone and spread back over the spoil within the right-of-way. All disturbed areas shall then be seeded as specified.

10.4 Spoil Treatment

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil within the working space and the adjacent spoil treatment zone to a maximum depth of 150 mm in areas that are being actively farmed; elsewhere it shall be levelled to a depth of 300 mm. However, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

10.5 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

10.6 Remove and Replace Culvert

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to necessitate the removal and disposal of the existing 450 mm dia. culvert at approximately Sta. 0+222; the work shall be undertaken in dry weather and in low or no flow conditions.

The lump sum price bid shall include the supply and placement of one (1) - 12 m length of 900 mm dia. corrugated steel pipe culvert (68 mm x 13 mm corrugations; 2.80 mm thickness) as specified c/w 10% bury; the new culvert shall be centered in the drain. The lump sum price bid shall include the supply and placement of all granular materials, bedding and backfill similar to the 3rd Line Culvert with the exception that there shall be no asphalt. The crossing shall have a minimum 6 m driving top width, shall be backfilled to 300 mm above the pipe with OPSS Granular 'B' and shall have a minimum thickness of 150 mm of OPSS Granular 'A' material for the travelled portion. The finished driving surface shall have a maximum approach angle of 10H:1V to the centerline. Crossing side slopes shall be a maximum of 2H:1V on the upstream and downstream side. Granular material shall be placed in maximum 150 mm depth lifts and compacted with an approved compactor to approximately 100% Standard Proctor Dry Density (SPDD), prior to the next lift being added.

The lump sum price shall also include the supply and placement of approximately 30 square meters or rip-rap protection at the ends of the new culvert in accordance with the proportions on Drawing 21. The protection shall be installed on the drain bed and banks as directed and in accordance with Item 9.2.10 with the exception that no river stone shall be required.

10.7 Culvert Cleanouts

The work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details.

11.0 10 Sideroad Branch Drain

11.1 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per each dam; refer to Item 9.2.2 for details.

11.2 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

11.3 Spot Cleanouts and Drain Maintenance

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake the necessary spot cleanouts and drain maintenance as well as any proposed minor widen of the existing 10 Sideroad Branch Drain on Lot 10, Conc. 3 from Sta. 0+031 to Sta. 1+425 for approximately 1,394 m in accordance with the cross sections and drawings; all new excavated side slopes shall be at a minimum of 2H:1V.

For the portion of the 10 Sideroad Branch Drain on the east limit of Lot 10, Conc. 3, (Roll No. 001-23800; 001-23900; and 001-24100), the work shall be completed from the west shoulder of 10 Sideroad. The shoulder (with proper traffic control) shall be used to work from, as well as to, load and haul the spoil from the 10 Sideroad Branch Drain between Sta. 0+031 and Sta. 0+371. The work shall also be completed as directed by the County.

For the portion of the 10 Sideroad Branch Drain on part Lot 10, Conc. 3, (Roll No. 001-24200) the work shall be completed from the existing field and the west side of the Branch Drain between Sta. 0+371 and Sta. 1+425.

Work in the existing drain bottom shall commence at the lowest possible match point on the side slope on the far drain bank and carry down to the new drain bottom proposed elevation. Excavation shall be completed by creating a new "V" shaped drain bottom then continuing up the near drain bank. Unless directed otherwise, there shall be no excavation on the far drain bank and all existing vegetation thereon shall remain undisturbed. Where minor widening it is proposed, it shall be undertaken on near bank only.

All required work for the drain construction shall take place within the specified working space as described in the table 'Working Space and Access Routes'. If during construction there is excavated subsoil material deemed unsuitable by the Contract Administrator for treatment in the designated spoil treatment zone, it shall be loaded and trucked off-site by the Contractor for disposal and paid as an extra at the time of construction.

The excavated material not being loaded and hauled shall be deposited for levelling beyond both the 3 m buffer and the 5 m working space on the working side of the Main Drain. The topsoil shall be stripped (see Section 8.1) from the spoil treatment zone and spread back over the spoil within the right-of-way. All disturbed areas shall then be seeded as specified.

11.4 Spoil Treatment

a) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall load, haul and dispose of offsite the excavated material and resulting spoil on the part of Lot 10, Conc. 3 from Sta. 0+031 to 0+371 for approximately 340 m. The work shall be undertaken within the width of the working space as specified in the Table entitled 'Working Space & Access Routes'. The work shall also be completed as directed by the County.

b) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil on the part of Lot 10, Conc. 3 from Sta. 0+371 to Sta. 1+425 for approximately 1,054 m within the working space and the adjacent spoil treatment zone to a maximum depth of 150 mm; however, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

11.5 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

11.6 Remove and Replace 3rd Line Culvert

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to necessitate the removal and disposal of the existing culvert (CSPA) under 3rd Line; the work shall be undertaken in dry weather and in low or no flow conditions.

The lump sum price bid shall include the supply and placement of 18 m of 1,600 mm dia. corrugated steel pipe culvert (125 mm x 25 mm corrugations; 3.5 mm thick) as specified complete with 10% bury; the new culvert shall be instated as per Drawing 21. The new pipe shall be Aluminized Type II Lockseam Hel-Cor Pipe (or approved equal) c/w 600 mm wide coupler(s) (if coupler(s) are required).

The lump sum price bid shall include the supply and placement of all necessary granular materials, bedding, backfill and asphalt. The crossing shall have a minimum driving top width as indicated on the drawings, shall be backfilled to a minimum of 300 mm above the pipe with OPSS Granular 'B' and shall have a minimum thickness of 150 mm of OPSS Granular 'A' material under the travelled portion. The travel portion shall be topped with a minimum of 90 mm of approved asphalt. The side slopes shall be a maximum of 2H:1V on the upstream and downstream side. Granular material shall be placed in maximum 150 mm depth lifts and compacted with an approved compactor to approximately 100% Standard Proctor Dry Density (SPDD), prior to the next lift being added.

The lump sum price shall also include the supply and placement of rip-rap protection at the ends of the new culvert in accordance with the proportions on Drawing 21. The protection shall be installed on the drain bed and banks as directed and in accordance with Item 9.2.10; only river stone shall be allowed in the new drain bottom and in the stilling basin.

11.7 Culvert Cleanouts

With the exception that this Item shall apply to a six (6) private entrance culverts along the course of the 10 Sideroad Branch Drain and the road culvert under 4th Line, the work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details. The culverts are numbered 21 to 27 inclusive on Drawing 22; all culverts are also shown on the profile drawing.

The lump sum price bid shall also include the treatment of the resulting spoil which shall be in a manner similar to that for the material excavated from the upstream reach of the 10 Sideroad Branch Drain; accordingly, the material from the three (3) downstream culverts shall be loaded and hauled and that from the four (4) upstream culverts shall be levelled.

12.0 3rd Line Branch Drain

12.1 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per each dam; refer to Item 9.2.2 for details.

12.2 Clearing and Brushing

The work shall be undertaken for the unit price bid for each; refer to Item 9.1.4 for details.

12.3 Spot Cleanouts and Drain Maintenance

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake the necessary spot cleanouts and drain maintenance of the existing 3rd Line Branch Drain from Sta. 0+000 to Sta. 1+660 for approximately 1,660 m in accordance with the cross sections and drawings; all new excavated side slopes shall be at a minimum of 2H:1V.

For the portion of the 3rd Line Branch Drain between Sta. 0+000 and Sta. 0+895, the work shall be completed from the existing fields and the south side of the Branch Drain

For the portion of the 3rd Line Branch Drain between Sta. 0+895 and Sta. 1+660, the work shall be completed from the south shoulder of the 3rd Line. The shoulder (with proper traffic control) shall be used to work from as well as to load and haul the spoil from the 3rd Line Branch Drain. The work shall also be completed as directed by the Town.

The remaining work shall be undertaken as described in Item 11.3.

12.4 Spoil Treatment

a) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil on the private lands from Sta. 0+000 to Sta. 0+895 for approximately 895 m within the working space and the adjacent spoil treatment zone to a maximum depth of 150 mm, however, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

b) For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall load, haul and dispose of offsite the excavated material and resulting spoil from Sta. 0+895 to Sta. 1+660 for approximately 765 m. The work shall be undertaken within the width of the working space as specified in the Table entitled 'Working Space & Access Routes'. The work shall also be completed as directed by the Town.

12.5 Hydroseeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.2.13 for details.

12.6 Culvert Cleanouts

With the exception that this Item shall apply to a total of 17 private entrance culverts along the course of the 3rd Line Branch Drain, the work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details. The culverts are numbered 1 to 17 inclusive on Drawing 22; all culverts are also shown on the profile drawing.

The lump sum price bid shall also include the treatment of the resulting spoil which shall be in a manner similar to that for the material excavated from the upstream reach of the 3rd Line Branch Drain; accordingly, the material from the culverts 1 to 9 inclusive shall be levelled and the material from the culverts 10 to 17 inclusive shall be loaded and hauled.

13.0 3rd Line Spur Branch Drain

13.1 Temporary Rock Flow Check Dam

The work shall be undertaken for the unit price bid per each dam; refer to Item 10.1 for details.

13.2 Tree Clearing

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall complete approx. 258 lineal meters of tree cutting, felling and clearing along the south limit of the existing wood lot on the south part of Lot 12, Conc. 3 from approximately Sta. 0+172 to Sta. 0+430 for a width of approximately 10 m on the north side of the branch drain.

The remaining work shall be undertaken as described in Item 9.2.4.

13.3 Brushing

The work shall be undertaken for the lump sum price bid; refer to Item 9.1.4 for details.

13.4 Spot Cleanouts and Drain Maintenance

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall undertake the necessary spot cleanouts and drain maintenance of the existing 3rd Line Spur Branch Drain from Sta. 0+000 to Sta. 0+780 for approximately 780 m in accordance with the cross sections and drawings; all new excavated side slopes shall be at a minimum of 2H:1V.

For the entire 3rd Line Spur Branch Drain between Sta. 0+000 and Sta. 0+780, the work shall be completed from the north side of the Branch Drain

The remaining work shall be undertaken as described in Item 12.3.

13.5 Spoil Treatment

For the lump sum price bid, and under the direction of the Contract Administrator, the Contractor shall spread and level the excavated material and resulting spoil on the private lands from Sta. 0+000 to Sta. 0+780 for approximately 780 m within the working space and the adjacent spoil treatment zone to a maximum depth of 300 mm, however, no spoil shall be levelled, spread or left within the 3 m buffer. The topsoil stripped from the spoil treatment zone shall be spread back over the spoil after levelling is complete.

13.6 Hand Seeding

The work shall be undertaken for the lump sum price bid; refer to Item 9.1.8 for details.

13.7 Confluence Splashpads

A confluence splashpad shall be installed on the transition of the 3rd Line Spur Branch Drain into the 3rd Line Branch Drain; the work shall be undertaken for the unit price bid for each; refer to Item 9.2.11 for details.

13.8 Culvert Cleanouts

With the exception that this Item shall apply to a total of two (2) private entrance culverts along the course of the 3rd Line Spur Branch Drain, the work shall be undertaken for the lump sum price bid; refer to Item 9.3.1 for details. The culverts are numbered 18 and 19 on Drawing 22; all culverts are also shown on the profile drawing.

The lump sum price bid shall also include the treatment of the resulting spoil which shall be in a manner similar to that for the material excavated from the 3rd Line Spur Branch Drain.

14.0 Contingency Items

This section covers work that may be required for this project. These items shall apply only as and when approved by the Contract Administrator.

14.1 Outlet Pipe for Existing Private Tile Drain

For the unit price bid for each, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to replace any existing outlet pipe on any private tile drain encountered during construction and/or the widening of the SICD. Included in this price shall be all material required to support the replacement consisting of compacted backfill or clear stone bedding, and the connection to the existing tile using a solid

4 m length of dual-wall HDPE pipe (320 kPa or approved equal) complete with a rodent grate, as per the detail on the drawings. The unit price bid for this item shall also include erosion protection on the banks and/or floor of the drain, with approx. 3 m^2 of erosion protection (450 mm thickness of OPSS R-50 with geotextile underlay*)* as well as an approved marker at the top of the bank as follows: (a) 100 mm; (b) 150 mm; and (c) 200 mm and larger.

The work shall be undertaken for the unit price bid; refer to Item 9.2.10 for details regarding drain bank protection. The construction and installation of the outlet pipe and the erosion protection shall be to the satisfaction of the Contract Administrator. Outlet pipes, connections and/or reconnections missed during construction shall be completed by the Contractor during the warranty period and paid at the Contract price. If the Contractor fails to complete the replacement, connection and/or reconnection within a reasonable timeframe, in the opinion of the Contract Administrator and/or the Drainage Superintendent, the work shall be completed by a Contractor of the Contract Administrator's choosing and the cost of the work deducted from the Contract holdback. Please refer to the Standard Drain Specifications (Sections E.2.3.4 and E.2.3.5) for additional information.

14.2 R-50 Rip-Rap (OPSS R-50)

For the unit price bid per square metre, the Contractor shall supply and install an approximately 450 mm thickness of 150 mm to 300 mm (R-50) diameter rip-rap protection as follows: (a) with geotextile; and b) without geotextile.

This unit price shall be used for payment for any rip-rap installed in addition to those quantities already specified in other items and for credit for any quantities of rip-rap deleted from other items. Additionally, this will include areas of the existing or new drain bank where erosion or slumping has occurred, or as directed on-site by the Contract Administrator and/or the Drainage Superintendent. The work shall be undertaken for the unit price bid; refer to Item 9.2.10 for more details.

14.3 River Stone (OPSS R-50)

For the unit price bid per square metre, the Contractor shall supply and install an approximately 450 mm thickness of rounded river stone in the same manner as specified in Item 14.2 above.

This unit price shall be used for payment for any river stone installed in addition to those quantities already specified in other items and for credit for any quantities of river stone deleted from other items. Additionally, this will include areas of the existing or new drain bank where erosion or slumping has occurred, or as directed on-site by the Contract Administrator and/or the Drainage Superintendent. The work shall be undertaken for the unit price bid; refer to Item 9.2.10 for more details. The gradation of the river stone shall match the gradation specified for R-50 rip-rap in accordance with OPSS 1004. Any river stone installed directly on the new or the existing drain bottom shall only be placed in a single layer and not 450 mm thick.

14.4 OPSS Granular 'B' Material

For the unit price bid per tonne, the Contractor shall supply, install and compact OPSS Granular 'B' material as substrate in the drain bottom. This unit prices shall be used for payment for any OPSS Granular 'B' material installed in addition to those quantities already specified in other items. The Contractor shall also refer to OPSS 577 and Municipal Drain Details.

14.5 Channel Substrate (Remove, Salvage and Reinstall)

For the unit price bid per hour, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour and equipment to remove and salvage suitable channel substrate material for fish spawning to a depth of 150 mm (as determined by the Contract Administrator) and reinstall in in the proposed drain bottom. This process is expected to form part of the DFO approval for this improvement project. The substrate shall be kept clean of all soil contamination prior to being reinstalled in the drain. The Contractor shall undertake this process during construction when informed by the Contract Administrator and applicable stationing shall be recorded by the Contractor and the Contract Administrator.

This Item shall be paid in addition to the rate for drain deepening, at the unit price bid per hour. The unit price bid shall include all equipment, personnel, materials, etc. to complete the salvaging and replacement process.

14.6 Riffle and Pool Structure

For the unit price bid for each, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to excavate for and install a riffle and pool structure as per the municipal drain details drawing and, in the locations, identified or specified on site. The resulting spoil shall be placed beyond the 3 m buffer in the spoil treatment zone in accordance with other excavation within this reach; seeding shall also be as specified for the other items of work within this reach. Each structure shall be armoured with both river stone in the drain bottom and rip-rap on the drain banks.

The riffle substrate to consist of 60% 100 mm to 150 mm round stone and 40% compacted Granular B (pit run). The riffle material must be compacted to ensure that flow is over the riffle and not through the stone that it is constructed with. Riffle thickness shall be three (3) x the diameter of the largest substrate or approx. 450 mm. The pool portion of the structure (which shall also act as an inline sediment basin) is approximately one (1) metre in depth from the riffle crest and shall be constructed immediately upstream of each riffle. The work shall be completed in dry weather and in low or no flow conditions per the DFO best management practices. When necessary, during and at the completion of the project and/or when instructed by the Contract Administrator, the Contractor shall remove and treat any accumulated sediment as specified.

14.7 Riffle Stone

For the unit price bid per cubic metre, the Contractor shall supply & install additional riffle stone, which shall consist of 60% round river stone ranging in diameter from 50 mm to 100 mm well mixed with 40% pit run gravel to prevent through flow of water. The riffle stone shall be installed to the specifications and/or as directed on-site by the Contract Administrator. The riffle stone shall be mechanically compacted during the installation to the satisfaction of the Contract Administrator.

14.8 Toe of Bank Treatment

For the unit price bid per cubic metre, the Contractor shall supply and install a veneer of 200 mm to 300 mm round river stone at the toe of the outside low flow channel bank or as directed by the Contract Administrator on site. The stone shall be placed at the toe and partially embedded into the drain bed and shall extend approximately 500 mm up the bank.

14.9 19 mm Dia. Clear Crushed Stone

For the unit price bid per tonne, the Contractor shall supply and install 19 mm (3/4 inch) dia. clear crushed stone. This unit price shall be used for payment for any 19 mm diameter clear crushed stone installed in addition to those quantities already specified in other items.

14.10 Low Flow Ditch Bottom Only Cleanout (year following construction)

For the lump sum price bid, if necessary, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to install sediment controls and undertake a ditch bottom only cleanout of the low flow portion of the SICD Main Drain from Sta. 1+224 to Sta. 6+335 the year following construction. Included in the lump sum price bid shall be the treatment and seeding of all resulting spoil in accordance with the original construction contract.

14.11 Temporary Rock Flow Check Dam

For the unit price bid per each, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to install a temporary rock flow check dam in the SICD Main Drain at the location specified; refer to OPSD 219.211. After the completion of the work and when so instructed by the Contract Administrator, the rock flow check dam shall be removed. The excess stone can be incorporated into the drain banks at that location.

14.12 Fish Salvage

This item shall be bid as a unit price per hour, however, it may not be required. If deemed necessary at the time of construction by the Contract Administrator and under their direction, the

Contractor shall supply one (1) labourer outfitted with chest waders, safety gear (i.e., personal floatation device) and any other necessary equipment, to undertake and assist with fish salvage.

Burnside will ensure that a "License to Collect Fish" acquired from MNRF is obtained to capture any fish trapped within an isolated/enclosed work area at the site and safely relocate them to an appropriate location in the same waters. This work shall be considered an **OPTIONAL** Item**.**

14.13 Light -Duty Silt Fence Barrier

For the unit price bid per lineal meter, and under the direction of the Contract Administrator, the Contractor shall supply all necessary labour, equipment and materials to install a (temporary) light-duty silt fence barrier at the location(s) specified along the SICD Main Drain; the silt fence shall be as per OPSD 219.110 (see the Municipal Drain Details Drawing). Construction shall be to the satisfaction of the Contract Administrator. When necessary during construction and/or when instructed by the Contract Administrator, the Contractor shall remove and spread any sediment that accumulates behind the silt fence barrier. The silt fence barrier shall be removed when directed by the Contract Administrator.

14.14 Woody Debris Placement

This item shall be bid as a unit price per hour.

Under the direction of the Contract Administrator, the Contractor shall supply a small excavator complete with operator and one (1) labourer equipped with chest waders, safety gear (i.e., personal floatation device), a chainsaw, winches and any other equipment to necessitate the removal and/or manipulation of existing log jams and available and re-useable woody debris; existing debris not deemed suitable by the Contract Administrator shall be removed from the existing drain and disposed of on the working side of the drain beyond the 3 m buffer. There may be some access restrictions that may not allow for the use of a small excavator; accordingly, an all-terrain vehicle (ATV) may be substituted to navigate the area in and around existing trees and vegetation.

The work shall consist of the removal and/or manipulation of log jams from within and across the existing drain to the sides. In addition, it shall also consist of the manipulation and placement of LWD and SWD in order to improve flow conditions that will naturally create a low flow channel (thalweg) and improve bank stability. The Contract Administrator will provide advice and direction regarding the proposed work and will assist the Contractor with it.

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F2

Appendix F2

South Innisfil Creek Drain – 4th Line Culvert Replacement
Special Provisions

Appendix F – Special Provisions

South Innisfil Creek Drain – 4th Line Culvert Replacement

PLEASE NOTE: *The 4th Line Culvert Replacement Special Provisions form a portion of (Section 9.9) and are to be read in conjunction with South Innisfil Creek Drain – 2019 Improvement Special Provisions.*

Operational Constraint No. 1 – Field Sampling and Concrete Testing

The quality control field sampling and testing specified in OPSS.MUNI 1350 shall be undertaken by the Contractor or person engaged by the Contractor for this purpose.

Concrete testing shall be done by personnel certified by the American Concrete Institute at the level of Concrete Field Testing Technician, Grade 1, or by personnel from a testing company certified by the Canadian Standards Association, CSA A283 Category O in conformance with OPSS.MUNI 1350.08.

The plastic concrete shall be sampled and field-tested for slump, air content and temperature in conformance with OPSS.MUNI 1350 and CSA 23.1-17 and the results of these tests recorded.

The minimum frequency of testing shall conform to Table 1 and the samples of the loads shall be taken directly from the load of concrete as directed by the Contract Administrator.

No concrete shall be placed without appropriate notification (24 hours) of the Contract Administrator. No concrete shall be placed without the designated testing personnel on site.

The Contractor shall provide documentation relating to the certification of the testing staff to be used on the Contract.

The Contractor shall identify the laboratory proposed to be used to complete the compressive testing.

The Contractor shall provide the Contract Administrator with the results of all slump, air and temperature tests performed and shall maintain a complete record of all tests undertaken.

The testing lab shall provide the Contract Administrator with appropriate information to identify the date, location, and mix parameters of cylinders cast and shall provide the Contract Administrator with copies of all compressive test results as they are available. A complete record of test results shall be maintained by the Contractor.

Table 1

CONSTRUCTION CATEGORIES	**PRODUCTION SAMPLING AND TESTING**	**MINIMUM FREQUENCIES**	**FIELD TESTS (Note 1 and 2)**
28 Day Compressive Test Cylinders	Quantity for Each Class of Concrete per Placement (m3)	Number of sets tested per day based on quantity of concrete	Air, Slump and Temperature Tests (Note 4)
I - Abutment, Catchbasin and Maintenance Holes, Column, Culvert, Approach Slab, Footing, Pier, Wingwall, Retaining Wall, Slipformed Barrier Walls, Misc. Work	< 100 100 - 500 > 500	1 set/day 2 sets/day 3 sets/day	One test for each load of concrete until satisfactory control (Note 3) is established daily; then one test for each 5 loads of concrete. (Note 5)
II - Curb and Gutter, Median Barrier, Sidewalk, Barrier or Parapet Wall.	as above	as above	One test for each load of concrete.
III - Deck.	< 100 100 - 500 > 500	2 sets/day 3 sets/day 4 sets/day	One test for each load of concrete until satisfactory control (Note 3) is established daily and rate of placement > 35 m3 per hour; then one test for each 3 loads of concrete.
IV - Concrete Overlay.	< 30 > 30	2 sets/day 3 sets/day	One test for each load of concrete or one test per hour for continuous mix plants.
Non-Structural Volume Batching.	One set for each load.	One set for each load.	One test for each load of concrete.

Notes:

1. Test Procedures: OPSS. MUNI 1350
2. Minimum size of samples:
   Compressive strength – 15 litres, per set of standard cylinders
   Air test – 8 litres
   Slump test – 8 litres
3. Satisfactory control is considered to have been established when tests on five consecutive loads or batches of concrete are within specification requirements.
4. Air, slump and temperature tests shall also be done whenever compressive test cylinders are cast.
5. For slip formed barrier walls, field tests shall be taken as follows:

   - The sample shall be directly from the load of concrete.
   - When tested in place in a plastic state the air content of concrete shall not be less than 5 percent. Tests shall be done when requested by the Contract Administrator.

Any references to testing to be undertaken by the owner shall be revised to read by the Contractor on behalf of the owner.

Concrete Field Testing Technicians

Field testing and sampling of concrete shall be done by a person certified as a concrete field-testing technician by the Canadian Standards Association (CSA), or by the American Concrete Institute (ACI). This person shall:

1) have successfully completed, as part of the certification requirements, written and practical examinations within the last five years verifying his/her competence to carry out field testing of concrete (slump, air content, temperature and casting of cylinders), and

2) have in his/her possession, at all times field-testing is to be performed, a card issued by the certifying agency verifying the currency of the individual's certification.

Measurement for Payment

No direct measurement of quantities will be made for this item. The work will be administered as being part of the concrete unit prices for each of the concrete components as administered under their respective items.

Operational Constraint No. 2 – Environmental Protection

General

The preservation, protection and restoration of the local environment will form part of the work of this Contract.

This Operational Constraint sets out the general requirements required to ensure and maintain an environmentally safe work place is supplemental to works covered under related items.

It is intended that the works proposed be executed in such a manner which, to the fullest possible extent, minimizes any adverse effect on the cultural and natural environment of the project area. The environmental conditions of the Contract stated herein must be complied with in all respects. It is a responsibility of the Contractor that all his personnel be sufficiently instructed so that the work is carried out in a manner consistent with minimizing environmental impact.

Refuelling Areas

The Contractor shall undertake a detailed review of his proposed route of construction to plan access routes and fuelling areas. Refuelling and maintenance of equipment shall not be undertaken in or adjacent to a watercourse. Suitable fuelling and maintenance areas shall be established away from the waterway and all maintenance and fuelling conducted in these areas. The locations of such areas are subject to review by the Contract Administrator. Procedures for the interception and rapid clean-up and disposal of spillages that do occur shall be submitted to the Contract Administrator for review prior to starting work. All materials required for clean-up of fuel spillages shall be maintained readily accessible on site.

The exception of these fuelling locations requirements shall be generators, cranes, backhoes or shovels which may be fuelled at other than the designated fuelling areas. However, no fuelling of equipment shall be carried out within thirty metres of any watercourse.

Any spills apt to cause impairment to the natural environment must be immediately reported by the Contractor to the Contract Administrator and to the local Ministry of the Environment District Office.

Sediment Basins & Settling Ponds

The Contractor shall take all precautions so as not to affect the quality of water as it passes through the area and to prevent eroded material from construction operations from entering streams, watercourses or private property. Appropriate sediment retention measures shall be incorporated in the work to ensure that sediment discharge to watercourses adjacent to the working area is minimized. These may include sedimentation ponds to which pumped water or run-off is directed prior to discharge to the adjacent watercourse.

As part of the work to be performed under this contract and where sediment traps are required they shall be constructed downstream of all road culverts where run-off from slopes under construction may enter a watercourse or private property. Sediment traps or similar sediment protection shall be constructed for receiving the discharge from dewatering operations. Temporary sediment traps shall be constructed in advance of any work where eroded materials could enter the watercourse. The overflow rate from settling or sedimentation ponds shall be such that the solids carryover is minimal. The Contractor shall incorporate filter berms or sandbags, as required, to retard and filter run-off prior to discharge to the watercourse.

In general, concentrated run-off from un-stabilized areas shall be intercepted and diverted to stabilized areas under sheet flow conditions. Any water pumped for the purposes of trench or structure excavation or dewatering shall be directed to a settling basin or other device to reduce suspended solids content prior to discharge to a storm sewer, drainage ditch or natural watercourse.

The Contractor shall clean and maintain the sediment traps as required. The traps shall be cleaned when approximately 50% filled with sediment and as directed by the Contract Administrator. Sediment material removed from the traps shall be hauled and disposed of outside the contract limits in areas arranged for by the Contractor.

The sediment traps shall be maintained until embankment slopes and ditches in the area are reinstated. The traps shall then be removed and the area restored to its original grade or as shown on the drawings.

The Contractor shall not permit any excavated materials or other material to be deposited in any watercourses except as indicated in the contract documents such as rip rap, river stone or clear stone.

Permits and Authorization

The requirements set out in any permits issued for the project shall form part of this Contract and shall be strictly adhered to.

The Contractor shall provide rock check dams and straw bale flow checks as indicated on the Contract Drawings, as specified by the Permit Issuing Authorities, and as directed by the Contract Administrator.

Any deviation from the prescribed requirements and/or methods contained in or implied by the permits as issued and this contract will result in a work stoppage until such time as the Contractor produces suitably approved or revised permits acknowledging the proposed deviation. All costs associated with revised work permits will be solely the responsibility of the Contractor.

General Restoration

Restoration shall not be undertaken as a final project task but shall be initiated as soon as backfilling and compaction activities have been completed.

Measurement for Payment

No direct measurement of quantities will be made for this work. The work will be administered as being part of the related environmental protection items or as part of the overall site work.

Operational Constraint No. 3 – Utilities

The Contractor's attention is drawn to the possible presence of underground utilities. The locations of such, if indicated on the drawings represent to the best of the Owner and Contract Administrator's knowledge, the approximate location of such utilities. The Contractor shall be responsible for all utility stakeouts as per GC7.01.16 as well as any inspection or test pits required and the inspection of any manholes, catchbasins, sewers or vaults necessary to locate any utility. The Contractor shall be wholly responsible for the accuracy of the information gathered by their own forces.

The work site is also located directly adjacent to power transmission and telephone lines. The contractor shall be aware of such lines at all times and shall utilize equipment and methodologies in the undertaking of the work that do not constitute a hazard or safety violation under the Occupational Health and Safety Act.

Buried communications line in south road shoulder
Overhead power lines on north side

Operational Constraint No. 4 – Ontario Traffic Manual (OTM)

All references in the contract to the Manual of Uniform Traffic Control Devices (MUTCD), including all Parts and Divisions thereof, or MTO Traffic Control Manual for Roadway Work Operations, or Traffic Control Manual for Roadway Operations

Field Editions are hereby deleted and replaced by the following books of the Ontario Traffic Manual (OTM):

Book 5 – Regulatory Signs;
Book 6 – Warning Signs;
Book 7 – Temporary Conditions (and Temporary Conditions Field Edition);
Book 11 – Pavement, Hazard and Delineation Markings;
Book 12 – Traffic Signals.

Any reference in the contract to OTM shall be deemed to be the Ontario Traffic Manual (Books 5, 6, 7, 11 and 12).

The Contractor shall comply with the applicable requirements of the above Ontario Traffic Control Manual book(s).

Operational Constraint No. 5 – Construction Timing

It is the intent of this contract that the work required to replace the 4th Line Culvert is substantially performed prior to **November 1st, in the calendar year when construction begins.**

No in-water activity will be allowed, between October 1st and July 15th of any year to prevent disruption of spawning fish and incubating eggs. Activities outside the waterway, such as roadway construction can be completed during this time provided precautions are taken to protect the waterway.

All construction is to be completed within the existing municipal right-of-way.

No seasonal shut down is planned and the Contractor is expected to work continuously from the project start to its completion.

Operational Constraint No. 6 – Materials

All material (except as specifically indicated in the Special Provisions) required on this Contract shall be supplied by the Contractor. All materials used shall be selected from the appropriate MTO designated sources list.

Operational Constraint No. 7 – List of Designated Substances

In accordance with the Occupational Health and Safety Act, R.S.O. 1990, C.S.30, the Contractor is advised of the presence of Designated Substances.

The Contractor is advised that the Designated Substances silica (Ontario Regulations number 521/92), lead (519/92) and arsenic (508/92) are generally present throughout the Working Area, occurring naturally or as a result of vehicle emissions. Exposure to these substances may occur as a result of activities by the Contractor such as sweeping, grinding, crushing, drilling, blasting, cutting and abrasive blasting.

Operational Constraint No. 8 – Garbage Collection

The Contractor shall maintain access to local residences at all times. Where the road is closed to through traffic, and the property owner has placed garbage/recyclables/leaf and yard waste in front of their property, the Contractor will be responsible for moving the items beyond the road closure limits as appropriate so that they are accessible to the driver for collection. Garbage, recyclables and leaf and yard waste are to be separated when relocated. Emptied containers are to be returned to the appropriate driveway following collection.

In the event of any road closure due to construction, where routes are inaccessible by collection vehicles, the construction Contractor is required to provide the County of Simcoe with thirty (30) day notification prior to the effective date of the road closure. Notification shall be communicated directly to the Contracts and Collections supervisor and must include a map of the affected area and suggest a common collection location. The final collection point will be mutually agreed upon by both the roads and collection contractors.

The Contractor is also required to distribute information to the affected households a minimum of 15 days in advance of road closure that includes:

- Dates of road closure
- Time that garbage/recyclables/leaf and yard waste or other optional collection must be placed at the curb
- Suggestion to residents that they indicate address on recyclable boxes and/or garbage cans to ensure return to the appropriate address
- Contact name and telephone number for issues or additional information

ITEM NO. 1 MOBILIZATION AND DEMOBILIZATION

Scope

This item covers the Contractors costs associated with the transportation and or accommodation (meals and lodging) of labour, equipment, offices, conveniences, temporary facilities, construction plant and other items not required to form part of the permanent works and not covered by the other items in the Schedule of Unit Prices.

Basis of Payment

Payment at the Lump Sum price set out in the schedule of unit prices for mobilization and demobilization will be made as follows:

- 50% payable on first Payment Certificate
- 50% payable on the Substantial Performance Payment Certificate

ITEM NO. 2 CONTRACT BONDS AND INSURANCE

Scope

This item shall cover the Contractor's cost for provision of the Performance, Labour and Materials Payment Bonds and Liability Insurance.

Basis of Payment

Payment at the Lump Sum price set out in the schedule of unit prices for Contract Bonds and Insurance will be made as follows:

- 100% payable on first Payment Certificate

ITEM NO. 3 CONSTRUCTION LAYOUT

Scope

This special provision sets outs the requirements for the Contractor to supply and undertake all construction layout for the project.

Construction

The Contractor shall use qualified personnel to do the layout work. They shall be thoroughly experienced in surveying and have extensive previous experience in construction layout. The benchmarks and points of reference shall be taken from the Contract Drawings enabling the Contractor will do his complete construction layout.

The Contractor will be responsible for the true and proper setting out of the work and for the correctness of the position, levels, dimensions and alignment of all parts of the work, and for the provision of all necessary instruments and labour for the construction layout.

If, at any time during the progress of the work, any error shall appear or arise in the positions, levels, dimensions or alignment of any part of the work, the Contractor shall, at his own expense, rectify such error to the satisfaction of the Contract Administrator or the Owner, unless such error is based on incorrect data supplied in writing by the Contract Administrator or the Owner.

The checking of the setting out of any line or level by the Contract Administrator shall not in any way relieve the Contractor of his responsibility for the correctness of the work.

The Contractor shall supply the Contract Administrator with a copy of all necessary information to enable him to use the Contractor's field layout. All information, both on work sheets and stakes, shall be neat and legible.

Measurement for Payment

No direct measurement of quantities will be made for this item. The work will be administered as a Lump Sum item.

Basis of Payment

Payment for this item at the Contract Unit Price shall be full compensation for all labour, equipment and materials necessary to completely layout the work. Payment shall be made on each payment certificate based on the Contract Administrator's estimate of the amount of layout that has been completed.

The layout required due to alterations in contract items shall be considered incidental to the work of the item, therefore no change will be made to the Lump Sum bid for this item.

ITEM NO. 4 AS BUILT DRAWINGS

Scope

This special provision sets out the requirements for the Contractor to prepare and maintain as-built construction drawings throughout the construction period and for the submission of the drawings at the conclusion of the work.

In addition to the drawings, a complete “As-Built Drawing” submission will include:

- As-built record drawings
- Complete concrete sampling and testing records (see standard requirements)
- Copy of all final fabrication/shop drawings

Construction

The Contractor shall keep one set of drawings on site solely for record purposes. The Contractor shall record confirmations and deviations on the drawings on a daily basis as the work is performed. Deviations shall include changes, additions and deletions and confirmation of critical information. The as-built drawings shall be presented at each jobsite meeting for review. All deviations must be recorded, including where applicable:

a) Plan View: Curb and gutter, sidewalk, fences, retaining walls, driveways, rail lines, watercourses, ditches, culverts, chambers, maintenance holes, catch basins, sewer mains, sewer laterals, water mains, valves, hydrants and water services, utility poles and guy wires, trees, traffic lights, traffic detection loops, bell, cable, gas and miscellaneous.

b) Profile: Road centreline elevations, footing elevations, bearing seat elevations, wingwall elevations, screed elevations, sewer size and inverts, sewer lateral inverts, water main size and depth, water service depth, ditch and watercourse inverts, culvert diameter, culvert length and inverts.

The Contractor shall deliver a full and complete set of as-built drawings and other requirements above to the Contract Administrator within the period of time between the publication of the Certificate of Substantial Performance and the release of the construction lien holdback.

Failure to provide a complete As-Built Drawings Submission as defined, will result in the Town retaining an owner’s set-off (as provided for in the general conditions) equal to 10% of the work until such time as the as-built drawings are received.

Basis of Payment

Payment at the Lump Sum price set out in the schedule of unit prices shall be full compensation for all labour, material and equipment necessary to undertake and complete the work as specified here in.

ITEM NO. 5 WATERWAY CONTROL
MUNI 182

General

The work to be constructed at this site includes removal of existing culverts and installation of a new precast concrete box culvert. It is the intent of the project and this item to control the waterway by isolating the work areas from the main flow of the drain.

Scope

OPSS.MUNI 182.01 shall be amended to include the following:

This special provision sets out the requirements for the management of drain flows during construction to enable the work to be carried out in the dry.

The Contractor will be required to provide protection for the drain through the work area and at its inlet and outlet locations to prevent contamination during construction. All protection must be provided while maintaining drain base flows and a capacity for fluctuations in flow volume. The Contractor shall assess the risk of fluctuations in flow volume and provide excess capacity based on their acceptance of this risk.

Design and Submission Requirements

OPSS.MUNI 182.04 shall be amended to include the following:

The waterway must be managed during construction to ensure that drain base flow is maintained at all times. The drain is to be protected from surface run-off generated from any exposed surface disturbed during construction and shall be kept free of sediment or other deposition of materials into the waterway. Relevant other works such as silt fence, check dams and rock checks are administered separately.

The Contractor is required to provide detailed plans to the Contract Administrator of their proposed methods, including:

- Construction sequencing indicating the steps taken for each stage of the work and how they are to be implemented. This includes sediment controls, cofferdam placement, removals, culvert excavations and reinstatement.
- A dewatering plan showing how the work areas are to be isolated (cofferdams), where dewatering will be discharged and how this will be filtered before re-entering the drain.
- Locations of erosion and sediment control measures.

As such, the Contractor shall, upon award of the Contract, provide the Contract Administrator with sketches of their proposed materials, sequencing, location, and timing for the work to protect the work areas and the inlet and outlet areas of the work area during construction, as noted above.

The Contractor should make these submissions as early as possible to facilitate review.

The Contractor is responsible for the design of all temporary works. Where the Contractor elects to use sheet piling or other propriety methods, the Contractor shall consult the Occupation Health and Safety Act and conform to its requirements.

Materials

OPSS.MUNI 182.05.02 shall be deleted and replaced with the following:

It is anticipated that the Contractor will provide isolation of the work area using some type of removable and temporary cofferdams.

Only clean material, free of dirt, debris, sediment, fines, oil or grease may be introduced into the waterway.

In the previously described submission requirements, the Contractor shall identify all materials used including (where applicable):

- Steel sheet piling
- Temporary concrete barriers
- Plastic sheeting
- Pea gravel filled bags
- Clean stone or rip rap
- Other materials proposed by the Contractor, meeting the general requirements of being clean removable and not subject to erosion will be considered on a project-specific basis.

All proposed materials deemed to be unsuitable will be rejected. Any materials found incorporated into the work and subsequently deemed to be unsuitable shall be removed and replaced at the Contractor's cost.

Construction

OPSS 182.07 shall be amended to include the following:

The Contractor must be aware of the potential for fluctuations in water levels resulting from rain or other weather events. The Contractor must identify and accept the level of risk associated with their selection of methods and design capacity.

The Contractor shall be responsible for the design and sizing of the necessary pumps, channel and or culverts. The Contractor shall size their facilities to ensure the maintenance of the stream base flows and allow for fluctuations in the stream flow as a result of rainfall events or other anticipated conditions.

The Owner and / or Contract Administrator can make no guarantee with respect to stream flow or groundwater elevations. The Owner cannot assess the risk for the Contractor or be held responsible for the Contractor's assessment of the risk.

The Contractor must schedule their work such that no in-water work will be allowed between October 1st and July 15th of any year.

Other works, including, placing concrete in distribution slab, grading the roadway and placement of asphalt and guiderail can all occur after October 1st.

- Before starting construction, salvage fish from behind the cofferdam and return them to the upstream portion of the watercourse.
- Remove accumulated sediment from behind the cofferdam before it is removed to ensure that the original streambed material is not excavated.
- Restore the original channel bottom gradient and substrate before removing cofferdams.
- Gradually remove the cofferdam to equalize the water levels inside and outside the isolated areas and reduce the amount of suspended sediment that is carried downstream.

Quality Assurance

OPSS 182.08 shall be edited to include the following:

The Contractor and Contract Administrator will inspect the in-water works on a routine basis. Any evidence of failure of the works or potential for failure shall be immediately rectified by the Contractor at no extra cost to the Owner.

Basis of Payment

OPSS 182.10 shall be deleted and replaced with the following:

Payment at the Lump Sum price set out in the Schedule of Unit Prices shall be full compensation for all labour, material and equipment necessary to undertake and complete the work as specified here in or indicated on the Contract Drawings.

ITEM NO. 6 EARTH EXCAVATION, GRADING
MUNI 206

Scope

OPSS.MUNI 206.01 shall be amended to include the following:

The scope is extended to include the excavation of any existing roadway surfaces and road base materials required to prepare for the construction of appropriate road profile and cross section to the limits and extents indicated on the Contract Drawings.

The scope of the item is extended to include the removal of any remaining trees, shrubs or foliage of any dimension, except and specifically noted otherwise, required to complete or access the work related to the 4th line culvert replacement.

References

OPSS.MUNI 206.02 shall be amended to include the following reference:

OPSS 201 – Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders.

Construction

OPSS 206.07.03.01 shall be amended to include the following:

The work shall include:

- Stripping of topsoil from existing road embankment over length of road scheduled for removal or relocation (for estimating purpose, depth of topsoil has been assumed as 150 mm and may be revised according to field conditions).
- Construction of new road and road embankment utilizing existing road embankment material foremost as scheduled for removal or reconstruction.
- Grading and shaping of all final ditches and swales to provide drainage outlets.
- Grading and shaping of the final watercourse including placement of specified natural channel elements.
- Grading of final roadside slopes.
- The removal of all trees and vegetation required to access the work areas.
- Shoulder grading (granular material administered under a separate item).

Note: The excavation for the structure and frost tapers shall be administered under a separate item (Earth Excavation – Structure).

'Earth Excavation, Grading' shall be in accordance with OPSS.MUNI 206. Earth is to be graded to the limits shown on the Contract Drawings and in accordance with any cross-sections provided.

Topsoil stripped and stockpiled for reuse shall be protected from run off by an enclosure of silt fence. The Contractor shall identify the location of the proposed material stockpile.

The Contractor is required to carefully examine and the Contract Drawings and existing site conditions to further assess the cut and fill requirements to their own satisfaction. The Contractor is advised to perform his own calculations to satisfy himself that the Lump Sum price is adequate compensation for the work required under this item.

During the earthwork operations, the Contractor shall, on a daily basis, provide positive drainage to an outlet satisfactory to the Contract Administrator. The outlet shall be protected from erosion and sediment migration and monitored on a regular basis until substantial grass growth has taken place and accepted by the Contract Administrator. No claims for additional construction costs will be considered for wet sub grade areas. The Contractor shall include in his Lump Sum price all costs to provide a sub grade that is suitable to accept granular material for road construction.

All areas graded to a slope of 3:1 (3 horizontal to 1 vertical) or steeper, shall be protected from erosion until substantial grass growth has taken place, and/or construction is completed.

Excess excavated materials may be temporarily stockpiled in an area approved by the Contract Administrator. All stockpiled material shall be protected from erosion. Any existing topsoil encountered in the grading, ditching or related earth works and suitable for reuse shall be stripped and stockpiled as per OPSS.MUNI 206.07.03.07. The Contract Administrator shall determine the suitability and volume of topsoil for stockpiling.

The reuse of the topsoil including all handling, spreading and grading shall be included in this item.

Measurement for Payment

OPSS.MUNI 206.09 shall be deleted in its entirety and replaced with the following:

No direct measurement of quantities will be made for this item. The item shall be administered as a Lump Sum contract price item.

Basis of Payment

OPSS.MUNI 206.10.01 shall be amended to include the following:

Payment for earth grading is by Lump Sum and shall include all costs, including dewatering, cut and fill operations and any other related items associated with grading the right-of-way to sub grade elevations as generally described herein.

Granular fill material to construct new road will be administered under their respective items.

ITEM NO. 7 HOT MIX HL-3
ITEM NO. 8 HOT MIX HL-8
MUNI 310

Scope

OPSS.MUNI 310.01 shall be amended to include the following:

This specification covers the supply and placement of tack coat on existing asphalt surfaces and on culvert waterproofing prior to placing base course asphalt.

Design and Submission Requirements

OPSS.MUNI 310.04 shall be edited to include the following:

In accordance with OPSS.MUNI 1151 the contractor is responsible for the Mix Design and Job Mix Formula and copies are to be provided to the Contract Administrator a minimum of 10 days prior to paving operations.

Materials

OPSS.MUNI 310.05 shall be amended to include the following:

In accordance with OPSS.MUNI 1101 and Town of Innisfil Standards, Zone 2 requirements PGAC 58 - 34 shall be used for HL-3 and HL-8 mixes.

Construction

OPSS.MUNI 310.07 shall be amended to include the following:

No asphalt shall be placed without the Contract Administrator on site.

The Contractor shall be responsible for sampling and testing the asphalt for aggregate gradation and compaction.

Hot Mix Asphalt sampling and testing shall be in accordance with OPSS.MUNI 310 Table 6. Copies of all test results shall be provided to the Contract Administrator within two weeks of paving operations.

Transverse joints between new asphalt and existing asphalt shall be as follows:

Base course joints and surface course joints shall be staggered by 3.0 meters.

Vertical faces of existing base course and top course asphalt shall be cut square, cleaned and treated with a tack coat prior to new asphalt being placed.

Where existing asphalt depth is greater than the proposed base course, the top of the existing base course shall be milled, cleaned and treated with tack coat.

Joints shall be rolled immediately after placement and the surface checked and confirmed with a straight edge before the paving operations advance more than 15 meters. Defects in joints shall be corrected immediately.

Where the plans indicate that joints are to be formed and filled, this shall be completed as soon as possible and within 24 hours of paving operations.

Compaction adjacent to concrete curbs, barriers or other rigid features will have to be by hand tampers or vibrators. Every effort shall be made to ensure that compaction in these locations is equal to the rolled compaction results.

The Contractor shall be responsible for the performance of the asphalt sub-contractor and shall have a representative on site during all paving operations to ensure that all procedures and requirements are being followed. The paving sub-contractor shall not leave the site until all joints have been examined with a straight edge and a visual inspection of the asphalt is completed at joints and rigid structures.

The Contractor shall be held responsible for defects in the asphalt finish and profile smoothness. Where defects are observed the Contractor will be responsible to remedy the defects at their own costs. Alternately, the cost of corrective action will be deducted from the warranty holdback, or Contract amounts as required.

<u>Measurement of Payment</u>

OPSS.MUNI 310.09.01.01 shall be deleted and replaced with the following:

Measurement of each type of HMA shall be by mass in tonnes.

Basis of Payment

OPSS.MUNI 310.10.01 sentence one (1) shall be deleted and replaced with the following:

Payment at the Contract price shall be full compensation for all labour, equipment and materials required to complete the work as specified. Tack coat shall be deemed to be included in the relevant unit prices of the HL-3 and HL-8 items.

ITEM NO. 9 GRANULAR A (ROADWAY)
ITEM NO. 10 GRANULAR A (BEDDING)
MUNI 314

Scope

OPSS.MUNI 314.01 shall be amended to include the following:

The work administered under this item includes:

- The Granular A material required to construct a 150 mm deep road base for the final road profile and cross section over the entire width of road embankment as indicated on the Contract Drawings.
- All final roadway shouldering required.
- The Granular A material required to construct 300 mm deep bedding under the proposed culvert
- The Granular A material required to construct bedding underneath the retaining walls
- Any miscellaneous Granular A required and or as directed by the Contract Administrator.

Quality Assurance

OPSS.MUNI 314.08 shall be amended to include the following:

In no case shall any materials be placed in the roadbed until it has been tested.

The Contractor shall be responsible for arranging for and carrying out quality control testing of granular material and for obtaining, delivering and testing material samples prior to their placement.

The Contractor testing work shall include:

- Granular gradation samples and tests (unless the pit can provide adequate documented evidence of current or recent material-tests).
- Standard or modified Proctor tests to establish compaction targets.
- Nuclear density compaction testing during placement.

Non-conforming material that has been incorporated into the work shall be removed and replaced with conforming material, or subjected to a payment reduction, as determined by the Contract Administrator.

Measurement for Payment

OPSS.MUNI 314.09.01.01.01 shall be amended to include the following:

Measurement of Granular A will be made based on weigh scale tickets provided by the Contractor for material delivered and incorporated into the work as specified.

ITEM NO. 11 GRANULAR B TYPE II (ROADWAY)
MUNI 314

Scope

OPSS.MUNI 314.01 shall be amended to include the following:

The work administered under this item includes:

- The Granular B material required to construct a 400 mm deep road sub-base for the final road profile over the entire width of road, as indicated on the Contract Drawings.

Quality Assurance

OPSS.MUNI 314.08 shall be amended to include the following:

In no case shall any materials be placed in the roadbed until it has been tested.

The Contractor shall be responsible for arranging for and carrying out quality control testing of granular material and for obtaining, delivering and testing material samples prior to their placement.

The Contractor testing work shall include:

- Granular gradation samples and tests (unless the pit can provide adequate documented evidence of current or recent material-tests).
- Standard or modified Proctor tests to establish compaction targets.
- Nuclear density compaction testing during placement.

Non-conforming material that has been incorporated into the work shall be removed and replaced with conforming material, or subjected to a payment reduction, as determined by the Contract Administrator.

Measurement for Payment

OPSS.MUNI 314.09.01.01.01 shall be amended to include the following:

Measurement of Granular B will be made based on weigh scale tickets provided by the Contractor for material delivered and incorporated into the work as specified.

ITEM NO. 12 GRANULAR B TYPE I (BACKFILL) 902

Appendix 902-B, November 2010 shall be invoked.

Scope

OPSS.MUNI 314.01 and 902.01 shall be amended to include the following:

The work administered under this item includes:

- The Granular B material required in the backfill areas for the culvert and retaining walls.
- The Granular B material in the frost tapers.
- The Granular B material required in the roadside fill slopes.
- The Granular B material backfill after removal to fill the void of the existing culverts
- Backfill to any rip-rap.
- Any miscellaneous Granular B required and or as directed by the Contract Administrator.

References

OPSS.MUNI 314.02 shall be amended to include the following reference:

OPSS 902 – Construction Specification for Excavating and Backfilling – Structures

Quality Assurance

OPSS.MUNI 314.08 shall be amended to include the following:

In no case shall any materials be placed until it has been tested.

The Contractor shall be responsible for arranging for and carrying out quality control testing of granular material and for obtaining, delivering and testing material samples prior to their placement.

The testing work shall include:

- Granular gradation samples and tests (unless the pit can provide adequate documented evidence of current or recent material-tests).
- Standard or modified Proctor tests to establish compaction targets.
- Nuclear density compaction testing during placement.

Non-conforming material that has been incorporated into the work shall be removed and replaced with conforming material, or subjected to a payment reduction, as determined by the Contract Administrator.

Measurement for Payment

OPSS.MUNI 314.09.01.01.01 shall be amended to include the following:

Measurement of Granular B will be made based on weigh scale tickets provided by the Contractor for material delivered and incorporated into the work as specified.

ITEM NO. 13 PIPE SUBDRAIN
MUNI 405

Scope

MUNI.OPSS 405.01 shall be deleted and replaced with the following:

The work administered under this item includes the installation of pipe subdrains and the supply and installation of galvanized rodent grates at each outlet location. Two (2) required, at downstream location only.

ITEM NO. 14 SUPPLY AND INSTALL PRECAST CONCRETE BOX CULVERT
422

Scope

OPSS 422.01 shall be amended to include the following:

This specification covers the requirements for the supply, delivery and installation of 6.0 m span x 2.5 m rise, precast concrete box culvert as indicated on the Contract Drawings including skewed end sections. This shall include the precast apron walls and associated dowels, and the geotextile required at the joints. The culvert shall be manufactured with preformed holes in the base slab and apron walls as shown on the drawings.

Design and Submission Requirements

OPSS 422.04 shall be amended to include the following:

The precast structure shall be designed in accordance with OPSS 1821 and the Canadian Highway Bridge Design Code (CHBDC). Shop drawings shall be submitted indicating that the precast structure has been designed to meet this standard.

Preformed holes shall be placed throughout the box culvert base slab as shown on the Contract Drawings to allow groundwater through the culvert base.

Perforated hole shall also be placed throughout the upstream apron wall as indicated on the Contract Drawings.

The precast structure shall be designed using the top slab thickness indicated on the drawings. If the Contractor wishes to use a top slab thickness that is thicker than shown on the drawings, the Contractor may be responsible for costs associated with redesigning the roadway and distributions slab grading.

The Contractor shall submit details of the selected product literature and associated installation requirements, including hole diameter and embedment depth for each size of dowel required to connect the apron wall to the culvert end units.

Materials

OPSS 422.05 shall be amended to include the following:

All dowels (embedment of reinforcing bars), shall be anchored utilizing an approved epoxy resin grout selected from the appropriate designated sources list (DSM #9.30.25) and installed as per the manufacturer's instructions.

Construction

OPSS 422.07 shall be amended to include the following:

The joints between precast concrete sections shall be wrapped in Class II Heavy Duty Geotextile fabric, at least 600 mm wide to minimize the migration of fines through the joint.

The upstream apron wall shall be wrapped with geotextile as shown on the drawings.

Basis of Payment

OPSS 422.10 shall be deleted and replaced with the following:

Payment at the Contract price shall be full compensation for the supply, delivery and installation of the precast concrete box culvert units including all labour, equipment and materials required to complete the Work as specified. Included in the Contract price are the preformed base slab holes, Class II Heavy Duty geotextile required at joints, and all of the materials (dowels and epoxy) required to connect the apron wall to the culvert end units.

ITEM NO. 15 REMOVAL OF ASPHALT PAVEMENT, FULL DEPTH MUNI 510

Scope

OPSS.MUNI 510.01 shall be deleted and replaced with the following:

The work administered under this item includes the full depth removal and disposal of the existing wearing and/or surface treatment. The limits of removal shall be as shown on the Contract Drawings or as indicated by the Contract Administrator.

Construction

OPSS.MUNI 510.07.06.03 shall be amended to include the following:

For the purpose of this Contract, full depth removal of asphalt shall include up to 90 mm depth of asphalt and deeper where previous patches are obvious. If actual site conditions indicate a greater depth of asphalt beyond the patch areas, no full depth removals shall occur until directed by the Contract Administrator.

Removal shall also include the saw cutting of the wearing surface at the limits of full depth removal as indicated on the Contract Drawings.

ITEM NO. 16 REMOVAL OF PIPE CULVERTS MUNI 510

Scope

OPSS.MUNI 510.01 shall be deleted and replaced with the following:

The work administered under this item includes the removal of all existing CSP culverts as identified on the Contract Drawings.

Construction

OPSS.MUNI 510.07 shall be amended to include the following:

This item includes the removal of the existing, 2400mm dia. CSP culvert and 1850 x 1000 mm arched csp culvert with surveyed lengths of 24.6 m, and 25.2 m respectively.

Basis of Payment

OPSS.MUNI 510.10.01 shall be amended to include the following:

Payment at the Contract price shall be full compensation for all labour, equipment, and materials to do the work. The Contractor shall be responsible for all costs associated with the disposal of unsalvageable materials including loading, hauling and tipping costs.

ITEM NO. 17 RIP-RAP
511

Materials

OPSS 511.05.01 shall be deleted and replaced with the following:

Rip Rap shall meet the R-10 gradation requirements of OPSS.MUNI 1004 Table 8.

Construction

OPSS 511.07.02.01 shall be amended to include the following:

The work administered under this item includes the following:

- Areas of fill slopes adjacent to retaining walls above the waterline
- Any areas designated and or directed by the Contract Administrator.

Measurement for Payment

OPSS 511.09.01.01 shall be deleted and replaced with the following:

Measurement of rip-rap will be made in tonnes based on load tickets collected by the Contractor for material delivered and placed as specified on the Contract Drawings.

Basis of Payment

OPSS 511.10.01 shall be deleted and replaced with the following:

Payment at the Contract price shall be full compensation for all labour, equipment, and materials to do the work. Payment for the geotextile shall be included in the unit price for this tender item.

ITEM NO. 18 DEWATERING STRUCTURE EXCAVATIONS MUNI 518

This item also refers to OPSS 902, Structure Excavations.

Scope

OPSS.MUNI 518.01 shall be amended to include the following:

Water sources deemed to require control include surface run-off, ground water, and ingress of water into the excavation areas through such works as cofferdams.

The work areas expected to require dewatering include: removal of existing culverts, installation of box culvert and retaining walls.

The work administered under this item includes all work, methods, manpower and equipment necessary to dewater the excavation areas including, but not limited to:

- Sumps
- Pumps
- Drains
- Culverts
- Well points
- Temporary sheet pile enclosures
- Any other methods deemed necessary to complete the work.

Cofferdams to isolate the work area shall be deemed to be administered under a separate item, (Waterway Control).

Design and Submission Requirements

OPSS 902.04.01.01 shall be amended to include the following:

The foundations for the structure are to be constructed in the dry. The methods proposed by the Contractor as noted above, are to be integrated to the benefit of the project with the proposed waterway controls.

The Contractor is required to provide detailed plans to the Contract Administrator of their proposed methods, including:

- A dewatering plan showing how the work areas are to be isolated (cofferdams), where dewatering will be discharged and how this will be filtered before re-entering the waterway.
- Construction sequencing.
- Locations of erosion and sediment control measures and existing structure demolition plans, all as outlined elsewhere in the Contract.

OPSS 902.04.02 shall be amended to include the following:

The Contractor shall, upon award of the Contract, provide the Contract Administrator with sketches of their proposed materials, methods, locations, and timing and discharge areas for the work to un-water/dewater the work areas.

Once this submission is reviewed by the Contract Administrator, copies of the details will be sent to the Nottawasaga Conservation Authority for their files.

The Contractor should make these submissions as early as possible to facilitate review.

<u>Construction</u>

OPSS.MUNI 518.07.01 shall be amended to include the following:

All dewatering of site in general shall not be discharged directly into the drain. All discharge shall be into a filtered sump, sock, soak pit or similar facility located at least 30 metres from the watercourse.

<u>Measurement for Payment</u>

OPSS 902.09 shall be deleted and replaced with the following:

No direct measurement of quantities will be made for this item as the Contractor must assess and develop their own design based on their own experience and equipment. The item shall be administered as a Lump Sum.

ITEM NO. 19 TRAFFIC CONTROL SIGNING
MUNI 706

<u>General</u>

The roadway will be closed for the duration of construction. The Contractor will provide adequate signs, barricades and barriers to safely close the work area to vehicle and pedestrian traffic as required. All signs and barricades shall be placed in accordance with the latest edition of the Ontario Traffic Manual (OTM) and the OTM Temporary Conditions – Field Edition.

Scope

OPSS.MUNI 706.01 shall be amended to include the following:

The work administered under this item will include the supply, placement, maintenance, repair and replacement as necessary, and removal of all signs, delineators and barricades necessary to advise the public, control traffic and protect the work area (vehicle and pedestrian barricades) during all stages of construction.

Definitions

OPSS.MUNI 706.03 shall be amended to include the following:

For the purposes of this contract, the definition of "Construction Signs" is amended to include: (in addition to all OTM requirements):

1) Contract Identification Signs containing the following information:

Owners Name and Logo
Project Name
Contract No.
Contractor's Name, Address & Telephone Number
R.J. Burnside & Associates Limited, Address & Telephone Number

2) Public Advisory Signs containing the following information:

Town of Innisfil
4th Line Culvert Replacement
Closed for Reconstruction
Local Traffic Only

Design and Submission Requirements

OPSS.MUNI 706.04 shall be amended to include the following:

The Contractor shall provide the Contract Administrator with a detailed construction sign plan prior to moving onto the site. The plan shall include all necessary advisory and contract identifications signs, and all detour warning signs including type, size and location as well as all signs and barricades required to limit vehicle and pedestrian traffic during construction.

The Contractor shall submit a proof of the Contract Administration signs to the Contract Administrator for approval prior to the signs being manufactured and erected.

Contract identification and Public Advisory signs as described shall be placed at both ends of the work areas and should be identified on the Contractors detailed signing plan.

Materials

OPSS.MUNI 706.05.02 shall be amended to include the following:

Contract Identification and Public Advisory signs shall be a minimum 1200 x 1200 mm size and shall meet the visibility requirements of OPSS.MUNI 706.

Construction

OPSS.MUNI 706.07 shall be amended to include the following.

The Contractor shall provide, erect, inspect, maintain, repair and replace as necessary, all necessary construction, temporary detour, advisory, identification and warning signs in accordance with the OTM, OTM Book 6 Warning Signs and OTM Book 7 Temporary Conditions – Field Edition.

One (1) Public Advisory sign as described shall be provided on the 4th Line at the intersection of 10 Sideroad and one (1) Public Advisory sign as described shall be provided on the 4th Line at the intersection of Yonge Street.

The public advisory signs shall be erected as soon after the execution of the Contract Documents as possible and prior to moving onto the site, in order to alert the public of the impending closure.

OPSS.MUNI 706.07.01 first paragraph, second sentence shall be deleted and replaced with the following:

The contract identification signs will be supplied, erected and maintained by the Contractor.

Two (2) Contract Identification Signs as described shall be provided with one located at each end of the Work area.

All signs shall be placed in locations that do not impair driver visibility in either direction or from any intersection, driveway or laneway.

All signs shall be by buried installation.

The detour route should utilize 10 Sideroad, 5th line and Yonge Street.

The Contractor shall:

- Provide the Contract Administrator with a detailed description of the proposed traffic control equipment and procedures that they intend to use on this project;
- Schedule his work in a way that there will be no open excavations adjacent to a lane carrying traffic overnight and on non-working days except where new sewers are being installed. Excavations within three (3) meters of lanes carrying traffic shall be backfilled with the specified material up to profile grade and compacted prior to closing down operations;
- Supply traffic control signage in accordance with the Ontario Traffic Manual – Book 7 – Temporary Conditions;
- Maintain the traffic control signage in good order for the duration of the Contract, and to repair or replace if necessary;
- Provide, erect, and maintain signs, flashing lights, etc. as required by the Contract Administrator to properly warn the public approaching the Contract site;
- Completely enclose, using snow fence and appropriate signings, all open excavations during non-working hours;
- Erect suitable barricades, signs, snow fence, etc. along the travelled (pedestrian or vehicular) lanes, if construction is proceeding adjacent to the travelled lanes; and
- Provide any traffic control as necessary during the course of the work.

Traffic control on this Contract shall be in conformance with Ministry of Labour Policies, Occupational Health and Safety Act and the procedures outlined in the pamphlet entitled "Correct Methods for Traffic Control" issued by the Construction Safety Associations of Ontario. Copies of this pamphlet may be obtained from the Ministry of Transportation's District Office.

Each Traffic Control Person (TCP) shall, while controlling traffic, wear the following:

- An approved fluorescent blaze orange or fluorescent red safety vest, and
- An approved fluorescent blaze orange or fluorescent red armband on each arm, and
- An approved fluorescent blaze orange or fluorescent red hard hat.

ITEM NO. 20 TYPE M20 STEEL BEAM GUIDE RAIL MUNI 721

Construction

OPSS.MUNI 721.07.01 shall be amended to include the following:

Steel beam guide rail shall be installed over top of the proposed structure as indicated on the Contract Drawings.

Reflectorized strips shall be installed as per OPSS.MUNI 721.07.02.03.

OPSS.MUNI 721.07.03.01 shall be amended to include the following:

The steel beam guide rail mounting height for Type M steel beam guide rail shall be 785mm.

Basis of Payment

OPSS.MUNI 721.10.01 shall be amended to include the following:

Included in the unit price of this item shall be the supply and installation of a high intensity object marker (Wa-33) mounted on a flexible post and a 250 mm x 250 mm green and white reflective snow plow marker (Wz-2) where guide rail is placed on a radius at entrances and intersections.

ITEM NO. 21 STEEL BEAM ENERGY ATTENUATING TERMINAL SYSTEM MUNI 732

Construction

OPSS.MUNI 732.07.01 shall be amended to include the following:

Steel Beam Energy Attenuating Terminal Systems (SBEATS) shall be installed at the locations specified on the Contract Drawings.

The Contractor has the option to install one of the following systems:

a) MASH SoftStop Terminal System – OPSD 922.165
b) MASH Sequential Kinking Terminal System – OPSD 922.186

The 14.3 m installed length of the end treatment shall be placed on a tangential alignment, or on curves providing the radius is greater than 250 m.

The granular or paved shoulder material in the immediate area of the support legs of the SBEAT system, shall be made level.

OPSS 732.07.05 shall be deleted and replaced with the following:

This item shall include the supply and installation of a high intensity object marker (Wa-33) and a 250 mm x 250 mm green and white reflective snow plow marker (Wz-2). Installation shall be in accordance with OPSD 984.201 and OPSD 984.202 for the approach and leaving ends, respectively.

ITEM NO. 22 TOPSOIL, IMPORTED
802

Construction

OPSS 802.07.03 sentence one (1) shall be deleted and replaced with the following:

Topsoil shall be placed to a uniform depth of 100 mm on all new and/or disturbed slopes as specified on the Contract Drawings and up to the subgrade elevation on the roadway front slope.

ITEM NO. 23 SEED AND EROSION CONTROL BLANKET
MUNI 804

Materials

OPSS 804.05.01.04 shall be deleted and replaced with the following:

The permanent seed mix shall be the ‘Standard Road Side Mix’ as per OPSS 804 - Table 1.

OPSS 804.05.04.05 shall be amended to include the following:

The Erosion Control Blanket (ECB) shall be a Terrafix S200B or approved equivalent.

Measurement for Payment

OPSS 804.09.01.02 shall be deleted and replaced with the following:

Seeding and erosion control blanket measurement shall be made in square metres following the contours of the ground with no allowance for overlap. The area shall be measured by the owner or the Contract Administrator.

ITEM NO. 24 HEAVY-DUTY SILT FENCE BARRIERS 805

Construction

OPSS 805.07.01.061 shall be deleted and replaced with the following:

The Contractor shall install all sediment and erosion control measures prior to commencing construction operations and shall remain in place until restoration is complete, or as directed by the Contract Administrator.

Measurement for Payment

OPSS 805.09.01.06 shall be deleted and replaced with the following:

No direct measurement will be made for sediment removal.

Basis of Payment

OPSS 805.10.02 shall be deleted and replaced with the following:

No extra payment will be made for sediment removal.

Sediment removal, when required and directed by the Contract Administrator, shall be deemed to be included in the unit price for this item.

ITEM NO. 25 STRAW BALE FLOW CHECK DAMS 805

Construction

OPSS 805.07.01.06 shall be deleted and replaced with the following:

The Contractor shall install all sediment and erosion control measures prior to commencing construction operations and shall remain in place until restoration is complete, or as directed by the Contract Administrator.

OPSS 805.07.05.01 shall be amended to include the following:

The Contractor shall place straw bale flow check dams in accordance with OPSD 219.18 at the locations indicated on the Contract Drawings or to specifically suit the proposed ditch lines and as directed by the Contract Administrator. Straw bale flow check dams shall be spaced along ditch lines as indicated, beginning 15 metres up the ditch line from the temporary rock check dams (administered under a separate item) located at each outlet.

Measurement for Payment

OPSS 805.09.01.06 shall be deleted and replaced with the following:

No direct measurement will be made for sediment removal.

Sediment removal, when required, shall be deemed to be included in the unit price for this item.

Basis of Payment

OPSS 805.10.02 shall be deleted and replaced with the following:

No extra payment will be made for sediment removal.

Sediment removal, when required and directed by the Contract Administrator, shall be deemed to be included in the unit price for this item.

ITEM NO. 26 ROCK FLOW CHECK DAMS 805

Construction

OPSS 805.07.01.06 shall be deleted and replaced with the following:

The Contractor shall install all sediment and erosion control measures prior to commencing construction operations and shall remain in place until restoration is complete, or as directed by the Contract Administrator.

OPSS 805.07.05.04 shall be deleted and replaced with the following:

The Contractor shall construct rock flow check dams in accordance with OPSD 219.210 for V-ditches or OPSD 219.211 for flat bottom ditches, at the locations indicated on the Contract Drawings or to specifically suit the proposed ditch lines and as directed by the Contract Administrator.

Measurement for Payment

OPSS 805.09.01.06 shall be deleted and replaced with the following.

No direct measurement will be made for sediment removal.

Sediment removal, when required, shall be deemed to be included in the unit price for this item.

Basis of Payment

OPSS 805.10.02 shall be deleted and replaced with the following:

No extra payment will be made for sediment removal.

Sediment removal, when required and directed by the Contract Administrator, shall be deemed to be included in the unit price for this item.

ITEM NO. 27 EARTH EXCAVATION FOR STRUCTURE
902

Appendix 902-B, November 2010 shall be invoked.

Scope

OPSS 902.01 is amended to include the following:

The structures that require excavation for their construction and administered under this item include:

- Pre-cast Concrete Box Culvert
- Concrete apron walls
- Backfill area and frost tapers.
- Retaining Walls
- Any areas requiring excavation for other equipment required to access the work.
- Any areas to access and construct any temporary shoring required under the Occupational Health and Safety Act.

The work shall include the design and construction of any temporary shoring or bracing of excavations as may be required to ensure compliance with the Occupational Health and Safety Act.

The work shall also include the cost of any and all lay-out of the work, for excavation and reconstruction by the Contractor.

Design and Submission Requirements

OPSS 902.04.01 shall be amended to include the following:

Excavations are required to access the area to construct the box culvert and retaining walls.
OPSS 902.04.02 shall be amended to include the following:

The Contractor shall submit a copy of their proposed excavation plan indicating how the work will be done in compliance with Occupational Health and Safety Act.

Where a support system is required, the Contractor shall make available to the Contract Administrator any and all engineered designs or opinions, as required by Regulation 213/91.

Construction

OPSS 902.07 shall be amended to include the following:

Over-excavations below the proposed culvert locations shall be backfilled with Granular B material compacted to 100% maximum dry density. Over-excavation below the proposed bedding elevations will be inspected by the Contract Administrator and may be reinstated with lean concrete or Granular B material as deemed appropriate by the Contract Administrator. The Contract Administrator shall inspect all excavations prior to placing either bedding. Except as may be due to the physical location and extent of the existing structures, no payment will be made for backfill or lean concrete material necessary to fill over-excavations resulting from the Contractor's methods. No payment will be made for any backfill or concrete material placed prior to inspection and authorization by the Contract Administrator.

Excess excavated materials may be temporarily stockpiled in an area approved by the Contract Administrator. All stockpiled material shall be enclosed in heavy duty silt fence barrier and protected from erosion.

The Contractor will be responsible for all layout working from vertical and horizontal control points provided by the Contract Administrator. The Contractor will provide all grade sheets, etc., necessary for the proper layout of the works to the Contract Administrator for checking and use for verification during construction. If deemed necessary by the Contract Administrator, work shall be suspended for such a reasonable time as necessary to check the accuracy of the layout without extra compensation for the suspension,

All costs for layout services are to be borne by the Contractor and included in the various unit rates tendered for the work. No claims for extra payment in respect of layout work will be considered

Measurement for Payment

OPSS 902.09.01 & 902.09.02 shall be deleted and replaced with the following:

No direct measurement of quantities will be made for this item. The item shall be administered as a Lump Sum item.

ITEM NO. 28 CONCRETE IN DISTRIBUTION SLAB MUNI 904

Scope

OPSS.MUNI 904.01 shall be amended to include the following:

- Concrete in distribution slab.

References

OPSS.MUNI 904.02 shall be amended to include the following reference:

CAN/CSA-A23.1-09 – Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete

Design and Submission Requirements

Designs and submissions shall be as required by OPSS.MUNI 904, OPSS.MUNI 1350 and CAN/CSA-A23.1-09.

In accordance with OPSS.MUNI 1350.04 Design and Submission Requirements shall be in accordance with OPSS.MUNI 1350.04.02.01 Performance Specification Alternative.

In accordance with 1350.04.02.01.01 the concrete supplier shall submit a 'Concrete Mix Design Submission' on form OPSF 1350 – 1, to the Contract Administrator.

Further, the concrete supplier shall identify the source of all aggregates to be used in the production of concrete used in the Contract and shall provide test results and certification that the aggregates do not contain chert or other deleterious substances or materials prone to causing pop-outs in the concrete.

Materials

OPSS.MUNI 904.05 shall be amended to include the following:

All concrete required for this project shall:

- Have a Minimum Specified Compressive Strength of 35 MPa at 28 days.
- Meet the requirements for class C-1 exposure as per Table 1 – CAN/CSA A23.1.

- Air Content to range from 5-8%.
- Slump = 80 +/- 30mm and 120 +/- 30mm when Super Plasticizer is added.

<u>Quality Assurance</u>

OPSS.MUNI 904.08 shall be amended to include the following:

The Contractor is responsible for the sampling, testing and reporting of all results as set out in OPSS.MUNI 1350.08 and CSA 23.1-17.

Testing of concrete shall be as per Table 1 outlined in the Standard Requirements for field sampling and testing of concrete.

The Owner may, at their discretion, undertake additional or supplementary independent testing to ensure quality assurance.

ITEM NO. 29 STEEL REINFORCEMENT FOR CONCRETE
MUNI 905

This item refers to the Steel Reinforcement required for the cast in place distribution slab and shall be in accordance with OPSS.MUNI 905.

ITEM NO. 30 CULVERT WATERPROOFING

<u>Scope</u>

This special provision covers the requirements for the surface preparation and installation of waterproofing. The waterproofing systems are separated into two distinct systems:

a) ~~Type 1 for the exposed concrete culvert waterproofing system; and~~
b) Type 2 for the buried culvert waterproofing system

~~Type 1 waterproofing system is required to protect the exposed concrete areas and extend onto a portion of the buried surfaces. Waterproofing shall be applied to the limits shown on the Contract Drawings on the top slab (horizontal) with a minimum 300 mm down the walls (vertical) from the top of the culvert.~~

~~The horizontal surface shall have an abrasive traffic layer (Heavy Duty). A smooth surface shall be used on the walls and on the 600 mm joint where it is overlain by the Type 2 waterproofing system.~~

Type 2 waterproofing system is required to protect the buried concrete areas and shall be applied to the limits shown on the Contract Drawings.

References

This Special Provision refers to the following standards, specifications, or publications:

Ontario Provincial Standards Specification, Construction

OPSS 929 Abrasive Blast Cleaning – Concrete Construction

Materials

~~Type 1 Waterproofing:~~

~~The Type 1 waterproofing systems to be placed on the exposed concrete surfaces shall be selected from the systems listed below or be an approved equal. The colour of the system shall a light grey matching the concrete culvert.~~

~~a) Vulkem 350/351 Pedestrian Deck Coating System~~

~~Manufactured by:~~
~~Tremco Commercial Sealants and Waterproofing,~~
~~220 Wicksteed Avenue,~~
~~Toronto, Ontario M4H 1G7~~
~~Telephone: (416) 421-3300 or (800) 363-3213~~

~~b) Sikalastic 180/181 System~~

~~Manufactured by:~~
~~Sika Canada Inc.,~~
~~6915 Davand Drive,~~
~~Mississauga, Ontario, L5T 1L5~~
~~Telephone: (905) 795-3177 or (800) 933-7452~~

~~Joint Sealants:~~

~~Joints in the sides and top of the culvert that will be exposed to air (will not have backfill material placed against them) shall be sealed prior to Type 1 waterproofing application. Joint seals exposed to air as detailed in the Contract Documents shall be installed using one of the following three modulus silicone joint sealants:~~

~~a) Dow Corning 888 Silicone Joint Sealant by Dow Corning~~
~~b) Crafco Roadsavers Silicone by Crafco Inc.~~

~~c) Spectrem 800 Low Modulus Silicone Highway and Parking Structure Sealant by Tremco~~

~~The application of the low modulus silicone joint sealants, including substrate (existing concrete surface) preparation, backer rod material/size/installation, masking of joints, depth and width of sealant for given gap dimension, installation of sealant and tooling/recessing of sealant in complete joint as required to provide protection to the sealant and the presentation of workmanlike appearance, shall be in accordance with the sealant manufacturer's recommendations.~~

Type 2 Waterproofing

The Type 2 waterproofing system, including the joint sealants for the buried concrete surfaces, shall be selected from the systems listed below:

Table 1-Waterproofing Treatment Systems for Joints Where Backfill will be Placed			
Manufacturer	**Joint Sealant**	**Self Adhesive Waterproofing Membrane**	**Waterproofing Membrane Protection System**
WR Meadows	Pointing mastic	MEL-ROL with MEL-PRIME primer	PROTECTION COURSE (PC-3 Heavy Duty)
BAKOR	Elasto-Seal LM	Blueskin WP200 with Blueskin Primer	Recover Board (6mm thickness)
Grace Construction Products	Bituthene Liquid Membrane	Bituthene System 4000 with Bituthene System 4000 surface Conditioner	25mm expanded polystyrene

The joint sealant, self-adhesive waterproofing membrane, and waterproofing membrane protection system products used shall all be obtained from a single manufacturer as indicated in Table 1 and be compatible with each other.

Application of joint sealant (including backer rod material/ size/installation, and depth and width of sealant for given gap dimension) shall be according with the sealant manufacturer's specifications.

Waterproofing membrane protection materials shall be a minimum 6 mm thick and shall be secured to the culvert as per the manufacturer's specifications.

Construction

The Contractor shall field verify all dimensions. The Contractor shall coordinate installation of the system with all other construction operations. The waterproofing system shall be installed on the top surface of the culverts/distribution slab and a minimum 300 mm down each side of the culverts, and additionally as shown on the Contract Drawings. The areas requiring waterproofing shall be prepared and the waterproofing installed in accordance with the manufacturer's instructions.

All joints, precast or construction, that are to receive waterproofing shall have waterproofing installed in accordance with the manufacturers recommendation procedure for the treatment of joints.

The exterior face of the box culvert units to receive any of the waterproofing joint treatments noted above shall be abrasive blast cleaned to remove all contaminants and laitance in accordance with OPSS 929. Any spent abrasive, dust and debris shall be removed from the joint gap and surrounding concrete surfaces using compressed air prior to applying any sealant or waterproofing treatments.

The concrete in the culverts or distribution slab shall be cured a minimum of 14 Days prior to waterproofing.

The surface of the concrete shall be dry at the time of waterproofing. Work shall not be scheduled following recent rainfalls.

Joint sealant, including backer rod shall be applied to the exterior face of all joints between precast units, excluding the bottom slab.

~~The application limits for the Type 1 system shall be masked.~~

~~A non-slip surface shall be provided for the horizontal portions of the Type 1 system. Silica sand shall be broadcast immediately into the wet topcoat and backrolled to distribute the aggregate.~~

~~A lap joint shall be constructed at the junction between the Type 1 and Type 2 systems, as shown on the plans. The Type 1 system shall be allowed to cure a minimum of 48 hours prior to application of the Type 2 overlap.~~

Measurement for Payment

Measurement of culvert waterproofing shall be by Plan Quantity of the waterproofed area with no deductions for overlaps. The unit of measure is square metres.

Basis of Payment

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work.

ITEM NO. 31 SMOOTH RUN RIVER STONE

Scope

This special provision sets out the requirements for the supply and placement of smooth run river stone in the area within the waterway, where any of the native material is been disturbed during construction.

Material

Smooth run river stone shall be rounded natural stone with a nominal stone size of 300 mm. Maximum stone size shall be 1.5 times the nominal stone size. 80 percent of the stones (by mass) shall have a diameter of at least 60 percent of the nominal stone size and the minimum river stone size is to be 50mm in diameter.

Construction

River stone shall be placed in the streambed, in the excavation in the areas where the native material is disturbed during construction. The material should be loosely placed and not compacted. The material shall not be placed over undisturbed existing native material. The streambed shall be shaped to maintain a low flow area where consistent with local conditions.

Measurement for Payment

Measurement will be made based on weigh scale ticket provided by the Contractor for material delivered and incorporated into the work as specified.

Basis of Payment

Payment at the unit price set out in the schedule of unit prices shall be full compensation for all labour, equipment, and material required to complete the work as specified.

ITEM NO. 32 CONCRETE BLOCK RETAINING WALL

Scope

This special provision sets out the requirements for the supply and placement of a precast concrete block retaining wall at the locations as shown on the Contract Drawings.

Material

Concrete blocks shall be precast, of uniform size and type and equipped with a precast mechanism to connect courses to each other.

Geotextile shall be Heavy Duty Class II.

Construction

Concrete blocks shall be installed to the dimensions and elevations indicated on the contract drawings.

The back face of the wall shall be wrapped with geotextile fabric.

Measurement for Payment

Measurement of concrete block retaining wall will be by plan quantity.

Basis of Payment

Payment at the Contract price set out in the schedule of unit prices shall be full compensation for all labour, equipment, excavation and material required to complete the work as specified. This includes all geotextile material required to install the retaining wall.

ITEM NO. 33 VEGETATED STONE REVETMENT

Scope

This special provision sets out the requirements for the supply and placement of vegetated stone revetment at the locations as shown on the Contract Drawings

Material

Stone shall be rounded natural stone with a nominal stone sizes as indicated on the Contract Drawings. Maximum stone size shall be 1.5 times the nominal stone size. 80 percent of the stones (by mass) shall have a diameter of at least 60 percent of the nominal stone size and the minimum stone size is to be 50 mm in diameter.

Geotextile shall be Heavy Duty Class II.

Coir Log shall be as per OPSS.MUNI 805.

Live stakes shall be Pussy Willow (Salix discoor) in the locations and dimensions as indicated on the Contract Drawings.

Container stock shrubs shall be Red-Osier Dogwood (Cornus stalonifera) and shall be 80 cm in size 3 gal. pots.

Construction

Stone shall be installed to the dimensions and elevations indicated on the contract drawings. Granular material for backfill (paid under separate item) shall be compacted to 98% proctor prior to placement of stone.

The back face of the embankment shall be wrapped with geotextile fabric.

Live staking shall be planted during the dormant season (spring or fall). Cut branches with several buds and nodes. Plant as soon as possible (within 48 hours) after cutting to ensure proper root establishment. Cut bottom of live stake on an angle to ease installation. Pre-drill planting holes by hammering a piece of rebar into the ground. Live stakes shall be installed at an angle of 90 degrees to the embankment slope. Stakes shall be installed 2/3 of their length into the ground.

Shrubs shall be planted as follows:

- Remove root ball from pot and set base root material so roots lie in a natural state.
- Backfill with soil mixture working soil between roots. Lightly tamp to remove air pockets and eliminate settlement.
- Plants to be set plumb in centre of planting pit.
- Water plants immediately following planting.
- Remove all broken, diseased, weak or crossing branches.
- Prune to leave as little stub as possible.
- Do not remove leader.
- Remove excess soil or rubbish off site.

Contractor shall continue to water shrubs and live staking as necessary to ensure normal growth is established.

Shrubs failing to survive after two months shall be replaced at no cost to the Owner.

Measurement for Payment

Measurement of vegetated stone revetment will be by square metres.

Basis of Payment

Payment at the Contract price set out in the schedule of unit prices shall be full compensation for all labour, equipment, excavation and material required to complete the work as specified. This includes all stone, geotextile, live stakes and shrubs required to install the revetment.

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Appendix F3

Excerpt from:

Vegetative Restoration Techniques – River Restoration Toolbox
Practice Guide 2, Section 2.5 – Sod Matting

F3

2.5 SOD MATTING

2.5.1 Narrative Description

Sod matting consists of large pieces of intact wetland soil and vegetation that has been removed from a donor site. Pieces of sod matting can be harvested from areas scheduled for demolition or other areas where material is available. Sod matting is used to provide channel bank stabilization where rock and/or logs are either not available or within context of the existing watershed conditions. The sod mats themselves provide initial channel bank stabilization, and the stabilization benefit is increased as the root systems grow deeper and denser. Sod matting is typically used in low-gradient stream systems where cohesive soils are present.

Installing sod mats on an existing slope can be undertaken by landowners. Often however, a lack of vegetation on stream banks is due to unstable conditions; analysis and design by a professional may be required to stabilize the stream bank and reestablish vegetation.

2.5.2 Technique Information

- **Use:** Sod matting can be used for both immediate and long-term bank stabilization. Immediate stabilization is provided by the mass of the harvested sod mats and the vegetation growth already present. Long-term stability is increased when rooting depth increases and becomes denser.

- **Other uses:** Sod matting can be used in combination with other bank protection measures such as toe wood, root wads; stacking sod mats on top of these and other types of toe protection provides a natural transition between the toe protection structure and the stream bank slope. Vegetative cover can improve wildlife habitat along the stream corridor while also improving the aesthetics of a project site. Sod mats prevent erosion from storm water runoff and reduce sheet and rill erosion.

- **Best applications:**

  - Sites with an adequate supply of sod with suitable species for sod mats

  - Transitions between in-stream and/or toe protection structures and stream banks.

  - Bare areas on existing stable slopes and stream banks or slopes and banks recently graded to a stable angle (e.g. - as part of a stream restoration project)

  - Areas on the floodplain where restoration activities are proposed

- **Computations:** Computations are generally not necessary for using sod mats to revegetate bare areas on otherwise stable stream banks. However, hydrologic and hydraulic computations can aid in verifying that the appropriate conditions exist for use of sod mats and whether a combination of other bank protection methods may be necessary.

- **Key Feature:** Sod mats are harvested at a site, usually in a proximity to the work, and placed on stream banks providing immediate vegetative cover of bare soils.

2.5.3 Detail Drawings and Data Table

The following drawings and data table depict information that should be included in construction plans for sod matting. The data table includes design guidelines and sources, where applicable.

Table 5. Required Design Data for Sod Matting[1]

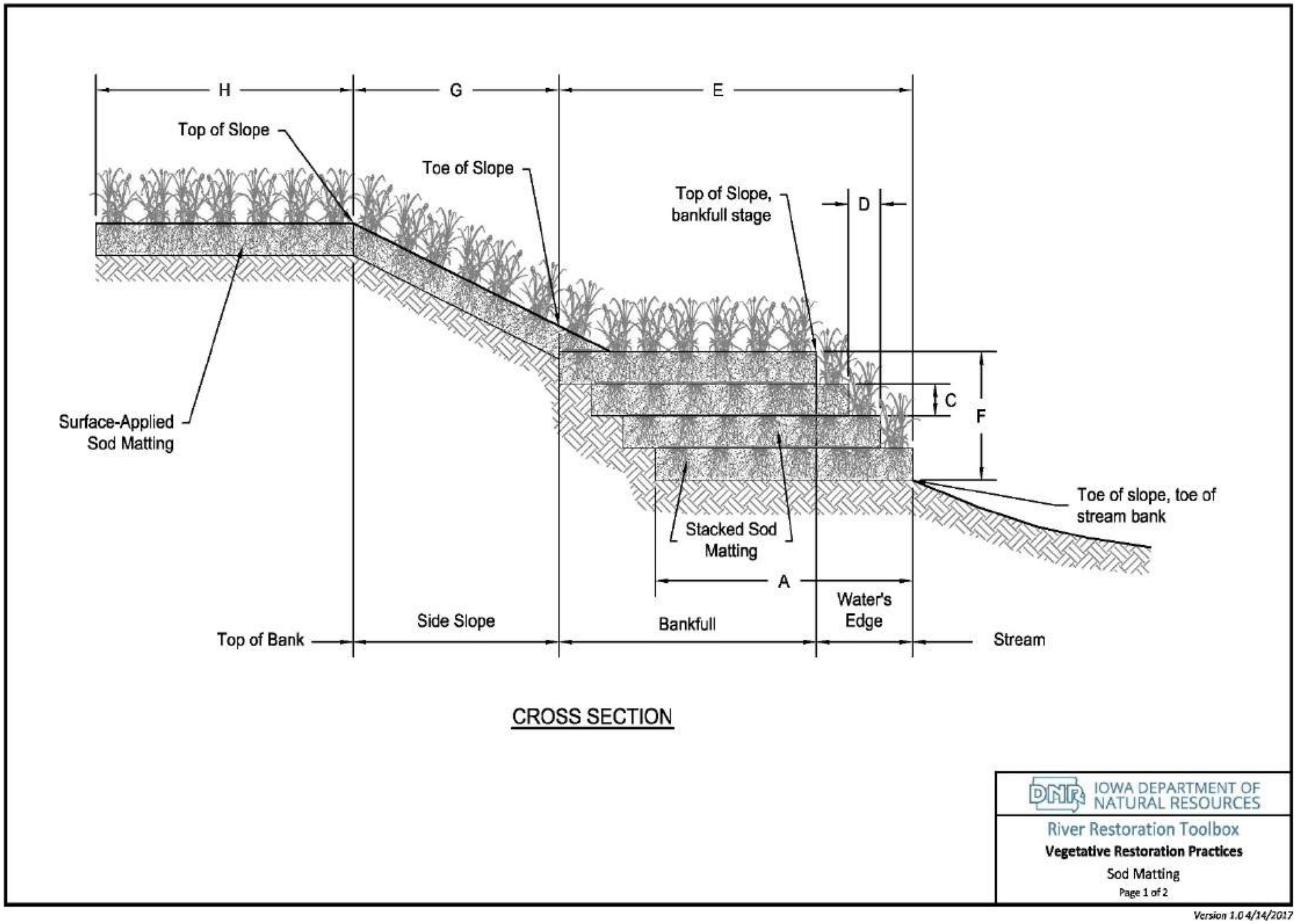
Dimension[2]	Name	Typical Unit	Guidelines[3]	Description
A	Sod mat width	Feet	Sod mats should generally be about 8 sq. ft and 6-8” thick, depending on the type of equipment used to excavate them (NRCS 2008).	Width of individual sod mat.
B	Sod mat length	Feet	Sod mats should generally be about 8 sq. ft and 6-8” thick, depending on the type of equipment used to excavate them (NRCS 2008).	Length of individual sod mat.
C	Sod mat thickness	Inches	6” – 8” (NRCS 2008)	Thickness of individual sod mat.
D	Stacked sod mat setback	Feet, inches	--	The distance between the edges of sod mats stacked to form a slope
E	Width of stacked sod mats	Feet, inches	--	Width of a bank created by stacked sod mats

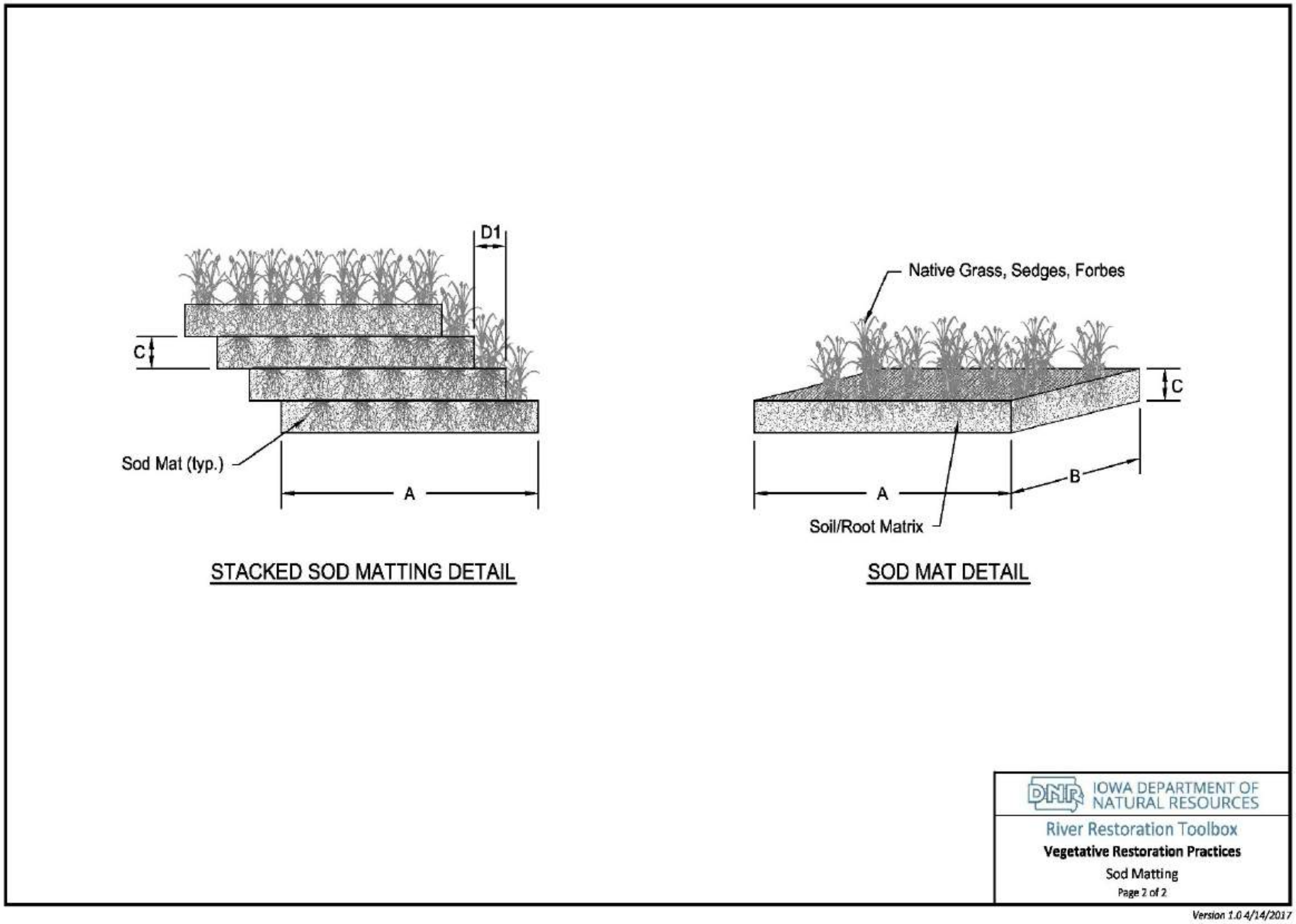
Dimension[2]	Name	Typical Unit	Guidelines[3]	Description
F	Height of stacked sod mats	Feet, inches	Harvested sod mats should be placed in a matching hydrological zone similar to the donor site.	Height of a slope created by stacked sod mats
G	Width of surface-applied sod mats	Feet, inches	--	Width of a slope stabilized with surface-applied sod mats
H	Top of bank sod matting distance	Feet	Harvested sod mats should be placed in a matching hydrological zone similar to the donor site.	Distance sod matting is installed on the top of bank

Notes:

1. Data are for sod matting that is stacked to form a slope or surface-applied to a slope.
2. Dimension labels are referenced in the detail drawings.
3. Common guidance, values, or ranges are given unless they require computation using site-specific input.

Drawing 5. Sod Matting




D1
C
Sod Mat (typ.)
A
STACKED SOD MATTING DETAIL
Native Grass, Sedges, Forbes
C
A
B
Soil/Root Matrix
SOD MAT DETAIL
IOWA DEPARTMENT OF NATURAL RESOURCES
River Restoration Toolbox
Vegetative Restoration Practices
Sod Matting
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2.5.4 Specifications

In addition to the information presented in Section 1.0 Introduction, the following information should be developed into specifications to accompany the use of sod matting:

- Materials
  - Donor site that contains an adequate supply of sod mats
  - Backhoe or front-end loader, wheel barrow, flatbed truck or trailer
  - Round and/or square tipped shovels
  - Wooden stakes
- Equipment:
  - A backhoe or front-end loader with a sharp-edged steel plate. A front-end loader can harvest uniform sod squares. The backhoe can harvest quickly, but yields uneven-edged mats.
- Sequence:
  - Identify location of sod mats to be harvested
  - Harvest sod mats from donor site with shovels, backhoe, or a modified front-end loader that contains a sharp-edged steel plate that undercuts the sod for safe and effective removal.
  - Depending upon the project size, load sod mats into a wheel barrow or onto a flatbed truck, or trailer and transport them to the work site.
  - Place the sod mat within the proper hydrologic zone, fitting them tightly against one another.
  - The top mat and/or other mats can be anchored with a live and/or dead stout stake to ensure that it does not mobilize during a flood event before the roots have established.
- Workmanship:
  - It is easiest to harvest sod mats when the soils are moist, yet well drained at the time of the cutting.
  - Sod mats can be stored on site if they are kept moist.

- When transporting sod mats long distances, maintain moisture levels so that they do not become dried out.

- The sod mat should be placed into the same hydrologic zone as where it was harvested.

- When placing sod mats, do not leave large gaps between each sod mat as non-native vegetation will quickly attempt to colonize these voids.

- Sod mats can be transplanted during any season if there is sufficient moisture in the soil where they will be placed.

2.5.5 Photographs

Photo 31. Sod mat harvest with a front-end loader. Source: Buck Engineering

Photo 32. Sod mat placed to form stream bank. Source: Buck Engineering

Photo 33. Sod mat stacked over toe wood. Source: Stantec

Photo 34. Sod matting on outside of a meander bend. Source: Stantec

Photo 35. Sod matting on stream banks. Source: Stantec

Photo 36. Excavator placing sod matting. Source: Bluegrass Streams, LLC

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Appendix G

Department of Fisheries and Oceans (DFO) Correspondence and Related Documentation

Appendix G1

Application Form for *Paragraph 35(2)(b) Fisheries Act* Authorization

Application Form for Paragraph 35(2)(*b*) *Fisheries Act* Authorization (Normal Circumstances)

I, the undersigned, hereby request authorization to carry on a work, undertaking or activity which will result in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. I understand that the *Fisheries Act* Authorization, if granted, is only from the standpoint of the Minister of Fisheries and Oceans and does not release me from my obligation to obtain permission from other concerned regulatory agencies.

1. Applicant Contact Information

Applicant	If applicable: Authorized Representative
Applicant's Name: Jeremy Nyenhuis, P.Eng Drainage Superintendent, Town of Innisfil	Authorized Representative's Name: Chris Pfohl, C.E.T., EP, CAN-CISEC
Address: 2101 Innisfil Beach Road, L9S 1A1	Address: 292 Speedvale Avenue West, Unit 20
Telephone No.: 705-436-3740 ext. 4222	Telephone No.: 226-486-1543
Fax No.:	Fax No.:
E-mail: jnyenhuis@innisfil.ca	E-mail: chris.pfohl@rjburnside.com

DFO File Referral No. (if known): 18-HCAA-00950

2. Checklist for Prescribed Information

An applicant does not need to re-submit documents that have already been submitted to DFO for review. An applicant may reference documents such as Environmental Impact Statements, technical supplements, etc. in their application but must provide the appropriate reference to any document cited, including the chapter, section, page reference and date of submission.

Type of Information/ Documentation	Have you submitted the following? (Yes/No)	Identify the appropriate reference document: Title, Chapter, Section, Page Number and Date of Submission	DFO Comments (For official use only)
Letter of Credit	No	Section 9.7 and Appendix E of the attached Authorization Report for Letter of Credit Estimate	
Description of Proposed work, undertaking or activity	Yes	Section 1.0 of the attached Authorization Report	
Project engineering specifications, scale drawings and dimensional drawings (for physical works)	Yes	Section 2.0 of the attached Authorization Report	
Timeline information	Yes	Section 3.0 of the attached Authorization Report	
Location information	Yes	Section 4.0 of the attached Authorization Report	
Description of Fish and Fish Habitat (Aquatic Environment)	Yes	Section 5.0 of the attached Authorization Report	
Description of Effects on Fish and Fish Habitat	Yes	Section 6.0 of the attached Authorization Report	
Description of Measures and Standards to Avoid or Mitigate Serious Harm to Fish	Yes	Section 7.0 of the attached Authorization Report	
Description of the Residual Serious Harm to Fish	Yes	Section 8.0 of the attached Authorization Report	
Offsetting Plan	Yes	Section 9.0 of the attached Authorization Report	

3. Public and Aboriginal Engagement

Have you engaged the public or Aboriginal group(s) who may be affected by your proposed work, undertaking or activity?

(•) Yes ( ) No

If yes, provide details including the groups engaged, type of engagement, dates, outcomes, etc.

Please refer to the attached technical memo titled "SICD Record of Public Consultation".

If providing (attaching) supporting documentation to describe your engagement activities (e.g., meeting log, summary of meetings, etc.), include the title of each document.

Please refer to the Record of Public Consultation Technical Memo attached

4. Fisheries Management Objectives

Did you consider local Fisheries Management Objectives in your planning process? (•) Yes ( ) No

If yes, please identify the Fisheries Management Objective(s)/Plan considered and, if applicable, reference the relevant sections.

The Nottawasaga Valley Conservation Authority, Fisheries Habitat Management Plan (2009). Sections: 12.2, 12.3, 12.4, 12.5, and 15.

Please identify any effects that the proposed work, undertaking or activity may have on achieving these objectives.

Please refer to the attached technical memo titled "SICD NVCA FHMP Considerations".

Applicant Declaration

I solemnly declare the that information provided for this application are true, complete and correct, and I make this declaration conscientiously believing it to be true knowing that it is of the same force and effect as if made under oath. This declaration applies to all material submitted as part of this application for a Paragraph 35(2)(*b*) *Fisheries Act* Authorization.

Applicant's signature (and corporate seal):

Date: 31/01/2019

Information about the above-noted proposed work, undertaking or activity is collected by DFO under the authority of the *Fisheries Act* for the purpose of administering the Fisheries Protection Provisions of the *Fisheries Act*. Personal information will be protected under the provisions of the *Privacy Act* and will be stored in the Personal Information Bank number DFO PPU 680. Under the provisions of the *Privacy Act*, individuals have a right to, and on request shall be given access to, any personal information about them contained in a personal information bank. Instructions for obtaining personal information are contained in the Government of Canada's Info Source publications available at www.infosource.gc.ca or in Government of Canada offices. Information other than "personal" information may be accessible or protected as required by the provision of the *Access to Information Act*.

If you require additional space to provide relevant information, please attach that information and indicate the title of the form being used and the section to which you are responding.

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G2

Appendix G2

South Innisfil Creek Municipal Drain Improvements
DFO Authorization Report (DFO File # 18-HCAA-00950)

South Innisfil Creek
Municipal Drain Improvements
DFO Authorization Report
(DFO File # 18-HCAA-00950)

Town of Innisfil
2101 Innisfil Beach Road
Innisfil, Ontario L9S 1A1

R.J. Burnside & Associates Limited
292 Speedvale Avenue West
Guelph ON   N1H 1C4 CANADA

January 31, 2019
300038790.0000

(DFO File # 18-HCAA-00950)
January 31, 2019

Distribution List

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Record of Revisions

Revision	Date	Description
0	January 31, 2019	Submission as an Application for Authorization to the Department of Fisheries and Oceans

R.J. Burnside & Associates Limited

Report Prepared By:

Matthew Moote, H.B.Sc., CAN-CISEC-IT
Aquatic Ecologist
MM:sgd

Report Reviewed By:

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist
CP:sgd

Jeff Dickson, P.Eng.
Project Engineer
JT:sgd

(DFO File # 18-HCAA-00950)
January 31, 2019

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Disclaimer

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1.0 Description of Proposed Work, Undertaking or Activity

R.J. Burnside & Associates Limited (here, Burnside) has been appointed by the Town of Innisfil (herein, the Town) to prepare and file a report recommending improvements to the South Innisfil Creek Drain (herein, the Drain) under Section 78 of the Drainage Act. The Drain is located wholly in the Town generally flowing from north to south from 5th Line to 15th Line. Downstream of 15th Line is it known as a natural waterbody, Innisfil Creek. Numerous municipal branch drains and natural tributaries also flow into the Main Drain. Under this municipal drain report, four branches will be included in the proposed works, namely the Branch ‘A’, 10 Sideroad Branch Drain, 3rd Line Branch Drain, and 3rd Line Spur Drain.

The Drain frequently breaches its banks and floods the surrounding agricultural lands during major storm events which can have major impacts to the “Market Garden” lands and downstream landowners. A significant length of the Drain flows through the “market garden lands” in Innisfil which provides high value market crops (carrots, onions, garlic, etc.) are grown.

Burnside’s Aquatic Ecology team has performed numerous site visits in 2017 and 2018 to confirm existing conditions and have reviewed relevant background information to support this project. The results of the site visits and background information review are presented in Sections 5.0 and 6.0 of this report.

Please refer to the attached cross section drawings in Appendix A regarding dimensions of the channel for the work described in Sections 1.1- 1.9 below. Please refer to Appendix B for the Geographic information System (GIS) mapping and accompanying spreadsheet which describes the quantities and locations of proposed work and offsetting measures associated with the Drain improvements.

1.1 15th Line to 5 Sideroad

Between 15th Line and 5 Sideroad (Sta. 0+000 to Sta. 1+224) only one spot-cleanout is proposed where 490 m^2 within the base of the Drain will be disturbed. There is one sedimentation basin proposed for construction at Sta. 1+224 to promote the accumulation of sediment as a mitigation measure during construction. It is noted that all sedimentation basins in the Drain are proposed to be constructed on bends in the Drain and not on straight sections where they will quickly become inundated with sediment. Burnside is proposing to construct a rock check dam at Sta. 1+120 which will be removed after construction and it will not impede fish migration outside of the relevant in-water works timing window. There are 3 Large Woody Debris (LWD) manipulations proposed at Sta. 0+110, 0+240 and 0+365 to improve conveyance and provide fish habitat. Tree plantings are also proposed within this reach. 112 trees will be planted in select locations, in two rows to shade 140 m of Drain. The density of planting of

2.5 trees per linear meter of Drain was based on the suggestions from Shannon Stephens (Healthy Waters Program Coordinator) with the Nottawasaga Valley Conservation Authority (NVCA), 5 Sideroad to Highway 400.

1.2 5 Sideroad to Highway 400

Between 5 Sideroad (Sta. 1+224) and the inlet of the Highway 400 crossing (Sta. 2+165) Burnside is proposing to deepen and widen the Drain in this section resulting in 7,490 m^2 of Drain disturbance. The channel will be constructed to form a low-flow channel within a benched two-stage channel. The benched area, or flood plain bench, will be vegetated with the use of sod-matting, live staking, seeding or a combination of these methods. It is anticipated that sod matting will be used to vegetate 1.0 m of the low-flow channel bench in all sections of the Drain where sod material is available. The sod will be placed with approximately 0.4 m of it down the slope of the flow channel and 0.6 m of it on the bench of the low-flow channel covering the crown of the slope. Between 5 Sideroad and Highway 400 approximately 930 m^2 of the bank will be restored with sod matting. A concept drawing that relates to the orientation of the LWD is provided in Appendix A. Work will only be completed on one side of the channel and the other side will remain undisturbed. The channel geometry will feature a 3.0 m buffer on each bank of the Drain; the excavated bank of the overflow channel will be built to a 2:1 slope, the low-flow channel will have 2:1 bank slopes and a 2-3 m bottom width and the benched area will be up to 7.5 m wide. Upstream of 3rd Line the low-flow channel bottom width will be 2.0 m and downstream it will be 3.0 m.

There are 3 sedimentation basins proposed for construction at Sta. 1+330, 1+700 and 1+925. Heavily eroded sections of the banks are present at Sta. 1+350 and 1+820 and 2+000. These eroded banks are proposed to be repaired and stabilized through the use of round river stone in the drain bottom and shelf, rip rap on the banks and plantings above the annual high-water mark. Plantings consisting of 208 trees are proposed for 260 m of the Drain at stations 1+750 to 1+880 and 2+040 to 2+170 (2.5 trees per linear meter of Drain). Downstream of the Highway 400 crossing, Burnside is proposing to retain the deep pool formed at the outlet of the CSP culvert beneath Highway 400.

There are 6 locations where the large woody debris in place will be manipulated to promote the establishment of a thalweg, promote conveyance, and to enhance fish habitat. These manipulations are proposed for Sta. 1+355, 1+395, 1+400, 1+485, 1+540 and 2+010.

1.3 Highway 400/Reive Boulevard Crossing

Between stations 2+165 and 2+280 Burnside is proposing to deepen and widen the channel within the road right-of-way for a total area of disturbance of 60 m^2. The culvert crossings under Highway 400 and Reive Boulevard are also proposed to be replaced to accommodate the proposed drainage improvements. The new culverts will be embedded at an elevation to improve fish migration through the Drain. Currently the existing culverts are impassable during low-flow conditions and impede seasonal movements of fish. Work on these road crossings will take place as a separate works, carried out by the respective road authorities (Ministry of Transportation and Town of Innisfil).

1.4 Reive Boulevard to 2nd Line

Between the Reive Boulevard culvert inlet (Sta. 2+280) and 2nd Line (Sta. 3+350), 5 sedimentation basins are proposed for construction (Sta. 2+350, 2+625, 2+825, 2+925, and 3+350). Burnside is proposing to deepen the Drain 0.6-0.7 m, the main channel will be widened, and a low flow channel will be excavated. Where possible, work will be completed on one bank with the other bank left undisturbed. A total of 6,460 m^2 of the Drain will be affected by the construction of the Drain improvements.

Burnside is also proposing to manipulate the existing large woody debris present in the Drain in order to promote the establishment of the thalweg, improve conveyance and fish habitat. The benched area of the low flow banks of the Drain will be vegetated with live stakings and seeded. Approximately 1,070 m^2 of the Drain bank between Reive Boulevard and 2nd Line will be restored using sod matting.

1.5 2nd Line to 3rd Line

Between 2nd Line and 3rd Line (station 3+350 to 6+355) Burnside is proposing to excavate the existing channel to deepen and widen it, resulting in a disturbance area of 25,930 m^2. The channel will be constructed to form the two-stage cross section with a low-flow channel as described in Section 1.2 of this report. In total 9 sedimentation basins are proposed for construction in this section at the following stations: 3+574, 3+895, 4+050, 4+180, 4+520, 4+816, 5+265, 5+498, and 6+133. Two large woody debris manipulations are proposed for at stations 4+880 and 5+455, although it must be noted there will be some “field fit” for the best locations of the large woody debris manipulations. Six areas of eroded banks are proposed to be repaired through using a combination of round riverstone, rip-rap and live staking as discussed above. The erosion areas to be stabilized are located at stations 4+515, 4+785, 5+255, 5+40, 6+125, and 6+325. Approximately 2,460 m^2 of the Drain bank between 2nd Line and 3rd Line will be restored using sod matting.

A riffle was located during a site visit on April 11, 2018 at Sta. 6+325 and it is proposed that it will be maintained and not changed based on the new design.

1.6 3rd Line to 4th Line

Between 3rd Line and 4th Line (Sta. 6+355 to Sta. 7+928) Burnside is proposing to perform riparian area maintenance by “pulling back” one side of the channel above the existing low flow channel and existing bed and banks. Debris jams and beaver dams will be removed as necessary. The total disturbance area of the Drain is approximately 6,650 m^2. No deepening of the Drain channel bottom or the low flow channel is proposed. Burnside is proposing to construct 5 pool-riffle structures between 3rd Line and 4th Line at Sta. 6+550, 6+800, 7+092, 7+457, and 7+815. The proposed riffle structures would be improvements to habitat diversity and could enhance or promote spawning activity within this reach. One large woody debris manipulation is proposed at station 4+880. Three sections of eroded bank are proposed to be repaired at stations 6+525, 7+180, and 7+300.

Between 3rd Line to 4th Line substrate will be left undisturbed, outside of where high points and debris jams are to be removed in the channel bottom. If granular or gravel substrate is encountered during the removal of high points, debris jams etc. then it will be salvaged and put back into the channel. Between 3rd Line and 4th Line, approximately 160 m^2 of the Drain bank will be restored using sod matting techniques.

1.7 4th Line to 5th Line

Between 4th Line and 5th Line (station 7+950 to 9+917) Burnside is proposing to perform riparian area maintenance by “pulling back” one side of the channel and remove debris jams and beaver dams as necessary. No deepening of the Drain channel bottom and the low flow channel is proposed. A total of 3,900 m^2 of the Drain will be disturbed through the construction of the improvements between 4th line and 5th Line. Burnside is proposing to construct 6 riffles between 4th Line and 5th Line at Sta. 8+024, 8+515, 8+850, 9+120, 9+485, and 9+830. Nine sections of eroded bank are proposed to be repaired and stabilized with round riverstone at stations 8+190, 8+320, 8+512, 8+645, 8+750, 8+810, 8+845, 8+900, and 9+025. In addition, there are 6 locations where large woody debris will be manipulated at stations 8+040, 8+740, 8+810, 8+845, 8+910 and 9+560. As previously mentioned, the large woody debris manipulations will occur using some “field fit” to manipulate the large woody debris in the most suitable locations.

Trees will be planted on the south bank of the Drain at station 8+900, 8+955 and 9+020. A total of 64 trees will be planted over 80 m of the Drain at the aforementioned density of 1 tree per 1.25 linear metres of Drain.

Within this section the bottom substrate will be left undisturbed, outside of where debris jams and high points are to be removed in the channel bottom. If granular or gravel substrate is encountered during the deepening it will be salvaged and put back into the channel to replicate pre-disturbed conditions. The woody debris in place will be manipulated to promote the re-establishment of a thalweg within the Drain bottom. Approximately 100 m^2 of the Drain will be restored using sod matting between 4th Line and 5th Line.

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The existing CSP culverts beneath 4th Line will be replaced as part of the Drain improvements. Burnside is replacing the existing structures with a Barefoot Box Culvert™ in order to promote the coldwater input to the Drain in a reach that has historically experienced thermal impacts during summer conditions. In addition to the culvert replacement a total of 10 m^2 will be disturbed as part of the channel works in the 4th Line right-of-way. A total of 10 m^2 of the Drain will be disturbed in the Drain through the replacement of the 4th Line culvert.

1.8 Branch ‘A’, 10 Sideroad Branch Drain, 3rd Line Spur Drain, 3rd Line Branch Drain

All of these drains convey flows to the Main Drain of the South Innisfil Creek Drain. Riffles, sedimentation basins, rock check dams, and repairs to eroded banks are not proposed for these drains. Burnside is proposing to perform maintenance on these branch drains only. Widening is not proposed; however, some deepening will occur in the form of spot or bottom cleanouts.

1.9 Additional Work and Improvements

Permanent 3.0 m vegetated buffers will be established on both banks of the Drain, and they will be considered part of the South Innisfil Creek Drain.

2.0 Project Engineering Specification, Scale Drawings and Dimensional Drawings

Please note a more detailed description of the staging of work and project specific specifications are highlighted in Section 4 of this document.

The following drain specifications will apply to this project:

2.1 Geometry

The drain shall have the full bottom width, at the gradient, specified or shown on the accompanying plan(s), profile(s), cross sections and detail sheet(s) in Appendix A and B.

2.2 Excavated Material

A clear buffer of at least 3.0 m shall be left between the top edge of the open drain and the excavated material. Excavated material shall be placed on the side specified. No excavated material is to be left in any low runs intended to conduct water into the open drain. Treatment of excavated material shall be to the satisfaction of the Engineer. The spoil shall be spread and levelled, hauled, or left for landowner use as per direction from the Engineer.

2.3 Outlets

During the construction of an open drain, the Contractor shall guard against damaging the outlet of any tributary, branch drain or tile outlets encountered. All tile outlets shall be fitted with an outlet pipe and rodent grate. Any unforeseen tile outlet repairs shall be paid for as a contingency item. All tributary confluences, whether from natural watercourses, private drains or municipal drains, shall be excavated and lined with round river stone and rip-rap to protect against erosion.

2.4 Sod Matts and Seeding

Vegetation “sod matts” and the first 30-50 cm of bank material from the Drain will be salvaged from the working bank and placed on the new bank once the channel has been lowered, widened and graded. The sod matts will be placed on upper portion of the excavated low-flow channel bank and will extend approximately 60-70 cm onto the ledge of the overflow channel. The use of sod matts greatly improves the naturalization process of channel banks due to the re-use of existing vegetated material that is salvaged from the grading work. Sod matting has been an accepted and preferred method to stabilize newly graded banks and reduce the potential for future erosion of exposed soils. Areas above the low flow channel that have been disturbed will be seeded with an approved seed mix by the contractor. A concept drawing that relates to the sod matting is provided in Appendix A.

The Contractor shall seed all disturbed areas including newly excavated ditch banks, disturbed construction area and leveled spoil (where specified) with an approved meadow mix or similar. The exact seed mixture will be confirmed with the NVCA and all local supplier before construction begins. The mix will include a nurse crop of annual rye grass. Application rates will be as-prescribed for the chosen approved seed mix. Seeding will be completed regularly during construction to avoid long exposures of unprotected excavated banks

2.5 Temporary Sediment Controls

Unless indicated otherwise in the Special Provisions, the Contractor shall install an approved sediment control measure (rock check dam constructed of rip-rap) at the downstream end of the open drain excavation and at any other locations specified in the Tender. The Contractor shall remove any accumulated sediment at regular intervals or as directed by the Engineer. The Contractor shall then remove these temporary measures, and any accumulated sediment therein, after the new open drain has stabilized and only after authorized by the Engineer or the Drainage Superintendent.

2.6 Sediment Basins

A total of 19 permanent sediment basins (between 5 and 10.0 m in length and 600 mm 500 mm in depth) shall be constructed as directed by the Engineer. When necessary, during and at the completion of the project and/or when instructed by the Engineer, the Contractor shall remove and spread any accumulated sediment within the working right-of-way.

The dug sediment basins shall be left in place permanently following the construction of the Municipal Drain and after that time shall be maintained by the Drainage Superintendent.

2.7 Rip-Rap & Non-Woven Geotextile

Rip-Rap – Rip-rap will be placed on areas of the drain banks above the high-water mark in order to protect against further erosion from the flows in the Drain. These eroded areas have been identified by Burnside staff and the Drainage Superintendent during previous inspections.

Non-Woven Geotextile - Non-woven geotextile will be used as underlay on areas of the drain banks above the high-water mark where bank soils contain significant fines such that the rip-rap would otherwise be undermined. Geotextile will be used in areas where there has been bank erosion and repair is required. These eroded areas have been identified by Burnside staff and the Drainage Superintendent during previous inspections.

2.8 Round River Stone

Round river stone will be placed on areas of the drain below the high-water mark in order to protect against further erosion from the flows in the Drain. These eroded areas have been identified by Burnside staff and the Drainage Superintendent during previous inspections.

2.9 Salvaged Substrate

Where required to maintain channel stability, granular substrate will be salvaged from the existing Drain. This granular substrate will be used to cover the new channel base and to replicate existing conditions within the newly excavated channel. Salvage of existing substrate will replicate existing conditions and improve the naturalization process for periphyton, invertebrates and aquatic biota. Existing substrate to be salvaged will be removed to a depth of 300 mm or a depth that will not include silt, clays or till.

2.10 Pool-Riffle Structures

A total of 11 pool-riffle structures will be constructed in the Drain upstream of 3rd Line in order to provide a source of aerated water during periods of low-flow, fish spawning habitat and to increase the diversity of morphology in the Drain. Downstream of 3rd Line the Pool riffle structures will include a 10 m long and 0.5 – 0.6 m deep pool upstream of the riffle constructed of suitably sized round river stone. Upstream of 3rd Line the pool will be 5 m long. The riffle crest will be built to approximately 0.4 m above the proposed channel invert. For details please see the Riffle and Pool Structure detail on the appended drawings.

2.11 Large Woody Debris Manipulations

There are numerous debris jams, fallen trees and beaver dams in the Drain between 15th Line and 5th Line. These will be removed during construction to allow for the conveyance of flow in the Drain. Wood from these structures, if of a suitable quality and not decomposed, will be placed in the Drain at the direction of the Burnside Aquatic Ecologist. The wood will be placed in the Drain to provide overhead cover for fish species and to promote the establishment of the thalweg in the Drain. A concept drawing that relates to the orientation of the LWD is provided in Appendix A.

2.12 Bank Shading

Tree plantings are proposed on the banks of the Drain to increase shading of the channel. Species to be planted have not been determined at this time, but direction from the NVCA with regards to species selection will occur prior to planting. Trees will be planted between Highway 89 and 5 Sideroad, between 5 Sideroad and Highway 400, and between 4th and 5th Line. Live staking on bends in the Drain in the Market Garden lands will also be completed in order to provide stabilization of the Drain banks. Red osier dogwood, or an available approved equivalent species, will be selected as the species for live staking. Staking density will be approximately 1 stake per square metre as recommended by the NVCA's Healthy Waters Program Coordinator. Where specified, stakes will be installed from the top of the overflow bank to 1 m below the top of bank.

2.13 In-Water Works

Construction of the in-water works of the Drain improvements will be completed within the relevant in-water works timing window (June 15 - September 30 of a given year). Works will be completed during low or no flow conditions. If a significant rainfall event occurs during construction causing higher than normal flows, in-channel construction may be postponed to avoid additional environmental disturbance. Burnside is proposing "fish exclusion" within the work area by installing "block nets" at the upstream and downstream limits of the in-water works within each section of the Drain. Once the upstream block net is installed Burnside will sweep downstream with a seine net to ensure fish are pushed downstream of the work area. Burnside is proposing to use a seine net that will have a float line and weighted lead line to ensure full depth coverage within the channel. The seine net will be pulled downstream with a worker on each bank to push and direct fish downstream without capturing them. At the downstream limit of work area, a block net will be left in place to prevent fish from moving upstream into the work area and could capture floating debris transported downstream during the construction. This method of fish exclusion will ensure that fish are not trapped in the work area during the in-water works. This fish exclusion method will be utilized as work proceeds throughout the Drain.

This method of fish exclusion will occur under a License to Collect Fish obtained from the MNRF.

3.0 Description of the Anticipated Phases and Scheduling

The subject watercourse is a Class-D and an unrated drain. Upstream of 3rd Line it is a Class-D drain and downstream to end of the municipal drain it is unrated. Both spring and fall spawning species are present within the Drain (see species list below in Table 2). As such, the proposed works will take place between June 15 and September 30 of a given year. The Ontario MNRF has confirmed that the in-water works timing window of June 15 - September 30 is acceptable. This email confirmation is available in Appendix C.

Drain construction will be completed from downstream to upstream. The Drain will be divided into sections for the completion of construction. These construction sections will be created based primarily on road crossings and scope of work, so that one entire section may be completed before moving upstream to the next section. As such, some phases listed below shall be repeated for each section of the drain.

3.1 Phase 1 Pre-Construction Preparation, Layout and Meetings

The Contractor, affected landowners, the engineer and aquatic ecologists will participate in pre-construction proceedings. The scope of work, including any applicable offsetting features to be constructed will be discussed and laid out before work begins.

Any clearing of trees that is required shall be completed during the appropriate timing window as directed by the MNRF. This work may be completed some time before drain construction begins.

3.2 Phase 2 Sediment Control Construction and Exclusion Nets

Sediment control measures will be constructed before any drain excavation begins. This phase may be repeated in each section of the drain as work progresses upstream. No in-water works will be completed without adequate downstream sediment controls in place.

Fish exclusion, as previously described in Section 2.13, will also be completed using blocker nets for a given section of the drain before any in water channel construction is completed.

3.3 Phase 3 Channel Construction

Channel construction, including the placement or installation of all appurtenances and offsetting measures shall be completed in this phase. This work will be completed in sections moving upstream. All excavated material shall be placed at least 3.0 m from the Drain bank. Banks will be stabilized in a timely manner to prevent erosion.

3.4 Phase 4 Collection of As-Constructed Information

This phase will take place as concurrently with the channel construction. Details on the location, elevation and gradient of the constructed drain and related features will be collected digitally for future monitoring, maintenance and enforcement.

3.5 Post Construction Monitoring

Post construction monitoring, and any required repair or remediation work, will take place after construction of the Drain has been completed. Monitoring will be performed as described in the Monitoring Plan in Section 9.4 of this report.

4.0 Description of the Location of the Proposed Work

(a) Geographic coordinates of Work location

UTM Coordinates:

609403.9 m E 4901413.8 m N NAD83 UTM Zone 17N (upstream limit)

606393.1 m E 4894392.3 m N NAD83 UTM Zone 17N (downstream limit)

Large and Small-Scale Plans: Please refer to Appendix A and B for the large and small-scale site plans.

Water bodies to be affected: Initially the South Innisfil Creek Drain, then Innisfil Creek, downstream of the Drain, south of 15th Line.

Nearest community – Town of Innisfil, ON Canada County of Simcoe.

5.0 Description of Fish and Fish Habitat

5.1 Type of Waterbody and Source

The subject watercourse is an unrated and a Class-D Municipal Drain, legally named the South Innisfil Creek Drain. The Drain is also known as Innisfil Creek, classified as a cold-water watercourse. The Drain flows from north to south and east to west from 5th Line to 15th Line in Innisfil. Downstream from 15th Line it is a natural watercourse named Innisfil Creek. Numerous other drains flow into the South Innsifil Creek Drain as well. The upstream limit of the Drain is a Class-D drain from 5th Line south to 3rd Line. Downstream from 3rd Line to where the municipal drain ends at 15th Line it is unrated.

The Ministry of Natural Resources and Forestry (MNRF) Aquatic Resources Area (ARA) mapping (2015) describes the Drain as a watercourse with a cold thermal regime upstream and downstream of 5th Line to Highway 89. Downstream of Highway 89 the watercourse is characterized as a cool-water watercourse, known as Innisfil Creek. The list of species observed by Nottawasaga Valley Conservation Authority (NVCA) during a study completed in 2000 was available in the MNRF ARA Mapping and these species are presented below in Table 2.

Nottawasga Valley Conservation Authority (NVCA) has completed multiple studies in the Innisfil Creek watershed including the Innsifil Creek Subwatershed Health Check (2013) and the Innisfil Creek Subwatershed Plan (2006). NVCA indicates that Innisfil Creek is an impaired watercourse with unimpaired or “below-potential” reaches present within the headwaters of the watercourse. NVCA further notes that trout habitat is limited to the cool headwaters of the Bailey, Innisfil and Beeton Creeks. Smaller tributaries of Innisfil Creek are below potential or impaired in terms of stream health, largely influenced by a lack of natural land cover and the dominance of intensive agricultural land use. During low flow periods the stream flow is reduced to near zero due to water taking activities for field irrigation purposes. Elevated phosphorus levels are present at the downstream end of Innisfil Creek, which are 47% above the provincial objective during low-flow periods. Overall stream health in Innisfil Creek has declined since 2007 with declining conditions in Innisfil Creek near Highway 89 and downstream.

The NVCA Innsifil Creek Subwatershed Plan (2006) notes that there are many agricultural users within the Innisifl Creek watershed who use the water for agricultural purposes, such as irrigating crops. This water usage affects the creek’s base flow and some residents are concerned that there is a lack of base flow within Innisfil Creek, particularly upstream of the confluence with Penville Creek. One of the targets within this subwatershed plan is that 75% of the natural length of Innisfil Creek should be naturally vegetated with a 30 m buffer on both sides of the stream. Only 38% of the stream corridor had adequate forest cover at the time of the report, 2006, whereas the goal was 75%. It is noted that municipal drains are not expected to follow and meet this

75% goal, but land owners are encouraged to keep as much vegetation on their land as possible. Landowners are encouraged to leave one side of the drain naturalized and vegetated and complete cleanouts and maintenance on the other side. A minimum of a 3 m buffer is recommended for agricultural municipal drains.

Benthic invertebrate community structures are analyzed to evaluate a stream's health. Based on the benthic community compositions present in the watercourse, the Innisfil Creek headwaters are unimpaired upstream of 5th Line, but stream health declines to ratings of below potential or impaired downstream of 5th Line.

The Ontario Hydro Network mapping (2015) provides permanency data for streams in Ontario. The South Innisfil Creek Drain is a permanent stream.

5.2 Characteristics of Waterbody

In Table 1.0 below the results of the aquatic habitat assessments performed on April 11 and 20, 2018. The aquatic habitat assessments were performed by Burnsides Aquatic Ecologists. The aquatic habitat assessments were performed following the MTO Environmental Guide for Fish and Fish Habitat (MTO, 2009). On April 11, 2018, Burnside Aquatic Ecologists walked the Drain from 5 Sideroad to 4th Line assessing and observing existing aquatic habitat conditions. Weather conditions during the April 11 site visit were overcast and cool with some minor snow falling. On the April 20 site visit, the weather conditions were sunny with snow on the ground from previous events and Burnside Aquatic Ecology staff walked the Drain from 4th Line to 5th Line. During both visits water clarity allowed the aquatic ecology staff to observe the aquatic habitat conditions (morphology and substrate) within the Drain. For full details regarding the existing aquatic habitat conditions and photos of the Drain, please refer Appendix D, which contains the Aquatic Assessment that was submitted to the DFO Fisheries Protection Program on July 11, 2018 as part of the Request for Review submission.

Between 15th Line and Highway 400 the lands surrounding the Drain are comprised of a mature forest and agricultural lands. Between Highway 400 and 2nd Line the lands surrounding the Drain are comprised of a golf course and agricultural lands. Between 2nd Line and 3rd Line the Drain flows through the market garden lands with limited riparian vegetation (shrubs and mature trees), the banks are highly eroded and the aquatic conditions are highly degraded. Between 3rd Line and 4th Line the lands surrounding the Drain featured more mature vegetation and some agricultural lands as well. Between 4th Line and 5th Line the Drain flows through agricultural lands and some densely forested areas as well.

During the aquatic habitat assessment completed on April 11th Burnside Aquatic Ecologists observed 4 migratory Rainbow trout (*Oncorhynchus mykiss*) within the South Innisfil Creek Drain between 3rd Line and 4th Line. In addition, Burnside noted several spawning redds downstream of 4th Line. Rainbow trout were not observed on these redds and many of them were dug down to the till. A single Rainbow trout was observed on April 20, approximately 20 m downstream of 5th Line.

In addition to the conditions observed and reported in Table 1.0, Burnside notes that the Highway 400/Reive Boulevard Crossing is of interest to the fish habitat conditions in the Drain. The Highway 400 crossing is comprised of 6 culverts; 3 beneath Reive Boulvard and 3 beneath Highway 400, downstream of Reive Boulevard. Beneath Highway 400 there is a 2,400 mm corrugated steel pipe (CSP) and two 5,100 x 2,900 corrugated steel pipe arch (CSPA) culverts. All three of these culverts have been lined with concrete. Beneath Reive Boulevard the three culverts are comprised of a 2,100 mm CSP and two 4,800 x3,650 mm CSPA culverts, none of which were lined with concrete. The CSP culverts beneath both right-of-ways convey flows during low flow conditions, and the CSPA culverts function as overflow culverts. The outlets of the single CSP and two large concrete lined CSPA culverts beneath Highway 400 were all elevated 0.5 to 1.0 m above the existing water level and represented barriers to fish movement upstream through the Drain.

The outlet of both concrete lined culverts was also elevated and would not allow for the passage of any species of fish during periods of low flow, which was observed during the assessment of fish habitat within the Drain. Wooden 2”x4” planks within the outlet of single CSP culvert also appeared to be constricting flow which contributes to velocity and seasonal barriers observed at this crossing. Throughout both of the concrete lined CSPA culverts there was a large amount of silt and fine sediment accumulated in the bottom of the culvert. The concrete lined CSPA culverts were inverted higher and likely only convey flows during periods of high water including the spring freshet and large precipitation events. The single CSP culverts conveys flow during all conditions.

Table 1: Summary of Aquatic Habitat Conditions

Section of the Drain	**Mean Wetted Width and Depth (m)** **Mean Bankfull Width and Height**	**Typical Substrate observed**	**Habitat conditions**
15th Line-Highway 400	3.5, 0.5, 10.0, 1.5	Sand, minimal gravel	Channel lacks diversity in bottom depth, morphology and substrate. Very sandy substrate. There are riparian trees present, as well as shrubs and grasses, but this vegetation is not thick enough to provide a dense overhead canopy and bank structure. Eroded banks are present in some locations and the banks

Section of the Drain	Mean Wetted Width and Depth (m) Mean Bankfull Width and Height	Typical Substrate observed	Habitat conditions
			are moderately unstable. Some woody debris jams were present.
Highway 400-2nd Line	3.0, 0.3 8.0, 1.2	Sand	Low habitat quality. Very eroded and vulnerable banks, no low flow channel, no channel shading, no overhead cover (undercut banks, overhanging vegetation), uniform channel lacking diversity in morphology, channel bottom depth and substrate.
2nd-3rd Line	4.0, 0.2 10.0, 1.5	Sand	Very low habitat quality. Very eroded and vulnerable banks, no low flow channel, laminar flow and limited depth in low flow conditions, no channel shading, no overhead cover (undercut banks, overhanging vegetation), uniform channel lacking diversity in morphology, channel bottom depth and substrate.
3rd-4th Line	2.5, 0.4 7.0, 1.4	Sand, Gravel and minimal cobble	Habitat quality higher than downstream sections. Channel meanders more with a higher diversity in morphology (more riffles, runs and pools), substrate and channel bottom depth than downstream sections. Banks were more stable and less vulnerable to erosion. Well vegetated with shrubs (ROD), grasses, and some riparian trees. Likely well shaded when grasses and shrubs mature. Well defined 2-stage channel present in areas through the section between 3rd and 4th Line. Rainbow Trout observed spawning in several locations.
4th-5th Line	2.5, 0.3 5.0, 1.8	Sand, Gravel, Cobble	Highest quality habitat was present in this section. There is a high diversity of channel bottom depth, substrate and morphology. There are many deposits of

Section of the Drain	Mean Wetted Width and Depth (m) Mean Bankfull Width and Height	Typical Substrate observed	Habitat conditions
			gravel in this section of the drain. The channel meanders though the forested section much more than in the southern agricultural lands. Eroded banks are present in the section of the drain which flows through agricultural land. Within the forested section many beaver dams are present. Debris jams are also present in the form of woody debris. Within the forested section the drain is well shaded, and the banks are slightly unstable. Overhead cover is present in the form of undercut banks, large woody debris deposits and overhanging vegetation.

5.3 Fish Species and Abundance Present

The list of species observed by Nottawasaga Valley Conservation Authority (NVCA) through a 2000 study was available in the MNRF ARA Mapping and these species are presented below in Table 2 below. In addition, Burnside Aquatic Ecology staff noted the presence of 4 adult Rainbow Trout during the aquatic habitat assessments performed on April 11 and 20, 2018. Department of Fisheries and Oceans staff also noted that chinook salmon (*Oncorhynchus tshawytscha*) have been observed spawning upstream of Highway 400, although it is not known how far upstream they travel. Department of Fisheries and Oceans (DFO) SAR and the Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) mapping indicated that no aquatic SAR or aquatic SAR habitat is present within the Drain or in downstream reaches.

Burnside did not conduct any fish sampling within the Drain other than the visual observation of the fish species during the aquatic habitat assessment. It is likely that some of the baitfish species listed in Table 2 inhabit the Drain, and the conditions in the Drain, particularly between 5th Line and 3rd Line would provide rearing and nursery habitat for the migratory species (Rainbow trout) which are known to inhabit the Drain.

Table 2: Fish Species Historically Observed in the South Innisfil Creek Drain

Species Name	Scientific Name	Thermal Regime Preference
Brook Trout	*Salvelinus fontinalis*	Cold
Creek Chub	*Semotilus atromaculatus*	Cool
Rainbow Trout	*Oncorhynchus mykiss*	Cold
Eastern Blacknose Dace	*Rhinichthys atratulus*	Cool
Central Mudminnow	*Umbra limi*	Cool
Johnny Darter	*Etheostoma nigrum*	Cool
Brook Stickleback	*Culaea inconstans*	Cool
Brown Bullhead	*Ameiurus nebulosus*	Warm
Longnose Dace	*Rhinichthys cataractae*	Cool
Mottled Sculpin	*Cottus bairdii*	Cold
Northern Redbelly Dace	*Chrosomus eos*	Cool
Pumpkinseed	*Lepomis gibbosus*	Warm
White Sucker	*Catostomus commersonii*	Cool
Fathead Minnow	*Pimephales promelas*	Warm

Source: MNRF ARA Survey Data Point (2000)

5.4 Methodology for Determination of Information in Section 5

The information in Section 5.1 was derived from the following sources:

- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Drain Mapping (2018);
- Ministry of Natural Resources (MNRF) Aquatic Resources Area (ARA) Mapping (2015);
- NVCA Innisfil Creek Subwatershed Health Check (2013);
- NVCA Innisfil Creek Subwatershed Plan (2006); and
- Ontario Hydro Network mapping (2015).

The information in Section 5.2 was obtained from the aquatic habitat assessment performed on April 11 and 20, 2018 following the MTO Environmental Guide for Fish and Fish Habitat.

The information in Section 5.3 regarding the fish species present in the Drain was derived from the MNRF ARA mapping, observations from the aquatic habitat assessment, through personnel communication with DFO staff Ben Didemus and Steve Cho, and through review of the DFO SAR distribution and Critical Habitat Mapping (DFO, 2018).

6.0 Description of Effects on Fish and Fish Habitat

6.1 Fish Species and Life Stages Affected by Proposed Works

Overall the Drain is considered to provide direct fish habitat to fish species that are considered to be part of, or contribute to, a Commercial, Recreational and/or Aboriginal fishery as defined by the *Fisheries Act*. Please refer to Table 2 above for the fish species which are likely to be affected by the proposed works. As Burnside is proposing to work between the in-water works timing windows which restrict in-water work (work to be completed June 15 - September 30 it would not be expected that adult rainbow trout and chinook salmon would be affected by the proposed works as adult individuals of these species would not inhabit the system during the summer months. For brook trout and the other species which are listed in Table 2, adults and all other life stages could potentially be affected. Work will not occur during the fall timing window (September 30-June 1) to protect the spawning adults, eggs, and emergent brook trout. Working outside of the spring timing window (construction to commence after June 15) is proposed to protect spawning spring species (i.e. rainbow trout) in their critical life stages (spawning adults, eggs, larvae, etc.).

It is possible that through the construction of the proposed works juvenile Rainbow trout, Brook trout, and Chinook salmon could be affected by the in-water works. All life stages of the fish species, except for adult Rainbow trout and Chinook salmon, listed in Table 2 could be affected by the proposed works as they can potentially inhabit the Drain throughout the year.

Based on the April 2018 aquatic habitat assessment, it is apparent that most of the assessed length of the Drain is not suitable habitat for Rainbow trout spawning; however Rainbow trout use the Drain for access to the high quality habitat in the upper reaches upstream of 3rd Line. Upstream of 3rd Line Burnside Aquatic Ecology staff visually observed 4 Rainbow trout on April 11, 2018. Two of these fish were moving downstream through the system and multiple spawning redds were identified upstream of 3rd Line. Spawning habitat in the form of gravel and larger stone clear of sediment deposition with flowing water flowing over the top of the gravel was present in the watercourse above 3rd Line. Downstream of 3rd Line, high quality spawning habitat was not present since the Drain is dominated by a flat bottom low gradient channel that lacks a diversity in channel depth and substrate. Sand and fine sediment is the dominant substrate located within this section with minimal gravel and granular substrate present.

6.2 Extent and Type of Fish Habitat to be Affected

Approximately 9,917m of riverine fish habitat are expected to be affected by proposed works through the construction and the improvements to the Drain. Spawning habitat for migratory salmonid species is present in the upper reaches of the Drain, upstream of 3rd Line. There are multiple deposits of gravel and cobble upstream of 3rd Line which function as spawning habitat and riffles. These deposits are not continuous throughout the reach between 3rd and 5th Line. Burnside observed limited locations of spawning habitat for migratory salmonids between 3rd Line and 5th Line. The total length of this section is 3,562 m however a very limited amount of this section of Drain contains habitat appropriate for spawning. Gravel deposits and riffles were very limited in number through the 3rd Line to 5th Line section of the Drain, and therefore the entire length (3,562m) is not considered to be spawning habitat. Downstream of 3rd Line spawning habitat for migratory salmonids was absent, however this reach would function as a migratory route for those species.

Through the Drain from 15th Line to 5th Line habitat for species of fish listed in Table 2 and juvenile migratory salmonids is present and used during times of the year where suitable thermal conditions exist for rearing and outward migration. The branch drains which flow into the main Drain contain seasonal habitat for baitfish species but are likely seasonal in nature and function as roadside drains. Between 15th Line and 3rd Line the Drain lacks summer refuge pools, overhead cover, diverse substrate and channel bottom depth. Upstream of 3rd Line there is some limited overhead cover, refuge areas and diversity in channel bottom depth and substrate.

6.3 Magnitude, Geographic Extent and Duration of the Effects to Fish and Fish Habitat

In the November 14, 2018 letter from the DFO explaining the requirement for *Fisheries Act* Authorization DFO listed, specifically, what is considered to be serious harm as defined by the Fisheries Act with regards to the proposed improvements to the Drain. The serious harm is specifically:

- The removal of pool-riffle morphology and undercut banks within the Innisfil Creek Drain which provides cover and refuge for fish.
- The removal of gravel riffle substrate which is used for spawning by numerous salmonid species in the creek.
- The removal of riparian vegetation and the widening of the channel which may result in increased water temperatures in Innisfil Creek Drain, which is a coldwater creek.

The removal of the riffle pool morphology will be relatively short-term in nature as Burnside is proposing to construct pool-riffle structures as noted in Section 1 of this report. Where most of the excavation is taking place (5 Sideroad to 3rd Line) there is a noted lack of pool-riffle morphology. Also noted in Section 1 of this report is the construction of sedimentation basins which will function as pools within the Drain.

Burnside is also proposing to salvage gravel substrate where it is encountered during excavation. This gravel substrate will be reused to create riffles or provide habitat and will be replaced in the bottom of the Drain to enhance the granular content of the substrate. It is noted that there is a lack of gravel substrate between 15th Line and 3rd Line in the Drain.

Riparian vegetation in the form of shrubs (red osier dogwood and shrub willow) will be removed through the widening of the Drain and the water temperature of the Drain may increase as a result of the widening. Burnside is proposing to reuse suitable shrubs and plant trees in the riparian lands on the south or west banks of the Drain in locations where there is a lack of mature riparian trees in order to provide shading of the Drain. The species of trees planted will be chosen with guidance provided by the NVCA stewardship team. A total of 425 trees will be planted on the Drain banks in two rows with trees spaced 1/0.8 linear m of Drain, on either the south or west banks. Please refer to Appendix B for the planting locations.

Burnside is also proposing to establish a permanent 3.0 m vegetated buffer on each bank of the Drain, which is absent in certain sections of the drain particularly between 2nd and 3rd Line. While the Drain will be widened there will be a two-stage channel constructed with a vegetated benched area and a low-flow channel. This will allow for the conveyance of a cooler and well contained base-flow during periods of low precipitation as compared to the existing channel, which conveys a very laminar and wide flow during low precipitation periods. It is also noted that the CSP culverts beneath 4th Line will be replaced with a Barefoot Box Culvert™ which will allow for potential thermal mitigation through groundwater discharge through perforations in the structure within a reach that has historically experienced thermal impacts during summer conditions. The likely effects from the construction of the proposed Drain Improvements may result in the potential mortality of fish and sediment suspension/releases within the Drain due to the use of industrial equipment, 'dredging' of the drain, vegetation removal and the replacement of culverts in the Drain. Due to the length of the Drain, in-water works will proceed during low flow conditions as de-watering is not feasible from a practical and cost perspective. Mortality of fish will be minimized through the fish exclusion measures described in Section 2.13.

The works will take place during the appropriate in-water works timing window (June 15-Septemebr 30 of a given year). It is difficult to anticipate at this time how long construction will take as there are variabilities with weather and other environmental constraints. However, works will not proceed before or after the in-water works timing window.

Changes to the habitat structure will occur through the modifications and improvements to the Drain through large woody debris manipulation for thalweg establishment, channel deepening and widening, creating pools for sedimentation basins and riffles in the Drain. The existing conditions in the Drain lack diversity in terms of morphology and channel bottom depth. The deeper sedimentation basins are not proposed to retain flows and warm them as the low-flow channel will be constructed through them. The replacement of the culvert beneath 4th Line with the Barefoot Box Culvert™ is proposed in the design of the Drain. This structure will provide improved fish passage through 4th Line crossing, in addition to potentially conveying cold-water to the system through this unique culvert design.

Fish passage through the Drain will be improved through culvert replacements beneath Highway 400-Reive Boulevard and 4th Line as well as in-stream barrier removal. As mentioned above the culverts beneath Highway 400/Reive boulevard do not allow for fish passage during low flow conditions and the culvert beneath 4th Line also does not allow for ideal fish passage conditions during low flows. There are numerous debris jams, beaver dams (some are 1.5 m high), and high points within the Drain that will be removed through the improvements that will allow for improved fish passage in low flow conditions.

6.4 Methodology for Section 6

The information above pertaining to the fish species present was compiled from the MNRF ARA mapping. The information regarding the habitat features and attributes present in the subject watercourses was obtained from the aquatic habitat assessment performed on April 11 and 20, 2018 following the MTO/DFO/MNRF Environmental Guide for Fish and Fish Habitat. The effects, geographic extent and timelines of the proposed works are known from Burnside Drainage Engineers surveys of the Drain and experience with municipal drain construction and improvements.

7.0 Description of Measures and Standards to Avoid or Mitigate Serious Harm to Fish

The works described in Section 1 of this report cannot be avoided. The banks of the drain frequently overtop, flooding the lands surrounding the Drain and in the lowlands of the watershed. The existing drain does not have the capacity to convey the 2-year rainfall event, which is the generally accepted minimum design standard for open municipal drains. This flooding can cause severe crop damage or loss in an area that provides high quality produce within the Market Gardens. Crop loss can occur within 24 hours if crops are inundated with water. Many farms typically turn to heavy pumping of flood waters to avoid crop damage. As such there is a need to improve the Drain to increase conveyance capacity so that there is no overtopping during the 2-year event. In addition, in the areas in which agricultural land use is most intensive, the Drain is degraded from a fish habitat perspective. Burnside will incorporate fish habitat improvements through design as discussed for this section of the Drain.

Construction of the Drain improvements will be within the in-water timing windows for the spring and fall spawning species which inhabit the Drain with work being completed between June 15th to September 30th of a given year. MNRF have confirmed that this timing window for in-water works is acceptable.

Plantings of riparian trees will be completed in order to provide shading of the Drain and additional structure and stability to the bank. Please refer to Appendix B for planting locations. In addition, Burnside is proposing to vegetate a portion of the benched area of the two-stage low-flow channel with sod salvaged from the existing bank of the Drain and live staking. Where possible the contractor will work on only one side of the bank, leaving the vegetation on the south and west bank undisturbed to promote maximum shading of the Drain. The disturbed banks of the Drain will be revegetated through a combination of sod-matting, live staking and seeding and tree planting. A 2-stage channel is going to be constructed through the Drain, including the areas where it does not currently exist (between 3rd Line and 15th Line). In this 2-stage channel the benched area will be vegetated with sod material currently in place, live staking or a seed mixture. A low-flow channel will be constructed through the Drain bottom. Multiple sediment basins are proposed for construction at the stations noted in Section 1.0 of this report. These sediment basins are proposed for construction in the Drain in order to encourage sediment deposition during construction and post-construction and will be cleaned out during Municipal Drain maintenance. These basins are going to be constructed on meander bends in the Drain where they will not fill in rapidly with sediment and become unusable. These basins will be maintained by the Drainage Superintendent in the future. In addition, a rock check dam will be constructed downstream of 5 Sideroad (Sta. 1+120) to prevent sedimentation of the downstream reach of the natural watercourse.

Burnside is proposing “fish exclusion” within the work area by installing “block nets” at the upstream and downstream limits of the in-water works within each section of the Drain. Once the upstream block net is installed Burnside will sweep downstream with a seine net to ensure fish are pushed downstream of the work area. Burnside is proposing to use a seine net that will have a float line and weighted lead line to ensure full depth coverage within the channel. The seine net will be pulled downstream with a worker on each bank to push and direct fish downstream without capturing them. At the downstream limit of work area, a block net will be left in place to prevent fish from moving upstream into the work area and could capture floating debris transported downstream during the construction. This method of fish exclusion will ensure that fish are not trapped in the work area during the in-water works. This fish exclusion method will be utilized as work proceeds throughout the Drain. All fish exclusion will occur under a License to Collect Fish obtained from the MNRF.

Debris removals in the Drain will commence in order to remove flow obstructions. Large woody debris in place in the Drain and on the banks will be manipulated to provide overhead cover, shading and refuge areas for fish species, and to promote the establishment of the thalweg in the Drain.

A Burnside Aquatic Ecologist will monitor locations where vegetation and substrate is salvaged from the existing Drain during the construction process. A Burnside Aquatic

Ecologists will ensure salvaged materials are being relocated to suitable locations. Post-construction, Burnside will monitor vegetation establishment, sediment deposition within the sedimentation basins, channel stability, rainbow trout spawning and bank protection measures through the use of photographic records. Burnside will observe fish passage conditions in the Highway400/Reive Boulevard Crossing and the 4th Line Crossing. For a detailed description of the offsetting measures monitoring program please refer to Sections 9.4 and 9.6 of this report. Burnside will monitor vegetation establishment to ensure vegetation on the channel banks and salvaged vegetation is growing. Should a major flooding and/or precipitation event occur, then Burnside will monitor the as built conditions to ensure that the seeding or plantings have not been washed away. If seeding coverage has been then compromised, then hydroseeding will be required to re-seed the impacted area. Channel stability and morphology will be monitored to ensure the sediment traps are not inundated with sediment and that the channel has not widened or eroded the banks of the Drain. Bank protection measures will be monitored to ensure that high flow events within the channel have not damaged the banks. If damage has occurred, then they will be repaired by the contractor. Burnside is proposing to monitor as built and post-construction conditions and the monitoring measures for the post-construction monitoring are listed below in Section 9.4 of this report.

8.0 Description of the Residual Harm to Fish

8.1 Outline of Proposed Works, Dates and Serious Harm to Fish

All in-water works outlined in Section 1 of this report will be completed during the relevant in-water working timing window (June 15-September 30 of a given year). Serious harm to fish that potentially will occur through the design of the proposed works has been identified by the DFO to be the removal of gravel substrate used for spawning habitat by migratory salmonids; the removal of pool-riffle morphology and undercut banks; and the removal of riparian vegetation and the widening of the Drain which has the potential to increase water temperatures in the Drain, which is a cold water watercourse.

8.2 Avoidance Measures

As previously described in this report, the proposed works cannot be avoided. The lands surrounding the Drain are frequently flooded by storms categorized below a 2-year event. Burnside has elected to use some construction methods to lower the impact to the habitat within the Drain, including only completing works on one side of the bank.

8.3 Measures and Standard to Mitigate Serious Harm to Fish

Please refer to Section 7.0 of this report for a full description of the measures to mitigate serious harm to fish that will be implemented during the construction of the Drain improvements. They generally include the following:

- Implementation of a fish exclusion program during construction;
- Construction of a rock-check dam to remain in place during construction at Sta. 1+120 to remove sediment from flow during construction;
- Vegetating the benched area of the low flow channel with a combination of sod-matting, live staking and seeding to promote an establishment of a rooted mass of vegetation;
- Planting 425 riparian trees in the locations noted in Appendix B;
- Establishment of a permanent 3.0 m vegetated buffer;
- Salvaging gravel and granular substrate where encountered during excavation;
- Excavating a low-flow channel within a 2-stage channel where widening and deepening of the Drain is proposed between 5 Sideroad and 3rd Line;
- Construction of 11 pool-riffle structures and 19 sedimentation basins;
- Repairing eroded banks with round river stone below the high-water mark and rip-rap/live staking above the high-water mark.
- Large woody debris manipulations in locations where debris jams will be removed and LWD is available; and
- Replacement of culverts beneath the Highway 400/Reive boulevard Crossing and the 4th Line crossing to improve fish passage and flow conveyance.

8.4 Residual Harm to Fish

Burnside does not anticipate that residual harm to fish will occur through the construction and design of the Drain improvements. The fish exclusion program, working within the appropriate timing window, and the construction of the sedimentation basins and rock-check dam are all proposed for use to lower the risk of serious harm during construction. The fish exclusion program will remove fish which potentially could be harmed by in-water works from the work area. Working within the timing window lowers the risk of harm for that fish species in vulnerable life stages. The sedimentation basins and rock-check dam will allow for sediment to be retained from flows during construction.

The use of sod matting on the crown of the slope of the low-flow channel bank will allow for the establishment of a rooted mass of vegetation. Burnside is also of the belief that establishing this rooted mass on the crown of the slope will expedite natural channel processes including the formation of undercut banks. Burnside is also proposing to manipulate large woody debris on the banks of the Drain in order to promote the establishment of a thalweg, as well as to provide overhead cover for fish species in the Drain.

It is not anticipated that a large amount of gravel substrate will be removed from the Drain. Where the excavation of the Drain is proposed, downstream of 3rd Line to 5 Sideroad, Burnside's Aquatic Ecology staff did not observe a large amount of gravel during the site visits completed in April of 2018. As previously mentioned in this report, Burnside is proposing to salvage and replace the gravel substrate encountered during excavation.

There is a limited amount of a pool-riffle morphology within the Drain, especially where excavation of the Drain is proposed. Burnside is proposing to construct 11 pool-riffle structures in the locations noted in section 2.10 of this report to provide potential spawning habitat for migratory salmonids. Sedimentation basins proposed for construction in the Drain downstream of 3rd Line will also provide refuge pools during low-flow periods and habitat for juvenile species of migratory salmonids.

Some vegetation will be removed during construction of the Drain improvements. Burnside is proposing to plant 425 trees at the locations noted in Appendix B. In addition, sod-matting, live staking and seeding will commence in order to promote an establishment of a rooted mass of vegetation on the banks of the Drain. There is also a permanent 3.0 m vegetated buffer written into the Final Engineer's Report and it will not be permitted to be removed by landowners.

The construction of the 2-3m wide low-flow channel within a 2-stage channel is proposed and is described in Section 1.1 of this report. The current conditions between 3rd Line and 5 Sideroad do not feature a low-flow channel or a 2-stage channel. By constructing the proposed channel Burnside anticipates that there will be cooler thermal conditions during periods of low-flow.

The replacement of the culverts beneath the Highway 400/Reive Boulevard crossing and the 4th Line crossing will allow for improved fish passage. The conditions through the Highway 400/Reive Boulevard crossing are outlined in Section 5.2 and Appendix D of this report. The replacement of the 4th Line CSP culverts with the Barefoot Box Culvert™ which will allow for potential thermal mitigation through groundwater discharge through perforations in the structure.

9.0 Offsetting Plan

9.1 Description of Measures to Offset Serious Harm

The following measures will be constructed in order to offset the serious harm caused to fish through the improvements to the Drain.

As mentioned earlier in this report, Burnside is proposing to construct a two-stage channel with a low-flow channel in the Drain where it will be widening and deepened between Highway 400 and 3rd Line (Sta. 2+280 to Sta. 6+355). The banks where the widening and deepening will take place will be revegetated with a combination of seeding, live staking and sod-matting to promote the establishment of rooted vegetation to stabilize the banks, shade the Drain, and remove sediment from runoff. A total of 4,730 m^2 of sod-matting will be used to establish a rooted mass of vegetation over the crown of the low-flow channel slope. A total of 68,350 m^2 of seed will be applied to disturbed areas above the low-flow channel after excavation and grading of the channel slopes to provide additional riparian vegetation.

In the Final Engineer's Report for the Drain there is a 3.0 m permanent vegetated buffer included to provide filtration during run-off and increase water quality. This 3.0 m buffer will exist on the total length the length of the Drain thus 56,080 m^2 of the tops of the bask will be permanently vegetated. This buffer will increase filtration of runoff water by retaining water and allowing sediment to settle out of the water before it enters the Drain. The buffer will assist with decreasing pollution and silting problems in the downstream portions of the Drain and crop residue, trash and debris should also have time to settle out and remain on the lands.

Burnside is proposing to construct 19 sedimentation basins between 5-10 m in length and 0.5-0.6 m in depth which will function as pools post-construction. Sedimentation basins downstream of 3rd Line will be 10m in length; upstream of 3rd Line they will be 5m in length. These will be maintained by the Drainage Superintendent in the future in order to avoid large full-cleanouts of the Drain. These sedimentation basins will also serve as refugia pools for fish, particularly species of baitfish and juvenile salmonids during periods of low-flow. The sedimentation basins will increase the diversity of the morphology of the Drain.

Burnside is also proposing to construct 14 pool-riffle structures in the Drain, upstream of 3rd Line where the existing conditions provide spawning habitat for migratory salmonids, thus enhancing the spawning habitat in place. Burnside is also proposing to conserve a riffle structure that was observed during the April 11, 2018 site visit (located at Sta. 6+323). Currently the existing Drain contains substrate comprised mostly of sands and other fine sediments, with gravel deposits being limited to the sections of the Drain upstream of 3rd Line and some minimal gravel downstream of Highway 400. When encountered the granular substrate (gravel, cobble, and/or boulders) located within the Drain will be salvaged and relocated to form fish habitat features as directed by an Aquatic Ecologist at the time of construction. The total area of the pool-riffle structures and sedimentation basins is 895 m^2.

Plantings of trees will take place on 140 m of the south bank of the Drain downstream of 5 Sideroad and upstream of Highway 89. 112 trees will be planted in two rows at a density of 1 tree per every 2.5 linear meters of Drain, a density that was recommended by Shannon Stephens (NVCA Healthy Waters Program Coordinator). A total of 208 trees will also be planted downstream of Highway 400, upstream of 5 Sideroad, at a density of 2.5 trees per linear metre thereby shading 260 m of the Drain. These trees will be planted on the south bank of the Drain as well. Upstream of 4th Line, and downstream of 5th Line, 64 trees will be planted on the south bank of the Drain at a density of 1 tree per 2.5 m of Drain shading 80 m of the Drain. A total of 480 m of the Drain will be shaded by these planted trees, it is noted that these trees are being planted in areas that are currently not vegetated with mature riparian trees. A total of 895 linear meters of the Drain will have trees planted on the bank. The average width of the bankfull channel through the sections where trees will be planted is 8.3 m. Once the trees are mature there is the potential they will shade approximately 7428.5 m^2 of the Drain.

Burnside is also proposing to manipulate the large woody debris in place in the Drain in order to promote the establishment of a thalweg and provide overhead cover for fish species inhabiting the Drain. Several debris jams and remnant beaver dams are located in the Drain and these will be removed and the wood, if of a high quality, will be used as large woody debris manipulations. These manipulations will take place at the locations noted in Section 1.0 of this report. Please note that these locations will be field fit and placed in locations directed by the on-site aquatic ecologist during construction.

There are 20 locations in the Drain where heavily eroded banks have been observed. Burnside is preparing to repair these eroded banks with round riverstone below the highwater mark and rip-rap above the high-water mark. If available large-woody debris will be used to repair these banks or may be combined with the round river stone for bank protection. The stabilization will result in 433 linear m of eroded bank being repaired.

There are two culvert replacements that are considered to be improvements to fish habitat in the Drain. The replacement of the structures beneath Highway 400-Reieve Boulevard crossing and embedding them at the level specified in the Final Engineer's Report will allow for improved fish passage during periods of low-flow. The replacement of the culverts beneath 4th Line with the Barefoot Box Culvert™ will allow for potential groundwater discharge and improved fish passage during periods of low-flow as well.

9.2 Analysis of Offsetting Measures

The two-stage channel with a low-flow channel will offset the serious harm to fish by creating a channel that is more confined, thus conveying a cooler base-flow during periods of low precipitation than the existing channel does. The existing conditions between 15th Line and 3rd Line do not allow for the conveyance of a cool-cold baseflow during periods of low precipitation. Flows are laminar, and thus potentially warmed, in this section. The construction of the low flow channel will allow for conveyance of flows within a confined channel preventing warming of the flow during low-precipitation periods thus improving the degradation to the thermal regime of the Drain observed in the existing conditions. The two-stage channel will be vegetated and stabilized through the use of sod-matting, live staking, seeding or a combination of these methods. The immediate littoral benches, also known as floodplain benches, will be vegetated with sod-matting, and in some instances live staking, to enhance the establishment of a rooted mass of vegetation to provide structure of the banks and erosion protection. The sod-matting will also provide filtration of sediment from overland runoff. Over time the sod-matting, and live-taking vegetation will mature and overhang the Drain which will provide cover and feeding areas for resident and migratory species *(salmonids)* of all life stages.

The sedimentation basins will provide an area of sediment retention during and after construction which will prevent the need for full-cleanouts in the future. These will be maintained by the Drainage Superintendent in the future. They will also provide areas of summer refugia for species of fish in the Drain, over wintering habitat and nursery areas for fish in the Drain.

In the existing Drain there is a lack of a riffle-pool morphology. A total of 11 pool-riffle structures are proposed for construction in the Drain and these could provide spawning habitat and nursery areas for migratory salmonids. The riffles provide an area to spawn and the emergent salmonids live amongst the gravel until their yolk sacs are consumed and they emerge as fry. The construction of the pool-riffle structures, as well as the sedimentation basins, will increase diversity of the habitat features in the Drain.

The debris jam and beaver dam removals will allow for improved migration of fish species in the Drain during periods of low-precipitation. Burnside is planning to manipulate wood from these jams and dams, as well as suitable wood (cedar preferred) from downed and rafted matured trees, to promote the establishment of a thalweg and provide overhead cover for fish species in the Drain. The woody debris will also function as a food source for fish by providing habitat for insects, and cover for prey species of fish inhabiting the Drain.

In order to prevent erosion and subsequent sedimentation, Burnside will install a 3.0 m vegetated buffer on each bank of the Drain and this buffer will be written into the drainage report. The two-stage channel will feature a benched area that will be vegetated with sod matting (where sod material is available), live stakings and/or seeding. In particular, shrubs and red osier dogwood will be salvaged to be replanted on the disturbed banks of the Drain. The existing banks of the drain between 2nd Line and 3rd Line do not contain significant vegetation and the planting and establishment of vegetation on these banks will provide stabilization and near shore shading. There are numerous sections with eroded banks noted in Section 1.0 of this report that will be repaired with the use of round river stone and large woody debris. This will prevent erosion of the banks and subsequent sedimentation of the Drain. The stone and woody debris will also serve as habitat for organisms (insects, crayfish, benthic invertebrates, etc.) and feeding areas for fish.

As mentioned above where gravel and granular materials are encountered during construction Burnside is proposing to salvage and relocate the granular material in the Drain. Relocating the material salvaged from the Drain will expedite the naturalization processes within the Drain and the granular material can potentially be used by migratory salmonids for spawning purposes. The granular materials also provide habitat for fish food sources (periphyton, invertebrates, crayfish etc.). The reuse of granular substrate will also expedite and improve the naturalization process within the Drain.

The culverts beneath Highway 400 and Reive Boulevard are considered to be barriers to fish migration during low-flow conditions within the Drain. Burnside will replace these culverts with culverts embedded at an invert that will allow for improved fish passage conditions during periods of low flow.

9.3 Description of Measures to Prevent Harm During Construction of Offsetting Measures

Burnside is proposing to work within the relevant in-water works timing window for the Drain (in-water works to commence between June 15 and September 30 of a given year). Working within the in-water works timing window is applicable to the construction of the offsetting measures as well, thus ensuring fish during their spawning and vulnerable life periods are protected from harm resulting from in-water works.

Burnside is proposing to exclude fish from a given work area through following the fish exclusion method outlined in Section 2.13 of this report.

The DFO Guidance for Repairing and Maintaining Municipal Drains in Ontario states that sediment traps can be created as an offsetting measure in A, C or E drains. The South Innsifil Creek Drain is an unrated drain where the sedimentation basins are proposed for construction. Currently sediment traps are not present within the Drain, therefore the 18 sediment traps proposed by Burnside will alleviate the need for full-cleanouts of the Drain in the future. During construction they will capture suspended sediment activated in the Drain through the in-water works. There will also be a rock check dam installed at Sta. 1+120 to capture and retain sediment activated during construction. This rock check dam will be removed from the Drain post-construction and will not obstruct fish migration outside of the in-water works timing window.

During the deepening and widening of the Drain only vegetation on one side of the Drain will be disturbed, although sod-matting methods will be utilized with the existing materials. This will promote the establishment of a rooted mass of vegetation to filter sediment and provide structure to the bank. Seeding with an approved meadow mix as described in Section 2.4 of this report will be conducted on lands where sod materials are not readily available.

9.4 Description of the Monitoring Measures

Burnside is proposing to monitor conditions after the spring freshet, during extreme low-flow periods in the summer, and in the fall after the effects of summer have occurred and the vegetation on the banks of the Drain has matured. Burnside Aquatic Ecologists will monitor the conditions with regards to the offsetting measures listed below:

- Establishment of sod-matting, seeding and live staking;
- Large woody debris and round river stone placement;
- Depth in sedimentation pools is maintained and functioning;
- Pool-riffle structures are maintained and functioning;
- Erosion of the low-flow channel banks;
- Fish use of natural features added to the Drain, including rainbow trout spawning habitat;
- Fish passage through culverts; and
- Success of tree plantings and the 3.0 m vegetated buffer

Burnside will monitor the above conditions over a period of 5 years. Burnside is proposing to monitor 1 and 2 years after construction and then again in the 5th year after construction. This monitoring schedule is subject to change if there are any issues with the offsetting measures. Please see Section 9.6 below for contingency measures that are in place in case the offsetting measures do not function as intended.

9.4.1 Riparian Vegetation Establishment Monitoring

The seeding and riparian vegetation that is salvaged and replanted (sod-matting) during the construction process will be monitored to ensure that it has established and is functioning to provide structure of the bank and shading of the Drain. Burnside will monitor the tree plantings to ensure they are in place and healthy. The live-staking will also be monitored to ensure they are in place and have not been removed. If the vegetation is successful in growing the first year after construction, Burnside will not monitor it in subsequent years. Please see Section 9.6 below for information regarding contingency measures if the vegetation is not successful and monitoring measures if that is the case.

Burnside will monitor the vegetated buffer and tree plantings during all 3 years of the 5-year monitoring program to ensure that the buffer has not been cut or removed and that the trees have not been removed.

9.4.2 Bank Protection and LWD Monitoring

Burnside will monitor the large woody debris manipulation to ensure that it is in place and protecting the vulnerable banks on bends in the Drain while providing fish habitat. Burnside will also monitor fish usage of woody debris in the water through the use of subsurface videos filmed with a GoPro™. The placement of the river stone, and woody debris where used, to protect eroded banks will be monitored to ensure that large flow events through the system (i.e., spring freshet) do not flush out the stone placed in the Drain. Bank protection measures and large woody debris manipulations conditions will be monitored at the three site visits through a given year. Burnside will monitor the large woody debris manipulations and the erosion protection measures during the three years of post-construction monitoring.

9.4.3 Sediment Trap Monitoring

Burnside will monitor the sediment traps to ensure they are not overly inundated with sediment and can function as intended to accumulate sediment and provide summer refugia and over wintering habitat for resident species. Sediment trap conditions will be monitored during the three site visits through for a period of 2 years.

Burnside will monitor as-built conditions in the low-flow channel to determine if erosional flows in the Drain are affecting the banks of the low-flow channel. This will be done through visual inspection and photographic records. Low-flow channel conditions will be monitored at the three site visits during the three monitoring years.

9.4.4 Rainbow Trout Spawning Occurrence Monitoring

Burnside will monitor rainbow trout spawning habitat in the Drain. Burnside will conduct a site visit in April of each year to look for spawning or evidence of rainbow trout presence, such as redds dug into the substrate. The monitoring for these species will be through visual observation or with a GoPro camera as appropriate. Sampling studies such as electrofishing will not occur. Burnside will also monitor the rainbow trout spawning during the spring freshet for a period of three years during the 5-year program.

9.4.5 Fish Passage Observations

Burnside will observe fish passage conditions in the culverts replaced in the highway 400-Reieve Boulevard crossing as well as the 4th Line crossing to ensure fish are able to pass through the replaced structures. Fish passage will be observed during the 3 years of monitoring in the 5-year monitoring program.

9.5 Timeline of Installation of Offsetting Measures

The offsetting measures are expected to be installed as construction of the Drain improvements are ongoing. Work will commence from downstream to upstream. As previously mentioned work will not occur outside of the in-water works timing window of June 15-September 30.

9.6 Discussion of Offsetting Contingency Measures

The offsetting measures described in Section 9.1 of the report area as follows:

- Establishment of vegetation on the low-flow channel banks through the use of sod matting, live staking, seeding or a combination of these methods;
- Construction of a two-stage channel with a low-flow channel;
- Implementing a 3.0m permanent vegetated buffer through the length of the Drain and tree plantings;
- Construction of riffle-pool structures;
- Construction of sediment basins;
- Large woody debris manipulations;
- Bank protection with round river stone below the annual highwater mark and rip-rap above the highwater mark; and
- Culvert replacements beneath the Highway 400-Reive Boulevard crossing and beneath 4th Line.

If the vegetation planted on the low-flow channel banks is not successful in terms of regenerating, then Burnside will propose to seed the banks of the Drain with a NVCA approved seed mixture as described in section 2.4 of this report. This will allow time for the seeds to germinate and vegetation to grow on the low-flow banks without being inundated by flood waters. This seeding would require another year of monitoring to ensure that suitable vegetation growth is successful. For example, if re-seeded in June, then Burnside would observe conditions in the fall following the seeding.

If there is evidence of erosion of the two-stage channel in the form of sloughing of the banks or other signs of erosion then Burnside has the ability to regrade the slopes from a 2:1 slope to a 2.5:1 slope. Burnside will monitor the banks during construction and if there are signs of erosion then they will be regraded to a 2.5:1 slope. If there is erosion after the construction (i.e., 2 years after construction) then Burnside will repair eroded slopes with live-stakings, round river stone or other erosion protection measures. There is a 1-year warranty period on the Drain construction, and during that period the contractor will be able to repair eroded banks as part of the original cost of construction. Any erosional events during the monitoring period will require future additional monitoring for a year during the three monitoring periods (spring freshet, summer and fall) to ensure how the repaired banks are functioning.

The 3.0 m vegetated buffer will be written into the Engineer’s Report for the Drain Improvements and thus it will remain permanent. The tree plantings will also be written into the Engineer’s Report for the Drain Improvements and are not permitted to be removed. If during monitoring Burnside notes the buffer or the trees have been removed, then the areas that have been removed will be re-seeded and replanted. Burnside would then monitor locations that had vegetation removed for an additional year to monitor establishment of the vegetation in the reseeded and replanted area.

If the riffle-pools are holding back water or are overly inundated with fine sediment, then the sediment will be removed and the riffles reshaped to allow for fish passage and to remove flow constriction. The sedimentation basins are intended to accumulate sediment overtime. If Burnside observes that the sedimentation basins are overly inundated with sediment during the monitoring period, then the fine sediment will be removed from the Drain. The sedimentation basins would then be monitored during the fall of the next year to observe sediment accumulation conditions within them.

The large woody debris manipulation and placements are removed from the Drain during major storm events then they could be rebuilt in locations where they are more protected. If they are collecting lots of trash and sediment from flows in the Drain, then they will be cleaned out to provide better fish habitat. If they are removed from the Drain or if they are not functioning as fish habitat then Burnside would monitor them for an additional two years.

The bank protection measures using round river stone below the annual highwater mark and rip rap above will be monitored to ensure the materials are still in place and that they are not causing erosion to occur downstream or on the opposite bank. If materials have been damaged or removed from major storm flows, then they will be replaced and embedded to not be damaged from future events. If they are causing additional erosional issues, then the bank protection measures will be adjusted to not cause erosion, and the additional erosional issues will be addressed with erosion protection measures. Burnside will monitor for an additional year if there are any issues with the round river stone bank protection measures.

Burnside does not anticipate any issues with the culvert replacements. Burnside will monitor conditions to ensure fish passage is possible (no downcutting or scour) and improved compared to the existing culverts. If there are fish passage issues (scour pools, culverts perched at the inlet or outlet, etc.) then rocky ramps or similar passage measures will be installed to ensure fish passage is not hampered in the replaced culverts. Any issues regarding fish passage will require additional monitoring during low-flow periods and during the spring freshet in the year after the passage issues have been addressed.

9.7 Cost Estimate of Installing Offsetting Measures

Burnside has prepared an estimate of the cost of all proposed offsetting measures and associated monitoring. This estimate is provided in Appendix E, and items are broken out by section of the Main Drain. While best management practices for drain maintenance will be followed for the branch drains, no offsetting measures are proposed for the branches, and as such, there are no offsetting costs. The items included in the estimate were discussed with DFO prior to submission. The cost of post-construction monitoring includes one year of contingency monitoring in addition to the proposed 3 years of monitoring. It should be noted that costs listed include the supply and installation of materials as well as any associated labour. Costs for Aquatic Ecologist time have been included in each applicable Drain section. Costs have been adjusted for inflation.

9.8 Description of Access to Lands Where Offsetting Measures are Located

The South Innisfil Creek Drain and its branches are a municipal drainage works under the Drainage Act. Section of the 12(1) of the Drainage Act states “The engineer or any of the engineer’s assistants when engaged in the performance of their duties during or after the examination of the locality may enter, measure along, ascertain the bearings of any line, plant the stakes that they consider necessary for the performance of the work and take levels on the land of any person.” As the Engineer appointed by the Town of Innisfil for this municipal drain project, access to any lands affected by the proposed works, including offsetting measure installation and monitoring, is granted to Burnside and its agents under this section of the Act. Work within the Drain will not commence prior to approval from the NVCA and the DFO.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

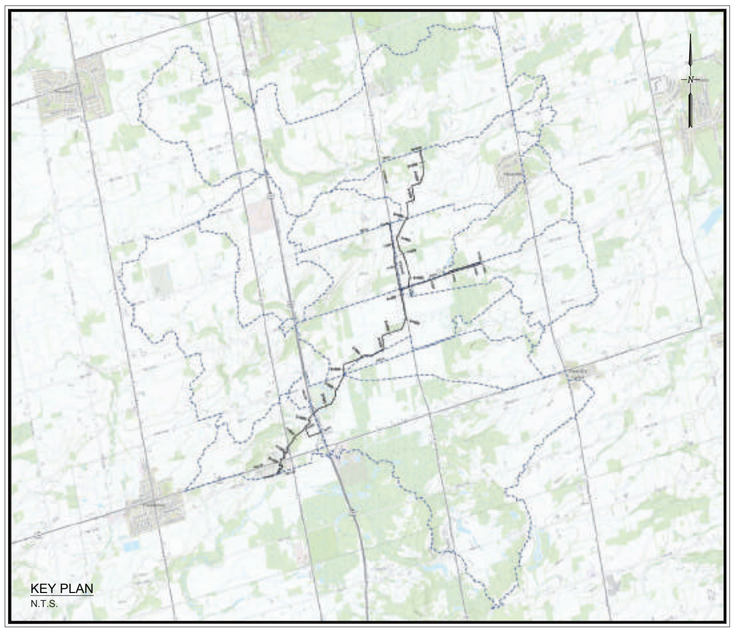
Detailed Design Drawings

TOWN OF INNISFIL

SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT

TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
TELEPHONE 1 (888) 436 3710
WEB WWW. INNISFIL.CA

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com



KEY PLAN
N.T.S.

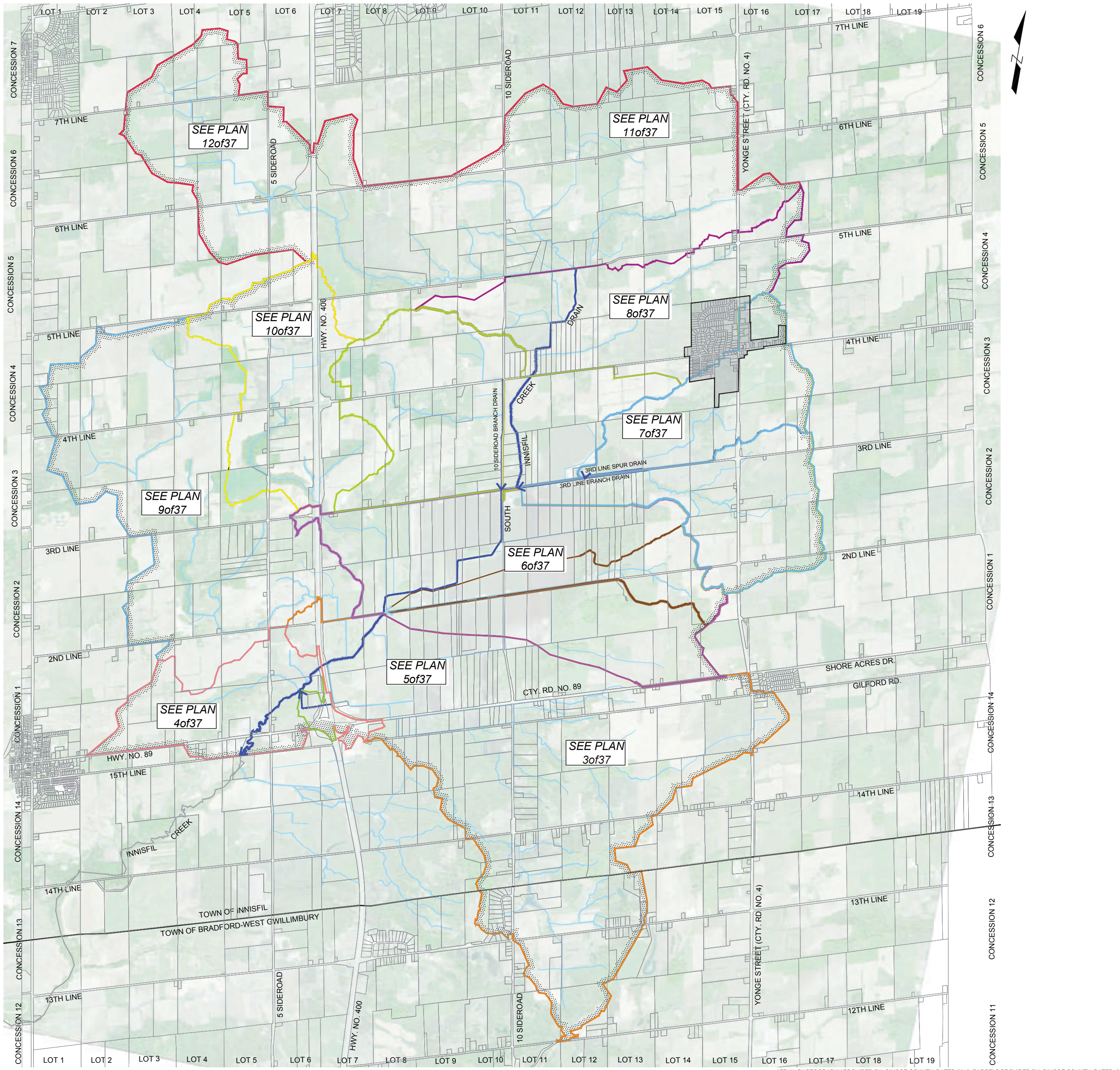
INDEX TABLE

Burnside Project No. 300038790.0000

APPLICATION FOR DFO AUTHORIZATION - 01/30/2019

TOWN OF INNISFIL - SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT

Burnside Project No. 300038790.0000 - APPLICATION FOR DFO AUTHORIZATION - 01/30/2019



KEY PLAN
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LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER 001-23414
- LANDOWNER M. VAN DER MAST

Notes

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2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.
4. All property lines are approximate and for information purposes only.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client

TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MASTER WATERSHED PLAN

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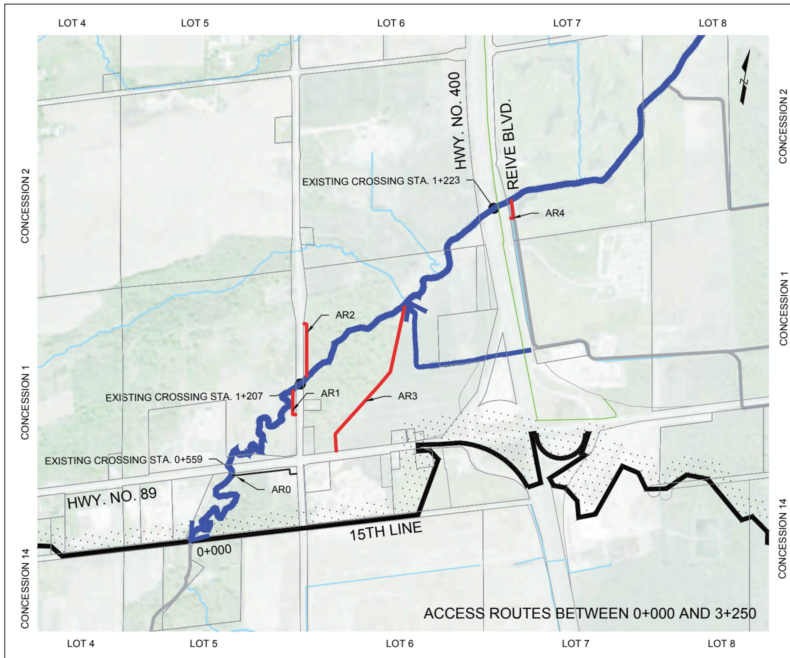

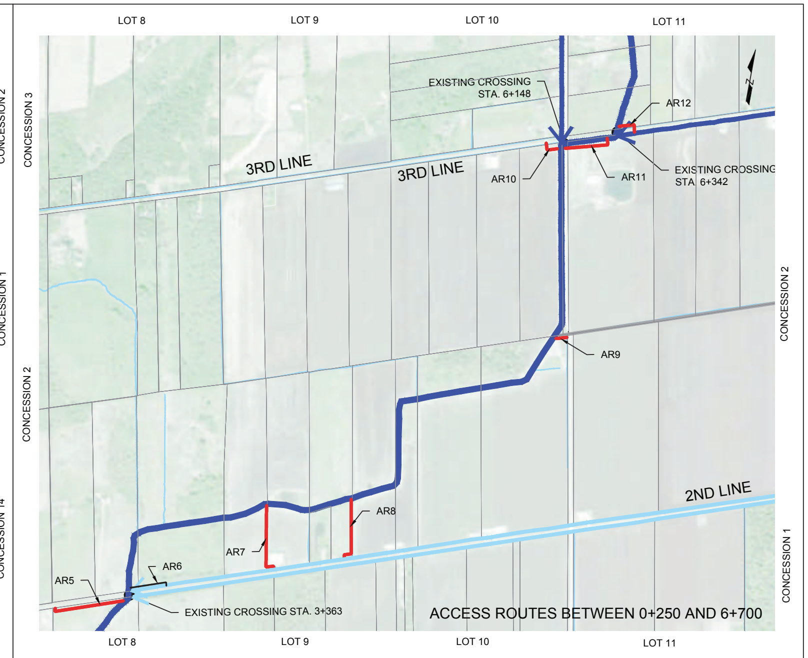

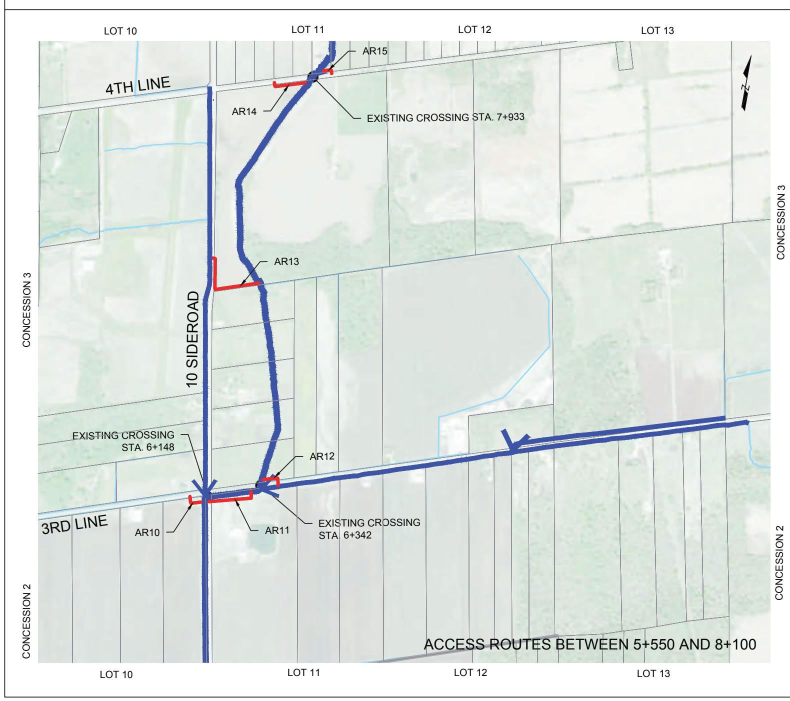

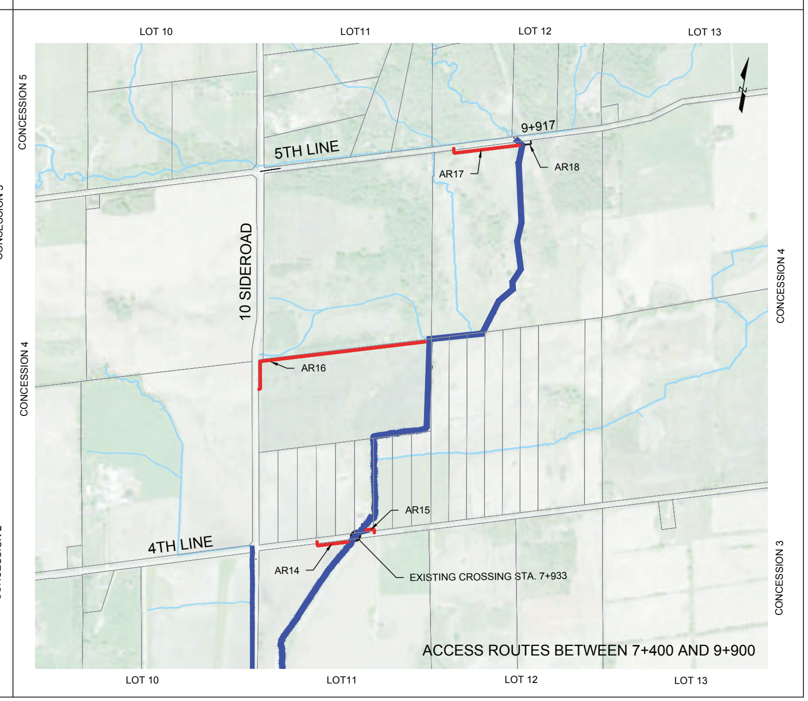

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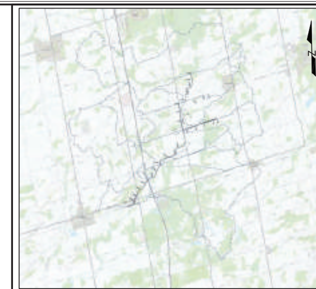

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER / LANDOWNER — 001-23414 / M. VAN DER MAST
5m ACCESS ROUTE

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 fax (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
ACCESS ROUTES

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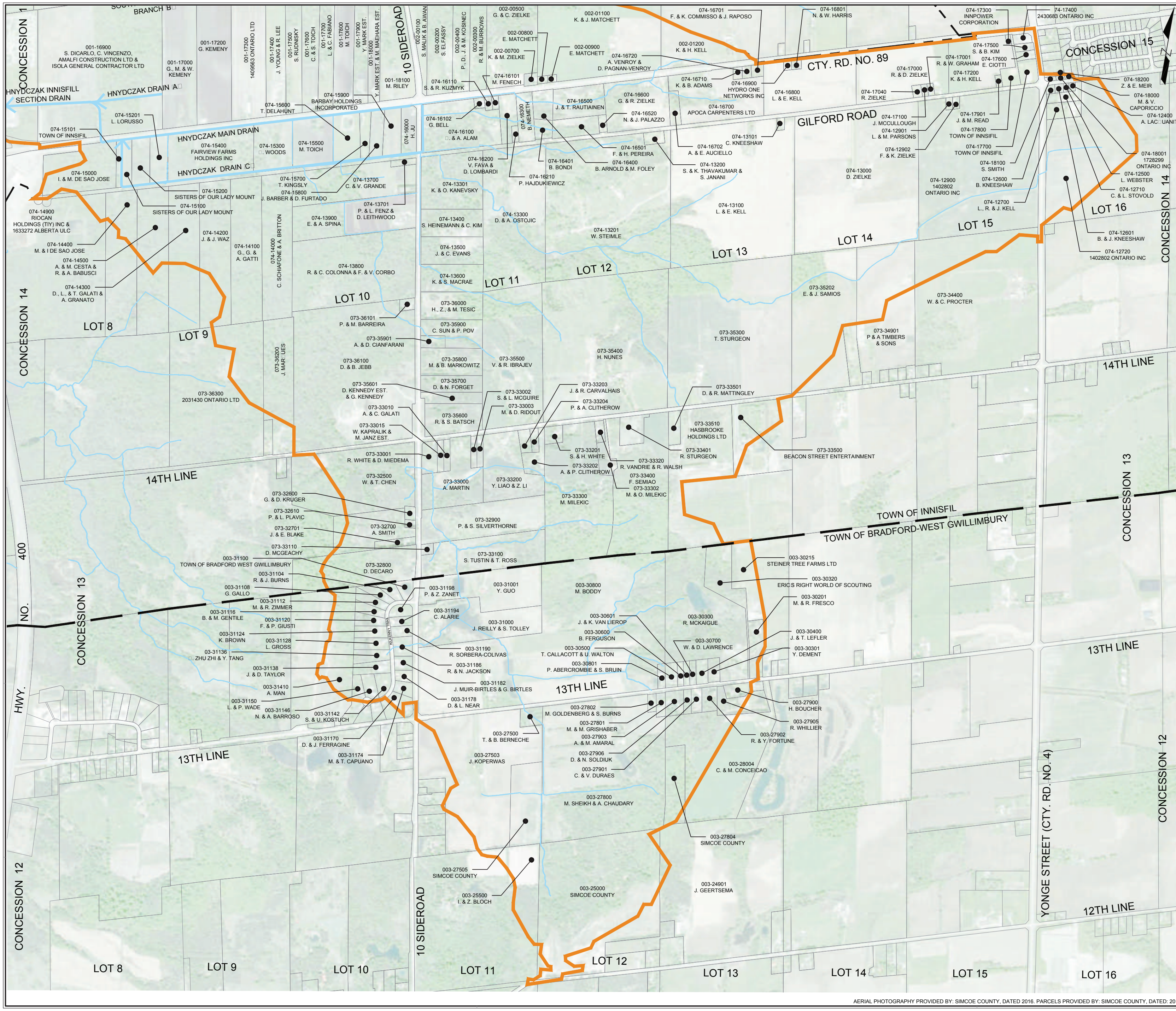

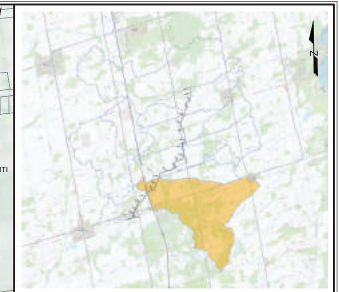

KEY PLAN

SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY

CATCHMENT AREA BOUNDARY

SUB WATERSHED BOUNDARY

DRAIN LOCATION & DIRECTION — DRAIN NAME

OTHER MUNICIPAL DRAIN — DRAIN NAME

NATURAL WATERCOURSE

ROLL NUMBER — 001-23414

LANDOWNER — M. VAN DER MAST

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6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	FILE FINAL ENGINEER'S REPORT	01/31/2019	JRD

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client

TOWN OF INNISFIL

2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 1

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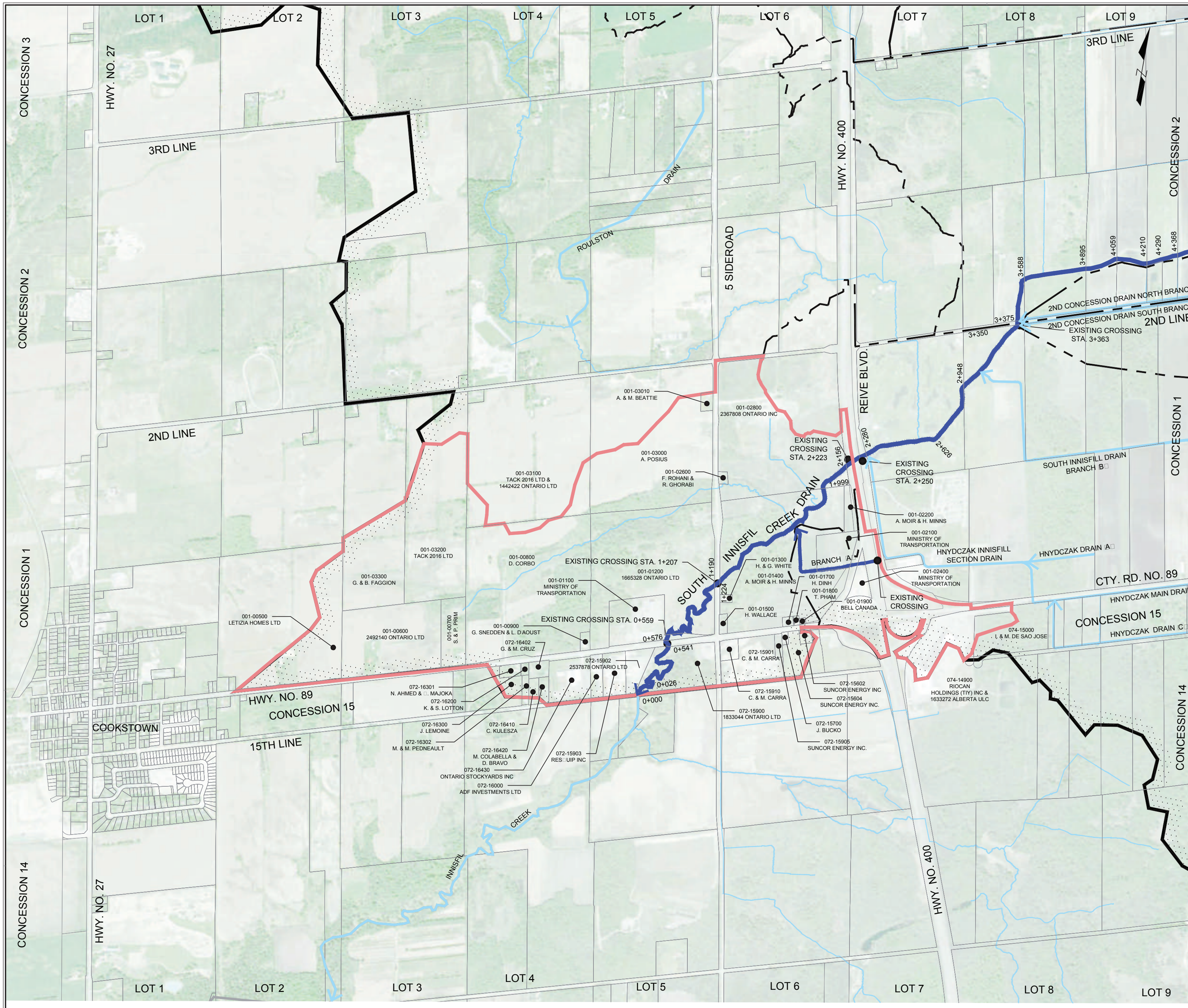

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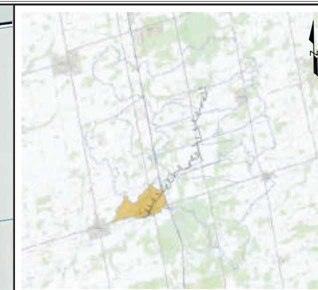

KEY PLAN
SCALE: N.T.S.

LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER — 001-23414
- LANDOWNER — M. VAN DER MAST

Notes

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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	FILE FINAL ENGINEER'S REPORT	01/31/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

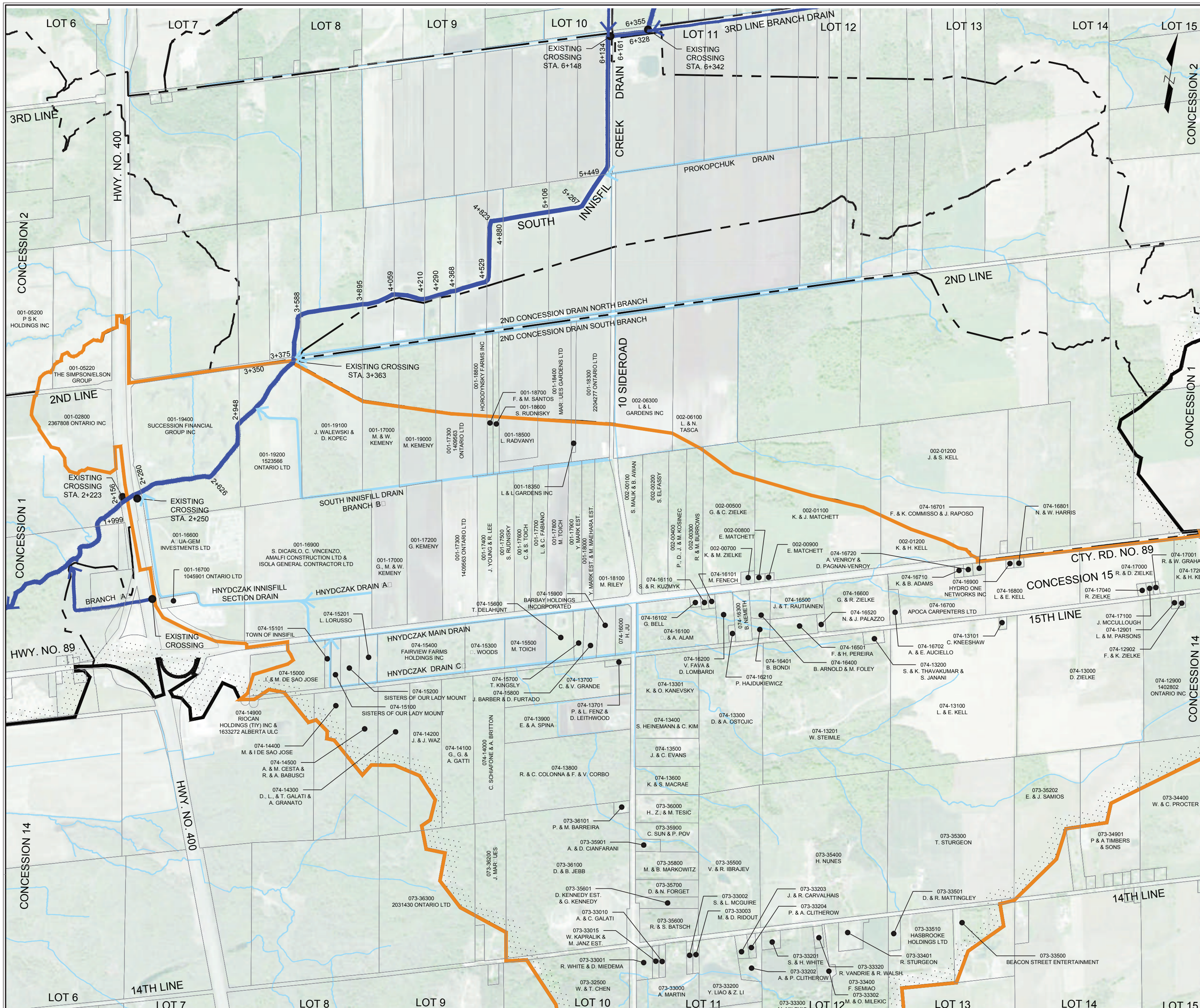
Client

TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

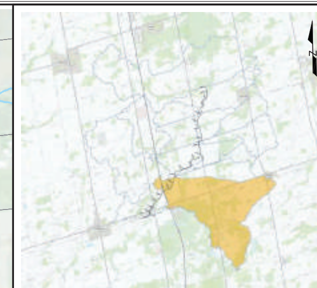
Drawing Title

SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 2

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	4 of 37
Date: 01/30/2019		Project No.: 300038790.0000		
Scale: 1:12,500	0	250	500	750m



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER / LANDOWNER — 001-23414 M. VAN DER MAST

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7	FILE FINAL ENGINEER'S REPORT	01/31/2019	JRD

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449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
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Client
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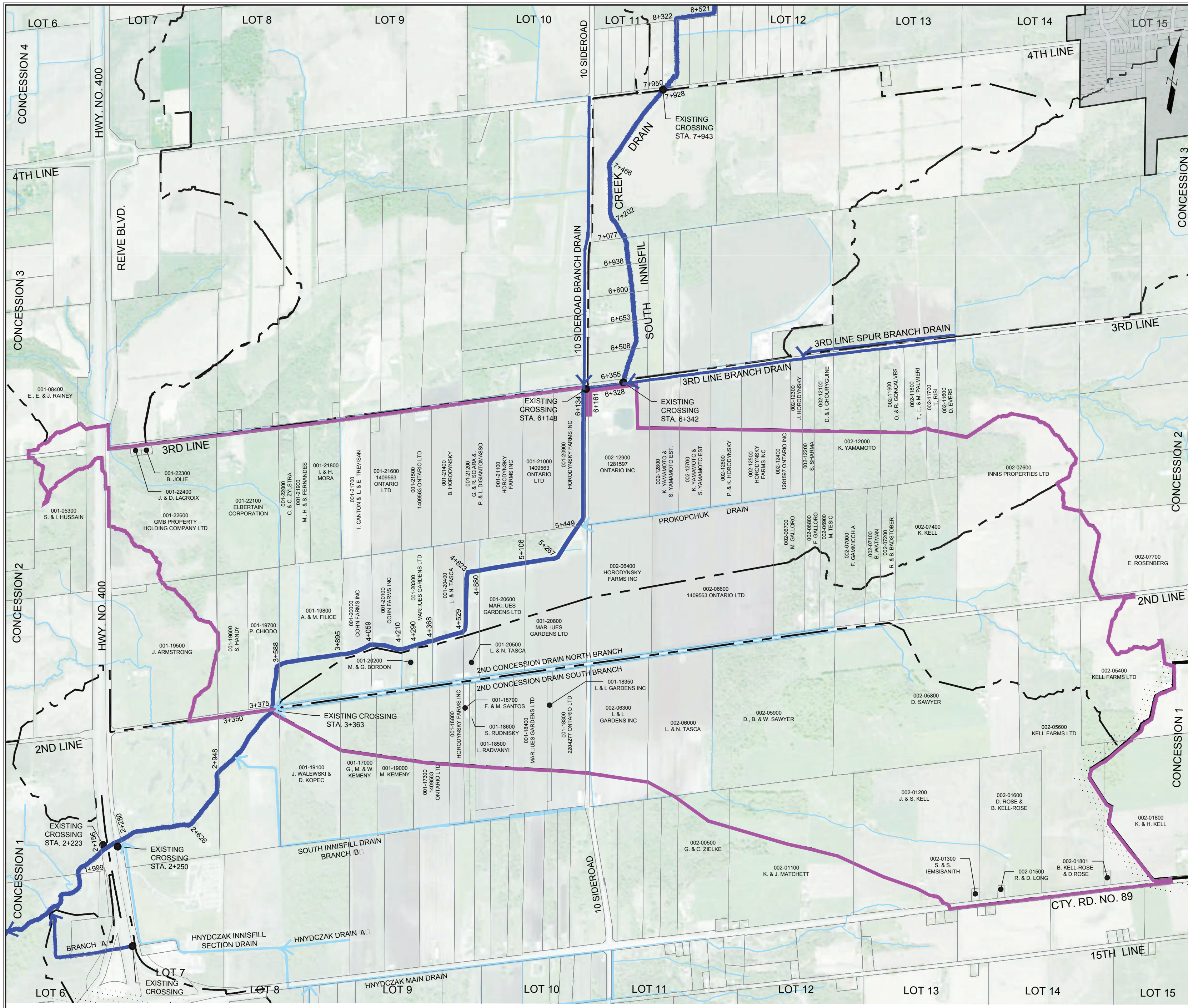
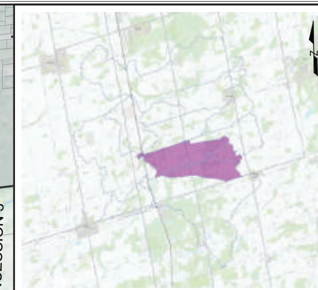
INNISFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
WATERSHED PLAN - 3

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	5 of 37
Date		Project No.		
01/30/2019		300038790.0000		
Scale				
1:12,500		0 250 500 750m		





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER / LANDOWNER — 001-23414 M. VAN DER MAST

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449 Josephine St., P.O. Box 10
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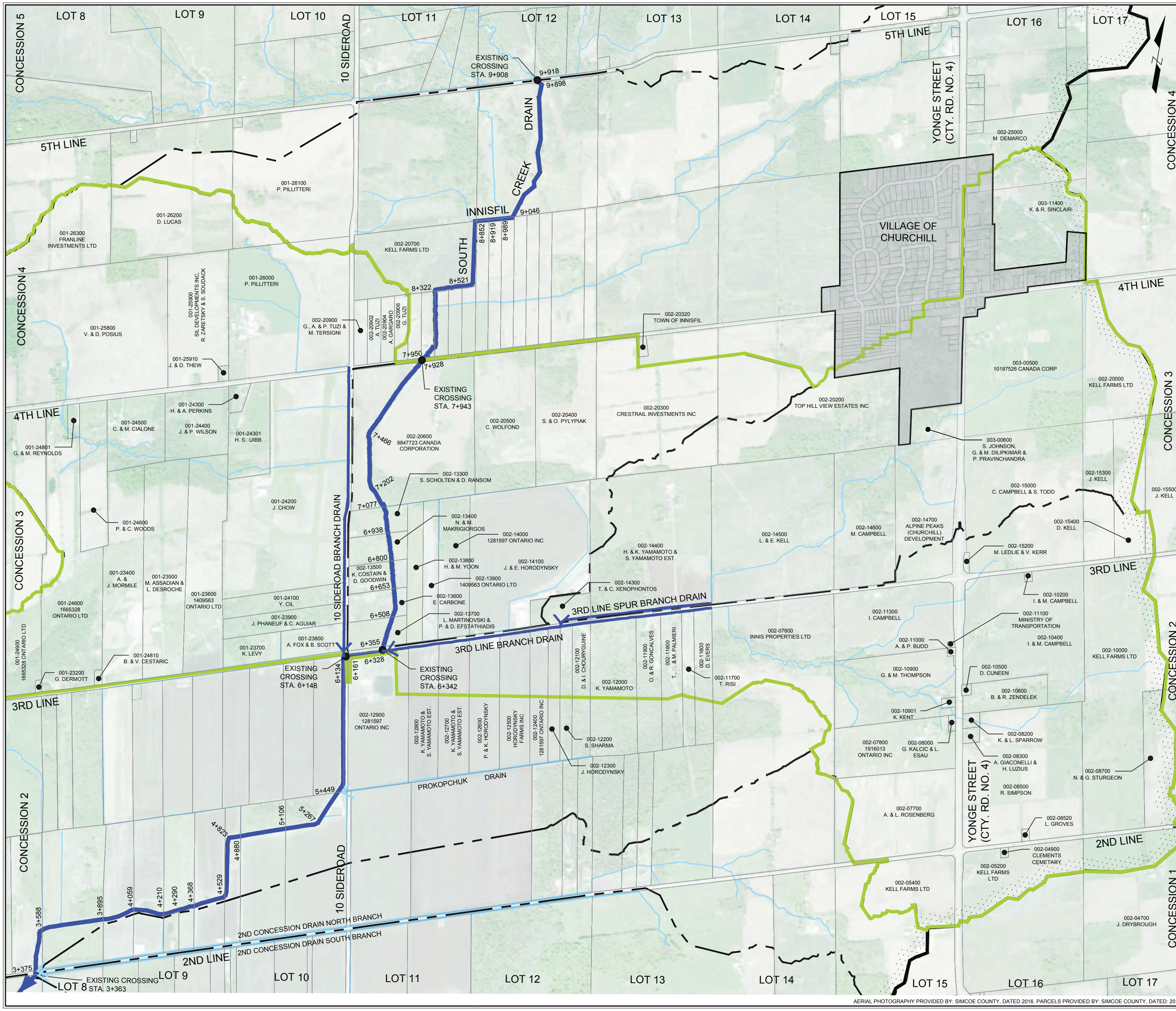
INNSIFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 4

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	6 of 37
Date: 01/30/2019		Project No.: 300038790.0000		
Scale: 1:12,500	0 250 500 750m			

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_ProductionDwg\038790_WATERSHED PLAN (2).dwg Date Plotted: January 30, 2019 - 10:41 AM



KEY PLAN
SCALE: N.T.S.

LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER / LANDOWNER — 001-23414 M. VAN DER MAST

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7	FILE FINAL ENGINEER'S REPORT	01/31/2019	JRD

BURNSIDE
R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
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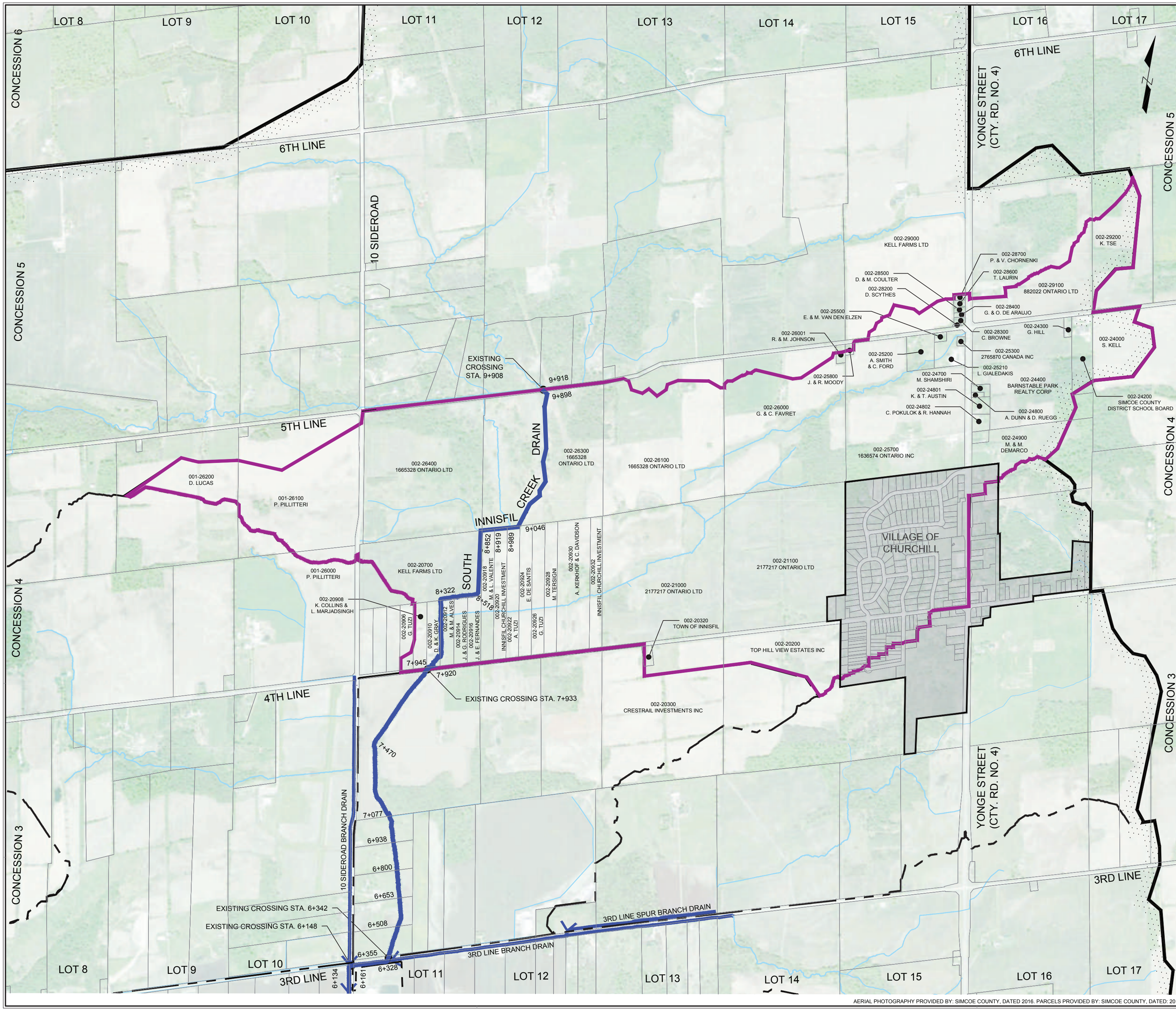
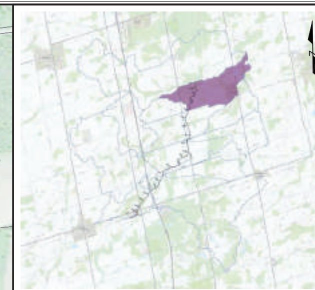
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 5

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	7of37
Date 01/30/2019		Project No. 300038790.0000		
Scale 1:12,500	0 250 500 750m			





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER / LANDOWNER — 001-23414 M. VAN DER MAST

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7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNSIFIL, ONTARIO
L9S 1A1

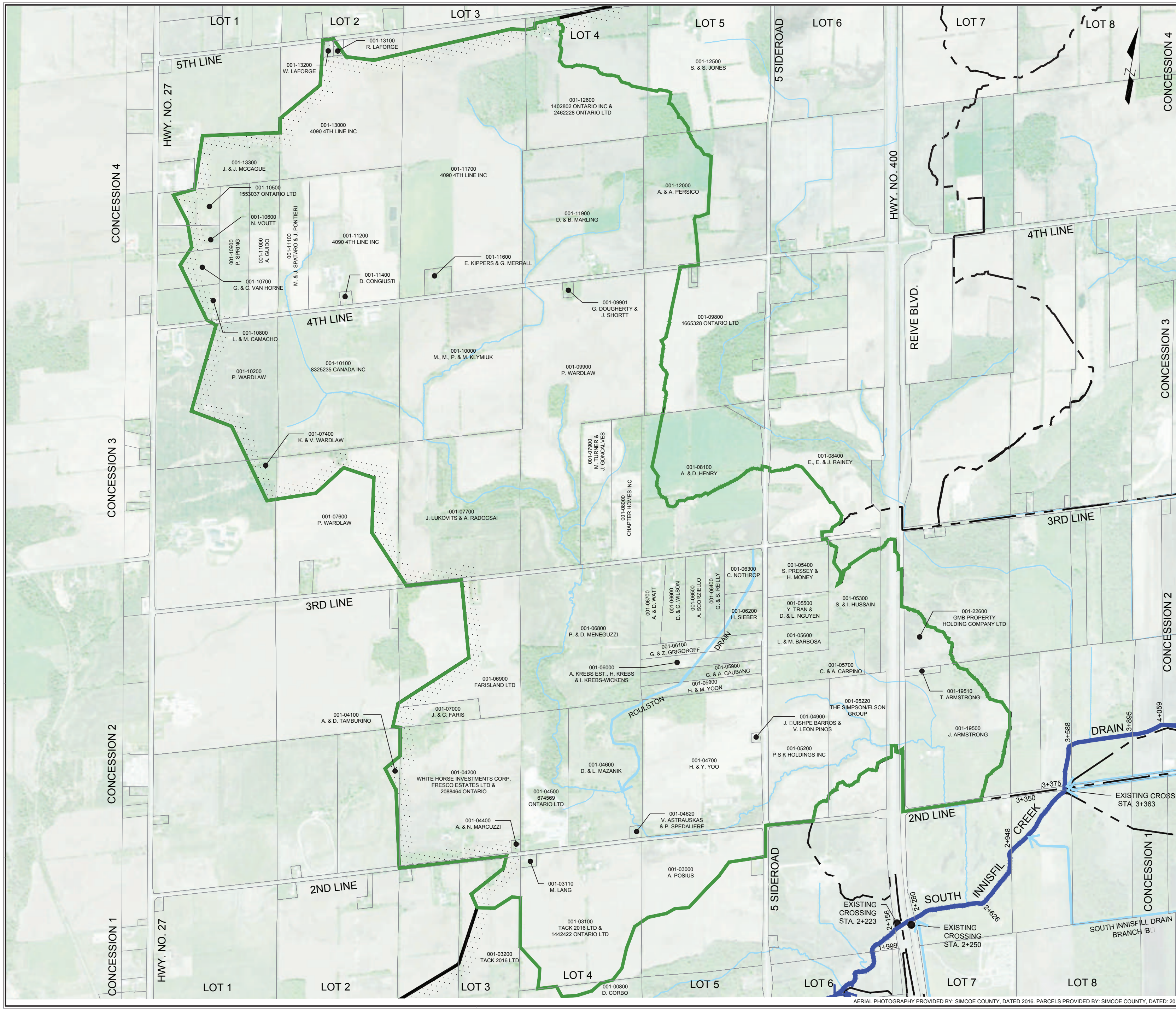
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 6

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	8 of 37
Date: 01/30/2019		Project No.: 300038790.0000		

Scale 1:12,500 — 0 250 500 750m

AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VANDERMAST

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Client
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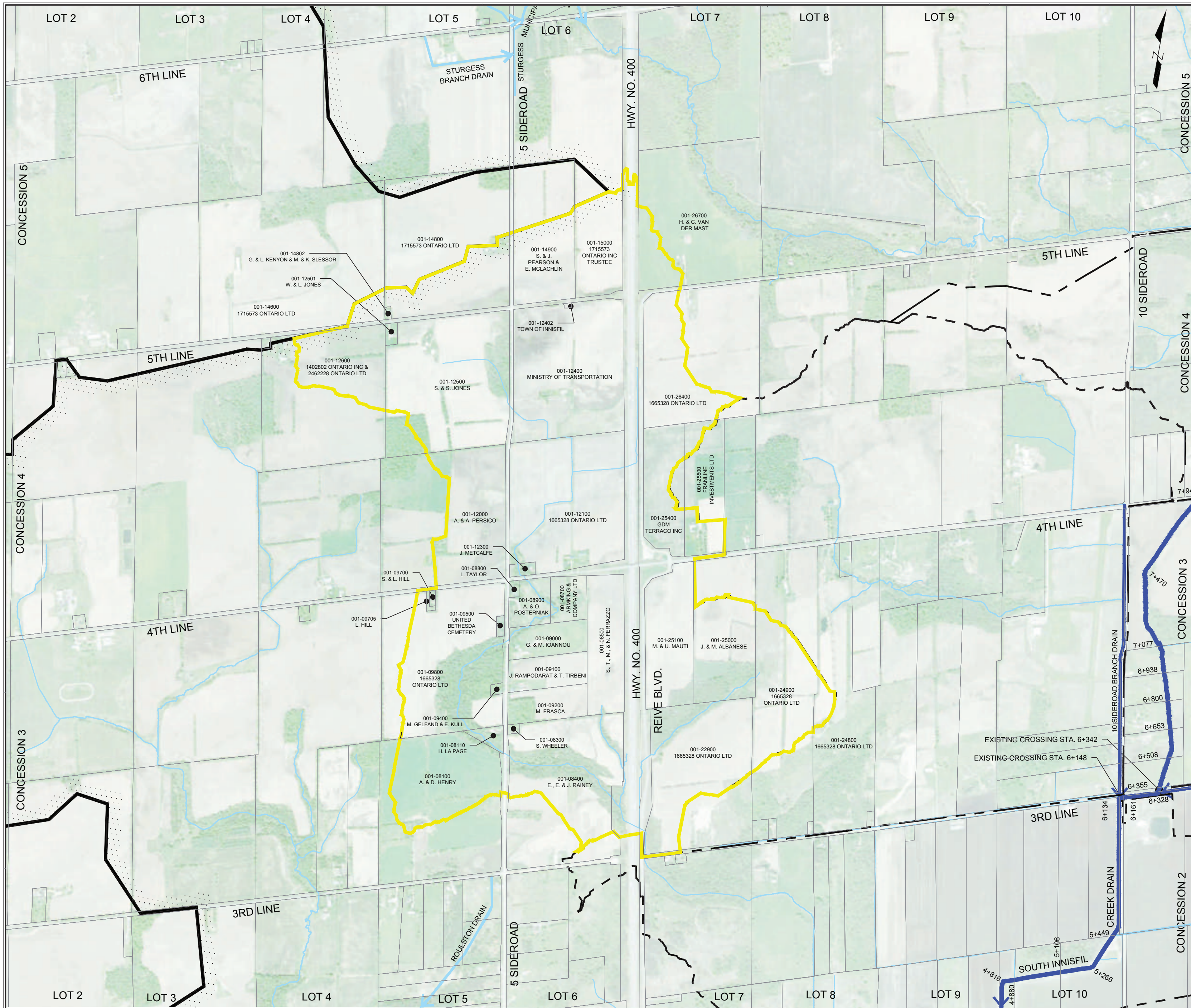
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 7

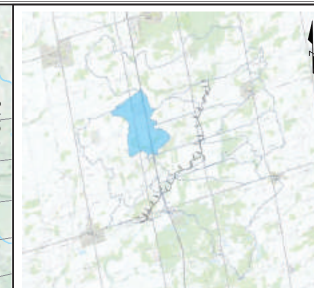
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	9 of 37
Date		Project No.		
01/30/2019		300038790.0000		
Scale				
1:12,500				

Scale bar: 0, 250, 500, 750m

File: \\COLLINGWOOD\Shared\Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_WATERSHED PLAN (2).dwg Date Plotted: January 30, 2019 - 10:45 AM



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER / LANDOWNER	001-23414 / M. VAN DER MAST

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BURNSIDE
R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 fax (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
WATERSHED PLAN - 8

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	10 of 37
Date: 01/30/2019		Project No.: 300038790.0000		
Scale: 1:12,500		0 250 500 750m		

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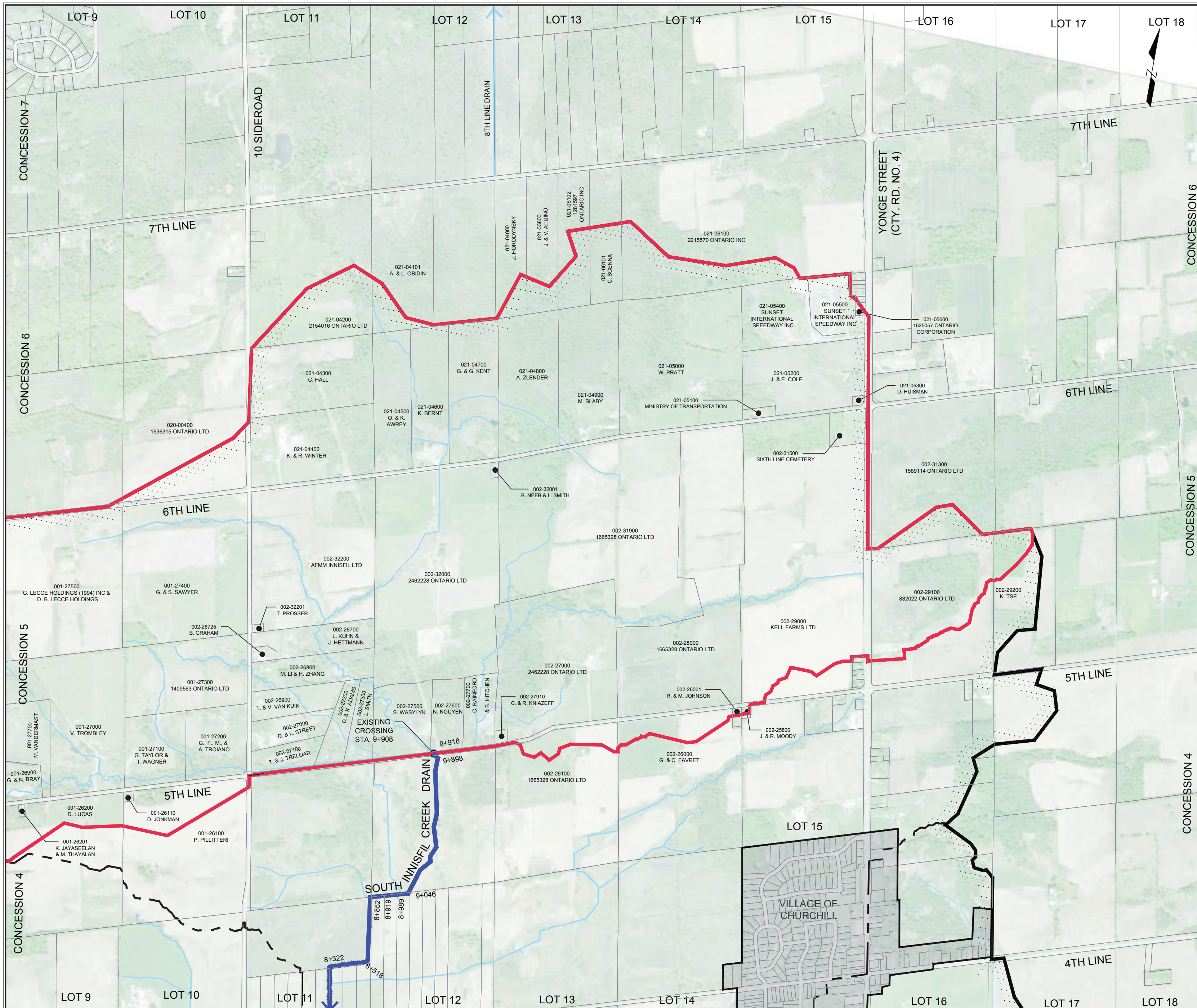

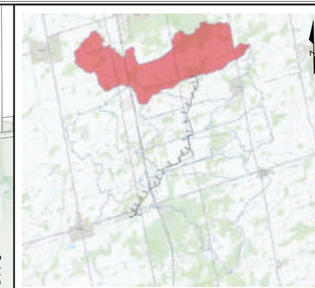

KEY PLAN
SCALE: N.T.S.

LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER / LANDOWNER — 001-23414 M. VAN DER MAST

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Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
WATERSHED PLAN - 9

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TB/AB/NC	DM/JD	11 of 37
Date: 01/30/2019		Project No.: 300038790.0000		
Scale: 1:12,500				

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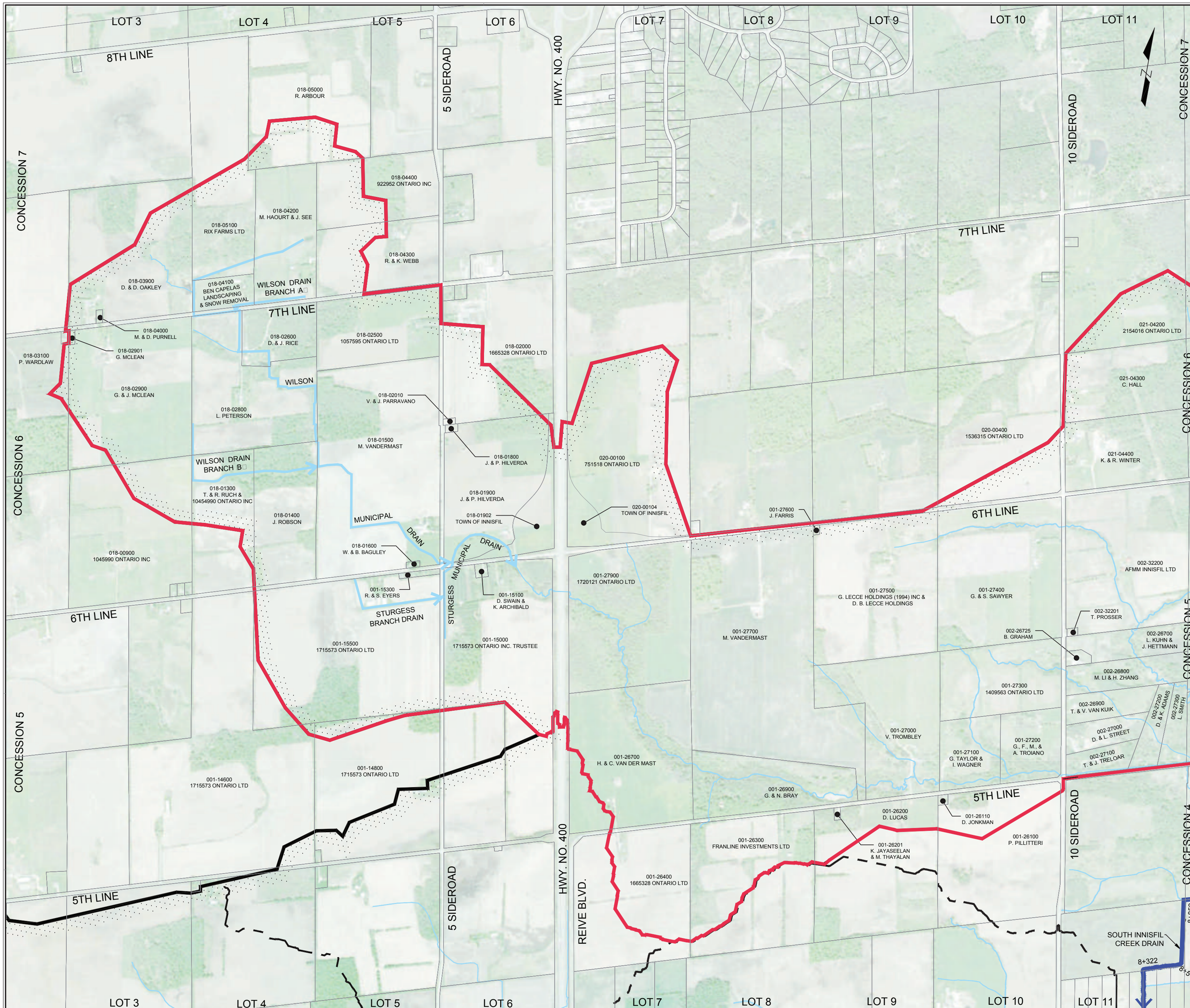
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN.dwg Date Plotted: January 30, 2019 - 10:47 AM



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017

KEY PLAN
SCALE: N.T.S.

LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER / LANDOWNER — 001-23414 M. VAN DER MAST

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R.J. Burnside & Associates Limited
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Client

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2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
WATERSHED PLAN - 10

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	12 of 37
Date 01/30/2019		Project No. 300038790.0000		
Scale 1:12,500				

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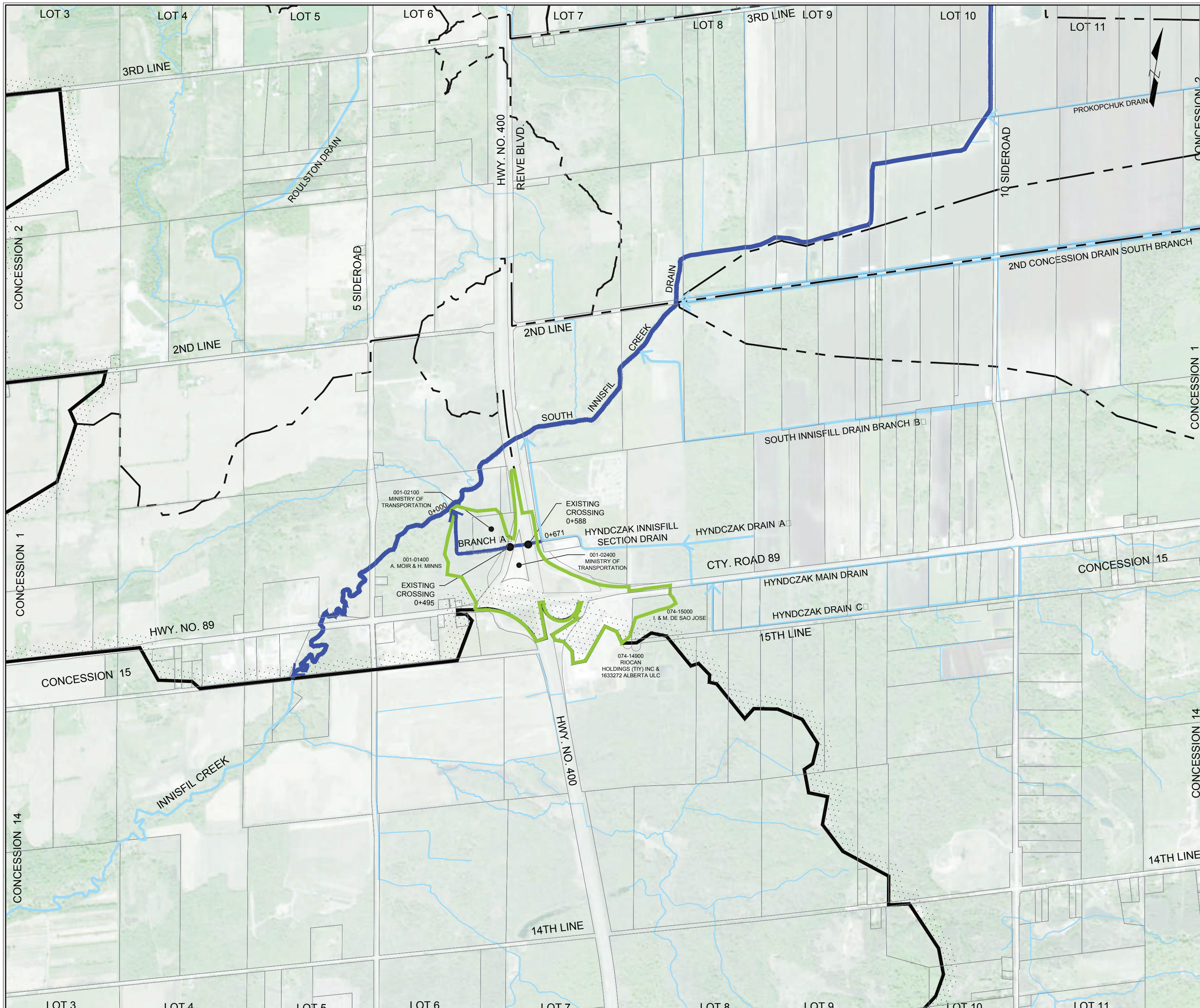
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN.dwg Date Plotted: January 30, 2019 - 10:46 AM



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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INNISFIL, ONTARIO
L9S 1A1

Innisfil

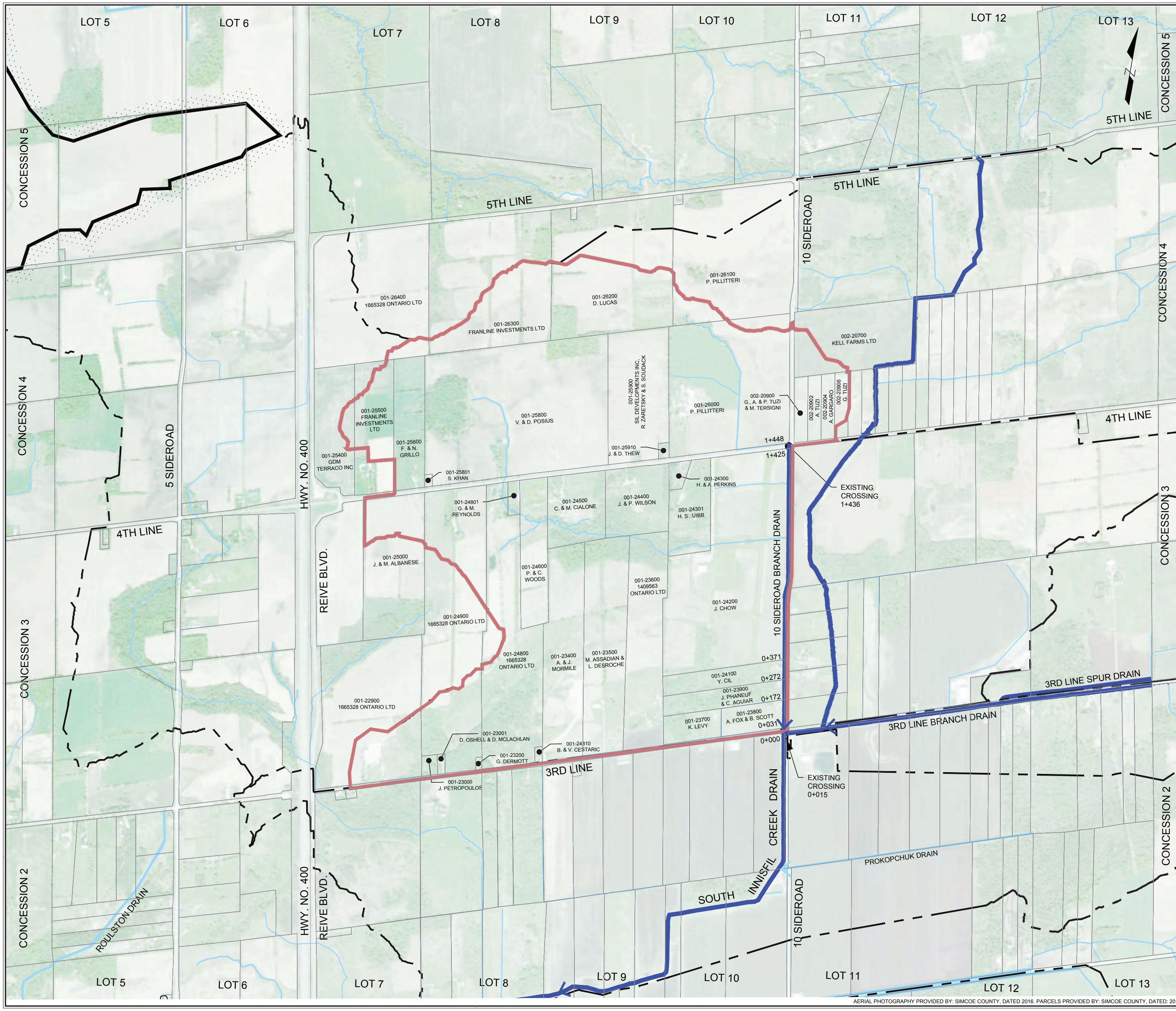
Drawing Title

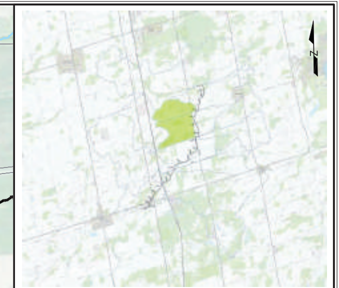
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - BRANCH A DRAIN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	13 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
1:12,500
0 250 500 750m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN (BRANCHES).dwg Date Plotted: January 30, 2019 - 10:49 AM





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

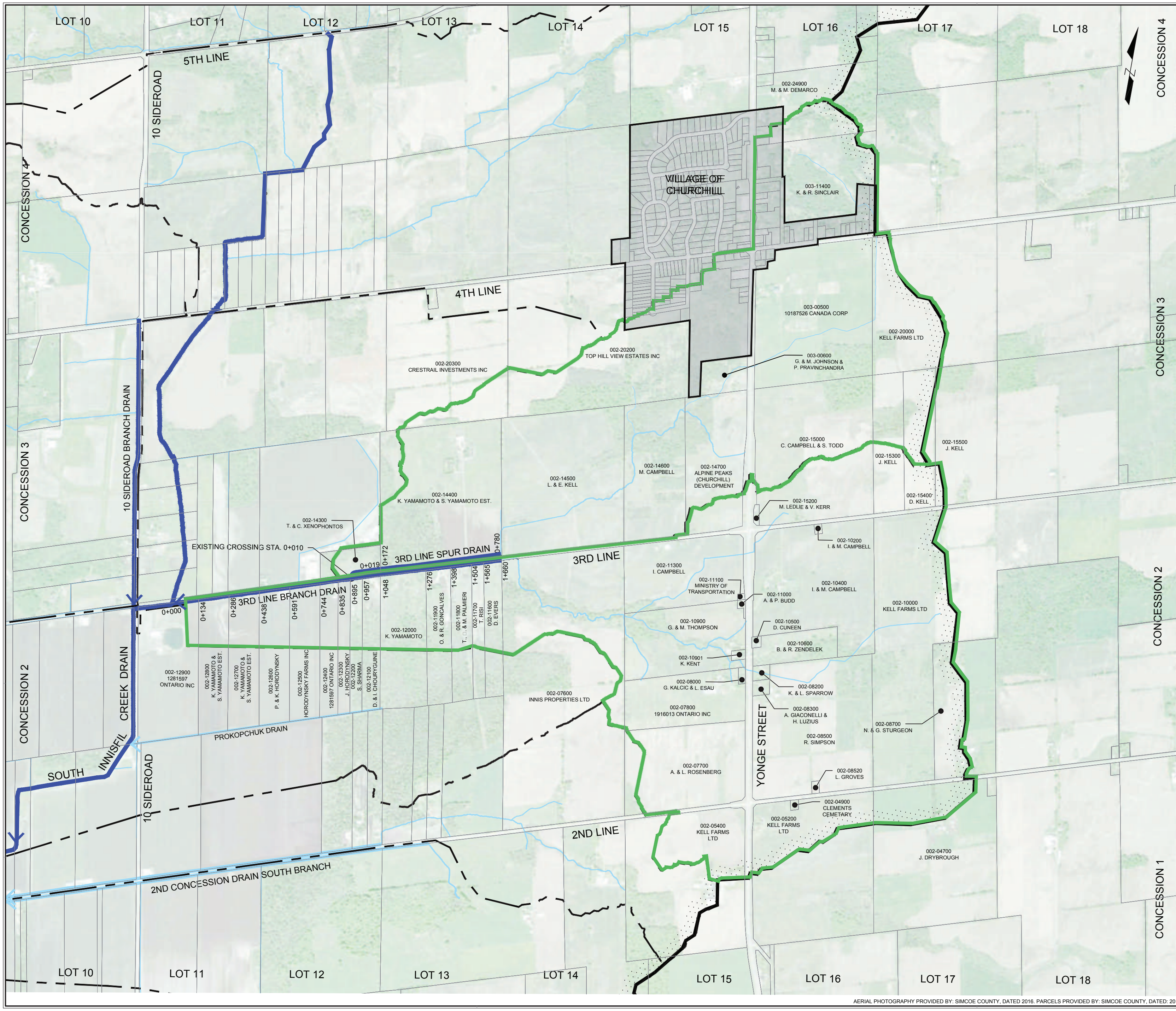
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 10 SIDEROAD BRANCH DRAIN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	14 of 37
Date		Project No.		
01/30/2019		300038790.0000		
Scale				
1:12,500	0 250 500 750m			

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_WATERSHED PLAN (BRANCHES).dwg Date Plotted: January 30, 2019 - 10:50 AM



KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER — 001-23414
LANDOWNER — M. VAN DER MAST

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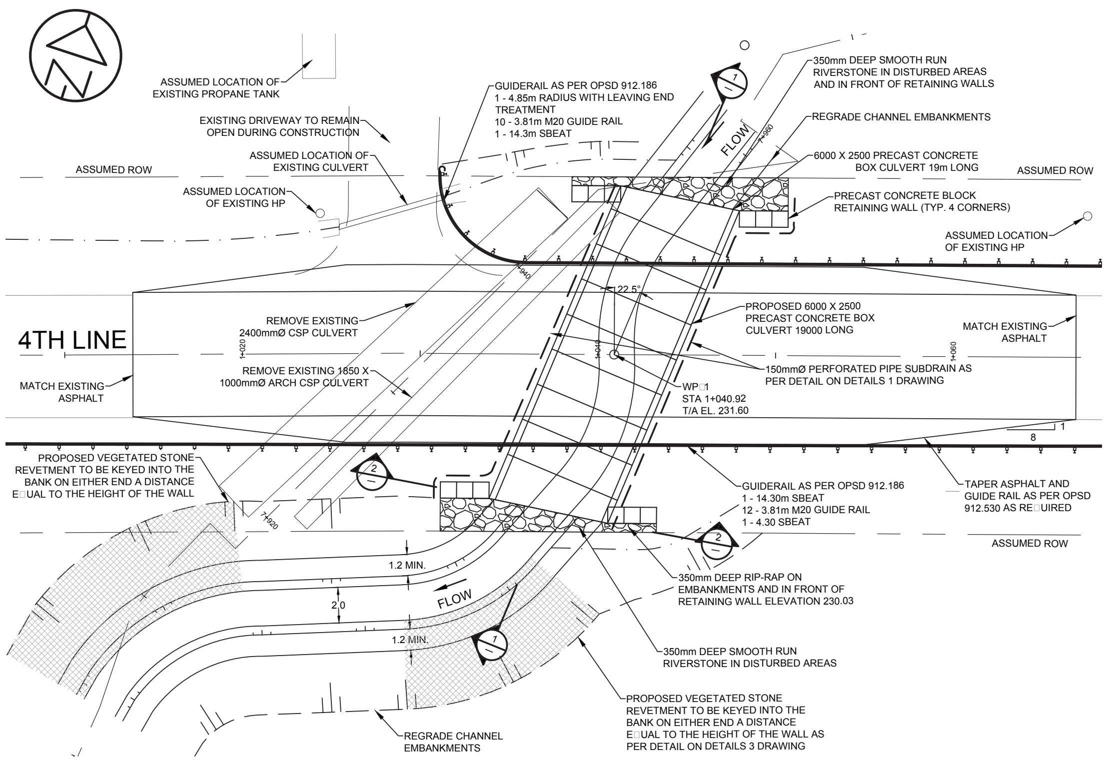
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 3RD LINE BRANCH AND 3RD LINE SPUR DRAIN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	15 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
1:12,500
0 250 500 750m



PLAN
SCALE 1:200

GENERAL NOTES

1. PRECAST BOX CULVERT TO BE DESIGNED TO CANADIAN HIGHWAY BRIDGE CODE (CHBDC), CAN/CSA-S6-14, LIVE LOAD TRUCK TO CL-625-ONT.
2. CLASS OF CAST-IN-PLACE CONCRETE = 35MPa, EXPOSURE CLASS C-1.
3. CLEAR COVER TO REINFORCING STEEL:
   - APRON WALL 70+/- 20
   - DISTRIBUTION SLAB TOP 70 ± 20, BOTTOM 40 ± 10
   - PRECAST AS PER CHBDC
4. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - UNLESS SHOWN OTHERWISE, TENSION LAP SPLICES SHALL BE CLASS B.
   - BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS.
5. ALL EXPOSED CORNERS TO HAVE 20mm CHAMFER UNLESS NOTED OTHERWISE.
6. CONSTRUCTION NOTES:
   - BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND EACH SIDE OF CULVERT KEEPING THE HEIGHT OF BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
   - GEOTECHNICAL REPORT BY PETO MACCALLUM LTD. FILE #15BF045 DATED: OCTOBER, 2015.
7. ALL DIMENSIONS SHOWN ARE IN mm UNLESS NOTED OTHERWISE.

APPLICABLE OPSDs

208.010 - BENCHING OF EARTH SLOPES
219.130 - HEAVY DUTY SILT FENCE BARRIER
219.180 - STRAW BALE FLOW CHECK DAM
219.211 - ROCK FLOW CHECK DAM, FLAT BOTTOM DITCH
221.020 - TEMPORARY WATER PASSAGE SYSTEM, PUMPING AND PIPING
3101.150 - BACKFILL MINIMUM GRANULAR REQUIREMENTS
912.186 - STEEL BEAM GUIDE RAIL - TYPE M20 - ADJACENT TO 2H:1V SLOPE
912.530 - GUIDE RAIL SYSTEM, STEEL BEAM STRUCTURE APPROACH
912.531 - STEEL BEAM GUIDE RAIL - ENTRANCES AND INTERSECTING ROADWAYS
922.186 - ENERGY ATTENUATOR, END TREATMENT, STEEL BEAM ENERGY ATTENUATING TERMINAL, MASH SEQUENTIAL KINKING TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION
984.201 - ENERGY ATTENUATOR, END TREATMENT DELINEATION INSTALLATION - APPROACH END
3102.100 - WALLS, ABUTMENT, BACKFILL DRAIN

LEGEND

WP	WORKING POINT
TYP.	TYPICAL
MIN.	MINIMUM
RND	ROUNDING
SHLD	SHOULDER
EX.	EXISTING
PR.	PROPOSED
C/L	CENTRELINE
EL.	ELEVATION
R.O.W.	RIGHT OF WAY
BM	BENCHMARK
W.L.	WATER LEVEL
D/W	DRIVEWAY
U.O.N.	UNLESS OTHERWISE NOTED
T/A	TOP OF ASPHALT
U/S	UPSTREAM
D/S	DOWNSTREAM
SBGR	STEEL BEAM GUIDE RAIL
STA	STATION
F.F.	FRONT FACE
B/W	BOTTOM OF WALL
T/W	TOP OF WALL
INV	INVERT
CSP	CORRUGATED STEEL PIPE
BH	BOREHOLE
HP	HYDRO POLE
E/W	EACH WAY

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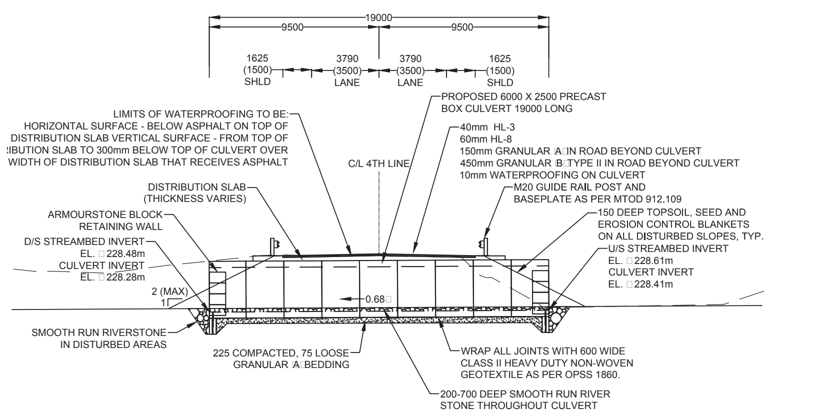
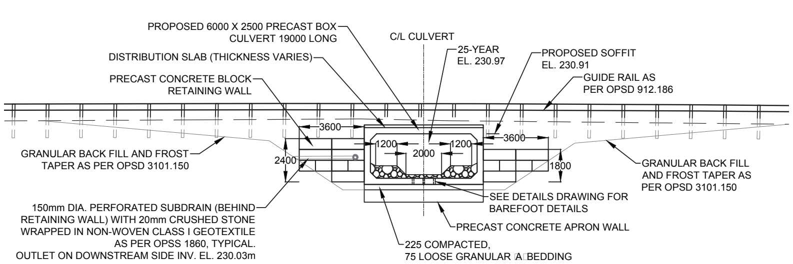
NOT FOR CONSTRUCTION

RETAINING WALL ELEVATIONS

LOCATION	T/W ELEVATION	B/W ELEVATION
NE	230.61	228.01
NW	230.41	228.01
SE	230.41	227.88
SW	230.61	227.88



1 SECTION
SCALE 1:200



2 ELEVATION
SCALE 1:200

No.	Issue / Revision	Date	Auth.
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Client
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INNISFIL, ONTARIO
L9S 1A1

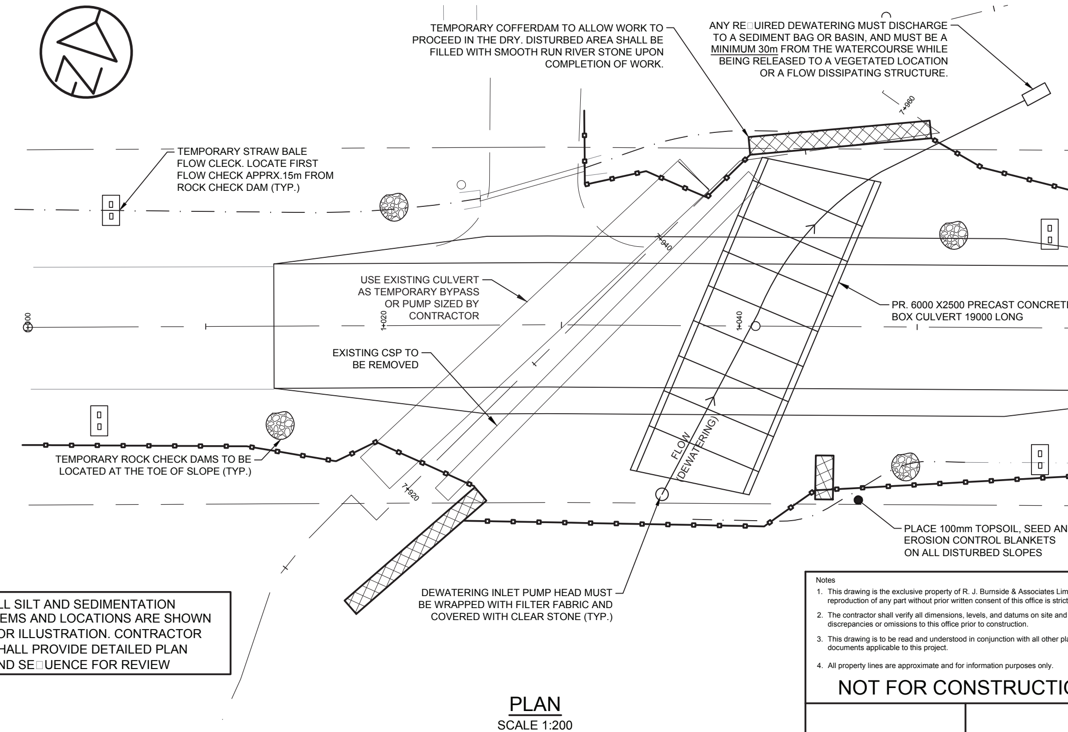
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT
GENERAL ARRANGEMENT

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	16 of 37
Date 01/30/2019		Project No. 300038790.0000		
Scale AS NOTED				

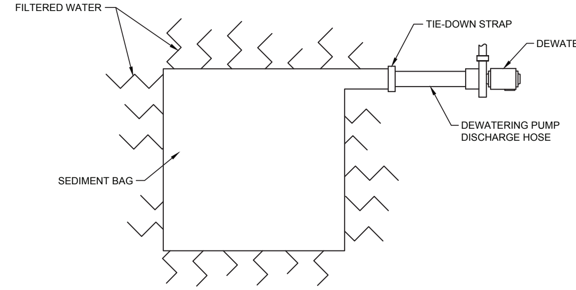
EROSION & SEDIMENTATION NOTES:

1. ALL SEDIMENTATION CONTROLS TO BE INSTALLED PRIOR TO EXECUTING ANY WORK.
2. ALL SEDIMENTATION CONTROLS TO BE INSPECTED DAILY AND REPAIRED/REPLACED AS NECESSARY.
3. ALL TEMPORARY EROSION & SEDIMENTATION CONTROLS SHALL REMAIN IN PLACE UNTIL SUCH TIME AS RE-VEGETATIVE MEASURES HAVE GERMINATED AND TAKEN HOLD.
4. ANY COFFERDAMS SHALL BE CONSTRUCTED OF CLEAN, NON-ERODIBLE MATERIALS SUCH AS, BUT NOT LIMITED TO □PEA GRAVEL BAGS, CLEAN GRAVEL AND PLASTIC SHEETING, PRECAST BARRIERS AND PLASTIC SHEETING, SHEET STEEL PILING, OR OTHER CLEAN MATERIAL APPROVED BY THE NVCA.
5. CONTROL OF CREEK BASE FLOWS AND STORM EVENT RUNOFF DURING CONSTRUCTION SHALL BE THE CONTRACTORS RESPONSIBILITY.
6. THE NATURAL STREAM COURSE SHALL BE PRESERVED AND REMAIN OPEN THROUGHOUT CONSTRUCTION.
7. COFFERDAM MATERIALS SHALL BE CLEAN, FREE OF DIRT OR DEBRIS, AND NON-ERODIBLE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF ANY CULVERT, PUMPS, CHANNELS OR ANY OTHER TEMPORARY MEASURES RE□UIRED TO CONTROL THE FLOW. THE CONTRACTOR SHALL ASSESS THE RISK OF FLOODS, STORMS AND EVENTS THAT MAY AFFECT CONSTRUCTION AND DETERMINE THEIR OWN LEVEL OF RISK ASSOCIATED WITH ANY TEMPORARY WORK. THE CONTRACTOR MAY USE THE EXISTING CULVERT FOR THE BYPASS, HOWEVER NO GUARANTEES ARE GIVEN THAT THE EXISTING CULVERT IS SUFFICIENT.
9. ALL EXCAVATIONS AND SUBSE□UENT WORK SHALL BE UNDERTAKEN IN THE DRY. GROUNDWATER FLOW AND SURFACE FLOW ENTERING ANY EXCAVATION SHALL BE REMOVED.
10. ALL DEWATERING/UNWATERING SHALL BE DISCHARGED INTO A FILTERED SUMP, SOCK OR SOAK PIT, LOCATED AT LEAST 30m FROM THE WATER COURSE.
11. STRAW BALE FLOW CHECKS AND TEMPORARY ROCK FLOW CHECKS, AS SPECIFIED, SHALL BE PLACED WHERE SUITABLE OR AS DIRECTED BY THE ENGINEER.
12. PROBABLE SILT FENCE BARRIER LOCATIONS ARE SHOWN. PROVIDE SILT FENCE BARRIERS WHERE RE□UIRED AND AS MAY BE DIRECTED BY THE ENGINEER.
13. NOMINAL STONE SIZE TO BE 200mm. MAXIMUM STONE SIZE TO BE 1½ TIMES THE NOMINAL STONE SIZE. 80□ OF STONES (BY MASS) MUST HAVE A DIAMETER OF AT LEAST 60□ OF NOMINAL STONE SIZE. MINIMUM STONE SIZE TO BE 50 mm.
14. CONTINUALLY MONITOR PUMP OUTLET AREA AND STABILIZE IF RE□UIRED.
15. THE ESC PLAN IS A DYNAMIC DOCUMENT, WHICH MAY BE SUBJECT TO CHANGE OR MODIFICATION AS A RESULT OF SITE DEVELOPMENTS OR CHANGES ON SITE. ANY DEVIATION FROM APPROVED PLANS MUST BE DESIGNED BY A □UALIFIED PROFESSIONAL. IT IS EVERYONE'S RESPONSIBILITY TO PREVENT CONSTRUCTION RELATED SEDIMENT FROM IMPACTING A□UATIC RESOURCES AND OTHER NATURAL FEATURES.
16. ALL SILT AND SEDIMENTATION ITEMS AND LOCATIONS ARE SHOWN FOR ILLUSTRATION. CONTRACTOR SHALL PROVIDE DETAILED PLAN AND SE□UENCE FOR ENGINEER & NVCA REVIEW.
17. ANY FISH OR A□UATIC LIFE SHALL BE REMOVED FROM THE CONSTRUCTION AREA BY A BURNSIDE □UALIFIED ENVIRONMENTAL PROFESSIONAL. A "LICENSE TO COLLECT FISH" WILL BE OBTAINED FROM THE MINISTRY OF NATURAL RESOURCES AND FORESTS (MNRF) FOR A□UATIC LIFE SALVAGE PRIOR TO IN-WATER WORKS. PROVIDE A MINIMUM OF 48 HOURS NOTICE PRIOR TO RE□UIRING FISH REMOVAL. IN THE EVENT OF FLOODING THAT RE□UIRES ADDITIONAL REMOVAL OF FISH, THE CONTRACTOR WILL BE RE□UIRED TO PAY FOR PROVIDING REMOVAL BY A □UALIFIED PROFESSIONAL. THE CONTRACTOR SHOULD SIZE THEIR WATERWAY CONTROL ACCORDINGLY.
18. A BURNSIDE □UALIFIED PERSON SHALL BE ON -SITE DURING THE PLACEMENT OF RIVER STONE SUBSTRATE AND THE RESTORATION OF A□UATIC HABITATS. PROVIDE A MINIMUM OF 48 HOURS NOTICE PRIOR TO PLACING OF RIVER STONE AND BAFFLES IN THE CULVERT.

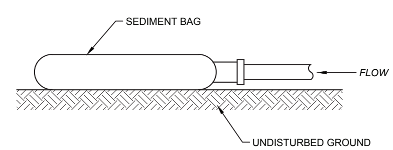


ALL SILT AND SEDIMENTATION ITEMS AND LOCATIONS ARE SHOWN FOR ILLUSTRATION. CONTRACTOR SHALL PROVIDE DETAILED PLAN AND SE□UENCE FOR REVIEW

PLAN
SCALE 1:200



SEDIMENT BAG - PLAN VIEW
N.T.S



SEDIMENT BAG - SECTION
N.T.S

LEGEND (TEMPORARY WORK)

- HEAVY DUTY SILT FENCE BARRIER AS PER OPSD 219.130.
- STRAW BALE FLOW CHECK AS PER OPSD 219.180
- ROCK CHECK DAMS AS PER OPSD 219.210 OR 219.211.
- TEMPORARY COFFERDAM

24-HR SCS	
EVENT	FLOW (M^3/S)
2-YEAR	5.44
5-YEAR	11.31
25-YEAR	22.45

FOR THE PROTECTION OF LOCAL FISH POPULATIONS DURING THEIR SPAWNING AND NURSERY PERIODS, CONSTRUCTION WORKS SHALL BE COMPLETED BETWEEN JULY 16TH AND SEPTEMBER 30TH.

ALL A□UATIC LIFE WILL BE SALVAGED UNDER A LICENCE TO COLLECT FISH (OBTAINED FROM THE MNRF) TO AVOID "SERIOUS HARM TO FISH" AS DESCRIBED IN THE FISHERIES ACT.

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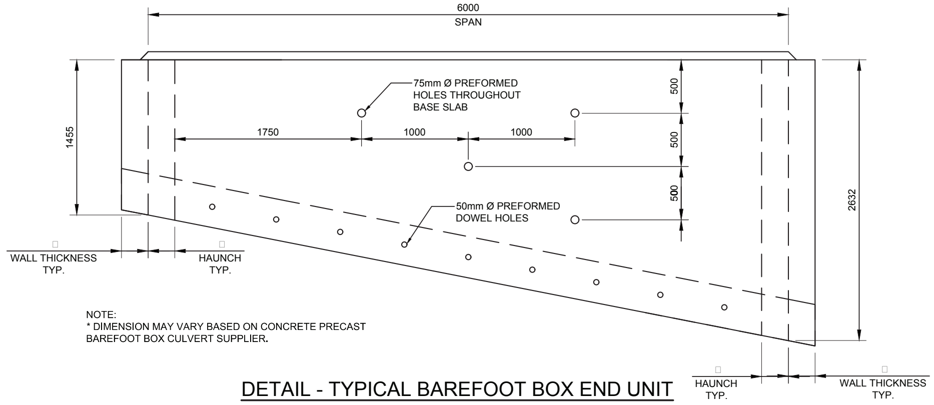
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

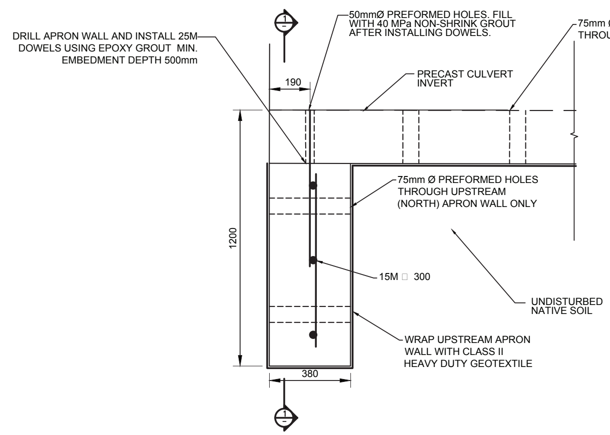
Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT - EROSION AND SEDIMENT CONTROL PLAN

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	17 of 37
Date 01/30/2019		Project No. 300038790.0000		
Scale AS NOTED				

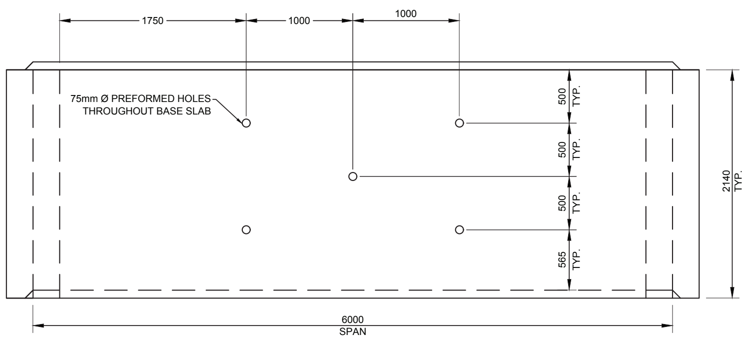
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_4TH LINE MAIN DRAIN CULVERT.dwg Date Plotted: January 30, 2019 - 10:54 AM



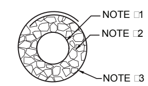
DETAIL - TYPICAL BAREFOOT BOX END UNIT
N.T.S.



B
APRON WALL SECTION DETAIL
N.T.S.



DETAIL - TYPICAL BAREFOOT BOX MIDDLE UNIT
N.T.S.



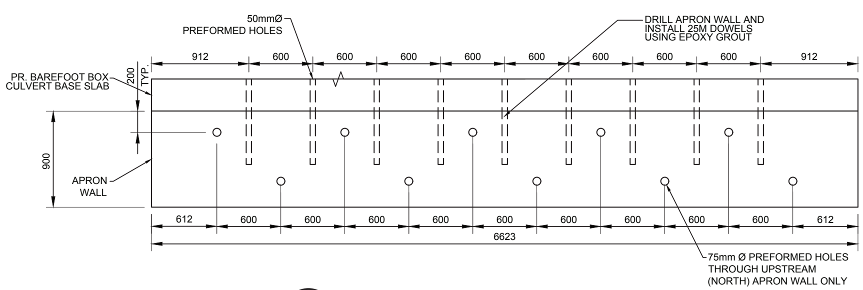
PERFORATED DRAIN DETAIL
N.T.S.

NOTE:

1. 150 mm PERFORATED CORRUGATED POLYETHYLENE PIPE CONFORMING TO OPSS 1840 WITH SOCK FILTER AS MANUFACTURED BY BIG O□ INC. OR APPROVED E□UAL.

2. OPEN GRADED 19 mm CRUSHED ROCK IN ACCORDANCE WITH OPSS 1004. USE 0.05m³ IN VOLUME, PER METRE OF PIPE, EVENLY DISTRIBUTED AROUND PIPE.

3. NON-WOVEN GEOTEXTILE SHALL CONFORM TO OPSS 1860 CLASS 1.



1 / -
SECTION - APRON WALL DETAIL
N.T.S.

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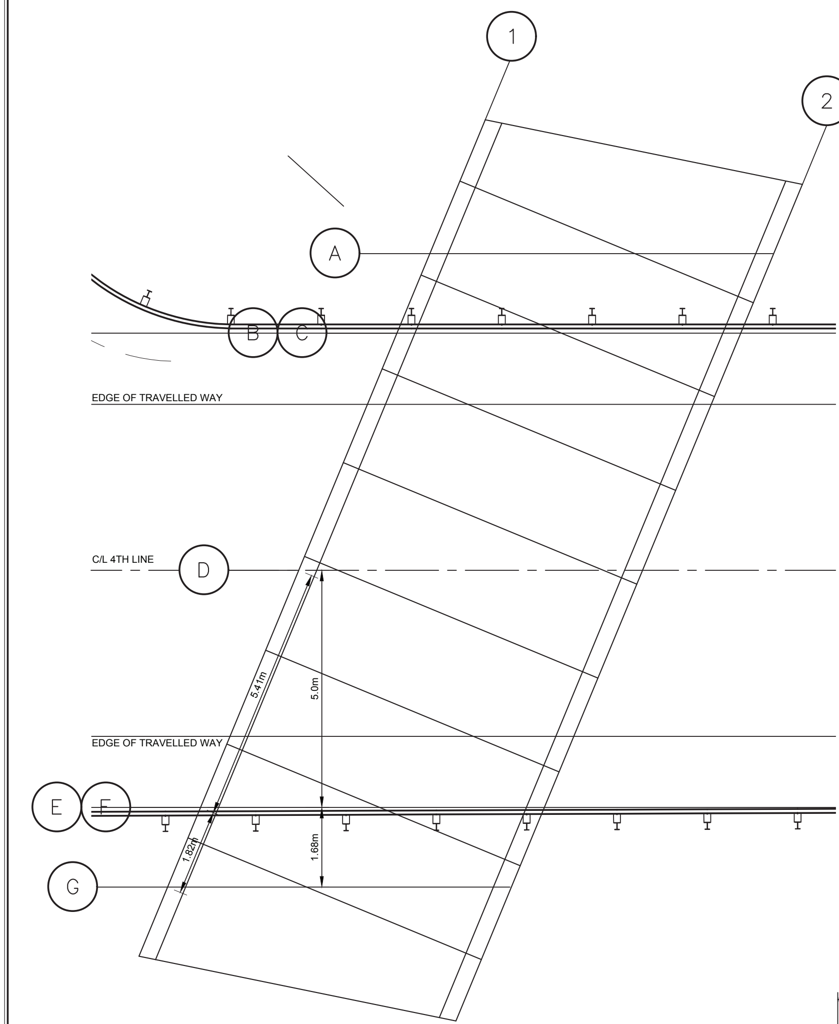
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT DETAILS 1

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	18 of 37
Date		Project No.		
01/30/2019		300038790.0000		
Scale				
AS NOTED				

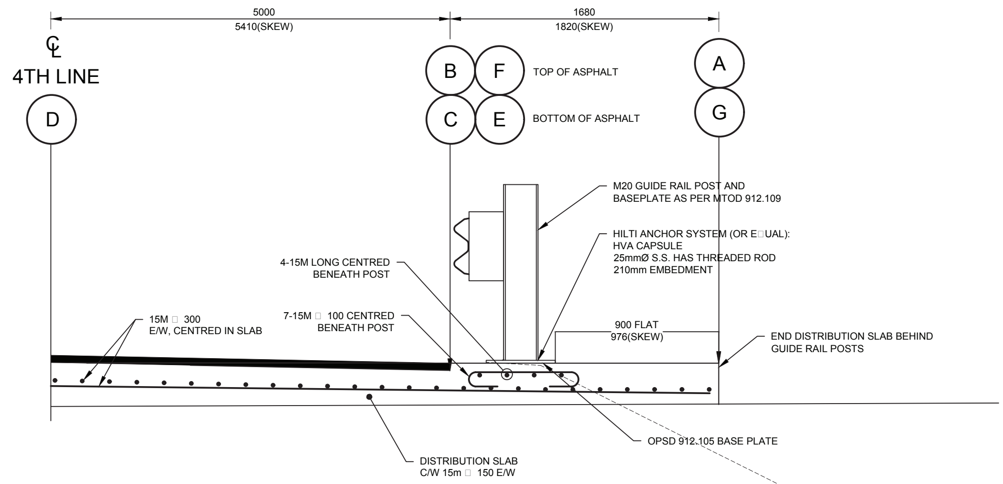
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_4TH LINE MAIN DRAIN CULVERT.dwg Date Plotted: January 30, 2019 - 10:54 AM



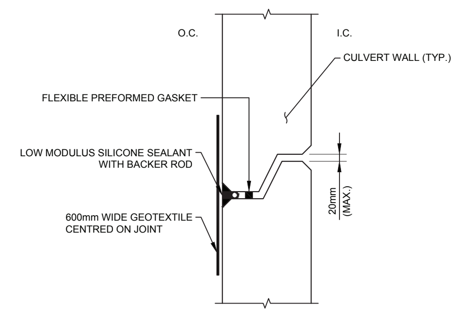
PLAN - SCREED ELEVATIONS
SCALE 1:75

SCREED ELEVATIONS (TOP OF DISTRIBUTION SLAB CONCRETE)		
LINE	1	2
A	231.490	231.490
B	231.490	231.490
C	231.390	231.390
D	231.490	231.490
E	231.390	231.390
F	231.490	231.490
G	231.490	231.490

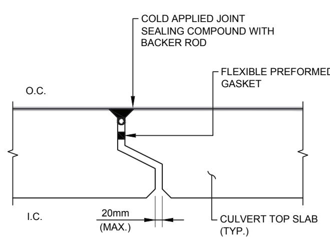
NOTE: ELEVATIONS TO BE CONFIRMED IN FUTURE AFTER COMPLETION OF DETAILED SURVEY.



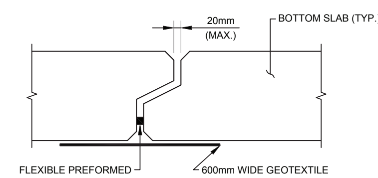
B DISTRIBUTION SLAB DETAIL
N.T.S.



JOINTS IN WALLS
N.T.S.



JOINTS IN TOP SLAB
N.T.S.



JOINTS IN BOTTOM SLAB
N.T.S.

D PRECAST CONCRETE CULVERT JOINT TREATMENT DETAILS
N.T.S.

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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
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4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

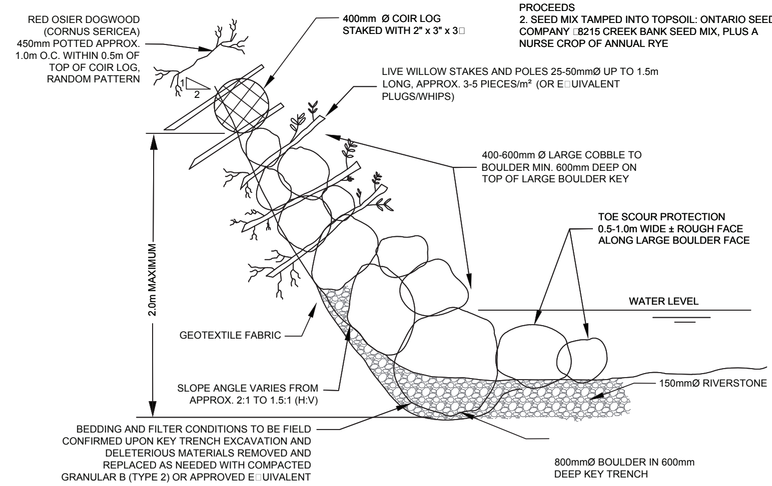
BURNSIDE
R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT DETAILS 2

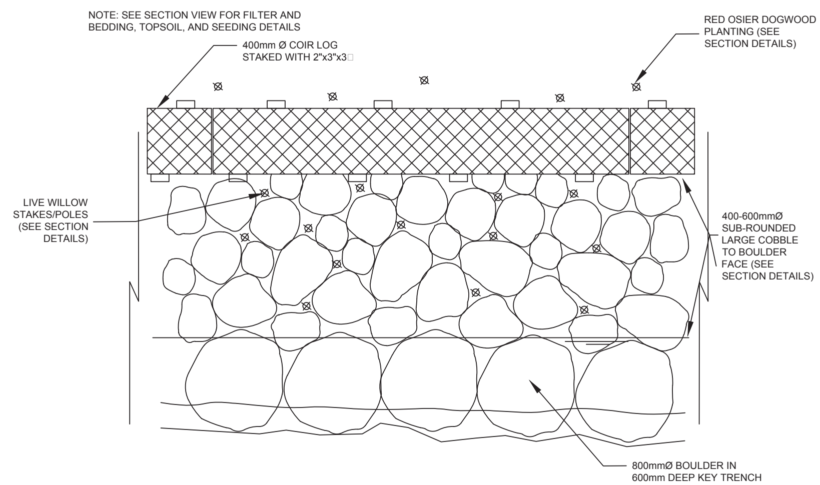
Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	19 of 37
Date 01/30/2019		Project No. 300038790.0000		
Scale AS NOTED				

NOTES
1. TOPSOIL TO BE MIXED WITH STONE AS PLACED TO FILL VOIDS AND TO BE WATERED IN AS WORK PROCEEDS
2. SEED MIX TAMPED INTO TOPSOIL: ONTARIO SEED COMPANY 8215 CREEK BANK SEED MIX, PLUS A NURSE CROP OF ANNUAL RYE



VEGETATED STONE REVETMENT

N.T.S.



VEGETATED STONE REVETMENT FACE VIEW (TYPICAL)

N.T.S.

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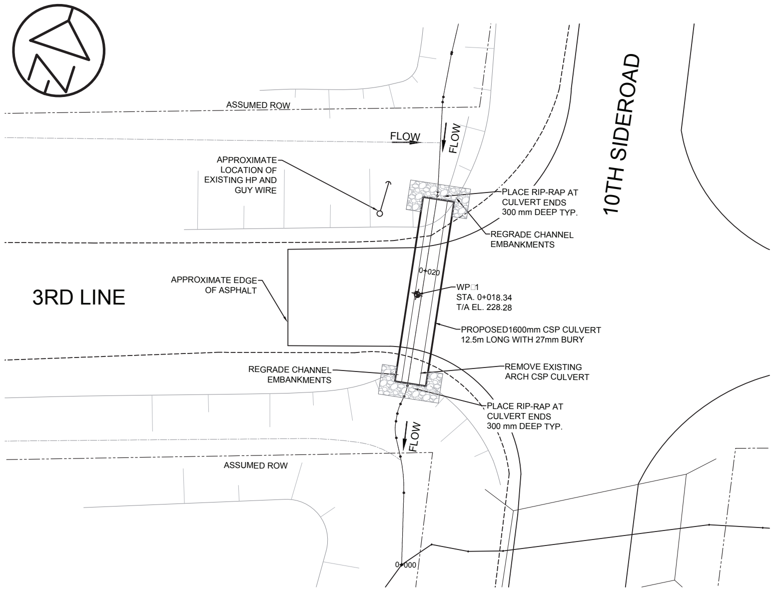
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT DETAILS 3

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	**20 of 37**
Date 01/30/2019		Project No. 300038790.0000		
Scale AS NOTED				

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_4TH LINE MAIN DRAIN CULVERT.dwg Date Plotted: January 30, 2019 - 10:54 AM



GENERAL NOTES

1. DESIGNED TO CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC) CAN/CSA-S6-06.
2. THE CONTRACTOR SHALL CONFIRM ALL DIMENSIONS AND DETAILS BEFORE STARTING WORK.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION AND PROTECTION OF ALL EXISTING UTILITIES, SERVICES, STRUCTURES, ROADWAYS, ETC. DURING CONSTRUCTION.

CORRUGATED STEEL PIPE CULVERT NOTES:

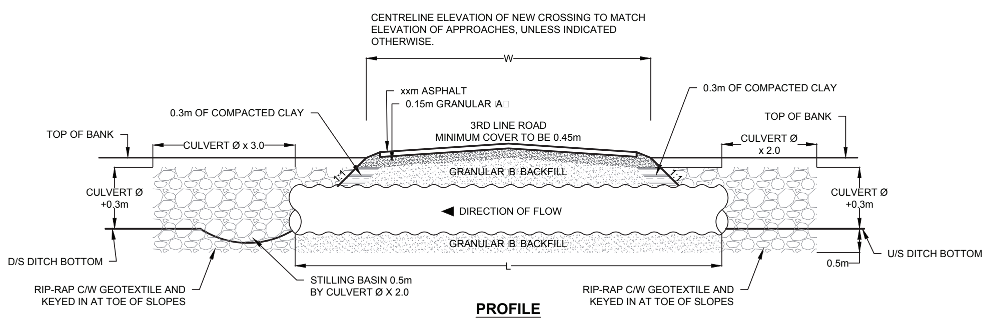
1. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND EACH SIDE OF THE CULVERT KEEPING THE HEIGHT OF BACKFILL APPROXIMATELY E□UAL. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 300mm. PLACE AND COMPACT GRANULAR BACKFILL IN 200mm LIFTS TO A MINIMUM OF 100□ STANDARD PROCTOR DENSITY.
2. THE CONTRACTOR IS TO MEASURE THE RISE AND SPAN AT SEVERAL LOCATIONS DURING THE BACKFILLING PROCESS TO ENSURE THAT CULVERT MAINTAINS ITS SHAPE THROUGHOUT CONSTRUCTION. AT NO POINT SHALL THE VERTICAL DIMENSION (RISE) INCREASE IN EXCESS OF 5□ OF THE NOMINAL DIAMETER. ALSO THE HORIZONTAL DIMENSION (SPAN) SHALL NOT INCREASE IN EXCESS OF 3□ GREATER THAN THE NOMINAL DIMENSION.
3. BEARING CAPACITY OF SOIL TO BE A MINIMUM OF 150kPa (ULS), TO BE VERIFIED BY CONTRACT ADMINISTRATOR PRIOR TO PLACEMENT OF CULVERT.

APPLICABLE OPSD□S

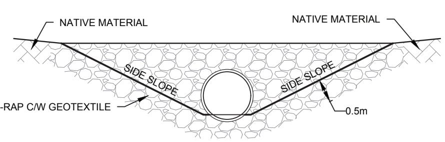
208.010	BENCHING OF EARTH SLOPES
219.130	HEAVY DUTY SILT FENCE
219.180	STRAW BALE FLOW CHECKS
219.210	ROCK FLOW CHECK DAM
802.010	FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION
810.010	RIP-RAP TREATMENT FOR SEWER AND CULVERT OUTLETS
912.130	GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST ASSEMBLY INSTALLATION - SINGLE RAIL
912.235	GUIDE RAIL SYSTEM, STEEL BEAM LEAVING END TREATMENT, INSTALLATION
912.240	GUIDE RAIL SYSTEM, STEEL BEAM TREATMENT AT CULVERTS WITH MINIMAL COVER
922.530	ENERGY ATTENUATOR, END TREATMENT EXTRUDER ASSEMBLY

LEGEND

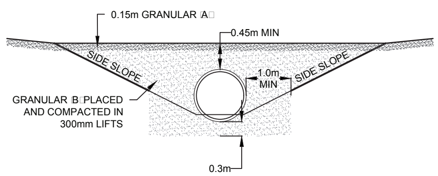
WP	WORKING POINT
TYP.	TYPICAL
MIN.	MINIMUM
RND	ROUNDING
SHLD	SHOULDER
EX.	EXISTING
PR.	PROPOSED
C/L	CENTRELINE
EL.	ELEVATION
R.O.W.	RIGHT OF WAY
BM	BENCHMARK
W.L.	WATER LEVEL
D/W	DRIVEWAY
U.O.N.	UNLESS OTHERWISE NOTED
T/A	TOP OF ASPHALT
U/S	UPSTREAM
D/S	DOWNSTREAM
SBGR	STEEL BEAM GUIDE RAIL
STA	STATION
F.F.	FRONT FACE
B/W	BOTTOM OF WALL
T/W	TOP OF WALL
INV	INVERT
CSP	CORRUGATED STEEL PIPE
BH	BOREHOLE
HP	HYDRO POLE
E/W	EACH WAY



PROFILE
N.T.S.

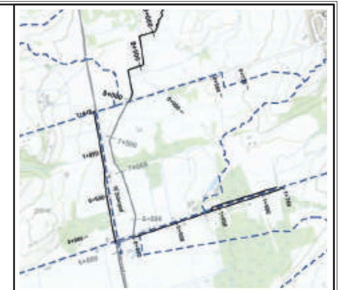


ELEVATION
N.T.S.



SECTION
N.T.S.

AERIAL PHOTOGRAPHY PROVIDED BY: □□□, PARCELS PROVIDED BY: □□□, DATED: □□□



KEY PLAN
SCALE: N.T.S.

LEGEND

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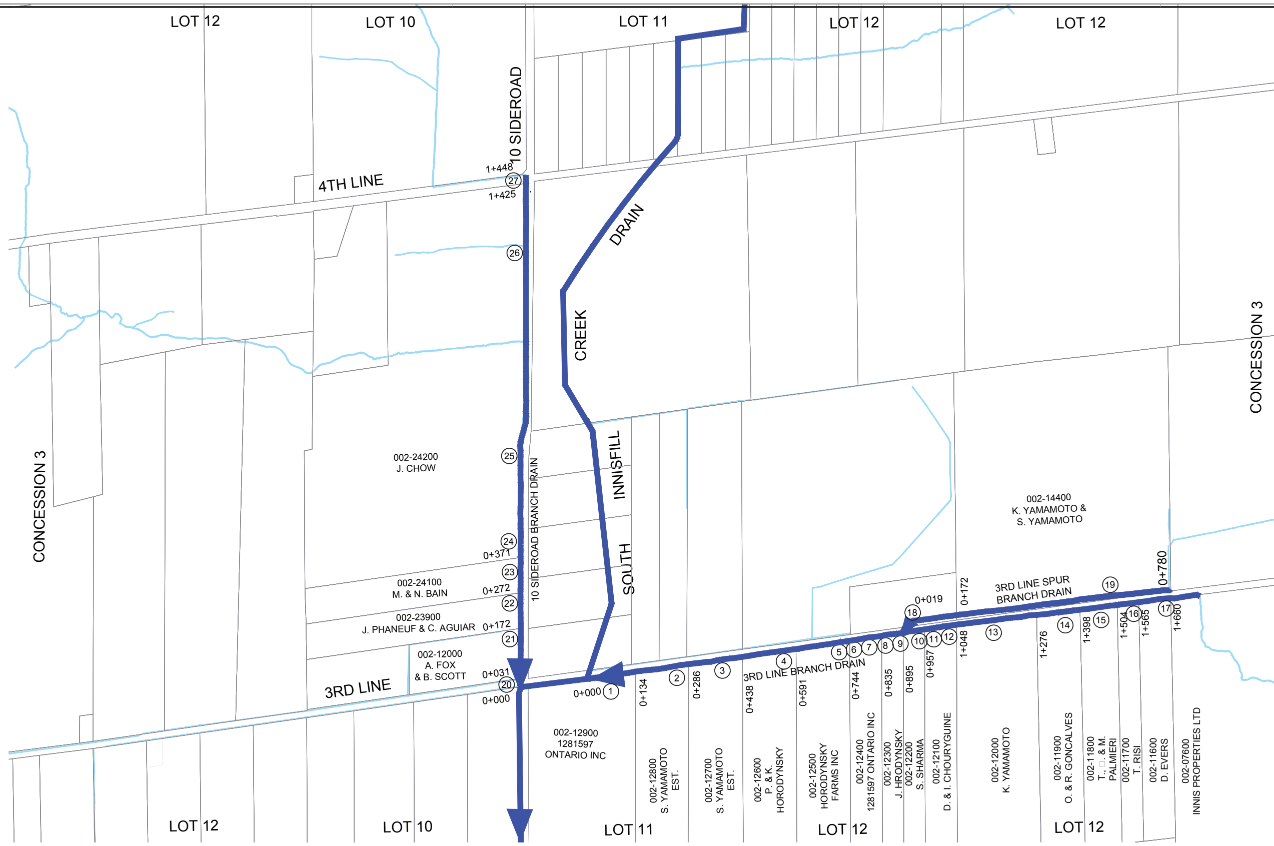
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
10TH SIDEROAD BRANCH DRAIN 3RD LINE CULVERT

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	21 of 37
Date		Project No.		
01/30/2019		300038790.0000		
Scale				
1:5,000	0 50 100 200 300m			

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_10 SIDEROAD BRANCH DRAIN CULVERT.dwg Date Plotted: January 30, 2019 - 10:55 AM



Branch Drain	Culvert No.	Station	Land Owner	Existing Size	Proposed Size	Sized For
3rd Line	1	35.8	1281597 Ontario Inc. (002-12900)	1400	1600mm CSP	2-Yr
	2	255.2	S. Yamamoto Est. (002-12800)	1500	1600mm CSP	2-Yr
	3	379.6	S. Yamamoto Est. (002-12800)	1500	1600mm CSP	2-Yr
	4	566.0	P. & K. Horodynsky (002-12600)	1350 x 1650	1600mm CSP	2-Yr
	5	709.8	Horodynsky Farms Inc. (002-12500)	2400	1600mm CSP	2-Yr*
	6	719.8	Horodynsky Farms Inc. (002-12500)	1830	1600mm CSP	2-Yr*
	7	762.0	1281597 Ontario Inc. (002-12400)	1500	1600mm CSP	2-Yr
	8	819.7	1281597 Ontario Inc. (002-12400)	1300 x 1000	1600mm CSP	2-Yr
	9	866.7	J. Horodynsky (002-12300)	2400	1600mm CSP	2-Yr
	10	905.8	S. Sharma (002-12200)	1200	1600mm CSP	2-Yr
	11	921.8	S. Sharma (002-12200)	1200	1600mm CSP	2-Yr
	12	999.0	D. & I. Choury Guine (002-12100)	1400	1600mm CSP	2-Yr
	13	1163.0	K. Yamamoto (002-12000)	1800 x 1100	1600mm CSP	2-Yr
	14	1346.0	O. & R. Goncalvse (002-1190)	1200	1600mm CSP	2-Yr
	15	1442.5	T., Q. & M. Palmeiri (002-11800)	1200	1600mm CSP	2-Yr
	16	1531.7	R. Tulio (002-11700)	800	2.4m x 1.2m Box with 200 bury	2-Yr
	17	1650.3	D. Evers (002-11600)	1499 span	1600mm CSP	2-Yr
3rd Line Spur	18	17.8	R.O.W.	1200	1400mm CSP	10-Yr
	19	601.4	S. Yamamoto Est. & K. Yamamoto (002-14400)	1500	1400mm CSP	2-Yr
10 Sideroad	20	31.0	R.O.W.	1800 x 1100	1600mm CSP	10-Yr
	21	144.8	A. Fox & B. Scott (001-23800)	800	1500mm CSP	5-yr
	22	268.5	J. Phaneuf & C. Aguiar (001-23900)	900	1500mm CSP	5-yr
	23	330.8	M. & N. Bain (001-24100)	1800	1500mm CSP	5-yr
	24	411.5	J. Chow (001-24200)	900	1200mm CSP	5-yr
	25	660.4	J. Chow (001-24200)	1200	1200mm CSP	5-yr
	26	1228.5	J. Chow (001-24200)	900	1000mm CSP	5-yr
	27	1436.7	R.O.W.	900	1000mm CSP	5-yr

NOTE: THERE SHALL BE 10 BURY ASSUMED FOR ALL CULVERTS.
THESE TWO CULVERTS SHALL BE REPLACED WITH ONLY 1 PIPE OF ADE UATE LENGTH AS APPROVED BY THE TOWN.

AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017

KEY PLAN
SCALE: N.T.S.

LEGEND

DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER — 001-23414
LANDOWNER — M. VAN DER MAST

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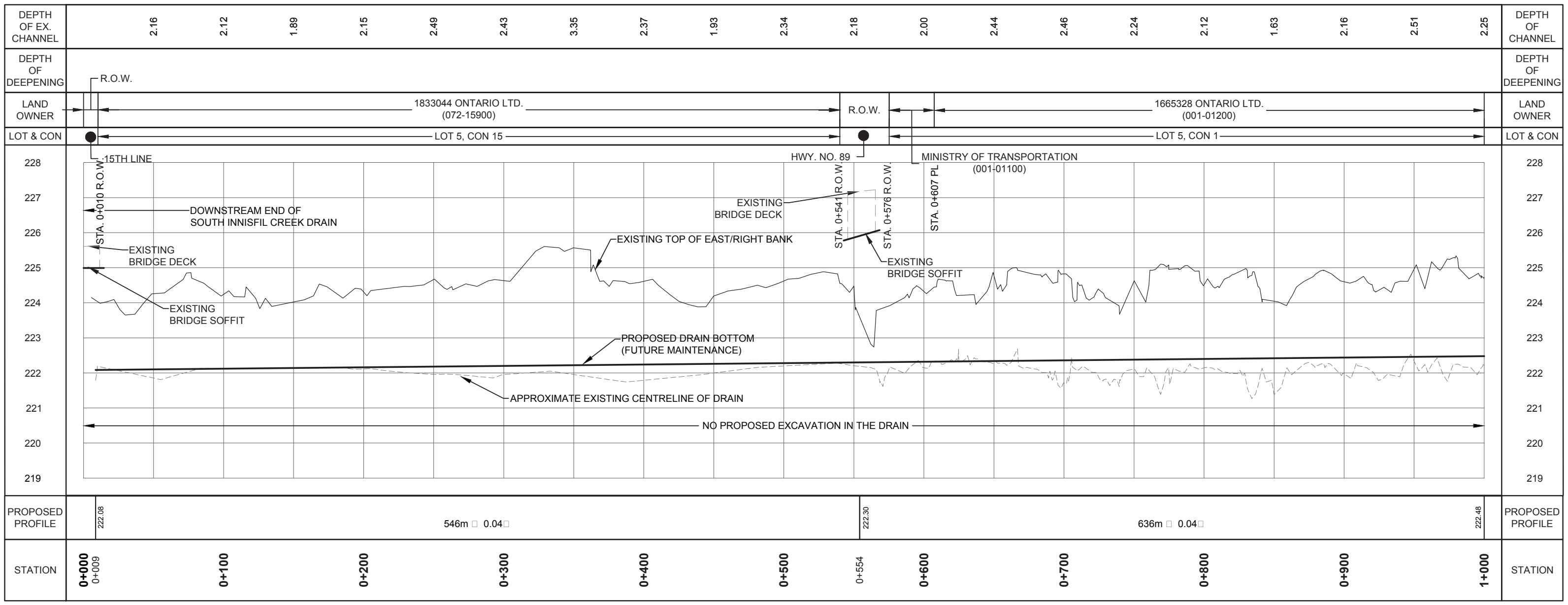
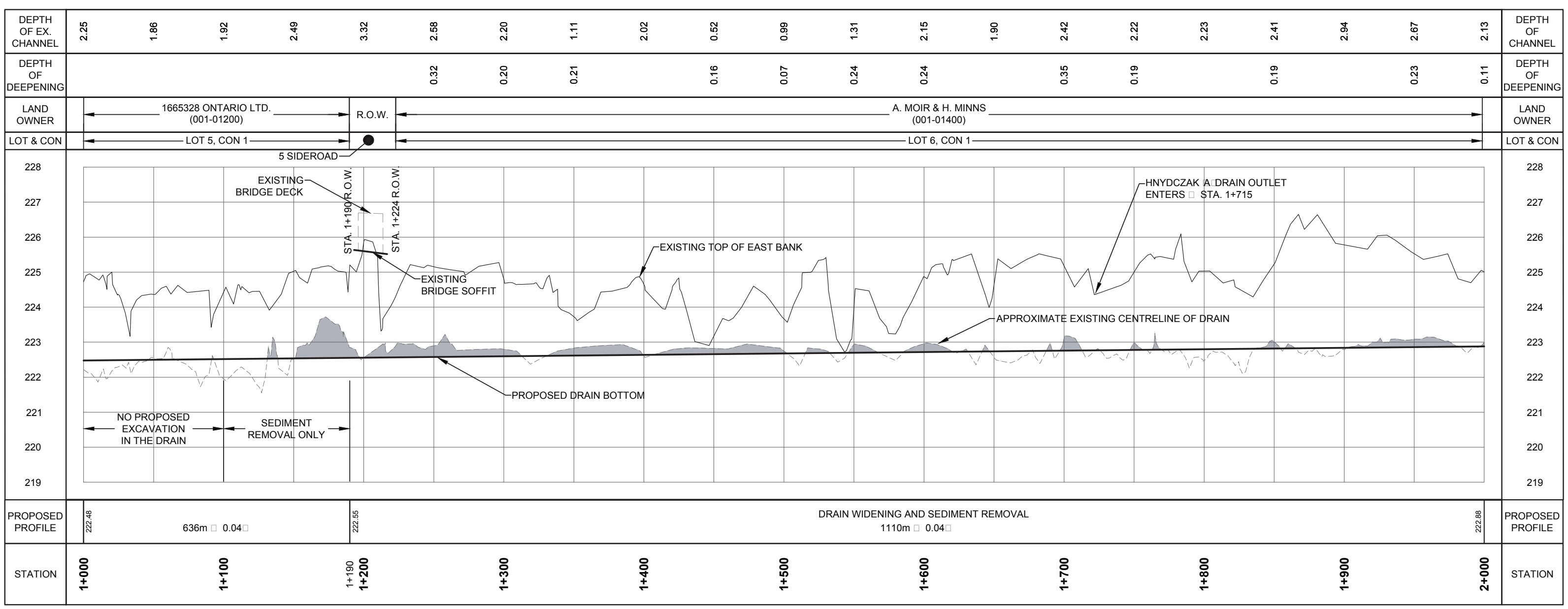
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

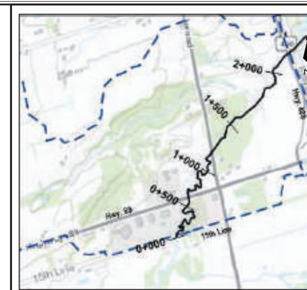
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
CULVERT TABLE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	22 of 37
Date: 01/30/2019		Project No.: 300038790.0000		
Scale: 1:5,000	0 50 100 200 300m			





ALL ELEVATION AND TOPOGRAPHIC DATA USED TO CREATE THE VARIOUS PROFILES WAS PROVIDED BY DILLON CONSULTING TO THE TOWN OF INNISFIL AND COLLECTED AT THE SITE OF THE DRAIN CIRCA 2006.



KEY PLAN
SCALE: N.T.S.

BENCHMARKS:		
No.	Elevation	Description
1	227.66	Temporary benchmark – top CL concrete curb, north end of 2nd Line bridge over South Innisfil Creek Drain.
2	228.81	Temporary benchmark – top CL concrete curb, east end of 10 Sideroad bridge over South Innisfil Creek Drain.
3	229.03	Temporary benchmark – top CL concrete curb, north end of 3rd Line bridge over South Innisfil Creek Drain.
4	236.98	Temporary benchmark – top CL concrete curb, south end of 5th Line bridge over South Innisfil Creek Drain.
5	227.41	MTO Monument approx. 410 m south of South Innisfil Creek Drain Sta. 2+280, on west bank of Hnydczak Drain – Main Branch
6	227.66	Temporary benchmark - top CL concrete curb, north end of 2nd line bridge over South Innisfil Creek Drain.
7	228.81	Temporary benchmark - top CL concrete curb, east end of 10 Side Road bridge over South Innisfil Creek Drain.
8	229.03	Temporary benchmark - top CL concrete curb, north end of South Innisfil Creek Drain.
9	236.98	Temporary benchmark - top CL concrete curb south end of 5th Line bridge over South Innisfil Creek Drain.

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2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN PROFILE 0+000 TO 2+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	23of37
Date		Project No.		
01/30/2019		300038790.0000		

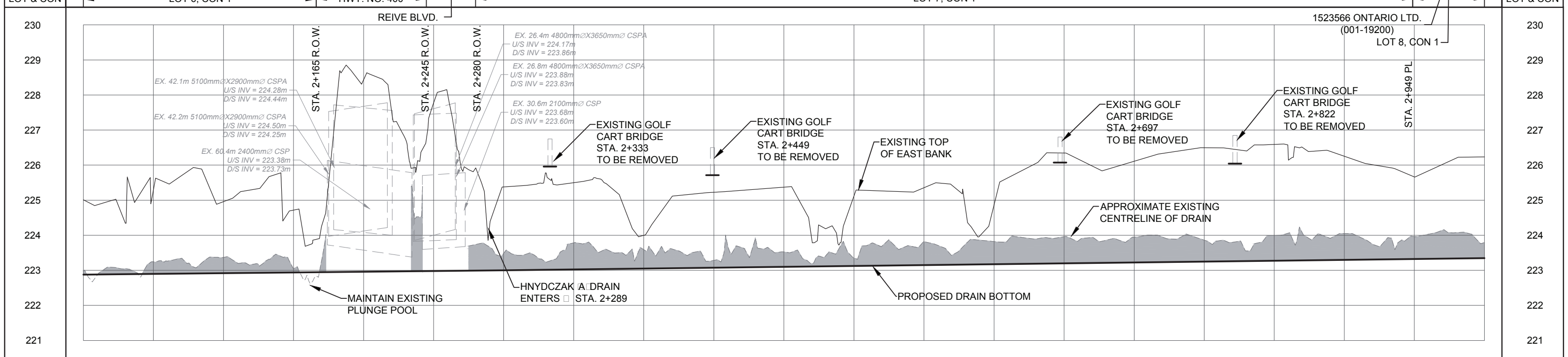
Scale
Horizontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: January 30, 2019 - 12:44 PM

DEPTH OF EX. CHANNEL	2.13	2.39	2.04	1.78	5.47	4.79	2.38	2.47	0.95	2.15	2.27	1.99	2.21	1.69	3.15	2.89	3.25	3.32	2.95	2.34	2.89
DEPTH OF DEEPENING	0.11	0.35	0.45	0.11			0.49	0.76	0.54	0.21	0.42	0.23	0.67	0.65	0.76	0.73	0.61	0.72	0.75	0.64	0.44
STATION	2+000		2+100		2+200		2+300		2+400		2+500		2+600		2+700		2+800		2+900		3+000

LAND OWNER: 2367808 ONTARIO INC. (001-02800) | R.O.W. | R.O.W. | SUCCESSION FINANCIAL GROUP INC. (001-19400) | 1523566 ONTARIO LTD. (001-19200)

LOT & CON: LOT 6, CON 1 | HWY. NO. 400 | REIVE BLVD. | LOT 7, CON 1 | LOT 8, CON 1

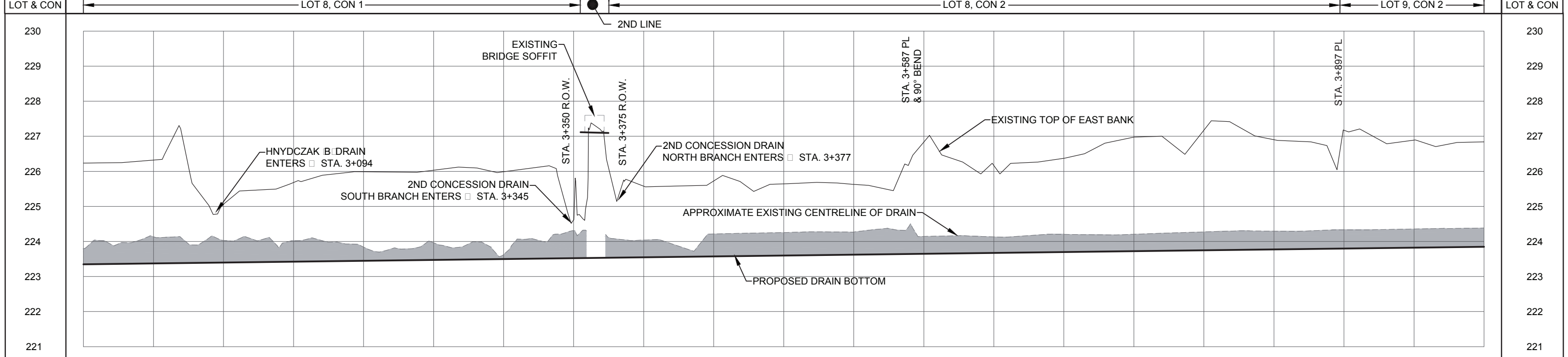


PROPOSED PROFILE	222.88	DRAIN WIDENING AND SEDIMENT REMOVAL 1110m 0.04	223.00
	223.00	DRAIN WIDENING AND DEEPENING 3820m 0.05	223.35

DEPTH OF EX. CHANNEL	2.89	2.95	1.67	2.26	2.54	2.56	2.49	1.09	2.03	2.15	2.04	2.00	3.18	2.49	2.67	3.25	3.42	3.13	3.37	3.07	2.99
DEPTH OF DEEPENING	0.44	0.76	0.63	0.60	0.39	0.49	0.13	0.78	0.49	0.64	0.66	0.65	0.49	0.46	0.50	0.48	0.52	0.52	0.53	0.53	0.53
STATION	3+000		3+100		3+200		3+300		3+400		3+500		3+600		3+700		3+800		3+900		4+000

LAND OWNER: 1523566 ONTARIO LTD. (001-19200) | R.O.W. | P. CHIODO (001-19700) | A. & M. FILICE (001-19800) | COHN FARMS INC. (001-20000)

LOT & CON: LOT 8, CON 1 | 2ND LINE | LOT 8, CON 2 | LOT 9, CON 2



PROPOSED PROFILE	223.35	DRAIN WIDENING AND DEEPENING 3820m 0.05	223.85

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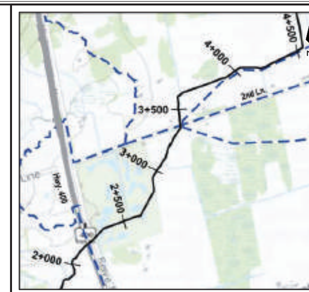

KEY PLAN
SCALE: N.T.S.

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5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

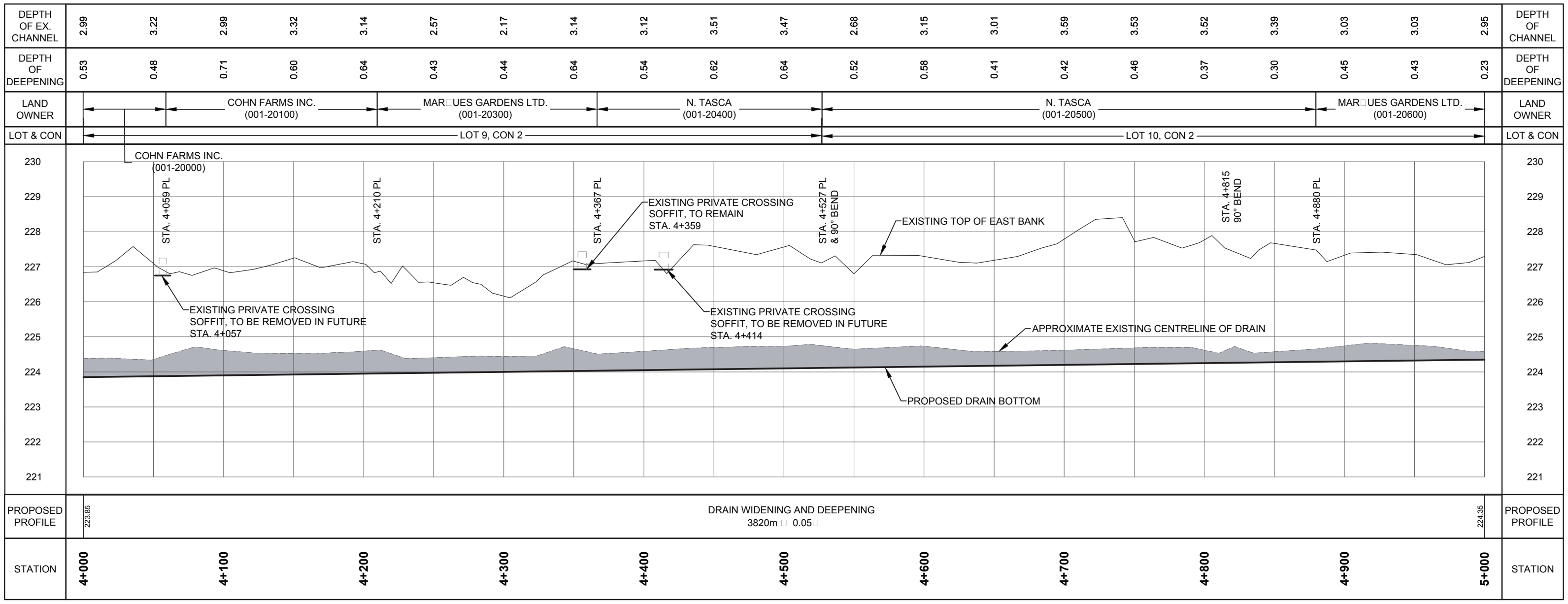
Innisfil

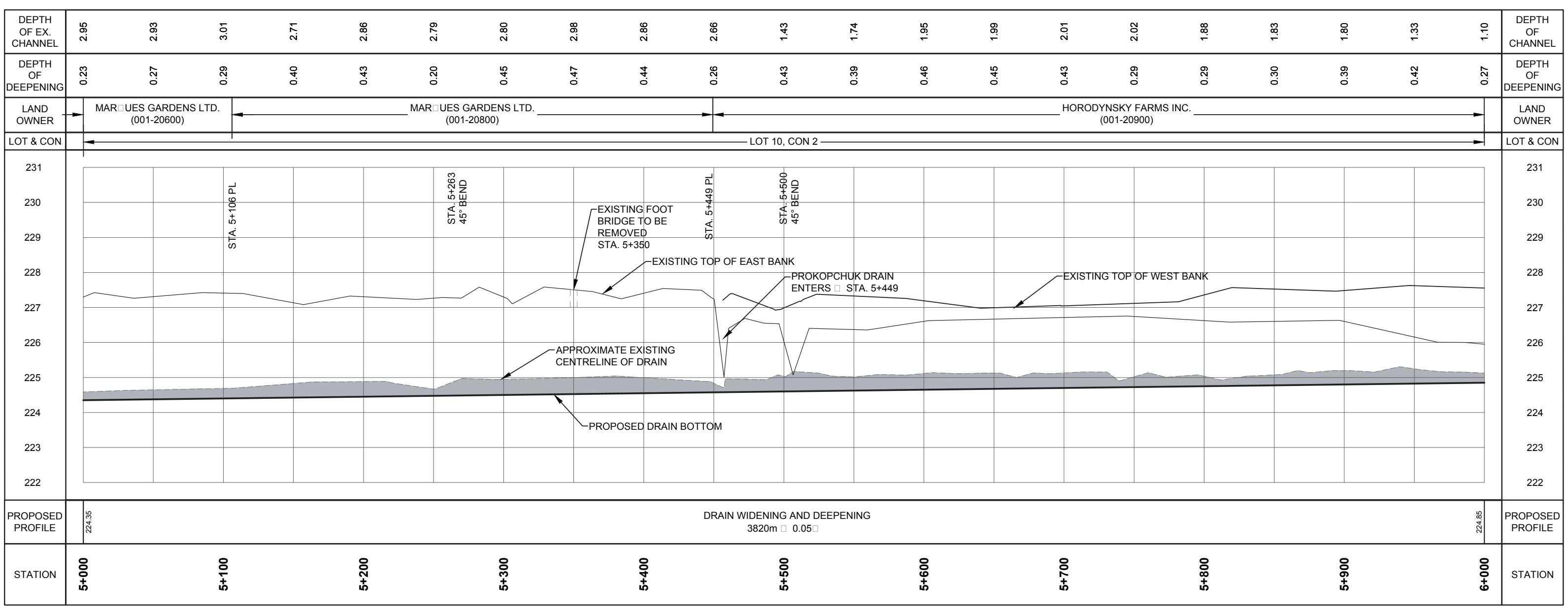
Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN PROFILE 2+000 TO 4+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	24 of 37
Date 01/30/2019		Project No. 300038790.0000		

Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: January 30, 2019 - 12:44 PM





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KEY PLAN
SCALE: N.T.S.

Notes
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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
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7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

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Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

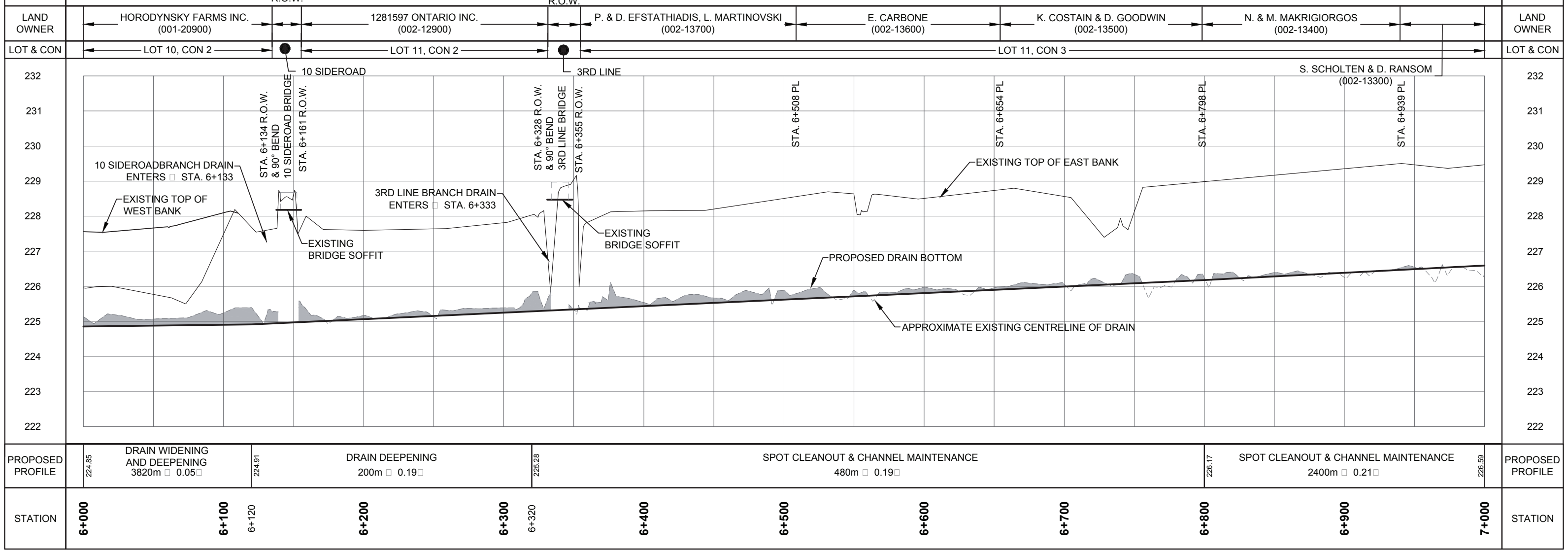
Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN PROFILE 4+000 TO 6+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	25of37
Date		Project No.		
01/30/2019		300038790.0000		

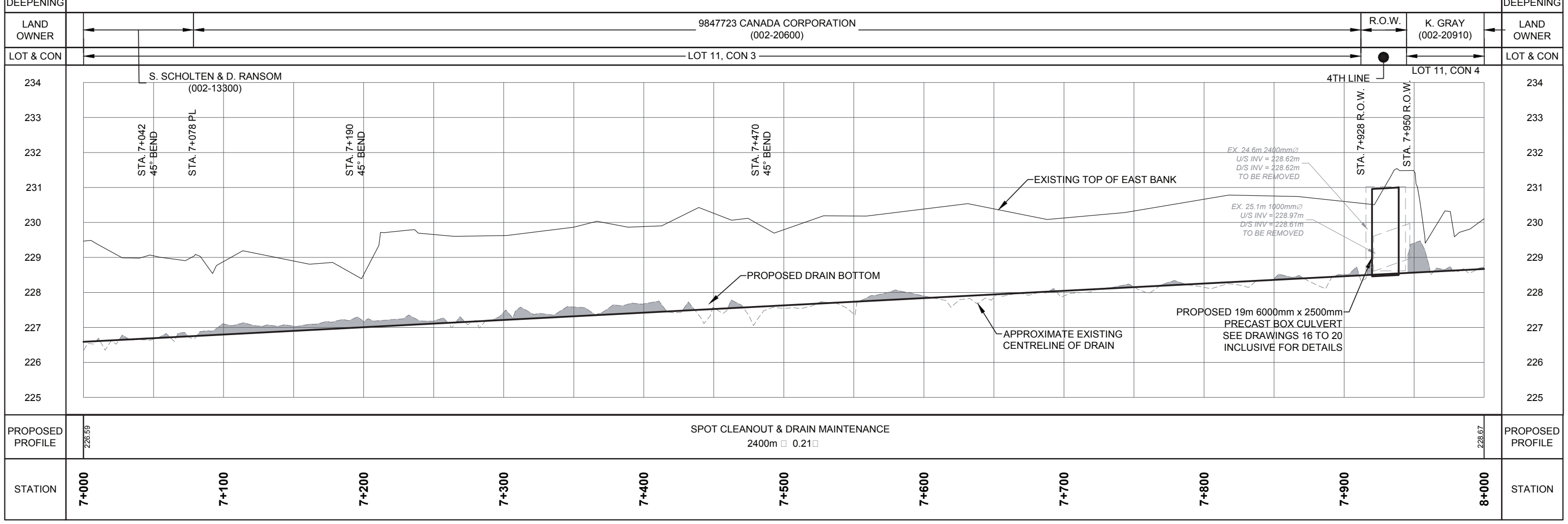
Scale
Hori ontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: January 30, 2019 - 12:44 PM

DEPTH OF EX. CHANNEL	1.10	0.89	2.59	3.65	2.53	2.49	2.57	3.71	2.72	2.68	2.89	2.89	2.70	2.84	2.57	2.04	2.81	2.89	2.97	2.98	2.88
DEPTH OF DEEPENING	0.27	0.19	0.34		0.10	-0.02	0.14		0.10	0.14	0.26	0.18	0.17	0.06	0.07	0.26	0.07	0.11		0.05	
STATION	6+000		6+100		6+200		6+300		6+400		6+500		6+600		6+700		6+800		6+900		7+000



DEPTH OF EX. CHANNEL	2.88	2.35	2.09	2.00	1.50	2.55	2.41	2.55	2.46	2.73	2.16	2.45	2.55	2.45	2.08	2.18	2.41	2.40	2.14	2.90	1.44
DEPTH OF DEEPENING			0.30	0.13	0.15	0.08	0.22	0.27	0.25	0.03			0.06			0.01		0.03	0.05	0.85	0.05
STATION	7+000		7+100		7+200		7+300		7+400		7+500		7+600		7+700		7+800		7+900		8+000



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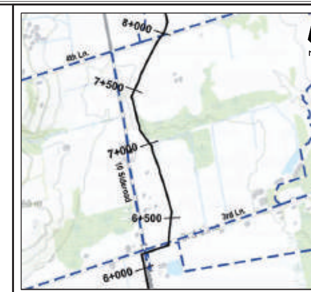

KEY PLAN
SCALE: N.T.S.

BENCHMARKS:

No.	Elevation	Description
1	227.66	Temporary benchmark – top CL concrete curb, north end of 2nd Line bridge over South Innisfil Creek Drain.
2	228.81	Temporary benchmark – top CL concrete curb, east end of 10 Sideroad bridge over South Innisfil Creek Drain.
3	229.03	Temporary benchmark – top CL concrete curb, north end of 3rd Line bridge over South Innisfil Creek Drain.
4	236.98	Temporary benchmark – top CL concrete curb, south end of 5th Line bridge over South Innisfil Creek Drain.
5	227.41	MTO Monument approx. 410 m south of South Innisfil Creek Drain Sta. 2+280, on west bank of Hnydczak Drain – Main Branch
6	227.66	Temporary benchmark - top CL concrete curb, north end of 2nd line bridge over South Innisfil Creek Drain.
7	228.81	Temporary benchmark - top CL concrete curb, east end of 10 Side Road bridge over South Innisfil Creek Drain.
8	229.03	Temporary benchmark - top CL concrete curb, north end of South Innisfil Creek Drain.
9	236.98	Temporary benchmark - top CL concrete curb south end of 5th Line bridge over South Innisfil Creek Drain.

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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
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6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

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Client

TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN PROFILE 6+000 TO 8+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	**26of37**
Date		Project No.		
01/30/2019		300038790.0000		

Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: January 30, 2019 12:45 PM

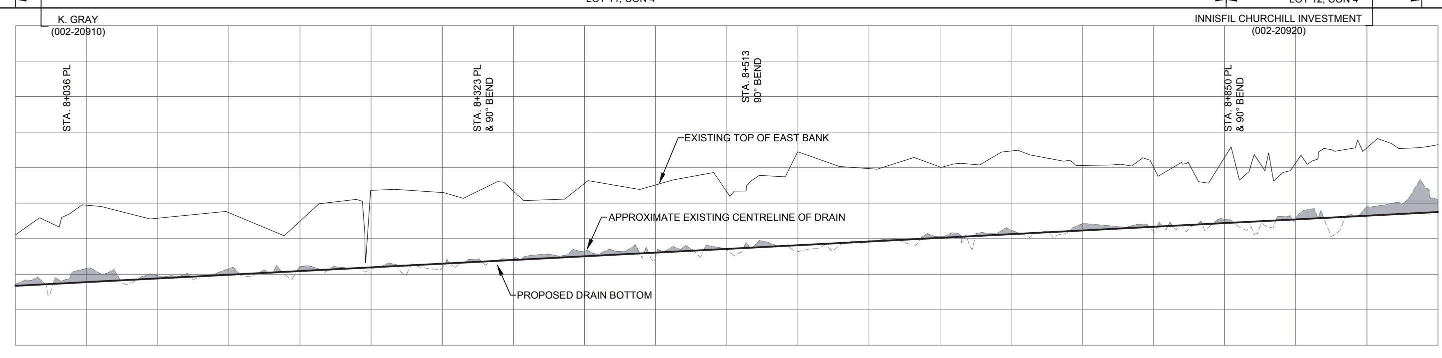
DEPTH OF EX. CHANNEL	1.44	2.17	1.70	1.75	1.41	2.17	2.01	1.94	2.05	1.91	1.61	2.63	2.06	2.00	2.34	1.83	1.68	1.85	1.59	1.91	1.90
DEPTH OF DEEPENING	0.05	0.39	0.08	0.17	0.13			0.04	0.15				0.04	0.05	0.12	0.19		0.11	0.03	0.26	0.34

LAND OWNER: M. & M. ALVES (002-20912); KELL FARMS LTD. (002-20700); M. & L. VALENTE (002-20918)

LOT & CON: LOT 11, CON 4; LOT 12, CON 4

K. GRAY (002-20910)

INNISFIL CHURCHILL INVESTMENT (002-20920)



PROPOSED PROFILE: 228.67 — SPOT CLEANOUT AND CHANNEL MAINTENANCE 2400m □ 0.21□ — 230.75

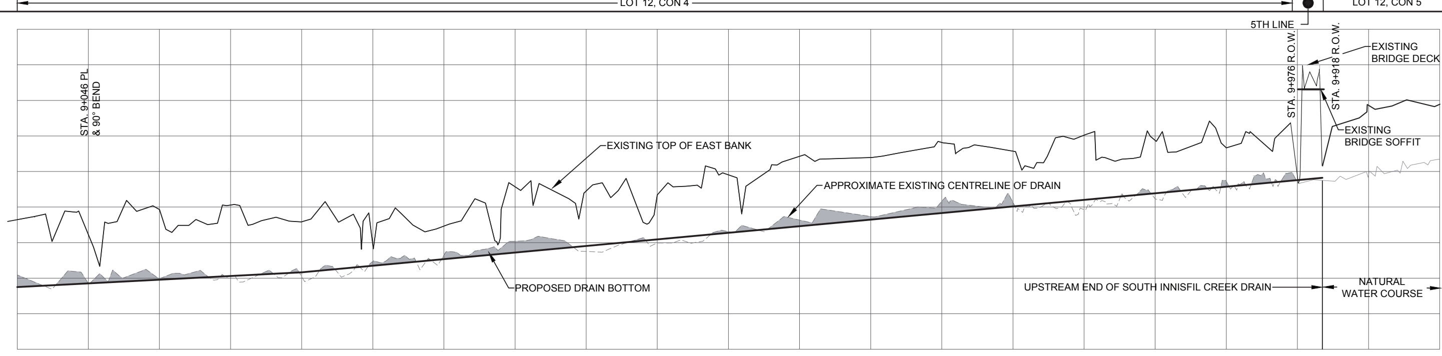
STATION: 8+000, 8+100, 8+200, 8+300, 8+400, 8+500, 8+600, 8+700, 8+800, 8+900, 9+000

DEPTH OF EX. CHANNEL	1.90	1.38	1.97	1.99	1.42	0.58	0.93	1.85	1.54	1.25	1.63	1.97	1.75	1.98	1.55	1.82	1.49	1.09	0.12
DEPTH OF DEEPENING	0.34	0.00	0.03	-0.01	-0.12	0.12	0.11	0.32	-0.15	-0.10	0.03	0.17	0.09	0.33	0.11			0.15	

R.O.W.

LAND OWNER: A. TUZI (002-20922); 1665328 ONTARIO LTD. (002-26300)

LOT & CON: LOT 12, CON 4; LOT 12, CON 5



PROPOSED PROFILE: 230.75 — SPOT CLEANOUT AND CHANNEL MAINTENANCE 2400m □ 0.21□ — 231.17 — SPOT CLEANOUT AND CHANNEL MAINTENANCE 718m □ 0.37□ — 233.82

STATION: 9+000, 9+100, 9+200, 9+300, 9+400, 9+500, 9+600, 9+700, 9+800, 9+900, 9+918, 10+000

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KEY PLAN
SCALE: N.T.S.

BENCHMARKS:

No.	Elevation	Description
1	227.66	Temporary benchmark – top CL concrete curb, north end of 2nd Line bridge over South Innisfil Creek Drain.
2	228.81	Temporary benchmark – top CL concrete curb, east end of 10 Sideroad bridge over South Innisfil Creek Drain.
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4	236.98	Temporary benchmark – top CL concrete curb, south end of 5th Line bridge over South Innisfil Creek Drain.
5	227.41	MTO Monument approx. 410 m south of South Innisfil Creek Drain Sta. 2+280, on west bank of Hrydczak Drain – Main Branch
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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
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BURNSIDE

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Client

TOWN OF INNISFIL

2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT

MAIN DRAIN PROFILE 8+000 TO 10+000

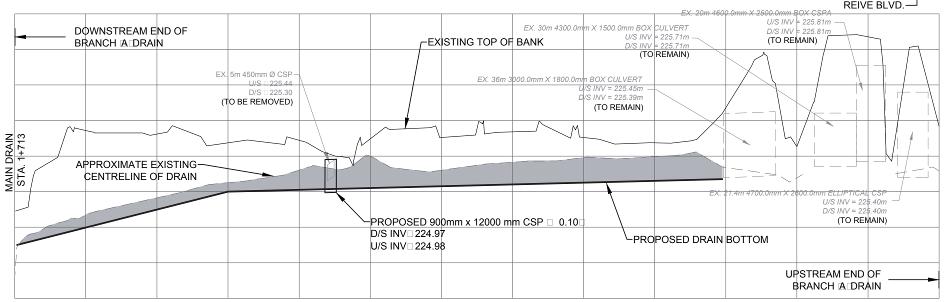
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	27 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: January 30, 2019 - 12:45 PM

DEPTH OF CHANNEL	2.37	1.79	1.12	0.84	0.49	0.92	0.85	0.57	0.39	1.26	DEPTH OF CHANNEL
DEPTH OF DEEPENING	0.36	0.33	0.25	0.55	0.89		0.63	0.71	0.68		DEPTH OF DEEPENING

LAND OWNER	A. MOIR & H. MINNS (001-01400)	MINISTRY OF TRANSPORTATION (001-02100)	LAND OWNER
LOT & CON	LOT 6, CON 1	HWY. 400 / REIVE BLVD.	LOT & CON

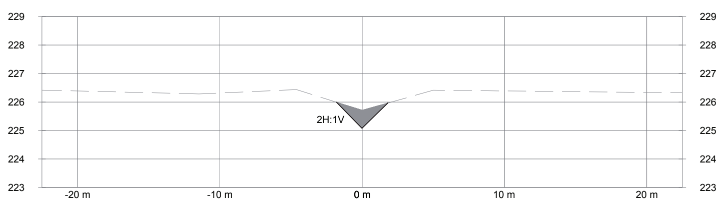


DESC. OF WORK	223.50	DEEPENING 150m □ 1.00□	225.00	DEEPENING 350m □ 0.01□	225.35	DESC. OF WORK

STATION	0+000	0+100	0+150	0+200	0+300	0+400	0+500	0+600	0+650	STATION

BRANCH □A□DRAIN
CROSS-SECTION

0+250



KEY PLAN
SCALE: N.T.S.

THERE ARE A LIMITED NUMBER OF EXISTING (DILLON) BENCHMARKS. BURNSIDE WILL ESTABLISH A COMPLETE AND EXTENSIVE CONSTRUCTION BENCHMARK DATABASE PRIOR TO CONSTRUCTION.

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Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

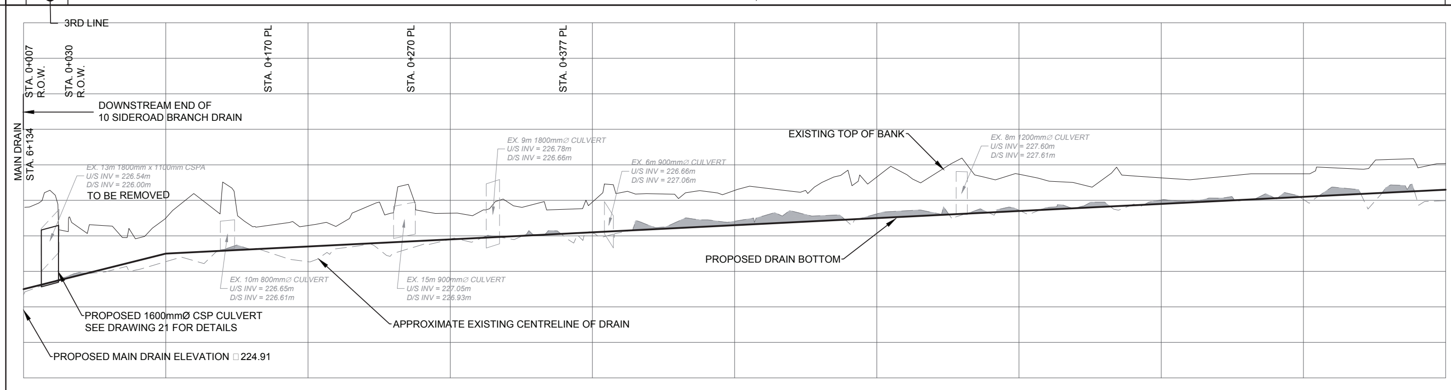
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
BRANCH □A□PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	28 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
Hori□ontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

DEPTH OF CHANNEL	1.31	1.00	1.09	0.59	1.15	0.74	0.80	0.85	0.98	0.98	0.87	1.16	1.38	1.03	0.59	0.73	0.70	0.65	0.90	0.74	DEPTH OF CHANNEL
DEPTH OF DEEPENING			0.14			0.01			0.05	0.11	0.20	0.12	0.04	0.02	0.14	0.11	0.09				DEPTH OF DEEPENING

LAND OWNER	R.O.W. — B. SCOTT (001-23800) — J. PHANEUF & C. AGUIAR (001-23900) — M. & N. BAIN (001-24100) — J. CHOW (001-24200)	LAND OWNER
LOT & CON	LOT 10, CON 3	LOT & CON



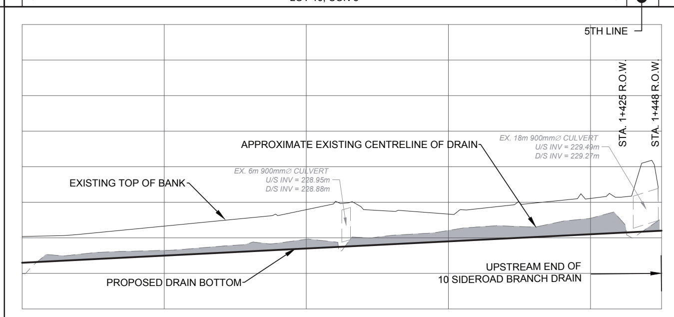
DESC. OF WORK	225.50 DITCH BOTTOM ONLY 100m 1.00	226.50 DITCH BOTTOM ONLY CLEANOUT 900m 0.20 228.30	DESC. OF WORK

STATION	0+000	0+100	0+200	0+300	0+400	0+500	0+600	0+700	0+800	0+900	1+000	STATION

NOTES:
1. SEE DRAWING 22 FOR (FUTURE) PROPOSED CULVERT SIZE.

DEPTH OF CHANNEL	0.74	0.74	0.83	0.92	1.09	0.97	0.77	0.99	1.01	DEPTH OF CHANNEL
DEPTH OF DEEPENING		0.18	0.15	0.19	0.26	0.22	0.31	0.32	0.45	DEPTH OF DEEPENING

LAND OWNER	J.CHOW (001-24200) — R.O.W.	LAND OWNER
LOT & CON	LOT 10, CON 3	LOT & CON

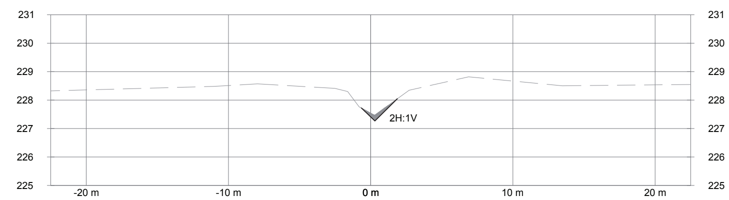


DESC. OF WORK	228.30 DITCH BOTTOM ONLY DEEPENING 450m 0.20 229.20	DESC. OF WORK

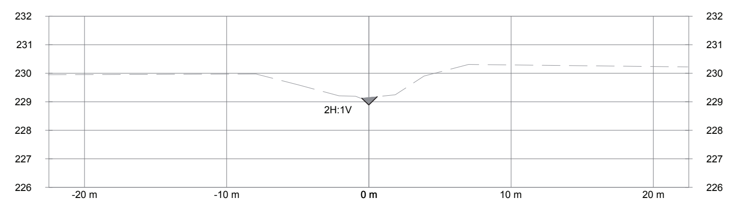
STATION	1+000	1+100	1+200	1+300	1+400	1+450	STATION

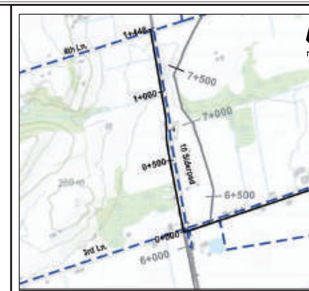
10 SIDEROAD BRANCH DRAIN
CROSS-SECTIONS

0+500



1+300





KEY PLAN
SCALE: N.T.S.

THERE ARE A LIMITED NUMBER OF EXISTING (DILLON) BENCHMARKS. BURNSIDE WILL ESTABLISH A COMPLETE AND EXTENSIVE CONSTRUCTION BENCHMARK DATABASE PRIOR TO CONSTRUCTION.

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BURNSIDE

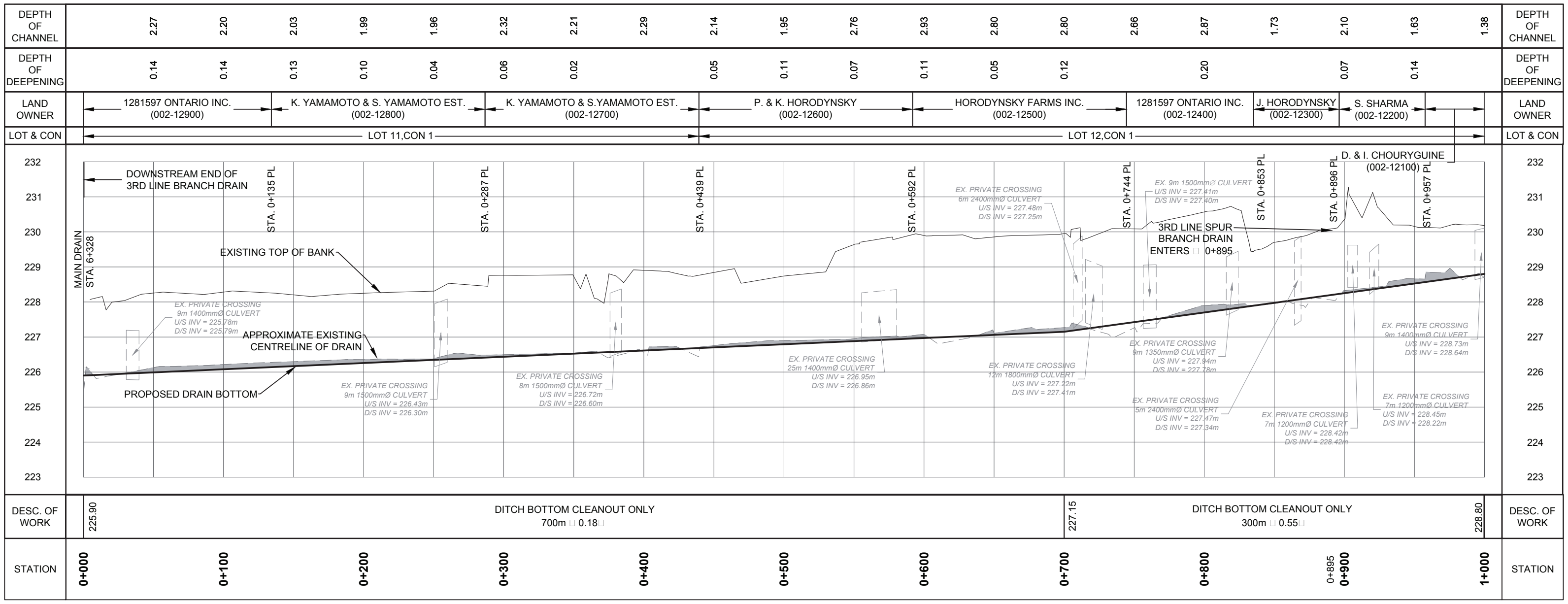
R.J. Burnside & Associates Limited
15 Townline
Orangeville, Ontario, L9W 3R4
telephone (519) 941-5331 **fax** (519) 941-8120
web www.rjburnside.com

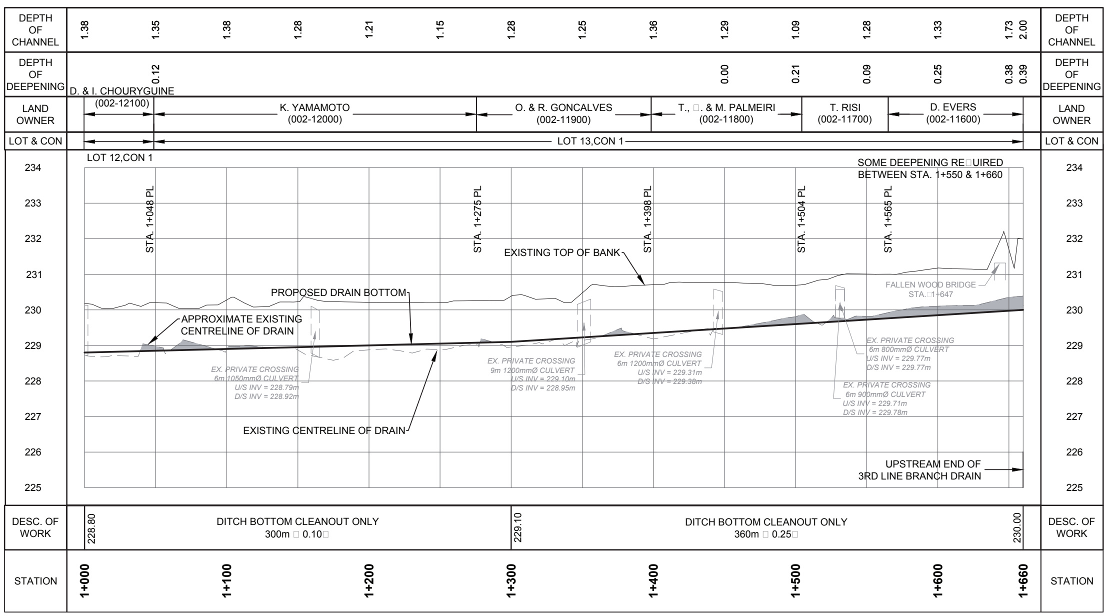
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
10 SIDEROAD BRANCH DRAIN PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	29 of 37
Date 01/30/2019		Project No. 300038790.0000		

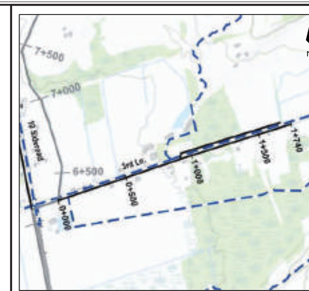
Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m





NOTES:
1. SEE DRAWING 22 FOR (FUTURE) PROPOSED CULVERT SIZE.
2. SEE DRAWING 31 FOR CROSS SECTIONS.

ALL ELEVATION AND TOPOGRAPHIC DATA USED TO CREATE THE VARIOUS PROFILES WAS PROVIDED BY DILLON CONSULTING TO THE TOWN OF INNISFIL AND COLLECTED AT THE SITE OF THE DRAIN CIRCA 2006.



KEY PLAN
SCALE: N.T.S.

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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

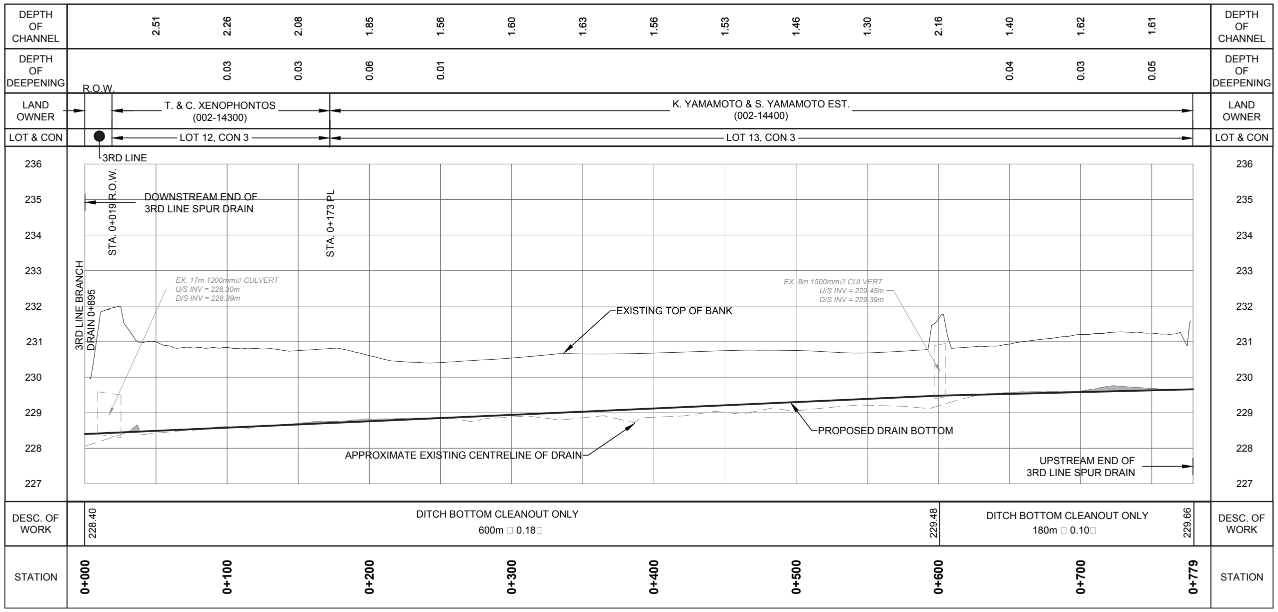
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
3RD LINE BRANCH DRAIN PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	30 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

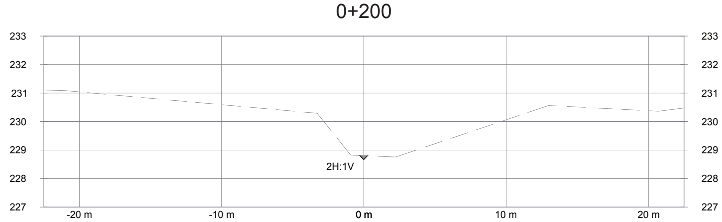


NOTES:

1. SEE DRAWING 22 FOR (FUTURE) PROPOSED CULVERT SIZES

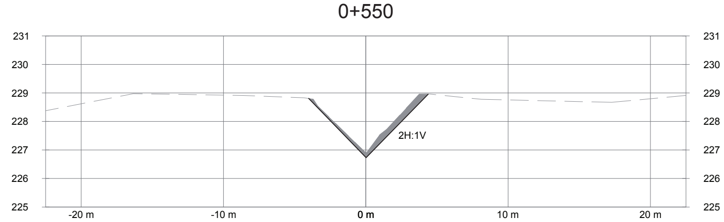
3RD LINE SPUR BRANCH DRAIN CROSS-SECTION

0+200

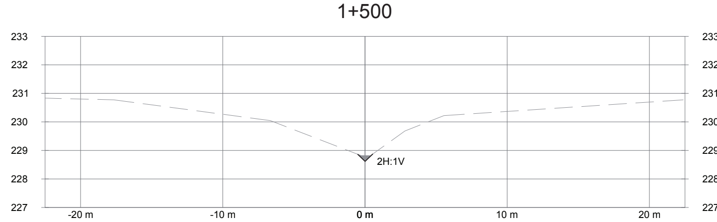


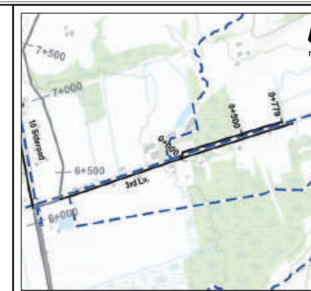
3RD LINE BRANCH DRAIN CROSS-SECTIONS

0+550



1+500





KEY PLAN
SCALE: N.T.S.

THERE ARE A LIMITED NUMBER OF EXISTING (DILLON) BENCHMARKS. BURNSIDE WILL ESTABLISH A COMPLETE AND EXTENSIVE CONSTRUCTION BENCHMARK DATABASE PRIOR TO CONSTRUCTION.

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Client

TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

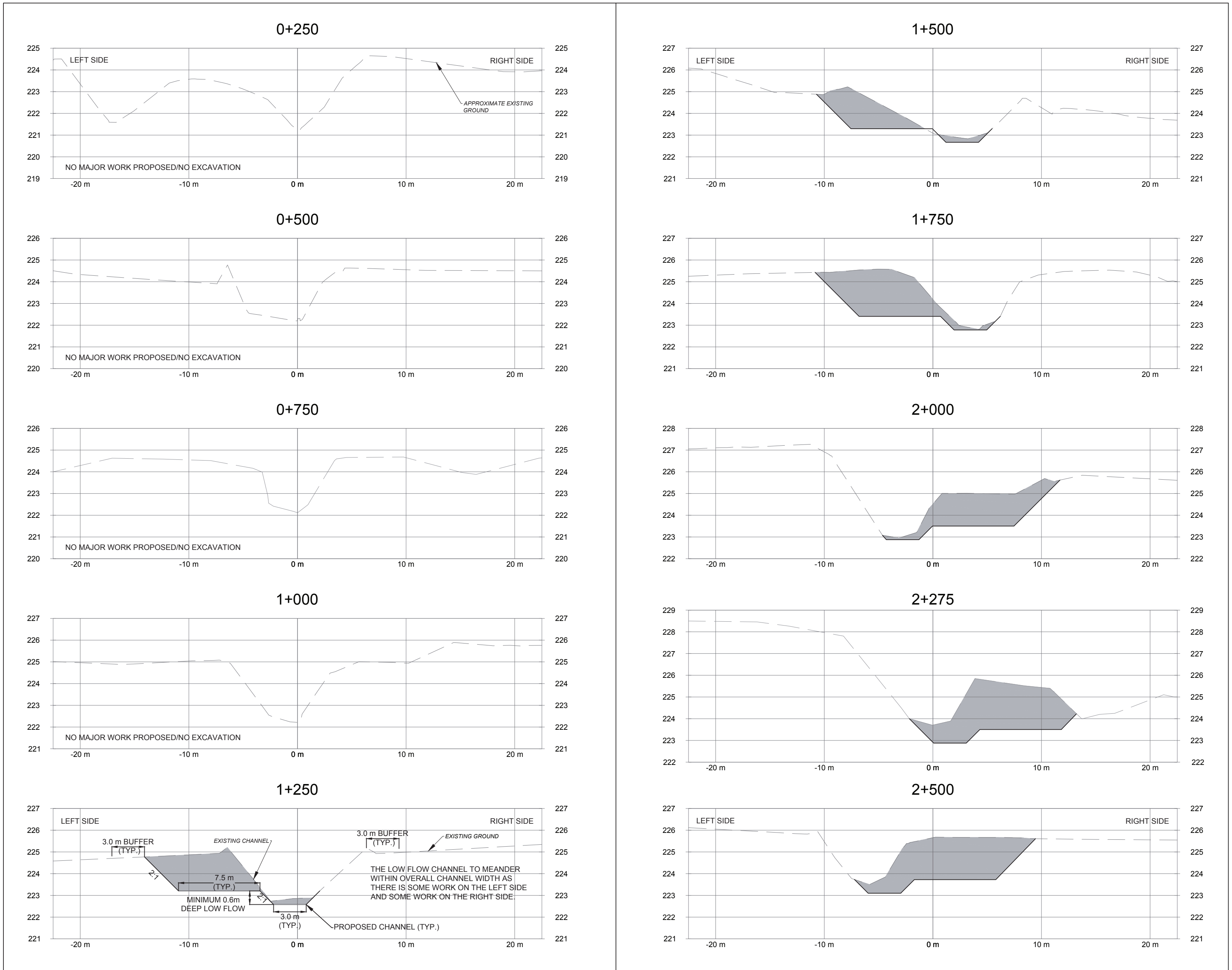
Innisfil

Drawing Title

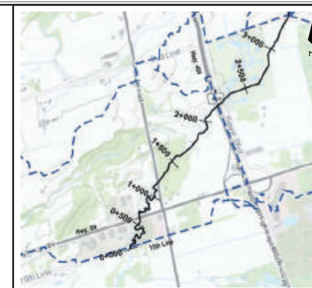
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
3RD LINE SPUR DRAIN PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	31 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM



KEY PLAN
SCALE: N.T.S.

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INNISFIL, ONTARIO
L9S 1A1

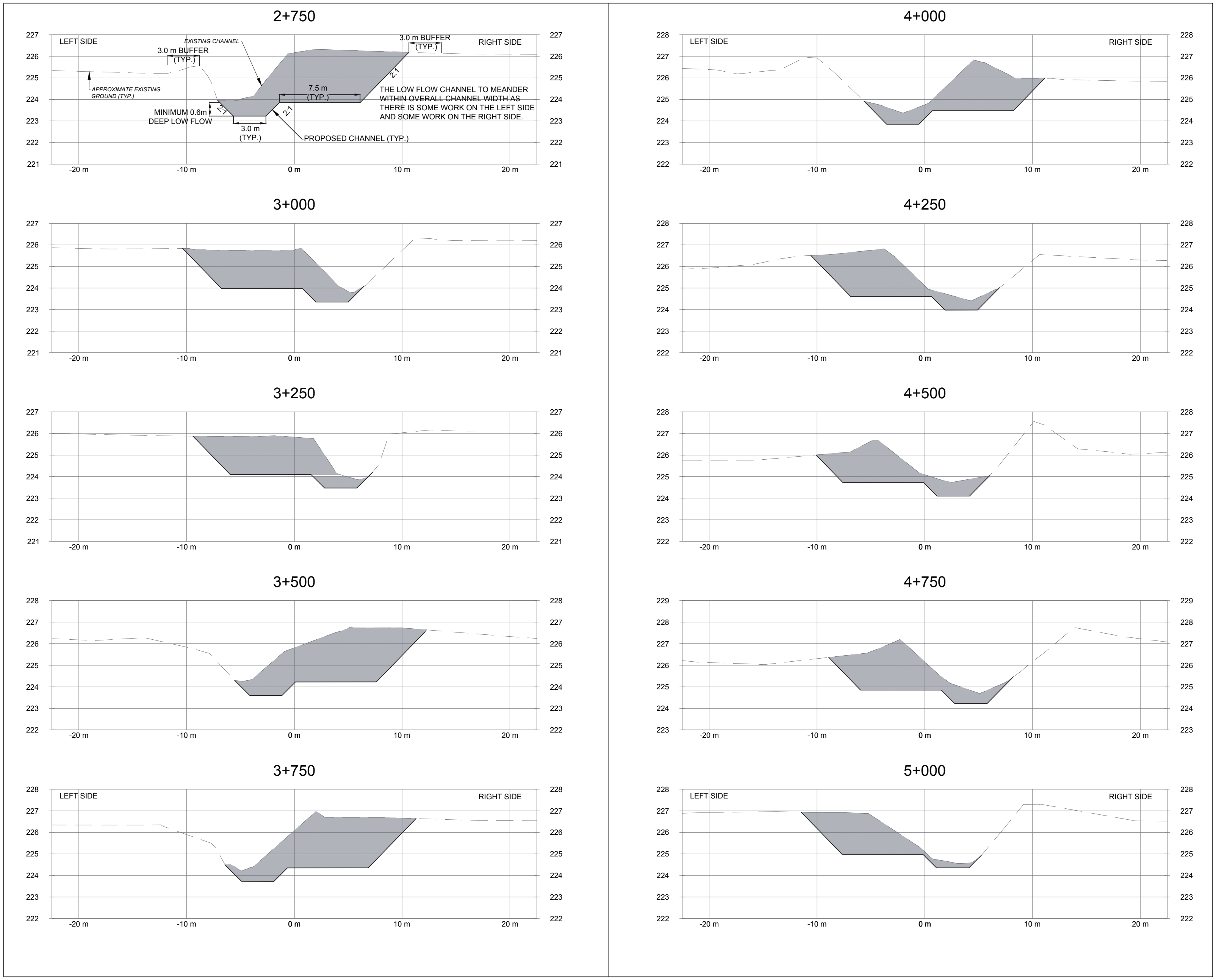
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
CROSS SECTIONS STA. 0+250 TO STA. 2+500

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	32 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale H 1:250 V 1:125 (0 5.0 10.0 15.0m; 0 2.5 5.0 7.5m)

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_SECTIONS.dwg Date Plotted: January 30, 2019 - 1:38 PM



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM

KEY PLAN
SCALE: N.T.S.

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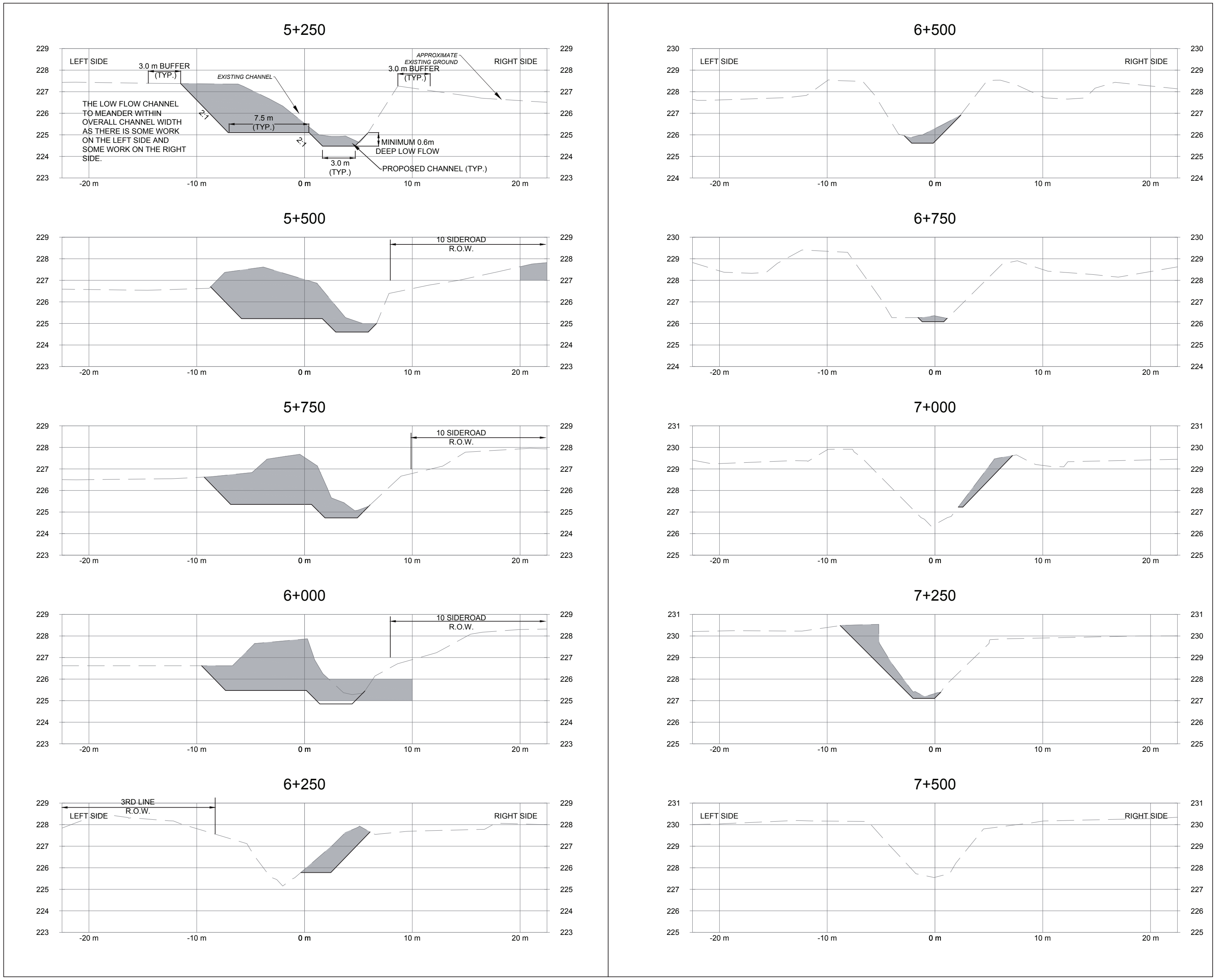
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
CROSS SECTIONS STA. 2+750 TO STA. 5+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	33 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale H 1:250 V 1:125



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM

KEY PLAN
SCALE: N.T.S.

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BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

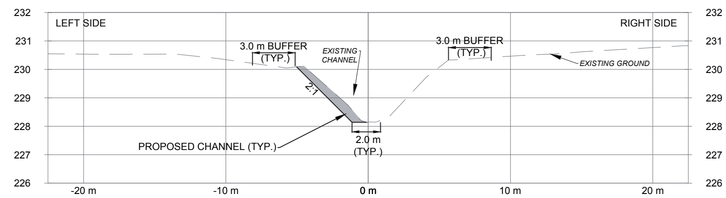
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
CROSS SECTIONS STA. 5+250 TO STA. 7+500

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	34 of 37
Date		Project No.		
01/30/2019		300038790.0000		

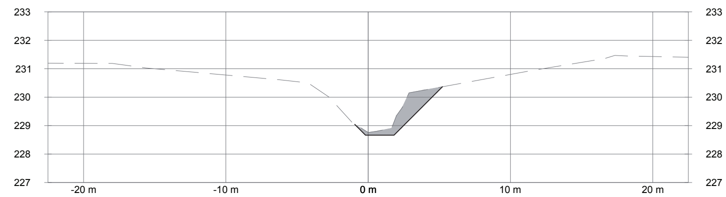
Scale H 1:250 V 1:125

File: I:\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_SECTIONS.dwg Date Plotted: January 30, 2019 - 1:39 PM

7+750



8+000



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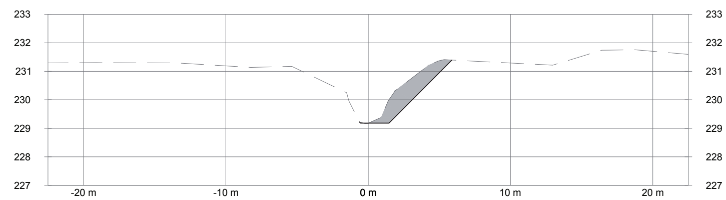

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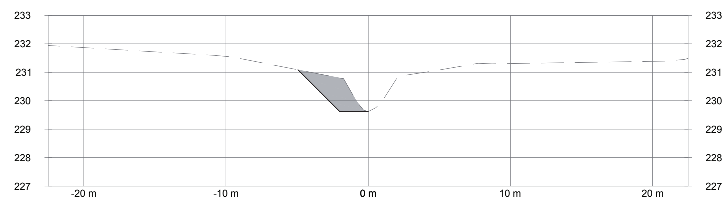
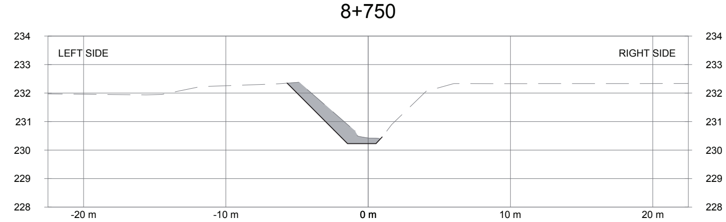
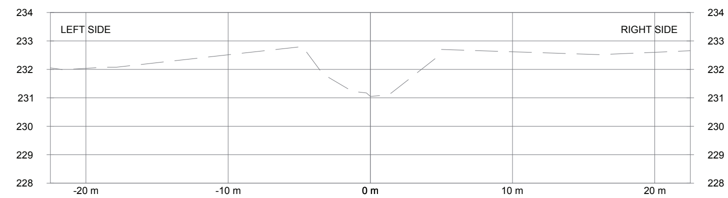


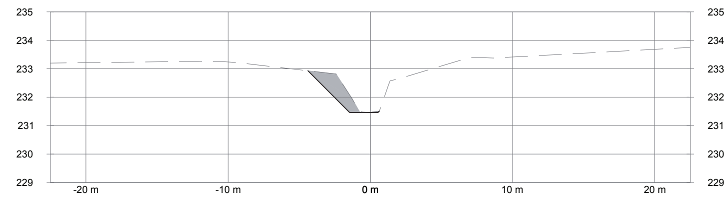
8+750



9+000



9+250



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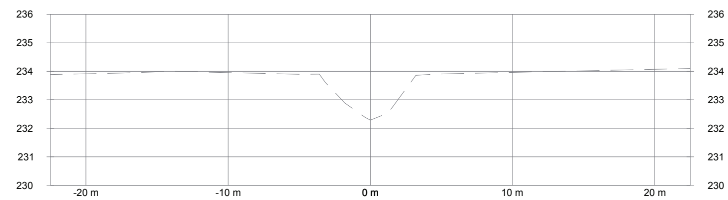
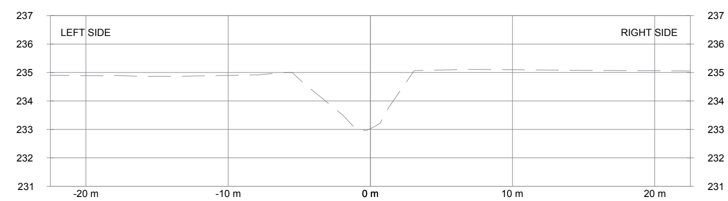
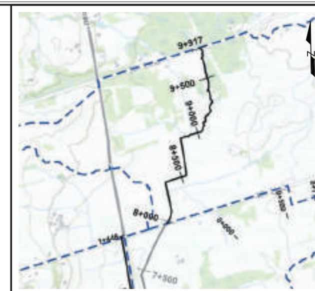


9+750



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM



KEY PLAN
SCALE: N.T.S.

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BURNSIDE

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web www.rjburnside.com

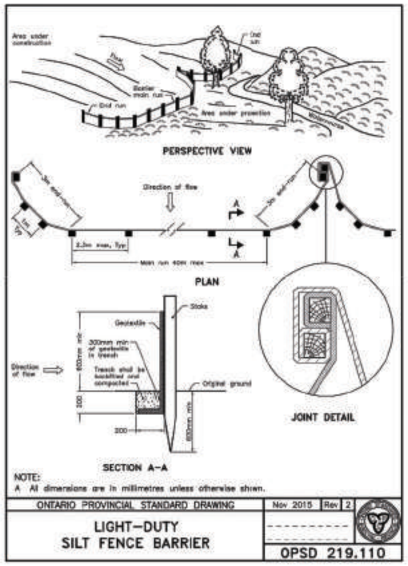
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

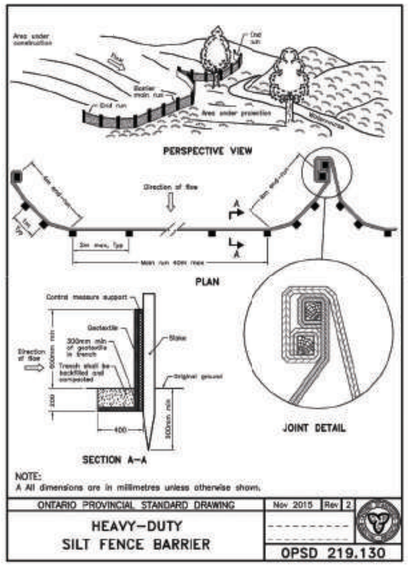
Innisfil

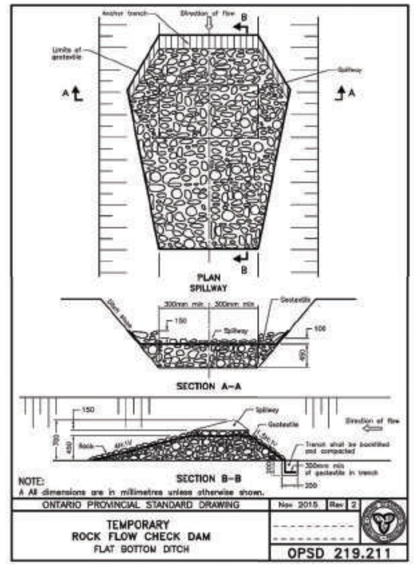
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
CROSS SECTIONS STA. 7+750 TO STA. 9+750

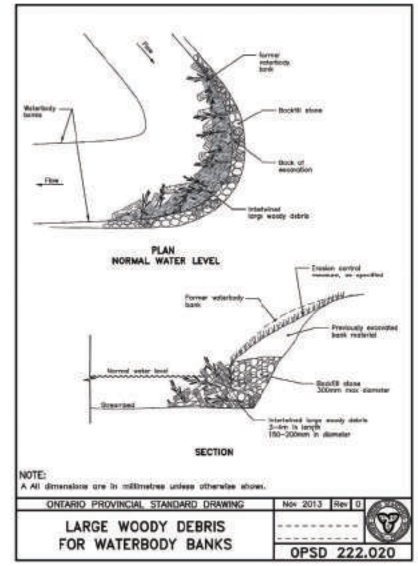
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	35of37
Date		Project No.		
01/30/2019		300038790.0000		

Scale H 1:250 V 1:125 — 0 5.0 10.0 15.0m / 0 2.5 5.0 7.5m









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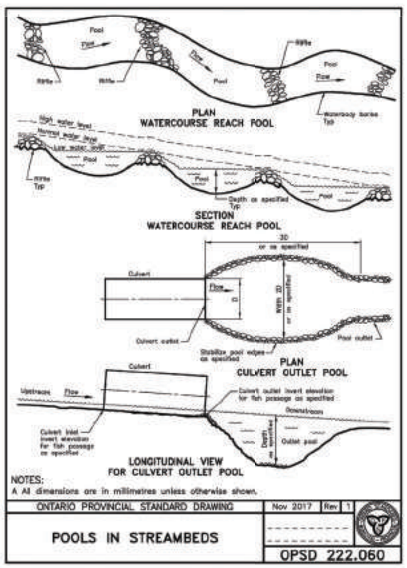

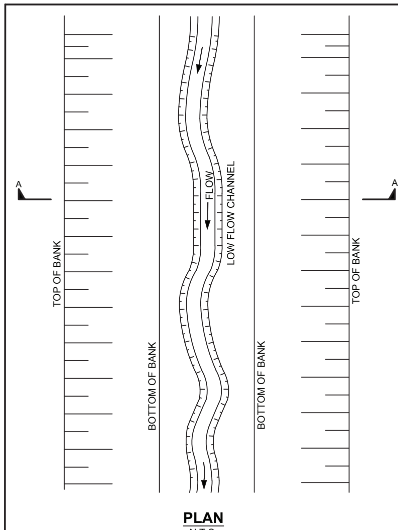

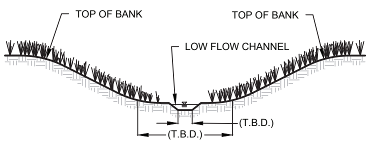

SECTION A-A
N.T.S.

NOTES:
1. LOW FLOW CHANNEL ALIGNMENT WILL BE EXCAVATED / CONSTRUCTED BASED ON GUIDANCE FROM A□UATIC ECOLOGIST.
2. DURING CONSTRUCTION, ON-SITE A□UATIC ECOLOGIST WILL CONFIRM THE SUITABILITY OF NATIVE SUBSTRATES , AVAILABLE FIELD STONE, OR IMPORTED RIVER STONE. IF SUITABLE SUBSTRATE IS ENCOUNTERED RIVER STONE MAY NOT BE RE□UIRED, OTHERWISE CONSTRUCTION TO BE AS PER GUIDANCE FROM THE A□UATIC ECOLOGIST AND APPROVED DESIGN BY THE DRAINAGE ENGINEER.
3. T.B.D. - TO BE DETERMINED BASED ON LOW FLOW CONDITIONS AND APPROVED HYDRAULIC MODEL.

LINEAR DRAINAGE CHANNEL WITH MEANDERING LOW FLOW CHANNEL
N.T.S.

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TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

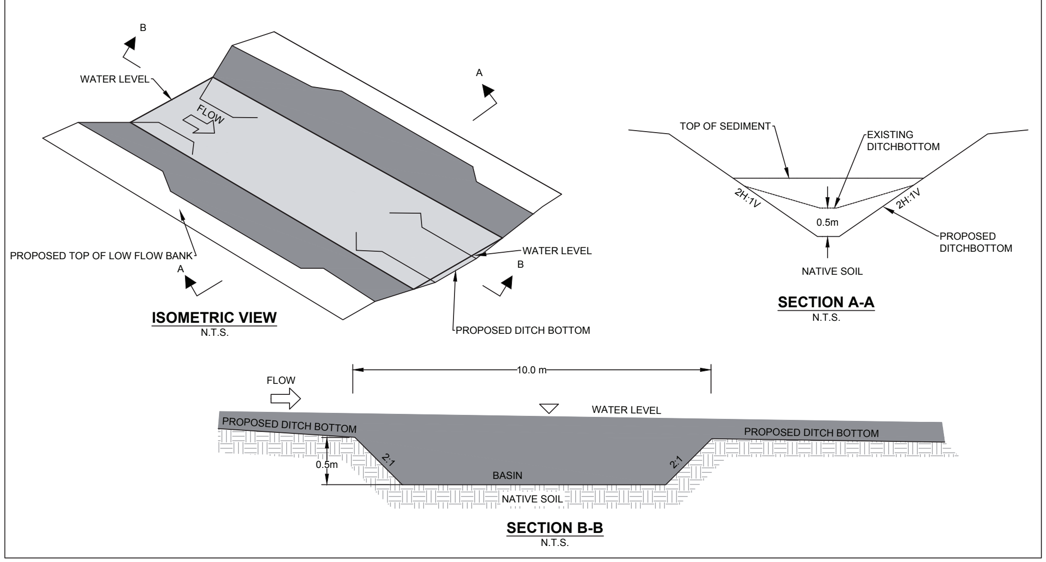
Innisfil

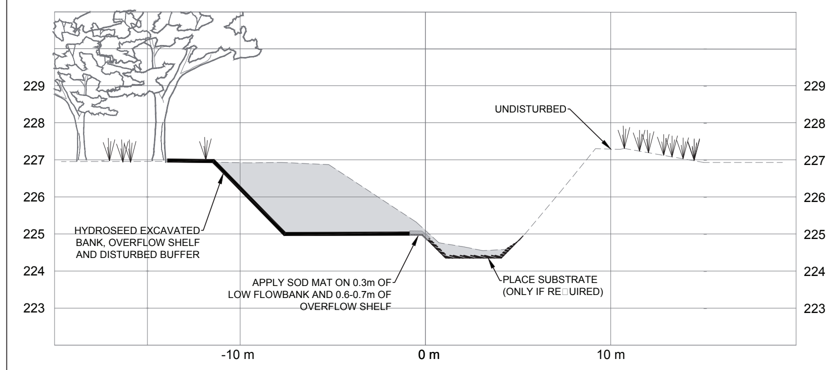
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MUNICIPAL DRAIN DETAILS

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	36 of 37
Date		Project No.		
01/30/2019		300038790.0000		

Scale
H 1:250 V 1:50
0 5.0 10.0 15.0m

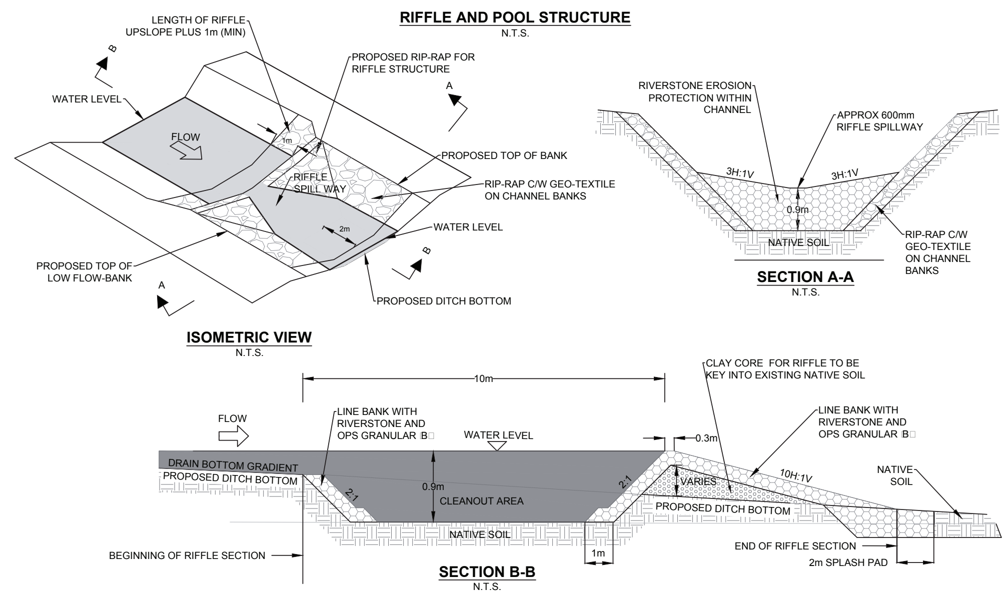
SEDIMENT BASIN DETAIL
N.T.S.



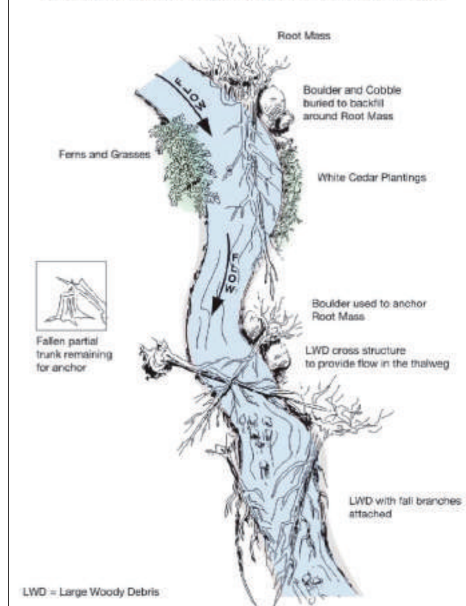


TYPICAL CHANNEL RESTORATION CROSS SECTION
N.T.S.

RIFFLE AND POOL STRUCTURE
N.T.S.



Use of Large Woody Debris in Channel Design



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Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MUNICIPAL DRAIN DETAILS

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	37 of 37
Date 01/30/2019		Project No. 300038790.0000		
Scale H 1:250 V 1:50		0 5.0 10.0 15.0m		

File: I:\COLLINGWOOD\Shared Work Areas\0038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_DETAILS.dwg Date Plotted: January 30, 2019 - 11:06 AM

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[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Offsetting Measures Mapping and Spreadsheet

Appendix B

Main Drain Section	Downstream Station	Upstream Station	Length (m)	Disturbed Area - Existing Drain (sq.m)	Area of Exist. Drain (Spot Cleanout) (sq.m)	Area of Exist. Drain (Deepen and Widen) (sq.m)	Area of Exist. Drain (Riparian Area Maint.) (sq.m)	Area of Vegetated Buffer Created (sq.m)	Area of Sod Matting in Channel (sq.m)	Area to be Seeded (Including Buffer) (sq.m)	No. Sediment Basins	Sed. Basin Locations	No. Pool-Riffles	Pool-Riffle Locations	Total Pool Area (sq.m)	No. LWD Manipulations	LWD Locations	No. Bank Stabilizations	Bank Stabilization Locations	Stabilization Method	Length (m)	No. Drain Bank Shadings	Shading Locations	Length (m)	Subtotal of Shade Length (m)	No. Trees (TYP. 0.8/lin.m)	Additional Offsetting
MO1	0+000	1+224	1,224	490	490			7,250		450	1	1+224	0		40	3	0+110 0+240 0+365	0				3	0+905 to 0+925 0+955 to 1+025 1+135 to 1+185	20 70 50	140	112	
MO2	1+224	2+165	941	7,490		7,490		5,650	930	10,500	3	1+330 1+700 1+925	0		120	6	1+355 1+395 1+400 1+485 1+540 2+010	3	1+330 to 1+350 1+820 to 1+850 2+000 to 2+025	Rip-rap Rip-rap Rip-rap	23 30 25	2	1+750 to 1+880 2+040 to 2+170	130 130	260	208	Install permanent rock check dam at Sta. 1+120 to remain throughout construction Salvage and replant tree at Sta. 2+010
MO3	2+165	2+280	115	60		60		140	10	120	0		0		0	0		0									
MO4	2+280	3+350	1,070	6,460		6,460		6,420	1,070	12,160	5	2+350 2+635 2+840 2+933 3+350			200	1	2+345	0									Maintain existing shade along south side of drain bank between Sta. 3+090 and Sta. 3+350
MO5	3+350	3+588	238	2,320		2,320		1,370	230	2,750	1	3+574	0		40	0		0				1	3+380 to 3+585	205	205	20 Intermittent plantings 1 per 10m	
MO6	3+588	5+449	1,861	18,600		18,600		11,170	1,350	21,020	6	3+895 4+050 4+180 4+520 4+816 5+265	0		240	1	4+880	3	4+515 to 4+545 4+785 to 4+815 5+255 to 5+275	Rip-rap + live stake Rip-rap + live stake Live stake	30 30 20	2	3+590 to 3+680 4+700 to 4+820	90 120	210	21 Intermittent plantings 1 per 10m	
MO7	5+449	6+355	906	5,010		5,010		2,890	880	7,410	2	5+498 6+133	0		72	1	5+455	3	5+490 to 5+520 6+125 to 6+135 6+325 to 6+335	Rip-rap Rip-rap Rip-rap	30 10 10						Maintain existing natural riffle structure at Sta. 6+323
MO8	6+355	7+928	1,573	6,650			6,650	9,440	160	7,620	0		5	6+550 6+800 7+092 7+457 7+815	100	1	7+210	3	6+525 to 6+535 7+180 to 7+210 7+300 to 7+315	Rip-rap Rip-rap Rip-rap	10 30 15						
MO9	7+928	7+950	22	10			10	20		10	1	7+928	0		20	0		0									
MO10	7+950	9+917	1,967	3,900			3,900	11,730	100	6,310	0		6	8+024 8+515 8+850 9+120 9+485 9+830	120	6	8+040 8+740 8+810 to 8+830 8+845 to 8+855 8+955 to 8+985 9+560 to 9+710 (where possible)	9	8+190 to 8+205 8+320 to 8+330 8+512 to 8+522 8+645 to 6+675 8+750 to 8+780 8+810 to 8+830 8+845 to 8+855 8+900 to 8+935 9+020 to 9+040	Rip-rap Rip-rap Rip-rap Rip-rap Rip-rap Rip-rap + LWD LWD Rip-rap + live stake Rip-rap + live stake	15 10 10 30 30 20 10 35 20	3	8+900 to 8+930 8+955 to 8+985 9+020 to 9+040	30 30 20	80	64	
Total			**9,917**	**50,990**	**490**	**39,940**	**10,560**	**56,080**	**4,730**	**68,350**	**19**		**11**		**952**	**19**		**21**			**443 m**	**11**		**480 m**	**895**	**384**	

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Appendix C

MNRF In-Water Works Timing Window Confirmation Email

Appendix C

Matthew Moote

From: Findlay, Graham (MNRF) <graham.findlay@ontario.ca>
Sent: Friday, January 11, 2019 4:15 PM
To: Matthew Moote
Cc: Chris Pfohl; Jeff Dickson; Natalie Connell
Subject: RE: South Innisfil Creek Drain- Timing Window Confirmation

Matt to your question concerning the appropriate timing window within which to complete the noted drainage works, the period you proposed for permitting in-water work is acceptable (i.e. June 15 through September 30).

You should be aware that brook trout have been collected within the subject watercourses during various fish community sampling events between the 3rd Line and 5th Line of Innisfil. We encourage that work minimally impact potential brook trout habitats, particularly should ground water discharge sites be identified that may support brook trout spawning habitat. Further, appropriate attention be provided to sedimentation and erosion controls in order to prevent impacting brook trout and their habitats. By your note work will progress upstream, resulting in work within the drain with resident brook trout later as the season progresses. We encourage that work be completed early enough in the upper reaches such that disturbed areas stabilize as much as possible, minimizing the potential for erosion within areas of brook trout habitat.

Do not hesitate to contact me with any questions.

Regards,

Graham Findlay
Management Biologist
Huronia Resources Management Team,
Midhurst, MNRF
705-725-7530
705-725-7584 (fax)
graham.findlay@ontario.ca

From: Matthew Moote <Matthew.Moote@rjburnside.com>
Sent: January 10, 2019 4:38 PM
To: Findlay, Graham (MNRF) <graham.findlay@ontario.ca>; Shirley, Brent (MNRF) <brent.shirley@ontario.ca>
Cc: Chris Pfohl <Chris.Pfohl@rjburnside.com>; Jeff Dickson <Jeff.Dickson@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>
Subject: South Innisfil Creek Drain- Timing Window Confirmation

Hello Brent and Graham,

I hope you had a good holiday season and a happy new year. My name is Matt Moote and I am an Aquatic Ecologist at R.J. Burnside & Associates in Guelph. Burnside has been retained to provide on the engineering, design and consulting services to the Town of Innisfil for the improvements of the South Innisfil Creek Drain. I am looking to get a confirmation of the in-water works timing window from the MNRF for the works associated with the Drain improvements.

In-water works are planned for the improvements of the Drain between 15th Line and 5th Line in Innisfil. Burnside has reviewed the MNRF ARA mapping for the South Innisfil Creek Drain. Using the data available in the ARA mapping from the NVCA sampling conducted in 2000 Burnside has determined that the species listed below in the table are likely to inhabit the Drain. Burnside is proposing to work with respect to the in-water works timing window for Rainbow Trout (work to commence after June 15th). Burnside also reviewed the ARA summary Data for the South Innisfil Creek Drain and determined that chinook salmon may potentially inhabit the Drain. Burnside would like to ask for permission to work until September 30th, thereby working into the timing window for chinook salmon by 15 days.

Species Name	**Scientific Name**	**Thermal Regime Preference**
Brook Trout	*Salvelinus fontinalis*	Cold
Creek Chub	*Semotilus atromaculatus*	Cool
Rainbow Trout	*Oncorhynchus mykiss*	Cold
Eastern Blacknose Dace	*Rhinichthys atratulus*	Cool
Central Mudminnow	*Umbra limi*	Cool
Johnny Darter	*Etheostoma nigrum*	Cool
Brook Stickleback	*Culaea inconstans*	Cool
Brown Bullhead	*Ameiurus nebulosus*	Warm
Longnose Dace	*Rhinichthys cataractae*	Cool
Mottled Sculpin	*Cottus bairdii*	Cold
Northern Redbelly Dace	*Chrosomus eos*	Cool
Pumpkinseed	*Lepomis gibbosus*	Warm
White Sucker	*Catostomus commersonii*	Cool
Fathead Minnow	*Pimephales promelas*	Warm
Source: MNRF ARA Survey Data Point (2000)		

Burnside is proposing to isolate in-water works areas with upstream blocker nets or turbidity curtains and Aquatic Ecologists will sweep a given area with a weighted blocker net to move fish downstream of the blocker nets/turbidity curtains and out of a given length of Drain prior to the commencement of in-water works. The blocker nets will then be left in place in order to keep fish out of the work area and to capture debris travelling downstream. Burnside will repeat this process as necessary as construction moves upstream. Burnside will obtain a license to collect fish for a scientific purpose in order to complete the fish exclusion measures.

Please confirm if the in-water timing window of June 15-September 30th of a given year will be acceptable by the MNRF. Should you have questions or concerns please let me know.

Thank you in advance for your time and consideration,

Matt Moote

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Matthew Moote, H.B.Sc.
Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20, Guelph ON N1H 1C4
Office: 800-265-9662 Direct: 226-486-1556
Cell: 519-830-5469 www.rjburnside.com

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Appendix D

Aquatic Habitat Assessment

South Innisfil Creek Municipal Drain Improvements

Aquatic Habitat Assessment

Town of Innisfil
7253 Yonge Street
Innisfil, ON L9S 0J3

R.J. Burnside & Associates Limited
292 Speedvale Avenue West Unit 20
Guelph ON   N1H 1C4 CANADA

July 10, 2018
300038790.0000

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
0	Yes	Yes	Town of Innisfil
0	Yes	Yes	Department of Fisheries and Oceans

Record of Revisions

Revision	Date	Description
0	July 10, 2018	Initial Submission

R.J. Burnside & Associates Limited

Report Prepared By:

Matthew Moote, H.B.Sc., CAN-CISEC-IT
Aquatic Ecologist
MM:sgd

Report Reviewed By:

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist
CP:sgd

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Appendices

Disclaimer

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1.0 Background

R.J. Burnside and Associates Limited (herein, Burnside) has been retained by the Town of Innisfil for the engineering and improvements of the South Innisfil Creek Drain (herein referred to as the Drain). The improvements are to take place between Highway 89 and 5th Line in the Town of Innisfil. The purpose of this document is to provide information regarding the relevant historical background information and current existing conditions regarding fish and fish habitat within the Drain.

Proponent Contact Information:
Mr. Jeremy Nyenhuis, P.Eng
The Town of Innisfil
7253 Yonge Street
Innisfil, Ontairo L9S 0J3

2.0 Project Description

Although the Drain provides an outlet for upstream relief runoff, the Drain has insufficient capacity to contain larger storm events that exceeded the original design criteria of the existing Drain. Specific large rainfall events result in flooding of the Market Garden Lands and the loss of crops. These events have contributed to affected property owners requesting an improvement to the Drain which was a matter placed before the Ontario Drainage Referee in 2004. Changes in the land uses within the Drain catchment area including more intense agriculture practices and development, and the more intense use of the Market Garden area have all contributed to the drainage flows and the need for an improved drainage channel and outlet. Please refer to Appendices A and D for the plan, profile and cross sections of the works proposed as part of the South Innisfil Creek Drain Improvements.

3.0 Desktop Assessment

The following sources of background information were reviewed as part of the desktop assessment for the subject watercourse:

- Natural Heritage Information Centre (2016);
- Aerial orthophotography (2015);
- Ministry of Natural Resources and Forestry (MNRF) Aquatic Resource Area mapping (2015);
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA, 2017) Drain Mapping (2017);
- Nottawasaga Valley Conservation Authority Innisfil Creek Subwatershed Health Report (2013);
- Nottawasaga Valley Conservation Authority Fisheries Management Plan (2009);

- Final Drainage Report for the Drain and Branches, Dillon Consulting (2013); and
- Department of Fisheries and Oceans Canada Species at Risk Distribution and Critical Habitat Mapping (2017).

The Drain is mostly an unrated drain (OMAFRA, 2017) that flows generally from north to south. The proposed works are to take place between 5th Line to the north and 5th Sideroad to the south. The Drain is an open drain and the main branch downstream, and south, of 3rd Line was not rated in the 2017 OMAFRA agricultural drain mapping. North of 3rd Line to 5th Line it is rated as a Class-D drain in the 2017 OMAFRA agricultural drain mapping.

As mentioned above the main branch of the Drain is located west to east between 5th Line and 15th Line. The Drain flows in a general north to south direction and receives flows from numerous secondary branches of the Drain and tributaries of natural watercourses. The F-Class Prokopchuk Drain flows from north to south discharging into the Drain main branch south of 3rd Line. The unrated 3rd Line Drain flows into the main branch of the Drain west of 10th Sideroad and south of 3rd Line. Another branch of the Prokopchuk Drain flows into the main branch of the Drain from east to west, south of 3rd Line and north of 2nd Line. The 2nd Line Drain which flows parallel to and south of 2nd Line is a D-rated drain that is aligned in an east-west direction and this drain conveys flows to the main branch of the Drain. North of 2nd Line a closed branch of the 2nd Line drain which is not rated flows from east to west and discharges into the main branch of the Drain. South of the 2nd Line Drain there is a F-Class Branch B of the Drain which conveys flows to the main branch of the Drain, flowing in an east to west and south to north direction. North of Highway 89 and east of Highway 400/Reive Boulevard the Drain receives flow from the Hyndazyak Drain, an unrated drain. The Hyndazyak Drain flows from east to west and from south to north and discharges into the main branch of the Drain, east of Reive Boulevard, south of 2nd Line. Based on the MNRF NHIC Mapping there is Provincially Significant Wetland located to the north and south of Highway 89 and east of Highway 400. West of Highway 400 the Drain flows north east to southwest beneath 5th Sideroad and from 5th Sideroad the 15th Line it flows in a north to south direction. Through this upper reach the Drain receives flows from natural tributaries of the watercourse (South Innisfil Creek).

The Innisfil Creek subwatershed consists of four creek systems- Innisifil Creek, Bailey Creek, Beeton Creek and Penville Creek (NVCA, 2013). These creek systems drain the southeastern portion of the Nottawasaga River watershed. Innisfil Creek originates in headwater forests and wetlands and flows south into intensively farmed lowlands that extend through Cookstown downstream to the Nottawasaga River. Innisfil Creek originates in the Simcoe Uplands, south of Barrie. Within the Innisfil creek subwatershed there is poor forest cover. There is a large forest tract east of Cookstown in the form of an extensive swamp. NVCA indicates that Innisfil Creek is an impaired watercourse with unimpaired or “below-potential” reaches present within the headwaters of the watercourse. NVCA further notes that trout habitat is limited to the cool headwaters of the Bailey, Innisfil and Beeton Creeks. Smaller tributaries of Innisfil Creek are below potential or impaired in terms of stream health, largely influenced by a lack of natural land cover and the dominance of intensive agricultural land use. During low flow periods the stream flow is reduced to near zero due to water taking activities for field irrigation purposes. Elevated phosphorus levels are present at the downstream end of Innisfil Creek, which are 47% above the provincial objective during low-flow periods. Overall stream health in Innisfil Creek has declined since 2007 with declining conditions in Innisfil Creek near Highway 89 and downstream.

The NVCA Innsifil Creek Subwatershed Plan (2006) notes that there are many agricultural users within the Innisifl Creek watershed who use the water for agricultural purposes, such as irrigating crops. This water usage affects the creek's base flow and some residents are concerned that there is a lack of base flow within Innisfil Creek, particularly upstream of the confluence with Penville Creek. One of the targets within this subwatershed plan is that 75% of the natural length of Innisfil Creek should be naturally vegetated with a 30 m buffer on both sides of the stream. Only 38% of the stream corridor had adequate forest cover at the time of the report, 2006, whereas the goal was 75%. It is noted that municipal drains are not expected to follow and meet this 75% goal, but land owners are encouraged to keep as much vegetation on their land as possible. Landowners are encouraged to leave one side of the drain naturalized and vegetated and complete cleanouts and maintenance on the other side. A minimum of a 3 m buffer is recommended for agricultural municipal drains.

Benthic invertebrate community structures are analyzed to evaluate a stream's health, and based on the benthic community compositions present in the watercourse the Innisfil Creek headwaters are unimpaired upstream of 5th Line, but stream health declines to ratings of below potential or impaired downstream of 5th Line.

The Final Drainage Report for the South Innisfil Creek Drain and Branches from Dillon Consulting Limited (2013) notes that the broad watershed area for the drain is best described as "bowl shaped'. The watershed spans 12 km in a north-south direction and 10 km in a west-east direction. The land elevation in the watershed perimeter the drain is consistently 60 to 80 m higher than the land close to the drain. The upper lands consistently slope at a 4-6% gradient and the lowlands close to the drain are very flat with a less than 0.50 m change in elevation. These lowlands extend out from the drain for approximately 1 km through the lower section of the drain. At the lower end of this drain, the gradient of the drain is very low at approximately 0.04%. Dillon Consulting noted in the Final Drainage Report (2013) that this lower end of the drain needs to be made wider and deeper in order to convey flows received from secondary drains that flow into the Drain from the upland area of the watershed.

The lowlands consist of highly workable muck soils including the Market Garden Lands, where high value market vegetables (i.e. onions and carrots) are grown. These muck soils represent approximately 10% of the Drain watershed. Workable lands for cash crops represent approximately 45% of the watershed area. Roads and residential areas represent 10% of the watershed area and the remaining 35% of the watershed consists of a mix of pasture, forage type crops, marshy lands and partially forested areas. The report notes that although the Drain has been straightened in many areas, it is a meandering creek south of Highway 89 and north of 4th Line.

The Final Drainage Report for the Drain and Branches describes previous work completed through a twin corrugated steel ellipse pipe culverts beneath Highway 400. This work involved shot-creting the interior of these culverts and constructing riffles out of concrete and filling them with smooth run river stone for fish passage and habitat purposes. The Report also states that there has been a buildup of sediment 3rd Line upstream to 5th Line. The Report states that downstream from 3rd Line the Drain does not appear to have sediment accumulation, indicating there may have been recent maintenance activities within the Drain. Within the Report it is stated that from Highway 89 downstream to County Road 27 the drain is consistent in bottom width (4 to 9 m) and the soil through this section was observed to be very sandy. Numerous obstructions were present within this section of the drain, however at the time of the Dillon survey these blockages did not prevent the flow of water.

Innisfil Creek is designated a “large stream” within the NVCA Fisheries Management Plan. The Fisheries Management Plan designates which fish species are found within cold, cool and warm habitats. Brook and Rainbow trout have historically been observed within the Drain (see Tables 1-3 below), confirming that there is cold water habitat present. The NVCA Fisheries Management Plan designates several management goals for Innisfil Creek Subwatershed. One of these goals is “the protection of local features which provide warm water predatory fish habitat in the main branch of Innisfil Creek and tributary streams, downstream from Highway 89.” It also states a goal for the Innisfil Creek Subwatershed is to “manage the Innisfil Creek and tributary streams consistent with the protection, enhancement and restoration of the coldwater fisheries habitat ecosystem which includes the middle Nottawasaga River reach immediately downstream.”

Innisifl Creek is a coldwater watercourse upstream of Highway 89 (MNRF ARA Summary Data, 2015). Downstream of Highway 89 Innisfil Creek is classified as a cool water watercourse (MNRF ARA Summary Data, 2015). The NVCA Fisheries Management Plan outlines several coldwater fisheries management strategies that support, protect and restore cold water fisheries habitats. Critical cold water habitat components include the following: cold/cool summer temperatures, abundant base flow and high flow stability, diversity of thermal regimes, functional migratory routes, high water quality and clarity, natural channel and flood plain structure and low width-depth ratios, healthy riparian vegetation, complexes of connected habitats that reduce the potential for local cold water species extinctions, a balanced distribution of habitat components which provide for the requirements of cold water species at all life stages, feeding/growth, spawning and over wintering habitats.

No aquatic Species at Risk (SAR) were identified as inhabiting the proposed works area or further downstream and/or upstream (DFO, SAR Mapping 2017). The species of fish that have historically been identified within the Drain within the Study Area are presented below in Table 1, 2 and 3.

Table 1: Species Identified by NVCA, 2000, 2013

Species Names	Scientific Name	Thermal Regime Preference	
Brook Stickleback	*Culaea inconstans*	Cool	**Source: MNRF ARA Mapping, NVCA 2000 and 2013**
Brook Trout	*Salvelinus fontinalis*	Cold	
Brown Bullhead	*Ameiurus nebulosus*	Warm	
Central Mudminnow	*Umbra limi*	Cool	
Common Shiner	*Luxilus cornutus*	Cool	
Creek Chub	*Semotilus atromaculatus*	Cool	
Eastern Blacknose Dace	*Rhinichthys atratulus*	Cool	
Fathead Minnow	*Pimephales promelas*	Warm	
Hornyhead Chub	*Nocomis biguttatus*	Cool	
Johnny Darter	*Etheostoma nigrum*	Cool	
Northern Redbelly Dace	*Chrosomus eos*	Cool	
Rainbow Trout	*Oncorhynchus mykiss*	Cold	
White Sucker	*Catostomus commersonii*	Cool	
Mottled Sculpin	*Cottus bairdii*	Cool	

Central Mudminnow	*Umbra limi*	Cool	
Common Shiner	*Luxilus cornutus*	Cool	
Brook Trout	*Salvelinus fontinalis*	Cold	
Longnose Dace	*Rhinichthys cataractae*	Cool	
Pumpkinseed	*Lepomis gibbosus*	Warm	

Table 2: Species Identified by MNRF, 2009

Species Names	**Scientific Name**	**Thermal Regime Preference**	
Brook Stickleback	*Culaea inconstans*	Cool	**Source: MNRF ARA Mapping, MNRF 2009**
Creek Chub	*Semotilus atromaculatus*	Cool	
Eastern Blacknose Dace	*Rhinichthys atratulus*	Cool	
Johnny Darter	*Etheostoma nigrum*	Cool	
Rainbow Trout	*Oncorhynchus mykiss*	Cold	
White Sucker	*Catostomus commersonii*	Cool	
Mottled Sculpin	*Cottus bairdii*	Cool	
Common Shiner	*Luxilus cornutus*	Cool	
Brook Trout	*Salvelinus fontinalis*	Cold	

Table 3: Species Identified by C. Portt and Associates, 2005

Species Name	Scientific Name	Thermal Regime Preference	
Bluntnose Minnow	*Pimephales notatus*	Warm	**Source: MNRF ARA Mapping, C. Portt and Associates**
Brassy Minnow	*Hybognathus hankinsoni*	Cool	
Brook Stickleback	*Culaea inconstans*	Cool	
Central Mudminnow	*Umbra limi*	Cool	
Creek Chub	*Semotilus atromaculatus*	Cool	
Eastern Blacknose Dace	*Rhinichthys atratulus*	Cool	
Johnny Darter	*Etheostoma nigrum*	Cool	
Longnose Dace	*Rhinichthys cataractae*	Cool	
Mottled Sculpin	*Cottus bairdii*	Cool	
Pearl Dace	*Margariscus margarita*	Cool	
White Sucker	*Catostomus commersonii*	Cool	

4.0 Aquatic Habitat Assessment

4.1 Methodology

Burnside aquatic ecology staff visited the proposed drainage works area on October 13, 2017 and April 11, 20 and May 8, 2018 in order to assess the existing aquatic conditions within the Drain with respect to form, function, morphology and fish habitat. During the October 2017 site visit Burnside staff worked from downstream to upstream while assessing the watercourse and inspecting it for fish presence from the Road Right-of-Way Crossings. Through the Study Area the watercourse crosses beneath Highway 89, 5th Sideroad, Highway 400 and Reive Boulevard, 2nd Line, 3rd Line and 4th Line.

During the April 2018 habitat assessment Burnside Aquatic Ecology staff assessed the watercourse by walking it from downstream to upstream and observing it from the banks from 5th Sideroad to 5th Line.

4.2 2017 Aquatic Habitat Conditions

4.2.1 Highway 89 Crossing

During the October 2017 visit the watercourse was assessed upstream and downstream of the Highway 89 Crossing. Through the Highway 89 crossing the watercourse was assessed as being a permanent stream. The watercourse flowed through this crossing in a north to south direction. Upstream surrounding land uses included industrial land use and vacant rural land. Downstream the land use was categorized by vacant rural land, a woodlot and industrial land uses. Upstream of the Highway 89 crossing the watercourse flowed in a meandering alignment. Downstream of the Highway 89 crossing the watercourse flows in a linear alignment for approximately 12 m then becoming a meandering watercourse.

At the time of the site visit the watercourse was flowing within a flats type of morphology. The watercourse crosses beneath Highway 89 through a concrete bridge that had a span of approximately 16.0 m. On the upstream portion of the crossing there is a roadside ditch that runs from west to east and it conveys flows during times of high flows to the Drain. There are concrete retaining walls on both the right and left upstream banks on the upstream side of the Highway 89 crossing. Upstream of the crossing the watercourse flowed through an area that was densely vegetated with grasses, forbs and shrubs. Downstream the banks of the watercourse were hardened with a round river stone buffer for approximately 3 m on each bank. The downstream banks of the watercourse were sparsely vegetated with grasses and forbs. This buffer was approximately 10 m long. Wetted width and depth ranged from 12 to 5 m and 0.45 m respectively. The watercourse substrate was comprised mostly of sand, however downstream there was some larger river stone that was cobble sized within the watercourse. Submergent vegetation was present within the watercourse as well. The land surrounding the watercourse was flat. Through the crossing there was minor overhanging vegetation and stream shading. Upstream and downstream of the Highway 89, grasses, forbs and shrubs were present and did not provide major stream shading. The banks through the downstream portion of the watercourse were undercut based on observations from the bridge during the October site visit.

The watercourse upstream and downstream of the Highway 89 crossing is considered direct fish habitat. There is a defined bed and bank and it is considered a permanent stream. Within the watercourse there was some limited cover in the form of overhanging vegetation, in-stream vegetation and some minor larger sized substrate.

4.2.2 5th Side Road Crossing

Burnside Aquatic Ecology staff assessed the watercourse through the 5th Side Road crossing during the October site visit. The watercourse flowed beneath 5th Side Road through a concrete bridge. The watercourse flowed through this crossing in a northeast to southwest direction. Through the 5th Side Road crossing the watercourse was assessed as being a permanent stream. The morphology through this crossing was characterized as flats throughout the assessed length. Upstream of the crossing the watercourse flowed through an area densely forested with mature trees and closer to the crossing the riparian area was vegetated with grasses, forbs and shrubs. The land use surrounding the 5th Side Road crossing was assessed as rural vacant land upstream and downstream with industrial land uses further downstream.

The wetted width and depth of the watercourse through the 5th Side Road crossing was estimated at 4 m and 0.3 m, respectively. The watercourse upstream of the 5th Side Road crossing was very well shaded by the mature forest present. Both upstream and downstream of the crossing there was minor overhanging vegetation and minor stream shading provided. Within the watercourse through the 5th Side Road crossing there was limited larger sized substrate in the form of cobble or boulders. In addition, there was minor in-stream vegetation. Other than some minor in-stream submerged grasses that were present there was no evidence of submergent or emergent vegetation.

The banks of the watercourse both upstream and downstream of the 5th Side Road crossing were steep; near vertical in some areas. Some minor undercutting was present through the 5th Side Road crossing and the banks were assessed as having minor instability.

Overall the watercourse through the 5th Side Road is considered to be direct fish habitat and contribute to downstream fish habitat. As mentioned above in the background assessment there have been fish species historically found within the Study Area. The watercourse had a defined bed and bank through the 5th Side Road crossing. No barriers to fish migration were visually observed during the October site visit.

4.2.3 Highway 400 Crossing and Reive Boulevard

During the October site visit the watercourse flowed from northeast to southwest beneath Reive Boulevard through a single corrugated steel pipe culvert (CSP) that was approximately 2.4 m in diameter. At the time of the site visit the watercourse was conveying flow and had a wetted width and depth of approximately 3 m and 0.40 m respectively. The banks of the watercourse through the Reive Boulevard crossing were vegetated with grasses, forbs and shrubs. Shading of the watercourse was provided by this riparian vegetation and was overhanging approximately 40% of the banks. The banks of the watercourse are steep and higher than the upstream banks within the 5th, 4th, 3rd and 2nd Line crossings. The main substrate type observed within the watercourse was comprised of fine sediments, likely sand and silt. There was minor large substrate in the form of cobble or boulders through the Reive Boulevard crossing. Watercress was present within the watercourse upstream of the crossing. Upstream of the Reive Boulevard crossing the watercourse flows through Innisfil Creek Golf Club. Downstream of the Reive Boulevard crossing the watercourse flows beneath Highway 400 and then through an area vegetated by grasses and shrubs and the surrounding area is dominated by active agricultural fields.

The single CSP was flowing during the October site visit. The watercourse flows within a flats type of morphology upstream of the single CSP. The banks of the upstream portion of the watercourse were densely vegetated with grasses, forbs and shrubs and the banks were steep and undercut. Vegetation on these banks overhung approximately 25% of the watercourse. The outlet of the single CSP culvert was flowing in a run type of morphology. The wetted width was estimated at 3.8 m downstream of the culvert outlet. Evidence of previous erosional flows were observed at the outlet of the single CSP culvert as the banks show symptoms of scour. This single CSP flows into a short length of channel then into another CSP culvert that flows beneath Highway 400 and outlets on the west side of Highway 400. A single CSP culvert upstream beneath Reive boulevard conveys flow to the single CSP beneath Highway 400. The CSP culvert beneath Reive boulevard has a diameter of 2.1 m.

During the October site visit the watercourse was flowing through the double CSPA culverts which had had a span of 4.8 m each. beneath Reive Boulevard and this culvert outlet flowed into a grassed channel. The double CSP culvert and grassed channel exhibited baseflow conditions during the October site visit. Downstream of this grassed channel the watercourse flows through a double concrete lined CSPA culvert beneath Highway 400. Each double CSPA culvert had a span of approximately 5.1 m.

Within the culvert there have been artificial boulders constructed out of concrete to mimic natural channel flows and design. During the site visit this double CSPA culvert was exhibiting base flow conditions. The double CSPA culverts exhibit flow in times of high precipitation and is considered a potential barrier to fish migration, however the single CSP was flowing at the time of the site visit and it is part of the same drainage system. The double CSPA culverts was discharging into an area vegetated with grasses and forbs. Burnside noted during the October 2017 site visit that the inlets to the double CSPA and single CSP culverts were perched and not properly inverted thus restricting flows and potentially fish migration through the Drain.

Burnside engineering staff visited the site during the spring of 2017 in April, May and June. During all 3 of these site visits the drain was conveying high flows and was wet throughout the double CSPA and CSP culverts. During these storm events wetted width was much wider than the double CSPA culverts during the May site visit and it had breached its banks.

Overall the Drain through the Highway 400 crossing is considered to provide seasonal fish habitat. There is a lack of large substrate and in-stream cover, however there is water quantity even in times of low precipitation and a defined channel. The CSPA culvert inlets are perched which represents a barrier to fish migration during periods of low flow. The watercourse through the Highway 400 crossing does convey flow, water quantity, water quantity and nutrients to downstream reaches of the Drain.

4.2.4 2nd Line Crossing

The watercourse flowed beneath the 2nd Line crossing in a north to south direction. The watercourse through this crossing was assessed as a permanent watercourse. The Drain flows through an open-foot concrete bridge culvert that had a span of approximately 8.0 m. The surrounding land uses upstream and downstream of the 2nd Line crossing were categorized as active agricultural lands within the Market Gardens. Both upstream and downstream of the 2nd Line crossing, the watercourse receives flows from roadside ditches. On both the north and south sides of this road the ditches are municipal drains that do not have a drain classification rating from DFO. The roadside ditch south of 2nd Line flows from east to west. Downstream of the 2nd Line crossing, south of 2nd Line, a Provincially Significant Wetland (PSW) is present.

In the upstream portion of the crossing the watercourse flowed through a channel that had banks vegetated with grasses, shrubs and some riparian trees. The wetted width and depth of the upstream section of the 2nd Line crossing was estimated at 3.0 m and 0.20 m, respectively. The substrate within the watercourse was comprised of sand and silt, larger stones such as cobble and boulders were not present. The vegetation on the stream banks overhung the watercourse significantly and the banks of the watercourse upstream of the 2nd Line crossing were undercut and moderately unstable. Within the watercourse aquatic macrophytes, both emergent and submergent, were observed. Watercress was observed upstream of the 2nd Line crossing indicating the potential presence of groundwater. Upstream of the 2nd Line crossing the low flow channel meandered within the overall linear alignment characterized as flats.

Downstream of the 2nd Line crossing the watercourse was approximately 4.0 m wide then narrowing into a uniform 0.30 m wide flat. The downstream banks were densely vegetated with grasses, forbs, shrubs and some riparian trees. The watercourse had a wetted width and depth of 4.0 and 0.20 m, respectively. The banks downstream of the 2nd Line crossing were much steeper than the upstream banks. Undercutting of the downstream banks was present to some degree, and the banks were moderately unstable. Substrate downstream of the 2nd Line crossing was comprised of sand and silt. The watercourse was not well shaded downstream of the 2nd Line crossing and there was minor cover provided by overhanging vegetation.

The watercourse through the 2nd Line crossing is considered to be direct fish habitat however, there was a lack of large substrate and cover within the downstream and upstream sections. A defined bed and bank was observed and the watercourse is considered a permanent stream.

4.2.5 3rd Line Crossing

The watercourse flowed beneath the 3rd Line crossing in a north to south direction. The land surrounding the upstream portion of the watercourse included active agricultural use. The watercourse through the 3rd Line crossing is assessed as a permanent stream. The watercourse flows through an open-foot concrete bridge culvert that had a span of approximately 3.0 m. Through the 3rd Line crossing the watercourse did not fill the span of the bridge. Wooden stakes were driven into the sediment (remnant cofferdam or forms) and were present on the east side of the existing culvert bridge. Upstream of the crossing the watercourse flows through a channel that had densely vegetated banks. These banks were densely vegetated with grasses, forbs, shrubs and a single large riparian tree was visible within the vicinity of the upstream portion of the watercourse through the assessed length. The bank vegetation overhung the watercourse significantly through the assessed upstream length. During the October site visit the watercourse was assessed as having a wetted width of approximately 0.8 m. The watercourse was flowing within in a flats morphology through the assessed upstream reach of the watercourse. Upstream of the 3rd Line crossing the watercourse substrate was comprised mostly of fine sediments, likely sand and silt with some gravel exposure in limited locations. The banks upstream exhibited signs of undercutting and were moderately unstable.

Downstream of the 3rd Line crossing the watercourse was also flowing in a flat and the substrate was comprised of fine sediment, likely sand and silt. Some minor watercress was present within the watercourse at the outlet of the concrete bridge culvert. The banks of the watercourse downstream of the 3rd Line crossing were also well vegetated with grasses, forbs and shrubs. The banks both upstream and downstream of the 3rd Line crossing were steep and moderately unstable with undercutting present. Downstream of the 3rd Line crossing the watercourse flowed through a run portion of morphology where it bends to the west 90 degrees and flows parallel to 3rd Line.

The watercourse through the 3rd Line crossing is considered to provide direct fish habitat. There is a defined bed and bank of the watercourse through the crossing, however there is a lack of cover provided by large substrate and aquatic vegetation.

4.2.6 4th Line Crossing

The watercourse flowed beneath 4th Line in a northeast to southwest direction. Beneath 4th Line the watercourse flowed through a corrugated steel pipe culvert (CSP) that had a diameter of approximately 1.2 m. Another larger overflow culvert was present although the invert is elevated and does not carry the main flow in average to low-flow conditions. The watercourse substrate through this crossing was comprised of fine sediment (i.e., sand), gravel and some larger cobble was present as well. The watercourse meanders within a linear alignment upstream of the 4th Line crossing. Downstream of the crossing it discharges from the lower CSP, bends to the west and then flows directly to the southwest. The watercourse was flowing through the 4th Line crossing in a flats type of morphology. There is a residential dwelling north of 4th Line and the land within this property is vegetated with manicured grasses.

The banks of the watercourse through this section of the watercourse were densely vegetated with grasses, forbs and some shrubs. The banks were undercut upstream and downstream of the 4th Line crossing and observed as moderately unstable. Riparian trees (except for a few large willow) were not present within the area of the 4th Line crossing, although the watercourse was well shaded by the long grasses and forbs on the banks. The Drain did not appear to have any major pools within the reach visible from the 4th Line crossing although the channel is observed as having steep banks (U type channel). The land surrounding the watercourse was very flat. During the October 2017 site visit Burnside staff observed the watercourse was flowing through a vegetated channel.

4.3 2018 Aquatic Habitat Conditions

The weather conditions during the April and May 2018 site visits ranged from overcast with some light snow flurries to sunny and warm. Water was flowing at average levels within the drain and was slightly turbid. When conducting the aquatic habitat assessment Burnside aquatic ecology staff were also looking any presence of spawning Rainbow trout and visible redds (depressions made for spawning). Burnside Aquatic Ecology staff worked from downstream to upstream in order to assess the Drain while minimizing the risk of alerting fish to their presence. Below is a summary of the aquatic habitat conditions observed along with descriptions of each section walked by Burnside staff.

Table 4: Summary of Aquatic Habitat Conditions Observed in April 2018

Section	Mean Wetted Width and Depth (m)	Mean BF Width and Depth (m)	Typical Substrate observed	Habitat conditions
5th SR-400	3.0 to 4.0, 0.4 to 0.5	10, 1.5	Sand, minimal gravel	Channel lacks diversity of channel bottom depth, morphology and substrate. Very sandy substrate. There are riparian trees present, as well as shrubs and grasses, but this vegetation is not thick enough to provide a dense overhead canopy and bank structure. Eroded banks

Section	Mean Wetted Width and Depth (m)	Mean BF Width and Depth (m)	Typical Substrate observed	Habitat conditions
				are present in some locations and the banks are moderately unstable. Deep pool at outlet of Hwy 400 low flow culvert. Both pipe arch culverts are not passing water based on invert elevation.
400-2nd Line	3, 0.3	8, 1.2	Sand	Low habitat quality. Very eroded and vulnerable banks, no low flow channel, no channel shading, no overhead cover (undercut banks, overhanging vegetation), uniform channel lacking diversity in morphology, channel bottom depth and substrate.
2nd-3rd Line	4.0 to >8.0, 0.2	10, 1.5	Sand	Low habitat quality. Very eroded and vulnerable banks, no low flow channel, no channel shading, no overhead cover (undercut banks, overhanging vegetation), uniform channel lacking diversity in morphology, channel bottom depth and substrate.
3rd-4th Line	1.8 to 3.0, 0.1 to 0.4	7.0, 1.4	Sand, Gravel and minimal cobble	Habitat quality higher than downstream sections. Channel meanders more with a higher diversity in morphology (more riffles, runs and pools), substrate and channel bottom depth than downstream sections. Banks were more stable and less vulnerable to erosion. Well vegetated with shrubs (ROD), grasses, and some riparian trees. Likely well shaded when grasses and shrubs mature. Well defined 2-stage channel present in areas through the section between 3rd and 4th Line. Rainbow Trout observed in several

Section	Mean Wetted Width and Depth (m)	Mean BF Width and Depth (m)	Typical Substrate observed	Habitat conditions
				(2) locations (potential spawning) in shallow gravel areas with higher gradient/velocity (April 11, 2018).
4^{th} -5^{th} Line	1.8 to 3.0, 0.2 to 0.4	5.0, 1.8	Sand, Gravel, Cobble	Highest quality habitat present in this section. There is a high diversity of channel bottom depth, substrate and morphology. There are many deposits of gravel in this section of the drain. The channel meanders and eroded banks are present in the section of the drain which flows through agricultural land. Within the forested section many beaver dams (2-3 remnant) are present. Debris jams are also present in the form of woody debris. Large woody debris, log jams and remnant beaver dams are controlling channel conditions and contributing to erosion. Within the forested section the drain is well shaded and the banks are slightly unstable. Overhead cover is present in the form of undercut banks, large woody debris deposits and overhanging vegetation.

4.3.1 5th Sideroad to Fenceline

Burnside Aquatic Ecology staff began the habitat assessment at the upstream side of the culvert beneath 5^{th} Sideroad. Surrounding land uses were identified as rural properties with little to no development, a mature riparian forest, and rural roadways. Potential pollution sources were identified as runoff from agricultural lands and Highway 400 upstream and 5^{th} Sideroad downstream. Within the immediate vicinity of the upstream side of the 5^{th} Sideroad the watercourse flowed within a flats type of morphology and substrate comprised almost entirely of sand, with minimal coarse substrate (gravel and cobble). Some deeper pools which potentially provide refuge habitat, particularly during periods of low flow, were present upstream of 5^{th} Sideroad within the forested portion of the watercourse. The mean wetted width and depth were assessed as being 3.5 m and 0.4 m respectively. Mean bankfull width and depth were assessed as being 10 m and 1.5 m respectively.

Upstream of the 5th Sideroad crossing the watercourse flows from a northeast to southwest direction through a mature forest (Photo 1), however there were very few trees present on the banks. Some trees have likely been cleared in the past during maintenance activities for the Drain. A large deposit of woody debris was present within the watercourse approximately 130 m upstream from 5th Sideroad (Photo 2). A remnant oxbow was observed approximately 250 m upstream of the 5th Sideroad (Photo 3). This oxbow was conveying minimal flows to the main branch of the Drain during the April site visit, however it may convey flows during higher periods of flow and potentially provides habitat for frogs and other semi-aquatic species.

The banks of the watercourse were well vegetated through the forested portion of the watercourse with shrubs, grasses, and forbs. Channel banks were slightly unstable and exhibited signs of erosional flows with scoured banks present in several locations (Photo 4). Outside meanders exhibited signs of previous erosional flow events and the channel was confined and relatively deep compared to upstream sections that are described below. Evidence of previous high flows were present through the forested area of the watercourse in the form of rafted material on the tops of the banks of the watercourse. The watercourse gently meandered through the forested section upstream of Sideroad 5.

Fish and spawning redds were not observed within the Drain from the 5th Sideroad to the "Fenceline" downstream of Highway 400. There were some habitat features through this section of the Drain which provided shelter and cover for fish species including shading provided form the mature riparian forest, undercut banks, in-stream large woody debris deposits, organic material, and the above mentioned deep refuge pools. However, there is a lack of larger coarse substrate as well as a lack of diversity of substrate and morphology through this portion of the watercourse. This portion of the watercourse provides access to upstream reaches of the Drain and contributes to downstream fish habitat through conveying flows, water quantity, water quality and nutrients.

4.3.2 Fenceline to 400

Burnside assessed the watercourse from the Fenceline located approximately 500 m upstream from the 5th Sideroad to the Highway 400 crossing. This portion of the Drain was not forested and flowed through an area that featured banks lower in height which were densely vegetated with grasses, and limited shrubs (Photo 5). Rafted material was present on the top of the banks and previous erosional flows were present in this section of the Drain in the form of slumping and sluffing of banks as well as scouring on outside of meander bends. Large sections of bank material were present within the watercourse indicating erosional flows causing significant damage and change over time to the banks of the drain.

The watercourse between the Fenceline and Highway 400 was flowing in a flats type of morphology and substrate comprised primarily of sand. There was a lack of diversity of substrate in the watercourse through this section. There were deeper pools present within the watercourse in some locations which potentially provide summer refuge to fish species present within the watercourse. Organic material and large woody debris were present within the watercourse as well which potentially provide shelter and habitat for fish and aquatic organisms.

Approximately 250 m downstream from Highway 400 a tributary was flowing into the Drain from the north. On the MNRF ARA mapping there was no data pertaining to the thermal regime of this tributary. This tributary is not mapped on the OMAFRA mapping as a municipal drain. This watercourse was also displaying signs of erosional flows and slumping banks during the April 2018 site investigation.

Fish were not observed in this section of the Drain during the April 2018 aquatic habitat assessment although conditions were slightly turbid. Several aspects of the drain would contribute to fish habitat including deposits of large woody debris, organic material and deeper pools were present. Although some banks were highly eroded (Photo 6), there is a diversity of substrate (sand, gravel, cobble and boulder), bottom depth, morphology and shading through this portion of the Drain. As mentioned above this section of the Drain provides access to habitat reaches upstream within the watercourse and it contributes to downstream fish habitat by conveying flow, water quality and nutrients.

4.3.3 Highway 400 and Reive Boulevard Crossing

Burnside Assessed the crossing at the Highway 400 following the MTO Protocol (See Appendix C). Upstream of this crossing a 2-lane road named Reive Boulevard is present as well as a golf course named Innisfil Creek Golf Course. Downstream of the Highway 400 crossing the water flowed through the culverts from a northeast to southwest direction. The single concrete lined corrugated steel pipe (CSP) culvert with a diameter of 2.4 m was conveying a very high velocity flow through the culvert and a deep pool was formed at the outlet (Photos 7 and 10). Downstream of the culvert outlet a large pool and run was formed and as the velocity of the flows decreased the morphology changed from a run to a flat that that flowed downstream to the 5th Sideroad. There are 2 large concrete lined corrugated steel pipe arch (CSPA) culverts beneath Highway 400 which each have a span of 5.1m and each has have been lined with concrete that were not conveying flow through their length during the April 11 and May 8 aquatic habitat assessment (Photo 9). The outlets of the single CSP and two large concrete lined CSPA culverts were all elevated 0.5 to 1.0 m above the existing water level and represented barriers to fish movement upstream through the Drain. The flow out of the single concrete lined CSP was high enough that smaller bodied fish species would not be able to swim upstream into the culvert (Photo 11). The outlet of both concrete lined culverts was also elevated and would not allow for the passage of any species of fish during periods of low flow, which was exhibited and observed during the assessment of fish habitat within the Drain. Wooden 2”x4” planks within the outlet of single CSP culvert which appeared to be constricting flow also contributes to velocity and seasonal barriers observed at this crossing (Photo 7). Throughout both of the concrete lined CSPA culverts there was a large amount of silt and fine sediment accumulated in the bottom of the culvert. The two concrete lined CSPA culverts were inverted higher and likely only convey flows during periods of high water including the spring freshet and large precipitation events (Photo 10). The single CSP culvert conveys flow during all conditions.

The northern CSPA culvert beneath Highway 400 has artificial boulders constructed out of concrete within the base; possibly created for habitat or flow dissipation (Photo 10). The southern culvert was lined with concrete but did not have the artificial boulders created through them and was completely smooth. There was a large, deep pool formed at the outlet of the three culverts and within this pool there were boulders and larger stone was exposed within the bank-water interface (Photo 8). The outlets of the culverts had also been hardened with stones likely to prevent scouring (downcutting) from high flows. The wetted depth and width through the concrete lined CSPA culverts was 3.0 and 0.05 m respectively. The water was not flowing through these culverts and they were exhibiting laminar flows and ponded water.

The wetted depth and substrate of the outlet pool could not be determined due to depth and safety of access of the pool. The mean wetted width of the pool was approximately 12 m. The banks downstream of the outlet of the culverts were vegetated with grasses, shrubs and forbs including Red Osier Dogwood. These banks were moderately unstable as they exhibited signs of slumping and erosional flows during high periods of flow.

Upstream of Highway 400 the water was conveyed to the inlet of the two CSPA culverts through a grassed channel (Photo 12). Water was conveyed to the single concrete lined CSP through main channel alignment with higher and steeper banks than the channel that conveyed flows to the double CSPA culverts. Upstream of these channels there were three culverts in place beneath Rieve Boulevard. These culverts included a single CSP culvert (2.1 m diameter) which conveys flow to the single concrete lined CSP beneath Highway 400, and two CSPA culverts which convey flow to the concrete lined CSPA culverts beneath Highway 400 (4.8 m span each). The CSPA culverts were not conveying flows to the concrete lined CSPA culverts beneath Highway 400, but they contained remnant water throughout their lengths. They had an estimated wetted width and depth of 4.0 m and 0.10 m respectively. The single CSP culvert beneath Reive Boulevard conveyed the main flow to the concrete lined CSP culvert beneath Highway 400 and this culvert was conveying flow during the aquatic habitat assessment (Photo 13). This culvert had a wetted width and depth of 1.5 m and 0.4 m respectively.

The Highway 400 Crossing is considered to be a seasonal barrier to fish movement unless inundated with water during high flows. The flow through the low flow CSP culvert have very high velocities based on flow constriction to allow for the passage of smaller bodied fish upstream. During periods of low flow and when the water level is high enough to allow flow through the CSPAs due to culvert invert elevations.

4.3.4 Reive Boulevard to 2nd Line

Burnside completed the fisheries habitat assessment from Reive Boulevard to 2nd Line through the Innisfil Creek Golf Course property and agricultural property that is south of 2nd Line. The Drain flows from north to south from 2nd Line then bending and flowing from east to west through the golf course property (Photos 14-17). Through this section the Drain was flowing within in a flats morphology and through a linear channel that did not meander. The substrate of the Drain through this section was comprised primarily of sand with very little coarse substrate present.

Through the golf course and upstream agricultural property there is a relatively narrow buffer of grasses, shrubs and forbs that stabilized the banks of the drain. A large woody debris deposit was present in the form of an in-stream tree approximately 80 m upstream of Reive Boulevard (Photo 15). The banks of the Drain through the golf course property exhibited signs of slumping and sluffing although the banks are much less steep than in the lower reaches of the Drain. The bank width was much wider than downstream reaches as well with an approximate bankfull width and depth of 8.0 m and 1.2 m. During the site visit Burnside staff spoke with the golf course superintendent who stated that the golf course has ongoing issues with beavers, muskrats and minks. Muskrats and minks burrow in the banks and cause issues with stability and fill with water. In addition, beavers dam the Drain and cause issues with flooding.

Overall, the section between Reive Boulevard and 2nd Line was considered to provide marginal fish habitat since there was minimal cover provided for fish species from larger substrate, aquatic macrophytes, large woody debris, boulders and undercut banks (Photo 16). There was also a lack of diversity of substrate, morphology and channel depth and width. Shading of the Drain was not provided as there were very few riparian trees and mature vegetation capable of providing shade.

4.3.5 2nd Line to 3rd Line

The assessed section of the drain between 2nd Line and 3rd Line generally flows from northeast to southwest. The Drain flows from form north to south through the 2nd Line crossing (Photo 17). Surrounding land use was identified as being intensive agriculture (high value Market Gardens) and potential sources of pollution included runoff from the agricultural lands and from roadways (Photo 18).

The Drain flows within a flats morphology with very little diversity in channel width and bottom depth. The banks of the drain were elevated (berms created by landowners), very steep, and bankfull width was the widest through this section (see Photos 19 to 21). It is apparent that these banks have been built up over time to serve the purpose of berms to prevent flooding onto the agricultural lands. Between 2nd line and 3rd line the drain had an average wetted width of 4.5 m and a wetted depth of 0.2 m. The banks were over 8 m wide in certain locations through the section of the Drain between 2nd Line and 3rd Line. Burnside observed these conditions during the April aquatic habitat assessment when there were higher flows from previous runoff and the spring freshet. In the dry period of the year, late summer, it is likely that the wetted depth becomes very shallow as a low flow channel did not exist through this section. The wide channel is also likely to warm up considerably during the summer months and remain warm as there is low gradient and no shading, riffles or deep pools which provide summer refuge. There were limited pools and no in-stream large woody debris, boulders, or large structure that fish and aquatic life could use as habitat.

One section of the drain, approximately 820 m upstream from 2nd Line, contained banks that were vegetated with grasses and shrubs and these banks were not disturbed. These banks did not exhibit major signs of slumping or erosion.

Where the drain flows from north to south parallel to the 10th Sideroad the gradient increased and one riffle was observed from 5th Sideroad to the 3rd Line (Photo 22). Some cyprinid species, most likely creek chub based on body size, shape and movement, were observed spawning in this section of the drain. Within this section of the Drain the slope of the banks was less severe, vegetated with grasses and forbs, and appeared more stable, although they exhibited minor signs of slumping and sluffing. The drain was more confined through this section with a wetted width of 2 m.

Where the drain flows through the Market Gardens unstable banks that were not vegetated, appear to contribute to increased sediment deposition. These banks exhibited signs of erosion during high flows and increased disturbance (landowner grading) contributes to un-stability future maintenance. In addition, there was no rooted vegetation capable of stabilizing the bank through the Market Gardens section between 2nd Line and 3rd Line (Photo 21).

4.3.6 3rd Line to 4th Line

For approximately 1.6 km this section of the Drain flows from the northeast to southwest. Surrounding land use through this section was identified as rural residential properties, agricultural land use, woodlots and vacant rural land. Potential pollution sources included runoff from surrounding agricultural land use and the roadways. Through this section higher quality fish habitat was observed compared to downstream between 3rd Line and 5th Sideroad. From the 3rd Line a low flow channel was observed within the drain (Photos 23 to 25). The banks through this section of the Drain were more stable than the downstream reaches and densely vegetated with grasses, shrubs, and some riparian trees (Photo 24). Red osier dogwood was also observed within the banks of the riparian land.

The Drain was characterized as a predominantly a flats type of morphology however, there was more diversity in terms of channel width and bottom depth than in the previously described sections of the Drain. Several shallower areas were present through this section and till was observed within bottom substrate near areas of coarser gravel. Several of these areas were clear of finer sediment deposits as well. Multiple riffles and deeper pools were located within the Drain (Near Sta. 6+000). Substrate was again comprised mostly of sand, but deposits of gravel, cobble substrate were observed (Photo 25). The low flow channel meandered more within the linear alignment than the reaches between 3rd Line and the highway 400 crossing. Where there were scoured banks and evidence of previous erosional flows till containing boulders and larger cobble was observed.

Burnside observed 4 Rainbow trout within the Drain between 3rd Line and 4th Line. In addition, Burnside noted several spawning redds downstream of 4th Line. Rainbow trout were not observed on these redds and many of them were dug down to the till . Overhanging vegetation was present in the form of grasses, shrubs and forbs along the stream banks. Large woody debris was present and there was minimal shading provided by riparian vegetation. Undercut banks were also present and provide cover for potential fish species in the Drain.

Beneath 4th Line there were two CSP culverts, one for low flow and one for elevated flows (Photos 26 and 27). During the aquatic habitat assessment on April 11, 2018 the overflow culvert was not receiving flows from the Drain and the low flow culvert was receiving a large volume of flow that almost completely inundated the inlet of the culvert.

4.3.7 4th Line to 5th Line

Burnside also observed the 5th Line crossing from the road right-of-way on the morning of April 11, 2018. No spawning Rainbow trout were observed within the upstream or downstream reach of the 5th Line crossing however suitable habitat was present in the form of gravel and larger coarse substrate with potential disturbed substrate present upstream of the culvert beneath 5th Line. The watercourse flows through an area densely vegetated with cedars and other riparian trees area upstream along the north side of 5th Line. Surrounding land uses next to the 5th Line crossing include rural residential homes and vacant rural areas.

Burnside aquatic ecology staff performed an additional aquatic habitat assessment of the Drain from 4th Line to 5th Line on April 20, 2018. Burnside aquatic ecology staff assessed this section of the Drain for form, function, morphology and fish habitat. Weather conditions were sunny during the aquatic habitat assessment and snow was present within the riparian area of the Drain. The surrounding land uses are rural homes, agricultural and pasture lands upstream for approximately 1100 m (Photos 28 and 29), then turning into a forested land dominated by old crack willow and cedar trees until the drain flows for approximately 750 m eventually flowing beneath 5th Line. Potential sources of pollution between 4th Line and 5th Line included runoff from roadways and agricultural land uses surrounding the drain. Generally wetted width and depth were measured to be 1.8 to 3 m and 0.2 to 0.4 m respectively. The mean bankfull width and depth were measured as being 5.0 and 1.8 m.

Through the approximate 1100 m of Drain from 4th Line upstream the banks of the Drain were dominated by agricultural activities. Through this section the Drain was flowed mostly in a flats morphology with some runs present. The substrate was comprised mostly of sand with deposits of gravel and cobble observed. Rainbow trout and rainbow trout redds were not observed in the areas surrounding this granular substrate. In some locations severe erosion was noted with the drain scouring large portions of the bank material (Photo 30). It was noted that the banks were more stable where red osier dogwood and riparian trees were present. Large woody debris and organic material deposits were found in relatively lower abundance than upstream within the forested area (Photos 31 to 33). Undercut banks were present in locations upstream of 4th Line, downstream of the wooded area these undercut banks potentially provide cover to larger bodied fish as well as cyprinid and other smaller bodied fish species.

In some instances, the agricultural lands were cultivated very close to the top of the banks within the Drain. The banks of the Drain were densely vegetated with grasses, shrubs and forbs in most areas. In some areas banks were moderately unstable and large portions of the bank material had entered the watercourse and the banks were slumping, scalloped and eroded (Photo 33 to 34). Through this section there were deposits of large woody debris and remnant beaver dams from previous beaver activity within the Drain. Upstream of these woody debris dams, pools were formed. These pools potentially provide habitat to cyprinids and young of the year species but they were small in nature and would not likely provide habitat to adult species of large bodied fish (i.e.. rainbow trout).

Where the Drain flowed primarily from north to south through the forested area the surrounding land was vacant and not being used for agriculture. The forested area contained some cedar trees and the canopy of these trees provided minor shading to the drain (Photo 35). There was evidence of bank sluffing and scalloping from previous erosional events throughout this section of the Drain due to woody debris jams diverting flows to the opposite bank (end cutting). Within the forested portion of the Drain the substrate was comprised mostly of organic materials, sand and some deposits of gravel.

In-stream cover included deposits of large woody debris in the form of downed trees and logs. Overhanging vegetation in the form of vascular macrophytes and woody debris was present as well and this provided additional shade and cover for fish species within the Drain. In the summer and early autumn, the grasses and shrubs present on the banks of the Drain likely mature and provide more cover and shading. Organic and woody debris was present in the form of beaver dams and deposits as well. Stream velocity increased in several locations downstream of beaver and woody debris jams. Undercut banks were present in some areas and these banks provided cover for fish species.

A single rainbow trout was observed approximately 20 m downstream of 5th Line. Closer to 5th Line there was a lack of mature riparian trees and the banks were vegetated with grasses and shrubs.

Overall, downstream of the 5th Line and upstream of 4th Line the Drain channel meandered much more than downstream within the sections south of 3rd Line where it flowed in a linear uniform alignment. There was more diversity between 4th and 5th Line in terms of channel bottom depth and width with some pools being located and changes in morphology were evident. As mentioned above there are numerous potential barriers to fish movement between 4th and 5th Line which are in the form of beaver dams and woody debris jams. The removal of these barriers will allow for the conveyance of cool water during periods of low flow and will allow for the passage of fish of all sizes through the Drain.

5.0 Proposed Detailed Design

The proposed drainage works involve improvements to the Municipal Drain through deepening and widening the channel, stabilizing banks, removal of accumulated sediment/woody debris, and establishing confined low flow channels. The works are proposed between Highway 89 to the south and 5th Line to the north. The proposed drainage works are described in the table below. Please refer to Appendices A and D for the plan, profile and cross sections of the works proposed as part of the South Innisfil Creek Drain Improvements.

Table 5: Proposed Drainage Works - South Innisfil Creek Drain

Drain Section	Station (m)		Average Deepening (m)	Average Top of Bank Widening (m)	Description of Proposed Works
	From	To			
Main Drain					
MO1	0+000	1+224	0.00	0.0	No major work proposed. Minor spot cleanout of high points in drain bottom and debris removal as required.

Drain Section	Station (m)		Average Deepening (m)	Average Top of Bank Widening (m)	Description of Proposed Works
	From	To			
MO2	1+224	2+165	0.15 (For low-flow channel only)	8.5	Channel to be widened to accommodate design storm flows. Some deepening in certain areas to accommodate establishment of low-flow channel within existing channel. Removal of debris as required. Bank stabilization in heavily eroded areas.
MO3	2+165	2+280	Section consists of the drain culvert crossings at Hwy. 400 and Rieve Blvd. Culverts are to be replaced at lowered inverts as per the new South Innisfil Creek Drain design profile (see attached profile). New crossing designs to be determined by MTO and the Town of Innisfil.		
MO4	2+280	3+350	0.54 (For low-flow channel only)	11.1	Channel to be widened to accommodate design storm flows Low-flow channel to be established below existing drain bottom to promote cold-water conditions during dry periods. Minimal deepening of channel aside from the low-flow channel excavation. Increase drain gradient by 20% to 0.05% (exist. gradient is 0.04%). Minor debris removal. Bank stabilization with native species and rip-rap as required.
MO5	3+350	3+588	0.60 (For low-flow channel only)	9.1	Channel to be widened to accommodate design storm flows. Low-flow channel to be established below existing drain bottom to promote cold-water conditions during dry periods. Minimal deepening of channel aside from the low-flow channel excavation.

Drain Section	Station (m)		Average Deepening (m)	Average Top of Bank Widening (m)	Description of Proposed Works
	From	To			
					Increase drain gradient by 20% to 0.05% (exist. gradient is 0.04%). Minor debris removal. Bank stabilization with native species and rip-rap as required. Clean out 2nd Line bridge crossing and place rip-rap for erosion protection.
MO6	3+588	5+449	0.48 (For low-flow channel only)	6.7	Channel to be widened to accommodate design storm flows. Low-flow channel to be established below existing drain bottom to promote cold-water conditions during dry periods. Minimal deepening of channel aside from the low-flow channel excavation. Increase drain gradient by 20% to 0.05% (exist. gradient is 0.04%). Minor debris removal. Bank stabilization of poorly excavated banks with native species and rip-rap as required.
MO7	5+449	6+355	0.30 (For low-flow channel only)	8.8	Channel to be widened to accommodate design storm flows. Low-flow channel to be established below existing drain bottom to promote cold-water conditions during dry periods. Minimal deepening of channel aside from the low-flow channel excavation. Increase drain gradient by 20% to 0.05% (exist. gradient is 0.04%). Minor debris removal. Bank stabilization of with native species and rip-rap as required.

Drain Section	Station (m) From	Station (m) To	Average Deepening (m)	Average Top of Bank Widening (m)	Description of Proposed Works
					Clean out 10 Sideroad and 3nd Line bridge crossings and place rip-rap for erosion protection under each.
MO8	6+355	7+950	Spot Cleanout Only	Minor Upper Bank Widening Only	Minimal work proposed. Maintain existing drain bottom elevation. Minor spot cleanout of sediment and debris where required to maintain flow in drain. Enhance/maintain existing low-flow channel by lowering top of low-flow banks on one side of the drain. Pull back one existing overbank to accommodate some drain widening. Preserve gravel bottom where possible to maintain existing habitat. Rehabilitate culvert crossing under 4th Line to improve flow through crossing.
MO9	7+950	9+917	Spot Cleanout Only	Minor Upper Bank Widening Only	Minimal work proposed. Maintain existing drain bottom elevation. Very minor spot cleanout of debris and beaver dams where required to maintain flow in drain. Enhance/maintain existing low-flow channel by lowering top of low-flow banks on one side of the drain. Pull back one existing overbank to accommodate some drain widening. Preserve gravel bottom where possible to maintain existing habitat.
10 Sideroad Branch					
	0+000	1+448		N/A	Bottom cleanout along length of drain to remove debris and accumulated sediment.
3rd Line Branch Drain					

Drain Section	Station (m)		Average Deepening (m)	Average Top of Bank Widening (m)	Description of Proposed Works
	From	To			
	0+000	1+740		N/A	Bottom cleanout along length of drain to remove debris and accumulated sediment.
3rd Line Spur Drain					
	0+000	0+779		N/A	Bottom cleanout along length of drain to remove debris and accumulated sediment.

See the colour coded plan in Appendix A for additional scale and location of the proposed improvements to the Drain.

6.0 Fish Habitat Regulated under the *Fisheries Act*

Overall the Drain is considered to provide direct fish habitat however, the Highway 400/ Reive Boulevard crossing does represent a major seasonal barrier to fish migration and prevents the seasonal movement of resident and migratory fish species during low flow conditions. Through the Highway 400/Reive Boulevard crossing there was a lack of fish habitat during the October site visit as the crossing was exhibiting baseflow conditions and the culverts through the Highway 400 were dry.

Based on the April 2018 aquatic habitat assessment it is apparent that most of the assessed length of the Drain is not suitable habitat for rainbow trout spawning; however rainbow trout use the Drain for access to the high quality habitat in the upper reaches (upstream of 4th and 5th Line). Above 3rd Line Burnside Aquatic Ecology staff visually observed 4 rainbow trout on April 11, 2018. Two of these fish were moving downstream through the system and multiple spawning redds were identified upstream of 3rd Line. Spawning habitat in the form of gravel and larger stone clear of sediment deposition with flowing water flowing over the top of the gravel was present in the watercourse above 3rd Line. Downstream of 3rd Line high quality spawning habitat was not present since the Drain is dominated by a flat bottom low gradient channel that lacks a diversity in channel depth and substrate. Sand and fine sediment is the dominant substrate located within this section with minimal gravel and granular substrate present.

Based on the confirmed presence of fish and fish habitat as it is defined in the *Fisheries Act* it is Burnside's opinion that the proposed works for the South Innisfil Creek Drain Improvements will affect fish and fish habitat. The fish species which inhabit the Drain are considered to be part of, or support, a Commercial, Recreational and potentially an Aboriginal Fishery. In section 7.0 of this report Burnside describes measures to mitigate harm to fish and fish habitat and these measures are included in the design of the Drain Improvements. This design is available in Appendix A and D of this report.

7.0 Proposed Mitigation

In-water works will only occur with respect to the timing windows for Rainbow and Brook trout (work completed between July 1 and September 30 of a given year). These timing windows are the most restrictive for the proposed works based on fish species historically observed within the Drain.

Burnside has proposed several measures to preserve or enhance fish habitat where it is found throughout the Drain. A low flow channel is proposed to be established or enhanced throughout the length of the Drain which will allow for the conveyance of flows of cool water during periods of low-flow periods. The establishment or enhancement of the low flow channel is proposed to occur between the 5th Sideroad and Highway 400.

It is proposed that gravel substrate will be preserved where possible in the sections between 3rd Line and 5th Line where Burnside aquatic ecologists observed rainbow trout and possible rainbow trout spawning activity. Debris and beaver dam removals are proposed in these sections as well in order to convey flows through the drain. The removal of these barriers to fish migration through the Drain will allow access to shaded, higher quality habitat found in the northern portions of the Drain.

Bank stabilization is proposed through the Drain to mitigate erosion occurring on the banks of the Drain. Burnside noted severe erosion in many locations through the drain during the 2018 aquatic habitat assessment site visits. The bank stabilization is proposed to be completed by planting of native species and riverstone as required. Stabilization of the banks with planting and riverstone will reduce the erosion and the sediment deposition noted from the habitat assessments. Plantings will also act as a filter to remove some of the fine sediment from runoff entering the Drain.

There are locations where the top of the banks will be widened to provide a “terraced” cross section and Burnside has proposed to remove vegetation on the north and east banks to ensure that the vegetation which shades the Drain throughout the majority of the photoperiod is not removed.

8.0 Conclusions

Based on the background review and observed existing aquatic conditions, the South Innisfil Creek Drain provides fish habitat for resident and migratory fish species regulated under the *Fisheries Act*. Due to the degraded and uniform sections of the Drain, the fish habitat appears to be limited based on seasonal conditions (flow, depth and temperature). Burnside has reviewed the channel conditions with regards to conveyance during high flow events and improvements to the channel are required to reduce flooding and impacts to high value crop lands. Proposed improvements to the Drain include suitable channel widths and depths, removal of accumulated sediment, bank stabilization, terracing with low flow channel and plantings to support riparian and channel conditions. These proposed channel improvements can create a more preferred aquatic habitat condition for cool and coldwater fish species and may improve the productivity by lowering water temperatures and reducing sediment loads to the channel from unstable banks.

9.0 References

Dillon Consulting, Final Drainage Report for the South Innisfil Creek Drain and Branches, 2013

Ministry of Natural Resources and Forestry Aquatic Resource Area Mapping, 2015

Ministry of natural Resources and Forestry, Natural Heritage Information Centre Make-A-Map, 2016.

Nottawasaga Valley Conservation Authority, Fisheries Habitat Management Plan, 2009

Nottawasga Valley Conservation Authority, Innisfil Creek Subwatershed Health Check, 2013

Nottawasaga Valley Conservation authority, Innisfil Creek Subwatershed Plan, 2006

Department of Fisheries and Oceans Canada, Aquatic species at risk maps, 2017

Ontario Ministry of Agriculture, Food and Rural Affairs, AgMaps Municipal Drain Mapping, 2017.

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Appendix B

South Innisfil Creek Drain Aquatic Habitat Assessment Photos

Photo 1: Looking east, South Innisfil Creek Drain (the Drain) upstream of 5th Sideroad (April, 2018).

Photo 2: Looking east, Drain within the wooded area upstream of 5th Sideroad. Large woody debris deposit present (April, 2018).

Photo 3: Looking north, remnant oxbow outlet located north of the main channel of the Drain upstream of 5th Sideroad(April, 2018).

Photo 4: Looking north, eroded banks, debris within the Drain downstream of Highway 400 within the forested area (April 2018).

Photo 5: Looking east, Drain flowing downstream of Highway 400 and upstream of the forested area (April, 2018).

Photo 6: Looking north, very eroded bank downstream of Highway 400 and upstream of Sideroad 5 (April, 2018).

Photo 7: Looking east, the wooden planks within the outlet of the single CSP beneath Highway 400 (April, 2018).

Photo 8: Looking east, the outlet of the single CSP beneath Highway 400 (April 2018).

Photo 9: Looking east the outlet of the double shot-creted CSPA culverts beneath Highway 400 (April, 2018).

Photo 10: Looking east, the concrete lined CSPA with artificial boulders constructed through it (April, 2018).

Photo 11: Looking west, the outlet of the single CSP beneath Highway 400 (April, 2018).

Photo 12: Looking east, the inlet to the southern CSPA culvert beneath Reive Boulevard (April, 2018).

Photo 13: Looking west, the wetted area between the Reive Boulevard CSP Culvert and the CSP culvert beneath Highway 400 (April, 2018).

Photo 14: Looking east, the Drain upstream of the Reive Boulevard crossing (April, 2018).

Photo 15: Looking east, tree and woody debris within the Drain, upstream of Reive Boulevard (April, 2018).

Photo 16: Looking east, typical section of the Drain where it flows between 2nd Line and Reive Boulevard (April, 2018).

Photo 17: Looking north, the Drain flowing through the 2nd Line Crossing. (April, 2018).

Photo 18: Looking north, roadside Drain North of 2nd Line conveying flow east to west to the DRAIN (April, 2018).

Photo 19: Looking north, the Drain flowing from north to south upstream of 2nd Line (April, 2018).

Photo 20: Looking east, the Drain flowing from east to west downstream of 3rd Line (April 2018).

Photo 21: Looking east, the Drain with eroded, non-vegetated banks.

Photo 22: Looking east, the Drain flowing parallel to 3rd Line, small riffle present (April 2018).

Photo 23: Looking north, the Drain flowing upstream of 3rd Line (April, 2018).

Photo 24: Looking north, the Drain flowing downstream of 4th Line. Small riffle present and banks densely vegetated. Red osier dogwood present (April, 2018).

Photo 25: Looking north, deposit of larger granular substrate within the Drain (April 2018).

Photo 26: Looking north, the outlets of the culverts beneath 4th Line (April, 2018).

Photo 27: Looking north, the outlet of the overflow CSP culvert located beneath 4th Line (April, 2018).

Photo 28: Looking south, the Inlet of the 4th Line CSP culverts (April, 2018).

Photo 29: Looking north, the Drain flowing from north to south upstream of 4th Line (April, 2018).

Photo 30: Looking north, highly eroded bank present on the right upstream bank of the Drain upstream of 4th Line within agriculturally cultivated land (April, 2018).

Photo 31: Looking west, debris dam present upstream of the eroded bank and upstream of 4th Line (April, 2018).

Photo 32: Looking north, typical debris dam and large woody deposit present in the east to west flowing portion of the Drain upstream of 4th Line (April, 2018).

Photo 33: Looking North, beaver dam present within the Drain in the forested area downstream of 5th Line (April 2018).

Photo 34: Looking North, scalloped and eroded banks downstream of 5th Line (April 20, 2018)

Photo 35: Looking south, cedar trees providing shading of the watercourse during April 20 (April 20, 2018).

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Appendix E

Letter of Credit Cost Estimate

Appendix E

DFO Application for Authorization Report
Appendix E
Letter of Credit Cost Estimate

PROJECT: South Innisfil Creek Drain 2019 Improvement
DATE Jan. 30, 2019 **PROJECT #:** 300038790
TOWN: Innisfil

Construction Items to be Included in Offsetting Plan

Section	From	To	Quantity	Units	Item	Cost
MO1	**0+000**	**1+224**				
	0+030	0+500	15	hr.	Woody Debris Manipulation and Placement	$ 4,330.00
			15	hr.	Labourer	$ 790.00
			15	hr.	Aquatic Ecologist Time ($/hr.)	$ 2,360.00
	0+905	0+925	20	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 110.00
	0+955	1+025	70	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 370.00
	1+135	1+185	50	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 260.00
			1	ea.	Construct Sediment Basin	$ 2,630.00
	1+000	1+200	450	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 470.00
MO2	**1+224**	**2+165**				
	1+224	2+165	30	hr.	Woody Debris Manipulation and Placement	$ 8,660.00
			35	hr.	Labourer	$ 1,840.00
			35	hr.	Aquatic Ecologist Time ($/hr.)	$ 5,510.00
	1+750	1+880	130	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 680.00
	2+040	2+170	130	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 680.00
	1+224	2+150	10,500	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 11,030.00
	1+224	2+150	930	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 14,650.00
			3	ea.	Construct Sediment Basin	$ 7,880.00
MO3	**2+165**	**2+280**				
	2+150	2+174			Maintain Plunge/Dissipation Pool at Culvert Outlet	$ -
	2+272	2+280	120	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 130.00
	2+272	2+280	10	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 160.00
MO4	**2+280**	**3+350**				
	2+280	3+350	20	hr.	Woody Debris Manipulation and Placement	$ 5,780.00
			25	hr.	Labourer	$ 1,310.00
			25	hr.	Aquatic Ecologist Time ($/hr.)	$ 3,940.00
	2+280	3+350	12,160	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 12,770.00
	2+280	3+350	1,070	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 16,850.00
			5	ea.	Construct Sediment Basin	$ 13,130.00
MO5	**3+350**	**3+588**				
			4	hr.	Labourer	$ 210.00
			4	hr.	Aquatic Ecologist Time ($/hr.)	$ 630.00
	3+380	3+585	205	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 130.00
	3+369	3+588	2,750	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 2,890.00
	3+369	3+588	230	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 3,620.00
			1	ea.	Construct Sediment Basin	$ 2,630.00
MO6	**3+588**	**5+449**				
	4+515	4+545	60	m2	Live Stake Drain Bank above High Water Mark ($/m2)	$ 320.00
	4+785	4+815	80	m2	Live Stake Drain Bank above High Water Mark ($/m2)	$ 420.00
	5+250	5+280	60	m2	Live Stake Drain Bank above High Water Mark ($/m2)	$ 320.00
	3+588	5+449	20	hr.	Woody Debris Manipulation and Placement	$ 5,780.00
			30	hr.	Labourer	$ 1,580.00
			30	hr.	Aquatic Ecologist Time ($/hr.)	$ 4,730.00
	3+590	3+880	290	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 190.00
	4+700	4+820	120	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 80.00
	3+588	5+449	21,020	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 22,070.00
	3+588	5+449	1,350	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 21,260.00
			6	ea.	Construct Sediment Basin	$ 15,750.00

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DFO Application for Authorization Report
Appendix E
Letter of Credit Cost Estimate

PROJECT: South Innisfil Creek Drain 2019 Improvement
DATE Jan. 30, 2019 **PROJECT #:** 300038790
TOWN: Innisfil

Construction Items to be Included in Offsetting Plan

Section	From	To	Quantity	Units	Item	Cost
MO7	**5+449**	**6+355**				
	5+449	6+355	5	hr.	Woody Debris Manipulation and Placement	$ 1,440.00
			10	hr.	Labourer	$ 530.00
			10	hr.	Aquatic Ecologist Time ($/hr.)	$ 1,580.00
	5+449	6+355	7,410	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 7,780.00
	5+449	6+355	890	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 14,020.00
			2	ea.	Construct Sediment Basin	$ 5,250.00
MO8	**6+355**	**7+928**				
	6+355	7+928	5	ea.	Construct Riffle Structure	$ 13,130.00
	6+355	7+928	9	ea.	Construct Gravel Substrate Area	$ 9,450.00
	6+355	7+928	30	hr.	Woody Debris Manipulation and Placement	$ 8,660.00
			30	hr.	Labourer	$ 1,580.00
			30	hr.	Aquatic Ecologist Time ($/hr.)	$ 4,730.00
	6+355	7+928	160	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 2,520.00
	6+355	7+928	7,620	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 8,000.00
MO9	**7+928**	**7+950**				
		7+925	1	ea.	Construct Sediment Basin	$ 2,630.00
MO10	**7+950**	**9+917**				
	8+900	8+935	70	m2	Live Stake Drain Bank above High Water Mark ($/m2)	$ 370.00
	9+020	9+040	40	m2	Live Stake Drain Bank above High Water Mark ($/m2)	$ 210.00
	7+950	9+918	6	ea.	Construct Riffle Structure	$ 15,750.00
	7+950	9+918	11	ea.	Construct Gravel Substrate Area	$ 11,550.00
	6+355	7+950	30	hr.	Woody Debris Manipulation and Placement	$ 8,660.00
			30	hr.	Labourer	$ 1,580.00
			30	hr.	Aquatic Ecologist Time ($/hr.)	$ 4,730.00
	7+950	9+917	6,310	m2	Seed Exposed Areas Including Buffer(s) ($/m2)	$ 6,630.00
	7+950	9+917	100	m2	Apply Sod Matts to Excavated Channel ($/m2)	$ 1,580.00
	8+900	8+930	30	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 160.00
	8+955	8+985	30	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 160.00
	9+020	9+040	20	m	Shade Drain Bank with Tree Plantings ($/lin.m)	$ 110.00
Offsetting Construction Contingency and Overhead						
			1	ea.	Construct Sediment Basin	$ 2,630.00
			100	m2	Sod Matting Contingency	$ 1,580.00
			50	hr.	Woody Debris Manipulation and Placement	$ 14,440.00
			50	hr.	Labourer	$ 2,630.00
			50	hr.	Aquatic Ecologist Time ($/hr.)	$ 7,880.00
					License to Collect Fish and Associated Labour	$ 1,000.00
Construction Subtotal						**$ 361,880.00**

Monitoring Cost Estimate *(see breakdown on page 3)*

**Annual monitoring costs were adjusted with an annual inflation rate of 2%*	**Year 1**	$ 8,830.00
	Year 2	$ 9,010.00
	Year 5	$ 9,560.00
	Contingency of 1 Additional Year	$ 9,750.00
Monitoring Subtotal		**$ 37,150.00**

Offsetting Plan Total	**$ 399,030.00**

PROJECT: South Innisfil Creek Drain 2019 Improvement
DATE Jan. 30, 2019 **PROJECT #:** 300038790
TOWN: Innisfil

One Year Monitoring Schedule
Amounts shown are for Year 1 and are not adjusted for inflation

Task Description	Staff Time (hr) Sr. Aquatic Ecologist $145/hr	Staff Time (hr) Aquatic Ecologist $80/hr	Subtotal Hours	Subtotal Fees	Total Fees
Spring Site Visit					**$ 4,145**
Travel Time (total)	3.0	3.0	6.0	$ 675	
Site Inspection	8.0	8.0	16.0	$ 1,800	
Report and Submission	6.0	10.0	16.0	$ 1,670	
Summer Site Visit					**$ 1,795**
Travel Time (total)		3.0	3.0	$ 240	
Site Inspection		8.0	8.0	$ 640	
Report and Submission	3.0	6.0	9.0	$ 915	
Fall Site Visit					**$ 2,510**
Travel Time (total)	3.0		3.0	$ 435	
Site Inspection	8.0		8.0	$ 1,160	
Report and Submission	3.0	6.0	9.0	$ 915	
Labour Total	34.0	44.0	**78.0**		**$ 8,450**
				Mileage	$ 380
				Annual Monitoring Total	**$ 8,830**

Appendix G3

South Innisfil Creek Drain – Record of Public Consultation Technical Memorandum

G3

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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Technical Memorandum- South Innisfil Creek Drain- Record of Public Consultation

Date:	January 30, 2019	**Project No.:**	300038790
Project Name:	South Innisfil Creek Drain Improvements		
Client Name:	Township of Innisfil		
Submitted To:	Fisheries Protection Program, Department of Fisheries and Oceans		
Submitted By:	Matthew Moote, H.B.Sc., CAN-CISEC-IT, Aquatic Ecologist		
Reviewed By:	Chris Pfohl, C.E.T., EP, CAN-CISEC, Sr. Aquatic Ecologist Jeff Dickson, P.Eng, Project Engineer		

1.0 Project Description

R.J. Burnside & Associates (herein, Burnside) has been appointed by the Town of Innisfil (herein, the Town) to prepare and file a report recommending improvements to the South Innisfil Creek Drain (herein, the Drain) under Section 78 of the Drainage Act. Burnside Aquatic Ecology staff submitted a Request for Review to the Department of Fisheries and Oceans (DFO) on July 11, 2018.

On November 11, 2018 the DFO notified Burnside that "serious harm to fish" as described in the *Fisheries Act* was likely to occur as a result of the proposed works within the Drain and that the project would require an authorization under the *Fisheries Act*.

As part of the DFO Authorization application Burnside has provided a record of the public engagement and consultation completed as part the preparation of the engineer's report below in section 2 of this technical memo.

2.0 Summary of Public Consultation

2.1 Formation of Public Liaison Committee

In accordance with Section 9 of the Drainage Act (herein, the Act), an On-Site Meeting is required before the engineer makes an examination and report. A notice for a Section 9 meeting shall be sent to each owner of land within the *"area requiring drainage as described in the petition";* therefore, a drain initiated in accordance with Section 4. It is also an accepted practice for such a notice to be sent for an appointment under Section 78 of the Act.

The initial On-Site Meeting was the responsibility of Dillon Consulting, the previously appointed engineer for the project, as documented in their August 15, 2013 report and was held on August 3, 2005. While Burnside was also appointed by the Town in accordance with Section 78 of the Act, a second On-Site Meeting was not scheduled. This matter was discussed with staff from OMAFRA, and it was implied that Burnside was appointed to "complete" the project started by Dillon, and therefore Burnside could be considered a "change" of the engineer to move the project forward to completion.

In lieu of another On-Site Meeting, Town staff and Burnside formed a Public Liaison Committee (PLC). The PLC was perceived to be a benefit in keeping stakeholders informed throughout the process under the Act for this sizeable drainage project as well as to create accountability and transparency with respect to its status and the on-going engineering that would eventually lead to the filing of an engineer's report in accordance with Section 78. The purpose of the PLC was to also provide a forum for Agencies and Owners to provide input and feedback to the Town and Burnside, not only regarding the engineering and design work, but also to arrive at a drainage solution that was as acceptable to as many stakeholders as possible while at the same time satisfying all the necessary regulatory protocol and environmental requirements.

It was decided to have the PLC made up of representatives of the Town, the Agencies, Burnside and the landowners (or public) affected by this Municipal Drain; it was formed over a period of months following the appointment of Burnside.

2.2 PLC Meeting #1

After the PLC was formed, it held its inaugural meeting on April 27, 2017 with 16 members of the committee present. An Agenda was prepared and distributed and approved at the start of the meeting. The goals of the PLC were discussed, and it was agreed that it would *"review additional details regarding work completed to date and obtain feedback and input from agencies and property owners in an effort to move the project to a satisfactory solution."* It was noted that input from the group will be key to it being successful and that the members of the PLC can hopefully channel the information coming from the meeting(s) back to the residents involved within the watershed; it was also suggested that members may even be able to assist and help in fielding questions and phone calls. Information will continue to be posted on the Town's website.

Discussions followed regarding the project in general and of the drain in particular; the information discussed included but was not necessarily limited to the following topics: the Burnside investigations and reviews of the Dillon documentation and data since appointment; the lack of agency approvals; the Highway 400 crossing; possible settlement of new agricultural crossings as proposed by Dillion; preliminary discussions with some of the agencies; the capacity of the drain; proposed rural stormwater facilities as per the Referee's Order; the drain bottom gradient (slope); etcetera.

Burnside staff provided an overview of the hydrology and the hydraulics for the watershed and the drain; an overall Watershed Plan was distributed to facilitate the discussions. Some of the items discussed included: providing evidence to MTO that the culverts through Highway 400 need to be lowered and enlarged; the protocol regarding municipal drains and crossings as determined by the Act, who is the owner and who is responsible for this type of infrastructure; the minimum design criteria/standard for open municipal drains; the hydrology model that Burnside has developed and resulting flows/output; the concern with global warming and what appears to be larger, more intense & more frequent rainfall events and incorporating this into a model; coordination and working with the local Conservation Authority; etcetera.

The drain gradient (slope of the bottom) was also reviewed and discussed; however, unless the drain is extended downstream, there may be limited opportunity to improve the existing gradient as it is currently only 0.04% to 0.05% according to the 1956 Weir report which is very flat. Also discussed was with some drain improvement projects there is an ability to go deeper with the channel bottom in combination with its gradient and as a result increase the capacity of the drain; with the current low and limited drain gradient, another way to increase capacity is to widen the existing drain cross-section.

The impact of the existing private landowners dyke system was also discussed and needs to be addressed in the final engineer's report regarding who is responsible to get flood waters that top the existing dykes back into the Main Drain channel. Other aspects of the dykes that also need to be resolved: the impact on the storm water management areas identified in the Referee's Order; cost implications; maintenance in the future; design details if they are part of the drain; etcetera.

Committee members were given an opportunity to bring forth issues and concerns about the drain itself. The information discussed and exchanged during this part of the meeting included, but was not necessarily limited to, the following: the farm crossings as proposed in the Dillon report; the Highway 400 crossings need to be addressed in the Burnside report; the Dillon proposed 2-stage ditch; the inadequacy of the proposed allowances; there only being a need of a drain cleanout upstream of the 3rd Line; the proposed work as well as the private access crossings on the 3rd Line Branch Drain, the 3rd Line Spur Branch Drain and the 10 Sideroad Branch Drain.

There was also a discussion regarding the SICD project in general and some of the concerns expressed were as follows: the major public concern to date related to the significate cost of the overall project and it is hoped that Burnside has this in mind as it continues the design work; the need for more consultation with the affected landowners, especially those in the Market Garden; not to propose the undertaking of unnecessary work that would add to the overall project cost; if possible take into consideration a design that can accommodate lager rainfall/runoff events; the involvement of DFO and the sensitive fish habitat; having face-to-face time with affected landowners; ongoing communication is key via update reports, memorandums, etc.; moving forward the discussions with MTO regarding the Highway 400 crossings; etc.

At the conclusion of the Meeting, attendees were informed that they would be kept apprised of the Burnside progress as well as next steps. The next meeting was proposed for later in the year; all will be canvased for the most suitable date and advised accordingly.

2.3 PLC Meeting #2

The second PLC meeting was held on November 29, 2017 with 11 members of the committee present. An Agenda was prepared, distributed and approved at the start of the meeting. The start of the meeting included a review of the main objectives for the project; namely: improvements to drain capacity and removal of obstructions including the Highway 400 crossings; the replacement of the Hwy. 400 crossings; the mitigation of flooding in the Market Garden; and the reduction of the overall cost of the Dillon project.

The next major item of discussion was regarding the Highway 400 crossings and information that has been made available since the April 27, 2017 PLC meeting. The discussions included but were not necessarily limited to the following: an AECOM “draft” Drainage Report; the proposed Highway 400 & Highway 89 Interchange; a proposed SWM facility as part of the interchange; liaison with Morrison Hershfield (MTO Interchange consultant); correspondence sent to MTO; and a Notice of Completion for the Highway 400 Environmental Assessment. Most of these items can also be found detailed in a project update Memorandum to the Mayor, Deputy Mayor and Members of Council dated January 17, 2018 and posted on the Town’s website.

Discussions then followed regarding the hydrology and the hydraulics as well as the results of some of the Burnside modelling. Information discussed included: a summary of the variation in flows generated using the Burnside model in comparison to those identified in the Dillon report; the proposed design flow and cross section for the drain in comparison of to the existing conditions; information and a comparison between the 2-year standard rainfall and the 2-year climate change rainfall; QA/QC efforts; and the Burnside need to “calibrate” the model.

There were a few questions for the Burnside team regarding the modelled flows and the capacity of the drain; it was recommended that it is better to compare the proposed capacity of the drain to its existing capacity and translate that into terms of the amount of improvement or increase and not necessarily to a design storm. The discussions also involved the increase in cost of the project with the increase in the drain capacity. Clarification was also requested regarding the need for a low flow channel; it was explained that this was to address base and low flow conditions as well as to attempt to reduce laminar flow in the drain which is a major concern of DFO. A low flow channel tends to create higher flow velocities in that portion of the drain and assists in the movement and transport of sediment; the much wider upper second stage or tier of the channel conveys flows the result after rainfall events. The effective transport and movement of sediment along the course of the drain normally creates better habitat that is in turn supported by DFO. The above type of system also hopefully requires less maintenance.

There was further discussion regarding the crossings on Reive Boulevard and if they would be considered part of the Highway 400 MTO work; Reive Boulevard is owned by the Town; regardless, the crossing through this road also need to be replaced. Other road crossings were discussed such as 2nd Line; it was explained that it was hoped to salvage the existing 2nd Line bridge.

Also discussed: berms or dykes along the course of the drain as per the Dillon report; the need to confirm in the Burnside report who is responsible to maintain the berms or dykes (existing as well as if new ones are proposed); is the lower stormwater pond prescribed by the Referee required; what are or will be the variations in channel cross section along the course of the existing drain; has there been any communication with the staff at the NVCA regarding a permit for the work; etc.

After the Meeting, attendees were again informed that they would be kept apprised of the Burnside progress, the next steps, the next meeting, etc.

2.4 Public Information Centre

A Public Information Center (PIC), modelled similar to that under the (former) Ministry of the Environment and Climate Change, Municipal Class Environmental Assessment process was held on Friday, February 23, 2018 from 4:00 until 7:00 p.m. at the Town Hall Community Room, Town Municipal Building at 2101 Innisfil Beach Road. A notice for the PIC was sent by the Town to all potentially affected landowners and Utility Companies within the watershed. The Notice also provided contact information for those who were not able to attend the PIC but wished to offer input.

The purpose of the PIC was to allow all stakeholders to join Burnside and Town staff in an “Open House” format to receive an update on the status of the South Innisfil Creek Drain Improvement project and to offer an opportunity for stakeholders to ask questions and/or provide input to Burnside and Town staff and to receive feedback.

There were a number of items that were prepared for the PIC which included but were not necessarily limited to the following:

- Sign-In sheets for the Attendees (it is known that not all attendees signed in).
- Display Boards (large format) depicting various aspects of the SICD project such as: A Drainage Act Section 78 Flowchart; a colour coded Watershed Plan; Existing and Proposed Drain Capacity information; Peak Flow tables; Drain Profiles & Cross Sections; Photos of the Existing Conditions; Highway 400 crossing information; Aquatic & Terrestrial Species information; etc. A digital copy of the Display Boards was posted on the Town's website.
- Handout sized copies of the Watershed Plan and the Drainage Act Flowchart.
- Comment Cards for attendees who wished to receive a written answer to a question or who required follow-up by either Burnside or Town staff to information that was not readily available at the PIC.

Burnside and Town staff were available during the 3-hour Open House to discuss aspects of the project with stakeholders as well as answer as many questions as possible; some stakeholders were requested to put their question in writing on a Comment Card and informed that Burnside would get back to them with an answer.

2.5 PLC Meeting #3

A third PLC meeting was held on July 23, 2018 with 12 in attendance. An Agenda was distributed and approved after the start of the meeting. Like the previous meetings, attendees were brought up-to-date with a review of the main objectives of the project. The next major item of discussion was an update regarding the Highway 400 crossings. The discussions included but were not necessarily limited to the following:

- Correspondence and documents prepared by Burnside and sent to MTO (Hydrology Report first issued on May 17, 2018; re-issued on July 12, 2018);
- Meetings with the MTO Project Team; and
- Correspondence and presentations by the Town to MTO; and a pending delegation with the new Minister of Transportation at the upcoming AMO AGM and Annual Conference.

It was noted that to date that there has been no formal response received from MTO regarding the Burnside Hydrology Report issued in May.

Discussions then followed regarding the hydrology and the hydraulics as well as a general overview of the Burnside reports for each. Information presented included: the Hydrology Report published and distributed (as noted); a review of the variation in flows generated by Burnside in comparison to those by Dillon and the calibration of the Burnside model; the design flows (2-year standard, 2-year climate change and 2-year hybrid) and the resulting cross section for the drain; the on-going work on a Hydraulics Report; etc. It was indicated that the Hydraulics Report would complement the Hydrology Report and that each would be referenced in the drainage engineer's report as well as form an Appendix therein; however, since these are stand-alone reports, it is not anticipated that there would be a lot of information repeated in the engineer's report.

The attendees were informed by the Burnside Team that although berms or dykes along the course of the Main Drain (as per the Dillon report) were considered, it is unlikely (but yet to be confirmed) that they will form part of the proposed work under the engineer's report. The primary reason is due to the implications of Section 74 regarding their maintenance by the Town, the variance in the standard to which some have been constructed and that they are "all" currently private. Accordingly, there are also implications with respect to costs to either build them and or provide adequate allowances to incorporated them as part of the SICD Main Drain.

It was confirmed, that at this time, there is no proposal by Burnside or the Town to include or incorporate any stormwater management facilities as once directed by the Referee; the final Order dated November 4, 2014, relieved the Town from being bound by the March 31, 2005 Order. The removal of the 2 facilities proposed by Dillon is also supported in the hydrology modelling performed by Burnside.

It was also confirmed that although there would be reference in the engineer's report regarding the crossing(s) under/through the Highway 400 and Reive Boulevard in so far as related to capacity and maximum invert (if any) elevation, these crossings will not be considered part of the project. It is hoped that the MTO and the Town can work cooperatively on this infrastructure.

A representative from the NVCA was present and offered the following regarding this subject matter: NVCA engineering staff have completed a review of the hydrology report, NVCA will be providing comments that we will issued separately; accordingly, NVCA would like to report that it is in general agreement with the conclusions.

The next topic of discussion was a presentation regarding the various features being considered as part of the proposed work to hopefully satisfy the concerns of the DFO as well as to eventually obtain a necessary "Authorization" for the proposed work. To that end, attendees were informed that a formal Request for Review was submitted to the DFO earlier in July accompanied by a detailed and extensive Technical Memorandum. The concept and need for a "low flow channel" was again explained; this is to minimize laminar flow in the drain, to attempt to create higher flow velocities and assist in the movement and transport of sediment; the proposed Main Drain profile and some drain cross sections were review and expanded upon.

Before the meeting concluded, attendees were provided with some information concerning a preliminary estimated cost for the project under the main headings of construction, allowances, contingencies, administration & financing and engineering. There was also a brief discussion regarding the approach being considered for the calculation of the various allowances under Sections 29 to 33 inclusive of the Act.

At the end of the Meeting, attendees were informed that Burnside will be presenting a project status update and the highlights of a “Draft” Drainage Report for the SICD 2018 Improvement to the Council and Staff on Wednesday, August 8, 2018 commencing at 5:30 p.m. They will also be kept apprised of other Burnside progress, next steps, another meeting (if necessary), etc.

2.6 Landowner Meetings and Discussions

Burnside staff met with several landowners who have a portion of the SICD on one (or more) of their properties. The particulars of the project were discussed in general as well as some of the impacts to their respective property in particular. A number of landowners were also contacted either via telephone or email to discuss the project and answer specific questions.

3.0 Conclusion

Burnside was successful in establishing a Public Liaison Committee for the sizeable drainage project. Throughout the project to date the PLC has functioned to provide transparency, accountability and it has kept the landowners affected by this project informed through the process of the Drain design, and DFO authorization. A PIC also was held on February 23, 2018 in order to further inform landowners about the project and to allow the public an opportunity to provide feedback and ask questions.

Through the PLC meetings and the PIC, the aspects of the project the public has asked about and been informed of with regards to the Fisheries Act and DFO include: the DFO involvement in the project, the DFO Request for Review and Authorization applications, the requirement for the low-flow channel in the Drain design and the sensitive fish habitat present in the Drain.

R.J. Burnside & Associates Limited

Matthew Moote

Matthew Moote
Aquatic Ecologist

MM:sgd

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix G4

NVCA Fisheries Habitat Management Plan
Technical Memorandum

G4

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

[THE DIFFERENCE IS OUR PEOPLE]

Technical Memorandum – NVCA Fisheries Habitat Management Plan

Date:	January 30, 2019	**Project No.:**	300038790
Project Name:	South Innisfil Creek Drain Improvements		
Client Name:	Town of Innisfil		
Submitted To:	Fisheries Protection Program, Department of Fisheries and Oceans		
Submitted By:	Matthew Moote, H.B.Sc., CAN-CISEC-IT, Aquatic Ecologist		
Reviewed By:	Chris Pfohl, C.E.T., EP, CAN-CISEC, Sr. Aquatic Ecologist		

1.0 Background

R.J. Burnside & Associates Limited (here, Burnside) has been appointed by the Town of Innisfil (herein, the Town) to prepare and file a report recommending improvements to the South Innisfil Creek Drain (herein, the Drain) under Section 78 of the Drainage Act. Burnside's Aquatic Ecology staff submitted a Request for Review regarding the project to the Department of Fisheries and Oceans (DFO) on July 11, 2018. On November 11, 2018 the DFO notified Burnside that "serious harm to fish" as described in the *Fisheries Act* was likely to occur as a result of the proposed works within the Drain and that the project would require an authorization under the *Fisheries Act*.

Burnside staff have completed an application for project Authorization under the *Fisheries Act*, and within it have considered the local fisheries management objectives stated in the Nottawasaga Valley Conservation Authority (NVCA) Fisheries Habitat Management Plan (FHMP), published in 2009. This memo identifies and discusses the compliance of the proposed improvements to the Drain with the local objectives detailed in the FHMP.

2.0 Core Restoration Strategy and General FHMP Objectives

The FHMP recommends implementing a Core Restoration Strategy on targeted watercourses within the watershed. The Drain is generally located within the Shallow Valley Sand Plain and the Eastern Uplands fisheries management zones and is one of the watercourses targeted in this Core Restoration Strategy. One key tactic of this strategy is to initiate work at the upstream end of the impact zones and to implement works in a downstream direction. Establishing restoration works from upstream to downstream allows cold water fish and invertebrate species to repopulate the restored sections quickly as they are typically located in the upper reaches of these watercourses, adjacent to the works. A second key tactic is to extend stream habitat restoration work downstream to the where healthy riparian forest cover is usually intact. The objective of this approach is to develop restored coldwater stream habitats which provide connecting linkages between coldwater habitats in upland zones and those in the Deep Valley Sand Plain zones. The Drain project conforms with these key concepts as the proposed works are planned to be completed within a targeted reach of this Core Restoration Strategy. Construction of the Drain improvements will occur from downstream to upstream, although the project is occurring near the upstream limit of the Innisfil Creek and thus conforms to the tactic of initiating work at the upstream end of the impact zone.

These core tactics provide the basis of a restoration approach for fisheries habitats supporting migratory salmonids, as well as Brook trout (*Salvelinus fontinalis*). Stream restoration in the Shallow Valley Sand Plain zone, to which the Drain is a part of, is identified in the FHMP as providing an opportunity to extend healthy coldwater habitats downstream from the Escarpment Natural Zone and to provide continuity with coldwater habitats in the Deep Valley Sand Plain Zone. The habitat restoration measures described below propose several improvements to the existing habitat within the Drain.

The NCVA FHMP states that applicable stream habitat restoration techniques to be applied in the Shallow Valley Sand Plain Zone to extend migratory Rainbow trout (*Oncorhynchus mykiss*), Chinook salmon (*Oncorhynchus tshawytscha*) and resident Brown trout (*Salmo trutta*) habitat include:

- Establishment/development of buffer strips and reforestation of riparian zones;
- In-stream habitat enhancement (e.g., adding woody material to the stream banks and channel to increase cover, decrease channel width and increase habitat diversity);
- Stream bank stabilization;
- Natural channel and floodplain restoration;
- Implementation of municipal drain best management practices; and
- Nutrient management.

Innisfil Creek is also identified in the NVCA FHMP as a high priority site for implementation of municipal drain best management practices as well as riparian buffer restoration intended to reconnect coldwater habitat in the Bethesda Creek tributary with the main branch of Innisfil Creek.

The habitat restoration measures described below propose several improvements to the existing habitat within the Drain and address these restoration techniques.

The proposed design includes the following improvements to the Drain:

- The construction of a two-stage channel with a low-flow channel throughout the length of the Drain;
- Stabilizing banks through a combination of rip-rap, round stone, live staking, sod-matting, and woody debris revetments;
- Planting 425 trees along the Drain;
- Establishing a 3.0 m wide vegetated buffer along both banks of the Drain;
- Removal of debris jams within the Drain;
- Construction of 19 sedimentation basins in the Drain which will be maintained by the drainage superintendent in the future;
- Construction of 11 riffle-pool structures within the Drain which will be maintained by the drainage superintendent in the future;
- Woody debris manipulation within the Drain to prevent erosion and provide overhead cover for fish species; and
- Salvage of gravel and granular substrate where encountered in the Drain.

The construction of the low-flow channel, planting on the banks and the woody debris manipulation to provide overhead cover will contribute to achieving cooler temperatures in the summer. The existing conditions in the Drain do not feature a low-flow channel downstream of 3rd Line and this contributes to a degradation of the thermal regime in the Drain through laminar, warm, base flow during periods of low-flow. The low-flow channel construction will also ensure the base-flow is contained in the stable low-flow channel resulting in cooler temperatures during periods of low precipitation compared to the existing conditions. The tree planting and woody debris manipulation will add shading to the Drain that does not currently exist to further cool temperatures of the water. Plantings are planned for the south and west banks of the Drain to maximize shading during the warm months of the year.

The banks will be stabilized through a combination of rip-rap, round stone, live staking, sod-matting, and woody debris revetments. Throughout large stretches of the Drain, particularly between 2nd Line and 3rd Line, there is a lack of vegetation on the banks of the Drain. These proposed restoration methods will result in bank stability during periods of high flow. The sod-matting, live staking and plantings will not only contribute to bank stability but will also act as a filter to remove sediment from runoff of surrounding agricultural lands, resulting in improved water clarity and quality.

There are numerous debris jams within the Drain that restrict potential fish migration during periods of the low-flow. Many of these are located between 15th Line and Highway 400, and between 3rd Line and 5th Line. These debris jams will be removed during the construction of the Drain improvements and the wood within the debris jams will be re-used for the proposed large woody debris manipulations to provide overhead cover and bank erosion protection. The removal of the debris jams will allow for more functional migration routes for fish within the Drain.

In addition to the use of woody debris to provide overhead cover for fish species and erosion protection, sedimentation basins are also proposed to capture suspended sediment within the Drain. Both of these techniques will provide measures of protection for fish, that could use the woody debris and deep pools for feeding/growth, nursery, and seasonal refuge.

The design also proposes salvaging deposits of gravel and granular material in the Drain to construct 11 riffle-pool structures in the Drain upstream of 3rd Line where the highest quality of existing habitat has been observed during Burnside's site visits (for full details of the aquatic habitat conditions observed, please refer to DFO Authorization Report submitted as part of the DFO Authorization Application). Gravel and granular substrate was not observed in abundance during the field investigations, so if encountered during excavation, the material will be salvaged for re-use within the Drain. Additional round stone substrate will be used below the annual high-water mark to construct riffle structures when existing substrate is not available. The riffle-pool structures will be constructed to provide cover in the pool, spawning habitat in the riffles and to increase overall morphological diversity in the Drain which is absent in the existing conditions. These features will potentially increase spawning habitat, thus increasing the habitat components within the Drain.

The existing culverts in the Drain beneath the Highway 400 and Reive Boulevard crossing represent barriers to fish migration during periods of low flow. The existing culvert configuration does not allow for fish migration during periods of low-flow as the single corrugated steel pipe (CSP) culvert beneath the crossing flows at a very high velocity at its outlet, while the two arched CSP culverts (CSPA) do not provide sufficient water quantity and depth to allow for fish passage. These culverts are proposed to be replaced with suitably embedded culverts which will allow for the improved conveyance of flows, consequently allowing for potential fish migration during low-flow periods.

Since a significant issue throughout much of the Drain is the lack of riparian vegetation along its banks, particularly between 2nd line and 3rd Line, a permanent 3 m-wide vegetated buffer has been proposed. This buffer will be comprised of tree plantings, sod-matting, live staking or seeding, or a combination of these methods. This vegetation will add structure to the banks above the low flow and bankfull channel and will also improve the amount of shading the Drain experiences when compared to the existing conditions. Between 15th Line and Highway 400, 2nd Line and 3rd Line, and 4th Line and 5th Line, a total of 425 trees are proposed to be planted and will be written into the Drainage Report as permanent trees. The species to be planted are not known at this time, but the NVCA will provide direction on which species will be planted.

3.0 NVCA FHMP Recommended Management Objectives and the Drain

Section 14 of the NVCA FHMP describes the management objectives for the Innisfil Creek Subwatershed Fisheries Habitat Management Unit (FHMU 8). The relevant management objectives to the project includes:

- Managing the Innisfil Creek and tributary streams consistent with the protection, enhancement and restoration of the coldwater fisheries habitat ecosystem which includes the middle Nottawasaga River reach immediately downstream.
- Protect local features which currently provide warmwater predator fisheries habitat in the main branch of Innisfil Creek and tributary streams downstream of Highway 89.

Please refer to Section 2.0 of this memo for a discussion of how the proposed improvements will protect, enhance and restore the coldwater fisheries habitat ecosystem in which Innisfil Creek is located. However, with regards to warm-water predatory fish habitat, the NVCA FHMP lists the following critical components:

- Water quality/clarity;
- Base flow quantity and stability;
- Natural shoreline diversity;
- Floodplains;
- Natural Shorelines including riparian vegetation;
- Attached wetlands complexes and features;
- Tributary stream spawning/nursery habitat areas etc.;
- Aquatic vegetation;
- Fish food sources;
- Migratory routes;
- Coldwater fisheries habitat features including coarse gravel-bottomed riffle and pool tailout areas providing habitats for migratory Rainbow trout and Chinook salmon;
- Coldwater discharges providing summer refuge habitats for adult northern pike;
- A balanced distribution of habitat components which provides for the requirements of warmwater predator species during difference life history stages and during different seasons; and
- A representation of feeding/growth, spawning and over wintering habitats which optimizes the productive capacity of warmwater predator ecosystem.

Similar to its effect on coldwater fisheries habitat, the establishment of the vegetated buffer will filter sediment from runoff, resulting in a localized improvement to water quality and clarity within the Drain. As discussed in Section 2.0 of this memo the bank stabilization methods and construction of the two-stage channel with a low-flow channel will result in the containment of base-flows and improve flow conveyance in a stable manner. Heavily eroded banks will be repaired through bank stabilization methods. Tree plantings, live staking with red osier dogwood (*Cornus serica*) or an available equivalent species recommended by the NVCA, and woody debris manipulation will provide feature diversity along the banks of the Drain, which is currently limited.

As mentioned in Section 2.0, impacts from existing migratory barriers will be mitigated through the removal of debris jams and the embedment of the Highway 400/Reive Boulevard culvert crossing, to an invert and obvert that will allow for fish passage during periods of low-flow.

In general, habitat diversity will be increased within the Drain through the addition of refuge pools in the form of sediment basins, riffle-pool structures, and woody debris. These measures will provide potential spawning and nursery areas for warm-water predatory fish species. The pool creation, woody debris manipulation, and riparian vegetation will also promote potential food sources and feeding areas within the Drain by providing habitat for terrestrial organisms which could then be fed on by fish along with providing overhead cover and refuge areas.

As discussed in Section 2, the design proposes the construction of 11 riffle-pool structures in the Drain which will increase spawning habitat for the migratory cold-water species. The design of the Drain improvements is not anticipated to result in a loss of cold-water discharges and may potentially increase groundwater discharge through the deepening of the Drain.

The construction of sedimentation basins, riffle-pool structures, woody debris manipulations and gravel/granular substrate salvage will increase the diversity of habitat component requirements of warmwater predatory species during different life history stages and seasons. Increasing the diversity of habitat components through the addition of pools and riffle-pool structures, along with the manipulation of woody debris is anticipated to improve the productive capacity within the Drain. Alterations to the floodplain and any attached wetland features are not included in the design of the Drain.

4.0 Conclusions

It is Burnside's opinion that the proposed design of the Drain generally complies with the relevant NVCA FHMP objectives and recommendations for the Innisfil Creek subwatershed and its related fisheries management zone.

R.J. Burnside & Associates Limited

Matthew Moote, H.B.Sc., CAN-CISEC-IT
Aquatic Ecologist

MM:sgd

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Appendix G5

Correspondence

G5

Matthew Moote

From: FPP.CA / PPP.CA (DFO/MPO) <fisheriesprotection@dfo-mpo.gc.ca>
Sent: Wednesday, August 08, 2018 1:36 PM
To: Chris Pfohl
Cc: Don McNalty; Jeff Dickson; Matthew Moote; Jeremy Nyenhuis
Subject: 18-HCAA-00950 Dredging, South Innisfil Creek Drain, Unrated, Town of Innisfil

Hello Chris,

The following project has been sent to the Fisheries Protection Program Regulatory Review unit in Burlington for site specific review.

File Title: Dredging, South Innisfil Creek Drain, Unrated, Town of Innisfil
DFO File number: 18-HCAA-00950

A Fisheries Protection Biologist from the Regulatory Review Unit will be contacting you shortly. For your information, the Supervisor for Regulatory Review is:

Andrea Doherty
Andrea.Doherty@dfo-mpo.gc.ca
(905) 336-6274

Please note that should DFO determine that your proposed project requires a *Fisheries Act* Authorization, regulated timelines will apply. Following submission of an Application for Authorization, DFO will respond within 60 days regarding whether the application is complete or incomplete. When a complete Application for Authorization has been received, DFO will issue the *Fisheries Act* Authorization or inform the proponent of its refusal to do so, within 90 days of the date upon which the application was deemed complete. These regulated timelines may be stopped with notification from DFO. Further information is available at www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/authorization-autorisation-eng.html.

Yours sincerely,

Sara Eddy
Team Leader, Triage and Planning
Fisheries and Oceans Canada

From: Chris Pfohl [mailto:Chris.Pfohl@rjburnside.com]
Sent: July-11-18 1:25 PM
To: FPP.CA / PPP.CA (DFO/MPO)
Cc: Don McNalty; Jeff Dickson; Matthew Moote; Jeremy Nyenhuis
Subject: 18-HCAA-00950 South Innisfil Creek Municipal Drain Improvements - Request for Project Review

To whom it may concern,

Please review the attached Request for Project Review and supporting Technical Memorandum (Aquatic Assessment and Detailed Design - use the provided link below) for the proposed improvements to the South Innisfil Creek Municipal Drain, Innisfil, Onatrio.

https://rjburnside-my.sharepoint.com/:b:/p/sarah_doze/EQqJO37poutCl_rl199mH0sBgYLKLWdF6NIrWtHJak-l0g?e=El2ANX

If you have any questions, please contact me at any time to discuss.

Best regards,

Chris

BURNSIDE

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20, Guelph ON N1H 1C4
Office: 800-265-9662 Direct: 226-486-1543
Cell: 519-827-8306
www.rjburnside.com

Jeff Dickson

From: Jeff Dickson
Sent: Monday, October 01, 2018 1:56 PM
To: Didemus, Ben
Cc: Jeremy Nyenhuis (jnyenhuis@innisfil.ca); Chris Pfohl; Natalie Connell
Subject: South Innisfil Creek Drain - Site Visit

Importance: High

Good afternoon!

A gentle reminder that tomorrow … **Tuesday, October 2nd** … this is ***THE date*** that we will meet you at the SICD site (with Caroline Boros [need to confirm spelling] who is to be accompanying you). I trust that this information will be passed on to Caroline; I do not have her contact info but we will get that from her tomorrow.

- Jeremy Nyenhuis – Town Drainage Superintendent; Chris Pfohl – Burnside Aquatic Ecologist and Jeff Dickson – engineer … will be attending for sure; and
- Natalie Connell - EIT "may" be attending.

We will meet you (as agreed) at 11:00 a.m. in the north west corner (end) of the Carpool Lot to the s/e of the intersection of Hwys. 400 & 89. Furthermore, we are also aware that you indicated that you would like to depart on or around 2:30 p.m.

Also, we are hoping to have a set of more "up-to-date" drawings from our CADD Team by end of the day today to use and provide a copy of same to you.

Until then ... remember boots, rain gear, etcetera … the forecast shows rain.

Regards,

Fisheries and Oceans Canada | Pêches et Océans Canada

Central & Arctic Region
Fisheries Protection Program
867 Lakeshore Road
Burlington, ON
L7S 1A1

Région centrale et de l'Arctique
Programme de Protection des Pêches
867 Chemin Lakeshore
Burlington, ON
L7S 1A1

November 14, 2018

Our file *Notre référence*

18-HCAA-00950

Town of Innisfil
ATTENTION: Jeremy Nyenhuis
7253 Young Street
Innisfil, ON L9S 0J3

Subject: Proposal likely to result in serious harm to fish. Application for *Fisheries Act* authorization required – Dredging, South Innisfil Creek Drain, Unrated, Town of Innisfil

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal on July 11, 2018. Please refer to the file number and title below:

DFO File No.: **18-HCAA-00950**
Title: **Dredging, South Innisfil Creek Drain, Unrated, Town of Innisfil**

Your proposal has been reviewed to determine whether it is likely to: 1) result in serious harm to fish, which is prohibited under subsection 35(1) of the *Fisheries Act*, and 2) impact aquatic species at risk listed on Schedule 1 of the *Species at Risk Act* in a manner that contravenes sections 32, 33 or 58 of that Act.

Since there are no SARA listed species or their habitats identified in the project area, no additional approvals under SARA will be required for your proposed activities.

Our review considered the following:

- Request for Review received on July 11, 2018.
- Aquatic habitat assessment received on July 11, 2018.
- Draft engineer's report received on September 13, 2018.
- Site visit to the Innisfil Creek Drain conducted by the Program on October 2, 2018.
- Email and telephone correspondence between Ben Didemus and Jeff Dickson.

.../2

We understand that you propose to:

- Conduct a spot cleanout of 1,200 linear meters of the Innisfil Creek Drain main channel.
- Deepen and widen 7,000 linear meters of the Innisfil Creek Drain main channel which will include the construction of a low flow channel. These works include regrading of 3,900 linear meters of the main channel and the stabilization of unstable banks with rip-rap and native vegetation.
- A bottom only cleanout of 2,000 linear meters of side branches to the main drain.
- The replacement of one corrugated steel pipe culvert with a box culvert in the 10th Side Road Branch.
- The replacement of two corrugated steel pipe culverts with a single box culvert where the main drain crosses 4th Line.

Based on the above information the Program has concluded that your proposal is likely to result in serous harm which is prohibited under subsection 35(1) of the *Fisheries Act.* Specifically, the serious harm entails:

- The removal of riffle-pool morphology and undercut banks within the Innisfil Creek Drain which provides cover and refuge for fish.
- The removal of gravel riffle substrate which is used for spawning by numerous salmonid species in the creek.
- The removal of riparian vegetation and the widening of the channel which may result in increased water temperatures in Innisfil Creek Drain, which is a cold water creek.

In order to be in compliance with the above legislation you must apply for and obtain an authorization from the Program pursuant to paragraph 35(2)(b) of the *Fisheries Act*.

Should you choose to proceed with your proposal, please complete the Application for Authorization under Paragraph 35(2)(b) of the *Fisheries Act* Form available at http://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/authorization-autorisation-eng.html.

Often times, relocation and redesign of a project can avoid and mitigate impacts and the potential for serious harm to fish. Should you elect to relocate or redesign your project this could reduce the impacts of your proposal to a level where an authorization is not required.

Please be advised that any unauthorized work, undertaking or activity that contravenes section 35 of the *Fisheries Act* or sections 32, 33 or 58 of SARA could lead to corrective action such as enforcement.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such

.../3

notifications should be directed to (http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html).

The Program may not issue a *Fisheries Act* authorization unless there has been a determination that an assessment for your project is not required, or an assessment decision that allows the project to proceed has been issued.

If you have any questions, please contact Ben Didemus by phone at 905-336-4558 or by email at Ben.Didemus@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

Jennifer Thomas

Jennifer Thomas
Regional Manager, Regulatory Reviews
Fisheries Protection Program

CC:
Ben Didemus – DFO
Jeff Dickson – R.J. Burnside & Associates Limited
Chris Pfohl – R.J. Burnside & Associates Limited

Matthew Moote

From: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>
Sent: Thursday, November 15, 2018 9:14 AM
To: Jeff Dickson; Eddy, Sara
Cc: Don McNalty; Natalie Connell; Chris Pfohl; Matthew Moote
Subject: RE: 18-HCAA-00950 - South Innisfil Creek Drain (SICD) Project
Attachments: 18-HCAA-00950 - Letter F - Innisfil Creek Drain.pdf

Letter attached.

Ben Didemus
Fisheries Protection Biologist | Biologiste Principal de Protection des Pêches
ph: (905) 336-4558 téléc: (905) 336-4558
Ben.Didemus@dfo-mpo.gc.ca

From: Didemus, Ben
Sent: November-15-18 9:13 AM
To: 'Jeff Dickson' <Jeff.Dickson@rjburnside.com>; Eddy, Sara <Sara.Eddy@dfo-mpo.gc.ca>
Cc: Don McNalty <Don.McNalty@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Chris Pfohl <Chris.Pfohl@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>
Subject: RE: 18-HCAA-00950 - South Innisfil Creek Drain (SICD) Project

Hi Jeff et al.,

Please find attached a letter detailing the DFO decision for the proposed works for the 'Dredging, South Innisfil Creek Drain, Unrated, Town of Innisfil' Project (DFO File# 18-HCAA-00950), submitted on July 11, 2018.

Please ensure that the works described in the attached letter are accurate, and take note of the serious harm described in the letter. Should you wish to proceed with a *Fisheries Act Authorization* I recommend that we have a conference call together to discuss the creation of an offsetting plan. I would recommend that my supervisor, Sara Eddy, be involved in this discussion as she has considerably more experience designing *Fisheries Act Authorization* than I do.

Once you have had the chance to review the letter we can discuss setting up a time for a call

Best Regards,

Ben Didemus
Fisheries Protection Biologist | Biologiste Principal de Protection des Pêches
ph: (905) 336-4558 téléc: (905) 336-4558
Ben.Didemus@dfo-mpo.gc.ca

From: Jeff Dickson <Jeff.Dickson@rjburnside.com>
Sent: November-14-18 1:10 PM
To: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>; Eddy, Sara <Sara.Eddy@dfo-mpo.gc.ca>; Doherty, Andrea

<Andrea.Doherty@dfo-mpo.gc.ca>
Cc: Don McNalty <Don.McNalty@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Chris Pfohl <Chris.Pfohl@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>
Subject: RE: 18-HCAA-00950 - South Innisfil Creek Drain (SICD) Project
Importance: High

Ben et la: good afternoon.

Further to our Tuesday, October 2, 2018 Site Investigation, as well as your last email below, we are following up with you regarding the South Innisfil Creek Drain (SICD) Project and a report on the status of the DFO review (feedback) on the various documents already provided and/or submitted (DFO "Request for Review", digital Draft engineer's Report c/w preliminary drawings, hard copy of revised drawings, etc.).

We have been requested by the Town of Innisfil (owner & client) to "file" the final engineer's report early in the new year. To that end, and to make that a reality, we are respectfully requesting written DFO comments so that we may incorporate any necessary changes and edits to the above noted documents and proceed to finalize our report.

Thanking you in advance for a response your earliest convenience.

Regards,

Jeff Dickson, P.Eng.
Project Engineer
R.J. Burnside & Associates Limited | www.rjburnside.com
Office: +1 800-265-9662 Direct: +1 226-476-3113

From: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>
Sent: Friday, October 26, 2018 2:54 PM
To: Jeff Dickson <Jeff.Dickson@rjburnside.com>
Subject: 18-HCAA-00950 - Innisfil Creek Project

Hi Jeff, I just wanted to let you now that your project is still on my RADAR. My primary supervisor is under a high workload so she has passed the project on to another one of our managers in the department. I have asked that we have a meeting about the file once she has had a chance to look things over. I will keep you updated.

Ben

Ben Didemus
Fisheries Protection Biologist | Biologiste Principal de Protection des Pêches
ph: (905) 336-4558 téléc: (905) 336-4558
Ben.Didemus@dfo-mpo.gc.ca

Matthew Moote

From: Matthew Moote
Sent: Friday, November 23, 2018 3:19 PM
To: Jeff Dickson; Chris Pfohl; Natalie Connell
Cc: Don McNalty
Subject: RE: 18-HCAA-00950 - Innisfil Creek Offsetting

Hi All,

I just spoke with Ben and it is all set for you to meet there at 1:30. He's booked a board room for you to meet in. H has asked that you can give him a call when you arrive.

Thanks, have a great weekend and see you on Monday.

Matt

From: Jeff Dickson
Sent: Friday, November 23, 2018 12:37 PM
To: Chris Pfohl <Chris.Pfohl@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>
Cc: Matthew Moote <Matthew.Moote@rjburnside.com>; Don McNalty <Don.McNalty@rjburnside.com>
Subject: RE: 18-HCAA-00950 - Innisfil Creek Offsetting
Importance: High

Chris & Natalie:

After some pondering and a discussion with Don we have decided it would probably be best … given the importance/magnitude of the DFO Authorization to the SICD project … that we actually **GO TO the CCIW** in Burlington and meet face-to-face with Ben & Steve.

Canada Centre for Inland Waters (CCIW)

867 Lakeshore Rd, Burlington, ON L7S 1A1

Please make the necessary arrangements with Ben et al (as per his offer) for a meeting on the same date (Mon. Nov. 26) at the same time (1330 or 1:30 p.m.) – thank you.

We (Natalie & I) will meet (Chris & Matt) in Guelph that morning to prepare for said meeting; Chris, Natalie & Jeff will attend the meeting; I (hopefully we) will be in Guelph between 0800-0830 Monday.

Cheers,
Jeff

From: Chris Pfohl
Sent: Friday, November 23, 2018 8:07 AM
To: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>
Cc: Jeff Dickson <Jeff.Dickson@rjburnside.com>; Cho, Steve <Steve.Cho@dfo-mpo.gc.ca>; Matthew Moote <Matthew.Moote@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>
Subject: Re: 18-HCAA-00950 - Innisfil Creek Offsetting

Sounds good Ben!

Please provide details to facilitate this discussion and review design details.

Thanks and have a great weekend!

cheers,

Chris

Sent from my iPhone

On Nov 22, 2018, at 3:40 PM, Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca> wrote:

Hi Chris, if it's alright by do perhaps we can do a conference call. If there are areas of the map that you'd like to point to etc., we can set up Skype and do a share screen video conference too. If you'd like to meet in person, you'd also be welcome to come into CCIW.

Ben Didemus
Fisheries Protection Biologist | Biologiste Principal de Protection des Pêches
ph: (905) 336-4558 téléc: (905) 336-4558
Ben.Didemus@dfo-mpo.gc.ca

From: Chris Pfohl <Chris.Pfohl@rjburnside.com>
Sent: November-22-18 11:08 AM
To: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>; Jeff Dickson <Jeff.Dickson@rjburnside.com>
Cc: Don McNalty <Don.McNalty@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Cho, Steve <Steve.Cho@dfo-mpo.gc.ca>; Eddy, Sara <Sara.Eddy@dfo-mpo.gc.ca>
Subject: RE: 18-HCAA-00950 - Innisfil Creek Offsetting

Sounds great Ben!

I will book a boardroom in our Guelph office Monday afternoon to review and discuss our design and off-setting.

Meeting invite and directions to follow.

Thanks,

Chris

<image001.gif>

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Ave West, Guelph, ON N1H1C4
Office: 800-265-9662 Direct:226-486-1543 Cell:519-827-8306
www.rjburnside.com

From: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>
Sent: Wednesday, November 21, 2018 4:55 PM
To: Chris Pfohl <Chris.Pfohl@rjburnside.com>; Jeff Dickson <Jeff.Dickson@rjburnside.com>
Cc: Don McNalty <Don.McNalty@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Cho, Steve <Steve.Cho@dfo-mpo.gc.ca>; Eddy, Sara <Sara.Eddy@dfo-mpo.gc.ca>
Subject: RE: 18-HCAA-00950 - Innisfil Creek Offsetting

Hi Chris, for this meeting it will just be Steve and I. If we have any concerns that requires Sara's input we will discuss those with Sara afterwards and follow up with you. Steve and I would be able to meet anytime Monday afternoon. Perhaps we could meet at 13:30?

Ben Didemus
Fisheries Protection Biologist | Biologiste Principal de Protection des Pêches
ph: (905) 336-4558 téléc: (905) 336-4558
Ben.Didemus@dfo-mpo.gc.ca

From: Chris Pfohl <Chris.Pfohl@rjburnside.com>
Sent: November-21-18 3:43 PM
To: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>; Jeff Dickson <Jeff.Dickson@rjburnside.com>
Cc: Don McNalty <Don.McNalty@rjburnside.com>; Natalie Connell <Natalie.Connell@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Cho, Steve <Steve.Cho@dfo-mpo.gc.ca>; Eddy, Sara <Sara.Eddy@dfo-mpo.gc.ca>
Subject: RE: 18-HCAA-00950 - Innisfil Creek Offsetting

HI Ben!

We would like to discuss our channel design that will relate to off-setting measures proposed for the South Innisfil Creek Drain. This project is moving forward at a rapid pace and the final Drainage Report is to be submitted for review early January 2019. We would like to have a conference call that outlines our preferred approach to the channel design to ensure that DFO and Burnside are on the same page with regards to the proposed design and off-setting measures. The final Drainage Report is not likely to be changed. We need to ensure consistency and that no major changes are required once DFO reviews our application for *Fisheries Act* Authorization.

We would greatly appreciate if you, Steve and Sara Eddy could be available for a call on Monday afternoon, November 26th. Please advise with availability so we can confirm the time.

Thanks and regards,
Chris

<image001.gif>

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Ave West, Guelph, ON N1H1C4
Office: 800-265-9662 Direct:226-486-1543 Cell:519-827-

8306
www.rjburnside.com

From: Didemus, Ben <Ben.Didemus@dfo-mpo.gc.ca>
Sent: Tuesday, November 20, 2018 4:29 PM
To: Jeff Dickson <Jeff.Dickson@rjburnside.com>
Cc: Chris Pfohl <Chris.Pfohl@rjburnside.com>
Subject: 18-HCAA-00950 - Innisfil Creek Offsetting

Hi Jeff and Chris, my contract at DFO will be completed on November 29. I will still be your primary contact at the department until that time, however beyond that my colleague Steve Cho will take over your file. If possible, it would be nice to discuss the offsetting plan for this project before my contract is over so that both Steve and I could sit in on the call. Let me know if there is a time within the next week that would work for you gentleman. If that's not possible, I will debrief Steve on the project as best as I can and perhaps Caroline could sit in on the call in my absence as she has seen the site.

Ben Didemus
Fisheries Protection Biologist | Biologiste Principal de Protection des Pêches
ph: (905) 336-4558 téléc: (905) 336-4558
Ben.Didemus@dfo-mpo.gc.ca

Matthew Moote

From: Chris Pfohl
Sent: Thursday, January 31, 2019 4:38 PM
To: Cho, Steve
Cc: Jeff Dickson; Natalie Connell; Matthew Moote; Don McNalty; Jeremy Nyenhuis
Subject: DFO Authorization Application for the South Innisfil Creek Drain Improvements (DFO File- 18-HCAA-00950)

Good afternoon Steve!

R.J. Burnside & Associates Limited is pleased to submit an application for *Fisheries Act* Authorization on behalf of the Town of Innisfil. Please find the link below which contains the documents for the Authorization Application for the South Innisfil Creek Drain Improvements (DFO File- 18-HCAA-00950). The documents include:

- Application for Authorization Form
- DFO Authorization Report
- Technical Memorandum Summarizing the Public Consultation to Date
- Technical Memorandum Summarizing the Proposed Works and how they relate the NVCA Fisheries Habitat Management Plan
- KMZ and GIS files which map the proposed work and locations of Offsetting Measures. The KMZ files can be opened with Google Earth and are referenced as Appendix B in the Authorization Report.

In order to open the KMZ files, download the individual files within the Appendix B folder and then open them with Google Earth.

https://rjburnside-my.sharepoint.com/:f:/p/matthew_moote/Epw5AZGbS9RIijiUTJxSIYcBJFeEDo79pE9ACgPz9H955A?e=9NIwaN

We greatly appreciate your time and support to complete our application for Authorization.

Please contact Burnside if you have any questions or concerns.

Sincerely,

Chris

BURNSIDE

Christopher Pfohl, C.E.T., EP, CAN-CISEC
Senior Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Ave West, Guelph, ON N1H1C4
Office: 800-265-9662 Direct:226-486-1543 Cell:519-827-8306
www.rjburnside.com

****

Matthew Moote

From: Cho, Steve <Steve.Cho@dfo-mpo.gc.ca>
Sent: Friday, February 01, 2019 11:04 AM
To: Chris Pfohl; Natalie Connell; Matthew Moote
Subject: Dredging, South Innisfil Creek Drain, Unrated, Town of Innisfil (18-HCAA-00950)
Attachments: 18-HCAA-00950 FA Application Received.pdf

Hello,

This email is to acknowledge receipt of your Fisheries Act Authorization Application. Please see attached.

Thanks,
Steve Cho

Steve Cho
Fisheries Protection Program Biologist
Regulatory Review
Steve.Cho@dfo-mpo.gc.ca
905-336-6248

Fisheries Protection Program | Programme de Protection des Pêches
Fisheries and Oceans Canada | Pêches et Océans Canada
867 Lakeshore Road | 867 Chemin Lakeshore
Burlington, ON, L7S 1A1

Fisheries and Oceans Canada
Central & Arctic Region
Fisheries Protection Program
867 Lakeshore Road
Burlington, ON
L7S 1A1

Pêches et Océans Canada
Région centrale et de l'Arctique
Programme de Protection des Pêches
867 Chemin Lakeshore
Burlington, ON
L7S 1A1

February 1, 2019

Our file *Notre référence*
18-HCAA-00950

Town of Innisfil
ATTENTION: Jeremy Nyenhuis
7253 Young Street
Innisfil, ON L9S 0J3

Subject: Receipt of Application for a Paragraph 35(2)(b) *Fisheries Act* Authorization

The Fisheries Protection Program of Fisheries and Oceans Canada (DFO) would like to acknowledge receipt of your application for a Paragraph 35(2)(b) authorization under the *Fisheries Act* which was received on January 31, 2019.

The Department will review the application to determine whether all information and documentation as set out in the *Application for Authorizations under Paragraph 35(2)(b) of the Fisheries Act Regulations* have been provided. The Department will notify you by April 1, 2019 of whether the application is complete or incomplete and, in addition, will identify the next steps in the process.

If your plans have changed or if the description of your proposal is incomplete or changed during the review of your application, you should contact Steve Cho at 905-336-6248 or Steve.Cho@dfo-mpo.gc.ca to avoid unnecessary delays in the review of your application.

If you have any questions, please contact. Please refer to the file number referenced above when corresponding with DFO.

Yours sincerely,

Steve Cho
Fisheries Protection Program Biologist

COPY:
Chris Pfohl, Chris.Pfohl@rjburnside.com;
Natalie Connell, Natalie.Connell@rjburnside.com;
Matthew Moote, Matthew.Moote@rjburnside.com.

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Appendix H

Hydrology and Hydraulics

Burnside
[The Difference is our People]

H1

Appendix H1

South Innisfil Creek Drain Improvements
Hydrology Report

South Innisfil Creek Drain Improvements Hydrology Report

Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

R.J. Burnside & Associates Limited
3 Ronell Crescent
Collingwood ON   L9Y 4J6 CANADA

May 2018
300038790.0000

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
1	Yes	Yes	Nottawasaga Valley Conservation Authority
1	Yes	Yes	Town of Innisfil
1	Yes	Yes	Ministry of Transportation

Record of Revisions

Rev.	Date	Description
-	May 17, 2018	Initial Submission to Nottawasaga Valley Conservation Authority for Review and Comment

R.J. Burnside & Associates Limited

Report Prepared By:

LICENSED PROFESSIONAL ENGINEER
T. LOZON
100144213
May 17 2018
PROVINCE OF ONTARIO

Tim Lozon, P.Eng.
Water Resource Engineer
TRL:lw

Report Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
D. G. McNALTY
MAY 17, 2018
PROVINCE OF ONTARIO

Don McNalty, P.Eng.
Senior Municipal Engineer

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Figures

Tables

Appendices

Disclaimer

1.0 Introduction

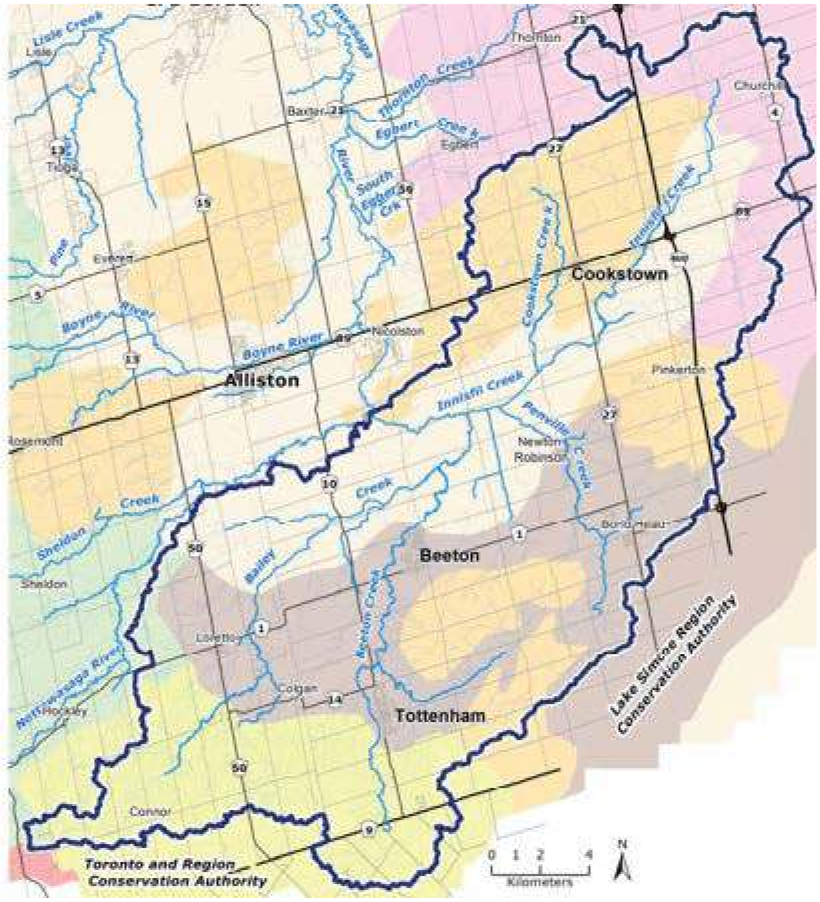
The South Innisfil Creek Drain (SICD) is located within the Town of Innisfil and services most of the lands in the southwest section of the Town and hence its name. Its headwaters are the most northerly portion of the Innisfil Creek watershed and start near the 6th Line and Yonge Street area from where the drain flows generally in a south and westerly direction through the Town. The SICD currently discharges into the South Innisfil Creek at Highway 89 just west of the 5th Sideroad.

R.J. Burnside & Associates Limited (Burnside) has been appointed under the Drainage Act by the Town of Innisfil to prepare a revised Engineer's Report under Section 78 to consider improvements to the SICD and Branches. Burnside has completed hydrological analysis of the drainage area to the 15th Line, south of Highway 89 and west of Highway 400. This report provides commentary and methodology used in the hydrological analysis of the existing catchment areas, and specifically to the Highway 400 crossing just north of Highway 89. Further this report summarizes and compares the flows calculated to those previously calculated by Dillon Consulting and AECOM as well as set out in the MacLaren Report and the URS Report.

2.0 Background Information

The Innisfil Creek watershed is located within the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA). It has a catchment area of approximately 480 km^2 and discharges into the Nottawasaga River southeast of Alliston. Figure 1 below illustrates the Innisfil Creek Watershed as referenced from the NVCA website.

Figure 1 Innisfil Creek Watershed



As previously noted the SICD is located within the Town of Innisfil and services most of the lands in the south-west section of the Town. The main drain starts at the 5th Line and currently discharges into the Innisfil Creek at Highway 89. Previous work on the Drain Improvements anticipated extending the Drain downstream to the 15th Line. The watershed of the SICD is generally bound to the west by County Road 27, to the north by the 7th Line, to the east by Yonge Street and finally to the south by the Line 12 of Bradford West Gwillimbury. The SICD watershed has been determined to be 8,021 ha as illustrated on in Appendix A.

Most of the main drain of the SICD has been designated as a Municipal Drain, under the Act, for more than 100 years. This study focusses upon the ~73 km^2 of Innisfil's agricultural lands drained by the SICD upstream of 15th Line.

The watershed in the Study Area can be characterized as a basin having sandy loam soils, in the uplands, draining into a productive market farm area on very flat, marshy lowlands. These lowlands support important market farming operations, especially in the area upstream of Highway 400. The marsh is valued for farming but, being low, is also flood prone. Flood damage to crops occurs during summer storms when the drain breaches its channel banks. The flooding can be widespread because the gradients of the SICD itself are quite flat.

The SICD has been realigned, cleaned and enlarged over the past century. The most recent work under a new Engineer's report and adopted under By-Law occurred in the mid-1950s. Maintenance work has occurred since with a major cleanout in the late 1970's and partial cleanouts and repairs since. This has resulted in the drain's channel through the marsh becoming wider than the natural creek channel downstream of Highway 400. Much of the dredged material seems to have been deposited along the channel banks creating small berms on both sides. These berms are not very high and are not contiguous, so they do not impede channel flow or provide adequate flood protection.

Despite past maintenance and repairs to the drain, flooding of the market farms persists. Some of the long-time landowners believe that Highway 400 and the associated drain crossing has aggravated the drainage problems by restricting the free flow of drainage at that point. Although the degree to which, if any, the highway has aggravated flooding within the marsh has been debatable, its closed-bottom culverts which are currently perched above the existing drain bottom certainly impose a vertical limitation to readily lower the invert or bottom of the drain any further.

The Innisfil Creek downstream of Highway 400 is largely in a natural state, although some sections of the watercourse are designated as being Municipal Drains in Innisfil and downstream in New Tecumseth. The downstream creek valleys have meandering channels and flat over-bank valley areas.

The watershed upstream of Highway 400 is the primary focus of this Study. It is a complex watershed not only from the perspective of topography, but particularly with drainage patterns. There are a significant number of tributaries and branch drains contributing to the drainage flows and complexity of the watershed. Unlike most watersheds, which have predominant downstream dendritic direction, the SICD has sub-watersheds that start in one direction and then flow in very different directions on the way to the main drain. This is most common in the lower watershed near Highway 400. Tributaries originating west of the highway cross to the east side, empty into the SICD, and then drain westerly under the highway again. There are 2 such tributaries draining a total of ~15 km^2 of land just upstream of Highway 400 and near 2nd Line.

Another ~7 km^2 tributary, called the Hnydczak Drain, services the lands south of Highway 89 and empties into the SICD immediately upstream the Highway 400 culverts. Years ago, this Drain was redirected from under Highway 400, in smaller culverts, to northerly along the east side of Highway 400 into the main SICD. This increased the amount of lands emptying into the SICD upstream of Highway 400.

This Report is prepared further to the Burnside March 2017 SICD Preliminary Hydrology Report and presents additional hydrologic analyses with preliminary drain channel improvement considerations.

3.0 Hydrological Background Information

There have been several previous analysis and reports prepared for the SICD and areas of interest in the vicinity of the SICD outlined below:

- Dillon Consulting has provided both VO2 and HEC-RAS digital files of the SICD, prepared in 2005-2007, which have been referenced to compare peak flows with Burnside calculations.
- Final Drainage Report for the South Innisfil Creek Drain and Branches Report, Town of Innisfil, County of Simcoe, Dillon Consulting, 2013.
- Highway 400 Improvements from 1 km South of Highway 89 to the Junction of Highway 11, Transportation Environmental Study Report Addendum, completed by AECOM, November 2017.
- AECOM was retained by the MTO to conduct a preliminary design of Highway 400 improvements. The report was dated November 2016.
- “Draft Drainage and Hydrology Report – Preliminary Design Highway 400 – 1 km South of Highway 89 to the Junction of Highway 11”, completed by AECOM, November 2016.
- “Drainage and Hydrology Report – Highway 400 – Highway 89 to Highway 11”, completed by URS, 2003.
- Hnydczak Drain Report, Jack Young (P.Eng.), 1990.
- “Watershed Hydrology Study for Nottawasaga, Pretty and Batteaux Rivers, Black Ash, Silver and Sturgeon Creeks” MacLaren Plansearch Report, May 1988.
- Nottawasaga Valley Conservation Authority, South Innisfil Creek Drainage Study, Ainley and Associates, 1981.
- Nottawasaga Valley Conservation Authority, Final Report for Innisfil Creek Watershed Study, Triton Engineering Services, 1983.
- Hnydczak Drain Improvements, Ainley Consulting Engineers and Planners, 1978.

The flows at Hwy 400 from each of these Reports have been summarized below in Table 1.

Table 1 Historical Peak Flow Summary

Return Interval	Dillon (Pre)	Dillon (Post)	AECOM	MacLaren (NVCA)	URS 2003 (Ex.)
2-Year	27.19	26.85	-	-	-
5-Year	66.5	65.37	12.6	8.3	-
10-Year	94.24	92.7	15.6	10.3	-
25-Year	127.67	125.54	18.6	12.3	-
50-Year	-	-	22.8	15.1	22.8
100-Year	189.1	186.25	26.1	17.3	81.9
Regional	-	-	81.9	70.3	-

Further commentary providing comparisons to historical flows to the flows presented in this Report have been provided in Section 8.0.

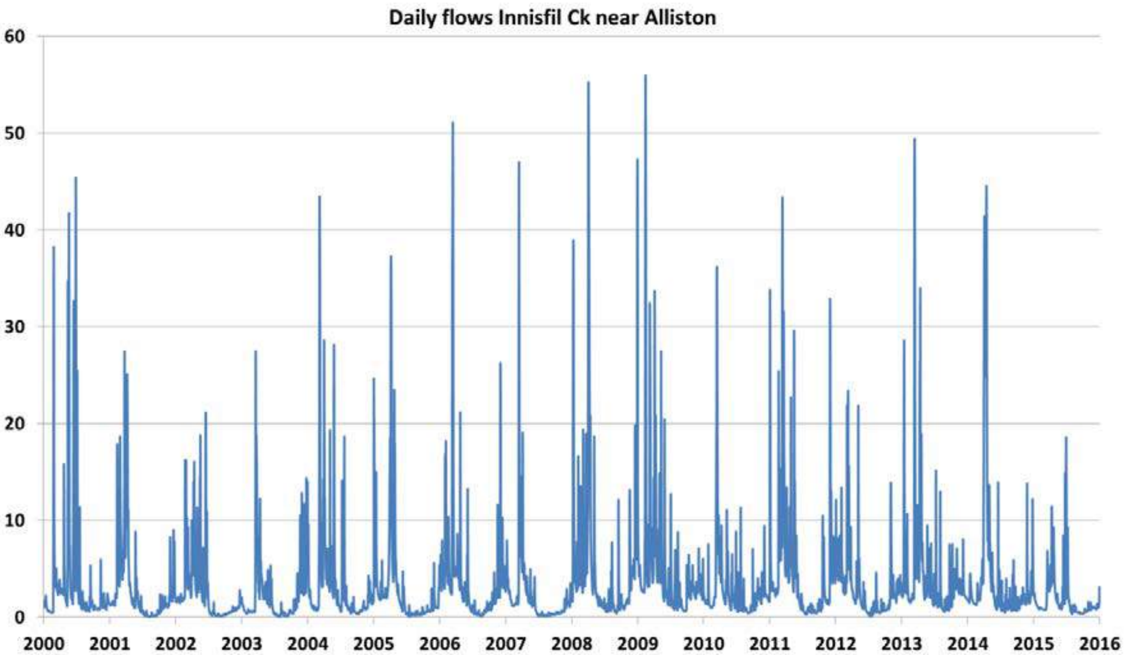
4.0 Stream Data Analysis

4.1 Innisfil Creek Watershed

Innisfil Creek is a predominantly farmed sub-watershed within the Nottawasaga River basin and has a drainage area of approximately 480 km^2. This study focuses on the SICD, particularly that portion which is upstream of Highway 89 / 15th Line. The Study Area has a drainage area of 80 km^2, or approximately 17% of the Innisfil Creek's upper watershed.

Environment Canada operates a number of stream gauges in and near the Nottawasaga River watershed and one (02ED029) measures flows in the Innisfil Creek just upstream of its outlet to the Nottawasaga River, near Alliston. This is a relatively new stream gauge providing hydrometric stream data since 2000, see Figure 2 below.

Figure 2 Innisfil Creek Streamguage Data



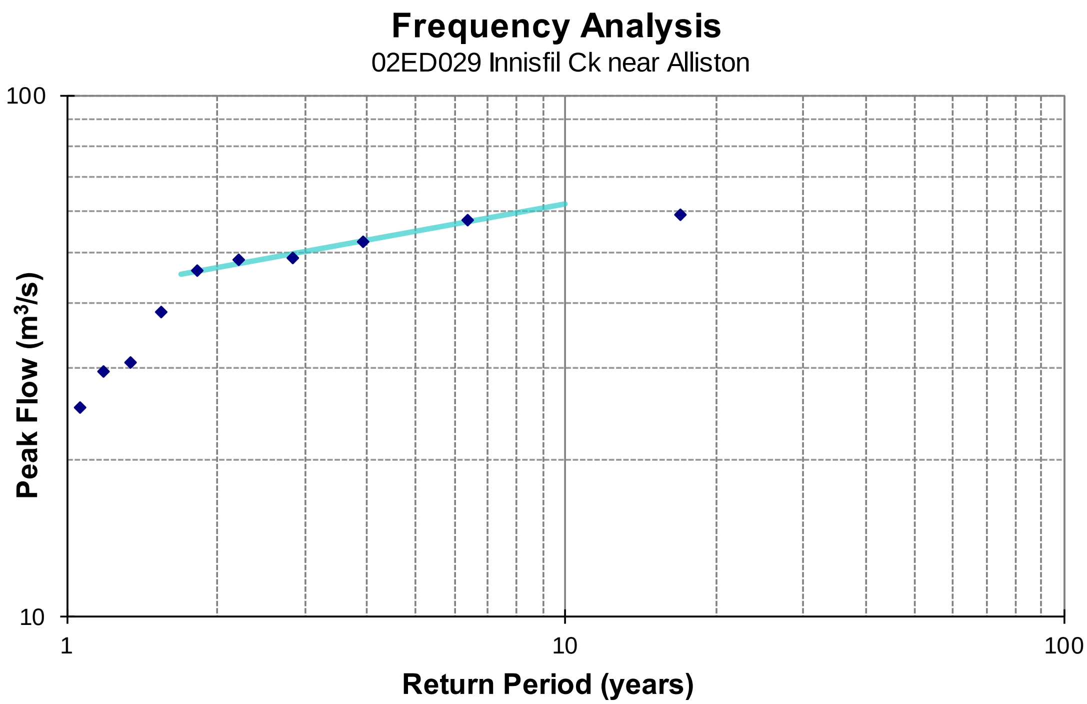
The daily flow records provide insight to the flows recorded over the 16 years and indicate the spring months are often when the highest flows occur.

The data from this station indicates that summer time low flows approach zero, despite draining a large area of approximately 480 km^2. This suggests there is very little base flow at the South Innisfil Creek's outlet to the Nottawasaga River during the summer months, and this is un-characteristic for a watershed of this size. One possible explanation for this low flow could be the extensive water taking for crop irrigation during summer months.

Although the snow melt causing the spring freshet often results in the highest annual flows, it is the summer rainstorms that cause the most damage to the crops, particularly those planted near the Creek. The highest annual flow rates range from just below 20 m^3/s to more than 50 m^3/per day. The peak instantaneous flow rates are slightly higher than the peak daily rates.

A frequency analysis of the instantaneous peak Innisfil Creek flow data was carried out to estimate the frequency of flow reoccurrence. Figure 3 below graphically illustrates the flow frequency analysis of the Innisfil Creek streamflow data;

Figure 3 Innisfil Creek – Flow Frequency Analysis



Watershed= 479 km^2

$$R_t = \frac{(n + 1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	47.3	46.9
1:5	55.0	55.0
1:10	58.4	61.9
1:25	n/a	72.5
1:50	n/a	81.7
1:100	n/a	92.1

best fit equation

$Q = 41.65\ R_t^{\ 0.172}$

Having 10 data points available for the years 2000 to 2015 enables calculations up to the ~1:17-year return period using the Cunnane plotting formula. This is a variation of the Weibull formula, and is used by Environment Canada. Reasonable accuracy is expected for the 1:2-year to 1:10-year return periods, in this case.

This frequency analysis becomes useful to assessing the hydrology of the study area after the results are transposed from the station near Alliston upstream and this is described later in this Report.

4.2 Frequency Analyses of Nearby Hydrometric Station Data

Although the data and analysis of the streamflow data downstream of the Study Area are most relevant to the hydrologic calculations, so is the data from nearby stream gauges located in similar sub-watersheds. The Nottawasaga River watershed has numerous stream gauge stations and many have been recording data for decades. The stations considered in this study include the gauges identified in Table 2 below:

Table 2 Nottawasaga River– Selected Streamgage Summary

Gauge ID	Gauge Description	Drainage Area	Regulation
02ED004	Bailey Creek near Beeton	207 km^2	Regulated
02ED007	Coldwater River at Coldwater	168 km^2	Natural
02ED009	Willow Creek above Little Lake	95 km^2	Natural
02ED010	Willow Creek at Midhurst	127 km^2	Natural
02ED100	Nottawasaga River near Tottenham	86 km^2	Regulated
02ED101	Nottawasaga River near Alliston	328 km^2	Natural
02ED102	Boyne River at Earl Rowe Park	216 km^2	Natural

The data from these stations were selected based on the station's proximity to Innisfil Creek and the size of the drainage areas. Environment Canada classify the watercourses at both Stations 02ED004 and 02ED100 as being regulated to some degree by dams. The data from these two stations trend slightly lower than the other stations, so we considered and bound the lower end of the flow variance accordingly.

An important factor in the design of Municipal Drains is the 1:2-year return period flow rate; this is also the recommended design flow in the *Design and Construction Guidelines for Work Under the Drainage Act*, as prepared by the Government of Ontario. This is often the minimum level of service considered when improving a Municipal Drain. Again, we used the Cunnane plotting method because we are most interested in the 1:2-year return period flow and this method is relatively accurate for estimating flow by using only a few years of data.

Flood frequency analyses results for the seven gauges noted above are provided in Appendix B.

4.3 Watershed Flood Flow Regression Analysis

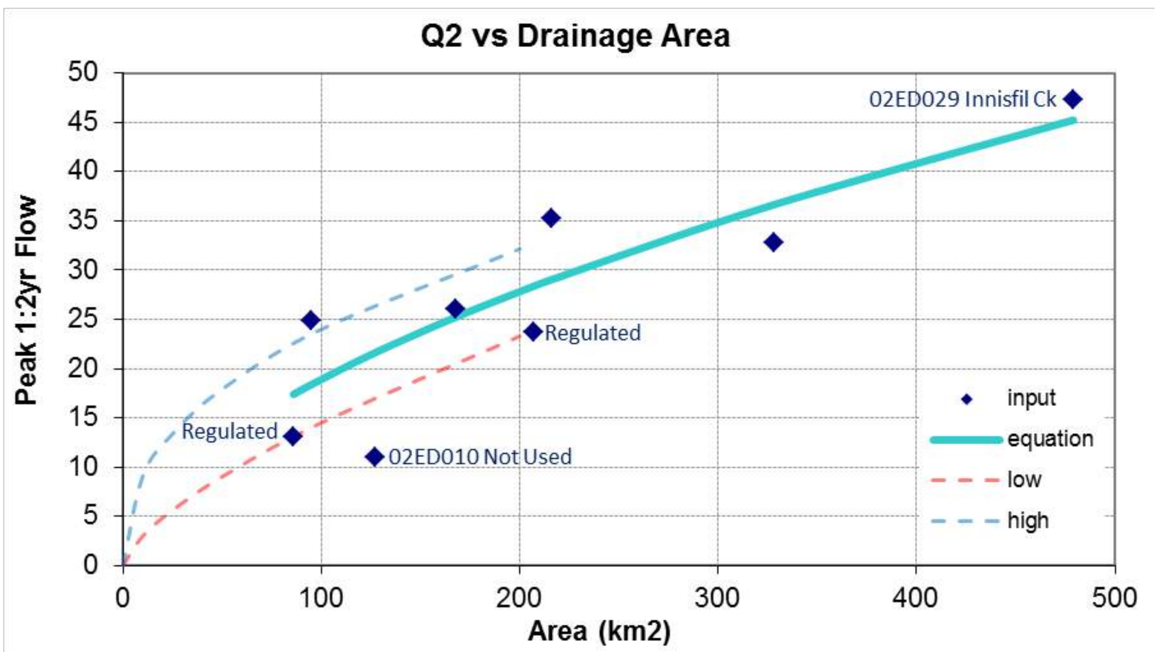
In order to estimate design flow rates within the SICD Study Area, regression analyses were completed to study the relationships between drainage areas and estimated flow rates. These include the flow rates calculated for the Innisfil Creek station and from stations nearby SICD, as noted in Table 2 above.

Of particular interest are the 1:2-year return flow (Q2) rates at Highway 400, as a point of flow comparison between previous studies, and through the marsh for reasons of channel design. The drainage area at Highway 400 is ~77 km^2 and ranges from ~25 km^2 to ~40 km^2 through the heart of the market farm area.

Input to this analysis is the output of the flood frequency analyses for the peak instantaneous 1:2-year return period flow rate.

Out of the stream gauge stations as noted above, the one exception is the data for Station 02ED010; Willow Creek at Midhurst from where the 1:2 year flow decreases from 25 m^3/s at Midhurst to only 11 m^3/s downstream of Little Lake. Although this watercourse is not categorized as "regulated", the attenuation capabilities of Little Lake impacts the hydrology too much to be considered in this analysis. Figure 4 below illustrates the regression analysis between drainage area and the measured 2-year peak flow rates of the stream gauge stations of interest;

Figure 4 1:2 yr. Flow vs Drainage Area for Nearby Streamguages



The least squares regression was repeated for those data points lying above the equation line to estimate the highest range of flows, then again for those below. This provides the widest range of high and low flow estimates. The results are as follows:

Table 3 Innisfil Creek 1:2 Year Flow Rate Estimations

Location	Description	Drainage Area (km^2)	Peak Flow (m^3/s)	Flow Variance (+/- m^3/s)
Reference Point	u/s Highway 400	77	~16	5
Lower Marsh Area	u/s 2nd Line	40	~12	4
Upper Marsh Area	u/s 3rd Line	25	~9	3

4.4 Index Flood Analysis

The methodology we used in this Study, for the Nottawasaga River watershed regressions, has previously been applied, by others, to various Regions throughout Canada. In Ontario, Regions having relatively homogeneous hydrologic characteristics have been identified and for which flood index regressions are published.

Provincial governments, such as the Ministry of Transportation (MTO) and Ministry of Natural Resources and Forestry (MNRF), in Ontario and federal departments such as Environment Canada have developed flood flow estimation methods and published Index Flood Analyses based upon Regional Flood Frequency Analyses.

This Study considered two such published references:

- Regional Flood Frequency Analysis for Ontario Streams Environment Canada with MNR, Moin & Shaw, 1985.
- Watershed Classification Method, Ontario Ministry of Transportation, Drainage and Hydrology Section, 1979.

4.4.1 Regional Flood Frequency Analyses

The Innisfil Creek falls within Region 3 for streams in Ontario and is referred to as “Saugeen-Nottawasaga System” by Moin and Shaw This Region extends from:

- the Nottawasaga River watershed, in Innisfil, in the east;
- near Highway 89 in the south;
- the Saugeen River watershed, near Walkerton, in the west; and
- Georgian Bay / Lake Huron in the north.

For this Region, the 1:2-year flow rate at Hwy 400is calculated by the equation:

Q2 = 0.20 x Area 0.957

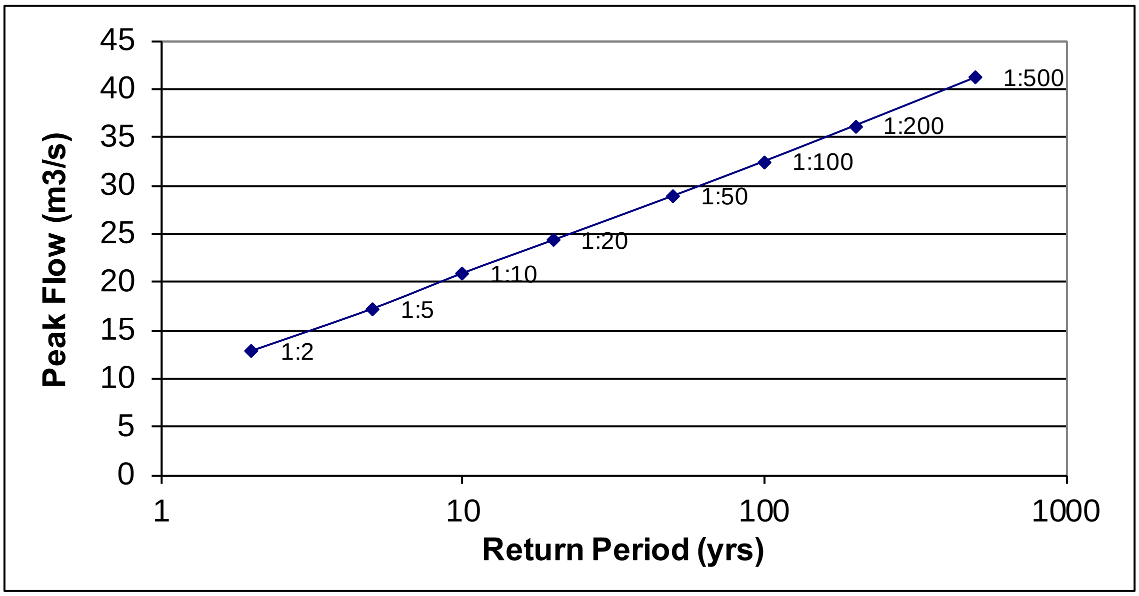
= 0.20 x 77 $^{0.957}$

= 12.8 m^3/s at Highway 400

Figure 5 below illustrates the results of the Regional Flood Frequency Analyses for the 2- to 500-year event flows of a 77km^2 watershed, such as Innisfil Creek at Hwy 400;

Figure 5 Regional Flood Frequency Regression Analysis

Region	Area (km^2)	Q_2	Q_5	Q_{10}	Q_{20}	Q_{50}	Q_{100}	Q_{200}	Q_{500}
3	77	13	17	21	24	29	32	36	41



4.4.2 Watershed Classification Method

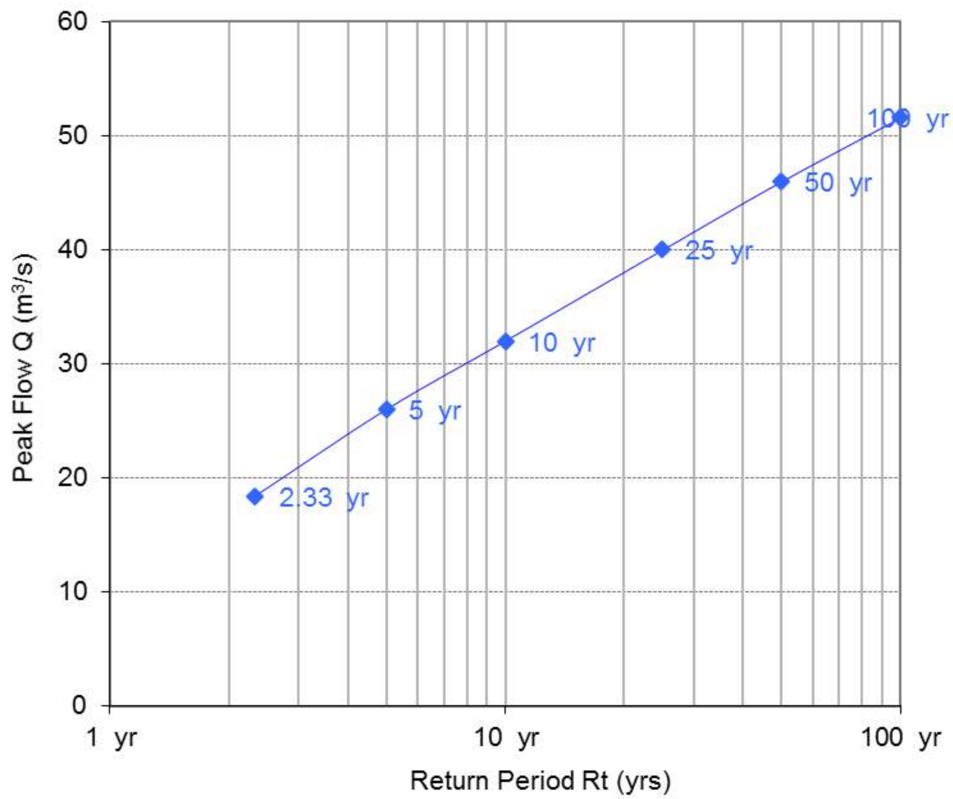
This method uses regressions of key watershed parameters to estimate flood flow rates, based upon frequency analyses of hydrometric stream data. This study uses the 1989 version of the method because we had created a digital version, which Burnside has used for years. This method compares very well to the example given in the 1997 MTO Drainage Manual, so we consider it fit for the purposes of this study.

The input parameters include:

- Drainage area (to Hwy 400) ($77km^2$)
- Basin shape and slope (L/W = 1.87; and 0.71%)
- Precipitation (1:25 yr, 24 hr rainfall depth) (90 mm)
- CN (soils complex number) (70)
- Attenuation caused by lakes and swamps ($10km^2$ at lower end of basin)

The results of the Watershed Classification Method have been illustrated graphically in Figure 6 below.

Figure 6 Watershed Classification Method Results at Hwy 400



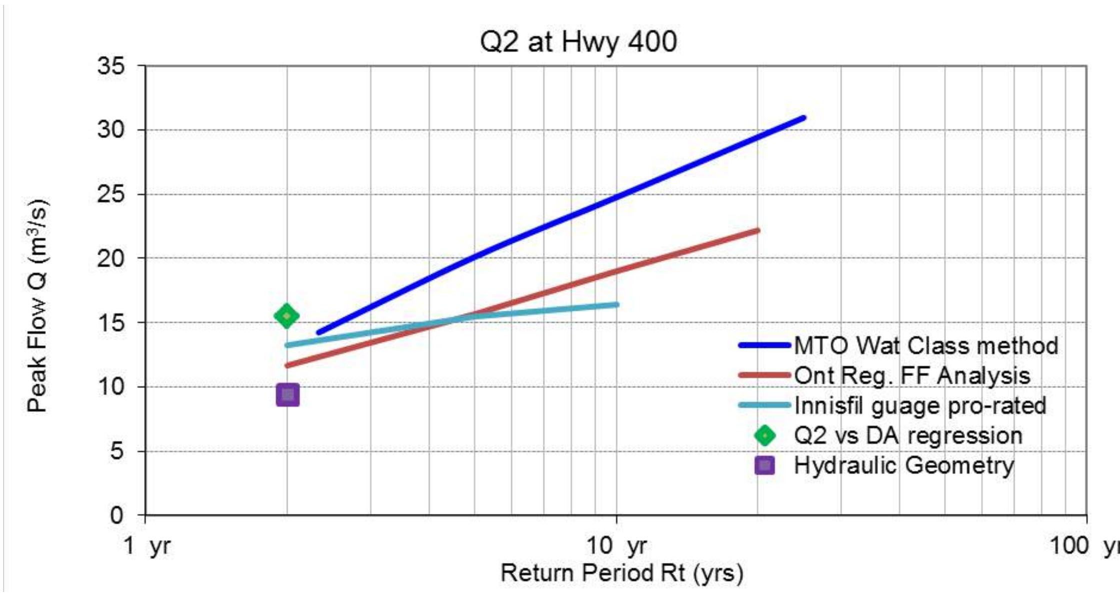
The 1:2-year flow estimated by this method is ~17m^3/s.

4.5 Comparison of Stream Data Analyses

The use of stream data to calculate frequent flood flow rates can provide valuable support to surface drainage studies. Figure 7 shows good correlation between the results obtained using the various methods. This is particularly evident for 1:2 year flow rate estimate at Highway 400, showing a consistent value of approximately 15m^3/s. The variations in flow rate estimates diverge for less frequent events.

Summary of the various methods' findings is shown in the chart in Figure 7:

Figure 7 Innisfil Creek Hydrometric Stream Flow Summary Chart



Of the 8 stream gauge frequency analyses completed herein, we included only the Innisfil Creek analysis in this comparison, because the SICD watershed resides within Innisfill Creek. The resulting flow rates are pro-rated to the ratio of the drainage areas raised to the power 0.66, as per the Q2 vs. drainage area regression.

Table 4 Innisfil Creek Hydrometric Analysis Peak Flow Summary at the Highway 400 Culvert Crossings

Hydrometric Analysis	Peak Flow (m^3/s)
Regional Watershed Flow Rate	16
Regional Flood Analysis	11.7
Watershed Regression Analysis	13
Geometric Mean	**12.6**
Average	**12.8**

Although there is more variation estimating flow rates less frequent than the 1:2-year event, the results of the methods considered in this Study are otherwise rather consistent. Detailed calculations in support of Hydrometric Analysis as presented in Section 3.0 of this Report have been provided in Appendix B.

5.0 Deterministic Hydrological Modelling

5.1 Watershed Area Discretization

5.1.1 SICD Catchment Area

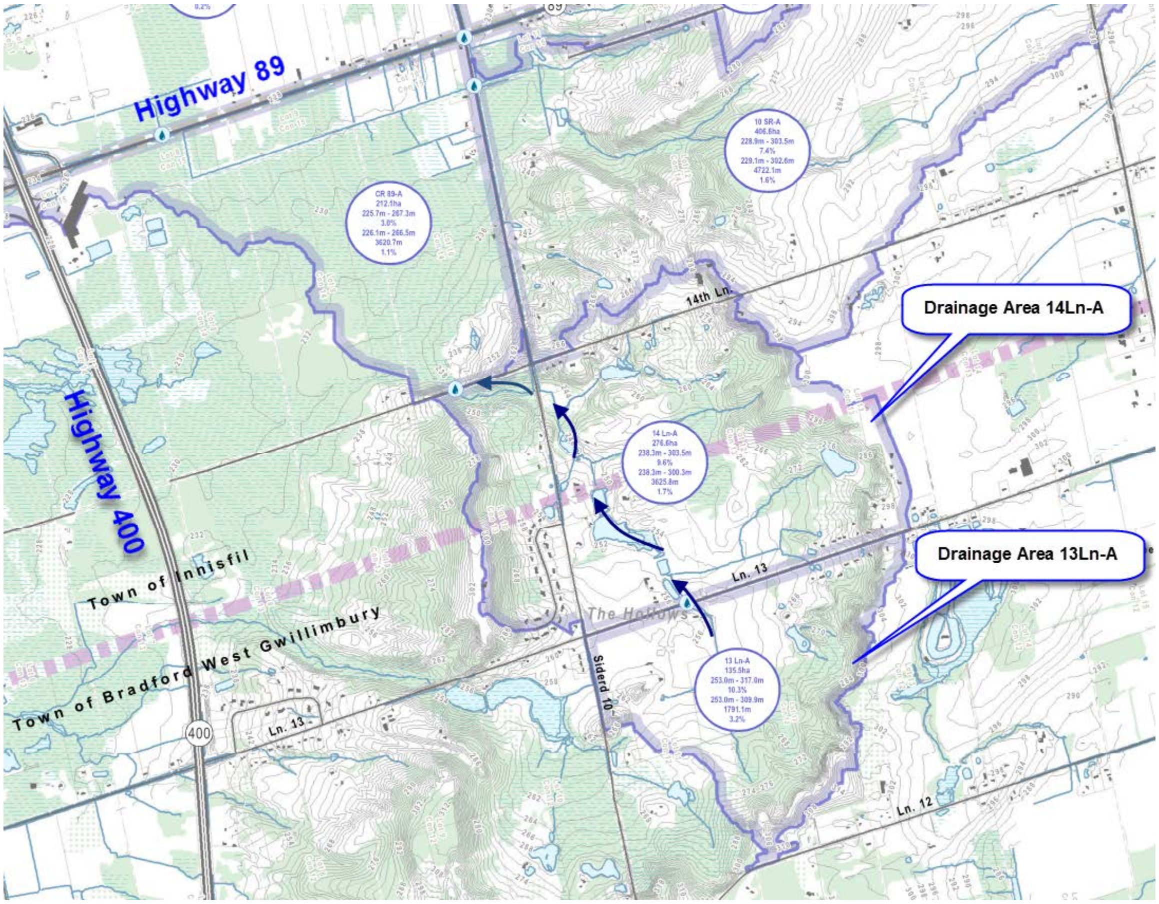
The Burnside GIS terrain model was created using photogrammetric data acquired during orthophoto collection mission. The drainage limits and surface flow analysis calculations for the catchment have been delineated using ArcHydro/ArcGIS software. Using field reconnaissance and existing drainage reports, we have been able to adjust the GIS terrain model to replicate field conditions.

5.1.2 Catchment Area Footprint Comparison

As noted in Section 2.0, several drainage studies have been completed overtime for the SICD. These drainage studies have well documented the overall watershed characteristics. The Final Drainage Report for the South Innisfil Creek Drain and Branches report completed in 2006 by Dillon Consulting, determined that the total drainage area of the SICD to be 7,025 ha, upstream of the 15th Line Culvert Crossing. With updated GIS topographic contour information, Burnside has been able to generally verify the catchment area boundaries and over all watershed area as depicted in the Dillon report, except for one area.

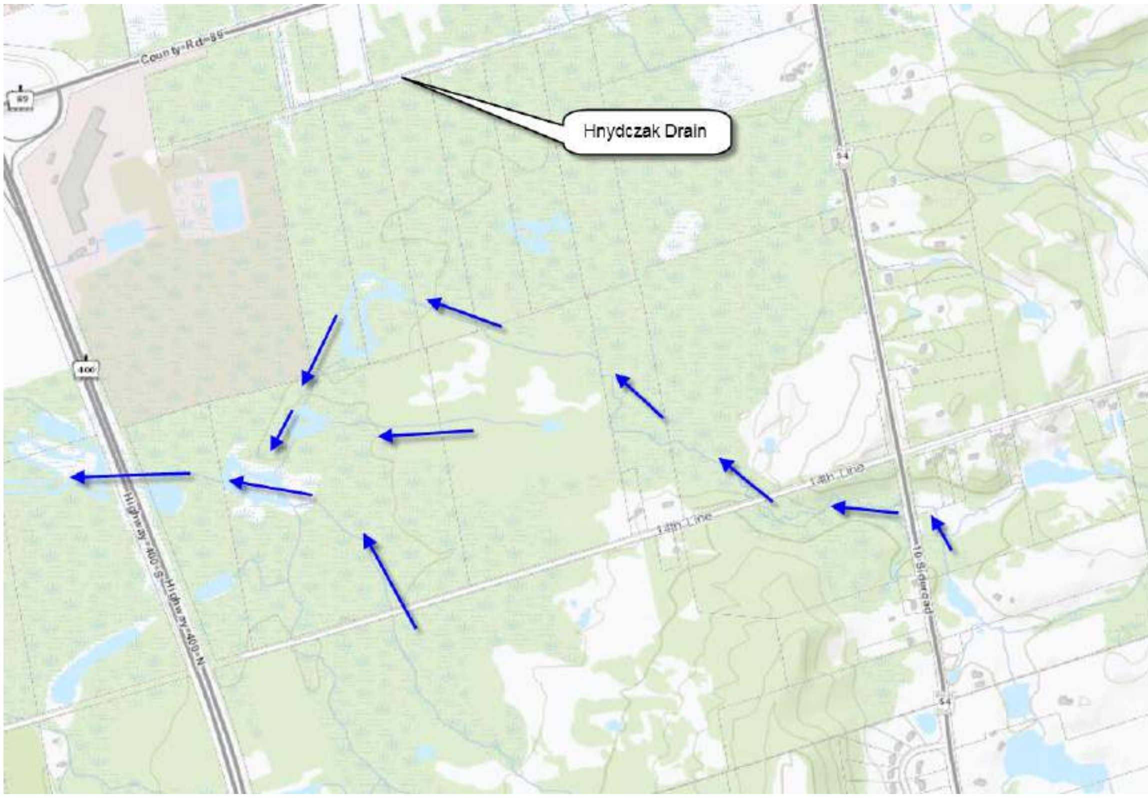
The Hnydczak Drain Improvements Report completed in 1978 by Ainley was to assess drainage conditions associated with a portion of the HD, located upstream of Highway 89. Of interest, this Report outlined an additional drainage area of approximately 450 ha. contributing flows to the HD and ultimately to the SICD that was not included in the 2006 Dillon report. Specifically, this drainage area is located south east of the Tanger Outlets Mall and extends as far upstream or south to Line 12 as illustrated on Figure 8 below.

Figure 8 Hnydczak Drain Additional Drainage Area



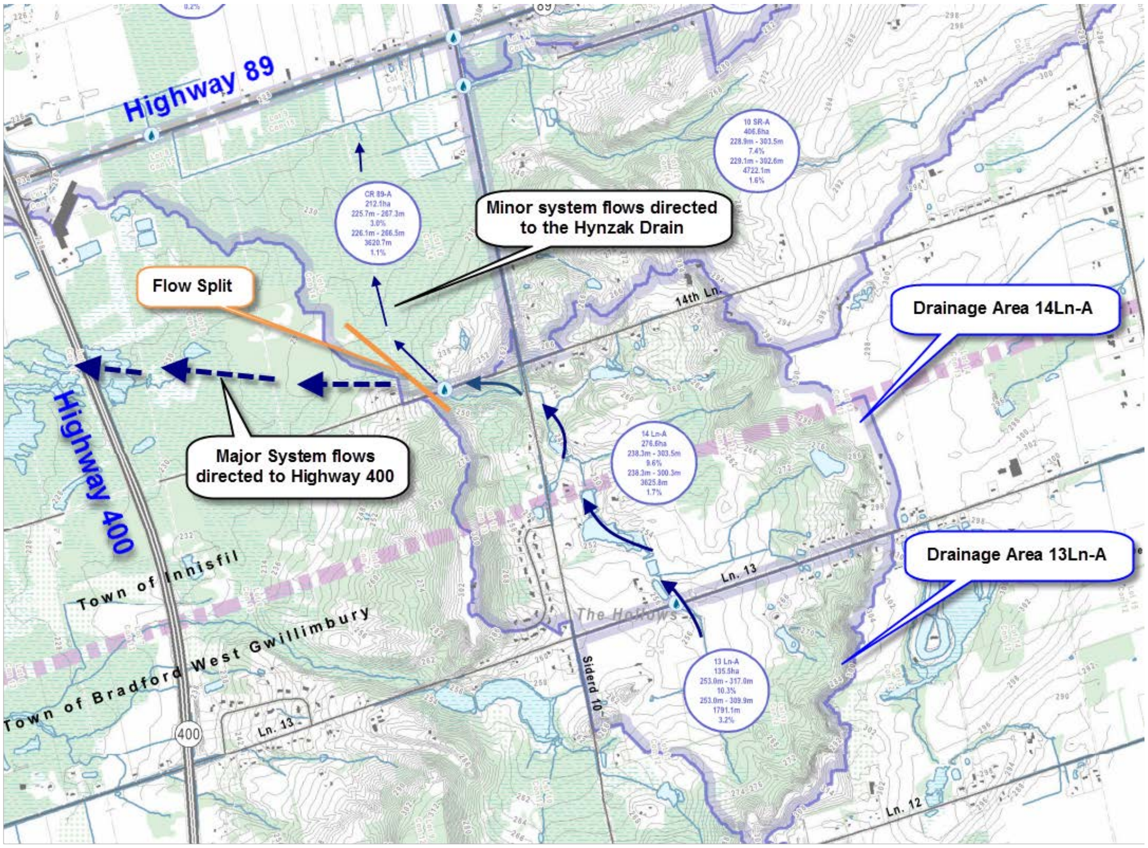
Burnside has completed a detailed review of GIS contour information and Orthophotographic information in the vicinity of this southern drainage area. From a desktop review, our analysis of Dillon's previous drainage area boundaries seemed reasonable as there is a clearly-defined flow path west towards Highway 400. Figure 9 illustrated below, referenced from the online Simcoe County GIS mapping, shows the drainage pathway being directed west to Highway 400 and not the HD.

Figure 9 Southern Drainage Area



However, given that the 1978 Ainley Drainage Report identified an additional ±450 ha. that may enter the HD, Burnside completed field reconnaissance during a thaw period in January 2018 to attempt to further discretize and verify the drainage areas boundaries in this area. Through field reconnaissance, Burnside has been able to characterize the low-lying area located to the southeast of the Tanger Outlet mall is quite flat, widespread and contains tall vegetation, fallen trees and pockets of stagnant water. Given the relatively flat nature of this portion of the drainage area, we would anticipate the direction of outlet flows in this region to be quite sensitive to small alterations in topography, fallen trees, beaver dams, etc. Accordingly, Burnside has been able to verify that the runoff from this southern drainage area does in fact flow north towards the HD, as shown in Figure 10 below.

Figure 10 Hnydczak Drain Additional Drainage Area – Flow Split



However, the channel cross section heading north towards the HD has been observed to be quite small, whereby suggesting that only minor system flows would be directed north. Flows in excess of this small section would be anticipated to spill laterally through the low-lying areas southeast of the Tanger Outlet Mall. The lateral spread of flows would inherently cause flows to travel west towards the Highway 400, south of Highway 89.

As the SICD and HD are both municipal drains and intended to be designed for the 2-year peak flow, we have assumed that the 2-year peak flows from Drainage Areas 14Ln-A and 13Ln-A enter the HD and eventually the SICD, north of Highway 89 at the Highway 400 culvert crossings.

5.1.3 Flow Nodes and Points of Interest

Given the overall magnitude of the SICD watershed, it has been divided into eight smaller sub-watershed areas ranging in size from 300 ha. to 1600 ha. The overall watershed has been sub-divided to produce areas of interest or Flow Nodes at key locations. Generally, areas of interest would reside at major roadway crossings, the confluence of drainage area outlets and the confluence of various branch drains. The locations of flow nodes have been illustrated in the Drainage Area Figure in Appendix A and have been shown in a tabular format in Table 5 below.

Table 5 Flow Node Location Summary

Flow Node	Description
Node 5	Total Flow at the 5th Line
Node 4	Total Flow at the 4th Line
TLN3ND	Total Flow within Line 3 North Ditch
TLN3SD	Total Flow within Line 3 South Ditch
TLN3US	Total Flow U/S of the 3rd Line
TFN3A	Outlet to 3rd Line (Main Drain)
TMID32	Total Flow at Confluence between Line 3 and 2
TFN2U	Total Flow Upstream of the 2nd Line
TFN2D	Total Flow Downstream of the 2nd Line
GOLFE	Total Flow to Flow Node GOLFE (Golf Course East)
GOLFN	Total Flow to Flow Node GOLFN (Golf Course North)
TGOLF	Total Flows from Golf North and Golf East
HYND	Flows from Hnydczak Drain Upstream of Highway 400
Highway 400	**Total Flow at Highway 400**
TFN15L	Total Flow at the 15th Line

In general, the existing topographic features within the various sub-catchments produce overland sheet flow that is conveyed to a centralized watercourse within each sub-catchment. Downstream of the outlet of each sub-catchment, flows enter the main drain of the SICD. The main drain of the SICD conveys flows in a north east to southwest direction to the outlet of the watershed located at the 15th Line, south of Highway 89 and west of Simcoe County Road 27. Downstream of the outlet of the SICD, the watercourse/creek/Innisfil Creek then drains into the Town of Bradford/ West Gwillimbury just east of Highway 27 and south of 14th Line, then through the Town of New Tecumseth, and ultimately into Georgian Bay via the Nottawasaga River.

5.1.4 Hnydczak Drain

The HD is located within the southeastern quadrant of the SICD watershed and produces a total catchment area of 1,430 ha. The HD is generally bound by Highway 89 to the north, Yonge Street to the east, the 12th Line of Bradford/ West Gwillimbury to the south, and Highway 400 to the west. Topographic features within the HD indicate that sheet flow is produced in a southeast-to-northwest direction. Runoff from the HD is collected within the drain itself and crosses to the north side of Highway 89, approximately 750 m east of Highway 400. Downstream and north of Highway 89, the drain conveys flows north adjacent to the east limit of Reive Boulevard to the Highway 400 culvert crossings located on the main drain of the SICD approximately 800 m north of Highway 89. Major system flows within the HD are intended to enter a perched CSP culvert crossing located beneath Highway 400, only approximately 350 m north of Highway 89 which connects to the SICD approximately 400 m west of Highway 400.

5.2 Assumptions

Assumptions made during the analysis of the hydrology data include:

- The land use data is created using the following combined with an air-photo review:
  - Parcel Fabric with MPAC code (Simcoe County)
  - Agricultural Resource Inventory (OMAFRA)
  - Wooded Areas (MNRF)
  - Wetlands (MNRF)
- Slopes are calculated using the 2012 Photogrammetric Terrain Model.
- Catchment areas are calculated using the 2012 Photogrammetric Terrain Model in the ArcHydro modelling environment.

A series of geoprocessing models were created to intersect, generalize and output a spreadsheet of the hydrologic surface.

The creation of this data is done using the following workflow:

- The sub-catchment polygon areas are converted into an analysis grid (in this case 10 m grid).
- The land cover data is a polygon dataset created with intersecting various independent datasets to form a best picture of the ground conditions. This polygon data is then converted into a more generalized analysis grid dataset (in this case 10 m grids) more suitable for spatial analysis and statistics generation.
- The soils data is converted into an analysis grid (in this case 50 m).
- The slope data is derived from the DEM that has a spatial resolution of 1 m (e.g. a 1 m grid). This data is converted into a 3-class dataset (0-5% Slope, 5-10%, etc.) at a specified grid size (in this case 50 m).
- All the gridded areas are intersected. This can result in hundreds to thousands of small polygons being generated as is a characteristic of intersecting 4 datasets that in themselves contain 3 to 30 sub classes of data. To eliminate these areas, any area that is less than a specified percentage of the overall sub-catchment it is part of, are identified and merged into adjacent polygons.

- Land classified as residential, business, wetland/swamp, lawns and industrial have been lumped into the 'cultivated' land cover group.

5.3 Soils Conditions

According to the Simcoe County Soils Map, prepared for the Department of Agriculture in 1959, the overall drainage area producing runoff analyzed in this Report consists of several soil types as illustrated in the hydrology parameters in Appendix C. Each soil type has been categorized into hydrological soil groups in accordance with the MTO soil classification system.

The catchment areas consist of Type A, B, C and D soils at coverages of 6.7%, 65.2%, 10.4% and 17.7% respectively; and have been used for computations of Runoff Curve Numbers. Runoff Curve Numbers were computed based on the corresponding land use and soil type. A summary of these calculations for the catchment area is included in Appendix C.

5.4 Land Use Patterns

Land use patterns for the catchment area have been determined using ArcHydro, aerial photography and field reconnaissance. Three separate land use patterns consisting of forest/woodlot, field/meadow and cultivated lands are pre-dominant within the catchment area analyzed and assumptions made have been outlined in Section 3.0 above. Each of the three land uses present within the catchment area has been calculated using ArcHydro and has been summarized as a percentage of the total drainage area for each catchment. Refer to Appendix C for additional details.

5.5 Hydrologic Model

The hydrological model SWMHYMO was used to assess peak flows for each drainage area. SWMHYMO is a derivative of the original HYMO program and is similar to the OTTHYMO89 model. SWMHYMO is recognized throughout the industry by the various Ministries as being an effective method by which runoff can be determined based on topography, soil conditions and land use. Due to the nature of this drainage area and the relatively low impervious level of each catchment, the NASHYD command was used to assess peak flows, except for one catchment area that used a STANDHYD command due to it being 21.1% impervious.

5.6 Rainfall Data

5.6.1 Local MCS Rain Gauge Stations

Figure 11 below illustrates the Environment Canada rain gauge locations, referenced from the MTO IDF Curve Lookup Tool, in proximity to the SICD watershed.

Figure 11 Environment Canada Rain Gauge Locations

Based on the location of the SICD, rain gauges in close proximity to the watershed have been observed to be the following:

- 6110556 (Barrie WPCC) – 24 years of data
- 611E001 (Egbert CS) – 13 years of data
- 6115820 (Orillia TS) – 34 years of data

5.6.2 Ministry of Transportation IDF Curves Finder

Hydrological analysis projects that reside between rain gauge locations can utilize the MTO IDF Curves Finder tool, available online through the MTO website. This tool uses a statistical analysis to conveniently interpolate IDF curve parameters between MSC stations. The analytics have been extrapolated to incorporate both climatological factors and local variability.

The following commentary has been referenced directly from the MTO website outlining the basic methodology of the MTO IDF Curves Finder tool:

> *"The method of analysis used is referred to as the Square Grid Technique because it uses UTM grid squares as elementary sub-catchments. The original Digital Elevation Model (DEM) is a set of gridded elevations and drainage fractions coded manually for each 10 km square of the Natural Resources Canada 1:250,000 topographic map series. The current version uses the 30 arc-second GTOPO-30 dataset from USGS.*
>
> *The premise is that local climate is strongly influenced by local and regional topography. Thus, topographic parameters are useful interpolators of surface fields of interest, such as temperature, runoff and, in this case, IDF curve parameters A and B.*
>
> *The digital elevation model is used to derive physiographic characteristics that become independent variables in a regression analysis with station statistics. The regression analysis produces a set of generating equations for the parameters used to produce IDF curves. The technique also weighs station data by their length of record, which ensures that data that are more reliable have greater influence on the interpolation. The database consists of statistics from 352 MSC and NOAA stations with an average record length of 30 years.*
>
> *The result is a gradually varying regional IDF curve. Because the regional curve and station curves both have uncertainty, the regional estimates are different from the station records. However, the 95% confidence intervals overlap and the upper limit is generally higher than the mean station value. Values from both the regional curve and station curves are accessible by this tool".*

Accordingly, we have used the MTO IDF Curves Finder tool for consideration in the Hydrological Analysis of the SICD.

5.6.3 IDF Rain Fall Depth Summary

Table 6 below illustrates the rainfall depths from the Orillia, Egbert and Barrie standard rain gauges. The City of Barrie WPCC rainfall depth data has been referenced from the City of Barrie engineering standards. This rainfall depth has been adjusted for climate change similar to rainfall depths with climate change as outlined by the MTO IDF Look Up Tool.

Table 6 Rainfall Depth Summary

RAINFALL DEPTH SUMMARY						
Return Interval (year)	**Duration (hour)**	**6115820 (Orillia TS) (34)**	**611E001 (Egbert CS) (13)**	**6110556 (Barrie WPCC) (24)**	**Barrie WPCC with Climate Change**	**MTO IDF Curve Lookup Tool with Climate Change**
	Total Precipitation (mm)	**Total Precipitation (mm)**	**Total Precipitation (mm)**	**Total Precipitation (mm)**	**Total Precipitation (mm)**	**Total Precipitation (mm)**
2	6	**37.6**	32.6	36.8	42.3	**37.8**
	12	**41.4**	37	40.6	46.7	**46.8**
	24	**46.7**	42.7	47.8	55	**57.6**
5	6	**52.4**	43.8	51.7	59.5	**49.8**
	12	**56.2**	48.2	55.9	64.3	**61.2**
	24	**60.6**	52.8	66.1	76	**74.4**

In comparing the rainfall depths between the Orillia TS and Barrie WPCC rain gauge we can see that the rainfall depths are comparable between rain gauges. While the Barrie and Egbert rain gauges reside in a closer proximity to the SICD watershed, the length of record for each gauge remains relatively short in comparison to the Orillia TS gauge. Accordingly, the Orillia TS rain gauge was selected for analysis in the determination of peak flows within the SICD watershed.

5.7 Time of Concentration

Given the low impervious level and runoff coefficient of less than 0.40 for the majority of the catchment areas, the Airport Method was used to calculate the time of concentration. For the four catchment areas that have a runoff coefficient of more than 0.40, the Bransby-Williams method was used. The time of concentration is a function of "time-to-peak", which represents the time from the beginning of rainfall to the peak of the runoff hydrograph. It is indicative of the basin's response to storm events. It depends on the physical characteristics of the watershed, such as length, slope, area and surface cover. The required overland flow lengths and slopes were determined from the ArcHydro mapping and Simcoe County GIS. Refer to Appendix C for related calculations.

5.7.1 Initial Abstraction

The United States Department of Agriculture, Natural Resources Conservation Service, Urban Hydrology for Small Watersheds, TR-55, defines Initial Abstraction (Ia) as;

> *"the losses in the watershed before runoff begins. It includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration. Ia is highly variable but generally is correlated with soil and cover parameters. Through studies of many small agricultural watersheds, Ia was found to be approximated by the following empirical equation:*
>
> $$Ia = 0.2 * S \text{ (mm)}$$
> $$\text{Where } S = (25400/CN - 254)\text{"}$$

We note that the NVCA Engineering Development Review Guidelines provides the following values for Initial Abstraction as referenced from the UNESCO, Manual on Drainage in Urbanized Areas, 1987.

Table 7 Initial Rainfall Abstraction Values

Initial Rainfall Abstraction, Ia (mm)						
Land Use	**Forest/ Woodlot**	**Meadow/ Field**	**Crop**	**Lawn/ Grass**	**Pavement**	**Water**
Ia	10	8	7	5	2	0

The Ia values as outlined in the NVCA Engineering Development Review Guidelines have been defined based on land use only. Accordingly, we would anticipate by using these values that watershed runoff would present a conservative value as the infiltration capabilities of varying hydrological soil types have not been accounted for.

To replicate flow conditions as would be witnessed in the field during peak rainfall events, we have used the original TR-55 methodology for calculating Ia values within the SICD watershed.

5.7.2 Hydrograph Shifting

The configuration of the overall sub-watershed drainage boundaries within the overall Innisfil Creek watershed are such that peak flows from each drainage area are collected by a series of smaller tributaries prior to discharging to the SICD. Given the magnitude of the watershed, peak flows outletting from individual catchment boundaries must travel through local draws or drains prior to outletting to the SICD. To account for travel times, where applicable, the SHIFT HYD command has been used to account for the flow lag time from each sub watershed outlet to various flow nodes within the study area. The Uplands method, with a grassed waterway land use coefficient of 4.6 was used to determine various hydrograph lag times within the model. It has been observed that various lag times produce flow velocities ranging from 0.2-0.5 m/s which would be consistent with anticipated flow velocities within the SICD.

5.7.3 Hydrograph Routing

The channel geometry of the SICD varies in shape and geometry from the upstream to the downstream limits of the watershed. Generally, the SICD consists of channel bottom widths of 2-5 m, side slopes of 1-2:1 and depths of 1-3 m. Accordingly, the SICD is large enough to influence hydrograph routing and storage volumes within the watershed. Accordingly, using the 2005 topographic survey completed by Dillon Consulting, we have utilized the ROUTE CHANNEL command to replicate channel routing within the SICD as would be representative of field conditions.

5.7.4 CN* (CN Star) Method

The CN* method as referenced from the Visual OTTHYMO (VO2) User's Manual is described below:

> *"The Modified Curve Number method was first proposed by Paul Wisner and Associates in 1982, and was based on their research and monitoring of rural and urban catchments in Canada. This method has been used successfully in Canada for the last 20-years and has correlated well with measured flows. Rather than varying IA parameter, as in the SCS method the IA is fixed, as described above and the CN is altered. The modified CN, called CN* is a function of the IA and total rainfall".*

To assess the impacts of using the standard SCS CN vs the CN* method, Burnside has completed a comparative review of parameters used in both methods. For this review, Burnside has assumed an arbitrary rainfall depth P = 120 mm. Table 8 below illustrates the calculated CN (I), CN (III) and Ia parameters based on a range of CN (II) values from 40 to 80. The CN notation (i.e., CN (I), CN (II) and CN (III)) represent the average moisture content present within the soil. CN (I) values represent dry arid conditions, CN (II) represents average moisture conditions, while CN (III) represent saturated soil conditions. Catchments within Ontario are typically modelled with CN (II) values associated with average moisture content. CN (III) values are typically reserved for the use of the Hurricane Hazel Regional Storm Distribution.

Table 8 Standard SCS Curve Number (CN) Summary Table

Original SCS Method			
CN (I)	CN(II)	CN (III)	Ia
21.88	40	60.53	12.42
29.58	50	69.7	8.28
38.65	60	77.53	5.52
49.49	70	84.29	3.55
62.59	80	90.2	4.14

As illustrated in Table 8 above, Ia parameters are largest with lower CN (II) values. This would correspond with sandier, more heavily-vegetated land use types. Conversely, the Ia parameter is smallest with larger CN (II) values. This would correspond with soil types with smaller infiltration rates (i.e., clays and loams) and agriculture type land uses. The standards parameters shown in Table 8 above have been used for comparison purposes to the calculated CN* parameters shown in Tables 9 and 10 below. The CN* calculations have been based on methodology presented in the Visual OTTHYMO (VO2) User's Manual. Further an Ia = 1 mm and Ia = 5 mm have been used (minimum and maximum recommended values in the VO2 manual) for comparison back to the standard CN number approach.

Table 9 CN* Comparison Table, Ia = 1 mm

CN* Method				Difference CN (II) - CN* (II)
CN (I)	CN (II)	CN (III)	Ia(mm)	
11.57	23.75	41.74	1	-16.25
19.72	36.9	57.36	1	-13.1
29.74	50.2	69.87	1	-9.8
42.01	63.3	79.87	1	-6.7
57.35	76.2	88.04	1	-3.8

Table 10 CN* Comparison Table, Ia = 5 mm

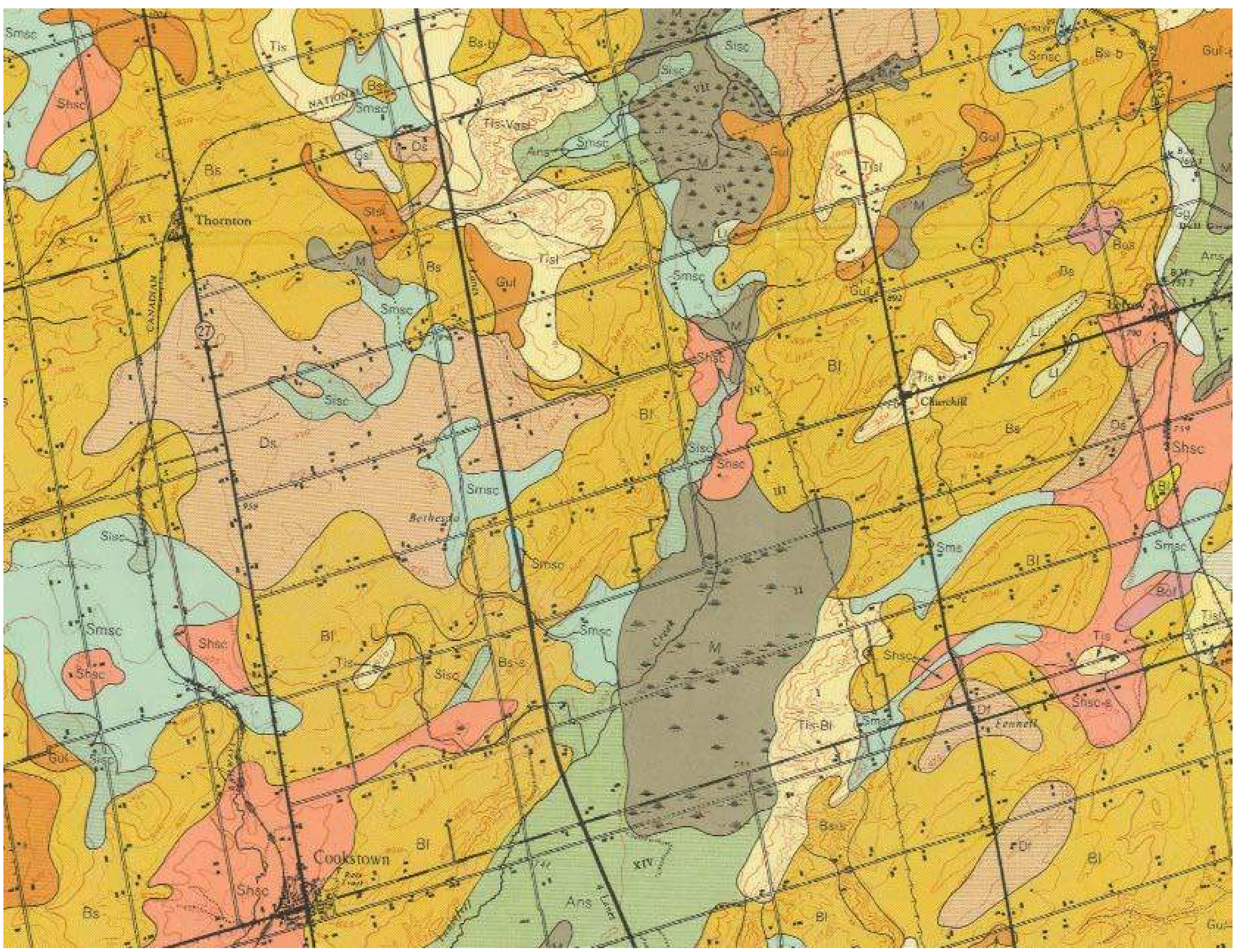
CN* Method				Difference CN (II) - CN* (II)
CN (I)	CN (II)	CN (III)	Ia(mm)	
12.4	25.2	43.68	5	-14.8
21.2	39.05	59.57	5	-10.95
32.01	52.85	72.05	5	-7.15
45.36	66.4	81.97	5	-3.6
62.03	79.55	89.95	5	-0.45

Tables 9 and 10 above have been constructed using fixed Ia depths of 1 mm and 5 mm respectively. Each Table also provides a comparison between the CN*(II) and standard CN (II) values. In summary, the largest calculated differences between each method have been observed to reside with lower value CN numbers. Both CN* values (with an assumed Ia value of 1 mm or 5 mm) have been observed to reside up 16.25 lower than the standard CN method. This observation is associated with CN numbers of lower value and further associated with soils of sandier (higher infiltration capacity) composition and heavily vegetated land use types.

A closer correlation between the standard CN values and CN* values has been observed with higher CN values. This observation is associated with soils of minimal infiltration capacity (clays and loams) and farming land use types.

Burnside has reviewed the Simcoe County Soils Map, prepared by the Department of Agriculture in 1959 to determine the soil composition present with the SICD. A screen shot of the soils map within the SICD has been illustrated below in Figure 12.

Figure 12 Simcoe County Soils Map – Town of Innisfil



The catchment areas with the SICD consist of Type A, B, C and D soils at coverages of 6.7%, 65.2%, 10.4% and 17.7% respectively as classified by the Ontario Ministry of Transportation (MTO) soil classification system and have been used for computations of

Runoff Curve Numbers. Runoff Curve Numbers were computed based on the corresponding land use and soil type. A summary of these calculations for the catchment area is included in Appendix C. Approximately 72% of the soils within the SICD are comprised of Type A or Type B soils and fall within the curve number range associated with the largest differences between the CN vs. CN* comparisons noted above.

We acknowledge that the applicable uses of the CN* method based on sandy soil types as noted above. However, Burnside has presented the findings of the CN vs. CN* comparative analysis for discussion purposes only as we note that the NVCA does not support the use of CN* based on the Paul Wisner Method as outlined on page 33 of the NVCA Stormwater Technical Guide. Accordingly, runoff curve numbers based on CN* have not been used or considered for analysis.

5.7.5 Hydrological Summary Calculations

Detailed hydrological calculations in support of the above noted SWMHYMO parameters have been provided in Appendix C.

5.8 Preliminary Hydrological Results

A SWMHYMO hydrological model was constructed based on the above commentary and methodology. Given the size and the configuration of the watercourse, it was necessary to analyze the impacts of varying depths of rainfalls associated with varying rainfall return intervals. Accordingly, the 6, 12 and 24-hour SCS Type-II rainfall distributions containing the 1:2, 1:5, 1:10, 1:25, 1:50 and 1:100-year return intervals were ran to determine the governing storm distribution. The governing storm distribution produces the largest peak flow in comparison to other storms and was determined to be the 24-hour SCS Type-II rainfall distribution and therefore has been used for further analysis. The Timmins storm has been selected as the Regional Storm in accordance with NVCA engineering standards.

Using the catchment areas as illustrated in the Drainage Area Figures in Appendix A and the Hydrological model SWMHYMO, peak flows were determined for the 2-year, 5-year, 10-year, 25-year, 50-year, 100-year and Regional Storm Events at each flow node.

The peak flows at each flow node for the 2-year storm are summarized in Table 11 below. The SWMHYMO runs for the 24-hour SCS Type-II storm distributions can be found in Appendix D, and a Drainage Area figure with the locations of flow nodes is included in Appendix A. Hydrological Calculations in support of the hydrological modelling have been provided in Appendix C

Table 11 Summarized Peak Flows at each Flow Node

Flow Node	Flow Node Description	Peak Flow 2-yr m^3/s
Node 5	Total Flow at the 5th Line	3.86
Node 4	Total Flow at the 4th Line	5.44
TLN3ND	Total Flow within Line 3 North Ditch	0.46
TLN3SD	Total Flow within Line 3 South Ditch	1.48
TLN3US	Total Flow U/S of the 3rd Line	3.17
TFN3A	Outlet to 3rd Line (Main Drain)	8.35
TMID32	Total Flow at Confluence Between Line 3 And 2	8.77
TFN2U	Total Flow Upstream of the 2nd Line	10.71
TFN2D	Total Flow Downstream of the 2nd Line	11.51
GOLFE	Total Flow to Flow Node GOLFE (Golf Course East)	11.12
GOLFN	Total Flow to Flow Node GOLFN (Golf Course North)	2.49
TGOLF	Total Flows from Golf North and Golf East	13.43
HYND	Flows from Hnydczak Drain Upstream of Highway 400	0.93
Highway400	**Total Flow at Highway 400**	**13.64**
TFN15L	Total Flow at the 15th Line	12.89

Table 12 below is a summary of flows at the Highway 400 Crossing only, this will be used for comparison between the existing models as will be noted in Section 6.0 below.

Table 12 Summarized Peak Flows at Highway 400 Crossing

Storm Event	2-year (m^3/s)	5-year (m^3/s)	10-year (m^3/s)	25-year (m^3/s)	50-year (m^3/s)	100-year (m^3/s)	Regional (m^3/s)
SCS Type II (24-hr)	13.64	26.87	39.41	61.56	77.7	93.92	290.47

6.0 Calibration and Validation

Historically, peak flows produced from spring snow melting and spring rainfall events have been observed and noted to overtop the banks of the SICD and enter lands in close proximity to the drain. Peak flow events in the summer months have been known to have overtopped the banks of the SICD and produce considerable crop damage. These events are known to occur; however, despite the known events, Burnside has not been able to locate photographical evidence or other flow measurements to quantify the flows experienced during them. Flow measurements and/or photos of peak flows experienced during flood conditions at permanent structures produce an accurate way of being able to quantify flows. Without these vital pieces of information, attempts to quantify flows based on water extents observed in farm fields can be very subjective, given the overall width and magnitude of the floodplain.

The process of being able to quantify peaks flows at permanent structures (i.e., roadway crossings) or flow gauges enables the Hydrological modelling to be calibrated to an actual flow event. This procedure produces a level of confidence in the modelling approach and parameters selected. If available, a second peak flow event with similar flow measurements would enable to the hydrological model to be validated to more than just one flow event. Again, this increases the confidence in the Hydrological model to be representative of field conditions.

6.1 Recorded Rainfall Events

Burnside contacted the Town and the NVCA in the spring of 2017 to obtain any relevant flow or photographic evidence of flood events in the SICD watershed. The NVCA has provided information that there is a new flow and rain gauge installed at the 5th Sideroad crossing. The flow measurement component of the gauge was not operational at the time of the writing of this Report; however, the rainfall depth measuring component of the gauge has been in operation since 2016. There are no other flow measurement devices on the SICD within the watershed limits.

The Town provided several photos of the SICD during peak flow events starting in 2008 up to and including the summer of 2017. These photos confirmed the presence of spring freshet flows overtopping the banks of the SICD as a result of melting snow and spring rainfall events.

Two rainfall events with supporting photographic evidence were on May 5, 2017 and on June 23, 2017.

6.1.1 May 5, 2017 Rainfall Event

Table 13 below illustrates the recorded rainfall depths at local rain gauges leading up to and including the May 5, 2017 event. The Innisfil Creek at 5SD Inni rain gauge is the NVCA rain gauge located at the 5th Sideroad on the main drain of the SICD.

Table 13 May 2017 Rainfall Summary Table

RECORDED RAINFALL DATA				
Date (M/D/YYYY)	6110556 (Barrie Landfill) (6)	611B002 (Borden AWOS) (17)	611E001 (Egbert CS) (13)	5SD-Inni Innisfil Creek at 5th Sideroad
	Total Precipitation (mm)	Total Precipitation (mm)	Total Precipitation (mm)	Total Precipitation (mm)
5/1/2017	12.2	11.5	16.7	21.6
5/2/2017	21	2.5	2.7	1.2
5/3/2017	0	0.5	0	0
5/4/2017	17.2	11	12.7	14.2
5/5/2017	22.2	21	23.6	21.8

Table 13 shows that in general all four rain gauges captured a daily rainfall depth of 21.0-23.6 mm on May 5, 2017. A closer review of hourly rainfall data at the NVCA 5th Sideroad gauge reveals that the rainfall event started at approximately 2:00 p.m. May 4th, 2017 and lasted until 6:00 p.m. on May 5th, 2017, for a total duration of 28 hours. The summation of the recorded rainfall depth over this time period was calculated at 36.0 mm. We note that prior to this rainfall event, the week of May 1st to May 4th, 2017, the watershed received 37.0 mm (21.6+1.2+14.2 mm) of rain. This initial onset in rainfall prior to the May 5th, 2017 event would have been assumed to create a "moist" Antecedent Moisture Condition (AMC). Accordingly, the runoff curve numbers for calibration purposes would remain a standard AMC II condition.

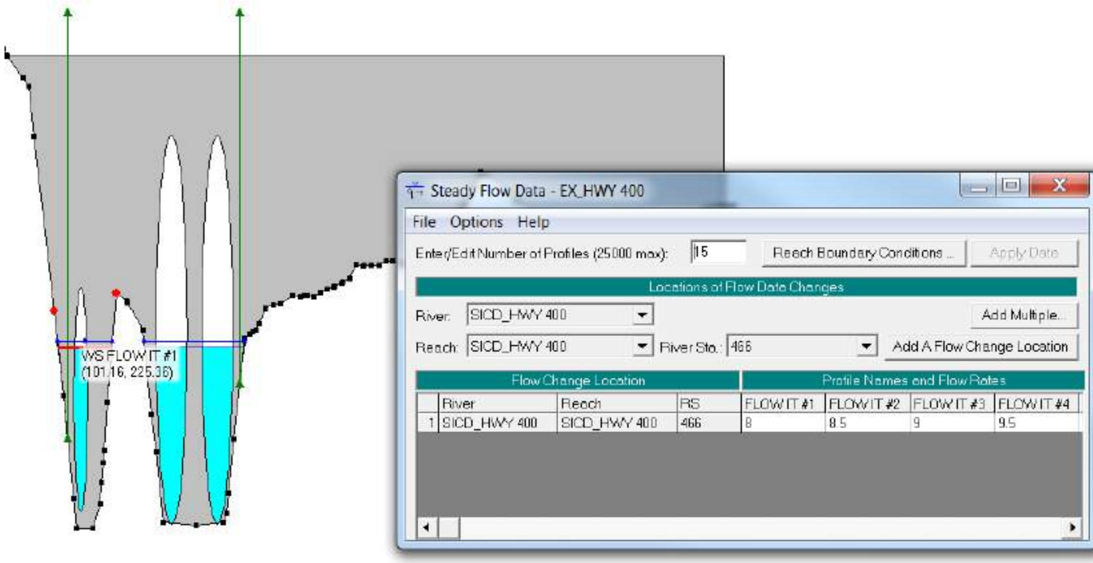
A photo was taken by the Town at the upstream limits of the Reive Boulevard culvert crossing on May 5, 2017 as shown overleaf.

Figure 13 May 5, 2017 Rainfall Event – Upstream Limits of Reive Boulevard

Based on the site photo above, in combination with field measurements and topographic survey data, we have been able to establish a water surface elevation at the upstream limit of the Reive Boulevard Culvert crossing of 225.38 m during the May 5th, 2017 rainfall event. We note that the photo was taken at 1:37 p.m., which was mid-storm and arguably flows may have reached a higher elevation. However, we will use 225.38 m for calibration purposes.

To determine the flow of runoff being conveyed through the Reive Boulevard roadway crossing, Burnside has constructed a HEC-RAS hydraulic model of the Reive Boulevard and Highway 400 culvert crossings. Detailed commentary outlining the methodology and assumptions used in the construction the HEC-RAS hydraulic model has been provided in Section 9.0 of the Report. Figure 14 (below) illustrates the calculated water surface elevation upstream of Reive Boulevard.

Figure 14 May 5, 2017 Rainfall Event – Reive Boulevard HEC-RAS Cross Section



Based on a water surface elevation of 225.38 m at the upstream limits of Reive Boulevard, we have been able to calculate the peak flow on May 5, 2017 to be 8.0 m^3/s.

6.1.2 June 23, 2017 Rainfall Event

Table 14 below illustrates the recorded rainfall depths at local rain gauges leading up to and including the June 23, 2017 event. The Innisfil Creek at 5SD Inni rain gauge is the NVCA rain gauge located at the 5th side road on the main drain of the SICD.

Table 14 June 2017 Rainfall Summary Table

RECORDED RAINFALL DATA				
Date	6110556 (Barrie Landfill) (6)	611B002 (Borden AWOS) (17)	611E001 (Egbert CS) (13)	Innisfil Creek at 5th Sideroad
	Total Precipitation (mm)	Total Precipitation (mm)	Total Precipitation (mm)	Total Precipitation (mm)
6/16/2017	0.6	-	0	1.2
6/17/2017	-	13.5	8.8	9.6
6/18/2017	11.4	-	6	9
6/19/2017	1.5	-	1.6	1
6/20/2017	19.2	-	6	6.2
6/21/2017	0	-	0	N/A
6/22/2017	27.8	-	6.4	6.6
6/23/2017	**2**	**-**	**31.5**	**48.4**

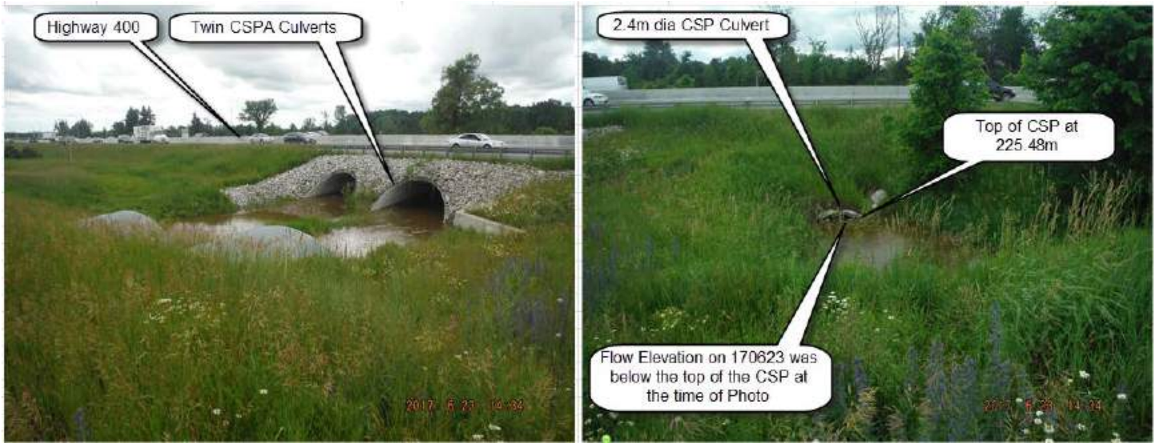
The table above shows varying ranges of rainfall depth between the four rain gauges noted above on June 23, 2017. The Barrie Landfill Gauge 6110556 only recorded a rainfall amount of 2.0 mm, thereby suggesting, in comparison to the Egbert and NVCA Gauge, that the storm event travelled through the SICD watershed; but, it did not appear to extend into the Barrie area with any significance.

A closer review of hourly rainfall data at the NVCA 5th Sideroad gauge, reveals that the rainfall event started at approximately 8:00 p.m. on June 22, 2017 and lasted until 8:00 a.m. on June 23, 2017, for a total duration of 12 hours producing a total rainfall depth of 53.0 mm. This recorded rainfall depth was 21.0 mm above the Egbert gauge located nearby.

The June 23, 2017 rainfall event in contrast to the May 5, 2017 event did not have prior rainfall events that would have moistened the soils conditions leading into the event. Accordingly, we would assume that dry soil conditions would have been present prior to the event starting.

Photos were taken by the Town at the upstream limits of the Highway 400 culvert crossing on June 23, 2017 as shown below.

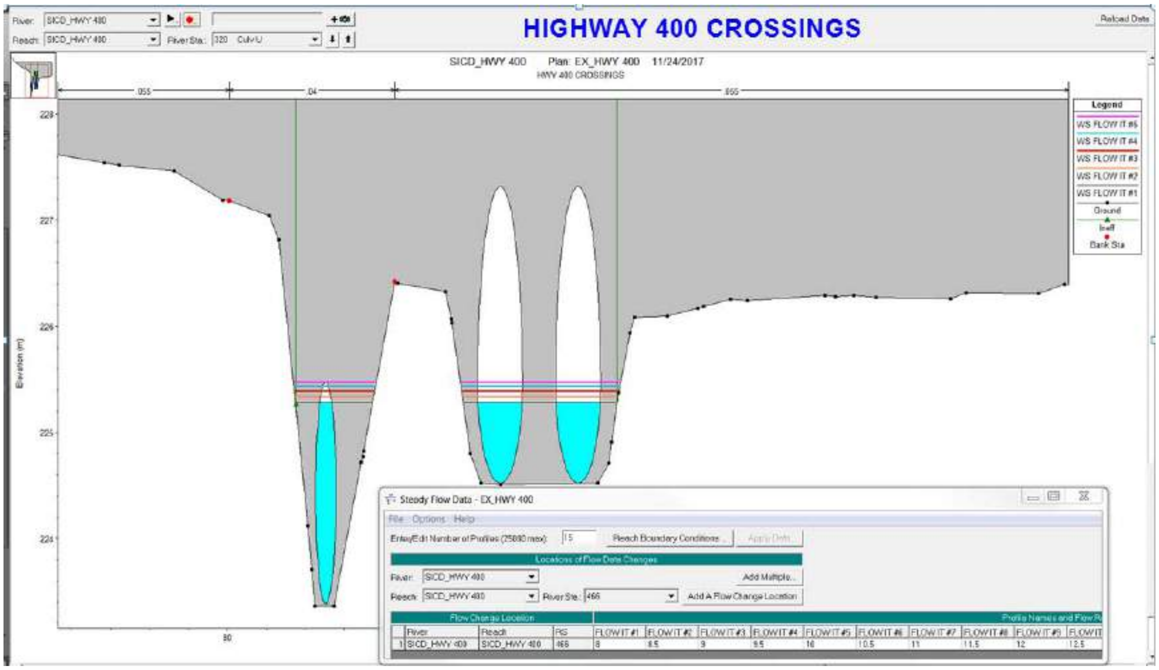
Figure 15 June 23, 2017 Rainfall Event – Upstream Limits of Reive Boulevard



Based on the site photos above, in combination with field measurements and topographic survey, we have been able to establish a water surface elevation at the upstream limit of the 2.4 m dia. CSP culvert crossing to be between approximately 225.28 m and 225.43 m during the June 23, 2017 rainfall event. We note that the photos were taken at 14:34 p.m., which was approximately 6 hours after the rainfall event had finished. However, given the long time to peak of the watershed, we have assumed this elevation range to represent an applicable range for validation purposes.

To determine the flow of runoff being conveyed through the Highway 400 crossing, Burnside has constructed a HEC-RAS hydraulic model of the Reive Boulevard and Highway No 400 culvert crossings. Detailed commentary outlining the methodology and assumptions used in the construction the HEC-RAS hydraulic model has been provided in Section 9.0 of the Report. Figure 16 below illustrates the calculated water surface elevation upstream of Highway 400 culvert crossings.

Figure 16 June 23, 2017 Rainfall Event – Highway 400 HEC-RAS Cross Section



Based on a water surface elevation range of 225.28 m to 225.43 m at the upstream limits of the Highway 400 crossings, we have been able to calculate the peak flow on June 23, 2017 to be between 10 and 12 m^3/s.

6.2 Hydrological Modelling Calibration and Validation

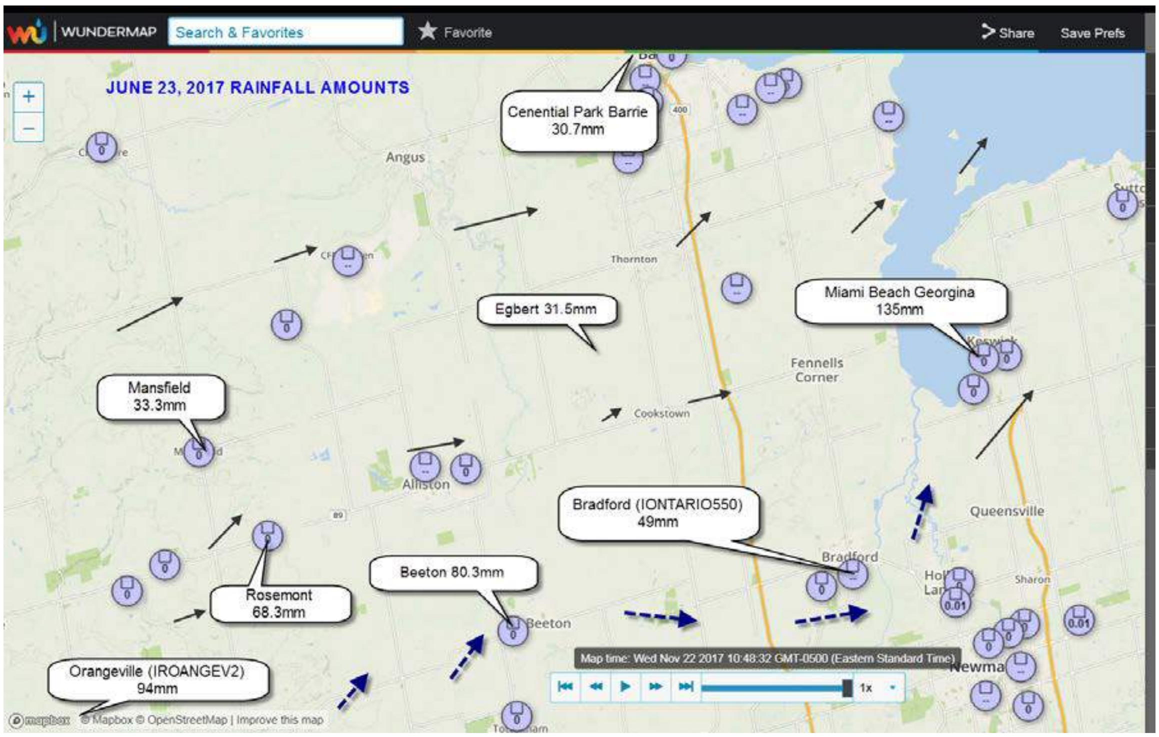
Considering the 24-hour May 5, 2017 rainfall event producing a rainfall depth of 36.0 mm, in conjunction with a peak flow of 8.0 m^3/s at Reive Boulevard, we have been able to calibrate the SWMHYMO Hydrological model. Through an iterative process, Burnside has been able to apply a reduction of 12% to the Initial Abstraction (Ia) parameters to calibrate the SWMHYMO model. The resulting peak flow at Reive Boulevard has been calculated to be 8.017 m^3/s. Detailed SWMHYMO output files have been provided in Appendix D illustrating the calibration process.

As the SWMHYMO hydrological model had been calibrated, it was then necessary to validate the model against the June 23, 2017 rainfall event. The 12-hour June 23, 2017 rainfall event producing a rainfall depth of 53.0 mm, in conjunction with a peak flow range of 10 to 12 m^3/s at the Highway 400 crossing culverts was used to validate the model. The resulting peak flow calculated at the Highway 400 crossings was observed to be 25.2 m^3/s. This peak flow is in excess of 2 times the observed peak flow as depicted in the site photos (Figure 15). This disconnect warranted further investigation into the June 23, 2017 rainfall event.

6.2.1 Revisiting the June 23, 2017 Rainfall Event

The NVCA 5th Sideroad gauge recorded a total rainfall depth of 53.0 mm over a 12 hour period on June 23, 2017. Burnside has reviewed the recorded rainfall depths at other local rain gauges on June 23, 2017 to assess whether this recorded rainfall was an isolated event specific to the 5th Sideroad gauge or if the rainfall event was dispersed over a broader area. Figure 17 below illustrates the observed rainfall depths on June 23, 2017 from the WUNDERMAP website.

Figure 17 June 23, 2017 Rainfall Event – Local Rainfall Depth Summary



The rainfall event on June 23, 2017 was indeed a broad event as the rain gauges from Orangeville, Barrie and Georgina received rainfall depths of 94.0 mm, 30.7 mm and 135.0 mm respectively. We note that rain gauges located north of Highway 89, including the Mansfield, Egbert and Centennial Park only recorded rainfall depths of 30.7-33.0 mm. Rain gauges south of Highway 89 have been noted to have recorded significantly more rainfall during this event. Therefore, with the 5th Sideroad gauge being located just north of Highway 89, and at the downstream limits of the SICD watershed, it would stand to reason that the SICD in its entirety may have not received the full extent of the event.

Accordingly, through an iterative process and using the calibrated SWMHYMO hydrological model as outlined in Section 5.0, we have been able to determine that a

12-hour SCS Type II rainfall distribution producing a depth of 37.0 mm produces a peak flow of 10.61 m^3/s at the Highway 400 culverts. This peak flow resides within the flow range of 10 to 12 m^3/s as determined by photos of the flow event at Highway 400 on June 23, 2017. Further, a 37.0 mm rainfall determination would also recognize an increased rainfall depth throughout the watershed over the 30.7–33.0 mm as measured by the Mansfield, Egbert and Centennial Park gauges while under the 53.0 mm recorded at the 5th Sideroad gauge.

6.2.2 Rainfall Confirmation - June 23, 2017

Through the hydrological modelling process Burnside has been able to speak with local land owners, Town Officials and NVCA staff who are familiar with local rainfall events and flood events within the SICD watershed. Burnside has been in contact with Nick Torkos from the Innisfil Creek Golf Club as the SICD traverses the central portion of the golf course east of Highway 400. In accordance with MOECC Permit to Take Water requirements, the golf course is required to maintain detailed logs of rainfall data received on a daily basis. Noting that NVCA 5th Sideroad gauge recorded a total rainfall depth of 53.0 mm over a 12 hour period on June 23, 2017, while the watershed north of the NVCA gauge recorded between 33.0-37.0 mm, depending on location, Burnside approached the Innisfil Creek Golf Club for local knowledge of rainfall depths on June 23, 2017.

On February 26, 2018, Nick provided Burnside a copy of the June 2017 rainfall data. The rainfall depth recorded at the Innisfil Creek Golf Club on June 23, 2017 was 38.2 mm. As outlined in Section 6.2.1, based on a detailed overview of recorded rainfall depths north of Highway No 89 on June 23, 2017, Burnside postulated that flows produced by an assumed 37.0 mm rainfall event seemed to fit the photographed water surface elevations at the upstream limits of the Highway 400 culvert crossings. The rainfall depth data provided by the Innisfil Creek Golf Club has confirmed that the original rainfall depth assumptions and the model calibration/validation procedure falls within the flow tolerance as noted.

Detailed SWMHYMO hydrological outputs of the validation process have been provided in Appendix D.

6.2.3 Hydrological Modelling Projection

The iterative calibration and validation process as outlined in Section 5.0 has provided a hydrological benchmark based on recorded rainfall events within the SICD watershed. The design criteria for the SICD, in accordance with the Drainage Act, require the drain to be designed to convey the 2-year peak flow. As outlined in Section 4.0, the Orillia TS 24-hour SCS Type II storm distribution, producing a total rainfall depth of 46.7 mm, has been determined to be the governing rainfall event for the SICD watershed.

Using the calibrated and validated SWMHYMO hydrological model, the 24-hour, 46.7 mm SCS Type II storm distribution was applied to determine the 2-year peak design flow for the SICD. The projected 2-year peak flow at the Highway 400 crossings was calculated to be 15.3 m^3/s. The projected peak flow of 15.3 m^3/s falls within the range as determined by the hydrometric stream flow analysis as outlined in Section 3.0. Therefore, we can assume that the original, non-calibrated SWMHYMO hydrological model provides an acceptable fit within the hydrometric analysis as well as the calibration and validation process. Accordingly, the non-calibrated SWMHYMO hydrological flows will be used for design purposes.

7.0 Considering Impacts of Climate Change

The following has been referenced from the Ministry of Ontario Climate Ready: Adaptation Strategy and Action Plan:

> *"In its January 2011 Progress Report on Adaptation to Climate Change, the Insurance Bureau of Canada noted that losses related to water damage are costing Canadian insurers and policyholders up to $1.5 billion annually — a figure that continues to rise. These losses can be attributed to both the aging of water and wastewater infrastructure and changing weather patterns.*
>
> *Rainstorms and floods have always been a fact of life in Ontario. So too have droughts and heat waves, ice storms and blizzards, tornadoes and windstorms. But weather is changing and has been for a generation now. Temperatures are higher, especially in winter; more rain is falling in heavy storms and summers have more frequent and longer dry periods. A few of the consequences of rising temperatures, such as a longer growing season and a decreased need for winter home heating, may be beneficial to people. Our natural systems, however, are adapted to today's climate and may have difficulty adjusting to changing weather patterns.*
>
> *Weather affects all sectors of our economy and our communities from the way we design stormwater drainage systems, bridges and roads, to the type of crops grown by farmers to the water levels in the Great Lakes.*
>
> *Scientists firmly believe a gradual increase in the amount of the sun's heat being captured by the atmosphere is the main reason for the change in weather events and seasonal weather patterns. The changes have developed over at least 40 years and clearly amount to a change in climate. The Ontario government agrees that an increase in the quantity of heat-trapping gases in the atmosphere has been largely responsible for contributing to climate change and is working to reduce Ontario's emissions of those gases.*

Regardless of the cause, changes in weather patterns already impose risks to life, property, and the natural world in Ontario that cannot be ignored. Reducing those immediate risks is the only prudent course of action for all levels of government, as well as communities, corporations, businesses, and individual citizens."

While the impacts of climate change have been occurring, and are noted not only by the province of Ontario as well as organizations around the world, it is not yet well understood what the longer term impacts of climate change will be. However, climate change, and in particular Global Warming, are phenomena that are increasingly becoming recognized as factors affecting our environment. Although there is little data linking changes in annual rainfall amounts over recent decades, Municipalities have observed that climate change has affected rainfall patterns whereby producing more extreme variations within the rainfall patterns. Droughts and heavy downpours are perceived to happen more frequently than 50 years ago.

Despite updates to IDF (rainfall Intensity-Duration-Frequency) curves not generally indicating significant increases in rainfall or intensity, some Municipalities have increased the curves' rainfall to compensate for the uncertainties related to extreme rainfalls. The City of Barrie for example increased their IDF curves by 15% to account for climate change.

A 15% increase in the IDF curves has the effect of reducing the frequency of occurrence by approximately half. So, events that occurred, say every 10 years on average would occur every 5 years. Another way to express this would be events that occurred 10 times in 100 years might now be expected to occur 20 times.

In recognizing the future impacts of climate change, Burnside has also used the MTO IDF Curve Finder tool determine rainfall depths for the 2, 5, 10, 25, 50 and 100-year rainfall events for the SICD watershed. We have utilized these rainfall depths within the SWMHYMO hydrological model to compare peak runoff values versus the Orillia TS rain gauge as outlined in Section 4.0. The hydrological results have been outlined in Section 8.0 below.

8.0 Hydrological Modelling Results Summary

The table below summarizes the calculated 2 and 5-year peak flows at each flow node within the SICD between the Orillia TS and MTO IDF Curve Finder tool.

Table 15 Peak Flow Summary Table

FLOW NODE	FLOW NODE DESCRIPTION	Orillia TS		MTO IDF Tool	
		2-year (46.7 mm) m^3/s	5-year (60.6 mm) m^3/s	2-year (57.6 mm) m^3/s	5-year (74.4 mm) m^3/s
Node 5	Total Flow at the 5th Line	3.86	8.41	7.31	14.09
Node 4	Total Flow at the 4th Line	5.44	11.31	9.94	18.5
TLN3ND	Total Flow within Line 3 North Ditch	0.46	1.395	1.16	2.75
TLN3SD	Total Flow within Line 3 South Ditch	1.48	3.05	2.67	4.944
TLN3US	Total Flow U/S of the 3rd Line	3.17	6.57	5.78	10.82
TFN3A	Outlet to 3rd Line (Main Drain)	8.35	17.24	15.16	28.09
TMID32	Total Flow at Confluence Between Line 3 and 2	8.77	16.93	15.81	28.74
TFN2U	Total Flow Upstream of the 2nd Line	10.71	20.28	19.44	33.55
TFN2D	Total Flow Downstream of the 2nd Line	11.51	22.401	21.14	36.68
GOLFE	Total Flow to Flow Node GOLFE (Golf Course East)	11.12	19.92	20.45	36.8
GOLFN	Total Flow to Flow Node GOLFN (Golf Course North)	2.49	5.77	5.18	8.15
TGOLF	Total Flows from Golf North and Golf East	13.43	24.18	25.61	44.81
HYND	Flows from Hnydczak Drain Upstream of Highway 400	0.93	2.316	1.97	4.268
Highway400	**Total Flow at Highway 400**	**13.64**	**26.87**	**27.13**	**48.81**
TFN15L	Total Flow at the 15th Line	12.89	24.89	25.04	43.85

We note that the MTO curve finder tool has applied a rainfall factor increase to the rainfall depth account for climate change data (46.7 mm for the Orillia TS gauge versus the 57.6 mm for the MTO IDF Tool). Accordingly, a side-by-side comparison between the 2 and 5-year peak flows illustrates that the peak flows with climate change rainfall data are observed to be higher than peak flows than with the standard Orillia TS rainfall information. Further, we note that the 5-year peak flows using the Orillia TS are comparable to the 2-year peak flows using the MTO IDF Tool.

8.1 Peak Flow Comparison

The peak flows summarized in Table 1 have compared previous flows calculated for the SICD watershed. Burnside flow comparisons have now been made to those contained in reports completed by Dillon Consulting, AECOM, URS and the NVCA as shown in Table 16 below.

Table 16 Peak Flow Comparison

Return Interval	Burnside	Dillon (Pre)	Dillon (Post)	AECOM	MacLaren (NVCA)	URS 2003 (Ex.)
2-Year	13.64	27.19	26.85	-	-	-
5-Year	26.87	66.5	65.37	12.6	8.3	-
10-Year	39.41	94.24	92.7	15.6	10.3	-
25-Year	61.56	127.67	125.54	18.6	12.3	-
50-Year	77.70	-	-	22.8	15.1	22.8
100-Year	93.92	189.1	186.25	26.1	17.3	81.9
Regional	290.47	-	-	81.9	70.3	-

Note: 1. RJB flows calculated using SWMHYMO. 2. Dillon (Pre and Post) flows from Dillon HEC-RAS model (SICD_DillonOct13.prj - @ RS 1829.23). 3. AECOM flows from 'Draft Drainage and Hydrology Report -Prelim. Design Highway 400 - 1km South of 89 to the Junction of Highway 11 - Nov. 2016' (Page 14). 4. MacLaren flows provided by Glenn Switzer from NVCA. 5. URS 2003 flows from 'Drainage and Hydrology Report - Highway 400 - Highway 89 to Highway 11 - January 2003 (Page 18).

In reviewing the Dillon VO2 Output file (‘Existing – Scenario 1 – SCS Method.out’) it was noted that there were several warnings within the model. The warning ‘Travel Time Table Exceeded’ occurs in the Dillon model on almost all ‘Route Channel’ commands, which suggests that the channel is not large enough to contain peak flows from individual return events. Therefore, the travel time for flow intervals larger than the 2-year event are being severed once the flows overtop the channel bank. This is artificially shortening the travel time of each sub-watershed area. By doing so, the model is calculating peak flows arriving at their destination faster than they actually are. As travel times are shorter, this has caused peak flows within the Dillon model to be higher than perhaps they should be.

The Burnside rainfall depth in the 2-year storm is 46.70 mm, while Dillon's is 44.74 mm. We would anticipate Burnside flows to be larger than the Dillon flows given the slight increase in rainfall depth. We note that we have also used the TR-55 method for calculating the Initial Abstraction values which in turn will decrease peak flows. However, the reduction in Initial Abstraction values has proved to provide hydrological values consistent with field conditions.

The AECOM flows were taken from 'Watershed Hydrology Study for Nottawasaga – Pretty and Batteaux Rivers, Black Ash, Silver and Sturgeon Creeks, MacLaren Plansearch, 1989, at Node 1021' as provided by the NVCA.

The NVCA provided flows from the MacLaren Study, from Node 1020 at the outlet of Catchment 303. This location corresponds to the Highway 400 within the main drain of Innisfil Creek. However, we feel this is not the correct Node to be referencing from this Report as the catchment area is only 58.2 (km^2), which is much smaller than our catchment area. .

The URS Report has utilized the flows from the MacLaren Study as well, at what appears to be from Node 1021; however, there appears to be an error in their flow table. The 100-year flows in their report match that of the Regional storm from the MacLaren Study.

9.0 SICD Hydrological Summary

Sections 1.0 to 8.0 of the SICD Improvements Hydrology Report have been prepared to outline the comprehensive study Burnside has completed to support the hydrological analysis. Table 17 illustrated below provides a summary of the calculated 2-year peak flows at the Highway 400 culvert crossings based on the various hydrological methods as outlined in this Report.

Table 17 South Innisfil Creek – Hydrological Peak Flow Summary at the Highway 400 Culvert Crossings

Hydrological Analysis	2-year Peak Flow (m^3/s)
Frequency, Regional Watershed, Index Flood and Classification Method - Geometric Mean	12.8
SWMHYMO Non-Calibrated Model	**13.64**
SWMHYMO Calibrated Model	16.30

As outlined in Section 4.3, a calculated peak flow variance at the Highway 400 Crossings should be anticipated to be ±5 m^3/s. Based on the peak flows as outlined in Table 17 above, we have been able to provide a flow variance of 3.5 m^3/s (16.30 m^3/s –

12.80 m^3/s) based on the hydrological analysis methods presented above. Therefore, we believe that the hydrological analysis of the SICD watershed as presented in this Report accurately represents field conditions to the best extent possible based on the available information at the time of writing. Given that the calculated peak flow variance resides within an acceptable tolerance, and given that the Innisfil Creek at 5SD Inni rain gauge is not a provincially-regulated rain gauge for calibration purposes, we have elected to use the non-calibrated SWMHYMO 2-year model and associated peak flows for the design of the proposed drain improvements.

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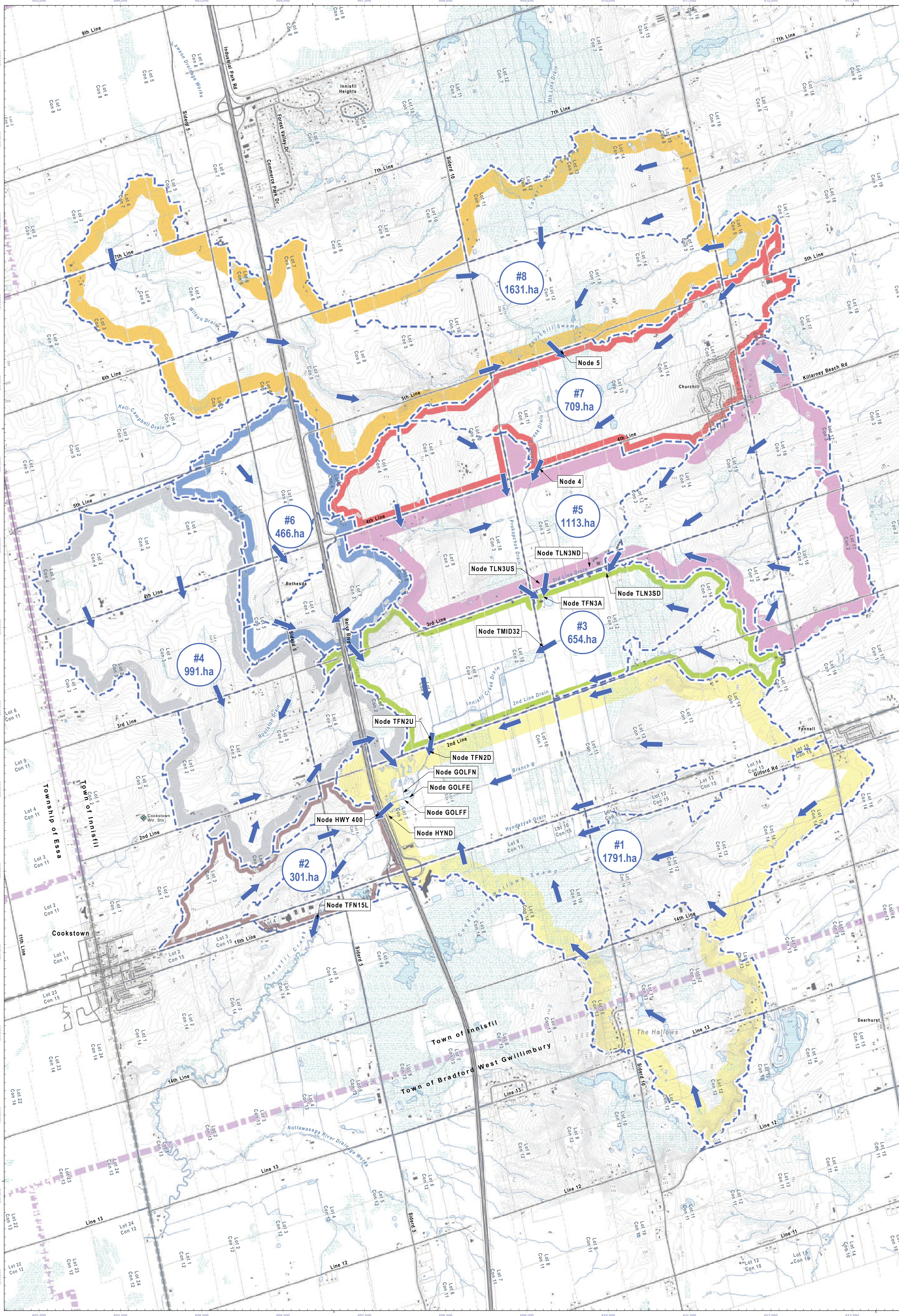
Appendix A

Appendix A

Figures



Notes:

1. Terrain Model created using photogrammetric data acquired during orthophot collection mission.
2. Catchment Delineation conducted using ArcHydro/ArcGIS software.
3. All measurments are in metric. Area measurments shown in hectares. Hectare to Acre conversion factor is *2.47105

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983 CSRS	
Coord. System: NAD 1983 CSRS UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N
Grid North

0 500 1,000 1,500 2,000
Metres

General Direction of Flow
Sub-Catchment Boundary
Catchment Grouping #1
Catchment Grouping #2
Catchment Grouping #3
Catchment Grouping #4
Catchment Grouping #5
Catchment Grouping #6
Catchment Grouping #7
Catchment Grouping #8

BURNSIDE

Client

TOWN OF INNISFIL

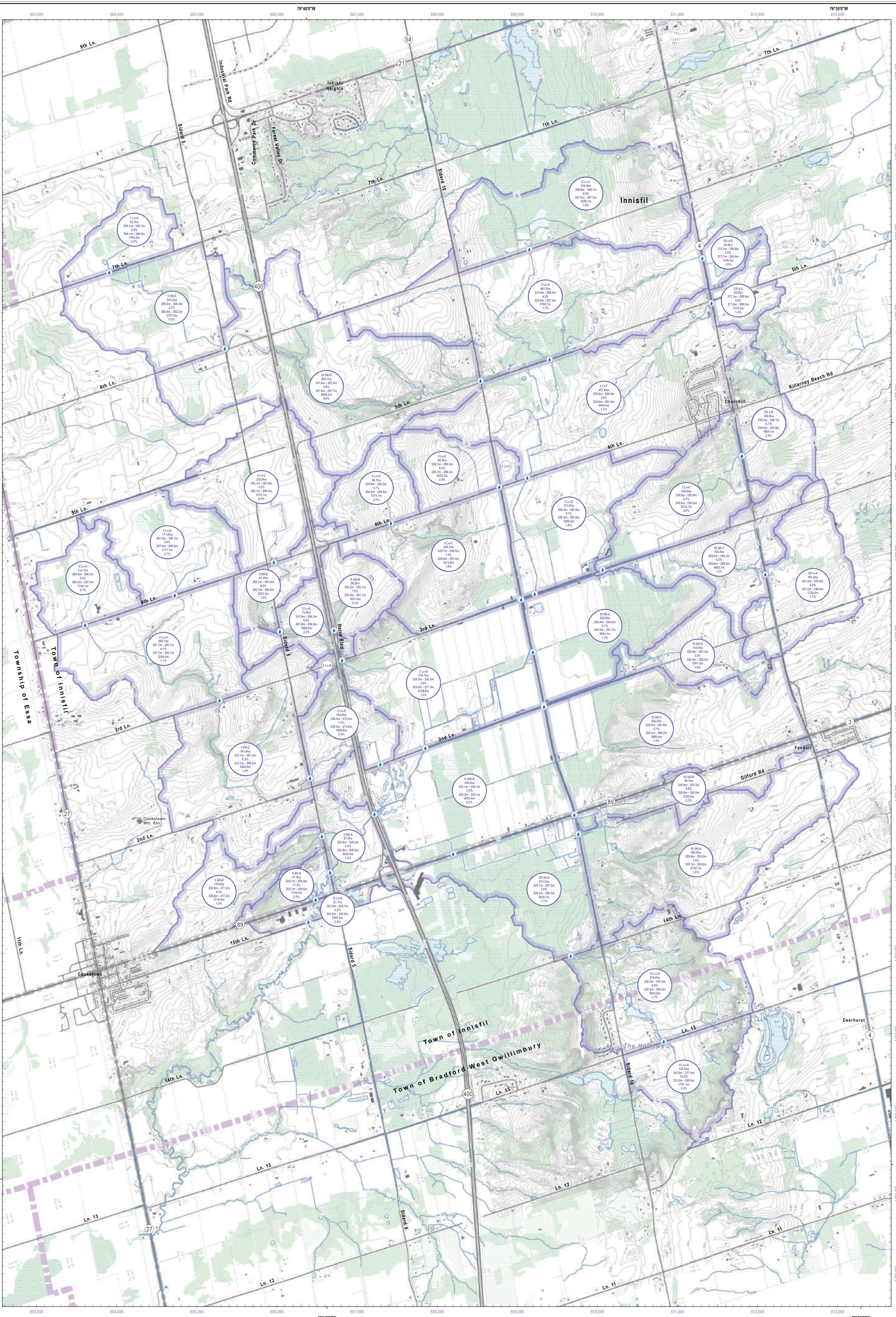
Map Title

SOUTH INNISFIL CREEK DRAIN

SUB-CATCHMENTS

Drawn	Checked	Date	Map No.
PS	TL	2018/02/22	1/1
Scale		Project No.	
H 1:20,000		300028790	

File Path: D:\GIS\Project\038790 (South Innisfil Creek)\ArcHydroAnalysis\Map\038790 Sub-Catchment Map 2 20k.mxd Print Date: 2018/02/22 Time: 11:09 AM



Notes:

1. Terrain Model created using photogrammetric data acquired during orthophot collection mission.
2. Catchment Deliniation conducted using ArcHydro/ArcGIS software.
3. All measurments are in metric. Area measurments shown in hectares. Hectare to Acre conversion factor is *2.47105

Disclaimer:

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This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983 CSRS	
Coord. System: NAD 1983 CSRS UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N

Grid North

0 500 1,000 1,500 2,000

Metres

Catchment Outlet (ArcHydro)

Catchment (ArcHydro Model)

G — Catchment ID
92.6ha — Catchment Area
487.1m - 517.2m — Catchment Low / High Elevation (1)
2.4% — Average Catchment Percent Slope (1)(4)
487.1m - 514.5m — Longest Flow Path Low / Hight Elevation (1)
2649.6m — Longest Flow Path Length (1)(5)
1.5% — Longest Flow Path Percent Slope (1)(3)

(1) Values based on model values.
(2) Values based on surveyed values.
(3) Calculated using linear Rise/Run.
(4) Calculated using weighted average.
(5) Based on 2D measurments.
(6) Based on 3D measurments.

BURNSIDE

Client

TOWN OF INNISFIL

Map Title

SOUTH INNISFIL CREEK DRAIN

SUB-CATCHMENTS (DRAFT)

Drawn	Checked	Date	Map No.
PS	TL	2018/01/19	1/1
Scale		Project No.	
H 1:20,000		300028790	

File Path: D:\GIS\Project\038790 (South Innisfil Creek)\ArcHydroAnalysis\Map\038790 Sub-Catchment Map 20k.mxd Print Date: 2018/01/19 Time: 10:53 AM

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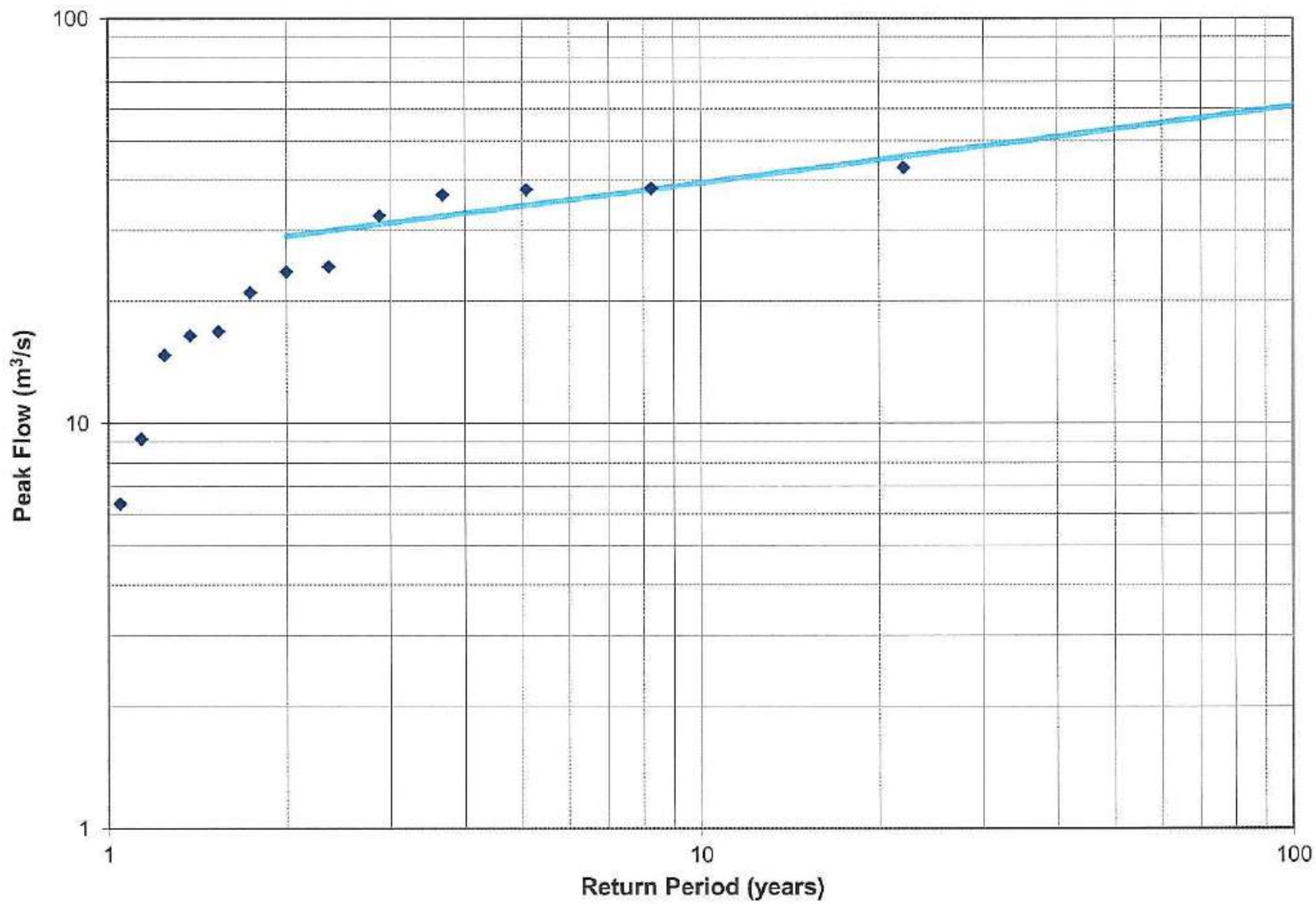
Appendix B

Hydrometric Analysis

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1964	6.34	13	1.0
1965	36.8	4	3.7
1966	9.17	12	1.1
1967	16.8	9	1.5
1968	23.7	7	2.0
1969	24.4	6	2.4
1970	16.4	10	1.4
1971	14.7	11	1.2
1972	43	1	22.0
1973	21	8	1.7
1975	38.2	2	8.3
1976	32.6	5	2.9
1978	37.9	3	5.1
✓	n= 13	13	max rank

Frequency Analysis

PEAK Freq analysis 02ED004 Bailey Ck at Beeton.xlsx]main



Watershed= 207 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	23.7	29.0
1:5	37.8	34.5
1:10	39.1	39.4
1:25	n/a	46.9
1:50	n/a	53.5
1:100	n/a	61.1

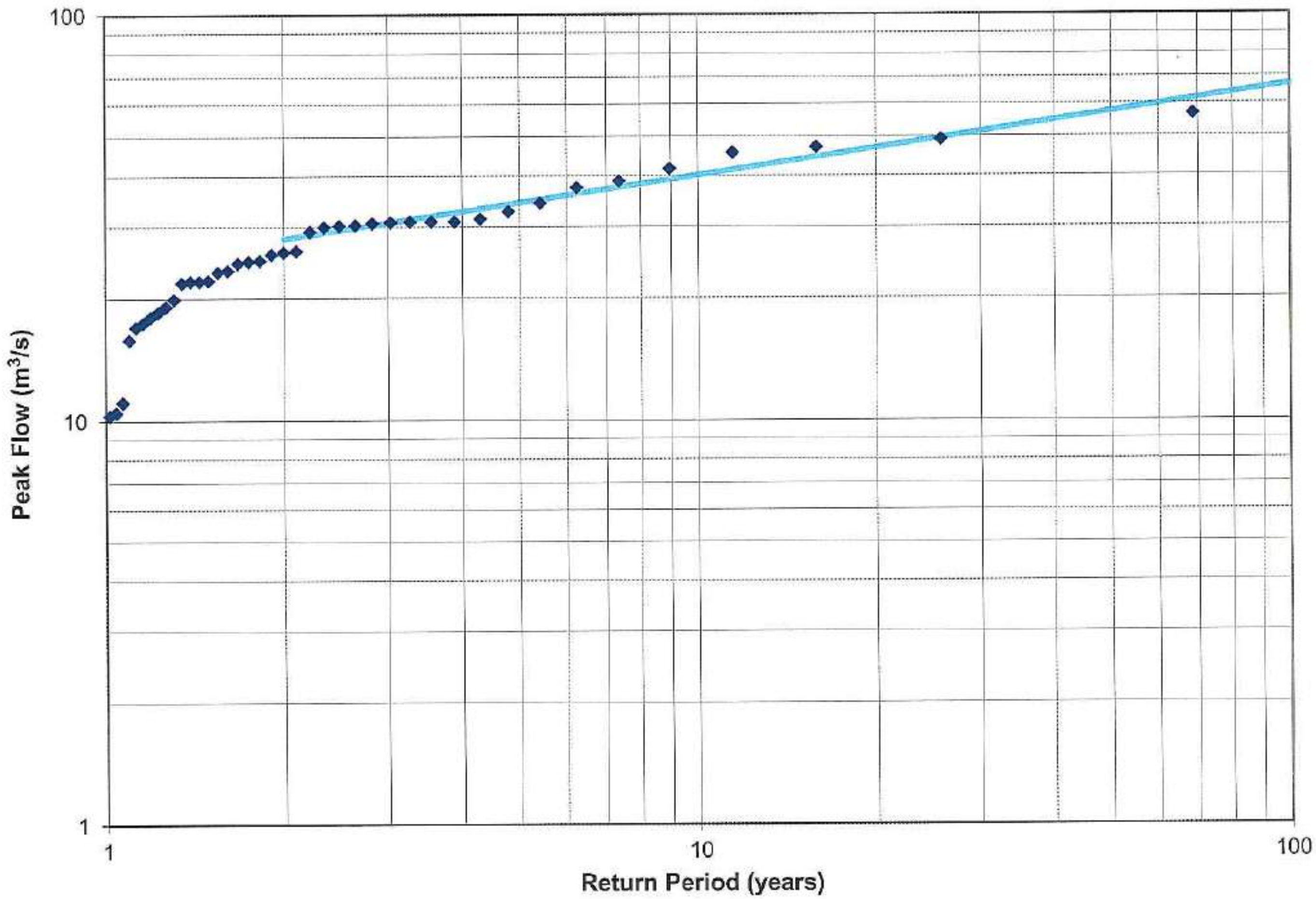
best fit equation

$Q = 25.42\ R_t^{\,0.190}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1968	30.9	13	3.3
1969	37.4	7	6.2
1970	30.9	12	3.6
1971	23.4	26	1.6
1972	41.6	5	9.0
1973	30.3	16	2.6
1974	30.6	15	2.8
1975	56.6	1	68.7
1976	34.3	8	5.4
1977	47.0	3	15.8
1978	17.4	36	1.2
1979	26.0	21	2.0
1981	30.9	11	3.9
1982	24.7	24	1.7
1983	11.1	39	1.1
1984	26.2	20	2.1
1985	30.8	14	3.0
1986	22.0	30	1.4
1987	18.0	35	1.2
1988	18.5	34	1.2
1989	45.6	4	11.4
1990	24.8	23	1.8
1991	32.7	9	4.8
1992	21.8	31	1.3
1993	25.7	22	1.9
1994	10.5	40	1.0
1996	22.0	29	1.4
1997	24.4	25	1.7
1998	30.2	17	2.5
1999	31.4	10	4.3
2000	30.0	18	2.3
2001	23.2	27	1.5
2002	17.0	37	1.1
2003	19.1	33	1.3
2006	15.8	38	1.1
2007	22.1	28	1.5
2008	49.1	2	25.8
2009	38.8	6	7.4
2011	19.9	32	1.3
2014	29.2	19	2.2
2015	10.3	41	1.0
✓	n= 41	41	max rank

Frequency Analysis

PEAK Freq analysis 02ED007 Coldwater Ck.xlsx]main



Watershed= 168 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	26.0	28.1
1:5	33.2	34.4
1:10	43.4	40.1
1:25	49.0	49.2
1:50	54.1	57.4
1:100	n/a	67.0

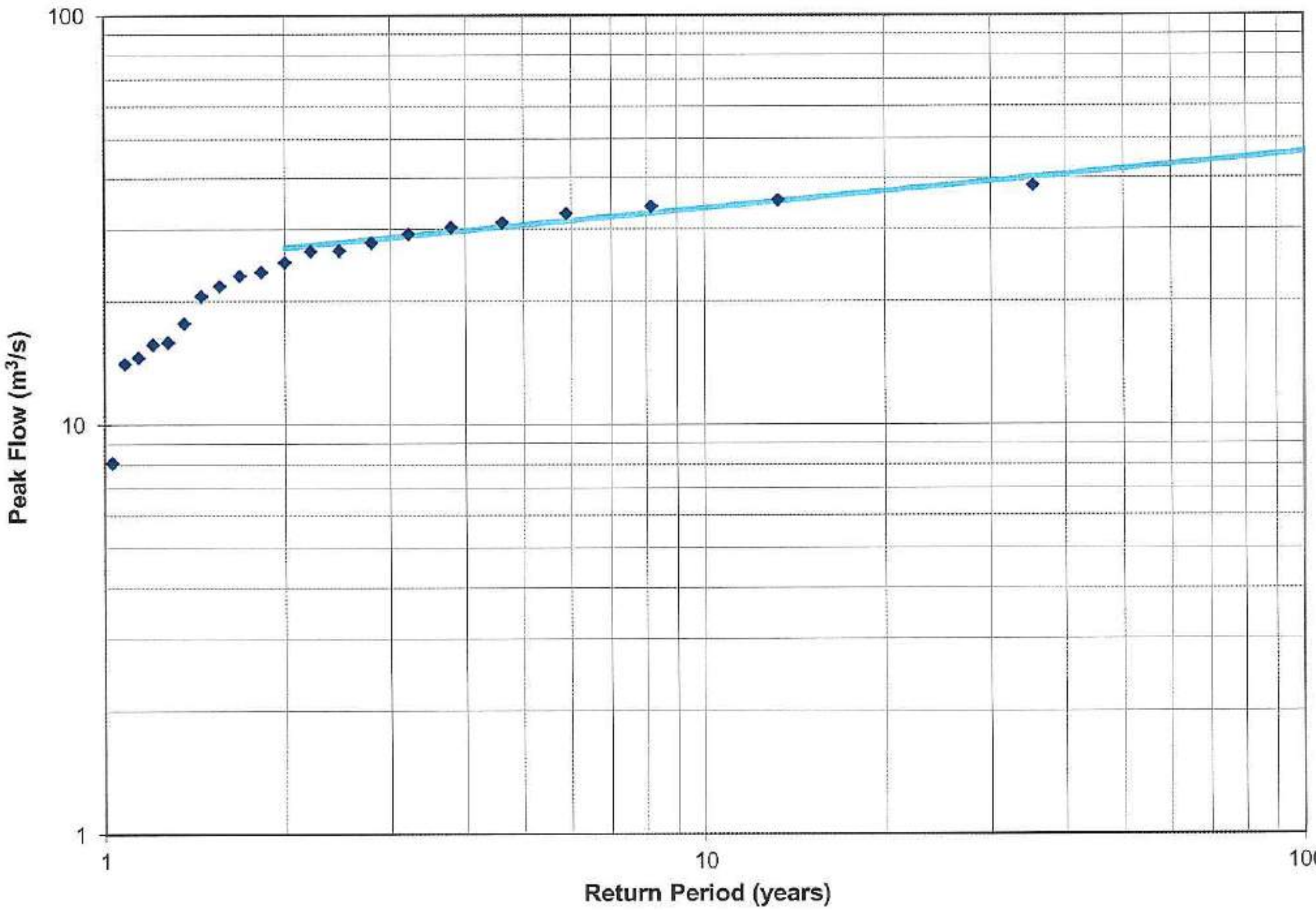
best fit equation

$Q = 24.04\ R_t^{\,0.222}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1973	23.6	12	1.8
1974	26.6	9	2.5
1975	30.3	6	3.8
1976	31.1	5	4.6
1977	29.2	7	3.2
1978	15.7	18	1.2
1979	26.5	10	2.2
1980	35.3	2	13.3
1981	21.8	14	1.6
1982	20.6	15	1.5
1983	8.1	21	1.0
1984	14.1	20	1.1
1985	23.1	13	1.7
1986	34.1	3	8.2
1987	14.6	19	1.1
1988	24.9	11	2.0
1989	38.3	1	35.3
1990	27.8	8	2.8
1991	32.7	4	5.9
1992	15.9	17	1.3
1993	17.7	16	1.4
✓	n= 21	21	max rank

Frequency Analysis

Freq analysis 02ED009 Willow at Lake.xlsx]main



Watershed= 94.8 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	24.9	27.1
1:5	31.6	30.7
1:10	34.6	33.7
1:25	37.2	38.3
1:50	n/a	42.1
1:100	n/a	46.3

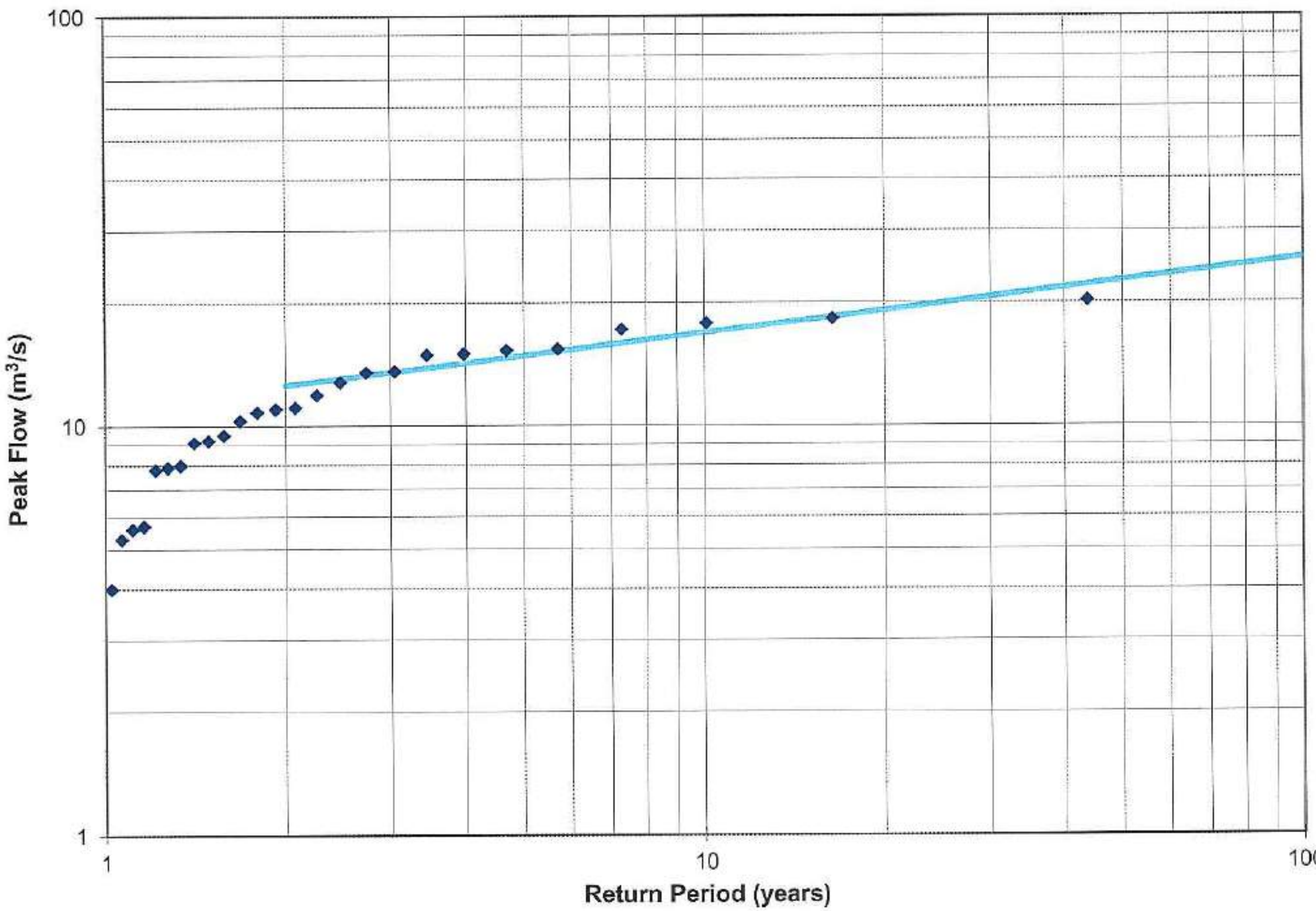
best fit equation

$Q = 24.62\ R_t^{\ 0.137}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1973	13.5	10	2.7
1974	12.8	11	2.5
1975	18.3	2	16.4
1976	17.2	4	7.3
1977	20.2	1	43.7
1978	10.8	15	1.8
1979	15.0	7	4.0
1980	10.3	16	1.7
1981	15.3	6	4.7
1982	13.6	9	3.0
1983	4.0	26	1.0
1984	5.7	23	1.2
1985	11.1	13	2.1
1986	9.1	19	1.4
1987	9.2	18	1.5
1988	9.5	17	1.6
1989	17.8	3	10.1
1990	14.9	8	3.4
1991	11.0	14	1.9
1992	5.6	24	1.1
1993	11.9	12	2.3
1994	5.3	25	1.1
1995	7.9	21	1.3
1996	8.0	20	1.3
1997	15.4	5	5.7
1998	7.8	22	1.2
✓	n= 26	26	max rank

Frequency Analysis

PEAK Freq analysis 02ED010 Willow Ck at Midhurst.xlsx]main



Watershed= 127 km^2

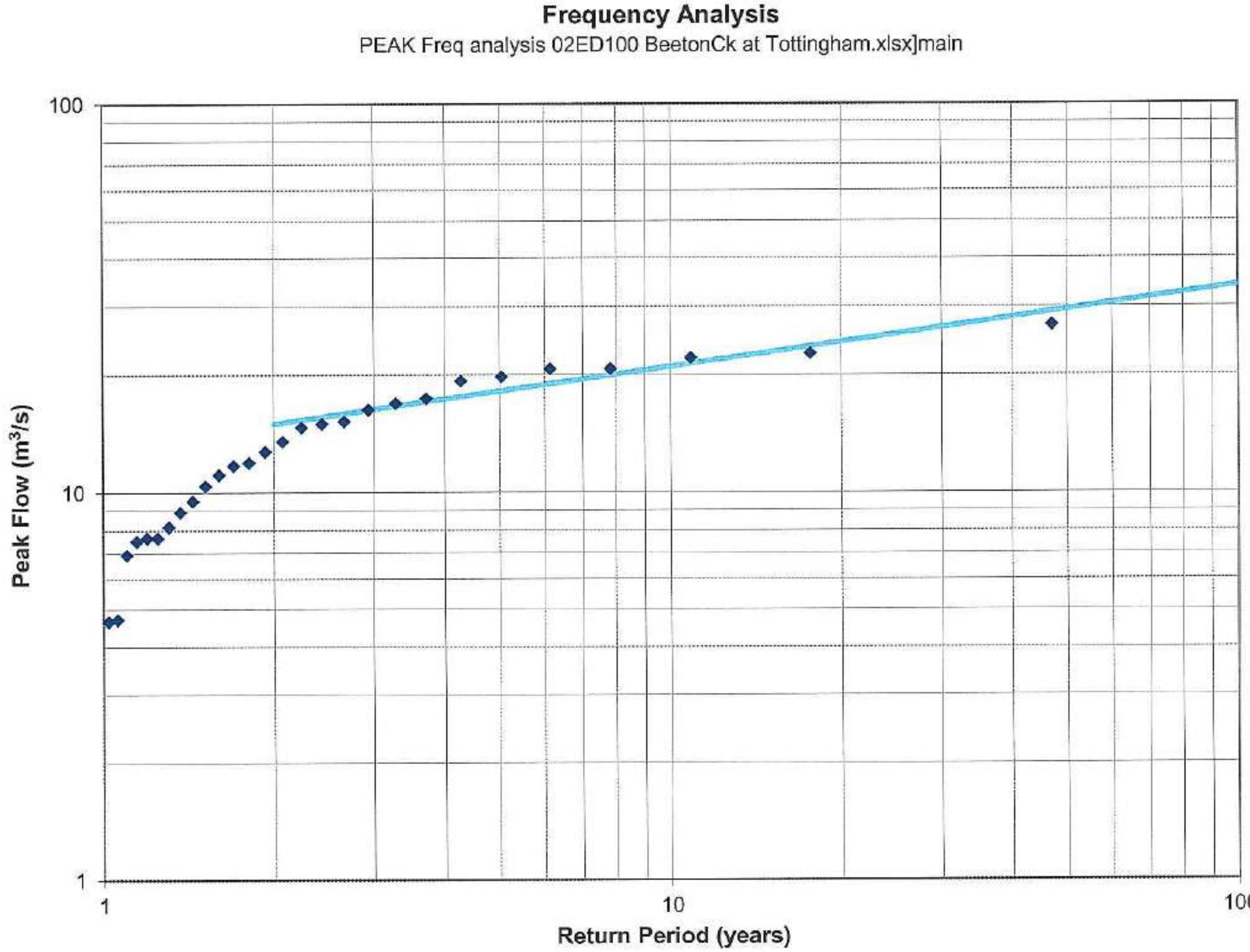
$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	11.0	12.6
1:5	15.3	14.9
1:10	17.8	16.9
1:25	19.1	19.9
1:50	n/a	22.7
1:100	n/a	25.7

best fit equation

$Q = 11.06\ R_t^{\ 0.183}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1970	6.91	26	1.1
1971	7.65	24	1.2
1972	19.8	6	5.0
1973	8.89	21	1.4
1974	22.7	2	17.6
1975	16.3	10	2.9
1976	9.51	20	1.4
1977	13.5	14	2.1
1978	14.7	13	2.2
1982	15	12	2.4
1983	7.51	25	1.1
1984	16.9	9	3.3
1997	20.7	5	6.1
1998	11.9	16	1.8
2000	26.9	1	47.0
2001	4.71	27	1.1
2002	15.2	11	2.7
2004	20.7	4	7.8
2006	12.7	15	1.9
2007	7.65	23	1.2
2008	22.1	3	10.8
2009	17.4	8	3.7
2011	11.1	18	1.6
2012	8.17	22	1.3
2013	19.3	7	4.3
2014	11.7	17	1.7
2015	4.65	28	1.0
2016	10.4	19	1.5
✓	n= 28	28	max rank



Watershed= 86 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	13.1	15.0
1:5	19.8	18.2
1:10	21.7	21.0
1:25	24.1	25.5
1:50	n/a	29.5
1:100	n/a	34.1

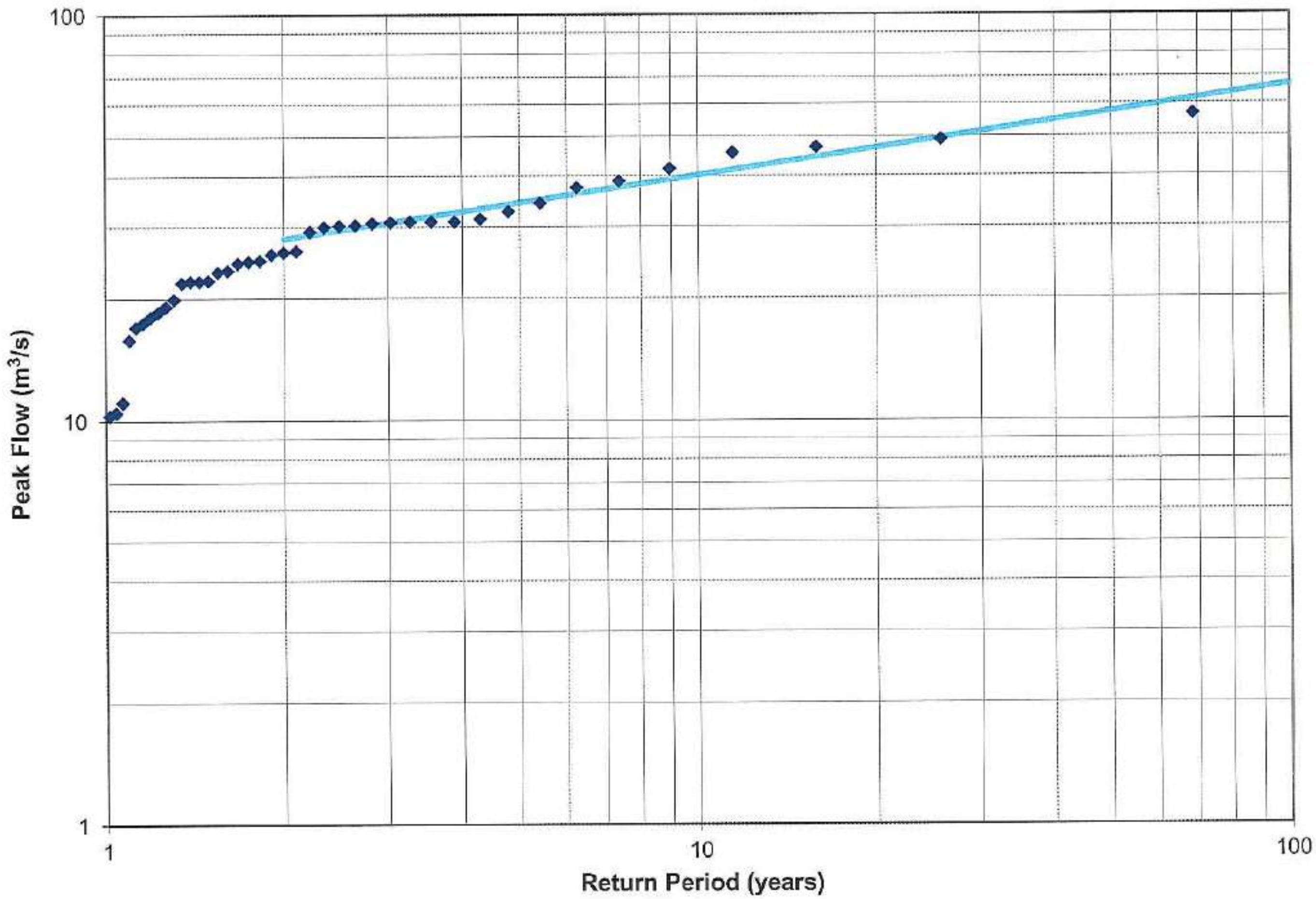
best fit equation

$Q = 12.98\ R_t^{\ 0.209}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1968	30.9	13	3.3
1969	37.4	7	6.2
1970	30.9	12	3.6
1971	23.4	26	1.6
1972	41.6	5	9.0
1973	30.3	16	2.6
1974	30.6	15	2.8
1975	56.6	1	68.7
1976	34.3	8	5.4
1977	47.0	3	15.8
1978	17.4	36	1.2
1979	26.0	21	2.0
1981	30.9	11	3.9
1982	24.7	24	1.7
1983	11.1	39	1.1
1984	26.2	20	2.1
1985	30.8	14	3.0
1986	22.0	30	1.4
1987	18.0	35	1.2
1988	18.5	34	1.2
1989	45.6	4	11.4
1990	24.8	23	1.8
1991	32.7	9	4.8
1992	21.8	31	1.3
1993	25.7	22	1.9
1994	10.5	40	1.0
1996	22.0	29	1.4
1997	24.4	25	1.7
1998	30.2	17	2.5
1999	31.4	10	4.3
2000	30.0	18	2.3
2001	23.2	27	1.5
2002	17.0	37	1.1
2003	19.1	33	1.3
2006	15.8	38	1.1
2007	22.1	28	1.5
2008	49.1	2	25.8
2009	38.8	6	7.4
2011	19.9	32	1.3
2014	29.2	19	2.2
2015	10.3	41	1.0
✓	n= 41	41	max rank

Frequency Analysis

PEAK Freq analysis 02ED007 Coldwater Ck.xlsx]main



Watershed= 168 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	26.0	28.1
1:5	33.2	34.4
1:10	43.4	40.1
1:25	49.0	49.2
1:50	54.1	57.4
1:100	n/a	67.0

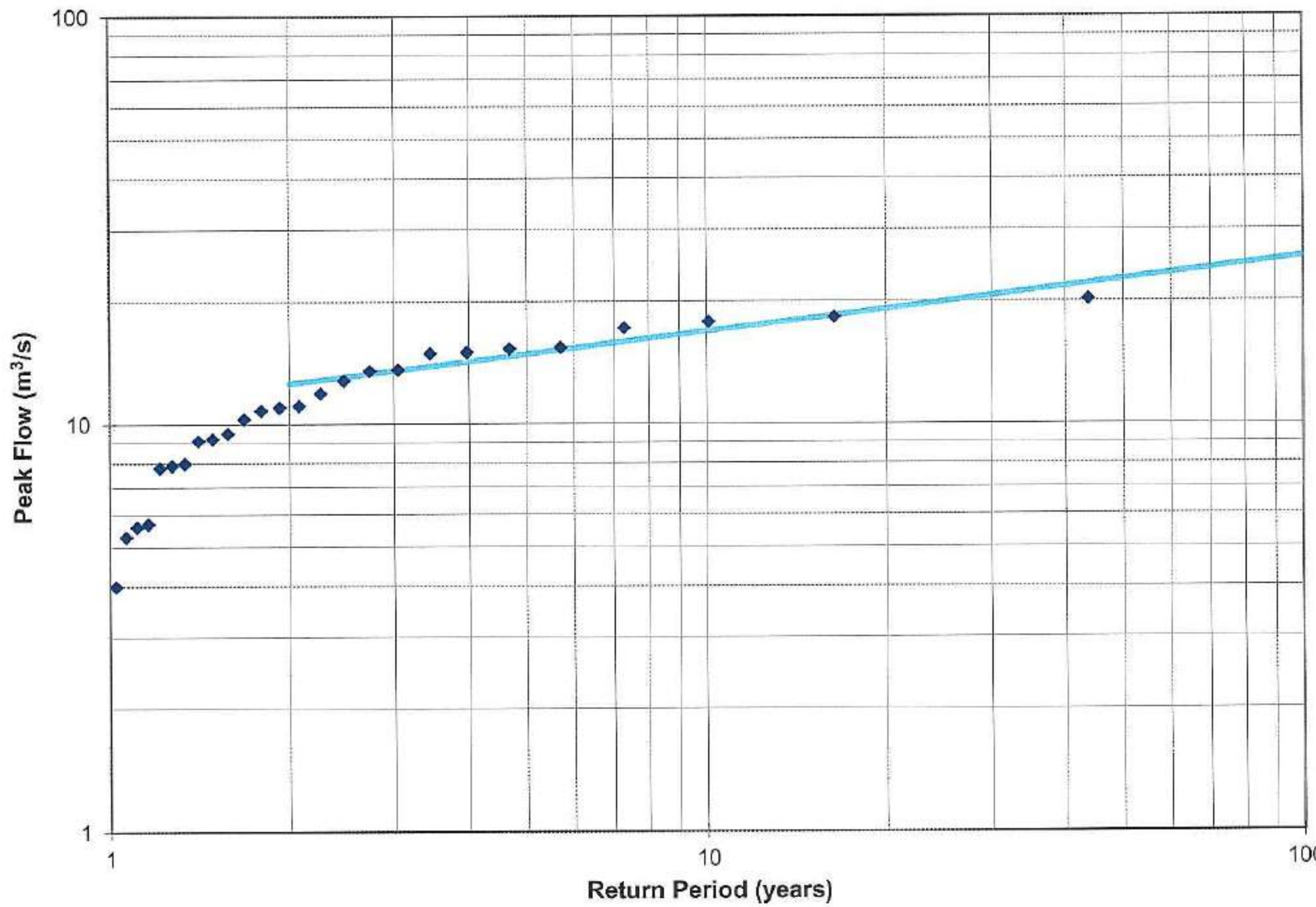
best fit equation

$Q = 24.04\ R_t^{\ 0.222}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1973	13.5	10	2.7
1974	12.8	11	2.5
1975	18.3	2	16.4
1976	17.2	4	7.3
1977	20.2	1	43.7
1978	10.8	15	1.8
1979	15.0	7	4.0
1980	10.3	16	1.7
1981	15.3	6	4.7
1982	13.6	9	3.0
1983	4.0	26	1.0
1984	5.7	23	1.2
1985	11.1	13	2.1
1986	9.1	19	1.4
1987	9.2	18	1.5
1988	9.5	17	1.6
1989	17.8	3	10.1
1990	14.9	8	3.4
1991	11.0	14	1.9
1992	5.6	24	1.1
1993	11.9	12	2.3
1994	5.3	25	1.1
1995	7.9	21	1.3
1996	8.0	20	1.3
1997	15.4	5	5.7
1998	7.8	22	1.2
✓	n= 26	26	max rank

Frequency Analysis

PEAK Freq analysis 02ED010 Willow Ck at Midhurst.xlsx]main



Watershed= 127 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	11.0	12.6
1:5	15.3	14.9
1:10	17.8	16.9
1:25	19.1	19.9
1:50	n/a	22.7
1:100	n/a	25.7

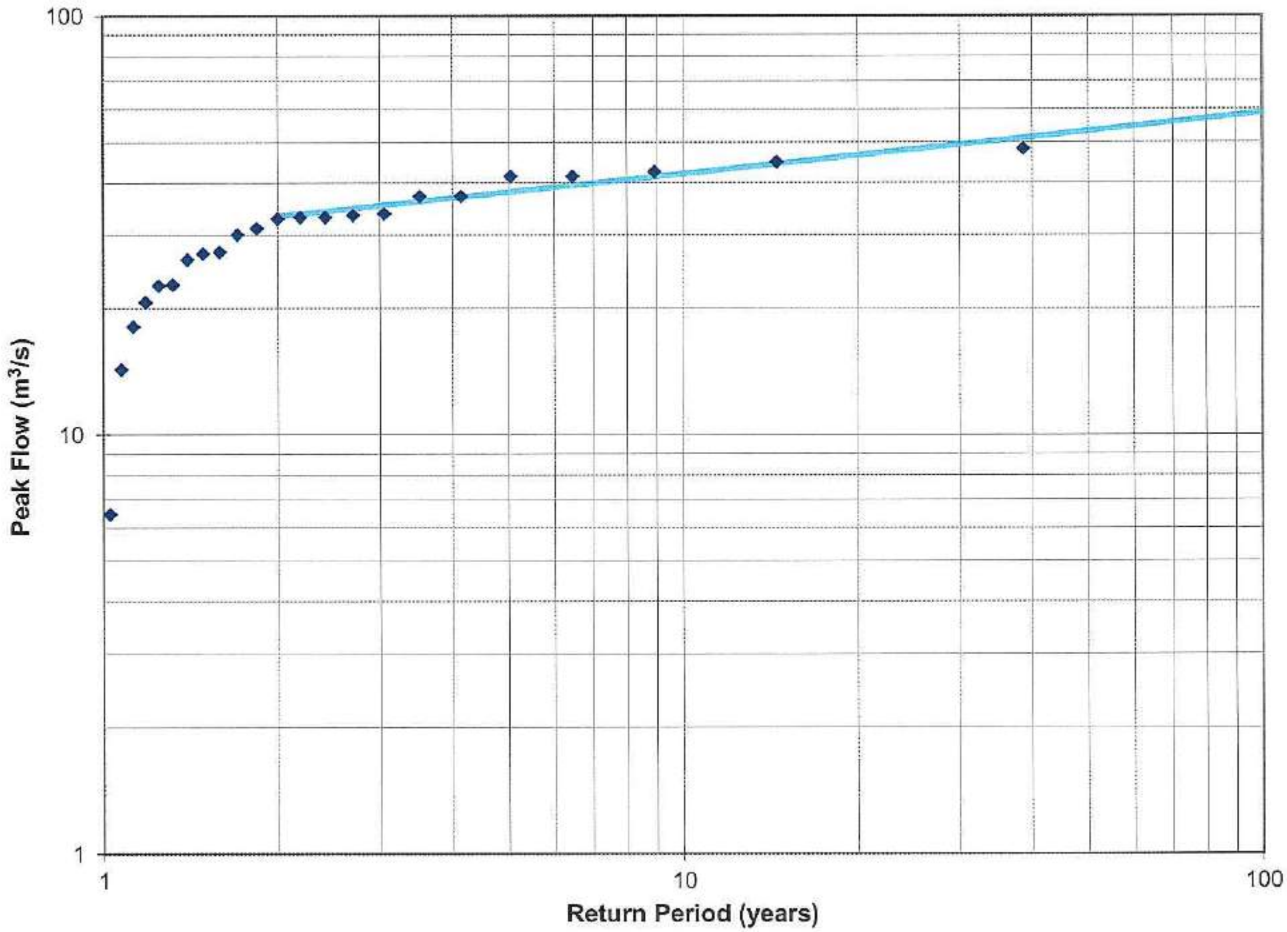
best fit equation

$Q = 11.06 \ R_t^{\ 0.183}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1970	31.1	13	1.8
1971	22.7	19	1.2
1972	32.8	12	2.0
1973	33.1	11	2.2
1974	42.5	3	8.9
1975	37.1	7	3.5
1976	33.1	10	2.4
1978	27.1	16	1.5
1998	44.9	2	14.5
1999	6.5	23	1.0
2000	48.3	1	38.7
2001	22.8	18	1.3
2002	14.3	22	1.1
2005	20.7	20	1.2
2006	33.4	9	2.7
2008	41.5	5	5.0
2009	37.1	6	4.1
2011	33.7	8	3.1
2012	30.1	14	1.7
2013	26.2	17	1.4
2014	41.5	4	6.4
2015	18.1	21	1.1
2016	27.3	15	1.6
✓	n= 23	23	max rank

Frequency Analysis

PEAK Freq analysis 02ED101 Nottawasaga at Alliston.xlsx]main



Watershed= 328 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	32.8	33.3
1:5	41.3	38.0
1:10	43.1	42.1
1:25	46.8	48.1
1:50	n/a	53.2
1:100	n/a	58.8

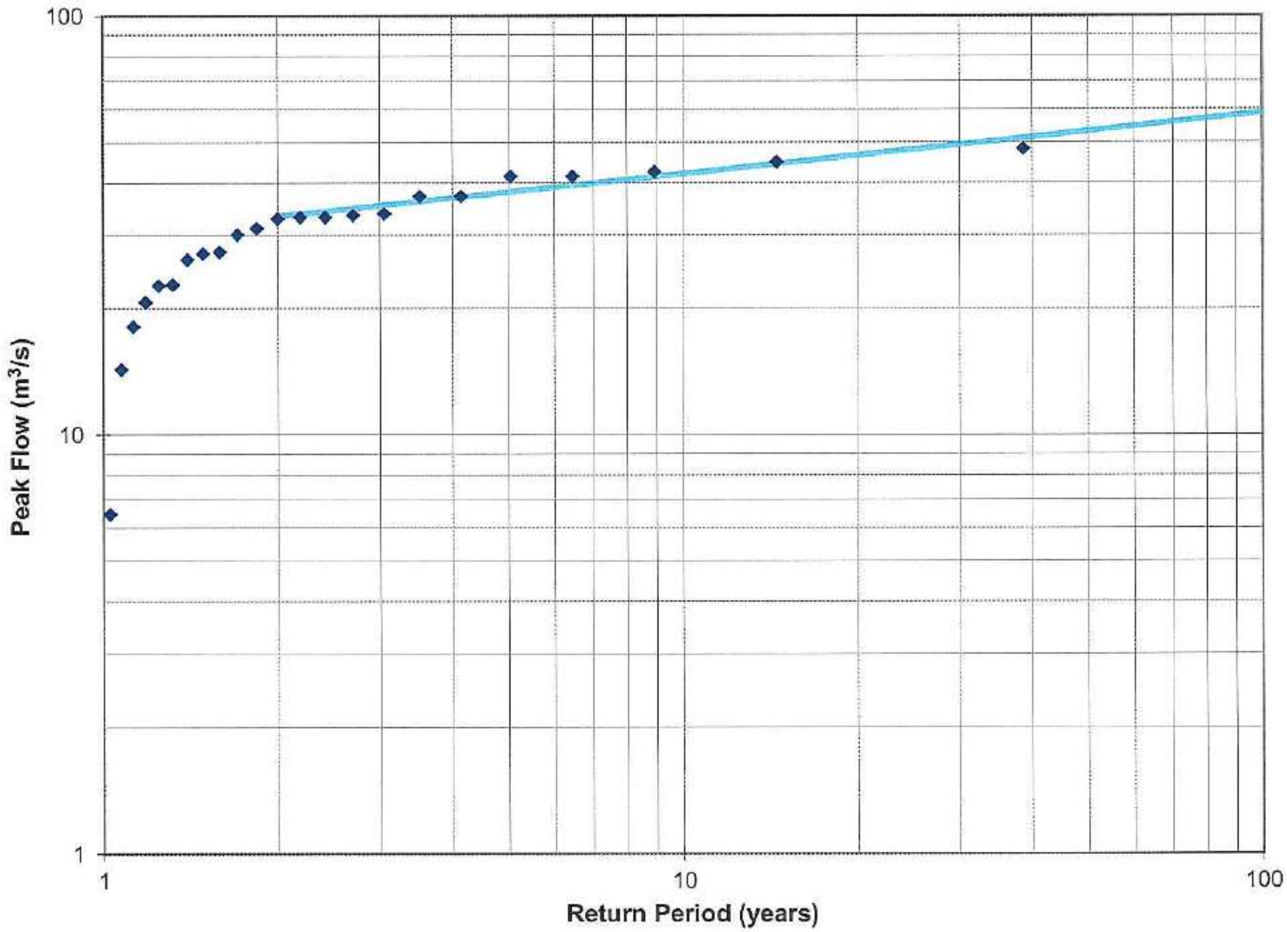
best fit equation

$Q = 30.11\ R_t^{\ 0.145}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1970	31.1	13	1.8
1971	22.7	19	1.2
1972	32.8	12	2.0
1973	33.1	11	2.2
1974	42.5	3	8.9
1975	37.1	7	3.5
1976	33.1	10	2.4
1978	27.1	16	1.5
1998	44.9	2	14.5
1999	6.5	23	1.0
2000	48.3	1	38.7
2001	22.8	18	1.3
2002	14.3	22	1.1
2005	20.7	20	1.2
2006	33.4	9	2.7
2008	41.5	5	5.0
2009	37.1	6	4.1
2011	33.7	8	3.1
2012	30.1	14	1.7
2013	26.2	17	1.4
2014	41.5	4	6.4
2015	18.1	21	1.1
2016	27.3	15	1.6
✓	n= 23	23	max rank

Frequency Analysis

PEAK Freq analysis 02ED101 Nottawasaga at Alliston.xlsx]main



Watershed= 328 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	32.8	33.3
1:5	41.3	38.0
1:10	43.1	42.1
1:25	46.8	48.1
1:50	n/a	53.2
1:100	n/a	58.8

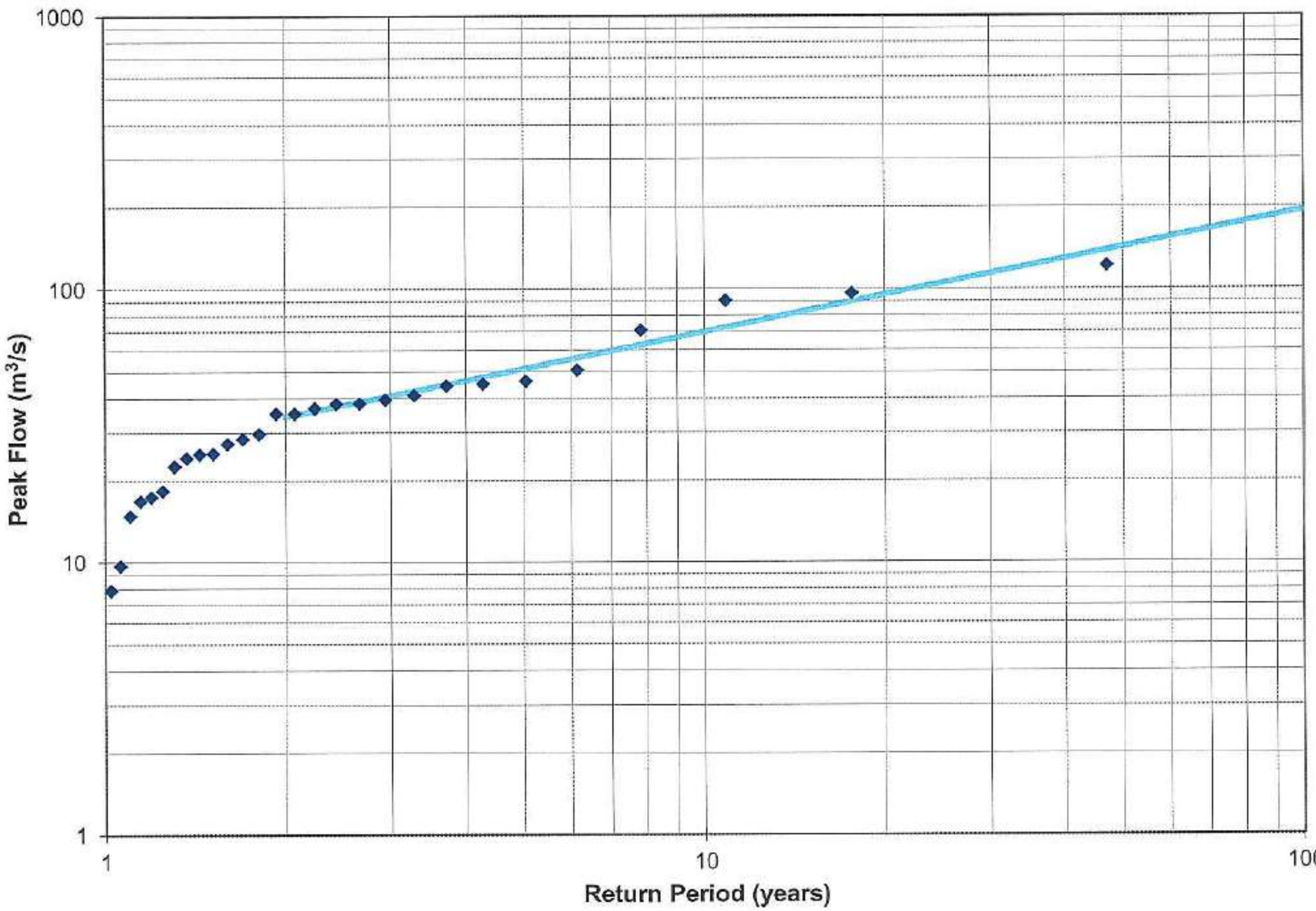
best fit equation

$Q= 30.11\ R_t^{\ 0.145}$

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
1970	41.1	9	3.3
1971	39.6	10	2.9
1972	45.3	7	4.3
1973	29.7	16	1.8
1974	96.3	2	17.6
1975	122.0	1	47.0
1976	90.6	3	10.8
1977	46.4	6	5.0
1978	25.1	19	1.5
1981	24.2	21	1.4
1982	70.8	4	7.8
1983	9.7	27	1.1
1985	28.5	17	1.7
1997	35.3	15	1.9
1998	50.8	5	6.1
1999	7.9	28	1.0
2000	44.6	8	3.7
2001	25.0	20	1.4
2002	14.8	26	1.1
2006	35.3	14	2.1
2007	18.3	23	1.2
2008	38.2	12	2.4
2009	38.3	11	2.7
2011	27.3	18	1.6
2012	17.4	24	1.2
2013	22.6	22	1.3
2014	36.9	13	2.2
2015	16.8	25	1.1
✓	n= 28	28	max rank

Frequency Analysis

PEAK Freq analysis 02ED102 Boyne at Earl Rowe Pk.xlsx]main



Watershed= 216 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

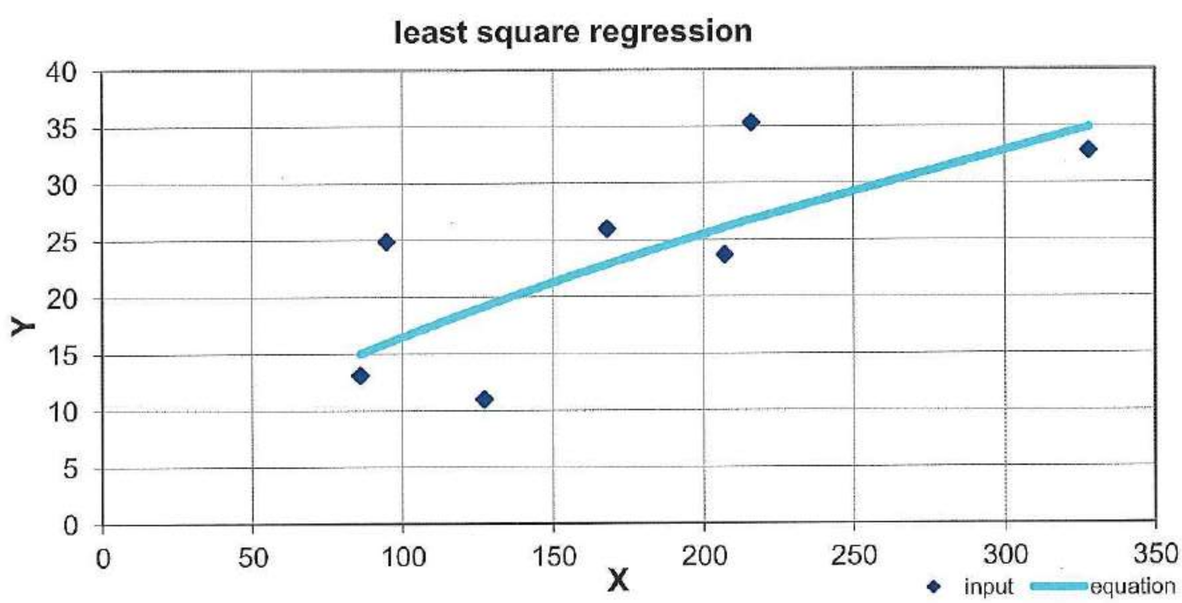
R_t	Q m^3/s	equat'n
1:2	35.3	34.2
1:5	46.4	51.4
1:10	85.2	69.9
1:25	104.8	105.0
1:50	n/a	142.8
1:100	n/a	194.2

best fit equation

$Q= 25.16\ R_t^{\ 0.444}$

Area x	1:2yr Q_p y	equation results	fit	Ln X	Ln X^2	Ln Y	Ln X*Ln Y	# data pts
207.0	23.7	26.1	110%	5.333	28.438	3.165	16.881	1
168.0	26.0	22.9	88%	5.124	26.255	3.258	16.694	1
94.8	24.9	16.0	64%	4.552	20.719	3.215	14.633	1
127.0	11.0	19.2	174%	4.844	23.466	2.398	11.616	1
86.0	13.1	15.0	115%	4.454	19.841	2.573	11.459	1
328.0	32.8	34.9	106%	5.793	33.559	3.490	20.220	1
216.0	35.3	26.8	76%	5.375	28.894	3.564	19.157	1
								0
								0
								0
								0
								0
								0
								0
								0
								0
								0
								0
								0
								0
expon = 0.630 coeff = 0.9073			sum=	35.475	181.171	21.663	110.660	7

02ED004	Bailey Ck near Beeton	207 km^2	23.7 m^3/s	Regulated
02ED007	Coldwater R at Coldwater	168 km^2	26.0 m^3/s	Natural
02ED009	Willow Ck above Little Lake	94.8 km^2	24.9 m^3/s	Natural
02ED010	Willow Ck at Midhurst	127 km^2	11.0 m^3/s	Natural
02ED100	Nottawasaga R near Tottingham	86.0 km^2	13.1 m^3/s	Regulated
02ED101	Nottawasaga R near Alliston	328 km^2	32.8 m^3/s	Natural
02ED102	Boyne R at Earl Rowe Pk	216 km^2	35.3 m^3/s	Natural



$$Y = 0.9073\ X^{0.630}$$

13.5 m^3/s from 72.9 km^2 South Innisfil Ck at Hwy 400

Annual Maximum and Minimum Instantaneous Discharge Data for
WILLOW CREEK ABOVE LITTLE LAKE (02ED009) [ON]

Maximum Instantaneous Discharge — 94.8 km2

Date/Time	Value (m^3/s)	Year	Q_p
3/12/1973 0:39	23.6 B	1973	23.6
4/4/1974 8:06	26.6	1974	26.6
4/19/1975 7:39	30.3	1975	30.3
3/25/1976 19:33	31.1	1976	31.1
3/13/1977 21:17	29.2 B	1977	29.2
4/11/1978 20:55	15.7	1978	15.7
3/24/1979 22:31	26.5	1979	26.5
3/21/1980 20:24	35.3	1980	35.3
2/23/1981 23:15	21.8	1981	21.8
4/1/1982 3:21	20.6	1982	20.6
4/10/1983 13:31	8.09	1983	8.09
12/29/1984 11:31	14.1	1984	14.1
3/29/1985 0:28	23.1	1985	23.1
9/12/1986 3:36	34.1	1986	34.1
4/5/1987 10:38	14.6	1987	14.6
3/26/1988 23:32	24.9	1988	24.9
3/29/1989 1:23	38.3 E	1989	38.3
3/13/1990 23:52	27.8	1990	27.8
4/9/1991 4:58	32.7	1991	32.7
11/13/1992 6:26	15.9	1992	15.9
1/5/1993 10:21	17.7	1993	17.7
1994			
1995			

Annual Maximum and Minimum Instantaneous Discharge Data for
NOTTAWASAGA RIVER NEAR ALLISTON (02ED101) [ON]

Maximum Instantaneous Discharge — 328 km2

Date/Time	Value (m^3/s)	Year	Q_p
1967			
1968			
1969			
4/9/1970 1:30	31.1 E	1970	31.1
4/13/1971 19:00	22.7 E	1971	22.7
4/19/1972 10:26	32.8 E	1972	32.8
3/8/1973 11:12	33.1	1973	33.1
3/5/1974 14:19	42.5	1974	42.5
4/19/1975 17:11	37.1	1975	37.1
3/21/1976 15:39	33.1	1976	33.1
1977			
4/12/1978 6:53	27.1	1978	27.1
1997			
3/28/1998 6:15	44.9	1998	44.9
11/3/1999 9:31	6.5	1999	6.5
6/26/2000 0:30	48.3	2000	48.3
4/9/2001 12:31	22.8	2001	22.8
4/9/2002 18:01	14.3	2002	14.3
2003			
2004			
1/14/2005 9:30	20.7	2005	20.7

Annual Maximum and Minimum Instantaneous Discharge Data for
BOYNE RIVER AT EARL ROWE PARK (02ED102) [ON]

Maximum Instantaneous Discharge — 216 km2

Date/Time	Value (m^3/s)	Year	Q_p
1967			
1968			
1969			
4/8/1970 22:30	41.1	1970	41.1
4/13/1971 10:00	39.6 E	1971	39.6
4/19/1972 6:37	45.3 E	1972	45.3
3/8/1973 16:12	29.7	1973	29.7
3/5/1974 2:00	96.3	1974	96.3
4/19/1975 12:50	122.0	1975	122.0
3/22/1976 11:45	90.6	1976	90.6
3/13/1977 17:15	46.4	1977	46.4
4/12/1978 4:34	25.1	1978	25.1
1979			
1980			
2/19/1981 21:41	24.2	1981	24.2
4/1/1982 0:10	70.8	1982	70.8
4/10/1983 19:40	9.7	1983	9.7
1984			
3/28/1985 21:03	28.5	1985	28.5
1986			
	10yr data gap		
3/29/1997 20:31	35.3	1997	35.3
3/28/1998 4:01	50.8	1998	50.8
2/13/1999 1:02	7.9	1999	7.9
6/25/2000 12:06	44.6	2000	44.6
4/9/2001 2:57	25.0	2001	25.0
6/16/2002 7:55	14.8	2002	14.8
2003			
2004			
2005			
3/13/2006 19:20	35.3	2006	35.3
3/14/2007 14:05	18.3	2007	18.3
1/9/2008 7:00	38.2	2008	38.2
2/12/2009 17:45	38.3	2009	38.3
2010			
5/15/2011 6:10	27.3	2011	27.3
3/9/2012 0:00	17.4	2012	17.4
7/9/2013 12:00	22.6	2013	22.6
4/13/2014 18:00	36.9	2014	36.9
6/28/2015 13:10	16.8	2015	16.8
2016			

Annual Maximum and Minimum Instantaneous Discharge Data for
COLDWATER RIVER AT COLDWATER (02ED007) [ON]

Maximum Instantaneous Discharge — 168 km2

Date/Time	Value (m^3/s)	Year	Q_p
1965			
12/7/1966 19:30	29.4	1966	**29.4**
6/22/1967 19:45	30.6	1967	**30.6**
4/1/1968 7:00	30.9	1968	30.9
5/10/1969 8:09	37.4	1969	37.4
4/15/1970 0:30	30.9	1970	30.9
4/13/1971 19:38	23.4 E	1971	23.4
4/19/1972 1:30	41.6	1972	41.6
3/8/1973 1:48	30.3	1973	30.3
4/4/1974 11:02	30.6	1974	30.6
4/19/1975 17:15	56.6	1975	56.6
3/21/1976 12:50	34.3	1976	34.3
3/13/1977 20:58	47.0 B	1977	47.0
4/11/1978 22:06	17.4	1978	17.4
3/25/1979 11:12	26.0	1979	26.0
1980			
2/23/1981 11:00	30.9	1981	30.9
4/1/1982 6:00	24.7 E	1982	24.7
1/11/1983 17:38	11.1	1983	11.1
12/29/1984 11:49	26.2	1984	26.2
9/6/1985 5:59	30.8	1985	30.8
9/12/1986 9:19	22.0	1986	22.0
3/26/1987 18:19	18.0	1987	18.0
3/27/1988 4:35	18.5	1988	18.5
3/29/1989 4:51	45.6	1989	45.6
3/14/1990 0:03	24.8	1990	24.8
3/28/1991 9:57	32.7	1991	32.7
11/13/1992 10:27	21.8	1992	21.8
1/5/1993 2:45	25.7	1993	25.7
5/15/1994 20:33	10.5	1994	10.5
1995			
1/19/1996 23:19	22.0 E	1996	22.0
4/7/1997 3:40	24.4	1997	24.4
1/6/1998 13:00	30.2	1998	30.2
7/4/1999 14:00	31.4	1999	31.4
2/26/2000 0:00	30.0	2000	30.0
4/9/2001 1:00	23.2 A	2001	23.2
4/9/2002 13:25	17.0	2002	17.0
3/25/2003 20:55	19.1	2003	19.1
2004			
2005			
3/14/2006 4:15	15.8	2006	15.8
3/26/2007 23:10	22.1	2007	22.1
12/28/2008 12:45	49.1	2008	49.1
4/4/2009 7:00	38.8	2009	38.8
2010			
3/18/2011 14:14	19.9	2011	19.9
2012			
2013			
4/11/2014 4:30	29.2	2014	29.2
4/10/2015 18:35	10.3	2015	10.3

Annual Maximum and Minimum Instantaneous Discharge Data Annual M Ar
WILLOW CREEK AT MIDHURST (02ED010) [ON] NOTTAW/ B/

Maximum Instantaneous Discharge — 127 km2

Date/Time	Value (m^3/s)	Year	Q_p
3/13/1973 1:33	13.5	1973	13.5
3/8/1974 12:36	12.8	1974	12.8
4/20/1975 1:49	18.3	1975	18.3
3/26/1976 16:41	17.2	1976	17.2
3/15/1977 19:13	20.2	1977	20.2
4/14/1978 6:47	10.8	1978	10.8
3/25/1979 23:28	15.0	1979	15.0
3/23/1980 4:49	10.3	1980	10.3
2/24/1981 8:05	15.3	1981	15.3
4/5/1982 10:54	13.6	1982	13.6
3/10/1983 15:03	4.0	1983	4.0
4/7/1984 9:25	5.7	1984	5.7
3/30/1985 9:57	11.1	1985	11.1
3/28/1986 0:56	9.1	1986	9.1
3/27/1987 8:50	9.2	1987	9.2
3/27/1988 21:53	9.5	1988	9.5
3/29/1989 23:13	17.8 B	1989	17.8
3/15/1990 12:16	14.9 B	1990	14.9
4/10/1991 14:43	11.0	1991	11.0
4/19/1992 18:46	5.6	1992	5.6
4/11/1993 4:48	11.9 E	1993	11.9
4/4/1994 1:52	5.3	1994	5.3
11/13/1995 15:42	7.9	1995	7.9
4/15/1996 11:27	8.0	1996	8.0
4/7/1997 13:48	15.4	1997	15.4
3/29/1998 20:02	7.8	1998	7.8

Annual Maximum and Minimum Instantaneous Discharge Data for
BAILEY CREEK NEAR BEETON (02ED004) [ON]

Maximum Instantaneous Discharge — 207 km2

Date/Time	Value (m^3/s)	Year	Q_p
1963			
4/8/1964 9:00	6.3	1964	6.3
4/8/1965 9:00	36.8	1965	36.8
1/1/1966 3:00	9.2	1966	9.2
6/25/1967 20:00	16.8	1967	16.8
3/18/1968 15:30	23.7 B	1968	23.7
4/19/1969 2:28	24.4	1969	24.4
4/9/1970 20:07	16.4	1970	16.4
4/2/1971 21:58	14.7 B	1971	14.7
4/14/1972 1:31	43.0	1972	43.0
4/3/1973 2:27	21.0	1973	21.0
1974			
4/19/1975 15:08	38.2	1975	38.2
3/21/1976 8:30	32.6	1976	32.6
1977			
4/2/1978 16:59	37.9	1978	37.9

Annual Maximum and Minimum Instantaneous Discharge Data for
BEETON CREEK NEAR TOTTENHAM (02ED100) [ON]

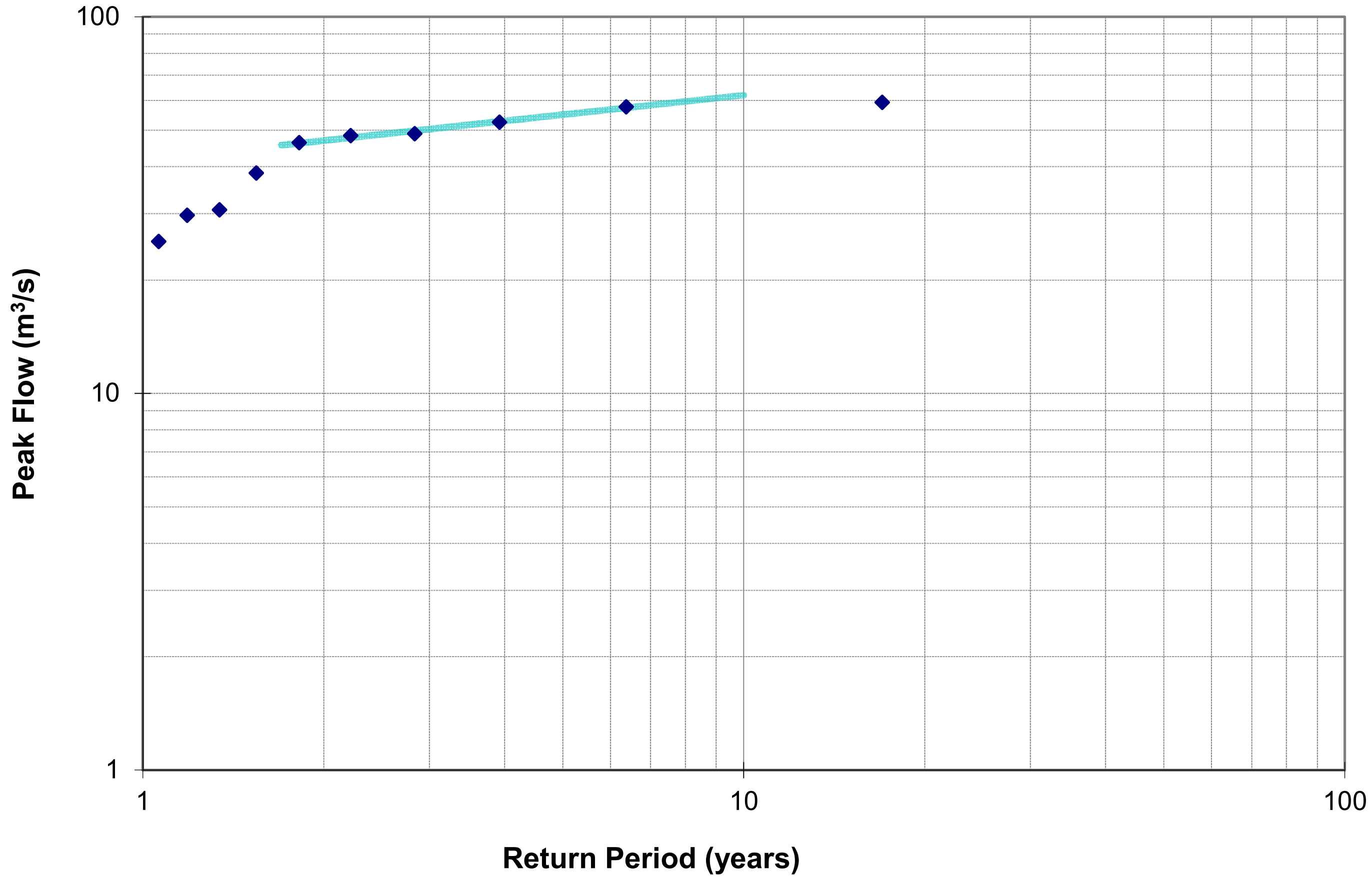
Maximum Instantaneous Discharge — 86 km2

Date/Time	Value (m^3/s)	Year	Q_p
1968			
1969			
4/8/1970 23:00	6.9	1970	6.9
4/2/1971 16:30	7.65 E	1971	7.7
4/13/1972 18:48	19.8 E	1972	19.8
1/19/1973 17:39	8.9	1973	8.9
3/5/1974 2:46	22.7	1974	22.7
4/19/1975 5:41	16.3	1975	16.3
3/20/1976 23:47	9.5	1976	9.5
3/9/1977 20:25	13.5	1977	13.5
4/7/1978 20:47	14.7	1978	14.7
1979			
1980			
1981			
3/31/1982 6:50	15.0	1982	15.0
2/3/1983 14:32	7.5	1983	7.5
2/14/1984 10:30	16.9	1984	16.9
1985			
1986			
3/27/1997 21:45	20.7	1997	20.7
3/27/1998 0:01	11.9	1998	11.9
1999			
6/25/2000 13:45	26.9	2000	26.9
3/23/2001 20:48	4.7	2001	4.7
6/21/2002 18:00	15.2	2002	15.2
2003			
3/5/2004 21:20	20.7 B	2004	20.7
2005			
3/13/2006 18:00	12.7	2006	12.7
3/14/2007 21:30	7.7	2007	7.7
4/1/2008 16:00	22.1	2008	22.1
2/12/2009 8:30	17.4	2009	17.4
2010			
3/11/2011 17:35	11.1	2011	11.1
5/4/2012 5:30	8.2	2012	8.2
3/12/2013 0:40	19.3	2013	19.3
4/13/2014 11:45	11.7	2014	11.7
6/28/2015 7:00	4.7	2015	4.7
3/28/2016 18:20	10.4	2016	10.4

Year	Peak Flow m^3/s	Rank "m"	Return Period a= 0.40 (years)
2000	48.4	5	2.2
2001	30.7	8	1.3
2002	25.3	10	1.1
2004	48.9	4	2.8
2005	38.5	7	1.5
2006	52.5	3	3.9
2008	57.7	2	6.4
2009	59.3	1	17.0
2011	29.7	9	1.2
2013	46.3	6	1.8

Frequency Analysis

02ED029 Innisfil Ck near Alliston



Watershed= 479 km^2

$$R_t = \frac{(n+1) - 2a}{m - a}$$

R_t	Q m^3/s	equat'n
1:2	47.3	46.9
1:5	55.0	55.0
1:10	58.4	61.9
1:25	n/a	72.5
1:50	n/a	81.7
1:100	n/a	92.1

best fit equation

$Q = 41.65 \; R_t^{\,0.172}$

1	WATERSHED AREA			
	SHIELD AREA (TYPE A)	Aa	=	0 km^2
	SOUTHERN AREA (TYPE B)	Ab	=	72.9 km^2
	TOTAL WATERSHED AREA	A	=	72.9 km^2
2	MAIN CHANNEL SLOPE			
	LENGTH OF MAIN CHANNEL TO HEAD OF BASIN	L	=	12000 m
	LENGTH FOR SLOPE CALCULATION (0.75 L)	Ls	=	9000 m
	STEEP SECTIONS (UP TO 0.1 L)	Lx	=	0 m
	NET LENGTH	Ln	=	9000 m
	ELEVATION AT 0.1 L FROM SITE	Ea	=	289 m
	ELEVATION AT 0.85 L FROM SITE	Eb	=	225 m
	DIFFERENCE IN ELEVATION	Ed	=	64 m
	HEIGHT OF STEEP SECTIONS	Es	=	0 m
	NET FALL	En	=	64 m
	SLOPE	S	=	0.0071 m/m
3	SHAPE FACTOR			
	LENGTH OF MAIN CHANNEL TO HEAD OF BASIN	L	=	12000 m
	WATERSHED AREA	A	=	72.9 km^2
	SHAPE FACTOR L^2/A	Fs	=	1.98
4	PRECIPITATION INDEX (24hr - 1:25yr rainfall)	PI	=	100 mm
6A	RETENTION - TYPE A BASINS UP TO 100 km^2			
				0 km^2
				0 km^2
				0 km^2
6B	RETENTION - TYPE B BASINS			
	AREA OF ALL LAKES	Lb	=	0 km^2
	AREA OF SWAMPS	Sb	=	10 km^2
	TOTAL EFFECTIVE RETENTION	Rb	=	10 km^2
	WATERSHED AREA	Ab	=	72.9 km^2
	RETENTION FACTOR 100 * Ar/A	Frb	=	13.72 %
	SCS CN NUMBER	CN	=	60

Kell

6C TYPE OF RETENTION BASIN TYPE B ONLY

UPPER END OF BASIN ONLY	TYPE A	Rt	=	C TYPE
DISTRIBUTED THROUGH BASIN	TYPE B			
LOWER END OF BASIN ONLY	TYPE C			

7 PRELIMINARY CLASSIFICATION

TYPE A BASINS	BA	=	0.00
TYPE B BASINS	BB	=	7.4

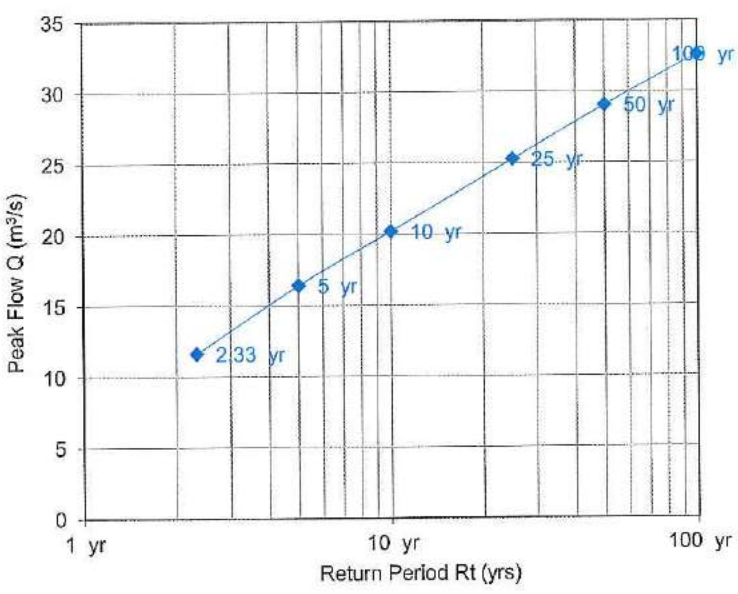
8 ADJUSTMENTS TO BASE CLASSIFICATION

			TYPE A		TYPE B	
			+ 'tve	- 'tve	+ 'tve	- 'tve
SLOPE	sl	=	0.000	0.000	0.521	0.000
SHAPE	sh	=	0.000	0.000	0.582	0.000
RETENTION	rf	=	----------	----------	----------	-1.537
PRECIPITATION	p	=	0.000	0.000	0.200	0.000
NET ADJUSTMENT	na	=	0.000		-0.755	

9 NET WATERSHED CLASSIFICATION

NET CLASS TYPE A BASIN	An	=	0.00
NET CLASS TYPE B BASIN	Bn	=	6.64
NET CLASS WATERSHED	Tn	=	6.64

10 DESIGN FLOWS



RETURN PERIOD	PEAK FLOW RATE
2.33 yr	11.6 m^3/s
5 yr	16.4 m^3/s
10 yr	20.2 m^3/s
25 yr	25.3 m^3/s
50 yr	29.1 m^3/s
100 yr	32.6 m^3/s

SCS Curve Number and Initial Rainfall Abstraction Data

Hydrologic Soil Group	SCS Curve Number (AMCII)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	30	39	66	44	98	100
AB	44	50	71	55	98	100
B	58	61	76	65	98	100
BC	65	68	79	71	98	100
C	71	74	82	76	98	100
CD	74	78	84	79	98	100
D	77	80	86	82	98	100

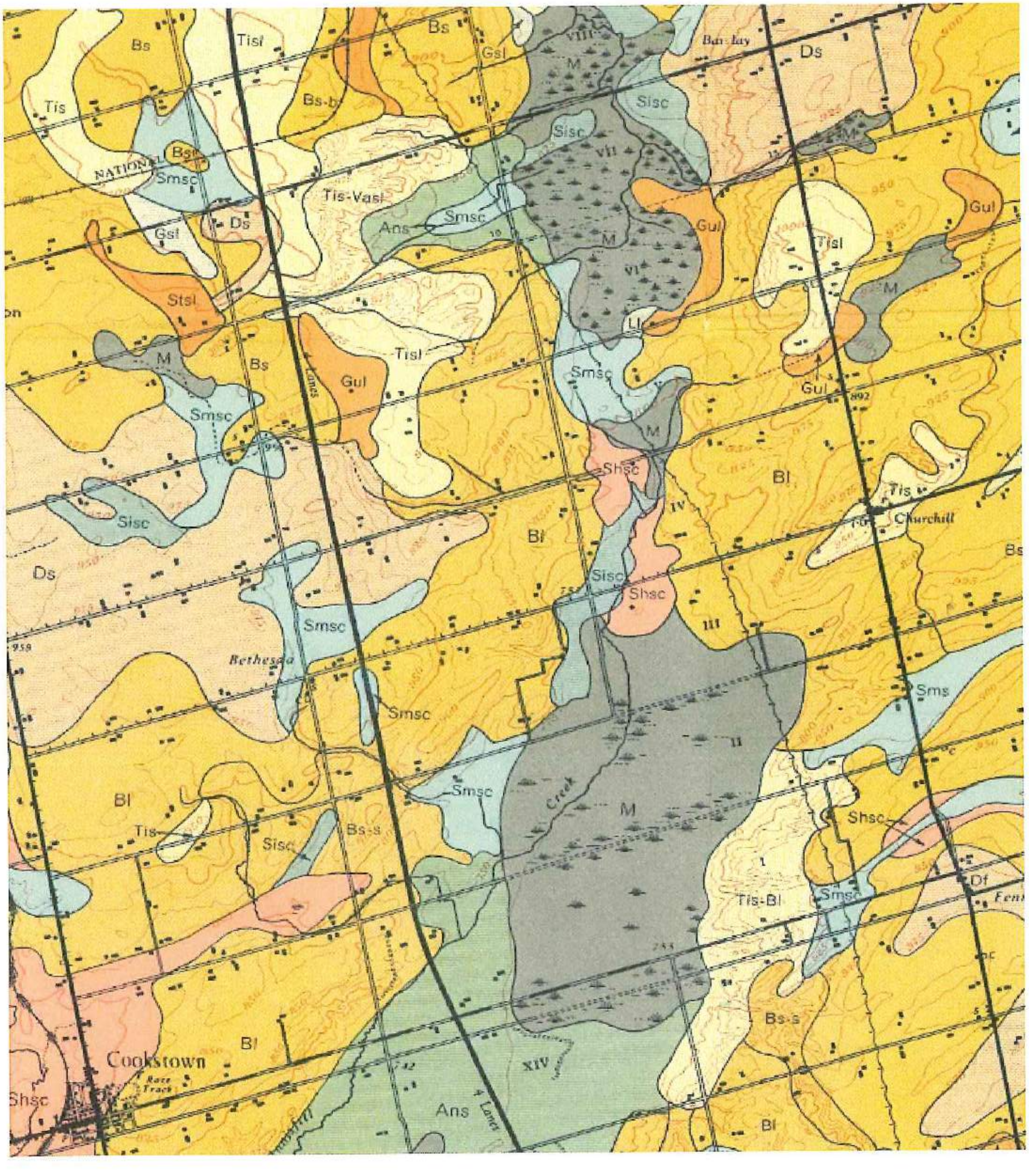
Initial Rainfall Abstraction, Ia (mm)						
Land Use	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
Ia	15	10	5	2	1	0

CN (I)= 4.2CN(II)/(10-0.058CN(II CN (III)= 23CN(II)/(10+0.13CN(II))

Dave B's cursory estimate using soils maps and air photos

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	10					
AB	20	15	10			
B		10	10			
BC			20			
C			5			
CD						
D						

Total area (ha): 100 **Composite CN:** 60 **Composite Ia (mm):** 9.3



NATIONAL
Barclay
Churchill
Bethesda
Cookstown
Race Track
Creek
4 Lanes
Lanes
Bs
Tisl
Tis
Bs-b
Gsl
Ds
Sisc
Smsc
Tis-Vasl
Ans
Gul
Gst
Stsl
M
Bl
Shsc
Sms
Tis-Bl
Bs-s
Df

LEGEND

SERIES	OSPREY	VASEY	BONDHEAD	GUERIN	LYONS	HARRISTON	WIARTON	PARKHILL	HARKAWAY	OTONABEE
TYPE, SYMBOL, ACREAGE	loam Os 1,200	sandy loam Vs 71,700 sandy loam — steep phase Vs-s 17,500 sandy loam — stony phase Vs-t 33,600	loam B 43,400 sandy loam Bs 30,300 sandy loam — steep phase Bs-s 5,200 sandy loam — stony phase Bs-t 3,000	loam Gu 5,400 sandy loam Gus 1,700 loam — stony phase Gu-t 5,100 sandy loam — stony phase Gus-t 300	loam Ll 1,700 loam — stony phase Ll-t 100	loam H 8,900 loam — steep phase H-s 2,000 silt loam Hs 13,300	loam Wi 12,700 loam — stony phase Wi-t 400	loam Pl 2,100	loam Hk 1,400	loam Ot 11,100 loam — steep phase Ot-s 900 loam — stony phase Ot-t 2,200
COLOUR										
SOIL MATERIALS	Pale brown, calcareous, stony loam till.	Light grey, calcareous and non-calcareous, sandy loam till.	Light grey, calcareous loam and sandy loam till			Pale yellow, calcareous, loam and silt loam till.			Pale yellow, calcareous, loam and silt loam till.	Light grey, calcareous, loam till.
DRAINAGE	Good	Good.	Good.	Imperfect.	Poor.	Good	Imperfect.	Poor.	Good.	
TOPOGRAPHY	Irregular, steeply sloping.	Smooth, moderately to steeply sloping.	Smooth, moderately to steeply sloping.	Smooth, gently sloping.	Smooth, very gently sloping.	Smooth, moderately to steeply sloping.	Smooth, gently sloping.	Smooth, very gently sloping.	Smooth, steeply sloping.	Smooth, moderately to steeply sloping.
SURFACE STONINESS	Very stony.	Moderately to very stony.	Slightly to very stony.	Slightly to moderately stony.	Slightly to very stony.	Slightly stony.	Slightly to very stony.	Slightly stony.	Moderately stony.	Moderately to very stony.
SURFACE REACTION	Neutral	Slightly to medium acid	Neutral			Neutral.	Neutral to alkaline.	Alkaline.	Alkaline.	Neutral to alkaline.
GREAT SOIL GROUP	Brown Forest.	Brown Podzolic and Grey-Brown Podzolic	Grey-Brown Podzolic.		Dark Grey Gleisolic.	Grey-Brown Podzolic.		Dark Grey Gleisolic.	Brown Forest.	

SERIES	VINCENT	DUNEDIN	TIOGA	ALLISTON	GRANBY	CALEDON	BURFORD	SARGENT	GWILLIMBURY	GILFORD	WYEVALE	DUNDONALD	EDENVALE
TYPE, SYMBOL, ACREAGE	clay loam Vc 2,700	clay Du 300	loamy sand Ts 55,300 sandy loam Tl 44,600 fine sandy loam Tf 27,000 loamy sand — stony phase Ts-t 3,900 loamy sand — eroded phase Ts-e 1,200 loamy sand — steep phase Ts-s 8,500	sandy loam Ay 33,300 fine sandy loam Af 2,200 sandy loam — stony phase Ay-t 1,200	sandy loam Gsl 17,900 fine sandy loam Gf 4,500 sandy loam — stony phase Gsl-t 300	gravelly loam Cg 1,000	gravelly loam Bg 2,100	gravelly sandy loam Sg 21,400 gravelly sandy loam — steep phase Sg-s 1,200	gravelly sandy loam Gg 5,900 gravelly sandy loam — stony phase Gg-t 400	gravelly loam Gi 400	gravelly sandy loam Wg 10,600	sandy loam Ds 16,000 fine sandy loam Df 1,600	sandy loam Es 2,600
COLOUR													
SOIL MATERIALS	Light brown, calcareous clay loam till.	Dark reddish brown, calcareous clay till.	Grey, calcareous outwash sand.			Brown, calcareous gravel and cobble stone.	Pale brown to grey, calcareous gravel and cobble stone.	Pale brown, calcareous outwash gravel			Grey non-calcareous gravel outwash.	Outwash sand underlain by grey calcareous loam or sandy loam till at depths of 3 feet or less.	
DRAINAGE	Good.	Good.	Good.	Imperfect.	Poor.	Good.	Good	Good	Imperfect.	Poor.	Good.	Good.	Imperfect.
TOPOGRAPHY	Smooth, moderately sloping.	Irregular steeply sloping.	Smooth, gently to irregular, steeply sloping.	Smooth, very gently sloping.	Level.	Smooth, moderately sloping.	Smooth, gently sloping.	Smooth, gently sloping.	Smooth, very gently sloping.	Level to depressional.	Smooth, gently sloping.	Smooth, gently sloping.	Smooth, very gently sloping.
SURFACE STONINESS	Slightly stony.	Slightly stony.	Stonefree to moderately stony		Stonefree.	Moderately cobbly	Moderately to very cobbly.	Stonefree.	Moderate to very stony.	Stonefree.	Moderately Stony.	Stonefree.	
SURFACE REACTION	Neutral to alkaline.	Neutral.	Medium acid		Slightly acid.	Slightly acid	Slightly acid.	Neutral to alkaline.	Alkaline.		Medium acid.	Slightly acid.	
GREAT SOIL GROUP	Brown Forest.	Brown Forest.	Podzol		Dark Grey Gleisolic	Grey-Brown Podzolic	Grey-Brown Podzolic	Brown Forest		Dark Grey Gleisolic	Podzol.	Grey-Brown Podzolic.	

SERIES	BROOKTON	BERRIEN	WAUSEON	PERCY	SCHOMBERG	SMITHFIELD	SIMCOE	MINESING	BENNINGTON	FARMINGTON	ROCK	MUCK	MARSH	BOTTOM LAND
TYPE, SYMBOL, ACREAGE	sandy loam Bos 9,000 fine sandy loam Bof 2,100	sandy loam Bes 10,200 fine sandy loam Bef 1,400	sandy loam Was 1,500 fine sandy loam Waf 1,300	fine sandy loam Pfs 1,700 fine sandy loam — stony phase Pfs-t 200	silty clay loam Sbsc 47,300 silt loam Sbs 2,100 silty clay loam—steep phase Sbsc-s 300 silty clay loam—stony phase Sbsc-t 400 silt loam — steep phase Sbs-s 700	silty clay loam Smsc 26,500 silt loam Sms 6,800	silty clay loam Sisc 3,100 silty clay loam—stony phase Sisc-t 100 silt loam Sis 1,500	marly clay Mmc 10,000 marly silty clay loam Mmsc 4,200	very fine sandy loam Bnf 9,800	loam Fl 9,000	R 1,100	M 46,800	Ma 2,200	B.L. 4,000
COLOUR														
SOIL MATERIALS	Outwash sand underlain by calcareous clay or silty clay loam at depths of 3 feet or less.			Pale brown, calcareous outwash, fine loamy sand or fine sandy loam.	Calcareous lacustrine varved silt loam and clay.			Lacustrine, marl, silt loam and clay.	Fine sandy loam or silt loam underlain by clay till or clay at depths of less than 3 feet.	Calcareous loam till. Limestone rock at depths less than 1 foot.	Bare rock with little or no soil cover.	Well decomposed organic material over 1 foot deep underlain by rock, sand, silt or clay.	Variable.	Recent alluvium.
DRAINAGE	Good	Imperfect.	Poor.	Good	Good.	Imperfect.	Poor.	Poor.	Good.	Good.		Very poor.	Very poor.	Variable.
TOPOGRAPHY	Smooth, moderately sloping.	Smooth, gently sloping.	Smooth, very gently sloping.	Smooth, gently sloping.	Smooth, moderately to steeply sloping.	Smooth, gently sloping.	Smooth, very gently sloping.	Level.	Smooth, moderately sloping.	Smooth, very gently sloping.	Very steep.	Depressional.	Depressional.	Variable.
SURFACE STONINESS	Stonefree.			Stonefree.	Stonefree to very stony.	Stonefree.		Stonefree.	Stonefree.	Slightly stony.		Stonefree.	Stonefree.	Variable.
SURFACE REACTION	Slightly to medium acid	Slightly acid.	Neutral.	Neutral.	Neutral	Neutral to Alkaline.	Alkaline.	Alkaline.	Slightly acid	Alkaline		Neutral	Neutral.	Variable.
GREAT SOIL GROUP	Grey-Brown Podzolic.		Dark Grey Gleisolic.	Grey-Brown Podzolic.	Grey-Brown Podzolic.		Dark Grey Gleisolic	Dark Grey Gleisolic	Grey-Brown Podzolic	Brown Forest.		Organic		Alluvial.

Innisfil Heights
Thornton
Tanger Outlets Cookstown
400
54
4
21
53
39
27
3
89

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Date | File No. | Name

Project

From Soils Map / MTC Manual

Bl	- Brodhead Loam	B	Tls - BL Tioga Loamy Sand A
BS	" Sandy L	AB	
Smsc			
Ans	- Alliston Sandy Loam	AB	
Smsc	- Smithfield Silty Clay	C	
Shsc	- Schomberg Silty Clay Loam	C	
Gul	Guerin Sandy Loam	AB	
Ds	~~Don~~ Donald Sandy Loam	AB	
M	Muck	BC	

Page of

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Appendix C

Hydrologic Calculations

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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R. J. Burnside & Associates Limited
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telephone (705) 446-0515 fax (705) 446-2399
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 7 Ln-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	3.343		29.734			
AB						
B	7.866	4.564	32.586			
BC						
C						
CD						
D		6.055	8.156			

Total area (ha):	92.3	Composite CN(I):	49	Ia (mm) NVCA	7.5
Pervious area (ha):	92.3	Composite CN(II):	70	Ia (mm) NRSCS	22.8
Impervious area (ha):	0.0	Composite CN(III):	84		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	29.734		32.59				8.156
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			4.56				6.055
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	3.343		7.87				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	92.30
Runoff Coefficient	0.28
Length (m)	1467
h_1 (m)	306.6
h_2 (m)	294.1
Dh (m)	12.5
Slope (%)	0.85

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		107.44	41.00	61.20		60.85
Tp (hr)		1.20	0.46	0.68		0.68

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	107.20	269.68				57.58
Tp (hr)	1.20	3.01				0.64

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 5 SR-E

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			6.143			
AB						
B	11.246		137.213			
BC						
C	7.054		37.37			
CD						
D			26.514			

Total area (ha):	225.5	Composite CN(I):	58	Ia (mm) NVCA	7.2
Pervious area (ha):	225.5	Composite CN(II):	77	Ia (mm) NRSCS	16.0
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	6.143		137.21		37.37		26.514
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			11.25		7.05		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	225.54
Runoff Coefficient	0.34
Length (m)	3274.1
h_1 (m)	303.8
h_2 (m)	289.4
Dh (m)	14.4
Slope (%)	0.44

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		185.25	66.91	99.86		148.98
Tp (hr)		2.07	0.75	1.12		1.66

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	184.43	588.13				178.87
Tp (hr)	2.06	6.57				2.00

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 10 SR-G

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	91.66	23.432	350.943			
BC						
C	6.715		32.365			
CD						
D						

Total area (ha):	505.1	Composite CN(I):	52	Ia (mm) NVCA	7.6
Pervious area (ha):	505.1	Composite CN(II):	72	Ia (mm) NRSCS	19.8
Impervious area (ha):	0.0	Composite CN(III):	86		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			350.94		32.37		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			23.43				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			91.66		6.72		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	505.12
Runoff Coefficient	0.29
Length (m)	6061.4
h_1 (m)	297.9
h_2 (m)	241.7
Dh (m)	56.2
Slope (%)	0.93

Uplands Method	
Flow Path Cover	
x	4.6

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Kerby Method	
Rk =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		211.14	79.57	118.77		180.51
Tp (hr)		2.36	0.89	1.33		2.02

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	210.73	753.74				228.08
Tp (hr)	2.35	8.42				2.55

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: CR 4-D

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	4.009	4.24	11.907			
BC						
C						
CD						
D	9.572		6.635			

Total area (ha):	36.4	Composite CN(I):	55	Ia (mm) NVCA	8.2
Pervious area (ha):	36.4	Composite CN(II):	74	Ia (mm) NRSCS	17.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			11.91				6.635
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			4.24				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			4.01				9.572
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	36.36
Runoff Coefficient	0.34
Length (m)	1111.8
h_1 (m)	290.7
h_2 (m)	272.8
Dh (m)	17.9
Slope (%)	1.61

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		70.50	24.87	37.13		38.02
Tp (hr)		0.79	0.28	0.41		0.42

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	70.49	139.24				31.75
Tp (hr)	0.79	1.55				0.35

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 6 Ln-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	12.929	4.43	33.097			
AB						
B	10.959	11.789	113.75			
BC						
C			31.977			
CD						
D			91.512			

Total area (ha):	310.4	Composite CN(I):	56	Ia (mm) NVCA	7.3
Pervious area (ha):	310.4	Composite CN(II):	75	Ia (mm) NRSCS	17.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	33.097		113.75		31.98		91.512
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	4.43		11.79				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	12.929		10.96				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	310.44
Runoff Coefficient	0.36
Length (m)	3308
h_1 (m)	308.5
h_2 (m)	247.6
Dh (m)	60.9
Slope (%)	1.84

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		113.09	57.10	85.22		85.32
Tp (hr)		1.26	0.64	0.95		0.95

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	113.12	307.14				88.33
Tp (hr)	1.26	3.43				0.99

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 5 Ln-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			14.339			
AB						
B	18.518	25.528	260.745			
BC						
C	4.86	6.819	83.482			
CD						
D		7.499	39.696			

Total area (ha):	461.5	Composite CN(I):	57	Ia (mm) NVCA	7.2
Pervious area (ha):	461.5	Composite CN(II):	76	Ia (mm) NRSCS	16.0
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	14.339		260.75		83.48		39.696
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			25.53		6.82		7.499
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			18.52		4.86		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	461.49
Runoff Coefficient	0.34
Length (m)	3787.3
h_1 (m)	297.7
h_2 (m)	234
Dh (m)	63.7
Slope (%)	1.68

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		128.73	68.13	101.69		98.40
Tp (hr)		1.44	0.76	1.14		1.10

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	128.73	345.71				105.81
Tp (hr)	1.44	3.86				1.18

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 4 Ln-E

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	3.834		85.802			
BC						
C						
CD						
D			3.255			

Total area (ha):	92.9	Composite CN(I):	57	Ia (mm) NVCA	7.1
Pervious area (ha):	92.9	Composite CN(II):	76	Ia (mm) NRSCS	16.9
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			85.80				3.255
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			3.83				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	92.89
Runoff Coefficient	0.31
Length (m)	2027.2
h_1 (m)	288.5
h_2 (m)	229.7
Dh (m)	58.8
Slope (%)	2.90

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		81.26	32.18	48.02		48.42
Tp (hr)		0.91	0.36	0.54		0.54

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	81.41	161.81				43.13
Tp (hr)	0.91	1.81				0.48

Project Name: South Innisfil Creek Drainage Improvements
Project No.: 300038790
Location: Town of Innisfil
Created By: J.Koen
Checked By: T.Lozon
Date Created: 15-Mar-2017
Date Modified: 15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: CR 4-C

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	6.38	0.762	47.719			
BC						
C						
CD						
D			0.903			

Total area (ha):	55.8	Composite CN(I):	54	Ia (mm) NVCA	7.4
Pervious area (ha):	55.8	Composite CN(II):	74	Ia (mm) NRSCS	18.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			47.72				0.903
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			0.76				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			6.38				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	55.76
Runoff Coefficient	0.30
Length (m)	1324.9
h_1 (m)	290.2
h_2 (m)	271.6
Dh (m)	18.6
Slope (%)	1.40

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		85.16	30.33	45.27		46.09
Tp (hr)		0.95	0.34	0.51		0.51

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	85.11	173.81				40.51
Tp (hr)	0.95	1.94				0.45

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 4 Ln-F

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	21.735	18.844	338.02			
BC						
C	9.792	5.301	33.928			
CD						
D		5.821	39.139			

Total area (ha):	472.6	Composite CN(I):	57	Ia (mm) NVCA	7.3
Pervious area (ha):	472.6	Composite CN(II):	76	Ia (mm) NRSCS	16.9
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			338.02		33.93		39.139
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			18.84		5.30		5.821
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			21.74		9.79		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	472.58
Runoff Coefficient	0.33
Length (m)	4469.7
h_1 (m)	288
h_2 (m)	229.6
Dh (m)	58.4
Slope (%)	1.31

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		154.14	72.34	107.98		123.92
Tp (hr)		1.72	0.81	1.21		1.38

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	154.01	451.88				141.68
Tp (hr)	1.72	5.05				1.58

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: CR 4-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	3.689	7.169	109.568			
BC						
C	9.308		51.42			
CD						
D						

Total area (ha):	181.2	Composite CN(I):	58	Ia (mm) NVCA	7.3
Pervious area (ha):	181.2	Composite CN(II):	76	Ia (mm) NRSCS	16.0
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			109.57		51.42		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			7.17				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			3.69		9.31		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	181.15
Runoff Coefficient	0.33
Length (m)	1764.2
h_1 (m)	290.3
h_2 (m)	261.2
Dh (m)	29.1
Slope (%)	1.65

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		89.13	47.05	70.23		54.23
Tp (hr)		1.00	0.53	0.78		0.61

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	89.12	187.14				49.77
Tp (hr)	1.00	2.09				0.56

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: CR 4-B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	14.004		24.634			
AB						
B	18.919	3.784	65.275			
BC						
C						
CD						
D						

Total area (ha):	126.6	Composite CN(I):	45	Ia (mm) NVCA	7.8
Pervious area (ha):	126.6	Composite CN(II):	66	Ia (mm) NRSCS	27.4
Impervious area (ha):	0.0	Composite CN(III):	82		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	24.634		65.28				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			3.78				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	14.004		18.92				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	126.62
Runoff Coefficient	0.25
Length (m)	1800.7
h_1 (m)	295.7
h_2 (m)	250.5
Dh (m)	45.2
Slope (%)	2.51

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		87.01	37.49	55.95		46.69
Tp (hr)		0.97	0.42	0.62		0.52

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	87.13	206.68				41.18
Tp (hr)	0.97	2.31				0.46

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 10 SR-F

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	8.11	4.345	103.149			
BC						
C			15.259			
CD						
D		10.443	17.101			

Total area (ha):	158.4	Composite CN(I):	58	Ia (mm) NVCA	7.2
Pervious area (ha):	158.4	Composite CN(II):	77	Ia (mm) NRSCS	16.0
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			103.15		15.26		17.101
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			4.35				10.443
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			8.11				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	158.41
Runoff Coefficient	0.34
Length (m)	4673.7
h_1 (m)	288
h_2 (m)	226.6
Dh (m)	61.4
Slope (%)	1.31

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		154.35	46.67	69.66		128.09
Tp (hr)		1.72	0.52	0.78		1.43

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	154.23	455.81				147.74
Tp (hr)	1.72	5.09				1.65

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 3 Ln-E

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	9.041	7.181				
AB						
B	33.753	12.361	84.256			
BC						
C						
CD						
D		2.24	36.163			

Total area (ha):	185.0	Composite CN(I):	50	Ia (mm) NVCA	7.8
Pervious area (ha):	185.0	Composite CN(II):	70	Ia (mm) NRSCS	21.8
Impervious area (ha):	0.0	Composite CN(III):	84		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			84.26				36.163
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	7.181		12.36				2.24
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	9.041		33.75				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	185.00
Runoff Coefficient	0.31
Length (m)	3218.4
h_1 (m)	292.8
h_2 (m)	229.8
Dh (m)	63
Slope (%)	1.96

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		116.83	45.85	68.44		81.49
Tp (hr)		1.30	0.51	0.76		0.91

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	116.89	333.14				83.35
Tp (hr)	1.31	3.72				0.93

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 3 Ln-D

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	5.242	5.812	60.513			
BC						
C			33.833			
CD						
D		4.212	104.189			

Total area (ha):	213.8	Composite CN(I):	64	Ia (mm) NVCA	7.1
Pervious area (ha):	213.8	Composite CN(II):	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	0.0	Composite CN(III):	91		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			60.51		33.83		104.189
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			5.81				4.212
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			5.24				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	213.80
Runoff Coefficient	0.44
Length (m)	3492.3
h_1 (m)	282.5
h_2 (m)	226.5
Dh (m)	56
Slope (%)	1.60

Uplands Method	
Flow Path Cover	
x	4.6

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Kerby Method	
Rk =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	105.92		50.56	75.47		94.05
Tp (hr)	1.18		0.56	0.84		1.05

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	108.72	285.06				99.92
Tp (hr)	1.21	3.18				1.12

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 4 Ln-D

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	4.475	3.456	66.331			
BC						
C	1.988		11.836			
CD						
D						

Total area (ha):	88.1	Composite CN(I):	56	Ia (mm) NVCA	7.3
Pervious area (ha):	88.1	Composite CN(II):	75	Ia (mm) NRSCS	16.9
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			66.33		11.84		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			3.46				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			4.48		1.99		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	88.09
Runoff Coefficient	0.31
Length (m)	1379.4
h_1 (m)	289.9
h_2 (m)	258.8
Dh (m)	31.1
Slope (%)	2.25

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		72.78	33.13	49.44		39.46
Tp (hr)		0.81	0.37	0.55		0.44

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	72.86	136.52				33.28
Tp (hr)	0.81	1.52				0.37

Project Name: South Innisfil Creek Drainage Improvements
Project No.: 300038790
Location: Town of Innisfil
Created By: J.Koen
Checked By: T.Lozon
Date Created: 15-Mar-2017
Date Modified: 15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 3 Ln-C

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
	Total Area per Various Land Use (ha)					
A						
AB						
B	20.897	29.654	114.694			
BC						
C	5.975					
CD						
D		8.477	68.476			

Total area (ha):	248.2	Composite CN(I):	56	Ia (mm) NVCA	7.5
Pervious area (ha):	248.2	Composite CN(II):	75	Ia (mm) NRSCS	16.9
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	A	AB	B	BC	C	CD	D
	Hydrologic Soil Groups						
Cultivated, 0-5% slope			114.69				68.476
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			29.65				8.477
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			20.90		5.98		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	248.17
Runoff Coefficient	0.36
Length (m)	3424.9
h_1 (m)	291.5
h_2 (m)	226.9
Dh (m)	64.6
Slope (%)	1.89

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		114.80	51.95	77.55		86.86
Tp (hr)		1.28	0.58	0.87		0.97

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	114.85	306.50				90.35
Tp (hr)	1.28	3.42				1.01

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 4 Ln-C

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	3.262		132.208			
BC						
C		4.772	90.656			
CD						
D						

Total area (ha):	230.9	Composite CN(I):	60	Ia (mm) NVCA	7.1
Pervious area (ha):	230.9	Composite CN(II):	78	Ia (mm) NRSCS	14.3
Impervious area (ha):	0.0	Composite CN(III):	89		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			132.21		90.66		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					4.77		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			3.26				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	230.90
Runoff Coefficient	0.35
Length (m)	3161.2
h_1 (m)	296.1
h_2 (m)	282.1
Dh (m)	14
Slope (%)	0.44

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		180.70	67.44	100.67		144.51
Tp (hr)		2.02	0.75	1.12		1.61

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	179.91	549.56				172.11
Tp (hr)	2.01	6.14				1.92

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 5 SR-D

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	11.572	4.759	48.742			
BC						
C	1.576		14.784			
CD						
D						

Total area (ha):	81.4	Composite CN(I):	54	Ia (mm) NVCA	7.5
Pervious area (ha):	81.4	Composite CN(II):	74	Ia (mm) NRSCS	18.8
Impervious area (ha):	0.0	Composite CN(III):	86		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			48.74		14.78		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			4.76				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			11.57		1.58		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	81.43
Runoff Coefficient	0.31
Length (m)	2302
h_1 (m)	291
h_2 (m)	262.7
Dh (m)	28.3
Slope (%)	1.23

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		116.07	36.24	54.09		75.15
Tp (hr)		1.30	0.40	0.60		0.84

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	115.96	291.74				75.22
Tp (hr)	1.29	3.26				0.84

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: H 400-B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	10.656	1.478	64.195			
BC						
C			3.665			
CD						
D						

Total area (ha):	80.0	Composite CN(I):	54	Ia (mm) NVCA	7.4
Pervious area (ha):	80.0	Composite CN(II):	74	Ia (mm) NRSCS	18.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			64.20		3.67		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			1.48				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			10.66				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	79.99
Runoff Coefficient	0.30
Length (m)	1632.2
h_1 (m)	292
h_2 (m)	253.2
Dh (m)	38.8
Slope (%)	2.38

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		79.44	31.54	47.07		44.14
Tp (hr)		0.89	0.35	0.53		0.49

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	79.54	159.16				38.36
Tp (hr)	0.89	1.78				0.43

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 3 Ln-B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	9.966		55.613			
BC						
C		1.638	7.59			
CD						
D						

Total area (ha):	74.8	Composite CN(I):	55	Ia (mm) NVCA	7.4
Pervious area (ha):	74.8	Composite CN(II):	74	Ia (mm) NRSCS	17.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			55.61		7.59		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					1.64		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			9.97				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	74.81
Runoff Coefficient	0.30
Length (m)	1892
h_1 (m)	285.5
h_2 (m)	241.9
Dh (m)	43.6
Slope (%)	2.30

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		85.56	30.90	46.11		50.22
Tp (hr)		0.96	0.34	0.51		0.56

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	85.65	179.03				45.16
Tp (hr)	0.96	2.00				0.50

Project Name:	South Innisfil Creek Drainage Improvements
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 4 Ln-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B		4.415	109.703			
BC						
C						
CD						
D						

Total area (ha):	114.1	Composite CN(I):	56	Ia (mm) NVCA	7.0
Pervious area (ha):	114.1	Composite CN(II):	75	Ia (mm) NRSCS	16.9
Impervious area (ha):	0.0	Composite CN(III):	88		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			109.70				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			4.42				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	114.12
Runoff Coefficient	0.30
Length (m)	1748.2
h_1 (m)	297.7
h_2 (m)	284.4
Dh (m)	13.3
Slope (%)	0.76

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		118.95	45.66	68.15		73.09
Tp (hr)		1.33	0.51	0.76		0.82

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	118.64	282.19				72.62
Tp (hr)	1.32	3.15				0.81

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 4 Ln-B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	6.962	6.692	158.157			
BC						
C						
CD						
D						

Total area (ha):	171.8	Composite CN(I):	55	Ia (mm) NVCA	7.2
Pervious area (ha):	171.8	Composite CN(II):	75	Ia (mm) NRSCS	17.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			158.16				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			6.69				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			6.96				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	171.81
Runoff Coefficient	0.30
Length (m)	1720.6
h_1 (m)	300.1
h_2 (m)	287.4
Dh (m)	12.7
Slope (%)	0.74

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		119.90	54.10	80.75		73.04
Tp (hr)		1.34	0.60	0.90		0.82

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	119.57	288.89				72.56
Tp (hr)	1.34	3.23				0.81

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 3 Ln-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			14.637			
AB						
B	15.947	5.212	232.285			
BC						
C						
CD						
D						

Total area (ha):	268.1	Composite CN(I):	55	Ia (mm) NVCA	7.2
Pervious area (ha):	268.1	Composite CN(II):	74	Ia (mm) NRSCS	17.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	14.637		232.29				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			5.21				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			15.95				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	268.08
Runoff Coefficient	0.29
Length (m)	3207.5
h_1 (m)	293
h_2 (m)	257.7
Dh (m)	35.3
Slope (%)	1.10

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		144.22	59.68	89.08		102.03
Tp (hr)		1.61	0.67	0.99		1.14

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	144.02	396.04				110.78
Tp (hr)	1.61	4.42				1.24

Project Name: South Innisfil Creek Drainage Improvements
Project No.: 300038790
Location: Town of Innisfil
Created By: J.Koen
Checked By: T.Lozon
Date Created: 15-Mar-2017
Date Modified: 15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 5 SR-C

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	22.014	31.522	224.83			
BC						
C	6.058	15.446	42.009			
CD						
D						

Total area (ha):	341.9	Composite CN(I):	54	Ia (mm) NVCA	7.4
Pervious area (ha):	341.9	Composite CN(II):	74	Ia (mm) NRSCS	17.8
Impervious area (ha):	0.0	Composite CN(III):	87		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			224.83		42.01		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			31.52		15.45		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			22.01		6.06		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	341.88
Runoff Coefficient	0.31
Length (m)	3378.8
h_1 (m)	280.6
h_2 (m)	233.1
Dh (m)	47.5
Slope (%)	1.41

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		134.47	62.63	93.48		96.51
Tp (hr)		1.50	0.70	1.04		1.08

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	134.39	366.08				103.25
Tp (hr)	1.50	4.09				1.15

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 2 Ln-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	14.61	20.144	65.585			
BC						
C			4.693			
CD						
D						

Total area (ha):	105.0	Composite CN(I):	51	Ia (mm) NVCA	7.6
Pervious area (ha):	105.0	Composite CN(II):	71	Ia (mm) NRSCS	21.8
Impervious area (ha):	0.0	Composite CN(III):	85		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			65.59		4.69		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			20.11				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			14.61				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	105.00
Runoff Coefficient	0.28
Length (m)	1915.8
h_1 (m)	274.9
h_2 (m)	226.3
Dh (m)	48.6
Slope (%)	2.54

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		85.88	34.71	51.81		48.83
Tp (hr)		0.96	0.39	0.58		0.55

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	85.99	188.81				43.58
Tp (hr)	0.96	2.11				0.49

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 10 SR-D

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	1.388	6.063	38.895			
AB						
B	8.191		32.862			
BC						
C			9.899			
CD						
D		1.388	11.337			

Total area (ha):	110.0	Composite CN(I):	50	Ia (mm) NVCA	7.3
Pervious area (ha):	110.0	Composite CN(II):	70	Ia (mm) NRSCS	21.8
Impervious area (ha):	0.0	Composite CN(III):	84		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	38.895		32.86		9.90		11.337
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	6.063						1.388
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	1.388		8.19				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	110.02
Runoff Coefficient	0.29
Length (m)	3266.4
h_1 (m)	289.5
h_2 (m)	226.9
Dh (m)	62.6
Slope (%)	1.92

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		121.58	37.40	55.83		83.14
Tp (hr)		1.36	0.42	0.62		0.93

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	121.63	339.83				85.49
Tp (hr)	1.36	3.79				0.95

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 10 SR-E

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	8.43		21.12			
BC						
C						
CD						
D		14.85	181.121			

Total area (ha):	225.5	Composite CN(I):	68	Ia (mm) NVCA	7.2
Pervious area (ha):	225.5	Composite CN(II):	84	Ia (mm) NRSCS	10.4
Impervious area (ha):	0.0	Composite CN(III):	92		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			21.12				181.121
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							14.85
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			8.43				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	225.52
Runoff Coefficient	0.50
Length (m)	2699
h_1 (m)	262.2
h_2 (m)	226.8
Dh (m)	35.4
Slope (%)	1.31

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	84.76		53.77	80.26		83.06
Tp (hr)	0.95		0.60	0.90		0.93

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	92.14	235.72				85.39
Tp (hr)	1.03	2.63				0.95

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 2 Ln-B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	5.849	24.506	26.706			
BC						
C	35.624	24.586	26.636			
CD						
D		11.008	163.155			

Total area (ha):	318.1	Composite CN(I):	62	Ia (mm) NVCA	7.6
Pervious area (ha):	318.1	Composite CN(II):	80	Ia (mm) NRSCS	13.5
Impervious area (ha):	0.0	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			26.71		26.64		163.155
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			24.51		24.59		11.008
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			5.85		35.62		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	318.07
Runoff Coefficient	0.43
Length (m)	3976.6
h_1 (m)	230
h_2 (m)	224.7
Dh (m)	5.3
Slope (%)	0.13

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	190.63		97.47	145.49		278.37
Tp (hr)	2.13		1.09	1.62		3.11

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	265.96	1149.40				394.66
Tp (hr)	2.97	12.84				4.41

Project Name: South Innisfil Creek Drainage Improvements
Project No.: 300038790
Location: Town of Innisfil
Created By: J.Koen
Checked By: T.Lozon
Date Created: 15-Mar-2017
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **10 SR-C**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	35.32		104.009			
AB						
B	3.76		81.189			
BC						
C			48.09			
CD						
D		14.52	78.309			

Total area (ha):	365.2	Composite CN(I):	51	Ia (mm) NVCA	7.4
Pervious area (ha):	365.2	Composite CN(II):	72	Ia (mm) NRSCS	20.7
Impervious area (ha):	0.0	Composite CN(III):	85		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	104.009		81.19		48.09		78.309
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							14.52
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	35.32		3.76				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	365.20
Runoff Coefficient	0.33
Length (m)	3785.6
h_1 (m)	299.3
h_2 (m)	226.5
Dh (m)	72.8
Slope (%)	1.92

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		124.32	60.40	90.15		93.29
Tp (hr)		1.39	0.67	1.01		1.04

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	124.37	366.59				98.91
Tp (hr)	1.39	4.09				1.10

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **10 SR-A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water	
A	53.614	18.988	7.209				79.81
AB							0.00
B	46.914	34.256	222.744				303.91
BC							0.00
C			8.889				8.89
CD							0.00
D			13.988				13.99
	25%	13%	62%	0%	0%	0%	

Total area (ha):	406.6	Composite CN(I):	44	Ia (mm) NVCA	7.9
Pervious area (ha):	406.6	Composite CN(II):	65	Ia (mm) NRSCS	27.4
Impervious area (ha):	0.0	Composite CN(III):	81		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	7.209		222.74		8.89		13.988
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	18.988		34.26				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	53.614		46.91				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	406.60
Runoff Coefficient	0.26
Length (m)	4737.8
h_1 (m)	302.9
h_2 (m)	229.1
Dh (m)	73.8
Slope (%)	1.56

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		163.38	65.77	98.16		121.05
Tp (hr)		1.82	0.73	1.10		1.35

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	163.34	578.82				137.54
Tp (hr)	1.82	6.46				1.54

Project Name: South Innisfil Creek Drainage Improvements
Project No.: 300038790
Location: Town of Innisfil
Created By: J.Koen
Checked By: T.Lozon
Date Created: 15-Mar-2017
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **10 SR-B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	9.488	11.1	17.005			
AB						
B			30.526			
BC						
C			20.808			
CD						
D		4.154	3.033			

Total area (ha):	96.1	Composite CN(I):	46	Ia (mm) NVCA	7.5
Pervious area (ha):	96.1	Composite CN(II):	67	Ia (mm) NRSCS	25.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	17.005		30.53		20.81		3.033
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	11.1						4.154
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	9.488						
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	96.11
Runoff Coefficient	0.28
Length (m)	3186.6
h_1 (m)	302.4
h_2 (m)	229
Dh (m)	73.4
Slope (%)	2.30

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		114.18	34.16	50.98		75.82
Tp (hr)		1.28	0.38	0.57		0.85

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	114.30	328.56				76.07
Tp (hr)	1.28	3.67				0.85

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: `

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B		9.632	128.734			
BC						
C						
CD						
D		21.484	190.365			

Total area (ha):	350.2	Composite CN(I):	65	Ia (mm) NVCA	7.1
Pervious area (ha):	350.2	Composite CN(II):	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	0.0	Composite CN(III):	91		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			128.73				190.365
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			9.63				21.484
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	350.22
Runoff Coefficient	0.44
Length (m)	3657.6
h_1 (m)	229.8
h_2 (m)	224.2
Dh (m)	5.6
Slope (%)	0.15

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	168.90		98.53	147.06		246.69
Tp (hr)	1.89		1.10	1.64		2.75

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	240.48	950.70				338.68
Tp (hr)	2.69	10.62				3.78

Project Name: South Innisfil Creek Drainage Improvements
Project No.: 300038790
Location: Town of Innisfil
Created By: J.Koen
Checked By: T.Lozon
Date Created: 15-Mar-2017
Date Modified: 15-May-2018

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3 Ronell Crescent, Collingwood, Ontario
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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 5 SR-B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	21.85	7.3	89.857			
BC						
C						
CD						
D						

Total area (ha):	119.0	Composite CN(I):	52	Ia (mm) NVCA	7.6
Pervious area (ha):	119.0	Composite CN(II):	72	Ia (mm) NRSCS	20.7
Impervious area (ha):	0.0	Composite CN(III):	85		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			89.86				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			7.30				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			21.85				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	119.01
Runoff Coefficient	0.28
Length (m)	2725.7
h_1 (m)	277.3
h_2 (m)	228.8
Dh (m)	48.5
Slope (%)	1.78

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		115.10	39.17	58.47		74.21
Tp (hr)		1.29	0.44	0.65		0.83

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	115.12	291.72				74.04
Tp (hr)	1.29	3.26				0.83

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 5 SR-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	15.416	4.716	77.022			
BC						
C						
CD						
D						

Total area (ha):	97.2	Composite CN(I):	52	Ia (mm) NVCA	7.5
Pervious area (ha):	97.2	Composite CN(II):	72	Ia (mm) NRSCS	19.8
Impervious area (ha):	0.0	Composite CN(III):	86		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			77.02				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			4.72				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			15.42				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	97.15
Runoff Coefficient	0.28
Length (m)	2253.3
h_1 (m)	259.5
h_2 (m)	223
Dh (m)	36.5
Slope (%)	1.62

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		107.46	36.81	54.94		66.26
Tp (hr)		1.20	0.41	0.61		0.74

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	107.45	257.95				64.15
Tp (hr)	1.20	2.88				0.72

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: H 89-A

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	14.926	19.021	13.414			
BC						
C						
CD						
D						

Total area (ha):	47.4	Composite CN(I):	43	Ia (mm) NVCA	8.3
Pervious area (ha):	47.4	Composite CN(II):	64	Ia (mm) NRSCS	28.6
Impervious area (ha):	0.0	Composite CN(III):	81		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			13.41				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			19.02				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			14.93				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	47.36
Runoff Coefficient	0.24
Length (m)	1152.3
h_1 (m)	250.1
h_2 (m)	222.7
Dh (m)	27.4
Slope (%)	2.38

Uplands Method	
Flow Path Cover	
x	4.6

Kerby Method	
Rk =	

Kinematic Wave/Izzard Method	
cr =	
n =	
i (mm/hr) =	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		71.62	25.57	38.17		33.52
Tp (hr)		0.80	0.29	0.43		0.37

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	71.71	154.59				27.07
Tp (hr)	0.80	1.73				0.30

Project Name:	South Innisfil Creek Drainage Improvements
Project No.:	300038790
Location:	Town of Innisfil
Created By:	J.Koen
Checked By:	T.Lozon
Date Created:	15-Mar-2017
Date Modified:	15-May-2018

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SWMHYMO STANDHYD Hydrologic Modeling Parameters - Urban Land Use

CATCHMENT: **15 Ln-A**

Composite Curve Number

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B	4.034	6.285	11.1	
BC				
C				
CD				
D				

Total area (ha):	37.1	Pervious CN (AMCI):	47
Pervious area (ha):	21.4	Pervious CN (AMCII):	68
Impervious area (ha):	15.7	Pervious CN (AMCIII):	83

Slope and Initial Abstraction

Pervious Area		Impervious Area	
Length (m)	1685.7	Length (m)	218.72
h_1 (m)	229.1	h_1 (m)	228
h_2 (m)	212.8	h_2 (m)	226
Δh (m)	16.3	Δh (m)	2
Slope (%)	1.0	Slope (%)	0.9
Ia (mm)	7.9	Ia (mm)	2.0
Manning's n	0.25	Manning's n	0.013

Impervious % - Directly Connected (XIMP) and Total (TIMP)

Land Use	Area (ha)	XIMP (%)	TIMP (%)
Roadway		0	42
Driveway			
Sidewalk			
Building			
Other			

Project Name:	South Innisfil Creek Drainage Improvements
Project No:	300038790
Location:	Town of Innisfil
Designer:	J.Koen
Date:	T.Lozon
Date Modified:	15-Mar-2017

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 13 Ln-A

Composite Curve Number and Initial Abstraction Calculation

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	7.662	10.708				
AB						
B	47.914	19.772	44.296			
BC						
C			5.169			
CD						
D						

Total area (ha):	135.52	**Composite CN(I):**	41	Ia (mm)	8.5	NVCA
Pervious area (ha):	135.5	**Composite CN(II):**	62	Ia (mm)	31.1	NRSCS
Impervious area (ha):	0.0	**Composite CN(III):**	79			

Composite Runoff Coefficient Calculation

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			44.29		5.17		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	10.708		19.77				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	7.662		47.91				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters- General	
Total Area (ha)	135.52
Runoff Coefficient	0.23
Length (m)	1791
h_1 (m)	310
h_2 (m)	253
Δh (m)	57
Slope (%)	3.18

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kinematic Wave/Izzard Method	
cr=	
n=	
i(mm/hr)=	

Kerby Method	
Rk=	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		81.70	36.73	54.83		42.33
Tp (hr)		0.91	0.41	0.61		0.47

Project Name:	South Innisfil Creek Drainage Improvements
Project No:	300038790
Location:	Town of Innisfil
Designer:	J.Koen
Date:	T.Lozon
Date Modified:	15-Mar-2017

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: 14 Ln-A

Composite Curve Number and Initial Abstraction Calculation

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	114.05	46.1	76.109			
BC						
C		20.503	19.84			
CD						
D						

Total area (ha):	276.60	**Composite CN(I):**	45	Ia (mm)	8.5	NVCA
Pervious area (ha):	276.6	**Composite CN(II):**	66	Ia (mm)	26.2	NRSCS
Impervious area (ha):	0.0	**Composite CN(III):**	82			

Composite Runoff Coefficient Calculation

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			76.11		19.84		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			46.10		20.50		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			114.05				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters- General	
Total Area (ha)	276.60
Runoff Coefficient	0.25
Length (m)	3625.8
h_1 (m)	300
h_2 (m)	238
Δh (m)	62
Slope (%)	1.71

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kinematic Wave/Izzard Method	
cr=	
n=	
i(mm/hr)=	

Kerby Method	
Rk=	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		138.82	55.33	82.59		94.45
Tp (hr)		1.55	0.62	0.92		1.05

Project Name:	South Innisfil Creek Drainage Improvements
Project No:	300038790
Location:	Town of Innisfil
Designer:	J.Koen
Date:	T.Lozon
Date Modified:	15-Mar-2017

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **CR 89-A**

Composite Curve Number and Initial Abstraction Calculation

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		11.614	11.954			
AB						
B		2.767	99.598			
BC						
C						
CD						
D		10.4	76.007			

Total area (ha):	212.34	Composite CN(I):	58	Ia (mm)	7.1	NVCA
Pervious area (ha):	212.3	Composite CN(II):	77	Ia (mm)	16.0	NRSCS
Impervious area (ha):	0.0	Composite CN(III):	89			

Composite Runoff Coefficient Calculation

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	11.95		99.59				76.007
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	11.61		2.77				10.4
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters- General	
Total Area (ha)	212.32
Runoff Coefficient	0.38
Length (m)	3620
h_1 (m)	267
h_2 (m)	226
Δh (m)	41
Slope (%)	1.13

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kinematic Wave/Izzard Method	
cr=	
n=	
i(mm/hr)=	

Kerby Method	
Rk=	

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		135.29	54.05	80.68		111.00
Tp (hr)		1.51	0.60	0.90		1.24

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Appendix D

Hydrologic Modelling Outputs

Appendix D

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D1

Sub-Appendix D1

Standard Rainfall Design Storms

```
2     Metric units
*#*****************************************************************************
*#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
*#  Project No. : [300038790]
*#  Date        : 2017-02-08
*#  Date Rev.   : N/A
*#  Modeller    : [T.Lozon]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#*****************************************************************************
*%
*# EXISTING CONDITION
*# EX_FINAL WITH STANDARD RAINFALL DATA
*# ORRILIA TS RAIN GAGE
*# Modified IA - Using NRSCS IA instead of NVCA IA
*# 12 HR SCS TYPE II
*# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
*# TOPOGRAPHIS SURVEY INFORMATION
*# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
*%
*%
*%
*% 2-YR SCS Type-II ORILLIA Storm Distribution . (12-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS12.STM"] <--storm filename
*%-----------------|------------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE ORANGE
*#Flows to Flow Node 5 (LINE 5)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 7 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["7Ln-A"], DT=[2]min, AREA=[92.30](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[22.8](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 7 Ln-A to Flow Node 1
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-7LnA"], IDin=[1], TLAG=[278.45](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-E
*%-----------------|------------------------------------------------------------|
```



```
CALIB NASHYD        ID=[1], NHYD=["5SR-E"], DT=[2]min, AREA=[225.54](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                    N=[3], TP=[2.07]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-E to Flow Node 1
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRE"], IDin=[1], TLAG=[165.95](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 10 SR-G (NO ROUTING NEEDED)
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-G"], DT=[2]min, AREA=[505.12](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[19.8](mm),
                    N=[3], TP=[2.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment CR 4-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["CR4-D"], DT=[2]min, AREA=[36.36](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[0.79]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-D to Flow Node 1
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-CR4D"], IDin=[5], TLAG=[84.11](min)
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 6 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["6Ln-A"], DT=[2]min, AREA=[310.44](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[17.8](mm),
                    N=[3], TP=[1.26]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 6 Ln-A to Flow Node 1
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["S-6LnA"], IDin=[1], TLAG=[86.92](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["5Ln-A"], DT=[2]min, AREA=[461.49](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.0](mm),
                    N=[3], TP=[1.44]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
```



```
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOWS AT LINE 5
*%Add flows at Flow Node 7 from Catchments 7 Ln-A, 5 SR-E, 10 SR-G, CR 4-D,
*%   6 Ln-A & 5 Ln-A
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN5"], IDs to add=[2+3+4+6+7+8]
*%-----------------|------------------------------------------------------------|

*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 5 TO LINE 4
*% DRAIN #1
*% USE HEC-RAS X-SECTION 18
ROUTE CHANNEL       IDout=[1], NHYD=["DR#1"], IDin=[9],
                    RDT=[5](min),
                    CHLGTH=[1780](m),  CHSLOPE=[0.29](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[18],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,249.27] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0,234.17]
                                                   [205.47,230.2]
                                                   [212.04,229.96]
                                                   [215.28,227.63]
                                                   [216.96,227.6]
                                                   [221.63,229.92]
                                                   [249.27,230.06]
*%-----------------|------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE RED
*%
*%Flows from Catchment CR 4-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-C"], DT=[2]min, AREA=[55.76](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-C to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4C"], IDin=[2], TLAG=[222.18](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-F
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-F"], DT=[2]min, AREA=[472.58](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.9](mm),
                    N=[3], TP=[1.72]hrs,
```



```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-F to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnF"], IDin=[2], TLAG=[156.21](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-E
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["4Ln-E"], DT=[2]min, AREA=[92.9](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.9](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% TOTAL RED
*% Add from Catchments CR4-C,4Ln-F,4Ln-E
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTRED"], IDs to add=[3+4+5]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW TO LINE 4
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN4"], IDs to add=[9+1]
*%-----------------|------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 4 TO LINE 3
*% USE HEC X-SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1530](m),  CHSLOPE=[0.23](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,779.49] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[746.77,227.72]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]

*%-----------------|------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE FLOWS TO LINE 3 NORTH DITCH
*%
CALIB NASHYD        ID=[2], NHYD=["CR4-B"], DT=[2]min, AREA=[126.62](ha),
                    DWF=[0](cms), CN/C=[66.0], IA=[27.4](mm),
                    N=[3], TP=[0.97]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
```

```
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-B to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-CR4B"], IDin=[2], TLAG=[41.18](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-E
CALIB NASHYD        ID=[5], NHYD=["3Ln-E"], DT=[2]min, AREA=[185.00](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[21.8](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% LINE 3 NORTH DITCH
*% Add from Catchments
ADD HYD             IDsum=[2], NHYD=["TLN3ND"], IDs to add=[4+5]
*%-----------------|------------------------------------------------------------|
*%Shift flow from LIN3ND TO FLOW NODE 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-L3ND"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*%Flows from Catchment CR 4-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-A"], DT=[2]min, AREA=[181.15](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.0](mm),
                    N=[3], TP=[1.00]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-A to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4A"], IDin=[2], TLAG=[147.74](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment CR 4-B
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 10 SR-F
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-F"], DT=[2]min, AREA=[158.41](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% LINE 3 SOUTH DITCH
ADD HYD             IDsum=[2], NHYD=["TLN3SD"], IDs to add=[2+3]
*%-----------------|------------------------------------------------------------|
*%Shift flow from LIN3NS TO FLOW NODE 3
*%-----------------|------------------------------------------------------------|
```



```
SHIFT HYD           IDout=[5], NHYD=["S-L3NS"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************

*%Flows from Catchment 3 Ln-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[7], NHYD=["3Ln-D"], DT=[2]min, AREA=[213.80](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[11.9](mm),
                    N=[3], TP=[1.18]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["4Ln-D"], DT=[2]min, AREA=[88.09](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                    N=[3], TP=[0.81]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-D to Flow Node 2
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-4LnD"], IDin=[8], TLAG=[84.98](min)
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["3Ln-C"], DT=[2]min, AREA=[248.17](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TPNK"], IDs to add=[7+2+8]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT U/S SIDE OF LINE 3
*% Add from Catchments
ADD HYD             IDsum=[3], NHYD=["TLN3US"], IDs to add=[4+6]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT THE D/S LIMTIS OF LINE 3
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN3A"], IDs to add=[3+5+1]
*%-----------------|------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*#****************************************************************************
*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO MIDWAY TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2US"], IDin=[9],
```



```
                    RDT=[15](min),
                    CHLGTH=[685](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 10 SR-E
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-E"], DT=[2]min, AREA=[225.52](ha),
                    DWF=[0](cms), CN/C=[84.0], IA=[10.4](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW MID A JUNCTION BETWEEN LINE 3 AND 2
ADD HYD             IDsum=[9], NHYD=["TMID32"], IDs to add=[1+2]
*%-----------------|------------------------------------------------------------|
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2DS"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[2250](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE BLUE
*%
*#Flows FROM WEST OF THE 400 TO 2ND LINE
```



```
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-C"], DT=[2]min, AREA=[230.90](ha),
                    DWF=[0](cms), CN/C=[78.0], IA=[14.3](mm),
                    N=[3], TP=[2.02]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-C to Flow Node 4
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnC"], IDin=[2], TLAG=[60.19](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-D"], DT=[2]min, AREA=[81.43](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-D to Flow Node 4
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRD"], IDin=[2], TLAG=[24.84](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment H 400-B
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["H400-B"], DT=[2]min, AREA=[79.99](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment H 400-B to Flow Node 4
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["SH400B"], IDin=[2], TLAG=[12.66](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-B"], DT=[2]min, AREA=[74.81](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
```

```
*%Add flows at Flow Node 4 from Catchments 4 Ln-C, 5 SR-D, H 400-B & 3 Ln-B
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLUE
ADD HYD             IDsum=[6], NHYD=["TOTBLU"], IDs to add=[3+4+5+2]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[7], NHYD=["DR#4"], IDin=[6],
                    RDT=[15](min),
                    CHLGTH=[2000](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#***************************************************************************
*%Flows from Catchment 10 SR-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-D"], DT=[2]min, AREA=[110.02](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[21.8](mm),
                    N=[3], TP=[1.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-D to Flow Node 2
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S10SRD"], IDin=[2], TLAG=[153.59](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["2Ln-B"], DT=[2]min, AREA=[318.07](ha),
                    DWF=[0](cms), CN/C=[80.0], IA=[13.5](mm),
                    N=[3], TP=[2.13]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL GREEN
*% Add from Catchments
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=["TOTGRN"], IDs to add=[2+4]
```



```
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW TO LINE 2
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW UPSTREAM OF THE 2ND LINE
ADD HYD             IDsum=[9], NHYD=["TFN2U"], IDs to add=[5+1+7]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment 10 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["10SR-C"], DT=[2]min, AREA=[365.20](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[20.7](mm),
                    N=[3], TP=[1.39]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-C DOWNSTREAM LIMITS OF 2ND LINE
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S10SRC"], IDin=[3], TLAG=[121.76](min)
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW DOWNSTREAM OF THE 2ND LINE
ADD HYD             IDsum=[4], NHYD=["TFN2D"], IDs to add=[4+9]
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 2 TO FLOW NODE GOLF EAST
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[1], NHYD=["RGLF"], IDin=[4],
                    RDT=[15](min),
                    CHLGTH=[785](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500.00,226.10]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
```



```
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment H 400-A
*% OUTLET TO GOLFE (GOLF COURSE EAST)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["H400-A"], DT=[2]min, AREA=[350.22](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[11.9](mm),
                    N=[3], TP=[1.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% CALCULATE TOTAL FLOW TO FLOW NODE GLFE (GOLF COURSE EAST)
ADD HYD             IDsum=[1], NHYD=["GOLFE"], IDs to add=[4+1]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE BLACK
*#Flows to Flow Node 2B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-A"], DT=[2]min, AREA=[114.12](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                    N=[3], TP=[1.33]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnA"], IDin=[2], TLAG=[234.20](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-B"], DT=[2]min, AREA=[171.81](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[17.8](mm),
                    N=[3], TP=[1.34]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-B to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnB"], IDin=[2], TLAG=[232.52](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-A
```



```
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-A"], DT=[2]min, AREA=[268.08](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[1.61]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 3 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-3LnA"], IDin=[2], TLAG=[158.77](min)
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[2], NHYD=["TBLK1"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["5SR-C"], DT=[2]min, AREA=[341.88](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[1.50]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-C to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRC"], IDin=[3], TLAG=[72.46](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["2Ln-A"], DT=[2]min, AREA=[105.00](ha),
                    DWF=[0](cms), CN/C=[71.0], IA=[21.8](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLACK
*%Add flows at Flow Node 5 from Catchments 4 Ln-A, 4 Ln-B, 3 Ln-A,
*%    5 SR-C & 2 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[7], NHYD=["TOTBLK"], IDs to add=[2+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TOTBLK TO FLOW NODE GOLF NORTH
*% ROUTE FLOWS FROM LINE 2 FLOW NODE GOLFN
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLFN"], IDin=[7],
                    RDT=[15](min),
                    CHLGTH=[330](m),  CHSLOPE=[0.04](%),
```

```
                               FPSLOPE=[0.50](%),
                  SECNUM=[11],        NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                  ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                 [860.67,226.03]
                                                 [865.17,223.96]
                                                 [867.01,223.96]
                                                 [871.48,225.21]
                                                 [879.46,225.75]
                                                 [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOWS FROM GOLF NORTH AND GOLF EAST
ADD HYD           IDsum=[7], NHYD=["TGOLF"], IDs to add=[2+1]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TGOLF TO HWY 400
*% USE HEC SECTION 11
ROUTE CHANNEL     IDout=[2], NHYD=["GOLF"], IDin=[7],
                  RDT=[15](min),
                  CHLGTH=[485](m),  CHSLOPE=[0.04](%),
                               FPSLOPE=[0.50](%),
                  SECNUM=[11],        NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                  ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                 [860.67,226.03]
                                                 [865.17,223.96]
                                                 [867.01,223.96]
                                                 [871.48,225.21]
                                                 [879.46,225.75]
                                                 [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% YELLOW SOUTH( HNYDCZAK DRAIN)
*%Flows from Catchment 10 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[3], NHYD=["10SR-A"], DT=[2]min, AREA=[406.60](ha),
                  DWF=[0](cms), CN/C=[65.0], IA=[27.4](mm),
                  N=[3], TP=[1.82]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
```



```
*%Flows from Catchment 10 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[4], NHYD=["10SR-B"], DT=[2]min, AREA=[96.11](ha),
                  DWF=[0](cms), CN/C=[67.0], IA=[25.0](mm),
                  N=[3], TP=[1.28]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B
*% INTERSECTION OF 10 SIDEROAD AND HWY 89
ADD HYD           IDsum=[3], NHYD=["T10AB"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW INTERSECTION OF 10 SIDEROAD AND HWY 89 TO OUTLET OF CR-89A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD         IDout=[5], NHYD=["S10AB"], IDin=[3], TLAG=[148.99](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 13 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[3], NHYD=["13Ln-A"], DT=[2]min, AREA=[135.52](ha),
                  DWF=[0](cms), CN/C=[62], IA=[31.1](mm),
                  N=[3], TP=[0.91]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM OUTLET OF 13 Ln-A to outelt of 14 Ln-A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD         IDout=[4], NHYD=["S13LnA"], IDin=[3], TLAG=[100.46](min)
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 14 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[3], NHYD=["14Ln-A"], DT=[2]min, AREA=[276.60](ha),
                  DWF=[0](cms), CN/C=[66], IA=[26.2](mm),
                  N=[3], TP=[1.55]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT THE 14TH LINE
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[9], NHYD=["TOT14L"], IDs to add=[4+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM 14TH LINE TO HIGHWAY 89
*%-----------------|-------------------------------------------------------------|
SHIFT HYD         IDout=[3], NHYD=["S13LnA"], IDin=[9], TLAG=[209.97](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 89-A
*%-----------------|-------------------------------------------------------------|
```



```
CALIB NASHYD      ID=[4], NHYD=["CR89-A"], DT=[2]min, AREA=[212.34](ha),
                  DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                  N=[3], TP=[1.51]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B + CR 89-A
*% HNYDCZAK CROSSES HWY 89
ADD HYD           IDsum=[3], NHYD=["THNYAK"], IDs to add=[4+5+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOWS FROM HNYDCZAK CROSSES HWY 89 TO FLOW NODE HYND
*% FLOW NODE HYND LOCATED AT THE OUTLET OF THE HNYDCZAK UPSTREAM OF HIGHWAY 400
SHIFT HYD         IDout=[4], NHYD=["HYND"], IDin=[3], TLAG=[123.60](min)
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT HWY 400
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[9], NHYD=["HWY400"], IDs to add=[4+2]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM HWY 400 TO 15TH LINE
*% USE HEC SECTION 6
ROUTE CHANNEL     IDout=[1], NHYD=["DR#6"], IDin=[9],
                  RDT=[15](min),
                  CHLGTH=[1700](m),  CHSLOPE=[0.01](%),
                               FPSLOPE=[0.50](%),
                  SECNUM=[6],        NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.06,400.82] NSEG times
                  ( DISTANCE (m), ELEVATION (m))=[200.00,225.3]
                                                 [220.07,225.18]
                                                 [231.91,224.9]
                                                 [240.6,222.78]
                                                 [245.45,222.77]
                                                 [251.91,224.78]
                                                 [355.82,225.16]
                                                 [400.82,225.30]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************

*% CALCULATE PLUM
*%-----------------|-------------------------------------------------------------|
```



```
*%Flows from Catchment 5 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[2], NHYD=["5SR-B"], DT=[2]min, AREA=[119.01](ha),
                  DWF=[0](cms), CN/C=[72.0], IA=[20.7](mm),
                  N=[3], TP=[1.29]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-B to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD         IDout=[3], NHYD=["S-5SRB"], IDin=[2], TLAG=[108.27](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[2], NHYD=["5SR-A"], DT=[2]min, AREA=[97.15](ha),
                  DWF=[0](cms), CN/C=[72.0], IA=[19.8](mm),
                  N=[3], TP=[1.20]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-A to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD         IDout=[4], NHYD=["S-5SRA"], IDin=[2], TLAG=[123.28](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 15 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB STANDHYD    ID= [5], NHYD=["15Ln-A"], DT=[2](min), AREA=[37.07](ha),
                  XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[68],
                  Pervious   surfaces: IAper=[7.9](mm), SLPP=[1.0](%),
                                       LGP=[1685.7](m), MNP=[.25], SCP=[0](min),
                  Impervious surfaces: IAimp=[2](mm), SLPI=[0.9](%),
                                       LGI=[218.72](m), MNI=[.013], SCI=[0](min),
                  RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment H 89-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[6], NHYD=["H89-A"], DT=[2]min, AREA=[47.36](ha),
                  DWF=[0](cms), CN/C=[64.0], IA=[28.6](mm),
                  N=[3], TP=[0.80]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment H 89-A to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD         IDout=[7], NHYD=["S-H89A"], IDin=[6], TLAG=[45.46](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL PLUM
```

```
*%Add flows at Flow Node 8 from Catchments 5 SR-B, 5 SR-A, H 89-A, 15 Ln-A
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD            IDsum=[6], NHYD=["TOTPLM"], IDs to add=[3+4+5+7]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD            IDsum=[9], NHYD=["TFN15L"], IDs to add=[6+1]
*%-----------------|-----------------------------------------------------------|
*% 5-YR SCS Type-II ORILLIA Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                  ["5SCS12.STM"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 10-YR SCS Type-II ORILLIA Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                  ["10SCS12.STM"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 25-YR SCS Type-II ORILLIA Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                  ["25SCS12.STM"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 50-YR SCS Type-II ORILLIA Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                  ["50SCS12.STM"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 100-YR SCS Type-II ORILLIA Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                  ["100SCS12.STM"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% Timmins Regional Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
*%                  ["12REGTIM.O89"] <--storm filename
*%-----------------|-----------------------------------------------------------|
FINISH
```

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999   999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9 9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9 9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999  9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9     9   =========
                                                       9   9 9   9   # 3877524
       StormWater Management HYdrologic Model           999   999    =========

 ******************************************************************************
 **************************** SWMHYMO Ver/4.05  *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884          *********
 *********                  Gatineau, Quebec: (819) 243-6858          *********
 *********                  E-Mail: swmhymo@jfsa.Com                  *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: R. J. Burnside & Associates Ltd.            +++++++++
 +++++++++                Brampton             SERIAL#:3877524        +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).   *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.). *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).   *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.            *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).      *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).      *****
 *****     *:  see WARNING or NOTE message printed at end of run.        *****
 *****    **:  see  ERROR  message printed at end of run.                *****
 ******************************************************************************
 ******************************************************************************
```



```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 **********************   S U M M A R Y   O U T P U T   **********************
 ******************************************************************************
 *        DATE: 2018-02-08     TIME: 14:20:44     RUN COUNTER: 000221        *
 ******************************************************************************
 * Input   filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\12hrSCS\EX_FINAL.txt  *
 * Output  filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\12hrSCS\EX_FINAL.out  *
 * Summary filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\12hrSCS\EX_FINAL.sum  *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 ******************************************************************************


#******************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#******************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 RUN:COMMAND#
 001:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=30.00:SDUR=  12.00:PTOT=  41.40]
#******************************************************************************
```



```
#******************************************************************************
#Flows to Flow Node 5 (LINE 5)
 001:0003--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30     .139 No_date    8:14    2.71 .066
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 001:0004--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30     .139 No_date    8:14    2.71  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30     .139 No_date   12:52    2.71  n/a
 001:0005--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54     .679 No_date    8:56    6.37 .154
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 001:0006--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54     .679 No_date    8:56    6.37  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54     .679 No_date   11:40    6.37  n/a
 001:0007--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12     .825 No_date    9:52    3.88 .094
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 001:0008--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36     .148 No_date    7:04    4.94 .119
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 001:0009--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36     .148 No_date    7:04    4.94  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36     .148 No_date    8:28    4.94  n/a
 001:0010--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44     .984 No_date    7:46    5.14 .124
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 001:0011--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44     .984 No_date    7:46    5.14  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44     .984 No_date    9:12    5.14  n/a
 001:0012--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    1.665 No_date    7:58    6.11 .148
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 001:0013--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30     .139 No_date   12:52    2.71  n/a
                    +  03:S-5SRE       225.54     .679 No_date   11:40    6.37  n/a
                    +  04:10SR-G       505.12     .825 No_date    9:52    3.88  n/a
                    +  06:S-CR4D        36.36     .148 No_date    8:28    4.94  n/a
                    +  07:S-6LnA       310.44     .984 No_date    9:12    5.14  n/a
                    +  08:5Ln-A        461.49    1.665 No_date    7:58    6.11  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25    3.415 No_date    9:28    5.05  n/a
#******************************************************************************
#******************************************************************************
```



```
 001:0014--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25    3.415 No_date    9:28    5.05  n/a
  *   [RDT= 2.00] out<- 01:DR#1       1631.25    3.390 No_date    9:46    5.05  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.200:Dmax=  .904}
#******************************************************************************
#******************************************************************************
 001:0015--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76     .181 No_date    7:20    4.57 .110
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0016--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76     .181 No_date    7:20    4.57  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76     .181 No_date   11:02    4.57  n/a
 001:0017--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    1.416 No_date    8:28    5.73 .138
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0018--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    1.416 No_date    8:28    5.73  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    1.416 No_date   11:04    5.73  n/a
 001:0019--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90     .415 No_date    7:12    5.73 .138
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 001:0020--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76     .181 No_date   11:02    4.57  n/a
                    +  04:S-4LnF       472.58    1.416 No_date   11:04    5.73  n/a
                    +  05:4Ln-E         92.90     .415 No_date    7:12    5.73  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24    1.710 No_date   11:00    5.63  n/a
 001:0021--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24    1.710 No_date   11:00    5.63  n/a
                    +  01:DR#1        1631.25    3.390 No_date    9:46    5.05  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49    4.915 No_date   10:34    5.21  n/a
#******************************************************************************
#******************************************************************************
 001:0022--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49    4.915 No_date   10:34    5.21  n/a
  *   [RDT= 2.00] out<- 01:DR#2       2252.49    4.847 No_date   10:52    5.21  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.087:Dmax=  .993}
#******************************************************************************
#******************************************************************************
 001:0023--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62     .093 No_date    8:36    1.35 .033
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 001:0024--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
     SHIFT HYD        -> 02:CR4-B         126.62     .093 No_date    8:36    1.35  n/a
      [LAG= 41.2 min]<- 04:S-CR4B         126.62     .093 No_date    9:16    1.35  n/a
 001:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        05:3Ln-E          185.00     .303 No_date    8:16    2.99 .072
      [CN= 70.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 001:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             04:S-CR4B         126.62     .093 No_date    9:16    1.35  n/a
                      +  05:3Ln-E          185.00     .303 No_date    8:16    2.99  n/a
      [DT= 2.00]  SUM=  02:TLN3ND         311.62     .384 No_date    8:34    2.33  n/a
 001:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:TLN3ND         311.62     .384 No_date    8:34    2.33  n/a
      [LAG= 66.9 min]<- 06:S-L3ND         311.62     .384 No_date    9:40    2.33  n/a
#******************************************************************************
#******************************************************************************
 001:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:CR4-A          181.15     .830 No_date    7:16    6.11 .148
      [CN= 76.0: N= 3.00]
      [Tp= 1.00:DT= 2.00]
 001:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:CR4-A          181.15     .830 No_date    7:16    6.11  n/a
      [LAG=147.7 min]<- 03:S-CR4A         181.15     .830 No_date    9:42    6.11  n/a
 001:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:10SR-F         158.41     .536 No_date    8:24    6.37 .154
      [CN= 77.0: N= 3.00]
      [Tp= 1.72:DT= 2.00]
 001:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             02:TLN3SD         158.41     .536 No_date    8:24    6.37  n/a
                      +  03:S-CR4A         181.15     .830 No_date    9:42    6.11  n/a
      [DT= 2.00]  SUM=  02:TLN3SD         339.56    1.293 No_date    9:38    6.23  n/a
 001:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:TLN3SD         339.56    1.293 No_date    9:38    6.23  n/a
      [LAG= 66.9 min]<- 05:S-L3NS         339.56    1.293 No_date   10:44    6.23  n/a
#******************************************************************************
#******************************************************************************
 001:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        07:3Ln-D          213.80    1.546 No_date    7:24    9.77 .236
      [CN= 81.0: N= 3.00]
      [Tp= 1.18:DT= 2.00]
 001:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        08:4Ln-D           88.09     .405 No_date    7:02    5.50 .133
      [CN= 75.0: N= 3.00]
      [Tp=  .81:DT= 2.00]
 001:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 08:4Ln-D           88.09     .405 No_date    7:02    5.50  n/a
      [LAG= 85.0 min]<- 02:S-4LnD           88.09     .405 No_date    8:26    5.50  n/a
 001:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        08:3Ln-C          248.17     .850 No_date    7:46    5.50 .133
```



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      [CN= 75.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 001:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             07:3Ln-D          213.80    1.546 No_date    7:24    9.77  n/a
                      +  02:S-4LnD          88.09     .405 No_date    8:26    5.50  n/a
                      +  08:3Ln-C          248.17     .850 No_date    7:46    5.50  n/a
      [DT= 2.00]  SUM=  04:TPNK           550.06    2.570 No_date    7:56    7.16  n/a
 001:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             04:TPNK           550.06    2.570 No_date    7:56    7.16  n/a
                      +  06:S-L3ND         311.62     .384 No_date    9:40    2.33  n/a
      [DT= 2.00]  SUM=  03:TLN3US         861.68    2.750 No_date    8:06    5.41  n/a
 001:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             03:TLN3US         861.68    2.750 No_date    8:06    5.41  n/a
                      +  05:S-L3NS         339.56    1.293 No_date   10:44    6.23  n/a
                      +  01:DR#2          2252.49    4.847 No_date   10:52    5.21  n/a
      [DT= 2.00]  SUM=  09:TFN3A         3453.73    7.601 No_date   10:34    5.36  n/a
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
 001:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL    -> 09:TFN3A         3453.73    7.601 No_date   10:34    5.36  n/a
  *   [RDT= 2.00] out<- 01:DR#2US        3453.73    7.456 No_date   10:58    5.36  n/a
      [L/S/n=  685./ .040/.030]
      {Vmax=  .633:Dmax= 1.748}
 001:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:10SR-E         225.52    2.460 No_date    7:02   12.11 .292
      [CN= 84.0: N= 3.00]
      [Tp=  .95:DT= 2.00]
 001:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             01:DR#2US        3453.73    7.456 No_date   10:58    5.36  n/a
                      +  02:10SR-E         225.52    2.460 No_date    7:02   12.11  n/a
      [DT= 2.00]  SUM=  09:TMID32        3679.25    8.008 No_date   10:28    5.77  n/a
#******************************************************************************
 001:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL    -> 09:TMID32        3679.25    8.008 No_date   10:28    5.77  n/a
  *   [RDT= 2.00] out<- 01:DR#2DS        3679.25    7.510 No_date   11:00    5.77  n/a
      [L/S/n= 2250./ .040/.030]
      {Vmax=  .641:Dmax= 1.785}
#******************************************************************************
#******************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 001:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:4Ln-C          230.90     .842 No_date    8:44    7.44 .180
      [CN= 78.0: N= 3.00]
      [Tp= 2.02:DT= 2.00]
 001:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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     SHIFT HYD        -> 02:4Ln-C          230.90     .842 No_date    8:44    7.44  n/a
      [LAG= 60.2 min]<- 03:S-4LnC         230.90     .842 No_date    9:44    7.44  n/a
 001:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:5SR-D           81.43     .219 No_date    7:56    4.57 .110
      [CN= 74.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 001:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:5SR-D           81.43     .219 No_date    7:56    4.57  n/a
      [LAG= 24.8 min]<- 04:S-5SRD           81.43     .219 No_date    8:20    4.57  n/a
 001:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:H400-B          79.99     .270 No_date    7:14    4.57 .110
      [CN= 74.0: N= 3.00]
      [Tp=  .89:DT= 2.00]
 001:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:H400-B          79.99     .270 No_date    7:14    4.57  n/a
      [LAG= 12.7 min]<- 05:SH400B           79.99     .270 No_date    7:26    4.57  n/a
 001:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:3Ln-B           74.81     .269 No_date    7:18    4.94 .119
      [CN= 74.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 001:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             03:S-4LnC         230.90     .842 No_date    9:44    7.44  n/a
                      +  04:S-5SRD          81.43     .219 No_date    8:20    4.57  n/a
                      +  05:SH400B          79.99     .270 No_date    7:26    4.57  n/a
                      +  02:3Ln-B           74.81     .269 No_date    7:18    4.94  n/a
      [DT= 2.00]  SUM=  06:TOTBLU         467.13    1.330 No_date    9:06    6.04  n/a
#******************************************************************************
#******************************************************************************
 001:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL    -> 06:TOTBLU         467.13    1.330 No_date    9:06    6.04  n/a
  *   [RDT= 2.00] out<- 07:DR#4           467.13    1.129 No_date   10:14    6.04  n/a
      [L/S/n= 2000./ .040/.030]
      {Vmax=  .405:Dmax=  .818}
#******************************************************************************
#****************************************************************************
 001:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:10SR-D         110.02     .177 No_date    8:22    2.99 .072
      [CN= 70.0: N= 3.00]
      [Tp= 1.36:DT= 2.00]
 001:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:10SR-D         110.02     .177 No_date    8:22    2.99  n/a
      [LAG=153.6 min]<- 04:S10SRD         110.02     .177 No_date   10:54    2.99  n/a
 001:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:2Ln-B          318.07    1.299 No_date    8:50    8.52 .206
      [CN= 80.0: N= 3.00]
      [Tp= 2.13:DT= 2.00]
 001:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             02:2Ln-B          318.07    1.299 No_date    8:50    8.52  n/a
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                      +  04:S10SRD         110.02     .177 No_date   10:54    2.99  n/a
      [DT= 2.00]  SUM=  05:TOTGRN         428.09    1.356 No_date    9:28    7.10  n/a
 001:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             05:TOTGRN         428.09    1.356 No_date    9:28    7.10  n/a
                      +  01:DR#2DS        3679.25    7.510 No_date   11:00    5.77  n/a
                      +  07:DR#4           467.13    1.129 No_date   10:14    6.04  n/a
      [DT= 2.00]  SUM=  09:TFN2U         4574.47    9.736 No_date   10:44    5.93  n/a
#******************************************************************************
#******************************************************************************
 001:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        03:10SR-C         365.20     .714 No_date    8:18    3.59 .087
      [CN= 72.0: N= 3.00]
      [Tp= 1.39:DT= 2.00]
 001:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 03:10SR-C         365.20     .714 No_date    8:18    3.59  n/a
      [LAG=121.8 min]<- 04:S10SRC         365.20     .714 No_date   10:18    3.59  n/a
 001:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             04:TFN2D          365.20     .714 No_date   10:18    3.59  n/a
                      +  09:TFN2U         4574.47    9.736 No_date   10:44    5.93  n/a
      [DT= 2.00]  SUM=  04:TFN2D         4939.67   10.432 No_date   10:44    5.75  n/a
#******************************************************************************
#******************************************************************************
 001:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL    -> 04:TFN2D         4939.67   10.432 No_date   10:44    5.75  n/a
  *   [RDT= 2.00] out<- 01:RGLF          4939.67    8.933 No_date   10:32    5.75  n/a
      [L/S/n=  785./ .040/.030]
      {Vmax=  .183:Dmax= 1.989}
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
 001:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        04:H400-A         350.22    1.816 No_date    8:24    9.77 .236
      [CN= 81.0: N= 3.00]
      [Tp= 1.89:DT= 2.00]
 001:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD             04:H400-A         350.22    1.816 No_date    8:24    9.77  n/a
                      +  01:GOLFE         4939.67    8.933 No_date   10:32    5.75  n/a
      [DT= 2.00]  SUM=  01:GOLFE         5289.89   10.202 No_date   10:32    6.02  n/a
#******************************************************************************
#******************************************************************************
#Flows to Flow Node 2B
 001:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD        02:4Ln-A          114.12     .382 No_date    7:50    5.50 .133
      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 001:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD        -> 02:4Ln-A          114.12     .382 No_date    7:50    5.50  n/a
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     [LAG=234.2 min]<- 03:S-4LnA       114.12      .382 No_date   11:44    5.50  n/a
 001:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81      .525 No_date    7:56    5.14 .124
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 001:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81      .525 No_date    7:56    5.14  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81      .525 No_date   11:48    5.14  n/a
 001:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08      .706 No_date    8:22    4.94 .119
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 001:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08      .706 No_date    8:22    4.94  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08      .706 No_date   11:00    4.94  n/a
 001:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12      .382 No_date   11:44    5.50  n/a
                    +  04:S-4LnB       171.81      .525 No_date   11:48    5.14  n/a
                    +  05:S-3LnA       268.08      .706 No_date   11:00    4.94  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01     1.579 No_date   11:34    5.12  n/a
 001:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88      .938 No_date    8:12    4.94 .119
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 001:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88      .938 No_date    8:12    4.94  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88      .938 No_date    9:24    4.94  n/a
 001:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00      .206 No_date    7:34    3.11 .075
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 001:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01     1.579 No_date   11:34    5.12  n/a
                    +  04:S-5SRC       341.88      .938 No_date    9:24    4.94  n/a
                    +  05:2Ln-A        105.00      .206 No_date    7:34    3.11  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89     2.334 No_date   11:18    4.84  n/a
 001:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89     2.334 No_date   11:18    4.84  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89     2.336 No_date   11:32    4.84  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .316:Dmax= 1.311}
#***************************************************************************
#***************************************************************************
 001:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89     2.336 No_date   11:32    4.84  n/a
                    +  01:GOLFE       5289.89    10.202 No_date   10:32    6.02  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78    12.136 No_date   10:32    5.83  n/a
#***************************************************************************
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#***************************************************************************
 001:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78    12.136 No_date   10:32    5.83  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78    10.896 No_date   12:46    5.83  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .108:Dmax= 2.094}
#***************************************************************************
#***************************************************************************
 001:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60      .244 No_date   10:12    1.30 .031
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 001:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11      .094 No_date    8:44    1.90 .046
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 001:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60      .244 No_date   10:12    1.30  n/a
                    +  04:10SR-B        96.11      .094 No_date    8:44    1.90  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71      .330 No_date    9:58    1.41  n/a
 001:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71      .330 No_date    9:58    1.41  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71      .330 No_date   12:26    1.41  n/a
 001:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52      .051 No_date    9:48     .64 .015
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 001:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52      .051 No_date    9:48     .64  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52      .051 No_date   11:28     .64  n/a
 001:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60      .212 No_date    9:44    1.58 .038
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 001:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52      .051 No_date   11:28     .64  n/a
                    +  03:14Ln-A       276.60      .212 No_date    9:44    1.58  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12      .250 No_date   10:06    1.27  n/a
 001:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12      .250 No_date   10:06    1.27  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12      .250 No_date   13:34    1.27  n/a
 001:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34      .778 No_date    8:06    6.37 .154
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 001:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34      .778 No_date    8:06    6.37  n/a
                    +  05:S10AB        502.71      .330 No_date   12:26    1.41  n/a
```



```
                    +  03:THNYAK       412.12      .250 No_date   13:34    1.27  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10     1.556 No_date    8:06    2.89  n/a
 001:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10     1.556 No_date    8:06    2.89  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10     1.556 No_date   10:08    2.89  n/a
#***************************************************************************
#***************************************************************************
 001:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10     1.556 No_date   10:08    2.89  n/a
                    +  02:GOLF        6290.78    10.896 No_date   12:46    5.83  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88    12.297 No_date   12:42    5.29  n/a
#***************************************************************************
#***************************************************************************
 001:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88    12.297 No_date   12:42    5.29  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88    11.304 No_date   14:16    5.29  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.529}
#***************************************************************************
#***************************************************************************
 001:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01      .241 No_date    8:08    3.59 .087
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 001:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01      .241 No_date    8:08    3.59  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01      .241 No_date    9:56    3.59  n/a
 001:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15      .225 No_date    7:50    3.88 .094
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 001:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15      .225 No_date    7:50    3.88  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15      .225 No_date    9:52    3.88  n/a
 001:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07     1.900 No_date    6:00   23.37 .564
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 001:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36      .028 No_date    8:32    1.05 .025
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 001:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36      .028 No_date    8:32    1.05  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36      .028 No_date    9:16    1.05  n/a
 001:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            03:S-5SRB       119.01      .241 No_date    9:56    3.59  n/a
                    +  04:S-5SRA        97.15      .225 No_date    9:52    3.88  n/a
                    +  05:15Ln-A        37.07     1.900 No_date    6:00   23.37  n/a
                    +  07:S-H89A        47.36      .028 No_date    9:16    1.05  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59     1.900 No_date    6:00    5.72  n/a
 001:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59     1.900 No_date    6:00    5.72  n/a
                    +  01:DR#6        7720.88    11.304 No_date   14:16    5.29  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47    11.512 No_date   14:10    5.30  n/a
  ** END OF RUN :   1

****************************************************************************



 RUN:COMMAND#
 002:0001---------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   2 ]
#***************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#***************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 002:0002---------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=30.00:SDUR=  12.00:PTOT=  56.20]
#***************************************************************************
#***************************************************************************
```

```
#Flows to Flow Node 5 (LINE 5)
 002:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30      .472 No_date    7:36    7.84 .140
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 002:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:7Ln-A         92.30      .472 No_date    7:36    7.84  n/a
     [LAG=278.5 min]<- 02:S-7LnA         92.30      .472 No_date   12:14    7.84  n/a
 002:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54     1.570 No_date    8:38   13.92 .248
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 002:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:5SR-E        225.54     1.570 No_date    8:38   13.92  n/a
     [LAG=165.9 min]<- 03:S-5SRE        225.54     1.570 No_date   11:22   13.92  n/a
 002:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12     2.188 No_date    9:16    9.80 .174
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 002:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36      .401 No_date    6:54   11.55 .206
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 002:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 05:CR4-D         36.36      .401 No_date    6:54   11.55  n/a
     [LAG= 84.1 min]<- 06:S-CR4D         36.36      .401 No_date    8:18   11.55  n/a
 002:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44     2.565 No_date    7:32   11.98 .213
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 002:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:6Ln-A        310.44     2.565 No_date    7:32   11.98  n/a
     [LAG= 86.9 min]<- 07:S-6LnA        310.44     2.565 No_date    8:58   11.98  n/a
 002:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49     3.980 No_date    7:44   13.42 .239
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 002:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA         92.30      .472 No_date   12:14    7.84  n/a
                    +  03:S-5SRE        225.54     1.570 No_date   11:22   13.92  n/a
                    +  04:10SR-G        505.12     2.188 No_date    9:16    9.80  n/a
                    +  06:S-CR4D         36.36      .401 No_date    8:18   11.55  n/a
                    +  07:S-6LnA        310.44     2.565 No_date    8:58   11.98  n/a
                    +  08:5Ln-A         461.49     3.980 No_date    7:44   13.42  n/a
     [DT= 2.00]  SUM=  09:TOTFN5       1631.25     8.453 No_date    8:42   11.74  n/a
#******************************************************************************
#******************************************************************************
 002:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ROUTE CHANNEL   -> 09:TOTFN5       1631.25     8.453 No_date    8:42   11.74  n/a
 *   [RDT= 2.00] out<- 01:DR#1         1631.25     8.345 No_date    9:06   11.74  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.517:Dmax= 1.392}
#******************************************************************************
#******************************************************************************
 002:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76      .509 No_date    7:08   11.04 .197
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 002:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-C         55.76      .509 No_date    7:08   11.04  n/a
     [LAG=222.2 min]<- 03:S-CR4C         55.76      .509 No_date   10:50   11.04  n/a
 002:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58     3.437 No_date    8:12   12.92 .230
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 002:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-F        472.58     3.437 No_date    8:12   12.92  n/a
     [LAG=156.2 min]<- 04:S-4LnF        472.58     3.437 No_date   10:48   12.92  n/a
 002:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90     1.061 No_date    7:02   12.92 .230
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 002:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C         55.76      .509 No_date   10:50   11.04  n/a
                    +  04:S-4LnF        472.58     3.437 No_date   10:48   12.92  n/a
                    +  05:4Ln-E          92.90     1.061 No_date    7:02   12.92  n/a
     [DT= 2.00]  SUM=  09:TOTRED        621.24     4.177 No_date   10:44   12.75  n/a
 002:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4        621.24     4.177 No_date   10:44   12.75  n/a
                    +  01:DR#1         1631.25     8.345 No_date    9:06   11.74  n/a
     [DT= 2.00]  SUM=  09:TOTFN4       2252.49    11.675 No_date   10:18   12.02  n/a
#******************************************************************************
#******************************************************************************
 002:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4       2252.49    11.675 No_date   10:18   12.02  n/a
 *   [RDT= 2.00] out<- 01:DR#2         2252.49    11.559 No_date   10:32   12.02  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.357:Dmax= 1.449}
#******************************************************************************
#******************************************************************************
 002:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62      .439 No_date    7:26    5.20 .092
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 002:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-B        126.62      .439 No_date    7:26    5.20  n/a
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     [LAG= 41.2 min]<- 04:S-CR4B        126.62      .439 No_date    8:06    5.20  n/a
 002:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00      .962 No_date    7:44    8.26 .147
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 002:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B        126.62      .439 No_date    8:06    5.20  n/a
                    +  05:3Ln-E         185.00      .962 No_date    7:44    8.26  n/a
     [DT= 2.00]  SUM=  02:TLN3ND        311.62     1.388 No_date    7:56    7.01  n/a
 002:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND        311.62     1.388 No_date    7:56    7.01  n/a
     [LAG= 66.9 min]<- 06:S-L3ND        311.62     1.388 No_date    9:02    7.01  n/a
#******************************************************************************
#******************************************************************************
 002:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15     2.034 No_date    7:08   13.42 .239
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 002:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A        181.15     2.034 No_date    7:08   13.42  n/a
     [LAG=147.7 min]<- 03:S-CR4A        181.15     2.034 No_date    9:34   13.42  n/a
 002:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41     1.254 No_date    8:10   13.92 .248
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 002:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD        158.41     1.254 No_date    8:10   13.92  n/a
                    +  03:S-CR4A        181.15     2.034 No_date    9:34   13.42  n/a
     [DT= 2.00]  SUM=  02:TLN3SD        339.56     3.052 No_date    9:28   13.66  n/a
 002:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD        339.56     3.052 No_date    9:28   13.66  n/a
     [LAG= 66.9 min]<- 05:S-L3NS        339.56     3.052 No_date   10:34   13.66  n/a
#******************************************************************************
#******************************************************************************
 002:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80     3.191 No_date    7:18   18.89 .336
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 002:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09     1.049 No_date    6:54   12.46 .222
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 002:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:4Ln-D         88.09     1.049 No_date    6:54   12.46  n/a
     [LAG= 85.0 min]<- 02:S-4LnD         88.09     1.049 No_date    8:18   12.46  n/a
 002:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:3Ln-C        248.17     2.133 No_date    7:32   12.46 .222
     [CN= 75.0: N= 3.00]
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     [Tp= 1.28:DT= 2.00]
 002:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D         213.80     3.191 No_date    7:18   18.89  n/a
                    +  02:S-4LnD         88.09     1.049 No_date    8:18   12.46  n/a
                    +  08:3Ln-C         248.17     2.133 No_date    7:32   12.46  n/a
     [DT= 2.00]  SUM=  04:TPNK          550.06     5.774 No_date    7:48   14.96  n/a
 002:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK          550.06     5.774 No_date    7:48   14.96  n/a
                    +  06:S-L3ND        311.62     1.388 No_date    9:02    7.01  n/a
     [DT= 2.00]  SUM=  03:TLN3US        861.68     6.557 No_date    8:06   12.09  n/a
 002:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US        861.68     6.557 No_date    8:06   12.09  n/a
                    +  05:S-L3NS        339.56     3.052 No_date   10:34   13.66  n/a
                    +  01:DR#2         2252.49    11.559 No_date   10:32   12.02  n/a
     [DT= 2.00]  SUM=  09:TFN3A        3453.73    17.911 No_date   10:20   12.20  n/a
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
 002:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A        3453.73    17.911 No_date   10:20   12.20  n/a
 *   [RDT= 2.00] out<- 01:DR#2US       3453.73    18.747 No_date   11:00   12.20  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .264:Dmax= 2.905}
 002:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52     4.800 No_date    6:58   22.27 .396
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 002:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US       3453.73    18.747 No_date   11:00   12.20  n/a
                    +  02:10SR-E        225.52     4.800 No_date    6:58   22.27  n/a
     [DT= 2.00]  SUM=  09:TMID32       3679.25    19.475 No_date   11:00   12.81  n/a
#******************************************************************************
 002:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32       3679.25    19.475 No_date   11:00   12.81  n/a
 *   [RDT= 2.00] out<- 01:DR#2DS       3679.25    15.010 No_date    9:42   12.81  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .262:Dmax= 2.927}
#******************************************************************************
#******************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 002:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90     1.843 No_date    8:30   15.46 .275
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 002:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C        230.90     1.843 No_date    8:30   15.46  n/a
```

```
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    1.843 No_date    9:30   15.46  n/a
 002:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .597 No_date    7:38   11.04 .197
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 002:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43     .597 No_date    7:38   11.04  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43     .597 No_date    8:02   11.04  n/a
 002:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99     .764 No_date    7:04   11.04 .197
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 002:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99     .764 No_date    7:04   11.04  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99     .764 No_date    7:16   11.04  n/a
 002:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81     .720 No_date    7:08   11.55 .206
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 002:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    1.843 No_date    9:30   15.46  n/a
                    +  04:S-5SRD        81.43     .597 No_date    8:02   11.04  n/a
                    +  05:SH400B        79.99     .764 No_date    7:16   11.04  n/a
                    +  02:3Ln-B         74.81     .720 No_date    7:08   11.55  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    3.045 No_date    8:40   13.31  n/a
#******************************************************************************
#******************************************************************************
 002:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    3.045 No_date    8:40   13.31  n/a
  *  [RDT= 2.00] out<- 07:DR#4         467.13    2.636 No_date    9:44   13.31  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .501:Dmax= 1.181}
#******************************************************************************
#****************************************************************************
 002:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .556 No_date    7:50    8.26 .147
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 002:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02     .556 No_date    7:50    8.26  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .556 No_date   10:22    8.26  n/a
 002:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    2.740 No_date    8:36   17.17 .305
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 002:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:2Ln-B        318.07    2.740 No_date    8:36   17.17  n/a
                    +  04:S10SRD       110.02     .556 No_date   10:22    8.26  n/a
```



```
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    2.972 No_date    9:28   14.88  n/a
 002:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    2.972 No_date    9:28   14.88  n/a
                    +  01:DR#2DS      3679.25   15.010 No_date    9:42   12.81  n/a
                    +  07:DR#4         467.13    2.636 No_date    9:44   13.31  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   20.600 No_date    9:42   13.06  n/a
#******************************************************************************
#******************************************************************************
 002:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    2.109 No_date    7:50    9.39 .167
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 002:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    2.109 No_date    7:50    9.39  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    2.109 No_date    9:50    9.39  n/a
 002:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    2.109 No_date    9:50    9.39  n/a
                    +  09:TFN2U       4574.47   20.600 No_date    9:42   13.06  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   22.700 No_date    9:42   12.79  n/a
#******************************************************************************
#******************************************************************************
 002:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   22.700 No_date    9:42   12.79  n/a
  *  [RDT= 2.00] out<- 01:RGLF        4939.67   18.501 No_date   12:08   12.79  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .177:Dmax= 2.117}
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
 002:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    3.671 No_date    8:14   18.89 .336
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 002:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    3.671 No_date    8:14   18.89  n/a
                    +  01:GOLFE       4939.67   18.501 No_date   12:08   12.79  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   19.922 No_date   12:04   13.19  n/a
#******************************************************************************
#******************************************************************************
#Flows to Flow Node 2B
 002:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12     .954 No_date    7:36   12.46 .222
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 002:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-A        114.12     .954 No_date    7:36   12.46  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12     .954 No_date   11:30   12.46  n/a
```



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 002:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    1.359 No_date    7:38   11.98 .213
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 002:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    1.359 No_date    7:38   11.98  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    1.359 No_date   11:30   11.98  n/a
 002:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    1.798 No_date    8:04   11.55 .206
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 002:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    1.798 No_date    8:04   11.55  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    1.798 No_date   10:42   11.55  n/a
 002:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12     .954 No_date   11:30   12.46  n/a
                    +  04:S-4LnB       171.81    1.359 No_date   11:30   11.98  n/a
                    +  05:S-3LnA       268.08    1.798 No_date   10:42   11.55  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    3.987 No_date   11:20   11.87  n/a
 002:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    2.405 No_date    7:54   11.55 .206
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 002:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    2.405 No_date    7:54   11.55  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    2.405 No_date    9:06   11.55  n/a
 002:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00     .694 No_date    7:14    8.57 .152
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 002:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    3.987 No_date   11:20   11.87  n/a
                    +  04:S-5SRC       341.88    2.405 No_date    9:06   11.55  n/a
                    +  05:2Ln-A        105.00     .694 No_date    7:14    8.57  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89    5.705 No_date   11:06   11.42  n/a
 002:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89    5.705 No_date   11:06   11.42  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89    6.011 No_date   11:20   11.42  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .108:Dmax= 1.976}
#******************************************************************************
#******************************************************************************
 002:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    6.011 No_date   11:20   11.42  n/a
                    +  01:GOLFE       5289.89   19.922 No_date   12:04   13.19  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   25.487 No_date   11:20   12.91  n/a
#******************************************************************************
#******************************************************************************
```



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 002:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   25.487 No_date   11:20   12.91  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   23.905 No_date   12:38   12.91  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#******************************************************************************
#******************************************************************************
 002:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60     .976 No_date    8:58    5.01 .089
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 002:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .359 No_date    7:52    6.23 .111
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 002:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60     .976 No_date    8:58    5.01  n/a
                    +  04:10SR-B        96.11     .359 No_date    7:52    6.23  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    1.296 No_date    8:38    5.24  n/a
 002:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    1.296 No_date    8:38    5.24  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    1.296 No_date   11:06    5.24  n/a
 002:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52     .292 No_date    7:34    3.48 .062
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 002:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52     .292 No_date    7:34    3.48  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52     .292 No_date    9:14    3.48  n/a
 002:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60     .820 No_date    8:26    5.60 .100
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 002:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52     .292 No_date    9:14    3.48  n/a
                    +  03:14Ln-A       276.60     .820 No_date    8:26    5.60  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    1.077 No_date    8:54    4.90  n/a
 002:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    1.077 No_date    8:54    4.90  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    1.077 No_date   12:22    4.90  n/a
 002:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    1.841 No_date    7:50   13.92 .248
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 002:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    1.841 No_date    7:50   13.92  n/a
                    +  05:S10AB        502.71    1.296 No_date   11:06    5.24  n/a
                    +  03:THNYAK       412.12    1.077 No_date   12:22    4.90  n/a
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     [DT= 2.00]  SUM=  03:THNYAK      1430.10    4.399 No_date   10:12    7.82  n/a
 002:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10    4.399 No_date   10:12    7.82  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10    4.399 No_date   12:14    7.82  n/a
#****************************************************************************
#****************************************************************************
 002:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10    4.399 No_date   12:14    7.82  n/a
                    +  02:GOLF        6290.78   23.905 No_date   12:38   12.91  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   28.255 No_date   12:32   11.97  n/a
#****************************************************************************
#****************************************************************************
 002:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   28.255 No_date   12:32   11.97  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   25.357 No_date   13:34   11.97  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .088:Dmax= 2.526}
#****************************************************************************
#****************************************************************************
 002:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01     .722 No_date    7:40    9.39 .167
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 002:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01     .722 No_date    7:40    9.39  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01     .722 No_date    9:28    9.39  n/a
 002:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15     .655 No_date    7:30    9.80 .174
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 002:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15     .655 No_date    7:30    9.80  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15     .655 No_date    9:32    9.80  n/a
 002:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    2.595 No_date    6:00   34.05 .606
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=    .0]
 002:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .152 No_date    7:14    4.47 .080
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 002:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .152 No_date    7:14    4.47  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .152 No_date    7:58    4.47  n/a
 002:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01     .722 No_date    9:28    9.39  n/a
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                    +  04:S-5SRA        97.15     .655 No_date    9:32    9.80  n/a
                    +  05:15Ln-A        37.07    2.595 No_date    6:00   34.05  n/a
                    +  07:S-H89A        47.36     .152 No_date    7:58    4.47  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    2.595 No_date    6:00   11.79  n/a
 002:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    2.595 No_date    6:00   11.79  n/a
                    +  01:DR#6        7720.88   25.357 No_date   13:34   11.97  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   25.861 No_date   13:32   11.96  n/a
  ** END OF RUN :   2

*****************************************************************************



 RUN:COMMAND#
 003:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   3 ]
#****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 003:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=30.00:SDUR=  12.00:PTOT=  66.00]
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
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 003:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30     .786 No_date    7:30   12.27 .186
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 003:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30     .786 No_date    7:30   12.27  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30     .786 No_date   12:08   12.27  n/a
 003:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    2.292 No_date    8:32   19.86 .301
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 003:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    2.292 No_date    8:32   19.86  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    2.292 No_date   11:16   19.86  n/a
 003:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    3.364 No_date    9:06   14.72 .223
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 003:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36     .618 No_date    6:52   16.90 .256
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 003:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36     .618 No_date    6:52   16.90  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36     .618 No_date    8:15   16.90  n/a
 003:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    3.901 No_date    7:28   17.49 .265
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 003:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    3.901 No_date    7:28   17.49  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    3.901 No_date    8:54   17.49  n/a
 003:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    5.882 No_date    7:40   19.20 .291
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 003:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30     .786 No_date   12:08   12.27  n/a
                    +  03:S-5SRE       225.54    2.292 No_date   11:16   19.86  n/a
                    +  04:10SR-G       505.12    3.364 No_date    9:06   14.72  n/a
                    +  06:S-CR4D        36.36     .618 No_date    8:15   16.90  n/a
                    +  07:S-6LnA       310.44    3.901 No_date    8:54   17.49  n/a
                    +  08:5Ln-A        461.49    5.882 No_date    7:40   19.20  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25   12.698 No_date    8:36   17.14  n/a
#****************************************************************************
#****************************************************************************
 003:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   12.698 No_date    8:36   17.14  n/a
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  *  [RDT= 2.00] out<- 01:DR#1        1631.25   12.533 No_date    8:56   17.14  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.685:Dmax= 1.680}
#****************************************************************************
#****************************************************************************
 003:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76     .793 No_date    7:04   16.33 .247
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 003:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76     .793 No_date    7:04   16.33  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76     .793 No_date   10:46   16.33  n/a
 003:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    5.105 No_date    8:06   18.64 .282
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 003:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    5.105 No_date    8:06   18.64  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    5.105 No_date   10:42   18.64  n/a
 003:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    1.600 No_date    7:00   18.64 .282
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 003:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76     .793 No_date   10:46   16.33  n/a
                    +  04:S-4LnF       472.58    5.105 No_date   10:42   18.64  n/a
                    +  05:4Ln-E         92.90    1.600 No_date    7:00   18.64  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24    6.215 No_date   10:40   18.44  n/a
 003:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24    6.215 No_date   10:40   18.44  n/a
                    +  01:DR#1        1631.25   12.533 No_date    8:56   17.14  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49   17.173 No_date   10:12   17.49  n/a
#****************************************************************************
#****************************************************************************
 003:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   17.173 No_date   10:12   17.49  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49   17.023 No_date   10:24   17.49  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.495:Dmax= 1.706}
#****************************************************************************
#****************************************************************************
 003:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62     .824 No_date    7:18    8.79 .133
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 003:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62     .824 No_date    7:18    8.79  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62     .824 No_date    7:58    8.79  n/a
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 003:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    1.569 No_date    7:38   12.76 .193
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 003:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62     .824 No_date    7:58    8.79  n/a
                    +  05:3Ln-E        185.00    1.569 No_date    7:38   12.76  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62    2.370 No_date    7:48   11.15  n/a
 003:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62    2.370 No_date    7:48   11.15  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62    2.370 No_date    8:54   11.15  n/a
#*****************************************************************************
#*****************************************************************************
 003:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    3.028 No_date    7:06   19.20 .291
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 003:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    3.028 No_date    7:06   19.20  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    3.028 No_date    9:32   19.20  n/a
 003:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    1.839 No_date    8:04   19.86 .301
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 003:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    1.839 No_date    8:04   19.86  n/a
                    +  03:S-CR4A       181.15    3.028 No_date    9:32   19.20  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56    4.484 No_date    9:26   19.51  n/a
 003:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    4.484 No_date    9:26   19.51  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    4.484 No_date   10:32   19.51  n/a
#*****************************************************************************
#*****************************************************************************
 003:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    4.457 No_date    7:14   25.75 .390
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 003:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    1.591 No_date    6:52   18.02 .273
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 003:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    1.591 No_date    6:52   18.02  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    1.591 No_date    8:15   18.02  n/a
 003:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:3Ln-C        248.17    3.205 No_date    7:28   18.02 .273
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
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 003:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    4.457 No_date    7:14   25.75  n/a
                    +  02:S-4LnD        88.09    1.591 No_date    8:15   18.02  n/a
                    +  08:3Ln-C        248.17    3.205 No_date    7:28   18.02  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06    8.340 No_date    7:46   21.02  n/a
 003:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06    8.340 No_date    7:46   21.02  n/a
                    +  06:S-L3ND       311.62    2.370 No_date    8:54   11.15  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68    9.744 No_date    8:08   17.45  n/a
 003:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68    9.744 No_date    8:08   17.45  n/a
                    +  05:S-L3NS       339.56    4.484 No_date   10:32   19.51  n/a
                    +  01:DR#2        2252.49   17.023 No_date   10:24   17.49  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73   26.268 No_date   10:16   17.68  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 003:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   26.268 No_date   10:16   17.68  n/a
 *   [RDT= 2.00] out<- 01:DR#2US      3453.73   25.012 No_date   10:50   17.68  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.999}
 003:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    6.544 No_date    6:56   29.73 .450
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 003:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   25.012 No_date   10:50   17.68  n/a
                    +  02:10SR-E       225.52    6.544 No_date    6:56   29.73  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25   26.021 No_date   10:44   18.42  n/a
#*****************************************************************************
 003:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   26.021 No_date   10:44   18.42  n/a
 *   [RDT= 2.00] out<- 01:DR#2DS      3679.25   20.883 No_date   13:52   18.42  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.999}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 003:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    2.637 No_date    8:26   21.67 .328
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 003:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    2.637 No_date    8:26   21.67  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    2.637 No_date    9:26   21.67  n/a
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 003:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .922 No_date    7:32   16.33 .247
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 003:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43     .922 No_date    7:32   16.33  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43     .922 No_date    7:56   16.33  n/a
 003:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    1.192 No_date    7:00   16.33 .247
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 003:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    1.192 No_date    7:00   16.33  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    1.192 No_date    7:12   16.33  n/a
 003:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    1.105 No_date    7:04   16.90 .256
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 003:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    2.637 No_date    9:26   21.67  n/a
                    +  04:S-5SRD        81.43     .922 No_date    7:56   16.33  n/a
                    +  05:SH400B        79.99    1.192 No_date    7:12   16.33  n/a
                    +  02:3Ln-B         74.81    1.105 No_date    7:04   16.90  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    4.445 No_date    8:32   19.06  n/a
#*****************************************************************************
#*****************************************************************************
 003:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    4.445 No_date    8:32   19.06  n/a
 *   [RDT= 2.00] out<- 07:DR#4         467.13    3.876 No_date    9:26   19.06  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .552:Dmax= 1.393}
#*****************************************************************************
#***************************************************************************
 003:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .905 No_date    7:42   12.76 .193
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 003:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02     .905 No_date    7:42   12.76  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .905 No_date   10:14   12.76  n/a
 003:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    3.864 No_date    8:32   23.76 .360
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 003:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:2Ln-B        318.07    3.864 No_date    8:32   23.76  n/a
                    +  04:S10SRD       110.02     .905 No_date   10:14   12.76  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    4.265 No_date    9:28   20.93  n/a
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 003:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    4.265 No_date    9:28   20.93  n/a
                    +  01:DR#2DS      3679.25   20.883 No_date   13:52   18.42  n/a
                    +  07:DR#4         467.13    3.876 No_date    9:26   19.06  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   27.415 No_date   10:56   18.72  n/a
#*****************************************************************************
#*****************************************************************************
 003:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    3.355 No_date    7:44   14.24 .216
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 003:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    3.355 No_date    7:44   14.24  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    3.355 No_date    9:44   14.24  n/a
 003:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    3.355 No_date    9:44   14.24  n/a
                    +  09:TFN2U       4574.47   27.415 No_date   10:56   18.72  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   30.093 No_date   10:56   18.39  n/a
#*****************************************************************************
#*****************************************************************************
 003:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   30.093 No_date   10:56   18.39  n/a
 *   [RDT= 2.00] out<- 01:RGLF        4939.67   27.110 No_date   11:14   18.39  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 003:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    5.094 No_date    8:10   25.75 .390
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 003:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    5.094 No_date    8:10   25.75  n/a
                    +  01:GOLFE       4939.67   27.110 No_date   11:14   18.39  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   29.587 No_date   11:14   18.88  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 003:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    1.433 No_date    7:32   18.02 .273
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 003:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-A        114.12    1.433 No_date    7:32   18.02  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    1.433 No_date   11:26   18.02  n/a
 003:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    CALIB NASHYD       02:4Ln-B        171.81    2.064 No_date    7:34   17.49 .265
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 003:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    2.064 No_date    7:34   17.49  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    2.064 No_date   11:26   17.49  n/a
 003:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    2.720 No_date    7:58   16.90 .256
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 003:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    2.720 No_date    7:58   16.90  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    2.720 No_date   10:36   16.90  n/a
 003:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    1.433 No_date   11:26   18.02  n/a
                    +  04:S-4LnB       171.81    2.064 No_date   11:26   17.49  n/a
                    +  05:S-3LnA       268.08    2.720 No_date   10:36   16.90  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    6.001 No_date   11:14   17.31  n/a
 003:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    3.648 No_date    7:48   16.90 .256
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 003:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    3.648 No_date    7:48   16.90  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    3.648 No_date    9:00   16.90  n/a
 003:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    1.143 No_date    7:08   13.21 .200
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 003:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    6.001 No_date   11:14   17.31  n/a
                    +  04:S-5SRC       341.88    3.648 No_date    9:00   16.90  n/a
                    +  05:2Ln-A        105.00    1.143 No_date    7:08   13.21  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89    8.482 No_date   11:02   16.74  n/a
 003:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89    8.482 No_date   11:02   16.74  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89    7.458 No_date   11:36   16.74  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .115:Dmax= 2.036}
#*****************************************************************************
#*****************************************************************************
 003:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    7.458 No_date   11:36   16.74  n/a
                    +  01:GOLFE       5289.89   29.587 No_date   11:14   18.88  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   36.857 No_date   11:14   18.54  n/a
#*****************************************************************************
#*****************************************************************************
 003:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   36.857 No_date   11:14   18.54  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   33.442 No_date   12:04   18.54  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#*****************************************************************************
#*****************************************************************************
 003:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    1.734 No_date    8:40    8.50 .129
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 003:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .624 No_date    7:42   10.12 .153
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 003:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    1.734 No_date    8:40    8.50  n/a
                    +  04:10SR-B        96.11     .624 No_date    7:42   10.12  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    2.291 No_date    8:22    8.81  n/a
 003:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    2.291 No_date    8:22    8.81  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    2.291 No_date   10:50    8.81  n/a
 003:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52     .614 No_date    7:18    6.39 .097
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 003:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52     .614 No_date    7:18    6.39  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52     .614 No_date    8:58    6.39  n/a
 003:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    1.438 No_date    8:12    9.28 .141
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 003:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52     .614 No_date    8:58    6.39  n/a
                    +  03:14Ln-A       276.60    1.438 No_date    8:12    9.28  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    1.974 No_date    8:42    8.33  n/a
 003:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    1.974 No_date    8:42    8.33  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    1.974 No_date   12:10    8.33  n/a
 003:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    2.711 No_date    7:46   19.86 .301
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 003:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    2.711 No_date    7:46   19.86  n/a
                    +  05:S10AB        502.71    2.291 No_date   10:50    8.81  n/a
                    +  03:THNYAK       412.12    1.974 No_date   12:10    8.33  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10    7.183 No_date   10:10   12.09  n/a
```



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 003:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10    7.183 No_date   10:10   12.09  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10    7.183 No_date   12:12   12.09  n/a
#*****************************************************************************
#*****************************************************************************
 003:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10    7.183 No_date   12:12   12.09  n/a
                    +  02:GOLF        6290.78   33.442 No_date   12:04   18.54  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   40.614 No_date   12:08   17.34  n/a
#*****************************************************************************
#*****************************************************************************
 003:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   40.614 No_date   12:08   17.34  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   36.925 No_date   13:52   17.34  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#*****************************************************************************
#*****************************************************************************
 003:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    1.152 No_date    7:34   14.24 .216
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 003:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    1.152 No_date    7:34   14.24  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    1.152 No_date    9:22   14.24  n/a
 003:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    1.034 No_date    7:26   14.72 .223
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 003:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    1.034 No_date    7:26   14.72  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    1.034 No_date    9:28   14.72  n/a
 003:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    3.056 No_date    6:00   41.50 .629
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=    .0]
 003:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .299 No_date    7:04    7.76 .118
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 003:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .299 No_date    7:04    7.76  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .299 No_date    7:48    7.76  n/a
 003:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    1.152 No_date    9:22   14.24  n/a
                    +  04:S-5SRA        97.15    1.034 No_date    9:28   14.72  n/a
```



```
                    +  05:15Ln-A        37.07    3.056 No_date    6:00   41.50  n/a
                    +  07:S-H89A        47.36     .299 No_date    7:48    7.76  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    3.056 No_date    6:00   16.74  n/a
 003:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    3.056 No_date    6:00   16.74  n/a
                    +  01:DR#6        7720.88   36.925 No_date   13:52   17.34  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   37.561 No_date   13:46   17.32  n/a
  ** END OF RUN :   3

*****************************************************************************




 RUN:COMMAND#
 004:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   4 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 004:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=30.00:SDUR=  12.00:PTOT=  78.40]
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 004:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    CALIB NASHYD       01:7Ln-A         92.30    1.268 No_date    7:24   18.80 .240
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 004:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:7Ln-A         92.30    1.268 No_date    7:24   18.80  n/a
     [LAG=278.5 min]<- 02:S-7LnA         92.30    1.268 No_date   12:02   18.80  n/a
 004:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    3.316 No_date    8:28   28.16 .359
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 004:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:5SR-E        225.54    3.316 No_date    8:28   28.16  n/a
     [LAG=165.9 min]<- 03:S-5SRE        225.54    3.316 No_date   11:12   28.16  n/a
 004:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    5.095 No_date    8:58   21.82 .278
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 004:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36     .935 No_date    6:48   24.51 .313
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 004:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 05:CR4-D         36.36     .935 No_date    6:48   24.51  n/a
     [LAG= 84.1 min]<- 06:S-CR4D         36.36     .935 No_date    8:11   24.51  n/a
 004:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    5.844 No_date    7:24   25.28 .322
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 004:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:6Ln-A        310.44    5.844 No_date    7:24   25.28  n/a
     [LAG= 86.9 min]<- 07:S-6LnA        310.44    5.844 No_date    8:50   25.28  n/a
 004:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    8.606 No_date    7:36   27.30 .348
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 004:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA         92.30    1.268 No_date   12:02   18.80  n/a
                    +  03:S-5SRE        225.54    3.316 No_date   11:12   28.16  n/a
                    +  04:10SR-G        505.12    5.095 No_date    8:58   21.82  n/a
                    +  06:S-CR4D         36.36     .935 No_date    8:11   24.51  n/a
                    +  07:S-6LnA        310.44    5.844 No_date    8:50   25.28  n/a
                    +  08:5Ln-A         461.49    8.606 No_date    7:36   27.30  n/a
     [DT= 2.00]  SUM=  09:TOTFN5       1631.25   18.846 No_date    8:32   24.80  n/a
#******************************************************************************
#******************************************************************************
 004:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TOTFN5      1631.25   18.846 No_date    8:32   24.80  n/a
  *  [RDT= 2.00] out<- 01:DR#1         1631.25   18.601 No_date    8:48   24.80  n/a
```



```
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.861:Dmax= 2.006}
#******************************************************************************
#******************************************************************************
 004:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    1.210 No_date    7:02   23.87 .304
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 004:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-C         55.76    1.210 No_date    7:02   23.87  n/a
     [LAG=222.2 min]<- 03:S-CR4C         55.76    1.210 No_date   10:44   23.87  n/a
 004:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    7.502 No_date    8:00   26.69 .340
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 004:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-F        472.58    7.502 No_date    8:00   26.69  n/a
     [LAG=156.2 min]<- 04:S-4LnF        472.58    7.502 No_date   10:36   26.69  n/a
 004:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    2.380 No_date    6:58   26.69 .340
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 004:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C         55.76    1.210 No_date   10:44   23.87  n/a
                    +  04:S-4LnF        472.58    7.502 No_date   10:36   26.69  n/a
                    +  05:4Ln-E          92.90    2.380 No_date    6:58   26.69  n/a
     [DT= 2.00]  SUM=  09:TOTRED        621.24    9.141 No_date   10:36   26.44  n/a
 004:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4        621.24    9.141 No_date   10:36   26.44  n/a
                    +  01:DR#1         1631.25   18.601 No_date    8:48   24.80  n/a
     [DT= 2.00]  SUM=  09:TOTFN4       2252.49   24.990 No_date   10:08   25.25  n/a
#******************************************************************************
#******************************************************************************
 004:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TOTFN4      2252.49   24.990 No_date   10:08   25.25  n/a
  *  [RDT= 2.00] out<- 01:DR#2         2252.49   24.805 No_date   10:20   25.25  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.642:Dmax= 1.993}
#******************************************************************************
#******************************************************************************
 004:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    1.450 No_date    7:12   14.30 .182
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 004:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-B        126.62    1.450 No_date    7:12   14.30  n/a
     [LAG= 41.2 min]<- 04:S-CR4B        126.62    1.450 No_date    7:52   14.30  n/a
 004:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       05:3Ln-E        185.00    2.492 No_date    7:32   19.36 .247
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 004:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B        126.62    1.450 No_date    7:52   14.30  n/a
                    +  05:3Ln-E         185.00    2.492 No_date    7:32   19.36  n/a
     [DT= 2.00]  SUM=  02:TLN3ND        311.62    3.903 No_date    7:42   17.31  n/a
 004:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND       311.62    3.903 No_date    7:42   17.31  n/a
     [LAG= 66.9 min]<- 06:S-L3ND        311.62    3.903 No_date    8:48   17.31  n/a
#******************************************************************************
#******************************************************************************
 004:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    4.455 No_date    7:04   27.30 .348
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 004:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A        181.15    4.455 No_date    7:04   27.30  n/a
     [LAG=147.7 min]<- 03:S-CR4A        181.15    4.455 No_date    9:30   27.30  n/a
 004:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    2.673 No_date    8:00   28.16 .359
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 004:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD        158.41    2.673 No_date    8:00   28.16  n/a
                    +  03:S-CR4A        181.15    4.455 No_date    9:30   27.30  n/a
     [DT= 2.00]  SUM=  02:TLN3SD        339.56    6.524 No_date    9:24   27.70  n/a
 004:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD       339.56    6.524 No_date    9:24   27.70  n/a
     [LAG= 66.9 min]<- 05:S-L3NS        339.56    6.524 No_date   10:30   27.70  n/a
#******************************************************************************
#******************************************************************************
 004:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    6.198 No_date    7:12   35.07 .447
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 004:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    2.376 No_date    6:50   25.88 .330
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 004:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:4Ln-D         88.09    2.376 No_date    6:50   25.88  n/a
     [LAG= 85.0 min]<- 02:S-4LnD         88.09    2.376 No_date    8:14   25.88  n/a
 004:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:3Ln-C        248.17    4.755 No_date    7:26   25.88 .330
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 004:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            07:3Ln-D         213.80    6.198 No_date    7:12   35.07  n/a
                    +  02:S-4LnD         88.09    2.376 No_date    8:14   25.88  n/a
                    +  08:3Ln-C         248.17    4.755 No_date    7:26   25.88  n/a
     [DT= 2.00]  SUM=  04:TPNK          550.06   11.957 No_date    7:44   29.45  n/a
 004:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK          550.06   11.957 No_date    7:44   29.45  n/a
                    +  06:S-L3ND        311.62    3.903 No_date    8:48   17.31  n/a
     [DT= 2.00]  SUM=  03:TLN3US        861.68   14.362 No_date    8:08   25.06  n/a
 004:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US        861.68   14.362 No_date    8:08   25.06  n/a
                    +  05:S-L3NS        339.56    6.524 No_date   10:30   27.70  n/a
                    +  01:DR#2         2252.49   24.805 No_date   10:20   25.25  n/a
     [DT= 2.00]  SUM=  09:TFN3A        3453.73   38.139 No_date   10:12   25.44  n/a
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
 004:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TFN3A       3453.73   38.139 No_date   10:12   25.44  n/a
  *  [RDT= 2.00] out<- 01:DR#2US       3453.73   37.367 No_date   10:32   25.44  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
 004:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    8.890 No_date    6:54   39.73 .507
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 004:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US       3453.73   37.367 No_date   10:32   25.44  n/a
                    +  02:10SR-E        225.52    8.890 No_date    6:54   39.73  n/a
     [DT= 2.00]  SUM=  09:TMID32       3679.25   38.834 No_date   10:28   26.32  n/a
#******************************************************************************
 004:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TMID32      3679.25   38.834 No_date   10:28   26.32  n/a
  *  [RDT= 2.00] out<- 01:DR#2DS       3679.25   36.224 No_date   11:18   26.32  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.996}
#******************************************************************************
#******************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 004:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    3.751 No_date    8:22   30.27 .386
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 004:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C        230.90    3.751 No_date    8:22   30.27  n/a
     [LAG= 60.2 min]<- 03:S-4LnC        230.90    3.751 No_date    9:22   30.27  n/a
 004:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       02:5SR-D         81.43    1.399 No_date    7:28   23.87 .304
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 004:0047--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    1.399 No_date    7:28   23.87  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.399 No_date    7:52   23.87  n/a
 004:0048--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    1.821 No_date    6:58   23.87 .304
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 004:0049--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    1.821 No_date    6:58   23.87  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    1.821 No_date    7:10   23.87  n/a
 004:0050--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    1.668 No_date    7:02   24.51 .313
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 004:0051--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    3.751 No_date    9:22   30.27  n/a
                    +  04:S-5SRD        81.43    1.399 No_date    7:52   23.87  n/a
                    +  05:SH400B        79.99    1.821 No_date    7:10   23.87  n/a
                    +  02:3Ln-B         74.81    1.668 No_date    7:02   24.51  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    6.449 No_date    8:24   27.13  n/a
#****************************************************************************
#****************************************************************************
 004:0052--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    6.449 No_date    8:24   27.13  n/a
  *  [RDT= 2.00] out<- 07:DR#4         467.13    5.692 No_date    9:14   27.13  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .606:Dmax= 1.630}
#****************************************************************************
#**************************************************************************
 004:0053--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    1.434 No_date    7:36   19.36 .247
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 004:0054--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    1.434 No_date    7:36   19.36  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    1.434 No_date   10:08   19.36  n/a
 004:0055--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    5.423 No_date    8:28   32.80 .418
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 004:0056--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:2Ln-B        318.07    5.423 No_date    8:28   32.80  n/a
                    +  04:S10SRD       110.02    1.434 No_date   10:08   19.36  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    6.087 No_date    9:26   29.35  n/a
 004:0057--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            05:TOTGRN       428.09    6.087 No_date    9:26   29.35  n/a
                    +  01:DR#2DS      3679.25   36.224 No_date   11:18   26.32  n/a
                    +  07:DR#4         467.13    5.692 No_date    9:14   27.13  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   45.340 No_date   10:48   26.69  n/a
#****************************************************************************
#****************************************************************************
 004:0058--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    5.219 No_date    7:38   21.28 .271
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 004:0059--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    5.219 No_date    7:38   21.28  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    5.219 No_date    9:38   21.28  n/a
 004:0060--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    5.219 No_date    9:38   21.28  n/a
                    +  09:TFN2U       4574.47   45.340 No_date   10:48   26.69  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   49.701 No_date   10:28   26.29  n/a
#****************************************************************************
#****************************************************************************
 004:0061--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   49.701 No_date   10:28   26.29  n/a
  *  [RDT= 2.00] out<- 01:RGLF        4939.67   46.963 No_date   11:38   26.29  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 004:0062--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    7.049 No_date    8:08   35.07 .447
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 004:0063--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    7.049 No_date    8:08   35.07  n/a
                    +  01:GOLFE       4939.67   46.963 No_date   11:38   26.29  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   49.942 No_date   11:24   26.87  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
 004:0064--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    2.124 No_date    7:30   25.88 .330
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 004:0065--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-A        114.12    2.124 No_date    7:30   25.88  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    2.124 No_date   11:24   25.88  n/a
 004:0066--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    3.088 No_date    7:30   25.28 .322
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     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 004:0067--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    3.088 No_date    7:30   25.28  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    3.088 No_date   11:22   25.28  n/a
 004:0068--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    4.061 No_date    7:52   24.51 .313
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 004:0069--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    4.061 No_date    7:52   24.51  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    4.061 No_date   10:30   24.51  n/a
 004:0070--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    2.124 No_date   11:24   25.88  n/a
                    +  04:S-4LnB       171.81    3.088 No_date   11:22   25.28  n/a
                    +  05:S-3LnA       268.08    4.061 No_date   10:30   24.51  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    8.918 No_date   11:12   25.03  n/a
 004:0071--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    5.458 No_date    7:44   24.51 .313
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 004:0072--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    5.458 No_date    7:44   24.51  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    5.458 No_date    8:56   24.51  n/a
 004:0073--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    1.825 No_date    7:04   19.98 .255
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 004:0074--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    8.918 No_date   11:12   25.03  n/a
                    +  04:S-5SRC       341.88    5.458 No_date    8:56   24.51  n/a
                    +  05:2Ln-A        105.00    1.825 No_date    7:04   19.98  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89   12.470 No_date   10:58   24.32  n/a
 004:0075--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   12.470 No_date   10:58   24.32  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89   10.908 No_date   11:24   24.32  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .108:Dmax= 2.099}
#****************************************************************************
#****************************************************************************
 004:0076--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   10.908 No_date   11:24   24.32  n/a
                    +  01:GOLFE       5289.89   49.942 No_date   11:24   26.87  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   60.850 No_date   11:24   26.46  n/a
#****************************************************************************
#****************************************************************************
 004:0077--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   60.850 No_date   11:24   26.46  n/a
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  *  [RDT= 2.00] out<- 02:GOLF        6290.78   57.909 No_date   12:22   26.46  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 004:0078--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    2.951 No_date    8:28   13.85 .177
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 004:0079--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    1.042 No_date    7:34   15.97 .204
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 004:0080--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    2.951 No_date    8:28   13.85  n/a
                    +  04:10SR-B        96.11    1.042 No_date    7:34   15.97  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    3.881 No_date    8:12   14.26  n/a
 004:0081--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    3.881 No_date    8:12   14.26  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    3.881 No_date   10:40   14.26  n/a
 004:0082--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    1.177 No_date    7:10   11.02 .141
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 004:0083--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    1.177 No_date    7:10   11.02  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    1.177 No_date    8:50   11.02  n/a
 004:0084--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    2.421 No_date    8:02   14.89 .190
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 004:0085--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    1.177 No_date    8:50   11.02  n/a
                    +  03:14Ln-A       276.60    2.421 No_date    8:02   14.89  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    3.433 No_date    8:36   13.62  n/a
 004:0086--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    3.433 No_date    8:36   13.62  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    3.433 No_date   12:04   13.62  n/a
 004:0087--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    3.951 No_date    7:42   28.16 .359
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 004:0088--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    3.951 No_date    7:42   28.16  n/a
                    +  05:S10AB        502.71    3.881 No_date   10:40   14.26  n/a
                    +  03:THNYAK       412.12    3.433 No_date   12:04   13.62  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10   11.456 No_date   10:08   18.39  n/a
 004:0089--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    SHIFT HYD       -> 03:THNYAK      1430.10   11.456 No_date   10:08   18.39  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   11.456 No_date   12:10   18.39  n/a
#*****************************************************************************
#*****************************************************************************
 004:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:HYND       1430.10   11.456 No_date   12:10   18.39  n/a
                     +  02:GOLF       6290.78   57.909 No_date   12:22   26.46  n/a
     [DT= 2.00]  SUM=   09:HWY400     7720.88   69.318 No_date   12:18   24.97  n/a
#*****************************************************************************
#*****************************************************************************
 004:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   69.318 No_date   12:18   24.97  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   61.069 No_date   13:20   24.97  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.529}
#*****************************************************************************
#*****************************************************************************
 004:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-B       119.01    1.797 No_date    7:30   21.28 .271
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 004:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    1.797 No_date    7:30   21.28  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    1.797 No_date    9:18   21.28  n/a
 004:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-A        97.15    1.598 No_date    7:22   21.82 .278
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 004:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    1.598 No_date    7:22   21.82  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    1.598 No_date    9:24   21.82  n/a
 004:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      05:15Ln-A       37.07    3.646 No_date    6:00   51.28 .654
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 004:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:H89-A        47.36     .545 No_date    6:58   12.87 .164
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 004:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .545 No_date    6:58   12.87  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .545 No_date    7:42   12.87  n/a
 004:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-5SRB      119.01    1.797 No_date    9:18   21.28  n/a
                     +  04:S-5SRA       97.15    1.598 No_date    9:24   21.82  n/a
                     +  05:15Ln-A       37.07    3.646 No_date    6:00   51.28  n/a
```



```
                     +  07:S-H89A       47.36     .545 No_date    7:42   12.87  n/a
     [DT= 2.00]  SUM=   06:TOTPLM      300.59    4.044 No_date    9:18   23.83  n/a
 004:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTPLM      300.59    4.044 No_date    9:18   23.83  n/a
                     +  01:DR#6       7720.88   61.069 No_date   13:20   24.97  n/a
     [DT= 2.00]  SUM=   09:TFN15L     8021.47   62.093 No_date   13:18   24.92  n/a
  ** END OF RUN :   4

******************************************************************************




 RUN:COMMAND#
 005:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   5 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 005:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=30.00:SDUR=  12.00:PTOT=  87.50]
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 005:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:7Ln-A        92.30    1.671 No_date    7:22   24.12 .276
```



```
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 005:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    1.671 No_date    7:22   24.12  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    1.671 No_date   12:00   24.12  n/a
 005:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:5SR-E       225.54    4.131 No_date    8:24   34.69 .396
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 005:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    4.131 No_date    8:24   34.69  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    4.131 No_date   11:08   34.69  n/a
 005:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:10SR-G      505.12    6.508 No_date    8:54   27.53 .315
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 005:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:CR4-D        36.36    1.193 No_date    6:48   30.57 .349
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 005:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    1.193 No_date    6:48   30.57  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    1.193 No_date    8:11   30.57  n/a
 005:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:6Ln-A       310.44    7.414 No_date    7:22   31.47 .360
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 005:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    7.414 No_date    7:22   31.47  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    7.414 No_date    8:48   31.47  n/a
 005:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:5Ln-A       461.49   10.783 No_date    7:34   33.70 .385
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 005:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:S-7LnA       92.30    1.671 No_date   12:00   24.12  n/a
                     +  03:S-5SRE      225.54    4.131 No_date   11:08   34.69  n/a
                     +  04:10SR-G      505.12    6.508 No_date    8:54   27.53  n/a
                     +  06:S-CR4D       36.36    1.193 No_date    8:11   30.57  n/a
                     +  07:S-6LnA      310.44    7.414 No_date    8:48   31.47  n/a
                     +  08:5Ln-A       461.49   10.783 No_date    7:34   33.70  n/a
     [DT= 2.00]  SUM=   09:TOTFN5     1631.25   23.802 No_date    8:30   30.89  n/a
#*****************************************************************************
#*****************************************************************************
 005:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   23.802 No_date    8:30   30.89  n/a
  *  [RDT= 2.00] out<- 01:DR#1        1631.25   23.412 No_date    8:44   30.89  n/a
     [L/S/n= 1780./ .290/.030]
```



```
     {Vmax= 1.807:Dmax= 2.329}
#*****************************************************************************
#*****************************************************************************
 005:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-C        55.76    1.550 No_date    7:00   29.88 .342
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 005:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    1.550 No_date    7:00   29.88  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    1.550 No_date   10:42   29.88  n/a
 005:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-F       472.58    9.421 No_date    7:58   33.05 .378
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 005:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    9.421 No_date    7:58   33.05  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    9.421 No_date   10:34   33.05  n/a
 005:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:4Ln-E        92.90    3.006 No_date    6:56   33.05 .378
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 005:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-CR4C       55.76    1.550 No_date   10:42   29.88  n/a
                     +  04:S-4LnF      472.58    9.421 No_date   10:34   33.05  n/a
                     +  05:4Ln-E        92.90    3.006 No_date    6:56   33.05  n/a
     [DT= 2.00]  SUM=   09:TOTRED      621.24   11.485 No_date   10:34   32.77  n/a
 005:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             09:TOTFN4      621.24   11.485 No_date   10:34   32.77  n/a
                     +  01:DR#1       1631.25   23.412 No_date    8:44   30.89  n/a
     [DT= 2.00]  SUM=   09:TOTFN4     2252.49   34.697 No_date   10:42   31.41  n/a
#*****************************************************************************
#*****************************************************************************
 005:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   34.697 No_date   10:42   31.41  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49   32.257 No_date   10:46   31.41  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.783:Dmax= 2.281}
#*****************************************************************************
#*****************************************************************************
 005:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-B       126.62    1.996 No_date    7:08   18.92 .216
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 005:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    1.996 No_date    7:08   18.92  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    1.996 No_date    7:48   18.92  n/a
 005:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:3Ln-E       185.00    3.260 No_date    7:30   24.73 .283
```

```
      [CN= 70.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 005:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S-CR4B       126.62    1.996 No_date    7:48   18.92  n/a
                      + 05:3Ln-E        185.00    3.260 No_date    7:30   24.73  n/a
      [DT= 2.00]  SUM=  02:TLN3ND       311.62    5.202 No_date    7:40   22.37  n/a
 005:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND       311.62    5.202 No_date    7:40   22.37  n/a
      [LAG= 66.9 min]<- 06:S-L3ND       311.62    5.202 No_date    8:46   22.37  n/a
#*****************************************************************************
#*****************************************************************************
 005:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-A        181.15    5.596 No_date    7:02   33.70 .385
      [CN= 76.0: N= 3.00]
      [Tp= 1.00:DT= 2.00]
 005:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A        181.15    5.596 No_date    7:02   33.70  n/a
      [LAG=147.7 min]<- 03:S-CR4A       181.15    5.596 No_date    9:28   33.70  n/a
 005:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-F       158.41    3.336 No_date    7:56   34.69 .396
      [CN= 77.0: N= 3.00]
      [Tp= 1.72:DT= 2.00]
 005:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TLN3SD       158.41    3.336 No_date    7:56   34.69  n/a
                      + 03:S-CR4A       181.15    5.596 No_date    9:28   33.70  n/a
      [DT= 2.00]  SUM=  02:TLN3SD       339.56    8.146 No_date    9:22   34.16  n/a
 005:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD       339.56    8.146 No_date    9:22   34.16  n/a
      [LAG= 66.9 min]<- 05:S-L3NS       339.56    8.146 No_date   10:28   34.16  n/a
#*****************************************************************************
#*****************************************************************************
 005:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:3Ln-D        213.80    7.550 No_date    7:12   42.28 .483
      [CN= 81.0: N= 3.00]
      [Tp= 1.18:DT= 2.00]
 005:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:4Ln-D         88.09    3.008 No_date    6:48   32.10 .367
      [CN= 75.0: N= 3.00]
      [Tp=  .81:DT= 2.00]
 005:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:4Ln-D         88.09    3.008 No_date    6:48   32.10  n/a
      [LAG= 85.0 min]<- 02:S-4LnD        88.09    3.008 No_date    8:11   32.10  n/a
 005:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:3Ln-C        248.17    6.002 No_date    7:24   32.10 .367
      [CN= 75.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 005:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:3Ln-D        213.80    7.550 No_date    7:12   42.28  n/a
```



```
                      + 02:S-4LnD        88.09    3.008 No_date    8:11   32.10  n/a
                      + 08:3Ln-C        248.17    6.002 No_date    7:24   32.10  n/a
      [DT= 2.00]  SUM=  04:TPNK         550.06   14.816 No_date    7:44   36.06  n/a
 005:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TPNK         550.06   14.816 No_date    7:44   36.06  n/a
                      + 06:S-L3ND       311.62    5.202 No_date    8:46   22.37  n/a
      [DT= 2.00]  SUM=  03:TLN3US       861.68   18.085 No_date    8:08   31.11  n/a
 005:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:TLN3US       861.68   18.085 No_date    8:08   31.11  n/a
                      + 05:S-L3NS       339.56    8.146 No_date   10:28   34.16  n/a
                      + 01:DR#2        2252.49   32.257 No_date   10:46   31.41  n/a
      [DT= 2.00]  SUM=  09:TFN3A       3453.73   47.562 No_date   10:12   31.60  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 005:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TFN3A       3453.73   47.562 No_date   10:12   31.60  n/a
  *   [RDT= 2.00] out<- 01:DR#2US      3453.73   46.586 No_date   10:32   31.60  n/a
      [L/S/n=  685./ .040/.030]
      {Vmax=  .258:Dmax= 3.000}
 005:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-E       225.52   10.685 No_date    6:54   47.37 .541
      [CN= 84.0: N= 3.00]
      [Tp=  .95:DT= 2.00]
 005:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:DR#2US      3453.73   46.586 No_date   10:32   31.60  n/a
                      + 02:10SR-E       225.52   10.685 No_date    6:54   47.37  n/a
      [DT= 2.00]  SUM=  09:TMID32      3679.25   48.283 No_date   10:28   32.57  n/a
#*****************************************************************************
 005:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TMID32      3679.25   48.283 No_date   10:28   32.57  n/a
  *   [RDT= 2.00] out<- 01:DR#2DS      3679.25   45.572 No_date   11:20   32.57  n/a
      [L/S/n= 2250./ .040/.030]
      {Vmax=  .258:Dmax= 2.999}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 005:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-C        230.90    4.631 No_date    8:18   36.99 .423
      [CN= 78.0: N= 3.00]
      [Tp= 2.02:DT= 2.00]
 005:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C        230.90    4.631 No_date    8:18   36.99  n/a
      [LAG= 60.2 min]<- 03:S-4LnC       230.90    4.631 No_date    9:18   36.99  n/a
 005:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-D         81.43    1.787 No_date    7:26   29.88 .342
```



```
      [CN= 74.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 005:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-D         81.43    1.787 No_date    7:26   29.88  n/a
      [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.787 No_date    7:50   29.88  n/a
 005:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:H400-B        79.99    2.334 No_date    6:56   29.88 .342
      [CN= 74.0: N= 3.00]
      [Tp=  .89:DT= 2.00]
 005:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:H400-B        79.99    2.334 No_date    6:56   29.88  n/a
      [LAG= 12.7 min]<- 05:SH400B        79.99    2.334 No_date    7:08   29.88  n/a
 005:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-B         74.81    2.125 No_date    7:00   30.57 .349
      [CN= 74.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 005:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnC       230.90    4.631 No_date    9:18   36.99  n/a
                      + 04:S-5SRD        81.43    1.787 No_date    7:50   29.88  n/a
                      + 05:SH400B        79.99    2.334 No_date    7:08   29.88  n/a
                      + 02:3Ln-B         74.81    2.125 No_date    7:00   30.57  n/a
      [DT= 2.00]  SUM=  06:TOTBLU       467.13    8.053 No_date    8:18   33.51  n/a
#*****************************************************************************
#*****************************************************************************
 005:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 06:TOTBLU       467.13    8.053 No_date    8:18   33.51  n/a
  *   [RDT= 2.00] out<- 07:DR#4         467.13    7.133 No_date    9:06   33.51  n/a
      [L/S/n= 2000./ .040/.030]
      {Vmax=  .641:Dmax= 1.789}
#*****************************************************************************
#***************************************************************************
 005:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-D       110.02    1.875 No_date    7:34   24.73 .283
      [CN= 70.0: N= 3.00]
      [Tp= 1.36:DT= 2.00]
 005:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:10SR-D       110.02    1.875 No_date    7:34   24.73  n/a
      [LAG=153.6 min]<- 04:S10SRD       110.02    1.875 No_date   10:06   24.73  n/a
 005:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:2Ln-B        318.07    6.642 No_date    8:26   39.83 .455
      [CN= 80.0: N= 3.00]
      [Tp= 2.13:DT= 2.00]
 005:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:2Ln-B        318.07    6.642 No_date    8:26   39.83  n/a
                      + 04:S10SRD       110.02    1.875 No_date   10:06   24.73  n/a
      [DT= 2.00]  SUM=  05:TOTGRN       428.09    7.529 No_date    9:26   35.95  n/a
 005:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:TOTGRN       428.09    7.529 No_date    9:26   35.95  n/a
```



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                      + 01:DR#2DS      3679.25   45.572 No_date   11:20   32.57  n/a
                      + 07:DR#4         467.13    7.133 No_date    9:06   33.51  n/a
      [DT= 2.00]  SUM=  09:TFN2U       4574.47   56.573 No_date   10:46   32.98  n/a
#*****************************************************************************
#*****************************************************************************
 005:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-C       365.20    6.755 No_date    7:36   26.95 .308
      [CN= 72.0: N= 3.00]
      [Tp= 1.39:DT= 2.00]
 005:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:10SR-C       365.20    6.755 No_date    7:36   26.95  n/a
      [LAG=121.8 min]<- 04:S10SRC       365.20    6.755 No_date    9:36   26.95  n/a
 005:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TFN2D        365.20    6.755 No_date    9:36   26.95  n/a
                      + 09:TFN2U       4574.47   56.573 No_date   10:46   32.98  n/a
      [DT= 2.00]  SUM=  04:TFN2D       4939.67   62.259 No_date   10:22   32.54  n/a
#*****************************************************************************
#*****************************************************************************
 005:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 04:TFN2D       4939.67   62.259 No_date   10:22   32.54  n/a
  *   [RDT= 2.00] out<- 01:RGLF        4939.67   59.058 No_date   11:32   32.54  n/a
      [L/S/n=  785./ .040/.030]
      {Vmax=  .173:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 005:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:H400-A       350.22    8.567 No_date    8:06   42.28 .483
      [CN= 81.0: N= 3.00]
      [Tp= 1.89:DT= 2.00]
 005:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:H400-A       350.22    8.567 No_date    8:06   42.28  n/a
                      + 01:GOLFE       4939.67   59.058 No_date   11:32   32.54  n/a
      [DT= 2.00]  SUM=  01:GOLFE       5289.89   62.670 No_date   11:18   33.18  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 005:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-A        114.12    2.680 No_date    7:28   32.10 .367
      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 005:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-A        114.12    2.680 No_date    7:28   32.10  n/a
      [LAG=234.2 min]<- 03:S-4LnA       114.12    2.680 No_date   11:22   32.10  n/a
 005:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-B        171.81    3.914 No_date    7:28   31.47 .360
      [CN= 75.0: N= 3.00]
```

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     [Tp= 1.34:DT= 2.00]
 005:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    3.914 No_date    7:28   31.47  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    3.914 No_date   11:20   31.47  n/a
 005:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    5.146 No_date    7:50   30.57 .349
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 005:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    5.146 No_date    7:50   30.57  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    5.146 No_date   10:28   30.57  n/a
 005:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    2.680 No_date   11:22   32.10  n/a
                    +  04:S-4LnB       171.81    3.914 No_date   11:20   31.47  n/a
                    +  05:S-3LnA       268.08    5.146 No_date   10:28   30.57  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01   11.267 No_date   11:10   31.16  n/a
 005:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    6.923 No_date    7:42   30.57 .349
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 005:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    6.923 No_date    7:42   30.57  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    6.923 No_date    8:54   30.57  n/a
 005:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    2.392 No_date    7:04   25.47 .291
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 005:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   11.267 No_date   11:10   31.16  n/a
                    +  04:S-5SRC       341.88    6.923 No_date    8:54   30.57  n/a
                    +  05:2Ln-A        105.00    2.392 No_date    7:04   25.47  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89   15.664 No_date   10:56   30.36  n/a
 005:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   15.664 No_date   10:56   30.36  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89   14.299 No_date   11:20   30.36  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 005:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   14.299 No_date   11:20   30.36  n/a
                    +  01:GOLFE       5289.89   62.670 No_date   11:18   33.18  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   76.968 No_date   11:20   32.73  n/a
#****************************************************************************
#****************************************************************************
 005:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   76.968 No_date   11:20   32.73  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   72.679 No_date   12:18   32.73  n/a
```



```
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 005:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    4.000 No_date    8:22   18.35 .210
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 005:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    1.398 No_date    7:32   20.82 .238
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 005:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    4.000 No_date    8:22   18.35  n/a
                    +  04:10SR-B        96.11    1.398 No_date    7:32   20.82  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    5.248 No_date    8:08   18.82  n/a
 005:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    5.248 No_date    8:08   18.82  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    5.248 No_date   10:36   18.82  n/a
 005:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    1.685 No_date    7:06   15.00 .171
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 005:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    1.685 No_date    7:06   15.00  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    1.685 No_date    8:46   15.00  n/a
 005:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    3.264 No_date    7:56   19.56 .224
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 005:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    1.685 No_date    8:46   15.00  n/a
                    +  03:14Ln-A       276.60    3.264 No_date    7:56   19.56  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    4.700 No_date    8:34   18.06  n/a
 005:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    4.700 No_date    8:34   18.06  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    4.700 No_date   12:02   18.06  n/a
 005:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    4.939 No_date    7:40   34.69 .396
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 005:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    4.939 No_date    7:40   34.69  n/a
                    +  05:S10AB        502.71    5.248 No_date   10:36   18.82  n/a
                    +  03:THNYAK       412.12    4.700 No_date   12:02   18.06  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10   15.040 No_date   10:06   23.53  n/a
 005:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   15.040 No_date   10:06   23.53  n/a
```



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     [LAG=123.6 min]<- 04:HYND        1430.10   15.040 No_date   12:08   23.53  n/a
#****************************************************************************
#****************************************************************************
 005:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   15.040 No_date   12:08   23.53  n/a
                    +  02:GOLF        6290.78   72.679 No_date   12:18   32.73  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   87.695 No_date   12:14   31.03  n/a
#****************************************************************************
#****************************************************************************
 005:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   87.695 No_date   12:14   31.03  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   78.477 No_date   13:30   31.03  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#****************************************************************************
#****************************************************************************
 005:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    2.328 No_date    7:28   26.95 .308
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 005:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    2.328 No_date    7:28   26.95  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    2.328 No_date    9:16   26.95  n/a
 005:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    2.062 No_date    7:20   27.53 .315
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 005:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    2.062 No_date    7:20   27.53  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    2.062 No_date    9:22   27.53  n/a
 005:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    4.080 No_date    6:00   58.66 .670
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 005:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .762 No_date    6:56   17.19 .196
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 005:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .762 No_date    6:56   17.19  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .762 No_date    7:40   17.19  n/a
 005:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    2.328 No_date    9:16   26.95  n/a
                    +  04:S-5SRA        97.15    2.062 No_date    9:22   27.53  n/a
                    +  05:15Ln-A        37.07    4.080 No_date    6:00   58.66  n/a
                    +  07:S-H89A        47.36     .762 No_date    7:40   17.19  n/a
```



```
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    5.193 No_date    9:14   29.51  n/a
 005:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    5.193 No_date    9:14   29.51  n/a
                    +  01:DR#6        7720.88   78.477 No_date   13:30   31.03  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   79.641 No_date   13:28   30.97  n/a
  ** END OF RUN :   5

*****************************************************************************



 RUN:COMMAND#
 006:0001---------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   6 ]
#****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 006:0002---------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=30.00:SDUR=  12.00:PTOT=  96.70]
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 006:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    2.115 No_date    7:20   29.88 .309
     [CN= 70.0: N= 3.00]
```

```
     [Tp= 1.20:DT= 2.00]
 006:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:7Ln-A          92.30    2.115 No_date    7:20   29.88  n/a
     [LAG=278.5 min]<- 02:S-7LnA          92.30    2.115 No_date   11:58   29.88  n/a
 006:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:5SR-E         225.54    4.998 No_date    8:22   41.59 .430
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 006:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:5SR-E         225.54    4.998 No_date    8:22   41.59  n/a
     [LAG=165.9 min]<- 03:S-5SRE         225.54    4.998 No_date   11:06   41.59  n/a
 006:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:10SR-G        505.12    8.036 No_date    8:50   33.66 .348
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 006:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:CR4-D          36.36    1.470 No_date    6:46   37.02 .383
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 006:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 05:CR4-D          36.36    1.470 No_date    6:46   37.02  n/a
     [LAG= 84.1 min]<- 06:S-CR4D          36.36    1.470 No_date    8:10   37.02  n/a
 006:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:6Ln-A         310.44    9.098 No_date    7:20   38.06 .394
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 006:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 01:6Ln-A         310.44    9.098 No_date    7:20   38.06  n/a
     [LAG= 86.9 min]<- 07:S-6LnA         310.44    9.098 No_date    8:46   38.06  n/a
 006:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:5Ln-A         461.49   13.106 No_date    7:34   40.47 .419
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 006:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:S-7LnA         92.30    2.115 No_date   11:58   29.88  n/a
                     +  03:S-5SRE        225.54    4.998 No_date   11:06   41.59  n/a
                     +  04:10SR-G        505.12    8.036 No_date    8:50   33.66  n/a
                     +  06:S-CR4D         36.36    1.470 No_date    8:10   37.02  n/a
                     +  07:S-6LnA        310.44    9.098 No_date    8:46   38.06  n/a
                     +  08:5Ln-A         461.49   13.106 No_date    7:34   40.47  n/a
     [DT= 2.00]  SUM=  09:TOTFN5        1631.25   29.124 No_date    8:28   37.38  n/a
#*****************************************************************************
#*****************************************************************************
 006:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TOTFN5       1631.25   29.124 No_date    8:28   37.38  n/a
  *  [RDT= 2.00] out<- 01:DR#1          1631.25   28.698 No_date    8:46   37.38  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.815:Dmax= 2.321}
```



```
#*****************************************************************************
#*****************************************************************************
 006:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-C          55.76    1.917 No_date    6:58   36.31 .375
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 006:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-C          55.76    1.917 No_date    6:58   36.31  n/a
     [LAG=222.2 min]<- 03:S-CR4C          55.76    1.917 No_date   10:40   36.31  n/a
 006:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-F         472.58   11.473 No_date    7:56   39.80 .412
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 006:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-F         472.58   11.473 No_date    7:56   39.80  n/a
     [LAG=156.2 min]<- 04:S-4LnF         472.58   11.473 No_date   10:32   39.80  n/a
 006:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:4Ln-E          92.90    3.674 No_date    6:54   39.80 .412
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 006:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-CR4C         55.76    1.917 No_date   10:40   36.31  n/a
                     +  04:S-4LnF        472.58   11.473 No_date   10:32   39.80  n/a
                     +  05:4Ln-E          92.90    3.674 No_date    6:54   39.80  n/a
     [DT= 2.00]  SUM=  09:TOTRED         621.24   13.990 No_date   10:32   39.48  n/a
 006:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             09:TOTFN4        621.24   13.990 No_date   10:32   39.48  n/a
                     +  01:DR#1         1631.25   28.698 No_date    8:46   37.38  n/a
     [DT= 2.00]  SUM=  09:TOTFN4        2252.49   38.170 No_date   10:06   37.96  n/a
#*****************************************************************************
#*****************************************************************************
 006:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TOTFN4       2252.49   38.170 No_date   10:06   37.96  n/a
  *  [RDT= 2.00] out<- 01:DR#2          2252.49   37.921 No_date   10:12   37.96  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.827:Dmax= 2.372}
#*****************************************************************************
#*****************************************************************************
 006:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-B         126.62    2.609 No_date    7:06   23.99 .248
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 006:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-B         126.62    2.609 No_date    7:06   23.99  n/a
     [LAG= 41.2 min]<- 04:S-CR4B         126.62    2.609 No_date    7:46   23.99  n/a
 006:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:3Ln-E         185.00    4.102 No_date    7:28   30.53 .316
     [CN= 70.0: N= 3.00]
```



```
     [Tp= 1.30:DT= 2.00]
 006:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S-CR4B        126.62    2.609 No_date    7:46   23.99  n/a
                     +  05:3Ln-E         185.00    4.102 No_date    7:28   30.53  n/a
     [DT= 2.00]  SUM=  02:TLN3ND         311.62    6.642 No_date    7:38   27.87  n/a
 006:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND        311.62    6.642 No_date    7:38   27.87  n/a
     [LAG= 66.9 min]<- 06:S-L3ND         311.62    6.642 No_date    8:44   27.87  n/a
#*****************************************************************************
#*****************************************************************************
 006:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-A         181.15    6.811 No_date    7:00   40.47 .419
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 006:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A         181.15    6.811 No_date    7:00   40.47  n/a
     [LAG=147.7 min]<- 03:S-CR4A         181.15    6.811 No_date    9:26   40.47  n/a
 006:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-F        158.41    4.042 No_date    7:54   41.59 .430
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 006:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TLN3SD        158.41    4.042 No_date    7:54   41.59  n/a
                     +  03:S-CR4A        181.15    6.811 No_date    9:26   40.47  n/a
     [DT= 2.00]  SUM=  02:TLN3SD         339.56    9.870 No_date    9:20   41.00  n/a
 006:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD        339.56    9.870 No_date    9:20   41.00  n/a
     [LAG= 66.9 min]<- 05:S-L3NS         339.56    9.870 No_date   10:26   41.00  n/a
#*****************************************************************************
#*****************************************************************************
 006:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:3Ln-D         213.80    8.963 No_date    7:10   49.81 .515
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 006:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:4Ln-D          88.09    3.684 No_date    6:48   38.72 .400
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 006:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:4Ln-D          88.09    3.684 No_date    6:48   38.72  n/a
     [LAG= 85.0 min]<- 02:S-4LnD          88.09    3.684 No_date    8:11   38.72  n/a
 006:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:3Ln-C         248.17    7.339 No_date    7:22   38.72 .400
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 006:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:3Ln-D         213.80    8.963 No_date    7:10   49.81  n/a
                     +  02:S-4LnD         88.09    3.684 No_date    8:11   38.72  n/a
```



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                     +  08:3Ln-C         248.17    7.339 No_date    7:22   38.72  n/a
     [DT= 2.00]  SUM=  04:TPNK           550.06   17.842 No_date    7:42   43.03  n/a
 006:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TPNK          550.06   17.842 No_date    7:42   43.03  n/a
                     +  06:S-L3ND        311.62    6.642 No_date    8:44   27.87  n/a
     [DT= 2.00]  SUM=  03:TLN3US         861.68   22.082 No_date    8:08   37.55  n/a
 006:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:TLN3US        861.68   22.082 No_date    8:08   37.55  n/a
                     +  05:S-L3NS        339.56    9.870 No_date   10:26   41.00  n/a
                     +  01:DR#2         2252.49   37.921 No_date   10:12   37.96  n/a
     [DT= 2.00]  SUM=  09:TFN3A         3453.73   57.948 No_date   10:08   38.16  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 006:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TFN3A        3453.73   57.948 No_date   10:08   38.16  n/a
  *  [RDT= 2.00] out<- 01:DR#2US        3453.73   57.311 No_date   10:14   38.16  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
 006:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-E        225.52   12.541 No_date    6:54   55.30 .572
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 006:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:DR#2US       3453.73   57.311 No_date   10:14   38.16  n/a
                     +  02:10SR-E        225.52   12.541 No_date    6:54   55.30  n/a
     [DT= 2.00]  SUM=  09:TMID32        3679.25   59.529 No_date   10:12   39.21  n/a
#*****************************************************************************
 006:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TMID32       3679.25   59.529 No_date   10:12   39.21  n/a
  *  [RDT= 2.00] out<- 01:DR#2DS        3679.25   55.878 No_date   10:48   39.21  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.997}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 006:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-C         230.90    5.561 No_date    8:16   44.08 .456
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 006:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C         230.90    5.561 No_date    8:16   44.08  n/a
     [LAG= 60.2 min]<- 03:S-4LnC         230.90    5.561 No_date    9:16   44.08  n/a
 006:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-D          81.43    2.206 No_date    7:24   36.31 .375
     [CN= 74.0: N= 3.00]
```

```
      [Tp= 1.30:DT= 2.00]
 006:0047--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-D         81.43    2.206 No_date    7:24   36.31  n/a
      [LAG= 24.8 min]<- 04:S-5SRD        81.43    2.206 No_date    7:48   36.31  n/a
 006:0048--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:H400-B        79.99    2.888 No_date    6:54   36.31 .375
      [CN= 74.0: N= 3.00]
      [Tp=  .89:DT= 2.00]
 006:0049--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:H400-B        79.99    2.888 No_date    6:54   36.31  n/a
      [LAG= 12.7 min]<- 05:SH400B        79.99    2.888 No_date    7:06   36.31  n/a
 006:0050--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:3Ln-B         74.81    2.615 No_date    7:00   37.02 .383
      [CN= 74.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 006:0051--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-4LnC       230.90    5.561 No_date    9:16   44.08  n/a
                    +   04:S-5SRD        81.43    2.206 No_date    7:48   36.31  n/a
                    +   05:SH400B        79.99    2.888 No_date    7:06   36.31  n/a
                    +   02:3Ln-B         74.81    2.615 No_date    7:00   37.02  n/a
      [DT= 2.00]  SUM=  06:TOTBLU       467.13    9.768 No_date    8:14   40.26  n/a
#*************************************************************************
#*************************************************************************
 006:0052--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 06:TOTBLU       467.13    9.768 No_date    8:14   40.26  n/a
  *   [RDT= 2.00] out<- 07:DR#4         467.13    8.707 No_date    8:58   40.26  n/a
      [L/S/n= 2000./ .040/.030]
      {Vmax=  .674:Dmax= 1.940}
#*************************************************************************
#***********************************************************************
 006:0053--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-D       110.02    2.358 No_date    7:32   30.53 .316
      [CN= 70.0: N= 3.00]
      [Tp= 1.36:DT= 2.00]
 006:0054--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:10SR-D       110.02    2.358 No_date    7:32   30.53  n/a
      [LAG=153.6 min]<- 04:S10SRD       110.02    2.358 No_date   10:04   30.53  n/a
 006:0055--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:2Ln-B        318.07    7.924 No_date    8:24   47.19 .488
      [CN= 80.0: N= 3.00]
      [Tp= 2.13:DT= 2.00]
 006:0056--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:2Ln-B        318.07    7.924 No_date    8:24   47.19  n/a
                    +   04:S10SRD       110.02    2.358 No_date   10:04   30.53  n/a
      [DT= 2.00]  SUM=  05:TOTGRN       428.09    9.059 No_date    9:26   42.91  n/a
 006:0057--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            05:TOTGRN       428.09    9.059 No_date    9:26   42.91  n/a
                    +   01:DR#2DS      3679.25   55.878 No_date   10:48   39.21  n/a
```



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                    +   07:DR#4         467.13    8.707 No_date    8:58   40.26  n/a
      [DT= 2.00]  SUM=  09:TFN2U       4574.47   70.800 No_date   10:20   39.66  n/a
#*************************************************************************
#*************************************************************************
 006:0058--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:10SR-C       365.20    8.428 No_date    7:34   33.05 .342
      [CN= 72.0: N= 3.00]
      [Tp= 1.39:DT= 2.00]
 006:0059--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:10SR-C       365.20    8.428 No_date    7:34   33.05  n/a
      [LAG=121.8 min]<- 04:S10SRC       365.20    8.428 No_date    9:34   33.05  n/a
 006:0060--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:TFN2D        365.20    8.428 No_date    9:34   33.05  n/a
                    +   09:TFN2U       4574.47   70.800 No_date   10:20   39.66  n/a
      [DT= 2.00]  SUM=  04:TFN2D       4939.67   78.400 No_date   10:08   39.17  n/a
#*************************************************************************
#*************************************************************************
 006:0061--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 04:TFN2D       4939.67   78.400 No_date   10:08   39.17  n/a
  *   [RDT= 2.00] out<- 01:RGLF        4939.67   73.488 No_date   11:12   39.17  n/a
      [L/S/n=  785./ .040/.030]
      {Vmax=  .173:Dmax= 2.139}
#*************************************************************************
#*************************************************************************
#*************************************************************************
#*************************************************************************
 006:0062--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:H400-A       350.22   10.157 No_date    8:04   49.81 .515
      [CN= 81.0: N= 3.00]
      [Tp= 1.89:DT= 2.00]
 006:0063--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:H400-A       350.22   10.157 No_date    8:04   49.81  n/a
                    +   01:GOLFE       4939.67   73.488 No_date   11:12   39.17  n/a
      [DT= 2.00]  SUM=  01:GOLFE       5289.89   78.213 No_date   11:00   39.88  n/a
#*************************************************************************
#*************************************************************************
#Flows to Flow Node 2B
 006:0064--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-A        114.12    3.277 No_date    7:26   38.72 .400
      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 006:0065--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-A        114.12    3.277 No_date    7:26   38.72  n/a
      [LAG=234.2 min]<- 03:S-4LnA       114.12    3.277 No_date   11:20   38.72  n/a
 006:0066--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-B        171.81    4.802 No_date    7:28   38.06 .394
      [CN= 75.0: N= 3.00]
      [Tp= 1.34:DT= 2.00]
```



```
 006:0067--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-B        171.81    4.802 No_date    7:28   38.06  n/a
      [LAG=232.5 min]<- 04:S-4LnB       171.81    4.802 No_date   11:20   38.06  n/a
 006:0068--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:3Ln-A        268.08    6.314 No_date    7:48   37.02 .383
      [CN= 74.0: N= 3.00]
      [Tp= 1.61:DT= 2.00]
 006:0069--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:3Ln-A        268.08    6.314 No_date    7:48   37.02  n/a
      [LAG=158.8 min]<- 05:S-3LnA       268.08    6.314 No_date   10:26   37.02  n/a
 006:0070--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-4LnA       114.12    3.277 No_date   11:20   38.72  n/a
                    +   04:S-4LnB       171.81    4.802 No_date   11:20   38.06  n/a
                    +   05:S-3LnA       268.08    6.314 No_date   10:26   37.02  n/a
      [DT= 2.00]  SUM=  02:TBLK1        554.01   13.786 No_date   11:08   37.69  n/a
 006:0071--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:5SR-C        341.88    8.499 No_date    7:40   37.02 .383
      [CN= 74.0: N= 3.00]
      [Tp= 1.50:DT= 2.00]
 006:0072--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:5SR-C        341.88    8.499 No_date    7:40   37.02  n/a
      [LAG= 72.5 min]<- 04:S-5SRC       341.88    8.499 No_date    8:52   37.02  n/a
 006:0073--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:2Ln-A        105.00    3.015 No_date    7:02   31.40 .325
      [CN= 71.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 006:0074--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TBLK1        554.01   13.786 No_date   11:08   37.69  n/a
                    +   04:S-5SRC       341.88    8.499 No_date    8:52   37.02  n/a
                    +   05:2Ln-A        105.00    3.015 No_date    7:02   31.40  n/a
      [DT= 2.00]  SUM=  07:TOTBLK      1000.89   19.078 No_date   10:54   36.80  n/a
 006:0075--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TOTBLK      1000.89   19.078 No_date   10:54   36.80  n/a
  *   [RDT= 2.00] out<- 02:GOLFN       1000.89   17.582 No_date   11:32   36.80  n/a
      [L/S/n=  330./ .040/.050]
      {Vmax=  .104:Dmax= 2.137}
#*************************************************************************
#*************************************************************************
 006:0076--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:GOLFN       1000.89   17.582 No_date   11:32   36.80  n/a
                    +   01:GOLFE       5289.89   78.213 No_date   11:00   39.88  n/a
      [DT= 2.00]  SUM=  07:TGOLF       6290.78   95.310 No_date   11:14   39.39  n/a
#*************************************************************************
#*************************************************************************
 006:0077--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TGOLF       6290.78   95.310 No_date   11:14   39.39  n/a
  *   [RDT= 2.00] out<- 02:GOLF        6290.78   90.525 No_date   12:04   39.39  n/a
      [L/S/n=  485./ .040/.050]
```



```
      {Vmax=  .104:Dmax= 2.140}
#*************************************************************************
#*************************************************************************
 006:0078--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:10SR-A       406.60    5.176 No_date    8:18   23.31 .241
      [CN= 65.0: N= 3.00]
      [Tp= 1.82:DT= 2.00]
 006:0079--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-B        96.11    1.795 No_date    7:28   26.12 .270
      [CN= 67.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 006:0080--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:T10AB        406.60    5.176 No_date    8:18   23.31  n/a
                    +   04:10SR-B        96.11    1.795 No_date    7:28   26.12  n/a
      [DT= 2.00]  SUM=  03:T10AB        502.71    6.780 No_date    8:04   23.84  n/a
 006:0081--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:T10AB        502.71    6.780 No_date    8:04   23.84  n/a
      [LAG=149.0 min]<- 05:S10AB        502.71    6.780 No_date   10:32   23.84  n/a
 006:0082--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:13Ln-A       135.52    2.269 No_date    7:04   19.45 .201
      [CN= 62.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 006:0083--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:13Ln-A       135.52    2.269 No_date    7:04   19.45  n/a
      [LAG=100.5 min]<- 04:S13LnA       135.52    2.269 No_date    8:44   19.45  n/a
 006:0084--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:14Ln-A       276.60    4.207 No_date    7:52   24.68 .255
      [CN= 66.0: N= 3.00]
      [Tp= 1.55:DT= 2.00]
 006:0085--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S13LnA       135.52    2.269 No_date    8:44   19.45  n/a
                    +   03:14Ln-A       276.60    4.207 No_date    7:52   24.68  n/a
      [DT= 2.00]  SUM=  09:TOT14L       412.12    6.127 No_date    8:32   22.96  n/a
 006:0086--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 09:TOT14L       412.12    6.127 No_date    8:32   22.96  n/a
      [LAG=210.0 min]<- 03:S13LnA       412.12    6.127 No_date   12:00   22.96  n/a
 006:0087--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:CR89-A       212.34    5.991 No_date    7:38   41.59 .430
      [CN= 77.0: N= 3.00]
      [Tp= 1.51:DT= 2.00]
 006:0088--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:CR89-A       212.34    5.991 No_date    7:38   41.59  n/a
                    +   05:S10AB        502.71    6.780 No_date   10:32   23.84  n/a
                    +   03:THNYAK       412.12    6.127 No_date   12:00   22.96  n/a
      [DT= 2.00]  SUM=  03:THNYAK      1430.10   18.993 No_date   10:06   29.11  n/a
 006:0089--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:THNYAK      1430.10   18.993 No_date   10:06   29.11  n/a
      [LAG=123.6 min]<- 04:HYND        1430.10   18.993 No_date   12:08   29.11  n/a
```

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#*****************************************************************************
#*****************************************************************************
 006:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              04:HYND         1430.10   18.993 No_date   12:08   29.11  n/a
                      +  02:GOLF         6290.78   90.525 No_date   12:04   39.39  n/a
     [DT= 2.00]  SUM=  09:HWY400       7720.88  109.505 No_date   12:04   37.49  n/a
#*****************************************************************************
#*****************************************************************************
 006:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400       7720.88  109.505 No_date   12:04   37.49  n/a
  *   [RDT= 2.00] out<- 01:DR#6        7720.88   97.345 No_date   13:28   37.48  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#*****************************************************************************
#*****************************************************************************
 006:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B         119.01    2.907 No_date    7:26   33.05 .342
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 006:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B         119.01    2.907 No_date    7:26   33.05  n/a
     [LAG=108.3 min]<- 03:S-5SRB        119.01    2.907 No_date    9:14   33.05  n/a
 006:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A          97.15    2.566 No_date    7:18   33.66 .348
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 006:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A          97.15    2.566 No_date    7:18   33.66  n/a
     [LAG=123.3 min]<- 04:S-5SRA         97.15    2.566 No_date    9:20   33.66  n/a
 006:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A         37.07    4.522 No_date    6:00   66.28 .685
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 006:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A          47.36    1.009 No_date    6:54   21.98 .227
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 006:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A          47.36    1.009 No_date    6:54   21.98  n/a
     [LAG= 45.5 min]<- 07:S-H89A         47.36    1.009 No_date    7:38   21.98  n/a
 006:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              03:S-5SRB        119.01    2.907 No_date    9:14   33.05  n/a
                      +  04:S-5SRA         97.15    2.566 No_date    9:20   33.66  n/a
                      +  05:15Ln-A         37.07    4.522 No_date    6:00   66.28  n/a
                      +  07:S-H89A         47.36    1.009 No_date    7:38   21.98  n/a
     [DT= 2.00]  SUM=  06:TOTPLM        300.59    6.439 No_date    9:12   35.60  n/a
```



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 006:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:TOTPLM        300.59    6.439 No_date    9:12   35.60  n/a
                      +  01:DR#6         7720.88   97.345 No_date   13:28   37.48  n/a
     [DT= 2.00]  SUM=  09:TFN15L       8021.47   98.733 No_date   13:24   37.41  n/a
  ** END OF RUN :   6

*****************************************************************************



 RUN:COMMAND#
 007:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   7 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# Modified IA - Using NRSCS IA instead of NVCA IA
# 12 HR SCS TYPE II
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 007:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=60.00:SDUR=  12.00:PTOT= 193.00]
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 007:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A          92.30    4.489 No_date    9:06  103.81 .538
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
```



```
 007:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A          92.30    4.489 No_date    9:06  103.81  n/a
     [LAG=278.5 min]<- 02:S-7LnA         92.30    4.489 No_date   13:44  103.81  n/a
 007:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E         225.54   11.032 No_date    9:54  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 007:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E         225.54   11.032 No_date    9:54  123.89  n/a
     [LAG=165.9 min]<- 03:S-5SRE        225.54   11.032 No_date   12:38  123.89  n/a
 007:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G        505.12   21.194 No_date   10:26  110.30 .571
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 007:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D          36.36    2.323 No_date    7:32  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 007:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D          36.36    2.323 No_date    7:32  116.07  n/a
     [LAG= 84.1 min]<- 06:S-CR4D         36.36    2.323 No_date    8:56  116.07  n/a
 007:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A         310.44   16.755 No_date    8:32  118.12 .612
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 007:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A         310.44   16.755 No_date    8:32  118.12  n/a
     [LAG= 86.9 min]<- 07:S-6LnA        310.44   16.755 No_date    9:58  118.12  n/a
 007:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A         461.49   24.839 No_date    9:12  121.80 .631
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 007:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              02:S-7LnA         92.30    4.489 No_date   13:44  103.81  n/a
                      +  03:S-5SRE        225.54   11.032 No_date   12:38  123.89  n/a
                      +  04:10SR-G        505.12   21.194 No_date   10:26  110.30  n/a
                      +  06:S-CR4D         36.36    2.323 No_date    8:56  116.07  n/a
                      +  07:S-6LnA        310.44   16.755 No_date    9:58  118.12  n/a
                      +  08:5Ln-A         461.49   24.839 No_date    9:12  121.80  n/a
     [DT= 2.00]  SUM=  09:TOTFN5       1631.25   69.347 No_date   10:32  116.68  n/a
#*****************************************************************************
#*****************************************************************************
 007:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5       1631.25   69.347 No_date   10:32  116.68  n/a
  *   [RDT= 2.00] out<- 01:DR#1        1631.25   69.196 No_date   10:44  116.68  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.846:Dmax= 2.295}
#*****************************************************************************
```



```
#*****************************************************************************
 007:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C          55.76    3.279 No_date    7:46  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 007:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C          55.76    3.279 No_date    7:46  115.19  n/a
     [LAG=222.2 min]<- 03:S-CR4C         55.76    3.279 No_date   11:28  115.19  n/a
 007:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F         472.58   24.204 No_date    9:30  120.99 .627
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 007:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F         472.58   24.204 No_date    9:30  120.99  n/a
     [LAG=156.2 min]<- 04:S-4LnF        472.58   24.204 No_date   12:06  120.99  n/a
 007:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E          92.90    5.840 No_date    7:40  120.99 .627
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 007:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              03:S-CR4C         55.76    3.279 No_date   11:28  115.19  n/a
                      +  04:S-4LnF        472.58   24.204 No_date   12:06  120.99  n/a
                      +  05:4Ln-E          92.90    5.840 No_date    7:40  120.99  n/a
     [DT= 2.00]  SUM=  09:TOTRED        621.24   29.973 No_date   11:50  120.47  n/a
 007:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              09:TOTFN4        621.24   29.973 No_date   11:50  120.47  n/a
                      +  01:DR#1         1631.25   69.196 No_date   10:44  116.68  n/a
     [DT= 2.00]  SUM=  09:TOTFN4       2252.49   97.785 No_date   11:18  117.73  n/a
#*****************************************************************************
#*****************************************************************************
 007:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4       2252.49   97.785 No_date   11:18  117.73  n/a
  *   [RDT= 2.00] out<- 01:DR#2        2252.49   97.510 No_date   11:32  117.73  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.872:Dmax= 2.467}
#*****************************************************************************
#*****************************************************************************
 007:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B         126.62    5.874 No_date    7:54   92.51 .479
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 007:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B         126.62    5.874 No_date    7:54   92.51  n/a
     [LAG= 41.2 min]<- 04:S-CR4B        126.62    5.874 No_date    8:34   92.51  n/a
 007:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E         185.00    8.946 No_date    9:12  104.65 .542
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
```

```
 007:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S-CR4B        126.62    5.874 No_date    8:34   92.51  n/a
                     +  05:3Ln-E         185.00    8.946 No_date    9:12  104.65  n/a
     [DT= 2.00]  SUM=   02:TLN3ND        311.62   14.706 No_date    8:42   99.72  n/a
 007:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND        311.62   14.706 No_date    8:42   99.72  n/a
     [LAG= 66.9 min]<-  06:S-L3ND        311.62   14.706 No_date    9:48   99.72  n/a
#*****************************************************************************
#*****************************************************************************
 007:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-A         181.15   10.990 No_date    7:48  121.80 .631
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 007:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A         181.15   10.990 No_date    7:48  121.80  n/a
     [LAG=147.7 min]<-  03:S-CR4A        181.15   10.990 No_date   10:14  121.80  n/a
 007:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-F        158.41    8.272 No_date    9:30  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 007:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TLN3SD        158.41    8.272 No_date    9:30  123.89  n/a
                     +  03:S-CR4A        181.15   10.990 No_date   10:14  121.80  n/a
     [DT= 2.00]  SUM=   02:TLN3SD        339.56   18.936 No_date   10:08  122.78  n/a
 007:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD        339.56   18.936 No_date   10:08  122.78  n/a
     [LAG= 66.9 min]<-  05:S-L3NS        339.56   18.936 No_date   11:14  122.78  n/a
#*****************************************************************************
#*****************************************************************************
 007:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:3Ln-D         213.80   13.436 No_date    8:04  136.27 .706
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 007:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:4Ln-D          88.09    5.706 No_date    7:32  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 007:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:4Ln-D          88.09    5.706 No_date    7:32  118.92  n/a
     [LAG= 85.0 min]<-  02:S-4LnD         88.09    5.706 No_date    8:56  118.92  n/a
 007:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:3Ln-C         248.17   13.391 No_date    8:38  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 007:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:3Ln-D         213.80   13.436 No_date    8:04  136.27  n/a
                     +  02:S-4LnD         88.09    5.706 No_date    8:56  118.92  n/a
                     +  08:3Ln-C         248.17   13.391 No_date    8:38  118.92  n/a
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     [DT= 2.00]  SUM=   04:TPNK          550.06   32.027 No_date    8:50  125.66  n/a
 007:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TPNK          550.06   32.027 No_date    8:50  125.66  n/a
                     +  06:S-L3ND        311.62   14.706 No_date    9:48   99.72  n/a
     [DT= 2.00]  SUM=   03:TLN3US        861.68   45.662 No_date    9:14  116.28  n/a
 007:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:TLN3US        861.68   45.662 No_date    9:14  116.28  n/a
                     +  05:S-L3NS        339.56   18.936 No_date   11:14  122.78  n/a
                     +  01:DR#2         2252.49   97.510 No_date   11:32  117.73  n/a
     [DT= 2.00]  SUM=   09:TFN3A        3453.73  152.128 No_date   11:04  117.86  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 007:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TFN3A        3453.73  152.128 No_date   11:04  117.86  n/a
  *  [RDT= 2.00] out<-  01:DR#2US       3453.73  149.472 No_date   11:34  117.86  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.997}
 007:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-E        225.52   16.380 No_date    7:40  144.35 .748
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 007:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:DR#2US       3453.73  149.472 No_date   11:34  117.86  n/a
                     +  02:10SR-E        225.52   16.380 No_date    7:40  144.35  n/a
     [DT= 2.00]  SUM=   09:TMID32       3679.25  157.454 No_date   11:28  119.49  n/a
#*****************************************************************************
 007:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TMID32       3679.25  157.454 No_date   11:28  119.49  n/a
  *  [RDT= 2.00] out<-  01:DR#2DS       3679.25  147.573 No_date   12:34  119.49  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.994}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 007:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-C         230.90   11.655 No_date    9:48  127.56 .661
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 007:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C         230.90   11.655 No_date    9:48  127.56  n/a
     [LAG= 60.2 min]<-  03:S-4LnC        230.90   11.655 No_date   10:48  127.56  n/a
 007:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-D          81.43    4.275 No_date    9:04  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
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 007:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-D          81.43    4.275 No_date    9:04  115.19  n/a
     [LAG= 24.8 min]<-  04:S-5SRD         81.43    4.275 No_date    9:28  115.19  n/a
 007:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:H400-B         79.99    4.835 No_date    7:40  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 007:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:H400-B         79.99    4.835 No_date    7:40  115.19  n/a
     [LAG= 12.7 min]<-  05:SH400B         79.99    4.835 No_date    7:52  115.19  n/a
 007:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-B          74.81    4.403 No_date    7:46  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 007:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnC        230.90   11.655 No_date   10:48  127.56  n/a
                     +  04:S-5SRD         81.43    4.275 No_date    9:28  115.19  n/a
                     +  05:SH400B         79.99    4.835 No_date    7:52  115.19  n/a
                     +  02:3Ln-B          74.81    4.403 No_date    7:46  116.07  n/a
     [DT= 2.00]  SUM=   06:TOTBLU        467.13   22.448 No_date    9:42  121.45  n/a
#*****************************************************************************
#*****************************************************************************
 007:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 06:TOTBLU        467.13   22.448 No_date    9:42  121.45  n/a
  *  [RDT= 2.00] out<-  07:DR#4          467.13   18.858 No_date   11:38  121.44  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .260:Dmax= 2.967}
#*****************************************************************************
#***************************************************************************
 007:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-D        110.02    5.279 No_date    9:14  104.65 .542
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 007:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:10SR-D        110.02    5.279 No_date    9:14  104.65  n/a
     [LAG=153.6 min]<-  04:S10SRD        110.02    5.279 No_date   11:46  104.65  n/a
 007:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:2Ln-B         318.07   16.260 No_date    9:56  132.59 .687
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 007:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:2Ln-B         318.07   16.260 No_date    9:56  132.59  n/a
                     +  04:S10SRD        110.02    5.279 No_date   11:46  104.65  n/a
     [DT= 2.00]  SUM=   05:TOTGRN        428.09   20.769 No_date   10:28  125.41  n/a
 007:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:TOTGRN        428.09   20.769 No_date   10:28  125.41  n/a
                     +  01:DR#2DS       3679.25  147.573 No_date   12:34  119.49  n/a
                     +  07:DR#4          467.13   18.858 No_date   11:38  121.44  n/a
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     [DT= 2.00]  SUM=   09:TFN2U        4574.47  183.556 No_date   12:18  120.24  n/a
#*****************************************************************************
#*****************************************************************************
 007:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-C        365.20   18.173 No_date    9:14  109.52 .567
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 007:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:10SR-C        365.20   18.173 No_date    9:14  109.52  n/a
     [LAG=121.8 min]<-  04:S10SRC        365.20   18.173 No_date   11:14  109.52  n/a
 007:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TFN2D         365.20   18.173 No_date   11:14  109.52  n/a
                     +  09:TFN2U        4574.47  183.556 No_date   12:18  120.24  n/a
     [DT= 2.00]  SUM=   04:TFN2D        4939.67  200.122 No_date   12:06  119.45  n/a
#*****************************************************************************
#*****************************************************************************
 007:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 04:TFN2D        4939.67  200.122 No_date   12:06  119.45  n/a
  *  [RDT= 2.00] out<-  01:RGLF         4939.67  190.184 No_date   13:08  119.45  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.138}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 007:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:H400-A        350.22   19.091 No_date    9:36  136.27 .706
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 007:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:H400-A        350.22   19.091 No_date    9:36  136.27  n/a
                     +  01:GOLFE        4939.67  190.184 No_date   13:08  119.45  n/a
     [DT= 2.00]  SUM=   01:GOLFE        5289.89  201.348 No_date   12:54  120.56  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 007:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-A         114.12    6.114 No_date    9:04  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 007:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-A         114.12    6.114 No_date    9:04  118.92  n/a
     [LAG=234.2 min]<-  03:S-4LnA        114.12    6.114 No_date   12:58  118.92  n/a
 007:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-B         171.81    9.161 No_date    9:06  118.12 .612
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 007:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-B        171.81    9.161 No_date    9:06  118.12  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    9.161 No_date   12:58  118.12  n/a
 007:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-A       268.08   13.497 No_date    9:24  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 007:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08   13.497 No_date    9:24  116.07  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08   13.497 No_date   12:02  116.07  n/a
 007:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnA      114.12    6.114 No_date   12:58  118.92  n/a
                     +  04:S-4LnB      171.81    9.161 No_date   12:58  118.12  n/a
                     +  05:S-3LnA      268.08   13.497 No_date   12:02  116.07  n/a
     [DT= 2.00]  SUM=   02:TBLK1       554.01   28.533 No_date   12:16  117.29  n/a
 007:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:5SR-C       341.88   17.529 No_date    9:18  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 007:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88   17.529 No_date    9:18  116.07  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88   17.529 No_date   10:30  116.07  n/a
 007:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:2Ln-A       105.00    5.681 No_date    7:48  106.60 .552
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 007:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TBLK1       554.01   28.533 No_date   12:16  117.29  n/a
                     +  04:S-5SRC      341.88   17.529 No_date   10:30  116.07  n/a
                     +  05:2Ln-A       105.00    5.681 No_date    7:48  106.60  n/a
     [DT= 2.00]  SUM=   07:TOTBLK     1000.89   46.140 No_date   11:46  115.76  n/a
 007:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   46.140 No_date   11:46  115.76  n/a
 *   [RDT= 2.00] out<- 02:GOLFN       1000.89   44.406 No_date   12:30  115.76  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#******************************************************************************
#******************************************************************************
 007:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:GOLFN      1000.89   44.406 No_date   12:30  115.76  n/a
                     +  01:GOLFE      5289.89  201.348 No_date   12:54  120.56  n/a
     [DT= 2.00]  SUM=   07:TGOLF      6290.78  245.367 No_date   12:48  119.80  n/a
#******************************************************************************
#******************************************************************************
 007:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78  245.367 No_date   12:48  119.80  n/a
 *   [RDT= 2.00] out<- 02:GOLF        6290.78  234.916 No_date   13:48  119.80  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
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#******************************************************************************
#******************************************************************************
 007:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-A      406.60   15.875 No_date    9:52   90.69 .470
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 007:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:10SR-B       96.11    4.340 No_date    9:14   96.29 .499
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 007:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:T10AB       406.60   15.875 No_date    9:52   90.69  n/a
                     +  04:10SR-B       96.11    4.340 No_date    9:14   96.29  n/a
     [DT= 2.00]  SUM=   03:T10AB       502.71   20.063 No_date    9:42   91.77  n/a
 007:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71   20.063 No_date    9:42   91.77  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71   20.063 No_date   12:10   91.77  n/a
 007:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:13Ln-A      135.52    5.683 No_date    7:50   82.54 .428
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 007:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    5.683 No_date    7:50   82.54  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    5.683 No_date    9:30   82.54  n/a
 007:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:14Ln-A      276.60   11.673 No_date    9:32   93.47 .484
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 007:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S13LnA      135.52    5.683 No_date    9:30   82.54  n/a
                     +  03:14Ln-A      276.60   11.673 No_date    9:32   93.47  n/a
     [DT= 2.00]  SUM=   09:TOT14L      412.12   17.356 No_date    9:30   89.88  n/a
 007:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12   17.356 No_date    9:30   89.88  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12   17.356 No_date   12:58   89.88  n/a
 007:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:CR89-A      212.34   11.491 No_date    9:14  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 007:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:CR89-A      212.34   11.491 No_date    9:14  123.89  n/a
                     +  05:S10AB       502.71   20.063 No_date   12:10   91.77  n/a
                     +  03:THNYAK      412.12   17.356 No_date   12:58   89.88  n/a
     [DT= 2.00]  SUM=   03:THNYAK     1430.10   55.553 No_date   11:44  101.31  n/a
 007:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   55.553 No_date   11:44  101.31  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   55.553 No_date   13:46  101.31  n/a
#******************************************************************************
```



```
#******************************************************************************
 007:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:HYND       1430.10   55.553 No_date   13:46  101.31  n/a
                     +  02:GOLF       6290.78  234.916 No_date   13:48  119.80  n/a
     [DT= 2.00]  SUM=   09:HWY400     7720.88  290.468 No_date   13:48  116.37  n/a
#******************************************************************************
#******************************************************************************
 007:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88  290.468 No_date   13:48  116.37  n/a
 *   [RDT= 2.00] out<- 01:DR#6        7720.88  265.749 No_date   15:12  116.37  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#******************************************************************************
#******************************************************************************
 007:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-B       119.01    5.998 No_date    9:08  109.52 .567
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 007:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    5.998 No_date    9:08  109.52  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    5.998 No_date   10:56  109.52  n/a
 007:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-A        97.15    4.980 No_date    8:24  110.30 .571
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 007:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    4.980 No_date    8:24  110.30  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    4.980 No_date   10:26  110.30  n/a
 007:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      05:15Ln-A       37.07    2.445 No_date    7:00  151.74 .786
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious    area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious  area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 007:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:H89-A        47.36    2.244 No_date    7:36   87.96 .456
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 007:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36    2.244 No_date    7:36   87.96  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36    2.244 No_date    8:20   87.96  n/a
 007:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-5SRB      119.01    5.998 No_date   10:56  109.52  n/a
                     +  04:S-5SRA       97.15    4.980 No_date   10:26  110.30  n/a
                     +  05:15Ln-A       37.07    2.445 No_date    7:00  151.74  n/a
                     +  07:S-H89A       47.36    2.244 No_date    8:20   87.96  n/a
     [DT= 2.00]  SUM=   06:TOTPLM      300.59   14.220 No_date   10:12  111.58  n/a
 007:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    ADD HYD             06:TOTPLM      300.59   14.220 No_date   10:12  111.58  n/a
                     +  01:DR#6       7720.88  265.749 No_date   15:12  116.37  n/a
     [DT= 2.00]  SUM=   09:TFN15L     8021.47  269.848 No_date   15:02  116.19  n/a
 007:0002-----------------------------------------------------------------------------
     FINISH
-------------------------------------------------------------------------------------
*************************************************************************************
    WARNINGS / ERRORS / NOTES
    -------------------------
 001:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
```

```
             Routing DT set to inflow hydrograph DT.
 002:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 002:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 002:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 002:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 003:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 003:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 003:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 003:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
```



```
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 004:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 004:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 004:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 004:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 005:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
```



```
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 005:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 006:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 006:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
```



```
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
 007:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
             Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
  Simulation ended on 2018-02-08     at 14:21:24
==============================================================================
```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
*#  Project No. : [300038790]
*#  Date        : 2017-02-08
*#  Date Rev.   : N/A
*#  Modeller    : [T.Lozon]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#****************************************************************************
*%
*# EXISTING CONDITION
*# EX_FINAL WITH STANDARD RAINFALL DATA
*# ORRILIA TS RAIN GAGE
*# 24 HR SCS TYPE II
*# Modified IA - Using NRSCS IA instead of NVCA IA
*#
*# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
*# TOPOGRAPHIC SURVEY INFORMATION
*# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
*%
*%
*%
*% 2-YR SCS Type-II ORILLIA Storm Distribution . (24-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS24.STM"] <--storm filename
*%-----------------|-------------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE ORANGE
*#Flows to Flow Node 5 (LINE 5)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 7 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["7Ln-A"], DT=[2]min, AREA=[92.30](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[22.8](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 7 Ln-A to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-7LnA"], IDin=[1], TLAG=[278.45](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-E
```



```
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["5SR-E"], DT=[2]min, AREA=[225.54](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                    N=[3], TP=[2.07]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-E to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRE"], IDin=[1], TLAG=[165.95](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-G (NO ROUTING NEEDED)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-G"], DT=[2]min, AREA=[505.12](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[19.8](mm),
                    N=[3], TP=[2.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 4-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["CR4-D"], DT=[2]min, AREA=[36.36](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[0.79]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-D to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-CR4D"], IDin=[5], TLAG=[84.11](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 6 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["6Ln-A"], DT=[2]min, AREA=[310.44](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[17.8](mm),
                    N=[3], TP=[1.26]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 6 Ln-A to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["S-6LnA"], IDin=[1], TLAG=[86.92](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["5Ln-A"], DT=[2]min, AREA=[461.49](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.0](mm),
                    N=[3], TP=[1.44]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
```

```
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOWS AT LINE 5
*%Add flows at Flow Node 7 from Catchments 7 Ln-A, 5 SR-E, 10 SR-G, CR 4-D,
*%   6 Ln-A & 5 Ln-A
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN5"], IDs to add=[2+3+4+6+7+8]
*%-----------------|------------------------------------------------------------|

*#*******************************************************************************
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 5 TO LINE 4
*% DRAIN #1
*% USE HEC-RAS X-SECTION 18
ROUTE CHANNEL       IDout=[1], NHYD=["DR#1"], IDin=[9],
                    RDT=[5](min),
                    CHLGTH=[1780](m),  CHSLOPE=[0.29](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[18],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,249.27] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0,234.17]
                                                   [205.47,230.2]
                                                   [212.04,229.96]
                                                   [215.28,227.63]
                                                   [216.96,227.6]
                                                   [221.63,229.92]
                                                   [249.27,230.06]
*%-----------------|------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*% CALCULATE RED
*%
*%Flows from Catchment CR 4-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-C"], DT=[2]min, AREA=[55.76](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-C to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4C"], IDin=[2], TLAG=[222.18](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-F
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-F"], DT=[2]min, AREA=[472.58](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.9](mm),
```



```
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-F to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnF"], IDin=[2], TLAG=[156.21](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-E
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["4Ln-E"], DT=[2]min, AREA=[92.9](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.9](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% TOTAL RED
*% Add from Catchments CR4-C,4Ln-F,4Ln-E
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTRED"], IDs to add=[3+4+5]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW TO LINE 4
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN4"], IDs to add=[9+1]
*%-----------------|------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 4 TO LINE 3
*% USE HEC X-SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1530](m),  CHSLOPE=[0.23](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,779.49] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[746.77,227.72]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]

*%-----------------|------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*% CALCULATE FLOWS TO LINE 3 NORTH DITCH
*%
CALIB NASHYD        ID=[2], NHYD=["CR4-B"], DT=[2]min, AREA=[126.62](ha),
                    DWF=[0](cms), CN/C=[66.0], IA=[27.4](mm),
                    N=[3], TP=[0.97]hrs,
```



```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-B to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-CR4B"], IDin=[2], TLAG=[41.18](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-E
CALIB NASHYD        ID=[5], NHYD=["3Ln-E"], DT=[2]min, AREA=[185.00](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[21.8](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% LINE 3 NORTH DITCH
*% Add from Catchments
ADD HYD             IDsum=[2], NHYD=["TLN3ND"], IDs to add=[4+5]
*%-----------------|------------------------------------------------------------|
*%Shift flow from LIN3ND TO FLOW NODE 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-L3ND"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%Flows from Catchment CR 4-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-A"], DT=[2]min, AREA=[181.15](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.0](mm),
                    N=[3], TP=[1.00]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment CR 4-A to Flow Node 3
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4A"], IDin=[2], TLAG=[147.74](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment CR 4-B
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 10 SR-F
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-F"], DT=[2]min, AREA=[158.41](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% LINE 3 SOUTH DITCH
ADD HYD             IDsum=[2], NHYD=["TLN3SD"], IDs to add=[2+3]
*%-----------------|------------------------------------------------------------|
*%Shift flow from LIN3NS TO FLOW NODE 3
```



```
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-L3NS"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************

*%Flows from Catchment 3 Ln-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[7], NHYD=["3Ln-D"], DT=[2]min, AREA=[213.80](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[11.9](mm),
                    N=[3], TP=[1.18]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["4Ln-D"], DT=[2]min, AREA=[88.09](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                    N=[3], TP=[0.81]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-D to Flow Node 2
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-4LnD"], IDin=[8], TLAG=[84.98](min)
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["3Ln-C"], DT=[2]min, AREA=[248.17](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TPNK"], IDs to add=[7+2+8]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT U/S SIDE OF LINE 3
*% Add from Catchments
ADD HYD             IDsum=[3], NHYD=["TLN3US"], IDs to add=[4+6]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT THE D/S LIMTIS OF LINE 3
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN3A"], IDs to add=[3+5+1]
*%-----------------|------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO MIDWAY TO LINE 2
*% USE HEC SECTION 14
```

```
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2US"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[685](m),  CHSLOPE=[0.04](%),
                                      FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 10 SR-E
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-E"], DT=[2]min, AREA=[225.52](ha),
                    DWF=[0](cms), CN/C=[84.0], IA=[10.4](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW MID A JUNCTION BETWEEN LINE 3 AND 2
ADD HYD             IDsum=[9], NHYD=["TMID32"], IDs to add=[1+2]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2DS"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[2250](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*% CALCULATE BLUE
*%
```



```
*#Flows FROM WEST OF THE 400 TO 2ND LINE
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-C"], DT=[2]min, AREA=[230.90](ha),
                    DWF=[0](cms), CN/C=[78.0], IA=[14.3](mm),
                    N=[3], TP=[2.02]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-C to Flow Node 4
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnC"], IDin=[2], TLAG=[60.19](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-D"], DT=[2]min, AREA=[81.43](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-D to Flow Node 4
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRD"], IDin=[2], TLAG=[24.84](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment H 400-B
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["H400-B"], DT=[2]min, AREA=[79.99](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment H 400-B to Flow Node 4
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["SH400B"], IDin=[2], TLAG=[12.66](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-B"], DT=[2]min, AREA=[74.81](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
```



```
*%-----------------|------------------------------------------------------------|
*%Add flows at Flow Node 4 from Catchments 4 Ln-C, 5 SR-D, H 400-B & 3 Ln-B
*%-----------------|------------------------------------------------------------|
*% TOTAL BLUE
ADD HYD             IDsum=[6], NHYD=["TOTBLU"], IDs to add=[3+4+5+2]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[7], NHYD=["DR#4"], IDin=[6],
                    RDT=[15](min),
                    CHLGTH=[2000](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#****************************************************************************
*%Flows from Catchment 10 SR-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-D"], DT=[2]min, AREA=[110.02](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[21.8](mm),
                    N=[3], TP=[1.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-D to Flow Node 2
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S10SRD"], IDin=[2], TLAG=[153.59](min)
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 2 Ln-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["2Ln-B"], DT=[2]min, AREA=[318.07](ha),
                    DWF=[0](cms), CN/C=[80.0], IA=[13.5](mm),
                    N=[3], TP=[2.13]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% TOTAL GREEN
*% Add from Catchments
*%-----------------|------------------------------------------------------------|
```



```
ADD HYD             IDsum=[5], NHYD=["TOTGRN"], IDs to add=[2+4]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW TO LINE 2
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW UPSTREAM OF THE 2ND LINE
ADD HYD             IDsum=[9], NHYD=["TFN2U"], IDs to add=[5+1+7]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment 10 SR-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["10SR-C"], DT=[2]min, AREA=[365.20](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[20.7](mm),
                    N=[3], TP=[1.39]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-C DOWNSTREAM LIMITS OF 2ND LINE
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S10SRC"], IDin=[3], TLAG=[121.76](min)
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW DOWNSTREAM OF THE 2ND LINE
ADD HYD             IDsum=[4], NHYD=["TFN2D"], IDs to add=[4+9]
*%-----------------|------------------------------------------------------------|


*#******************************************************************************
*#******************************************************************************
*% ROUTE FLOWS FROM LINE 2 TO FLOW NODE GOLF EAST
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[1], NHYD=["RGLF"], IDin=[4],
                    RDT=[15](min),
                    CHLGTH=[785](m),  CHSLOPE=[0.04](%),
                                      FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500.00,226.10]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*#******************************************************************************
```

```
*#****************************************************************************

*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment H 400-A
*% OUTLET TO GOLFE (GOLF COURSE EAST)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["H400-A"], DT=[2]min, AREA=[350.22](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[11.9](mm),
                    N=[3], TP=[1.89]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% CALCULATE TOTAL FLOW TO FLOW NODE GLFE (GOLF COURSE EAST)
ADD HYD             IDsum=[1], NHYD=["GOLFE"], IDs to add=[4+1]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|


*#****************************************************************************
*#****************************************************************************
*% CALCULATE BLACK
*#Flows to Flow Node 2B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-A"], DT=[2]min, AREA=[114.12](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                    N=[3], TP=[1.33]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnA"], IDin=[2], TLAG=[234.20](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-B"], DT=[2]min, AREA=[171.81](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[17.8](mm),
                    N=[3], TP=[1.34]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-B to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnB"], IDin=[2], TLAG=[232.52](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
```



```
*%Flows from Catchment 3 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-A"], DT=[2]min, AREA=[268.08](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[1.61]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 3 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-3LnA"], IDin=[2], TLAG=[158.77](min)
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[2], NHYD=["TBLK1"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["5SR-C"], DT=[2]min, AREA=[341.88](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[1.50]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-C to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRC"], IDin=[3], TLAG=[72.46](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["2Ln-A"], DT=[2]min, AREA=[105.00](ha),
                    DWF=[0](cms), CN/C=[71.0], IA=[21.8](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLACK
*%Add flows at Flow Node 5 from Catchments 4 Ln-A, 4 Ln-B, 3 Ln-A,
*%    5 SR-C & 2 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[7], NHYD=["TOTBLK"], IDs to add=[2+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TOTBLK TO FLOW NODE GOLF NORTH
*% ROUTE FLOWS FROM LINE 2 FLOW NODE GOLFN
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLFN"], IDin=[7],
                    RDT=[15](min),
```



```
                    CHLGTH=[330](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOWS FROM GOLF NORTH AND GOLF EAST
ADD HYD             IDsum=[7], NHYD=["TGOLF"], IDs to add=[2+1]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TGOLF TO HWY 400
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLF"], IDin=[7],
                    RDT=[15](min),
                    CHLGTH=[485](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% YELLOW SOUTH( HNYDCZAK DRAIN)
*%Flows from Catchment 10 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["10SR-A"], DT=[2]min, AREA=[406.60](ha),
                    DWF=[0](cms), CN/C=[65.0], IA=[27.4](mm),
                    N=[3], TP=[1.82]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
```



```
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-B"], DT=[2]min, AREA=[96.11](ha),
                    DWF=[0](cms), CN/C=[67.0], IA=[25.0](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B
*% INTERSECTION OF 10 SIDEROAD AND HWY 89
ADD HYD             IDsum=[3], NHYD=["T10AB"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW INTERSECTION OF 10 SIDEROAD AND HWY 89 TO OUTLET OF CR-89A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S10AB"], IDin=[3], TLAG=[148.99](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 13 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["13Ln-A"], DT=[2]min, AREA=[135.52](ha),
                    DWF=[0](cms), CN/C=[62], IA=[31.1](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM OUTLET OF 13 Ln-A to outelt of 14 Ln-A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S13LnA"], IDin=[3], TLAG=[100.46](min)
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 14 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["14Ln-A"], DT=[2]min, AREA=[276.60](ha),
                    DWF=[0](cms), CN/C=[66], IA=[26.2](mm),
                    N=[3], TP=[1.55]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT THE 14TH LINE
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOT14L"], IDs to add=[4+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM 14TH LINE TO HIGHWAY 89
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S13LnA"], IDin=[9], TLAG=[209.97](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 89-A
```

```
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["CR89-A"], DT=[2]min, AREA=[212.34](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                    N=[3], TP=[1.51]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B + CR 89-A
*% HNYDCZAK CROSSES HWY 89
ADD HYD             IDsum=[3], NHYD=["THNYAK"], IDs to add=[4+5+3]
*%-----------------|------------------------------------------------------------|
*% SHIFT FLOWS FROM HNYDCZAK CROSSES HWY 89 TO FLOW NODE HYND
*% FLOW NODE HYND LOCATED AT THE OUTLET OF THE HNYDCZAK UPSTREAM OF HIGHWAY 400
SHIFT HYD           IDout=[4], NHYD=["HYND"], IDin=[3], TLAG=[123.60](min)
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT HWY 400
*%
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["HWY400"], IDs to add=[4+2]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*% ROUTE FLOWS FROM HWY 400 TO 15TH LINE
*% USE HEC SECTION 6
ROUTE CHANNEL       IDout=[1], NHYD=["DR#6"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1700](m),  CHSLOPE=[0.01](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[6],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.06,400.82] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[200.00,225.3]
                                                   [220.07,225.18]
                                                   [231.91,224.9]
                                                   [240.6,222.78]
                                                   [245.45,222.77]
                                                   [251.91,224.78]
                                                   [355.82,225.16]
                                                   [400.82,225.30]

*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************

*% CALCULATE PLUM
```



```
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-B"], DT=[2]min, AREA=[119.01](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[20.7](mm),
                    N=[3], TP=[1.29]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-B to Flow Node 8
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRB"], IDin=[2], TLAG=[108.27](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-A"], DT=[2]min, AREA=[97.15](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[19.8](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-A to Flow Node 8
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRA"], IDin=[2], TLAG=[123.28](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 15 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB STANDHYD      ID= [5], NHYD=["15Ln-A"], DT=[2](min), AREA=[37.07](ha),
                    XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[68],
                    Pervious   surfaces: IAper=[7.9](mm), SLPP=[1.0](%),
                                         LGP=[1685.7](m), MNP=[.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[0.9](%),
                                         LGI=[218.72](m), MNI=[.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment H 89-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD        ID=[6], NHYD=["H89-A"], DT=[2]min, AREA=[47.36](ha),
                    DWF=[0](cms), CN/C=[64.0], IA=[28.6](mm),
                    N=[3], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment H 89-A to Flow Node 8
*%-----------------|------------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["S-H89A"], IDin=[6], TLAG=[45.46](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
```



```
*% TOTAL PLUM
*%Add flows at Flow Node 8 from Catchments 5 SR-B, 5 SR-A, H 89-A, 15 Ln-A
*%
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["TOTPLM"], IDs to add=[3+4+5+7]
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN15L"], IDs to add=[6+1]
*%-----------------|------------------------------------------------------------|
*% 5-YR SCS Type-II ORILLIA Storm Distribution (24-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                   ["5SCS24.STM"] <--storm filename
*%-----------------|------------------------------------------------------------|
*% 10-YR SCS Type-II ORILLIA Storm Distribution (24-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                   ["10SCS24.STM"] <--storm filename
*%-----------------|------------------------------------------------------------|
*% 25-YR SCS Type-II ORILLIA Storm Distribution (24-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                   ["25SCS24.STM"] <--storm filename
*%-----------------|------------------------------------------------------------|
*% 50-YR SCS Type-II ORILLIA Storm Distribution (24-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                   ["50SCS24.STM"] <--storm filename
*%-----------------|------------------------------------------------------------|
*% 100-YR SCS Type-II ORILLIA Storm Distribution (24-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                   ["100SCS24.STM"] <--storm filename
*%-----------------|------------------------------------------------------------|
*% Timmins Regional Storm Distribution (12-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
*%                   ["12REGTIM.O89"] <--storm filename
*%-----------------|------------------------------------------------------------|
FINISH



FINISH
```

```
===============================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S       W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3877524
       StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05 ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: R. J. Burnside & Associates Ltd.             +++++++++
 +++++++++                Brampton             SERIAL#:3877524         +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****--------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                 *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).    *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).  *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).    *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.             *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).       *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).       *****
 *****     *:  see WARNING or NOTE message printed at end of run.         *****
 *****    **:  see  ERROR  message printed at end of run.                 *****
 ******************************************************************************
 ******************************************************************************
```



```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 **********************  S U M M A R Y   O U T P U T  *************************
 ******************************************************************************
 *        DATE: 2018-02-08     TIME: 14:09:31     RUN COUNTER: 000216         *
 ******************************************************************************
 * Input   filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\___24H~1\EX_FINAL.txt *
 * Output  filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\___24H~1\EX_FINAL.out *
 * Summary filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\___24H~1\EX_FINAL.sum *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************


#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 RUN:COMMAND#
 001:0001----------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002----------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=12.00:SDUR=  24.00:PTOT=  46.70]
```

```
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30     .167 No_date   13:54    4.30 .092
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30     .167 No_date   13:54    4.30  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30     .167 No_date   18:32    4.30  n/a
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54     .766 No_date   14:44    8.84 .189
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54     .766 No_date   14:44    8.84  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54     .766 No_date   17:28    8.84  n/a
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12     .925 No_date   15:26    5.76 .123
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36     .179 No_date   12:58    7.07 .151
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36     .179 No_date   12:58    7.07  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36     .179 No_date   14:22    7.07  n/a
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    1.158 No_date   13:38    7.35 .157
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    1.158 No_date   13:38    7.35  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    1.158 No_date   15:04    7.35  n/a
 001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    1.923 No_date   13:50    8.50 .182
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 001:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30     .167 No_date   18:32    4.30  n/a
                    +  03:S-5SRE       225.54     .766 No_date   17:28    8.84  n/a
                    +  04:10SR-G       505.12     .925 No_date   15:26    5.76  n/a
                    +  06:S-CR4D        36.36     .179 No_date   14:22    7.07  n/a
                    +  07:S-6LnA       310.44    1.158 No_date   15:04    7.35  n/a
                    +  08:5Ln-A        461.49    1.923 No_date   13:50    8.50  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25    3.863 No_date   14:48    7.21  n/a
#****************************************************************************
```



```
#****************************************************************************
 001:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25    3.863 No_date   14:48    7.21  n/a
  *   [RDT= 2.00] out<- 01:DR#1       1631.25    3.804 No_date   15:20    7.21  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.236:Dmax=  .958}
#****************************************************************************
#****************************************************************************
 001:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76     .219 No_date   13:14    6.65 .142
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76     .219 No_date   13:14    6.65  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76     .219 No_date   16:56    6.65  n/a
 001:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    1.622 No_date   14:18    8.07 .173
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    1.622 No_date   14:18    8.07  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    1.622 No_date   16:54    8.07  n/a
 001:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90     .495 No_date   13:06    8.07 .173
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 001:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76     .219 No_date   16:56    6.65  n/a
                    +  04:S-4LnF       472.58    1.622 No_date   16:54    8.07  n/a
                    +  05:4Ln-E         92.90     .495 No_date   13:06    8.07  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24    1.971 No_date   16:54    7.94  n/a
 001:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24    1.971 No_date   16:54    7.94  n/a
                    +  01:DR#1        1631.25    3.804 No_date   15:20    7.21  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49    5.440 No_date   16:26    7.41  n/a
#****************************************************************************
#****************************************************************************
 001:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49    5.440 No_date   16:26    7.41  n/a
  *   [RDT= 2.00] out<- 01:DR#2       2252.49    5.369 No_date   16:44    7.41  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.119:Dmax= 1.042}
#****************************************************************************
#****************************************************************************
 001:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62     .113 No_date   14:12    2.48 .053
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
```



```
 001:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62     .113 No_date   14:12    2.48  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62     .113 No_date   14:52    2.48  n/a
 001:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00     .362 No_date   14:00    4.64 .099
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62     .113 No_date   14:52    2.48  n/a
                    +  05:3Ln-E        185.00     .362 No_date   14:00    4.64  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62     .464 No_date   14:14    3.76  n/a
 001:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62     .464 No_date   14:14    3.76  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62     .464 No_date   15:20    3.76  n/a
#****************************************************************************
#****************************************************************************
 001:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15     .979 No_date   13:12    8.50 .182
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 001:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15     .979 No_date   13:12    8.50  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15     .979 No_date   15:38    8.50  n/a
 001:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41     .611 No_date   14:16    8.84 .189
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41     .611 No_date   14:16    8.84  n/a
                    +  03:S-CR4A       181.15     .979 No_date   15:38    8.50  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56    1.478 No_date   15:32    8.66  n/a
 001:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    1.478 No_date   15:32    8.66  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    1.478 No_date   16:37    8.66  n/a
#****************************************************************************
#****************************************************************************
 001:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    1.761 No_date   13:20   12.83 .275
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 001:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09     .487 No_date   12:58    7.76 .166
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 001:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09     .487 No_date   12:58    7.76  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09     .487 No_date   14:22    7.76  n/a
 001:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    CALIB NASHYD       08:3Ln-C        248.17     .994 No_date   13:38    7.76 .166
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 001:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    1.761 No_date   13:20   12.83  n/a
                    +  02:S-4LnD        88.09     .487 No_date   14:22    7.76  n/a
                    +  08:3Ln-C        248.17     .994 No_date   13:38    7.76  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06    2.942 No_date   13:52    9.73  n/a
 001:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06    2.942 No_date   13:52    9.73  n/a
                    +  06:S-L3ND       311.62     .464 No_date   15:20    3.76  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68    3.171 No_date   14:02    7.57  n/a
 001:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68    3.171 No_date   14:02    7.57  n/a
                    +  05:S-L3NS       339.56    1.478 No_date   16:37    8.66  n/a
                    +  01:DR#2        2252.49    5.369 No_date   16:44    7.41  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73    8.353 No_date   16:30    7.57  n/a
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 001:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73    8.353 No_date   16:30    7.57  n/a
  *   [RDT= 2.00] out<- 01:DR#2US     3453.73    8.232 No_date   16:38    7.57  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .647:Dmax= 1.817}
 001:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    2.788 No_date   13:00   15.56 .333
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73    8.232 No_date   16:38    7.57  n/a
                    +  02:10SR-E       225.52    2.788 No_date   13:00   15.56  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25    8.765 No_date   16:36    8.06  n/a
#****************************************************************************
 001:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25    8.765 No_date   16:36    8.06  n/a
  *   [RDT= 2.00] out<- 01:DR#2DS     3679.25    8.274 No_date   16:58    8.06  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .655:Dmax= 1.854}
#****************************************************************************
#****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 001:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90     .946 No_date   14:34   10.09 .216
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
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 001:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90     .946 No_date   14:34   10.09  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90     .946 No_date   15:34   10.09  n/a
 001:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .259 No_date   13:46    6.65 .142
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43     .259 No_date   13:46    6.65  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43     .259 No_date   14:10    6.65  n/a
 001:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99     .328 No_date   13:08    6.65 .142
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 001:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99     .328 No_date   13:08    6.65  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99     .328 No_date   13:20    6.65  n/a
 001:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81     .323 No_date   13:12    7.07 .151
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 001:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90     .946 No_date   15:34   10.09  n/a
                    +  04:S-5SRD        81.43     .259 No_date   14:10    6.65  n/a
                    +  05:SH400B        79.99     .328 No_date   13:20    6.65  n/a
                    +  02:3Ln-B         74.81     .323 No_date   13:12    7.07  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    1.483 No_date   14:52    8.42  n/a
#*****************************************************************************
#*****************************************************************************
 001:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    1.483 No_date   14:52    8.42  n/a
  *  [RDT= 2.00] out<- 07:DR#4         467.13    1.236 No_date   16:02    8.42  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .416:Dmax=  .857}
#*****************************************************************************
#***************************************************************************
 001:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .210 No_date   14:08    4.64 .099
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 001:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02     .210 No_date   14:08    4.64  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .210 No_date   16:40    4.64  n/a
 001:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    1.449 No_date   14:40   11.40 .244
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 001:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    1.449 No_date   14:40   11.40  n/a
                    +  04:S10SRD       110.02     .210 No_date   16:40    4.64  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    1.502 No_date   15:18    9.66  n/a
 001:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    1.502 No_date   15:18    9.66  n/a
                    +  01:DR#2DS      3679.25    8.274 No_date   16:58    8.06  n/a
                    +  07:DR#4         467.13    1.236 No_date   16:02    8.42  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   10.706 No_date   16:42    8.25  n/a
#*****************************************************************************
#*****************************************************************************
 001:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20     .843 No_date   14:04    5.42 .116
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 001:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20     .843 No_date   14:04    5.42  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20     .843 No_date   16:04    5.42  n/a
 001:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20     .843 No_date   16:04    5.42  n/a
                    +  09:TFN2U       4574.47   10.706 No_date   16:42    8.25  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   11.510 No_date   16:34    8.04  n/a
#*****************************************************************************
#*****************************************************************************
 001:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   11.510 No_date   16:34    8.04  n/a
  *  [RDT= 2.00] out<- 01:RGLF        4939.67   10.177 No_date   17:50    8.04  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .187:Dmax= 2.004}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 001:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    2.024 No_date   14:18   12.83 .275
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 001:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    2.024 No_date   14:18   12.83  n/a
                    +  01:GOLFE       4939.67   10.177 No_date   17:50    8.04  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   11.123 No_date   17:36    8.36  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 001:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12     .445 No_date   13:42    7.76 .166
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 001:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12     .445 No_date   13:42    7.76  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12     .445 No_date   17:36    7.76  n/a
 001:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81     .615 No_date   13:46    7.35 .157
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 001:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81     .615 No_date   13:46    7.35  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81     .615 No_date   17:38    7.35  n/a
 001:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08     .816 No_date   14:12    7.07 .151
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 001:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08     .816 No_date   14:12    7.07  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08     .816 No_date   16:50    7.07  n/a
 001:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12     .445 No_date   17:36    7.76  n/a
                    +  04:S-4LnB       171.81     .615 No_date   17:38    7.35  n/a
                    +  05:S-3LnA       268.08     .816 No_date   16:50    7.07  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    1.824 No_date   17:26    7.30  n/a
 001:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    1.089 No_date   14:02    7.07 .151
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 001:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    1.089 No_date   14:02    7.07  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    1.089 No_date   15:14    7.07  n/a
 001:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00     .255 No_date   13:22    4.82 .103
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 001:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    1.824 No_date   17:26    7.30  n/a
                    +  04:S-5SRC       341.88    1.089 No_date   15:14    7.07  n/a
                    +  05:2Ln-A        105.00     .255 No_date   13:22    4.82  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89    2.623 No_date   17:12    6.96  n/a
 001:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89    2.623 No_date   17:12    6.96  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89    2.488 No_date   16:52    6.96  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .314:Dmax= 1.400}
#*****************************************************************************
#*****************************************************************************
 001:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    2.488 No_date   16:52    6.96  n/a
                    +  01:GOLFE       5289.89   11.123 No_date   17:36    8.36  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   13.432 No_date   17:12    8.14  n/a
```



```
#*****************************************************************************
#*****************************************************************************
 001:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   13.432 No_date   17:12    8.14  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   12.067 No_date   18:48    8.14  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .106:Dmax= 2.114}
#*****************************************************************************
#*****************************************************************************
 001:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60     .275 No_date   15:40    2.39 .051
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 001:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .113 No_date   14:20    3.21 .069
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 001:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60     .275 No_date   15:40    2.39  n/a
                    +  04:10SR-B        96.11     .113 No_date   14:20    3.21  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71     .374 No_date   15:14    2.54  n/a
 001:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71     .374 No_date   15:14    2.54  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71     .374 No_date   17:42    2.54  n/a
 001:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52     .057 No_date   14:42    1.42 .030
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 001:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52     .057 No_date   14:42    1.42  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52     .057 No_date   16:22    1.42  n/a
 001:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60     .246 No_date   14:56    2.78 .059
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 001:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52     .057 No_date   16:22    1.42  n/a
                    +  03:14Ln-A       276.60     .246 No_date   14:56    2.78  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12     .285 No_date   15:32    2.33  n/a
 001:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12     .285 No_date   15:32    2.33  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12     .285 No_date   19:00    2.33  n/a
 001:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34     .895 No_date   13:56    8.84 .189
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 001:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34     .895 No_date   13:56    8.84  n/a
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                 +  05:S10AB        502.71     .374 No_date   17:42    2.54  n/a
                 +  03:THNYAK       412.12     .285 No_date   19:00    2.33  n/a
    [DT= 2.00]  SUM=  03:THNYAK      1430.10    1.789 No_date   13:56    4.41  n/a
 001:0089--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10    1.789 No_date   13:56    4.41  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10    1.789 No_date   15:58    4.41  n/a
#****************************************************************************
#****************************************************************************
 001:0090--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10    1.789 No_date   15:58    4.41  n/a
                 +  02:GOLF        6290.78   12.067 No_date   18:48    8.14  n/a
    [DT= 2.00]  SUM=  09:HWY400      7720.88   13.641 No_date   18:48    7.45  n/a
#****************************************************************************
#****************************************************************************
 001:0091--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   13.641 No_date   18:48    7.45  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   12.613 No_date   20:24    7.45  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.530}
#****************************************************************************
#****************************************************************************
 001:0092--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01     .287 No_date   13:52    5.42 .116
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 001:0093--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01     .287 No_date   13:52    5.42  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01     .287 No_date   15:40    5.42  n/a
 001:0094--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15     .270 No_date   13:40    5.76 .123
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 001:0095--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15     .270 No_date   13:40    5.76  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15     .270 No_date   15:42    5.76  n/a
 001:0096--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    2.450 No_date   12:00   27.10 .580
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 001:0097--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .034 No_date   14:10    2.04 .044
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 001:0098--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .034 No_date   14:10    2.04  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .034 No_date   14:54    2.04  n/a
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 001:0099--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01     .287 No_date   15:40    5.42  n/a
                 +  04:S-5SRA        97.15     .270 No_date   15:42    5.76  n/a
                 +  05:15Ln-A        37.07    2.450 No_date   12:00   27.10  n/a
                 +  07:S-H89A        47.36     .034 No_date   14:54    2.04  n/a
    [DT= 2.00]  SUM=  06:TOTPLM       300.59    2.450 No_date   12:00    7.67  n/a
 001:0100--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    2.450 No_date   12:00    7.67  n/a
                 +  01:DR#6        7720.88   12.613 No_date   20:24    7.45  n/a
    [DT= 2.00]  SUM=  09:TFN15L      8021.47   12.893 No_date   20:16    7.45  n/a
  ** END OF RUN :   1

*****************************************************************************



 RUN:COMMAND#
 002:0001-----------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   2 ]
#****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 002:0002-----------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=12.00:SDUR=  24.00:PTOT=  60.60]
```



```
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 002:0003--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30     .476 No_date   13:32    9.74 .161
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 002:0004--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30     .476 No_date   13:32    9.74  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30     .476 No_date   18:10    9.74  n/a
 002:0005--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    1.559 No_date   14:32   16.51 .272
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 002:0006--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    1.559 No_date   14:32   16.51  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    1.559 No_date   17:15   16.51  n/a
 002:0007--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    2.143 No_date   15:06   11.93 .197
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 002:0008--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36     .413 No_date   12:52   13.87 .229
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 002:0009--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36     .413 No_date   12:52   13.87  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36     .413 No_date   14:16   13.87  n/a
 002:0010--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    2.595 No_date   13:30   14.37 .237
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 002:0011--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    2.595 No_date   13:30   14.37  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    2.595 No_date   14:56   14.37  n/a
 002:0012--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    4.009 No_date   13:42   15.94 .263
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 002:0013--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30     .476 No_date   18:10    9.74  n/a
                 +  03:S-5SRE       225.54    1.559 No_date   17:15   16.51  n/a
                 +  04:10SR-G       505.12    2.143 No_date   15:06   11.93  n/a
                 +  06:S-CR4D        36.36     .413 No_date   14:16   13.87  n/a
                 +  07:S-6LnA       310.44    2.595 No_date   14:56   14.37  n/a
                 +  08:5Ln-A        461.49    4.009 No_date   13:42   15.94  n/a
    [DT= 2.00]  SUM=  09:TOTFN5      1631.25    8.413 No_date   14:34   14.08  n/a
#****************************************************************************
```



```
#****************************************************************************
 002:0014--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25    8.413 No_date   14:34   14.08  n/a
  *  [RDT= 2.00] out<- 01:DR#1        1631.25    8.261 No_date   14:56   14.08  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.515:Dmax= 1.389}
#****************************************************************************
#****************************************************************************
 002:0015--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76     .521 No_date   13:06   13.33 .220
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 002:0016--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76     .521 No_date   13:06   13.33  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76     .521 No_date   16:48   13.33  n/a
 002:0017--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    3.435 No_date   14:06   15.41 .254
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 002:0018--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    3.435 No_date   14:06   15.41  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    3.435 No_date   16:42   15.41  n/a
 002:0019--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    1.087 No_date   13:02   15.41 .254
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 002:0020--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76     .521 No_date   16:48   13.33  n/a
                 +  04:S-4LnF       472.58    3.435 No_date   16:42   15.41  n/a
                 +  05:4Ln-E         92.90    1.087 No_date   13:02   15.41  n/a
    [DT= 2.00]  SUM=  09:TOTRED       621.24    4.180 No_date   16:44   15.23  n/a
 002:0021--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24    4.180 No_date   16:44   15.23  n/a
                 +  01:DR#1        1631.25    8.261 No_date   14:56   14.08  n/a
    [DT= 2.00]  SUM=  09:TOTFN4      2252.49   11.310 No_date   16:16   14.40  n/a
#****************************************************************************
#****************************************************************************
 002:0022--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   11.310 No_date   16:16   14.40  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49   11.196 No_date   16:28   14.40  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.346:Dmax= 1.430}
#****************************************************************************
#****************************************************************************
 002:0023--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62     .442 No_date   13:22    6.72 .111
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
```

```
 002:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62      .442 No_date   13:22     6.72  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62      .442 No_date   14:02     6.72  n/a
 002:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00      .967 No_date   13:40    10.20 .168
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 002:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62      .442 No_date   14:02     6.72  n/a
                    +  05:3Ln-E        185.00      .967 No_date   13:40    10.20  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62     1.395 No_date   13:50     8.78  n/a
 002:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62     1.395 No_date   13:50     8.78  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62     1.395 No_date   14:56     8.78  n/a
#*****************************************************************************
#*****************************************************************************
 002:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15     2.076 No_date   13:08    15.94 .263
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 002:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15     2.076 No_date   13:08    15.94  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15     2.076 No_date   15:34    15.94  n/a
 002:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41     1.255 No_date   14:04    16.51 .272
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 002:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41     1.255 No_date   14:04    16.51  n/a
                    +  03:S-CR4A       181.15     2.076 No_date   15:34    15.94  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56     3.052 No_date   15:26    16.21  n/a
 002:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56     3.052 No_date   15:26    16.21  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56     3.052 No_date   16:32    16.21  n/a
#*****************************************************************************
#*****************************************************************************
 002:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80     3.221 No_date   13:16    21.90 .361
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 002:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09     1.080 No_date   12:54    14.88 .245
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 002:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09     1.080 No_date   12:54    14.88  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09     1.080 No_date   14:18    14.88  n/a
 002:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    CALIB NASHYD       08:3Ln-C        248.17     2.157 No_date   13:30    14.88 .245
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 002:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80     3.221 No_date   13:16    21.90  n/a
                    +  02:S-4LnD        88.09     1.080 No_date   14:18    14.88  n/a
                    +  08:3Ln-C        248.17     2.157 No_date   13:30    14.88  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06     5.793 No_date   13:48    17.61  n/a
 002:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06     5.793 No_date   13:48    17.61  n/a
                    +  06:S-L3ND       311.62     1.395 No_date   14:56     8.78  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68     6.576 No_date   14:04    14.42  n/a
 002:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68     6.576 No_date   14:04    14.42  n/a
                    +  05:S-L3NS       339.56     3.052 No_date   16:32    16.21  n/a
                    +  01:DR#2        2252.49    11.196 No_date   16:28    14.40  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73    17.239 No_date   16:20    14.58  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 002:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73    17.239 No_date   16:20    14.58  n/a
 *   [RDT= 2.00] out<- 01:DR#2US      3453.73    15.946 No_date   16:02    14.58  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .264:Dmax= 2.896}
 002:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52     4.832 No_date   12:58    25.56 .422
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 002:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73    15.946 No_date   16:02    14.58  n/a
                    +  02:10SR-E       225.52     4.832 No_date   12:58    25.56  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25    16.934 No_date   14:46    15.25  n/a
#*****************************************************************************
 002:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25    16.934 No_date   14:46    15.25  n/a
 *   [RDT= 2.00] out<- 01:DR#2DS      3679.25    14.864 No_date   15:44    15.25  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .264:Dmax= 2.892}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 002:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90     1.834 No_date   14:26    18.18 .300
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
```



```
 002:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90     1.834 No_date   14:26    18.18  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90     1.834 No_date   15:26    18.18  n/a
 002:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43      .603 No_date   13:34    13.33 .220
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 002:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43      .603 No_date   13:34    13.33  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43      .603 No_date   13:58    13.33  n/a
 002:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99      .784 No_date   13:02    13.33 .220
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 002:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99      .784 No_date   13:02    13.33  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99      .784 No_date   13:14    13.33  n/a
 002:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81      .737 No_date   13:06    13.87 .229
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 002:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90     1.834 No_date   15:26    18.18  n/a
                    +  04:S-5SRD        81.43      .603 No_date   13:58    13.33  n/a
                    +  05:SH400B        79.99      .784 No_date   13:14    13.33  n/a
                    +  02:3Ln-B         74.81      .737 No_date   13:06    13.87  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13     3.007 No_date   14:34    15.81  n/a
#*****************************************************************************
#*****************************************************************************
 002:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13     3.007 No_date   14:34    15.81  n/a
 *   [RDT= 2.00] out<- 07:DR#4         467.13     2.566 No_date   15:26    15.81  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .499:Dmax= 1.175}
#*****************************************************************************
#***************************************************************************
 002:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02      .558 No_date   13:46    10.20 .168
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 002:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02      .558 No_date   13:46    10.20  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02      .558 No_date   16:18    10.20  n/a
 002:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07     2.724 No_date   14:32    20.06 .331
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 002:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07     2.724 No_date   14:32    20.06  n/a
                    +  04:S10SRD       110.02      .558 No_date   16:18    10.20  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09     2.914 No_date   15:22    17.52  n/a
 002:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09     2.914 No_date   15:22    17.52  n/a
                    +  01:DR#2DS      3679.25    14.864 No_date   15:44    15.25  n/a
                    +  07:DR#4         467.13     2.566 No_date   15:26    15.81  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47    20.284 No_date   15:44    15.52  n/a
#*****************************************************************************
#*****************************************************************************
 002:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20     2.118 No_date   13:46    11.48 .189
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 002:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20     2.118 No_date   13:46    11.48  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20     2.118 No_date   15:46    11.48  n/a
 002:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20     2.118 No_date   15:46    11.48  n/a
                    +  09:TFN2U       4574.47    20.284 No_date   15:44    15.52  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67    22.401 No_date   15:44    15.22  n/a
#*****************************************************************************
#*****************************************************************************
 002:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67    22.401 No_date   15:44    15.22  n/a
 *   [RDT= 2.00] out<- 01:RGLF        4939.67    17.394 No_date   16:04    15.22  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .177:Dmax= 2.114}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 002:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22     3.660 No_date   14:10    21.90 .361
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 002:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22     3.660 No_date   14:10    21.90  n/a
                    +  01:GOLFE       4939.67    17.394 No_date   16:04    15.22  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89    19.920 No_date   16:04    15.67  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 002:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12      .964 No_date   13:34    14.88 .245
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 002:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    SHIFT HYD        -> 02:4Ln-A        114.12     .964 No_date   13:34   14.88  n/a
     [LAG=234.2 min]<- 03:S-4LnA        114.12     .964 No_date   17:28   14.88  n/a
 002:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-B        171.81    1.372 No_date   13:36   14.37 .237
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 002:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-B        171.81    1.372 No_date   13:36   14.37  n/a
     [LAG=232.5 min]<- 04:S-4LnB        171.81    1.372 No_date   17:28   14.37  n/a
 002:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-A        268.08    1.800 No_date   14:00   13.87 .229
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 002:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:3Ln-A        268.08    1.800 No_date   14:00   13.87  n/a
     [LAG=158.8 min]<- 05:S-3LnA        268.08    1.800 No_date   16:38   13.87  n/a
 002:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnA       114.12     .964 No_date   17:28   14.88  n/a
                     +  04:S-4LnB       171.81    1.372 No_date   17:28   14.37  n/a
                     +  05:S-3LnA       268.08    1.800 No_date   16:38   13.87  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    3.989 No_date   17:16   14.23  n/a
 002:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:5SR-C        341.88    2.416 No_date   13:50   13.87 .229
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 002:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:5SR-C        341.88    2.416 No_date   13:50   13.87  n/a
     [LAG= 72.5 min]<- 04:S-5SRC        341.88    2.416 No_date   15:02   13.87  n/a
 002:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:2Ln-A        105.00     .707 No_date   13:10   10.56 .174
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 002:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TBLK1        554.01    3.989 No_date   17:16   14.23  n/a
                     +  04:S-5SRC       341.88    2.416 No_date   15:02   13.87  n/a
                     +  05:2Ln-A        105.00     .707 No_date   13:10   10.56  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89    5.592 No_date   17:02   13.73  n/a
 002:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 07:TOTBLK      1000.89    5.592 No_date   17:02   13.73  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89    5.744 No_date   17:20   13.73  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .108:Dmax= 1.974}
#*****************************************************************************
#*****************************************************************************
 002:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:GOLFN       1000.89    5.744 No_date   17:20   13.73  n/a
                     +  01:GOLFE       5289.89   19.920 No_date   16:04   15.67  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   24.181 No_date   17:22   15.36  n/a
```



```
#*****************************************************************************
#*****************************************************************************
 002:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 07:TGOLF       6290.78   24.181 No_date   17:22   15.36  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   22.687 No_date   18:32   15.36  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#*****************************************************************************
#*****************************************************************************
 002:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-A       406.60     .945 No_date   14:44    6.48 .107
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 002:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:10SR-B        96.11     .358 No_date   13:46    7.89 .130
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 002:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:T10AB        406.60     .945 No_date   14:44    6.48  n/a
                     +  04:10SR-B        96.11     .358 No_date   13:46    7.89  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    1.265 No_date   14:28    6.75  n/a
 002:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:T10AB        502.71    1.265 No_date   14:28    6.75  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    1.265 No_date   16:56    6.75  n/a
 002:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:13Ln-A       135.52     .290 No_date   13:26    4.70 .078
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 002:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:13Ln-A       135.52     .290 No_date   13:26    4.70  n/a
     [LAG=100.5 min]<- 04:S13LnA        135.52     .290 No_date   15:06    4.70  n/a
 002:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:14Ln-A       276.60     .806 No_date   14:16    7.16 .118
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 002:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S13LnA       135.52     .290 No_date   15:06    4.70  n/a
                     +  03:14Ln-A       276.60     .806 No_date   14:16    7.16  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    1.052 No_date   14:46    6.35  n/a
 002:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 09:TOT14L       412.12    1.052 No_date   14:46    6.35  n/a
     [LAG=210.0 min]<- 03:S13LnA        412.12    1.052 No_date   18:14    6.35  n/a
 002:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:CR89-A       212.34    1.852 No_date   13:46   16.51 .272
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 002:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:CR89-A       212.34    1.852 No_date   13:46   16.51  n/a
```



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                     +  05:S10AB        502.71    1.265 No_date   16:56    6.75  n/a
                     +  03:THNYAK       412.12    1.052 No_date   18:14    6.35  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10    4.227 No_date   16:08    9.65  n/a
 002:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:THNYAK      1430.10    4.227 No_date   16:08    9.65  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10    4.227 No_date   18:10    9.65  n/a
#*****************************************************************************
#*****************************************************************************
 002:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:HYND        1430.10    4.227 No_date   18:10    9.65  n/a
                     +  02:GOLF        6290.78   22.687 No_date   18:32   15.36  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   26.876 No_date   18:28   14.30  n/a
#*****************************************************************************
#*****************************************************************************
 002:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:HWY400      7720.88   26.876 No_date   18:28   14.30  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   24.316 No_date   19:30   14.30  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.530}
#*****************************************************************************
#*****************************************************************************
 002:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-B        119.01     .728 No_date   13:36   11.48 .189
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 002:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-B        119.01     .728 No_date   13:36   11.48  n/a
     [LAG=108.3 min]<- 03:S-5SRB        119.01     .728 No_date   15:24   11.48  n/a
 002:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-A         97.15     .663 No_date   13:28   11.93 .197
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 002:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-A         97.15     .663 No_date   13:28   11.93  n/a
     [LAG=123.3 min]<- 04:S-5SRA         97.15     .663 No_date   15:30   11.93  n/a
 002:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      05:15Ln-A        37.07    3.310 No_date   12:00   37.36 .617
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 002:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:H89-A         47.36     .154 No_date   13:08    5.86 .097
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 002:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 06:H89-A         47.36     .154 No_date   13:08    5.86  n/a
     [LAG= 45.5 min]<- 07:S-H89A         47.36     .154 No_date   13:52    5.86  n/a
```



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 002:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-5SRB       119.01     .728 No_date   15:24   11.48  n/a
                     +  04:S-5SRA        97.15     .663 No_date   15:30   11.93  n/a
                     +  05:15Ln-A        37.07    3.310 No_date   12:00   37.36  n/a
                     +  07:S-H89A        47.36     .154 No_date   13:52    5.86  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    3.310 No_date   12:00   13.93  n/a
 002:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTPLM       300.59    3.310 No_date   12:00   13.93  n/a
                     +  01:DR#6        7720.88   24.316 No_date   19:30   14.30  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   24.889 No_date   19:30   14.29  n/a
  ** END OF RUN :   2

******************************************************************************



 RUN:COMMAND#
 003:0001-------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   3 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 003:0002-------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=12.00:SDUR=  24.00:PTOT=  69.80]
```

```
#***************************************************************************
#***************************************************************************
#Flows to Flow Node 5 (LINE 5)
 003:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:7Ln-A          92.30     .751 No_date   13:28   14.17 .203
      [CN= 70.0: N= 3.00]
      [Tp= 1.20:DT= 2.00]
 003:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:7Ln-A          92.30     .751 No_date   13:28   14.17  n/a
      [LAG=278.5 min]<- 02:S-7LnA         92.30     .751 No_date   18:06   14.17  n/a
 003:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:5SR-E         225.54    2.182 No_date   14:28   22.32 .320
      [CN= 77.0: N= 3.00]
      [Tp= 2.07:DT= 2.00]
 003:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:5SR-E         225.54    2.182 No_date   14:28   22.32  n/a
      [LAG=165.9 min]<- 03:S-5SRE        225.54    2.182 No_date   17:12   22.32  n/a
 003:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-G        505.12    3.154 No_date   14:58   16.80 .241
      [CN= 72.0: N= 3.00]
      [Tp= 2.36:DT= 2.00]
 003:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:CR4-D          36.36     .605 No_date   12:50   19.14 .274
      [CN= 74.0: N= 3.00]
      [Tp=  .79:DT= 2.00]
 003:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:CR4-D          36.36     .605 No_date   12:50   19.14  n/a
      [LAG= 84.1 min]<- 06:S-CR4D         36.36     .605 No_date   14:14   19.14  n/a
 003:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:6Ln-A         310.44    3.763 No_date   13:26   19.79 .283
      [CN= 75.0: N= 3.00]
      [Tp= 1.26:DT= 2.00]
 003:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:6Ln-A         310.44    3.763 No_date   13:26   19.79  n/a
      [LAG= 86.9 min]<- 07:S-6LnA        310.44    3.763 No_date   14:52   19.79  n/a
 003:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:5Ln-A         461.49    5.662 No_date   13:38   21.60 .309
      [CN= 76.0: N= 3.00]
      [Tp= 1.44:DT= 2.00]
 003:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:S-7LnA         92.30     .751 No_date   18:06   14.17  n/a
                     +  03:S-5SRE        225.54    2.182 No_date   17:12   22.32  n/a
                     +  04:10SR-G        505.12    3.154 No_date   14:58   16.80  n/a
                     +  06:S-CR4D         36.36     .605 No_date   14:14   19.14  n/a
                     +  07:S-6LnA        310.44    3.763 No_date   14:52   19.79  n/a
                     +  08:5Ln-A         461.49    5.662 No_date   13:38   21.60  n/a
      [DT= 2.00]  SUM=  09:TOTFN5       1631.25   12.091 No_date   14:32   19.39  n/a
#***************************************************************************
```



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#***************************************************************************
 003:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN5       1631.25   12.091 No_date   14:32   19.39  n/a
  *   [RDT= 2.00] out<- 01:DR#1         1631.25   11.882 No_date   14:50   19.39  n/a
      [L/S/n= 1780./ .290/.030]
      {Vmax= 1.663:Dmax= 1.642}
#***************************************************************************
#***************************************************************************
 003:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-C          55.76     .771 No_date   13:04   18.55 .266
      [CN= 74.0: N= 3.00]
      [Tp=  .95:DT= 2.00]
 003:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-C          55.76     .771 No_date   13:04   18.55  n/a
      [LAG=222.2 min]<- 03:S-CR4C         55.76     .771 No_date   16:46   18.55  n/a
 003:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-F         472.58    4.882 No_date   14:02   21.02 .301
      [CN= 76.0: N= 3.00]
      [Tp= 1.72:DT= 2.00]
 003:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-F         472.58    4.882 No_date   14:02   21.02  n/a
      [LAG=156.2 min]<- 04:S-4LnF        472.58    4.882 No_date   16:37   21.02  n/a
 003:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:4Ln-E          92.90    1.561 No_date   12:58   21.02 .301
      [CN= 76.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 003:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-CR4C         55.76     .771 No_date   16:46   18.55  n/a
                     +  04:S-4LnF        472.58    4.882 No_date   16:37   21.02  n/a
                     +  05:4Ln-E          92.90    1.561 No_date   12:58   21.02  n/a
      [DT= 2.00]  SUM=  09:TOTRED        621.24    5.943 No_date   16:40   20.80  n/a
 003:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            09:TOTFN4        621.24    5.943 No_date   16:40   20.80  n/a
                     +  01:DR#1         1631.25   11.882 No_date   14:50   19.39  n/a
      [DT= 2.00]  SUM=  09:TOTFN4       2252.49   15.946 No_date   16:12   19.78  n/a
#***************************************************************************
#***************************************************************************
 003:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN4       2252.49   15.946 No_date   16:12   19.78  n/a
  *   [RDT= 2.00] out<- 01:DR#2         2252.49   15.808 No_date   16:24   19.78  n/a
      [L/S/n= 1530./ .230/.030]
      {Vmax= 1.466:Dmax= 1.652}
#***************************************************************************
#***************************************************************************
 003:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-B         126.62     .781 No_date   13:14   10.38 .149
      [CN= 66.0: N= 3.00]
      [Tp=  .97:DT= 2.00]
```



```
 003:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-B         126.62     .781 No_date   13:14   10.38  n/a
      [LAG= 41.2 min]<- 04:S-CR4B        126.62     .781 No_date   13:54   10.38  n/a
 003:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:3Ln-E         185.00    1.499 No_date   13:34   14.69 .210
      [CN= 70.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 003:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S-CR4B        126.62     .781 No_date   13:54   10.38  n/a
                     +  05:3Ln-E         185.00    1.499 No_date   13:34   14.69  n/a
      [DT= 2.00]  SUM=  02:TLN3ND        311.62    2.255 No_date   13:46   12.94  n/a
 003:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:TLN3ND        311.62    2.255 No_date   13:46   12.94  n/a
      [LAG= 66.9 min]<- 06:S-L3ND        311.62    2.255 No_date   14:52   12.94  n/a
#***************************************************************************
#***************************************************************************
 003:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-A         181.15    2.946 No_date   13:04   21.60 .309
      [CN= 76.0: N= 3.00]
      [Tp= 1.00:DT= 2.00]
 003:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-A         181.15    2.946 No_date   13:04   21.60  n/a
      [LAG=147.7 min]<- 03:S-CR4A        181.15    2.946 No_date   15:30   21.60  n/a
 003:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-F        158.41    1.761 No_date   14:00   22.32 .320
      [CN= 77.0: N= 3.00]
      [Tp= 1.72:DT= 2.00]
 003:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TLN3SD        158.41    1.761 No_date   14:00   22.32  n/a
                     +  03:S-CR4A        181.15    2.946 No_date   15:30   21.60  n/a
      [DT= 2.00]  SUM=  02:TLN3SD        339.56    4.289 No_date   15:24   21.94  n/a
 003:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:TLN3SD        339.56    4.289 No_date   15:24   21.94  n/a
      [LAG= 66.9 min]<- 05:S-L3NS        339.56    4.289 No_date   16:30   21.94  n/a
#***************************************************************************
#***************************************************************************
 003:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       07:3Ln-D         213.80    4.302 No_date   13:14   28.54 .409
      [CN= 81.0: N= 3.00]
      [Tp= 1.18:DT= 2.00]
 003:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:4Ln-D          88.09    1.557 No_date   12:52   20.34 .291
      [CN= 75.0: N= 3.00]
      [Tp=  .81:DT= 2.00]
 003:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 08:4Ln-D          88.09    1.557 No_date   12:52   20.34  n/a
      [LAG= 85.0 min]<- 02:S-4LnD         88.09    1.557 No_date   14:16   20.34  n/a
 003:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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     CALIB NASHYD       08:3Ln-C         248.17    3.093 No_date   13:26   20.34 .291
      [CN= 75.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 003:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            07:3Ln-D         213.80    4.302 No_date   13:14   28.54  n/a
                     +  02:S-4LnD         88.09    1.557 No_date   14:16   20.34  n/a
                     +  08:3Ln-C         248.17    3.093 No_date   13:26   20.34  n/a
      [DT= 2.00]  SUM=  04:TPNK          550.06    7.993 No_date   13:48   23.53  n/a
 003:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:TPNK          550.06    7.993 No_date   13:48   23.53  n/a
                     +  06:S-L3ND        311.62    2.255 No_date   14:52   12.94  n/a
      [DT= 2.00]  SUM=  03:TLN3US        861.68    9.315 No_date   14:06   19.70  n/a
 003:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:TLN3US        861.68    9.315 No_date   14:06   19.70  n/a
                     +  05:S-L3NS        339.56    4.289 No_date   16:30   21.94  n/a
                     +  01:DR#2         2252.49   15.808 No_date   16:24   19.78  n/a
      [DT= 2.00]  SUM=  09:TFN3A        3453.73   24.243 No_date   16:16   19.97  n/a
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
 003:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TFN3A        3453.73   24.243 No_date   16:16   19.97  n/a
  *   [RDT= 2.00] out<- 01:DR#2US       3453.73   21.989 No_date   16:38   19.97  n/a
      [L/S/n=  685./ .040/.030]
      {Vmax=  .258:Dmax= 2.991}
 003:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-E        225.52    6.300 No_date   12:56   32.74 .469
      [CN= 84.0: N= 3.00]
      [Tp=  .95:DT= 2.00]
 003:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:DR#2US       3453.73   21.989 No_date   16:38   19.97  n/a
                     +  02:10SR-E        225.52    6.300 No_date   12:56   32.74  n/a
      [DT= 2.00]  SUM=  09:TMID32       3679.25   23.135 No_date   15:30   20.75  n/a
#***************************************************************************
 003:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TMID32       3679.25   23.135 No_date   15:30   20.75  n/a
  *   [RDT= 2.00] out<- 01:DR#2DS       3679.25   19.746 No_date   18:08   20.75  n/a
      [L/S/n= 2250./ .040/.030]
      {Vmax=  .259:Dmax= 2.976}
#***************************************************************************
#***************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 003:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-C         230.90    2.518 No_date   14:22   24.23 .347
      [CN= 78.0: N= 3.00]
      [Tp= 2.02:DT= 2.00]
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 003:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    2.518 No_date   14:22   24.23  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    2.518 No_date   15:22   24.23  n/a
 003:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .887 No_date   13:30   18.55 .266
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 003:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43     .887 No_date   13:30   18.55  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43     .887 No_date   13:54   18.55  n/a
 003:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    1.161 No_date   12:58   18.55 .266
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 003:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    1.161 No_date   12:58   18.55  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    1.161 No_date   13:10   18.55  n/a
 003:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    1.075 No_date   13:04   19.14 .274
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 003:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    2.518 No_date   15:22   24.23  n/a
                     + 04:S-5SRD        81.43     .887 No_date   13:54   18.55  n/a
                     + 05:SH400B        79.99    1.161 No_date   13:10   18.55  n/a
                     + 02:3Ln-B         74.81    1.075 No_date   13:04   19.14  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    4.215 No_date   14:26   21.45  n/a
#*****************************************************************************
#*****************************************************************************
 003:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    4.215 No_date   14:26   21.45  n/a
  *   [RDT= 2.00] out<- 07:DR#4        467.13    3.636 No_date   15:20   21.45  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .544:Dmax= 1.360}
#*****************************************************************************
#***************************************************************************
 003:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .862 No_date   13:40   14.69 .210
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 003:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02     .862 No_date   13:40   14.69  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .862 No_date   16:12   14.69  n/a
 003:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    3.689 No_date   14:28   26.46 .379
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 003:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    3.689 No_date   14:28   26.46  n/a
                     + 04:S10SRD       110.02     .862 No_date   16:12   14.69  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    4.009 No_date   15:22   23.43  n/a
 003:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    4.009 No_date   15:22   23.43  n/a
                     + 01:DR#2DS      3679.25   19.746 No_date   18:08   20.75  n/a
                     + 07:DR#4         467.13    3.636 No_date   15:20   21.45  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   24.921 No_date   17:20   21.08  n/a
#*****************************************************************************
#*****************************************************************************
 003:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    3.206 No_date   13:40   16.30 .234
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 003:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    3.206 No_date   13:40   16.30  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    3.206 No_date   15:40   16.30  n/a
 003:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    3.206 No_date   15:40   16.30  n/a
                     + 09:TFN2U       4574.47   24.921 No_date   17:20   21.08  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   27.278 No_date   16:48   20.72  n/a
#*****************************************************************************
#*****************************************************************************
 003:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   27.278 No_date   16:48   20.72  n/a
  *   [RDT= 2.00] out<- 01:RGLF       4939.67   25.843 No_date   18:10   20.72  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 003:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    4.877 No_date   14:08   28.54 .409
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 003:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    4.877 No_date   14:08   28.54  n/a
                     + 01:GOLFE       4939.67   25.843 No_date   18:10   20.72  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   27.626 No_date   17:50   21.24  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 003:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    1.381 No_date   13:30   20.34 .291
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 003:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    1.381 No_date   13:30   20.34  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    1.381 No_date   17:24   20.34  n/a
 003:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    1.987 No_date   13:32   19.79 .283
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 003:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    1.987 No_date   13:32   19.79  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    1.987 No_date   17:24   19.79  n/a
 003:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    2.601 No_date   13:54   19.14 .274
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 003:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    2.601 No_date   13:54   19.14  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    2.601 No_date   16:32   19.14  n/a
 003:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    1.381 No_date   17:24   20.34  n/a
                     + 04:S-4LnB       171.81    1.987 No_date   17:24   19.79  n/a
                     + 05:S-3LnA       268.08    2.601 No_date   16:32   19.14  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    5.736 No_date   17:12   19.59  n/a
 003:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    3.497 No_date   13:46   19.14 .274
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 003:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    3.497 No_date   13:46   19.14  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    3.497 No_date   14:58   19.14  n/a
 003:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    1.104 No_date   13:08   15.18 .218
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 003:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    5.736 No_date   17:12   19.59  n/a
                     + 04:S-5SRC       341.88    3.497 No_date   14:58   19.14  n/a
                     + 05:2Ln-A        105.00    1.104 No_date   13:08   15.18  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89    7.963 No_date   17:00   18.98  n/a
 003:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89    7.963 No_date   17:00   18.98  n/a
  *   [RDT= 2.00] out<- 02:GOLFN      1000.89    6.916 No_date   17:28   18.98  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .116:Dmax= 2.028}
#*****************************************************************************
#*****************************************************************************
 003:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    6.916 No_date   17:28   18.98  n/a
                     + 01:GOLFE       5289.89   27.626 No_date   17:50   21.24  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   34.470 No_date   17:36   20.88  n/a
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#*****************************************************************************
#*****************************************************************************
 003:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   34.470 No_date   17:36   20.88  n/a
  *   [RDT= 2.00] out<- 02:GOLF       6290.78   32.927 No_date   18:32   20.88  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
 003:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    1.598 No_date   14:32   10.03 .144
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 003:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .590 No_date   13:38   11.81 .169
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 003:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    1.598 No_date   14:32   10.03  n/a
                     + 04:10SR-B        96.11     .590 No_date   13:38   11.81  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    2.124 No_date   14:16   10.37  n/a
 003:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    2.124 No_date   14:16   10.37  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    2.124 No_date   16:44   10.37  n/a
 003:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52     .572 No_date   13:16    7.71 .110
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 003:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52     .572 No_date   13:16    7.71  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52     .572 No_date   14:56    7.71  n/a
 003:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    1.341 No_date   14:06   10.90 .156
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 003:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52     .572 No_date   14:56    7.71  n/a
                     + 03:14Ln-A       276.60    1.341 No_date   14:06   10.90  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    1.825 No_date   14:38    9.85  n/a
 003:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    1.825 No_date   14:38    9.85  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    1.825 No_date   18:06    9.85  n/a
 003:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    2.607 No_date   13:44   22.32 .320
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 003:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    2.607 No_date   13:44   22.32  n/a
```

```
                  +  05:S10AB         502.71     2.124 No_date   16:44   10.37  n/a
                  +  03:THNYAK        412.12     1.825 No_date   18:06    9.85  n/a
     [DT= 2.00]  SUM=  03:THNYAK       1430.10     6.580 No_date   16:08   13.92  n/a
 003:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK       1430.10     6.580 No_date   16:08   13.92  n/a
     [LAG=123.6 min]<- 04:HYND         1430.10     6.580 No_date   18:10   13.92  n/a
#****************************************************************************
#****************************************************************************
 003:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND         1430.10     6.580 No_date   18:10   13.92  n/a
                  +  02:GOLF           6290.78    32.927 No_date   18:32   20.88  n/a
     [DT= 2.00]  SUM=  09:HWY400       7720.88    39.411 No_date   18:32   19.59  n/a
#****************************************************************************
#****************************************************************************
 003:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400       7720.88    39.411 No_date   18:32   19.59  n/a
  *   [RDT= 2.00] out<- 01:DR#6        7720.88    35.648 No_date   19:58   19.59  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .088:Dmax= 2.526}
#****************************************************************************
#****************************************************************************
 003:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B         119.01     1.104 No_date   13:32   16.30 .234
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 003:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B         119.01     1.104 No_date   13:32   16.30  n/a
     [LAG=108.3 min]<- 03:S-5SRB        119.01     1.104 No_date   15:20   16.30  n/a
 003:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A          97.15      .995 No_date   13:24   16.80 .241
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 003:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A          97.15      .995 No_date   13:24   16.80  n/a
     [LAG=123.3 min]<- 04:S-5SRA         97.15      .995 No_date   15:26   16.80  n/a
 003:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A         37.07     3.848 No_date   12:00   44.46 .637
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 003:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A          47.36      .284 No_date   13:02    9.22 .132
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 003:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A          47.36      .284 No_date   13:02    9.22  n/a
     [LAG= 45.5 min]<- 07:S-H89A         47.36      .284 No_date   13:46    9.22  n/a
```



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 003:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB        119.01     1.104 No_date   15:20   16.30  n/a
                  +  04:S-5SRA          97.15      .995 No_date   15:26   16.80  n/a
                  +  05:15Ln-A          37.07     3.848 No_date   12:00   44.46  n/a
                  +  07:S-H89A          47.36      .284 No_date   13:46    9.22  n/a
     [DT= 2.00]  SUM=  06:TOTPLM        300.59     3.848 No_date   12:00   18.82  n/a
 003:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM        300.59     3.848 No_date   12:00   18.82  n/a
                  +  01:DR#6           7720.88    35.648 No_date   19:58   19.59  n/a
     [DT= 2.00]  SUM=  09:TFN15L       8021.47    36.337 No_date   19:56   19.56  n/a
  ** END OF RUN :   3

*****************************************************************************



 RUN:COMMAND#
 004:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   4 ]
#****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 004:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=12.00:SDUR=  24.00:PTOT=  81.40]
```



```
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 004:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A          92.30     1.164 No_date   13:24   20.51 .252
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 004:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A          92.30     1.164 No_date   13:24   20.51  n/a
     [LAG=278.5 min]<- 02:S-7LnA         92.30     1.164 No_date   18:02   20.51  n/a
 004:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E         225.54     3.050 No_date   14:24   30.28 .372
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 004:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E         225.54     3.050 No_date   14:24   30.28  n/a
     [LAG=165.9 min]<- 03:S-5SRE        225.54     3.050 No_date   17:07   30.28  n/a
 004:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G        505.12     4.615 No_date   14:52   23.66 .291
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 004:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D          36.36      .878 No_date   12:48   26.46 .325
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 004:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D          36.36      .878 No_date   12:48   26.46  n/a
     [LAG= 84.1 min]<- 06:S-CR4D         36.36      .878 No_date   14:12   26.46  n/a
 004:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A         310.44     5.422 No_date   13:24   27.28 .335
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 004:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A         310.44     5.422 No_date   13:24   27.28  n/a
     [LAG= 86.9 min]<- 07:S-6LnA        310.44     5.422 No_date   14:50   27.28  n/a
 004:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A         461.49     7.975 No_date   13:36   29.37 .361
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 004:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA         92.30     1.164 No_date   18:02   20.51  n/a
                  +  03:S-5SRE         225.54     3.050 No_date   17:07   30.28  n/a
                  +  04:10SR-G         505.12     4.615 No_date   14:52   23.66  n/a
                  +  06:S-CR4D          36.36      .878 No_date   14:12   26.46  n/a
                  +  07:S-6LnA         310.44     5.422 No_date   14:50   27.28  n/a
                  +  08:5Ln-A          461.49     7.975 No_date   13:36   29.37  n/a
     [DT= 2.00]  SUM=  09:TOTFN5       1631.25    17.315 No_date   14:28   26.76  n/a
#****************************************************************************
```



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#****************************************************************************
 004:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5       1631.25    17.315 No_date   14:28   26.76  n/a
  *   [RDT= 2.00] out<- 01:DR#1        1631.25    17.040 No_date   14:44   26.76  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.822:Dmax= 1.932}
#****************************************************************************
#****************************************************************************
 004:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C          55.76     1.129 No_date   13:02   25.81 .317
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 004:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C          55.76     1.129 No_date   13:02   25.81  n/a
     [LAG=222.2 min]<- 03:S-CR4C         55.76     1.129 No_date   16:44   25.81  n/a
 004:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F         472.58     6.918 No_date   13:58   28.75 .353
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 004:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F         472.58     6.918 No_date   13:58   28.75  n/a
     [LAG=156.2 min]<- 04:S-4LnF        472.58     6.918 No_date   16:34   28.75  n/a
 004:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E          92.90     2.227 No_date   12:56   28.75 .353
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 004:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C         55.76     1.129 No_date   16:44   25.81  n/a
                  +  04:S-4LnF         472.58     6.918 No_date   16:34   28.75  n/a
                  +  05:4Ln-E           92.90     2.227 No_date   12:56   28.75  n/a
     [DT= 2.00]  SUM=  09:TOTRED        621.24     8.422 No_date   16:36   28.48  n/a
 004:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4        621.24     8.422 No_date   16:36   28.48  n/a
                  +  01:DR#1           1631.25    17.040 No_date   14:44   26.76  n/a
     [DT= 2.00]  SUM=  09:TOTFN4       2252.49    22.450 No_date   16:08   27.24  n/a
#****************************************************************************
#****************************************************************************
 004:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4       2252.49    22.450 No_date   16:08   27.24  n/a
  *   [RDT= 2.00] out<- 01:DR#2        2252.49    22.286 No_date   16:18   27.24  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.598:Dmax= 1.906}
#****************************************************************************
#****************************************************************************
 004:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B         126.62     1.318 No_date   13:10   15.78 .194
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
```

```
 004:0024--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-B        126.62    1.318 No_date   13:10   15.78  n/a
      [LAG= 41.2 min]<- 04:S-CR4B       126.62    1.318 No_date   13:50   15.78  n/a
 004:0025--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:3Ln-E        185.00    2.287 No_date   13:30   21.09 .259
      [CN= 70.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 004:0026--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S-CR4B       126.62    1.318 No_date   13:50   15.78  n/a
                     +  05:3Ln-E        185.00    2.287 No_date   13:30   21.09  n/a
      [DT= 2.00]  SUM=  02:TLN3ND       311.62    3.565 No_date   13:42   18.93  n/a
 004:0027--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:TLN3ND       311.62    3.565 No_date   13:42   18.93  n/a
      [LAG= 66.9 min]<- 06:S-L3ND       311.62    3.565 No_date   14:48   18.93  n/a
#****************************************************************************
#****************************************************************************
 004:0028--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-A        181.15    4.159 No_date   13:02   29.37 .361
      [CN= 76.0: N= 3.00]
      [Tp= 1.00:DT= 2.00]
 004:0029--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-A        181.15    4.159 No_date   13:02   29.37  n/a
      [LAG=147.7 min]<- 03:S-CR4A       181.15    4.159 No_date   15:28   29.37  n/a
 004:0030--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-F       158.41    2.468 No_date   13:58   30.28 .372
      [CN= 77.0: N= 3.00]
      [Tp= 1.72:DT= 2.00]
 004:0031--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TLN3SD       158.41    2.468 No_date   13:58   30.28  n/a
                     +  03:S-CR4A       181.15    4.159 No_date   15:28   29.37  n/a
      [DT= 2.00]  SUM=  02:TLN3SD       339.56    6.007 No_date   15:22   29.80  n/a
 004:0032--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:TLN3SD       339.56    6.007 No_date   15:22   29.80  n/a
      [LAG= 66.9 min]<- 05:S-L3NS       339.56    6.007 No_date   16:28   29.80  n/a
#****************************************************************************
#****************************************************************************
 004:0033--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       07:3Ln-D        213.80    5.755 No_date   13:12   37.42 .460
      [CN= 81.0: N= 3.00]
      [Tp= 1.18:DT= 2.00]
 004:0034--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:4Ln-D         88.09    2.228 No_date   12:50   27.89 .343
      [CN= 75.0: N= 3.00]
      [Tp=  .81:DT= 2.00]
 004:0035--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 08:4Ln-D         88.09    2.228 No_date   12:50   27.89  n/a
      [LAG= 85.0 min]<- 02:S-4LnD        88.09    2.228 No_date   14:14   27.89  n/a
 004:0036--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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```
     CALIB NASHYD       08:3Ln-C        248.17    4.414 No_date   13:24   27.89 .343
      [CN= 75.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 004:0037--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            07:3Ln-D        213.80    5.755 No_date   13:12   37.42  n/a
                     +  02:S-4LnD        88.09    2.228 No_date   14:14   27.89  n/a
                     +  08:3Ln-C        248.17    4.414 No_date   13:24   27.89  n/a
      [DT= 2.00]  SUM=  04:TPNK         550.06   11.026 No_date   13:46   31.59  n/a
 004:0038--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:TPNK         550.06   11.026 No_date   13:46   31.59  n/a
                     +  06:S-L3ND       311.62    3.565 No_date   14:48   18.93  n/a
      [DT= 2.00]  SUM=  03:TLN3US       861.68   13.193 No_date   14:06   27.01  n/a
 004:0039--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:TLN3US       861.68   13.193 No_date   14:06   27.01  n/a
                     +  05:S-L3NS       339.56    6.007 No_date   16:28   29.80  n/a
                     +  01:DR#2        2252.49   22.286 No_date   16:18   27.24  n/a
      [DT= 2.00]  SUM=  09:TFN3A       3453.73   34.050 No_date   16:12   27.43  n/a
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 004:0040--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TFN3A       3453.73   34.050 No_date   16:12   27.43  n/a
  *   [RDT= 2.00] out<- 01:DR#2US      3453.73   33.388 No_date   16:32   27.43  n/a
      [L/S/n=  685./ .040/.030]
      {Vmax=  .258:Dmax= 2.998}
 004:0041--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-E       225.52    8.235 No_date   12:56   42.23 .519
      [CN= 84.0: N= 3.00]
      [Tp=  .95:DT= 2.00]
 004:0042--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:DR#2US      3453.73   33.388 No_date   16:32   27.43  n/a
                     +  02:10SR-E       225.52    8.235 No_date   12:56   42.23  n/a
      [DT= 2.00]  SUM=  09:TMID32      3679.25   34.639 No_date   16:30   28.34  n/a
#****************************************************************************
 004:0043--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TMID32      3679.25   34.639 No_date   16:30   28.34  n/a
  *   [RDT= 2.00] out<- 01:DR#2DS      3679.25   32.410 No_date   17:18   28.34  n/a
      [L/S/n= 2250./ .040/.030]
      {Vmax=  .258:Dmax= 2.999}
#****************************************************************************
#****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 004:0044--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-C        230.90    3.459 No_date   14:18   32.45 .399
      [CN= 78.0: N= 3.00]
      [Tp= 2.02:DT= 2.00]
```



```
 004:0045--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-C        230.90    3.459 No_date   14:18   32.45  n/a
      [LAG= 60.2 min]<- 03:S-4LnC       230.90    3.459 No_date   15:18   32.45  n/a
 004:0046--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-D         81.43    1.295 No_date   13:28   25.81 .317
      [CN= 74.0: N= 3.00]
      [Tp= 1.30:DT= 2.00]
 004:0047--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-D         81.43    1.295 No_date   13:28   25.81  n/a
      [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.295 No_date   13:52   25.81  n/a
 004:0048--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:H400-B        79.99    1.703 No_date   12:56   25.81 .317
      [CN= 74.0: N= 3.00]
      [Tp=  .89:DT= 2.00]
 004:0049--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:H400-B        79.99    1.703 No_date   12:56   25.81  n/a
      [LAG= 12.7 min]<- 05:SH400B        79.99    1.703 No_date   13:08   25.81  n/a
 004:0050--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:3Ln-B         74.81    1.558 No_date   13:02   26.46 .325
      [CN= 74.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 004:0051--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-4LnC       230.90    3.459 No_date   15:18   32.45  n/a
                     +  04:S-5SRD        81.43    1.295 No_date   13:52   25.81  n/a
                     +  05:SH400B        79.99    1.703 No_date   13:08   25.81  n/a
                     +  02:3Ln-B         74.81    1.558 No_date   13:02   26.46  n/a
      [DT= 2.00]  SUM=  06:TOTBLU       467.13    5.914 No_date   14:20   29.20  n/a
#****************************************************************************
#****************************************************************************
 004:0052--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 06:TOTBLU       467.13    5.914 No_date   14:20   29.20  n/a
  *   [RDT= 2.00] out<- 07:DR#4         467.13    5.154 No_date   15:06   29.20  n/a
      [L/S/n= 2000./ .040/.030]
      {Vmax=  .594:Dmax= 1.574}
#****************************************************************************
#**************************************************************************
 004:0053--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-D       110.02    1.314 No_date   13:36   21.09 .259
      [CN= 70.0: N= 3.00]
      [Tp= 1.36:DT= 2.00]
 004:0054--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:10SR-D       110.02    1.314 No_date   13:36   21.09  n/a
      [LAG=153.6 min]<- 04:S10SRD       110.02    1.314 No_date   16:07   21.09  n/a
 004:0055--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:2Ln-B        318.07    5.003 No_date   14:24   35.09 .431
      [CN= 80.0: N= 3.00]
      [Tp= 2.13:DT= 2.00]
 004:0056--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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     ADD HYD            02:2Ln-B        318.07    5.003 No_date   14:24   35.09  n/a
                     +  04:S10SRD       110.02    1.314 No_date   16:07   21.09  n/a
      [DT= 2.00]  SUM=  05:TOTGRN       428.09    5.528 No_date   15:24   31.49  n/a
 004:0057--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            05:TOTGRN       428.09    5.528 No_date   15:24   31.49  n/a
                     +  01:DR#2DS      3679.25   32.410 No_date   17:18   28.34  n/a
                     +  07:DR#4         467.13    5.154 No_date   15:06   29.20  n/a
      [DT= 2.00]  SUM=  09:TFN2U       4574.47   40.499 No_date   16:48   28.72  n/a
#****************************************************************************
#****************************************************************************
 004:0058--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:10SR-C       365.20    4.799 No_date   13:36   23.10 .284
      [CN= 72.0: N= 3.00]
      [Tp= 1.39:DT= 2.00]
 004:0059--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:10SR-C       365.20    4.799 No_date   13:36   23.10  n/a
      [LAG=121.8 min]<- 04:S10SRC       365.20    4.799 No_date   15:36   23.10  n/a
 004:0060--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:TFN2D        365.20    4.799 No_date   15:36   23.10  n/a
                     +  09:TFN2U       4574.47   40.499 No_date   16:48   28.72  n/a
      [DT= 2.00]  SUM=  04:TFN2D       4939.67   44.447 No_date   16:26   28.31  n/a
#****************************************************************************
#****************************************************************************
 004:0061--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 04:TFN2D       4939.67   44.447 No_date   16:26   28.31  n/a
  *   [RDT= 2.00] out<- 01:RGLF        4939.67   42.007 No_date   17:36   28.31  n/a
      [L/S/n=  785./ .040/.030]
      {Vmax=  .173:Dmax= 2.140}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 004:0062--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:H400-A       350.22    6.517 No_date   14:06   37.42 .460
      [CN= 81.0: N= 3.00]
      [Tp= 1.89:DT= 2.00]
 004:0063--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:H400-A       350.22    6.517 No_date   14:06   37.42  n/a
                     +  01:GOLFE       4939.67   42.007 No_date   17:36   28.31  n/a
      [DT= 2.00]  SUM=  01:GOLFE       5289.89   44.694 No_date   17:22   28.91  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
 004:0064--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-A        114.12    1.970 No_date   13:28   27.89 .343
      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 004:0065--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    1.970 No_date   13:28   27.89  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    1.970 No_date   17:22   27.89  n/a
 004:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    2.860 No_date   13:30   27.28 .335
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 004:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    2.860 No_date   13:30   27.28  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    2.860 No_date   17:22   27.28  n/a
 004:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    3.742 No_date   13:50   26.46 .325
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 004:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    3.742 No_date   13:50   26.46  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    3.742 No_date   16:28   26.46  n/a
 004:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    1.970 No_date   17:22   27.89  n/a
                    +  04:S-4LnB       171.81    2.860 No_date   17:22   27.28  n/a
                    +  05:S-3LnA       268.08    3.742 No_date   16:28   26.46  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01    8.211 No_date   17:10   27.01  n/a
 004:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    5.039 No_date   13:42   26.46 .325
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 004:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    5.039 No_date   13:42   26.46  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    5.039 No_date   14:54   26.46  n/a
 004:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    1.692 No_date   13:04   21.75 .267
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 004:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    8.211 No_date   17:10   27.01  n/a
                    +  04:S-5SRC       341.88    5.039 No_date   14:54   26.46  n/a
                    +  05:2Ln-A        105.00    1.692 No_date   13:04   21.75  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89   11.303 No_date   16:56   26.27  n/a
 004:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   11.303 No_date   16:56   26.27  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89    9.919 No_date   17:28   26.27  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .110:Dmax= 2.081}
#*****************************************************************************
#*****************************************************************************
 004:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    9.919 No_date   17:28   26.27  n/a
                    +  01:GOLFE       5289.89   44.694 No_date   17:22   28.91  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   54.604 No_date   17:26   28.49  n/a
```



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#*****************************************************************************
#*****************************************************************************
 004:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   54.604 No_date   17:26   28.49  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   51.481 No_date   17:58   28.49  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#*****************************************************************************
#*****************************************************************************
 004:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    2.620 No_date   14:22   15.29 .188
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 004:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .946 No_date   13:32   17.53 .215
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 004:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    2.620 No_date   14:22   15.29  n/a
                    +  04:10SR-B        96.11     .946 No_date   13:32   17.53  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    3.464 No_date   14:08   15.71  n/a
 004:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    3.464 No_date   14:08   15.71  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    3.464 No_date   16:36   15.71  n/a
 004:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    1.052 No_date   13:08   12.28 .151
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 004:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    1.052 No_date   13:08   12.28  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    1.052 No_date   14:48   12.28  n/a
 004:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    2.173 No_date   13:58   16.38 .201
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 004:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    1.052 No_date   14:48   12.28  n/a
                    +  03:14Ln-A       276.60    2.173 No_date   13:58   16.38  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    3.053 No_date   14:34   15.03  n/a
 004:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    3.053 No_date   14:34   15.03  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    3.053 No_date   18:02   15.03  n/a
 004:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    3.660 No_date   13:40   30.28 .372
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 004:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    3.660 No_date   13:40   30.28  n/a
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                    +  05:S10AB        502.71    3.464 No_date   16:36   15.71  n/a
                    +  03:THNYAK       412.12    3.053 No_date   18:02   15.03  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10   10.124 No_date   16:06   20.04  n/a
 004:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   10.124 No_date   16:06   20.04  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   10.124 No_date   18:07   20.04  n/a
#*****************************************************************************
#*****************************************************************************
 004:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   10.124 No_date   18:07   20.04  n/a
                    +  02:GOLF        6290.78   51.481 No_date   17:58   28.49  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   61.568 No_date   18:00   26.93  n/a
#*****************************************************************************
#*****************************************************************************
 004:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   61.568 No_date   18:00   26.93  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   52.912 No_date   19:10   26.93  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#*****************************************************************************
#*****************************************************************************
 004:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    1.656 No_date   13:28   23.10 .284
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 004:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    1.656 No_date   13:28   23.10  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    1.656 No_date   15:16   23.10  n/a
 004:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    1.478 No_date   13:20   23.66 .291
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 004:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    1.478 No_date   13:20   23.66  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    1.478 No_date   15:22   23.66  n/a
 004:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    4.533 No_date   12:00   53.69 .660
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious    area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious  area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 004:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .495 No_date   12:58   14.25 .175
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 004:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .495 No_date   12:58   14.25  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .495 No_date   13:42   14.25  n/a
```



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 004:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    1.656 No_date   15:16   23.10  n/a
                    +  04:S-5SRA        97.15    1.478 No_date   15:22   23.66  n/a
                    +  05:15Ln-A        37.07    4.533 No_date   12:00   53.69  n/a
                    +  07:S-H89A        47.36     .495 No_date   13:42   14.25  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    4.533 No_date   12:00   25.66  n/a
 004:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    4.533 No_date   12:00   25.66  n/a
                    +  01:DR#6        7720.88   52.912 No_date   19:10   26.93  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   53.982 No_date   19:08   26.88  n/a
  ** END OF RUN :   4

******************************************************************************




 RUN:COMMAND#
 005:0001-----------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   5 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 005:0002-----------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=12.00:SDUR=  24.00:PTOT=  90.10]
```

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#***************************************************************************
#***************************************************************************
#Flows to Flow Node 5 (LINE 5)
 005:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    1.513 No_date   13:22   25.71 .285
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 005:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    1.513 No_date   13:22   25.71  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    1.513 No_date   18:00   25.71  n/a
 005:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    3.748 No_date   14:22   36.61 .406
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 005:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    3.748 No_date   14:22   36.61  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    3.748 No_date   17:06   36.61  n/a
 005:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    5.823 No_date   14:50   29.23 .324
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 005:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    1.100 No_date   12:48   32.36 .359
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 005:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    1.100 No_date   12:48   32.36  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    1.100 No_date   14:12   32.36  n/a
 005:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    6.773 No_date   13:22   33.30 .370
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 005:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    6.773 No_date   13:22   33.30  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    6.773 No_date   14:48   33.30  n/a
 005:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    9.840 No_date   13:34   35.58 .395
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 005:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    1.513 No_date   18:00   25.71  n/a
                    +  03:S-5SRE       225.54    3.748 No_date   17:06   36.61  n/a
                    +  04:10SR-G       505.12    5.823 No_date   14:50   29.23  n/a
                    +  06:S-CR4D        36.36    1.100 No_date   14:12   32.36  n/a
                    +  07:S-6LnA       310.44    6.773 No_date   14:48   33.30  n/a
                    +  08:5Ln-A        461.49    9.840 No_date   13:34   35.58  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25   21.580 No_date   14:28   32.69  n/a
#***************************************************************************
```



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#***************************************************************************
 005:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   21.580 No_date   14:28   32.69  n/a
  *  [RDT= 2.00] out<- 01:DR#1        1631.25   21.255 No_date   14:42   32.69  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.925:Dmax= 2.130}
#***************************************************************************
#***************************************************************************
 005:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    1.423 No_date   13:00   31.67 .351
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 005:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    1.423 No_date   13:00   31.67  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    1.423 No_date   16:42   31.67  n/a
 005:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    8.566 No_date   13:56   34.93 .388
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 005:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    8.566 No_date   13:56   34.93  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    8.566 No_date   16:32   34.93  n/a
 005:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    2.764 No_date   12:56   34.93 .388
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 005:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    1.423 No_date   16:42   31.67  n/a
                    +  04:S-4LnF       472.58    8.566 No_date   16:32   34.93  n/a
                    +  05:4Ln-E         92.90    2.764 No_date   12:56   34.93  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24   10.427 No_date   16:34   34.63  n/a
 005:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24   10.427 No_date   16:34   34.63  n/a
                    +  01:DR#1        1631.25   21.255 No_date   14:42   32.69  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49   27.709 No_date   16:06   33.23  n/a
#***************************************************************************
#***************************************************************************
 005:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   27.709 No_date   16:06   33.23  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49   27.525 No_date   16:16   33.23  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.686:Dmax= 2.081}
#***************************************************************************
#***************************************************************************
 005:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    1.790 No_date   13:08   20.31 .225
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
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 005:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    1.790 No_date   13:08   20.31  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    1.790 No_date   13:48   20.31  n/a
 005:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    2.951 No_date   13:28   26.33 .292
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 005:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    1.790 No_date   13:48   20.31  n/a
                    +  05:3Ln-E        185.00    2.951 No_date   13:28   26.33  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62    4.687 No_date   13:40   23.89  n/a
 005:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62    4.687 No_date   13:40   23.89  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62    4.687 No_date   14:46   23.89  n/a
#***************************************************************************
#***************************************************************************
 005:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    5.135 No_date   13:02   35.58 .395
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 005:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    5.135 No_date   13:02   35.58  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    5.135 No_date   15:28   35.58  n/a
 005:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    3.037 No_date   13:54   36.61 .406
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 005:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    3.037 No_date   13:54   36.61  n/a
                    +  03:S-CR4A       181.15    5.135 No_date   15:28   35.58  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56    7.383 No_date   15:22   36.06  n/a
 005:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    7.383 No_date   15:22   36.06  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    7.383 No_date   16:28   36.06  n/a
#***************************************************************************
#***************************************************************************
 005:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    6.893 No_date   13:12   44.38 .493
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 005:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    2.771 No_date   12:48   33.94 .377
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 005:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    2.771 No_date   12:48   33.94  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    2.771 No_date   14:12   33.94  n/a
 005:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       08:3Ln-C        248.17    5.484 No_date   13:22   33.94 .377
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 005:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    6.893 No_date   13:12   44.38  n/a
                    +  02:S-4LnD        88.09    2.771 No_date   14:12   33.94  n/a
                    +  08:3Ln-C        248.17    5.484 No_date   13:22   33.94  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06   13.440 No_date   13:44   38.00  n/a
 005:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   13.440 No_date   13:44   38.00  n/a
                    +  06:S-L3ND       311.62    4.687 No_date   14:46   23.89  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68   16.354 No_date   14:08   32.90  n/a
 005:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   16.354 No_date   14:08   32.90  n/a
                    +  05:S-L3NS       339.56    7.383 No_date   16:28   36.06  n/a
                    +  01:DR#2        2252.49   27.525 No_date   16:16   33.23  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73   41.970 No_date   16:10   33.42  n/a
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
 005:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   41.970 No_date   16:10   33.42  n/a
  *  [RDT= 2.00] out<- 01:DR#2US      3453.73   41.304 No_date   16:28   33.42  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
 005:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    9.731 No_date   12:54   49.59 .550
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 005:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   41.304 No_date   16:28   33.42  n/a
                    +  02:10SR-E       225.52    9.731 No_date   12:54   49.59  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25   42.769 No_date   16:24   34.42  n/a
#***************************************************************************
 005:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   42.769 No_date   16:24   34.42  n/a
  *  [RDT= 2.00] out<- 01:DR#2DS      3679.25   40.285 No_date   17:10   34.42  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
#***************************************************************************
#***************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 005:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    4.210 No_date   14:16   38.97 .433
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
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 005:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    4.210 No_date   14:16   38.97  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    4.210 No_date   15:16   38.97  n/a
 005:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    1.630 No_date   13:26   31.67 .351
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 005:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    1.630 No_date   13:26   31.67  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.630 No_date   13:50   31.67  n/a
 005:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    2.146 No_date   12:56   31.67 .351
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 005:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    2.146 No_date   12:56   31.67  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    2.146 No_date   13:08   31.67  n/a
 005:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    1.950 No_date   13:00   32.36 .359
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 005:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    4.210 No_date   15:16   38.97  n/a
                  +  04:S-5SRD        81.43    1.630 No_date   13:50   31.67  n/a
                  +  05:SH400B        79.99    2.146 No_date   13:08   31.67  n/a
                  +  02:3Ln-B         74.81    1.950 No_date   13:00   32.36  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    7.291 No_date   14:14   35.39  n/a
#****************************************************************************
#****************************************************************************
 005:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    7.291 No_date   14:14   35.39  n/a
  *   [RDT= 2.00] out<- 07:DR#4         467.13    6.399 No_date   15:00   35.39  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .626:Dmax= 1.718}
#****************************************************************************
#**************************************************************************
 005:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    1.695 No_date   13:32   26.33 .292
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 005:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    1.695 No_date   13:32   26.33  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    1.695 No_date   16:04   26.33  n/a
 005:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    6.043 No_date   14:22   41.88 .465
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 005:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    6.043 No_date   14:22   41.88  n/a
                  +  04:S10SRD       110.02    1.695 No_date   16:04   26.33  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    6.747 No_date   15:24   37.89  n/a
 005:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    6.747 No_date   15:24   37.89  n/a
                  +  01:DR#2DS      3679.25   40.285 No_date   17:10   34.42  n/a
                  +  07:DR#4         467.13    6.399 No_date   15:00   35.39  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   50.393 No_date   16:38   34.84  n/a
#****************************************************************************
#****************************************************************************
 005:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    6.125 No_date   13:34   28.64 .318
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 005:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    6.125 No_date   13:34   28.64  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    6.125 No_date   15:34   28.64  n/a
 005:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    6.125 No_date   15:34   28.64  n/a
                  +  09:TFN2U       4574.47   50.393 No_date   16:38   34.84  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   55.628 No_date   16:14   34.38  n/a
#****************************************************************************
#****************************************************************************
 005:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   55.628 No_date   16:14   34.38  n/a
  *   [RDT= 2.00] out<- 01:RGLF        4939.67   52.446 No_date   17:26   34.38  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 005:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    7.804 No_date   14:04   44.38 .493
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 005:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    7.804 No_date   14:04   44.38  n/a
                  +  01:GOLFE       4939.67   52.446 No_date   17:26   34.38  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   55.741 No_date   17:14   35.04  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
 005:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    2.447 No_date   13:26   33.94 .377
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 005:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    SHIFT HYD       -> 02:4Ln-A        114.12    2.447 No_date   13:26   33.94  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    2.447 No_date   17:20   33.94  n/a
 005:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    3.572 No_date   13:28   33.30 .370
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 005:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    3.572 No_date   13:28   33.30  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    3.572 No_date   17:20   33.30  n/a
 005:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    4.675 No_date   13:48   32.36 .359
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 005:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    4.675 No_date   13:48   32.36  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    4.675 No_date   16:26   32.36  n/a
 005:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    2.447 No_date   17:20   33.94  n/a
                  +  04:S-4LnB       171.81    3.572 No_date   17:20   33.30  n/a
                  +  05:S-3LnA       268.08    4.675 No_date   16:26   32.36  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01   10.223 No_date   17:08   32.98  n/a
 005:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    6.298 No_date   13:40   32.36 .359
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 005:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    6.298 No_date   13:40   32.36  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    6.298 No_date   14:52   32.36  n/a
 005:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    2.185 No_date   13:02   27.11 .301
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 005:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   10.223 No_date   17:08   32.98  n/a
                  +  04:S-5SRC       341.88    6.298 No_date   14:52   32.36  n/a
                  +  05:2Ln-A        105.00    2.185 No_date   13:02   27.11  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89   14.008 No_date   16:56   32.15  n/a
 005:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   14.008 No_date   16:56   32.15  n/a
  *   [RDT= 2.00] out<- 02:GOLFN       1000.89   12.209 No_date   17:24   32.15  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .105:Dmax= 2.123}
#****************************************************************************
#****************************************************************************
 005:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   12.209 No_date   17:24   32.15  n/a
                  +  01:GOLFE       5289.89   55.741 No_date   17:14   35.04  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   67.911 No_date   17:20   34.58  n/a
```



```
#****************************************************************************
#****************************************************************************
 005:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   67.911 No_date   17:20   34.58  n/a
  *   [RDT= 2.00] out<- 02:GOLF        6290.78   64.579 No_date   18:16   34.58  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 005:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    3.513 No_date   14:18   19.71 .219
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 005:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    1.254 No_date   13:30   22.28 .247
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 005:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    3.513 No_date   14:18   19.71  n/a
                  +  04:10SR-B        96.11    1.254 No_date   13:30   22.28  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    4.632 No_date   14:04   20.20  n/a
 005:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    4.632 No_date   14:04   20.20  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    4.632 No_date   16:32   20.20  n/a
 005:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    1.489 No_date   13:06   16.22 .180
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 005:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    1.489 No_date   13:06   16.22  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    1.489 No_date   14:46   16.22  n/a
 005:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    2.896 No_date   13:54   20.97 .233
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 005:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    1.489 No_date   14:46   16.22  n/a
                  +  03:14Ln-A       276.60    2.896 No_date   13:54   20.97  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    4.134 No_date   14:32   19.40  n/a
 005:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    4.134 No_date   14:32   19.40  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    4.134 No_date   18:00   19.40  n/a
 005:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    4.506 No_date   13:38   36.61 .406
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 005:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    4.506 No_date   13:38   36.61  n/a
```

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                  +  05:S10AB        502.71    4.632 No_date   16:32   20.20  n/a
                  +  03:THNYAK       412.12    4.134 No_date   18:00   19.40  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10   13.143 No_date   16:06   25.07  n/a
 005:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   13.143 No_date   16:06   25.07  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   13.143 No_date   18:07   25.07  n/a
#*****************************************************************************
#*****************************************************************************
 005:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   13.143 No_date   18:07   25.07  n/a
                  +  02:GOLF        6290.78   64.579 No_date   18:16   34.58  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   77.700 No_date   18:12   32.82  n/a
#*****************************************************************************
#*****************************************************************************
 005:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   77.700 No_date   18:12   32.82  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   68.998 No_date   19:24   32.82  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.527}
#*****************************************************************************
#*****************************************************************************
 005:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    2.115 No_date   13:26   28.64 .318
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 005:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    2.115 No_date   13:26   28.64  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    2.115 No_date   15:14   28.64  n/a
 005:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    1.879 No_date   13:18   29.23 .324
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 005:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    1.879 No_date   13:18   29.23  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    1.879 No_date   15:20   29.23  n/a
 005:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    5.052 No_date   12:00   60.80 .675
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 005:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .684 No_date   12:56   18.51 .205
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 005:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .684 No_date   12:56   18.51  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .684 No_date   13:40   18.51  n/a
```



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 005:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    2.115 No_date   15:14   28.64  n/a
                  +  04:S-5SRA        97.15    1.879 No_date   15:20   29.23  n/a
                  +  05:15Ln-A        37.07    5.052 No_date   12:00   60.80  n/a
                  +  07:S-H89A        47.36     .684 No_date   13:40   18.51  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    5.052 No_date   12:00   31.20  n/a
 005:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    5.052 No_date   12:00   31.20  n/a
                  +  01:DR#6        7720.88   68.998 No_date   19:24   32.82  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   70.183 No_date   19:22   32.76  n/a
  ** END OF RUN :   5

*****************************************************************************



 RUN:COMMAND#
 006:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   6 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 006:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=12.00:SDUR=  24.00:PTOT=  98.70]
```



```
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 006:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    1.886 No_date   13:20   31.18 .316
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 006:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    1.886 No_date   13:20   31.18  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    1.886 No_date   17:58   31.18  n/a
 006:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    4.469 No_date   14:20   43.13 .437
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 006:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    4.469 No_date   14:20   43.13  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    4.469 No_date   17:04   43.13  n/a
 006:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    7.097 No_date   14:46   35.04 .355
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 006:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    1.330 No_date   12:46   38.47 .390
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 006:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    1.330 No_date   12:46   38.47  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    1.330 No_date   14:10   38.47  n/a
 006:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    8.178 No_date   13:20   39.53 .401
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 006:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    8.178 No_date   13:20   39.53  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    8.178 No_date   14:46   39.53  n/a
 006:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49   11.769 No_date   13:32   41.98 .425
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 006:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    1.886 No_date   17:58   31.18  n/a
                  +  03:S-5SRE       225.54    4.469 No_date   17:04   43.13  n/a
                  +  04:10SR-G       505.12    7.097 No_date   14:46   35.04  n/a
                  +  06:S-CR4D        36.36    1.330 No_date   14:10   38.47  n/a
                  +  07:S-6LnA       310.44    8.178 No_date   14:46   39.53  n/a
                  +  08:5Ln-A        461.49   11.769 No_date   13:32   41.98  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25   26.032 No_date   14:26   38.83  n/a
#*****************************************************************************
```



```
#*****************************************************************************
 006:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   26.032 No_date   14:26   38.83  n/a
  *  [RDT= 2.00] out<- 01:DR#1        1631.25   25.607 No_date   14:44   38.83  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.820:Dmax= 2.317}
#*****************************************************************************
#*****************************************************************************
 006:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    1.730 No_date   12:58   37.74 .382
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 006:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    1.730 No_date   12:58   37.74  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    1.730 No_date   16:40   37.74  n/a
 006:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58   10.276 No_date   13:54   41.30 .418
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 006:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58   10.276 No_date   13:54   41.30  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58   10.276 No_date   16:30   41.30  n/a
 006:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    3.319 No_date   12:54   41.30 .418
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 006:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    1.730 No_date   16:40   37.74  n/a
                  +  04:S-4LnF       472.58   10.276 No_date   16:30   41.30  n/a
                  +  05:4Ln-E         92.90    3.319 No_date   12:54   41.30  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24   12.507 No_date   16:34   40.98  n/a
 006:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24   12.507 No_date   16:34   40.98  n/a
                  +  01:DR#1        1631.25   25.607 No_date   14:44   38.83  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49   35.381 No_date   16:52   39.43  n/a
#*****************************************************************************
#*****************************************************************************
 006:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   35.381 No_date   16:52   39.43  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49   33.197 No_date   16:56   39.43  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.792:Dmax= 2.299}
#*****************************************************************************
#*****************************************************************************
 006:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    2.307 No_date   13:06   25.15 .255
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
```

```
 006:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    2.307 No_date   13:06   25.15  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    2.307 No_date   13:46   25.15  n/a
 006:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    3.657 No_date   13:26   31.84 .323
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 006:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    2.307 No_date   13:46   25.15  n/a
                    +  05:3Ln-E        185.00    3.657 No_date   13:26   31.84  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62    5.896 No_date   13:38   29.12  n/a
 006:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62    5.896 No_date   13:38   29.12  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62    5.896 No_date   14:44   29.12  n/a
#*****************************************************************************
#*****************************************************************************
 006:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    6.141 No_date   13:00   41.98 .425
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 006:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    6.141 No_date   13:00   41.98  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    6.141 No_date   15:26   41.98  n/a
 006:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    3.624 No_date   13:54   43.13 .437
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 006:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    3.624 No_date   13:54   43.13  n/a
                    +  03:S-CR4A       181.15    6.141 No_date   15:26   41.98  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56    8.801 No_date   15:20   42.52  n/a
 006:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    8.801 No_date   15:20   42.52  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    8.801 No_date   16:26   42.52  n/a
#*****************************************************************************
#*****************************************************************************
 006:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    8.048 No_date   13:10   51.47 .521
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 006:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    3.332 No_date   12:48   40.20 .407
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 006:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    3.332 No_date   12:48   40.20  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    3.332 No_date   14:12   40.20  n/a
 006:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



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    CALIB NASHYD       08:3Ln-C        248.17    6.595 No_date   13:22   40.20 .407
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 006:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    8.048 No_date   13:10   51.47  n/a
                    +  02:S-4LnD        88.09    3.332 No_date   14:12   40.20  n/a
                    +  08:3Ln-C        248.17    6.595 No_date   13:22   40.20  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06   15.921 No_date   13:44   44.58  n/a
 006:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   15.921 No_date   13:44   44.58  n/a
                    +  06:S-L3ND       311.62    5.896 No_date   14:44   29.12  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68   19.653 No_date   14:08   38.99  n/a
 006:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   19.653 No_date   14:08   38.99  n/a
                    +  05:S-L3NS       339.56    8.801 No_date   16:26   42.52  n/a
                    +  01:DR#2        2252.49   33.197 No_date   16:56   39.43  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73   49.566 No_date   16:14   39.62  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 006:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   49.566 No_date   16:14   39.62  n/a
 *   [RDT= 2.00] out<- 01:DR#2US      3453.73   48.802 No_date   16:30   39.62  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
 006:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52   11.239 No_date   12:54   57.05 .578
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 006:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   48.802 No_date   16:30   39.62  n/a
                    +  02:10SR-E       225.52   11.239 No_date   12:54   57.05  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25   50.488 No_date   15:08   40.69  n/a
#*****************************************************************************
 006:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   50.488 No_date   15:08   40.69  n/a
 *   [RDT= 2.00] out<- 01:DR#2DS      3679.25   48.129 No_date   17:16   40.69  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.996}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 006:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    4.982 No_date   14:14   45.65 .463
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
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 006:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    4.982 No_date   14:14   45.65  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    4.982 No_date   15:14   45.65  n/a
 006:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    1.979 No_date   13:24   37.74 .382
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 006:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    1.979 No_date   13:24   37.74  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.979 No_date   13:48   37.74  n/a
 006:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    2.608 No_date   12:54   37.74 .382
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 006:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    2.608 No_date   12:54   37.74  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    2.608 No_date   13:06   37.74  n/a
 006:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    2.359 No_date   13:00   38.47 .390
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 006:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    4.982 No_date   15:14   45.65  n/a
                    +  04:S-5SRD        81.43    1.979 No_date   13:48   37.74  n/a
                    +  05:SH400B        79.99    2.608 No_date   13:06   37.74  n/a
                    +  02:3Ln-B         74.81    2.359 No_date   13:00   38.47  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    8.722 No_date   14:10   41.77  n/a
#*****************************************************************************
#*****************************************************************************
 006:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    8.722 No_date   14:10   41.77  n/a
 *   [RDT= 2.00] out<- 07:DR#4         467.13    7.693 No_date   14:54   41.77  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .655:Dmax= 1.850}
#*****************************************************************************
#***************************************************************************
 006:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    2.100 No_date   13:32   31.84 .323
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 006:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    2.100 No_date   13:32   31.84  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    2.100 No_date   16:04   31.84  n/a
 006:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    7.106 No_date   14:22   48.82 .495
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 006:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    7.106 No_date   14:22   48.82  n/a
                    +  04:S10SRD       110.02    2.100 No_date   16:04   31.84  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    8.005 No_date   15:24   44.45  n/a
 006:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    8.005 No_date   15:24   44.45  n/a
                    +  01:DR#2DS      3679.25   48.129 No_date   17:16   40.69  n/a
                    +  07:DR#4         467.13    7.693 No_date   14:54   41.77  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   60.083 No_date   16:26   41.15  n/a
#*****************************************************************************
#*****************************************************************************
 006:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    7.527 No_date   13:32   34.42 .349
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 006:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    7.527 No_date   13:32   34.42  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    7.527 No_date   15:32   34.42  n/a
 006:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    7.527 No_date   15:32   34.42  n/a
                    +  09:TFN2U       4574.47   60.083 No_date   16:26   41.15  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   66.883 No_date   16:00   40.65  n/a
#*****************************************************************************
#*****************************************************************************
 006:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   66.883 No_date   16:00   40.65  n/a
 *   [RDT= 2.00] out<- 01:RGLF        4939.67   62.929 No_date   17:22   40.65  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 006:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    9.115 No_date   14:02   51.47 .521
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 006:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    9.115 No_date   14:02   51.47  n/a
                    +  01:GOLFE       4939.67   62.929 No_date   17:22   40.65  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   66.808 No_date   17:08   41.37  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 006:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    2.943 No_date   13:24   40.20 .407
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 006:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    2.943 No_date   13:24   40.20  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    2.943 No_date   17:18   40.20  n/a
 006:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    4.312 No_date   13:26   39.53 .401
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 006:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    4.312 No_date   13:26   39.53  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    4.312 No_date   17:18   39.53  n/a
 006:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    5.648 No_date   13:46   38.47 .390
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 006:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    5.648 No_date   13:46   38.47  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    5.648 No_date   16:24   38.47  n/a
 006:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    2.943 No_date   17:18   40.20  n/a
                    +  04:S-4LnB       171.81    4.312 No_date   17:18   39.53  n/a
                    +  05:S-3LnA       268.08    5.648 No_date   16:24   38.47  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01   12.315 No_date   17:06   39.15  n/a
 006:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    7.612 No_date   13:38   38.47 .390
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 006:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    7.612 No_date   13:38   38.47  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    7.612 No_date   14:50   38.47  n/a
 006:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    2.709 No_date   13:02   32.74 .332
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 006:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   12.315 No_date   17:06   39.15  n/a
                    +  04:S-5SRC       341.88    7.612 No_date   14:50   38.47  n/a
                    +  05:2Ln-A        105.00    2.709 No_date   13:02   32.74  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89   16.817 No_date   16:54   38.25  n/a
 006:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   16.817 No_date   16:54   38.25  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89   15.480 No_date   17:30   38.25  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
 006:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   15.480 No_date   17:30   38.25  n/a
                    +  01:GOLFE       5289.89   66.808 No_date   17:08   41.37  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78   82.101 No_date   17:20   40.87  n/a
```



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#*****************************************************************************
#*****************************************************************************
 006:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   82.101 No_date   17:20   40.87  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78   77.532 No_date   18:08   40.87  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.140}
#*****************************************************************************
#*****************************************************************************
 006:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    4.489 No_date   14:14   24.43 .248
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 006:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    1.587 No_date   13:28   27.32 .277
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 006:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    4.489 No_date   14:14   24.43  n/a
                    +  04:10SR-B        96.11    1.587 No_date   13:28   27.32  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71    5.906 No_date   14:00   24.99  n/a
 006:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    5.906 No_date   14:00   24.99  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    5.906 No_date   16:28   24.99  n/a
 006:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    1.980 No_date   13:04   20.47 .207
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 006:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    1.980 No_date   13:04   20.47  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    1.980 No_date   14:44   20.47  n/a
 006:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    3.683 No_date   13:50   25.85 .262
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 006:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    1.980 No_date   14:44   20.47  n/a
                    +  03:14Ln-A       276.60    3.683 No_date   13:50   25.85  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12    5.319 No_date   14:30   24.08  n/a
 006:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    5.319 No_date   14:30   24.08  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    5.319 No_date   17:58   24.08  n/a
 006:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    5.380 No_date   13:38   43.13 .437
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 006:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    5.380 No_date   13:38   43.13  n/a
```



```
                    +  05:S10AB        502.71    5.906 No_date   16:28   24.99  n/a
                    +  03:THNYAK       412.12    5.319 No_date   17:58   24.08  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10   16.389 No_date   16:04   30.37  n/a
 006:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   16.389 No_date   16:04   30.37  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   16.389 No_date   18:06   30.37  n/a
#*****************************************************************************
#*****************************************************************************
 006:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   16.389 No_date   18:06   30.37  n/a
                    +  02:GOLF        6290.78   77.532 No_date   18:08   40.87  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88   93.919 No_date   18:08   38.93  n/a
#*****************************************************************************
#*****************************************************************************
 006:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   93.919 No_date   18:08   38.93  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88   83.923 No_date   19:30   38.93  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#*****************************************************************************
#*****************************************************************************
 006:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    2.600 No_date   13:24   34.42 .349
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 006:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    2.600 No_date   13:24   34.42  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    2.600 No_date   15:12   34.42  n/a
 006:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    2.301 No_date   13:18   35.04 .355
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 006:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    2.301 No_date   13:18   35.04  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    2.301 No_date   15:20   35.04  n/a
 006:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    5.567 No_date   12:00   67.95 .688
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=    .0]
 006:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .893 No_date   12:54   23.07 .234
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 006:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .893 No_date   12:54   23.07  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .893 No_date   13:38   23.07  n/a
```



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 006:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    2.600 No_date   15:12   34.42  n/a
                    +  04:S-5SRA        97.15    2.301 No_date   15:20   35.04  n/a
                    +  05:15Ln-A        37.07    5.567 No_date   12:00   67.95  n/a
                    +  07:S-H89A        47.36     .893 No_date   13:38   23.07  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59    5.673 No_date   15:12   36.97  n/a
 006:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    5.673 No_date   15:12   36.97  n/a
                    +  01:DR#6        7720.88   83.923 No_date   19:30   38.93  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47   85.274 No_date   19:30   38.85  n/a
  ** END OF RUN :   6

******************************************************************************



 RUN:COMMAND#
 007:0001------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   7 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH STANDARD RAINFALL DATA
# ORRILIA TS RAIN GAGE
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 007:0002------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=60.00:SDUR=  12.00:PTOT= 193.00]
```

```
#***************************************************************************
#***************************************************************************
#Flows to Flow Node 5 (LINE 5)
 007:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    4.489 No_date    9:06  103.81 .538
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 007:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    4.489 No_date    9:06  103.81  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    4.489 No_date   13:44  103.81  n/a
 007:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54   11.032 No_date    9:54  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 007:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54   11.032 No_date    9:54  123.89  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54   11.032 No_date   12:38  123.89  n/a
 007:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12   21.194 No_date   10:26  110.30 .571
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 007:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    2.323 No_date    7:32  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 007:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    2.323 No_date    7:32  116.07  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    2.323 No_date    8:56  116.07  n/a
 007:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44   16.755 No_date    8:32  118.12 .612
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 007:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44   16.755 No_date    8:32  118.12  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44   16.755 No_date    9:58  118.12  n/a
 007:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49   24.839 No_date    9:12  121.80 .631
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 007:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    4.489 No_date   13:44  103.81  n/a
                    +  03:S-5SRE       225.54   11.032 No_date   12:38  123.89  n/a
                    +  04:10SR-G       505.12   21.194 No_date   10:26  110.30  n/a
                    +  06:S-CR4D        36.36    2.323 No_date    8:56  116.07  n/a
                    +  07:S-6LnA       310.44   16.755 No_date    9:58  118.12  n/a
                    +  08:5Ln-A        461.49   24.839 No_date    9:12  121.80  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25   69.347 No_date   10:32  116.68  n/a
#***************************************************************************
```



```
#***************************************************************************
 007:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   69.347 No_date   10:32  116.68  n/a
  *  [RDT= 2.00] out<- 01:DR#1        1631.25   69.196 No_date   10:44  116.68  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.846:Dmax= 2.295}
#***************************************************************************
#***************************************************************************
 007:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    3.279 No_date    7:46  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 007:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    3.279 No_date    7:46  115.19  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    3.279 No_date   11:28  115.19  n/a
 007:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58   24.204 No_date    9:30  120.99 .627
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 007:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58   24.204 No_date    9:30  120.99  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58   24.204 No_date   12:06  120.99  n/a
 007:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    5.840 No_date    7:40  120.99 .627
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 007:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    3.279 No_date   11:28  115.19  n/a
                    +  04:S-4LnF       472.58   24.204 No_date   12:06  120.99  n/a
                    +  05:4Ln-E         92.90    5.840 No_date    7:40  120.99  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24   29.973 No_date   11:50  120.47  n/a
 007:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24   29.973 No_date   11:50  120.47  n/a
                    +  01:DR#1        1631.25   69.196 No_date   10:44  116.68  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49   97.785 No_date   11:18  117.73  n/a
#***************************************************************************
#***************************************************************************
 007:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   97.785 No_date   11:18  117.73  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49   97.510 No_date   11:32  117.73  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.872:Dmax= 2.467}
#***************************************************************************
#***************************************************************************
 007:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    5.874 No_date    7:54   92.51 .479
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
```



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 007:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    5.874 No_date    7:54   92.51  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    5.874 No_date    8:34   92.51  n/a
 007:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    8.946 No_date    9:12  104.65 .542
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 007:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    5.874 No_date    8:34   92.51  n/a
                    +  05:3Ln-E        185.00    8.946 No_date    9:12  104.65  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62   14.706 No_date    8:42   99.72  n/a
 007:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62   14.706 No_date    8:42   99.72  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62   14.706 No_date    9:48   99.72  n/a
#***************************************************************************
#***************************************************************************
 007:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15   10.990 No_date    7:48  121.80 .631
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 007:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15   10.990 No_date    7:48  121.80  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15   10.990 No_date   10:14  121.80  n/a
 007:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    8.272 No_date    9:30  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 007:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    8.272 No_date    9:30  123.89  n/a
                    +  03:S-CR4A       181.15   10.990 No_date   10:14  121.80  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56   18.936 No_date   10:08  122.78  n/a
 007:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56   18.936 No_date   10:08  122.78  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56   18.936 No_date   11:14  122.78  n/a
#***************************************************************************
#***************************************************************************
 007:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80   13.436 No_date    8:04  136.27 .706
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 007:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    5.706 No_date    7:32  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 007:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    5.706 No_date    7:32  118.92  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    5.706 No_date    8:56  118.92  n/a
 007:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       08:3Ln-C        248.17   13.391 No_date    8:38  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 007:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80   13.436 No_date    8:04  136.27  n/a
                    +  02:S-4LnD        88.09    5.706 No_date    8:56  118.92  n/a
                    +  08:3Ln-C        248.17   13.391 No_date    8:38  118.92  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06   32.027 No_date    8:50  125.66  n/a
 007:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   32.027 No_date    8:50  125.66  n/a
                    +  06:S-L3ND       311.62   14.706 No_date    9:48   99.72  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68   45.662 No_date    9:14  116.28  n/a
 007:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   45.662 No_date    9:14  116.28  n/a
                    +  05:S-L3NS       339.56   18.936 No_date   11:14  122.78  n/a
                    +  01:DR#2        2252.49   97.510 No_date   11:32  117.73  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73  152.128 No_date   11:04  117.86  n/a
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
 007:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73  152.128 No_date   11:04  117.86  n/a
  *  [RDT= 2.00] out<- 01:DR#2US      3453.73  149.472 No_date   11:34  117.86  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.997}
 007:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52   16.380 No_date    7:40  144.35 .748
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 007:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73  149.472 No_date   11:34  117.86  n/a
                    +  02:10SR-E       225.52   16.380 No_date    7:40  144.35  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25  157.454 No_date   11:28  119.49  n/a
#***************************************************************************
 007:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25  157.454 No_date   11:28  119.49  n/a
  *  [RDT= 2.00] out<- 01:DR#2DS      3679.25  147.573 No_date   12:34  119.49  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.994}
#***************************************************************************
#***************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 007:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90   11.655 No_date    9:48  127.56 .661
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
```

```
 007:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90   11.655 No_date    9:48  127.56  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90   11.655 No_date   10:48  127.56  n/a
 007:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    4.275 No_date    9:04  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 007:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    4.275 No_date    9:04  115.19  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    4.275 No_date    9:28  115.19  n/a
 007:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    4.835 No_date    7:40  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 007:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    4.835 No_date    7:40  115.19  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    4.835 No_date    7:52  115.19  n/a
 007:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    4.403 No_date    7:46  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 007:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90   11.655 No_date   10:48  127.56  n/a
                    +  04:S-5SRD        81.43    4.275 No_date    9:28  115.19  n/a
                    +  05:SH400B        79.99    4.835 No_date    7:52  115.19  n/a
                    +  02:3Ln-B         74.81    4.403 No_date    7:46  116.07  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13   22.448 No_date    9:42  121.45  n/a
#******************************************************************************
#******************************************************************************
 007:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13   22.448 No_date    9:42  121.45  n/a
  *  [RDT= 2.00] out<- 07:DR#4         467.13   18.858 No_date   11:38  121.44  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .260:Dmax= 2.967}
#******************************************************************************
#****************************************************************************
 007:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    5.279 No_date    9:14  104.65 .542
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 007:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    5.279 No_date    9:14  104.65  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    5.279 No_date   11:46  104.65  n/a
 007:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07   16.260 No_date    9:56  132.59 .687
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 007:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07   16.260 No_date    9:56  132.59  n/a
                    +  04:S10SRD       110.02    5.279 No_date   11:46  104.65  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09   20.769 No_date   10:28  125.41  n/a
 007:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09   20.769 No_date   10:28  125.41  n/a
                    +  01:DR#2DS      3679.25  147.573 No_date   12:34  119.49  n/a
                    +  07:DR#4         467.13   18.858 No_date   11:38  121.44  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47  183.556 No_date   12:18  120.24  n/a
#******************************************************************************
#******************************************************************************
 007:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20   18.173 No_date    9:14  109.52 .567
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 007:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20   18.173 No_date    9:14  109.52  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20   18.173 No_date   11:14  109.52  n/a
 007:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20   18.173 No_date   11:14  109.52  n/a
                    +  09:TFN2U       4574.47  183.556 No_date   12:18  120.24  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67  200.122 No_date   12:06  119.45  n/a
#******************************************************************************
#******************************************************************************
 007:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67  200.122 No_date   12:06  119.45  n/a
  *  [RDT= 2.00] out<- 01:RGLF        4939.67  190.184 No_date   13:08  119.45  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.138}
#******************************************************************************
#******************************************************************************
#******************************************************************************
#******************************************************************************
 007:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22   19.091 No_date    9:36  136.27 .706
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 007:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22   19.091 No_date    9:36  136.27  n/a
                    +  01:GOLFE       4939.67  190.184 No_date   13:08  119.45  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89  201.348 No_date   12:54  120.56  n/a
#******************************************************************************
#******************************************************************************
#Flows to Flow Node 2B
 007:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    6.114 No_date    9:04  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
 007:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    6.114 No_date    9:04  118.92  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    6.114 No_date   12:58  118.92  n/a
 007:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    9.161 No_date    9:06  118.12 .612
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 007:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    9.161 No_date    9:06  118.12  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    9.161 No_date   12:58  118.12  n/a
 007:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08   13.497 No_date    9:24  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 007:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08   13.497 No_date    9:24  116.07  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08   13.497 No_date   12:02  116.07  n/a
 007:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    6.114 No_date   12:58  118.92  n/a
                    +  04:S-4LnB       171.81    9.161 No_date   12:58  118.12  n/a
                    +  05:S-3LnA       268.08   13.497 No_date   12:02  116.07  n/a
     [DT= 2.00]  SUM=  02:TBLK1        554.01   28.533 No_date   12:16  117.29  n/a
 007:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88   17.529 No_date    9:18  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 007:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88   17.529 No_date    9:18  116.07  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88   17.529 No_date   10:30  116.07  n/a
 007:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    5.681 No_date    7:48  106.60 .552
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 007:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   28.533 No_date   12:16  117.29  n/a
                    +  04:S-5SRC       341.88   17.529 No_date   10:30  116.07  n/a
                    +  05:2Ln-A        105.00    5.681 No_date    7:48  106.60  n/a
     [DT= 2.00]  SUM=  07:TOTBLK      1000.89   46.140 No_date   11:46  115.76  n/a
 007:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   46.140 No_date   11:46  115.76  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89   44.406 No_date   12:30  115.76  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#******************************************************************************
#******************************************************************************
 007:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   44.406 No_date   12:30  115.76  n/a
                    +  01:GOLFE       5289.89  201.348 No_date   12:54  120.56  n/a
     [DT= 2.00]  SUM=  07:TGOLF       6290.78  245.367 No_date   12:48  119.80  n/a
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#******************************************************************************
#******************************************************************************
 007:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78  245.367 No_date   12:48  119.80  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78  234.916 No_date   13:48  119.80  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#******************************************************************************
#******************************************************************************
 007:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60   15.875 No_date    9:52   90.69 .470
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 007:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    4.340 No_date    9:14   96.29 .499
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 007:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60   15.875 No_date    9:52   90.69  n/a
                    +  04:10SR-B        96.11    4.340 No_date    9:14   96.29  n/a
     [DT= 2.00]  SUM=  03:T10AB        502.71   20.063 No_date    9:42   91.77  n/a
 007:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71   20.063 No_date    9:42   91.77  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71   20.063 No_date   12:10   91.77  n/a
 007:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    5.683 No_date    7:50   82.54 .428
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 007:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    5.683 No_date    7:50   82.54  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    5.683 No_date    9:30   82.54  n/a
 007:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60   11.673 No_date    9:32   93.47 .484
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 007:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    5.683 No_date    9:30   82.54  n/a
                    +  03:14Ln-A       276.60   11.673 No_date    9:32   93.47  n/a
     [DT= 2.00]  SUM=  09:TOT14L       412.12   17.356 No_date    9:30   89.88  n/a
 007:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12   17.356 No_date    9:30   89.88  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12   17.356 No_date   12:58   89.88  n/a
 007:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34   11.491 No_date    9:14  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 007:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34   11.491 No_date    9:14  123.89  n/a
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                  +  05:S10AB        502.71   20.063 No_date   12:10   91.77  n/a
                  +  03:THNYAK       412.12   17.356 No_date   12:58   89.88  n/a
     [DT= 2.00]  SUM=  03:THNYAK      1430.10   55.553 No_date   11:44  101.31  n/a
 007:0089--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   55.553 No_date   11:44  101.31  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   55.553 No_date   13:46  101.31  n/a
#****************************************************************************
#****************************************************************************
 007:0090--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   55.553 No_date   13:46  101.31  n/a
                  +  02:GOLF        6290.78  234.916 No_date   13:48  119.80  n/a
     [DT= 2.00]  SUM=  09:HWY400      7720.88  290.468 No_date   13:48  116.37  n/a
#****************************************************************************
#****************************************************************************
 007:0091--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88  290.468 No_date   13:48  116.37  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88  265.749 No_date   15:12  116.37  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#****************************************************************************
#****************************************************************************
 007:0092--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    5.998 No_date    9:08  109.52 .567
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 007:0093--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    5.998 No_date    9:08  109.52  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    5.998 No_date   10:56  109.52  n/a
 007:0094--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    4.980 No_date    8:24  110.30 .571
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 007:0095--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    4.980 No_date    8:24  110.30  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    4.980 No_date   10:26  110.30  n/a
 007:0096--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    2.445 No_date    7:00  151.74 .786
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 007:0097--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36    2.244 No_date    7:36   87.96 .456
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 007:0098--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36    2.244 No_date    7:36   87.96  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36    2.244 No_date    8:20   87.96  n/a
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 007:0099--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    5.998 No_date   10:56  109.52  n/a
                  +  04:S-5SRA        97.15    4.980 No_date   10:26  110.30  n/a
                  +  05:15Ln-A        37.07    2.445 No_date    7:00  151.74  n/a
                  +  07:S-H89A        47.36    2.244 No_date    8:20   87.96  n/a
     [DT= 2.00]  SUM=  06:TOTPLM       300.59   14.220 No_date   10:12  111.58  n/a
 007:0100--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59   14.220 No_date   10:12  111.58  n/a
                  +  01:DR#6        7720.88  265.749 No_date   15:12  116.37  n/a
     [DT= 2.00]  SUM=  09:TFN15L      8021.47  269.848 No_date   15:02  116.19  n/a
 007:0002-----------------------------------------------------------------------
     FINISH
-------------------------------------------------------------------------------
*******************************************************************************
    WARNINGS / ERRORS / NOTES
    -------------------------
 001:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0022 ROUTE CHANNEL   ->
```



```
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 002:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 003:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 003:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 003:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 003:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 003:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 003:0077 ROUTE CHANNEL   ->
```



```
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 004:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 004:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 004:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 004:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 005:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 005:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
```

```
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 005:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 005:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 006:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 006:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
```



```
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 007:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
   Simulation ended on 2018-02-08     at 14:10:08
==================================================================================
```

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

D2

Sub-Appendix D2

Climate Change Design Storms

```
2     Metric units
*#****************************************************************************
*#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
*#  Project No. : [300038790]
*#  Date        : 2018-02-08
*#  Date Rev.   : N/A
*#  Modeller    : [T.Lozon]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#****************************************************************************
*%
*# EXISTING CONDITION
*# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
*# MTO IDF RAINFALL TOOL
*# 24 HR SCS TYPE II
*# Modified IA - Using NRSCS IA instead of NVCA IA
*#
*# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
*# TOPOGRAPHIC SURVEY INFORMATION
*# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
*%
*%
*%
*% 2-Year SCS Type-II Storm Distribution (24-hour) MTO IDF CURVE TOOL
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS24.txt"] <--storm filename
*%-----------------|--------------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|--------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE ORANGE
*#Flows to Flow Node 5 (LINE 5)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 7 Ln-A
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["7Ln-A"], DT=[2]min, AREA=[92.30](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[22.8](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 7 Ln-A to Flow Node 1
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-7LnA"], IDin=[1], TLAG=[278.45](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 5 SR-E
```



```
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["5SR-E"], DT=[2]min, AREA=[225.54](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                    N=[3], TP=[2.07]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-E to Flow Node 1
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRE"], IDin=[1], TLAG=[165.95](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 10 SR-G (NO ROUTING NEEDED)
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-G"], DT=[2]min, AREA=[505.12](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[19.8](mm),
                    N=[3], TP=[2.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment CR 4-D
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["CR4-D"], DT=[2]min, AREA=[36.36](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                    N=[3], TP=[0.79]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment CR 4-D to Flow Node 1
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-CR4D"], IDin=[5], TLAG=[84.11](min)
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 6 Ln-A
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["6Ln-A"], DT=[2]min, AREA=[310.44](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[17.8](mm),
                    N=[3], TP=[1.26]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 6 Ln-A to Flow Node 1
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["S-6LnA"], IDin=[1], TLAG=[86.92](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 5 Ln-A
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["5Ln-A"], DT=[2]min, AREA=[461.49](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.0](mm),
                    N=[3], TP=[1.44]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
```



```
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*% TOTAL FLOWS AT LINE 5
*%Add flows at Flow Node 7 from Catchments 7 Ln-A, 5 SR-E, 10 SR-G, CR 4-D,
*%   6 Ln-A & 5 Ln-A
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN5"], IDs to add=[2+3+4+6+7+8]
*%-----------------|--------------------------------------------------------------|

*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 5 TO LINE 4
*% DRAIN #1
*% USE HEC-RAS X-SECTION 18
ROUTE CHANNEL       IDout=[1], NHYD=["DR#1"], IDin=[9],
                    RDT=[5](min),
                    CHLGTH=[1780](m),  CHSLOPE=[0.29](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[18],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,249.27] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0,234.17]
                                                   [205.47,230.2]
                                                   [212.04,229.96]
                                                   [215.28,227.63]
                                                   [216.96,227.6]
                                                   [221.63,229.92]
                                                   [249.27,230.06]
*%-----------------|--------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE RED
*%
*%Flows from Catchment CR 4-C
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-C"], DT=[2]min, AREA=[55.76](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment CR 4-C to Flow Node 3
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4C"], IDin=[2], TLAG=[222.18](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 4 Ln-F
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-F"], DT=[2]min, AREA=[472.58](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.9](mm),
```



```
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-F to Flow Node 3
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnF"], IDin=[2], TLAG=[156.21](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 4 Ln-E
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["4Ln-E"], DT=[2]min, AREA=[92.9](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[16.9](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*% TOTAL RED
*% Add from Catchments CR4-C,4Ln-F,4Ln-E
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTRED"], IDs to add=[3+4+5]
*%-----------------|--------------------------------------------------------------|
*% TOTAL FLOW TO LINE 4
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN4"], IDs to add=[9+1]
*%-----------------|--------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 4 TO LINE 3
*% USE HEC X-SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1530](m),  CHSLOPE=[0.23](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,779.49] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[746.77,227.72]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]

*%-----------------|--------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE FLOWS TO LINE 3 NORTH DITCH
*%
CALIB NASHYD        ID=[2], NHYD=["CR4-B"], DT=[2]min, AREA=[126.62](ha),
                    DWF=[0](cms), CN/C=[66.0], IA=[27.4](mm),
                    N=[3], TP=[0.97]hrs,
```

```
                  RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Shift flow from Catchment CR 4-B to Flow Node 3
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-CR4B"], IDin=[2], TLAG=[41.18](min)
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 3 Ln-E
CALIB NASHYD       ID=[5], NHYD=["3Ln-E"], DT=[2]min, AREA=[185.00](ha),
                   DWF=[0](cms), CN/C=[70.0], IA=[21.8](mm),
                   N=[3], TP=[1.30]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*% LINE 3 NORTH DITCH
*% Add from Catchments
ADD HYD            IDsum=[2], NHYD=["TLN3ND"], IDs to add=[4+5]
*%-----------------|---------------------------------------------------------------|
*%Shift flow from LIN3ND TO FLOW NODE 3
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[6], NHYD=["S-L3ND"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|---------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%Flows from Catchment CR 4-A
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["CR4-A"], DT=[2]min, AREA=[181.15](ha),
                   DWF=[0](cms), CN/C=[76.0], IA=[16.0](mm),
                   N=[3], TP=[1.00]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Shift flow from Catchment CR 4-A to Flow Node 3
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-CR4A"], IDin=[2], TLAG=[147.74](min)
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment CR 4-B
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 10 SR-F
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["10SR-F"], DT=[2]min, AREA=[158.41](ha),
                   DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                   N=[3], TP=[1.72]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*% LINE 3 SOUTH DITCH
ADD HYD            IDsum=[2], NHYD=["TLN3SD"], IDs to add=[2+3]
*%-----------------|---------------------------------------------------------------|
*%Shift flow from LIN3NS TO FLOW NODE 3
```



```
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[5], NHYD=["S-L3NS"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|---------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************

*%Flows from Catchment 3 Ln-D
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[7], NHYD=["3Ln-D"], DT=[2]min, AREA=[213.80](ha),
                   DWF=[0](cms), CN/C=[81.0], IA=[11.9](mm),
                   N=[3], TP=[1.18]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 4 Ln-D
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[8], NHYD=["4Ln-D"], DT=[2]min, AREA=[88.09](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                   N=[3], TP=[0.81]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-D to Flow Node 2
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[2], NHYD=["S-4LnD"], IDin=[8], TLAG=[84.98](min)
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 3 Ln-C
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[8], NHYD=["3Ln-C"], DT=[2]min, AREA=[248.17](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                   N=[3], TP=[1.28]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
ADD HYD            IDsum=[4], NHYD=["TPNK"], IDs to add=[7+2+8]
*%-----------------|---------------------------------------------------------------|
*% TOTAL FLOW AT U/S SIDE OF LINE 3
*% Add from Catchments
ADD HYD            IDsum=[3], NHYD=["TLN3US"], IDs to add=[4+6]
*%-----------------|---------------------------------------------------------------|
*% TOTAL FLOW AT THE D/S LIMTIS OF LINE 3
*%-----------------|---------------------------------------------------------------|
ADD HYD            IDsum=[9], NHYD=["TFN3A"], IDs to add=[3+5+1]
*%-----------------|---------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO MIDWAY TO LINE 2
*% USE HEC SECTION 14
```



```
ROUTE CHANNEL      IDout=[1], NHYD=["DR#2US"], IDin=[9],
                   RDT=[15](min),
                   CHLGTH=[685](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[14],        NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                  [746.77,227.77]
                                                  [762.52,227.56]
                                                  [766.8,225]
                                                  [768.23,225]
                                                  [779.49,227.48]
                                                  [900.00,228.00]

*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 10 SR-E
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["10SR-E"], DT=[2]min, AREA=[225.52](ha),
                   DWF=[0](cms), CN/C=[84.0], IA=[10.4](mm),
                   N=[3], TP=[0.95]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*% TOTAL FLOW MID A JUNCTION BETWEEN LINE 3 AND 2
ADD HYD            IDsum=[9], NHYD=["TMID32"], IDs to add=[1+2]
*%-----------------|---------------------------------------------------------------|
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL      IDout=[1], NHYD=["DR#2DS"], IDin=[9],
                   RDT=[15](min),
                   CHLGTH=[2250](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[14],        NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                  [746.77,227.77]
                                                  [762.52,227.56]
                                                  [766.8,225]
                                                  [768.23,225]
                                                  [779.49,227.48]
                                                  [900.00,228.00]

*%-----------------|---------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE BLUE
*%
```



```
*#Flows FROM WEST OF THE 400 TO 2ND LINE
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 4 Ln-C
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-C"], DT=[2]min, AREA=[230.90](ha),
                   DWF=[0](cms), CN/C=[78.0], IA=[14.3](mm),
                   N=[3], TP=[2.02]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-C to Flow Node 4
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-4LnC"], IDin=[2], TLAG=[60.19](min)
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 5 SR-D
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["5SR-D"], DT=[2]min, AREA=[81.43](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                   N=[3], TP=[1.30]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-D to Flow Node 4
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-5SRD"], IDin=[2], TLAG=[24.84](min)
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment H 400-B
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["H400-B"], DT=[2]min, AREA=[79.99](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[18.8](mm),
                   N=[3], TP=[0.89]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%Shift flow from Catchment H 400-B to Flow Node 4
*%-----------------|---------------------------------------------------------------|
SHIFT HYD          IDout=[5], NHYD=["SH400B"], IDin=[2], TLAG=[12.66](min)
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*%Flows from Catchment 3 Ln-B
*%-----------------|---------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["3Ln-B"], DT=[2]min, AREA=[74.81](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                   N=[3], TP=[0.96]hrs,
                   RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
*%-----------------|---------------------------------------------------------------|
```

```
*%-----------------|-------------------------------------------------------------|
*%Add flows at Flow Node 4 from Catchments 4 Ln-C, 5 SR-D, H 400-B & 3 Ln-B
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLUE
ADD HYD            IDsum=[6], NHYD=["TOTBLU"], IDs to add=[3+4+5+2]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL      IDout=[7], NHYD=["DR#4"], IDin=[6],
                   RDT=[15](min),
                   CHLGTH=[2000](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[14],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                  [746.77,227.77]
                                                  [762.52,227.56]
                                                  [766.8,225]
                                                  [768.23,225]
                                                  [779.49,227.48]
                                                  [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#***************************************************************************
*%Flows from Catchment 10 SR-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["10SR-D"], DT=[2]min, AREA=[110.02](ha),
                   DWF=[0](cms), CN/C=[70.0], IA=[21.8](mm),
                   N=[3], TP=[1.36]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-D to Flow Node 2
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S10SRD"], IDin=[2], TLAG=[153.59](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["2Ln-B"], DT=[2]min, AREA=[318.07](ha),
                   DWF=[0](cms), CN/C=[80.0], IA=[13.5](mm),
                   N=[3], TP=[2.13]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL GREEN
*% Add from Catchments
*%-----------------|-------------------------------------------------------------|
```



```
ADD HYD            IDsum=[5], NHYD=["TOTGRN"], IDs to add=[2+4]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW TO LINE 2
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW UPSTREAM OF THE 2ND LINE
ADD HYD            IDsum=[9], NHYD=["TFN2U"], IDs to add=[5+1+7]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment 10 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[3], NHYD=["10SR-C"], DT=[2]min, AREA=[365.20](ha),
                   DWF=[0](cms), CN/C=[72.0], IA=[20.7](mm),
                   N=[3], TP=[1.39]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-C DOWNSTREAM LIMITS OF 2ND LINE
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S10SRC"], IDin=[3], TLAG=[121.76](min)
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW DOWNSTREAM OF THE 2ND LINE
ADD HYD            IDsum=[4], NHYD=["TFN2D"], IDs to add=[4+9]
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 2 TO FLOW NODE GOLF EAST
*% USE HEC SECTION 11
ROUTE CHANNEL      IDout=[1], NHYD=["RGLF"], IDin=[4],
                   RDT=[15](min),
                   CHLGTH=[785](m),  CHSLOPE=[0.04](%),
                                      FPSLOPE=[0.50](%),
                   SECNUM=[11],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,1500] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                  [860.67,226.03]
                                                  [865.17,223.96]
                                                  [867.01,223.96]
                                                  [871.48,225.21]
                                                  [879.46,225.75]
                                                  [1500.00,226.10]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
```



```
*#*****************************************************************************

*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment H 400-A
*% OUTLET TO GOLFE (GOLF COURSE EAST)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[4], NHYD=["H400-A"], DT=[2]min, AREA=[350.22](ha),
                   DWF=[0](cms), CN/C=[81.0], IA=[11.9](mm),
                   N=[3], TP=[1.89]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% CALCULATE TOTAL FLOW TO FLOW NODE GLFE (GOLF COURSE EAST)
ADD HYD            IDsum=[1], NHYD=["GOLFE"], IDs to add=[4+1]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE BLACK
*#Flows to Flow Node 2B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-A"], DT=[2]min, AREA=[114.12](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[16.9](mm),
                   N=[3], TP=[1.33]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-4LnA"], IDin=[2], TLAG=[234.20](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-B"], DT=[2]min, AREA=[171.81](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[17.8](mm),
                   N=[3], TP=[1.34]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-B to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-4LnB"], IDin=[2], TLAG=[232.52](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
```



```
*%Flows from Catchment 3 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["3Ln-A"], DT=[2]min, AREA=[268.08](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                   N=[3], TP=[1.61]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 3 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[5], NHYD=["S-3LnA"], IDin=[2], TLAG=[158.77](min)
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[2], NHYD=["TBLK1"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[3], NHYD=["5SR-C"], DT=[2]min, AREA=[341.88](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[17.8](mm),
                   N=[3], TP=[1.50]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-C to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-5SRC"], IDin=[3], TLAG=[72.46](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[5], NHYD=["2Ln-A"], DT=[2]min, AREA=[105.00](ha),
                   DWF=[0](cms), CN/C=[71.0], IA=[21.8](mm),
                   N=[3], TP=[0.96]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLACK
*%Add flows at Flow Node 5 from Catchments 4 Ln-A, 4 Ln-B, 3 Ln-A,
*%    5 SR-C & 2 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[7], NHYD=["TOTBLK"], IDs to add=[2+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TOTBLK TO FLOW NODE GOLF NORTH
*% ROUTE FLOWS FROM LINE 2 FLOW NODE GOLFN
*% USE HEC SECTION 11
ROUTE CHANNEL      IDout=[2], NHYD=["GOLFN"], IDin=[7],
                   RDT=[15](min),
```

```
                  CHLGTH=[330](m),  CHSLOPE=[0.04](%),
                                    FPSLOPE=[0.50](%),
                  SECNUM=[11],       NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                  ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                  [860.67,226.03]
                                                  [865.17,223.96]
                                                  [867.01,223.96]
                                                  [871.48,225.21]
                                                  [879.46,225.75]
                                                  [1500,226.10]

*%-----------------|------------------------------------------------------------|
*#*************************************************************************
*#*************************************************************************
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOWS FROM GOLF NORTH AND GOLF EAST
ADD HYD           IDsum=[7], NHYD=["TGOLF"], IDs to add=[2+1]
*%-----------------|------------------------------------------------------------|
*#*************************************************************************
*#*************************************************************************
*%-----------------|------------------------------------------------------------|
*% ROUTE FLOWS FROM TGOLF TO HWY 400
*% USE HEC SECTION 11
ROUTE CHANNEL     IDout=[2], NHYD=["GOLF"], IDin=[7],
                  RDT=[15](min),
                  CHLGTH=[485](m),  CHSLOPE=[0.04](%),
                                    FPSLOPE=[0.50](%),
                  SECNUM=[11],       NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                  ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                  [860.67,226.03]
                                                  [865.17,223.96]
                                                  [867.01,223.96]
                                                  [871.48,225.21]
                                                  [879.46,225.75]
                                                  [1500,226.10]

*%-----------------|------------------------------------------------------------|
*#*************************************************************************
*#*************************************************************************
*% YELLOW SOUTH( HNYDCZAK DRAIN)
*%Flows from Catchment 10 SR-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[3], NHYD=["10SR-A"], DT=[2]min, AREA=[406.60](ha),
                  DWF=[0](cms), CN/C=[65.0], IA=[27.4](mm),
                  N=[3], TP=[1.82]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
```



```
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 10 SR-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[4], NHYD=["10SR-B"], DT=[2]min, AREA=[96.11](ha),
                  DWF=[0](cms), CN/C=[67.0], IA=[25.0](mm),
                  N=[3], TP=[1.28]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B
*% INTERSECTION OF 10 SIDEROAD AND HWY 89
ADD HYD           IDsum=[3], NHYD=["T10AB"], IDs to add=[3+4]
*%-----------------|------------------------------------------------------------|
*% SHIFT FLOW INTERSECTION OF 10 SIDEROAD AND HWY 89 TO OUTLET OF CR-89A
*%-----------------|------------------------------------------------------------|
SHIFT HYD         IDout=[5], NHYD=["S10AB"], IDin=[3], TLAG=[148.99](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|

*%Flows from Catchment 13 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[3], NHYD=["13Ln-A"], DT=[2]min, AREA=[135.52](ha),
                  DWF=[0](cms), CN/C=[62], IA=[31.1](mm),
                  N=[3], TP=[0.91]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% SHIFT FLOW FROM OUTLET OF 13 Ln-A to outelt of 14 Ln-A
*%-----------------|------------------------------------------------------------|
SHIFT HYD         IDout=[4], NHYD=["S13LnA"], IDin=[3], TLAG=[100.46](min)
*%-----------------|------------------------------------------------------------|

*%Flows from Catchment 14 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[3], NHYD=["14Ln-A"], DT=[2]min, AREA=[276.60](ha),
                  DWF=[0](cms), CN/C=[66], IA=[26.2](mm),
                  N=[3], TP=[1.55]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT THE 14TH LINE
*%
*%-----------------|------------------------------------------------------------|
ADD HYD           IDsum=[9], NHYD=["TOT14L"], IDs to add=[4+3]
*%-----------------|------------------------------------------------------------|
*% SHIFT FLOW FROM 14TH LINE TO HIGHWAY 89
*%-----------------|------------------------------------------------------------|
SHIFT HYD         IDout=[3], NHYD=["S13LnA"], IDin=[9], TLAG=[209.97](min)
*%-----------------|------------------------------------------------------------|
```



```
*%Flows from Catchment CR 89-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[4], NHYD=["CR89-A"], DT=[2]min, AREA=[212.34](ha),
                  DWF=[0](cms), CN/C=[77.0], IA=[16.0](mm),
                  N=[3], TP=[1.51]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|

*% ADD FLOWS FROM 10A + 10B + CR 89-A
*% HNYDCZAK CROSSES HWY 89
ADD HYD           IDsum=[3], NHYD=["THNYAK"], IDs to add=[4+5+3]
*%-----------------|------------------------------------------------------------|
*% SHIFT FLOWS FROM HNYDCZAK CROSSES HWY 89 TO FLOW NODE HYND
*% FLOW NODE HYND LOCATED AT THE OUTLET OF THE HNYDCZAK UPSTREAM OF HIGHWAY 400
SHIFT HYD         IDout=[4], NHYD=["HYND"], IDin=[3], TLAG=[123.60](min)
*%-----------------|------------------------------------------------------------|
*#*************************************************************************
*#*************************************************************************
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW AT HWY 400
*%
*%-----------------|------------------------------------------------------------|
ADD HYD           IDsum=[9], NHYD=["HWY400"], IDs to add=[4+2]
*%-----------------|------------------------------------------------------------|
*#*************************************************************************
*#*************************************************************************
*% ROUTE FLOWS FROM HWY 400 TO 15TH LINE
*% USE HEC SECTION 6
ROUTE CHANNEL     IDout=[1], NHYD=["DR#6"], IDin=[9],
                  RDT=[15](min),
                  CHLGTH=[1700](m),  CHSLOPE=[0.01](%),
                                     FPSLOPE=[0.50](%),
                  SECNUM=[6],       NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.06,400.82] NSEG times
                  ( DISTANCE (m), ELEVATION (m))=[200.00,225.3]
                                                  [220.07,225.18]
                                                  [231.91,224.9]
                                                  [240.6,222.78]
                                                  [245.45,222.77]
                                                  [251.91,224.78]
                                                  [355.82,225.16]
                                                  [400.82,225.30]

*%-----------------|------------------------------------------------------------|
*#*************************************************************************
*#*************************************************************************
```



```
*% CALCULATE PLUM
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[2], NHYD=["5SR-B"], DT=[2]min, AREA=[119.01](ha),
                  DWF=[0](cms), CN/C=[72.0], IA=[20.7](mm),
                  N=[3], TP=[1.29]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-B to Flow Node 8
*%-----------------|------------------------------------------------------------|
SHIFT HYD         IDout=[3], NHYD=["S-5SRB"], IDin=[2], TLAG=[108.27](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[2], NHYD=["5SR-A"], DT=[2]min, AREA=[97.15](ha),
                  DWF=[0](cms), CN/C=[72.0], IA=[19.8](mm),
                  N=[3], TP=[1.20]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-A to Flow Node 8
*%-----------------|------------------------------------------------------------|
SHIFT HYD         IDout=[4], NHYD=["S-5SRA"], IDin=[2], TLAG=[123.28](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 15 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB STANDHYD    ID= [5], NHYD=["15Ln-A"], DT=[2](min), AREA=[37.07](ha),
                  XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[68],
                  Pervious   surfaces: IAper=[7.9](mm), SLPP=[1.0](%),
                                       LGP=[1685.7](m), MNP=[.25], SCP=[0](min),
                  Impervious surfaces: IAimp=[2](mm), SLPI=[0.9](%),
                                       LGI=[218.72](m), MNI=[.013], SCI=[0](min),
                  RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment H 89-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD      ID=[6], NHYD=["H89-A"], DT=[2]min, AREA=[47.36](ha),
                  DWF=[0](cms), CN/C=[64.0], IA=[28.6](mm),
                  N=[3], TP=[0.80]hrs,
                  RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment H 89-A to Flow Node 8
*%-----------------|------------------------------------------------------------|
SHIFT HYD         IDout=[7], NHYD=["S-H89A"], IDin=[6], TLAG=[45.46](min)
```

```
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*% TOTAL PLUM
*%Add flows at Flow Node 8 from Catchments 5 SR-B, 5 SR-A, H 89-A, 15 Ln-A
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD            IDsum=[6], NHYD=["TOTPLM"], IDs to add=[3+4+5+7]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD            IDsum=[9], NHYD=["TFN15L"], IDs to add=[6+1]
*%-----------------|-----------------------------------------------------------|
*% 5-Year SCS Type-II Storm Distribution (24-hour) MTO IDF CURVE TOOL
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                  ["5SCS24.txt"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 10-Year SCS Type-II Storm Distribution (24-hour) MTO IDF CURVE TOOL
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                  ["10SCS24.txt"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 25-Year SCS Type-II Storm Distribution (24-hour) MTO IDF CURVE TOOL
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                  ["25SCS24.txt"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 50-Year SCS Type-II Storm Distribution (24-hour) MTO IDF CURVE TOOL
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                  ["50SCS24.txt"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 100-Year SCS Type-II Storm Distribution (24-hour) MTO IDF CURVE TOOL
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                  ["100SCS24.txt"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% Timmins Regional Storm Distribution (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
*%                  ["12REGTIM.O89"] <--storm filename
*%-----------------|-----------------------------------------------------------|
FINISH
```

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3877524
       StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05 *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors       *********
 *********                OTTHYMO-83 and OTTHYMO-89.                    *********
 ******************************************************************************
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 *********                  Ottawa,  Ontario: (613) 836-3884            *********
 *********                  Gatineau, Quebec: (819) 243-6858            *********
 *********                  E-Mail: swmhymo@jfsa.Com                    *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: R. J. Burnside & Associates Ltd.              +++++++++
 +++++++++                Brampton              SERIAL#:3877524         +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
 *********           Maximum value for ID numbers  :     10             *********
 *********           Max. number of rainfall points: 105408             *********
 *********           Max. number of flow points    : 105408             *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).               *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).  *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.). *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).  *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.           *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).     *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).     *****
 *****     *:  see WARNING or NOTE message printed at end of run.       *****
 *****    **:  see  ERROR  message printed at end of run.               *****
 ******************************************************************************
 ******************************************************************************
```



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::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 **********************  S U M M A R Y   O U T P U T  **********************
 ******************************************************************************
 *        DATE: 2018-02-08      TIME: 14:10:37      RUN COUNTER: 000217        *
 ******************************************************************************
 * Input   filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\___24H~2\EX_FIN~1.TXT *
 * Output  filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\___24H~2\EX_FIN~1.out *
 * Summary filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\___24H~2\EX_FIN~1.sum *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 ******************************************************************************


#******************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#******************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 RUN:COMMAND#
 001:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002-----------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=  24.25:PTOT=  57.60]
```



```
#******************************************************************************
#******************************************************************************
#Flows to Flow Node 5 (LINE 5)
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:7Ln-A         92.30     .399 No_date   13:36    8.43 .146
      [CN= 70.0: N= 3.00]
      [Tp= 1.20:DT= 2.14]
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:7Ln-A         92.30     .399 No_date   13:36    8.43  n/a
      [LAG=278.5 min]<- 02:S-7LnA        92.30     .399 No_date   18:12    8.43  n/a
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:5SR-E        225.54    1.372 No_date   14:34   14.73 .256
      [CN= 77.0: N= 3.00]
      [Tp= 2.07:DT= 2.14]
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:5SR-E        225.54    1.372 No_date   14:34   14.73  n/a
      [LAG=165.9 min]<- 03:S-5SRE       225.54    1.372 No_date   17:19   14.73  n/a
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-G       505.12    1.839 No_date   15:06   10.46 .182
      [CN= 72.0: N= 3.00]
      [Tp= 2.36:DT= 2.14]
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:CR4-D         36.36     .355 No_date   12:53   12.28 .213
      [CN= 74.0: N= 3.00]
      [Tp=  .79:DT= 2.14]
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:CR4-D         36.36     .355 No_date   12:53   12.28  n/a
      [LAG= 84.1 min]<- 06:S-CR4D        36.36     .355 No_date   14:17   12.28  n/a
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:6Ln-A        310.44    2.255 No_date   13:32   12.73 .221
      [CN= 75.0: N= 3.00]
      [Tp= 1.26:DT= 2.14]
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:6Ln-A        310.44    2.255 No_date   13:32   12.73  n/a
      [LAG= 86.9 min]<- 07:S-6LnA       310.44    2.255 No_date   14:57   12.73  n/a
 001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:5Ln-A        461.49    3.528 No_date   13:45   14.21 .247
      [CN= 76.0: N= 3.00]
      [Tp= 1.44:DT= 2.14]
 001:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:S-7LnA        92.30     .399 No_date   18:12    8.43  n/a
                    +   03:S-5SRE       225.54    1.372 No_date   17:19   14.73  n/a
                    +   04:10SR-G       505.12    1.839 No_date   15:06   10.46  n/a
                    +   06:S-CR4D        36.36     .355 No_date   14:17   12.28  n/a
                    +   07:S-6LnA       310.44    2.255 No_date   14:57   12.73  n/a
                    +   08:5Ln-A        461.49    3.528 No_date   13:45   14.21  n/a
      [DT= 2.14]  SUM=  09:TOTFN5      1631.25    7.308 No_date   14:34   12.47  n/a
#******************************************************************************
```



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#******************************************************************************
 001:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN5      1631.25    7.308 No_date   14:34   12.47  n/a
  *   [RDT= 2.14] out<- 01:DR#1        1631.25    7.173 No_date   14:57   12.47  n/a
      [L/S/n= 1780./ .290/.030]
      {Vmax= 1.463:Dmax= 1.302}
#******************************************************************************
#******************************************************************************
 001:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-C         55.76     .446 No_date   13:08   11.76 .204
      [CN= 74.0: N= 3.00]
      [Tp=  .95:DT= 2.14]
 001:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-C         55.76     .446 No_date   13:08   11.76  n/a
      [LAG=222.2 min]<- 03:S-CR4C        55.76     .446 No_date   16:49   11.76  n/a
 001:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-F        472.58    3.011 No_date   14:08   13.70 .238
      [CN= 76.0: N= 3.00]
      [Tp= 1.72:DT= 2.14]
 001:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-F        472.58    3.011 No_date   14:08   13.70  n/a
      [LAG=156.2 min]<- 04:S-4LnF       472.58    3.011 No_date   16:42   13.70  n/a
 001:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:4Ln-E         92.90     .943 No_date   13:02   13.70 .238
      [CN= 76.0: N= 3.00]
      [Tp=  .91:DT= 2.14]
 001:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-CR4C        55.76     .446 No_date   16:49   11.76  n/a
                    +   04:S-4LnF       472.58    3.011 No_date   16:42   13.70  n/a
                    +   05:4Ln-E         92.90     .943 No_date   13:02   13.70  n/a
      [DT= 2.14]  SUM=  09:TOTRED       621.24    3.667 No_date   16:42   13.53  n/a
 001:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            09:TOTFN4       621.24    3.667 No_date   16:42   13.53  n/a
                    +   01:DR#1        1631.25    7.173 No_date   14:57   12.47  n/a
      [DT= 2.14]  SUM=  09:TOTFN4      2252.49    9.943 No_date   16:17   12.76  n/a
#******************************************************************************
#******************************************************************************
 001:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN4      2252.49    9.943 No_date   16:17   12.76  n/a
  *   [RDT= 2.14] out<- 01:DR#2        2252.49    9.837 No_date   16:32   12.76  n/a
      [L/S/n= 1530./ .230/.030]
      {Vmax= 1.301:Dmax= 1.352}
#******************************************************************************
#******************************************************************************
 001:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-B        126.62     .353 No_date   13:27    5.66 .098
      [CN= 66.0: N= 3.00]
      [Tp=  .97:DT= 2.14]
```

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 001:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-B         126.62      .353 No_date   13:27     5.66  n/a
     [LAG= 41.2 min]<- 04:S-CR4B         126.62      .353 No_date   14:08     5.66  n/a
 001:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:3Ln-E         185.00      .819 No_date   13:45     8.86 .154
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 001:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S-CR4B        126.62      .353 No_date   14:08     5.66  n/a
                     +  05:3Ln-E         185.00      .819 No_date   13:45     8.86  n/a
     [DT= 2.14]  SUM=   02:TLN3ND        311.62     1.157 No_date   13:55     7.56  n/a
 001:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND        311.62     1.157 No_date   13:55     7.56  n/a
     [LAG= 66.9 min]<- 06:S-L3ND         311.62     1.157 No_date   15:02     7.56  n/a
#************************************************************************
#************************************************************************
 001:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:CR4-A         181.15     1.814 No_date   13:08    14.21 .247
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.14]
 001:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A         181.15     1.814 No_date   13:08    14.21  n/a
     [LAG=147.7 min]<- 03:S-CR4A         181.15     1.814 No_date   15:34    14.21  n/a
 001:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-F        158.41     1.106 No_date   14:06    14.73 .256
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 001:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TLN3SD        158.41     1.106 No_date   14:06    14.73  n/a
                     +  03:S-CR4A        181.15     1.814 No_date   15:34    14.21  n/a
     [DT= 2.14]  SUM=   02:TLN3SD        339.56     2.672 No_date   15:27    14.45  n/a
 001:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD        339.56     2.672 No_date   15:27    14.45  n/a
     [LAG= 66.9 min]<- 05:S-L3NS         339.56     2.672 No_date   16:34    14.45  n/a
#************************************************************************
#************************************************************************
 001:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:3Ln-D         213.80     2.889 No_date   13:17    19.84 .344
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.14]
 001:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:4Ln-D          88.09      .935 No_date   12:55    13.21 .229
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.14]
 001:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:4Ln-D          88.09      .935 No_date   12:55    13.21  n/a
     [LAG= 85.0 min]<- 02:S-4LnD          88.09      .935 No_date   14:19    13.21  n/a
 001:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



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    CALIB NASHYD        08:3Ln-C         248.17     1.884 No_date   13:32    13.21 .229
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 001:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:3Ln-D         213.80     2.889 No_date   13:17    19.84  n/a
                     +  02:S-4LnD         88.09      .935 No_date   14:19    13.21  n/a
                     +  08:3Ln-C         248.17     1.884 No_date   13:32    13.21  n/a
     [DT= 2.14]  SUM=   04:TPNK          550.06     5.162 No_date   13:49    15.79  n/a
 001:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TPNK          550.06     5.162 No_date   13:49    15.79  n/a
                     +  06:S-L3ND        311.62     1.157 No_date   15:02     7.56  n/a
     [DT= 2.14]  SUM=   03:TLN3US        861.68     5.775 No_date   14:04    12.81  n/a
 001:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:TLN3US        861.68     5.775 No_date   14:04    12.81  n/a
                     +  05:S-L3NS        339.56     2.672 No_date   16:34    14.45  n/a
                     +  01:DR#2         2252.49     9.837 No_date   16:32    12.76  n/a
     [DT= 2.14]  SUM=   09:TFN3A        3453.73    15.163 No_date   16:21    12.94  n/a
#************************************************************************
#************************************************************************
#************************************************************************
#************************************************************************
#************************************************************************
 001:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TFN3A        3453.73    15.163 No_date   16:21    12.94  n/a
  *  [RDT= 2.14] out<- 01:DR#2US        3453.73    14.963 No_date   16:27    12.94  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .752:Dmax= 2.325}
 001:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-E        225.52     4.371 No_date   13:00    23.31 .405
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 001:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:DR#2US       3453.73    14.963 No_date   16:27    12.94  n/a
                     +  02:10SR-E        225.52     4.371 No_date   13:00    23.31  n/a
     [DT= 2.14]  SUM=   09:TMID32       3679.25    15.806 No_date   16:17    13.58  n/a
#************************************************************************
 001:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TMID32       3679.25    15.806 No_date   16:17    13.58  n/a
  *  [RDT= 2.14] out<- 01:DR#2DS        3679.25    15.068 No_date   16:47    13.57  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .761:Dmax= 2.366}
#************************************************************************
#************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 001:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-C         230.90     1.628 No_date   14:25    16.31 .283
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.14]
```



```
 001:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C         230.90     1.628 No_date   14:25    16.31  n/a
     [LAG= 60.2 min]<- 03:S-4LnC         230.90     1.628 No_date   15:25    16.31  n/a
 001:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-D          81.43      .521 No_date   13:38    11.76 .204
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 001:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-D          81.43      .521 No_date   13:38    11.76  n/a
     [LAG= 24.8 min]<- 04:S-5SRD          81.43      .521 No_date   14:02    11.76  n/a
 001:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:H400-B         79.99      .670 No_date   13:04    11.76 .204
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.14]
 001:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:H400-B         79.99      .670 No_date   13:04    11.76  n/a
     [LAG= 12.7 min]<- 05:SH400B          79.99      .670 No_date   13:15    11.76  n/a
 001:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-B          74.81      .635 No_date   13:08    12.28 .213
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 001:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnC        230.90     1.628 No_date   15:25    16.31  n/a
                     +  04:S-5SRD         81.43      .521 No_date   14:02    11.76  n/a
                     +  05:SH400B         79.99      .670 No_date   13:15    11.76  n/a
                     +  02:3Ln-B          74.81      .635 No_date   13:08    12.28  n/a
     [DT= 2.14]  SUM=   06:TOTBLU        467.13     2.632 No_date   14:36    14.09  n/a
#************************************************************************
#************************************************************************
 001:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 06:TOTBLU        467.13     2.632 No_date   14:36    14.09  n/a
  *  [RDT= 2.14] out<- 07:DR#4           467.13     2.235 No_date   15:36    14.09  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .484:Dmax= 1.112}
#************************************************************************
#**********************************************************************
 001:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:10SR-D        110.02      .473 No_date   13:49     8.86 .154
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.14]
 001:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:10SR-D        110.02      .473 No_date   13:49     8.86  n/a
     [LAG=153.6 min]<- 04:S10SRD         110.02      .473 No_date   16:21     8.86  n/a
 001:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:2Ln-B         318.07     2.429 No_date   14:32    18.07 .314
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.14]
 001:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD             02:2Ln-B         318.07     2.429 No_date   14:32    18.07  n/a
                     +  04:S10SRD        110.02      .473 No_date   16:21     8.86  n/a
     [DT= 2.14]  SUM=   05:TOTGRN        428.09     2.573 No_date   15:21    15.71  n/a
 001:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:TOTGRN        428.09     2.573 No_date   15:21    15.71  n/a
                     +  01:DR#2DS       3679.25    15.068 No_date   16:47    13.57  n/a
                     +  07:DR#4          467.13     2.235 No_date   15:36    14.09  n/a
     [DT= 2.14]  SUM=   09:TFN2U        4574.47    19.438 No_date   16:30    13.83  n/a
#************************************************************************
#************************************************************************
 001:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-C        365.20     1.810 No_date   13:49    10.04 .174
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.14]
 001:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:10SR-C        365.20     1.810 No_date   13:49    10.04  n/a
     [LAG=121.8 min]<- 04:S10SRC         365.20     1.810 No_date   15:49    10.04  n/a
 001:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TFN2D         365.20     1.810 No_date   15:49    10.04  n/a
                     +  09:TFN2U        4574.47    19.438 No_date   16:30    13.83  n/a
     [DT= 2.14]  SUM=   04:TFN2D        4939.67    21.137 No_date   16:15    13.55  n/a
#************************************************************************
#************************************************************************
 001:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 04:TFN2D        4939.67    21.137 No_date   16:15    13.55  n/a
  *  [RDT= 2.14] out<- 01:RGLF          4939.67    18.843 No_date   17:17    13.55  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .179:Dmax= 2.102}
#************************************************************************
#************************************************************************
#************************************************************************
#************************************************************************
 001:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:H400-A        350.22     3.293 No_date   14:12    19.84 .344
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.14]
 001:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:H400-A        350.22     3.293 No_date   14:12    19.84  n/a
                     +  01:GOLFE        4939.67    18.843 No_date   17:17    13.55  n/a
     [DT= 2.14]  SUM=   01:GOLFE        5289.89    20.451 No_date   17:12    13.96  n/a
#************************************************************************
#************************************************************************
#Flows to Flow Node 2B
 001:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-A         114.12      .843 No_date   13:36    13.21 .229
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.14]
 001:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12     .843 No_date   13:36   13.21  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12     .843 No_date   17:30   13.21  n/a
 001:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    1.194 No_date   13:38   12.73 .221
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.14]
 001:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    1.194 No_date   13:38   12.73  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    1.194 No_date   17:30   12.73  n/a
 001:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    1.569 No_date   14:02   12.28 .213
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.14]
 001:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    1.569 No_date   14:02   12.28  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    1.569 No_date   16:40   12.28  n/a
 001:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12     .843 No_date   17:30   13.21  n/a
                    +  04:S-4LnB       171.81    1.194 No_date   17:30   12.73  n/a
                    +  05:S-3LnA       268.08    1.569 No_date   16:40   12.28  n/a
     [DT= 2.14]  SUM=  02:TBLK1        554.01    3.472 No_date   17:17   12.61  n/a
 001:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    2.105 No_date   13:53   12.28 .213
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.14]
 001:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    2.105 No_date   13:53   12.28  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    2.105 No_date   15:04   12.28  n/a
 001:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00     .592 No_date   13:15    9.18 .159
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 001:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    3.472 No_date   17:17   12.61  n/a
                    +  04:S-5SRC       341.88    2.105 No_date   15:04   12.28  n/a
                    +  05:2Ln-A        105.00     .592 No_date   13:15    9.18  n/a
     [DT= 2.14]  SUM=  07:TOTBLK      1000.89    4.874 No_date   17:04   12.14  n/a
 001:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89    4.874 No_date   17:04   12.14  n/a
  *  [RDT= 2.14] out<- 02:GOLFN       1000.89    5.182 No_date   17:08   12.14  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .106:Dmax= 1.957}
#******************************************************************************
#******************************************************************************
 001:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    5.182 No_date   17:08   12.14  n/a
                    +  01:GOLFE       5289.89   20.451 No_date   17:12   13.96  n/a
     [DT= 2.14]  SUM=  07:TGOLF       6290.78   25.611 No_date   17:08   13.67  n/a
```



```
#******************************************************************************
#******************************************************************************
 001:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   25.611 No_date   17:08   13.67  n/a
  *  [RDT= 2.14] out<- 02:GOLF        6290.78   23.547 No_date   18:23   13.67  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#******************************************************************************
#******************************************************************************
 001:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60     .763 No_date   14:47    5.46 .095
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.14]
 001:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .296 No_date   13:51    6.74 .117
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 001:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60     .763 No_date   14:47    5.46  n/a
                    +  04:10SR-B        96.11     .296 No_date   13:51    6.74  n/a
     [DT= 2.14]  SUM=  03:T10AB        502.71    1.027 No_date   14:30    5.71  n/a
 001:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    1.027 No_date   14:30    5.71  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    1.027 No_date   16:57    5.71  n/a
 001:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52     .222 No_date   13:38    3.85 .067
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 001:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52     .222 No_date   13:38    3.85  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52     .222 No_date   15:17    3.85  n/a
 001:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60     .659 No_date   14:19    6.08 .106
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.14]
 001:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52     .222 No_date   15:17    3.85  n/a
                    +  03:14Ln-A       276.60     .659 No_date   14:19    6.08  n/a
     [DT= 2.14]  SUM=  09:TOT14L       412.12     .840 No_date   14:49    5.35  n/a
 001:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12     .840 No_date   14:49    5.35  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12     .840 No_date   18:17    5.35  n/a
 001:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    1.632 No_date   13:49   14.73 .256
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.14]
 001:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    1.632 No_date   13:49   14.73  n/a
```



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                    +  05:S10AB        502.71    1.027 No_date   16:57    5.71  n/a
                    +  03:THNYAK       412.12     .840 No_date   18:17    5.35  n/a
     [DT= 2.14]  SUM=  03:THNYAK      1430.10    3.585 No_date   16:15    8.39  n/a
 001:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10    3.585 No_date   16:15    8.39  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10    3.585 No_date   18:17    8.39  n/a
#******************************************************************************
#******************************************************************************
 001:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10    3.585 No_date   18:17    8.39  n/a
                    +  02:GOLF        6290.78   23.547 No_date   18:23   13.67  n/a
     [DT= 2.14]  SUM=  09:HWY400      7720.88   27.130 No_date   18:21   12.69  n/a
#******************************************************************************
#******************************************************************************
 001:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   27.130 No_date   18:21   12.69  n/a
  *  [RDT= 2.14] out<- 01:DR#6        7720.88   24.557 No_date   19:49   12.69  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.529}
#******************************************************************************
#******************************************************************************
 001:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01     .621 No_date   13:40   10.04 .174
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.14]
 001:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01     .621 No_date   13:40   10.04  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01     .621 No_date   15:27   10.04  n/a
 001:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15     .567 No_date   13:32   10.46 .182
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 001:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15     .567 No_date   13:32   10.46  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15     .567 No_date   15:34   10.46  n/a
 001:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    3.472 No_date   12:00   35.10 .609
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 001:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .119 No_date   13:15    4.89 .085
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.14]
 001:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .119 No_date   13:15    4.89  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .119 No_date   14:00    4.89  n/a
```



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 001:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01     .621 No_date   15:27   10.04  n/a
                    +  04:S-5SRA        97.15     .567 No_date   15:34   10.46  n/a
                    +  05:15Ln-A        37.07    3.472 No_date   12:00   35.10  n/a
                    +  07:S-H89A        47.36     .119 No_date   14:00    4.89  n/a
     [DT= 2.14]  SUM=  06:TOTPLM       300.59    3.472 No_date   12:00   12.45  n/a
 001:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    3.472 No_date   12:00   12.45  n/a
                    +  01:DR#6        7720.88   24.557 No_date   19:49   12.69  n/a
     [DT= 2.14]  SUM=  09:TFN15L      8021.47   25.036 No_date   19:47   12.68  n/a
  ** END OF RUN :   1

*******************************************************************************



 RUN:COMMAND#
 002:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   2 ]
#******************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#******************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 002:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=15.00:SDUR=  24.25:PTOT=  74.40]
```

```
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 002:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:7Ln-A         92.30     .909 No_date   13:27   16.59 .223
      [CN= 70.0: N= 3.00]
      [Tp= 1.20:DT= 2.14]
 002:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:7Ln-A         92.30     .909 No_date   13:27   16.59  n/a
      [LAG=278.5 min]<- 02:S-7LnA        92.30     .909 No_date   18:04   16.59  n/a
 002:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:5SR-E        225.54    2.520 No_date   14:25   25.40 .341
      [CN= 77.0: N= 3.00]
      [Tp= 2.07:DT= 2.14]
 002:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:5SR-E        225.54    2.520 No_date   14:25   25.40  n/a
      [LAG=165.9 min]<- 03:S-5SRE       225.54    2.520 No_date   17:10   25.40  n/a
 002:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-G       505.12    3.706 No_date   14:55   19.44 .261
      [CN= 72.0: N= 3.00]
      [Tp= 2.36:DT= 2.14]
 002:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:CR4-D         36.36     .709 No_date   12:51   21.97 .295
      [CN= 74.0: N= 3.00]
      [Tp=  .79:DT= 2.14]
 002:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:CR4-D         36.36     .709 No_date   12:51   21.97  n/a
      [LAG= 84.1 min]<- 06:S-CR4D        36.36     .709 No_date   14:15   21.97  n/a
 002:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:6Ln-A        310.44    4.410 No_date   13:25   22.68 .305
      [CN= 75.0: N= 3.00]
      [Tp= 1.26:DT= 2.14]
 002:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:6Ln-A        310.44    4.410 No_date   13:25   22.68  n/a
      [LAG= 86.9 min]<- 07:S-6LnA       310.44    4.410 No_date   14:51   22.68  n/a
 002:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:5Ln-A        461.49    6.578 No_date   13:38   24.61 .331
      [CN= 76.0: N= 3.00]
      [Tp= 1.44:DT= 2.14]
 002:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:S-7LnA        92.30     .909 No_date   18:04   16.59  n/a
                     +  03:S-5SRE       225.54    2.520 No_date   17:10   25.40  n/a
                     +  04:10SR-G       505.12    3.706 No_date   14:55   19.44  n/a
                     +  06:S-CR4D        36.36     .709 No_date   14:15   21.97  n/a
                     +  07:S-6LnA       310.44    4.410 No_date   14:51   22.68  n/a
                     +  08:5Ln-A        461.49    6.578 No_date   13:38   24.61  n/a
      [DT= 2.14]  SUM=  09:TOTFN5      1631.25   14.095 No_date   14:30   22.24  n/a
#*****************************************************************************
```



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#*****************************************************************************
 002:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN5      1631.25   14.095 No_date   14:30   22.24  n/a
  *   [RDT= 2.14] out<- 01:DR#1        1631.25   13.846 No_date   14:47   22.24  n/a
      [L/S/n= 1780./ .290/.030]
      {Vmax= 1.729:Dmax= 1.760}
#*****************************************************************************
#*****************************************************************************
 002:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-C         55.76     .907 No_date   13:04   21.34 .287
      [CN= 74.0: N= 3.00]
      [Tp=  .95:DT= 2.14]
 002:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-C         55.76     .907 No_date   13:04   21.34  n/a
      [LAG=222.2 min]<- 03:S-CR4C        55.76     .907 No_date   16:45   21.34  n/a
 002:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-F        472.58    5.686 No_date   14:02   24.01 .323
      [CN= 76.0: N= 3.00]
      [Tp= 1.72:DT= 2.14]
 002:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-F        472.58    5.686 No_date   14:02   24.01  n/a
      [LAG=156.2 min]<- 04:S-4LnF       472.58    5.686 No_date   16:36   24.01  n/a
 002:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:4Ln-E         92.90    1.817 No_date   12:57   24.01 .323
      [CN= 76.0: N= 3.00]
      [Tp=  .91:DT= 2.14]
 002:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-CR4C        55.76     .907 No_date   16:45   21.34  n/a
                     +  04:S-4LnF       472.58    5.686 No_date   16:36   24.01  n/a
                     +  05:4Ln-E         92.90    1.817 No_date   12:57   24.01  n/a
      [DT= 2.14]  SUM=  09:TOTRED       621.24    6.932 No_date   16:36   23.77  n/a
 002:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            09:TOTFN4       621.24    6.932 No_date   16:36   23.77  n/a
                     +  01:DR#1        1631.25   13.846 No_date   14:47   22.24  n/a
      [DT= 2.14]  SUM=  09:TOTFN4      2252.49   18.500 No_date   16:10   22.66  n/a
#*****************************************************************************
#*****************************************************************************
 002:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN4      2252.49   18.500 No_date   16:10   22.66  n/a
  *   [RDT= 2.14] out<- 01:DR#2        2252.49   18.353 No_date   16:21   22.66  n/a
      [L/S/n= 1530./ .230/.030]
      {Vmax= 1.522:Dmax= 1.758}
#*****************************************************************************
#*****************************************************************************
 002:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-B        126.62     .977 No_date   13:15   12.42 .167
      [CN= 66.0: N= 3.00]
      [Tp=  .97:DT= 2.14]
```



```
 002:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-B        126.62     .977 No_date   13:15   12.42  n/a
      [LAG= 41.2 min]<- 04:S-CR4B       126.62     .977 No_date   13:55   12.42  n/a
 002:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:3Ln-E        185.00    1.803 No_date   13:34   17.14 .230
      [CN= 70.0: N= 3.00]
      [Tp= 1.30:DT= 2.14]
 002:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S-CR4B       126.62     .977 No_date   13:55   12.42  n/a
                     +  05:3Ln-E        185.00    1.803 No_date   13:34   17.14  n/a
      [DT= 2.14]  SUM=  02:TLN3ND       311.62    2.750 No_date   13:45   15.22  n/a
 002:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:TLN3ND       311.62    2.750 No_date   13:45   15.22  n/a
      [LAG= 66.9 min]<- 06:S-L3ND       311.62    2.750 No_date   14:51   15.22  n/a
#*****************************************************************************
#*****************************************************************************
 002:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-A        181.15    3.414 No_date   13:04   24.61 .331
      [CN= 76.0: N= 3.00]
      [Tp= 1.00:DT= 2.14]
 002:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-A        181.15    3.414 No_date   13:04   24.61  n/a
      [LAG=147.7 min]<- 03:S-CR4A       181.15    3.414 No_date   15:30   24.61  n/a
 002:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-F       158.41    2.042 No_date   14:00   25.40 .341
      [CN= 77.0: N= 3.00]
      [Tp= 1.72:DT= 2.14]
 002:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TLN3SD       158.41    2.042 No_date   14:00   25.40  n/a
                     +  03:S-CR4A       181.15    3.414 No_date   15:30   24.61  n/a
      [DT= 2.14]  SUM=  02:TLN3SD       339.56    4.944 No_date   15:23   24.98  n/a
 002:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:TLN3SD       339.56    4.944 No_date   15:23   24.98  n/a
      [LAG= 66.9 min]<- 05:S-L3NS       339.56    4.944 No_date   16:30   24.98  n/a
#*****************************************************************************
#*****************************************************************************
 002:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       07:3Ln-D        213.80    4.875 No_date   13:15   32.00 .430
      [CN= 81.0: N= 3.00]
      [Tp= 1.18:DT= 2.14]
 002:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:4Ln-D         88.09    1.815 No_date   12:51   23.26 .313
      [CN= 75.0: N= 3.00]
      [Tp=  .81:DT= 2.14]
 002:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 08:4Ln-D         88.09    1.815 No_date   12:51   23.26  n/a
      [LAG= 85.0 min]<- 02:S-4LnD        88.09    1.815 No_date   14:15   23.26  n/a
 002:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



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     CALIB NASHYD       08:3Ln-C        248.17    3.609 No_date   13:27   23.26 .313
      [CN= 75.0: N= 3.00]
      [Tp= 1.28:DT= 2.14]
 002:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            07:3Ln-D        213.80    4.875 No_date   13:15   32.00  n/a
                     +  02:S-4LnD        88.09    1.815 No_date   14:15   23.26  n/a
                     +  08:3Ln-C        248.17    3.609 No_date   13:27   23.26  n/a
      [DT= 2.14]  SUM=  04:TPNK         550.06    9.237 No_date   13:47   26.65  n/a
 002:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:TPNK         550.06    9.237 No_date   13:47   26.65  n/a
                     +  06:S-L3ND       311.62    2.750 No_date   14:51   15.22  n/a
      [DT= 2.14]  SUM=  03:TLN3US       861.68   10.819 No_date   14:06   22.52  n/a
 002:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:TLN3US       861.68   10.819 No_date   14:06   22.52  n/a
                     +  05:S-L3NS       339.56    4.944 No_date   16:30   24.98  n/a
                     +  01:DR#2        2252.49   18.353 No_date   16:21   22.66  n/a
      [DT= 2.14]  SUM=  09:TFN3A       3453.73   28.086 No_date   16:15   22.85  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 002:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TFN3A       3453.73   28.086 No_date   16:15   22.85  n/a
  *   [RDT= 2.14] out<- 01:DR#2US      3453.73   27.582 No_date   16:34   22.85  n/a
      [L/S/n=  685./ .040/.030]
      {Vmax=  .258:Dmax= 3.000}
 002:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:10SR-E       225.52    7.063 No_date   12:57   36.45 .490
      [CN= 84.0: N= 3.00]
      [Tp=  .95:DT= 2.14]
 002:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:DR#2US      3453.73   27.582 No_date   16:34   22.85  n/a
                     +  02:10SR-E       225.52    7.063 No_date   12:57   36.45  n/a
      [DT= 2.14]  SUM=  09:TMID32      3679.25   28.734 No_date   16:32   23.68  n/a
#*****************************************************************************
 002:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TMID32      3679.25   28.734 No_date   16:32   23.68  n/a
  *   [RDT= 2.14] out<- 01:DR#2DS      3679.25   26.731 No_date   17:10   23.68  n/a
      [L/S/n= 2250./ .040/.030]
      {Vmax=  .258:Dmax= 2.999}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 002:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-C        230.90    2.887 No_date   14:19   27.42 .369
      [CN= 78.0: N= 3.00]
      [Tp= 2.02:DT= 2.14]
```

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 002:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    2.887 No_date   14:19   27.42  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    2.887 No_date   15:19   27.42  n/a
 002:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    1.046 No_date   13:30   21.34 .287
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 002:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    1.046 No_date   13:30   21.34  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.046 No_date   13:53   21.34  n/a
 002:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    1.367 No_date   12:57   21.34 .287
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.14]
 002:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    1.367 No_date   12:57   21.34  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    1.367 No_date   13:08   21.34  n/a
 002:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    1.260 No_date   13:04   21.97 .295
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 002:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    2.887 No_date   15:19   27.42  n/a
                    +  04:S-5SRD        81.43    1.046 No_date   13:53   21.34  n/a
                    +  05:SH400B        79.99    1.367 No_date   13:08   21.34  n/a
                    +  02:3Ln-B         74.81    1.260 No_date   13:04   21.97  n/a
     [DT= 2.14]  SUM=  06:TOTBLU       467.13    4.857 No_date   14:21   24.45  n/a
#****************************************************************************
#****************************************************************************
 002:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    4.857 No_date   14:21   24.45  n/a
  *  [RDT= 2.14] out<- 07:DR#4         467.13    4.200 No_date   15:12   24.45  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .565:Dmax= 1.447}
#****************************************************************************
#**************************************************************************
 002:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    1.037 No_date   13:38   17.14 .230
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.14]
 002:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    1.037 No_date   13:38   17.14  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    1.037 No_date   16:10   17.14  n/a
 002:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    4.204 No_date   14:25   29.81 .401
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.14]
 002:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    4.204 No_date   14:25   29.81  n/a
                    +  04:S10SRD       110.02    1.037 No_date   16:10   17.14  n/a
     [DT= 2.14]  SUM=  05:TOTGRN       428.09    4.583 No_date   15:23   26.56  n/a
 002:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    4.583 No_date   15:23   26.56  n/a
                    +  01:DR#2DS      3679.25   26.731 No_date   17:10   23.68  n/a
                    +  07:DR#4         467.13    4.200 No_date   15:12   24.45  n/a
     [DT= 2.14]  SUM=  09:TFN2U       4574.47   33.550 No_date   16:51   24.03  n/a
#****************************************************************************
#****************************************************************************
 002:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    3.827 No_date   13:40   18.91 .254
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.14]
 002:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    3.827 No_date   13:40   18.91  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    3.827 No_date   15:40   18.91  n/a
 002:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    3.827 No_date   15:40   18.91  n/a
                    +  09:TFN2U       4574.47   33.550 No_date   16:51   24.03  n/a
     [DT= 2.14]  SUM=  04:TFN2D       4939.67   36.680 No_date   16:30   23.65  n/a
#****************************************************************************
#****************************************************************************
 002:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   36.680 No_date   16:30   23.65  n/a
  *  [RDT= 2.14] out<- 01:RGLF        4939.67   34.250 No_date   17:12   23.65  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 002:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    5.532 No_date   14:06   32.00 .430
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.14]
 002:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    5.532 No_date   14:06   32.00  n/a
                    +  01:GOLFE       4939.67   34.250 No_date   17:12   23.65  n/a
     [DT= 2.14]  SUM=  01:GOLFE       5289.89   36.801 No_date   17:12   24.21  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
 002:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    1.612 No_date   13:32   23.26 .313
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.14]
 002:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    1.612 No_date   13:32   23.26  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    1.612 No_date   17:25   23.26  n/a
 002:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    2.329 No_date   13:32   22.68 .305
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.14]
 002:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    2.329 No_date   13:32   22.68  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    2.329 No_date   17:23   22.68  n/a
 002:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    3.051 No_date   13:53   21.97 .295
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.14]
 002:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    3.051 No_date   13:53   21.97  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    3.051 No_date   16:32   21.97  n/a
 002:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    1.612 No_date   17:25   23.26  n/a
                    +  04:S-4LnB       171.81    2.329 No_date   17:23   22.68  n/a
                    +  05:S-3LnA       268.08    3.051 No_date   16:32   21.97  n/a
     [DT= 2.14]  SUM=  02:TBLK1        554.01    6.699 No_date   17:12   22.45  n/a
 002:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    4.105 No_date   13:45   21.97 .295
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.14]
 002:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    4.105 No_date   13:45   21.97  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    4.105 No_date   14:55   21.97  n/a
 002:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    1.324 No_date   13:06   17.70 .238
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 002:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01    6.699 No_date   17:12   22.45  n/a
                    +  04:S-5SRC       341.88    4.105 No_date   14:55   21.97  n/a
                    +  05:2Ln-A        105.00    1.324 No_date   13:06   17.70  n/a
     [DT= 2.14]  SUM=  07:TOTBLK      1000.89    9.236 No_date   17:00   21.79  n/a
 002:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89    9.236 No_date   17:00   21.79  n/a
  *  [RDT= 2.14] out<- 02:GOLFN       1000.89    8.158 No_date   17:32   21.79  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .113:Dmax= 2.048}
#****************************************************************************
#****************************************************************************
 002:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89    8.158 No_date   17:32   21.79  n/a
                    +  01:GOLFE       5289.89   36.801 No_date   17:12   24.21  n/a
     [DT= 2.14]  SUM=  07:TGOLF       6290.78   44.810 No_date   17:12   23.82  n/a
```



```
#****************************************************************************
#****************************************************************************
 002:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   44.810 No_date   17:12   23.82  n/a
  *  [RDT= 2.14] out<- 02:GOLF        6290.78   40.956 No_date   17:53   23.82  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 002:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    1.978 No_date   14:25   12.02 .162
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.14]
 002:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11     .726 No_date   13:36   13.98 .188
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 002:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    1.978 No_date   14:25   12.02  n/a
                    +  04:10SR-B        96.11     .726 No_date   13:36   13.98  n/a
     [DT= 2.14]  SUM=  03:T10AB        502.71    2.629 No_date   14:10   12.40  n/a
 002:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    2.629 No_date   14:10   12.40  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    2.629 No_date   16:38   12.40  n/a
 002:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52     .745 No_date   13:15    9.42 .127
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 002:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52     .745 No_date   13:15    9.42  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52     .745 No_date   14:53    9.42  n/a
 002:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    1.658 No_date   14:02   12.98 .174
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.14]
 002:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52     .745 No_date   14:53    9.42  n/a
                    +  03:14Ln-A       276.60    1.658 No_date   14:02   12.98  n/a
     [DT= 2.14]  SUM=  09:TOT14L       412.12    2.278 No_date   14:34   11.81  n/a
 002:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    2.278 No_date   14:34   11.81  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    2.278 No_date   18:02   11.81  n/a
 002:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    3.025 No_date   13:42   25.40 .341
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.14]
 002:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    3.025 No_date   13:42   25.40  n/a
```

```
                 +  05:S10AB        502.71    2.629 No_date   16:38   12.40  n/a
                 +  03:THNYAK       412.12    2.278 No_date   18:02   11.81  n/a
     [DT= 2.14]  SUM=  03:THNYAK   1430.10    7.956 No_date   16:10   16.26  n/a
 002:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10    7.956 No_date   16:10   16.26  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10    7.956 No_date   18:12   16.26  n/a
#*****************************************************************************
#*****************************************************************************
 002:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10    7.956 No_date   18:12   16.26  n/a
                 +  02:GOLF          6290.78   40.956 No_date   17:53   23.82  n/a
     [DT= 2.14]  SUM=  09:HWY400     7720.88   48.818 No_date   17:57   22.42  n/a
#*****************************************************************************
#*****************************************************************************
 002:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88   48.818 No_date   17:57   22.42  n/a
  *   [RDT= 2.14] out<- 01:DR#6       7720.88   42.976 No_date   19:17   22.42  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.529}
#*****************************************************************************
#*****************************************************************************
 002:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    1.318 No_date   13:32   18.91 .254
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.14]
 002:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    1.318 No_date   13:32   18.91  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    1.318 No_date   15:19   18.91  n/a
 002:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    1.181 No_date   13:23   19.44 .261
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 002:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    1.181 No_date   13:23   19.44  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    1.181 No_date   15:25   19.44  n/a
 002:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    4.551 No_date   12:00   48.09 .646
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=    .0]
 002:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36     .359 No_date   13:02   11.12 .149
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.14]
 002:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36     .359 No_date   13:02   11.12  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36     .359 No_date   13:47   11.12  n/a
```



```
 002:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    1.318 No_date   15:19   18.91  n/a
                 +  04:S-5SRA         97.15    1.181 No_date   15:25   19.44  n/a
                 +  05:15Ln-A         37.07    4.551 No_date   12:00   48.09  n/a
                 +  07:S-H89A         47.36     .359 No_date   13:47   11.12  n/a
     [DT= 2.14]  SUM=  06:TOTPLM      300.59    4.551 No_date   12:00   21.45  n/a
 002:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    4.551 No_date   12:00   21.45  n/a
                 +  01:DR#6          7720.88   42.976 No_date   19:17   22.42  n/a
     [DT= 2.14]  SUM=  09:TFN15L     8021.47   43.849 No_date   19:15   22.38  n/a
  ** END OF RUN :   2

*******************************************************************************



 RUN:COMMAND#
 003:0001------------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   3 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 003:0002------------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=15.00:SDUR=  24.25:PTOT=  86.40]
```



```
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 003:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    1.363 No_date   13:23   23.46 .271
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 003:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    1.363 No_date   13:23   23.46  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    1.363 No_date   18:00   23.46  n/a
 003:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    3.452 No_date   14:23   33.88 .392
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.14]
 003:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    3.452 No_date   14:23   33.88  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    3.452 No_date   17:08   33.88  n/a
 003:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    5.296 No_date   14:49   26.82 .310
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.14]
 003:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    1.004 No_date   12:49   29.81 .345
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.14]
 003:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    1.004 No_date   12:49   29.81  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    1.004 No_date   14:12   29.81  n/a
 003:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    6.203 No_date   13:23   30.70 .355
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.14]
 003:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    6.203 No_date   13:23   30.70  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    6.203 No_date   14:49   30.70  n/a
 003:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    9.065 No_date   13:36   32.91 .381
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.14]
 003:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    1.363 No_date   18:00   23.46  n/a
                 +  03:S-5SRE        225.54    3.452 No_date   17:08   33.88  n/a
                 +  04:10SR-G        505.12    5.296 No_date   14:49   26.82  n/a
                 +  06:S-CR4D         36.36    1.004 No_date   14:12   29.81  n/a
                 +  07:S-6LnA        310.44    6.203 No_date   14:49   30.70  n/a
                 +  08:5Ln-A         461.49    9.065 No_date   13:36   32.91  n/a
     [DT= 2.14]  SUM=  09:TOTFN5     1631.25   19.747 No_date   14:27   30.13  n/a
#*****************************************************************************
```



```
#*****************************************************************************
 003:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   19.747 No_date   14:27   30.13  n/a
  *   [RDT= 2.14] out<- 01:DR#1       1631.25   19.430 No_date   14:42   30.13  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.883:Dmax= 2.049}
#*****************************************************************************
#*****************************************************************************
 003:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    1.296 No_date   13:02   29.14 .337
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 003:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    1.296 No_date   13:02   29.14  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    1.296 No_date   16:42   29.14  n/a
 003:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    7.884 No_date   13:57   32.26 .373
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 003:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    7.884 No_date   13:57   32.26  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    7.884 No_date   16:32   32.26  n/a
 003:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    2.533 No_date   12:57   32.26 .373
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 003:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    1.296 No_date   16:42   29.14  n/a
                 +  04:S-4LnF        472.58    7.884 No_date   16:32   32.26  n/a
                 +  05:4Ln-E          92.90    2.533 No_date   12:57   32.26  n/a
     [DT= 2.14]  SUM=  09:TOTRED      621.24    9.613 No_date   16:34   31.98  n/a
 003:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24    9.613 No_date   16:34   31.98  n/a
                 +  01:DR#1          1631.25   19.430 No_date   14:42   30.13  n/a
     [DT= 2.14]  SUM=  09:TOTFN4     2252.49   25.500 No_date   16:08   30.64  n/a
#*****************************************************************************
#*****************************************************************************
 003:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   25.500 No_date   16:08   30.64  n/a
  *   [RDT= 2.14] out<- 01:DR#2       2252.49   25.328 No_date   16:17   30.64  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.650:Dmax= 2.009}
#*****************************************************************************
#*****************************************************************************
 003:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    1.579 No_date   13:08   18.34 .212
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.14]
```

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003:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    1.579 No_date   13:08   18.34  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    1.579 No_date   13:49   18.34  n/a
003:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    2.669 No_date   13:30   24.06 .278
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
003:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    1.579 No_date   13:49   18.34  n/a
                    +  05:3Ln-E        185.00    2.669 No_date   13:30   24.06  n/a
     [DT= 2.14]  SUM=  02:TLN3ND       311.62    4.202 No_date   13:42   21.73  n/a
003:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62    4.202 No_date   13:42   21.73  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62    4.202 No_date   14:49   21.73  n/a
#*******************************************************************************
#*******************************************************************************
003:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    4.715 No_date   13:04   32.91 .381
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.14]
003:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    4.715 No_date   13:04   32.91  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    4.715 No_date   15:30   32.91  n/a
003:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    2.802 No_date   13:57   33.88 .392
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
003:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    2.802 No_date   13:57   33.88  n/a
                    +  03:S-CR4A       181.15    4.715 No_date   15:30   32.91  n/a
     [DT= 2.14]  SUM=  02:TLN3SD       339.56    6.783 No_date   15:23   33.36  n/a
003:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    6.783 No_date   15:23   33.36  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    6.783 No_date   16:30   33.36  n/a
#*******************************************************************************
#*******************************************************************************
003:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    6.413 No_date   13:12   41.40 .479
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.14]
003:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    2.538 No_date   12:49   31.33 .363
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.14]
003:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    2.538 No_date   12:49   31.33  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    2.538 No_date   14:12   31.33  n/a
003:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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```
    CALIB NASHYD       08:3Ln-C        248.17    5.032 No_date   13:25   31.33 .363
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
003:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    6.413 No_date   13:12   41.40  n/a
                    +  02:S-4LnD        88.09    2.538 No_date   14:12   31.33  n/a
                    +  08:3Ln-C        248.17    5.032 No_date   13:25   31.33  n/a
     [DT= 2.14]  SUM=  04:TPNK         550.06   12.495 No_date   13:45   35.24  n/a
003:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   12.495 No_date   13:45   35.24  n/a
                    +  06:S-L3ND       311.62    4.202 No_date   14:49   21.73  n/a
     [DT= 2.14]  SUM=  03:TLN3US       861.68   15.000 No_date   14:06   30.36  n/a
003:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   15.000 No_date   14:06   30.36  n/a
                    +  05:S-L3NS       339.56    6.783 No_date   16:30   33.36  n/a
                    +  01:DR#2        2252.49   25.328 No_date   16:17   30.64  n/a
     [DT= 2.14]  SUM=  09:TFN3A       3453.73   38.631 No_date   16:10   30.84  n/a
#*******************************************************************************
#*******************************************************************************
#*******************************************************************************
#*******************************************************************************
#*******************************************************************************
003:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   38.631 No_date   16:10   30.84  n/a
 *   [RDT= 2.14] out<- 01:DR#2US      3453.73   37.952 No_date   16:30   30.84  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.999}
003:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    9.102 No_date   12:55   46.44 .537
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
003:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   37.952 No_date   16:30   30.84  n/a
                    +  02:10SR-E       225.52    9.102 No_date   12:55   46.44  n/a
     [DT= 2.14]  SUM=  09:TMID32      3679.25   39.395 No_date   16:27   31.80  n/a
#*******************************************************************************
003:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   39.395 No_date   16:27   31.80  n/a
 *   [RDT= 2.14] out<- 01:DR#2DS      3679.25   36.944 No_date   17:15   31.80  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 3.000}
#*******************************************************************************
#*******************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
003:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    3.895 No_date   14:17   36.17 .419
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.14]
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003:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    3.895 No_date   14:17   36.17  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    3.895 No_date   15:17   36.17  n/a
003:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    1.488 No_date   13:27   29.14 .337
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
003:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    1.488 No_date   13:27   29.14  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    1.488 No_date   13:51   29.14  n/a
003:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    1.954 No_date   12:55   29.14 .337
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.14]
003:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    1.954 No_date   12:55   29.14  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    1.954 No_date   13:06   29.14  n/a
003:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    1.781 No_date   13:02   29.81 .345
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
003:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    3.895 No_date   15:17   36.17  n/a
                    +  04:S-5SRD        81.43    1.488 No_date   13:51   29.14  n/a
                    +  05:SH400B        79.99    1.954 No_date   13:06   29.14  n/a
                    +  02:3Ln-B         74.81    1.781 No_date   13:02   29.81  n/a
     [DT= 2.14]  SUM=  06:TOTBLU       467.13    6.689 No_date   14:15   32.72  n/a
#*******************************************************************************
#*******************************************************************************
003:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    6.689 No_date   14:15   32.72  n/a
 *   [RDT= 2.14] out<- 07:DR#4         467.13    5.846 No_date   15:04   32.72  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .612:Dmax= 1.655}
#*******************************************************************************
#*****************************************************************************
003:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    1.535 No_date   13:36   24.06 .278
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.14]
003:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    1.535 No_date   13:36   24.06  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    1.535 No_date   16:08   24.06  n/a
003:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    5.605 No_date   14:23   38.96 .451
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.14]
003:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    5.605 No_date   14:23   38.96  n/a
                    +  04:S10SRD       110.02    1.535 No_date   16:08   24.06  n/a
     [DT= 2.14]  SUM=  05:TOTGRN       428.09    6.206 No_date   15:23   35.13  n/a
003:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    6.206 No_date   15:23   35.13  n/a
                    +  01:DR#2DS      3679.25   36.944 No_date   17:15   31.80  n/a
                    +  07:DR#4         467.13    5.846 No_date   15:04   32.72  n/a
     [DT= 2.14]  SUM=  09:TFN2U       4574.47   46.200 No_date   16:42   32.20  n/a
#*******************************************************************************
#*******************************************************************************
003:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    5.569 No_date   13:36   26.24 .304
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.14]
003:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    5.569 No_date   13:36   26.24  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    5.569 No_date   15:36   26.24  n/a
003:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    5.569 No_date   15:36   26.24  n/a
                    +  09:TFN2U       4574.47   46.200 No_date   16:42   32.20  n/a
     [DT= 2.14]  SUM=  04:TFN2D       4939.67   50.856 No_date   16:19   31.76  n/a
#*******************************************************************************
#*******************************************************************************
003:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   50.856 No_date   16:19   31.76  n/a
 *   [RDT= 2.14] out<- 01:RGLF        4939.67   47.956 No_date   17:30   31.76  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#*******************************************************************************
#*******************************************************************************
#*******************************************************************************
#*******************************************************************************
003:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    7.274 No_date   14:04   41.40 .479
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.14]
003:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    7.274 No_date   14:04   41.40  n/a
                    +  01:GOLFE       4939.67   47.956 No_date   17:30   31.76  n/a
     [DT= 2.14]  SUM=  01:GOLFE       5289.89   50.992 No_date   17:17   32.40  n/a
#*******************************************************************************
#*******************************************************************************
#Flows to Flow Node 2B
003:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    2.247 No_date   13:27   31.33 .363
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.14]
003:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD        -> 02:4Ln-A        114.12    2.247 No_date   13:27   31.33  n/a
     [LAG=234.2 min]<- 03:S-4LnA        114.12    2.247 No_date   17:21   31.33  n/a
 003:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-B        171.81    3.273 No_date   13:30   30.70 .355
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.14]
 003:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-B        171.81    3.273 No_date   13:30   30.70  n/a
     [LAG=232.5 min]<- 04:S-4LnB        171.81    3.273 No_date   17:21   30.70  n/a
 003:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-A        268.08    4.289 No_date   13:51   29.81 .345
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.14]
 003:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:3Ln-A        268.08    4.289 No_date   13:51   29.81  n/a
     [LAG=158.8 min]<- 05:S-3LnA        268.08    4.289 No_date   16:30   29.81  n/a
 003:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnA       114.12    2.247 No_date   17:21   31.33  n/a
                     +  04:S-4LnB       171.81    3.273 No_date   17:21   30.70  n/a
                     +  05:S-3LnA       268.08    4.289 No_date   16:30   29.81  n/a
     [DT= 2.14]  SUM=  02:TBLK1         554.01    9.375 No_date   17:08   30.40  n/a
 003:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:5SR-C        341.88    5.776 No_date   13:42   29.81 .345
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.14]
 003:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:5SR-C        341.88    5.776 No_date   13:42   29.81  n/a
     [LAG= 72.5 min]<- 04:S-5SRC        341.88    5.776 No_date   14:53   29.81  n/a
 003:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:2Ln-A        105.00    1.970 No_date   13:04   24.79 .287
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 003:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TBLK1        554.01    9.375 No_date   17:08   30.40  n/a
                     +  04:S-5SRC       341.88    5.776 No_date   14:53   29.81  n/a
                     +  05:2Ln-A        105.00    1.970 No_date   13:04   24.79  n/a
     [DT= 2.14]  SUM=  07:TOTBLK       1000.89   12.830 No_date   16:55   29.61  n/a
 003:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 07:TOTBLK      1000.89   12.830 No_date   16:55   29.61  n/a
  *  [RDT= 2.14] out<- 02:GOLFN       1000.89   11.196 No_date   17:27   29.61  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .107:Dmax= 2.105}
#****************************************************************************
#****************************************************************************
 003:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:GOLFN       1000.89   11.196 No_date   17:27   29.61  n/a
                     +  01:GOLFE       5289.89   50.992 No_date   17:17   32.40  n/a
     [DT= 2.14]  SUM=  07:TGOLF        6290.78   62.155 No_date   17:23   31.96  n/a
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#****************************************************************************
#****************************************************************************
 003:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 07:TGOLF       6290.78   62.155 No_date   17:23   31.96  n/a
  *  [RDT= 2.14] out<- 02:GOLF        6290.78   59.126 No_date   18:19   31.96  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.140}
#****************************************************************************
#****************************************************************************
 003:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-A       406.60    3.126 No_date   14:19   17.78 .206
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.14]
 003:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:10SR-B        96.11    1.123 No_date   13:32   20.21 .234
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 003:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:T10AB        406.60    3.126 No_date   14:19   17.78  n/a
                     +  04:10SR-B        96.11    1.123 No_date   13:32   20.21  n/a
     [DT= 2.14]  SUM=  03:T10AB         502.71    4.134 No_date   14:06   18.25  n/a
 003:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:T10AB        502.71    4.134 No_date   14:06   18.25  n/a
     [LAG=149.0 min]<- 05:S10AB         502.71    4.134 No_date   16:34   18.25  n/a
 003:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:13Ln-A       135.52    1.291 No_date   13:08   14.50 .168
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 003:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:13Ln-A       135.52    1.291 No_date   13:08   14.50  n/a
     [LAG=100.5 min]<- 04:S13LnA        135.52    1.291 No_date   14:47   14.50  n/a
 003:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:14Ln-A       276.60    2.591 No_date   13:55   18.97 .220
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.14]
 003:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S13LnA       135.52    1.291 No_date   14:47   14.50  n/a
                     +  03:14Ln-A       276.60    2.591 No_date   13:55   18.97  n/a
     [DT= 2.14]  SUM=  09:TOT14L        412.12    3.662 No_date   14:32   17.50  n/a
 003:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 09:TOT14L       412.12    3.662 No_date   14:32   17.50  n/a
     [LAG=210.0 min]<- 03:S13LnA        412.12    3.662 No_date   18:00   17.50  n/a
 003:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:CR89-A       212.34    4.156 No_date   13:40   33.88 .392
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.14]
 003:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:CR89-A       212.34    4.156 No_date   13:40   33.88  n/a
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                     +  05:S10AB        502.71    4.134 No_date   16:34   18.25  n/a
                     +  03:THNYAK       412.12    3.662 No_date   18:00   17.50  n/a
     [DT= 2.14]  SUM=  03:THNYAK       1430.10   11.880 No_date   16:08   22.89  n/a
 003:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:THNYAK      1430.10   11.880 No_date   16:08   22.89  n/a
     [LAG=123.6 min]<- 04:HYND         1430.10   11.880 No_date   18:10   22.89  n/a
#****************************************************************************
#****************************************************************************
 003:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:HYND        1430.10   11.880 No_date   18:10   22.89  n/a
                     +  02:GOLF        6290.78   59.126 No_date   18:19   31.96  n/a
     [DT= 2.14]  SUM=  09:HWY400       7720.88   70.988 No_date   18:15   30.28  n/a
#****************************************************************************
#****************************************************************************
 003:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:HWY400      7720.88   70.988 No_date   18:15   30.28  n/a
  *  [RDT= 2.14] out<- 01:DR#6        7720.88   62.579 No_date   19:21   30.28  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.529}
#****************************************************************************
#****************************************************************************
 003:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-B        119.01    1.920 No_date   13:30   26.24 .304
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.14]
 003:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-B        119.01    1.920 No_date   13:30   26.24  n/a
     [LAG=108.3 min]<- 03:S-5SRB        119.01    1.920 No_date   15:17   26.24  n/a
 003:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-A         97.15    1.708 No_date   13:21   26.82 .310
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 003:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-A         97.15    1.708 No_date   13:21   26.82  n/a
     [LAG=123.3 min]<- 04:S-5SRA         97.15    1.708 No_date   15:23   26.82  n/a
 003:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      05:15Ln-A        37.07    5.330 No_date   12:00   57.76 .669
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious    area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious  area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 003:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:H89-A         47.36     .598 No_date   12:55   16.65 .193
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.14]
 003:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 06:H89-A         47.36     .598 No_date   12:55   16.65  n/a
     [LAG= 45.5 min]<- 07:S-H89A         47.36     .598 No_date   13:40   16.65  n/a
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```
 003:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-5SRB       119.01    1.920 No_date   15:17   26.24  n/a
                     +  04:S-5SRA        97.15    1.708 No_date   15:23   26.82  n/a
                     +  05:15Ln-A        37.07    5.330 No_date   12:00   57.76  n/a
                     +  07:S-H89A        47.36     .598 No_date   13:40   16.65  n/a
     [DT= 2.14]  SUM=  06:TOTPLM        300.59    5.330 No_date   12:00   28.81  n/a
 003:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTPLM       300.59    5.330 No_date   12:00   28.81  n/a
                     +  01:DR#6        7720.88   62.579 No_date   19:21   30.28  n/a
     [DT= 2.14]  SUM=  09:TFN15L       8021.47   63.692 No_date   19:19   30.22  n/a
  ** END OF RUN :   3

*****************************************************************************




 RUN:COMMAND#
 004:0001-----------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   4 ]
#****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 004:0002-----------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=15.00:SDUR=  24.25:PTOT= 103.20]
```

```
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 004:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    2.094 No_date   13:21   34.16 .331
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 004:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    2.094 No_date   13:21   34.16  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    2.094 No_date   17:57   34.16  n/a
 004:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    4.867 No_date   14:19   46.63 .452
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.14]
 004:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    4.867 No_date   14:19   46.63  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    4.867 No_date   17:04   46.63  n/a
 004:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    7.790 No_date   14:45   38.18 .370
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.14]
 004:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    1.456 No_date   12:47   41.76 .405
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.14]
 004:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    1.456 No_date   12:47   41.76  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    1.456 No_date   14:10   41.76  n/a
 004:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44    8.953 No_date   13:21   42.88 .416
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.14]
 004:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44    8.953 No_date   13:21   42.88  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44    8.953 No_date   14:47   42.88  n/a
 004:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49   12.844 No_date   13:34   45.42 .440
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.14]
 004:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    2.094 No_date   17:57   34.16  n/a
                    +  03:S-5SRE       225.54    4.867 No_date   17:04   46.63  n/a
                    +  04:10SR-G       505.12    7.790 No_date   14:45   38.18  n/a
                    +  06:S-CR4D        36.36    1.456 No_date   14:10   41.76  n/a
                    +  07:S-6LnA       310.44    8.953 No_date   14:47   42.88  n/a
                    +  08:5Ln-A        461.49   12.844 No_date   13:34   45.42  n/a
     [DT= 2.14]  SUM=  09:TOTFN5      1631.25   28.470 No_date   14:25   42.14  n/a
#*****************************************************************************
```



```
#*****************************************************************************
 004:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   28.470 No_date   14:25   42.14  n/a
  *   [RDT= 2.14] out<- 01:DR#1       1631.25   27.978 No_date   14:42   42.14  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.827:Dmax= 2.311}
#*****************************************************************************
#*****************************************************************************
 004:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    1.896 No_date   13:00   41.02 .398
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 004:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    1.896 No_date   13:00   41.02  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    1.896 No_date   16:40   41.02  n/a
 004:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58   11.237 No_date   13:55   44.73 .433
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 004:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58   11.237 No_date   13:55   44.73  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58   11.237 No_date   16:30   44.73  n/a
 004:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    3.620 No_date   12:55   44.73 .433
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 004:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    1.896 No_date   16:40   41.02  n/a
                    +  04:S-4LnF       472.58   11.237 No_date   16:30   44.73  n/a
                    +  05:4Ln-E         92.90    3.620 No_date   12:55   44.73  n/a
     [DT= 2.14]  SUM=  09:TOTRED       621.24   13.701 No_date   16:32   44.40  n/a
 004:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24   13.701 No_date   16:32   44.40  n/a
                    +  01:DR#1        1631.25   27.978 No_date   14:42   42.14  n/a
     [DT= 2.14]  SUM=  09:TOTFN4      2252.49   36.317 No_date   15:53   42.76  n/a
#*****************************************************************************
#*****************************************************************************
 004:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   36.317 No_date   15:53   42.76  n/a
  *   [RDT= 2.14] out<- 01:DR#2       2252.49   35.805 No_date   15:53   42.76  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.804:Dmax= 2.324}
#*****************************************************************************
#*****************************************************************************
 004:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    2.594 No_date   13:06   27.80 .269
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.14]
```



```
 004:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    2.594 No_date   13:06   27.80  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    2.594 No_date   13:47   27.80  n/a
 004:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    4.054 No_date   13:27   34.83 .337
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 004:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    2.594 No_date   13:47   27.80  n/a
                    +  05:3Ln-E        185.00    4.054 No_date   13:27   34.83  n/a
     [DT= 2.14]  SUM=  02:TLN3ND       311.62    6.573 No_date   13:38   31.97  n/a
 004:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62    6.573 No_date   13:38   31.97  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62    6.573 No_date   14:45   31.97  n/a
#*****************************************************************************
#*****************************************************************************
 004:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    6.686 No_date   13:02   45.42 .440
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.14]
 004:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    6.686 No_date   13:02   45.42  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    6.686 No_date   15:27   45.42  n/a
 004:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    3.954 No_date   13:53   46.63 .452
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 004:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    3.954 No_date   13:53   46.63  n/a
                    +  03:S-CR4A       181.15    6.686 No_date   15:27   45.42  n/a
     [DT= 2.14]  SUM=  02:TLN3SD       339.56    9.557 No_date   15:21   45.98  n/a
 004:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    9.557 No_date   15:21   45.98  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    9.557 No_date   16:27   45.98  n/a
#*****************************************************************************
#*****************************************************************************
 004:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    8.674 No_date   13:12   55.25 .535
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.14]
 004:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    3.638 No_date   12:47   43.56 .422
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.14]
 004:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    3.638 No_date   12:47   43.56  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    3.638 No_date   14:10   43.56  n/a
 004:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



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    CALIB NASHYD       08:3Ln-C        248.17    7.208 No_date   13:21   43.56 .422
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 004:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    8.674 No_date   13:12   55.25  n/a
                    +  02:S-4LnD        88.09    3.638 No_date   14:10   43.56  n/a
                    +  08:3Ln-C        248.17    7.208 No_date   13:21   43.56  n/a
     [DT= 2.14]  SUM=  04:TPNK         550.06   17.379 No_date   13:45   48.10  n/a
 004:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   17.379 No_date   13:45   48.10  n/a
                    +  06:S-L3ND       311.62    6.573 No_date   14:45   31.97  n/a
     [DT= 2.14]  SUM=  03:TLN3US       861.68   21.443 No_date   14:08   42.27  n/a
 004:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   21.443 No_date   14:08   42.27  n/a
                    +  05:S-L3NS       339.56    9.557 No_date   16:27   45.98  n/a
                    +  01:DR#2        2252.49   35.805 No_date   15:53   42.76  n/a
     [DT= 2.14]  SUM=  09:TFN3A       3453.73   54.466 No_date   15:53   42.96  n/a
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 004:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   54.466 No_date   15:53   42.96  n/a
  *   [RDT= 2.14] out<- 01:DR#2US     3453.73   53.242 No_date   15:55   42.96  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.999}
 004:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52   12.050 No_date   12:55   61.00 .591
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 004:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   53.242 No_date   15:55   42.96  n/a
                    +  02:10SR-E       225.52   12.050 No_date   12:55   61.00  n/a
     [DT= 2.14]  SUM=  09:TMID32      3679.25   55.412 No_date   15:55   44.06  n/a
#*****************************************************************************
 004:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   55.412 No_date   15:55   44.06  n/a
  *   [RDT= 2.14] out<- 01:DR#2DS     3679.25   52.451 No_date   17:02   44.06  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.990}
#*****************************************************************************
#*****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 004:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    5.408 No_date   14:15   49.23 .477
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.14]
```

```
 004:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    5.408 No_date   14:15   49.23  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    5.408 No_date   15:15   49.23  n/a
 004:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    2.173 No_date   13:25   41.02 .398
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 004:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    2.173 No_date   13:25   41.02  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    2.173 No_date   13:49   41.02  n/a
 004:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    2.859 No_date   12:55   41.02 .398
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.14]
 004:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    2.859 No_date   12:55   41.02  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    2.859 No_date   13:06   41.02  n/a
 004:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    2.581 No_date   13:00   41.76 .405
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 004:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    5.408 No_date   15:15   49.23  n/a
                    +  04:S-5SRD        81.43    2.173 No_date   13:49   41.02  n/a
                    +  05:SH400B        79.99    2.859 No_date   13:06   41.02  n/a
                    +  02:3Ln-B         74.81    2.581 No_date   13:00   41.76  n/a
     [DT= 2.14]  SUM=  06:TOTBLU       467.13    9.495 No_date   14:08   45.20  n/a
#*****************************************************************************
#*****************************************************************************
 004:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    9.495 No_date   14:08   45.20  n/a
  *  [RDT= 2.14] out<- 07:DR#4         467.13    8.373 No_date   14:51   45.20  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .669:Dmax= 1.918}
#*****************************************************************************
#***************************************************************************
 004:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    2.329 No_date   13:32   34.83 .337
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.14]
 004:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    2.329 No_date   13:32   34.83  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    2.329 No_date   16:04   34.83  n/a
 004:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    7.688 No_date   14:21   52.52 .509
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.14]
 004:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    ADD HYD            02:2Ln-B        318.07    7.688 No_date   14:21   52.52  n/a
                    +  04:S10SRD       110.02    2.329 No_date   16:04   34.83  n/a
     [DT= 2.14]  SUM=  05:TOTGRN       428.09    8.662 No_date   15:23   47.97  n/a
 004:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    8.662 No_date   15:23   47.97  n/a
                    +  01:DR#2DS      3679.25   52.451 No_date   17:02   44.06  n/a
                    +  07:DR#4         467.13    8.373 No_date   14:51   45.20  n/a
     [DT= 2.14]  SUM=  09:TFN2U       4574.47   66.018 No_date   16:21   44.54  n/a
#*****************************************************************************
#*****************************************************************************
 004:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    8.316 No_date   13:34   37.55 .364
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.14]
 004:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    8.316 No_date   13:34   37.55  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    8.316 No_date   15:34   37.55  n/a
 004:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    8.316 No_date   15:34   37.55  n/a
                    +  09:TFN2U       4574.47   66.018 No_date   16:21   44.54  n/a
     [DT= 2.14]  SUM=  04:TFN2D       4939.67   73.552 No_date   16:00   44.03  n/a
#*****************************************************************************
#*****************************************************************************
 004:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   73.552 No_date   16:00   44.03  n/a
  *  [RDT= 2.14] out<- 01:RGLF        4939.67   68.847 No_date   17:17   44.03  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.139}
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
#*****************************************************************************
 004:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    9.843 No_date   14:02   55.25 .535
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.14]
 004:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    9.843 No_date   14:02   55.25  n/a
                    +  01:GOLFE       4939.67   68.847 No_date   17:17   44.03  n/a
     [DT= 2.14]  SUM=  01:GOLFE       5289.89   73.142 No_date   17:04   44.77  n/a
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 2B
 004:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    3.218 No_date   13:25   43.56 .422
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.14]
 004:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    SHIFT HYD       -> 02:4Ln-A        114.12    3.218 No_date   13:25   43.56  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    3.218 No_date   17:19   43.56  n/a
 004:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    4.723 No_date   13:27   42.88 .416
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.14]
 004:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    4.723 No_date   13:27   42.88  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    4.723 No_date   17:19   42.88  n/a
 004:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    6.199 No_date   13:47   41.76 .405
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.14]
 004:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    6.199 No_date   13:47   41.76  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    6.199 No_date   16:25   41.76  n/a
 004:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    3.218 No_date   17:19   43.56  n/a
                    +  04:S-4LnB       171.81    4.723 No_date   17:19   42.88  n/a
                    +  05:S-3LnA       268.08    6.199 No_date   16:25   41.76  n/a
     [DT= 2.14]  SUM=  02:TBLK1        554.01   13.481 No_date   17:06   42.48  n/a
 004:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88    8.352 No_date   13:38   41.76 .405
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.14]
 004:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88    8.352 No_date   13:38   41.76  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88    8.352 No_date   14:49   41.76  n/a
 004:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    2.995 No_date   13:02   35.79 .347
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 004:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   13.481 No_date   17:06   42.48  n/a
                    +  04:S-5SRC       341.88    8.352 No_date   14:49   41.76  n/a
                    +  05:2Ln-A        105.00    2.995 No_date   13:02   35.79  n/a
     [DT= 2.14]  SUM=  07:TOTBLK      1000.89   18.323 No_date   16:53   41.53  n/a
 004:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   18.323 No_date   16:53   41.53  n/a
  *  [RDT= 2.14] out<- 02:GOLFN       1000.89   16.862 No_date   17:32   41.53  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#*****************************************************************************
#*****************************************************************************
 004:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   16.862 No_date   17:32   41.53  n/a
                    +  01:GOLFE       5289.89   73.142 No_date   17:04   44.77  n/a
     [DT= 2.14]  SUM=  07:TGOLF       6290.78   89.678 No_date   17:17   44.25  n/a
```



```
#*****************************************************************************
#*****************************************************************************
 004:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78   89.678 No_date   17:17   44.25  n/a
  *  [RDT= 2.14] out<- 02:GOLF        6290.78   84.953 No_date   17:57   44.26  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#*****************************************************************************
#*****************************************************************************
 004:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    5.047 No_date   14:12   27.03 .262
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.14]
 004:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    1.776 No_date   13:27   30.08 .291
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 004:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    5.047 No_date   14:12   27.03  n/a
                    +  04:10SR-B        96.11    1.776 No_date   13:27   30.08  n/a
     [DT= 2.14]  SUM=  03:T10AB        502.71    6.644 No_date   14:00   27.61  n/a
 004:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    6.644 No_date   14:00   27.61  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    6.644 No_date   16:27   27.61  n/a
 004:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    2.252 No_date   13:04   22.82 .221
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 004:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    2.252 No_date   13:04   22.82  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    2.252 No_date   14:42   22.82  n/a
 004:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    4.139 No_date   13:51   28.53 .276
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.14]
 004:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    2.252 No_date   14:42   22.82  n/a
                    +  03:14Ln-A       276.60    4.139 No_date   13:51   28.53  n/a
     [DT= 2.14]  SUM=  09:TOT14L       412.12    5.998 No_date   14:27   26.65  n/a
 004:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    5.998 No_date   14:27   26.65  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    5.998 No_date   17:55   26.65  n/a
 004:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    5.869 No_date   13:38   46.63 .452
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.14]
 004:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    5.869 No_date   13:38   46.63  n/a
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                  +  05:S10AB        502.71    6.644 No_date   16:27   27.61  n/a
                  +  03:THNYAK       412.12    5.998 No_date   17:55   26.65  n/a
     [DT= 2.14]  SUM=  03:THNYAK      1430.10   18.255 No_date   16:06   33.26  n/a
 004:0089--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   18.255 No_date   16:06   33.26  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   18.255 No_date   18:08   33.26  n/a
#***************************************************************************
#***************************************************************************
 004:0090--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   18.255 No_date   18:08   33.26  n/a
                  +  02:GOLF        6290.78   84.953 No_date   17:57   44.26  n/a
     [DT= 2.14]  SUM=  09:HWY400      7720.88  103.152 No_date   18:04   42.22  n/a
#***************************************************************************
#***************************************************************************
 004:0091--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88  103.152 No_date   18:04   42.22  n/a
  *  [RDT= 2.14] out<- 01:DR#6        7720.88   91.748 No_date   19:32   42.22  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.530}
#***************************************************************************
#***************************************************************************
 004:0092--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    2.871 No_date   13:25   37.55 .364
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.14]
 004:0093--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    2.871 No_date   13:25   37.55  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    2.871 No_date   15:12   37.55  n/a
 004:0094--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    2.534 No_date   13:19   38.18 .370
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 004:0095--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    2.534 No_date   13:19   38.18  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    2.534 No_date   15:21   38.18  n/a
 004:0096--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    6.429 No_date   12:00   71.74 .695
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 004:0097--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36    1.009 No_date   12:53   25.59 .248
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.14]
 004:0098--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36    1.009 No_date   12:53   25.59  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36    1.009 No_date   13:38   25.59  n/a
```



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 004:0099--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    2.871 No_date   15:12   37.55  n/a
                  +  04:S-5SRA        97.15    2.534 No_date   15:21   38.18  n/a
                  +  05:15Ln-A        37.07    6.429 No_date   12:00   71.74  n/a
                  +  07:S-H89A        47.36    1.009 No_date   13:38   25.59  n/a
     [DT= 2.14]  SUM=  06:TOTPLM       300.59    6.429 No_date   12:00   40.08  n/a
 004:0100--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    6.429 No_date   12:00   40.08  n/a
                  +  01:DR#6        7720.88   91.748 No_date   19:32   42.22  n/a
     [DT= 2.14]  SUM=  09:TFN15L      8021.47   93.167 No_date   19:30   42.14  n/a
  ** END OF RUN :   4

****************************************************************************



 RUN:COMMAND#
 005:0001-------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   5 ]
#***************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#***************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 005:0002-------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=15.00:SDUR=  24.25:PTOT= 115.20]
```



```
#***************************************************************************
#***************************************************************************
#Flows to Flow Node 5 (LINE 5)
 005:0003--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    2.667 No_date   13:19   42.42 .368
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 005:0004--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    2.667 No_date   13:19   42.42  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    2.667 No_date   17:55   42.42  n/a
 005:0005--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    5.934 No_date   14:17   56.21 .488
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.14]
 005:0006--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    5.934 No_date   14:17   56.21  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    5.934 No_date   17:02   56.21  n/a
 005:0007--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12    9.720 No_date   14:42   46.87 .407
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.14]
 005:0008--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    1.799 No_date   12:47   50.83 .441
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.14]
 005:0009--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    1.799 No_date   12:47   50.83  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    1.799 No_date   14:10   50.83  n/a
 005:0010--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44   11.043 No_date   13:19   52.11 .452
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.14]
 005:0011--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44   11.043 No_date   13:19   52.11  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44   11.043 No_date   14:45   52.11  n/a
 005:0012--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49   15.699 No_date   13:32   54.85 .476
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.14]
 005:0013--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    2.667 No_date   17:55   42.42  n/a
                  +  03:S-5SRE       225.54    5.934 No_date   17:02   56.21  n/a
                  +  04:10SR-G       505.12    9.720 No_date   14:42   46.87  n/a
                  +  06:S-CR4D        36.36    1.799 No_date   14:10   50.83  n/a
                  +  07:S-6LnA       310.44   11.043 No_date   14:45   52.11  n/a
                  +  08:5Ln-A        461.49   15.699 No_date   13:32   54.85  n/a
     [DT= 2.14]  SUM=  09:TOTFN5      1631.25   35.136 No_date   14:23   51.25  n/a
#***************************************************************************
```



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#***************************************************************************
 005:0014--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   35.136 No_date   14:23   51.25  n/a
  *  [RDT= 2.14] out<- 01:DR#1        1631.25   34.525 No_date   14:40   51.25  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.846:Dmax= 2.294}
#***************************************************************************
#***************************************************************************
 005:0015--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    2.354 No_date   12:57   50.06 .435
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 005:0016--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    2.354 No_date   12:57   50.06  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    2.354 No_date   16:38   50.06  n/a
 005:0017--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58   13.779 No_date   13:53   54.13 .470
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 005:0018--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58   13.779 No_date   13:53   54.13  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58   13.779 No_date   16:27   54.13  n/a
 005:0019--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    4.439 No_date   12:53   54.13 .470
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 005:0020--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    2.354 No_date   16:38   50.06  n/a
                  +  04:S-4LnF       472.58   13.779 No_date   16:27   54.13  n/a
                  +  05:4Ln-E         92.90    4.439 No_date   12:53   54.13  n/a
     [DT= 2.14]  SUM=  09:TOTRED       621.24   16.796 No_date   16:30   53.77  n/a
 005:0021--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24   16.796 No_date   16:30   53.77  n/a
                  +  01:DR#1        1631.25   34.525 No_date   14:40   51.25  n/a
     [DT= 2.14]  SUM=  09:TOTFN4      2252.49   44.668 No_date   16:02   51.95  n/a
#***************************************************************************
#***************************************************************************
 005:0022--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   44.668 No_date   16:02   51.95  n/a
  *  [RDT= 2.14] out<- 01:DR#2        2252.49   44.420 No_date   16:15   51.95  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.877:Dmax= 2.479}
#***************************************************************************
#***************************************************************************
 005:0023--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    3.416 No_date   13:04   35.26 .306
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.14]
```

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005:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    3.416 No_date   13:04   35.26  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    3.416 No_date   13:45   35.26  n/a
005:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    5.137 No_date   13:25   43.13 .374
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
005:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    3.416 No_date   13:45   35.26  n/a
                    +  05:3Ln-E        185.00    5.137 No_date   13:25   43.13  n/a
     [DT= 2.14]  SUM=  02:TLN3ND       311.62    8.454 No_date   13:36   39.93  n/a
005:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62    8.454 No_date   13:36   39.93  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62    8.454 No_date   14:42   39.93  n/a
#************************************************************************
#************************************************************************
005:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    8.171 No_date   13:00   54.85 .476
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.14]
005:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    8.171 No_date   13:00   54.85  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    8.171 No_date   15:25   54.85  n/a
005:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    4.823 No_date   13:51   56.21 .488
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
005:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    4.823 No_date   13:51   56.21  n/a
                    +  03:S-CR4A       181.15    8.171 No_date   15:25   54.85  n/a
     [DT= 2.14]  SUM=  02:TLN3SD       339.56   11.641 No_date   15:19   55.48  n/a
005:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56   11.641 No_date   15:19   55.48  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56   11.641 No_date   16:25   55.48  n/a
#************************************************************************
#************************************************************************
005:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80   10.345 No_date   13:10   65.51 .569
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.14]
005:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    4.471 No_date   12:47   52.81 .458
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.14]
005:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    4.471 No_date   12:47   52.81  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    4.471 No_date   14:10   52.81  n/a
005:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       08:3Ln-C        248.17    8.859 No_date   13:21   52.81 .458
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
005:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80   10.345 No_date   13:10   65.51  n/a
                    +  02:S-4LnD        88.09    4.471 No_date   14:10   52.81  n/a
                    +  08:3Ln-C        248.17    8.859 No_date   13:21   52.81  n/a
     [DT= 2.14]  SUM=  04:TPNK         550.06   21.028 No_date   13:45   57.75  n/a
005:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   21.028 No_date   13:45   57.75  n/a
                    +  06:S-L3ND       311.62    8.454 No_date   14:42   39.93  n/a
     [DT= 2.14]  SUM=  03:TLN3US       861.68   26.369 No_date   14:08   51.31  n/a
005:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   26.369 No_date   14:08   51.31  n/a
                    +  05:S-L3NS       339.56   11.641 No_date   16:25   55.48  n/a
                    +  01:DR#2        2252.49   44.420 No_date   16:15   51.95  n/a
     [DT= 2.14]  SUM=  09:TFN3A       3453.73   67.157 No_date   16:08   52.13  n/a
#************************************************************************
#************************************************************************
#************************************************************************
#************************************************************************
#************************************************************************
005:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   67.157 No_date   16:08   52.13  n/a
 *   [RDT= 2.14] out<- 01:DR#2US      3453.73   66.735 No_date   16:19   52.13  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
005:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52   14.200 No_date   12:53   71.70 .622
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
005:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   66.735 No_date   16:19   52.13  n/a
                    +  02:10SR-E       225.52   14.200 No_date   12:53   71.70  n/a
     [DT= 2.14]  SUM=  09:TMID32      3679.25   69.676 No_date   14:47   53.33  n/a
#************************************************************************
005:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   69.676 No_date   14:47   53.33  n/a
 *   [RDT= 2.14] out<- 01:DR#2DS      3679.25   66.026 No_date   16:51   53.33  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
#************************************************************************
#************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
005:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    6.543 No_date   14:12   59.01 .512
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.14]
```



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005:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    6.543 No_date   14:12   59.01  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    6.543 No_date   15:12   59.01  n/a
005:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    2.697 No_date   13:23   50.06 .435
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
005:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    2.697 No_date   13:23   50.06  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    2.697 No_date   13:47   50.06  n/a
005:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    3.550 No_date   12:53   50.06 .435
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.14]
005:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    3.550 No_date   12:53   50.06  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    3.550 No_date   13:04   50.06  n/a
005:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    3.189 No_date   12:57   50.83 .441
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
005:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    6.543 No_date   15:12   59.01  n/a
                    +  04:S-5SRD        81.43    2.697 No_date   13:47   50.06  n/a
                    +  05:SH400B        79.99    3.550 No_date   13:04   50.06  n/a
                    +  02:3Ln-B         74.81    3.189 No_date   12:57   50.83  n/a
     [DT= 2.14]  SUM=  06:TOTBLU       467.13   11.629 No_date   14:04   54.60  n/a
#************************************************************************
#************************************************************************
005:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13   11.629 No_date   14:04   54.60  n/a
 *   [RDT= 2.14] out<- 07:DR#4         467.13   10.321 No_date   14:45   54.60  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .704:Dmax= 2.085}
#************************************************************************
#**********************************************************************
005:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    2.950 No_date   13:30   43.13 .374
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.14]
005:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    2.950 No_date   13:30   43.13  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    2.950 No_date   16:02   43.13  n/a
005:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    9.238 No_date   14:19   62.61 .543
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.14]
005:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07    9.238 No_date   14:19   62.61  n/a
                    +  04:S10SRD       110.02    2.950 No_date   16:02   43.13  n/a
     [DT= 2.14]  SUM=  05:TOTGRN       428.09   10.515 No_date   15:23   57.60  n/a
005:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09   10.515 No_date   15:23   57.60  n/a
                    +  01:DR#2DS      3679.25   66.026 No_date   16:51   53.33  n/a
                    +  07:DR#4         467.13   10.321 No_date   14:45   54.60  n/a
     [DT= 2.14]  SUM=  09:TFN2U       4574.47   82.888 No_date   16:17   53.86  n/a
#************************************************************************
#************************************************************************
005:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20   10.443 No_date   13:32   46.20 .401
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.14]
005:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20   10.443 No_date   13:32   46.20  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20   10.443 No_date   15:32   46.20  n/a
005:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20   10.443 No_date   15:32   46.20  n/a
                    +  09:TFN2U       4574.47   82.888 No_date   16:17   53.86  n/a
     [DT= 2.14]  SUM=  04:TFN2D       4939.67   92.658 No_date   15:51   53.30  n/a
#************************************************************************
#************************************************************************
005:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   92.658 No_date   15:51   53.30  n/a
 *   [RDT= 2.14] out<- 01:RGLF        4939.67   86.751 No_date   17:06   53.30  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#************************************************************************
#************************************************************************
#************************************************************************
#************************************************************************
005:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22   11.744 No_date   14:00   65.51 .569
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.14]
005:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22   11.744 No_date   14:00   65.51  n/a
                    +  01:GOLFE       4939.67   86.751 No_date   17:06   53.30  n/a
     [DT= 2.14]  SUM=  01:GOLFE       5289.89   92.059 No_date   16:55   54.10  n/a
#************************************************************************
#************************************************************************
#Flows to Flow Node 2B
005:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    3.954 No_date   13:25   52.81 .458
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.14]
005:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    3.954 No_date   13:25   52.81  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    3.954 No_date   17:19   52.81  n/a
 005:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    5.825 No_date   13:25   52.11 .452
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.14]
 005:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    5.825 No_date   13:25   52.11  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    5.825 No_date   17:17   52.11  n/a
 005:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    7.657 No_date   13:45   50.83 .441
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.14]
 005:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    7.657 No_date   13:45   50.83  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    7.657 No_date   16:23   50.83  n/a
 005:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    3.954 No_date   17:19   52.81  n/a
                    +  04:S-4LnB       171.81    5.825 No_date   17:17   52.11  n/a
                    +  05:S-3LnA       268.08    7.657 No_date   16:23   50.83  n/a
     [DT= 2.14]  SUM=  02:TBLK1        554.01   16.601 No_date   17:04   51.63  n/a
 005:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88   10.319 No_date   13:38   50.83 .441
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.14]
 005:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88   10.319 No_date   13:38   50.83  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88   10.319 No_date   14:49   50.83  n/a
 005:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    3.793 No_date   13:00   44.25 .384
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 005:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   16.601 No_date   17:04   51.63  n/a
                    +  04:S-5SRC       341.88   10.319 No_date   14:49   50.83  n/a
                    +  05:2Ln-A        105.00    3.793 No_date   13:00   44.25  n/a
     [DT= 2.14]  SUM=  07:TOTBLK      1000.89   22.488 No_date   16:51   50.58  n/a
 005:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   22.488 No_date   16:51   50.58  n/a
  *  [RDT= 2.14] out<- 02:GOLFN       1000.89   20.817 No_date   17:27   50.58  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#******************************************************************************
#******************************************************************************
 005:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   20.817 No_date   17:27   50.58  n/a
                    +  01:GOLFE       5289.89   92.059 No_date   16:55   54.10  n/a
     [DT= 2.14]  SUM=  07:TGOLF       6290.78  112.271 No_date   17:08   53.54  n/a
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#******************************************************************************
#******************************************************************************
 005:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78  112.271 No_date   17:08   53.54  n/a
  *  [RDT= 2.14] out<- 02:GOLF        6290.78  106.632 No_date   18:00   53.54  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#******************************************************************************
#******************************************************************************
 005:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    6.603 No_date   14:10   34.33 .298
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.14]
 005:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    2.298 No_date   13:25   37.79 .328
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 005:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    6.603 No_date   14:10   34.33  n/a
                    +  04:10SR-B        96.11    2.298 No_date   13:25   37.79  n/a
     [DT= 2.14]  SUM=  03:T10AB        502.71    8.671 No_date   13:57   34.99  n/a
 005:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71    8.671 No_date   13:57   34.99  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71    8.671 No_date   16:25   34.99  n/a
 005:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    3.056 No_date   13:02   29.50 .256
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 005:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    3.056 No_date   13:02   29.50  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    3.056 No_date   14:40   29.50  n/a
 005:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    5.385 No_date   13:47   36.03 .313
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.14]
 005:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    3.056 No_date   14:40   29.50  n/a
                    +  03:14Ln-A       276.60    5.385 No_date   13:47   36.03  n/a
     [DT= 2.14]  SUM=  09:TOT14L       412.12    7.899 No_date   14:25   33.88  n/a
 005:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    7.899 No_date   14:25   33.88  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    7.899 No_date   17:53   33.88  n/a
 005:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    7.159 No_date   13:36   56.21 .488
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.14]
 005:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    7.159 No_date   13:36   56.21  n/a
```



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                    +  05:S10AB        502.71    8.671 No_date   16:25   34.99  n/a
                    +  03:THNYAK       412.12    7.899 No_date   17:53   33.88  n/a
     [DT= 2.14]  SUM=  03:THNYAK      1430.10   23.321 No_date   16:06   41.29  n/a
 005:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:THNYAK      1430.10   23.321 No_date   16:06   41.29  n/a
     [LAG=123.6 min]<- 04:HYND        1430.10   23.321 No_date   18:08   41.29  n/a
#******************************************************************************
#******************************************************************************
 005:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:HYND        1430.10   23.321 No_date   18:08   41.29  n/a
                    +  02:GOLF        6290.78  106.632 No_date   18:00   53.54  n/a
     [DT= 2.14]  SUM=  09:HWY400      7720.88  129.903 No_date   18:04   51.27  n/a
#******************************************************************************
#******************************************************************************
 005:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:HWY400      7720.88  129.903 No_date   18:04   51.27  n/a
  *  [RDT= 2.14] out<- 01:DR#6        7720.88  114.569 No_date   19:21   51.27  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .088:Dmax= 2.526}
#******************************************************************************
#******************************************************************************
 005:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-B        119.01    3.606 No_date   13:23   46.20 .401
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.14]
 005:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-B        119.01    3.606 No_date   13:23   46.20  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    3.606 No_date   15:10   46.20  n/a
 005:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-A         97.15    3.171 No_date   13:17   46.87 .407
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 005:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-A         97.15    3.171 No_date   13:17   46.87  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    3.171 No_date   15:19   46.87  n/a
 005:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     05:15Ln-A        37.07    7.219 No_date   12:00   81.98 .712
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 005:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:H89-A         47.36    1.346 No_date   12:51   32.68 .284
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.14]
 005:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:H89-A         47.36    1.346 No_date   12:51   32.68  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36    1.346 No_date   13:36   32.68  n/a
```



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 005:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-5SRB       119.01    3.606 No_date   15:10   46.20  n/a
                    +  04:S-5SRA        97.15    3.171 No_date   15:19   46.87  n/a
                    +  05:15Ln-A        37.07    7.219 No_date   12:00   81.98  n/a
                    +  07:S-H89A        47.36    1.346 No_date   13:36   32.68  n/a
     [DT= 2.14]  SUM=  06:TOTPLM       300.59    7.814 No_date   15:10   48.70  n/a
 005:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTPLM       300.59    7.814 No_date   15:10   48.70  n/a
                    +  01:DR#6        7720.88  114.569 No_date   19:21   51.27  n/a
     [DT= 2.14]  SUM=  09:TFN15L      8021.47  116.323 No_date   19:19   51.18  n/a
  ** END OF RUN :   5

*******************************************************************************




 RUN:COMMAND#
 006:0001---------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   6 ]
#******************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#******************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 006:0002---------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  =
     [SDT=15.00:SDUR=  24.25:PTOT= 124.80]
```

```
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 006:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30    3.150 No_date   13:17   49.34 .395
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.14]
 006:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30    3.150 No_date   13:17   49.34  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30    3.150 No_date   17:53   49.34  n/a
 006:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54    6.814 No_date   14:17   64.10 .514
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.14]
 006:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54    6.814 No_date   14:17   64.10  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54    6.814 No_date   17:02   64.10  n/a
 006:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12   11.334 No_date   14:40   54.10 .434
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.14]
 006:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36    2.083 No_date   12:45   58.34 .467
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.14]
 006:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36    2.083 No_date   12:45   58.34  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36    2.083 No_date   14:08   58.34  n/a
 006:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44   12.772 No_date   13:19   59.73 .479
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.14]
 006:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44   12.772 No_date   13:19   59.73  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44   12.772 No_date   14:45   59.73  n/a
 006:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49   18.051 No_date   13:32   62.63 .502
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.14]
 006:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30    3.150 No_date   17:53   49.34  n/a
                    +  03:S-5SRE       225.54    6.814 No_date   17:02   64.10  n/a
                    +  04:10SR-G       505.12   11.334 No_date   14:40   54.10  n/a
                    +  06:S-CR4D        36.36    2.083 No_date   14:08   58.34  n/a
                    +  07:S-6LnA       310.44   12.772 No_date   14:45   59.73  n/a
                    +  08:5Ln-A        461.49   18.051 No_date   13:32   62.63  n/a
     [DT= 2.14]  SUM=  09:TOTFN5      1631.25   40.672 No_date   14:23   58.79  n/a
#****************************************************************************
```



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#****************************************************************************
 006:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25   40.672 No_date   14:23   58.79  n/a
  *  [RDT= 2.14] out<- 01:DR#1        1631.25   39.951 No_date   14:40   58.79  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.873:Dmax= 2.272}
#****************************************************************************
#****************************************************************************
 006:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76    2.733 No_date   12:57   57.55 .461
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 006:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76    2.733 No_date   12:57   57.55  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76    2.733 No_date   16:38   57.55  n/a
 006:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58   15.878 No_date   13:51   61.89 .496
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 006:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58   15.878 No_date   13:51   61.89  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58   15.878 No_date   16:25   61.89  n/a
 006:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90    5.114 No_date   12:53   61.89 .496
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 006:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76    2.733 No_date   16:38   57.55  n/a
                    +  04:S-4LnF       472.58   15.878 No_date   16:25   61.89  n/a
                    +  05:4Ln-E         92.90    5.114 No_date   12:53   61.89  n/a
     [DT= 2.14]  SUM=  09:TOTRED       621.24   19.349 No_date   16:30   61.50  n/a
 006:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24   19.349 No_date   16:30   61.50  n/a
                    +  01:DR#1        1631.25   39.951 No_date   14:40   58.79  n/a
     [DT= 2.14]  SUM=  09:TOTFN4      2252.49   51.461 No_date   16:02   59.54  n/a
#****************************************************************************
#****************************************************************************
 006:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49   51.461 No_date   16:02   59.54  n/a
  *  [RDT= 2.14] out<- 01:DR#2        2252.49   51.181 No_date   16:12   59.54  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.878:Dmax= 2.479}
#****************************************************************************
#****************************************************************************
 006:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-B        126.62    4.120 No_date   13:02   41.56 .333
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.14]
```



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 006:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    4.120 No_date   13:02   41.56  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    4.120 No_date   13:42   41.56  n/a
 006:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    6.046 No_date   13:25   50.08 .401
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 006:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    4.120 No_date   13:42   41.56  n/a
                    +  05:3Ln-E        185.00    6.046 No_date   13:25   50.08  n/a
     [DT= 2.14]  SUM=  02:TLN3ND       311.62   10.048 No_date   13:36   46.62  n/a
 006:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62   10.048 No_date   13:36   46.62  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62   10.048 No_date   14:42   46.62  n/a
#****************************************************************************
#****************************************************************************
 006:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    9.394 No_date   13:00   62.63 .502
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.14]
 006:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    9.394 No_date   13:00   62.63  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    9.394 No_date   15:25   62.63  n/a
 006:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    5.538 No_date   13:51   64.10 .514
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.14]
 006:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    5.538 No_date   13:51   64.10  n/a
                    +  03:S-CR4A       181.15    9.394 No_date   15:25   62.63  n/a
     [DT= 2.14]  SUM=  02:TLN3SD       339.56   13.355 No_date   15:19   63.31  n/a
 006:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56   13.355 No_date   15:19   63.31  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56   13.355 No_date   16:25   63.31  n/a
#****************************************************************************
#****************************************************************************
 006:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80   11.704 No_date   13:10   73.90 .592
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.14]
 006:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    5.157 No_date   12:47   60.46 .484
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.14]
 006:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    5.157 No_date   12:47   60.46  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    5.157 No_date   14:10   60.46  n/a
 006:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       08:3Ln-C        248.17   10.222 No_date   13:21   60.46 .484
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 006:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80   11.704 No_date   13:10   73.90  n/a
                    +  02:S-4LnD        88.09    5.157 No_date   14:10   60.46  n/a
                    +  08:3Ln-C        248.17   10.222 No_date   13:21   60.46  n/a
     [DT= 2.14]  SUM=  04:TPNK         550.06   24.024 No_date   13:42   65.68  n/a
 006:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   24.024 No_date   13:42   65.68  n/a
                    +  06:S-L3ND       311.62   10.048 No_date   14:42   46.62  n/a
     [DT= 2.14]  SUM=  03:TLN3US       861.68   30.460 No_date   14:08   58.79  n/a
 006:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   30.460 No_date   14:08   58.79  n/a
                    +  05:S-L3NS       339.56   13.355 No_date   16:25   63.31  n/a
                    +  01:DR#2        2252.49   51.181 No_date   16:12   59.54  n/a
     [DT= 2.14]  SUM=  09:TFN3A       3453.73   77.265 No_date   16:06   59.72  n/a
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 006:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73   77.265 No_date   16:06   59.72  n/a
  *  [RDT= 2.14] out<- 01:DR#2US      3453.73   76.795 No_date   16:17   59.72  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.998}
 006:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52   15.940 No_date   12:53   80.40 .644
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.14]
 006:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73   76.795 No_date   16:17   59.72  n/a
                    +  02:10SR-E       225.52   15.940 No_date   12:53   80.40  n/a
     [DT= 2.14]  SUM=  09:TMID32      3679.25   80.479 No_date   14:45   60.99  n/a
#****************************************************************************
 006:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   80.479 No_date   14:45   60.99  n/a
  *  [RDT= 2.14] out<- 01:DR#2DS      3679.25   76.002 No_date   16:49   60.99  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.994}
#****************************************************************************
#****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 006:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90    7.475 No_date   14:10   67.04 .537
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.14]
```

```
 006:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    7.475 No_date   14:10   67.04  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    7.475 No_date   15:10   67.04  n/a
 006:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    3.132 No_date   13:23   57.55 .461
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.14]
 006:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    3.132 No_date   13:23   57.55  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    3.132 No_date   13:47   57.55  n/a
 006:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    4.122 No_date   12:53   57.55 .461
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.14]
 006:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    4.122 No_date   12:53   57.55  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    4.122 No_date   13:04   57.55  n/a
 006:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    3.694 No_date   12:57   58.34 .467
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 006:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    7.475 No_date   15:10   67.04  n/a
                    +  04:S-5SRD        81.43    3.132 No_date   13:47   57.55  n/a
                    +  05:SH400B        79.99    4.122 No_date   13:04   57.55  n/a
                    +  02:3Ln-B         74.81    3.694 No_date   12:57   58.34  n/a
     [DT= 2.14]  SUM=  06:TOTBLU       467.13   13.396 No_date   14:02   62.37  n/a
#****************************************************************************
#****************************************************************************
 006:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13   13.396 No_date   14:02   62.37  n/a
  *  [RDT= 2.14] out<- 07:DR#4         467.13   11.933 No_date   14:40   62.37  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .730:Dmax= 2.211}
#****************************************************************************
#**************************************************************************
 006:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    3.472 No_date   13:30   50.08 .401
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.14]
 006:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    3.472 No_date   13:30   50.08  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    3.472 No_date   16:02   50.08  n/a
 006:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07   10.506 No_date   14:17   70.87 .568
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.14]
 006:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            02:2Ln-B        318.07   10.506 No_date   14:17   70.87  n/a
                    +  04:S10SRD       110.02    3.472 No_date   16:02   50.08  n/a
     [DT= 2.14]  SUM=  05:TOTGRN       428.09   12.041 No_date   15:23   65.52  n/a
 006:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09   12.041 No_date   15:23   65.52  n/a
                    +  01:DR#2DS      3679.25   76.002 No_date   16:49   60.99  n/a
                    +  07:DR#4         467.13   11.933 No_date   14:40   62.37  n/a
     [DT= 2.14]  SUM=  09:TFN2U       4574.47   95.377 No_date   16:10   61.56  n/a
#****************************************************************************
#****************************************************************************
 006:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20   12.221 No_date   13:30   53.42 .428
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.14]
 006:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20   12.221 No_date   13:30   53.42  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20   12.221 No_date   15:30   53.42  n/a
 006:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20   12.221 No_date   15:30   53.42  n/a
                    +  09:TFN2U       4574.47   95.377 No_date   16:10   61.56  n/a
     [DT= 2.14]  SUM=  04:TFN2D       4939.67  106.884 No_date   15:49   60.95  n/a
#****************************************************************************
#****************************************************************************
 006:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67  106.884 No_date   15:49   60.95  n/a
  *  [RDT= 2.14] out<- 01:RGLF        4939.67   99.920 No_date   17:04   60.95  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.140}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 006:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22   13.294 No_date   14:00   73.90 .592
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.14]
 006:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22   13.294 No_date   14:00   73.90  n/a
                    +  01:GOLFE       4939.67   99.920 No_date   17:04   60.95  n/a
     [DT= 2.14]  SUM=  01:GOLFE       5289.89  105.921 No_date   16:53   61.81  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
 006:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    4.563 No_date   13:23   60.46 .484
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.14]
 006:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 02:4Ln-A        114.12    4.563 No_date   13:23   60.46  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    4.563 No_date   17:17   60.46  n/a
 006:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-B        171.81    6.737 No_date   13:25   59.73 .479
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.14]
 006:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-B        171.81    6.737 No_date   13:25   59.73  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    6.737 No_date   17:17   59.73  n/a
 006:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-A        268.08    8.868 No_date   13:45   58.34 .467
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.14]
 006:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:3Ln-A        268.08    8.868 No_date   13:45   58.34  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08    8.868 No_date   16:23   58.34  n/a
 006:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnA       114.12    4.563 No_date   17:17   60.46  n/a
                    +  04:S-4LnB       171.81    6.737 No_date   17:17   59.73  n/a
                    +  05:S-3LnA       268.08    8.868 No_date   16:23   58.34  n/a
     [DT= 2.14]  SUM=  02:TBLK1        554.01   19.185 No_date   17:04   59.21  n/a
 006:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:5SR-C        341.88   11.950 No_date   13:36   58.34 .467
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.14]
 006:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:5SR-C        341.88   11.950 No_date   13:36   58.34  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88   11.950 No_date   14:47   58.34  n/a
 006:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:2Ln-A        105.00    4.461 No_date   13:00   51.31 .411
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.14]
 006:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TBLK1        554.01   19.185 No_date   17:04   59.21  n/a
                    +  04:S-5SRC       341.88   11.950 No_date   14:47   58.34  n/a
                    +  05:2Ln-A        105.00    4.461 No_date   13:00   51.31  n/a
     [DT= 2.14]  SUM=  07:TOTBLK      1000.89   25.931 No_date   16:51   58.08  n/a
 006:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TOTBLK      1000.89   25.931 No_date   16:51   58.08  n/a
  *  [RDT= 2.14] out<- 02:GOLFN       1000.89   24.062 No_date   17:25   58.08  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 006:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:GOLFN       1000.89   24.062 No_date   17:25   58.08  n/a
                    +  01:GOLFE       5289.89  105.921 No_date   16:53   61.81  n/a
     [DT= 2.14]  SUM=  07:TGOLF       6290.78  129.284 No_date   17:08   61.22  n/a
```



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#****************************************************************************
#****************************************************************************
 006:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 07:TGOLF       6290.78  129.284 No_date   17:08   61.22  n/a
  *  [RDT= 2.14] out<- 02:GOLF        6290.78  122.742 No_date   18:00   61.22  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 006:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-A       406.60    7.939 No_date   14:08   40.51 .325
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.14]
 006:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-B        96.11    2.742 No_date   13:25   44.29 .355
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.14]
 006:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:T10AB        406.60    7.939 No_date   14:08   40.51  n/a
                    +  04:10SR-B        96.11    2.742 No_date   13:25   44.29  n/a
     [DT= 2.14]  SUM=  03:T10AB        502.71   10.410 No_date   13:55   41.23  n/a
 006:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:T10AB        502.71   10.410 No_date   13:55   41.23  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71   10.410 No_date   16:23   41.23  n/a
 006:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:13Ln-A       135.52    3.758 No_date   13:00   35.21 .282
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.14]
 006:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:13Ln-A       135.52    3.758 No_date   13:00   35.21  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    3.758 No_date   14:38   35.21  n/a
 006:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:14Ln-A       276.60    6.452 No_date   13:47   42.37 .340
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.14]
 006:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S13LnA       135.52    3.758 No_date   14:38   35.21  n/a
                    +  03:14Ln-A       276.60    6.452 No_date   13:47   42.37  n/a
     [DT= 2.14]  SUM=  09:TOT14L       412.12    9.536 No_date   14:25   40.01  n/a
 006:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOT14L       412.12    9.536 No_date   14:25   40.01  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12    9.536 No_date   17:53   40.01  n/a
 006:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:CR89-A       212.34    8.220 No_date   13:36   64.10 .514
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.14]
 006:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:CR89-A       212.34    8.220 No_date   13:36   64.10  n/a
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                 +  05:S10AB        502.71   10.410 No_date   16:23   41.23  n/a
                 +  03:THNYAK       412.12    9.536 No_date   17:53   40.01  n/a
   [DT= 2.14]  SUM=  03:THNYAK      1430.10   27.622 No_date   16:06   48.02  n/a
 006:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 03:THNYAK      1430.10   27.622 No_date   16:06   48.02  n/a
    [LAG=123.6 min]<- 04:HYND         1430.10   27.622 No_date   18:08   48.02  n/a
#*****************************************************************************
#*****************************************************************************
 006:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ADD HYD              04:HYND         1430.10   27.622 No_date   18:08   48.02  n/a
                 +  02:GOLF         6290.78  122.742 No_date   18:00   61.22  n/a
    [DT= 2.14]  SUM=  09:HWY400       7720.88  150.315 No_date   18:02   58.77  n/a
#*****************************************************************************
#*****************************************************************************
 006:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ROUTE CHANNEL    -> 09:HWY400      7720.88  150.315 No_date   18:02   58.77  n/a
 *  [RDT= 2.14] out<- 01:DR#6         7720.88  132.356 No_date   19:21   58.77  n/a
    [L/S/n= 1700./ .010/.060]
    {Vmax=  .087:Dmax= 2.528}
#*****************************************************************************
#*****************************************************************************
 006:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         02:5SR-B         119.01    4.221 No_date   13:23   53.42 .428
    [CN= 72.0: N= 3.00]
    [Tp= 1.29:DT= 2.14]
 006:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 02:5SR-B         119.01    4.221 No_date   13:23   53.42  n/a
    [LAG=108.3 min]<- 03:S-5SRB        119.01    4.221 No_date   15:10   53.42  n/a
 006:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         02:5SR-A          97.15    3.701 No_date   13:17   54.10 .434
    [CN= 72.0: N= 3.00]
    [Tp= 1.20:DT= 2.14]
 006:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 02:5SR-A          97.15    3.701 No_date   13:17   54.10  n/a
    [LAG=123.3 min]<- 04:S-5SRA         97.15    3.701 No_date   15:19   54.10  n/a
 006:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB STANDHYD       05:15Ln-A         37.07    7.857 No_date   12:00   90.30 .724
    [XIMP=.50:TIMP=.50]
    [LOSS= 2 :CN= 68.0]
    [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
    [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 006:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         06:H89-A          47.36    1.636 No_date   12:51   38.71 .310
    [CN= 64.0: N= 3.00]
    [Tp=  .80:DT= 2.14]
 006:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 06:H89-A          47.36    1.636 No_date   12:51   38.71  n/a
    [LAG= 45.5 min]<- 07:S-H89A         47.36    1.636 No_date   13:36   38.71  n/a
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 006:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ADD HYD              03:S-5SRB        119.01    4.221 No_date   15:10   53.42  n/a
                 +  04:S-5SRA          97.15    3.701 No_date   15:19   54.10  n/a
                 +  05:15Ln-A          37.07    7.857 No_date   12:00   90.30  n/a
                 +  07:S-H89A          47.36    1.636 No_date   13:36   38.71  n/a
    [DT= 2.14]  SUM=  06:TOTPLM        300.59    9.108 No_date   15:08   55.87  n/a
 006:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ADD HYD              06:TOTPLM        300.59    9.108 No_date   15:08   55.87  n/a
                 +  01:DR#6          7720.88  132.356 No_date   19:21   58.77  n/a
    [DT= 2.14]  SUM=  09:TFN15L       8021.47  134.331 No_date   19:19   58.66  n/a
 ** END OF RUN :   6

******************************************************************************




 RUN:COMMAND#
 007:0001-----------------------------------------------------------------------------
   START
    [TZERO =    .00 hrs on        0]
    [METOUT=   2    (1=imperial, 2=metric output)]
    [NSTORM=   1 ]
    [NRUN  =   7 ]
#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2018-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# EX_FINAL WITH CLIMATE CHANGE RAINFALL DATA
# MTO IDF RAINFALL TOOL
# 24 HR SCS TYPE II
# Modified IA - Using NRSCS IA instead of NVCA IA
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIS SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 007:0002-----------------------------------------------------------------------------
   READ STORM
    Filename = STORM.001
    Comment  =
    [SDT=60.00:SDUR=  12.00:PTOT= 193.00]
```



```
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 007:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         01:7Ln-A          92.30    4.489 No_date    9:06  103.81 .538
    [CN= 70.0: N= 3.00]
    [Tp= 1.20:DT= 2.00]
 007:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 01:7Ln-A          92.30    4.489 No_date    9:06  103.81  n/a
    [LAG=278.5 min]<- 02:S-7LnA         92.30    4.489 No_date   13:44  103.81  n/a
 007:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         01:5SR-E         225.54   11.032 No_date    9:54  123.89 .642
    [CN= 77.0: N= 3.00]
    [Tp= 2.07:DT= 2.00]
 007:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 01:5SR-E         225.54   11.032 No_date    9:54  123.89  n/a
    [LAG=165.9 min]<- 03:S-5SRE        225.54   11.032 No_date   12:38  123.89  n/a
 007:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         04:10SR-G        505.12   21.194 No_date   10:26  110.30 .571
    [CN= 72.0: N= 3.00]
    [Tp= 2.36:DT= 2.00]
 007:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         05:CR4-D          36.36    2.323 No_date    7:32  116.07 .601
    [CN= 74.0: N= 3.00]
    [Tp=  .79:DT= 2.00]
 007:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 05:CR4-D          36.36    2.323 No_date    7:32  116.07  n/a
    [LAG= 84.1 min]<- 06:S-CR4D         36.36    2.323 No_date    8:56  116.07  n/a
 007:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         01:6Ln-A         310.44   16.755 No_date    8:32  118.12 .612
    [CN= 75.0: N= 3.00]
    [Tp= 1.26:DT= 2.00]
 007:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 01:6Ln-A         310.44   16.755 No_date    8:32  118.12  n/a
    [LAG= 86.9 min]<- 07:S-6LnA        310.44   16.755 No_date    9:58  118.12  n/a
 007:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         08:5Ln-A         461.49   24.839 No_date    9:12  121.80 .631
    [CN= 76.0: N= 3.00]
    [Tp= 1.44:DT= 2.00]
 007:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ADD HYD              02:S-7LnA         92.30    4.489 No_date   13:44  103.81  n/a
                 +  03:S-5SRE         225.54   11.032 No_date   12:38  123.89  n/a
                 +  04:10SR-G         505.12   21.194 No_date   10:26  110.30  n/a
                 +  06:S-CR4D          36.36    2.323 No_date    8:56  116.07  n/a
                 +  07:S-6LnA         310.44   16.755 No_date    9:58  118.12  n/a
                 +  08:5Ln-A          461.49   24.839 No_date    9:12  121.80  n/a
    [DT= 2.00]  SUM=  09:TOTFN5       1631.25   69.347 No_date   10:32  116.68  n/a
#*****************************************************************************
```



```
#*****************************************************************************
 007:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ROUTE CHANNEL    -> 09:TOTFN5      1631.25   69.347 No_date   10:32  116.68  n/a
 *  [RDT= 2.00] out<- 01:DR#1         1631.25   69.196 No_date   10:44  116.68  n/a
    [L/S/n= 1780./ .290/.030]
    {Vmax= 1.846:Dmax= 2.295}
#*****************************************************************************
#*****************************************************************************
 007:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         02:CR4-C          55.76    3.279 No_date    7:46  115.19 .597
    [CN= 74.0: N= 3.00]
    [Tp=  .95:DT= 2.00]
 007:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 02:CR4-C          55.76    3.279 No_date    7:46  115.19  n/a
    [LAG=222.2 min]<- 03:S-CR4C         55.76    3.279 No_date   11:28  115.19  n/a
 007:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         02:4Ln-F         472.58   24.204 No_date    9:30  120.99 .627
    [CN= 76.0: N= 3.00]
    [Tp= 1.72:DT= 2.00]
 007:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   SHIFT HYD        -> 02:4Ln-F         472.58   24.204 No_date    9:30  120.99  n/a
    [LAG=156.2 min]<- 04:S-4LnF        472.58   24.204 No_date   12:06  120.99  n/a
 007:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         05:4Ln-E          92.90    5.840 No_date    7:40  120.99 .627
    [CN= 76.0: N= 3.00]
    [Tp=  .91:DT= 2.00]
 007:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ADD HYD              03:S-CR4C         55.76    3.279 No_date   11:28  115.19  n/a
                 +  04:S-4LnF         472.58   24.204 No_date   12:06  120.99  n/a
                 +  05:4Ln-E           92.90    5.840 No_date    7:40  120.99  n/a
    [DT= 2.00]  SUM=  09:TOTRED        621.24   29.973 No_date   11:50  120.47  n/a
 007:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ADD HYD              09:TOTFN4        621.24   29.973 No_date   11:50  120.47  n/a
                 +  01:DR#1          1631.25   69.196 No_date   10:44  116.68  n/a
    [DT= 2.00]  SUM=  09:TOTFN4       2252.49   97.785 No_date   11:18  117.73  n/a
#*****************************************************************************
#*****************************************************************************
 007:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   ROUTE CHANNEL    -> 09:TOTFN4      2252.49   97.785 No_date   11:18  117.73  n/a
 *  [RDT= 2.00] out<- 01:DR#2         2252.49   97.510 No_date   11:32  117.73  n/a
    [L/S/n= 1530./ .230/.030]
    {Vmax= 1.872:Dmax= 2.467}
#*****************************************************************************
#*****************************************************************************
 007:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   CALIB NASHYD         02:CR4-B         126.62    5.874 No_date    7:54   92.51 .479
    [CN= 66.0: N= 3.00]
    [Tp=  .97:DT= 2.00]
```

```
007:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62    5.874 No_date    7:54   92.51  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62    5.874 No_date    8:34   92.51  n/a
007:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00    8.946 No_date    9:12  104.65 .542
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
007:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62    5.874 No_date    8:34   92.51  n/a
                    +  05:3Ln-E        185.00    8.946 No_date    9:12  104.65  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62   14.706 No_date    8:42   99.72  n/a
007:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62   14.706 No_date    8:42   99.72  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62   14.706 No_date    9:48   99.72  n/a
#****************************************************************************
#****************************************************************************
007:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15   10.990 No_date    7:48  121.80 .631
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
007:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15   10.990 No_date    7:48  121.80  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15   10.990 No_date   10:14  121.80  n/a
007:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41    8.272 No_date    9:30  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
007:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41    8.272 No_date    9:30  123.89  n/a
                    +  03:S-CR4A       181.15   10.990 No_date   10:14  121.80  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56   18.936 No_date   10:08  122.78  n/a
007:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56   18.936 No_date   10:08  122.78  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56   18.936 No_date   11:14  122.78  n/a
#****************************************************************************
#****************************************************************************
007:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80   13.436 No_date    8:04  136.27 .706
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
007:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09    5.706 No_date    7:32  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
007:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:4Ln-D         88.09    5.706 No_date    7:32  118.92  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09    5.706 No_date    8:56  118.92  n/a
007:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       08:3Ln-C        248.17   13.391 No_date    8:38  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
007:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80   13.436 No_date    8:04  136.27  n/a
                    +  02:S-4LnD        88.09    5.706 No_date    8:56  118.92  n/a
                    +  08:3Ln-C        248.17   13.391 No_date    8:38  118.92  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06   32.027 No_date    8:50  125.66  n/a
007:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06   32.027 No_date    8:50  125.66  n/a
                    +  06:S-L3ND       311.62   14.706 No_date    9:48   99.72  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68   45.662 No_date    9:14  116.28  n/a
007:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68   45.662 No_date    9:14  116.28  n/a
                    +  05:S-L3NS       339.56   18.936 No_date   11:14  122.78  n/a
                    +  01:DR#2        2252.49   97.510 No_date   11:32  117.73  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73  152.128 No_date   11:04  117.86  n/a
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
007:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73  152.128 No_date   11:04  117.86  n/a
 *   [RDT= 2.00] out<- 01:DR#2US      3453.73  149.472 No_date   11:34  117.86  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .258:Dmax= 2.997}
007:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52   16.380 No_date    7:40  144.35 .748
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
007:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73  149.472 No_date   11:34  117.86  n/a
                    +  02:10SR-E       225.52   16.380 No_date    7:40  144.35  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25  157.454 No_date   11:28  119.49  n/a
#****************************************************************************
007:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25  157.454 No_date   11:28  119.49  n/a
 *   [RDT= 2.00] out<- 01:DR#2DS      3679.25  147.573 No_date   12:34  119.49  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .258:Dmax= 2.994}
#****************************************************************************
#****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
007:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-C        230.90   11.655 No_date    9:48  127.56 .661
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
```



```
007:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90   11.655 No_date    9:48  127.56  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90   11.655 No_date   10:48  127.56  n/a
007:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43    4.275 No_date    9:04  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
007:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43    4.275 No_date    9:04  115.19  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43    4.275 No_date    9:28  115.19  n/a
007:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99    4.835 No_date    7:40  115.19 .597
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
007:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99    4.835 No_date    7:40  115.19  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99    4.835 No_date    7:52  115.19  n/a
007:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81    4.403 No_date    7:46  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
007:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90   11.655 No_date   10:48  127.56  n/a
                    +  04:S-5SRD        81.43    4.275 No_date    9:28  115.19  n/a
                    +  05:SH400B        79.99    4.835 No_date    7:52  115.19  n/a
                    +  02:3Ln-B         74.81    4.403 No_date    7:46  116.07  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13   22.448 No_date    9:42  121.45  n/a
#****************************************************************************
#****************************************************************************
007:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13   22.448 No_date    9:42  121.45  n/a
 *   [RDT= 2.00] out<- 07:DR#4         467.13   18.858 No_date   11:38  121.44  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .260:Dmax= 2.967}
#****************************************************************************
#**************************************************************************
007:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02    5.279 No_date    9:14  104.65 .542
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
007:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02    5.279 No_date    9:14  104.65  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02    5.279 No_date   11:46  104.65  n/a
007:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07   16.260 No_date    9:56  132.59 .687
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
007:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    ADD HYD            02:2Ln-B        318.07   16.260 No_date    9:56  132.59  n/a
                    +  04:S10SRD       110.02    5.279 No_date   11:46  104.65  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09   20.769 No_date   10:28  125.41  n/a
007:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09   20.769 No_date   10:28  125.41  n/a
                    +  01:DR#2DS      3679.25  147.573 No_date   12:34  119.49  n/a
                    +  07:DR#4         467.13   18.858 No_date   11:38  121.44  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47  183.556 No_date   12:18  120.24  n/a
#****************************************************************************
#****************************************************************************
007:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20   18.173 No_date    9:14  109.52 .567
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
007:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20   18.173 No_date    9:14  109.52  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20   18.173 No_date   11:14  109.52  n/a
007:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20   18.173 No_date   11:14  109.52  n/a
                    +  09:TFN2U       4574.47  183.556 No_date   12:18  120.24  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67  200.122 No_date   12:06  119.45  n/a
#****************************************************************************
#****************************************************************************
007:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67  200.122 No_date   12:06  119.45  n/a
 *   [RDT= 2.00] out<- 01:RGLF        4939.67  190.184 No_date   13:08  119.45  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .173:Dmax= 2.138}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
007:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22   19.091 No_date    9:36  136.27 .706
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
007:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22   19.091 No_date    9:36  136.27  n/a
                    +  01:GOLFE       4939.67  190.184 No_date   13:08  119.45  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89  201.348 No_date   12:54  120.56  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
007:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12    6.114 No_date    9:04  118.92 .616
     [CN= 75.0: N= 3.00]
     [Tp= 1.33:DT= 2.00]
007:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    SHIFT HYD        -> 02:4Ln-A        114.12    6.114 No_date    9:04  118.92  n/a
     [LAG=234.2 min]<- 03:S-4LnA       114.12    6.114 No_date   12:58  118.92  n/a
 007:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:4Ln-B        171.81    9.161 No_date    9:06  118.12 .612
     [CN= 75.0: N= 3.00]
     [Tp= 1.34:DT= 2.00]
 007:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-B        171.81    9.161 No_date    9:06  118.12  n/a
     [LAG=232.5 min]<- 04:S-4LnB       171.81    9.161 No_date   12:58  118.12  n/a
 007:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:3Ln-A        268.08   13.497 No_date    9:24  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp= 1.61:DT= 2.00]
 007:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:3Ln-A        268.08   13.497 No_date    9:24  116.07  n/a
     [LAG=158.8 min]<- 05:S-3LnA       268.08   13.497 No_date   12:02  116.07  n/a
 007:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-4LnA       114.12    6.114 No_date   12:58  118.92  n/a
                     +  04:S-4LnB       171.81    9.161 No_date   12:58  118.12  n/a
                     +  05:S-3LnA       268.08   13.497 No_date   12:02  116.07  n/a
     [DT= 2.00]  SUM=   02:TBLK1        554.01   28.533 No_date   12:16  117.29  n/a
 007:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:5SR-C        341.88   17.529 No_date    9:18  116.07 .601
     [CN= 74.0: N= 3.00]
     [Tp= 1.50:DT= 2.00]
 007:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:5SR-C        341.88   17.529 No_date    9:18  116.07  n/a
     [LAG= 72.5 min]<- 04:S-5SRC       341.88   17.529 No_date   10:30  116.07  n/a
 007:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        05:2Ln-A        105.00    5.681 No_date    7:48  106.60 .552
     [CN= 71.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 007:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:TBLK1        554.01   28.533 No_date   12:16  117.29  n/a
                     +  04:S-5SRC       341.88   17.529 No_date   10:30  116.07  n/a
                     +  05:2Ln-A        105.00    5.681 No_date    7:48  106.60  n/a
     [DT= 2.00]  SUM=   07:TOTBLK      1000.89   46.140 No_date   11:46  115.76  n/a
 007:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 07:TOTBLK      1000.89   46.140 No_date   11:46  115.76  n/a
  *  [RDT= 2.00] out<- 02:GOLFN       1000.89   44.406 No_date   12:30  115.76  n/a
     [L/S/n=  330./ .040/.050]
     {Vmax=  .104:Dmax= 2.138}
#****************************************************************************
#****************************************************************************
 007:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:GOLFN       1000.89   44.406 No_date   12:30  115.76  n/a
                     +  01:GOLFE       5289.89  201.348 No_date   12:54  120.56  n/a
     [DT= 2.00]  SUM=   07:TGOLF       6290.78  245.367 No_date   12:48  119.80  n/a
```



```
#****************************************************************************
#****************************************************************************
 007:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 07:TGOLF       6290.78  245.367 No_date   12:48  119.80  n/a
  *  [RDT= 2.00] out<- 02:GOLF        6290.78  234.916 No_date   13:48  119.80  n/a
     [L/S/n=  485./ .040/.050]
     {Vmax=  .104:Dmax= 2.139}
#****************************************************************************
#****************************************************************************
 007:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:10SR-A       406.60   15.875 No_date    9:52   90.69 .470
     [CN= 65.0: N= 3.00]
     [Tp= 1.82:DT= 2.00]
 007:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:10SR-B        96.11    4.340 No_date    9:14   96.29 .499
     [CN= 67.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 007:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:T10AB        406.60   15.875 No_date    9:52   90.69  n/a
                     +  04:10SR-B        96.11    4.340 No_date    9:14   96.29  n/a
     [DT= 2.00]  SUM=   03:T10AB        502.71   20.063 No_date    9:42   91.77  n/a
 007:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:T10AB        502.71   20.063 No_date    9:42   91.77  n/a
     [LAG=149.0 min]<- 05:S10AB        502.71   20.063 No_date   12:10   91.77  n/a
 007:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:13Ln-A       135.52    5.683 No_date    7:50   82.54 .428
     [CN= 62.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 007:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:13Ln-A       135.52    5.683 No_date    7:50   82.54  n/a
     [LAG=100.5 min]<- 04:S13LnA       135.52    5.683 No_date    9:30   82.54  n/a
 007:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        03:14Ln-A       276.60   11.673 No_date    9:32   93.47 .484
     [CN= 66.0: N= 3.00]
     [Tp= 1.55:DT= 2.00]
 007:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:S13LnA       135.52    5.683 No_date    9:30   82.54  n/a
                     +  03:14Ln-A       276.60   11.673 No_date    9:32   93.47  n/a
     [DT= 2.00]  SUM=   09:TOT14L       412.12   17.356 No_date    9:30   89.88  n/a
 007:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 09:TOT14L       412.12   17.356 No_date    9:30   89.88  n/a
     [LAG=210.0 min]<- 03:S13LnA       412.12   17.356 No_date   12:58   89.88  n/a
 007:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:CR89-A       212.34   11.491 No_date    9:14  123.89 .642
     [CN= 77.0: N= 3.00]
     [Tp= 1.51:DT= 2.00]
 007:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:CR89-A       212.34   11.491 No_date    9:14  123.89  n/a
```



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                     +  05:S10AB        502.71   20.063 No_date   12:10   91.77  n/a
                     +  03:THNYAK       412.12   17.356 No_date   12:58   89.88  n/a
     [DT= 2.00]  SUM=   03:THNYAK      1430.10   55.553 No_date   11:44  101.31  n/a
 007:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:THNYAK      1430.10   55.553 No_date   11:44  101.31  n/a
     [LAG=123.6 min]<- 04:HYND         1430.10   55.553 No_date   13:46  101.31  n/a
#****************************************************************************
#****************************************************************************
 007:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:HYND        1430.10   55.553 No_date   13:46  101.31  n/a
                     +  02:GOLF        6290.78  234.916 No_date   13:48  119.80  n/a
     [DT= 2.00]  SUM=   09:HWY400      7720.88  290.468 No_date   13:48  116.37  n/a
#****************************************************************************
#****************************************************************************
 007:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:HWY400      7720.88  290.468 No_date   13:48  116.37  n/a
  *  [RDT= 2.00] out<- 01:DR#6        7720.88  265.749 No_date   15:12  116.37  n/a
     [L/S/n= 1700./ .010/.060]
     {Vmax=  .087:Dmax= 2.528}
#****************************************************************************
#****************************************************************************
 007:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-B        119.01    5.998 No_date    9:08  109.52 .567
     [CN= 72.0: N= 3.00]
     [Tp= 1.29:DT= 2.00]
 007:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-B        119.01    5.998 No_date    9:08  109.52  n/a
     [LAG=108.3 min]<- 03:S-5SRB       119.01    5.998 No_date   10:56  109.52  n/a
 007:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:5SR-A         97.15    4.980 No_date    8:24  110.30 .571
     [CN= 72.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 007:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-A         97.15    4.980 No_date    8:24  110.30  n/a
     [LAG=123.3 min]<- 04:S-5SRA        97.15    4.980 No_date   10:26  110.30  n/a
 007:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      05:15Ln-A        37.07    2.445 No_date    7:00  151.74 .786
     [XIMP=.50:TIMP=.50]
     [LOSS= 2 :CN= 68.0]
     [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=    .0]
 007:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:H89-A         47.36    2.244 No_date    7:36   87.96 .456
     [CN= 64.0: N= 3.00]
     [Tp=  .80:DT= 2.00]
 007:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 06:H89-A         47.36    2.244 No_date    7:36   87.96  n/a
     [LAG= 45.5 min]<- 07:S-H89A        47.36    2.244 No_date    8:20   87.96  n/a
```



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 007:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:S-5SRB       119.01    5.998 No_date   10:56  109.52  n/a
                     +  04:S-5SRA        97.15    4.980 No_date   10:26  110.30  n/a
                     +  05:15Ln-A        37.07    2.445 No_date    7:00  151.74  n/a
                     +  07:S-H89A        47.36    2.244 No_date    8:20   87.96  n/a
     [DT= 2.00]  SUM=   06:TOTPLM       300.59   14.220 No_date   10:12  111.58  n/a
 007:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTPLM       300.59   14.220 No_date   10:12  111.58  n/a
                     +  01:DR#6        7720.88  265.749 No_date   15:12  116.37  n/a
     [DT= 2.00]  SUM=   09:TFN15L      8021.47  269.848 No_date   15:02  116.19  n/a
 007:0002-----------------------------------------------------------------------------
     FINISH
--------------------------------------------------------------------------------
********************************************************************************
    WARNINGS / ERRORS / NOTES
    -------------------------
 001:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0022 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0040 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0043 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0052 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0061 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0075 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
 001:0077 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 001:0091 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
     *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0014 ROUTE CHANNEL   ->
     *** WARNING: Requested routing DT > than inflow DT.
                  Routing DT set to inflow hydrograph DT.
```

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 002:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 002:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 002:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 002:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 002:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0014 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 003:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 003:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 003:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
```



```
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 003:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 003:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0014 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 004:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 004:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 004:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0014 ROUTE CHANNEL   ->
```



```
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 005:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 005:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0014 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
```



```
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 006:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 006:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0014 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 007:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
```

```
 007:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 007:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
   Simulation ended on 2018-02-08     at 14:11:15
================================================================================
```

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Sub-Appendix D3

Calibration and Validation

D3

```
2     Metric units
*#****************************************************************************
*#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
*#  Project No. : [300038790]
*#  Date        : 2017-02-08
*#  Date Rev.   : N/A
*#  Modeller    : [T.Lozon]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#****************************************************************************
*%
*# EXISTING CONDITION
*# MODEL RUN BASED ON EX_FINAL.TXT
*# EX_CALIBRATION RUN(EX_CALIB4)
*# 12% REDUCTION IN IA VALUES
*#
*# RECORDED 36mm RAINFALL EVENT
*# Innisfil Creek at 5SD Inni RAIN GAGE
*#
*#
*# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
*# TOPOGRAPHIC SURVEY INFORMATION
*# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
*%
*%
*%
*% 2-YR SCS Type-II ORILLIA Storm Distribution . (12-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["36SCS24.txt"] <--storm filename
*%-----------------|-----------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-----------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE ORANGE
*#Flows to Flow Node 5 (LINE 5)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 7 Ln-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["7Ln-A"], DT=[2]min, AREA=[92.30](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment 7 Ln-A to Flow Node 1
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-7LnA"], IDin=[1], TLAG=[278.45](min)
```



```
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 5 SR-E
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["5SR-E"], DT=[2]min, AREA=[225.54](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[13.35](mm),
                    N=[3], TP=[2.07]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment 5 SR-E to Flow Node 1
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRE"], IDin=[1], TLAG=[165.95](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 10 SR-G (NO ROUTING NEEDED)
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-G"], DT=[2]min, AREA=[505.12](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[2.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment CR 4-D
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["CR4-D"], DT=[2]min, AREA=[36.36](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.79]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment CR 4-D to Flow Node 1
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-CR4D"], IDin=[5], TLAG=[84.11](min)
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 6 Ln-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["6Ln-A"], DT=[2]min, AREA=[310.44](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.26]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment 6 Ln-A to Flow Node 1
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["S-6LnA"], IDin=[1], TLAG=[86.92](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 5 Ln-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["5Ln-A"], DT=[2]min, AREA=[461.49](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
```



```
                    N=[3], TP=[1.44]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*% TOTAL FLOWS AT LINE 5
*%Add flows at Flow Node 7 from Catchments 7 Ln-A, 5 SR-E, 10 SR-G, CR 4-D,
*%   6 Ln-A & 5 Ln-A
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN5"], IDs to add=[2+3+4+6+7+8]
*%-----------------|-----------------------------------------------------------|

*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 5 TO LINE 4
*% DRAIN #1
*% USE HEC-RAS X-SECTION 18
ROUTE CHANNEL       IDout=[1], NHYD=["DR#1"], IDin=[9],
                    RDT=[5](min),
                    CHLGTH=[1780](m),  CHSLOPE=[0.29](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[18],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,249.27] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0,234.17]
                                                   [205.47,230.2]
                                                   [212.04,229.96]
                                                   [215.28,227.63]
                                                   [216.96,227.6]
                                                   [221.63,229.92]
                                                   [249.27,230.06]
*%-----------------|-----------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE RED
*%
*%Flows from Catchment CR 4-C
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-C"], DT=[2]min, AREA=[55.76](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment CR 4-C to Flow Node 3
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4C"], IDin=[2], TLAG=[222.18](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 4 Ln-F
```



```
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-F"], DT=[2]min, AREA=[472.58](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-F to Flow Node 3
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnF"], IDin=[2], TLAG=[156.21](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 4 Ln-E
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["4Ln-E"], DT=[2]min, AREA=[92.9](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*% TOTAL RED
*% Add from Catchments CR4-C,4Ln-F,4Ln-E
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTRED"], IDs to add=[3+4+5]
*%-----------------|-----------------------------------------------------------|
*% TOTAL FLOW TO LINE 4
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN4"], IDs to add=[9+1]
*%-----------------|-----------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 4 TO LINE 3
*% USE HEC X-SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1530](m),  CHSLOPE=[0.23](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,779.49] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[746.77,227.72]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]

*%-----------------|-----------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE FLOWS TO LINE 3 NORTH DITCH
*%
```

```
CALIB NASHYD        ID=[2], NHYD=["CR4-B"], DT=[2]min, AREA=[126.62](ha),
                    DWF=[0](cms), CN/C=[66.0], IA=[23.03](mm),
                    N=[3], TP=[0.97]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment CR 4-B to Flow Node 3
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-CR4B"], IDin=[2], TLAG=[41.18](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 3 Ln-E
CALIB NASHYD        ID=[5], NHYD=["3Ln-E"], DT=[2]min, AREA=[185.00](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*% LINE 3 NORTH DITCH
*% Add from Catchments
ADD HYD             IDsum=[2], NHYD=["TLN3ND"], IDs to add=[4+5]
*%-----------------|--------------------------------------------------------------|
*%Shift flow from LIN3ND TO FLOW NODE 3
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-L3ND"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|--------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%Flows from Catchment CR 4-A
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-A"], DT=[2]min, AREA=[181.15](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[1.00]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment CR 4-A to Flow Node 3
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4A"], IDin=[2], TLAG=[147.74](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment CR 4-B
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 10 SR-F
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-F"], DT=[2]min, AREA=[158.41](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[13.35](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*% LINE 3 SOUTH DITCH
```



```
ADD HYD             IDsum=[2], NHYD=["TLN3SD"], IDs to add=[2+3]
*%-----------------|--------------------------------------------------------------|
*%Shift flow from LIN3NS TO FLOW NODE 3
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-L3NS"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|--------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************

*%Flows from Catchment 3 Ln-D
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[7], NHYD=["3Ln-D"], DT=[2]min, AREA=[213.80](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[10.49](mm),
                    N=[3], TP=[1.18]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 4 Ln-D
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["4Ln-D"], DT=[2]min, AREA=[88.09](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[0.81]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-D to Flow Node 2
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-4LnD"], IDin=[8], TLAG=[84.98](min)
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 3 Ln-C
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["3Ln-C"], DT=[2]min, AREA=[248.17](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TPNK"], IDs to add=[7+2+8]
*%-----------------|--------------------------------------------------------------|
*% TOTAL FLOW AT U/S SIDE OF LINE 3
*% Add from Catchments
ADD HYD             IDsum=[3], NHYD=["TLN3US"], IDs to add=[4+6]
*%-----------------|--------------------------------------------------------------|
*% TOTAL FLOW AT THE D/S LIMTIS OF LINE 3
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN3A"], IDs to add=[3+5+1]
*%-----------------|--------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
```



```
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO MIDWAY TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2US"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[685](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 10 SR-E
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-E"], DT=[2]min, AREA=[225.52](ha),
                    DWF=[0](cms), CN/C=[84.0], IA=[8.52](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*% TOTAL FLOW MID A JUNCTION BETWEEN LINE 3 AND 2
ADD HYD             IDsum=[9], NHYD=["TMID32"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------------|
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2DS"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[2250](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|--------------------------------------------------------------|
*#*******************************************************************************
```



```
*#*******************************************************************************
*% CALCULATE BLUE
*%
*#Flows FROM WEST OF THE 400 TO 2ND LINE
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 4 Ln-C
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-C"], DT=[2]min, AREA=[230.90](ha),
                    DWF=[0](cms), CN/C=[78.0], IA=[12.61](mm),
                    N=[3], TP=[2.02]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-C to Flow Node 4
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnC"], IDin=[2], TLAG=[60.19](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 5 SR-D
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-D"], DT=[2]min, AREA=[81.43](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-D to Flow Node 4
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRD"], IDin=[2], TLAG=[24.84](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment H 400-B
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["H400-B"], DT=[2]min, AREA=[79.99](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|--------------------------------------------------------------|
*%Shift flow from Catchment H 400-B to Flow Node 4
*%-----------------|--------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["SH400B"], IDin=[2], TLAG=[12.66](min)
*%-----------------|--------------------------------------------------------------|
*%-----------------|--------------------------------------------------------------|
*%Flows from Catchment 3 Ln-B
*%-----------------|--------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-B"], DT=[2]min, AREA=[74.81](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
```

```
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Add flows at Flow Node 4 from Catchments 4 Ln-C, 5 SR-D, H 400-B & 3 Ln-B
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLUE
ADD HYD             IDsum=[6], NHYD=["TOTBLU"], IDs to add=[3+4+5+2]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[7], NHYD=["DR#4"], IDin=[6],
                    RDT=[15](min),
                    CHLGTH=[2000](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#***************************************************************************
*%Flows from Catchment 10 SR-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-D"], DT=[2]min, AREA=[110.02](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                    N=[3], TP=[1.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-D to Flow Node 2
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S10SRD"], IDin=[2], TLAG=[153.59](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["2Ln-B"], DT=[2]min, AREA=[318.07](ha),
                    DWF=[0](cms), CN/C=[80.0], IA=[11.18](mm),
                    N=[3], TP=[2.13]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
```



```
*% TOTAL GREEN
*% Add from Catchments
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=["TOTGRN"], IDs to add=[2+4]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW TO LINE 2
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW UPSTREAM OF THE 2ND LINE
ADD HYD             IDsum=[9], NHYD=["TFN2U"], IDs to add=[5+1+7]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment 10 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["10SR-C"], DT=[2]min, AREA=[365.20](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[1.39]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-C DOWNSTREAM LIMITS OF 2ND LINE
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S10SRC"], IDin=[3], TLAG=[121.76](min)
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW DOWNSTREAM OF THE 2ND LINE
ADD HYD             IDsum=[4], NHYD=["TFN2D"], IDs to add=[4+9]
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 2 TO FLOW NODE GOLF EAST
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[1], NHYD=["RGLF"], IDin=[4],
                    RDT=[15](min),
                    CHLGTH=[785](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500.00,226.10]
*%-----------------|-------------------------------------------------------------|
```



```
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************

*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment H 400-A
*% OUTLET TO GOLFE (GOLF COURSE EAST)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["H400-A"], DT=[2]min, AREA=[350.22](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[10.49](mm),
                    N=[3], TP=[1.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% CALCULATE TOTAL FLOW TO FLOW NODE GLFE (GOLF COURSE EAST)
ADD HYD             IDsum=[1], NHYD=["GOLFE"], IDs to add=[4+1]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE BLACK
*#Flows to Flow Node 2B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-A"], DT=[2]min, AREA=[114.12](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.33]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnA"], IDin=[2], TLAG=[234.20](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-B"], DT=[2]min, AREA=[171.81](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.34]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-B to Flow Node 5
*%-----------------|-------------------------------------------------------------|
```



```
SHIFT HYD           IDout=[4], NHYD=["S-4LnB"], IDin=[2], TLAG=[232.52](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-A"], DT=[2]min, AREA=[268.08](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[1.61]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 3 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-3LnA"], IDin=[2], TLAG=[158.77](min)
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[2], NHYD=["TBLK1"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["5SR-C"], DT=[2]min, AREA=[341.88](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[1.50]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-C to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRC"], IDin=[3], TLAG=[72.46](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["2Ln-A"], DT=[2]min, AREA=[105.00](ha),
                    DWF=[0](cms), CN/C=[71.0], IA=[18.26](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLACK
*%Add flows at Flow Node 5 from Catchments 4 Ln-A, 4 Ln-B, 3 Ln-A,
*%    5 SR-C & 2 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[7], NHYD=["TOTBLK"], IDs to add=[2+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TOTBLK TO FLOW NODE GOLF NORTH
*% ROUTE FLOWS FROM LINE 2 FLOW NODE GOLFN
```

```
*% USE HEC SECTION 11
ROUTE CHANNEL        IDout=[2], NHYD=["GOLFN"], IDin=[7],
                     RDT=[15](min),
                     CHLGTH=[330](m),  CHSLOPE=[0.04](%),
                                         FPSLOPE=[0.50](%),
                     SECNUM=[11],       NSEG=[1]
                     ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                     ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                    [860.67,226.03]
                                                    [865.17,223.96]
                                                    [867.01,223.96]
                                                    [871.48,225.21]
                                                    [879.46,225.75]
                                                    [1500,226.10]

*%-----------------|-----------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%-----------------|-----------------------------------------------------------|
*% TOTAL FLOWS FROM GOLF NORTH AND GOLF EAST
ADD HYD              IDsum=[7], NHYD=["TGOLF"], IDs to add=[2+1]
*%-----------------|-----------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%-----------------|-----------------------------------------------------------|
*% ROUTE FLOWS FROM TGOLF TO HWY 400
*% USE HEC SECTION 11
ROUTE CHANNEL        IDout=[2], NHYD=["GOLF"], IDin=[7],
                     RDT=[15](min),
                     CHLGTH=[485](m),  CHSLOPE=[0.04](%),
                                         FPSLOPE=[0.50](%),
                     SECNUM=[11],       NSEG=[1]
                     ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                     ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                    [860.67,226.03]
                                                    [865.17,223.96]
                                                    [867.01,223.96]
                                                    [871.48,225.21]
                                                    [879.46,225.75]
                                                    [1500,226.10]

*%-----------------|-----------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% YELLOW SOUTH( HNYDCZAK DRAIN)
*%Flows from Catchment 10 SR-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[3], NHYD=["10SR-A"], DT=[2]min, AREA=[406.60](ha),
```



```
                     DWF=[0](cms), CN/C=[65.0], IA=[24.07](mm),
                     N=[3], TP=[1.82]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 10 SR-B
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[4], NHYD=["10SR-B"], DT=[2]min, AREA=[96.11](ha),
                     DWF=[0](cms), CN/C=[67.0], IA=[22.02](mm),
                     N=[3], TP=[1.28]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B
*% INTERSECTION OF 10 SIDEROAD AND HWY 89
ADD HYD              IDsum=[3], NHYD=["T10AB"], IDs to add=[3+4]
*%-----------------|-----------------------------------------------------------|
*% SHIFT FLOW INTERSECTION OF 10 SIDEROAD AND HWY 89 TO OUTLET OF CR-89A
*%-----------------|-----------------------------------------------------------|
SHIFT HYD            IDout=[5], NHYD=["S10AB"], IDin=[3], TLAG=[148.99](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|

*%Flows from Catchment 13 Ln-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[3], NHYD=["13Ln-A"], DT=[2]min, AREA=[135.52](ha),
                     DWF=[0](cms), CN/C=[62], IA=[27.40](mm),
                     N=[3], TP=[0.91]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*% SHIFT FLOW FROM OUTLET OF 13 Ln-A to outelt of 14 Ln-A
*%-----------------|-----------------------------------------------------------|
SHIFT HYD            IDout=[4], NHYD=["S13LnA"], IDin=[3], TLAG=[100.46](min)
*%-----------------|-----------------------------------------------------------|

*%Flows from Catchment 14 Ln-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[3], NHYD=["14Ln-A"], DT=[2]min, AREA=[276.60](ha),
                     DWF=[0](cms), CN/C=[66], IA=[23.03](mm),
                     N=[3], TP=[1.55]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*% TOTAL FLOW AT THE 14TH LINE
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=["TOT14L"], IDs to add=[4+3]
*%-----------------|-----------------------------------------------------------|
*% SHIFT FLOW FROM 14TH LINE TO HIGHWAY 89
*%-----------------|-----------------------------------------------------------|
```



```
SHIFT HYD            IDout=[3], NHYD=["S13LnA"], IDin=[9], TLAG=[209.97](min)
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment CR 89-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[4], NHYD=["CR89-A"], DT=[2]min, AREA=[212.34](ha),
                     DWF=[0](cms), CN/C=[77.0], IA=[11.88](mm),
                     N=[3], TP=[1.51]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B + CR 89-A
*% HNYDCZAK CROSSES HWY 89
ADD HYD              IDsum=[3], NHYD=["THNYAK"], IDs to add=[4+5+3]
*%-----------------|-----------------------------------------------------------|
*% SHIFT FLOWS FROM HNYDCZAK CROSSES HWY 89 TO FLOW NODE HYND
*% FLOW NODE HYND LOCATED AT THE OUTLET OF THE HNYDCZAK UPSTREAM OF HIGHWAY 400
SHIFT HYD            IDout=[4], NHYD=["HYND"], IDin=[3], TLAG=[123.60](min)
*%-----------------|-----------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*%-----------------|-----------------------------------------------------------|
*% TOTAL FLOW AT HWY 400
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=["HWY400"], IDs to add=[4+2]
*%-----------------|-----------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM HWY 400 TO 15TH LINE
*% USE HEC SECTION 6
ROUTE CHANNEL        IDout=[1], NHYD=["DR#6"], IDin=[9],
                     RDT=[15](min),
                     CHLGTH=[1700](m),  CHSLOPE=[0.01](%),
                                         FPSLOPE=[0.50](%),
                     SECNUM=[6],       NSEG=[1]
                     ( SEGROUGH, SEGDIST (m))=[0.06,400.82] NSEG times
                     ( DISTANCE (m), ELEVATION (m))=[200.00,225.3]
                                                    [220.07,225.18]
                                                    [231.91,224.9]
                                                    [240.6,222.78]
                                                    [245.45,222.77]
                                                    [251.91,224.78]
                                                    [355.82,225.16]
                                                    [400.82,225.30]

*%-----------------|-----------------------------------------------------------|
*#*****************************************************************************
```



```
*#*****************************************************************************

*% CALCULATE PLUM
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 5 SR-B
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[2], NHYD=["5SR-B"], DT=[2]min, AREA=[119.01](ha),
                     DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                     N=[3], TP=[1.29]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment 5 SR-B to Flow Node 8
*%-----------------|-----------------------------------------------------------|
SHIFT HYD            IDout=[3], NHYD=["S-5SRB"], IDin=[2], TLAG=[108.27](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 5 SR-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[2], NHYD=["5SR-A"], DT=[2]min, AREA=[97.15](ha),
                     DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                     N=[3], TP=[1.20]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment 5 SR-A to Flow Node 8
*%-----------------|-----------------------------------------------------------|
SHIFT HYD            IDout=[4], NHYD=["S-5SRA"], IDin=[2], TLAG=[123.28](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment 15 Ln-A
*%-----------------|-----------------------------------------------------------|
CALIB STANDHYD       ID= [5], NHYD=["15Ln-A"], DT=[2](min), AREA=[37.07](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                     SCS curve number CN=[68],
                     Pervious   surfaces: IAper=[7.9](mm), SLPP=[1.0](%),
                                          LGP=[1685.7](m), MNP=[.25], SCP=[0](min),
                     Impervious surfaces: IAimp=[2](mm), SLPI=[0.9](%),
                                          LGI=[218.72](m), MNI=[.013], SCI=[0](min),
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*%Flows from Catchment H 89-A
*%-----------------|-----------------------------------------------------------|
CALIB NASHYD         ID=[6], NHYD=["H89-A"], DT=[2]min, AREA=[47.36](ha),
                     DWF=[0](cms), CN/C=[64.0], IA=[25.15](mm),
                     N=[3], TP=[0.80]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
*%Shift flow from Catchment H 89-A to Flow Node 8
*%-----------------|-----------------------------------------------------------|
```

```
SHIFT HYD           IDout=[7], NHYD=["S-H89A"], IDin=[6], TLAG=[45.46](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*% TOTAL PLUM
*%Add flows at Flow Node 8 from Catchments 5 SR-B, 5 SR-A, H 89-A, 15 Ln-A
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["TOTPLM"], IDs to add=[3+4+5+7]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN15L"], IDs to add=[6+1]
*%-----------------|-----------------------------------------------------------|
FINISH
```

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999   999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O      9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9   =========
                                                      9   9  9   9   # 3877524
      StormWater Management HYdrologic Model           999   999     =========

 ******************************************************************************
 **************************** SWMHYMO Ver/4.05 *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
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 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: R. J. Burnside & Associates Ltd.            +++++++++
 +++++++++                Brampton            SERIAL#:3877524         +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                 *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).    *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).  *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).    *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.             *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).       *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).       *****
 *****     *:  see WARNING or NOTE message printed at end of run.         *****
 *****    **:  see  ERROR  message printed at end of run.                 *****
 ******************************************************************************
 ******************************************************************************
```



```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 **********************   S U M M A R Y   O U T P U T   **********************
 ******************************************************************************
 *        DATE: 2018-02-09     TIME: 09:36:55     RUN COUNTER: 000232         *
 ******************************************************************************
 * Input   filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_CAL~4.TXT *
 * Output  filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_CAL~4.out *
 * Summary filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_CAL~4.sum *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************


#****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#****************************************************************************
# EXISTING CONDITION
# MODEL RUN BASED ON EX_FINAL.TXT
# EX_CALIBRATION RUN(EX_CALIB4)
# 12% REDUCTION IN IA VALUES
#
# RECORDED 36mm RAINFALL EVENT
# Innisfil Creek at 5SD Inni RAIN GAGE
#
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIC SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 RUN:COMMAND#
 001:0001---------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002---------------------------------------------------------------------------
     READ STORM
```



```
      Filename = STORM.001
      Comment  =
      [SDT= 6.00:SDUR=  24.10:PTOT=  36.00]
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A          92.30      .079 No_date   14:12    2.26 .063
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A          92.30      .079 No_date   14:12    2.26  n/a
     [LAG=278.5 min]<- 02:S-7LnA         92.30      .079 No_date   18:50    2.26  n/a
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E         225.54      .432 No_date   14:56    5.21 .145
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E         225.54      .432 No_date   14:56    5.21  n/a
     [LAG=165.9 min]<- 03:S-5SRE        225.54      .432 No_date   17:40    5.21  n/a
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G        505.12      .441 No_date   15:58    2.95 .082
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D          36.36      .083 No_date   13:10    3.76 .104
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D          36.36      .083 No_date   13:10    3.76  n/a
     [LAG= 84.1 min]<- 06:S-CR4D         36.36      .083 No_date   14:33    3.76  n/a
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A         310.44      .620 No_date   13:50    4.21 .117
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A         310.44      .620 No_date   13:50    4.21  n/a
     [LAG= 86.9 min]<- 07:S-6LnA        310.44      .620 No_date   15:16    4.21  n/a
 001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A         461.49      .979 No_date   14:04    4.69 .130
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 001:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA         92.30      .079 No_date   18:50    2.26  n/a
                  +  03:S-5SRE        225.54      .432 No_date   17:40    5.21  n/a
                  +  04:10SR-G        505.12      .441 No_date   15:58    2.95  n/a
                  +  06:S-CR4D         36.36      .083 No_date   14:33    3.76  n/a
                  +  07:S-6LnA        310.44      .620 No_date   15:16    4.21  n/a
```



```
                  +  08:5Ln-A         461.49      .979 No_date   14:04    4.69  n/a
     [DT= 2.00]  SUM=  09:TOTFN5       1631.25     1.997 No_date   15:26    3.97  n/a
#****************************************************************************
#****************************************************************************
 001:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5       1631.25     1.997 No_date   15:26    3.97  n/a
  *   [RDT= 2.00] out<- 01:DR#1         1631.25     1.970 No_date   15:54    3.97  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.033:Dmax=  .689}
#****************************************************************************
#****************************************************************************
 001:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C          55.76      .113 No_date   13:24    3.76 .104
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C          55.76      .113 No_date   13:24    3.76  n/a
     [LAG=222.2 min]<- 03:S-CR4C         55.76      .113 No_date   17:06    3.76  n/a
 001:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F         472.58      .894 No_date   14:28    4.69 .130
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F         472.58      .894 No_date   14:28    4.69  n/a
     [LAG=156.2 min]<- 04:S-4LnF        472.58      .894 No_date   17:04    4.69  n/a
 001:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E          92.90      .266 No_date   13:16    4.69 .130
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 001:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C         55.76      .113 No_date   17:06    3.76  n/a
                  +  04:S-4LnF        472.58      .894 No_date   17:04    4.69  n/a
                  +  05:4Ln-E          92.90      .266 No_date   13:16    4.69  n/a
     [DT= 2.00]  SUM=  09:TOTRED        621.24     1.085 No_date   17:02    4.61  n/a
 001:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4        621.24     1.085 No_date   17:02    4.61  n/a
                  +  01:DR#1         1631.25     1.970 No_date   15:54    3.97  n/a
     [DT= 2.00]  SUM=  09:TOTFN4       2252.49     2.968 No_date   16:42    4.15  n/a
#****************************************************************************
#****************************************************************************
 001:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4       2252.49     2.968 No_date   16:42    4.15  n/a
  *   [RDT= 2.00] out<- 01:DR#2         2252.49     2.921 No_date   17:06    4.15  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax=  .957:Dmax=  .793}
#****************************************************************************
#****************************************************************************
 001:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    CALIB NASHYD       02:CR4-B        126.62     .046 No_date   14:46    1.17 .032
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 001:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62     .046 No_date   14:46    1.17  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62     .046 No_date   15:26    1.17  n/a
 001:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00     .152 No_date   14:24    2.26 .063
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62     .046 No_date   15:26    1.17  n/a
                    +  05:3Ln-E        185.00     .152 No_date   14:24    2.26  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62     .193 No_date   14:42    1.81  n/a
 001:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62     .193 No_date   14:42    1.81  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62     .193 No_date   15:48    1.81  n/a
#*************************************************************************
#*************************************************************************
 001:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15     .488 No_date   13:24    4.69 .130
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 001:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15     .488 No_date   13:24    4.69  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15     .488 No_date   15:50    4.69  n/a
 001:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41     .343 No_date   14:24    5.21 .145
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41     .343 No_date   14:24    5.21  n/a
                    +  03:S-CR4A       181.15     .488 No_date   15:50    4.69  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56     .773 No_date   15:42    4.93  n/a
 001:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56     .773 No_date   15:42    4.93  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56     .773 No_date   16:48    4.93  n/a
#*************************************************************************
#*************************************************************************
 001:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80     .990 No_date   13:30    7.65 .212
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 001:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09     .233 No_date   13:10    4.21 .117
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 001:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 08:4Ln-D         88.09     .233 No_date   13:10    4.21  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09     .233 No_date   14:33    4.21  n/a
 001:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:3Ln-C        248.17     .491 No_date   13:52    4.21 .117
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 001:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80     .990 No_date   13:30    7.65  n/a
                    +  02:S-4LnD        88.09     .233 No_date   14:33    4.21  n/a
                    +  08:3Ln-C        248.17     .491 No_date   13:52    4.21  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06    1.574 No_date   13:58    5.55  n/a
 001:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06    1.574 No_date   13:58    5.55  n/a
                    +  06:S-L3ND       311.62     .193 No_date   15:48    1.81  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68    1.651 No_date   14:06    4.20  n/a
 001:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68    1.651 No_date   14:06    4.20  n/a
                    +  05:S-L3NS       339.56     .773 No_date   16:48    4.93  n/a
                    +  01:DR#2        2252.49    2.921 No_date   17:06    4.15  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73    4.515 No_date   16:46    4.24  n/a
#*************************************************************************
#*************************************************************************
#*************************************************************************
#*************************************************************************
#*************************************************************************
 001:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73    4.515 No_date   16:46    4.24  n/a
  *  [RDT= 2.00] out<- 01:DR#2US      3453.73    4.428 No_date   16:58    4.24  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .555:Dmax= 1.403}
 001:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    1.725 No_date   13:08    9.95 .277
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73    4.428 No_date   16:58    4.24  n/a
                    +  02:10SR-E       225.52    1.725 No_date   13:08    9.95  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25    4.770 No_date   16:54    4.59  n/a
#*************************************************************************
 001:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25    4.770 No_date   16:54    4.59  n/a
  *  [RDT= 2.00] out<- 01:DR#2DS      3679.25    4.445 No_date   17:30    4.59  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .563:Dmax= 1.436}
#*************************************************************************
#*************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 001:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       02:4Ln-C        230.90     .509 No_date   14:48    5.76 .160
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 001:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90     .509 No_date   14:48    5.76  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90     .509 No_date   15:48    5.76  n/a
 001:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .137 No_date   13:58    3.76 .104
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43     .137 No_date   13:58    3.76  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43     .137 No_date   14:22    3.76  n/a
 001:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99     .169 No_date   13:20    3.76 .104
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 001:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99     .169 No_date   13:20    3.76  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99     .169 No_date   13:32    3.76  n/a
 001:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81     .151 No_date   13:26    3.76 .104
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 001:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90     .509 No_date   15:48    5.76  n/a
                    +  04:S-5SRD        81.43     .137 No_date   14:22    3.76  n/a
                    +  05:SH400B        79.99     .169 No_date   13:32    3.76  n/a
                    +  02:3Ln-B         74.81     .151 No_date   13:26    3.76  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13     .795 No_date   15:10    4.75  n/a
#*************************************************************************
#*************************************************************************
 001:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13     .795 No_date   15:10    4.75  n/a
  *  [RDT= 2.00] out<- 07:DR#4         467.13     .647 No_date   16:28    4.75  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .355:Dmax=  .646}
#*************************************************************************
#***********************************************************************
 001:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .089 No_date   14:30    2.26 .063
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 001:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02     .089 No_date   14:30    2.26  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .089 No_date   17:02    2.26  n/a
 001:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07     .857 No_date   14:50    6.98 .194
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     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 001:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:2Ln-B        318.07     .857 No_date   14:50    6.98  n/a
                    +  04:S10SRD       110.02     .089 No_date   17:02    2.26  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09     .871 No_date   15:14    5.76  n/a
 001:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09     .871 No_date   15:14    5.76  n/a
                    +  01:DR#2DS      3679.25    4.445 No_date   17:30    4.59  n/a
                    +  07:DR#4         467.13     .647 No_date   16:28    4.75  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47    5.754 No_date   17:04    4.71  n/a
#*************************************************************************
#*************************************************************************
 001:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20     .423 No_date   14:18    2.95 .082
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 001:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20     .423 No_date   14:18    2.95  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20     .423 No_date   16:18    2.95  n/a
 001:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20     .423 No_date   16:18    2.95  n/a
                    +  09:TFN2U       4574.47    5.754 No_date   17:04    4.71  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67    6.146 No_date   17:02    4.58  n/a
#*************************************************************************
#*************************************************************************
 001:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67    6.146 No_date   17:02    4.58  n/a
  *  [RDT= 2.00] out<- 01:RGLF        4939.67    6.031 No_date   17:22    4.58  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .534:Dmax= 1.632}
#*************************************************************************
#*************************************************************************
#*************************************************************************
#*************************************************************************
 001:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    1.152 No_date   14:28    7.65 .212
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 001:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    1.152 No_date   14:28    7.65  n/a
                    +  01:GOLFE       4939.67    6.031 No_date   17:22    4.58  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89    6.699 No_date   16:58    4.79  n/a
#*************************************************************************
#*************************************************************************
#Flows to Flow Node 2B
 001:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12     .220 No_date   13:58    4.21 .117
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      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 001:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-A        114.12      .220 No_date   13:58    4.21  n/a
      [LAG=234.2 min]<- 03:S-4LnA       114.12      .220 No_date   17:52    4.21  n/a
 001:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-B        171.81      .330 No_date   13:58    4.21 .117
      [CN= 75.0: N= 3.00]
      [Tp= 1.34:DT= 2.00]
 001:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-B        171.81      .330 No_date   13:58    4.21  n/a
      [LAG=232.5 min]<- 04:S-4LnB       171.81      .330 No_date   17:50    4.21  n/a
 001:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:3Ln-A        268.08      .395 No_date   14:28    3.76 .104
      [CN= 74.0: N= 3.00]
      [Tp= 1.61:DT= 2.00]
 001:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:3Ln-A        268.08      .395 No_date   14:28    3.76  n/a
      [LAG=158.8 min]<- 05:S-3LnA       268.08      .395 No_date   17:06    3.76  n/a
 001:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-4LnA       114.12      .220 No_date   17:52    4.21  n/a
                    +   04:S-4LnB       171.81      .330 No_date   17:50    4.21  n/a
                    +   05:S-3LnA       268.08      .395 No_date   17:06    3.76  n/a
      [DT= 2.00]  SUM=  02:TBLK1        554.01      .926 No_date   17:40    3.99  n/a
 001:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:5SR-C        341.88      .526 No_date   14:16    3.76 .104
      [CN= 74.0: N= 3.00]
      [Tp= 1.50:DT= 2.00]
 001:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:5SR-C        341.88      .526 No_date   14:16    3.76  n/a
      [LAG= 72.5 min]<- 04:S-5SRC       341.88      .526 No_date   15:28    3.76  n/a
 001:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:2Ln-A        105.00      .122 No_date   13:40    2.59 .072
      [CN= 71.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 001:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TBLK1        554.01      .926 No_date   17:40    3.99  n/a
                    +   04:S-5SRC       341.88      .526 No_date   15:28    3.76  n/a
                    +   05:2Ln-A        105.00      .122 No_date   13:40    2.59  n/a
      [DT= 2.00]  SUM=  07:TOTBLK      1000.89     1.351 No_date   17:26    3.76  n/a
 001:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TOTBLK      1000.89     1.351 No_date   17:26    3.76  n/a
  *   [RDT= 2.00] out<- 02:GOLFN       1000.89     1.302 No_date   17:38    3.76  n/a
      [L/S/n=  330./ .040/.050]
      {Vmax=  .283:Dmax= 1.006}
#*****************************************************************************
#*****************************************************************************
 001:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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     ADD HYD            02:GOLFN       1000.89     1.302 No_date   17:38    3.76  n/a
                    +   01:GOLFE       5289.89     6.699 No_date   16:58    4.79  n/a
      [DT= 2.00]  SUM=  07:TGOLF       6290.78     7.966 No_date   17:24    4.62  n/a
#*****************************************************************************
#*****************************************************************************
 001:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TGOLF       6290.78     7.966 No_date   17:24    4.62  n/a
  *   [RDT= 2.00] out<- 02:GOLF        6290.78     7.163 No_date   18:22    4.62  n/a
      [L/S/n=  485./ .040/.050]
      {Vmax=  .116:Dmax= 2.028}
#*****************************************************************************
#*****************************************************************************
 001:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:10SR-A       406.60      .102 No_date   17:22     .96 .027
      [CN= 65.0: N= 3.00]
      [Tp= 1.82:DT= 2.00]
 001:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-B        96.11      .042 No_date   15:08    1.41 .039
      [CN= 67.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 001:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:T10AB        406.60      .102 No_date   17:22     .96  n/a
                    +   04:10SR-B        96.11      .042 No_date   15:08    1.41  n/a
      [DT= 2.00]  SUM=  03:T10AB        502.71      .137 No_date   16:46    1.04  n/a
 001:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:T10AB        502.71      .137 No_date   16:46    1.04  n/a
      [LAG=149.0 min]<- 05:S10AB        502.71      .137 No_date   19:14    1.04  n/a
 001:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:13Ln-A       135.52      .017 No_date   18:38     .45 .013
      [CN= 62.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 001:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:13Ln-A       135.52      .017 No_date   18:38     .45  n/a
      [LAG=100.5 min]<- 04:S13LnA       135.52      .017 No_date   20:18     .45  n/a
 001:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:14Ln-A       276.60      .090 No_date   16:12    1.17 .032
      [CN= 66.0: N= 3.00]
      [Tp= 1.55:DT= 2.00]
 001:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S13LnA       135.52      .017 No_date   20:18     .45  n/a
                    +   03:14Ln-A       276.60      .090 No_date   16:12    1.17  n/a
      [DT= 2.00]  SUM=  09:TOT14L       412.12      .100 No_date   17:04     .93  n/a
 001:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 09:TOT14L       412.12      .100 No_date   17:04     .93  n/a
      [LAG=210.0 min]<- 03:S13LnA       412.12      .100 No_date   20:32     .93  n/a
 001:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:CR89-A       212.34      .590 No_date   14:02    5.82 .162
      [CN= 77.0: N= 3.00]
```



```
      [Tp= 1.51:DT= 2.00]
 001:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:CR89-A       212.34      .590 No_date   14:02    5.82  n/a
                    +   05:S10AB        502.71      .137 No_date   19:14    1.04  n/a
                    +   03:THNYAK       412.12      .100 No_date   20:32     .93  n/a
      [DT= 2.00]  SUM=  03:THNYAK      1430.10     1.179 No_date   14:02    2.46  n/a
 001:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:THNYAK      1430.10     1.179 No_date   14:02    2.46  n/a
      [LAG=123.6 min]<- 04:HYND        1430.10     1.179 No_date   16:04    2.46  n/a
#*****************************************************************************
#*****************************************************************************
 001:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:HYND        1430.10     1.179 No_date   16:04    2.46  n/a
                    +   02:GOLF        6290.78     7.163 No_date   18:22    4.62  n/a
      [DT= 2.00]  SUM=  09:HWY400      7720.88     8.017 No_date   18:08    4.22  n/a
#*****************************************************************************
#*****************************************************************************
 001:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:HWY400      7720.88     8.017 No_date   18:08    4.22  n/a
  *   [RDT= 2.00] out<- 01:DR#6        7720.88     7.174 No_date   20:08    4.22  n/a
      [L/S/n= 1700./ .010/.060]
      {Vmax=  .087:Dmax= 2.529}
#*****************************************************************************
#*****************************************************************************
 001:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-B        119.01      .144 No_date   14:08    2.95 .082
      [CN= 72.0: N= 3.00]
      [Tp= 1.29:DT= 2.00]
 001:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-B        119.01      .144 No_date   14:08    2.95  n/a
      [LAG=108.3 min]<- 03:S-5SRB       119.01      .144 No_date   15:56    2.95  n/a
 001:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-A         97.15      .122 No_date   13:58    2.95 .082
      [CN= 72.0: N= 3.00]
      [Tp= 1.20:DT= 2.00]
 001:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-A         97.15      .122 No_date   13:58    2.95  n/a
      [LAG=123.3 min]<- 04:S-5SRA        97.15      .122 No_date   16:00    2.95  n/a
 001:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD     05:15Ln-A        37.07     2.002 No_date   12:04   19.67 .547
      [XIMP=.50:TIMP=.50]
      [LOSS= 2 :CN= 68.0]
      [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 001:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       06:H89-A         47.36      .010 No_date   15:46     .77 .021
      [CN= 64.0: N= 3.00]
      [Tp=  .80:DT= 2.00]
```



```
 001:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 06:H89-A         47.36      .010 No_date   15:46     .77  n/a
      [LAG= 45.5 min]<- 07:S-H89A        47.36      .010 No_date   16:30     .77  n/a
 001:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-5SRB       119.01      .144 No_date   15:56    2.95  n/a
                    +   04:S-5SRA        97.15      .122 No_date   16:00    2.95  n/a
                    +   05:15Ln-A        37.07     2.002 No_date   12:04   19.67  n/a
                    +   07:S-H89A        47.36      .010 No_date   16:30     .77  n/a
      [DT= 2.00]  SUM=  06:TOTPLM       300.59     2.002 No_date   12:04    4.67  n/a
 001:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            06:TOTPLM       300.59     2.002 No_date   12:04    4.67  n/a
                    +   01:DR#6        7720.88     7.174 No_date   20:08    4.22  n/a
      [DT= 2.00]  SUM=  09:TFN15L      8021.47     7.350 No_date   20:02    4.24  n/a
 001:0101-------------------------------------------------------------------------
      FINISH
----------------------------------------------------------------------------------
**********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0014 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
   Simulation ended on 2018-02-09     at 09:37:02
```

==

```
2     Metric units
*#****************************************************************************
*#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
*#  Project No. : [300038790]
*#  Date        : 2017-02-08
*#  Date Rev.   : N/A
*#  Modeller    : [T.Lozon]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#****************************************************************************
*%
*# EXISTING CONDITION
*# MODEL RUN BASED ON EX_FINAL.TXT
*# EX_CALIBRATION EXTENSION RUN(EX_CLB_EXT)
*# 12% REDUCTION IN IA VALUES
*#
*# ORILLIA TS RAIN GAGE
*# 2-YEAR RUN ONLY
*#
*#
*# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
*# TOPOGRAPHIC SURVEY INFORMATION
*# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
*%
*%
*%
*% 2-YR SCS Type-II ORILLIA Storm Distribution . (12-hour)
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                  ["2SCS24.STM"] <--storm filename
*%-----------------|-------------------------------------------------------------|
READ STORM         STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE ORANGE
*#Flows to Flow Node 5 (LINE 5)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 7 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[1], NHYD=["7Ln-A"], DT=[2]min, AREA=[92.30](ha),
                   DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                   N=[3], TP=[1.20]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 7 Ln-A to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[2], NHYD=["S-7LnA"], IDin=[1], TLAG=[278.45](min)
```



```
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-E
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[1], NHYD=["5SR-E"], DT=[2]min, AREA=[225.54](ha),
                   DWF=[0](cms), CN/C=[77.0], IA=[13.35](mm),
                   N=[3], TP=[2.07]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-E to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-5SRE"], IDin=[1], TLAG=[165.95](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-G (NO ROUTING NEEDED)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[4], NHYD=["10SR-G"], DT=[2]min, AREA=[505.12](ha),
                   DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                   N=[3], TP=[2.36]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 4-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[5], NHYD=["CR4-D"], DT=[2]min, AREA=[36.36](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                   N=[3], TP=[0.79]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-D to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[6], NHYD=["S-CR4D"], IDin=[5], TLAG=[84.11](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 6 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[1], NHYD=["6Ln-A"], DT=[2]min, AREA=[310.44](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                   N=[3], TP=[1.26]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 6 Ln-A to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[7], NHYD=["S-6LnA"], IDin=[1], TLAG=[86.92](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[8], NHYD=["5Ln-A"], DT=[2]min, AREA=[461.49](ha),
                   DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
```



```
                   N=[3], TP=[1.44]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOWS AT LINE 5
*%Add flows at Flow Node 7 from Catchments 7 Ln-A, 5 SR-E, 10 SR-G, CR 4-D,
*%   6 Ln-A & 5 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[9], NHYD=["TOTFN5"], IDs to add=[2+3+4+6+7+8]
*%-----------------|-------------------------------------------------------------|

*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 5 TO LINE 4
*% DRAIN #1
*% USE HEC-RAS X-SECTION 18
ROUTE CHANNEL      IDout=[1], NHYD=["DR#1"], IDin=[9],
                   RDT=[5](min),
                   CHLGTH=[1780](m),  CHSLOPE=[0.29](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[18],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,249.27] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[0,234.17]
                                                  [205.47,230.2]
                                                  [212.04,229.96]
                                                  [215.28,227.63]
                                                  [216.96,227.6]
                                                  [221.63,229.92]
                                                  [249.27,230.06]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE RED
*%
*%Flows from Catchment CR 4-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["CR4-C"], DT=[2]min, AREA=[55.76](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                   N=[3], TP=[0.95]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-C to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-CR4C"], IDin=[2], TLAG=[222.18](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-F
```



```
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-F"], DT=[2]min, AREA=[472.58](ha),
                   DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                   N=[3], TP=[1.72]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-F to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-4LnF"], IDin=[2], TLAG=[156.21](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-E
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[5], NHYD=["4Ln-E"], DT=[2]min, AREA=[92.9](ha),
                   DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                   N=[3], TP=[0.91]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL RED
*% Add from Catchments CR4-C,4Ln-F,4Ln-E
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[9], NHYD=["TOTRED"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW TO LINE 4
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[9], NHYD=["TOTFN4"], IDs to add=[9+1]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 4 TO LINE 3
*% USE HEC X-SECTION 14
ROUTE CHANNEL      IDout=[1], NHYD=["DR#2"], IDin=[9],
                   RDT=[15](min),
                   CHLGTH=[1530](m),  CHSLOPE=[0.23](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[14],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,779.49] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[746.77,227.72]
                                                  [762.52,227.56]
                                                  [766.8,225]
                                                  [768.23,225]
                                                  [779.49,227.48]

*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE FLOWS TO LINE 3 NORTH DITCH
*%
```

```
CALIB NASHYD        ID=[2], NHYD=["CR4-B"], DT=[2]min, AREA=[126.62](ha),
                    DWF=[0](cms), CN/C=[66.0], IA=[23.03](mm),
                    N=[3], TP=[0.97]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-B to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-CR4B"], IDin=[2], TLAG=[41.18](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-E
CALIB NASHYD        ID=[5], NHYD=["3Ln-E"], DT=[2]min, AREA=[185.00](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% LINE 3 NORTH DITCH
*% Add from Catchments
ADD HYD             IDsum=[2], NHYD=["TLN3ND"], IDs to add=[4+5]
*%-----------------|-------------------------------------------------------------|
*%Shift flow from LIN3ND TO FLOW NODE 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-L3ND"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%Flows from Catchment CR 4-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-A"], DT=[2]min, AREA=[181.15](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[1.00]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-A to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4A"], IDin=[2], TLAG=[147.74](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 4-B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-F
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-F"], DT=[2]min, AREA=[158.41](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[13.35](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% LINE 3 SOUTH DITCH
```



```
ADD HYD             IDsum=[2], NHYD=["TLN3SD"], IDs to add=[2+3]
*%-----------------|-------------------------------------------------------------|
*%Shift flow from LIN3NS TO FLOW NODE 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-L3NS"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************

*%Flows from Catchment 3 Ln-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[7], NHYD=["3Ln-D"], DT=[2]min, AREA=[213.80](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[10.49](mm),
                    N=[3], TP=[1.18]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["4Ln-D"], DT=[2]min, AREA=[88.09](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[0.81]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-D to Flow Node 2
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-4LnD"], IDin=[8], TLAG=[84.98](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["3Ln-C"], DT=[2]min, AREA=[248.17](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TPNK"], IDs to add=[7+2+8]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT U/S SIDE OF LINE 3
*% Add from Catchments
ADD HYD             IDsum=[3], NHYD=["TLN3US"], IDs to add=[4+6]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT THE D/S LIMTIS OF LINE 3
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN3A"], IDs to add=[3+5+1]
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
```



```
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO MIDWAY TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2US"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[685](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],        NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-E
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-E"], DT=[2]min, AREA=[225.52](ha),
                    DWF=[0](cms), CN/C=[84.0], IA=[8.52](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW MID A JUNCTION BETWEEN LINE 3 AND 2
ADD HYD             IDsum=[9], NHYD=["TMID32"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2DS"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[2250](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],        NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
```



```
*#*******************************************************************************
*% CALCULATE BLUE
*%
*#Flows FROM WEST OF THE 400 TO 2ND LINE
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-C"], DT=[2]min, AREA=[230.90](ha),
                    DWF=[0](cms), CN/C=[78.0], IA=[12.61](mm),
                    N=[3], TP=[2.02]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-C to Flow Node 4
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnC"], IDin=[2], TLAG=[60.19](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-D"], DT=[2]min, AREA=[81.43](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-D to Flow Node 4
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRD"], IDin=[2], TLAG=[24.84](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment H 400-B
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["H400-B"], DT=[2]min, AREA=[79.99](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment H 400-B to Flow Node 4
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["SH400B"], IDin=[2], TLAG=[12.66](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-B"], DT=[2]min, AREA=[74.81](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
```

```
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Add flows at Flow Node 4 from Catchments 4 Ln-C, 5 SR-D, H 400-B & 3 Ln-B
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLUE
ADD HYD            IDsum=[6], NHYD=["TOTBLU"], IDs to add=[3+4+5+2]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL      IDout=[7], NHYD=["DR#4"], IDin=[6],
                   RDT=[15](min),
                   CHLGTH=[2000](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[14],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                  [746.77,227.77]
                                                  [762.52,227.56]
                                                  [766.8,225]
                                                  [768.23,225]
                                                  [779.49,227.48]
                                                  [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#***************************************************************************
*%Flows from Catchment 10 SR-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["10SR-D"], DT=[2]min, AREA=[110.02](ha),
                   DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                   N=[3], TP=[1.36]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-D to Flow Node 2
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S10SRD"], IDin=[2], TLAG=[153.59](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["2Ln-B"], DT=[2]min, AREA=[318.07](ha),
                   DWF=[0](cms), CN/C=[80.0], IA=[11.18](mm),
                   N=[3], TP=[2.13]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
```



```
*% TOTAL GREEN
*% Add from Catchments
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[5], NHYD=["TOTGRN"], IDs to add=[2+4]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW TO LINE 2
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW UPSTREAM OF THE 2ND LINE
ADD HYD            IDsum=[9], NHYD=["TFN2U"], IDs to add=[5+1+7]
*%-----------------|-------------------------------------------------------------|
*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment 10 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[3], NHYD=["10SR-C"], DT=[2]min, AREA=[365.20](ha),
                   DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                   N=[3], TP=[1.39]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-C DOWNSTREAM LIMITS OF 2ND LINE
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S10SRC"], IDin=[3], TLAG=[121.76](min)
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW DOWNSTREAM OF THE 2ND LINE
ADD HYD            IDsum=[4], NHYD=["TFN2D"], IDs to add=[4+9]
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% ROUTE FLOWS FROM LINE 2 TO FLOW NODE GOLF EAST
*% USE HEC SECTION 11
ROUTE CHANNEL      IDout=[1], NHYD=["RGLF"], IDin=[4],
                   RDT=[15](min),
                   CHLGTH=[785](m),  CHSLOPE=[0.04](%),
                                      FPSLOPE=[0.50](%),
                   SECNUM=[11],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,1500] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                  [860.67,226.03]
                                                  [865.17,223.96]
                                                  [867.01,223.96]
                                                  [871.48,225.21]
                                                  [879.46,225.75]
                                                  [1500.00,226.10]
*%-----------------|-------------------------------------------------------------|
```



```
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************
*#*****************************************************************************

*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment H 400-A
*% OUTLET TO GOLFE (GOLF COURSE EAST)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[4], NHYD=["H400-A"], DT=[2]min, AREA=[350.22](ha),
                   DWF=[0](cms), CN/C=[81.0], IA=[10.49](mm),
                   N=[3], TP=[1.89]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% CALCULATE TOTAL FLOW TO FLOW NODE GLFE (GOLF COURSE EAST)
ADD HYD            IDsum=[1], NHYD=["GOLFE"], IDs to add=[4+1]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|


*#*****************************************************************************
*#*****************************************************************************
*% CALCULATE BLACK
*#Flows to Flow Node 2B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-A"], DT=[2]min, AREA=[114.12](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                   N=[3], TP=[1.33]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-4LnA"], IDin=[2], TLAG=[234.20](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-B"], DT=[2]min, AREA=[171.81](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                   N=[3], TP=[1.34]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-B to Flow Node 5
*%-----------------|-------------------------------------------------------------|
```



```
SHIFT HYD          IDout=[4], NHYD=["S-4LnB"], IDin=[2], TLAG=[232.52](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["3Ln-A"], DT=[2]min, AREA=[268.08](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                   N=[3], TP=[1.61]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 3 Ln-A to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[5], NHYD=["S-3LnA"], IDin=[2], TLAG=[158.77](min)
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[2], NHYD=["TBLK1"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[3], NHYD=["5SR-C"], DT=[2]min, AREA=[341.88](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                   N=[3], TP=[1.50]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-C to Flow Node 5
*%-----------------|-------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-5SRC"], IDin=[3], TLAG=[72.46](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 2 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD       ID=[5], NHYD=["2Ln-A"], DT=[2]min, AREA=[105.00](ha),
                   DWF=[0](cms), CN/C=[71.0], IA=[18.26](mm),
                   N=[3], TP=[0.96]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL BLACK
*%Add flows at Flow Node 5 from Catchments 4 Ln-A, 4 Ln-B, 3 Ln-A,
*%    5 SR-C & 2 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD            IDsum=[7], NHYD=["TOTBLK"], IDs to add=[2+4+5]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TOTBLK TO FLOW NODE GOLF NORTH
*% ROUTE FLOWS FROM LINE 2 FLOW NODE GOLFN
```

```
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLFN"], IDin=[7],
                    RDT=[15](min),
                    CHLGTH=[330](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#*************************************************************************************
*#*************************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOWS FROM GOLF NORTH AND GOLF EAST
ADD HYD             IDsum=[7], NHYD=["TGOLF"], IDs to add=[2+1]
*%-----------------|-------------------------------------------------------------|
*#*************************************************************************************
*#*************************************************************************************
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TGOLF TO HWY 400
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLF"], IDin=[7],
                    RDT=[15](min),
                    CHLGTH=[485](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#*************************************************************************************
*#*************************************************************************************
*% YELLOW SOUTH( HNYDCZAK DRAIN)
*%Flows from Catchment 10 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["10SR-A"], DT=[2]min, AREA=[406.60](ha),
```



```
                    DWF=[0](cms), CN/C=[65.0], IA=[24.07](mm),
                    N=[3], TP=[1.82]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-B"], DT=[2]min, AREA=[96.11](ha),
                    DWF=[0](cms), CN/C=[67.0], IA=[22.02](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B
*% INTERSECTION OF 10 SIDEROAD AND HWY 89
ADD HYD             IDsum=[3], NHYD=["T10AB"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW INTERSECTION OF 10 SIDEROAD AND HWY 89 TO OUTLET OF CR-89A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S10AB"], IDin=[3], TLAG=[148.99](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 13 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["13Ln-A"], DT=[2]min, AREA=[135.52](ha),
                    DWF=[0](cms), CN/C=[62], IA=[27.40](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM OUTLET OF 13 Ln-A to outelt of 14 Ln-A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S13LnA"], IDin=[3], TLAG=[100.46](min)
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 14 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["14Ln-A"], DT=[2]min, AREA=[276.60](ha),
                    DWF=[0](cms), CN/C=[66], IA=[23.03](mm),
                    N=[3], TP=[1.55]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT THE 14TH LINE
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOT14L"], IDs to add=[4+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM 14TH LINE TO HIGHWAY 89
*%-----------------|-------------------------------------------------------------|
```



```
SHIFT HYD           IDout=[3], NHYD=["S13LnA"], IDin=[9], TLAG=[209.97](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 89-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["CR89-A"], DT=[2]min, AREA=[212.34](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[11.88](mm),
                    N=[3], TP=[1.51]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B + CR 89-A
*% HNYDCZAK CROSSES HWY 89
ADD HYD             IDsum=[3], NHYD=["THNYAK"], IDs to add=[4+5+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOWS FROM HNYDCZAK CROSSES HWY 89 TO FLOW NODE HYND
*% FLOW NODE HYND LOCATED AT THE OUTLET OF THE HNYDCZAK UPSTREAM OF HIGHWAY 400
SHIFT HYD           IDout=[4], NHYD=["HYND"], IDin=[3], TLAG=[123.60](min)
*%-----------------|-------------------------------------------------------------|
*#*************************************************************************************
*#*************************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT HWY 400
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["HWY400"], IDs to add=[4+2]
*%-----------------|-------------------------------------------------------------|
*#*************************************************************************************
*#*************************************************************************************
*% ROUTE FLOWS FROM HWY 400 TO 15TH LINE
*% USE HEC SECTION 6
ROUTE CHANNEL       IDout=[1], NHYD=["DR#6"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1700](m),  CHSLOPE=[0.01](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[6],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.06,400.82] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[200.00,225.3]
                                                   [220.07,225.18]
                                                   [231.91,224.9]
                                                   [240.6,222.78]
                                                   [245.45,222.77]
                                                   [251.91,224.78]
                                                   [355.82,225.16]
                                                   [400.82,225.30]

*%-----------------|-------------------------------------------------------------|
*#*************************************************************************************
```



```
*#*************************************************************************************

*% CALCULATE PLUM
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-B"], DT=[2]min, AREA=[119.01](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[1.29]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-B to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRB"], IDin=[2], TLAG=[108.27](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-A"], DT=[2]min, AREA=[97.15](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-A to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRA"], IDin=[2], TLAG=[123.28](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 15 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB STANDHYD      ID= [5], NHYD=["15Ln-A"], DT=[2](min), AREA=[37.07](ha),
                    XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[68],
                    Pervious   surfaces: IAper=[7.9](mm), SLPP=[1.0](%),
                                         LGP=[1685.7](m), MNP=[.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[0.9](%),
                                         LGI=[218.72](m), MNI=[.013], SCI=[0](min),
                    RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment H 89-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[6], NHYD=["H89-A"], DT=[2]min, AREA=[47.36](ha),
                    DWF=[0](cms), CN/C=[64.0], IA=[25.15](mm),
                    N=[3], TP=[0.80]hrs,
                    RAINFALL=[ ,   ,   ,   , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment H 89-A to Flow Node 8
*%-----------------|-------------------------------------------------------------|
```

```
SHIFT HYD           IDout=[7], NHYD=["S-H89A"], IDin=[6], TLAG=[45.46](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*% TOTAL PLUM
*%Add flows at Flow Node 8 from Catchments 5 SR-B, 5 SR-A, H 89-A, 15 Ln-A
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["TOTPLM"], IDs to add=[3+4+5+7]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN15L"], IDs to add=[6+1]
*%-----------------|-----------------------------------------------------------|
FINISH
```

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S       W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3877524
       StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05 ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: R. J. Burnside & Associates Ltd.             +++++++++
 +++++++++                Brampton              SERIAL#:3877524        +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                  *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).     *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).   *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).     *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.              *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).        *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).        *****
 *****     *:  see WARNING or NOTE message printed at end of run.          *****
 *****    **:  see  ERROR  message printed at end of run.                  *****
 ******************************************************************************
 ******************************************************************************
```



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::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 **********************   S U M M A R Y   O U T P U T   **********************
 ******************************************************************************
 *        DATE: 2018-02-09     TIME: 09:44:55     RUN COUNTER: 000233         *
 ******************************************************************************
 * Input   filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_CLB~1.TXT *
 * Output  filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_CLB~1.out *
 * Summary filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_CLB~1.sum *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************


#*****************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#*****************************************************************************
# EXISTING CONDITION
# MODEL RUN BASED ON EX_FINAL.TXT
# EX_CALIBRATION EXTENSION RUN(EX_CLB_EXT)
# 12% REDUCTION IN IA VALUES
#
# ORILLIA TS RAIN GAGE
# 2-YEAR RUN ONLY
#
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIC SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 RUN:COMMAND#
 001:0001------------------------------------------------------------------------
     START
      [TZERO =     .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002------------------------------------------------------------------------
     READ STORM
```



```
      Filename = STORM.001
      Comment  =
      [SDT=12.00:SDUR=  24.00:PTOT=  46.70]
#*****************************************************************************
#*****************************************************************************
#Flows to Flow Node 5 (LINE 5)
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:7Ln-A          92.30     .252 No_date   13:38    5.56 .119
      [CN= 70.0: N= 3.00]
      [Tp= 1.20:DT= 2.00]
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:7Ln-A          92.30     .252 No_date   13:38    5.56  n/a
      [LAG=278.5 min]<- 02:S-7LnA         92.30     .252 No_date   18:16    5.56  n/a
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:5SR-E         225.54     .930 No_date   14:36   10.18 .218
      [CN= 77.0: N= 3.00]
      [Tp= 2.07:DT= 2.00]
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:5SR-E         225.54     .930 No_date   14:36   10.18  n/a
      [LAG=165.9 min]<- 03:S-5SRE        225.54     .930 No_date   17:20   10.18  n/a
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-G        505.12    1.140 No_date   15:14    6.71 .144
      [CN= 72.0: N= 3.00]
      [Tp= 2.36:DT= 2.00]
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:CR4-D          36.36     .219 No_date   12:56    7.99 .171
      [CN= 74.0: N= 3.00]
      [Tp=  .79:DT= 2.00]
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:CR4-D          36.36     .219 No_date   12:56    7.99  n/a
      [LAG= 84.1 min]<- 06:S-CR4D         36.36     .219 No_date   14:20    7.99  n/a
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:6Ln-A         310.44    1.492 No_date   13:32    8.68 .186
      [CN= 75.0: N= 3.00]
      [Tp= 1.26:DT= 2.00]
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 01:6Ln-A         310.44    1.492 No_date   13:32    8.68  n/a
      [LAG= 86.9 min]<- 07:S-6LnA        310.44    1.492 No_date   14:58    8.68  n/a
 001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       08:5Ln-A         461.49    2.234 No_date   13:46    9.41 .202
      [CN= 76.0: N= 3.00]
      [Tp= 1.44:DT= 2.00]
 001:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:S-7LnA         92.30     .252 No_date   18:16    5.56  n/a
                     +  03:S-5SRE        225.54     .930 No_date   17:20   10.18  n/a
                     +  04:10SR-G        505.12    1.140 No_date   15:14    6.71  n/a
                     +  06:S-CR4D         36.36     .219 No_date   14:20    7.99  n/a
                     +  07:S-6LnA        310.44    1.492 No_date   14:58    8.68  n/a
```



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                     +  08:5Ln-A         461.49    2.234 No_date   13:46    9.41  n/a
      [DT= 2.00]  SUM=  09:TOTFN5       1631.25    4.698 No_date   14:40    8.29  n/a
#*****************************************************************************
#*****************************************************************************
 001:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN5       1631.25    4.698 No_date   14:40    8.29  n/a
  *   [RDT= 2.00] out<- 01:DR#1         1631.25    4.612 No_date   15:10    8.29  n/a
      [L/S/n= 1780./ .290/.030]
      {Vmax= 1.303:Dmax= 1.054}
#*****************************************************************************
#*****************************************************************************
 001:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:CR4-C          55.76     .294 No_date   13:08    7.99 .171
      [CN= 74.0: N= 3.00]
      [Tp=  .95:DT= 2.00]
 001:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:CR4-C          55.76     .294 No_date   13:08    7.99  n/a
      [LAG=222.2 min]<- 03:S-CR4C         55.76     .294 No_date   16:50    7.99  n/a
 001:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-F         472.58    2.017 No_date   14:10    9.41 .202
      [CN= 76.0: N= 3.00]
      [Tp= 1.72:DT= 2.00]
 001:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-F         472.58    2.017 No_date   14:10    9.41  n/a
      [LAG=156.2 min]<- 04:S-4LnF        472.58    2.017 No_date   16:45    9.41  n/a
 001:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:4Ln-E          92.90     .631 No_date   13:02    9.41 .202
      [CN= 76.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 001:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-CR4C         55.76     .294 No_date   16:50    7.99  n/a
                     +  04:S-4LnF        472.58    2.017 No_date   16:45    9.41  n/a
                     +  05:4Ln-E          92.90     .631 No_date   13:02    9.41  n/a
      [DT= 2.00]  SUM=  09:TOTRED        621.24    2.454 No_date   16:46    9.28  n/a
 001:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            09:TOTFN4        621.24    2.454 No_date   16:46    9.28  n/a
                     +  01:DR#1         1631.25    4.612 No_date   15:10    8.29  n/a
      [DT= 2.00]  SUM=  09:TOTFN4       2252.49    6.573 No_date   16:20    8.57  n/a
#*****************************************************************************
#*****************************************************************************
 001:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:TOTFN4       2252.49    6.573 No_date   16:20    8.57  n/a
  *   [RDT= 2.00] out<- 01:DR#2         2252.49    6.490 No_date   16:38    8.57  n/a
      [L/S/n= 1530./ .230/.030]
      {Vmax= 1.171:Dmax= 1.130}
#*****************************************************************************
#*****************************************************************************
 001:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       02:CR4-B        126.62     .212 No_date   13:28    3.63 .078
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 001:0024--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-B        126.62     .212 No_date   13:28    3.63  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62     .212 No_date   14:08    3.63  n/a
 001:0025--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00     .480 No_date   13:48    5.56 .119
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0026--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62     .212 No_date   14:08    3.63  n/a
                    +  05:3Ln-E        185.00     .480 No_date   13:48    5.56  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62     .686 No_date   13:58    4.77  n/a
 001:0027--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3ND       311.62     .686 No_date   13:58    4.77  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62     .686 No_date   15:04    4.77  n/a
#***************************************************************************
#***************************************************************************
 001:0028--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15    1.147 No_date   13:10    9.41 .202
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 001:0029--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-A        181.15    1.147 No_date   13:10    9.41  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15    1.147 No_date   15:36    9.41  n/a
 001:0030--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41     .746 No_date   14:08   10.18 .218
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0031--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41     .746 No_date   14:08   10.18  n/a
                    +  03:S-CR4A       181.15    1.147 No_date   15:36    9.41  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56    1.736 No_date   15:30    9.77  n/a
 001:0032--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:TLN3SD       339.56    1.736 No_date   15:30    9.77  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    1.736 No_date   16:36    9.77  n/a
#***************************************************************************
#***************************************************************************
 001:0033--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    1.931 No_date   13:18   13.69 .293
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 001:0034--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09     .584 No_date   12:56    8.68 .186
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 001:0035--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    SHIFT HYD       -> 08:4Ln-D         88.09     .584 No_date   12:56    8.68  n/a
     [LAG= 85.0 min]<- 02:S-4LnD        88.09     .584 No_date   14:20    8.68  n/a
 001:0036--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:3Ln-C        248.17    1.179 No_date   13:34    8.68 .186
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 001:0037--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    1.931 No_date   13:18   13.69  n/a
                    +  02:S-4LnD        88.09     .584 No_date   14:20    8.68  n/a
                    +  08:3Ln-C        248.17    1.179 No_date   13:34    8.68  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06    3.337 No_date   13:50   10.63  n/a
 001:0038--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06    3.337 No_date   13:50   10.63  n/a
                    +  06:S-L3ND       311.62     .686 No_date   15:04    4.77  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68    3.699 No_date   14:04    8.51  n/a
 001:0039--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68    3.699 No_date   14:04    8.51  n/a
                    +  05:S-L3NS       339.56    1.736 No_date   16:36    9.77  n/a
                    +  01:DR#2        2252.49    6.490 No_date   16:38    8.57  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73    9.954 No_date   16:24    8.67  n/a
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
 001:0040--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TFN3A       3453.73    9.954 No_date   16:24    8.67  n/a
 *   [RDT= 2.00] out<- 01:DR#2US      3453.73    9.823 No_date   16:32    8.67  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .677:Dmax= 1.954}
 001:0041--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E       225.52    3.101 No_date   12:58   16.84 .361
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0042--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73    9.823 No_date   16:32    8.67  n/a
                    +  02:10SR-E       225.52    3.101 No_date   12:58   16.84  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25   10.383 No_date   16:32    9.17  n/a
#***************************************************************************
 001:0043--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TMID32      3679.25   10.383 No_date   16:32    9.17  n/a
 *   [RDT= 2.00] out<- 01:DR#2DS      3679.25    9.823 No_date   16:54    9.17  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .684:Dmax= 1.989}
#***************************************************************************
#***************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 001:0044--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       02:4Ln-C        230.90    1.063 No_date   14:30   10.99 .235
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 001:0045--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-C        230.90    1.063 No_date   14:30   10.99  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90    1.063 No_date   15:30   10.99  n/a
 001:0046--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .343 No_date   13:38    7.99 .171
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0047--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:5SR-D         81.43     .343 No_date   13:38    7.99  n/a
     [LAG= 24.8 min]<- 04:S-5SRD        81.43     .343 No_date   14:02    7.99  n/a
 001:0048--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B        79.99     .443 No_date   13:04    7.99 .171
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 001:0049--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:H400-B        79.99     .443 No_date   13:04    7.99  n/a
     [LAG= 12.7 min]<- 05:SH400B        79.99     .443 No_date   13:16    7.99  n/a
 001:0050--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B         74.81     .392 No_date   13:10    7.99 .171
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 001:0051--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90    1.063 No_date   15:30   10.99  n/a
                    +  04:S-5SRD        81.43     .343 No_date   14:02    7.99  n/a
                    +  05:SH400B        79.99     .443 No_date   13:16    7.99  n/a
                    +  02:3Ln-B         74.81     .392 No_date   13:10    7.99  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    1.730 No_date   14:40    9.47  n/a
#***************************************************************************
#***************************************************************************
 001:0052--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 06:TOTBLU       467.13    1.730 No_date   14:40    9.47  n/a
 *   [RDT= 2.00] out<- 07:DR#4         467.13    1.439 No_date   15:46    9.47  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .434:Dmax=  .921}
#***************************************************************************
#*************************************************************************
 001:0053--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .277 No_date   13:54    5.56 .119
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 001:0054--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:10SR-D       110.02     .277 No_date   13:54    5.56  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .277 No_date   16:26    5.56  n/a
 001:0055--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    1.683 No_date   14:34   12.74 .273
```



```
     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 001:0056--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:2Ln-B        318.07    1.683 No_date   14:34   12.74  n/a
                    +  04:S10SRD       110.02     .277 No_date   16:26    5.56  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    1.758 No_date   15:18   10.90  n/a
 001:0057--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    1.758 No_date   15:18   10.90  n/a
                    +  01:DR#2DS      3679.25    9.823 No_date   16:54    9.17  n/a
                    +  07:DR#4         467.13    1.439 No_date   15:46    9.47  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47   12.658 No_date   16:32    9.36  n/a
#***************************************************************************
#***************************************************************************
 001:0058--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20    1.167 No_date   13:50    6.71 .144
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 001:0059--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:10SR-C       365.20    1.167 No_date   13:50    6.71  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20    1.167 No_date   15:50    6.71  n/a
 001:0060--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20    1.167 No_date   15:50    6.71  n/a
                    +  09:TFN2U       4574.47   12.658 No_date   16:32    9.36  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67   13.735 No_date   16:32    9.17  n/a
#***************************************************************************
#***************************************************************************
 001:0061--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 04:TFN2D       4939.67   13.735 No_date   16:32    9.17  n/a
 *   [RDT= 2.00] out<- 01:RGLF        4939.67   12.354 No_date   17:26    9.17  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .192:Dmax= 2.032}
#***************************************************************************
#***************************************************************************
#***************************************************************************
#***************************************************************************
 001:0062--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    2.209 No_date   14:14   13.69 .293
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 001:0063--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    2.209 No_date   14:14   13.69  n/a
                    +  01:GOLFE       4939.67   12.354 No_date   17:26    9.17  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89   13.448 No_date   17:14    9.47  n/a
#***************************************************************************
#***************************************************************************
#Flows to Flow Node 2B
 001:0064--------------ID:NHYD----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12     .527 No_date   13:38    8.68 .186
```

```
      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 001:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-A        114.12     .527 No_date   13:38    8.68  n/a
      [LAG=234.2 min]<- 03:S-4LnA       114.12     .527 No_date   17:32    8.68  n/a
 001:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-B        171.81     .790 No_date   13:38    8.68 .186
      [CN= 75.0: N= 3.00]
      [Tp= 1.34:DT= 2.00]
 001:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-B        171.81     .790 No_date   13:38    8.68  n/a
      [LAG=232.5 min]<- 04:S-4LnB       171.81     .790 No_date   17:30    8.68  n/a
 001:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:3Ln-A        268.08     .974 No_date   14:06    7.99 .171
      [CN= 74.0: N= 3.00]
      [Tp= 1.61:DT= 2.00]
 001:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:3Ln-A        268.08     .974 No_date   14:06    7.99  n/a
      [LAG=158.8 min]<- 05:S-3LnA       268.08     .974 No_date   16:44    7.99  n/a
 001:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-4LnA       114.12     .527 No_date   17:32    8.68  n/a
                     +  04:S-4LnB       171.81     .790 No_date   17:30    8.68  n/a
                     +  05:S-3LnA       268.08     .974 No_date   16:44    7.99  n/a
      [DT= 2.00]  SUM=  02:TBLK1        554.01    2.222 No_date   17:20    8.35  n/a
 001:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:5SR-C        341.88    1.303 No_date   13:56    7.99 .171
      [CN= 74.0: N= 3.00]
      [Tp= 1.50:DT= 2.00]
 001:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:5SR-C        341.88    1.303 No_date   13:56    7.99  n/a
      [LAG= 72.5 min]<- 04:S-5SRC       341.88    1.303 No_date   15:08    7.99  n/a
 001:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:2Ln-A        105.00     .381 No_date   13:14    6.12 .131
      [CN= 71.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 001:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TBLK1        554.01    2.222 No_date   17:20    8.35  n/a
                     +  04:S-5SRC       341.88    1.303 No_date   15:08    7.99  n/a
                     +  05:2Ln-A        105.00     .381 No_date   13:14    6.12  n/a
      [DT= 2.00]  SUM=  07:TOTBLK      1000.89    3.138 No_date   17:08    7.99  n/a
 001:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TOTBLK      1000.89    3.138 No_date   17:08    7.99  n/a
  *   [RDT= 2.00] out<- 02:GOLFN       1000.89    2.534 No_date   16:36    7.99  n/a
      [L/S/n=  330./ .040/.050]
      {Vmax=  .315:Dmax= 1.526}
#******************************************************************************
#******************************************************************************
 001:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
     ADD HYD            02:GOLFN       1000.89    2.534 No_date   16:36    7.99  n/a
                     +  01:GOLFE       5289.89   13.448 No_date   17:14    9.47  n/a
      [DT= 2.00]  SUM=  07:TGOLF       6290.78   15.542 No_date   16:36    9.23  n/a
#******************************************************************************
#******************************************************************************
 001:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TGOLF       6290.78   15.542 No_date   16:36    9.23  n/a
  *   [RDT= 2.00] out<- 02:GOLF        6290.78   14.068 No_date   18:10    9.23  n/a
      [L/S/n=  485./ .040/.050]
      {Vmax=  .104:Dmax= 2.140}
#******************************************************************************
#******************************************************************************
 001:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:10SR-A       406.60     .419 No_date   15:04    3.21 .069
      [CN= 65.0: N= 3.00]
      [Tp= 1.82:DT= 2.00]
 001:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-B        96.11     .163 No_date   14:00    4.07 .087
      [CN= 67.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 001:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:T10AB        406.60     .419 No_date   15:04    3.21  n/a
                     +  04:10SR-B        96.11     .163 No_date   14:00    4.07  n/a
      [DT= 2.00]  SUM=  03:T10AB        502.71     .565 No_date   14:44    3.38  n/a
 001:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:T10AB        502.71     .565 No_date   14:44    3.38  n/a
      [LAG=149.0 min]<- 05:S10AB        502.71     .565 No_date   17:12    3.38  n/a
 001:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:13Ln-A       135.52     .105 No_date   14:08    2.13 .046
      [CN= 62.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 001:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:13Ln-A       135.52     .105 No_date   14:08    2.13  n/a
      [LAG=100.5 min]<- 04:S13LnA       135.52     .105 No_date   15:48    2.13  n/a
 001:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:14Ln-A       276.60     .364 No_date   14:32    3.63 .078
      [CN= 66.0: N= 3.00]
      [Tp= 1.55:DT= 2.00]
 001:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S13LnA       135.52     .105 No_date   15:48    2.13  n/a
                     +  03:14Ln-A       276.60     .364 No_date   14:32    3.63  n/a
      [DT= 2.00]  SUM=  09:TOT14L       412.12     .449 No_date   15:00    3.13  n/a
 001:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 09:TOT14L       412.12     .449 No_date   15:00    3.13  n/a
      [LAG=210.0 min]<- 03:S13LnA       412.12     .449 No_date   18:28    3.13  n/a
 001:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:CR89-A       212.34    1.217 No_date   13:48   10.95 .235
      [CN= 77.0: N= 3.00]
```



```
      [Tp= 1.51:DT= 2.00]
 001:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:CR89-A       212.34    1.217 No_date   13:48   10.95  n/a
                     +  05:S10AB        502.71     .565 No_date   17:12    3.38  n/a
                     +  03:THNYAK       412.12     .449 No_date   18:28    3.13  n/a
      [DT= 2.00]  SUM=  03:THNYAK      1430.10    2.434 No_date   13:48    5.63  n/a
 001:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:THNYAK      1430.10    2.434 No_date   13:48    5.63  n/a
      [LAG=123.6 min]<- 04:HYND        1430.10    2.434 No_date   15:50    5.63  n/a
#******************************************************************************
#******************************************************************************
 001:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:HYND        1430.10    2.434 No_date   15:50    5.63  n/a
                     +  02:GOLF        6290.78   14.068 No_date   18:10    9.23  n/a
      [DT= 2.00]  SUM=  09:HWY400      7720.88   16.301 No_date   18:10    8.56  n/a
#******************************************************************************
#******************************************************************************
 001:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:HWY400      7720.88   16.301 No_date   18:10    8.56  n/a
  *   [RDT= 2.00] out<- 01:DR#6        7720.88   14.836 No_date   20:08    8.56  n/a
      [L/S/n= 1700./ .010/.060]
      {Vmax=  .087:Dmax= 2.528}
#******************************************************************************
#******************************************************************************
 001:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-B        119.01     .400 No_date   13:40    6.71 .144
      [CN= 72.0: N= 3.00]
      [Tp= 1.29:DT= 2.00]
 001:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-B        119.01     .400 No_date   13:40    6.71  n/a
      [LAG=108.3 min]<- 03:S-5SRB       119.01     .400 No_date   15:28    6.71  n/a
 001:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-A         97.15     .343 No_date   13:32    6.71 .144
      [CN= 72.0: N= 3.00]
      [Tp= 1.20:DT= 2.00]
 001:0095---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-A         97.15     .343 No_date   13:32    6.71  n/a
      [LAG=123.3 min]<- 04:S-5SRA        97.15     .343 No_date   15:34    6.71  n/a
 001:0096---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD     05:15Ln-A        37.07    2.450 No_date   12:00   27.10 .580
      [XIMP=.50:TIMP=.50]
      [LOSS= 2 :CN= 68.0]
      [Pervious    area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
      [Impervious  area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
 001:0097---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       06:H89-A         47.36     .060 No_date   13:22    2.82 .060
      [CN= 64.0: N= 3.00]
      [Tp=  .80:DT= 2.00]
```



```
 001:0098---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 06:H89-A         47.36     .060 No_date   13:22    2.82  n/a
      [LAG= 45.5 min]<- 07:S-H89A        47.36     .060 No_date   14:06    2.82  n/a
 001:0099---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-5SRB       119.01     .400 No_date   15:28    6.71  n/a
                     +  04:S-5SRA        97.15     .343 No_date   15:34    6.71  n/a
                     +  05:15Ln-A        37.07    2.450 No_date   12:00   27.10  n/a
                     +  07:S-H89A        47.36     .060 No_date   14:06    2.82  n/a
      [DT= 2.00]  SUM=  06:TOTPLM       300.59    2.450 No_date   12:00    8.61  n/a
 001:0100---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            06:TOTPLM       300.59    2.450 No_date   12:00    8.61  n/a
                     +  01:DR#6        7720.88   14.836 No_date   20:08    8.56  n/a
      [DT= 2.00]  SUM=  09:TFN15L      8021.47   15.160 No_date   20:02    8.57  n/a
 001:0101----------------------------------------------------------------------------
      FINISH
-------------------------------------------------------------------------------------
*************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0014 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0022 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0040 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0043 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0052 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0061 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0075 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
 001:0077 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
 001:0091 ROUTE CHANNEL   ->
      *** WARNING: Requested routing DT > than inflow DT.
                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
```

Simulation ended on 2018-02-09   at 09:45:03
==

```
2     Metric units
*#****************************************************************************
*#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
*#  Project No. : [300038790]
*#  Date        : 2017-02-08
*#  Date Rev.   : N/A
*#  Modeller    : [T.Lozon]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#****************************************************************************
*%
*# EXISTING CONDITION
*# MODEL RUN BASED ON EX_FINAL.TXT
*# EX_VALIDATION RUN
*# 12% REDUCTION IN IA VALUES
*#
*# RECORDED 37mm RAINFALL EVENT (12-hour)
*# Innisfil Creek at 5SD Inni RAIN GAGE
*#
*#
*# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
*# TOPOGRAPHIC SURVEY INFORMATION
*# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
*%
*%
*%
*% Validation Storm Event . (12-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["37SCS12.txt"] <--storm filename
*%-----------------|-------------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE ORANGE
*#Flows to Flow Node 5 (LINE 5)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 7 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["7Ln-A"], DT=[2]min, AREA=[92.30](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 7 Ln-A to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-7LnA"], IDin=[1], TLAG=[278.45](min)
```



```
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-E
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["5SR-E"], DT=[2]min, AREA=[225.54](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[13.35](mm),
                    N=[3], TP=[2.07]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-E to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRE"], IDin=[1], TLAG=[165.95](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-G (NO ROUTING NEEDED)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-G"], DT=[2]min, AREA=[505.12](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[2.36]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 4-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["CR4-D"], DT=[2]min, AREA=[36.36](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.79]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-D to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-CR4D"], IDin=[5], TLAG=[84.11](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 6 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["6Ln-A"], DT=[2]min, AREA=[310.44](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.26]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 6 Ln-A to Flow Node 1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["S-6LnA"], IDin=[1], TLAG=[86.92](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["5Ln-A"], DT=[2]min, AREA=[461.49](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
```



```
                    N=[3], TP=[1.44]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOWS AT LINE 5
*%Add flows at Flow Node 7 from Catchments 7 Ln-A, 5 SR-E, 10 SR-G, CR 4-D,
*%   6 Ln-A & 5 Ln-A
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN5"], IDs to add=[2+3+4+6+7+8]
*%-----------------|-------------------------------------------------------------|

*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 5 TO LINE 4
*% DRAIN #1
*% USE HEC-RAS X-SECTION 18
ROUTE CHANNEL       IDout=[1], NHYD=["DR#1"], IDin=[9],
                    RDT=[5](min),
                    CHLGTH=[1780](m),  CHSLOPE=[0.29](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[18],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,249.27] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[0,234.17]
                                                   [205.47,230.2]
                                                   [212.04,229.96]
                                                   [215.28,227.63]
                                                   [216.96,227.6]
                                                   [221.63,229.92]
                                                   [249.27,230.06]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE RED
*%
*%Flows from Catchment CR 4-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-C"], DT=[2]min, AREA=[55.76](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-C to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4C"], IDin=[2], TLAG=[222.18](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-F
```



```
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-F"], DT=[2]min, AREA=[472.58](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-F to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-4LnF"], IDin=[2], TLAG=[156.21](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-E
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[5], NHYD=["4Ln-E"], DT=[2]min, AREA=[92.9](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL RED
*% Add from Catchments CR4-C,4Ln-F,4Ln-E
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTRED"], IDs to add=[3+4+5]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW TO LINE 4
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTFN4"], IDs to add=[9+1]
*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% ROUTE FLOWS FROM LINE 4 TO LINE 3
*% USE HEC X-SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1530](m),  CHSLOPE=[0.23](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,779.49] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[746.77,227.72]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]

*%-----------------|-------------------------------------------------------------|
*#****************************************************************************
*#****************************************************************************
*% CALCULATE FLOWS TO LINE 3 NORTH DITCH
*%
```

```
CALIB NASHYD        ID=[2], NHYD=["CR4-B"], DT=[2]min, AREA=[126.62](ha),
                    DWF=[0](cms), CN/C=[66.0], IA=[23.03](mm),
                    N=[3], TP=[0.97]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-B to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-CR4B"], IDin=[2], TLAG=[41.18](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-E
CALIB NASHYD        ID=[5], NHYD=["3Ln-E"], DT=[2]min, AREA=[185.00](ha),
                    DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% LINE 3 NORTH DITCH
*% Add from Catchments
ADD HYD             IDsum=[2], NHYD=["TLN3ND"], IDs to add=[4+5]
*%-----------------|-------------------------------------------------------------|
*%Shift flow from LIN3ND TO FLOW NODE 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["S-L3ND"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%Flows from Catchment CR 4-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["CR4-A"], DT=[2]min, AREA=[181.15](ha),
                    DWF=[0](cms), CN/C=[76.0], IA=[14.12](mm),
                    N=[3], TP=[1.00]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment CR 4-A to Flow Node 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-CR4A"], IDin=[2], TLAG=[147.74](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 4-B
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-F
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-F"], DT=[2]min, AREA=[158.41](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[13.35](mm),
                    N=[3], TP=[1.72]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% LINE 3 SOUTH DITCH
```



```
ADD HYD             IDsum=[2], NHYD=["TLN3SD"], IDs to add=[2+3]
*%-----------------|-------------------------------------------------------------|
*%Shift flow from LIN3NS TO FLOW NODE 3
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S-L3NS"], IDin=[2], TLAG=[66.87 ](min)
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************

*%Flows from Catchment 3 Ln-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[7], NHYD=["3Ln-D"], DT=[2]min, AREA=[213.80](ha),
                    DWF=[0](cms), CN/C=[81.0], IA=[10.49](mm),
                    N=[3], TP=[1.18]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["4Ln-D"], DT=[2]min, AREA=[88.09](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[0.81]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-D to Flow Node 2
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-4LnD"], IDin=[8], TLAG=[84.98](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[8], NHYD=["3Ln-C"], DT=[2]min, AREA=[248.17](ha),
                    DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TPNK"], IDs to add=[7+2+8]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT U/S SIDE OF LINE 3
*% Add from Catchments
ADD HYD             IDsum=[3], NHYD=["TLN3US"], IDs to add=[4+6]
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT THE D/S LIMTIS OF LINE 3
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN3A"], IDs to add=[3+5+1]
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
*#*******************************************************************************
```



```
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO MIDWAY TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2US"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[685](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-E
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["10SR-E"], DT=[2]min, AREA=[225.52](ha),
                    DWF=[0](cms), CN/C=[84.0], IA=[8.52](mm),
                    N=[3], TP=[0.95]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW MID A JUNCTION BETWEEN LINE 3 AND 2
ADD HYD             IDsum=[9], NHYD=["TMID32"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL       IDout=[1], NHYD=["DR#2DS"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[2250](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[14],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                   [746.77,227.77]
                                                   [762.52,227.56]
                                                   [766.8,225]
                                                   [768.23,225]
                                                   [779.49,227.48]
                                                   [900.00,228.00]

*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
```



```
*#*******************************************************************************
*% CALCULATE BLUE
*%
*#Flows FROM WEST OF THE 400 TO 2ND LINE
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 4 Ln-C
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["4Ln-C"], DT=[2]min, AREA=[230.90](ha),
                    DWF=[0](cms), CN/C=[78.0], IA=[12.61](mm),
                    N=[3], TP=[2.02]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-C to Flow Node 4
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-4LnC"], IDin=[2], TLAG=[60.19](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-D
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-D"], DT=[2]min, AREA=[81.43](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[1.30]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-D to Flow Node 4
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRD"], IDin=[2], TLAG=[24.84](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment H 400-B
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["H400-B"], DT=[2]min, AREA=[79.99](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.89]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment H 400-B to Flow Node 4
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["SH400B"], IDin=[2], TLAG=[12.66](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 3 Ln-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["3Ln-B"], DT=[2]min, AREA=[74.81](ha),
                    DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                    N=[3], TP=[0.96]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
```

```
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Add flows at Flow Node 4 from Catchments 4 Ln-C, 5 SR-D, H 400-B & 3 Ln-B
*%-----------------|------------------------------------------------------------|
*% TOTAL BLUE
ADD HYD            IDsum=[6], NHYD=["TOTBLU"], IDs to add=[3+4+5+2]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*% ROUTE FLOWS FROM LINE 3 TO LINE 2
*% USE HEC SECTION 14
ROUTE CHANNEL      IDout=[7], NHYD=["DR#4"], IDin=[6],
                   RDT=[15](min),
                   CHLGTH=[2000](m),  CHSLOPE=[0.04](%),
                                       FPSLOPE=[0.50](%),
                   SECNUM=[14],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,900] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[500.00,228.00]
                                                  [746.77,227.77]
                                                  [762.52,227.56]
                                                  [766.8,225]
                                                  [768.23,225]
                                                  [779.49,227.48]
                                                  [900.00,228.00]

*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#****************************************************************************
*%Flows from Catchment 10 SR-D
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["10SR-D"], DT=[2]min, AREA=[110.02](ha),
                   DWF=[0](cms), CN/C=[70.0], IA=[19.16](mm),
                   N=[3], TP=[1.36]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-D to Flow Node 2
*%-----------------|------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S10SRD"], IDin=[2], TLAG=[153.59](min)
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 2 Ln-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["2Ln-B"], DT=[2]min, AREA=[318.07](ha),
                   DWF=[0](cms), CN/C=[80.0], IA=[11.18](mm),
                   N=[3], TP=[2.13]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
```



```
*% TOTAL GREEN
*% Add from Catchments
*%-----------------|------------------------------------------------------------|
ADD HYD            IDsum=[5], NHYD=["TOTGRN"], IDs to add=[2+4]
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW TO LINE 2
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW UPSTREAM OF THE 2ND LINE
ADD HYD            IDsum=[9], NHYD=["TFN2U"], IDs to add=[5+1+7]
*%-----------------|------------------------------------------------------------|
*#******************************************************************************
*#******************************************************************************
*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment 10 SR-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[3], NHYD=["10SR-C"], DT=[2]min, AREA=[365.20](ha),
                   DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                   N=[3], TP=[1.39]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 10 SR-C DOWNSTREAM LIMITS OF 2ND LINE
*%-----------------|------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S10SRC"], IDin=[3], TLAG=[121.76](min)
*%-----------------|------------------------------------------------------------|
*% TOTAL FLOW DOWNSTREAM OF THE 2ND LINE
ADD HYD            IDsum=[4], NHYD=["TFN2D"], IDs to add=[4+9]
*%-----------------|------------------------------------------------------------|


*#******************************************************************************
*#******************************************************************************
*% ROUTE FLOWS FROM LINE 2 TO FLOW NODE GOLF EAST
*% USE HEC SECTION 11
ROUTE CHANNEL      IDout=[1], NHYD=["RGLF"], IDin=[4],
                   RDT=[15](min),
                   CHLGTH=[785](m),  CHSLOPE=[0.04](%),
                                      FPSLOPE=[0.50](%),
                   SECNUM=[11],       NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.03,1500] NSEG times
                   ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                  [860.67,226.03]
                                                  [865.17,223.96]
                                                  [867.01,223.96]
                                                  [871.48,225.21]
                                                  [879.46,225.75]
                                                  [1500.00,226.10]
*%-----------------|------------------------------------------------------------|
```



```
*#******************************************************************************
*#******************************************************************************
*#******************************************************************************
*#******************************************************************************

*% CALCULATE YELLOW
*% YELLOW NORTH
*%Flows from Catchment H 400-A
*% OUTLET TO GOLFE (GOLF COURSE EAST)
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[4], NHYD=["H400-A"], DT=[2]min, AREA=[350.22](ha),
                   DWF=[0](cms), CN/C=[81.0], IA=[10.49](mm),
                   N=[3], TP=[1.89]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% CALCULATE TOTAL FLOW TO FLOW NODE GLFE (GOLF COURSE EAST)
ADD HYD            IDsum=[1], NHYD=["GOLFE"], IDs to add=[4+1]
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|


*#******************************************************************************
*#******************************************************************************
*% CALCULATE BLACK
*#Flows to Flow Node 2B
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-A"], DT=[2]min, AREA=[114.12](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                   N=[3], TP=[1.33]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-A to Flow Node 5
*%-----------------|------------------------------------------------------------|
SHIFT HYD          IDout=[3], NHYD=["S-4LnA"], IDin=[2], TLAG=[234.20](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 4 Ln-B
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["4Ln-B"], DT=[2]min, AREA=[171.81](ha),
                   DWF=[0](cms), CN/C=[75.0], IA=[14.90](mm),
                   N=[3], TP=[1.34]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 4 Ln-B to Flow Node 5
*%-----------------|------------------------------------------------------------|
```



```
SHIFT HYD          IDout=[4], NHYD=["S-4LnB"], IDin=[2], TLAG=[232.52](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 3 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[2], NHYD=["3Ln-A"], DT=[2]min, AREA=[268.08](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                   N=[3], TP=[1.61]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 3 Ln-A to Flow Node 5
*%-----------------|------------------------------------------------------------|
SHIFT HYD          IDout=[5], NHYD=["S-3LnA"], IDin=[2], TLAG=[158.77](min)
*%-----------------|------------------------------------------------------------|
ADD HYD            IDsum=[2], NHYD=["TBLK1"], IDs to add=[3+4+5]
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 5 SR-C
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[3], NHYD=["5SR-C"], DT=[2]min, AREA=[341.88](ha),
                   DWF=[0](cms), CN/C=[74.0], IA=[15.71](mm),
                   N=[3], TP=[1.50]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-C to Flow Node 5
*%-----------------|------------------------------------------------------------|
SHIFT HYD          IDout=[4], NHYD=["S-5SRC"], IDin=[3], TLAG=[72.46](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%Flows from Catchment 2 Ln-A
*%-----------------|------------------------------------------------------------|
CALIB NASHYD       ID=[5], NHYD=["2Ln-A"], DT=[2]min, AREA=[105.00](ha),
                   DWF=[0](cms), CN/C=[71.0], IA=[18.26](mm),
                   N=[3], TP=[0.96]hrs,
                   RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% TOTAL BLACK
*%Add flows at Flow Node 5 from Catchments 4 Ln-A, 4 Ln-B, 3 Ln-A,
*%    5 SR-C & 2 Ln-A
*%-----------------|------------------------------------------------------------|
ADD HYD            IDsum=[7], NHYD=["TOTBLK"], IDs to add=[2+4+5]
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*% ROUTE FLOWS FROM TOTBLK TO FLOW NODE GOLF NORTH
*% ROUTE FLOWS FROM LINE 2 FLOW NODE GOLFN
```

```
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLFN"], IDin=[7],
                    RDT=[15](min),
                    CHLGTH=[330](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOWS FROM GOLF NORTH AND GOLF EAST
ADD HYD             IDsum=[7], NHYD=["TGOLF"], IDs to add=[2+1]
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%-----------------|-------------------------------------------------------------|
*% ROUTE FLOWS FROM TGOLF TO HWY 400
*% USE HEC SECTION 11
ROUTE CHANNEL       IDout=[2], NHYD=["GOLF"], IDin=[7],
                    RDT=[15](min),
                    CHLGTH=[485](m),  CHSLOPE=[0.04](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[11],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.05,1500] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[400.67,226.10]
                                                   [860.67,226.03]
                                                   [865.17,223.96]
                                                   [867.01,223.96]
                                                   [871.48,225.21]
                                                   [879.46,225.75]
                                                   [1500,226.10]

*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*% YELLOW SOUTH( HNYDCZAK DRAIN)
*%Flows from Catchment 10 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["10SR-A"], DT=[2]min, AREA=[406.60](ha),
```



```
                    DWF=[0](cms), CN/C=[65.0], IA=[24.07](mm),
                    N=[3], TP=[1.82]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 10 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["10SR-B"], DT=[2]min, AREA=[96.11](ha),
                    DWF=[0](cms), CN/C=[67.0], IA=[22.02](mm),
                    N=[3], TP=[1.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B
*% INTERSECTION OF 10 SIDEROAD AND HWY 89
ADD HYD             IDsum=[3], NHYD=["T10AB"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW INTERSECTION OF 10 SIDEROAD AND HWY 89 TO OUTLET OF CR-89A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["S10AB"], IDin=[3], TLAG=[148.99](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 13 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["13Ln-A"], DT=[2]min, AREA=[135.52](ha),
                    DWF=[0](cms), CN/C=[62], IA=[27.40](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM OUTLET OF 13 Ln-A to outelt of 14 Ln-A
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S13LnA"], IDin=[3], TLAG=[100.46](min)
*%-----------------|-------------------------------------------------------------|

*%Flows from Catchment 14 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[3], NHYD=["14Ln-A"], DT=[2]min, AREA=[276.60](ha),
                    DWF=[0](cms), CN/C=[66], IA=[23.03](mm),
                    N=[3], TP=[1.55]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT THE 14TH LINE
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOT14L"], IDs to add=[4+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOW FROM 14TH LINE TO HIGHWAY 89
*%-----------------|-------------------------------------------------------------|
```



```
SHIFT HYD           IDout=[3], NHYD=["S13LnA"], IDin=[9], TLAG=[209.97](min)
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment CR 89-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[4], NHYD=["CR89-A"], DT=[2]min, AREA=[212.34](ha),
                    DWF=[0](cms), CN/C=[77.0], IA=[11.88](mm),
                    N=[3], TP=[1.51]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*% ADD FLOWS FROM 10A + 10B + CR 89-A
*% HNYDCZAK CROSSES HWY 89
ADD HYD             IDsum=[3], NHYD=["THNYAK"], IDs to add=[4+5+3]
*%-----------------|-------------------------------------------------------------|
*% SHIFT FLOWS FROM HNYDCZAK CROSSES HWY 89 TO FLOW NODE HYND
*% FLOW NODE HYND LOCATED AT THE OUTLET OF THE HNYDCZAK UPSTREAM OF HIGHWAY 400
SHIFT HYD           IDout=[4], NHYD=["HYND"], IDin=[3], TLAG=[123.60](min)
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*%-----------------|-------------------------------------------------------------|
*% TOTAL FLOW AT HWY 400
*%
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["HWY400"], IDs to add=[4+2]
*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
*#*******************************************************************************
*% ROUTE FLOWS FROM HWY 400 TO 15TH LINE
*% USE HEC SECTION 6
ROUTE CHANNEL       IDout=[1], NHYD=["DR#6"], IDin=[9],
                    RDT=[15](min),
                    CHLGTH=[1700](m),  CHSLOPE=[0.01](%),
                                        FPSLOPE=[0.50](%),
                    SECNUM=[6],       NSEG=[1]
                    ( SEGROUGH, SEGDIST (m))=[0.06,400.82] NSEG times
                    ( DISTANCE (m), ELEVATION (m))=[200.00,225.3]
                                                   [220.07,225.18]
                                                   [231.91,224.9]
                                                   [240.6,222.78]
                                                   [245.45,222.77]
                                                   [251.91,224.78]
                                                   [355.82,225.16]
                                                   [400.82,225.30]

*%-----------------|-------------------------------------------------------------|
*#*******************************************************************************
```



```
*#*******************************************************************************

*% CALCULATE PLUM
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-B
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-B"], DT=[2]min, AREA=[119.01](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[1.29]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-B to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-5SRB"], IDin=[2], TLAG=[108.27](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 5 SR-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[2], NHYD=["5SR-A"], DT=[2]min, AREA=[97.15](ha),
                    DWF=[0](cms), CN/C=[72.0], IA=[17.38](mm),
                    N=[3], TP=[1.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment 5 SR-A to Flow Node 8
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[4], NHYD=["S-5SRA"], IDin=[2], TLAG=[123.28](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment 15 Ln-A
*%-----------------|-------------------------------------------------------------|
CALIB STANDHYD      ID= [5], NHYD=["15Ln-A"], DT=[2](min), AREA=[37.07](ha),
                    XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[68],
                    Pervious   surfaces: IAper=[7.9](mm), SLPP=[1.0](%),
                                         LGP=[1685.7](m), MNP=[.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2](mm), SLPI=[0.9](%),
                                         LGI=[218.72](m), MNI=[.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*%Flows from Catchment H 89-A
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[6], NHYD=["H89-A"], DT=[2]min, AREA=[47.36](ha),
                    DWF=[0](cms), CN/C=[64.0], IA=[25.15](mm),
                    N=[3], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*%Shift flow from Catchment H 89-A to Flow Node 8
*%-----------------|-------------------------------------------------------------|
```

```
SHIFT HYD           IDout=[7], NHYD=["S-H89A"], IDin=[6], TLAG=[45.46](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*% TOTAL PLUM
*%Add flows at Flow Node 8 from Catchments 5 SR-B, 5 SR-A, H 89-A, 15 Ln-A
*%
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["TOTPLM"], IDs to add=[3+4+5+7]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TFN15L"], IDs to add=[6+1]
*%-----------------|-----------------------------------------------------------|
FINISH
```

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3877524
       StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05 ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: R. J. Burnside & Associates Ltd.             +++++++++
 +++++++++                Brampton             SERIAL#:3877524         +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
 *********          Maximum value for ID numbers  :     10             *********
 *********          Max. number of rainfall points: 105408             *********
 *********          Max. number of flow points    : 105408             *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                 *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).    *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).  *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).    *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.             *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).       *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).       *****
 *****     *:  see WARNING or NOTE message printed at end of run.         *****
 *****    **:  see  ERROR  message printed at end of run.                 *****
 ******************************************************************************
 ******************************************************************************
```



```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 **********************   S U M M A R Y   O U T P U T   **********************
 ******************************************************************************
 *        DATE: 2018-02-09     TIME: 09:55:42     RUN COUNTER: 000235         *
 ******************************************************************************
 * Input   filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_VAL~1.TXT *
 * Output  filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_VAL~1.out *
 * Summary filename: C:\USERS\TLOZON\DESKTOP\SOUTHI~1\TL\CALIB_~1\EX_VAL~1.sum *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************


#******************************************************************************
#  Project Name: [Town of Innisfil - South Innisfil Creek Drain Improvements]
#  Project No. : [300038790]
#  Date        : 2017-02-08
#  Date Rev.   : N/A
#  Modeller    : [T.Lozon]
#  Company     : R.J. Burnside and Associates
#  License #   : 3846413
#******************************************************************************
# EXISTING CONDITION
# MODEL RUN BASED ON EX_FINAL.TXT
# EX_CALIBRATION EXTENSION RUN(EX_CLB_EXT)
# 12% REDUCTION IN IA VALUES
#
# RECORDED 40mm RAINFALL EVENT (12-hour)
# Innisfil Creek at 5SD Inni RAIN GAGE
#
#
# MAIN SICD HAS BEEN MODELLED USING THE ROUTE CHANNEL COMMAND BASED ON
# TOPOGRAPHIC SURVEY INFORMATION
# ADDITIONAL NODES ADDED TO REFINE CHANNEL GEOMETRY
 RUN:COMMAND#
 001:0001------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   1 ]
 001:0002------------------------------------------------------------------------
     READ STORM
```



```
      Filename = STORM.001
      Comment  =
      [SDT= 6.00:SDUR=  12.10:PTOT=  37.42]
#******************************************************************************
#******************************************************************************
#Flows to Flow Node 5 (LINE 5)
 001:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:7Ln-A         92.30     .136 No_date    8:10    2.62 .070
     [CN= 70.0: N= 3.00]
     [Tp= 1.20:DT= 2.00]
 001:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:7Ln-A         92.30     .136 No_date    8:10    2.62  n/a
     [LAG=278.5 min]<- 02:S-7LnA        92.30     .136 No_date   12:48    2.62  n/a
 001:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:5SR-E        225.54     .614 No_date    9:02    5.80 .155
     [CN= 77.0: N= 3.00]
     [Tp= 2.07:DT= 2.00]
 001:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:5SR-E        225.54     .614 No_date    9:02    5.80  n/a
     [LAG=165.9 min]<- 03:S-5SRE       225.54     .614 No_date   11:46    5.80  n/a
 001:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:10SR-G       505.12     .697 No_date    9:56    3.38 .090
     [CN= 72.0: N= 3.00]
     [Tp= 2.36:DT= 2.00]
 001:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:CR4-D         36.36     .126 No_date    7:14    4.25 .114
     [CN= 74.0: N= 3.00]
     [Tp=  .79:DT= 2.00]
 001:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:CR4-D         36.36     .126 No_date    7:14    4.25  n/a
     [LAG= 84.1 min]<- 06:S-CR4D        36.36     .126 No_date    8:37    4.25  n/a
 001:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:6Ln-A        310.44     .919 No_date    7:56    4.73 .126
     [CN= 75.0: N= 3.00]
     [Tp= 1.26:DT= 2.00]
 001:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 01:6Ln-A        310.44     .919 No_date    7:56    4.73  n/a
     [LAG= 86.9 min]<- 07:S-6LnA       310.44     .919 No_date    9:22    4.73  n/a
 001:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:5Ln-A        461.49    1.420 No_date    8:10    5.24 .140
     [CN= 76.0: N= 3.00]
     [Tp= 1.44:DT= 2.00]
 001:0013---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:S-7LnA        92.30     .136 No_date   12:48    2.62  n/a
                    +  03:S-5SRE       225.54     .614 No_date   11:46    5.80  n/a
                    +  04:10SR-G       505.12     .697 No_date    9:56    3.38  n/a
                    +  06:S-CR4D        36.36     .126 No_date    8:37    4.25  n/a
                    +  07:S-6LnA       310.44     .919 No_date    9:22    4.73  n/a
```



```
                    +  08:5Ln-A        461.49    1.420 No_date    8:10    5.24  n/a
     [DT= 2.00]  SUM=  09:TOTFN5      1631.25    2.974 No_date    9:28    4.48  n/a
#******************************************************************************
#******************************************************************************
 001:0014---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN5      1631.25    2.974 No_date    9:28    4.48  n/a
  *  [RDT= 2.00] out<- 01:DR#1        1631.25    2.940 No_date    9:52    4.48  n/a
     [L/S/n= 1780./ .290/.030]
     {Vmax= 1.152:Dmax=  .841}
#******************************************************************************
#******************************************************************************
 001:0015---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-C         55.76     .172 No_date    7:30    4.25 .114
     [CN= 74.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0016---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:CR4-C         55.76     .172 No_date    7:30    4.25  n/a
     [LAG=222.2 min]<- 03:S-CR4C        55.76     .172 No_date   11:12    4.25  n/a
 001:0017---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-F        472.58    1.296 No_date    8:34    5.24 .140
     [CN= 76.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0018---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:4Ln-F        472.58    1.296 No_date    8:34    5.24  n/a
     [LAG=156.2 min]<- 04:S-4LnF       472.58    1.296 No_date   11:10    5.24  n/a
 001:0019---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:4Ln-E         92.90     .386 No_date    7:22    5.24 .140
     [CN= 76.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 001:0020---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-CR4C        55.76     .172 No_date   11:12    4.25  n/a
                    +  04:S-4LnF       472.58    1.296 No_date   11:10    5.24  n/a
                    +  05:4Ln-E         92.90     .386 No_date    7:22    5.24  n/a
     [DT= 2.00]  SUM=  09:TOTRED       621.24    1.581 No_date   11:08    5.16  n/a
 001:0021---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:TOTFN4       621.24    1.581 No_date   11:08    5.16  n/a
                    +  01:DR#1        1631.25    2.940 No_date    9:52    4.48  n/a
     [DT= 2.00]  SUM=  09:TOTFN4      2252.49    4.361 No_date   10:48    4.66  n/a
#******************************************************************************
#******************************************************************************
 001:0022---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL   -> 09:TOTFN4      2252.49    4.361 No_date   10:48    4.66  n/a
  *  [RDT= 2.00] out<- 01:DR#2        2252.49    4.300 No_date   11:08    4.66  n/a
     [L/S/n= 1530./ .230/.030]
     {Vmax= 1.055:Dmax=  .943}
#******************************************************************************
#******************************************************************************
 001:0023---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    CALIB NASHYD       02:CR4-B        126.62     .097 No_date    8:20    1.43 .038
     [CN= 66.0: N= 3.00]
     [Tp=  .97:DT= 2.00]
 001:0024---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-B        126.62     .097 No_date    8:20    1.43  n/a
     [LAG= 41.2 min]<- 04:S-CR4B       126.62     .097 No_date    9:00    1.43  n/a
 001:0025---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       05:3Ln-E        185.00     .262 No_date    8:22    2.62 .070
     [CN= 70.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0026---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:S-CR4B       126.62     .097 No_date    9:00    1.43  n/a
                    +  05:3Ln-E        185.00     .262 No_date    8:22    2.62  n/a
     [DT= 2.00]  SUM=  02:TLN3ND       311.62     .353 No_date    8:36    2.14  n/a
 001:0027---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3ND       311.62     .353 No_date    8:36    2.14  n/a
     [LAG= 66.9 min]<- 06:S-L3ND       311.62     .353 No_date    9:42    2.14  n/a
#****************************************************************************
#****************************************************************************
 001:0028---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:CR4-A        181.15     .708 No_date    7:30    5.24 .140
     [CN= 76.0: N= 3.00]
     [Tp= 1.00:DT= 2.00]
 001:0029---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:CR4-A        181.15     .708 No_date    7:30    5.24  n/a
     [LAG=147.7 min]<- 03:S-CR4A       181.15     .708 No_date    9:56    5.24  n/a
 001:0030---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-F       158.41     .488 No_date    8:32    5.80 .155
     [CN= 77.0: N= 3.00]
     [Tp= 1.72:DT= 2.00]
 001:0031---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:TLN3SD       158.41     .488 No_date    8:32    5.80  n/a
                    +  03:S-CR4A       181.15     .708 No_date    9:56    5.24  n/a
     [DT= 2.00]  SUM=  02:TLN3SD       339.56    1.115 No_date    9:48    5.50  n/a
 001:0032---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:TLN3SD       339.56    1.115 No_date    9:48    5.50  n/a
     [LAG= 66.9 min]<- 05:S-L3NS       339.56    1.115 No_date   10:54    5.50  n/a
#****************************************************************************
#****************************************************************************
 001:0033---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:3Ln-D        213.80    1.322 No_date    7:36    8.38 .224
     [CN= 81.0: N= 3.00]
     [Tp= 1.18:DT= 2.00]
 001:0034---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:4Ln-D         88.09     .346 No_date    7:14    4.73 .126
     [CN= 75.0: N= 3.00]
     [Tp=  .81:DT= 2.00]
 001:0035---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    SHIFT HYD        -> 08:4Ln-D         88.09     .346 No_date    7:14    4.73  n/a
     [LAG= 85.0 min]<- 02:S-4LnD         88.09     .346 No_date    8:37    4.73  n/a
 001:0036---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:3Ln-C        248.17     .728 No_date    7:58    4.73 .126
     [CN= 75.0: N= 3.00]
     [Tp= 1.28:DT= 2.00]
 001:0037---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:3Ln-D        213.80    1.322 No_date    7:36    8.38  n/a
                    +  02:S-4LnD         88.09     .346 No_date    8:37    4.73  n/a
                    +  08:3Ln-C        248.17     .728 No_date    7:58    4.73  n/a
     [DT= 2.00]  SUM=  04:TPNK         550.06    2.208 No_date    8:06    6.15  n/a
 001:0038---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TPNK         550.06    2.208 No_date    8:06    6.15  n/a
                    +  06:S-L3ND       311.62     .353 No_date    9:42    2.14  n/a
     [DT= 2.00]  SUM=  03:TLN3US       861.68    2.369 No_date    8:16    4.70  n/a
 001:0039---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:TLN3US       861.68    2.369 No_date    8:16    4.70  n/a
                    +  05:S-L3NS       339.56    1.115 No_date   10:54    5.50  n/a
                    +  01:DR#2        2252.49    4.300 No_date   11:08    4.66  n/a
     [DT= 2.00]  SUM=  09:TFN3A       3453.73    6.646 No_date   10:48    4.75  n/a
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 001:0040---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TFN3A       3453.73    6.646 No_date   10:48    4.75  n/a
  *   [RDT= 2.00] out<- 01:DR#2US      3453.73    6.515 No_date   11:00    4.75  n/a
     [L/S/n=  685./ .040/.030]
     {Vmax=  .611:Dmax= 1.651}
 001:0041---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-E        225.52    2.223 No_date    7:14   10.81 .289
     [CN= 84.0: N= 3.00]
     [Tp=  .95:DT= 2.00]
 001:0042---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:DR#2US      3453.73    6.515 No_date   11:00    4.75  n/a
                    +  02:10SR-E        225.52    2.223 No_date    7:14   10.81  n/a
     [DT= 2.00]  SUM=  09:TMID32      3679.25    7.000 No_date   10:46    5.13  n/a
#****************************************************************************
 001:0043---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 09:TMID32      3679.25    7.000 No_date   10:46    5.13  n/a
  *   [RDT= 2.00] out<- 01:DR#2DS      3679.25    6.562 No_date   11:30    5.13  n/a
     [L/S/n= 2250./ .040/.030]
     {Vmax=  .619:Dmax= 1.688}
#****************************************************************************
#****************************************************************************
#Flows FROM WEST OF THE 400 TO 2ND LINE
 001:0044---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB NASHYD       02:4Ln-C        230.90     .713 No_date    8:54    6.38 .171
     [CN= 78.0: N= 3.00]
     [Tp= 2.02:DT= 2.00]
 001:0045---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:4Ln-C        230.90     .713 No_date    8:54    6.38  n/a
     [LAG= 60.2 min]<- 03:S-4LnC       230.90     .713 No_date    9:54    6.38  n/a
 001:0046---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:5SR-D         81.43     .207 No_date    8:02    4.25 .114
     [CN= 74.0: N= 3.00]
     [Tp= 1.30:DT= 2.00]
 001:0047---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:5SR-D         81.43     .207 No_date    8:02    4.25  n/a
     [LAG= 24.8 min]<- 04:S-5SRD         81.43     .207 No_date    8:26    4.25  n/a
 001:0048---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:H400-B         79.99     .257 No_date    7:24    4.25 .114
     [CN= 74.0: N= 3.00]
     [Tp=  .89:DT= 2.00]
 001:0049---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:H400-B         79.99     .257 No_date    7:24    4.25  n/a
     [LAG= 12.7 min]<- 05:SH400B         79.99     .257 No_date    7:36    4.25  n/a
 001:0050---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:3Ln-B          74.81     .230 No_date    7:30    4.25 .114
     [CN= 74.0: N= 3.00]
     [Tp=  .96:DT= 2.00]
 001:0051---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:S-4LnC       230.90     .713 No_date    9:54    6.38  n/a
                    +  04:S-5SRD         81.43     .207 No_date    8:26    4.25  n/a
                    +  05:SH400B         79.99     .257 No_date    7:36    4.25  n/a
                    +  02:3Ln-B          74.81     .230 No_date    7:30    4.25  n/a
     [DT= 2.00]  SUM=  06:TOTBLU       467.13    1.141 No_date    9:12    5.30  n/a
#****************************************************************************
#****************************************************************************
 001:0052---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 06:TOTBLU       467.13    1.141 No_date    9:12    5.30  n/a
  *   [RDT= 2.00] out<- 07:DR#4         467.13     .950 No_date   10:30    5.30  n/a
     [L/S/n= 2000./ .040/.030]
     {Vmax=  .389:Dmax=  .763}
#****************************************************************************
#**************************************************************************
 001:0053---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:10SR-D       110.02     .152 No_date    8:28    2.62 .070
     [CN= 70.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
 001:0054---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:10SR-D       110.02     .152 No_date    8:28    2.62  n/a
     [LAG=153.6 min]<- 04:S10SRD       110.02     .152 No_date   11:00    2.62  n/a
 001:0055---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:2Ln-B        318.07    1.165 No_date    8:58    7.67 .205
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     [CN= 80.0: N= 3.00]
     [Tp= 2.13:DT= 2.00]
 001:0056---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:2Ln-B        318.07    1.165 No_date    8:58    7.67  n/a
                    +  04:S10SRD       110.02     .152 No_date   11:00    2.62  n/a
     [DT= 2.00]  SUM=  05:TOTGRN       428.09    1.205 No_date    9:32    6.37  n/a
 001:0057---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:TOTGRN       428.09    1.205 No_date    9:32    6.37  n/a
                    +  01:DR#2DS      3679.25    6.562 No_date   11:30    5.13  n/a
                    +  07:DR#4         467.13     .950 No_date   10:30    5.30  n/a
     [DT= 2.00]  SUM=  09:TFN2U       4574.47    8.459 No_date   11:08    5.26  n/a
#****************************************************************************
#****************************************************************************
 001:0058---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       03:10SR-C       365.20     .678 No_date    8:20    3.38 .090
     [CN= 72.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
 001:0059---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:10SR-C       365.20     .678 No_date    8:20    3.38  n/a
     [LAG=121.8 min]<- 04:S10SRC       365.20     .678 No_date   10:20    3.38  n/a
 001:0060---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TFN2D        365.20     .678 No_date   10:20    3.38  n/a
                    +  09:TFN2U       4574.47    8.459 No_date   11:08    5.26  n/a
     [DT= 2.00]  SUM=  04:TFN2D       4939.67    9.084 No_date   11:04    5.12  n/a
#****************************************************************************
#****************************************************************************
 001:0061---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE CHANNEL    -> 04:TFN2D      4939.67    9.084 No_date   11:04    5.12  n/a
  *   [RDT= 2.00] out<- 01:RGLF       4939.67    8.524 No_date   12:12    5.12  n/a
     [L/S/n=  785./ .040/.030]
     {Vmax=  .179:Dmax= 1.970}
#****************************************************************************
#****************************************************************************
#****************************************************************************
#****************************************************************************
 001:0062---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:H400-A       350.22    1.543 No_date    8:36    8.38 .224
     [CN= 81.0: N= 3.00]
     [Tp= 1.89:DT= 2.00]
 001:0063---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:H400-A       350.22    1.543 No_date    8:36    8.38  n/a
                    +  01:GOLFE       4939.67    8.524 No_date   12:12    5.12  n/a
     [DT= 2.00]  SUM=  01:GOLFE       5289.89    9.282 No_date   12:02    5.34  n/a
#****************************************************************************
#****************************************************************************
#Flows to Flow Node 2B
 001:0064---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:4Ln-A        114.12     .327 No_date    8:02    4.73 .126
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      [CN= 75.0: N= 3.00]
      [Tp= 1.33:DT= 2.00]
 001:0065---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-A        114.12      .327 No_date    8:02    4.73  n/a
      [LAG=234.2 min]<- 03:S-4LnA       114.12      .327 No_date   11:56    4.73  n/a
 001:0066---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:4Ln-B        171.81      .489 No_date    8:04    4.73 .126
      [CN= 75.0: N= 3.00]
      [Tp= 1.34:DT= 2.00]
 001:0067---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:4Ln-B        171.81      .489 No_date    8:04    4.73  n/a
      [LAG=232.5 min]<- 04:S-4LnB       171.81      .489 No_date   11:56    4.73  n/a
 001:0068---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:3Ln-A        268.08      .599 No_date    8:32    4.25 .114
      [CN= 74.0: N= 3.00]
      [Tp= 1.61:DT= 2.00]
 001:0069---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:3Ln-A        268.08      .599 No_date    8:32    4.25  n/a
      [LAG=158.8 min]<- 05:S-3LnA       268.08      .599 No_date   11:10    4.25  n/a
 001:0070---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:S-4LnA       114.12      .327 No_date   11:56    4.73  n/a
                     +  04:S-4LnB       171.81      .489 No_date   11:56    4.73  n/a
                     +  05:S-3LnA       268.08      .599 No_date   11:10    4.25  n/a
      [DT= 2.00]  SUM=  02:TBLK1        554.01     1.383 No_date   11:46    4.50  n/a
 001:0071---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:5SR-C        341.88      .798 No_date    8:22    4.25 .114
      [CN= 74.0: N= 3.00]
      [Tp= 1.50:DT= 2.00]
 001:0072---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:5SR-C        341.88      .798 No_date    8:22    4.25  n/a
      [LAG= 72.5 min]<- 04:S-5SRC       341.88      .798 No_date    9:33    4.25  n/a
 001:0073---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       05:2Ln-A        105.00      .205 No_date    7:40    2.99 .080
      [CN= 71.0: N= 3.00]
      [Tp=  .96:DT= 2.00]
 001:0074---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            02:TBLK1        554.01     1.383 No_date   11:46    4.50  n/a
                     +  04:S-5SRC       341.88      .798 No_date    9:33    4.25  n/a
                     +  05:2Ln-A        105.00      .205 No_date    7:40    2.99  n/a
      [DT= 2.00]  SUM=  07:TOTBLK      1000.89     2.021 No_date   11:30    4.25  n/a
 001:0075---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TOTBLK      1000.89     2.021 No_date   11:30    4.25  n/a
  *   [RDT= 2.00] out<- 02:GOLFN       1000.89     1.966 No_date   11:38    4.25  n/a
      [L/S/n=  330./ .040/.050]
      {Vmax=  .314:Dmax= 1.208}
#******************************************************************************
#******************************************************************************
 001:0076---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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     ADD HYD            02:GOLFN       1000.89     1.966 No_date   11:38    4.25  n/a
                     +  01:GOLFE       5289.89     9.282 No_date   12:02    5.34  n/a
      [DT= 2.00]  SUM=  07:TGOLF       6290.78    11.210 No_date   11:50    5.16  n/a
#******************************************************************************
#******************************************************************************
 001:0077---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 07:TGOLF       6290.78    11.210 No_date   11:50    5.16  n/a
  *   [RDT= 2.00] out<- 02:GOLF        6290.78    10.113 No_date   13:00    5.16  n/a
      [L/S/n=  485./ .040/.050]
      {Vmax=  .110:Dmax= 2.079}
#******************************************************************************
#******************************************************************************
 001:0078---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:10SR-A       406.60      .209 No_date   10:30    1.19 .032
      [CN= 65.0: N= 3.00]
      [Tp= 1.82:DT= 2.00]
 001:0079---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:10SR-B        96.11      .081 No_date    8:46    1.69 .045
      [CN= 67.0: N= 3.00]
      [Tp= 1.28:DT= 2.00]
 001:0080---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            03:T10AB        406.60      .209 No_date   10:30    1.19  n/a
                     +  04:10SR-B        96.11      .081 No_date    8:46    1.69  n/a
      [DT= 2.00]  SUM=  03:T10AB        502.71      .280 No_date   10:04    1.28  n/a
 001:0081---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:T10AB        502.71      .280 No_date   10:04    1.28  n/a
      [LAG=149.0 min]<- 05:S10AB        502.71      .280 No_date   12:32    1.28  n/a
 001:0082---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:13Ln-A       135.52      .042 No_date    9:58     .61 .016
      [CN= 62.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 001:0083---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:13Ln-A       135.52      .042 No_date    9:58     .61  n/a
      [LAG=100.5 min]<- 04:S13LnA       135.52      .042 No_date   11:38     .61  n/a
 001:0084---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       03:14Ln-A       276.60      .180 No_date    9:36    1.43 .038
      [CN= 66.0: N= 3.00]
      [Tp= 1.55:DT= 2.00]
 001:0085---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:S13LnA       135.52      .042 No_date   11:38     .61  n/a
                     +  03:14Ln-A       276.60      .180 No_date    9:36    1.43  n/a
      [DT= 2.00]  SUM=  09:TOT14L       412.12      .213 No_date   10:14    1.16  n/a
 001:0086---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 09:TOT14L       412.12      .213 No_date   10:14    1.16  n/a
      [LAG=210.0 min]<- 03:S13LnA       412.12      .213 No_date   13:42    1.16  n/a
 001:0087---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       04:CR89-A       212.34      .814 No_date    8:08    6.43 .172
      [CN= 77.0: N= 3.00]
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      [Tp= 1.51:DT= 2.00]
 001:0088---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:CR89-A       212.34      .814 No_date    8:08    6.43  n/a
                     +  05:S10AB        502.71      .280 No_date   12:32    1.28  n/a
                     +  03:THNYAK       412.12      .213 No_date   13:42    1.16  n/a
      [DT= 2.00]  SUM=  03:THNYAK      1430.10     1.629 No_date    8:08    2.81  n/a
 001:0089---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 03:THNYAK      1430.10     1.629 No_date    8:08    2.81  n/a
      [LAG=123.6 min]<- 04:HYND        1430.10     1.629 No_date   10:10    2.81  n/a
#******************************************************************************
#******************************************************************************
 001:0090---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:HYND        1430.10     1.629 No_date   10:10    2.81  n/a
                     +  02:GOLF        6290.78    10.113 No_date   13:00    5.16  n/a
      [DT= 2.00]  SUM=  09:HWY400      7720.88    11.415 No_date   12:56    4.73  n/a
#******************************************************************************
#******************************************************************************
 001:0091---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ROUTE CHANNEL   -> 09:HWY400      7720.88    11.415 No_date   12:56    4.73  n/a
  *   [RDT= 2.00] out<- 01:DR#6        7720.88    10.216 No_date   13:46    4.73  n/a
      [L/S/n= 1700./ .010/.060]
      {Vmax=  .087:Dmax= 2.530}
#******************************************************************************
#******************************************************************************
 001:0092---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-B        119.01      .231 No_date    8:10    3.38 .090
      [CN= 72.0: N= 3.00]
      [Tp= 1.29:DT= 2.00]
 001:0093---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:5SR-B        119.01      .231 No_date    8:10    3.38  n/a
      [LAG=108.3 min]<- 03:S-5SRB       119.01      .231 No_date    9:58    3.38  n/a
 001:0094---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       02:5SR-A         97.15      .196 No_date    8:00    3.38 .090
      [CN= 72.0: N= 3.00]
      [Tp= 1.20:DT= 2.00]
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      [LAG=123.3 min]<- 04:S-5SRA        97.15      .196 No_date   10:02    3.38  n/a
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     CALIB STANDHYD     05:15Ln-A        37.07     2.523 No_date    6:10   20.63 .551
      [XIMP=.50:TIMP=.50]
      [LOSS= 2 :CN= 68.0]
      [Pervious     area: IAper= 7.90:SLPP=1.00:LGP=1686.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp= 2.00:SLPI= .90:LGI= 219.:MNI=.013:SCI=   .0]
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     CALIB NASHYD       06:H89-A         47.36      .024 No_date    8:28     .97 .026
      [CN= 64.0: N= 3.00]
      [Tp=  .80:DT= 2.00]
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                     +  04:S-5SRA        97.15      .196 No_date   10:02    3.38  n/a
                     +  05:15Ln-A        37.07     2.523 No_date    6:10   20.63  n/a
                     +  07:S-H89A        47.36      .024 No_date    9:12     .97  n/a
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      [DT= 2.00]  SUM=  09:TFN15L      8021.47    10.452 No_date   13:44    4.74  n/a
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                   Routing DT set to inflow hydrograph DT.
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                   Routing DT set to inflow hydrograph DT.
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                   Routing DT set to inflow hydrograph DT.
      *** WARNING: TRAVEL TIME TABLE was exceeded
   Simulation ended on 2018-02-09     at 09:55:52
```

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BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

H2

Appendix H2

South Innisfil Creek Drain Improvements
Hydraulic Report

BURNSIDE

South Innisfil Creek Drainage Improvements
Hydraulic Report

Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

R.J. Burnside & Associates Limited
3 Ronell Crescent
Collingwood ON L9Y 4J6 CANADA

February 1, 2019
300038790.0000

South Innisfil Creek Drainage Improvements
Hudraulic Report
February 1, 2019

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
-	-	Yes	Town of Innisfil (Town)
-	-	Yes	Nottawasaga Valley Conservation Authority (NVCA)

Record of Revisions

Rev.	Date	Description
-	February 1, 2019	Issued for Final Engineer's Report

R.J. Burnside & Associates Limited

Report Prepared By:

Tim Lozon, P.Eng.
Water Resources Engineer
TL:lw

Report Reviewed By:

Jeff Dickson, P.Eng.
Drainage Engineer

Executive Summary

The South Innisfil Creek Drain (SICD) is located within the Town of Innisfil (Town) and has a catchment area of approximately 8,021 ha outletting at the 15th Line, located south of Highway No 89. Historical flooding events, impacting prime agricultural farm lands and private property within the watershed have triggered requirements for improvements to the municipal drain under Section 78 of the Drainage Act. To quantify existing peak flows within the drain, a systemized hydrometric analysis was conducted including:

- Daily inflow hydrograph analysis of Innisfil Creek;
- Frequency analysis of the Innisfil Creek flow data; and
- Watershed Flow Regression analysis.

Burnside was able to summarize peak flow ranges from the various hydrometric analysis as noted above to determine the geometric mean and average peak flows for the watershed. This analysis provided a benchmark for estimates of historical flows within the SICD as well as watersheds with comparable geometric characteristics. Deterministic Hydrological Modelling was further completed using the SWMHYMO Hydrological model. The SWMHYMO hydrological model was calibrated and validated to two recorded rainfall events in May and June of 2017. The results of the Hydrometric and Deterministic hydrological analysis provided a level of flow accuracy required for the consideration of conveyance improvements within the drain. While hydrological analysis was completed to provide an understanding of current peak flow conditions within the drain, future incremental flow changes associated with climate change were also considered for analysis.

Detailed hydraulic analysis on key isolated sections of the drain were conducted using the HEC-RAS hydraulic software. Isolated hydraulic analysis was completed on those key sections of the drain where historical flooding had been observed in the field. The HEC-RAS software is intended for calculating water surface profiles for steady, gradually varied flow. The software can handle a full network of channels, a dendritic system, or a single river reach. HEC-RAS is capable of modeling subcritical, supercritical and mixed flow regime water surface profiles. It is the most accepted hydraulic model in Ontario.

The results of this analysis concluded that the existing drain geometry does not have the capacity to convey the intended 2-year peak flow in accordance with Municipal Drain design and construction guidelines in the Province of Ontario. Accordingly, detailed design of conveyance alternatives was completed. Proposed conveyance improvements include: drain bottom profile gradient revisions, deepening of the drain, increased cross sectional widening, creation of a low flow channel to support aquatic habitat and proposed drain crossings that would not impede normal conditions associated with the 2-year peak design flows. Based on the preferred design, the proposed conveyance improvements were analyzed hydraulically using HEC-RAS. The results of the proposed HEC-RAS analysis confirmed the containment of the current day 2-year peak flows in accordance with the Municipal Drain design and construction guidelines while providing freeboard to accommodate future climate change impacts.

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Tables

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Appendices

Please refer to *Appendix I* of the *Final Engineer's Report for South Innisfil Creek Drain 2019 Improvement* to view applicable Drawings.

Disclaimer

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In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third-party materials and documents.

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by the Town of Innisfil (Town) to undertake the analysis and design required for the South Innisfil Creek Drain (SICD) Improvements and the analysis of existing structures located between the 5th Line and the 15th Line in the Town.

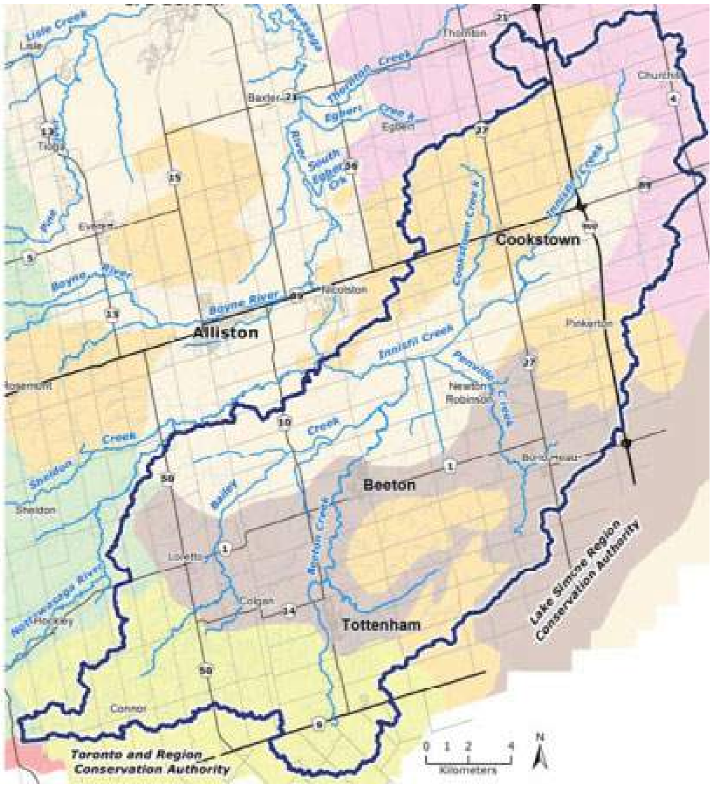
This Report provides commentary and methodology used in the hydraulic analysis of the existing drain and structures while providing recommendations for the proposed replacement structures and drain improvements

For simplicity, the hydraulic analysis of the project area will be referred to as the South Innisfil Creek Drain Hydraulic Analysis (SICDHA) for the remainder of the Report.

1.1 Project Area and Description

The Innisfil Creek watershed is located within the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA). It has a catchment area of approximately 480 km^2 and discharges into the Nottawasaga River southeast of Alliston. Figure 1 illustrates the Innisfil Creek Watershed as referenced from the NVCA website.

Figure 1 Innisfil Creek Watershed



As previously noted the SICD is located within the Town and services most of the lands in the south-west section of the Town. The upstream end of the main drain starts at the 5th Line and currently discharges into the Innisfil Creek at Highway 89. Previous work on the Drain Improvements anticipated extending the Drain downstream to the 15th Line. The watershed of the SICD is generally bound to the west by County Road 27, to the north by the 7th Line, to the east by Yonge Street and finally to the south by the 12th Line of the Town of Bradford West Gwillimbury. The SICD watershed upstream of the 15th Line has been determined to be 8,021 ha.

2.0 Background Information

Information obtained from previous reports and outside sources used to complete the hydraulic modelling for the SICD have been referenced in detail in Section 1.0 of the "draft" Engineer's Report dated August 2018 and provided under separate cover. A detailed overview of the history of the SICD has also been detailed in Section 2.0 of that "draft" report for reference. A copy of the draft Engineer's report can be found on the Town of Innisfil web site.[1]

2.1 Hydrology

For the complete hydrological analysis of the drainage area please refer to the 'South Innisfil Creek Drain Improvements Hydrology Report – Dated April 2018' prepared by Burnside. Table 1 below summarizes the 2 and 5-year standard and climate change flows as referenced from the above noted hydrology report.

Table 1 Summarized Peak Flows

	Flow Rate (m3/s)			
Drain Station	**2-Year Standard**	**5-Year Standard**	**2-Year Climate Control**	**5-Year Climate Control**
7+989.92	5.44	11.31	9.94	18.50
6+350.13	3.17	6.57	5.78	10.82
6+298.01	8.35	17.24	15.16	28.09
5+440.69	8.77	16.93	15.81	28.74
3+882.59	10.71	20.28	19.44	33.55
3+380.41	11.51	22.401	21.14	36.68
2+822.87	11.12	19.92	20.45	36.80
2+268.89	13.43	24.18	25.61	44.81
2+229.00	13.64	26.87	27.13	48.81
1+178.21	12.89	24.89	25.04	43.85

Detailed commentary supporting the design criteria of the SICD has been provided in Section 7.0; however, it is noted here that the 2-year standard and 2-year climate change flows will be considered for the proposed design of the SICD.

In order to produce the most accurate hydraulic modelling possible, Burnside has compiled data from a number of sources in support of SICDHA. Key references have been provided in Section 1.0 of the "draft" Engineer's Report for South Innisfil Creek Drain – 2018 Improvement as well as the South Innisfil Creek Drain Improvements Hydrology Report completed by Burnside in August 2018 and April 2018 respectively.

It is noted that the survey data, used to prepare the various drawings contained herein, was originally collected by Dillon Consulting Limited (Dillon) in 2005 as part of their preliminary report. Dillon also surveyed the existing bottom of the natural watercourse from Highway 89 downstream to County Road 27 and the downstream area at 20 Sideroad in the Town of New Tecumseth. In September 2011, subsequent data was

[1] https://innisfil.ca/living/newconstruction/MunicipalDrains/SouthInnisfilCreekDrain

collected by Dillon, in preparation of their final report including survey spot checks and periodic examinations of the SICD and branches to verify drain bottom elevations, to review (the then) current general site conditions and to record any obvious drain feature changes or additions. All this data was subsequently released to Burnside.

To facilitate the hydrological modelling and the preparation of this Report, Burnside has collected additional topographic survey data in 2017 and 2018. Although Burnside did collect more recent limited topographic survey data, it is recognized and expected that there may be portions of the SICD that may no longer be accurately reflected by the data collected by Dillon in 2005. However, the proposed drainage improvements as outlined in the following sections of the report are designed to contain the 2-year peak flows. Accordingly, should current field conditions not fully reflect the 2005 Dillon survey at the time of construction, we do not believe any differences will impact the ultimate design of the drain. A detailed summary of the topographic information used in the preparation of the design has been included in Appendix A.

Finally, and although not adopted by By-Law, the August 15, 2013 final report prepared by Dillon, supported by the February 24, 2006 preliminary report, were examined and referenced in the preparation of this Burnside report.

2.2 Field Reconnaissance

Field reconnaissance was completed by Burnside to review and verify data received from the Town, NVCA and other sources. The field work has been completed to obtain an understanding of:

- Vegetation characteristics.
- Verify hydraulic structure dimensions and orientation within the floodplain.
- Shape and surface characteristics of the drainage courses.
- General watercourse hydraulics.
- Degree of maintenance applied to the drainage courses and the terrestrial cover of the drainage course floodplain area.
- Confirm low flow geometry and channel forms.

3.0 History, Studies, Existing Conditions

Detailed commentary outlining the history of the SICD, previous studies completed as well as an overview of existing drain conditions have been provided in Section 2.0 of the “draft” Engineer’s Report for South Innisfil Creek Drain – 2018 Improvement completed by Burnside in August 2018.

4.0 Municipal Drain Design Requirements

The applicable sections of the Design and Construction Guidelines for Work Under the Drainage Act, as prepared by the Government of Ontario, and the applicable sections of the Drainage Guide for Ontario, as published by the Ontario Ministry of Agriculture and Food, are used for the design and construction of municipal drains.

Under these guidelines, the recommended design criterion for an open municipal drain is the 2-year return period storm. Accordingly, the proposed conveyance improvements on the SICD have been derived from the 2-year peak flows as outlined in the South Innisfil Creek Drain Improvements Hydrology Report – Dated April 2018.

5.0 Existing Conditions HEC-RAS Hydraulic Analysis

5.1 HEC-RAS Hydraulic Model

The HEC-RAS version 4.1.0 computer model, developed by the U.S. Army Corps of Engineers, has been used for the SICDHA. This model estimates the change in water surface elevation between selected valley cross sections and routines to account for local increases in water levels due to bridges, culverts, weirs and/or other flow obstructions. The model is intended for utilization in the analysis of water surface profiles of steady state, gradually varied, one-dimensional flow in natural and man-made channels.

A number of considerations are required in the selection of data and variables to be used in the application of the HEC-RAS model to the floodplains of the study area, and these are as follows:

- Cross-sections
- Hydraulic Structures and Computational Routines
- Hydraulic Parameters
- Boundary Conditions

The Municipal Drain requirements as noted in Section 4.0 above require the drain to be designed to convey the 2-year flows generated within the SICD watershed. The subsequent sections of this Report speak specifically to the configuration and orientation of the HEC-RAS to replicate flow conditions for the 2-year flows only. As this report and associated modelling focuses on the 2-year peak flows, the hydraulic modelling presented in this report may not be applicable for major system storm events as the flows are likely to exceed the extents of the HEC-RAS model. Accordingly, additional modelling may be required should a need for major system considerations be a requirement within the SICD.

5.2 Reaches

Based on the anticipated flow directions, a single reach HEC-RAS plan file has been constructed for the SICDHA and described below:

- Pr_Innisfil Creek_FINAL p.24 – Plan File
- Pr_Innisfil Creek_FINAL g.24 – Geometry File
- Pr_Innisfil Creek_FINAL f.10 – Flow File

Floodplain boundaries and the lateral extension of flows along a natural stream are controlled by the topographic relief within which the stream flows. This relief is quantified in terms of ground surface elevations and/or contours. For utilization in the HEC-RAS program, it was necessary to convert this topographic relief into its geometric configuration, represented by cross sections taken perpendicular to the direction of flow. Furthermore, it was necessary to represent the linear topographic relief and variability by drawing repetitive cross sections at various intervals throughout the length of the valley systems. The distance between the cross sections required to represent the valley system is referred to as the reach length.

For the selection of digitized cross sections which are representative of the SICDHA, the criteria described in the following sections were used.

5.2.1 Location and Orientation of Cross Sections

The location cross sections were derived from anticipated flow directions as outlined in Sections 7.1 and 7.2. The digitized cross sections were initially taken from the composite AutoCAD TIN surface looking from left to right in the upstream direction. Cross sections have been intentionally cut at key locations described below:

- Changes in water course or channel cross sectional shape.
- Rapid changes in watercourse or channel slope.
- Significant changes in watercourse or channel roughness.
- Upstream and downstream of culvert crossings.
- At all defined control points.
- Upstream and downstream of all water confluences.

5.2.2 Cross Sections Spacing and Alignment

Following the initial evaluation of the cross sections selections as noted above, additional sections were added to the model when calculations indicated any of the following conditions:

- Where energy slope decreased or increased significantly.
- When significant changes in the conveyance of adjacent sections were observed.

- Where topographic representation of flow between cross sections indicated unrealistic transition.

5.2.3 Determination of Reach Length

For the determination of reach lengths, the topographic maps were measured between cross sections parallel to the estimated direction of flow along the low flow channel, and along the centroid of water mass moving through the anticipated floodplain. For each reach, a minimum of three lengths were measured defining the channel, and both right and left overbank flow paths. For the selection of the direction of the reach length measurement, the topographic relief was analyzed to interpret the direction of flow in the particular reach of the drain.

5.3 Hydraulic Structures and Computation Routines

5.3.1 Culvert Crossings

As hydraulic structures, such as bridges, culverts and roadways, have the greatest potential to change the flood elevation for a given reach assuming a constant flow, each structure within the study area limits was carefully reviewed and coded into the HEC-RAS hydraulic model.

The following has been the methodology completed at each roadway crossing within the SICDHA:

- The hydraulic structure information for the SICDHA information was obtained via topographic survey data and verified via field reconnaissance. This data included the location, orientation, elevation, width and height, composition, inlet/outlet characteristics, and overflow profile of all hydraulic structures within the study area, including bridges and culverts.
- In accordance with the HEC-RAS user's manual, a minimum of four cross sections have been applied to each crossing, as noted in Figure 2.

Figure 2 Cross Section Locations at Roadway Crossings

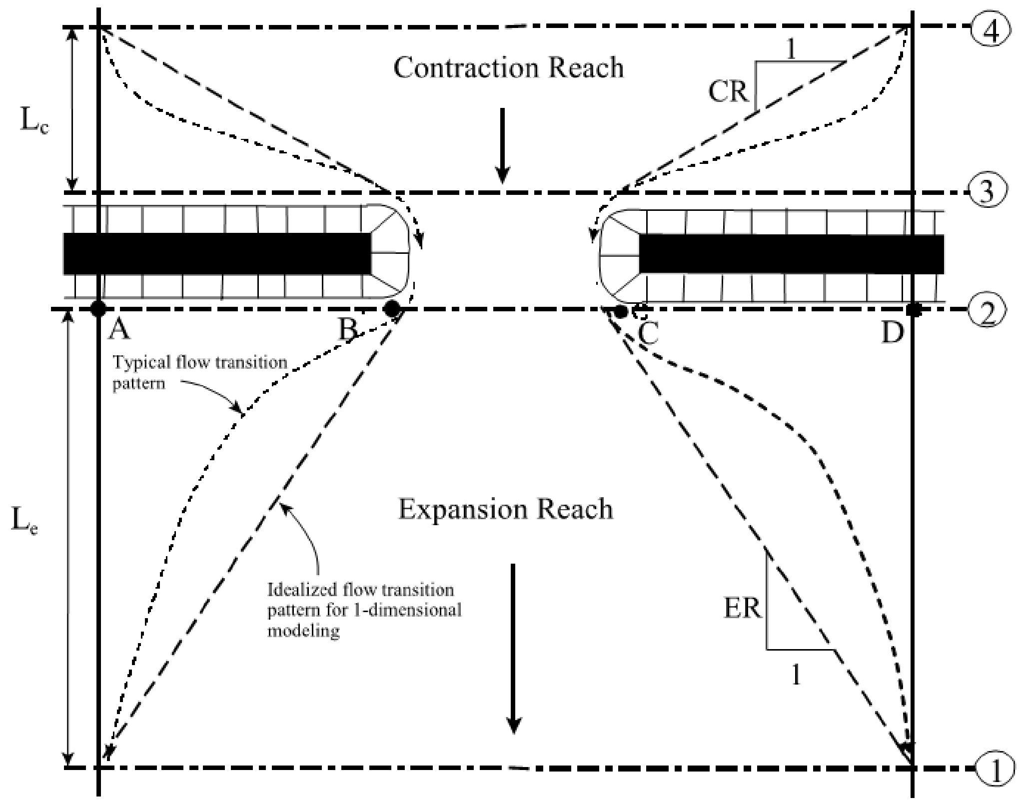


Figure 6-11 Cross Section Locations at a Bridge or Culvert

- Additional cross sections were added as needed within the contraction and expansion reach of each crossing to reflect changes in watercourse topography in the vicinity of the culvert inlet or outlet that may impact the hydraulic performance of the culvert.
- Ineffective flow areas have been applied on each side of the culvert/bridge openings. The horizontal stationing of the ineffective flow areas has been placed within 1 m on each side of the opening. The vertical stationing of the ineffective flow areas has been measured to the lowest roadway profile elevation on each side of the crossing.
- Expansion/contraction coefficients of 0.3 and 0.5 have been applied to the two cross sections upstream of the crossing, as well as the first cross section downstream of each crossing.
- Roadway weir coefficients have been set at C=1.4. The weir value of 1.4 is at the lower limits of the range of applicable weir coefficients for roadways. This lower weir coefficient produces a conservative water surface elevation estimate should the roadways within the watershed be overtopped by a major system event.
- Guard rails have been CAD measured and coded into the roadway deck profile at each crossing where applicable. As guard rails impede flows overtopping a roadway, guard rails have only been coded where flows have been expected to

overtop the roadway and as present in the field. The guard rail openings, as coded into roadway deck profile, have been assumed to be blocked. This assumption produces a conservative surface elevation estimate should the roadways within the watershed be overtopped within a major system event.

- The distance between the upstream reach cross section and the bridge opening, as well as the roadway deck width, has been CAD measured and coded into the HEC-RAS model at each crossing.
- Each hydraulic structure coded within the model includes notes in the HEC-RAS comment/description area.
- Building Obstructions

The minor system floodplain of the SICDHA is not anticipated to contain residential homes and commercial buildings. Accordingly, building obstructions have not been coded into the HEC-RAS model.

5.4 Hydraulic Parameters

The following section of the report outlines the key modelling coefficients used in the SICDHA HEC-RAS model to evaluate head losses. The following coefficients have been outlined with supporting documentation for each coefficient used:

- Manning's 'n' values are used to compute flow friction losses and have been referenced from the HEC-RAS Reference Manual and illustrated below:
  - CSP Culverts n=0.024
  - Concrete Box Culvert n=0.013
  - Open bottom within Box Culvert n=0.040 – clean, straight, full, no rifts or deep pools
  - Main Channel n=0.040 to 0.050 – clean, straight, full, some pools and shoals or deep pools, with some stones and weeds. Normal to maximum values depending on location within the reach.
    - Right and Left Overbank (ROB and LOB) n=0.050 to 0.080. Values associated with overland flow roughness values of agricultural lands located within the regulatory floodplain.
    - Expansion and contraction coefficients for the study area floodplains have been set at 0.1 and 0.3, respectively, for all areas due to the relative uniformity of cross sectional transitions. For culvert sections, expansion and contraction coefficients have been estimated at 0.3 and 0.5 respectively at the first two cross sections upstream of the crossing, as well as the first cross section downstream of the crossing.

- Roadway weir loss coefficients relate head losses to weir shape, deck width, and deck material and configuration. Broad crested weir coefficients associated with deck/roadway profiles have been set at C=1.4 in accordance with the HEC-RAS Reference Manual.

5.5 Boundary Conditions

The downstream boundary conditions of the HEC-RAS hydraulic model directly influence water surface profiles of the individual reaches of study area. The downstream boundary conditions of the SICDHA have been set to normal depth flow conditions with the Downstream slope profile set to 0.0064 m/m, downstream of the 15^{th} Line.

5.6 Hydraulic Modelling Approach

Burnside has used the design tool suite in Civil 3D to develop a One Dimensional (1D) hydraulic model using the Autodesk River and Flood Analysis Module (ARFAM) “Stream Analysis” HEC-RAS software. The ARFAM software program utilises an interface module that links AutoCAD and GIS directly with HEC-RAS 5.0.1. It permits the integration of the newly generated Digital Terrain Model and facilitates the locating and automatic generation of cross-sections. The seamless transfer of the cross-section information into HEC-RAS through the ARFAM software from the DTM avoids errors associated with traditional approaches that rely on manual input.

The proposed ARFAM approach improves productivity and accuracy in the following ways:

- Cross-section locations are drawn on the DTM mapping and the program extracts cross-section information that is applied to HEC-RAS coding information. This eliminates unnecessary errors in the coding process through automatic generation of a table of values through the section.
- Floodline locations can be accurately located at each section based on the DTM information, requiring minimal interpolation of results.
- Revisions can be quickly undertaken using the software above.

6.0 Existing Conditions HEC-RAS Hydraulic Model

Using the available topographic background information listed in Section 2.0, cross section orientation and placement was conducted on a composite AutoCAD TINN surface to initiate the creation of a HEC-RAS hydraulic model for the SICD. Roadway and field crossing information was referenced from varying sources of topographic survey data. Using the ARFAM software as noted above, we completed preliminary modelling attempts to quantify the hydraulic characteristics of the SICD. Through these modelling attempts, it was observed that the 2-year standard peak flow could not be contained within the existing drain geometry. As the 2-year standard peaks flows spill out of the drain, coupled with the relatively flat topography of the SICD watershed adjacent to some reaches of the drain itself (namely, the Market Garden), the 2-year floodplain is challenging to quantify. Given the computational limitations of the one-dimensional HEC-RAS model within flat topographical areas, knowing that the 2-year standard flows were not contained within the banks of the SICD, Burnside has not completed a full existing conditions model of the SICD. Rather, Burnside has constructed isolated sections of HEC-RAS modelling in key areas of the drain to assess existing hydraulic conditions and capacities. Further commentary on this isolated hydraulic modelling has been provided below.

6.1 Existing Conditions Isolated HEC-RAS Analysis

Isolated HEC-RAS hydraulic modelling was completed in key areas of interest throughout SICD. Two sections of the drain were specifically modelled as detailed below;

- Highway 89 to Highway 400 - STA 0+550 to STA 2+200 = 1,650 m of drain
- 2nd to 3rd line - STA 3+350 to STA 6+330 = 2,980 m of drain

To simplify the modelling approach during this stage of the analysis, drain crossings were not coded into the HEC-RAS hydraulic model. Rather, the intent of this stage of the analysis was simply to assess the free-flowing capacity of the existing sections of drain noted above. Bank locations, for the purpose of this exercise, were set within each cross section to where flows would be contained within the top of bank elevations in the drain. Peak flows exceeding the top of bank elevations would be classified as a spill within the model and flagged for further analysis.

To determine capacity of the sections of drain as noted above, peak flows were iterated in the model. Iterations starting with low flow ranges were gradually increased within the HEC-RAS model. Low flow conditions were intended to be contained within the drain banks and as flows were increased in the model, the number of spill locations incrementally increased. Minimum flow capacities were established where peak flows initially started to overtop the drain banks.

The maximum flow capacity was determined based on number of spill locations vs the average number of cross sections in the reach. For example, the HEC-RAS model between the 2nd and 3rd Line is comprised of a total of 13 cross sections. At a peak flow of 15 m^3/s a total of 8 spill locations were identified. A total of 8 spill locations is more than 50% of the cross sections within the reach and therefore, we have attributed spill conditions on more than 50% of the cross sections to equal the maximum capacity of the drain.

The range of flows where spilling started overtopping the drain banks were noted and documented for each section of drain and summarized in Table 2;

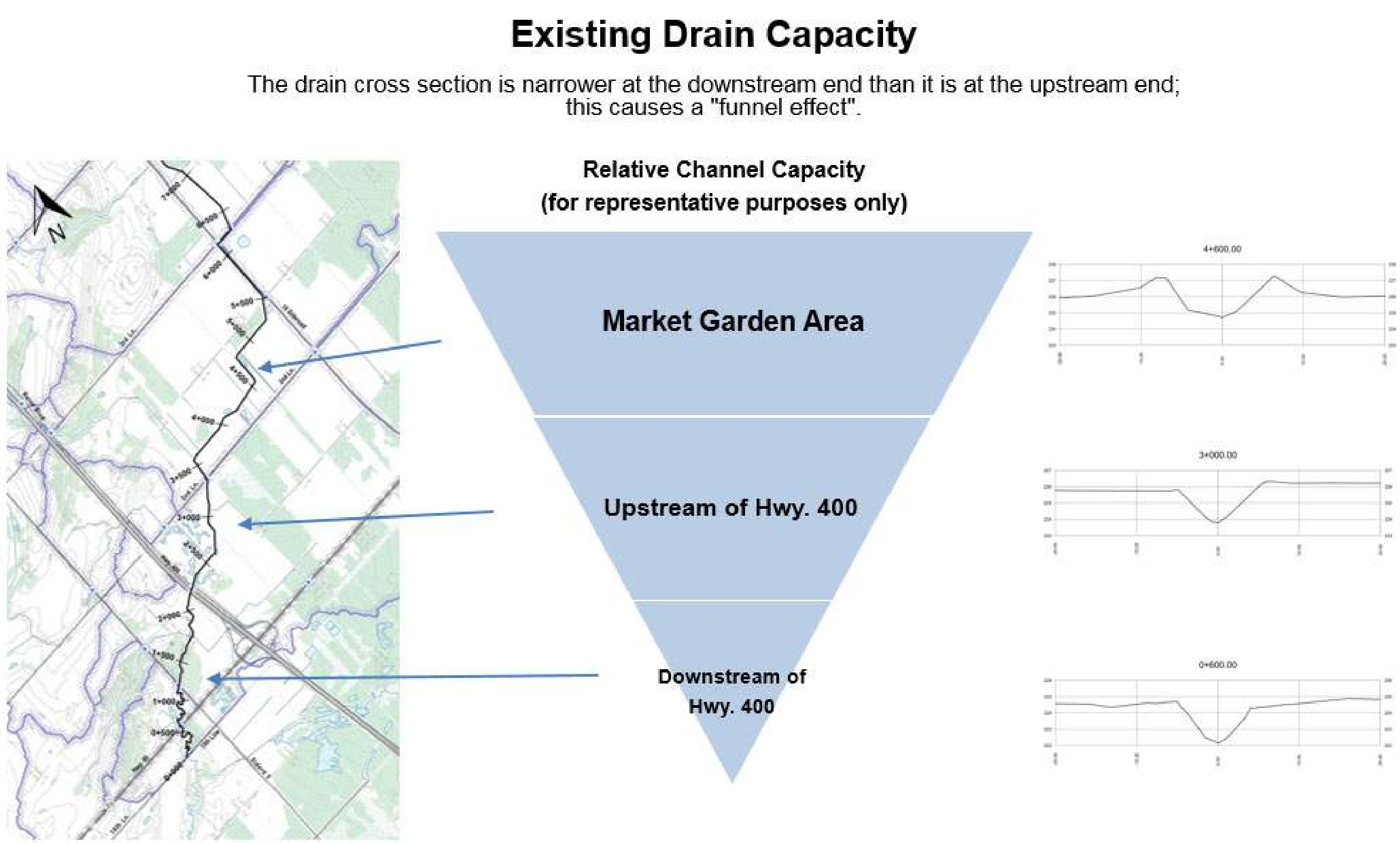
Table 2 Existing Drain Capacity Table

Reach	Min Flow Capacity	Max Flow Capacity	Average Flow Capacity (m3/s)
Highway 89 to Highway 400 STA 0+550 to STA 2+200	5 m^3/s	10 m^3/s	7.5 m^3/s
2nd & 3rd line STA 3+350 to STA 6+330	8 m^3/s	15 m^3/s	11.5 m^3/s

6.1.1 The Funnel Effect and Flow Restrictions

The Hydraulic analysis as outlined in Section 7.1 provided key insights into the hydraulic behavior of the existing drain. It was observed that the drain geometry consists of a larger cross-sectional area than the drain geometry in the lower limits of the drain. Figure 3 was presented at the Public Information Centre, held on February 23, 2018, showing a funnel effect of the largest drain geometry being located in the Market Garden lands and the smallest drain geometry being located downstream of Highway 400.

Figure 3 Existing Drain Capacity



The Funnel effect impacts the conveyance capabilities of the drain and therefore is a contributor to minor system flood events that occur in the drain. Based on the above analysis, we have observed flow restrictions.

Table 3 Existing Drain Capacity Table vs the 2-Year Design Flow

Reach	Min Flow Capacity (m3/s)	Max Flow Capacity (m3/s)	Average Flow Capacity (m3/s)	2-year Standard Design Flow (m3/s)	2-year Climate Change Design Flow (m3/s)
Highway 89 to Highway 400	5	10	**7.5**	13.64	27.13
2nd & 3rd Line	8	15	**11.5**	11.51	21.14

It is apparent that the existing drain geometry is insufficient to convey the 2-year standard and 2-year climate change flows as areas displaying minimum flow capacity are less than both the 2-year standard and 2-year climate change flows. This analysis was also completed without drain crossings in place. Drain crossings ultimately impeded flows within the drain and for simplicity, we assumed that conveyance capacity would be lower during field conditions as a result of current crossing restrictions in the drain. Accordingly, conveyance improvements were explored to meet the design criteria requirements as noted in Section 4.0. Proposed conveyance alternatives have been explored in Section 7.0.

6.2 Drain Crossings

Hydraulic structures within the watershed have the largest ability to influence calculated flood elevations within their respective reaches. Accordingly, Burnside has verified all hydraulic structure information based upon the background information as outlined in Section 2.0 including as-built and design drawings, field reconnaissance, detailed field survey, etc., where available. Detailed commentary for hydraulic structures including any assumptions with respect to the modelling approach contained within hydraulic modelling have been provided in the preceding sections of the report as applicable. Table 4 below summarizes the existing major crossings within the SICD.

Table 4 Existing SICD Major Roadway Structure Inventory

Structure ID	Structure Description	Upstream Invert Elev. (m)	Downstream Invert Elev. (m)	Length (m)	Road Sag Elev. (m)
Hwy 89	25 m span bridge	Soffit (226.95)	Soffit (226.95)	10.2	226.53
5th Sideroad	13 m span bridge	Soffit (225.75)	Soffit (225.75)	14.59	226.75
Hwy 400 - North	2.5 m dia. CSP	223.38	223.75	60.6	228.52
Hwy 400 - Central	4.62 m span x 2.8 m rise CSPA	224.52	224.52	42.2	228.52
Hwy 400 - South	4.62 m span x 2.8 m rise CSPA	224.52	224.52	42.2	228.52
Reive Blvd - North	2.1 m dia. CSP	223.82	223.87	30.6	228.10
Reive Blvd - Central	4.8 m span x 3.65 m rise CSPA	223.70	223.62	26.9	228.10
Reive Blvd - South	4.8 m span x 3.65 m rise CSPA	223.70	223.62	26.9	228.10
2nd Line	10 m span bridge	Soffit (227.21)	Soffit (227.21)	6.1	227.09
10th Sideroad	5.9 m span bridge	Soffit (228.18)	Soffit (228.18)	7.8	228.31
3rd Line	4.70 m span bridge	Soffit (228.47)	Soffit (228.47)	6.5	228.50
4th Line	1.8 m CSPA1 m span x, 2.4 dia. CSP	228.23/228.41	228.49/228.44	24.6	231.49

6.2.1 Existing Highway 400 Crossings

The Highway 400 crossings are located in the downstream quadrant of the SICD watershed. The Highway 400 crossings consist of a total of three structures as illustrated below in Figure 4 detailed in Table 4 in Section 6.2.

Figure 4 Existing Highway 400 Culvert Crossings – Upstream View

Due to deteriorating condition of the culverts, the culverts were lined with shotcrete in 2010 to further the life span of the structures. This procedure, while extending the life cycle of the culverts would however have had a negative impact on water surface elevations upstream of the culverts as their cross-sectional area would be reduced when compared to existing conditions. A smaller cross-sectional conveyance area inherently raises head water elevations by default. Currently, the culvert inlets and outlets reside at 0.3-0.5 m above the existing unimproved invert of the SICD whereby impeding low flow conditions. Through an analysis of the survey data cross referenced to the design gradient set out in the current Municipal Drain By-Law, it has been determined that the existing channel invert is at or above the gradient and elevation required by the current By-Law. Furthermore, and given the relatively low flow velocities of the SICD, it is not believed that the flows themselves could have eroded the drain bottom upstream and downstream of the culverts to perch both the inlets and outlets. It is beyond the scope of this report to speculate on any rationale as to the perched inlets at this time.

Based on the recent lining of the culverts and their perched inlets and outlets, it is reasonable to assume that the Highway 400 crossings would be a flow restriction within the SICD. Further commentary on the impact of the Highway 400 culvert crossings will be discussed in Section 7.6.

7.0 Proposed Conditions Hydraulic Analysis

7.1 General

As illustrated in Section 6.1.1, the existing conveyance capacity of the drain, in a number of locations does not accommodate the existing 2-year standard flows. Further, the absence of capacity of the drain has resulted in historical flooding of the adjacent lands on either side of the drain. To accommodate the 2-year peak flows, conveyance improvements to the drain must be completed. Primary conveyance characteristic improvements to the drain include drain profile improvements, drain widening and improvements to some of the drain crossings.

7.2 Proposed Profile Grade and Capacity Improvements

As noted in Section 6.2.1, the inlets and outlets of the existing Highway 400 crossings are perched above the existing profile of the SICD thereby restricting flows within the SICD. Since the Highway 400 crossings are perched above the design grade for the existing drain, this provided an opportunity to re-visit the overall profile of the drain. Increasing the overall cross section of the drain and alterations to the profile (deepening the drain), provides the ability to improve conveyance conditions and accommodate the 2-year design flows.

The overall profile or drain bottom gradient of the SICD, has been separated into the components described in Sections 7.2.1 to 7.2.3. The preceding sections of the report have been intended to speak to the overall profile and cross-sectional geometry changes required to the SICD. Additional commentary, as applicable to key sections of the drain have been provided further in the report.

7.2.1 Section #1 – 15th Line to the 5 Sideroad (STA 0+000 to STA 1+200)

This 1,200 m section of drain is located at the downstream limits of the project area producing a profile gradient of approximately 0.04%. The 2-year peak flows to this section of drain have been determined at 12.89 m^3/s. Figure 5 illustrates the existing drain between STA 0+000 to STA 1+200, looking upstream of bridge on Highway No. 89.

Figure 5 Existing Drain Configuration STA 0+000 to STA 1+200

The existing drain profile in this section of the drain is one of the most mature sections of the drain characterized by low historical maintenance, sinuous alignment and mature vegetation. Accordingly, given the mature nature of this section of the drain, minimal work is proposed and there will be no profile alterations.

7.2.2 Section #2 - 5 Sideroad to Highway 400 (STA 1+200 to STA 2+300)

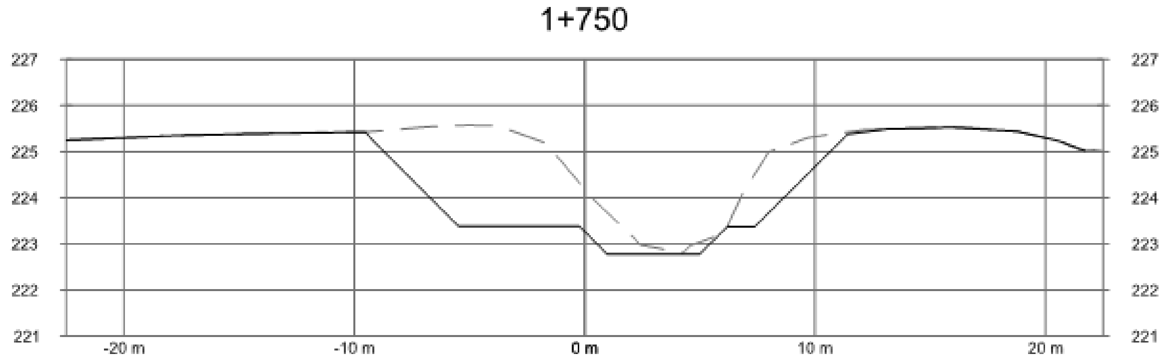
This 1,100 m section of drain is located between the 5 Sideroad and Highway 400 and is considered to be located in the downstream limits of the drain. Peak flows to this section of drain have been determined at 13.43 m^3/s

This section of drain is proposed to be lowered to a profile gradient of 0.04%. The lowering of this section of the drain will allow the proposed profile of the drain to be improved through the Highway 400 and Reive Boulevard corridor whereby providing free flowing conditions. The lowering of this section of the drain provides an opportunity for sections of drain upstream of the Highway 400 crossings to be lowered as well.

This section of drain includes the following drain crossings: STA 2+200 Highway 400; and STA 2+250 Reive Boulevard.

In addition to profile improvements (deepening) in this section of the drain, the cross-section configuration of the drain is proposed to be enlarged by widened to provide additional capacity. Figure 6 illustrates a typical plot of the existing and proposed drain cross sections at STA 1+750.

Figure 6 STA 1+750 Existing vs Proposed Section Comparison



The proposed section improvement is comprised of a low flow channel and main channel section. The low flow channel produces a bottom with of 4 m, 2:1 side slopes and depth of 0.6 m. The main channel section is comprised of total of 6.5 m of benching located on either side of the low flow channel (staggered as indicated) and 2:1 m side slopes, daylighting into existing topography. Proposed channel depths vary between 1.1 m to 2.9 m depending on location. Additional typical drain sections and plan and profile drawings for the drain have been provided in Appendix I of the Final Engineer's Report for South Innisfil Creek Drain 2019 Improvement.

7.2.3 Section #3 - Highway 400 to 10 Sideroad (STA 2+300 to STA 6+120)

This 3,820 m section of drain is located between Highway 400 and the 10 Sideroad and is the longest section of drain subject to improvements in this report. This section of the drain extends north east from the Highway 400 corridor and includes the following major crossings;

- STA 2+333 – Private golf cart bridge
- STA 2+449 – Private golf cart bridge
- STA 2+697 – Private golf cart bridge
- STA 2+822 – Private golf cart bridge
- STA 3+360 – Municipal – 2nd Line Bridge
- STA 3+650 – private agricultural bridge (previously removed by the owner)
- STA 4+057 – private agricultural bridge (eventually to be removed and replaced)
- STA 4+327 – private agricultural bridge (already removed and replaced)
- STA 4+359 – new private agricultural bridge which is understood to have been installed to replace the structure removed from Station 4+327;
- STA 4+414 – private agricultural bridge (eventually to be removed and replaced)
- STA 4+550 - steel beam supporting hydro cable; and
- STA 5+205 – private wooden foot bridge. (to be removed)

Figure 7 illustrates the existing drain at STA 4+450 approximately half way between the 2nd and 3rd Line;

Figure 7 Existing Drain Configuration STA 2+300 to STA 6+120

Historically, this section of the drain has been reported to be subject to spring freshet flooding and flood conditions associated with peak flows exceeding the capacity of the existing drain. Further, this section of the drain passes through the "Market Garden" located between the 2nd and 3rd Lines, consisting of prime agricultural lands where carrots and onions are typically grown. Due to insufficient drain capacity, the lands in the Market Garden are prone to flooding when peak flows exceed the banks of the drain and are sensitive to flood conditions due to significant potential crop damage that may be incurred in a short time frame of flood conditions. Figure 8 illustrates the flood conditions experienced in the June 23, 2017 rainfall event downstream of STA. 4+359 as outlined in the South Innisfil Creek Hydrology Report, April 2018.

Figure 8 Existing Drain June 2017 Flood Event – Main Drain at STA. 4+359

By lowering and deepening of the drain downstream of STA 2+300, this provides an opportunity to lower the drain as well from STA 2+300 to STA 6+120. The revised profile gradient has been set to 0.05% and produces a deeper profile of up to 0.78 m below the existing drain bottom just upstream of 400. Given the length and orientation of this section of drain within the SICD watershed, there are a number of direction of flow change locations and varying topography that influence the overall conveyance characteristics of the drain. These varying conditions also influence the proposed drain geometry.

Figures 9 and 10 illustrate comparative typical views of the existing vs proposed drain section geometry within Section #3 of the Drain.

Figure 9 STA 3+500 Existing vs Proposed Section Comparison

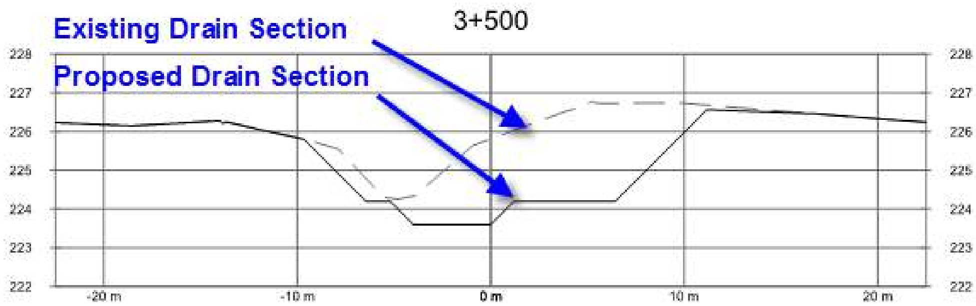
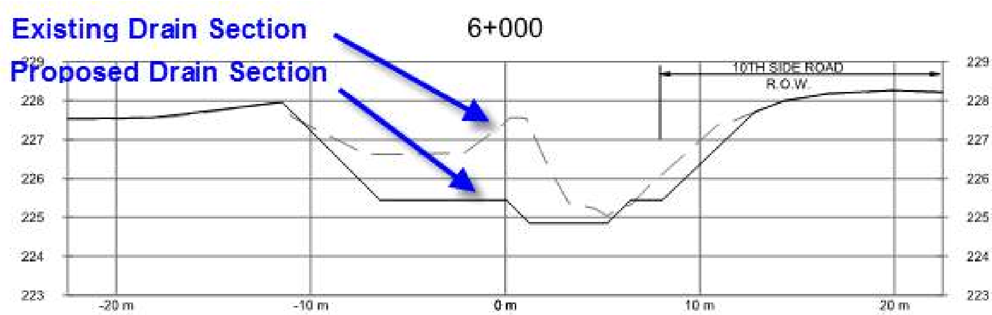


Figure 10 STA 6+000 Existing vs Proposed Section Comparison



Figures 9 and 10 also illustrate the constriction of the existing drain geometry versus the proposed drain geometry that is required the convey the 2-year peak flow. Additional typical drain sections and plan and profile drawings of the drain have been provided in Appendix I of the Final Engineer's Report for South Innisfil Creek Drain 2019 Improvement.

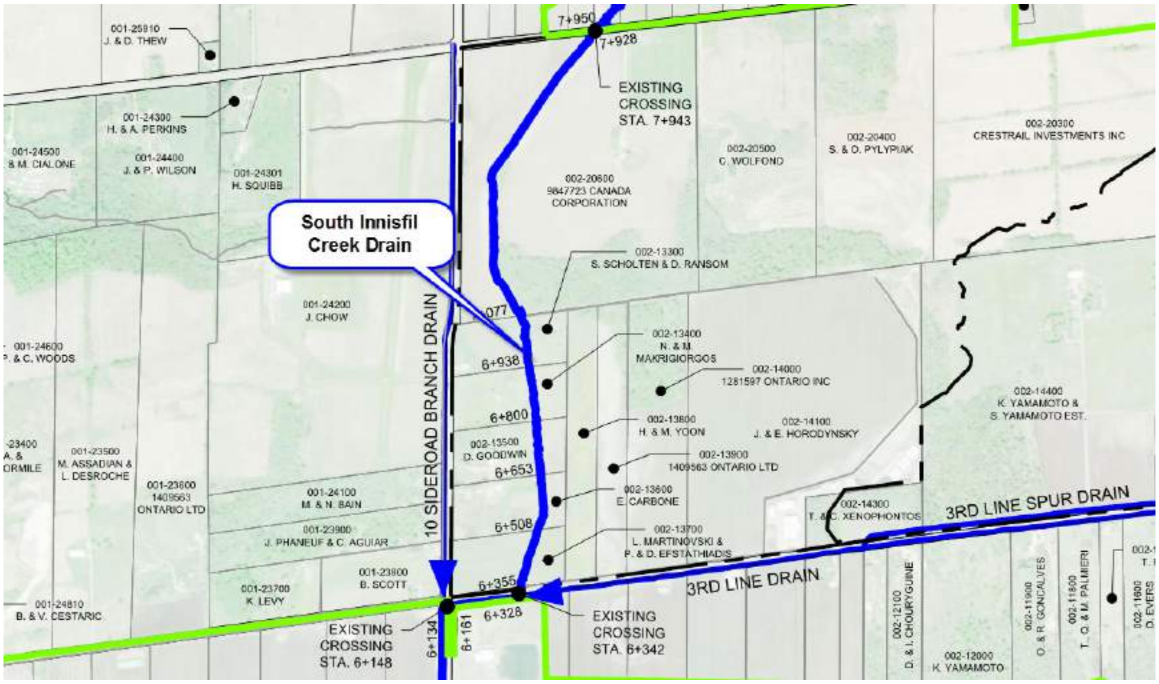
7.2.4 Section #4 - 10 Sideroad to 4th Line Crossing (STA 6+120 to STA 7+930)

This 1,810 m section of drain is located between the 10 Sideroad and the 4th Line crossing. This section of drain is located near the upper limits of the drainage improvements proposed in this report. Generally, profile improvements in this section of the drain involve removing highpoints in the profile to produce an overall 0.21% gradient. This section of the drain extends east from the 10th Sideroad right-of-way and then north and includes the following major roadway crossings;

- STA 6+134 to 6+161 = 10 Sideroad (bridge);
- STA 6+330 to 6+355 = 3rd Line (bridge)
- STA 7+930 to 7+950 = 4th Line culverts

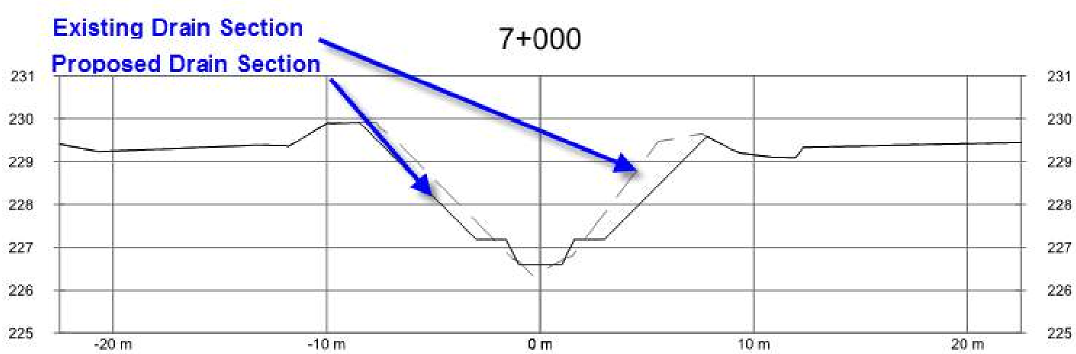
Figure 11 illustrates the physical location of Section #4 within the upper limits of the SICD watershed between the 3rd and 4th Lines.

Figure 11 SICD Section #4 – Drain Location



In addition to profile improvements in this section of the drain, the cross-section configuration of the drain is proposed to be enlarged to provide additional capacity for the 2-year standard peak flow. Figure 12 illustrates a typical plot of the existing and proposed drain cross sections at STA 7+000.

Figure 12 STA 7+000 Existing vs Proposed Section Comparison



The proposed section improvement is comprised of a low flow channel and main channel section. The low flow channel produces a bottom with of approx. 2 m, 1:1 side slopes and depth of 0.6 m. The main channel section is comprised of total of 1.4 m of benching located on either side of the low flow channel and 2:1 m side slopes, daylighting into existing topography. Proposed channel depths vary between 2.0 m to

3.0 m depending on location. Additional typical drain sections and plan and profile drawings of the drain have been provided in Appendix I of the Final Engineer's Report for South Innisfil Creek Drain 2019 Improvement.

7.2.5 SICD Drain Geometry Summary

Table 5 summarizes the varying flows within these three Sections of the SICD.

Table 5 Sections 1-3 - Proposed Drain Geometry Characteristics

Location		Flow	Low Flow Channel Section				Main Channel Section	
To	From	2-yr Std	Bottom Width	Side Slopes	Depth	Bench Width	Side slopes	Depth Range
STA	STA	(m3/s)	(m)	X:1	(m)	(m)	X:1	(m)
0+000	1+224	12.89	NO WORK PROPOSED			NO WORK PROPOSED		1.6-3.4
1+224	2+280	13.64	4	2	0.6	3.25	2	1.1-2.9
2+280	3+350	13.43	4	2	0.6	3.25	2	1.7-3.2
3+350	5+449	10.71	4	2	0.6	3.25	2	2.0-3.5
5+449	6+134	8.77	4	2	0.6	3.25	2	1.7-2.0
6+134	7+950	8.35	2	1	0.6	1.4	1	2.0-3.0
7+950	9+918	5.44	2	1	0.6	1.4	1	0.9-2.3

As noted previously, varying topographical and peak flows conditions ultimately drive the drain geometry required to convey the 2-year flows. The section of the SICD between STA 7+950 and 9+918 has been designated for spot cleanout and channel maintenance only. Accordingly, this section of drain has not been further discussed in the report.

7.2.5.1 SICD Base Flow and Low Flow Channel Commentary

Burnside has reviewed and compiled the Daily Discharge data from the INNISFIL CREEK NEAR ALLISTON (02ED029) gage on the Environment Canada website to observe flow rates during the summer months of June, July and August from 2000 - 2016. The flow summary table below represents the Minimum, Maximum and Median Flow rates for the summer months. The purpose of this exercise was to assess base flow conditions within the SICD watershed and to evaluate the flow conditions in the low flow channel relative to capacity, fisheries and overall flow characteristics

Table 6 Innisfil Creek near Alliston (02ED029) Flow Summary

Year	Min (m3/s)	Max (m3/s)	Median (m3/s)	Year	Min (m3/s)	Max (m3/s)	Median (m3/s)
2000	0.65	45.10	1.80	2009	0.73	12.60	1.76
2001	0.01	2.66	0.38	2010	0.47	11.30	1.21
2002	0.15	21.10	0.42	2011	0.28	4.50	0.71
2003	0.05	5.26	0.34	2012	0.15	4.54	0.55
2004	0.39	18.70	1.36	2013	0.54	15.10	1.77
2005	0.11	4.64	0.38	2014	0.45	13.90	1.12
2006	0.14	13.20	0.53	2015	0.05	56.00	1.86
2007	0.12	4.18	0.25	2016	0.06	1.74	0.31
2008	0.50	7.76	1.11				

We note that the flow data from gage 02ED029 represents a total drainage area of 479 km^2 or 47,900 ha compared to the 8,021 ha (80.21 km^2) drainage area of the SICD. Accordingly, we have assumed that in the absence of actual flow data within the SICD, a pro-rated base flow approach would be appropriate.

Further, in speaking with NVCA staff, catchments within the overall NVCA watershed, at the lower limits of base flows contribution, would be expected to produce a base flow of about 2 L/s of flow per km^2 of drainage area. For discussion purposes, we have used the assumed 2 L/s/km^2 base flow rate to calculate a base flow of 958L/s or 0.98m^3/s (2 L/s x 479 km^2) for the contributing drainage area to gage 02ED029.

Table 7 Innisfil Creek near Alliston (02ED029) Min-Median Flows

2000 - 2016 Historical - June, July, August Historical Flow Rate Summary				
Flow Gage	02ED029	Innisfil Creek Watershed Area	479	km2
Watershed	Area(ha)	Min (L/s)	Median (L/s)	Description
Innisfil Creek	47900	283.71	932.41	Recorded Base Flow Data

An average minimum base flow of 283.71L/s (0.28m3/s) would be generated by a base flow rate of 0.59 L/s / km^2 vs the 2.0 L/s / km^2 base flow expectation based on NVCA historical experience. Accordingly, we assume that the recorded minimum peak flows at gage 02ED029 may not be representative of base flows of other areas in the NVCA watershed including the SICD.

Noting the above, Burnside has considered the 2.0 L/s / km^2 as a minimum threshold for flows while also considering an upper limit of 4.0 L/s / km^2. The calculations in support of the flow range have been provided below;

- 2 L/s/km^2 * 80.2km^2= 160.4L/s (0.16 m^3/sec)
- 4L/s/km^2 *80.2km^2 = 320.8L/s (0.32 m^3/sec)

Also, noting that the Minimum flows of gage 02ED029, in 2001, 2002, 2003, 2005, 2006, 2007, 2012, 2015 and 2016 appear to be unusually low and did not exceed 0.20 m^3/s, we have omitted these years from the overall calculations and have revised the average minimum and median flows for gage 02ED029 in Table 8 below;

Table 8 GAGE (02ED029) Pro-Rated Min-Median Flows

2000 - 2016 Historical - June, July, August Historical Flow Rate Summary				
Flow Gage	02ED029	Innisfil Creek Watershed Area	479	km2
Watershed	Area(ha)	Min (L/s)	Median (L/s)	Description
Innisfil Creek (L/s)	47900	498.75	1353.25	Recorded Base Flow Data
Unit Rates (L/s/ha)	47900	0.010	0.028	Base Flow Unit Rates
SICD (L/s)	8021.47	83.52	226.62	Pro-Rated Base Flows

We note the revised minimum and median flows at gage 02ED029 have been calculated at 498.75 L/s (0.5 m^3/s) and 1353.25 L/s (1.35 m^3/s) respectively. Pro-rating the above noted Minimum and Median Baseflows to the SICD drainage area we note the minimum and median flows at 83.52 L/s (0.08 m^3/s) and 226.6 L/s (0.23 m^3/s) respectively. Based on the calculated Minimum and Median Baseflows and a total drainage area of 8021 ha or 80.21 km^2, we have provided the following flow ranges for the SICD;

- 83.52 L/s / 80.2km2 = 1.04L/s/km^2 – based on Minimum Flows
- 226.62 L/s / 80.2km2 = 2.82L/s/km^2 – based on Median Flows

The pro-rated median flows fall within the 2 to 4 L/s/km^2 base flow ranges as noted previously. Given, the absence of recorded flow data within the watershed, Burnside has used the higher base flow value of 320.8 L/s (4 L/s/km^2 x 80.2 km^2) for the design of the low flow channel within the SICD.

The dimensions of the low flow channel have been derived through field reconnaissance by Burnside staff. Field measurements and assessments have provided estimates of the existing drain low flow geometry; accordingly, the proposed drain improvements are intended to replicate the existing low flow geometry to the best extent possible. The side slopes of the proposed low flow channel have been derived based on field observation. Where existing side slopes have been observed to vary, we have specified that all new side slopes be 2.0H: 1.0V as part of our proposed design. The proposed low flow channel is comprised of a 3 m bottom width, depth of 0.6 m, whereby producing a capacity of 0.66 m^3/s. While this low flow geometry produces a capacity in excess of 320.8 L/s (0.32 m^3/s) as noted above, the 3 m bottom width is congruent with existing conditions while providing a degree of freeboard should base flows in fact be higher than noted. It would not be a desirable condition for normal daily flows to exceed the capacity of the low flow channel and have water extending over the top of the bench.

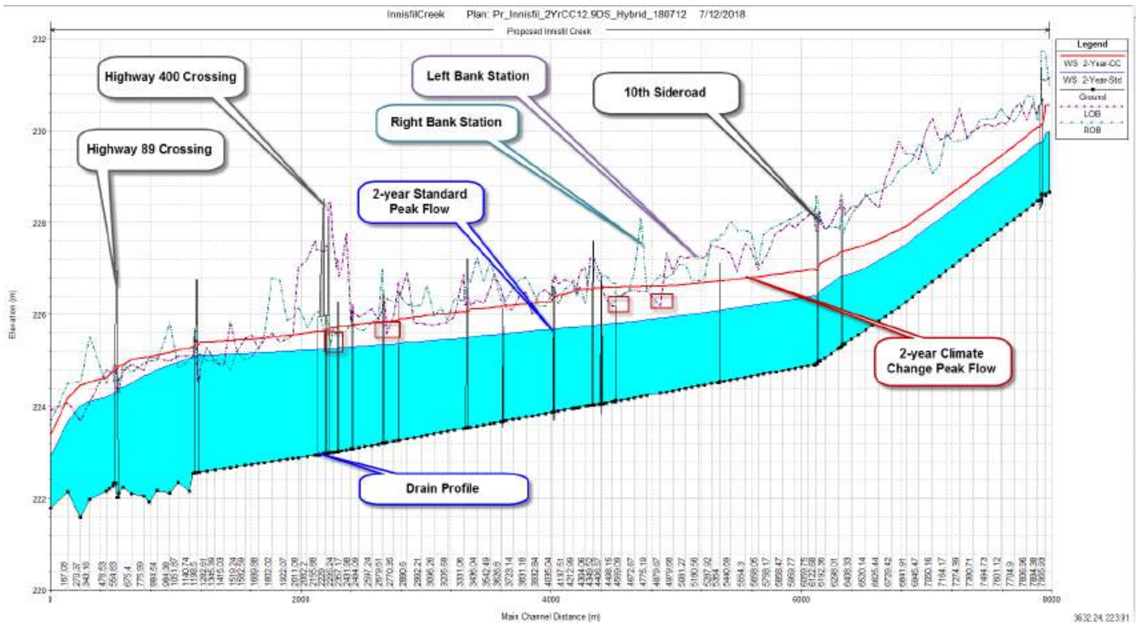
At a base flow of 320.8 L/s, the flow depth in the low flow channel has been calculated at 0.40 m with a velocity of 0.21 m/s. Based on the proposed low flow channel geometry we have provided a freeboard of 0.2 m (0.6 m maximum depth – 0.40 m flow depth) to account for sediment deposition overtime. This additional freeboard recognizes that sediment deposition and accumulation will occur between cleanouts due to low flow velocities within the drain. Further, the additional freeboard will also benefit aquatic habitat by retaining base flows within the low flow portion of the drain (deeper, colder flow depths) and away from the wide drain bench (shallow, warmer flow depths) located above the low flow portion of the drain. Flows residing in the bench portion of the drain would have an adverse effect on water temperatures, fisheries, vegetation growth, erosion control, etc. We believe the low flow channel as described above is the best solution for the SICD.

7.3 Proposed HEC-RAS Modelling Results – 2-Year Climate Change Flows

Hydraulic modelling iterations were completed whereby adjusting the 2-year peak flows between the 2-year standard peak flow and 2-year peak flow with climate change data. As the climate change 2-year peak flow is near double the flow of the 2-year standard rain fall, the channel geometry capacity must also double to accommodate the peak flow. Accordingly, this flow criteria served as a starting point to determine the maximum geometric requirements of the drain.

Figure 13 illustrates the HEC-RAS profile of the SICD, based on the drain characteristics as outlined in Section 7.2.

Figure 13 Proposed HEC-RAS Profile – 2-Year Climate Change Flows



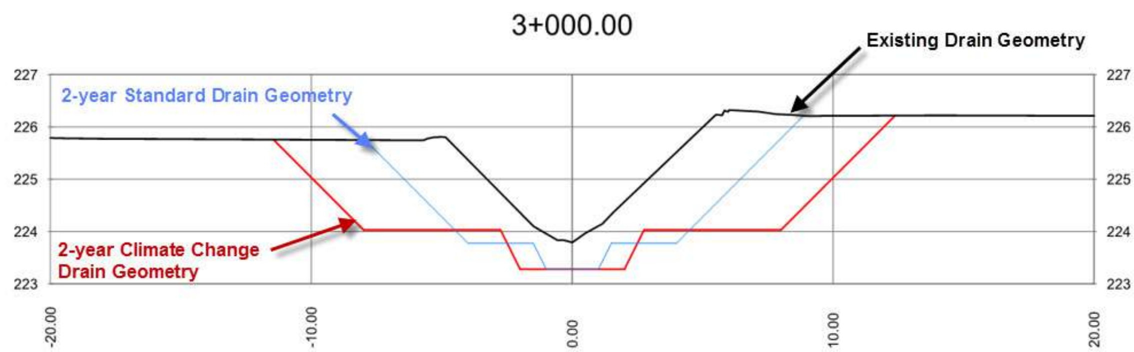
Through geometric hydraulic modelling iterations, it was observed that the drain has capacity in excess of the 2-year Climate Change Flows in many locations. However, between the 2nd Line and the 10th Sideroad, a number of drain tributaries are present whereby connecting to the main drain. Given the varying topography of the SICD, the 2-year water surface elevation within the drain must be lower than the low spot elevations in the overbank areas. Where drain tributaries connect to the main drain represents the low points in the overbank areas. Low points in the overbank areas of the drain between STA 3+392 and STA 4+929 are located below the water surface elevation produced by the 2-year climate change flows.

While the 2-year climate change flows are observed to overtop these low points in Figure 13, peak flows would in turn spill out of the main drain and enter the tributaries between the 2nd Line and the 10 Sideroad. It is recognized that some peak flows may not be contained within the tributaries of the SICD; however, it would be challenging to quantify given the relatively flat topography of the SICD watershed and one-dimensional characteristics of HEC-RAS. Further, to lower the water surface elevation of the 2-year Climate Change Flows to remain within the drain and to prevent flows from entering the tributaries would require an expansive cross section located solely between 2nd Line and the 10 Sideroad. As noted previously, downstream of the 2nd line and upstream of the 10 Sideroad, peak flows have been observed to be relatively contained in the existing drain banks.

Hydraulic geometric iterations as discussed previously, were completed on the drain to determine the footprint of drain required to contain the 2-Year Climate Change Flows.

Figure 14 is a generic comparative representation of existing and proposed drain geometry at STA 3+000. Freeboard has been provided in both cases. Scenarios for proposed conditions include both drain cross-sections; namely, one for the 2-year Standard Peak Flow and one for the 2-year Climate Change Flows as a comparison.

Figure 14 STA 3+000 - Proposed Drain Geometry Comparison

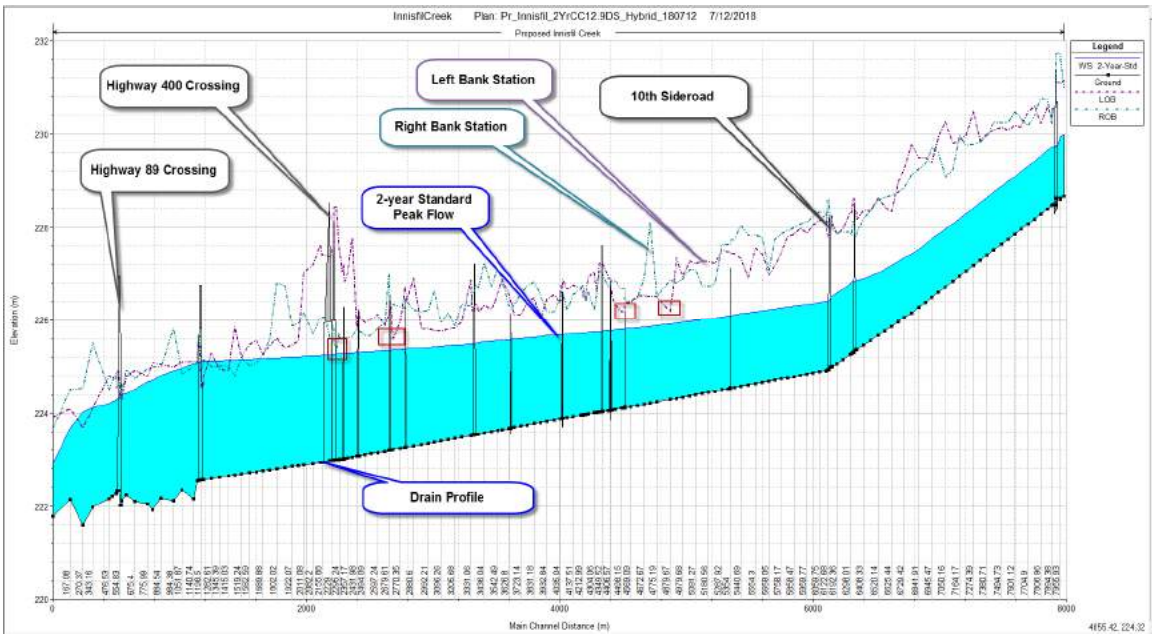


The red drain cross-section represents the typical geometry required to convey the 2-year climate change flows. As illustrated, this required drain geometry is in excess of geometry required to convey the 2-year standard peak flows due to the difference in peak flow magnitudes. Further the proposed 2-year climate change flows drain geometry produces a significant improvement over existing conditions.

7.4 Proposed Conditions – 2-Year Standard Peak Flows

Using the drain geometry as outlined in Section 7.3, Figure 15 illustrates the proposed HEC-RAS profile for the SICD using the 2-year standard flow rates.

Figure 15 Proposed HEC-RAS Profile – 2-Year Standard Peak Flows



The red boxes in Figure 15 illustrate low points in the natural topography of the SICD where peak flows may have the opportunity to exit the drain through the tributaries noted in Section 7.3. Based on the proposed drain geometry as outlined in Section 7.4, the 2-year standard peak flow is fully contained within the drain upstream of Highway 400. The proposed drain geometry has been designed to contain the 2-year peak flows at elevations within the main branch of the drain below the inverts of the tributaries to eliminate spills from occurring within the tributaries in the 2-year event. The drain geometry as noted in Section 7.2 of the report meets the design criteria for an open municipal drain. Supporting HEC-RAS modelling results can be found in Appendix A.

7.5 Proposed Conditions – 2-Year Standard vs Climate Change Comparison

The proposed drain geometry, as outlined in Section 7.2 will fully contain the 2-year Standard peak flows within the drain banks while providing freeboard of up to 0.2 m without spilling into the adjacent tributaries. The 2-year Climate change flows have assumed to be contained within the main branch and its associated tributaries within the length of the drain. It would be more desirable to fully contain the 2-year climate change flows within the drain; however, the proposed drain geometry meets the design criteria as outlined in Section 4.0 of the report. As there is freeboard available in the drain, Burnside has completed an iterative flow analysis whereby increasing peak flows above the 2-year standard flows to determine the threshold at where flows would begin to enter the tributaries. Detailed results of this analysis have been appended in Appendix D. In summary, we have been able to determine that the 2-year standard peak flows plus an additional 50% would be able to be fully contained within the drain. For reference, the 2-year standard peak flows plus an additional 50% is approximately the average flow between the 2-year standard flow and 2-year climate change flow and will be referenced as the 2-year Hybrid flow for the remainder of this report. Based on this result, we believe that the proposed geometric configuration of the drain provides a compromise to both flow scenarios and has been carried forward as the preferred design.

7.6 Proposed Crossing Requirements

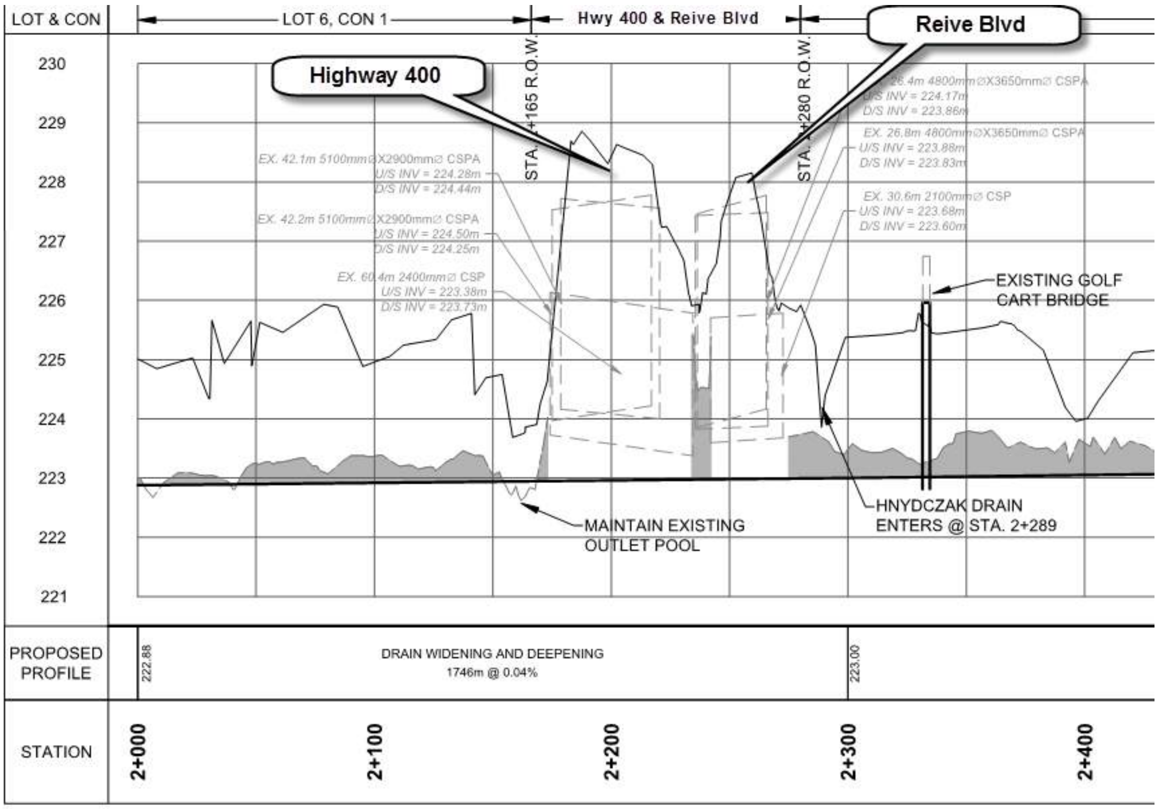
To achieve containment of the 2-year standard flow within the proposed geometry of the SICD, the drain must be able to fully contain the magnitude of the peak flow without impediment. Therefore, all drain crossings must be designed in excess of the 2-year standard flow to permit free flowing conditions. Accordingly, drain crossings were increased in size, in the HEC-RAS hydraulic model where applicable to permit these free-flowing conditions within the drain. Additional commentary pertaining to the specifics of crossings has been provided in following sections in this report.

7.6.1 Proposed Highway 400 and Reive Boulevard Crossings

The Proposed future replacement of the Highway 400 crossings has been confirmed as being a necessary requirement by the MTO (and its consultants) and is intended to be completed in concert with Highway 400 roadway expansion improvements. The proposed design of the Highway 400 structures is outside the scope of this report; however, it is assumed that any new crossings would be required to be sized in accordance to the MTO Directive B-100. Accordingly, the peak flow design criteria for the proposed Highway 400 crossings will be in an order of magnitude much larger than the 2-year peak flows proposed for the SICD. Similarly, it has been acknowledged by the Town that the Reive Boulevard Crossings will need to be replaced as well with a structure that is sized in accordance with the MTO B-100 directive. Accordingly, Burnside arbitrarily coded a large span at each of the Highway 400 and Reive Boulevard Crossings that will not impede the 2-year peak flows.

As outlined in Section 7.2 of the report, the drain profile is proposed to be lowered through the Highway 400 crossings and Reive Boulevard to provide the ability to lower the drain upstream of the Highway 400 corridor and to provide the required increased conveyance capacity. Figure 16 illustrates the proposed profile and the minimum drain bottom gradient and elevation of the SICD through the Highway 400 corridor and Reive Boulevard

Figure 16 SICD Profile – STA 2+000 to STA 2+400



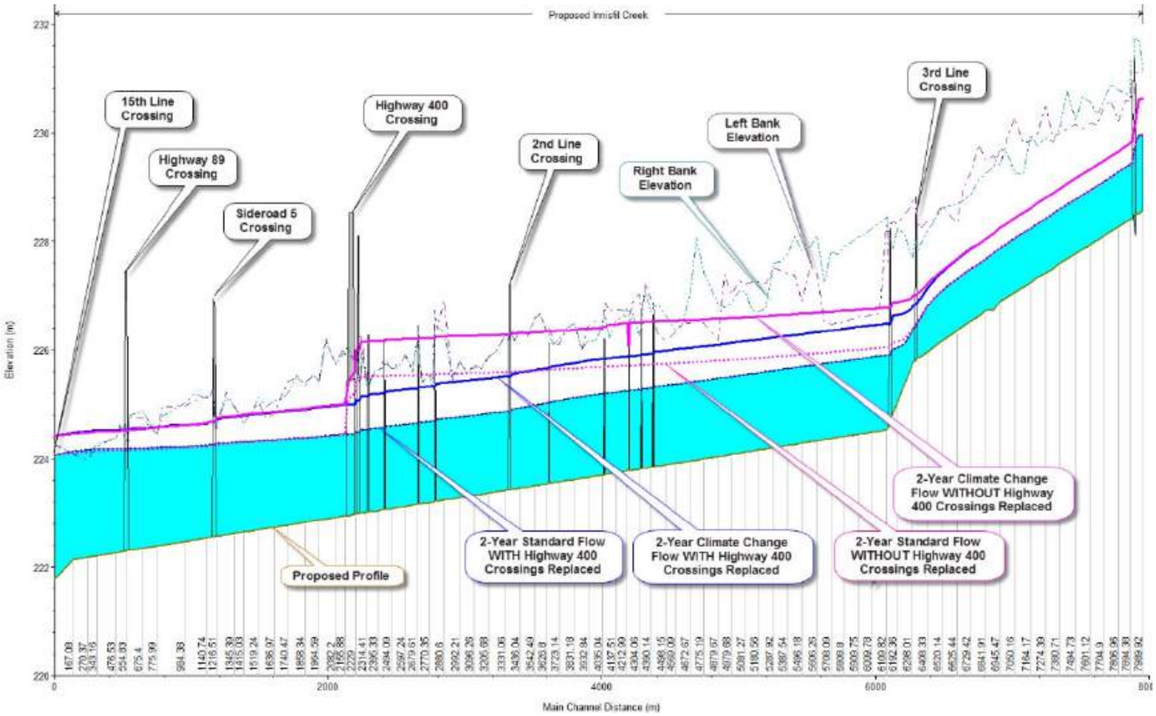
The proposed profile of the drain as illustrated in Figure 16, resides approximately 0.4--1.0 m below the existing culvert inverts. This lowering is required to permit increased capacity upstream of the Highway 400 corridor.

To assess the hydraulic impacts of the Highway 400 and Reive Boulevard crossings on the SICD, Burnside has completed a hydraulic performance evaluation of the drain as follows:

- Scenario #1 – Proposed drain geometry and profile gradients tied into the existing Highway 400 and Reive Boulevard crossing upstream inverts.
- Scenario #2 – Ultimate conditions associated with the proposed drain geometry, desired profile gradients and replacement of the Highway 400 and Reive Boulevard crossings.

This assessment was completed to determine if the Highway 400 and Reive Boulevard crossings impede the 2-year peak flows and if so, to what extent. Figure 17 illustrates a HEC-RAS profile comparison between Scenario #1 (pink) and Scenario #2 (blue) using both the 2-year standard and climate change flows.

Figure 17 HEC-RAS Profile – Proposed Highway 400 Crossings



Whether looking at the 2-year standard or at the 2-year climate change water surface elevations in Figure 18, we note a “wedge” of elevation differences between Scenario #1 and Scenario #2. This wedge or difference in water surface upstream of the Highway 400 and Reive Boulevard corridors, can be classified as the “Head pond”. The “Head Pond” influences water surface elevations as far upstream as the 3rd Line as seen where the water surface elevations for both scenario #1 and Scenario #2 converge (both 2-year standard and 2-year climate change surface profiles). By lowering the drain bottom of the SICD as previously described and enlarging the Highway 400 and Reive Boulevard crossings to permit free flowing conditions of the 2-year peak flow, the water surface elevations upstream of Highway 400 may be reduced up to 0.90 m. Given the relatively flat topography of the SICD watershed, a reduction of 0.9m in the 2-year water surface profile upstream of the Highway 400 and Reive Boulevard corridor could be considered a significant improvement to the drain. Further, the conveyance improvements associated with the Highway 400 and Reive Boulevard corridor will also provide hydraulic benefit to lands upstream of the 3rd Line. Without conveyance improvements at the Highway 400 and Reive Boulevard corridor, the proposed improvements as outlined in this report would not be viable.

7.6.2 Highway 400 Crossing Interim Considerations

The proposed replacement of the Highway 400 crossings has been confirmed as being a necessary requirement by the MTO (and its consultants) and is intended to be completed in concert with future roadway expansion/improvements. However, the timing of that future roadway expansion was not known at this time. While the proposed design of the ultimate Highway 400 crossing is beyond the scope of this report, in discussions with the MTO it was requested that the Town and Burnside explore an interim conveyance alternative that would satisfy the design criteria of the SICD Improvement project. This interim conveyance alternative would include a proposed culvert(s) under the Highway 400 corridor that could be installed with trenchless technology at the invert elevation of the proposed drain. It is Burnside's understanding that locally available trenchless technology can jack and bore pipe sizes up to 3.0 m in diameter. Accordingly, we have used that knowledge in the succeeding text to outline an interim design solution.

The following briefly reviews the objectives of the proposed SICD improvements;

- The proposed SICD improvements are designed to contain the 2-year hybrid design flows and in accordance with Design and Construction Guidelines described in Section 7.0 of this Report.
- While the overall depth of the drain varies depending on location, flow depths have been designed to be generally less than 2 m to prevent over-topping of the existing drain banks under the 2-year event within the market garden area and other flat areas of topography that would be sensitive to minor fluctuations in flow elevations.
- The proposed SICD improvements are designed to permit free flowing conditions under the 2-year event. Obstructions to flow under the 2-year event will reduce flow velocities, increase sediment deposition and reduce the capacity of the drain. This is an un-desired flow characteristic for this drainage project.
- The proposed SICD improvements have been associated with the lowering of the gradient of the drain bottom profile, specifically through the Highway 400 and Reive Boulevard corridors, as well as increasing the cross-sectional geometry of the drain.

Table 9 below, referenced from the South Innisfil Creek Drain Improvements Hydrology Report – Dated April 2018, summarizes the calculated peak flows for the 2-year to 100-year and Regional storm events at the Highway 400 Crossings.

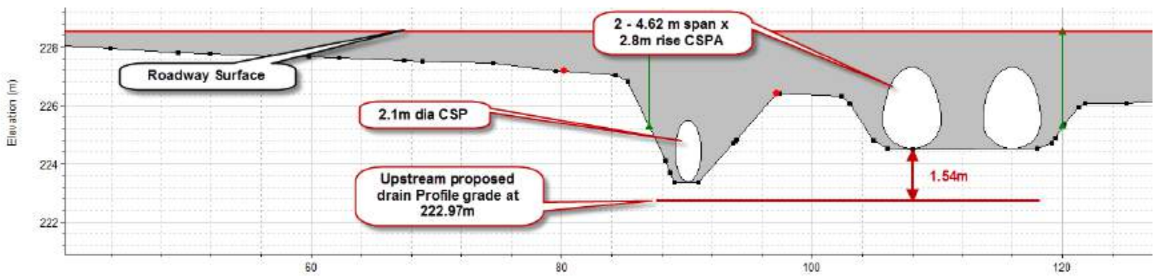
Table 9 Summarized Peak Flows at Highway 400 Crossing

Storm Event	2-year (m^3/s)	5-year (m^3/s)	10-year (m^3/s)	25-year (m^3/s)	50-year (m^3/s)	100-year (m^3/s)	Regional (m^3/s)
SCS Type II (24-hr)	13.64	26.87	39.41	61.56	77.7	93.92	290.47

It is noted that the calculated 2-year peak flow of 13.64m3/s is 14.5% of the 100-year flow of 93.92 m^3/s. Accordingly, the ultimate design of the Highway 400 crossings would require significantly more conveyance than what would be required to convey the 2-year peak flows.

As the proposed flow depth within most of the SICD has been designed to be less than 2 m deep to prevent spilling, it was deemed appropriate to consider an interim Highway 400 crossing with capacity to convey the 2-year flows also at depths of the same magnitude. Figure 18 below illustrates the upstream view of the existing Highway 400 culvert crossing configuration within the HEC-RAS hydraulic model.

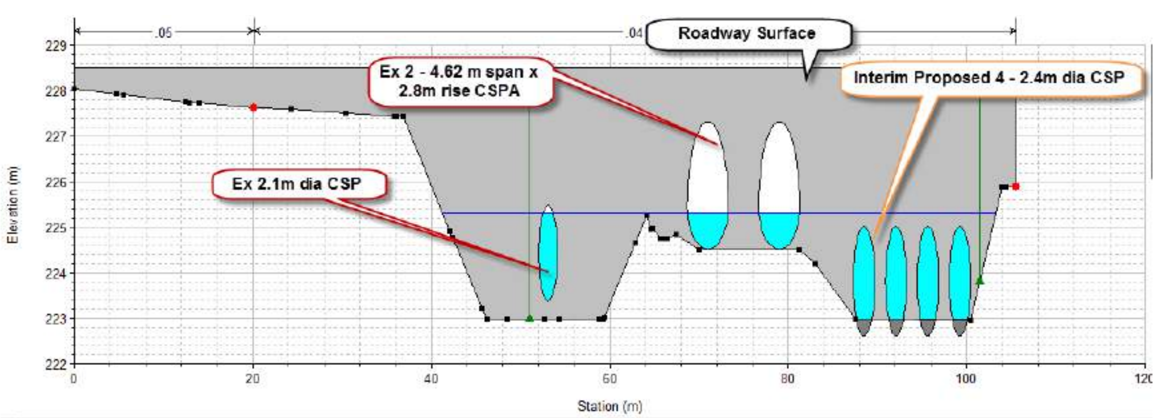
Figure 18 Existing Highway 400 Crossing – Upstream View



As shown in Figure 18, the inverts of the existing 4.62 m span x 2.80 m rise CSPA culverts reside 1.54 m above the proposed drain invert. Accordingly, it would stand to reason that these CSPA culverts would not be fully utilized under the 2-year event as the majority of the flow depth would reside below their inverts. Furthermore, these CSPA culverts would be viewed primarily as relief culverts for flow events greater than the 2-year event.

Based on the commentary above, Burnside has completed an iterative process whereby adding additional culverts to the existing crossing to provide free flowing conditions for a 2-year peak flow of 13.64 m^3/s. Figure 19 below has been provided to illustrate an interim alternative required to provide conveyance for that 2-year peak flow.

Figure 19 Proposed Conceptual Highway 400 Interim Condition - HEC-RAS Section View



To maintain free flowing conditions and flow depths up to 2 m within the market garden areas, upstream of the Highway 400 corridor, during the 2 year. event a total of four 2.40 m dia. CSP culverts are required. The culvert inverts have been buried by 15% for aquatic habitat purposes. These culverts have been sized to convey the 2-year standard flows only. It has been determined that these culverts will not provide adequate conveyance for the 2-year hybrid flow as outlined in prior sections of this Report. Details of the interim culvert geometry of the Highway 400 crossings have been provided in Table 10 below.

Table 10 Proposed Highway 400 Interim Condition Crossing Summary

Structure ID	Structure Description	Upstream Invert Elev. (m)	Downstream Invert Elev. (m)	Length (m)	Road Sag Elev. (m)
Hwy 400 - North	2.1 m dia. CSP	223.38	223.75	60.6	228.52
Hwy 400 - Central	4.62 m span x 2.8 m rise CSPA	224.52	224.52	42.2	228.52
Hwy 400 - South	4.62 m span x 2.8 m rise CSPA	224.52	224.52	42.2	228.52
Interim Condition	4 – 2.4 m dia. CSP with 0.36 m bury	222.62	222.58	60.6	228.52

Alternatively, considering the proposed Highway 400 interim crossings will likely be installed via trenchless technologies, we have determined that a total of four 2.1 m dia. steel pipe culverts may provide a suitable alternative vs the four 2.40 m dia. CSP culverts as previously noted. The smaller 2.1 m dia. steel pipe culverts have a reduced manning's n coefficient (n=0.013) vs the CSP culverts (n=0.024). Accordingly, this reduced barrel friction encourages increased flow through the culverts. Four 2.1 m dia. steel pipe culverts provide similar flow characteristics to the four 2.40 m dia. CSP culverts.

The commentary in this section of the report has been provided to facilitate additional discussions with the MTO surrounding the replacement of the Highway 400 crossings. While it may be preferable and more cost effective to replace the Highway 400 crossings with the ultimate design structure at the time of the SICD drainage works, the interim condition as presented in this section of the report would provide a suitable interim solution for conveyance of the 2-year peak flows within the SICD. The analysis presented above has been intended to be location neutral as this is a conceptual interim condition at the time of writing of this report. Should the interim condition be pursued as an acceptable alternative, additional design works surrounding the location of the proposed culverts, installation procedures, drain relocation and estimated construction costs would be required. The aforementioned design requirements are considered to be out of the scope of this report and therefore have not been detailed further.

While the intention of this section of the report is directed to the Highway 400 crossings, Reive Blvd, located immediately upstream of Highway 400, would also require an interim condition structure to be installed or an ultimate replacement structure to be designed in accordance with Town Design Criteria. The interim condition of an additional four 2.4 m dia. CSP's would be a viable interim condition for Reive Boulevard. Further, we assume that ultimate design conditions would require conveyance in excess of the 2-year event and accordingly, the ultimate bridge design would also be a viable alternative for Reive Boulevard. The ultimate design and or interim design condition of Reive Boulevard is considered beyond the scope of this report and has not been detailed further.

7.6.3 Proposed Roadway Crossing Requirements

The proposed drain improvements as outlined in Section 7.2 have been designed under the assumption that the 2-year peak flows will be conveyed within the SICD without restriction and flowing under normal depth flow conditions. Accordingly, structures over and crossings of the drain must not impede the 2-year peak flows within the proposed drain cross-section (geometry). Table 11 below illustrates the replacement and design requirements for major roadway crossings along the course of the SICD main drain.

Table 11 Main Drain Roadway Structure Design Requirement Summary

Structure ID	Ex Structure Description	Replacement Required	Design Criteria	Design Storm Criteria	Re-Design Included in this report?
Hwy 89	25 m span bridge	No	N/A	N/A	N/A
5 Sideroad	13 m span bridge	No	N/A	N/A	N/A
Hwy 400 - North	2.5m dia. CSP	Yes	MTO B-100	100-yr or Regional	No
Hwy 400 - Central	4.62 m span x 2.8 m rise CSPA	Yes	MTO B-100	100-yr or Regional	No
Hwy 400 - South	4.62 m span x 2.8 m rise CSPA	Yes	MTO B-100	100-yr or Regional	No
Reive Blvd - North	2.1 m dia. CSP	Yes	MTO B-100	25-year	No
Reive Blvd - Central	4.8 m span x 3.65m rise CSPA	Yes	MTO B-100	25-year	No
Reive Blvd - South	4.8 m span x 3.65m rise CSPA	Yes	MTO B-100	25-year	No
2nd Line	10 m span bridge	No	N/A	N/A	N/A
10th Sideroad	5.9 m span bridge	No	N/A	N/A	N/A

3rd Line	4.75 m span bridge	No	MTO B-100	25-year	No
4th Line	1.0 m span x 1.8 m CSPA and 2.4 m dia. CSP	Yes	MTO B-100	25-year	Yes

The HEC-RAS hydraulic modelling associated with the proposed SICD drain improvements have provided arbitrary culvert sizes for the Highway 400 and Reive Boulevard Crossings such that free flowing conditions in the 2-year event could be achieved. Given the proposed profile lowering and perched culvert configuration surrounding the Highway 400 and Reive Boulevard crossings and the replacement conveyance criteria requirements in excess of the 2-year peak flows, the design of these crossings is considered to be outside the scope of this report. It is recommended that detailed design on these structures be re-visited at a future date to accommodate the appropriate design and construction criteria. Further, commentary surrounding the replacement of the 4th Line culvert crossing has been provided in Section 7.6.4.

7.6.4 4th Line Crossing

The 4th line crossing has been designated for replacement due to the age and deterioration of the existing crossing. As the 4th Line crossing is contained in the HEC-RAS hydraulic model for the SICD, the crossing has been analyzed in HEC-RAS. Table 12 below provides the characteristics of the existing 4th Line Crossing.

Table 12 Culvert Comparison

Structure ID	Structure Description	Upstream Invert Elev.	Downstream Invert Elev.	Length
Existing #1	1.0 m x 1.8 m CSPA	228.23	228.49	25.1
Existing #2	2.4 m CSP	228.41	228.44	24.6

The existing 1.0 x 1.8 m CSPA and 2.4 m CSP has been observed to convey the 2-Year Hybrid storm event, with 0.57 m of clearance to the soffit in the CSP and zero clearance in the CSPA. Peak flows from the design criteria event (25 yr.) producing headwater elevations in excess of 231.37 m would overtop the 4th Line.

While the existing culvert configuration yields reasonable hydraulic results, alternatives were considered to improve conveyance for major system events, and also improve site geometry and aquatic habitat through the crossing. The proposed crossing has been sized to convey the 25-year event in accordance with Town of Innisfil engineering standards. As illustrated in Tables 13 and 14 below, a proposed 6.0m span x 2.5m Rise Concrete Box been selected and observed to provide adequate conveyance for the 25-Year storm event.

Table 13 Culvert Comparison

Structure ID	Structure Description	Upstream Invert Elev.	Downstream Invert Elev.	Length
Proposed	6.0 m span x 2.5 m Rise Conc. Box, 0.2 m bury	228.41	228.28	24.6

Table 14 below illustrates the headwater comparisons between existing and proposed conditions at the 4th Line.

Table 14 Headwater Comparison at Cross Section 7955.93

Design Event	Design Flow (m^3/s)	Existing Headwater Elevation (m)	Proposed Headwater Elevation (m)	Difference in Headwater Elevation (m)
2 –Year Std.	5.44	230.21	229.78	-0.43
5 – Year Std.	11.31	231.06	230.29	-0.77
2 – Year C.C.	9.94	230.87	230.18	-0.69
2 – Yr. Hybrid	7.69	231.8	230.18	-1.62
25-Year	22.45	231.8	230.97	-0.83

As illustrated in Table 14, the proposed 6.0 m span x 2.5 m Rise Conc. Box reduces headwater elevations by up to 1.62 m. The calculated 25-year water elevation at cross section 7955.53 is observed at 230.97 m. This provides approximately 0.4 m (231.37 – 230.97) of freeboard to the centerline of the 4th Line.

7.6.5 3rd Line Branch Crossing West of the 10th Sideroad

The 3rd Line crossing runs north/south across the 3rd Line, west of the 10 Sideroad. This crossing has been selected for replacement due to drainage improvements in the area. As this crossing does not reside on the main branch of the SICD and therefore not contained within the SICD HEC-RAS model, this crossing was modelled using the HY-8 culvert analysis software. The HY-8 model has pre-set sizes for corrugated steel pipe arches (CSPA). The existing CSPA is a 1.8 m rise x 1.1 m span. The existing structure was modelled as a 1.803 m x 1.193 m CSPA, which is the closest size to the actual existing culvert. The tailwater elevation has been assumed to be half the opening height for both existing and proposed conditions.

The existing 1.8 m x 1.1 m CSPA has been observed to convey the 2-Year storm event, with no clearance to the soffit. Peak flows producing headwater elevations in excess of 228.00 m would overtop the 3rd Line.

While the existing culvert configuration yields reasonable hydraulic results, alternatives were considered to improve conveyance for the 10-year event, and also improve site geometry and aquatic habitat through the crossing. As illustrated in Tables 15 and 16 below, a proposed 1.6 m CSP with 0.18 m bury has been selected and observed to provide adequate conveyance up to the 10-year storm event.

Table 15 Culvert Comparison

Structure ID	Structure Description	Upstream Invert Elev.	Downstream Invert Elev.	Length
Existing	1.8 m x 1.1 m CSPA	226.54	226.00	12.54
Proposed	1.6 m CSP with 0.18 m Bury	225.99	225.50	12.54

Table 16 Headwater Comparison

Design Event	Design Flow (m^3/s)	Existing Headwater Elevation (m)	Proposed Headwater Elevation (m)	Difference in Headwater Elevation (m)
2 –Year	1.842	227.41	226.85	-0.56
5 – Year	3.958	228.05	227.27	-0.78
10 –Year	5.647	228.12	227.59	-0.53
Overtopping	-	228.00	228.00	-

7.6.6 Proposed Field Crossings

Within Section #3 of the main drain of the SICD, there is a total of 7 existing independent private drain crossings, most of which are proposed for replacement. Replacement of most of the existing crossings is required due to the proposed widening of the drain itself and therefore a requirement of a larger structure to span the new drain. Two completely new crossings have also been proposed to provide access to land locked areas along the drain.

As stated in Section 7.6.2, the proposed conveyance improvements of the drain have been intentionally designed to provide conveyance for the 2-year peak flows without restriction. Accordingly, and by default, private drain crossings must also be configured to prevent flow restriction within the drain. Based on feedback from some of the land owners within the Market Garden, during spring freshet flows most existing drain crossings have been observed to overtop when the drain itself overtops. This is a reasonable feedback/observation as the results of the modelling have indicated that the existing configuration of the drain does not accommodate the 2-year peak flow.

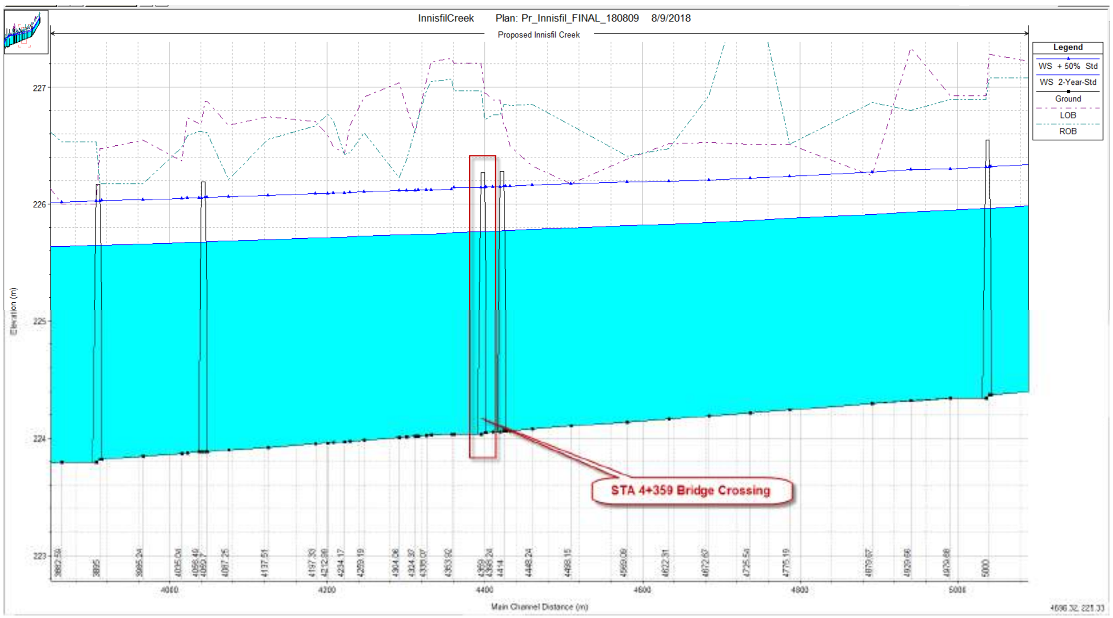
In 2016 an existing drain crossing located at STA 4+327 was replaced and relocated to STA 4+359 by the respective land owner at property roll number 001-20300. This replacement structure is a 13.4 m span bridge with a 4.4 m wide deck supported on either side of the drain by concrete abutments as detailed in Figure 20.

Figure 20 Drain Crossing at STA 4+359

Further, this crossing at STA 4+359 has been reported to be one of few private crossings within the SICD watershed that was not overtopped in the May and June 2017 peak rainfall events as described in detail in the South Innisfil Creek Improvements Drain-Hydrology Report. Accordingly, the proposed structure was inputted into the HEC-RAS hydraulic model for conveyance verification. The intent was, knowing that this crossing was recently replaced and subject to confirmation of conveyance through hydraulic analysis, that this structure be used as a benchmark template structure for other crossings within this reach or section of the drain.

Figure 22 illustrates the proposed HEC-RAS hydraulic profile in the vicinity of the STA 4+359 bridge crossing.

Figure 21 Drain Crossing at STA 4+359 – HEC-RAS Profile



As illustrated in Figure 21, the 13.4 m span bridge at STA 4+359 conveys the 2-year standard peak flows as well as the 2-year +50% flow without restriction. Accordingly, this structure was deemed an acceptable benchmark template structure to use for any future crossing of the drain where similar flows are present. Based on this sample analysis, Burnside completed a further iterative analysis on the other private crossings within this reach or section of the drain. Table 17 summarizes the results of this private crossing hydraulic iterative analysis and provides an overview of the required minimum replacement size for the other private crossings along the course of the SICD Main Drain.

Table 17 Private Crossing Design Summary Table

No.	STA	Description	Std 2-year Flow (m^3/s)	Proposed Min Span (m)	Pr 2-year W.S Elev. (m)	Pr 2-year+50% W.S Elev. (m)	Proposed Min Soffit Elev (m)	Soffit Above 2-yr+50% ?	Freeboard Provided to 2-year+50% (m)
1	2+333	golf cart bridge	13.43	15.0	225.28	225.55	225.58	Yes	0.03
2	2+449	golf cart bridge	13.43	15.0	225.3	225.57	225.6	Yes	0.03
3	2+697	golf cart bridge	13.43	15.0	225.34	225.63	225.64	Yes	0.01
4	2+822	golf cart bridge	13.43	15.0	225.37	225.68	225.87	Yes	0.19
5	4+057	private agriculture bridge	10.71	15.0	225.68	226.06	226.18	Yes	0.12
6	4+359	new private agricultural bridge which is understood to have been installed to replace the structure removed from Station 4+327	10.70	13.4	225.77	226.15	226.27	Yes	0.12
7	4+414	private agriculture bridge	10.70	13.4	225.77	226.15	226.27	Yes	0.12

As illustrated in Table 17, the proposed minimum spans of each bridge have been selected to minimize flow restriction within the channel cross section. Soffit elevations on each structure have been selected to reside above the 2-year +50% peak flow water surface elevation. Based on the analysis completed, the minimum span and minimum soffit elevation of each structure are critical to the hydraulic performance of the drain. Based on the intent of the crossing (pedestrian, farm equipment, etcetera) the landowner may select applicable structure material and configuration to support loads crossing the drain as required. Supporting HEC-RAS summary output tables have been provided in Appendix A.

7.6.7 10th Sideroad, 3rd Line Spur and 3rd Line Drain - Private Driveway Crossings

There are 26 private driveway crossings on the 3rd Line, 3rd Line Spur and 10th Sideroad. The residential crossings have been sized for the 5-year storm, where the field/other crossings have been sized for the 2-year storm. Table 18 below has been provided to summarise the replacement sizes for each culvert crossing based on the design criteria of the culvert. The replacement sizes are intended as replacement options when crossings require replacement in the future. These sizes are a minimum size needed to convey the flows, larger culverts may be selected as needed to suit individual crossing needs.

Table 18 10th Sideroad, 3rd Line Spur and 3rd Line Drain – Replacement Summary

Drain	Culvert No.	Station	Land Owner	Existing Size	Proposed Size	Sized For
3rd Line	1	35.79	1281597 Ontario Inc. (002-12900)	1400	1600 mm CSP	2-Yr
	2	255.2	S. Yamamoto Est. (002-12800)	1500	1600 mm CSP	2-Yr
	3	379.58	S. Yamamoto Est. (002-12800)	1500	1600 mm CSP	2-Yr
	4	566.02	P. & K. Horodynsky (002-12600)	1350 x 1650	1600 mm CSP	2-Yr
	5	709.8	Horodynsky Farms Inc. (002-12500)	2400	1600 mm CSP	2-Yr
	6	719.84	Horodynsky Farms Inc. (002-12500)	1830	1600 mm CSP	2-Yr
	7	762.01	1281597 Ontario Inc. (002-12400)	1500	1600 mm CSP	2-Yr
	8	819.74	1281597 Ontario Inc. (002-12400)	1300 x 1000	1600 mm CSP	2-Yr
	9	866.74	J. Horodynsky (002-12300)	2400	1600 mm CSP	2-Yr

Drain	Culvert No.	Station	Land Owner	Existing Size	Proposed Size	Sized For
	10	905.77	S. Sharma (002-12200)	1200	1600 mm CSP	2-Yr
	11	921.83	S. Sharma (002-12200)	1200	1600 mm CSP	2-Yr
	12	998.96	D. & I. Choury Guine (002-12100)	1400	1600 mm CSP	2-Yr
	13	1163	K. Yamamoto (002-12000)	1800 x 1100	1600 mm CSP	2-Yr
	14	1346	O. & R. Goncalvse (002-1190)	1200	1600 mm CSP	2-Yr
	15	1442.5	T., Q. & M. Palmeiri (002-11800)	1200	1600 mm CSP	2-Yr
	16	1531.7	R. Tulio (002-11700)	800	2.4 m x 1.2 m Box with 200 bury	2-Yr
	17	1650.3	D. Evers (002-11600)	1499 span	1600 mm CSP	2-Yr
3rd Line Spur	18	17.78	R.O.W.	1200	1400 mm CSP	10-Yr
	19	601.42	S. Yamamoto Est. & K. Yamamoto (002-14400)	1500	1400 mm CSP	2-Yr
		3rd Line	West of 10th Sideroad		1600 mm CSP	10-yr
10th Sideroad	20	144.82	B. Scott (001-23800)	800	1500 mm CSP	5-yr
	21	268.51	J. Phaneuf & C. Aguiar (001-23900)	900	1500 mm CSP	5-Yr
	22	330.84	M. & N. Bain (001-24100)	1800	1500 mm CSP	5-Yr
	23	411.5	J. Chow (001-24200)	900	1200 mm CSP	2-Yr
	24	660.43	J. Chow (001-24200)	1200	1200 mm CSP	2-Yr
	25	1228.5	J. Chow (001-24200)	900	1000 mm CSP	2-Yr
	26	1436.7	R.O.W.	900	1000 mm CSP	2-Yr

7.7 Aquatic Habitat Assessment

The SICD project area and watershed are located at the upstream limits of Innisfil Creek. As the project area is located within the Innisfil Creek watershed, the proposed conveyance improvements must take into consideration the existing and future Aquatic Habitat of the drain. Accordingly, Burnside has completed a detailed Aquatic Habitat Assessment of the drain in July 2018. The Aquatic Habitat Assessment report speaks in detail to the existing habitat of the drain, impacts associated with the proposed deepening and widening of the drain as well as low flow channel construction and proposed restoration measures. This aquatic assessment has been provided under a separate cover and has been issued to the Department of Fisheries and Oceans (DFO) and NVCA for review and subsequent approval.

8.0 Peak Flow Attenuation Considerations

The Final Drainage Report for the South Innisfil Creek Drain and Branches, Town of Innisfil, 2013 completed by Dillon Consulting, identified that two drainage options were to be implemented as a result of the order of the Drainage Referee in 2013. These options were identified as Option Nos. 1 and 3. Both options, as they pertain to peak flow attenuation, called for the construction of two stormwater management facilities as outlined below.

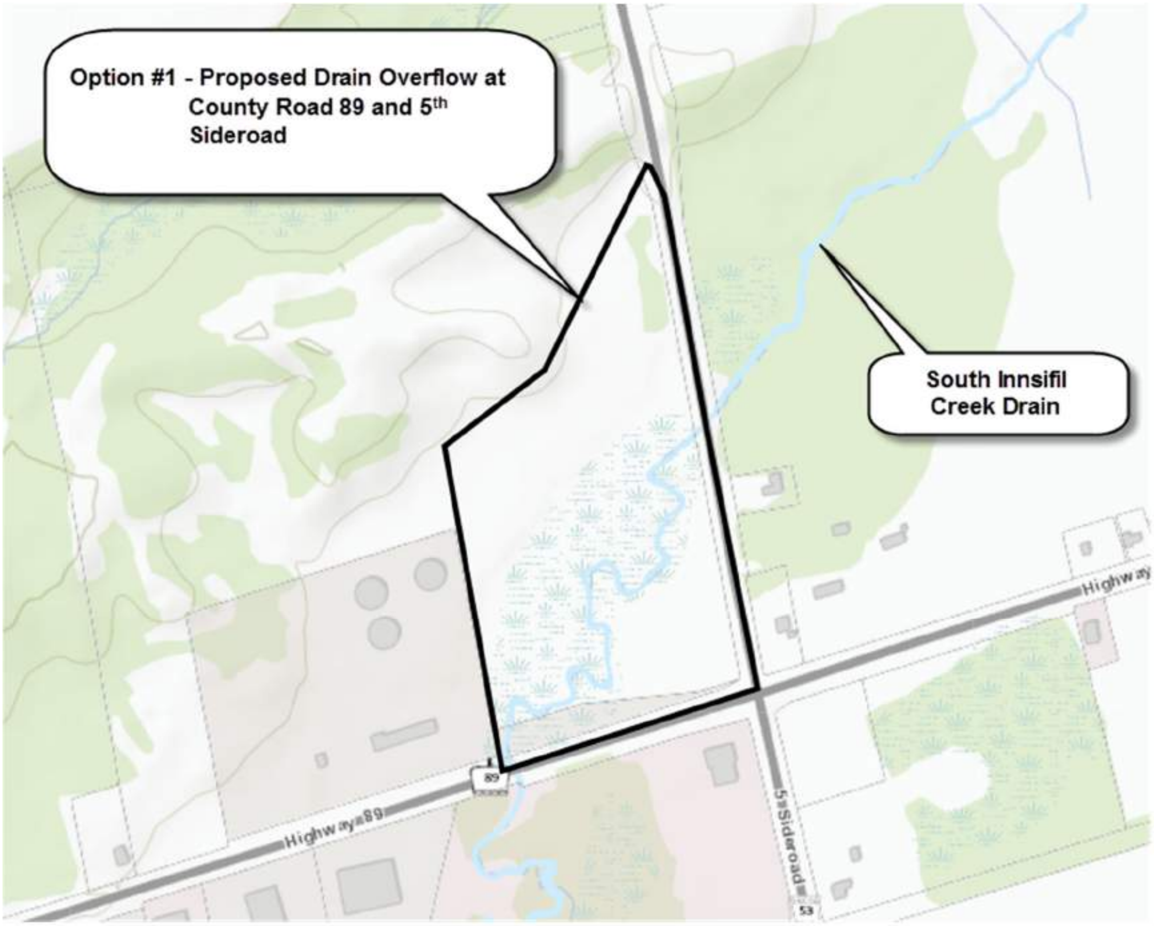
8.1 Option No. 1 – Proposed Drain Overflow at Hwy. No. 89 and 5 Sideroad

This drain overflow area was proposed to be located downstream of the 5 Sideroad and upstream of Highway No. 89 and was designed to provide approximately 50,000 m^3 of storage over a determined footprint of approximately 5 hectares. This facility was intended to provide two primary functions including:

- Regulate drain flows passing through the overflow area such that storms up to the 1:2-year return period would be attenuated within the creek downstream of the SICD watershed when compared to existing conditions; and
- Reduce the transport of colloidal sediments downstream of the SICD watershed.

The proposed location of the Dillon Option No. 1 detention facility has been illustrated in Figure 22

Figure 22 Option No. 1 – Proposed Drain Overflow at County Road 89 and 5th Sideroad

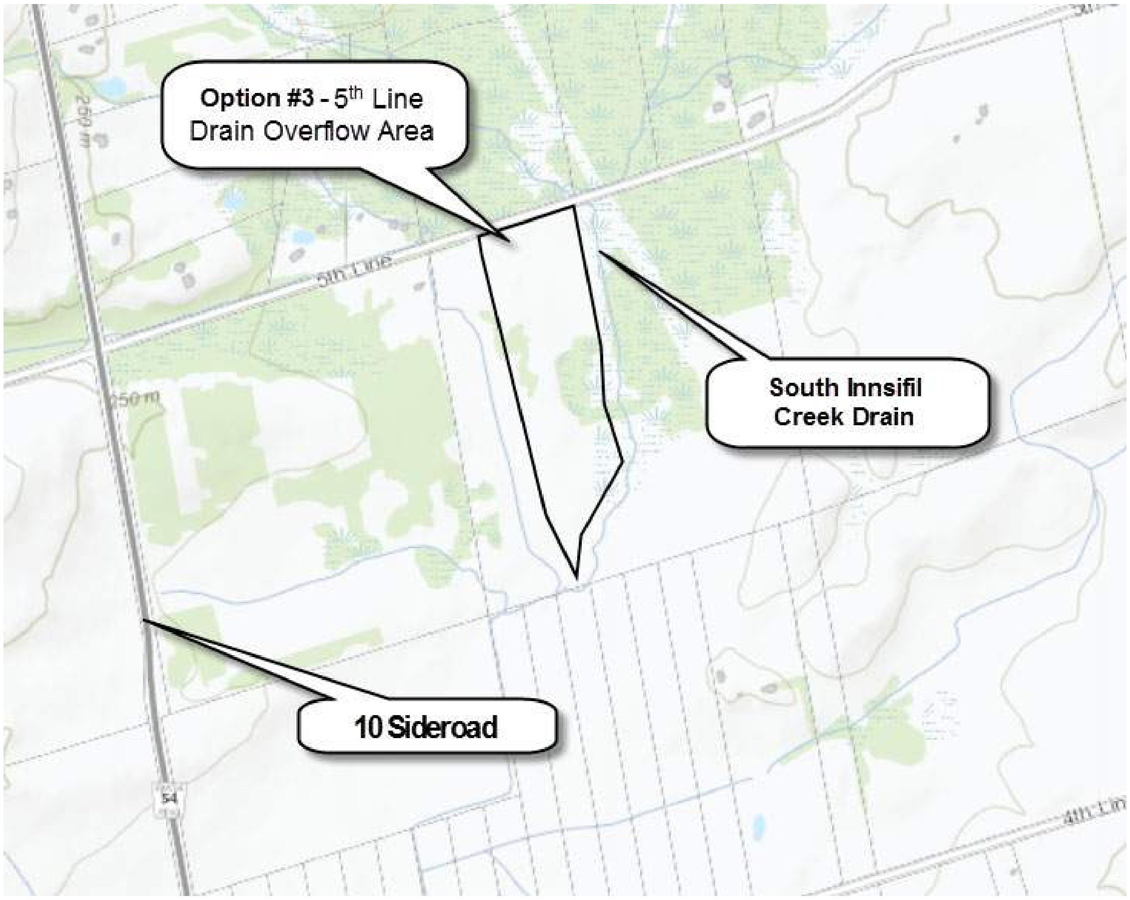


8.2 Option No. 3 – 5th Line Drain Overflow Area

The proposed 5th Line drain overflow area was proposed to be located downstream of the 5th Line, in the upper limits of the watershed. This facility was also designed to provide approximately 50,000 m^3 of storage over a determined footprint of approximately 6 hectares. The 5th Line drain overflow area was specifically designed to provide detention storage during a 1:2-year return period to attenuate flows as well as increase downstream conveyance capacity.

The proposed location of the Dillon Option No. 3 detention facility has been illustrated in Figure 23.

Figure 23 Option No. 3 – 5th Line Drain Overflow Area



8.3 Reviewing Attenuation Impacts – Option No. 3

Burnside has reviewed the hydrological modelling completed by Dillon in support of Option No. 1 and No. 3 as noted above. As the Option No.3 attenuation facility is located upstream of the Option No 1 facility, we will review the attenuation of the Option No.3 attenuation facility first in this section of the report as this facility would have the most impact on downstream flow conditions. Table 19 illustrates the calculated peak flows at the Highway 400 crossings between the existing (Ex) conditions and proposed (post) conditions as referenced from the Dillon Report with the Option No. 3 detention facility included in the model.

Table 19 Dillon – Peak Flow Comparison at Highway 400

Return Interval	Ex- Dillon (m^3/s)	Post- Dillon (m^3/s)	Peak Flow Reduction (m^3/s)
2-Year	27.19	26.85	-0.34
5-Year	66.50	65.37	-1.13
10-Year	94.24	92.70	-1.54
25-Year	127.67	125.54	-2.13
100-Year	189.10	186.25	-2.85

The comparison in peak flow rates between existing and proposed conditions with the 5th Line drain overflow area shows minimal impacts of attenuation in the 2 to the 100-year events at the Highway 400 crossings. In summary, the construction of the Option No. 3 SWM facility only reduces peak flows by less than 2%. We note that this comparison has been made at the Highway 400 crossings and not within the Market Garden where it would be most desirable to witness attenuated peak flows and improved conveyance capacity.

Burnside has completed a detailed hydrological analysis of the attenuation impacts associated with Option No. 3 within the Burnside SWMHYMO Hydrological model. To complete this analysis, Burnside has used the Discharge-Storage curves referenced from the Dillion HYMO hydrological model to replicate the same storage characteristics within our hydrological model. This additional step has been completed to model the peak flow fluctuations at the various flow nodes located downstream of the SWM facility. Table 20 illustrates the reductions in peak flows downstream of the SWM facility as a result of the 5th Line drain overflow area.

Table 20 Option No. 3 – Pre to Post – Peak Flow Summary Comparison Table

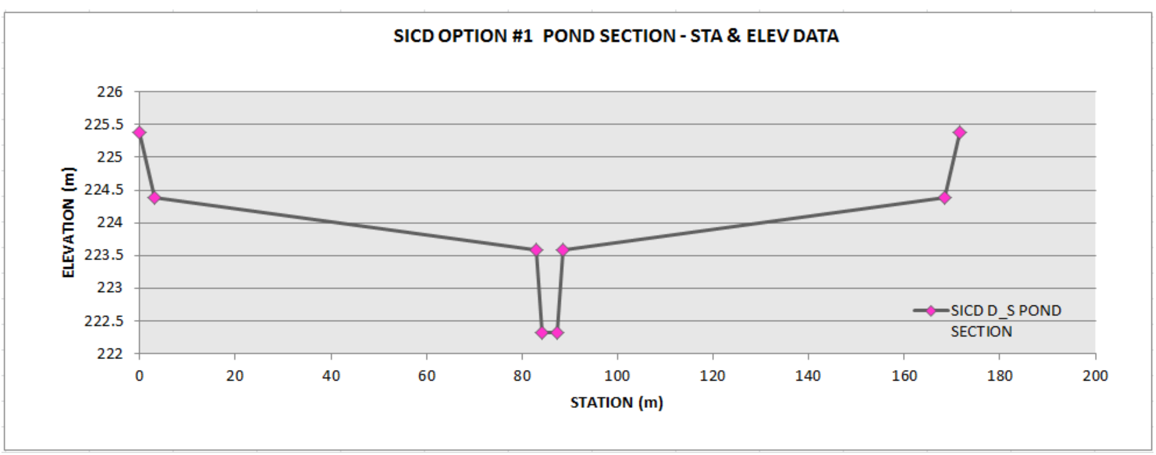
Flow Node	Description	Option No. 3 – Peak Flow Comparison		
		Ex -2 year	PR_w Pond – 2 year	Peak Flow Reduction
		(m^3/s)	(m^3/s)	(m^3/s)
Node 4	Total Flow at the 4th Line	5.44	2.02	-3.42
TFN3A	Outlet to 3rd Line (Main Drain)	8.13	4.59	-3.54
TFN2D	Total Flow Downstream of the 2nd Line	12.12	8.87	-3.25
Highway 400	**Total Flow at Highway 400**	**13.64**	**11.41**	-2.23
TFN15L	Total Flow at the 15th Line	12.89	10.89	-2.00

Based on the previous pond configuration and attenuation volumes as outlined in the Dillon report, in general, we agree that the 5th Line drain overflow area has the potential to provide a net reduction in peak flows for the 2-year return event. Peak flows have been observed to show the largest reduction in close proximity to the overflow area while decreasing in effectiveness the greater the distance away from it. However, we note that the majority of peak flow reductions have been provided to primarily one of many branch tributaries. This observation can be attributed to the impacts of peak flow timing within the watershed. Of interest we note a reduction of 3.25 m^3/s downstream of the 2nd Line (Market Garden Area) and a reduction of 2.2 3m^3/s at the Highway 400 Crossings as a result of the Option No.3 SWM facility. While agree that the reduction in peak flows may be attractive from a storm water perspective, accommodating an additional 2 to 3 m^3/s in the SICD is easily accommodated with nominal increased drain geometry. This nominal increase in drain geometry would be more cost-effective vs the overall cost of constructing a stormwater management facility. Accordingly, we have not considered the implementation of Option No. 3 attenuation facility within the final design of the SICD.

8.4 Reviewing Attenuation Impacts – Option No. 1 and Option No.3

The proposed drain overflow area located downstream of the 5 Sideroad and upstream of Highway 89 was not included in the Dillon hydrological modelling for reference for further use. Accordingly, we have replicated the overflow area by constructing the ROUTE Reservoir command within our SWMHYMO hydrological model. This overflow area encompassed a total footprint of five hectares over a total reach length of approximately 500 m. To replicate the storage area, we have used a typical reach cross section at STATION 0+100 as referenced on page 14 of 63 of the Dillon South Innisfil Creek Drain and Branches drawing set. In graphical format, the overflow area Option No. 1 typical section has been illustrated below.

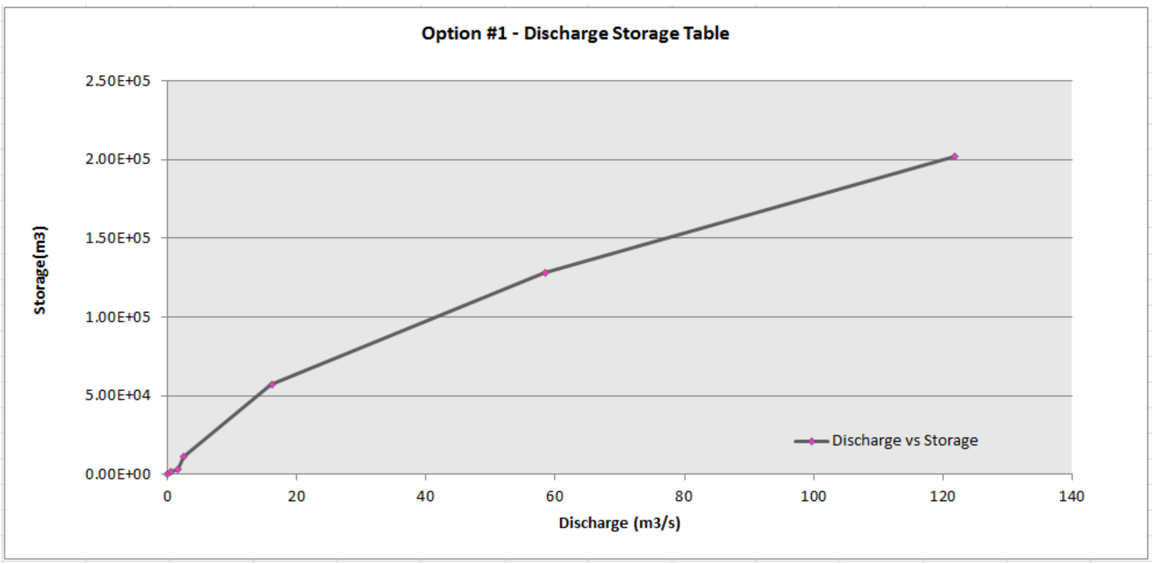
Figure 24 Option No. 1 – Proposed Drain Overflow – Typical Section



The SWMHYMO ROUTE Reservoir command requires two primary components to represent attenuation within the hydrological model. One of the components of the command requires storage volume of the facility to be provided. The storage volumes of the attenuation facility can be determined via the typical section as illustrated in Figure 24. The second component of the command requires the determination of peak flow elevations (stage) based on peak discharge flows. Accordingly, using the Overflow Area Typical cross section, a HY-8 hydraulic model was constructed to determine flow elevations at 0.5 m intervals within the overflow area. Refer to Appendix A for supporting HY-8 hydraulic modelling results.

The resulting storage discharge curve as illustrated in Figure 25 was then inserted into the SWHMYO Route reservoir command to assess the impacts of the attenuation capabilities of Overflow Area No. 1.

Figure 25 Option No. 1 – Storage Discharge Curve



We note that although Highway 89 resides downstream of Overflow Area No. 1, we have not accounted for storage upstream of the roadway as a result of the roadway itself. This analysis has been completed to replicate riparian storage only.

Table 21 illustrates the 2-year peak summary comparison between Option No. 1 and Option No. 3. Note, we have only referenced flow node TFN15L as this is the last flow node within the SICD watershed (downstream of Option No. 1) and all other flow nodes would not be influenced by the Option No. 1 overflow area attenuation facility.

Table 21 Option No. 1 and Option No. 3– Pre to Post – Peak Flow Summary Comparison Table

Flow Node	Description	Option No. 1 - Peak Flow Comparison			
		Ex -2 year	PR_w Opt. No. 3 Pond – 2 year	PR_w Opt. No. 1 Pond – 2 year	Peak Flow Reduction
		(m^3/s)	(m^3/s)	(m^3/s)	(%)
TFN15L	Total Flow at the 15th Line	12.89	10.89	10.54	-3.21

The Option No. 1 drain overflow area has been observed to marginally decrease peak flows in the 2-year return interval by approximately 3.2%. The drain overflow area is functioning as intended; however, this slight increase in peak flows can be attributed to the reduction of timing of peak release rates within the lower limits of the watershed. At first review, the Option No. 1 drain overflow area is not providing the intended attenuation function within the watershed.

Based on the marginal reduction in peak flows, coupled with the estimated (by Dillon) cost to construct the Option No 1 attenuation facility, we do not view this concept as a viable alternative for further exploration. Therefore, based on previous commentary in Section 8.3 and the commentary provided in this section of the report, the Option No 1 and Option No 3 attenuation facilities have not been included in the proposed conveyance improvements for the SICD by Burnside.

9.0 Conclusion and Recommendations

Burnside has completed a hydraulic analysis of the SICD and provided recommendations for conveyance improvements to meet the design criteria for the municipal drain in accordance with Section 78 of the Drainage Act.

- Peak flow calculations have been referenced and summarized from the South Innisfil Creek Drain Improvements Hydrology Report – Dated April 2018.
- HEC-RAS hydraulic modelling has been completed to replicate flow conditions associated with the 2-year peak flows.
- Proposed Drain geometry has been designed to contain the 2-year standard peak flows with up to 0.2 m of freeboard.
- The Proposed Drain geometry will contain the 2-year Hybrid Flow which has been outlined in the report as the 2-year standard peak flow plus 50% of the 2-year peak flow.

- A composite trapezoidal drain section has been proposed to provide conveyance of base flows within the low flow portion of the drain while conveying the 2-year event within the main section of the drain.
- Increased drain capacity has been achieved through a deepening of the drain through a revised profile grade as well as increased conveyance area.
- Private drain crossings have been sized to permit free flowing conditions in the 2-year event.
- Proposed interim conveyance recommendations have been provided for the Reive Boulevard and Highway 400 corridors.
- Burnside has reviewed and provided commentary the attenuation options presented in the Final Drainage Report for the South Innisfil Creek Drain and Branches, Town of Innisfil, 2013 completed by Dillon Consulting.

Based on the commentary above, the proposed drain improvements provide containment of the current day 2-year peak flows in accordance with the Municipal Drain design and construction guidelines while providing freeboard to accommodate future climate change impacts. As a result, we believe that the proposed drainage improvements represent the most practical conveyance solution for the South Innisfil Creek Drain.

[The Difference is our People]

Appendix A

Hydraulic Modelling Output Summary

Project Name: South Innisfil Creek Drainage Improvements
Project No: 300038790
Location: Town of Innisfil
Designer: J.Koen
Checked By: T.Lozon
Date: 28-Sep-17
Date Revised: 28-Sep-17

South Innisfil Creek Drain - Highway 89 to 400

Low Flow Channel

					4 cms			5 cms			6 cms			7cms			8 cms			9 cms			10 cms		
River Stn.	Left Bank Stn	Right Bank Stn	Left Bank Elev	Right Bank Elev	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.
17	17.94	35.77	227.97	225.72	225.04	-2.93	-0.68	225.23	-2.74	-0.49	225.39	-2.58	-0.33	225.53	-2.44	-0.19	225.65	-2.32	-0.07	225.75	-2.22	0.03	225.83	-2.14	0.11
16	11.13	28.75	227.13	225.98	225	-2.13	-0.98	225.19	-1.94	-0.79	225.35	-1.78	-0.63	225.49	-1.64	-0.49	225.61	-1.52	-0.37	225.71	-1.42	-0.27	225.79	-1.34	-0.19
15	18.48	35.94	227.53	225.65	224.97	-2.56	-0.68	225.16	-2.37	-0.49	225.32	-2.21	-0.33	225.46	-2.07	-0.19	225.58	-1.95	-0.07	225.68	-1.85	0.03	225.75	-1.78	0.1
14	20.1	40.64	226.86	226.18	224.95	-1.91	-1.23	225.14	-1.72	-1.04	225.29	-1.57	-0.89	225.43	-1.43	-0.75	225.54	-1.32	-0.64	225.64	-1.22	-0.54	225.72	-1.14	-0.46
13	27.83	38.28	226.76	224.93	224.91	-1.85	-0.02	225.1	-1.66	0.17	225.25	-1.51	0.32	225.38	-1.38	0.45	225.5	-1.26	0.57	225.6	-1.16	0.67	225.67	-1.09	0.74
12	21.56	35.88	225.45	226.05	224.83	-0.62	-1.22	225.01	-0.44	-1.04	225.16	-0.29	-0.89	225.29	-0.16	-0.76	225.41	-0.04	-0.64	225.51	0.06	-0.54	225.58	0.13	-0.47
11	12.17	29.6	225.26	226.35	224.73	-0.53	-1.62	224.91	-0.35	-1.44	225.06	-0.2	-1.29	225.19	-0.07	-1.16	225.3	0.04	-1.05	225.4	0.14	-0.95	**225.47**	**0.21**	**-0.88**
10	28.45	49.81	225.51	225.44	224.64	-0.87	-0.8	224.81	-0.7	-0.63	224.96	-0.55	-0.48	225.09	-0.42	-0.35	225.2	-0.31	-0.24	225.31	-0.2	-0.13	225.37	-0.14	-0.07
9	17.41	33.11	225.34	225.45	224.55	-0.79	-0.9	224.71	-0.63	-0.74	224.85	-0.49	-0.6	224.98	-0.36	-0.47	225.09	-0.25	-0.36	225.19	-0.15	-0.26	225.25	-0.09	-0.2
8	17.39	33.03	225.6	225.52	224.48	-1.12	-1.04	224.63	-0.97	-0.89	224.76	-0.84	-0.76	224.88	-0.72	-0.64	224.99	-0.61	-0.53	225.09	-0.51	-0.43	225.15	-0.45	-0.37
7	17.9	29.29	224.81	225.05	224.4	-0.41	-0.65	224.55	-0.26	-0.5	224.67	-0.14	-0.38	224.79	-0.02	-0.26	224.89	0.08	-0.16	224.99	0.18	-0.06	**225.07**	**0.26**	**0.02**
6.9	10.28	21.81	225.16	225.37	224.33	-0.83	-1.04	224.47	-0.69	-0.9	224.6	-0.56	-0.77	224.71	-0.45	-0.66	224.81	-0.35	-0.56	224.9	-0.26	-0.47	224.98	-0.18	-0.39
9	12.95	25.9	225.42	224.73	224.23	-1.19	-0.5	224.37	-1.05	-0.36	224.49	-0.93	-0.24	224.59	-0.83	-0.14	224.69	-0.73	-0.04	224.78	-0.64	0.05	224.86	-0.56	0.13
5	16.46	31.07	224.85	224.8	224.13	-0.72	-0.67	224.26	-0.59	-0.54	224.38	-0.47	-0.42	224.48	-0.37	-0.32	224.57	-0.28	-0.23	224.66	-0.19	-0.14	224.74	-0.11	-0.06
4	11.92	24.43	224.8	224.69	224	-0.8	-0.69	224.12	-0.68	-0.57	224.23	-0.57	-0.46	224.33	-0.47	-0.36	224.42	-0.38	-0.27	224.5	-0.3	-0.19	224.58	-0.22	-0.11
3.1	15.84	26.99	225.08	225.15	223.82	-1.26	-1.33	223.93	-1.15	-1.22	224.02	-1.06	-1.13	224.11	-0.97	-1.04	224.19	-0.89	-0.96	224.27	-0.81	-0.88	224.34	-0.74	-0.81
3	12.84	25.38	225.31	225.2	223.72	-1.59	-1.48	223.82	-1.49	-1.38	223.91	-1.4	-1.29	223.99	-1.32	-1.21	224.07	-1.24	-1.13	224.14	-1.17	-1.06	224.21	-1.1	-0.99
2	8.24	21.26	225.2	225.18	223.51	-1.69	-1.67	223.6	-1.6	-1.58	223.68	-1.52	-1.5	223.76	-1.44	-1.42	223.82	-1.38	-1.36	223.89	-1.31	-1.29	223.94	-1.26	-1.24
1	23.431	43.16	225.32	225.44	223.45	-1.87	-1.99	223.54	-1.78	-1.9	223.62	-1.7	-1.82	223.7	-1.62	-1.74	223.77	-1.55	-1.67	223.83	-1.49	-1.61	223.89	-1.43	-1.55

10cms
RS#7 & 11 Water Leaving System

Project Name: South Innisfil Creek Drainage Improvements
Project No: 300038790
Location: Town of Innisfil
Designer: J.Koen
Checked By: T.Lozon
Date: 10-Oct-17
Date Revised: 10-Oct-17

South Innisfil Creek Drain - 2nd Line to 3rd Line

Low Flow Channel

					5 cms			6 cms			7 cms			8 cms		
River Stn.	Left Bank Stn	Right Bank Stn	Left Bank Elev	Right Bank Elev	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.
3370.75	83.203	93.129	228.33	228.16	227.3	-1.03	-0.86	227.43	-0.9	-0.73	227.55	-0.78	-0.61	227.66	-0.67	-0.5
3256.52	121.038	129.237	227.96	228.00	227.14	-0.82	-0.86	227.27	-0.69	-0.73	227.39	-0.57	-0.61	227.5	-0.46	-0.5
3052.84	192.029	202.48	228.03	227.88	226.98	-1.05	-0.9	227.11	-0.92	-0.77	227.22	-0.81	-0.66	227.32	-0.71	-0.56
2736.03	279.843	292.714	227.35	227.47	226.8	-0.55	-0.67	226.92	-0.43	-0.55	227.04	-0.31	-0.43	227.13	-0.22	-0.34
2511.15	167.641	182.287	227.28	227.69	226.66	-0.62	-1.03	226.79	-0.49	-0.9	226.9	-0.38	-0.79	227	-0.28	-0.69
2236.95	159.69	178.579	227.51	227.72	226.54	-0.97	-1.18	226.67	-0.84	-1.05	226.78	-0.73	-0.94	226.87	-0.64	-0.85
1933.86	150.022	164.264	226.89	227.19	226.41	-0.48	-0.78	226.53	-0.36	-0.66	226.65	-0.24	-0.54	226.73	-0.16	-0.46
1705.96	89.561	105.77	227.24	227.83	226.3	-0.94	-1.53	226.42	-0.82	-1.41	226.53	-0.71	-1.3	226.61	-0.63	-1.22
1408.26	147.53	163.849	226.97	227.45	226.17	-0.8	-1.28	226.29	-0.68	-1.16	226.4	-0.57	-1.05	226.46	-0.51	-0.99
1185.62	251.163	265.705	226.69	226.56	226.1	-0.59	-0.46	226.22	-0.47	-0.34	226.32	-0.37	-0.24	226.38	-0.31	-0.18
834.4	250.866	265.988	226.18	226.94	225.96	-0.22	-0.98	226.07	-0.11	-0.87	226.17	-0.01	-0.77	226.23	0.05	-0.71
530.27	222.67	235.365	226.66	226.46	225.65	-1.01	-0.81	225.76	-0.9	-0.7	225.85	-0.81	-0.61	225.94	-0.72	-0.52
322.7	207.466	232.968	226.51	226.68	225.1	-1.41	-1.58	225.19	-1.32	-1.49	225.27	-1.24	-1.41	225.34	-1.17	-1.34

	9 cms			10 cms			11 cms			12 cms		
River Stn.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.
3370.75	227.76	-0.57	-0.4	227.85	-0.48	-0.31	227.94	-0.39	-0.22	228.01	-0.32	-0.15
3256.52	227.59	-0.37	-0.41	227.68	-0.28	-0.32	227.77	-0.19	-0.23	227.84	-0.12	-0.16
3052.84	227.41	-0.62	-0.47	227.49	-0.54	-0.39	227.57	-0.46	-0.31	227.63	-0.4	-0.25
2736.03	227.22	-0.13	-0.25	227.3	-0.05	-0.17	227.38	0.03	-0.09	227.43	0.08	-0.04
2511.15	227.1	-0.18	-0.59	227.18	-0.1	-0.51	227.25	-0.03	-0.44	227.3	0.02	-0.39
2236.95	226.96	-0.55	-0.76	227.05	-0.46	-0.67	227.12	-0.39	-0.6	227.15	-0.36	-0.57
1933.86	226.82	-0.07	-0.37	226.9	0.01	-0.29	226.96	0.07	-0.23	226.98	0.09	-0.21
1705.96	226.69	-0.55	-1.14	226.76	-0.48	-1.07	226.83	-0.41	-1	226.81	-0.43	-1.02
1408.26	226.54	-0.43	-0.91	226.6	-0.37	-0.85	226.65	-0.32	-0.8	226.58	-0.39	-0.87
1185.62	226.45	-0.24	-0.11	226.5	-0.19	-0.06	226.54	-0.15	-0.02	226.59	-0.1	0.03
834.4	226.3	0.12	-0.64	226.36	0.18	-0.58	226.41	0.23	-0.53	226.47	0.29	-0.47
530.27	226.02	-0.64	-0.44	226.1	-0.56	-0.36	226.18	-0.48	-0.28	226.26	-0.4	-0.2
322.7	225.41	-1.1	-1.27	225.48	-1.03	-1.2	225.55	-0.96	-1.13	225.62	-0.89	-1.06

Low Flow Channel

					13 cms			14 cms			15 cms			16 cms		
River Stn.	Left Bank Stn	Right Bank Stn	Left Bank Elev	Right Bank Elev	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.
3370.75	83.203	93.129	228.33	228.16	228.08	-0.25	-0.08	228.14	-0.19	-0.02	228.2	-0.13	0.04	228.22	-0.11	0.06
3256.52	121.038	129.237	227.96	228.00	227.89	-0.07	-0.11	227.95	-0.01	-0.05	228	0.04	0.00	228.06	0.1	0.06
3052.84	192.029	202.48	228.03	227.88	227.66	-0.37	-0.22	227.71	-0.32	-0.17	227.76	-0.27	-0.12	227.8	-0.23	-0.08
2736.03	279.843	292.714	227.35	227.47	227.43	0.08	-0.04	227.47	0.12	0	227.52	0.17	0.05	227.56	0.21	0.09
2511.15	167.641	182.287	227.28	227.69	227.27	-0.01	-0.42	227.3	0.02	-0.39	227.35	0.07	-0.34	227.39	0.11	-0.3
2236.95	159.69	178.579	227.51	227.72	227.07	-0.44	-0.65	227.08	-0.43	-0.64	227.11	-0.4	-0.61	227.15	-0.36	-0.57
1933.86	150.022	164.264	226.89	227.19	227	0.11	-0.19	227	0.11	-0.19	227.04	0.15	-0.15	227.09	0.2	-0.1
1705.96	89.561	105.77	227.24	227.83	226.91	-0.33	-0.92	226.88	-0.36	-0.95	226.94	-0.3	-0.89	226.98	-0.26	-0.85
1408.26	147.53	163.849	226.97	227.45	226.69	-0.28	-0.76	226.58	-0.39	-0.87	226.63	-0.34	-0.82	226.66	-0.31	-0.79
1185.62	251.163	265.705	226.69	226.56	226.54	-0.15	-0.02	226.59	-0.1	0.03	226.64	-0.05	0.08	226.68	-0.01	0.12
834.4	250.866	265.988	226.18	226.94	226.52	0.34	-0.42	226.57	0.39	-0.37	226.62	0.44	-0.32	226.66	0.48	-0.28
530.27	222.67	235.365	226.66	226.46	226.33	-0.33	-0.13	226.4	-0.26	-0.06	226.46	-0.2	0	226.51	-0.15	0.05
322.7	207.466	232.968	226.51	226.68	225.69	-0.82	-0.99	225.76	-0.75	-0.92	225.82	-0.69	-0.86	225.87	-0.64	-0.81

	17 cms			18 cms			19 cms			20 cms		
River Stn.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.	W.S.E	Left Bank Diff.	Right Bank Diff.
3370.75	228.27	-0.06	0.11	228.22	-0.11	0.06	228.24	-0.09	0.08	228.26	-0.07	0.1
3256.52	228.11	0.15	0.11	228.12	0.16	0.12	228.16	0.2	0.16	228.18	0.22	0.18
3052.84	227.85	-0.18	-0.03	227.9	-0.13	0.02	227.94	-0.09	0.06	227.93	-0.1	0.05
2736.03	227.61	0.26	0.14	227.65	0.3	0.18	227.7	0.35	0.23	227.62	0.27	0.15
2511.15	227.43	0.15	-0.26	227.48	0.2	-0.21	227.52	0.24	-0.17	227.57	0.29	-0.12
2236.95	227.18	-0.33	-0.54	227.22	-0.29	-0.5	227.25	-0.26	-0.47	227.29	-0.22	-0.43
1933.86	227.13	0.24	-0.06	227.17	0.28	-0.02	227.22	0.33	0.03	227.26	0.37	0.07
1705.96	227.03	-0.21	-0.8	227.07	-0.17	-0.76	227.12	-0.12	-0.71	227.16	-0.08	-0.67
1408.26	226.68	-0.29	-0.77	226.72	-0.25	-0.73	226.76	-0.21	-0.69	226.8	-0.17	-0.65
1185.62	226.71	0.02	0.15	226.75	0.06	0.19	226.79	0.1	0.23	226.83	0.14	0.27
834.4	226.7	0.52	-0.24	226.74	0.56	-0.2	226.78	0.6	-0.16	226.82	0.64	-0.12
530.27	226.55	-0.11	0.09	226.6	-0.06	0.14	226.64	-0.02	0.18	226.67	0.01	0.21
322.7	225.92	-0.59	-0.76	225.97	-0.54	-0.71	226.01	-0.5	-0.67	226.05	-0.46	-0.63

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
[The Difference is our People]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	7989.92	2-Year-Std	5.44	228.66	229.87		229.91	0.002477	0.92	5.9	8.46	0.35
Innisfil Creek	7989.92	2-Year-CC	9.94	228.66	230.25		230.3	0.002183	1.05	9.43	10.05	0.35
Innisfil Creek	7989.92	2yr + 50% Std	8.16	228.66	230.1		230.16	0.002313	1.02	8.03	9.46	0.35
Innisfil Creek	7959.34	2-Year-Std	5.44	228.6	229.79		229.82	0.003075	0.87	6.26	11.77	0.38
Innisfil Creek	7959.34	2-Year-CC	9.94	228.6	230.2		230.24	0.00166	0.84	11.78	14.61	0.3
Innisfil Creek	7959.34	2yr + 50% Std	8.16	228.6	230.05		230.09	0.001997	0.85	9.61	13.54	0.32
Innisfil Creek	7955.93	2-Year-Std	5.44	228.62	229.78	229.33	229.81	0.001879	0.84	6.45	11.23	0.32
Innisfil Creek	7955.93	2-Year-CC	9.94	228.62	230.18	229.54	230.23	0.001458	0.97	10.25	15.33	0.3
Innisfil Creek	7955.93	2yr + 50% Std	8.16	228.62	230.03	229.47	230.08	0.001614	0.92	8.84	13.77	0.31
Innisfil Creek	7925.47		Culvert									
Innisfil Creek	7903.16	2-Year-Std	5.44	228.48	229.75	229.22	229.77	0.00122	0.73	7.5	12.51	0.26
Innisfil Creek	7903.16	2-Year-CC	9.94	228.48	230.1	229.4	230.14	0.001222	0.91	10.88	15.38	0.27
Innisfil Creek	7903.16	2yr + 50% Std	8.16	228.48	229.97	229.33	230.01	0.001228	0.85	9.65	14.31	0.27
Innisfil Creek	7894.38	2-Year-Std	5.44	228.47	229.72		229.76	0.001877	0.82	6.65	9.33	0.31
Innisfil Creek	7894.38	2-Year-CC	9.94	228.47	230.08		230.13	0.001948	0.95	10.45	12.14	0.33
Innisfil Creek	7894.38	2yr + 50% Std	8.16	228.47	229.95		229.99	0.00187	0.91	8.95	10.67	0.32
Innisfil Creek	7859.36	2-Year-Std	5.44	228.39	229.65		229.69	0.001961	0.85	6.38	8.63	0.32
Innisfil Creek	7859.36	2-Year-CC	9.94	228.39	230.01		230.06	0.001997	1.03	9.7	10.06	0.33
Innisfil Creek	7859.36	2yr + 50% Std	8.16	228.39	229.88		229.93	0.001987	0.97	8.44	9.54	0.33
Innisfil Creek	7806.96	2-Year-Std	5.44	228.28	229.53		229.57	0.002402	0.92	5.92	8.34	0.35
Innisfil Creek	7806.96	2-Year-CC	9.94	228.28	229.89		229.95	0.002344	1.09	9.12	9.72	0.36
Innisfil Creek	7806.96	2yr + 50% Std	8.16	228.28	229.76		229.81	0.002361	1.03	7.91	9.22	0.36
Innisfil Creek	7754.55	2-Year-Std	5.44	228.18	229.42		229.46	0.002108	0.87	6.23	8.59	0.33
Innisfil Creek	7754.55	2-Year-CC	9.94	228.18	229.77		229.83	0.002118	1.04	9.58	10.25	0.34
Innisfil Creek	7754.55	2yr + 50% Std	8.16	228.18	229.64		229.69	0.002121	0.98	8.31	9.65	0.34
Innisfil Creek	7704.9	2-Year-Std	5.44	228.07	229.31		229.35	0.002086	0.87	6.25	8.59	0.33
Innisfil Creek	7704.9	2-Year-CC	9.94	228.07	229.67		229.72	0.002085	1.04	9.55	10.01	0.34
Innisfil Creek	7704.9	2yr + 50% Std	8.16	228.07	229.54		229.59	0.002086	0.98	8.31	9.5	0.34
Innisfil Creek	7651.65	2-Year-Std	5.44	227.96	229.2		229.24	0.00211	0.87	6.22	8.57	0.33
Innisfil Creek	7651.65	2-Year-CC	9.94	227.96	229.56		229.61	0.002102	1.04	9.52	10	0.34
Innisfil Creek	7651.65	2yr + 50% Std	8.16	227.96	229.43		229.48	0.002106	0.99	8.28	9.48	0.34
Innisfil Creek	7601.12	2-Year-Std	5.44	227.86	229.1		229.13	0.002063	0.87	6.28	8.65	0.32
Innisfil Creek	7601.12	2-Year-CC	9.94	227.86	229.45		229.51	0.002051	1.03	9.62	10.08	0.34
Innisfil Creek	7601.12	2yr + 50% Std	8.16	227.86	229.32		229.37	0.002056	0.98	8.36	9.56	0.33
Innisfil Creek	7550.06	2-Year-Std	5.44	227.75	228.99		229.03	0.002021	0.86	6.34	8.7	0.32
Innisfil Creek	7550.06	2-Year-CC	9.94	227.75	229.35		229.4	0.002012	1.02	9.7	10.15	0.33
Innisfil Creek	7550.06	2yr + 50% Std	8.16	227.75	229.22		229.27	0.002016	0.97	8.43	9.63	0.33
Innisfil Creek	7494.73	2-Year-Std	5.44	227.63	228.88		228.92	0.002045	0.86	6.3	8.63	0.32
Innisfil Creek	7494.73	2-Year-CC	9.94	227.63	229.24		229.29	0.002044	1.03	9.63	10.07	0.34
Innisfil Creek	7494.73	2yr + 50% Std	8.16	227.63	229.11		229.16	0.002045	0.97	8.37	9.54	0.33
Innisfil Creek	7435.18	2-Year-Std	5.44	227.51	228.75		228.79	0.002137	0.88	6.17	8.47	0.33
Innisfil Creek	7435.18	2-Year-CC	9.94	227.51	229.11		229.17	0.002135	1.05	9.44	9.87	0.34
Innisfil Creek	7435.18	2yr + 50% Std	8.16	227.51	228.98		229.03	0.002136	0.99	8.21	9.36	0.34
Innisfil Creek	7380.71	2-Year-Std	5.44	227.4	228.64		228.68	0.002032	0.86	6.32	8.67	0.32
Innisfil Creek	7380.71	2-Year-CC	9.94	227.4	229		229.05	0.002025	1.03	9.68	10.14	0.34
Innisfil Creek	7380.71	2yr + 50% Std	8.16	227.4	228.87		228.92	0.00203	0.97	8.41	9.61	0.33
Innisfil Creek	7328.15	2-Year-Std	5.44	227.29	228.53		228.57	0.00208	0.87	6.25	8.58	0.33
Innisfil Creek	7328.15	2-Year-CC	9.94	227.29	228.89		228.94	0.002074	1.04	9.57	10.01	0.34
Innisfil Creek	7328.15	2yr + 50% Std	8.16	227.29	228.76		228.81	0.002079	0.98	8.31	9.49	0.33
Innisfil Creek	7274.39	2-Year-Std	5.44	227.18	228.42		228.46	0.002138	0.88	6.18	8.49	0.33
Innisfil Creek	7274.39	2-Year-CC	9.94	227.18	228.78		228.83	0.002118	1.05	9.46	9.84	0.34
Innisfil Creek	7274.39	2yr + 50% Std	8.16	227.18	228.65		228.7	0.002127	0.99	8.22	9.36	0.34
Innisfil Creek	7217.73	2-Year-Std	5.44	227.06	228.3		228.34	0.002078	0.87	6.27	8.63	0.33
Innisfil Creek	7217.73	2-Year-CC	9.94	227.06	228.66		228.71	0.002047	1.03	9.63	10.1	0.34
Innisfil Creek	7217.73	2yr + 50% Std	8.16	227.06	228.53		228.58	0.002062	0.98	8.35	9.57	0.33
Innisfil Creek	7164.17	2-Year-Std	5.44	226.95	228.19		228.23	0.002088	0.87	6.25	8.59	0.33
Innisfil Creek	7164.17	2-Year-CC	9.94	226.95	228.55		228.6	0.002048	1.03	9.61	10.04	0.34
Innisfil Creek	7164.17	2yr + 50% Std	8.16	226.95	228.42		228.47	0.002067	0.98	8.33	9.51	0.33
Innisfil Creek	7112.51	2-Year-Std	5.44	226.84	228.08		228.12	0.002115	0.88	6.22	8.56	0.33
Innisfil Creek	7112.51	2-Year-CC	9.94	226.84	228.44		228.5	0.002052	1.04	9.6	10.02	0.34
Innisfil Creek	7112.51	2yr + 50% Std	8.16	226.84	228.31		228.36	0.002079	0.98	8.31	9.49	0.33
Innisfil Creek	7050.16	2-Year-Std	5.44	226.71	227.96		227.99	0.001839	0.83	6.58	8.94	0.31
Innisfil Creek	7050.16	2-Year-CC	9.94	226.71	228.33		228.38	0.001788	0.98	10.16	10.47	0.32
Innisfil Creek	7050.16	2yr + 50% Std	8.16	226.71	228.19		228.24	0.001814	0.93	8.79	9.91	0.31
Innisfil Creek	6996.9	2-Year-Std	5.44	226.6	227.86		227.89	0.001939	0.85	6.41	8.69	0.31
Innisfil Creek	6996.9	2-Year-CC	9.94	226.6	228.23		228.28	0.001882	1	9.91	10.17	0.32
Innisfil Creek	6996.9	2yr + 50% Std	8.16	226.6	228.09		228.14	0.001915	0.95	8.57	9.63	0.32
Innisfil Creek	6945.47	2-Year-Std	5.44	226.49	227.76		227.8	0.001853	0.83	6.52	8.76	0.31
Innisfil Creek	6945.47	2-Year-CC	9.94	226.49	228.13		228.18	0.001803	0.99	10.08	10.29	0.32
Innisfil Creek	6945.47	2yr + 50% Std	8.16	226.49	228		228.04	0.001835	0.94	8.71	9.72	0.32
Innisfil Creek	6894.65	2-Year-Std	5.44	226.39	227.64		227.68	0.002581	0.94	5.77	8.22	0.36
Innisfil Creek	6894.65	2-Year-CC	9.94	226.39	228.02		228.08	0.002307	1.08	9.21	9.84	0.36
Innisfil Creek	6894.65	2yr + 50% Std	8.16	226.39	227.88		227.93	0.002419	1.04	7.86	9.24	0.36
Innisfil Creek	6841.91	2-Year-Std	5.44	226.28	227.53		227.56	0.001941	0.85	6.43	8.77	0.32
Innisfil Creek	6841.91	2-Year-CC	9.94	226.28	227.92		227.97	0.001742	0.97	10.22	10.38	0.31
Innisfil Creek	6841.91	2yr + 50% Std	8.16	226.28	227.78		227.82	0.001824	0.93	8.74	9.79	0.32
Innisfil Creek	6783.42	2-Year-Std	5.44	226.16	227.43		227.46	0.001677	0.77	7.02	9.92	0.29
Innisfil Creek	6783.42	2-Year-CC	9.94	226.16	227.84		227.88	0.001393	0.86	11.56	12.17	0.28
Innisfil Creek	6783.42	2yr + 50% Std	8.16	226.16	227.69		227.72	0.001478	0.83	9.78	11.25	0.29
Innisfil Creek	6729.42	2-Year-Std	5.44	226.06	227.35		227.37	0.001368	0.73	7.46	9.92	0.27
Innisfil Creek	6729.42	2-Year-CC	9.94	226.06	227.77		227.81	0.001164	0.82	12.1	11.88	0.26
Innisfil Creek	6729.42	2yr + 50% Std	8.16	226.06	227.62		227.65	0.00123	0.79	10.3	11.15	0.26

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
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BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	6675.61	2-Year-Std	5.44	225.96	227.26		227.29	0.00165	0.8	6.78	8.82	0.29
Innisfil Creek	6675.61	2-Year-CC	9.94	225.96	227.7		227.74	0.001398	0.9	11.01	10.57	0.28
Innisfil Creek	6675.61	2yr + 50% Std	8.16	225.96	227.54		227.57	0.001481	0.87	9.37	9.93	0.29
Innisfil Creek	6625.44	2-Year-Std	5.44	225.86	227.18		227.21	0.001622	0.8	6.78	8.7	0.29
Innisfil Creek	6625.44	2-Year-CC	9.94	225.86	227.63		227.67	0.001349	0.9	11.07	10.38	0.28
Innisfil Creek	6625.44	2yr + 50% Std	8.16	225.86	227.46		227.5	0.00143	0.87	9.42	9.75	0.28
Innisfil Creek	6574.68	2-Year-Std	5.44	225.77	227.1		227.13	0.001542	0.79	6.92	8.82	0.28
Innisfil Creek	6574.68	2-Year-CC	9.94	225.77	227.56		227.6	0.001242	0.87	11.45	10.64	0.27
Innisfil Creek	6574.68	2yr + 50% Std	8.16	225.77	227.4		227.43	0.001328	0.84	9.71	9.98	0.27
Innisfil Creek	6520.14	2-Year-Std	5.44	225.67	227.02		227.05	0.001334	0.74	7.32	9.14	0.26
Innisfil Creek	6520.14	2-Year-CC	9.94	225.67	227.5		227.54	0.001056	0.82	12.2	11.07	0.25
Innisfil Creek	6520.14	2yr + 50% Std	8.16	225.67	227.33		227.36	0.001131	0.79	10.34	10.38	0.25
Innisfil Creek	6459.61	2-Year-Std	5.44	225.55	226.95		226.97	0.001164	0.71	7.68	9.3	0.25
Innisfil Creek	6459.61	2-Year-CC	9.94	225.55	227.45		227.48	0.000921	0.78	12.82	11.32	0.23
Innisfil Creek	6459.61	2yr + 50% Std	8.16	225.55	227.27		227.3	0.000982	0.75	10.88	10.6	0.24
Innisfil Creek	6408.33	2-Year-Std	5.44	225.46	226.89	226.25	226.92	0.001062	0.69	7.91	9.32	0.24
Innisfil Creek	6408.33	2-Year-CC	9.94	225.46	227.4	226.46	227.43	0.000845	0.75	13.19	19.65	0.22
Innisfil Creek	6408.33	2yr + 50% Std	8.16	225.46	227.22	226.38	227.25	0.000897	0.73	11.21	12.63	0.23
Innisfil Creek	6357.07	2-Year-Std	5.44	225.36	226.84	226.15	226.87	0.000909	0.65	8.32	9.38	0.22
Innisfil Creek	6357.07	2-Year-CC	9.94	225.36	227.36	226.36	227.39	0.000746	0.72	13.71	17.38	0.21
Innisfil Creek	6357.07	2yr + 50% Std	8.16	225.36	227.18	226.28	227.21	0.000783	0.7	11.7	10.67	0.21
Innisfil Creek	6350.13	2-Year-Std	3.17	225.35	226.85	226	226.86	0.000271	0.42	7.52	9.74	0.13
Innisfil Creek	6350.13	2-Year-CC	5.78	225.35	227.37	226.15	227.38	0.000254	0.52	11.01	16.29	0.13
Innisfil Creek	6350.13	2yr + 50% Std	4.75	225.35	227.18	226.09	227.2	0.000254	0.49	9.79	11.05	0.13
Innisfil Creek	6332.44		Bridge									
Innisfil Creek	6320.07	2-Year-Std	3.17	225.3	226.83	225.94	226.84	0.000233	0.4	7.84	9.78	0.12
Innisfil Creek	6320.07	2-Year-CC	5.78	225.3	227.34	226.08	227.36	0.00023	0.51	11.29	13.91	0.13
Innisfil Creek	6320.07	2yr + 50% Std	4.75	225.3	227.16	226.03	227.18	0.000227	0.47	10.08	11.05	0.12
Innisfil Creek	6308.21	2-Year-Std	3.17	225.27	226.83	225.85	226.83	0.000248	0.35	8.96	9.52	0.12
Innisfil Creek	6308.21	2-Year-CC	5.78	225.27	227.34	226.07	227.35	0.000219	0.4	14.37	15.28	0.11
Innisfil Creek	6308.21	2yr + 50% Std	4.75	225.27	227.16	226.02	227.17	0.000226	0.38	12.37	12.22	0.11
Innisfil Creek	6298.01	2-Year-Std	8.35	225.25	226.78	226.18	226.82	0.001841	0.95	8.83	10.02	0.32
Innisfil Creek	6298.01	2-Year-CC	15.16	225.25	227.28	226.44	227.34	0.001582	1.06	14.28	15.97	0.31
Innisfil Creek	6298.01	2yr + 50% Std	12.53	225.25	227.11	226.35	227.16	0.001652	1.02	12.25	13.13	0.31
Innisfil Creek	6244.02	2-Year-Std	8.35	225.15	226.68		226.72	0.001846	0.95	8.81	9.71	0.32
Innisfil Creek	6244.02	2-Year-CC	15.16	225.15	227.2		227.26	0.001529	1.05	14.45	11.82	0.3
Innisfil Creek	6244.02	2yr + 50% Std	12.53	225.15	227.02		227.07	0.001607	1.01	12.37	11.09	0.31
Innisfil Creek	6192.36	2-Year-Std	8.35	225.06	226.58		226.63	0.001794	0.94	8.92	9.81	0.31
Innisfil Creek	6192.36	2-Year-CC	15.16	225.06	227.13		227.18	0.001427	1.02	14.84	12.01	0.29
Innisfil Creek	6192.36	2yr + 50% Std	12.53	225.06	226.94		226.99	0.001509	0.99	12.68	11.26	0.3
Innisfil Creek	6158.78	2-Year-Std	8.35	224.99	226.52		226.57	0.001759	0.93	8.99	9.86	0.31
Innisfil Creek	6158.78	2-Year-CC	15.16	224.99	227.08		227.13	0.001362	1	15.1	12.12	0.29
Innisfil Creek	6158.78	2yr + 50% Std	12.53	224.99	226.89		226.94	0.001444	0.97	12.88	11.35	0.29
Innisfil Creek	6152.49	2-Year-Std	8.35	224.98	226.5	225.91	226.55	0.001781	1.02	8.19	9.69	0.32
Innisfil Creek	6152.49	2-Year-CC	15.16	224.98	227.04	226.17	227.11	0.001458	1.22	12.44	11.84	0.31
Innisfil Creek	6152.49	2yr + 50% Std	12.53	224.98	226.86	226.07	226.92	0.001494	1.14	11.01	11.12	0.31
Innisfil Creek	6138.03		Bridge									
Innisfil Creek	6122.68	2-Year-Std	8.35	224.93	226.39	225.86	226.45	0.002373	1.12	7.47	11.04	0.36
Innisfil Creek	6122.68	2-Year-CC	15.16	224.93	226.91	226.13	227	0.001853	1.31	11.58	17.84	0.35
Innisfil Creek	6122.68	2yr + 50% Std	12.53	224.93	226.74	226.03	226.82	0.001907	1.22	10.24	15.6	0.34
Innisfil Creek	6117.41	2-Year-Std	8.35	224.92	226.4		226.43	0.001238	0.77	10.85	12.27	0.26
Innisfil Creek	6117.41	2-Year-CC	15.16	224.92	226.93		226.97	0.000939	0.85	17.77	13.72	0.24
Innisfil Creek	6117.41	2yr + 50% Std	12.53	224.92	226.76		226.79	0.000972	0.81	15.42	13.25	0.24
Innisfil Creek	6109.82	2-Year-Std	8.35	224.91	226.4		226.42	0.000499	0.55	15.18	14.31	0.17
Innisfil Creek	6109.82	2-Year-CC	15.16	224.91	226.94		226.96	0.000469	0.65	23.23	16.01	0.17
Innisfil Creek	6109.82	2yr + 50% Std	12.53	224.91	226.76		226.78	0.000458	0.61	20.5	15.34	0.17
Innisfil Creek	6059.75	2-Year-Std	8.35	224.88	226.38		226.39	0.000448	0.51	16.34	16.52	0.16
Innisfil Creek	6059.75	2-Year-CC	15.16	224.88	226.92		226.93	0.000443	0.57	26.76	23.01	0.17
Innisfil Creek	6059.75	2yr + 50% Std	12.53	224.88	226.74		226.76	0.000476	0.55	22.82	21.71	0.17
Innisfil Creek	6009.78	2-Year-Std	8.35	224.86	226.36		226.37	0.000446	0.51	16.36	16.5	0.16
Innisfil Creek	6009.78	2-Year-CC	15.16	224.86	226.9		226.91	0.000434	0.57	26.8	22.76	0.17
Innisfil Creek	6009.78	2yr + 50% Std	12.53	224.86	226.72		226.73	0.000473	0.55	22.85	21.7	0.17
Innisfil Creek	5959.77	2-Year-Std	8.35	224.83	226.34		226.35	0.000442	0.51	16.4	16.5	0.16
Innisfil Creek	5959.77	2-Year-CC	15.16	224.83	226.87		226.89	0.000426	0.57	26.75	22.31	0.17
Innisfil Creek	5959.77	2yr + 50% Std	12.53	224.83	226.69		226.71	0.000461	0.55	22.84	21.24	0.17
Innisfil Creek	5909.75	2-Year-Std	8.35	224.81	226.31		226.33	0.000438	0.51	16.46	16.53	0.16
Innisfil Creek	5909.75	2-Year-CC	15.16	224.81	226.85		226.87	0.000429	0.56	27.01	22.99	0.17
Innisfil Creek	5909.75	2yr + 50% Std	12.53	224.81	226.67		226.69	0.000473	0.55	22.93	21.9	0.17
Innisfil Creek	5858.47	2-Year-Std	8.35	224.78	226.29		226.31	0.000432	0.5	16.54	16.57	0.16
Innisfil Creek	5858.47	2-Year-CC	15.16	224.78	226.83		226.85	0.000407	0.56	26.88	21.76	0.16
Innisfil Creek	5858.47	2yr + 50% Std	12.53	224.78	226.65		226.66	0.000448	0.55	22.95	21.03	0.17
Innisfil Creek	5808.8	2-Year-Std	8.35	224.76	226.27		226.28	0.000427	0.5	16.61	16.58	0.16
Innisfil Creek	5808.8	2-Year-CC	15.16	224.76	226.81		226.83	0.000404	0.56	27.12	22.14	0.16
Innisfil Creek	5808.8	2yr + 50% Std	12.53	224.76	226.63		226.64	0.00045	0.54	23.07	21.38	0.17
Innisfil Creek	5758.17	2-Year-Std	8.35	224.73	226.25		226.26	0.000423	0.5	16.65	16.57	0.16
Innisfil Creek	5758.17	2-Year-CC	15.16	224.73	226.79		226.81	0.000403	0.56	27.1	22.08	0.16
Innisfil Creek	5758.17	2yr + 50% Std	12.53	224.73	226.6		226.62	0.000452	0.54	23.01	21.31	0.17
Innisfil Creek	5708.09	2-Year-Std	8.35	224.71	226.23	225.42	226.24	0.000416	0.5	16.76	16.63	0.16
Innisfil Creek	5708.09	2-Year-CC	15.16	224.71	226.77	225.59	226.79	0.000417	0.55	27.44	28.46	0.16
Innisfil Creek	5708.09	2yr + 50% Std	12.53	224.71	226.58	225.53	226.59	0.000467	0.54	23.12	22.17	0.17

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

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[The Difference is our People]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	5658.05	2-Year-Std	8.35	224.68	226.21	225.39	226.22	0.000413	0.5	16.79	16.61	0.16
Innisfil Creek	5658.05	2-Year-CC	15.16	224.68	226.75	225.56	226.77	0.000409	0.56	27.19	38.92	0.16
Innisfil Creek	5658.05	2yr + 50% Std	12.53	224.68	226.56	225.5	226.57	0.000479	0.55	22.88	24.41	0.17
Innisfil Creek	5606.26	2-Year-Std	8.35	224.66	226.19		226.2	0.000407	0.5	16.87	16.62	0.16
Innisfil Creek	5606.26	2-Year-CC	15.16	224.66	226.73		226.74	0.000409	0.56	27.12	22.23	0.16
Innisfil Creek	5606.26	2yr + 50% Std	12.53	224.66	226.53		226.55	0.00038	0.55	22.87	18.3	0.16
Innisfil Creek	5554.3	2-Year-Std	8.35	224.63	226.17		226.18	0.0004	0.49	16.97	16.66	0.16
Innisfil Creek	5554.3	2-Year-CC	15.16	224.63	226.71		226.72	0.000421	0.56	27.09	22.69	0.16
Innisfil Creek	5554.3	2yr + 50% Std	12.53	224.63	226.51		226.53	0.000366	0.54	23	18.05	0.15
Innisfil Creek	5496.18	2-Year-Std	8.35	224.6	226.14	225.3	226.16	0.000367	0.47	17.62	17.17	0.15
Innisfil Creek	5496.18	2-Year-CC	15.16	224.6	226.69	225.47	226.7	0.000325	0.55	27.51	24.74	0.15
Innisfil Creek	5496.18	2yr + 50% Std	12.53	224.6	226.49	225.41	226.51	0.000335	0.52	23.88	18.59	0.15
Innisfil Creek	5440.69	2-Year-Std	8.77	224.57	226.12		226.14	0.000389	0.49	18.02	17.7	0.15
Innisfil Creek	5440.69	2-Year-CC	15.81	224.57	226.67		226.68	0.000338	0.56	28.35	20.28	0.15
Innisfil Creek	5440.69	2yr + 50% Std	13.16	224.57	226.47		226.49	0.000355	0.54	24.54	19.37	0.15
Innisfil Creek	5387.54	2-Year-Std	8.77	224.55	226.1		226.11	0.000415	0.5	17.5	17.22	0.16
Innisfil Creek	5387.54	2-Year-CC	15.81	224.55	226.65		226.66	0.000356	0.57	27.59	19.69	0.15
Innisfil Creek	5387.54	2yr + 50% Std	13.16	224.55	226.45		226.47	0.000375	0.55	23.87	18.82	0.16
Innisfil Creek	5337.73	2-Year-Std	8.77	224.52	226.08	225.24	226.09	0.000415	0.51	17.33	16.75	0.16
Innisfil Creek	5337.73	2-Year-CC	15.81	224.52	226.63	225.42	226.65	0.000361	0.58	27.13	18.95	0.16
Innisfil Creek	5337.73	2yr + 50% Std	13.16	224.52	226.44	225.35	226.45	0.000378	0.56	23.53	18.17	0.16
Innisfil Creek	5287.92	2-Year-Std	8.77	224.5	226.06		226.07	0.000409	0.5	17.41	16.78	0.16
Innisfil Creek	5287.92	2-Year-CC	15.81	224.5	226.61		226.63	0.000355	0.58	27.28	18.99	0.15
Innisfil Creek	5287.92	2yr + 50% Std	13.16	224.5	226.42		226.43	0.000372	0.56	23.66	18.21	0.16
Innisfil Creek	5230.43	2-Year-Std	8.77	224.47	226.04	225.19	226.05	0.0004	0.5	17.56	16.85	0.16
Innisfil Creek	5230.43	2-Year-CC	15.81	224.47	226.59	225.36	226.61	0.000346	0.57	27.53	19.07	0.15
Innisfil Creek	5230.43	2yr + 50% Std	13.16	224.47	226.4	225.3	226.41	0.000363	0.55	23.87	18.29	0.15
Innisfil Creek	5205		Bridge									
Innisfil Creek	5180.56	2-Year-Std	8.77	224.44	226.02	225.17	226.03	0.000395	0.5	17.62	16.84	0.16
Innisfil Creek	5180.56	2-Year-CC	15.81	224.44	226.56	225.34	226.58	0.000352	0.58	27.36	19.02	0.15
Innisfil Creek	5180.56	2yr + 50% Std	13.16	224.44	226.38	225.28	226.39	0.000361	0.55	23.92	18.28	0.15
Innisfil Creek	5130.44	2-Year-Std	8.77	224.42	226	225.14	226.01	0.00039	0.5	17.69	16.84	0.15
Innisfil Creek	5130.44	2-Year-CC	15.81	224.42	226.54	225.31	226.56	0.000347	0.58	27.48	19.02	0.15
Innisfil Creek	5130.44	2yr + 50% Std	13.16	224.42	226.36	225.25	226.37	0.000356	0.55	24.03	18.28	0.15
Innisfil Creek	5081.27	2-Year-Std	8.77	224.39	225.98	225.11	225.99	0.000383	0.49	17.8	16.89	0.15
Innisfil Creek	5081.27	2-Year-CC	15.81	224.39	226.53	225.29	226.54	0.000341	0.57	27.66	19.07	0.15
Innisfil Creek	5081.27	2yr + 50% Std	13.16	224.39	226.34	225.23	226.36	0.000349	0.54	24.19	18.34	0.15
Innisfil Creek	5030.83	2-Year-Std	8.77	224.37	225.96	225.09	225.97	0.000379	0.49	17.86	16.87	0.15
Innisfil Creek	5030.83	2-Year-CC	15.81	224.37	226.51	225.26	226.53	0.000337	0.57	27.78	24.67	0.15
Innisfil Creek	5030.83	2yr + 50% Std	13.16	224.37	226.32	225.2	226.34	0.000345	0.54	24.28	18.32	0.15
Innisfil Creek	5000		Bridge									
Innisfil Creek	4979.68	2-Year-Std	8.77	224.34	225.94	225.06	225.95	0.000373	0.49	17.95	16.89	0.15
Innisfil Creek	4979.68	2-Year-CC	15.81	224.34	226.49	225.24	226.5	0.000334	0.57	28.04	23.82	0.15
Innisfil Creek	4979.68	2yr + 50% Std	13.16	224.34	226.3	225.18	226.32	0.000341	0.54	24.37	18.34	0.15
Innisfil Creek	4929.66	2-Year-Std	8.77	224.32	225.92	225.04	225.93	0.000344	0.47	21.01	42.29	0.15
Innisfil Creek	4929.66	2-Year-CC	15.81	224.32	226.48	225.21	226.49	0.000191	0.43	46.53	48.84	0.11
Innisfil Creek	4929.66	2yr + 50% Std	13.16	224.32	226.29	225.15	226.3	0.000225	0.44	37.56	46.65	0.12
Innisfil Creek	4879.67	2-Year-Std	8.77	224.29	225.9	225.01	225.92	0.000355	0.48	18.27	17.05	0.15
Innisfil Creek	4879.67	2-Year-CC	15.81	224.29	226.47	225.19	226.48	0.000251	0.44	44.35	59.8	0.13
Innisfil Creek	4879.67	2yr + 50% Std	13.16	224.29	226.28	225.12	226.29	0.000356	0.48	32.87	59.41	0.15
Innisfil Creek	4775.19	2-Year-Std	8.77	224.24	225.87	224.96	225.88	0.000341	0.47	18.53	48.2	0.15
Innisfil Creek	4775.19	2-Year-CC	15.81	224.24	226.44	225.13	226.45	0.000271	0.52	36.32	99.53	0.14
Innisfil Creek	4775.19	2yr + 50% Std	13.16	224.24	226.24	225.07	226.25	0.000306	0.52	26.56	68.23	0.14
Innisfil Creek	4725.54	2-Year-Std	8.77	224.22	225.85	224.94	225.86	0.000335	0.47	18.61	44.34	0.14
Innisfil Creek	4725.54	2-Year-CC	15.81	224.22	226.42	225.11	226.44	0.000269	0.52	35.94	86.63	0.14
Innisfil Creek	4725.54	2yr + 50% Std	13.16	224.22	226.22	225.05	226.24	0.000303	0.52	26.41	61.42	0.14
Innisfil Creek	4672.67	2-Year-Std	8.77	224.19	225.83		225.84	0.000326	0.47	18.81	17.16	0.14
Innisfil Creek	4672.67	2-Year-CC	15.81	224.19	226.41		226.42	0.000254	0.51	37.96	63.63	0.13
Innisfil Creek	4672.67	2yr + 50% Std	13.16	224.19	226.21		226.22	0.000296	0.51	26.84	39.34	0.14
Innisfil Creek	4622.31	2-Year-Std	8.77	224.16	225.82		225.83	0.000317	0.46	18.97	17.16	0.14
Innisfil Creek	4622.31	2-Year-CC	15.81	224.16	226.4		226.41	0.000211	0.46	47.54	98.95	0.12
Innisfil Creek	4622.31	2yr + 50% Std	13.16	224.16	226.2		226.21	0.000277	0.5	29.91	61.29	0.14
Innisfil Creek	4569.09	2-Year-Std	8.77	224.14	225.81		225.81	0.000223	0.39	29.39	54.32	0.12
Innisfil Creek	4569.09	2-Year-CC	15.81	224.14	226.4		226.4	0.000096	0.31	73.97	104.91	0.08
Innisfil Creek	4569.09	2yr + 50% Std	13.16	224.14	226.19		226.19	0.00013	0.34	53.93	81.68	0.09
Innisfil Creek	4498.15	2-Year-Std	8.77	224.1	225.78	224.82	225.79	0.000281	0.44	21.55	41.85	0.13
Innisfil Creek	4498.15	2-Year-CC	15.81	224.1	226.39	225	226.39	0.000135	0.38	56.07	99.91	0.1
Innisfil Creek	4498.15	2yr + 50% Std	13.16	224.1	226.18	224.94	226.18	0.000179	0.41	43.17	97.38	0.11
Innisfil Creek	4448.24	2-Year-Std	8.77	224.08	225.77	224.8	225.78	0.000287	0.45	19.6	17.28	0.13
Innisfil Creek	4448.24	2-Year-CC	15.81	224.08	226.38	224.97	226.38	0.000158	0.41	51.08	96.36	0.1
Innisfil Creek	4448.24	2yr + 50% Std	13.16	224.08	226.16	224.91	226.17	0.000205	0.44	38.42	59.82	0.12
Innisfil Creek	4420.59	2-Year-Std	8.77	224.06	225.76	224.78	225.77	0.000283	0.45	19.71	17.3	0.13
Innisfil Creek	4420.59	2-Year-CC	15.81	224.06	226.37	224.96	226.38	0.000175	0.43	47.6	94.64	0.11
Innisfil Creek	4420.59	2yr + 50% Std	13.16	224.06	226.16	224.9	226.17	0.000222	0.46	35.31	58.89	0.12
Innisfil Creek	4414.78	2-Year-Std	8.77	224.06	225.76	224.78	225.77	0.000282	0.44	19.73	17.31	0.13
Innisfil Creek	4414.78	2-Year-CC	15.81	224.06	226.37	224.95	226.38	0.000166	0.42	52.84	94.07	0.11
Innisfil Creek	4414.78	2yr + 50% Std	13.16	224.06	226.16	224.89	226.17	0.000222	0.45	35.27	58.01	0.12
Innisfil Creek	4414		Bridge									
Innisfil Creek	4398.24	2-Year-Std	8.77	224.05	225.75		225.76	0.000281	0.44	19.76	17.31	0.13
Innisfil Creek	4398.24	2-Year-CC	15.81	224.05	226.37		226.37	0.000159	0.41	53.59	87.55	0.1
Innisfil Creek	4398.24	2yr + 50% Std	13.16	224.05	226.15		226.16	0.00021	0.44	36.42	60.86	0.12

Project Name: South Innisfil Creek Drain Improvements
Project No.: 300038790
Watershed: Innisfil Creek
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Reach: Innisfil Creek

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R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
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Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	4390.14	2-Year-Std	8.77	224.05	225.75	224.77	225.76	0.000275	0.44	19.96	19.49	0.13
Innisfil Creek	4390.14	2-Year-CC	15.81	224.05	226.36	224.94	226.37	0.000163	0.42	52.85	87.57	0.11
Innisfil Creek	4390.14	2yr + 50% Std	13.16	224.05	226.15	224.88	226.16	0.000217	0.45	35.3	65.56	0.12
Innisfil Creek	4359		Bridge									
Innisfil Creek	4357.15	2-Year-Std	8.77	224.03	225.74		225.75	0.000258	0.39	24.15	41.12	0.12
Innisfil Creek	4357.15	2-Year-CC	15.81	224.03	226.36		226.36	0.000129	0.34	60.78	76.53	0.09
Innisfil Creek	4357.15	2yr + 50% Std	13.16	224.03	226.14		226.15	0.000168	0.36	45.47	65.67	0.1
Innisfil Creek	4353.92	2-Year-Std	8.77	224.03	225.74	224.75	225.75	0.000255	0.47	18.8	39.07	0.13
Innisfil Creek	4353.92	2-Year-CC	15.81	224.03	226.34	224.93	226.36	0.000233	0.57	27.5	71.79	0.13
Innisfil Creek	4353.92	2yr + 50% Std	13.16	224.03	226.13	224.86	226.14	0.000238	0.54	24.46	61.12	0.13
Innisfil Creek	4344.82	2-Year-Std	8.77	224.02	225.73	224.74	225.74	0.000255	0.47	18.8	46.76	0.13
Innisfil Creek	4344.82	2-Year-CC	15.81	224.02	226.33	224.92	226.35	0.000233	0.57	27.5	76.48	0.13
Innisfil Creek	4344.82	2yr + 50% Std	13.16	224.02	226.12	224.86	226.14	0.000238	0.54	24.46	66.9	0.13
Innisfil Creek	4338.07	2-Year-Std	8.77	224.02	225.73	224.74	225.74	0.000276	0.44	19.85	46.85	0.13
Innisfil Creek	4338.07	2-Year-CC	15.81	224.02	226.33	224.92	226.35	0.000243	0.51	31.07	76.1	0.13
Innisfil Creek	4338.07	2yr + 50% Std	13.16	224.02	226.12	224.86	226.14	0.000253	0.49	26.99	66.34	0.13
Innisfil Creek	4328.33	2-Year-Std	8.77	224.02	225.73	224.73	225.74	0.000261	0.43	20.38	48.11	0.13
Innisfil Creek	4328.33	2-Year-CC	15.81	224.02	226.33	224.9	226.35	0.00023	0.5	31.92	81.76	0.13
Innisfil Creek	4328.33	2yr + 50% Std	13.16	224.02	226.12	224.84	226.13	0.00024	0.47	27.71	71.41	0.13
Innisfil Creek	4324.37	2-Year-Std	8.77	224.01	225.73	224.73	225.74	0.000268	0.43	20.23	47.91	0.13
Innisfil Creek	4324.37	2-Year-CC	15.81	224.01	226.33	224.91	226.34	0.000234	0.5	31.81	89.06	0.13
Innisfil Creek	4324.37	2yr + 50% Std	13.16	224.01	226.12	224.85	226.13	0.000244	0.48	27.59	76.62	0.13
Innisfil Creek	4313.06	2-Year-Std	8.77	224.01	225.72	224.73	225.73	0.00025	0.42	23.27	43.59	0.13
Innisfil Creek	4313.06	2-Year-CC	15.81	224.01	226.33	224.9	226.34	0.00015	0.4	51.83	94.35	0.1
Innisfil Creek	4313.06	2yr + 50% Std	13.16	224.01	226.12	224.84	226.13	0.00018	0.41	40.2	79.96	0.11
Innisfil Creek	4304.06	2-Year-Std	8.77	224.01	225.72	224.73	225.73	0.000247	0.42	23.63	37.08	0.12
Innisfil Creek	4304.06	2-Year-CC	15.81	224.01	226.33	224.9	226.34	0.000136	0.38	55.1	95.22	0.1
Innisfil Creek	4304.06	2yr + 50% Std	13.16	224.01	226.12	224.84	226.13	0.000174	0.4	42.12	81.85	0.11
Innisfil Creek	4259.19	2-Year-Std	8.77	223.98	225.71	224.7	225.72	0.000256	0.43	20.45	20.53	0.13
Innisfil Creek	4259.19	2-Year-CC	15.81	223.98	226.32	224.87	226.33	0.000227	0.49	31.94	54.86	0.13
Innisfil Creek	4259.19	2yr + 50% Std	13.16	223.98	226.11	224.81	226.12	0.000236	0.47	27.76	47.14	0.13
Innisfil Creek	4241.22	2-Year-Std	8.77	223.97	225.7	224.69	225.71	0.000255	0.43	20.47	17.59	0.13
Innisfil Creek	4241.22	2-Year-CC	15.81	223.97	226.31	224.87	226.33	0.000226	0.49	31.94	80.78	0.13
Innisfil Creek	4241.22	2yr + 50% Std	13.16	223.97	226.1	224.81	226.11	0.000235	0.47	27.77	48.51	0.13
Innisfil Creek	4234.17	2-Year-Std	8.77	223.97	225.7	224.69	225.71	0.000258	0.43	20.33	21.02	0.13
Innisfil Creek	4234.17	2-Year-CC	15.81	223.97	226.31	224.86	226.33	0.000229	0.5	31.73	81.87	0.13
Innisfil Creek	4234.17	2yr + 50% Std	13.16	223.97	226.1	224.8	226.11	0.000238	0.48	27.58	52.96	0.13
Innisfil Creek	4220.05	2-Year-Std	8.77	223.96	225.7	224.68	225.71	0.000257	0.43	20.36	24.38	0.13
Innisfil Creek	4220.05	2-Year-CC	15.81	223.96	226.31	224.86	226.32	0.000229	0.5	31.75	89.5	0.13
Innisfil Creek	4220.05	2yr + 50% Std	13.16	223.96	226.1	224.8	226.11	0.000237	0.48	27.6	54.63	0.13
Innisfil Creek	4212.99	2-Year-Std	8.77	223.96	225.7	224.68	225.71	0.000256	0.43	20.4	19.99	0.13
Innisfil Creek	4212.99	2-Year-CC	15.81	223.96	226.31	224.85	226.32	0.000228	0.5	31.81	48.92	0.13
Innisfil Creek	4212.99	2yr + 50% Std	13.16	223.96	226.09	224.79	226.11	0.000236	0.48	27.66	43.79	0.13
Innisfil Creek	4197.33	2-Year-Std	8.77	223.95	225.69	224.67	225.7	0.000252	0.43	20.52	17.52	0.13
Innisfil Creek	4197.33	2-Year-CC	15.81	223.95	226.3	224.85	226.32	0.000225	0.49	31.97	77.68	0.12
Innisfil Creek	4197.33	2yr + 50% Std	13.16	223.95	226.09	224.78	226.1	0.000233	0.47	27.8	74.2	0.13
Innisfil Creek	4137.51	2-Year-Std	8.77	223.92	225.68	224.64	225.69	0.000237	0.42	21.05	55.02	0.12
Innisfil Creek	4137.51	2-Year-CC	15.81	223.92	226.29	224.81	226.3	0.000212	0.48	32.79	95.75	0.12
Innisfil Creek	4137.51	2yr + 50% Std	13.16	223.92	226.08	224.75	226.09	0.00022	0.46	28.52	91.48	0.12
Innisfil Creek	4087.25	2-Year-Std	8.77	223.9	225.67	224.62	225.68	0.000232	0.41	21.34	40.92	0.12
Innisfil Creek	4087.25	2-Year-CC	15.81	223.9	226.28	224.79	226.29	0.000162	0.42	46.99	90.07	0.11
Innisfil Creek	4087.25	2yr + 50% Std	13.16	223.9	226.07	224.73	226.08	0.000201	0.44	34	85.18	0.12
Innisfil Creek	4059.7	2-Year-Std	8.77	223.88	225.66	224.6	225.67	0.000228	0.41	21.25	35.85	0.12
Innisfil Creek	4059.7	2-Year-CC	15.81	223.88	226.28	224.78	226.29	0.000113	0.36	63.91	86.16	0.09
Innisfil Creek	4059.7	2yr + 50% Std	13.16	223.88	226.06	224.71	226.07	0.000214	0.46	28.69	78.89	0.12
Innisfil Creek	4057		Bridge									
Innisfil Creek	4056.49	2-Year-Std	8.77	223.88	225.66	224.6	225.67	0.000229	0.41	21.23	32.8	0.12
Innisfil Creek	4056.49	2-Year-CC	15.81	223.88	226.28	224.78	226.29	0.000116	0.36	64.73	94.71	0.09
Innisfil Creek	4056.49	2yr + 50% Std	13.16	223.88	226.06	224.71	226.07	0.000215	0.46	28.64	83.32	0.12
Innisfil Creek	4041.79	2-Year-Std	8.77	223.87	225.65	224.59	225.66	0.00023	0.42	21.08	25.67	0.12
Innisfil Creek	4041.79	2-Year-CC	15.81	223.87	226.28	224.77	226.28	0.000133	0.39	59.16	89.99	0.1
Innisfil Creek	4041.79	2yr + 50% Std	13.16	223.87	226.05	224.71	226.06	0.000218	0.46	28.4	77.49	0.12
Innisfil Creek	4035.04	2-Year-Std	8.77	223.87	225.65	224.59	225.66	0.000226	0.41	21.3	17.73	0.12
Innisfil Creek	4035.04	2-Year-CC	15.81	223.87	226.27	224.76	226.28	0.000164	0.43	46.61	65.5	0.11
Innisfil Creek	4035.04	2yr + 50% Std	13.16	223.87	226.05	224.7	226.06	0.000213	0.46	28.7	53.91	0.12
Innisfil Creek	3985.24	2-Year-Std	8.77	223.85	225.64	224.57	225.65	0.00022	0.41	21.48	18.74	0.12
Innisfil Creek	3985.24	2-Year-CC	15.81	223.85	226.27	224.74	226.27	0.000139	0.4	51.47	62.09	0.1
Innisfil Creek	3985.24	2yr + 50% Std	13.16	223.85	226.04	224.68	226.05	0.000208	0.46	28.89	58.51	0.12
Innisfil Creek	3932.84	2-Year-Std	8.77	223.82	225.63	224.54	225.64	0.000212	0.4	21.73	18.03	0.12
Innisfil Creek	3932.84	2-Year-CC	15.81	223.82	226.26	224.71	226.27	0.000145	0.41	49.4	61.32	0.1
Innisfil Creek	3932.84	2yr + 50% Std	13.16	223.82	226.03	224.65	226.04	0.000181	0.43	36.31	51.88	0.11
Innisfil Creek	3895		Bridge									
Innisfil Creek	3882.59	2-Year-Std	10.71	223.79	225.62		225.63	0.000307	0.49	21.96	17.82	0.14
Innisfil Creek	3882.59	2-Year-CC	19.44	223.79	226.24		226.26	0.000272	0.57	38.13	60.07	0.14
Innisfil Creek	3882.59	2yr + 50% Std	16.07	223.79	226.02		226.04	0.000293	0.55	29.73	26.4	0.14
Innisfil Creek	3831.18	2-Year-Std	10.71	223.77	225.6		225.62	0.0003	0.48	22.13	17.86	0.14
Innisfil Creek	3831.18	2-Year-CC	19.44	223.77	226.23		226.24	0.000277	0.56	36.73	37.82	0.14
Innisfil Creek	3831.18	2yr + 50% Std	16.07	223.77	226.01		226.02	0.000288	0.54	29.84	24.59	0.14
Innisfil Creek	3776.17	2-Year-Std	10.71	223.74	225.59		225.6	0.00029	0.48	22.43	17.99	0.14
Innisfil Creek	3776.17	2-Year-CC	19.44	223.74	226.21		226.23	0.000271	0.56	36.77	39.92	0.14

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

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[THE DIFFERENCE IS OUR PEOPLE]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	3776.17	2yr + 50% Std	16.07	223.74	225.99		226.01	0.00028	0.54	29.98	19.62	0.14
Innisfil Creek	3723.14	2-Year-Std	10.71	223.72	225.57		225.59	0.000283	0.47	22.59	18.01	0.14
Innisfil Creek	3723.14	2-Year-CC	19.44	223.72	226.2		226.21	0.000268	0.56	35.16	33.34	0.14
Innisfil Creek	3723.14	2yr + 50% Std	16.07	223.72	225.98		225.99	0.000275	0.53	30.17	19.65	0.14
Innisfil Creek	3674.53	2-Year-Std	10.71	223.69	225.56		225.57	0.000275	0.47	22.79	18.01	0.13
Innisfil Creek	3674.53	2-Year-CC	19.44	223.69	226.18		226.2	0.000271	0.55	37.13	51.68	0.14
Innisfil Creek	3674.53	2yr + 50% Std	16.07	223.69	225.96		225.98	0.000269	0.53	30.36	19.67	0.14
Innisfil Creek	3649.94	2-Year-Std	10.71	223.68	225.55		225.56	0.000273	0.47	22.93	18.2	0.13
Innisfil Creek	3649.94	2-Year-CC	19.44	223.68	226.18		226.19	0.000263	0.55	35.08	20.84	0.14
Innisfil Creek	3649.94	2yr + 50% Std	16.07	223.68	225.96		225.97	0.000266	0.52	30.6	19.91	0.14
Innisfil Creek	3647.73	2-Year-Std	10.71	223.68	225.55	224.45	225.56	0.000252	0.47	22.88	18.2	0.13
Innisfil Creek	3647.73	2-Year-CC	19.44	223.68	226.17	224.65	226.19	0.000233	0.58	33.49	46.59	0.13
Innisfil Creek	3647.73	2yr + 50% Std	16.07	223.68	225.95	224.57	225.97	0.000236	0.54	29.75	19.85	0.13
Innisfil Creek	3638.35	2-Year-Std	10.71	223.67	225.55	224.45	225.56	0.000251	0.47	22.89	18.24	0.13
Innisfil Creek	3638.35	2-Year-CC	19.44	223.67	226.17	224.64	226.19	0.000232	0.58	33.51	49.49	0.13
Innisfil Creek	3638.35	2yr + 50% Std	16.07	223.67	225.95	224.57	225.97	0.000236	0.54	29.76	19.91	0.13
Innisfil Creek	3626.8	2-Year-Std	10.71	223.67	225.55		225.56	0.000258	0.46	23.42	18.39	0.13
Innisfil Creek	3626.8	2-Year-CC	19.44	223.67	226.17		226.18	0.000251	0.55	36.21	48.84	0.13
Innisfil Creek	3626.8	2yr + 50% Std	16.07	223.67	225.95		225.96	0.000253	0.52	31.15	20.02	0.13
Innisfil Creek	3578.81	2-Year-Std	10.71	223.64	225.54		225.55	0.000262	0.46	23.19	18.12	0.13
Innisfil Creek	3578.81	2-Year-CC	19.44	223.64	226.16		226.17	0.000257	0.55	35.23	20.59	0.13
Innisfil Creek	3578.81	2yr + 50% Std	16.07	223.64	225.94		225.95	0.000257	0.52	30.81	19.7	0.13
Innisfil Creek	3542.49	2-Year-Std	10.71	223.62	225.53		225.54	0.000257	0.46	23.38	18.22	0.13
Innisfil Creek	3542.49	2-Year-CC	19.44	223.62	226.15		226.16	0.000252	0.55	35.49	20.74	0.13
Innisfil Creek	3542.49	2yr + 50% Std	16.07	223.62	225.93		225.94	0.000253	0.52	31.04	19.85	0.13
Innisfil Creek	3492.18	2-Year-Std	10.71	223.6	225.51		225.52	0.00025	0.45	23.55	18.19	0.13
Innisfil Creek	3492.18	2-Year-CC	19.44	223.6	226.14		226.15	0.000248	0.55	35.93	31.86	0.13
Innisfil Creek	3492.18	2yr + 50% Std	16.07	223.6	225.92		225.93	0.000248	0.51	31.2	19.77	0.13
Innisfil Creek	3436.04	2-Year-Std	10.71	223.57	225.5		225.51	0.000242	0.45	23.8	18.24	0.13
Innisfil Creek	3436.04	2-Year-CC	19.44	223.57	226.12		226.14	0.000237	0.53	38.91	47.09	0.13
Innisfil Creek	3436.04	2yr + 50% Std	16.07	223.57	225.9		225.92	0.000243	0.51	31.49	20.67	0.13
Innisfil Creek	3388.5	2-Year-Std	10.71	223.55	225.49		225.5	0.000232	0.44	24.18	18.39	0.12
Innisfil Creek	3388.5	2-Year-CC	19.44	223.55	226.11		226.13	0.000234	0.53	36.4	20.87	0.13
Innisfil Creek	3388.5	2yr + 50% Std	16.07	223.55	225.89		225.9	0.000233	0.5	31.91	19.98	0.13
Innisfil Creek	3380.41	2-Year-Std	11.51	223.54	225.48	224.33	225.49	0.000316	0.6	19.21	18.85	0.15
Innisfil Creek	3380.41	2-Year-CC	21.14	223.54	226.09	224.56	226.12	0.000363	0.8	26.53	21.35	0.17
Innisfil Creek	3380.41	2yr + 50% Std	17.27	223.54	225.87	224.47	225.9	0.00034	0.72	23.96	20.49	0.16
Innisfil Creek	3357.46		Bridge									
Innisfil Creek	3340.98	2-Year-Std	11.51	223.52	225.45	224.28	225.47	0.000299	0.59	19.52	21.09	0.15
Innisfil Creek	3340.98	2-Year-CC	21.14	223.52	226.05	224.51	226.09	0.000354	0.79	26.72	25.68	0.17
Innisfil Creek	3340.98	2yr + 50% Std	17.27	223.52	225.84	224.42	225.87	0.000328	0.71	24.2	22.89	0.16
Innisfil Creek	3331.06	2-Year-Std	11.51	223.52	225.46		225.46	0.000214	0.43	26.8	20.21	0.12
Innisfil Creek	3331.06	2-Year-CC	21.14	223.52	226.06		226.07	0.000232	0.53	39.87	23.21	0.13
Innisfil Creek	3331.06	2yr + 50% Std	17.27	223.52	225.85		225.86	0.000221	0.49	35.08	22.04	0.12
Innisfil Creek	3255.76	2-Year-Std	11.51	223.48	225.44		225.45	0.000264	0.47	24.28	18.34	0.13
Innisfil Creek	3255.76	2-Year-CC	21.14	223.48	226.04		226.06	0.000279	0.58	37.52	46.79	0.14
Innisfil Creek	3255.76	2yr + 50% Std	17.27	223.48	225.83		225.84	0.000272	0.54	31.78	19.91	0.14
Innisfil Creek	3205.68	2-Year-Std	11.51	223.46	225.42		225.43	0.000254	0.47	24.64	18.51	0.13
Innisfil Creek	3205.68	2-Year-CC	21.14	223.46	226.02		226.04	0.000259	0.57	39.68	60.54	0.14
Innisfil Creek	3205.68	2yr + 50% Std	17.27	223.46	225.81		225.83	0.000264	0.54	32.2	20.1	0.14
Innisfil Creek	3148.66	2-Year-Std	11.51	223.43	225.41		225.42	0.000249	0.46	24.76	18.46	0.13
Innisfil Creek	3148.66	2-Year-CC	21.14	223.43	226.01		226.02	0.000373	0.5	44.55	60.98	0.15
Innisfil Creek	3148.66	2yr + 50% Std	17.27	223.43	225.79		225.81	0.000491	0.51	33.6	36.53	0.17
Innisfil Creek	3096.26	2-Year-Std	11.51	223.4	225.4		225.41	0.000238	0.46	25.25	18.72	0.13
Innisfil Creek	3096.26	2-Year-CC	21.14	223.4	225.99		226	0.000339	0.51	43.4	58.08	0.15
Innisfil Creek	3096.26	2yr + 50% Std	17.27	223.4	225.77		225.78	0.000441	0.52	33.27	33.46	0.16
Innisfil Creek	3040.55	2-Year-Std	11.51	223.37	225.38		225.39	0.000231	0.45	25.59	18.96	0.12
Innisfil Creek	3040.55	2-Year-CC	21.14	223.37	225.97		225.98	0.000356	0.48	45.95	62.6	0.15
Innisfil Creek	3040.55	2yr + 50% Std	17.27	223.37	225.75		225.76	0.000469	0.51	34.11	36.72	0.17
Innisfil Creek	2992.21	2-Year-Std	11.51	223.35	225.37		225.38	0.000228	0.45	25.6	18.72	0.12
Innisfil Creek	2992.21	2-Year-CC	21.14	223.35	225.95		225.97	0.00037	0.54	40.16	47.99	0.16
Innisfil Creek	2992.21	2yr + 50% Std	17.27	223.35	225.73		225.74	0.000257	0.53	32.51	20.19	0.13
Innisfil Creek	2938.31	2-Year-Std	11.51	223.32	225.36		225.37	0.000225	0.43	26.73	20.86	0.12
Innisfil Creek	2938.31	2-Year-CC	21.14	223.32	225.94		225.95	0.000314	0.47	45.13	48.41	0.14
Innisfil Creek	2938.31	2yr + 50% Std	17.27	223.32	225.71		225.72	0.000352	0.48	36.05	34	0.15
Innisfil Creek	2880.6	2-Year-Std	11.51	223.29	225.35	224.09	225.36	0.000214	0.44	26.07	18.68	0.12
Innisfil Creek	2880.6	2-Year-CC	21.14	223.29	225.91	224.3	225.93	0.000287	0.56	37.57	23.36	0.14
Innisfil Creek	2880.6	2yr + 50% Std	17.27	223.29	225.69	224.22	225.71	0.00025	0.53	32.77	20.14	0.13
Innisfil Creek	2822.87	2-Year-Std	11.12	223.26	225.34	224.04	225.35	0.000186	0.41	26.88	19.12	0.11
Innisfil Creek	2822.87	2-Year-CC	20.45	223.26	225.9	224.25	225.91	0.000265	0.51	40.1	27.43	0.13
Innisfil Creek	2822.87	2yr + 50% Std	16.68	223.26	225.68	224.17	225.69	0.000265	0.49	34.34	25.3	0.13
Innisfil Creek	2822		Bridge									
Innisfil Creek	2819.4	2-Year-Std	11.12	223.26	225.33	224.05	225.34	0.000193	0.42	26.42	18.79	0.11
Innisfil Creek	2819.4	2-Year-CC	20.45	223.26	225.89	224.26	225.9	0.000261	0.53	38.85	24.99	0.13
Innisfil Creek	2819.4	2yr + 50% Std	16.68	223.26	225.67	224.18	225.69	0.000257	0.5	33.66	23.44	0.13
Innisfil Creek	2807.94	2-Year-Std	11.12	223.26	225.32	224.04	225.34	0.000238	0.55	20.32	18.78	0.13
Innisfil Creek	2807.94	2-Year-CC	20.45	223.26	225.86	224.27	225.89	0.000325	0.77	26.68	23.9	0.16
Innisfil Creek	2807.94	2yr + 50% Std	16.68	223.26	225.66	224.18	225.68	0.000298	0.69	24.23	22.34	0.15
Innisfil Creek	2801.39	2-Year-Std	11.12	223.25	225.32	224.04	225.33	0.0002	0.43	25.95	18.48	0.12
Innisfil Creek	2801.39	2-Year-CC	20.45	223.25	225.87	224.26	225.88	0.000279	0.53	38.24	25.12	0.14
Innisfil Creek	2801.39	2yr + 50% Std	16.68	223.25	225.66	224.17	225.67	0.000279	0.5	33.09	23.8	0.14

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	2770.35	2-Year-Std	11.12	223.24	225.32		225.33	0.000188	0.42	26.67	18.87	0.11
Innisfil Creek	2770.35	2-Year-CC	20.45	223.24	225.86		225.88	0.000289	0.52	40.42	43.48	0.14
Innisfil Creek	2770.35	2yr + 50% Std	16.68	223.24	225.65		225.66	0.000262	0.5	33.61	23.65	0.13
Innisfil Creek	2715.53	2-Year-Std	11.12	223.21	225.31	223.99	225.32	0.000181	0.41	27	18.98	0.11
Innisfil Creek	2715.53	2-Year-CC	20.45	223.21	225.85	224.21	225.86	0.000212	0.52	43.26	42.96	0.12
Innisfil Creek	2715.53	2yr + 50% Std	16.68	223.21	225.64	224.13	225.65	0.000214	0.49	35.22	33.6	0.12
Innisfil Creek	2697		Bridge									
Innisfil Creek	2695.48	2-Year-Std	11.12	223.2	225.3	223.98	225.31	0.000178	0.41	27.19	19.05	0.11
Innisfil Creek	2695.48	2-Year-CC	20.45	223.2	225.83	224.19	225.85	0.000242	0.54	37.88	21.96	0.13
Innisfil Creek	2695.48	2yr + 50% Std	16.68	223.2	225.63	224.11	225.64	0.000216	0.5	33.65	20.35	0.12
Innisfil Creek	2693.24	2-Year-Std	11.12	223.2	225.3	223.98	225.31	0.000178	0.47	23.58	19.03	0.11
Innisfil Creek	2693.24	2-Year-CC	20.45	223.2	225.82	224.19	225.85	0.000249	0.67	30.74	21.77	0.14
Innisfil Creek	2693.24	2yr + 50% Std	16.68	223.2	225.62	224.11	225.64	0.000226	0.6	28.02	20.34	0.13
Innisfil Creek	2685.7	2-Year-Std	11.12	223.2	225.3	223.98	225.31	0.000178	0.47	23.61	18.97	0.11
Innisfil Creek	2685.7	2-Year-CC	20.45	223.2	225.82	224.18	225.84	0.000249	0.66	30.77	21.09	0.14
Innisfil Creek	2685.7	2yr + 50% Std	16.68	223.2	225.62	224.11	225.64	0.000225	0.59	28.05	20.28	0.13
Innisfil Creek	2679.61	2-Year-Std	11.12	223.19	225.3	223.97	225.31	0.000173	0.4	27.51	19.2	0.11
Innisfil Creek	2679.61	2-Year-CC	20.45	223.19	225.82	224.18	225.84	0.000228	0.54	38.15	21.32	0.13
Innisfil Creek	2679.61	2yr + 50% Std	16.68	223.19	225.62	224.1	225.64	0.000212	0.49	33.97	20.51	0.12
Innisfil Creek	2649.27	2-Year-Std	11.12	223.18	225.29	223.96	225.3	0.000175	0.4	27.57	19.49	0.11
Innisfil Creek	2649.27	2-Year-CC	20.45	223.18	225.82	224.17	225.83	0.000206	0.5	45.2	38.84	0.12
Innisfil Creek	2649.27	2yr + 50% Std	16.68	223.18	225.62	224.09	225.63	0.000204	0.48	37.64	36.58	0.12
Innisfil Creek	2597.24	2-Year-Std	11.12	223.15	225.29	223.93	225.29	0.000165	0.4	28	19.33	0.11
Innisfil Creek	2597.24	2-Year-CC	20.45	223.15	225.81	224.14	225.82	0.000221	0.53	38.63	21.47	0.13
Innisfil Creek	2597.24	2yr + 50% Std	16.68	223.15	225.61	224.06	225.62	0.000204	0.48	34.45	20.66	0.12
Innisfil Creek	2541.69	2-Year-Std	11.12	223.12	225.28		225.28	0.000158	0.39	28.43	19.52	0.1
Innisfil Creek	2541.69	2-Year-CC	20.45	223.12	225.79		225.81	0.000208	0.52	40.15	36.76	0.12
Innisfil Creek	2541.69	2yr + 50% Std	16.68	223.12	225.6		225.61	0.000197	0.48	34.89	20.84	0.12
Innisfil Creek	2494.09	2-Year-Std	11.12	223.1	225.27		225.28	0.000154	0.39	28.58	19.33	0.1
Innisfil Creek	2494.09	2-Year-CC	20.45	223.1	225.79		225.8	0.000196	0.51	45.5	53.21	0.12
Innisfil Creek	2494.09	2yr + 50% Std	16.68	223.1	225.59		225.6	0.000194	0.48	35.77	40.11	0.12
Innisfil Creek	2449.63	2-Year-Std	11.12	223.08	225.26	223.86	225.27	0.000153	0.39	28.6	19.25	0.1
Innisfil Creek	2449.63	2-Year-CC	20.45	223.08	225.78	224.07	225.79	0.000204	0.51	43.94	53.05	0.12
Innisfil Creek	2449.63	2yr + 50% Std	16.68	223.08	225.58	223.99	225.59	0.000194	0.48	35.44	33.61	0.12
Innisfil Creek	2449		Bridge									
Innisfil Creek	2445.98	2-Year-Std	11.12	223.08	225.26		225.27	0.000154	0.39	28.57	19.25	0.1
Innisfil Creek	2445.98	2-Year-CC	20.45	223.08	225.77		225.78	0.000208	0.52	43.4	55.21	0.12
Innisfil Creek	2445.98	2yr + 50% Std	16.68	223.08	225.57		225.59	0.000195	0.48	35.06	31.16	0.12
Innisfil Creek	2437.64	2-Year-Std	11.12	223.07	225.25	223.86	225.26	0.000189	0.51	22	22.8	0.12
Innisfil Creek	2437.64	2-Year-CC	20.45	223.07	225.75	224.08	225.77	0.000288	0.73	27.93	63.69	0.15
Innisfil Creek	2437.64	2yr + 50% Std	16.68	223.07	225.56	224	225.58	0.000253	0.65	25.69	25.76	0.14
Innisfil Creek	2431.98	2-Year-Std	11.12	223.07	225.25	223.85	225.26	0.000153	0.39	28.56	23.87	0.1
Innisfil Creek	2431.98	2-Year-CC	20.45	223.07	225.75	224.06	225.76	0.0002	0.51	47.39	71.99	0.12
Innisfil Creek	2431.98	2yr + 50% Std	16.68	223.07	225.56	223.98	225.57	0.000197	0.48	34.71	26.09	0.12
Innisfil Creek	2395.33	2-Year-Std	11.12	223.05	225.25	223.83	225.25	0.000147	0.38	29.04	30.25	0.1
Innisfil Creek	2395.33	2-Year-CC	20.45	223.05	225.75	224.04	225.76	0.000166	0.47	54.99	60.94	0.11
Innisfil Creek	2395.33	2yr + 50% Std	16.68	223.05	225.56	223.96	225.57	0.000169	0.45	43.87	51.05	0.11
Innisfil Creek	2357.17	2-Year-Std	11.12	223.03	225.24	223.81	225.25	0.000142	0.38	30.27	35.96	0.1
Innisfil Creek	2357.17	2-Year-CC	20.45	223.03	225.74	224.02	225.75	0.000171	0.48	50.62	47.39	0.11
Innisfil Creek	2357.17	2yr + 50% Std	16.68	223.03	225.55	223.94	225.56	0.000168	0.45	42.06	40.31	0.11
Innisfil Creek	2333		Bridge									
Innisfil Creek	2332.4	2-Year-Std	11.12	223.02	225.24		225.24	0.000136	0.37	30.63	32.74	0.1
Innisfil Creek	2332.4	2-Year-CC	20.45	223.02	225.73		225.74	0.000171	0.48	48.73	40.18	0.11
Innisfil Creek	2332.4	2yr + 50% Std	16.68	223.02	225.55		225.55	0.000164	0.44	41.5	38.08	0.11
Innisfil Creek	2329.07	2-Year-Std	11.12	223.02	225.23	223.8	225.24	0.000144	0.44	25.08	30.91	0.1
Innisfil Creek	2329.07	2-Year-CC	20.45	223.02	225.72	224	225.74	0.000225	0.65	31.63	38.92	0.14
Innisfil Creek	2329.07	2yr + 50% Std	16.68	223.02	225.54	223.93	225.55	0.000195	0.57	29.19	36.1	0.12
Innisfil Creek	2320.03	2-Year-Std	11.12	223.01	225.23	223.79	225.24	0.000154	0.45	24.65	42.28	0.11
Innisfil Creek	2320.03	2-Year-CC	20.45	223.01	225.71	224.02	225.73	0.000238	0.66	31.19	51.83	0.14
Innisfil Creek	2320.03	2yr + 50% Std	16.68	223.01	225.53	223.93	225.55	0.000207	0.58	28.75	47.8	0.13
Innisfil Creek	2314.41	2-Year-Std	11.12	223.01	225.23		225.24	0.000139	0.38	30.85	45.96	0.1
Innisfil Creek	2314.41	2-Year-CC	20.45	223.01	225.72		225.73	0.000157	0.46	55.08	53.42	0.11
Innisfil Creek	2314.41	2yr + 50% Std	16.68	223.01	225.54		225.55	0.000158	0.43	45.58	51.27	0.11
Innisfil Creek	2295.24	2-Year-Std	11.12	223	225.23		225.24	0.00014	0.38	29.64	19.69	0.1
Innisfil Creek	2295.24	2-Year-CC	20.45	223	225.71		225.72	0.000205	0.52	39.7	27.07	0.12
Innisfil Creek	2295.24	2yr + 50% Std	16.68	223	225.53		225.54	0.000184	0.47	35.74	20.94	0.11
Innisfil Creek	2289.76	2-Year-Std	11.12	223	225.23		225.24	0.000136	0.37	29.95	19.83	0.1
Innisfil Creek	2289.76	2-Year-CC	20.45	223	225.71		225.72	0.000202	0.51	39.94	21.9	0.12
Innisfil Creek	2289.76	2yr + 50% Std	16.68	223	225.53		225.54	0.00018	0.46	36.1	21.13	0.11
Innisfil Creek	2271.37	2-Year-Std	11.12	222.99	225.23	223.77	225.23	0.000131	0.37	30.36	36.67	0.09
Innisfil Creek	2271.37	2-Year-CC	20.45	222.99	225.71	223.97	225.72	0.000119	0.41	61.21	44.24	0.09
Innisfil Creek	2271.37	2yr + 50% Std	16.68	222.99	225.53	223.89	225.54	0.000113	0.38	53.37	42.01	0.09
Innisfil Creek	2268.89	2-Year-Std	13.43	222.99	225.22	223.83	225.23	0.00018	0.48	28.15	34.3	0.11
Innisfil Creek	2268.89	2-Year-CC	25.61	222.99	225.68	224.08	225.71	0.000301	0.72	35.58	45.73	0.15
Innisfil Creek	2268.89	2yr + 50% Std	20.15	222.99	225.51	223.97	225.53	0.000243	0.61	32.84	40.56	0.14
Innisfil Creek	2249.77		Culvert									
Innisfil Creek	2234.06	2-Year-Std	13.43	222.98	225.21	223.82	225.22	0.000182	0.48	28.09	34.29	0.12
Innisfil Creek	2234.06	2-Year-CC	25.61	222.98	225.66	224.07	225.69	0.00031	0.73	35.27	38.39	0.16
Innisfil Creek	2234.06	2yr + 50% Std	20.15	222.98	225.5	223.97	225.51	0.000248	0.62	32.65	36.89	0.14

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	2230.74	2-Year-Std	13.43	222.97	225.21	223.81	225.22	0.000196	0.45	30.1	35.08	0.12
Innisfil Creek	2230.74	2-Year-CC	25.61	222.97	225.66	224.06	225.68	0.000254	0.57	51.5	38.9	0.14
Innisfil Creek	2230.74	2yr + 50% Std	20.15	222.97	225.5	223.95	225.51	0.000219	0.51	45.14	37.61	0.12
Innisfil Creek	2229	2-Year-Std	13.64	222.97	225.21	223.82	225.22	0.000186	0.48	28.16	35	0.12
Innisfil Creek	2229	2-Year-CC	27.13	222.97	225.64	224.09	225.67	0.000351	0.77	35.14	38.93	0.17
Innisfil Creek	2229	2yr + 50% Std	20.46	222.97	225.49	223.97	225.51	0.000255	0.63	32.64	37.58	0.14
Innisfil Creek	2197.01		Culvert									
Innisfil Creek	2155.88	2-Year-Std	13.64	222.94	225.2	223.78	225.21	0.000158	0.46	29.37	24.36	0.11
Innisfil Creek	2155.88	2-Year-CC	27.13	222.94	225.62	224.03	225.65	0.000315	0.75	36.09	66.18	0.16
Innisfil Creek	2155.88	2yr + 50% Std	20.46	222.94	225.47	223.91	225.49	0.000225	0.61	33.74	39.49	0.13
Innisfil Creek	2140.69	2-Year-Std	13.64	222.94	225.2		225.21	0.000201	0.45	30.02	19.61	0.12
Innisfil Creek	2140.69	2-Year-CC	27.13	222.94	225.62		225.64	0.000368	0.69	45.64	92.22	0.16
Innisfil Creek	2140.69	2yr + 50% Std	20.46	222.94	225.47		225.49	0.000278	0.58	36.12	37.59	0.14
Innisfil Creek	2082.2	2-Year-Std	13.64	222.91	225.18		225.2	0.000196	0.45	30.27	19.65	0.12
Innisfil Creek	2082.2	2-Year-CC	27.13	222.91	225.59		225.62	0.000381	0.7	40.94	54.45	0.17
Innisfil Creek	2082.2	2yr + 50% Std	20.46	222.91	225.45		225.47	0.000275	0.57	35.68	20.73	0.14
Innisfil Creek	2011.08	2-Year-Std	13.64	222.89	225.17		225.18	0.000167	0.41	32.95	21.72	0.11
Innisfil Creek	2011.08	2-Year-CC	27.13	222.89	225.57		225.59	0.000332	0.65	42.15	45.6	0.15
Innisfil Creek	2011.08	2yr + 50% Std	20.46	222.89	225.44		225.45	0.000235	0.53	38.84	23.02	0.13
Innisfil Creek	1964.59	2-Year-Std	13.64	222.87	225.16		225.17	0.000183	0.44	31.46	25.9	0.11
Innisfil Creek	1964.59	2-Year-CC	27.13	222.87	225.56		225.58	0.000327	0.65	55.59	197.15	0.15
Innisfil Creek	1964.59	2yr + 50% Std	20.46	222.87	225.42		225.44	0.000253	0.55	40.87	62.91	0.13
Innisfil Creek	1922.07	2-Year-Std	13.64	222.85	225.16		225.17	0.000183	0.44	31.25	25.69	0.11
Innisfil Creek	1922.07	2-Year-CC	27.13	222.85	225.54		225.56	0.000328	0.65	56.68	154.96	0.15
Innisfil Creek	1922.07	2yr + 50% Std	20.46	222.85	225.41		225.43	0.000256	0.56	40.74	77.27	0.13
Innisfil Creek	1858.34	2-Year-Std	13.64	222.83	225.14		225.15	0.000181	0.43	31.41	20.37	0.11
Innisfil Creek	1858.34	2-Year-CC	27.13	222.83	225.52		225.54	0.000448	0.62	52.64	91.5	0.17
Innisfil Creek	1858.34	2yr + 50% Std	20.46	222.83	225.39		225.41	0.000378	0.53	41.93	73.07	0.16
Innisfil Creek	1802.02	2-Year-Std	13.64	222.8	225.14	223.65	225.14	0.000166	0.42	32.44	57.83	0.11
Innisfil Creek	1802.02	2-Year-CC	27.13	222.8	225.5	223.92	225.52	0.000251	0.57	63.79	77.78	0.13
Innisfil Creek	1802.02	2yr + 50% Std	20.46	222.8	225.38	223.79	225.39	0.000191	0.48	54.77	71.74	0.12
Innisfil Creek	1740.47	2-Year-Std	13.64	222.78	225.12	223.62	225.13	0.000173	0.43	31.99	57.34	0.11
Innisfil Creek	1740.47	2-Year-CC	27.13	222.78	225.49	223.9	225.5	0.000295	0.59	64	100.94	0.14
Innisfil Creek	1740.47	2yr + 50% Std	20.46	222.78	225.37	223.77	225.38	0.000222	0.5	53.09	86.06	0.12
Innisfil Creek	1689.88	2-Year-Std	13.64	222.76	225.12		225.13	0.000171	0.43	31.7	21.35	0.11
Innisfil Creek	1689.88	2-Year-CC	27.13	222.76	225.46		225.48	0.000324	0.66	50.43	82.56	0.15
Innisfil Creek	1689.88	2yr + 50% Std	20.46	222.76	225.35		225.37	0.000237	0.55	42.37	63.74	0.13
Innisfil Creek	1636.97	2-Year-Std	13.64	222.74	225.11	223.57	225.12	0.000138	0.39	41.71	81.7	0.1
Innisfil Creek	1636.97	2-Year-CC	27.13	222.74	225.46	223.84	225.47	0.000219	0.52	76.49	111.36	0.13
Innisfil Creek	1636.97	2yr + 50% Std	20.46	222.74	225.35	223.72	225.36	0.000157	0.45	64.74	105.14	0.11
Innisfil Creek	1582.59	2-Year-Std	13.64	222.71	225.1	223.56	225.11	0.000125	0.37	46.54	81.03	0.09
Innisfil Creek	1582.59	2-Year-CC	27.13	222.71	225.45	223.84	225.46	0.000178	0.5	79.78	91.14	0.11
Innisfil Creek	1582.59	2yr + 50% Std	20.46	222.71	225.34	223.71	225.35	0.000135	0.42	70.3	88.01	0.1
Innisfil Creek	1519.24	2-Year-Std	13.64	222.69	225.1	223.53	225.1	0.000104	0.34	49.79	62.37	0.09
Innisfil Creek	1519.24	2-Year-CC	27.13	222.69	225.43	223.8	225.44	0.000176	0.49	77.08	87.15	0.11
Innisfil Creek	1519.24	2yr + 50% Std	20.46	222.69	225.33	223.67	225.34	0.00013	0.41	68.38	82.4	0.1
Innisfil Creek	1466.41	2-Year-Std	13.64	222.67	225.09		225.09	0.000141	0.38	38.45	43.18	0.1
Innisfil Creek	1466.41	2-Year-CC	27.13	222.67	225.42		225.43	0.000282	0.58	55.26	59.12	0.14
Innisfil Creek	1466.41	2yr + 50% Std	20.46	222.67	225.32		225.33	0.000196	0.47	49.77	54.3	0.12
Innisfil Creek	1415.03	2-Year-Std	13.64	222.65	225.08		225.09	0.000138	0.31	47.09	50.23	0.09
Innisfil Creek	1415.03	2-Year-CC	27.13	222.65	225.41		225.42	0.000217	0.47	65.38	62.42	0.12
Innisfil Creek	1415.03	2yr + 50% Std	20.46	222.65	225.31		225.32	0.000158	0.38	59.66	58.55	0.1
Innisfil Creek	1345.39	2-Year-Std	13.64	222.62	225.07		225.08	0.000148	0.29	54.54	101.6	0.1
Innisfil Creek	1345.39	2-Year-CC	27.13	222.62	225.4		225.4	0.00017	0.38	89.57	113.92	0.11
Innisfil Creek	1345.39	2yr + 50% Std	20.46	222.62	225.3		225.31	0.000133	0.32	79.2	110.63	0.09
Innisfil Creek	1282.61	2-Year-Std	13.64	222.6	225.06		225.07	0.000133	0.32	56.1	101.99	0.09
Innisfil Creek	1282.61	2-Year-CC	27.13	222.6	225.39		225.39	0.000165	0.41	94.75	132.64	0.11
Innisfil Creek	1282.61	2yr + 50% Std	20.46	222.6	225.3		225.3	0.000129	0.35	82.99	127.89	0.09
Innisfil Creek	1220.49	2-Year-Std	13.64	222.57	225.06		225.06	0.000066	0.28	73.8	121.19	0.07
Innisfil Creek	1220.49	2-Year-CC	27.13	222.57	225.38		225.39	0.000096	0.38	116.57	146.84	0.09
Innisfil Creek	1220.49	2yr + 50% Std	20.46	222.57	225.29		225.3	0.000071	0.31	103.98	137.39	0.07
Innisfil Creek	1216.51	2-Year-Std	13.64	222.57	225.05	223.41	225.06	0.000148	0.47	29.1	129.36	0.11
Innisfil Creek	1216.51	2-Year-CC	27.13	222.57	225.34	223.71	225.38	0.000368	0.81	33.43	154.61	0.17
Innisfil Creek	1216.51	2yr + 50% Std	20.46	222.57	225.27	223.57	225.29	0.000234	0.63	32.36	143.07	0.14
Innisfil Creek	1198.5		Bridge									
Innisfil Creek	1178.21	2-Year-Std	12.89	222.55	225.04	223.38	225.05	0.000134	0.44	29.04	90.78	0.1
Innisfil Creek	1178.21	2-Year-CC	25.04	222.55	225.32	223.65	225.34	0.000326	0.76	33.11	109.5	0.16
Innisfil Creek	1178.21	2yr + 50% Std	19.34	222.55	225.25	223.53	225.27	0.000214	0.6	32.19	103.04	0.13
Innisfil Creek	1169.82	2-Year-Std	12.89	222.54	225.02	223.57	225.04	0.000416	0.65	19.85	19.84	0.16
Innisfil Creek	1169.82	2-Year-CC	25.04	222.54	225.29	223.95	225.34	0.000806	0.99	33.4	61.82	0.23
Innisfil Creek	1169.82	2yr + 50% Std	19.34	222.54	225.23	223.79	225.26	0.000566	0.81	29.97	59.44	0.19
Innisfil Creek	1140.74	2-Year-Std	12.89	222.15	225	223.6	225.03	0.000735	0.77	17.53	44.05	0.21
Innisfil Creek	1140.74	2-Year-CC	25.04	222.15	225.27	224.11	225.31	0.000955	0.97	40.99	89.51	0.25
Innisfil Creek	1140.74	2yr + 50% Std	19.34	222.15	225.22	223.9	225.24	0.000702	0.82	36.42	84.3	0.21
Innisfil Creek	1051.87	2-Year-Std	12.89	222.34	224.89	223.56	224.94	0.001422	0.94	13.76	88.17	0.28
Innisfil Creek	1051.87	2-Year-CC	25.04	222.34	225.23	224.11	225.24	0.000508	0.65	69.94	138.34	0.17
Innisfil Creek	1051.87	2yr + 50% Std	19.34	222.34	225.19	223.88	225.19	0.000377	0.55	64.29	135.49	0.15
Innisfil Creek	984.38	2-Year-Std	12.89	222.11	224.84	223.42	224.87	0.000643	0.78	16.56	75.35	0.2
Innisfil Creek	984.38	2-Year-CC	25.04	222.11	225.19	223.89	225.21	0.000484	0.68	68.79	155.61	0.18
Innisfil Creek	984.38	2yr + 50% Std	19.34	222.11	225.16	223.69	225.17	0.000338	0.57	63.98	154.59	0.15
Innisfil Creek	884.54	2-Year-Std	12.89	222.16	224.75	223.35	224.79	0.000887	0.91	14.18	64.2	0.23

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
[The Difference is our People]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Final Drain Geometry HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	884.54	2-Year-CC	25.04	222.16	225.14	223.86	225.15	0.000538	0.69	66.87	156.6	0.18
Innisfil Creek	884.54	2yr + 50% Std	19.34	222.16	225.05	223.65	225.11	0.001384	1.07	21.53	128.07	0.29
Innisfil Creek	818.21	2-Year-Std	12.89	221.92	224.63	223.55	224.71	0.001967	1.2	10.79	64.87	0.32
Innisfil Creek	818.21	2-Year-CC	25.04	221.92	225	224.13	225.08	0.002685	1.37	27.54	164.16	0.39
Innisfil Creek	818.21	2yr + 50% Std	19.34	221.92	224.91	223.89	224.98	0.002211	1.23	22.31	130.16	0.35
Innisfil Creek	775.99	2-Year-Std	12.89	222.05	224.62	223.25	224.64	0.000827	0.66	19.57	84.2	0.22
Innisfil Creek	775.99	2-Year-CC	25.04	222.05	225.02	223.7	225.03	0.000283	0.45	84.08	137.77	0.13
Innisfil Creek	775.99	2yr + 50% Std	19.34	222.05	224.88	223.5	224.91	0.000917	0.75	26.26	122.53	0.23
Innisfil Creek	675.4	2-Year-Std	12.89	222.1	224.46	223.35	224.52	0.001916	1.07	12	44.4	0.32
Innisfil Creek	675.4	2-Year-CC	25.04	222.1	224.98	223.87	224.99	0.000442	0.56	74.14	140.13	0.16
Innisfil Creek	675.4	2yr + 50% Std	19.34	222.1	224.82	223.65	224.83	0.000616	0.62	52.1	121.9	0.19
Innisfil Creek	610.94	2-Year-Std	12.89	222.24	224.37		224.42	0.001172	1.02	12.69	8	0.26
Innisfil Creek	610.94	2-Year-CC	25.04	222.24	224.85		224.93	0.002396	1.28	25.21	53.17	0.37
Innisfil Creek	610.94	2yr + 50% Std	19.34	222.24	224.68		224.75	0.00196	1.23	17.41	33.49	0.33
Innisfil Creek	573.99	2-Year-Std	12.89	222.12	224.34		224.37	0.001223	0.75	18.75	29.53	0.26
Innisfil Creek	573.99	2-Year-CC	25.04	222.12	224.84		224.86	0.000703	0.76	45.05	96.98	0.21
Innisfil Creek	573.99	2yr + 50% Std	19.34	222.12	224.67		224.69	0.000793	0.74	30.52	53.23	0.22
Innisfil Creek	570.75	2-Year-Std	12.89	222.02	224.33	223.21	224.36	0.001384	0.75	18.03	29.76	0.27
Innisfil Creek	570.75	2-Year-CC	25.04	222.02	224.82	223.66	224.86	0.000921	0.85	30.84	102.84	0.24
Innisfil Creek	570.75	2yr + 50% Std	19.34	222.02	224.66	223.47	224.69	0.000887	0.76	26.63	94.62	0.23
Innisfil Creek	554.83		Bridge									
Innisfil Creek	538.03	2-Year-Std	12.89	222.33	224.24	223.4	224.3	0.001722	1.07	13.59	16.38	0.29
Innisfil Creek	538.03	2-Year-CC	25.04	222.33	224.72	223.9	224.79	0.002037	1.31	23.45	65.81	0.33
Innisfil Creek	538.03	2yr + 50% Std	19.34	222.33	224.57	223.7	224.63	0.001839	1.18	19.68	49.33	0.31
Innisfil Creek	530.11	2-Year-Std	12.89	222.27	224.22		224.28	0.001491	1.08	11.92	8.64	0.29
Innisfil Creek	530.11	2-Year-CC	25.04	222.27	224.71		224.77	0.001315	1.14	36.06	78.23	0.28
Innisfil Creek	530.11	2yr + 50% Std	19.34	222.27	224.56		224.62	0.001415	1.15	24.6	66.53	0.29
Innisfil Creek	502.92	2-Year-Std	12.89	222.22	224.19		224.24	0.00131	1.02	12.76	13.1	0.28
Innisfil Creek	502.92	2-Year-CC	25.04	222.22	224.64		224.72	0.001715	1.31	25.55	66.83	0.33
Innisfil Creek	502.92	2yr + 50% Std	19.34	222.22	224.51		224.58	0.001441	1.16	19.47	26.43	0.3
Innisfil Creek	476.53	2-Year-Std	12.89	222.16	224.15		224.21	0.001401	1.08	11.97	8.05	0.28
Innisfil Creek	476.53	2-Year-CC	25.04	222.16	224.59		224.67	0.00217	1.36	26.82	76.06	0.36
Innisfil Creek	476.53	2yr + 50% Std	19.34	222.16	224.45		224.53	0.00206	1.28	17.39	51.23	0.34
Innisfil Creek	343.16	2-Year-Std	12.89	221.97	224.07		224.09	0.000521	0.52	24.64	26.59	0.17
Innisfil Creek	343.16	2-Year-CC	25.04	221.97	224.5		224.52	0.000549	0.66	42.94	86.96	0.19
Innisfil Creek	343.16	2yr + 50% Std	19.34	221.97	224.38		224.4	0.000466	0.57	35.6	45.42	0.17
Innisfil Creek	270.37	2-Year-Std	12.89	221.59	223.99		224.03	0.001283	0.97	17.31	31.69	0.27
Innisfil Creek	270.37	2-Year-CC	25.04	221.59	224.44		224.47	0.000956	0.97	50.18	106.12	0.24
Innisfil Creek	270.37	2yr + 50% Std	19.34	221.59	224.31		224.34	0.001074	0.99	36.77	98.69	0.25
Innisfil Creek	167.08	2-Year-Std	12.89	222.14	223.64	223.21	223.78	0.005029	1.66	7.74	7.71	0.53
Innisfil Creek	167.08	2-Year-CC	25.04	222.14	224.14	223.67	224.27	0.004906	1.73	22.16	87.68	0.54
Innisfil Creek	167.08	2yr + 50% Std	19.34	222.14	223.94	223.47	224.11	0.005622	1.85	11.7	29.78	0.57
Innisfil Creek	32.1	2-Year-Std	12.89	221.79	222.88	222.61	223.02	0.006407	1.64	7.84	9.88	0.59
Innisfil Creek	32.1	2-Year-CC	25.04	221.79	223.32	222.96	223.52	0.006405	2	12.52	11.57	0.61
Innisfil Creek	32.1	2yr + 50% Std	19.34	221.79	223.13	222.81	223.31	0.006401	1.85	10.45	10.94	0.6

Project Name: South Innisfil Creek Drain Improvements
Project No.: 300038790
Watershed: Innisfil Creek
River: Innisfil Creek
Reach: Innisfil Creek

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	7989.92	2-Year-Std	5.44	228.66	229.99		230.02	0.001559	0.78	6.94	8.96	0.28
Innisfil Creek	7989.92	2-Year-CC	9.94	228.66	230.58		230.6	0.001272	0.74	13.45	16.8	0.26
Innisfil Creek	7989.92	2yr + 50% Std	8.16	228.66	230.34		230.37	0.001142	0.79	10.39	10.59	0.25
Innisfil Creek	7959.34	2-Year-Std	5.44	228.6	229.95		229.97	0.001372	0.66	8.26	12.83	0.26
Innisfil Creek	7959.34	2-Year-CC	9.94	228.6	230.56		230.57	0.000632	0.57	17.57	19.46	0.19
Innisfil Creek	7959.34	2yr + 50% Std	8.16	228.6	230.32		230.34	0.000753	0.6	13.55	15.42	0.21
Innisfil Creek	7955.93	2-Year-Std	5.44	228.62	229.91	229.32	229.96	0.001352	0.93	5.85	12.37	0.29
Innisfil Creek	7955.93	2-Year-CC	9.94	228.62	230.5	229.55	230.56	0.001044	1.09	9.08	21.87	0.27
Innisfil Creek	7955.93	2yr + 50% Std	8.16	228.62	230.27	229.46	230.33	0.001154	1.04	7.83	16.24	0.28
Innisfil Creek	7925.47		Culvert									
Innisfil Creek	7903.16	2-Year-Std	5.44	228.48	229.73	229.21	229.78	0.00187	1.01	5.39	12.4	0.33
Innisfil Creek	7903.16	2-Year-CC	9.94	228.48	230.08	229.44	230.17	0.002258	1.36	7.32	15.2	0.38
Innisfil Creek	7903.16	2yr + 50% Std	8.16	228.48	229.95	229.36	230.03	0.002124	1.23	6.62	14.13	0.36
Innisfil Creek	7894.38	2-Year-Std	5.44	228.47	229.72		229.76	0.001877	0.82	6.65	9.33	0.31
Innisfil Creek	7894.38	2-Year-CC	9.94	228.47	230.08		230.13	0.001948	0.95	10.45	12.14	0.33
Innisfil Creek	7894.38	2yr + 50% Std	8.16	228.47	229.95		229.99	0.00187	0.91	8.95	10.67	0.32
Innisfil Creek	7859.36	2-Year-Std	5.44	228.39	229.65		229.69	0.001961	0.85	6.38	8.63	0.32
Innisfil Creek	7859.36	2-Year-CC	9.94	228.39	230.01		230.06	0.001997	1.03	9.7	10.06	0.33
Innisfil Creek	7859.36	2yr + 50% Std	8.16	228.39	229.88		229.93	0.001987	0.97	8.44	9.54	0.33
Innisfil Creek	7806.96	2-Year-Std	5.44	228.28	229.53		229.57	0.002402	0.92	5.92	8.34	0.35
Innisfil Creek	7806.96	2-Year-CC	9.94	228.28	229.89		229.95	0.002344	1.09	9.12	9.72	0.36
Innisfil Creek	7806.96	2yr + 50% Std	8.16	228.28	229.76		229.81	0.002361	1.03	7.91	9.22	0.36
Innisfil Creek	7754.55	2-Year-Std	5.44	228.18	229.42		229.46	0.002108	0.87	6.23	8.59	0.33
Innisfil Creek	7754.55	2-Year-CC	9.94	228.18	229.77		229.83	0.002118	1.04	9.58	10.25	0.34
Innisfil Creek	7754.55	2yr + 50% Std	8.16	228.18	229.64		229.69	0.002121	0.98	8.31	9.65	0.34
Innisfil Creek	7704.9	2-Year-Std	5.44	228.07	229.31		229.35	0.002086	0.87	6.25	8.59	0.33
Innisfil Creek	7704.9	2-Year-CC	9.94	228.07	229.67		229.72	0.002085	1.04	9.55	10.01	0.34
Innisfil Creek	7704.9	2yr + 50% Std	8.16	228.07	229.54		229.59	0.002086	0.98	8.31	9.5	0.34
Innisfil Creek	7651.65	2-Year-Std	5.44	227.96	229.2		229.24	0.00211	0.87	6.22	8.57	0.33
Innisfil Creek	7651.65	2-Year-CC	9.94	227.96	229.56		229.61	0.002102	1.04	9.52	10	0.34
Innisfil Creek	7651.65	2yr + 50% Std	8.16	227.96	229.43		229.48	0.002106	0.99	8.28	9.48	0.34
Innisfil Creek	7601.12	2-Year-Std	5.44	227.86	229.1		229.13	0.002063	0.87	6.28	8.65	0.32
Innisfil Creek	7601.12	2-Year-CC	9.94	227.86	229.45		229.51	0.002051	1.03	9.62	10.08	0.34
Innisfil Creek	7601.12	2yr + 50% Std	8.16	227.86	229.32		229.37	0.002056	0.98	8.36	9.56	0.33
Innisfil Creek	7550.06	2-Year-Std	5.44	227.75	228.99		229.03	0.002021	0.86	6.34	8.7	0.32
Innisfil Creek	7550.06	2-Year-CC	9.94	227.75	229.35		229.4	0.002012	1.02	9.7	10.15	0.33
Innisfil Creek	7550.06	2yr + 50% Std	8.16	227.75	229.22		229.27	0.002016	0.97	8.43	9.63	0.33
Innisfil Creek	7494.73	2-Year-Std	5.44	227.63	228.88		228.92	0.002045	0.86	6.3	8.63	0.32
Innisfil Creek	7494.73	2-Year-CC	9.94	227.63	229.24		229.29	0.002043	1.03	9.63	10.07	0.34
Innisfil Creek	7494.73	2yr + 50% Std	8.16	227.63	229.11		229.16	0.002045	0.97	8.37	9.54	0.33
Innisfil Creek	7435.18	2-Year-Std	5.44	227.51	228.75		228.79	0.002137	0.88	6.17	8.47	0.33
Innisfil Creek	7435.18	2-Year-CC	9.94	227.51	229.11		229.17	0.002134	1.05	9.44	9.87	0.34
Innisfil Creek	7435.18	2yr + 50% Std	8.16	227.51	228.98		229.03	0.002136	0.99	8.21	9.36	0.34
Innisfil Creek	7380.71	2-Year-Std	5.44	227.4	228.64		228.68	0.002032	0.86	6.32	8.67	0.32
Innisfil Creek	7380.71	2-Year-CC	9.94	227.4	229		229.05	0.002025	1.03	9.68	10.14	0.34
Innisfil Creek	7380.71	2yr + 50% Std	8.16	227.4	228.87		228.92	0.00203	0.97	8.41	9.61	0.33
Innisfil Creek	7328.15	2-Year-Std	5.44	227.29	228.53		228.57	0.00208	0.87	6.25	8.58	0.33
Innisfil Creek	7328.15	2-Year-CC	9.94	227.29	228.89		228.94	0.002073	1.04	9.57	10.01	0.34
Innisfil Creek	7328.15	2yr + 50% Std	8.16	227.29	228.76		228.81	0.002079	0.98	8.31	9.49	0.33
Innisfil Creek	7274.39	2-Year-Std	5.44	227.18	228.42		228.46	0.002138	0.88	6.18	8.49	0.33
Innisfil Creek	7274.39	2-Year-CC	9.94	227.18	228.78		228.83	0.002117	1.05	9.46	9.84	0.34
Innisfil Creek	7274.39	2yr + 50% Std	8.16	227.18	228.65		228.7	0.002126	0.99	8.22	9.36	0.34
Innisfil Creek	7217.73	2-Year-Std	5.44	227.06	228.3		228.34	0.002078	0.87	6.27	8.63	0.33
Innisfil Creek	7217.73	2-Year-CC	9.94	227.06	228.66		228.71	0.002046	1.03	9.64	10.1	0.34
Innisfil Creek	7217.73	2yr + 50% Std	8.16	227.06	228.53		228.58	0.002061	0.98	8.35	9.57	0.33
Innisfil Creek	7164.17	2-Year-Std	5.44	226.95	228.19		228.23	0.002088	0.87	6.25	8.59	0.33
Innisfil Creek	7164.17	2-Year-CC	9.94	226.95	228.55		228.6	0.002047	1.03	9.62	10.04	0.34
Innisfil Creek	7164.17	2yr + 50% Std	8.16	226.95	228.42		228.47	0.002067	0.98	8.33	9.51	0.33
Innisfil Creek	7112.51	2-Year-Std	5.44	226.84	228.08		228.12	0.002114	0.88	6.22	8.56	0.33
Innisfil Creek	7112.51	2-Year-CC	9.94	226.84	228.44		228.5	0.00205	1.03	9.61	10.02	0.34
Innisfil Creek	7112.51	2yr + 50% Std	8.16	226.84	228.31		228.36	0.002079	0.98	8.31	9.49	0.33
Innisfil Creek	7050.16	2-Year-Std	5.44	226.71	227.96		227.99	0.001839	0.83	6.58	8.95	0.31
Innisfil Creek	7050.16	2-Year-CC	9.94	226.71	228.33		228.38	0.001785	0.98	10.17	10.47	0.32
Innisfil Creek	7050.16	2yr + 50% Std	8.16	226.71	228.19		228.24	0.001813	0.93	8.79	9.91	0.31
Innisfil Creek	6996.9	2-Year-Std	5.44	226.6	227.86		227.89	0.001939	0.85	6.42	8.69	0.31
Innisfil Creek	6996.9	2-Year-CC	9.94	226.6	228.23		228.28	0.001878	1	9.92	10.17	0.32
Innisfil Creek	6996.9	2yr + 50% Std	8.16	226.6	228.09		228.14	0.001913	0.95	8.57	9.63	0.32
Innisfil Creek	6945.47	2-Year-Std	5.44	226.49	227.76		227.8	0.001853	0.83	6.52	8.76	0.31
Innisfil Creek	6945.47	2-Year-CC	9.94	226.49	228.13		228.18	0.001797	0.98	10.09	10.29	0.32
Innisfil Creek	6945.47	2yr + 50% Std	8.16	226.49	228		228.04	0.001833	0.94	8.71	9.72	0.32
Innisfil Creek	6894.65	2-Year-Std	5.44	226.39	227.64		227.68	0.002581	0.94	5.77	8.22	0.36
Innisfil Creek	6894.65	2-Year-CC	9.94	226.39	228.02		228.08	0.002297	1.08	9.22	9.84	0.36
Innisfil Creek	6894.65	2yr + 50% Std	8.16	226.39	227.88		227.93	0.002416	1.04	7.87	9.24	0.36
Innisfil Creek	6841.91	2-Year-Std	5.44	226.28	227.53		227.56	0.001941	0.85	6.43	8.77	0.32
Innisfil Creek	6841.91	2-Year-CC	9.94	226.28	227.92		227.97	0.001732	0.97	10.24	10.39	0.31
Innisfil Creek	6841.91	2yr + 50% Std	8.16	226.28	227.78		227.82	0.00182	0.93	8.75	9.79	0.31
Innisfil Creek	6783.42	2-Year-Std	5.44	226.16	227.43		227.46	0.001676	0.77	7.02	9.92	0.29
Innisfil Creek	6783.42	2-Year-CC	9.94	226.16	227.84		227.88	0.001382	0.86	11.6	12.19	0.28
Innisfil Creek	6783.42	2yr + 50% Std	8.16	226.16	227.69		227.72	0.001474	0.83	9.79	11.25	0.29
Innisfil Creek	6729.42	2-Year-Std	5.44	226.06	227.35		227.37	0.001367	0.73	7.46	9.92	0.27
Innisfil Creek	6729.42	2-Year-CC	9.94	226.06	227.78		227.81	0.001154	0.82	12.14	11.9	0.26
Innisfil Creek	6729.42	2yr + 50% Std	8.16	226.06	227.62		227.65	0.001226	0.79	10.32	11.15	0.26

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE

R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	6675.61	2-Year-Std	5.44	225.96	227.26		227.29	0.001649	0.8	6.78	8.83	0.29
Innisfil Creek	6675.61	2-Year-CC	9.94	225.96	227.7		227.74	0.001383	0.9	11.06	10.59	0.28
Innisfil Creek	6675.61	2yr + 50% Std	8.16	225.96	227.54		227.58	0.001474	0.87	9.39	9.94	0.29
Innisfil Creek	6625.44	2-Year-Std	5.44	225.86	227.18		227.21	0.00162	0.8	6.79	8.7	0.29
Innisfil Creek	6625.44	2-Year-CC	9.94	225.86	227.63		227.67	0.001332	0.89	11.12	10.4	0.28
Innisfil Creek	6625.44	2yr + 50% Std	8.16	225.86	227.47		227.5	0.001422	0.86	9.44	9.76	0.28
Innisfil Creek	6574.68	2-Year-Std	5.44	225.77	227.1		227.13	0.00154	0.79	6.93	8.82	0.28
Innisfil Creek	6574.68	2-Year-CC	9.94	225.77	227.57		227.61	0.001224	0.86	11.52	10.67	0.27
Innisfil Creek	6574.68	2yr + 50% Std	8.16	225.77	227.4		227.43	0.00132	0.84	9.74	9.99	0.27
Innisfil Creek	6520.14	2-Year-Std	5.44	225.67	227.02		227.05	0.001331	0.74	7.33	9.14	0.26
Innisfil Creek	6520.14	2-Year-CC	9.94	225.67	227.51		227.54	0.001038	0.81	12.27	11.1	0.25
Innisfil Creek	6520.14	2yr + 50% Std	8.16	225.67	227.33		227.37	0.001122	0.79	10.37	10.39	0.25
Innisfil Creek	6459.61	2-Year-Std	5.44	225.55	226.95		226.98	0.001162	0.71	7.69	9.3	0.25
Innisfil Creek	6459.61	2-Year-CC	9.94	225.55	227.46		227.49	0.000903	0.77	12.91	11.35	0.23
Innisfil Creek	6459.61	2yr + 50% Std	8.16	225.55	227.27		227.3	0.000974	0.75	10.91	10.61	0.24
Innisfil Creek	6408.33	2-Year-Std	5.44	225.46	226.89	226.25	226.92	0.001059	0.69	7.92	9.32	0.24
Innisfil Creek	6408.33	2-Year-CC	9.94	225.46	227.41	226.46	227.44	0.000828	0.75	13.29	19.79	0.22
Innisfil Creek	6408.33	2yr + 50% Std	8.16	225.46	227.23	226.38	227.25	0.000889	0.73	11.25	12.78	0.23
Innisfil Creek	6357.07	2-Year-Std	5.44	225.36	226.85	226.15	226.87	0.000907	0.65	8.33	9.39	0.22
Innisfil Creek	6357.07	2-Year-CC	9.94	225.36	227.37	226.36	227.4	0.00073	0.72	13.82	17.55	0.21
Innisfil Creek	6357.07	2yr + 50% Std	8.16	225.36	227.19	226.28	227.21	0.000775	0.69	11.75	10.69	0.21
Innisfil Creek	6350.13	2-Year-Std	3.17	225.35	226.85	226	226.86	0.000271	0.42	7.53	9.74	0.13
Innisfil Creek	6350.13	2-Year-CC	5.78	225.35	227.38	226.15	227.39	0.000249	0.52	11.07	16.64	0.13
Innisfil Creek	6350.13	2yr + 50% Std	4.75	225.35	227.19	226.09	227.2	0.000252	0.48	9.81	11.06	0.13
Innisfil Creek	6332.44		Bridge									
Innisfil Creek	6320.07	2-Year-Std	3.17	225.3	226.83	225.94	226.84	0.000232	0.4	7.85	9.79	0.12
Innisfil Creek	6320.07	2-Year-CC	5.78	225.3	227.35	226.08	227.37	0.000225	0.51	11.36	14.16	0.12
Innisfil Creek	6320.07	2yr + 50% Std	4.75	225.3	227.17	226.03	227.18	0.000225	0.47	10.11	11.09	0.12
Innisfil Creek	6308.21	2-Year-Std	3.17	225.27	226.83	225.85	226.83	0.000247	0.35	8.97	9.53	0.12
Innisfil Creek	6308.21	2-Year-CC	5.78	225.27	227.35	226.07	227.36	0.000215	0.4	14.49	15.45	0.11
Innisfil Creek	6308.21	2yr + 50% Std	4.75	225.27	227.17	226.02	227.17	0.000223	0.38	12.41	12.26	0.11
Innisfil Creek	6298.01	2-Year-Std	8.35	225.25	226.78	226.18	226.82	0.001834	0.94	8.84	10.03	0.32
Innisfil Creek	6298.01	2-Year-CC	15.16	225.25	227.29	226.44	227.35	0.001542	1.05	14.41	16.17	0.3
Innisfil Creek	6298.01	2yr + 50% Std	12.53	225.25	227.11	226.35	227.16	0.001632	1.02	12.31	13.18	0.31
Innisfil Creek	6244.02	2-Year-Std	8.35	225.15	226.68		226.72	0.001837	0.95	8.83	9.72	0.32
Innisfil Creek	6244.02	2-Year-CC	15.16	225.15	227.21		227.27	0.001483	1.04	14.61	11.87	0.3
Innisfil Creek	6244.02	2yr + 50% Std	12.53	225.15	227.02		227.08	0.001583	1.01	12.44	11.11	0.3
Innisfil Creek	6192.36	2-Year-Std	8.35	225.06	226.59		226.63	0.001781	0.93	8.95	9.82	0.31
Innisfil Creek	6192.36	2-Year-CC	15.16	225.06	227.14		227.19	0.001376	1.01	15.03	12.07	0.29
Innisfil Creek	6192.36	2yr + 50% Std	12.53	225.06	226.95		227	0.001481	0.98	12.76	11.29	0.29
Innisfil Creek	6158.78	2-Year-Std	8.35	224.99	226.53		226.57	0.001744	0.93	9.02	9.87	0.31
Innisfil Creek	6158.78	2-Year-CC	15.16	224.99	227.1		227.15	0.001309	0.99	15.32	12.19	0.28
Innisfil Creek	6158.78	2yr + 50% Std	12.53	224.99	226.9		226.95	0.001415	0.97	12.98	11.39	0.29
Innisfil Creek	6152.49	2-Year-Std	8.35	224.98	226.5	225.91	226.56	0.001764	1.02	8.21	9.7	0.32
Innisfil Creek	6152.49	2-Year-CC	15.16	224.98	227.06	226.17	227.13	0.001401	1.2	12.59	11.91	0.3
Innisfil Creek	6152.49	2yr + 50% Std	12.53	224.98	226.87	226.07	226.93	0.001463	1.13	11.08	11.16	0.3
Innisfil Creek	6138.03		Bridge									
Innisfil Creek	6122.68	2-Year-Std	8.35	224.93	226.39	225.86	226.46	0.002342	1.11	7.5	11.09	0.36
Innisfil Creek	6122.68	2-Year-CC	15.16	224.93	226.94	226.13	227.02	0.001756	1.29	11.77	18.15	0.34
Innisfil Creek	6122.68	2yr + 50% Std	12.53	224.93	226.75	226.03	226.83	0.001853	1.21	10.33	15.75	0.34
Innisfil Creek	6117.41	2-Year-Std	8.35	224.92	226.4		226.43	0.001221	0.77	10.9	12.28	0.26
Innisfil Creek	6117.41	2-Year-CC	15.16	224.92	226.95		226.99	0.000891	0.84	18.09	13.78	0.23
Innisfil Creek	6117.41	2yr + 50% Std	12.53	224.92	226.77		226.8	0.000946	0.8	15.57	13.28	0.24
Innisfil Creek	6109.82	2-Year-Std	8.35	224.91	226.41		226.42	0.000493	0.55	15.24	14.32	0.17
Innisfil Creek	6109.82	2-Year-CC	15.16	224.91	226.96		226.98	0.000448	0.64	23.6	16.1	0.17
Innisfil Creek	6109.82	2yr + 50% Std	12.53	224.91	226.77		226.79	0.000447	0.61	20.67	15.37	0.17
Innisfil Creek	6059.75	2-Year-Std	8.35	224.88	226.39		226.4	0.000443	0.51	16.41	16.54	0.16
Innisfil Creek	6059.75	2-Year-CC	15.16	224.88	226.94		226.96	0.000418	0.55	27.32	23.2	0.16
Innisfil Creek	6059.75	2yr + 50% Std	12.53	224.88	226.75		226.77	0.000461	0.54	23.07	21.8	0.17
Innisfil Creek	6009.78	2-Year-Std	8.35	224.86	226.36		226.38	0.00044	0.51	16.44	16.52	0.16
Innisfil Creek	6009.78	2-Year-CC	15.16	224.86	226.92		226.94	0.000408	0.55	27.39	22.91	0.16
Innisfil Creek	6009.78	2yr + 50% Std	12.53	224.86	226.73		226.75	0.000457	0.54	23.12	21.77	0.17
Innisfil Creek	5959.77	2-Year-Std	8.35	224.83	226.34		226.35	0.000436	0.51	16.48	16.52	0.16
Innisfil Creek	5959.77	2-Year-CC	15.16	224.83	226.9		226.92	0.000399	0.55	27.36	22.47	0.16
Innisfil Creek	5959.77	2yr + 50% Std	12.53	224.83	226.71		226.72	0.000445	0.54	23.12	21.32	0.17
Innisfil Creek	5909.75	2-Year-Std	8.35	224.81	226.32		226.33	0.000431	0.5	16.55	16.55	0.16
Innisfil Creek	5909.75	2-Year-CC	15.16	224.81	226.88		226.9	0.0004	0.55	27.66	23.17	0.16
Innisfil Creek	5909.75	2yr + 50% Std	12.53	224.81	226.69		226.7	0.000455	0.54	23.23	21.99	0.17
Innisfil Creek	5858.47	2-Year-Std	8.35	224.78	226.3		226.31	0.000425	0.5	16.64	16.59	0.16
Innisfil Creek	5858.47	2-Year-CC	15.16	224.78	226.86		226.88	0.000379	0.55	27.53	21.88	0.16
Innisfil Creek	5858.47	2yr + 50% Std	12.53	224.78	226.66		226.68	0.00043	0.54	23.27	21.09	0.16
Innisfil Creek	5808.8	2-Year-Std	8.35	224.76	226.28		226.29	0.000419	0.5	16.71	16.6	0.16
Innisfil Creek	5808.8	2-Year-CC	15.16	224.76	226.84		226.86	0.000374	0.55	27.81	22.27	0.16
Innisfil Creek	5808.8	2yr + 50% Std	12.53	224.76	226.64		226.66	0.00043	0.54	23.41	21.45	0.16
Innisfil Creek	5758.17	2-Year-Std	8.35	224.73	226.26		226.27	0.000415	0.5	16.76	16.6	0.16
Innisfil Creek	5758.17	2-Year-CC	15.16	224.73	226.82		226.84	0.000373	0.54	27.82	22.22	0.16
Innisfil Creek	5758.17	2yr + 50% Std	12.53	224.73	226.62		226.63	0.000431	0.54	23.37	21.38	0.16
Innisfil Creek	5708.09	2-Year-Std	8.35	224.71	226.24	225.42	226.25	0.000408	0.49	16.87	16.66	0.16
Innisfil Creek	5708.09	2-Year-CC	15.16	224.71	226.81	225.59	226.82	0.000393	0.54	28.25	34.27	0.16
Innisfil Creek	5708.09	2yr + 50% Std	12.53	224.71	226.6	225.53	226.61	0.000443	0.53	23.52	22.25	0.17

Project Name: South Innisfil Creek Drain Improvements
Project No.: 300038790
Watershed: Innisfil Creek
River: Innisfil Creek
Reach: Innisfil Creek

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	5658.05	2-Year-Std	8.35	224.68	226.22	225.39	226.23	0.000404	0.49	16.91	16.64	0.16
Innisfil Creek	5658.05	2-Year-CC	15.16	224.68	226.79	225.56	226.8	0.000377	0.54	27.99	40.24	0.16
Innisfil Creek	5658.05	2yr + 50% Std	12.53	224.68	226.58	225.5	226.59	0.000452	0.54	23.31	27.16	0.17
Innisfil Creek	5606.26	2-Year-Std	8.35	224.66	226.2		226.21	0.000398	0.49	17	16.65	0.16
Innisfil Creek	5606.26	2-Year-CC	15.16	224.66	226.77		226.78	0.000372	0.54	27.96	22.31	0.15
Innisfil Creek	5606.26	2yr + 50% Std	12.53	224.66	226.55		226.57	0.000435	0.54	23.23	21.19	0.16
Innisfil Creek	5554.3	2-Year-Std	8.35	224.63	226.17		226.19	0.000391	0.49	17.11	16.69	0.15
Innisfil Creek	5554.3	2-Year-CC	15.16	224.63	226.75		226.76	0.00038	0.54	28	22.78	0.16
Innisfil Creek	5554.3	2yr + 50% Std	12.53	224.63	226.53		226.55	0.000352	0.54	23.32	18.12	0.15
Innisfil Creek	5496.18	2-Year-Std	8.35	224.6	226.15	225.3	226.16	0.000357	0.47	17.77	17.21	0.15
Innisfil Creek	5496.18	2-Year-CC	15.16	224.6	226.73	225.47	226.74	0.000298	0.54	28.31	25.71	0.14
Innisfil Creek	5496.18	2yr + 50% Std	12.53	224.6	226.51	225.41	226.53	0.000322	0.52	24.22	18.67	0.14
Innisfil Creek	5440.69	2-Year-Std	8.77	224.57	226.13		226.14	0.000379	0.48	18.19	17.74	0.15
Innisfil Creek	5440.69	2-Year-CC	15.81	224.57	226.71		226.73	0.000309	0.54	29.23	20.48	0.14
Innisfil Creek	5440.69	2yr + 50% Std	13.16	224.57	226.49		226.51	0.00034	0.53	24.91	19.46	0.15
Innisfil Creek	5387.54	2-Year-Std	8.77	224.55	226.11		226.12	0.000403	0.5	17.67	17.27	0.16
Innisfil Creek	5387.54	2-Year-CC	15.81	224.55	226.69		226.71	0.000325	0.56	28.47	19.9	0.15
Innisfil Creek	5387.54	2yr + 50% Std	13.16	224.55	226.47		226.49	0.000359	0.54	24.25	18.91	0.15
Innisfil Creek	5337.73	2-Year-Std	8.77	224.52	226.09	225.24	226.1	0.000402	0.5	17.51	16.79	0.16
Innisfil Creek	5337.73	2-Year-CC	15.81	224.52	226.68	225.42	226.69	0.000329	0.56	28.01	19.14	0.15
Innisfil Creek	5337.73	2yr + 50% Std	13.16	224.52	226.46	225.35	226.47	0.000361	0.55	23.91	18.25	0.15
Innisfil Creek	5287.92	2-Year-Std	8.77	224.5	226.07		226.08	0.000396	0.5	17.6	16.82	0.16
Innisfil Creek	5287.92	2-Year-CC	15.81	224.5	226.66		226.68	0.000322	0.56	28.2	19.18	0.15
Innisfil Creek	5287.92	2yr + 50% Std	13.16	224.5	226.44		226.45	0.000355	0.55	24.06	18.3	0.15
Innisfil Creek	5230.43	2-Year-Std	8.77	224.47	226.05	225.19	226.06	0.000386	0.49	17.77	16.9	0.15
Innisfil Creek	5230.43	2-Year-CC	15.81	224.47	226.64	225.36	226.66	0.000313	0.56	28.49	19.27	0.15
Innisfil Creek	5230.43	2yr + 50% Std	13.16	224.47	226.42	225.3	226.43	0.000345	0.54	24.29	18.38	0.15
Innisfil Creek	5205		Bridge									
Innisfil Creek	5180.56	2-Year-Std	8.77	224.44	226.03	225.17	226.04	0.000381	0.49	17.83	16.89	0.15
Innisfil Creek	5180.56	2-Year-CC	15.81	224.44	226.61	225.34	226.63	0.000318	0.56	28.34	19.22	0.15
Innisfil Creek	5180.56	2yr + 50% Std	13.16	224.44	226.4	225.28	226.41	0.000342	0.54	24.36	18.37	0.15
Innisfil Creek	5130.44	2-Year-Std	8.77	224.42	226.01	225.14	226.02	0.000376	0.49	17.92	16.9	0.15
Innisfil Creek	5130.44	2-Year-CC	15.81	224.42	226.6	225.31	226.61	0.000313	0.56	28.48	19.23	0.15
Innisfil Creek	5130.44	2yr + 50% Std	13.16	224.42	226.38	225.25	226.4	0.000337	0.54	24.48	18.38	0.15
Innisfil Creek	5081.27	2-Year-Std	8.77	224.39	225.99	225.11	226	0.000368	0.49	18.04	16.94	0.15
Innisfil Creek	5081.27	2-Year-CC	15.81	224.39	226.58	225.29	226.6	0.000307	0.55	28.7	19.3	0.14
Innisfil Creek	5081.27	2yr + 50% Std	13.16	224.39	226.37	225.23	226.38	0.00033	0.53	24.66	18.44	0.15
Innisfil Creek	5030.83	2-Year-Std	8.77	224.37	225.97	225.09	225.99	0.000363	0.48	18.12	16.93	0.15
Innisfil Creek	5030.83	2-Year-CC	15.81	224.37	226.56	225.26	226.58	0.000301	0.55	29.82	43.1	0.14
Innisfil Creek	5030.83	2yr + 50% Std	13.16	224.37	226.35	225.2	226.36	0.000325	0.53	24.77	18.43	0.15
Innisfil Creek	5000		Bridge									
Innisfil Creek	4979.68	2-Year-Std	8.77	224.34	225.95	225.06	225.97	0.000357	0.48	18.22	16.95	0.15
Innisfil Creek	4979.68	2-Year-CC	15.81	224.34	226.54	225.24	226.55	0.000302	0.55	29.27	26.09	0.14
Innisfil Creek	4979.68	2yr + 50% Std	13.16	224.34	226.33	225.18	226.35	0.000321	0.53	24.88	18.45	0.15
Innisfil Creek	4929.66	2-Year-Std	8.77	224.32	225.94	225.04	225.95	0.000324	0.46	21.72	42.49	0.14
Innisfil Creek	4929.66	2-Year-CC	15.81	224.32	226.53	225.21	226.54	0.000167	0.41	49.02	49.43	0.11
Innisfil Creek	4929.66	2yr + 50% Std	13.16	224.32	226.32	225.15	226.33	0.000207	0.43	38.9	46.98	0.12
Innisfil Creek	4879.67	2-Year-Std	8.77	224.29	225.92	225.01	225.93	0.000339	0.47	18.59	20.21	0.14
Innisfil Creek	4879.67	2-Year-CC	15.81	224.29	226.52	225.19	226.53	0.00021	0.42	47.5	59.9	0.12
Innisfil Creek	4879.67	2yr + 50% Std	13.16	224.29	226.31	225.12	226.32	0.000316	0.46	34.68	59.47	0.14
Innisfil Creek	4775.19	2-Year-Std	8.77	224.24	225.89	224.96	225.9	0.000323	0.47	18.85	48.57	0.14
Innisfil Creek	4775.19	2-Year-CC	15.81	224.24	226.49	225.13	226.51	0.000232	0.49	39.73	101.75	0.13
Innisfil Creek	4775.19	2yr + 50% Std	13.16	224.24	226.27	225.07	226.29	0.000284	0.5	27.7	75.94	0.14
Innisfil Creek	4725.54	2-Year-Std	8.77	224.22	225.87	224.94	225.88	0.000317	0.46	18.95	44.82	0.14
Innisfil Creek	4725.54	2-Year-CC	15.81	224.22	226.48	225.11	226.49	0.00023	0.49	39.35	88.04	0.13
Innisfil Creek	4725.54	2yr + 50% Std	13.16	224.22	226.26	225.05	226.27	0.00028	0.5	27.56	65.71	0.14
Innisfil Creek	4672.67	2-Year-Std	8.77	224.19	225.85		225.87	0.000308	0.46	19.17	17.24	0.14
Innisfil Creek	4672.67	2-Year-CC	15.81	224.19	226.47		226.48	0.000215	0.47	42.33	88.57	0.12
Innisfil Creek	4672.67	2yr + 50% Std	13.16	224.19	226.24		226.26	0.000272	0.5	28.36	45.78	0.13
Innisfil Creek	4622.31	2-Year-Std	8.77	224.16	225.84		225.85	0.000299	0.45	19.35	17.25	0.14
Innisfil Creek	4622.31	2-Year-CC	15.81	224.16	226.46		226.47	0.00017	0.42	53.88	100.51	0.11
Innisfil Creek	4622.31	2yr + 50% Std	13.16	224.16	226.23		226.24	0.000249	0.48	32.43	73.6	0.13
Innisfil Creek	4569.09	2-Year-Std	8.77	224.14	225.83		225.83	0.000204	0.38	30.65	54.99	0.11
Innisfil Creek	4569.09	2-Year-CC	15.81	224.14	226.46		226.46	0.000077	0.29	80.72	104.99	0.07
Innisfil Creek	4569.09	2yr + 50% Std	13.16	224.14	226.23		226.23	0.000115	0.33	57.14	88.08	0.09
Innisfil Creek	4498.15	2-Year-Std	8.77	224.1	225.81	224.82	225.82	0.00026	0.43	22.62	45.53	0.13
Innisfil Creek	4498.15	2-Year-CC	15.81	224.1	226.45	225	226.46	0.000112	0.35	60.13	100.22	0.09
Innisfil Creek	4498.15	2yr + 50% Std	13.16	224.1	226.22	224.94	226.22	0.000157	0.39	45.59	98.29	0.1
Innisfil Creek	4448.24	2-Year-Std	8.77	224.08	225.79	224.8	225.8	0.000269	0.44	20.05	18.2	0.13
Innisfil Creek	4448.24	2-Year-CC	15.81	224.08	226.45	224.97	226.45	0.00013	0.38	55.13	97.55	0.1
Innisfil Creek	4448.24	2yr + 50% Std	13.16	224.08	226.21	224.91	226.21	0.000181	0.42	40.82	70.94	0.11
Innisfil Creek	4420.59	2-Year-Std	8.77	224.06	225.79	224.78	225.8	0.000265	0.44	20.16	17.4	0.13
Innisfil Creek	4420.59	2-Year-CC	15.81	224.06	226.44	224.96	226.45	0.000145	0.4	51.65	96.46	0.1
Innisfil Creek	4420.59	2yr + 50% Std	13.16	224.06	226.2	224.9	226.21	0.000196	0.43	37.65	65	0.11
Innisfil Creek	4414.78	2-Year-Std	8.77	224.06	225.79	224.78	225.8	0.000264	0.43	20.18	17.41	0.13
Innisfil Creek	4414.78	2-Year-CC	15.81	224.06	226.44	224.95	226.45	0.000134	0.38	59.38	95.92	0.1
Innisfil Creek	4414.78	2yr + 50% Std	13.16	224.06	226.2	224.89	226.21	0.000196	0.43	37.79	64.34	0.11
Innisfil Creek	4414		Bridge									
Innisfil Creek	4398.24	2-Year-Std	8.77	224.05	225.78		225.79	0.000262	0.43	20.27	21.65	0.13
Innisfil Creek	4398.24	2-Year-CC	15.81	224.05	226.44		226.44	0.000129	0.38	59.79	90.25	0.09
Innisfil Creek	4398.24	2yr + 50% Std	13.16	224.05	226.19		226.2	0.000186	0.42	39.23	71.95	0.11

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	4390.14	2-Year-Std	8.77	224.05	225.78	224.77	225.79	0.000256	0.43	20.51	22.42	0.13
Innisfil Creek	4390.14	2-Year-CC	15.81	224.05	226.43	224.94	226.44	0.000132	0.38	59.08	90.3	0.1
Innisfil Creek	4390.14	2yr + 50% Std	13.16	224.05	226.19	224.88	226.2	0.000192	0.43	38.32	75.92	0.11
Innisfil Creek	4359		Bridge									
Innisfil Creek	4357.15	2-Year-Std	8.77	224.03	225.77		225.78	0.000237	0.38	25.29	42.71	0.12
Innisfil Creek	4357.15	2-Year-CC	15.81	224.03	226.43		226.43	0.000105	0.32	66.34	79.84	0.08
Innisfil Creek	4357.15	2yr + 50% Std	13.16	224.03	226.19		226.19	0.000148	0.35	48.37	68.13	0.1
Innisfil Creek	4353.92	2-Year-Std	8.77	224.03	225.76	224.75	225.78	0.000238	0.46	19.19	40.49	0.13
Innisfil Creek	4353.92	2-Year-CC	15.81	224.03	226.41	224.93	226.43	0.000206	0.55	28.53	75.38	0.13
Innisfil Creek	4353.92	2yr + 50% Std	13.16	224.03	226.17	224.86	226.19	0.000219	0.52	25.09	63.36	0.13
Innisfil Creek	4344.82	2-Year-Std	8.77	224.02	225.76	224.74	225.77	0.000238	0.46	19.2	48.2	0.13
Innisfil Creek	4344.82	2-Year-CC	15.81	224.02	226.41	224.92	226.42	0.000206	0.55	28.54	79.77	0.13
Innisfil Creek	4344.82	2yr + 50% Std	13.16	224.02	226.17	224.86	226.18	0.000219	0.52	25.1	68.9	0.13
Innisfil Creek	4338.07	2-Year-Std	8.77	224.02	225.76	224.74	225.77	0.000257	0.43	20.34	48.32	0.13
Innisfil Creek	4338.07	2-Year-CC	15.81	224.02	226.41	224.92	226.42	0.000213	0.49	32.51	79.34	0.12
Innisfil Creek	4338.07	2yr + 50% Std	13.16	224.02	226.17	224.86	226.18	0.000231	0.47	27.82	68.46	0.12
Innisfil Creek	4328.33	2-Year-Std	8.77	224.02	225.76	224.73	225.76	0.000243	0.42	20.88	50.76	0.12
Innisfil Creek	4328.33	2-Year-CC	15.81	224.02	226.41	224.9	226.42	0.000202	0.47	33.41	86	0.12
Innisfil Creek	4328.33	2yr + 50% Std	13.16	224.02	226.17	224.84	226.18	0.000219	0.46	28.57	73.59	0.12
Innisfil Creek	4324.37	2-Year-Std	8.77	224.01	225.75	224.73	225.76	0.000249	0.42	20.73	50.51	0.13
Innisfil Creek	4324.37	2-Year-CC	15.81	224.01	226.4	224.91	226.42	0.000205	0.47	33.31	93.58	0.12
Innisfil Creek	4324.37	2yr + 50% Std	13.16	224.01	226.16	224.85	226.18	0.000223	0.46	28.46	79.1	0.12
Innisfil Creek	4313.06	2-Year-Std	8.77	224.01	225.75	224.73	225.76	0.000229	0.41	24.27	47	0.12
Innisfil Creek	4313.06	2-Year-CC	15.81	224.01	226.41	224.9	226.41	0.000124	0.37	56.22	98.17	0.09
Innisfil Creek	4313.06	2yr + 50% Std	13.16	224.01	226.17	224.84	226.17	0.00016	0.39	42.49	83.01	0.1
Innisfil Creek	4304.06	2-Year-Std	8.77	224.01	225.75	224.73	225.76	0.000227	0.4	24.71	38.42	0.12
Innisfil Creek	4304.06	2-Year-CC	15.81	224.01	226.41	224.9	226.41	0.000111	0.36	59.66	96.43	0.09
Innisfil Creek	4304.06	2yr + 50% Std	13.16	224.01	226.16	224.84	226.17	0.000154	0.39	44.72	85.92	0.1
Innisfil Creek	4259.19	2-Year-Std	8.77	223.98	225.74	224.7	225.75	0.000238	0.42	20.96	31.5	0.12
Innisfil Creek	4259.19	2-Year-CC	15.81	223.98	226.39	224.87	226.4	0.000199	0.47	33.46	57.27	0.12
Innisfil Creek	4259.19	2yr + 50% Std	13.16	223.98	226.15	224.81	226.16	0.000215	0.46	28.64	49.09	0.12
Innisfil Creek	4241.22	2-Year-Std	8.77	223.97	225.73	224.69	225.74	0.000237	0.42	20.99	23.45	0.12
Innisfil Creek	4241.22	2-Year-CC	15.81	223.97	226.39	224.87	226.4	0.000198	0.47	33.46	90.75	0.12
Innisfil Creek	4241.22	2yr + 50% Std	13.16	223.97	226.15	224.81	226.16	0.000214	0.46	28.65	49.17	0.12
Innisfil Creek	4234.17	2-Year-Std	8.77	223.97	225.73	224.69	225.74	0.00024	0.42	20.86	27.77	0.12
Innisfil Creek	4234.17	2-Year-CC	15.81	223.97	226.39	224.86	226.4	0.000201	0.48	33.25	94.58	0.12
Innisfil Creek	4234.17	2yr + 50% Std	13.16	223.97	226.15	224.8	226.16	0.000217	0.46	28.47	53.86	0.12
Innisfil Creek	4220.05	2-Year-Std	8.77	223.96	225.73	224.68	225.74	0.000238	0.42	20.88	24.6	0.12
Innisfil Creek	4220.05	2-Year-CC	15.81	223.96	226.39	224.86	226.4	0.0002	0.48	33.27	93.1	0.12
Innisfil Creek	4220.05	2yr + 50% Std	13.16	223.96	226.14	224.8	226.15	0.000217	0.46	28.49	65.7	0.12
Innisfil Creek	4212.99	2-Year-Std	8.77	223.96	225.73	224.68	225.74	0.000237	0.42	20.93	20.19	0.12
Innisfil Creek	4212.99	2-Year-CC	15.81	223.96	226.38	224.85	226.4	0.000199	0.47	33.35	55.79	0.12
Innisfil Creek	4212.99	2yr + 50% Std	13.16	223.96	226.14	224.79	226.15	0.000215	0.46	28.56	44.33	0.12
Innisfil Creek	4197.33	2-Year-Std	8.77	223.95	225.72	224.67	225.73	0.000233	0.42	21.05	25.92	0.12
Innisfil Creek	4197.33	2-Year-CC	15.81	223.95	226.38	224.85	226.39	0.000196	0.47	33.51	78.92	0.12
Innisfil Creek	4197.33	2yr + 50% Std	13.16	223.95	226.14	224.78	226.15	0.000212	0.46	28.71	74.95	0.12
Innisfil Creek	4137.51	2-Year-Std	8.77	223.92	225.71	224.64	225.72	0.000219	0.41	21.62	66.72	0.12
Innisfil Creek	4137.51	2-Year-CC	15.81	223.92	226.38	224.81	226.38	0.000041	0.22	99.9	97.85	0.05
Innisfil Creek	4137.51	2yr + 50% Std	13.16	223.92	226.13	224.75	226.14	0.0002	0.45	29.47	92.62	0.12
Innisfil Creek	4087.25	2-Year-Std	8.77	223.9	225.7	224.62	225.71	0.000214	0.4	21.93	41.56	0.12
Innisfil Creek	4087.25	2-Year-CC	15.81	223.9	226.38	224.79	226.38	0.000076	0.3	76.44	90.82	0.07
Innisfil Creek	4087.25	2yr + 50% Std	13.16	223.9	226.12	224.73	226.13	0.000177	0.42	36.89	86.79	0.11
Innisfil Creek	4059.7	2-Year-Std	8.77	223.88	225.69	224.6	225.7	0.00021	0.4	21.84	37.67	0.12
Innisfil Creek	4059.7	2-Year-CC	15.81	223.88	226.38	224.78	226.38	0.000087	0.32	71.99	89.18	0.08
Innisfil Creek	4059.7	2yr + 50% Std	13.16	223.88	226.11	224.71	226.12	0.000194	0.44	29.66	80.52	0.12
Innisfil Creek	4057		Bridge									
Innisfil Creek	4056.49	2-Year-Std	8.77	223.88	225.69	224.6	225.7	0.000211	0.4	21.82	34.71	0.12
Innisfil Creek	4056.49	2-Year-CC	15.81	223.88	226.37	224.78	226.38	0.000089	0.32	73.8	100.91	0.08
Innisfil Creek	4056.49	2yr + 50% Std	13.16	223.88	226.11	224.71	226.12	0.000195	0.44	29.61	85.87	0.12
Innisfil Creek	4041.79	2-Year-Std	8.77	223.87	225.69	224.59	225.7	0.000212	0.4	21.67	27.52	0.12
Innisfil Creek	4041.79	2-Year-CC	15.81	223.87	226.37	224.77	226.38	0.000102	0.35	67.84	95.79	0.08
Innisfil Creek	4041.79	2yr + 50% Std	13.16	223.87	226.1	224.71	226.11	0.000198	0.45	29.37	80.26	0.12
Innisfil Creek	4035.04	2-Year-Std	8.77	223.87	225.69	224.59	225.69	0.000208	0.4	21.89	17.87	0.12
Innisfil Creek	4035.04	2-Year-CC	15.81	223.87	226.37	224.76	226.37	0.000129	0.39	53.17	85.54	0.1
Innisfil Creek	4035.04	2yr + 50% Std	13.16	223.87	226.1	224.7	226.11	0.000193	0.44	29.68	55.35	0.11
Innisfil Creek	3985.24	2-Year-Std	8.77	223.85	225.68	224.57	225.68	0.000202	0.4	22.09	19.02	0.11
Innisfil Creek	3985.24	2-Year-CC	15.81	223.85	226.36	224.74	226.37	0.000108	0.36	57.54	65.23	0.09
Innisfil Creek	3985.24	2yr + 50% Std	13.16	223.85	226.09	224.68	226.1	0.000189	0.44	29.89	58.9	0.11
Innisfil Creek	3932.84	2-Year-Std	8.77	223.82	225.67	224.54	225.67	0.000195	0.39	22.48	25.29	0.11
Innisfil Creek	3932.84	2-Year-CC	15.81	223.82	226.36	224.71	226.36	0.000112	0.37	55.47	63.5	0.09
Innisfil Creek	3932.84	2yr + 50% Std	13.16	223.82	226.09	224.65	226.09	0.000159	0.41	39.17	56.17	0.1
Innisfil Creek	3895		Bridge									
Innisfil Creek	3882.59	2-Year-Std	10.71	223.79	225.66		225.67	0.000282	0.47	22.6	17.96	0.13
Innisfil Creek	3882.59	2-Year-CC	19.44	223.79	226.34		226.35	0.000215	0.52	44.39	68.78	0.12
Innisfil Creek	3882.59	2yr + 50% Std	16.07	223.79	226.07		226.09	0.000262	0.53	31.22	29.37	0.13
Innisfil Creek	3831.18	2-Year-Std	10.71	223.77	225.64		225.65	0.000275	0.47	22.8	18.01	0.13
Innisfil Creek	3831.18	2-Year-CC	19.44	223.77	226.33		226.34	0.000227	0.52	40.83	42.52	0.13
Innisfil Creek	3831.18	2yr + 50% Std	16.07	223.77	226.06		226.07	0.000259	0.52	31.28	28.04	0.13
Innisfil Creek	3776.17	2-Year-Std	10.71	223.74	225.63		225.64	0.000265	0.46	23.13	18.15	0.13
Innisfil Creek	3776.17	2-Year-CC	19.44	223.74	226.32		226.33	0.000221	0.52	41.21	44.76	0.13

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	3776.17	2yr + 50% Std	16.07	223.74	226.05		226.06	0.000252	0.52	31.09	19.86	0.13
Innisfil Creek	3723.14	2-Year-Std	10.71	223.72	225.61		225.62	0.000258	0.46	23.32	18.18	0.13
Innisfil Creek	3723.14	2-Year-CC	19.44	223.72	226.3		226.32	0.000218	0.52	39.53	48.52	0.13
Innisfil Creek	3723.14	2yr + 50% Std	16.07	223.72	226.03		226.05	0.000247	0.51	31.31	19.88	0.13
Innisfil Creek	3674.53	2-Year-Std	10.71	223.69	225.6		225.61	0.00025	0.46	23.53	18.18	0.13
Innisfil Creek	3674.53	2-Year-CC	19.44	223.69	226.29		226.31	0.000212	0.51	43.51	60.48	0.12
Innisfil Creek	3674.53	2yr + 50% Std	16.07	223.69	226.02		226.04	0.000242	0.51	31.54	19.91	0.13
Innisfil Creek	3649.94	2-Year-Std	10.71	223.68	225.6		225.61	0.000248	0.45	23.7	18.37	0.13
Innisfil Creek	3649.94	2-Year-CC	19.44	223.68	226.29		226.3	0.000212	0.51	41.72	78.01	0.12
Innisfil Creek	3649.94	2yr + 50% Std	16.07	223.68	226.02		226.03	0.000238	0.51	31.81	20.17	0.13
Innisfil Creek	3647.73	2-Year-Std	10.71	223.68	225.59	224.45	225.61	0.000227	0.45	23.6	18.38	0.12
Innisfil Creek	3647.73	2-Year-CC	19.44	223.68	226.29	224.65	226.3	0.000208	0.51	42.87	76.4	0.12
Innisfil Creek	3647.73	2yr + 50% Std	16.07	223.68	226.01	224.57	226.03	0.000211	0.52	30.77	20.1	0.12
Innisfil Creek	3638.35	2-Year-Std	10.71	223.67	225.59	224.45	225.6	0.000227	0.45	23.61	18.41	0.12
Innisfil Creek	3638.35	2-Year-CC	19.44	223.67	226.29	224.64	226.3	0.000209	0.51	42.45	61.45	0.12
Innisfil Creek	3638.35	2yr + 50% Std	16.07	223.67	226.01	224.57	226.03	0.00021	0.52	30.79	20.16	0.12
Innisfil Creek	3626.8	2-Year-Std	10.71	223.67	225.59		225.6	0.000234	0.44	24.21	18.56	0.12
Innisfil Creek	3626.8	2-Year-CC	19.44	223.67	226.28		226.3	0.000202	0.5	42.51	59.71	0.12
Innisfil Creek	3626.8	2yr + 50% Std	16.07	223.67	226.01		226.02	0.000226	0.5	32.37	20.27	0.13
Innisfil Creek	3578.81	2-Year-Std	10.71	223.64	225.58		225.59	0.000237	0.45	23.99	18.29	0.12
Innisfil Creek	3578.81	2-Year-CC	19.44	223.64	226.27		226.29	0.000211	0.52	38.81	38.11	0.12
Innisfil Creek	3578.81	2yr + 50% Std	16.07	223.64	226		226.01	0.00023	0.5	32.04	19.95	0.13
Innisfil Creek	3542.49	2-Year-Std	10.71	223.62	225.57		225.58	0.000232	0.44	24.19	18.4	0.12
Innisfil Creek	3542.49	2-Year-CC	19.44	223.62	226.26		226.28	0.000207	0.51	39.31	40.65	0.12
Innisfil Creek	3542.49	2yr + 50% Std	16.07	223.62	225.99		226	0.000226	0.5	32.3	20.11	0.13
Innisfil Creek	3492.18	2-Year-Std	10.71	223.6	225.56		225.57	0.000226	0.44	24.38	18.38	0.12
Innisfil Creek	3492.18	2-Year-CC	19.44	223.6	226.25		226.27	0.0002	0.5	41.23	52.28	0.12
Innisfil Creek	3492.18	2yr + 50% Std	16.07	223.6	225.98		225.99	0.000221	0.49	32.48	20.02	0.12
Innisfil Creek	3436.04	2-Year-Std	10.71	223.57	225.55		225.56	0.000218	0.43	24.67	18.43	0.12
Innisfil Creek	3436.04	2-Year-CC	19.44	223.57	226.24		226.26	0.000186	0.49	45.39	55.08	0.12
Innisfil Creek	3436.04	2yr + 50% Std	16.07	223.57	225.97		225.98	0.000215	0.49	33.2	30.36	0.12
Innisfil Creek	3388.5	2-Year-Std	10.71	223.55	225.54		225.55	0.000209	0.43	25.07	18.58	0.12
Innisfil Creek	3388.5	2-Year-CC	19.44	223.55	226.23		226.25	0.00019	0.5	40.04	39.58	0.12
Innisfil Creek	3388.5	2yr + 50% Std	16.07	223.55	225.96		225.97	0.000207	0.48	33.26	20.26	0.12
Innisfil Creek	3380.41	2-Year-Std	11.51	223.54	225.52	224.33	225.54	0.000286	0.58	19.8	19.06	0.14
Innisfil Creek	3380.41	2-Year-CC	21.14	223.54	226.21	224.56	226.24	0.000302	0.75	28.05	30.53	0.16
Innisfil Creek	3380.41	2yr + 50% Std	17.27	223.54	225.94	224.47	225.96	0.000304	0.7	24.78	20.76	0.15
Innisfil Creek	3357.46		Bridge									
Innisfil Creek	3340.98	2-Year-Std	11.51	223.52	225.5	224.28	225.52	0.00027	0.57	20.13	21.33	0.14
Innisfil Creek	3340.98	2-Year-CC	21.14	223.52	226.18	224.51	226.21	0.000293	0.75	28.29	61.87	0.16
Innisfil Creek	3340.98	2yr + 50% Std	17.27	223.52	225.92	224.42	225.94	0.000293	0.69	25.05	23.22	0.15
Innisfil Creek	3331.06	2-Year-Std	11.51	223.52	225.51		225.51	0.000191	0.41	27.84	20.43	0.11
Innisfil Creek	3331.06	2-Year-CC	21.14	223.52	226.19		226.2	0.000189	0.49	43.6	48.5	0.12
Innisfil Creek	3331.06	2yr + 50% Std	17.27	223.52	225.92		225.93	0.000196	0.47	36.65	22.43	0.12
Innisfil Creek	3255.76	2-Year-Std	11.51	223.48	225.49		225.5	0.000235	0.46	25.26	18.55	0.12
Innisfil Creek	3255.76	2-Year-CC	21.14	223.48	226.17		226.19	0.000211	0.53	46.06	80.87	0.12
Innisfil Creek	3255.76	2yr + 50% Std	17.27	223.48	225.9		225.91	0.000239	0.52	33.25	20.21	0.13
Innisfil Creek	3205.68	2-Year-Std	11.51	223.46	225.48		225.49	0.000226	0.45	25.65	18.73	0.12
Innisfil Creek	3205.68	2-Year-CC	21.14	223.46	226.16		226.18	0.000188	0.51	50.55	88.23	0.12
Innisfil Creek	3205.68	2yr + 50% Std	17.27	223.46	225.89		225.9	0.000229	0.51	33.84	26.78	0.13
Innisfil Creek	3148.66	2-Year-Std	11.51	223.43	225.46		225.47	0.000221	0.45	25.8	18.68	0.12
Innisfil Creek	3148.66	2-Year-CC	21.14	223.43	226.16		226.17	0.000174	0.49	53.87	82.3	0.11
Innisfil Creek	3148.66	2yr + 50% Std	17.27	223.43	225.88		225.89	0.000218	0.5	37.06	48.89	0.12
Innisfil Creek	3096.26	2-Year-Std	11.51	223.4	225.45		225.46	0.00021	0.44	26.34	18.96	0.12
Innisfil Creek	3096.26	2-Year-CC	21.14	223.4	226.15		226.16	0.000166	0.49	53.82	72.75	0.11
Innisfil Creek	3096.26	2yr + 50% Std	17.27	223.4	225.87		225.88	0.000208	0.5	37.04	45.24	0.12
Innisfil Creek	3040.55	2-Year-Std	11.51	223.37	225.44		225.45	0.000204	0.43	26.72	19.21	0.12
Innisfil Creek	3040.55	2-Year-CC	21.14	223.37	226.14		226.15	0.000157	0.47	56.37	62.98	0.11
Innisfil Creek	3040.55	2yr + 50% Std	17.27	223.37	225.85		225.87	0.0002	0.49	38.88	52.69	0.12
Innisfil Creek	2992.21	2-Year-Std	11.51	223.35	225.43		225.44	0.000201	0.43	26.74	18.97	0.12
Innisfil Creek	2992.21	2-Year-CC	21.14	223.35	226.13		226.14	0.000176	0.5	49.94	61.55	0.11
Innisfil Creek	2992.21	2yr + 50% Std	17.27	223.35	225.84		225.86	0.000207	0.49	35.57	37.76	0.12
Innisfil Creek	2938.31	2-Year-Std	11.51	223.32	225.42		225.43	0.000207	0.41	28.06	22.14	0.12
Innisfil Creek	2938.31	2-Year-CC	21.14	223.32	226.12		226.13	0.000162	0.43	55.34	71.72	0.11
Innisfil Creek	2938.31	2yr + 50% Std	17.27	223.32	225.83		225.84	0.000212	0.44	40.6	41.25	0.12
Innisfil Creek	2880.6	2-Year-Std	11.51	223.29	225.41	224.09	225.42	0.000188	0.42	27.25	18.92	0.11
Innisfil Creek	2880.6	2-Year-CC	21.14	223.29	226.11	224.3	226.12	0.000214	0.5	42.26	25.14	0.12
Innisfil Creek	2880.6	2yr + 50% Std	17.27	223.29	225.82	224.22	225.83	0.000217	0.49	35.44	22.12	0.12
Innisfil Creek	2822.87	2-Year-Std	11.12	223.26	225.4	224.04	225.41	0.000164	0.4	28.12	19.47	0.11
Innisfil Creek	2822.87	2-Year-CC	20.45	223.26	226.1	224.25	226.11	0.000189	0.45	45.74	29.6	0.11
Innisfil Creek	2822.87	2yr + 50% Std	16.68	223.26	225.81	224.17	225.82	0.000206	0.44	37.68	26.45	0.12
Innisfil Creek	2822		Bridge									
Innisfil Creek	2819.4	2-Year-Std	11.12	223.26	225.4	224.05	225.41	0.000175	0.4	27.65	19.62	0.11
Innisfil Creek	2819.4	2-Year-CC	20.45	223.26	226.08	224.26	226.09	0.000189	0.47	43.88	26.52	0.12
Innisfil Creek	2819.4	2yr + 50% Std	16.68	223.26	225.8	224.18	225.81	0.000202	0.45	36.76	24.38	0.12
Innisfil Creek	2807.94	2-Year-Std	11.12	223.26	225.39	224.04	225.4	0.00021	0.53	21.08	19.05	0.13
Innisfil Creek	2807.94	2-Year-CC	20.45	223.26	226.06	224.27	226.09	0.000246	0.71	29.01	25.11	0.14
Innisfil Creek	2807.94	2yr + 50% Std	16.68	223.26	225.79	224.18	225.81	0.000242	0.65	25.77	23.42	0.14
Innisfil Creek	2801.39	2-Year-Std	11.12	223.25	225.39	224.04	225.4	0.000178	0.41	27.16	18.94	0.11
Innisfil Creek	2801.39	2-Year-CC	20.45	223.25	226.07	224.26	226.08	0.000196	0.47	43.34	26.35	0.12
Innisfil Creek	2801.39	2yr + 50% Std	16.68	223.25	225.79	224.17	225.8	0.000215	0.46	36.27	24.62	0.12

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	2770.35	2-Year-Std	11.12	223.24	225.38		225.39	0.000164	0.4	27.92	19.14	0.11
Innisfil Creek	2770.35	2-Year-CC	20.45	223.24	226.06		226.07	0.000192	0.44	52.07	73.13	0.12
Innisfil Creek	2770.35	2yr + 50% Std	16.68	223.24	225.78		225.79	0.000216	0.45	37.37	34.94	0.12
Innisfil Creek	2715.53	2-Year-Std	11.12	223.21	225.38	223.99	225.38	0.000159	0.39	28.28	19.26	0.1
Innisfil Creek	2715.53	2-Year-CC	20.45	223.21	226.06	224.21	226.06	0.000117	0.41	63.56	61.49	0.09
Innisfil Creek	2715.53	2yr + 50% Std	16.68	223.21	225.77	224.13	225.78	0.000163	0.45	40.19	39.65	0.11
Innisfil Creek	2697		Bridge									
Innisfil Creek	2695.48	2-Year-Std	11.12	223.2	225.37	223.98	225.38	0.000156	0.39	28.48	19.33	0.1
Innisfil Creek	2695.48	2-Year-CC	20.45	223.2	226.04	224.19	226.05	0.000184	0.48	42.62	24	0.11
Innisfil Creek	2695.48	2yr + 50% Std	16.68	223.2	225.76	224.11	225.78	0.000174	0.46	36.39	20.98	0.11
Innisfil Creek	2693.24	2-Year-Std	11.12	223.2	225.37	223.98	225.38	0.000157	0.45	24.51	19.3	0.11
Innisfil Creek	2693.24	2-Year-CC	20.45	223.2	226.03	224.19	226.05	0.000186	0.61	33.57	23.84	0.12
Innisfil Creek	2693.24	2yr + 50% Std	16.68	223.2	225.76	224.11	225.77	0.000183	0.56	29.84	20.87	0.12
Innisfil Creek	2685.7	2-Year-Std	11.12	223.2	225.37	223.98	225.38	0.000156	0.45	24.54	19.24	0.11
Innisfil Creek	2685.7	2-Year-CC	20.45	223.2	226.03	224.18	226.05	0.000185	0.61	33.6	23.08	0.12
Innisfil Creek	2685.7	2yr + 50% Std	16.68	223.2	225.76	224.11	225.77	0.000182	0.56	29.87	20.82	0.12
Innisfil Creek	2679.61	2-Year-Std	11.12	223.19	225.37	223.97	225.37	0.000151	0.39	28.83	19.47	0.1
Innisfil Creek	2679.61	2-Year-CC	20.45	223.19	226.03	224.18	226.04	0.000168	0.48	42.67	22.45	0.11
Innisfil Creek	2679.61	2yr + 50% Std	16.68	223.19	225.76	224.1	225.77	0.000169	0.45	36.75	21.06	0.11
Innisfil Creek	2649.27	2-Year-Std	11.12	223.18	225.36	223.96	225.37	0.000152	0.38	28.92	19.8	0.1
Innisfil Creek	2649.27	2-Year-CC	20.45	223.18	226.03	224.17	226.04	0.000111	0.39	72.15	89.24	0.09
Innisfil Creek	2649.27	2yr + 50% Std	16.68	223.18	225.75	224.09	225.76	0.000156	0.43	42.69	38.1	0.11
Innisfil Creek	2597.24	2-Year-Std	11.12	223.15	225.35	223.93	225.36	0.000143	0.38	29.36	19.61	0.1
Innisfil Creek	2597.24	2-Year-CC	20.45	223.15	226.02	224.14	226.03	0.000154	0.47	45.8	51.44	0.11
Innisfil Creek	2597.24	2yr + 50% Std	16.68	223.15	225.74	224.06	225.75	0.000162	0.45	37.32	21.22	0.11
Innisfil Creek	2541.69	2-Year-Std	11.12	223.12	225.35		225.35	0.000138	0.37	29.82	19.82	0.1
Innisfil Creek	2541.69	2-Year-CC	20.45	223.12	226.01		226.02	0.000139	0.46	51.08	64.38	0.1
Innisfil Creek	2541.69	2yr + 50% Std	16.68	223.12	225.74		225.75	0.000154	0.44	38.19	30.13	0.11
Innisfil Creek	2494.09	2-Year-Std	11.12	223.1	225.34		225.35	0.000134	0.37	29.97	19.61	0.1
Innisfil Creek	2494.09	2-Year-CC	20.45	223.1	226.01		226.02	0.000123	0.43	57.85	59.69	0.1
Innisfil Creek	2494.09	2yr + 50% Std	16.68	223.1	225.73		225.74	0.000147	0.43	42.54	51.99	0.1
Innisfil Creek	2449.63	2-Year-Std	11.12	223.08	225.33	223.86	225.34	0.000133	0.37	30.01	19.54	0.1
Innisfil Creek	2449.63	2-Year-CC	20.45	223.08	226	224.07	226.01	0.000128	0.43	56.2	56.14	0.1
Innisfil Creek	2449.63	2yr + 50% Std	16.68	223.08	225.72	223.99	225.73	0.000149	0.43	41.3	46.59	0.1
Innisfil Creek	2449		Bridge									
Innisfil Creek	2445.98	2-Year-Std	11.12	223.08	225.33		225.34	0.000134	0.37	29.98	19.54	0.1
Innisfil Creek	2445.98	2-Year-CC	20.45	223.08	225.99		226	0.00013	0.44	57.07	73.58	0.1
Innisfil Creek	2445.98	2yr + 50% Std	16.68	223.08	225.72		225.73	0.000152	0.44	40.82	47.56	0.1
Innisfil Creek	2437.64	2-Year-Std	11.12	223.07	225.32	223.86	225.34	0.000166	0.49	22.88	23.37	0.11
Innisfil Creek	2437.64	2-Year-CC	20.45	223.07	225.97	224.08	226	0.000211	0.67	30.65	77.66	0.13
Innisfil Creek	2437.64	2yr + 50% Std	16.68	223.07	225.7	224	225.72	0.000204	0.61	27.41	58.8	0.13
Innisfil Creek	2431.98	2-Year-Std	11.12	223.07	225.33	223.85	225.33	0.000133	0.37	29.98	24.4	0.1
Innisfil Creek	2431.98	2-Year-CC	20.45	223.07	225.98	224.06	225.99	0.000115	0.41	65.52	83.07	0.09
Innisfil Creek	2431.98	2yr + 50% Std	16.68	223.07	225.71	223.98	225.72	0.000147	0.43	44.2	66.39	0.1
Innisfil Creek	2395.33	2-Year-Std	11.12	223.05	225.32	223.83	225.33	0.000128	0.36	30.49	30.87	0.09
Innisfil Creek	2395.33	2-Year-CC	20.45	223.05	225.98	224.04	225.98	0.000098	0.38	69.05	61.41	0.09
Innisfil Creek	2395.33	2yr + 50% Std	16.68	223.05	225.7	223.96	225.71	0.000123	0.4	52.27	60.85	0.09
Innisfil Creek	2357.17	2-Year-Std	11.12	223.03	225.32	223.81	225.32	0.000122	0.36	33.01	37.01	0.09
Innisfil Creek	2357.17	2-Year-CC	20.45	223.03	225.97	224.02	225.98	0.000106	0.4	62.98	62.22	0.09
Innisfil Creek	2357.17	2yr + 50% Std	16.68	223.03	225.7	223.94	225.71	0.000125	0.4	48.61	47.11	0.09
Innisfil Creek	2333		Bridge									
Innisfil Creek	2332.4	2-Year-Std	11.12	223.02	225.31		225.32	0.000117	0.35	33.14	34.04	0.09
Innisfil Creek	2332.4	2-Year-CC	20.45	223.02	225.96		225.97	0.000111	0.41	59.33	60.48	0.09
Innisfil Creek	2332.4	2yr + 50% Std	16.68	223.02	225.69		225.7	0.000123	0.4	47.17	39.84	0.09
Innisfil Creek	2329.07	2-Year-Std	11.12	223.02	225.31	223.8	225.32	0.000126	0.43	26.1	32.2	0.1
Innisfil Creek	2329.07	2-Year-CC	20.45	223.02	225.95	224	225.97	0.000163	0.59	34.82	55.06	0.12
Innisfil Creek	2329.07	2yr + 50% Std	16.68	223.02	225.68	223.93	225.7	0.000157	0.54	31.16	38.59	0.11
Innisfil Creek	2320.03	2-Year-Std	11.12	223.01	225.31	223.79	225.32	0.000134	0.43	25.68	43.59	0.1
Innisfil Creek	2320.03	2-Year-CC	20.45	223.01	225.95	224.02	225.97	0.000171	0.59	34.39	54.19	0.12
Innisfil Creek	2320.03	2yr + 50% Std	16.68	223.01	225.68	223.93	225.69	0.000166	0.54	30.73	51.45	0.12
Innisfil Creek	2314.41	2-Year-Std	11.12	223.01	225.31		225.31	0.000118	0.35	34.39	47.17	0.09
Innisfil Creek	2314.41	2-Year-CC	20.45	223.01	225.95		225.96	0.000095	0.38	67.95	55.85	0.08
Innisfil Creek	2314.41	2yr + 50% Std	16.68	223.01	225.68		225.69	0.000113	0.38	53.21	53.06	0.09
Innisfil Creek	2295.24	2-Year-Std	11.12	223	225.31		225.31	0.000121	0.36	31.14	20.01	0.09
Innisfil Creek	2295.24	2-Year-CC	20.45	223	225.95		225.96	0.000138	0.45	47.5	41.29	0.1
Innisfil Creek	2295.24	2yr + 50% Std	16.68	223	225.68		225.69	0.000144	0.43	38.87	23.63	0.1
Innisfil Creek	2289.76	2-Year-Std	11.12	223	225.31		225.31	0.000118	0.35	31.47	20.16	0.09
Innisfil Creek	2289.76	2-Year-CC	20.45	223	225.95		225.96	0.000138	0.45	46.38	34.9	0.1
Innisfil Creek	2289.76	2yr + 50% Std	16.68	223	225.68		225.69	0.000142	0.43	39.24	21.76	0.1
Innisfil Creek	2271.37	2-Year-Std	11.12	222.99	225.31	223.77	225.31	0.000082	0.3	44.35	38.57	0.08
Innisfil Creek	2271.37	2-Year-CC	20.45	222.99	225.95	223.97	225.95	0.000076	0.34	71.84	45.34	0.08
Innisfil Creek	2271.37	2yr + 50% Std	16.68	222.99	225.68	223.89	225.68	0.000084	0.34	59.76	44.08	0.08
Innisfil Creek	2268.89	2-Year-Std	13.43	222.99	225.31	223.43	225.31	0.000052	0.28	51.72	44.78	0.06
Innisfil Creek	2268.89	2-Year-CC	25.61	222.99	225.94	223.68	225.95	0.000068	0.38	75.13	57.35	0.08
Innisfil Creek	2268.89	2yr + 50% Std	20.15	222.99	225.68	223.6	225.68	0.000064	0.34	64.97	54.51	0.07
Innisfil Creek	2249.77		Culvert									
Innisfil Creek	2234.06	2-Year-Std	13.43	222.98	225.28	223.43	225.29	0.000057	0.29	49.85	45.77	0.07
Innisfil Creek	2234.06	2-Year-CC	25.61	222.98	225.89	223.68	225.9	0.000079	0.39	73.91	65.7	0.08
Innisfil Creek	2234.06	2yr + 50% Std	20.15	222.98	225.64	223.56	225.65	0.000071	0.35	63.66	49.32	0.08

Project Name:	South Innisfil Creek Drain Improvements
Project No.:	300038790
Watershed:	Innisfil Creek
River:	Innisfil Creek
Reach:	Innisfil Creek

R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	2230.74	2-Year-Std	13.43	222.97	225.28	223.81	225.29	0.000154	0.4	37.14	35.69	0.1
Innisfil Creek	2230.74	2-Year-CC	25.61	222.97	225.89	224.06	225.9	0.000176	0.51	60.86	60.28	0.11
Innisfil Creek	2230.74	2yr + 50% Std	20.15	222.97	225.64	223.95	225.65	0.000167	0.46	50.38	38.76	0.11
Innisfil Creek	2229	2-Year-Std	13.64	222.96	225.28	223.31	225.28	0.000029	0.18	77.4	61.87	0.05
Innisfil Creek	2229	2-Year-CC	27.13	222.96	225.89	223.5	225.9	0.000038	0.25	108.13	64.55	0.05
Innisfil Creek	2229	2yr + 50% Std	20.46	222.96	225.64	223.41	225.64	0.000032	0.21	95.34	63.04	0.05
Innisfil Creek	2197.01		Culvert									
Innisfil Creek	2155.88	2-Year-Std	13.64	222.93	225.21	223.26	225.21	0.000023	0.19	73.52	69.41	0.04
Innisfil Creek	2155.88	2-Year-CC	27.13	222.93	225.64	223.44	225.65	0.000048	0.3	89.76	125.97	0.06
Innisfil Creek	2155.88	2yr + 50% Std	20.46	222.93	225.49	223.36	225.49	0.000034	0.24	83.98	84.72	0.05
Innisfil Creek	2140.69	2-Year-Std	13.64	222.94	225.2		225.21	0.000201	0.45	30.02	19.61	0.12
Innisfil Creek	2140.69	2-Year-CC	27.13	222.94	225.62		225.64	0.000368	0.69	45.64	92.22	0.16
Innisfil Creek	2140.69	2yr + 50% Std	20.46	222.94	225.47		225.49	0.000278	0.58	36.12	37.59	0.14
Innisfil Creek	2082.2	2-Year-Std	13.64	222.91	225.18		225.2	0.000196	0.45	30.27	19.65	0.12
Innisfil Creek	2082.2	2-Year-CC	27.13	222.91	225.59		225.62	0.000381	0.7	40.94	54.45	0.17
Innisfil Creek	2082.2	2yr + 50% Std	20.46	222.91	225.45		225.47	0.000275	0.57	35.68	20.73	0.14
Innisfil Creek	2011.08	2-Year-Std	13.64	222.89	225.17		225.18	0.000167	0.41	32.95	21.72	0.11
Innisfil Creek	2011.08	2-Year-CC	27.13	222.89	225.57		225.59	0.000332	0.65	42.15	45.6	0.15
Innisfil Creek	2011.08	2yr + 50% Std	20.46	222.89	225.44		225.45	0.000235	0.53	38.84	23.02	0.13
Innisfil Creek	1964.59	2-Year-Std	13.64	222.87	225.16		225.17	0.000183	0.44	31.46	25.9	0.11
Innisfil Creek	1964.59	2-Year-CC	27.13	222.87	225.56		225.58	0.000327	0.65	55.59	197.15	0.15
Innisfil Creek	1964.59	2yr + 50% Std	20.46	222.87	225.42		225.44	0.000253	0.55	40.87	62.91	0.13
Innisfil Creek	1922.07	2-Year-Std	13.64	222.85	225.16		225.17	0.000183	0.44	31.25	25.69	0.11
Innisfil Creek	1922.07	2-Year-CC	27.13	222.85	225.54		225.56	0.000328	0.65	56.68	154.96	0.15
Innisfil Creek	1922.07	2yr + 50% Std	20.46	222.85	225.41		225.43	0.000256	0.56	40.74	77.27	0.13
Innisfil Creek	1858.34	2-Year-Std	13.64	222.83	225.14		225.15	0.000181	0.43	31.41	20.37	0.11
Innisfil Creek	1858.34	2-Year-CC	27.13	222.83	225.52		225.54	0.000448	0.62	52.64	91.5	0.17
Innisfil Creek	1858.34	2yr + 50% Std	20.46	222.83	225.39		225.41	0.000378	0.53	41.93	73.07	0.16
Innisfil Creek	1802.02	2-Year-Std	13.64	222.8	225.14	223.65	225.14	0.000166	0.42	32.44	57.83	0.11
Innisfil Creek	1802.02	2-Year-CC	27.13	222.8	225.5	223.92	225.52	0.000251	0.57	63.79	77.78	0.13
Innisfil Creek	1802.02	2yr + 50% Std	20.46	222.8	225.38	223.79	225.39	0.000191	0.48	54.77	71.74	0.12
Innisfil Creek	1740.47	2-Year-Std	13.64	222.78	225.12	223.62	225.13	0.000173	0.43	31.99	57.34	0.11
Innisfil Creek	1740.47	2-Year-CC	27.13	222.78	225.49	223.9	225.5	0.000295	0.59	64	100.94	0.14
Innisfil Creek	1740.47	2yr + 50% Std	20.46	222.78	225.37	223.77	225.38	0.000222	0.5	53.09	86.06	0.12
Innisfil Creek	1689.88	2-Year-Std	13.64	222.76	225.12		225.13	0.000171	0.43	31.7	21.35	0.11
Innisfil Creek	1689.88	2-Year-CC	27.13	222.76	225.46		225.48	0.000324	0.66	50.43	82.56	0.15
Innisfil Creek	1689.88	2yr + 50% Std	20.46	222.76	225.35		225.37	0.000237	0.55	42.37	63.74	0.13
Innisfil Creek	1636.97	2-Year-Std	13.64	222.74	225.11	223.57	225.12	0.000138	0.39	41.71	81.7	0.1
Innisfil Creek	1636.97	2-Year-CC	27.13	222.74	225.46	223.84	225.47	0.000219	0.52	76.49	111.36	0.13
Innisfil Creek	1636.97	2yr + 50% Std	20.46	222.74	225.35	223.72	225.36	0.000157	0.45	64.74	105.14	0.11
Innisfil Creek	1582.59	2-Year-Std	13.64	222.71	225.1	223.56	225.11	0.000125	0.37	46.54	81.03	0.09
Innisfil Creek	1582.59	2-Year-CC	27.13	222.71	225.45	223.84	225.46	0.000178	0.5	79.78	91.14	0.11
Innisfil Creek	1582.59	2yr + 50% Std	20.46	222.71	225.34	223.71	225.35	0.000135	0.42	70.3	88.01	0.1
Innisfil Creek	1519.24	2-Year-Std	13.64	222.69	225.1	223.53	225.1	0.000104	0.34	49.79	62.37	0.09
Innisfil Creek	1519.24	2-Year-CC	27.13	222.69	225.43	223.8	225.44	0.000176	0.49	77.08	87.15	0.11
Innisfil Creek	1519.24	2yr + 50% Std	20.46	222.69	225.33	223.67	225.34	0.00013	0.41	68.38	82.4	0.1
Innisfil Creek	1466.41	2-Year-Std	13.64	222.67	225.09		225.09	0.000141	0.38	38.45	43.18	0.1
Innisfil Creek	1466.41	2-Year-CC	27.13	222.67	225.42		225.43	0.000282	0.58	55.26	59.12	0.14
Innisfil Creek	1466.41	2yr + 50% Std	20.46	222.67	225.32		225.33	0.000196	0.47	49.77	54.3	0.12
Innisfil Creek	1415.03	2-Year-Std	13.64	222.65	225.08		225.09	0.000138	0.31	47.09	50.23	0.09
Innisfil Creek	1415.03	2-Year-CC	27.13	222.65	225.41		225.42	0.000217	0.47	65.38	62.42	0.12
Innisfil Creek	1415.03	2yr + 50% Std	20.46	222.65	225.31		225.32	0.000158	0.38	59.66	58.55	0.1
Innisfil Creek	1345.39	2-Year-Std	13.64	222.62	225.07		225.08	0.000148	0.29	54.54	101.6	0.1
Innisfil Creek	1345.39	2-Year-CC	27.13	222.62	225.4		225.4	0.00017	0.38	89.57	113.92	0.11
Innisfil Creek	1345.39	2yr + 50% Std	20.46	222.62	225.3		225.31	0.000133	0.32	79.2	110.63	0.09
Innisfil Creek	1282.61	2-Year-Std	13.64	222.6	225.06		225.07	0.000133	0.32	56.1	101.99	0.09
Innisfil Creek	1282.61	2-Year-CC	27.13	222.6	225.39		225.39	0.000165	0.41	94.75	132.64	0.11
Innisfil Creek	1282.61	2yr + 50% Std	20.46	222.6	225.3		225.3	0.000129	0.35	82.99	127.89	0.09
Innisfil Creek	1220.49	2-Year-Std	13.64	222.57	225.06		225.06	0.000066	0.28	73.8	121.19	0.07
Innisfil Creek	1220.49	2-Year-CC	27.13	222.57	225.38		225.39	0.000096	0.38	116.57	146.84	0.09
Innisfil Creek	1220.49	2yr + 50% Std	20.46	222.57	225.29		225.3	0.000071	0.31	103.98	137.39	0.07
Innisfil Creek	1216.51	2-Year-Std	13.64	222.57	225.05	223.41	225.06	0.000148	0.47	29.1	129.36	0.11
Innisfil Creek	1216.51	2-Year-CC	27.13	222.57	225.34	223.71	225.38	0.000368	0.81	33.43	154.61	0.17
Innisfil Creek	1216.51	2yr + 50% Std	20.46	222.57	225.27	223.57	225.29	0.000234	0.63	32.36	143.07	0.14
Innisfil Creek	1198.5		Bridge									
Innisfil Creek	1178.21	2-Year-Std	12.89	222.55	225.04	223.38	225.05	0.000134	0.44	29.04	90.78	0.1
Innisfil Creek	1178.21	2-Year-CC	25.04	222.55	225.32	223.65	225.34	0.000326	0.76	33.11	109.5	0.16
Innisfil Creek	1178.21	2yr + 50% Std	19.34	222.55	225.25	223.53	225.27	0.000214	0.6	32.19	103.04	0.13
Innisfil Creek	1169.82	2-Year-Std	12.89	222.54	225.02	223.57	225.04	0.000416	0.65	19.85	19.84	0.16
Innisfil Creek	1169.82	2-Year-CC	25.04	222.54	225.29	223.95	225.34	0.000806	0.99	33.4	61.82	0.23
Innisfil Creek	1169.82	2yr + 50% Std	19.34	222.54	225.23	223.79	225.26	0.000566	0.81	29.97	59.44	0.19
Innisfil Creek	1140.74	2-Year-Std	12.89	222.15	225	223.6	225.03	0.000735	0.77	17.53	44.05	0.21
Innisfil Creek	1140.74	2-Year-CC	25.04	222.15	225.27	224.11	225.31	0.000955	0.97	40.99	89.51	0.25
Innisfil Creek	1140.74	2yr + 50% Std	19.34	222.15	225.22	223.9	225.24	0.000702	0.82	36.42	84.3	0.21
Innisfil Creek	1051.87	2-Year-Std	12.89	222.34	224.89	223.56	224.94	0.001422	0.94	13.76	88.17	0.28
Innisfil Creek	1051.87	2-Year-CC	25.04	222.34	225.23	224.11	225.24	0.000508	0.65	69.94	138.34	0.17
Innisfil Creek	1051.87	2yr + 50% Std	19.34	222.34	225.19	223.88	225.19	0.000377	0.55	64.29	135.49	0.15
Innisfil Creek	984.38	2-Year-Std	12.89	222.11	224.84	223.42	224.87	0.000643	0.78	16.56	75.35	0.2
Innisfil Creek	984.38	2-Year-CC	25.04	222.11	225.19	223.89	225.21	0.000484	0.68	68.79	155.61	0.18
Innisfil Creek	984.38	2yr + 50% Std	19.34	222.11	225.16	223.69	225.17	0.000338	0.57	63.98	154.59	0.15
Innisfil Creek	884.54	2-Year-Std	12.89	222.16	224.75	223.35	224.79	0.000887	0.91	14.18	64.2	0.23

Project Name: South Innisfil Creek Drain Improvements
Project No.: 300038790
Watershed: Innisfil Creek
River: Innisfil Creek
Reach: Innisfil Creek

BURNSIDE
[The Difference is our People]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 fax (705) 446-2399
web www.rjburnside.com

Proposed Interim Condition HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Innisfil Creek	884.54	2-Year-CC	25.04	222.16	225.14	223.86	225.15	0.000538	0.69	66.87	156.6	0.18
Innisfil Creek	884.54	2yr + 50% Std	19.34	222.16	225.05	223.65	225.11	0.001384	1.07	21.53	128.07	0.29
Innisfil Creek	818.21	2-Year-Std	12.89	221.92	224.63	223.55	224.71	0.001967	1.2	10.79	64.87	0.32
Innisfil Creek	818.21	2-Year-CC	25.04	221.92	225	224.13	225.08	0.002685	1.37	27.54	164.16	0.39
Innisfil Creek	818.21	2yr + 50% Std	19.34	221.92	224.91	223.89	224.98	0.002211	1.23	22.31	130.16	0.35
Innisfil Creek	775.99	2-Year-Std	12.89	222.05	224.62	223.25	224.64	0.000827	0.66	19.57	84.2	0.22
Innisfil Creek	775.99	2-Year-CC	25.04	222.05	225.02	223.7	225.03	0.000283	0.45	84.08	137.77	0.13
Innisfil Creek	775.99	2yr + 50% Std	19.34	222.05	224.88	223.5	224.91	0.000917	0.75	26.26	122.53	0.23
Innisfil Creek	675.4	2-Year-Std	12.89	222.1	224.46	223.35	224.52	0.001916	1.07	12	44.4	0.32
Innisfil Creek	675.4	2-Year-CC	25.04	222.1	224.98	223.87	224.99	0.000442	0.56	74.14	140.13	0.16
Innisfil Creek	675.4	2yr + 50% Std	19.34	222.1	224.82	223.65	224.83	0.000616	0.62	52.1	121.9	0.19
Innisfil Creek	610.94	2-Year-Std	12.89	222.24	224.37		224.42	0.001172	1.02	12.69	8	0.26
Innisfil Creek	610.94	2-Year-CC	25.04	222.24	224.85		224.93	0.002396	1.28	25.21	53.17	0.37
Innisfil Creek	610.94	2yr + 50% Std	19.34	222.24	224.68		224.75	0.00196	1.23	17.41	33.49	0.33
Innisfil Creek	573.99	2-Year-Std	12.89	222.12	224.34		224.37	0.001223	0.75	18.75	29.53	0.26
Innisfil Creek	573.99	2-Year-CC	25.04	222.12	224.84		224.86	0.000703	0.76	45.05	96.98	0.21
Innisfil Creek	573.99	2yr + 50% Std	19.34	222.12	224.67		224.69	0.000793	0.74	30.52	53.23	0.22
Innisfil Creek	570.75	2-Year-Std	12.89	222.02	224.33	223.21	224.36	0.001384	0.75	18.03	29.76	0.27
Innisfil Creek	570.75	2-Year-CC	25.04	222.02	224.82	223.66	224.86	0.000921	0.85	30.84	102.84	0.24
Innisfil Creek	570.75	2yr + 50% Std	19.34	222.02	224.66	223.47	224.69	0.000887	0.76	26.63	94.62	0.23
Innisfil Creek	554.83		Bridge									
Innisfil Creek	538.03	2-Year-Std	12.89	222.33	224.24	223.4	224.3	0.001722	1.07	13.59	16.38	0.29
Innisfil Creek	538.03	2-Year-CC	25.04	222.33	224.72	223.9	224.79	0.002037	1.31	23.45	65.81	0.33
Innisfil Creek	538.03	2yr + 50% Std	19.34	222.33	224.57	223.7	224.63	0.001839	1.18	19.68	49.33	0.31
Innisfil Creek	530.11	2-Year-Std	12.89	222.27	224.22		224.28	0.001491	1.08	11.92	8.64	0.29
Innisfil Creek	530.11	2-Year-CC	25.04	222.27	224.71		224.77	0.001315	1.14	36.06	78.23	0.28
Innisfil Creek	530.11	2yr + 50% Std	19.34	222.27	224.56		224.62	0.001415	1.15	24.6	66.53	0.29
Innisfil Creek	502.92	2-Year-Std	12.89	222.22	224.19		224.24	0.00131	1.02	12.76	13.1	0.28
Innisfil Creek	502.92	2-Year-CC	25.04	222.22	224.64		224.72	0.001715	1.31	25.55	66.83	0.33
Innisfil Creek	502.92	2yr + 50% Std	19.34	222.22	224.51		224.58	0.001441	1.16	19.47	26.43	0.3
Innisfil Creek	476.53	2-Year-Std	12.89	222.16	224.15		224.21	0.001401	1.08	11.97	8.05	0.28
Innisfil Creek	476.53	2-Year-CC	25.04	222.16	224.59		224.67	0.00217	1.36	26.82	76.06	0.36
Innisfil Creek	476.53	2yr + 50% Std	19.34	222.16	224.45		224.53	0.00206	1.28	17.39	51.23	0.34
Innisfil Creek	343.16	2-Year-Std	12.89	221.97	224.07		224.09	0.000521	0.52	24.64	26.59	0.17
Innisfil Creek	343.16	2-Year-CC	25.04	221.97	224.5		224.52	0.000549	0.66	42.94	86.96	0.19
Innisfil Creek	343.16	2yr + 50% Std	19.34	221.97	224.38		224.4	0.000466	0.57	35.6	45.42	0.17
Innisfil Creek	270.37	2-Year-Std	12.89	221.59	223.99		224.03	0.001283	0.97	17.31	31.69	0.27
Innisfil Creek	270.37	2-Year-CC	25.04	221.59	224.44		224.47	0.000956	0.97	50.18	106.12	0.24
Innisfil Creek	270.37	2yr + 50% Std	19.34	221.59	224.31		224.34	0.001074	0.99	36.77	98.69	0.25
Innisfil Creek	167.08	2-Year-Std	12.89	222.14	223.64	223.21	223.78	0.005029	1.66	7.74	7.71	0.53
Innisfil Creek	167.08	2-Year-CC	25.04	222.14	224.14	223.67	224.27	0.004906	1.73	22.16	87.68	0.54
Innisfil Creek	167.08	2yr + 50% Std	19.34	222.14	223.94	223.47	224.11	0.005622	1.85	11.7	29.78	0.57
Innisfil Creek	32.1	2-Year-Std	12.89	221.79	222.88	222.61	223.02	0.006407	1.64	7.84	9.88	0.59
Innisfil Creek	32.1	2-Year-CC	25.04	221.79	223.32	222.96	223.52	0.006405	2	12.52	11.57	0.61
Innisfil Creek	32.1	2yr + 50% Std	19.34	221.79	223.13	222.81	223.31	0.006401	1.85	10.45	10.94	0.6

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Appendix B

Plan and Profile Drawings

Please refer to:

Final Engineer's Report for South Innisfil Creek Drain, Appendix I

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Appendix I

Drawings*

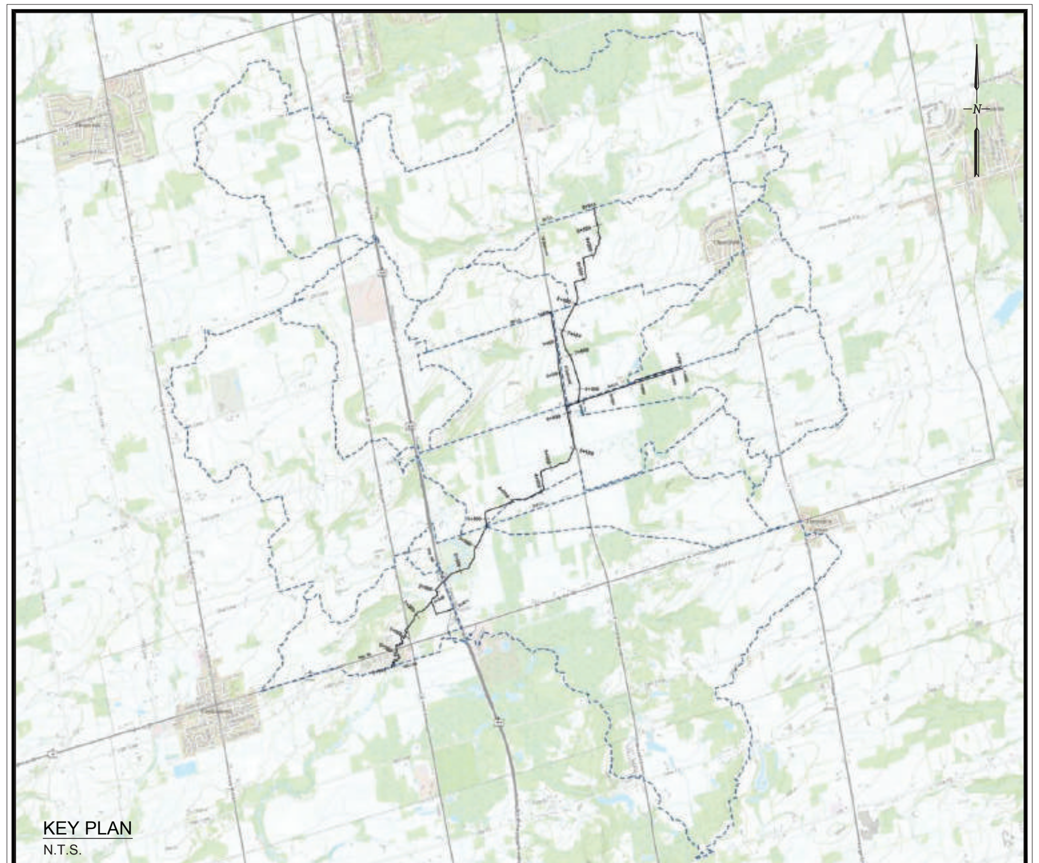
***Drawings' scales are based on an 'A2' sheet (approx. 23 ½" x 16 ½"); Drawings bound within this Report have been provided for ease-of-reference and have *NOT* been produced to scale**

TOWN OF INNISFIL

SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT

TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNSIFIL, ONTARIO
L9S 1A1
TELEPHONE 1 (888) 436 3710
WEB WWW. INNISFIL.CA

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com



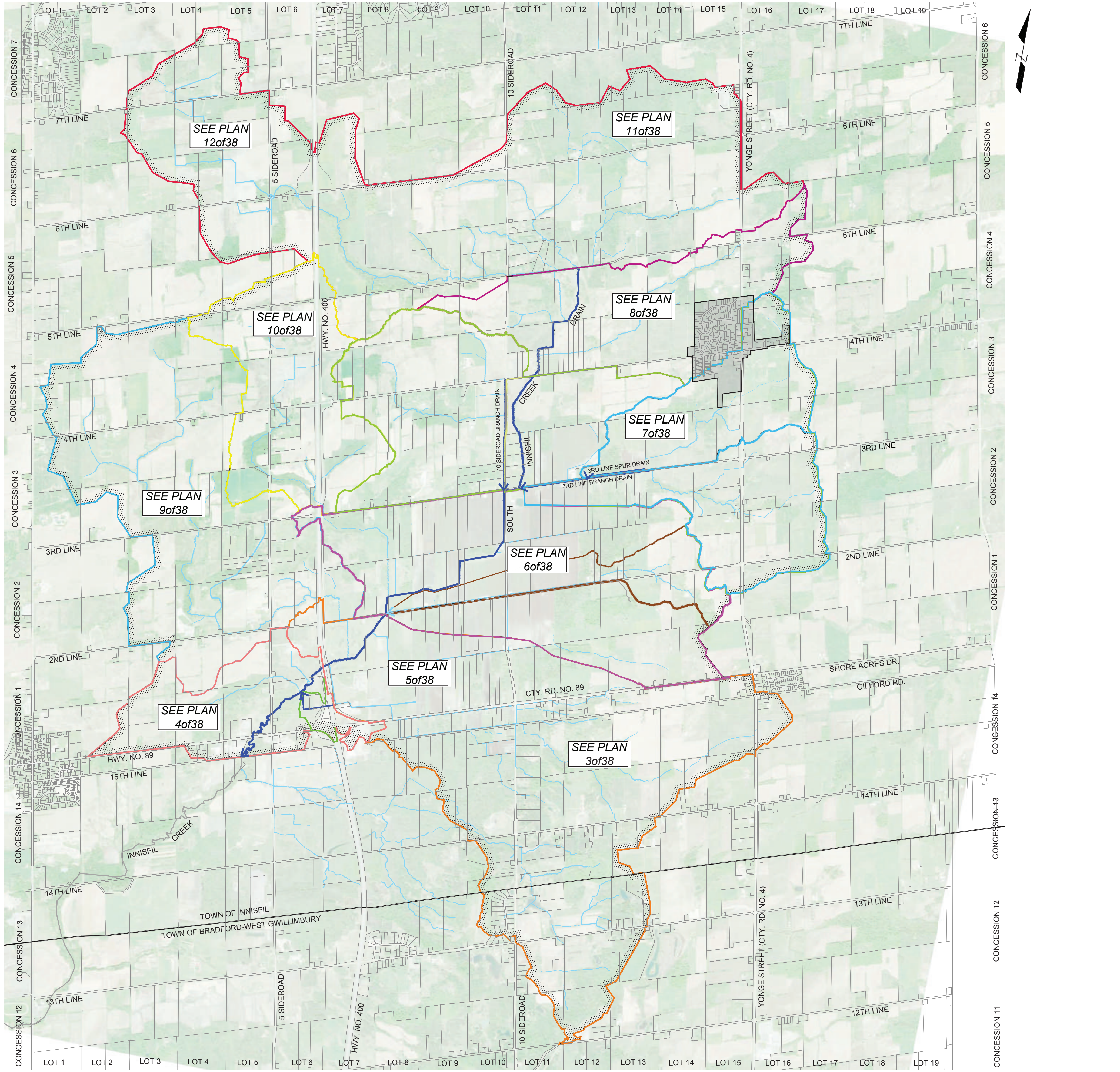
KEY PLAN
N.T.S.

INDEX TABLE

Burnside Project No. 300038790.0000

FILE FINAL ENGINEER'S REPORT - 02/13/2019

TOWN OF INNISFIL - SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
Burnside Project No. 300038790.0000 - FILE FINAL ENGINEER'S REPORT - 02/13/2019



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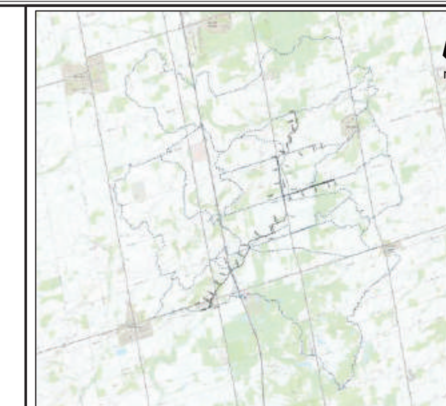

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER — 001-23414
LANDOWNER — M. VAN DER MAST

Notes

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LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
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6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD
8	FILE FINAL ENGINEER'S REPORT	02/13/2019	JRD

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNSIFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MASTER WATERSHED PLAN

Designed	Checked	Drawn	Checked	Drawing No.
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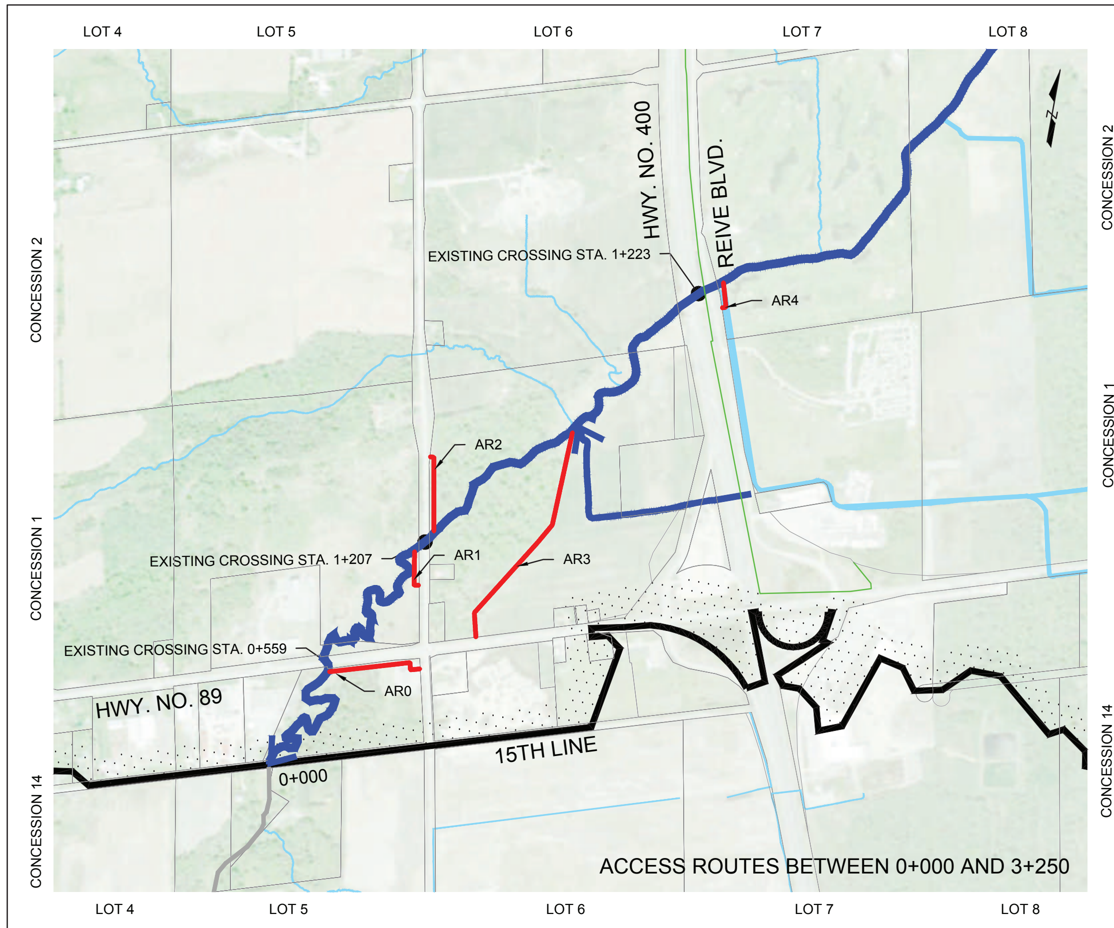

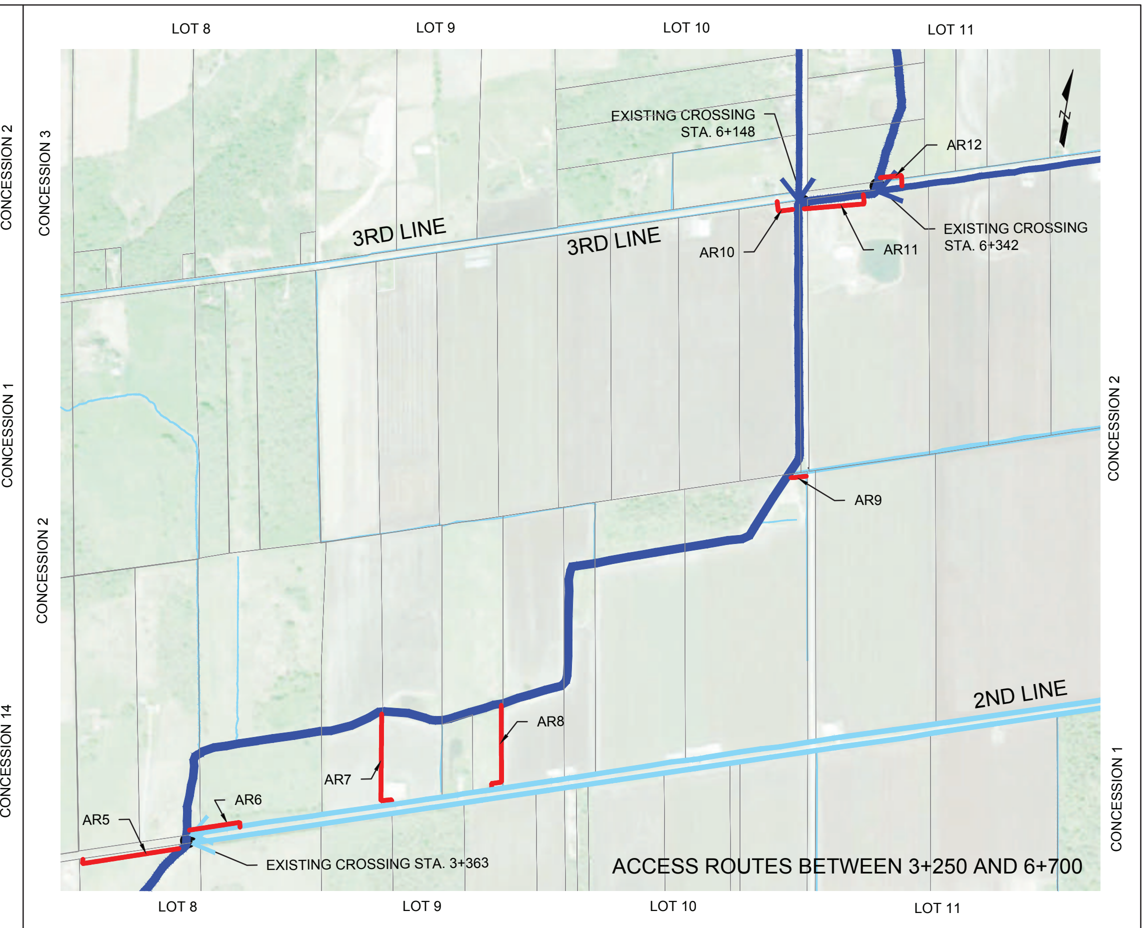

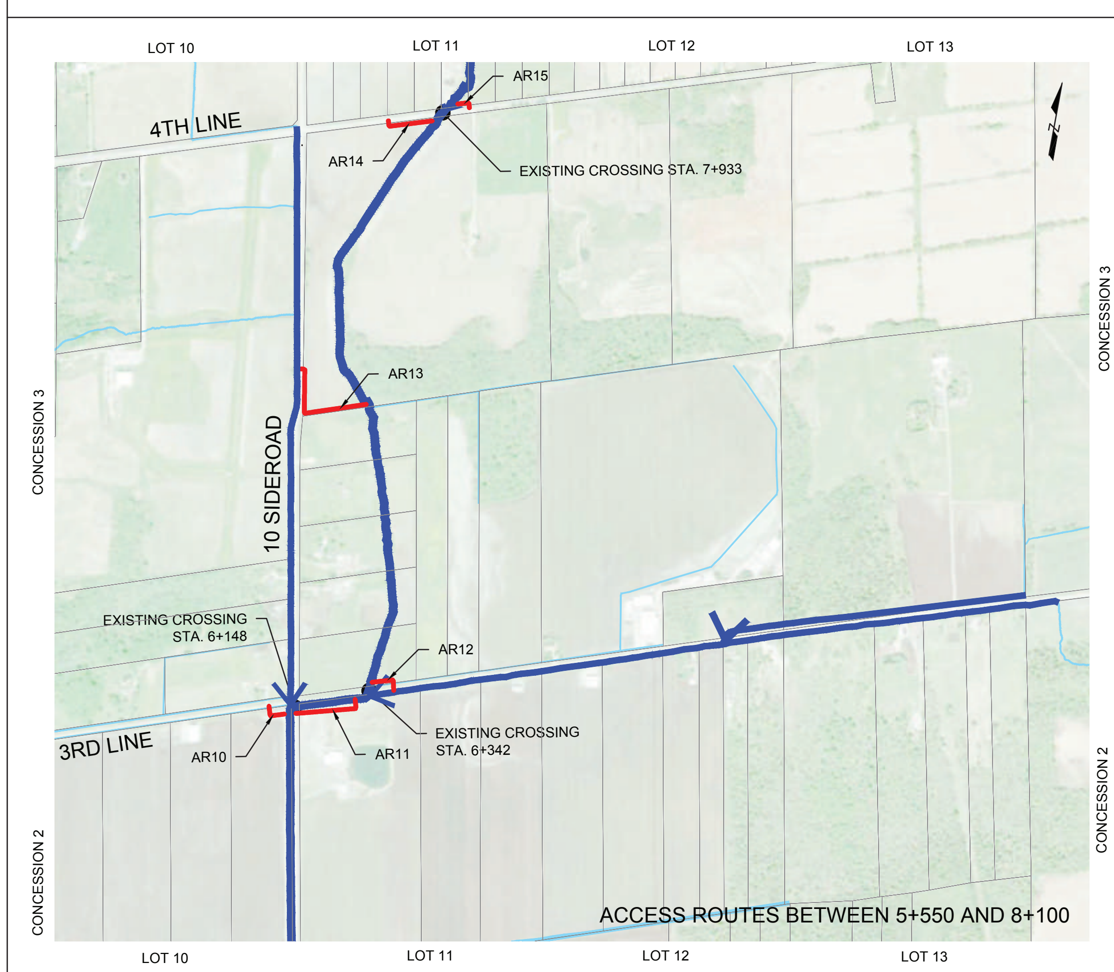

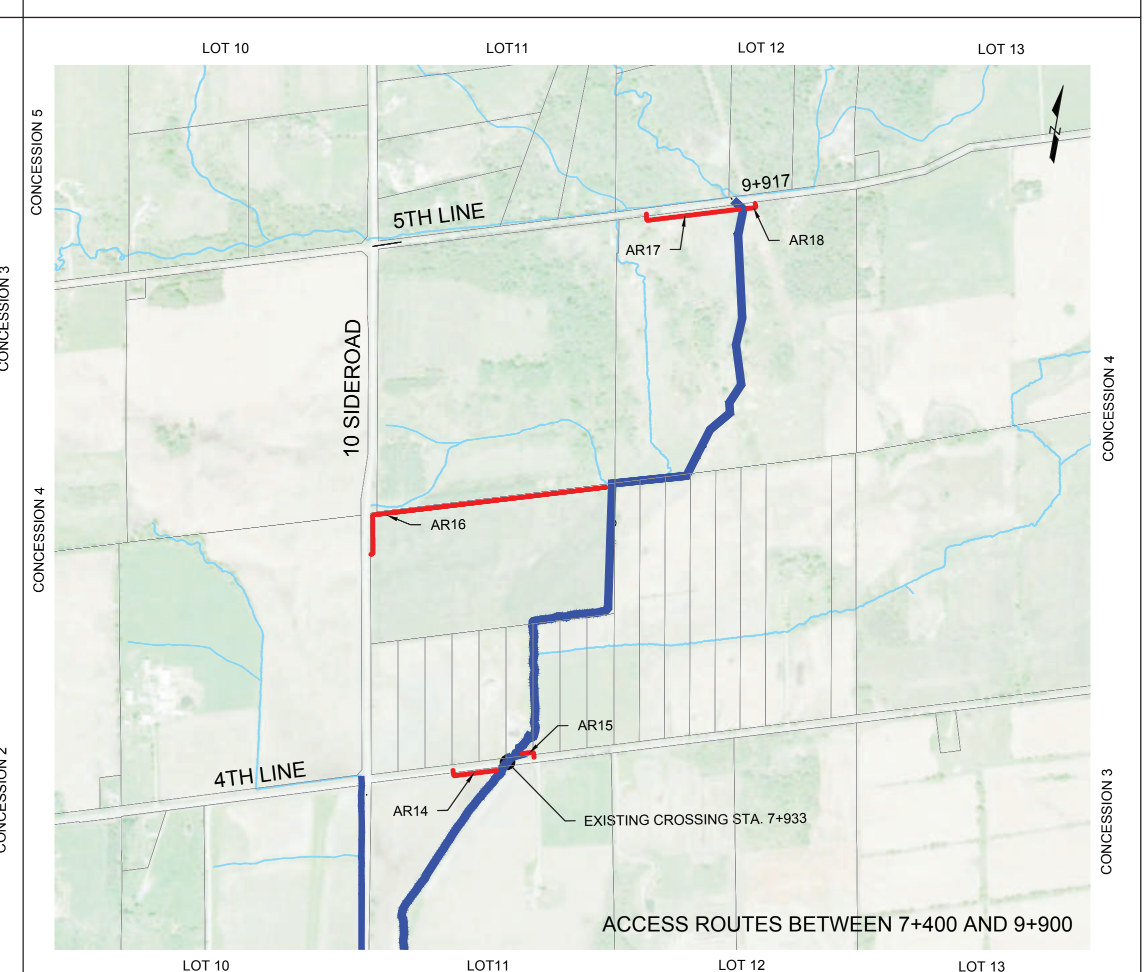

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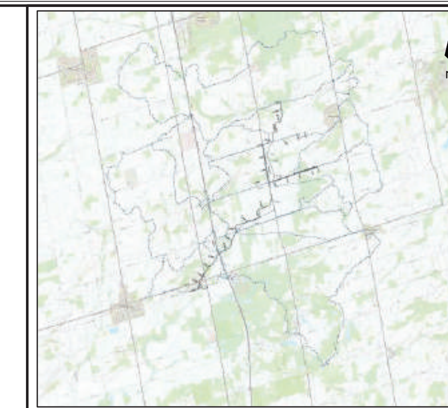

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST
5m ACCESS ROUTE	

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J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
ACCESS ROUTES

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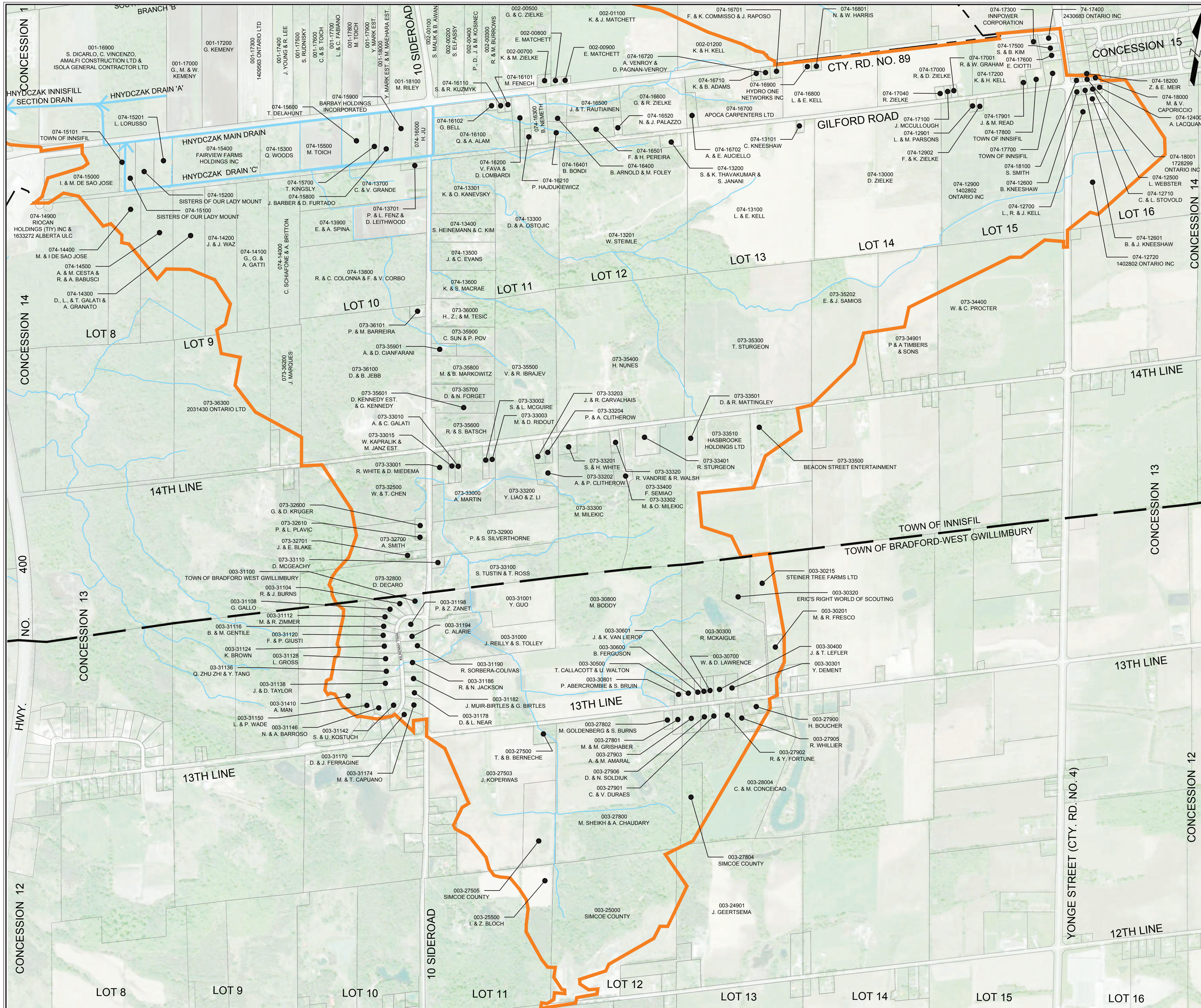

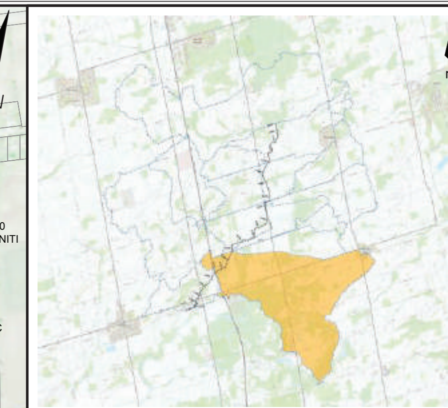

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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Feb. 13/19
PROVINCE OF ONTARIO

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 fax (519) 357-3624
web www.rjburnside.com

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TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 1

Designed	Checked	Drawn	Checked	Drawing No.
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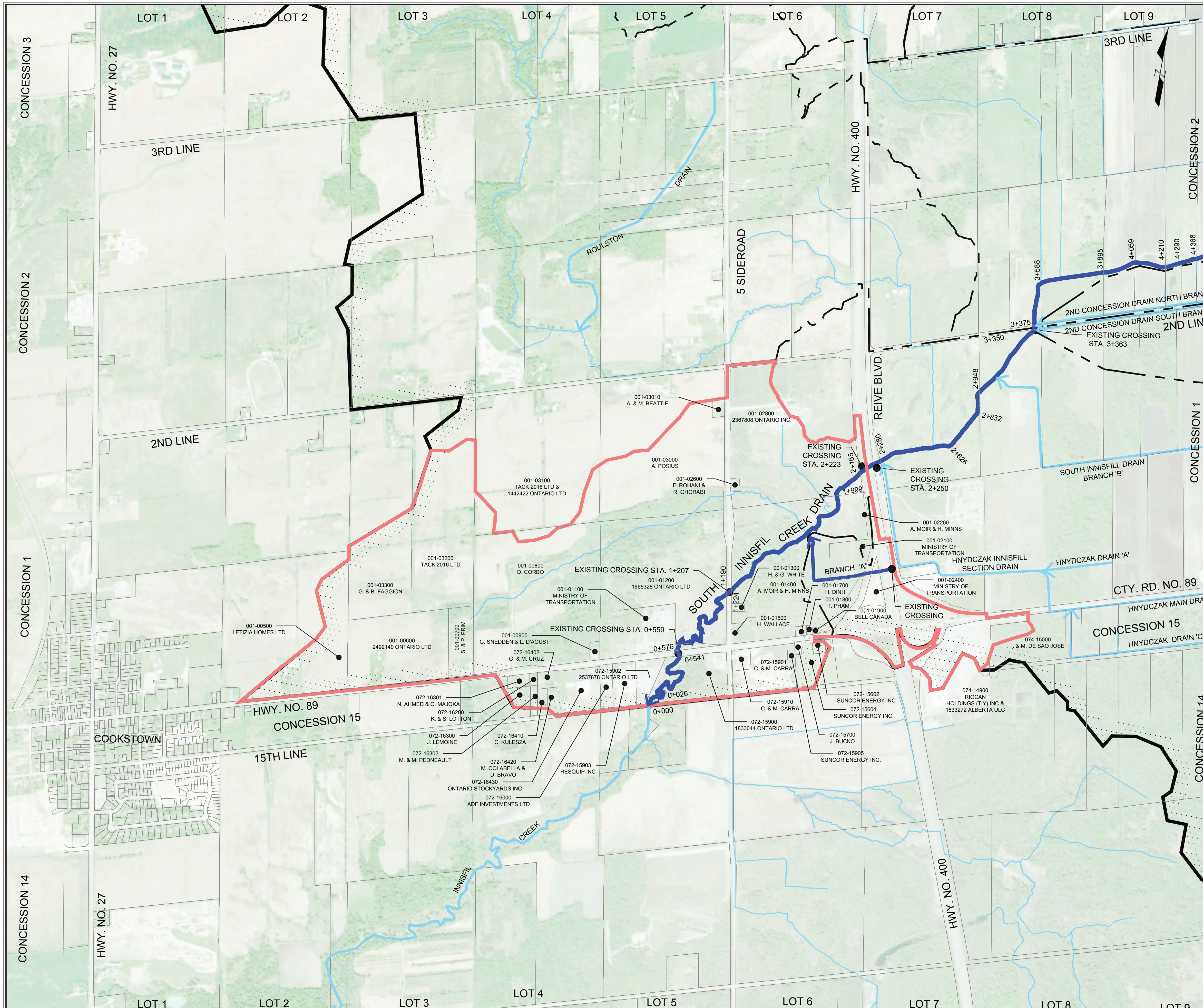

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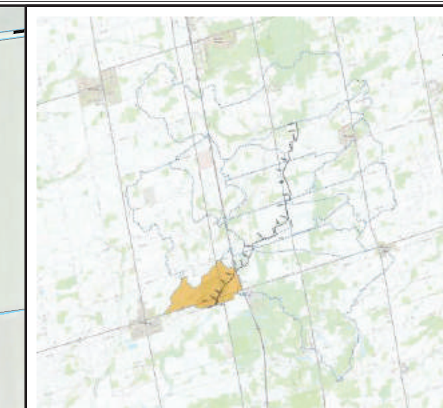

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER	001-23414
LANDOWNER	M. VAN DER MAST

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

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2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 2

Designed	Checked	Drawn	Checked	Drawing No.
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02/13/2019		300038790.0000		

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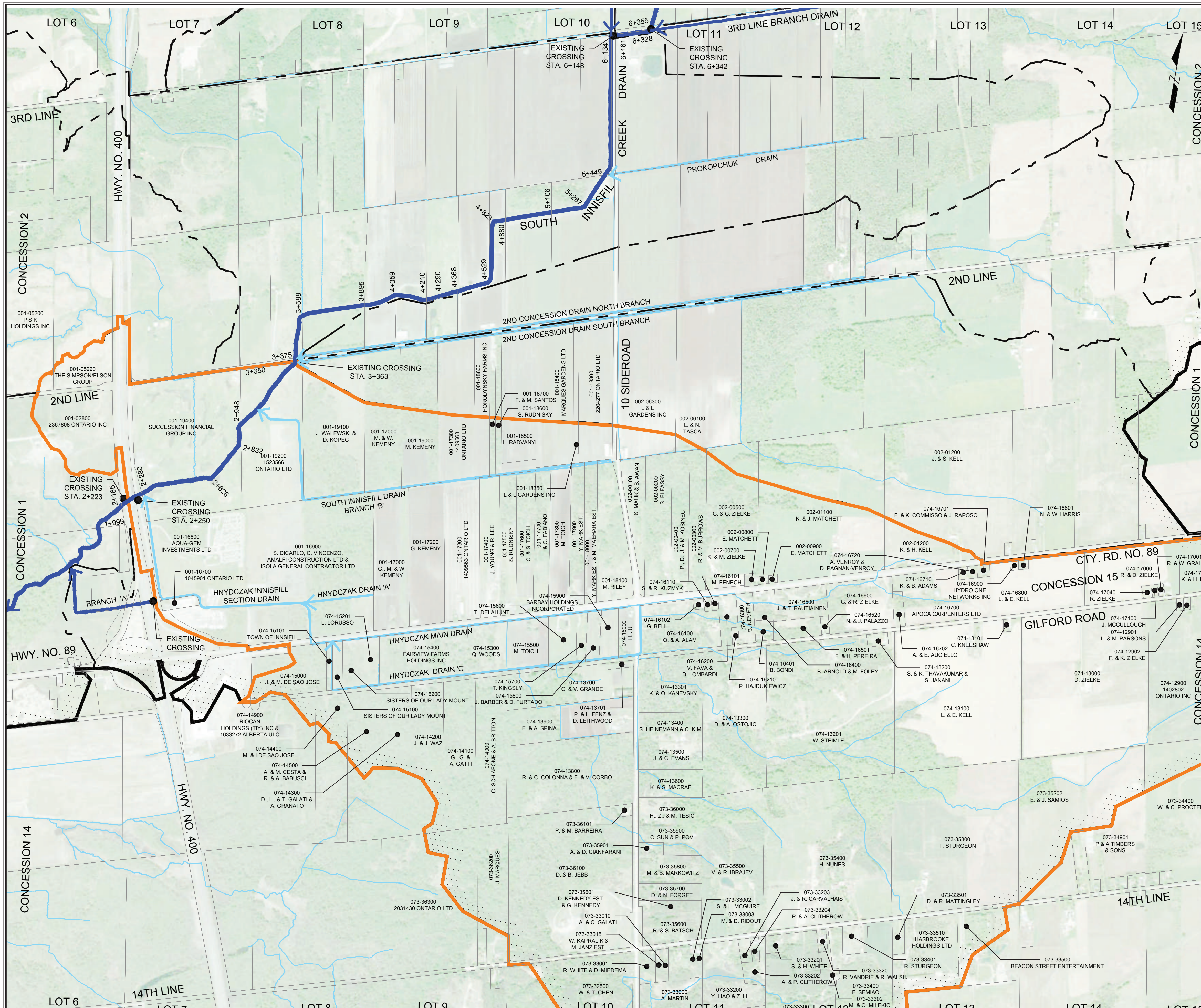

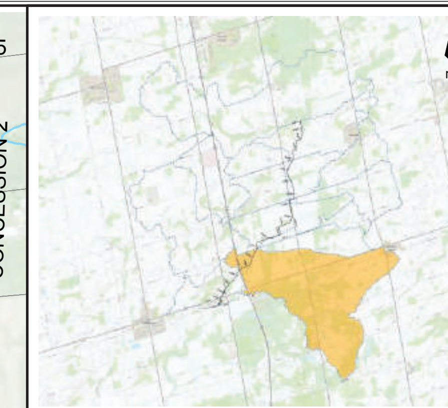

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER — 001-23414
LANDOWNER — M. VAN DER MAST

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PROVINCE OF ONTARIO

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TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 3

Designed	Checked	Drawn	Checked	Drawing No.
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Date: 02/13/2019		Project No.: 300038790.0000		
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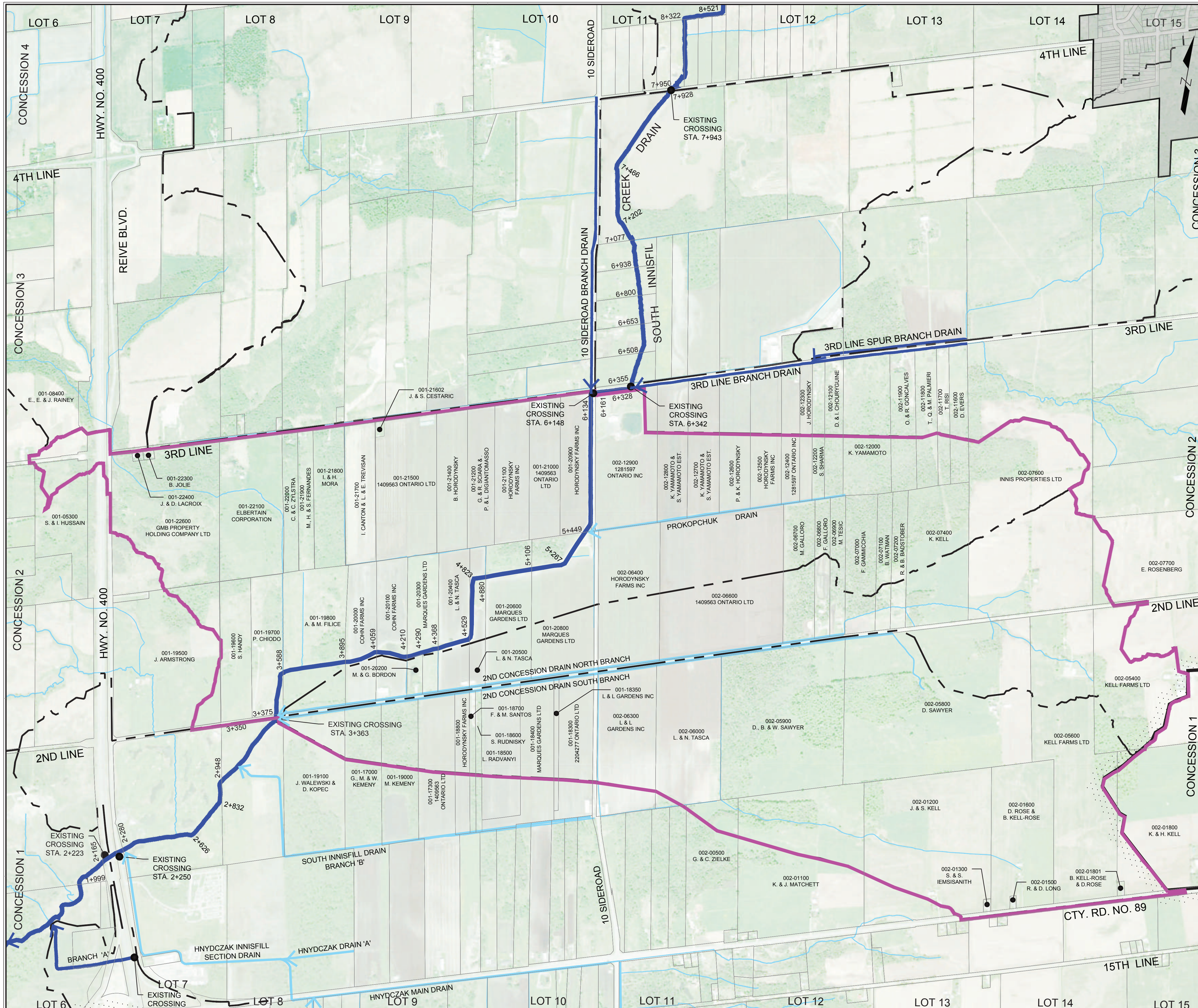

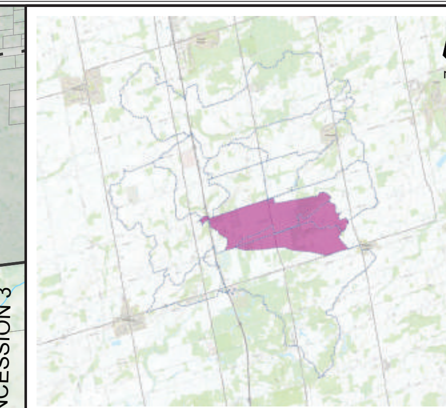

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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Feb 13/19
PROVINCE OF ONTARIO

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web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 4

Designed	Checked	Drawn	Checked	Drawing No.
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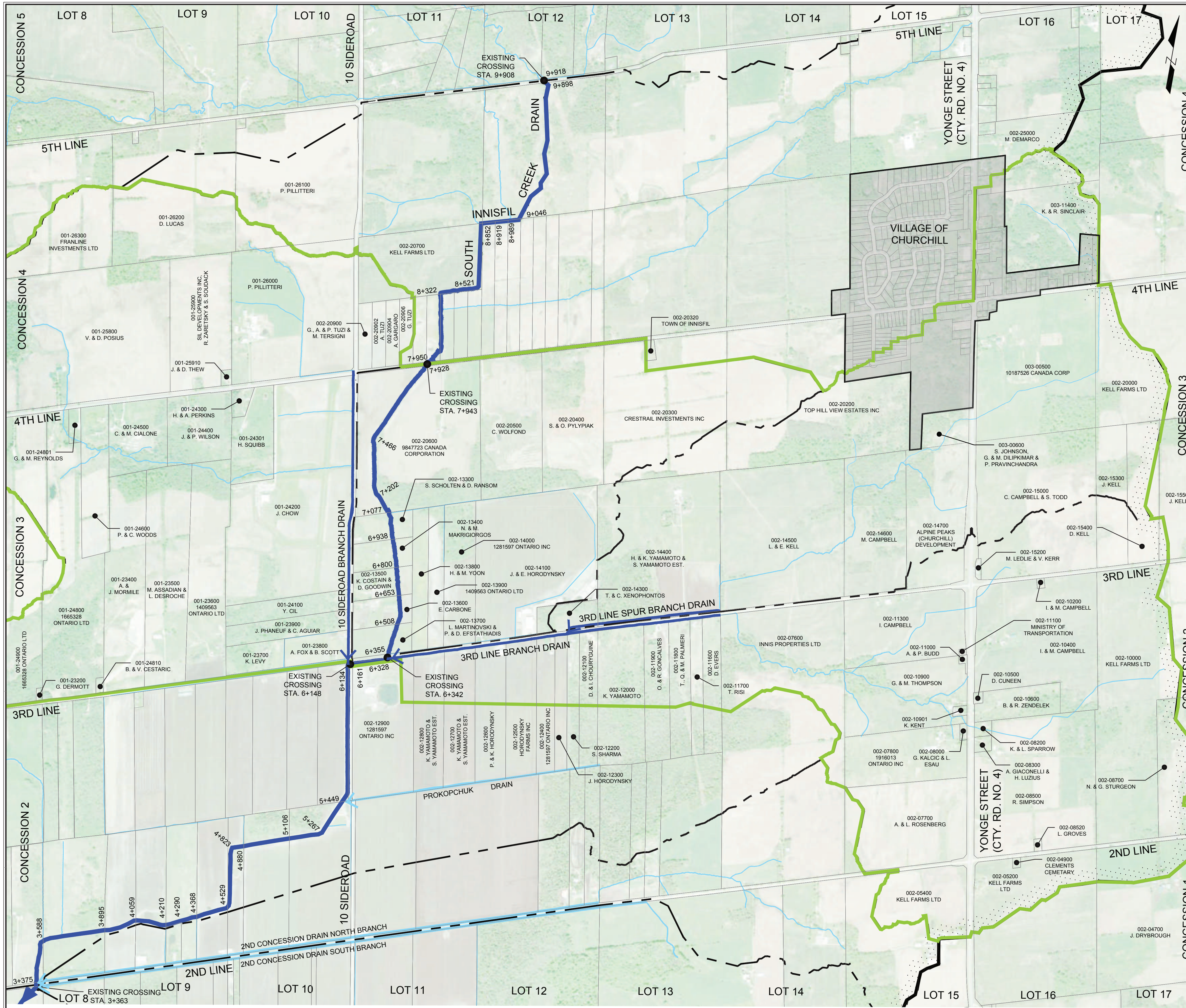

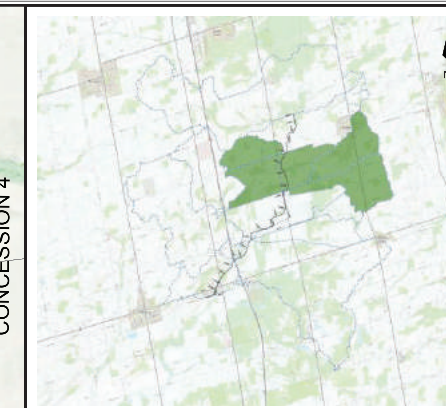

KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER	001-23414
LANDOWNER	M. VAN DER MAST

Notes

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LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
3	TOWN OF INNISFIL REVIEW	07/13/2018	JRD
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	FILE FINAL ENGINEER'S REPORT	01/31/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

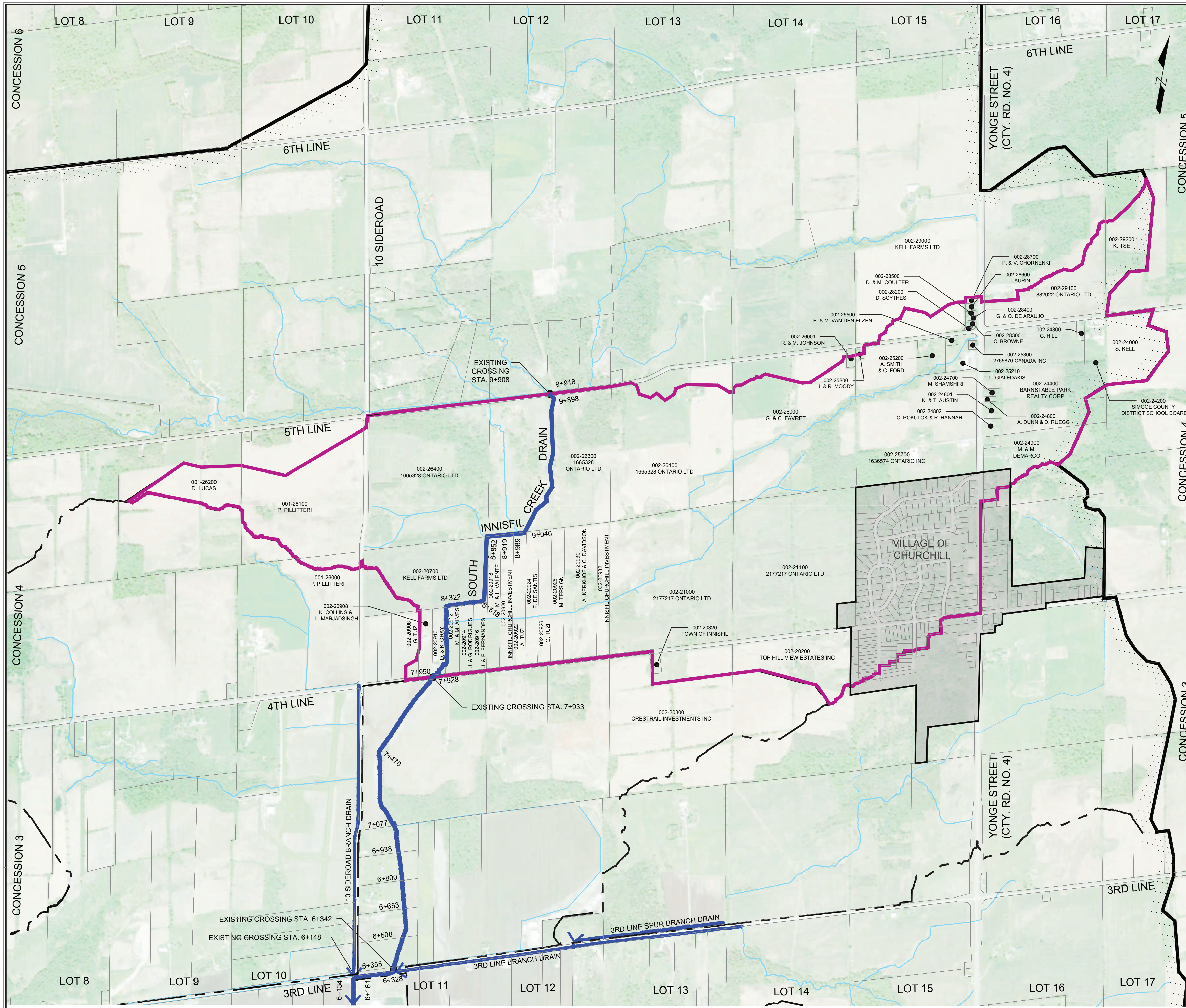
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNSIFIL, ONTARIO
L9S 1A1

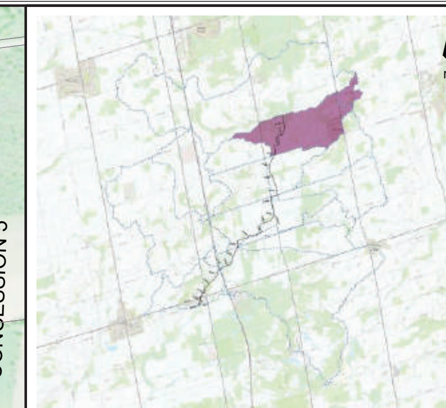
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 5

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	7 of 38
Date: 02/13/2019		Project No.: 300038790.0000		

Scale 1:12,500 — 0 250 500 750m





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER	001-23414
LANDOWNER	M. VAN DER MAST

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J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

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INNISFIL, ONTARIO
L9S 1A1

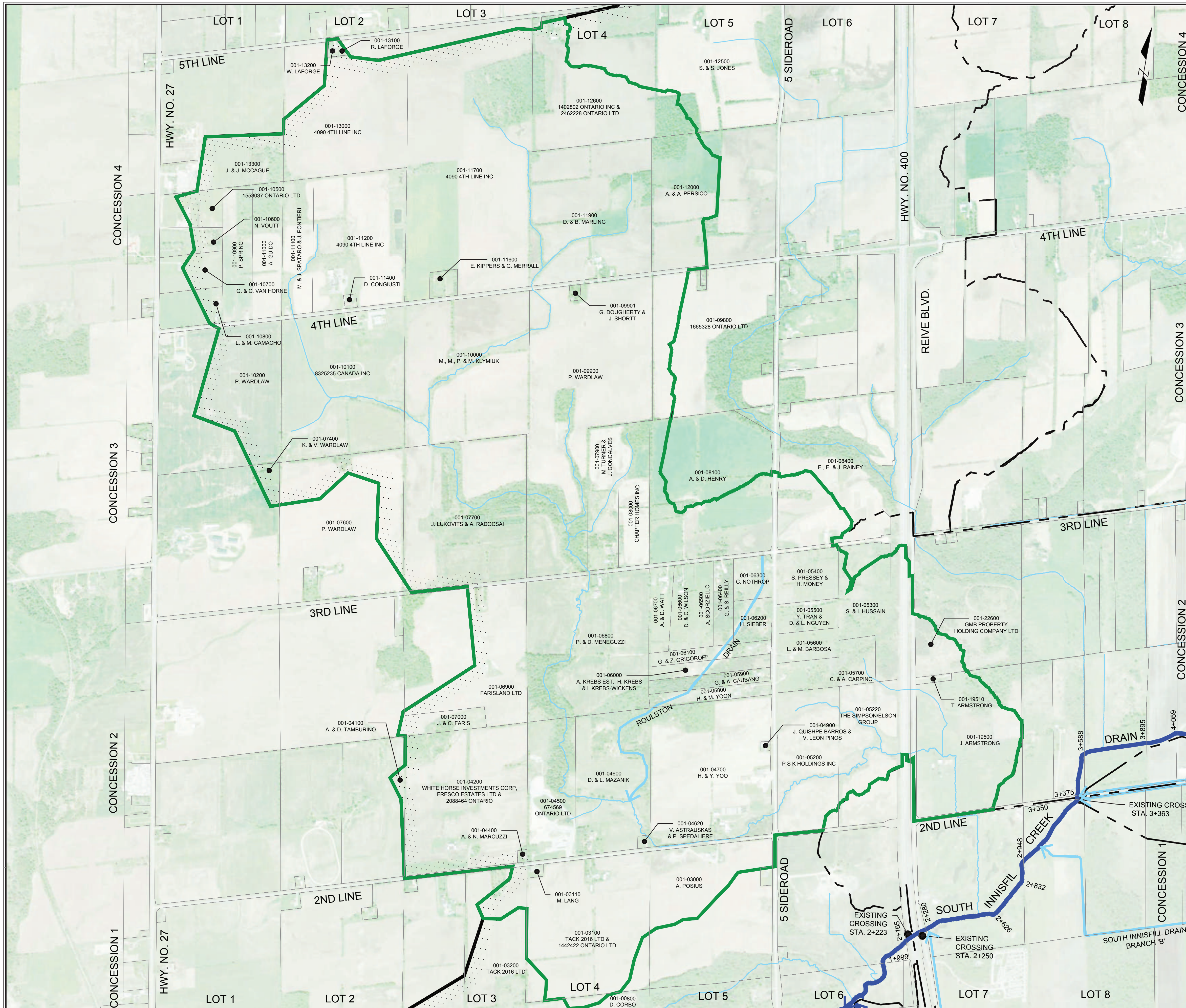
Innisfil

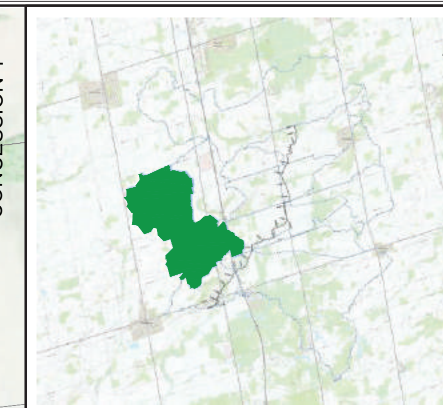
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 6

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	
Date		Project No.		8 of 38
02/13/2019		300038790.0000		

Scale 1:12,500 — 0 250 500 750m

File: I:\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN.dwg Date Plotted: February 5, 2019 - 1:31 PM





KEY PLAN
SCALE: N.T.S.

LEGEND

- WATERSHED BOUNDARY
- CATCHMENT AREA BOUNDARY
- SUB WATERSHED BOUNDARY
- DRAIN LOCATION & DIRECTION — DRAIN NAME
- OTHER MUNICIPAL DRAIN — DRAIN NAME
- NATURAL WATERCOURSE
- ROLL NUMBER / LANDOWNER — 001-23414 / M. VANDERMAST

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Feb.13/19
PROVINCE OF ONTARIO

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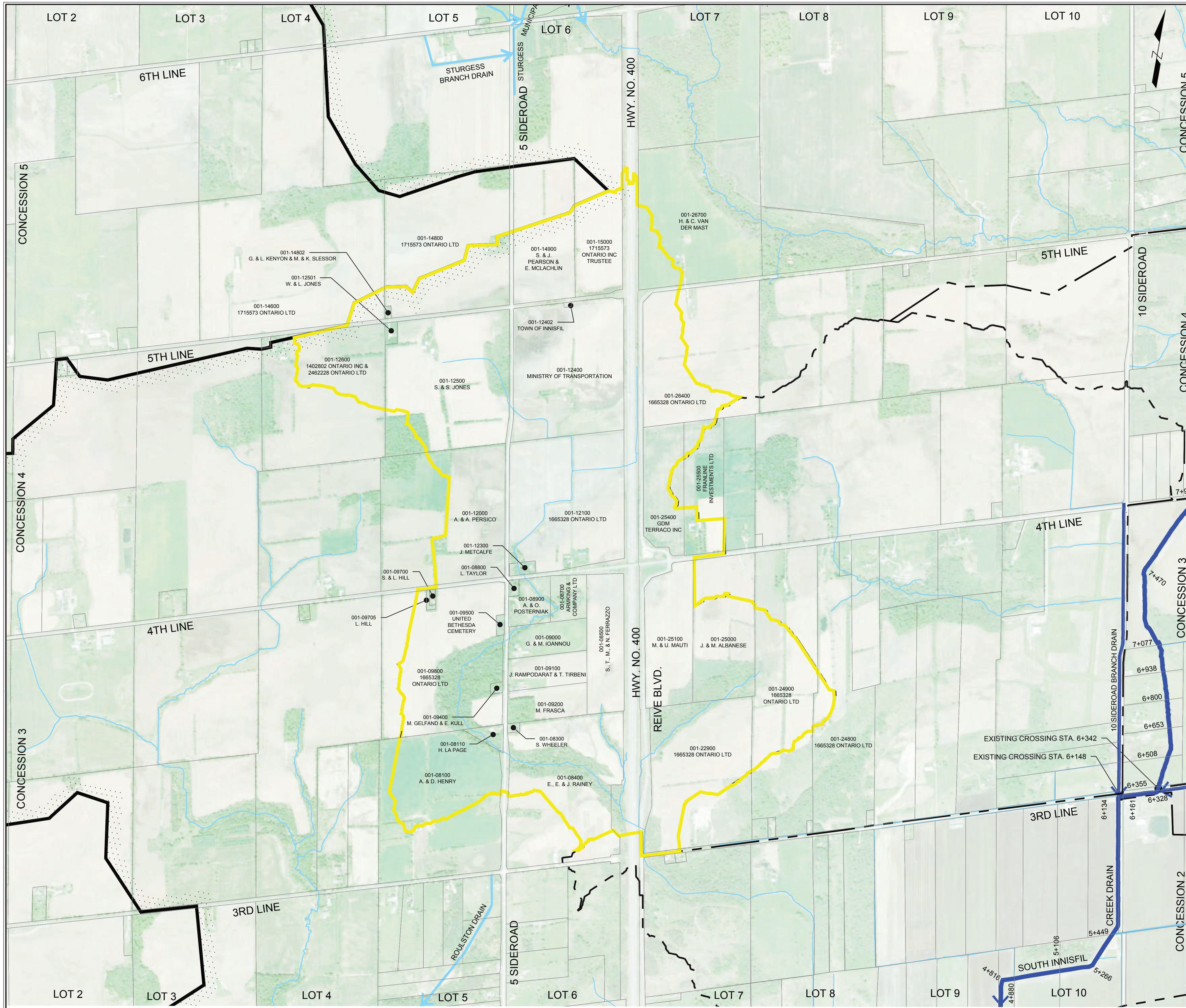
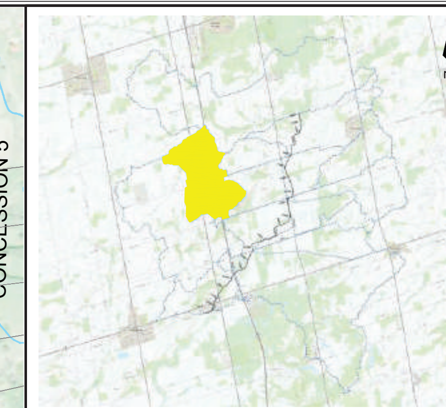
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 7

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	9 of 38
Date: 02/13/2019		Project No.: 300038790.0000		
Scale: 1:12,500		0 250 500 750m		





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

Notes

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Feb.13/19
PROVINCE OF ONTARIO

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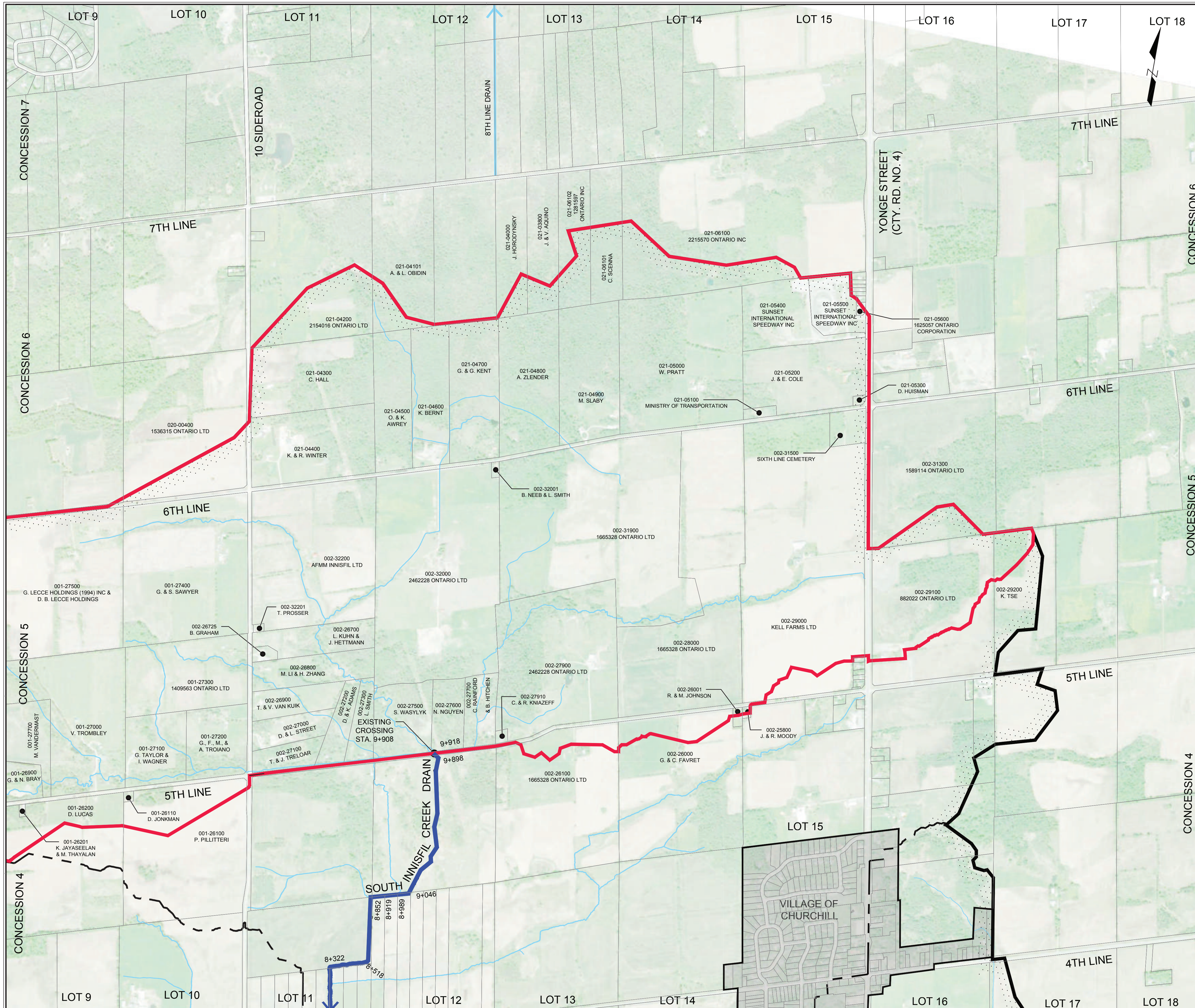
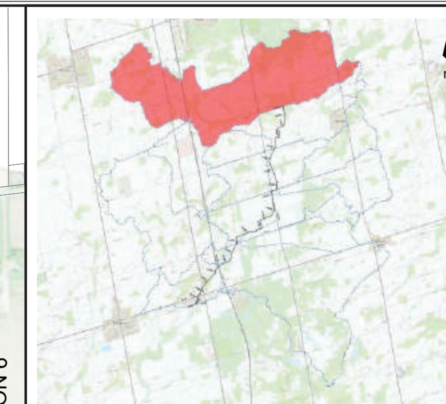
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 8

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	10of38
Date		Project No.		
02/13/2019		300038790.0000		
Scale				
1:12,500	0 250 500 750m			





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY
CATCHMENT AREA BOUNDARY
SUB WATERSHED BOUNDARY
DRAIN LOCATION & DIRECTION — DRAIN NAME
OTHER MUNICIPAL DRAIN — DRAIN NAME
NATURAL WATERCOURSE
ROLL NUMBER — 001-23414
LANDOWNER — M. VAN DER MAST

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PROVINCE OF ONTARIO

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Client
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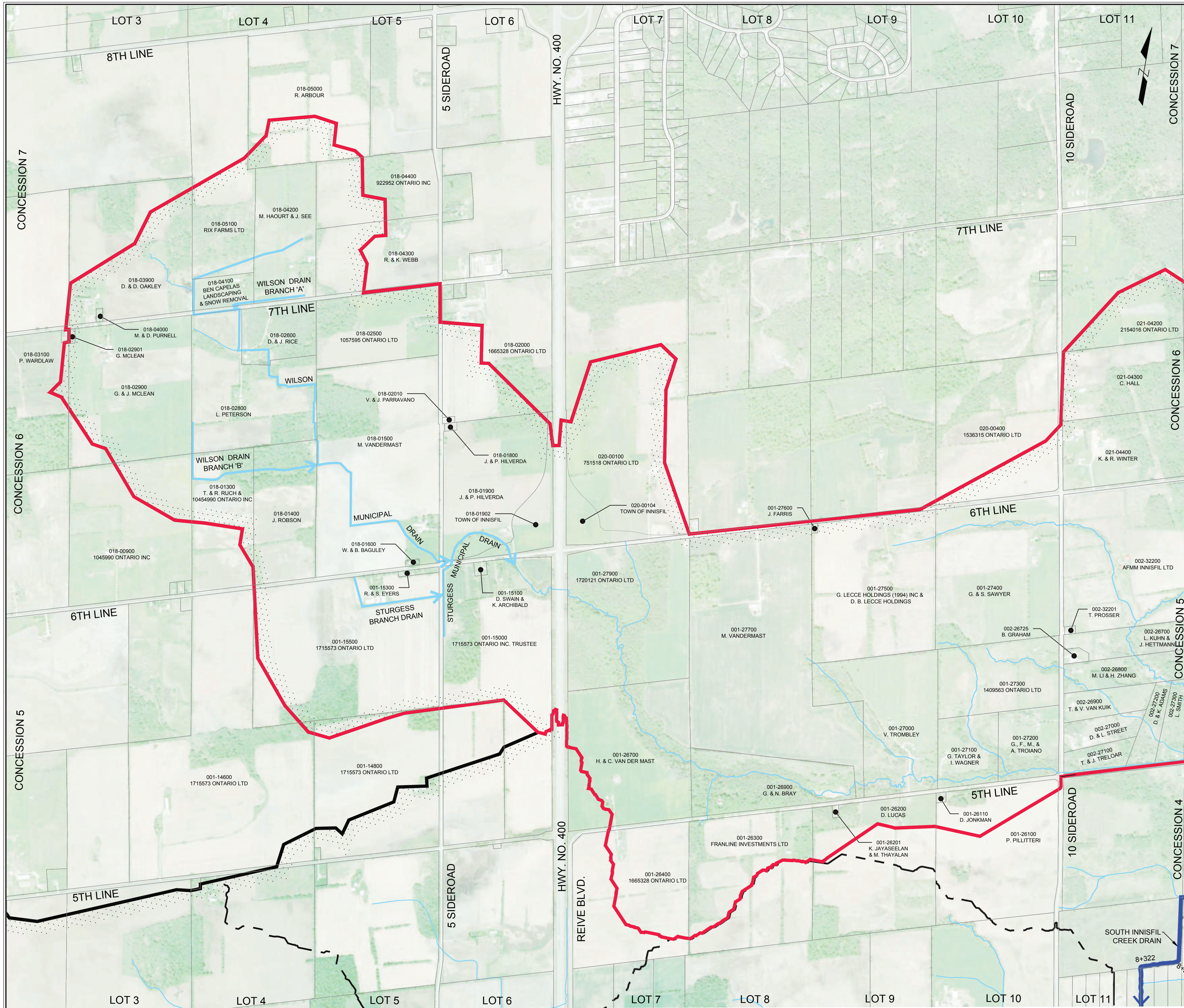
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

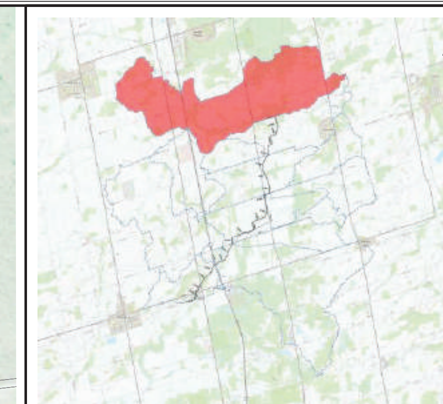
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 9

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TB/AB/NC	DM/JD	11 of 38
Date 02/13/2019		Project No. 300038790.0000		
Scale 1:12,500	0 250 500 750m			

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_ProductionDwg\038790_WATERSHED PLAN.dwg Date Plotted: February 5, 2019 - 1:35 PM





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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PROVINCE OF ONTARIO

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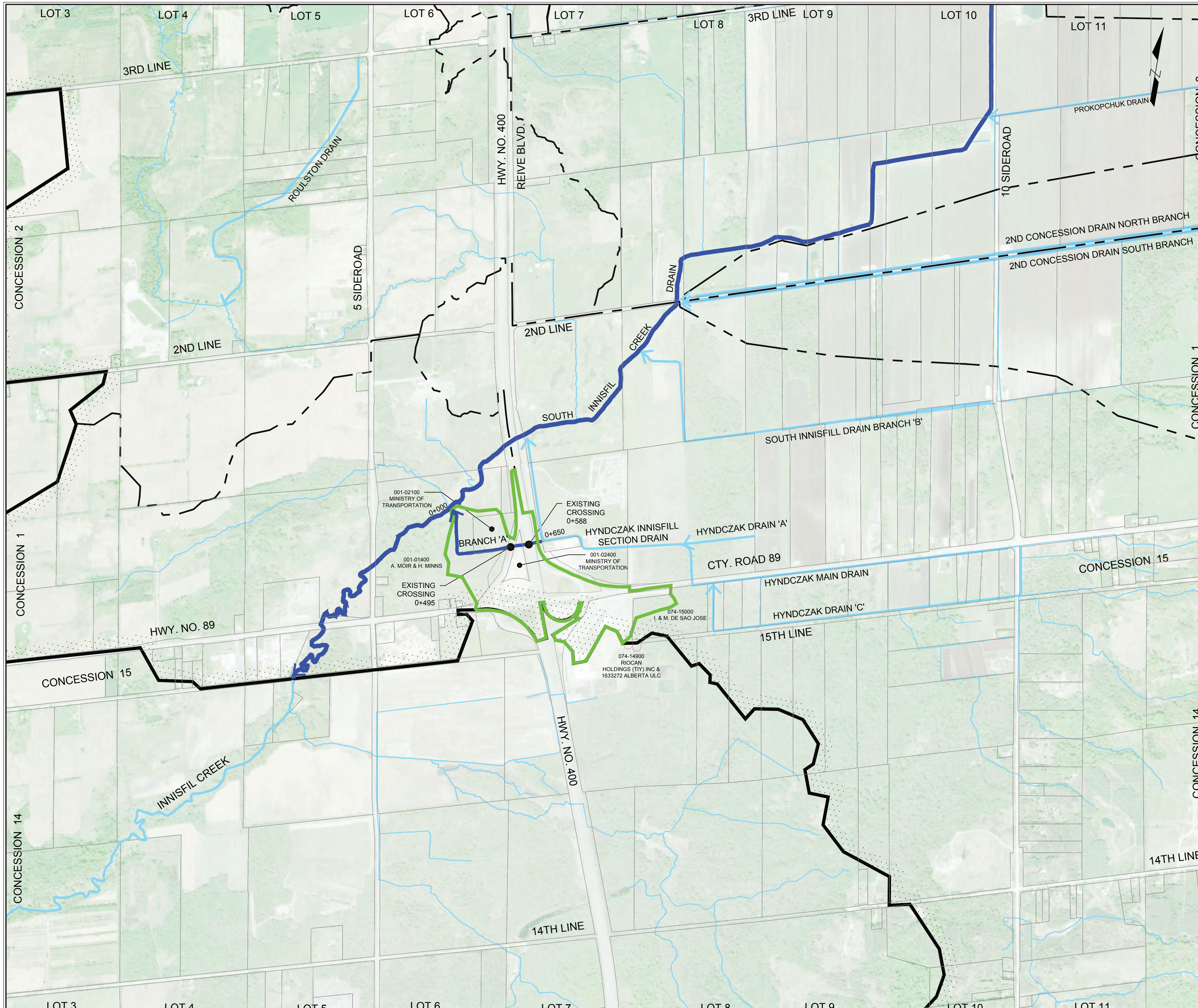
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 10

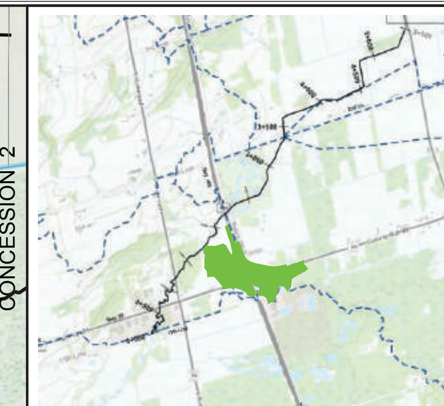
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	12 of 38
Date 02/13/2019		Project No. 300038790.0000		

Scale 1:12,500 — 0, 250, 500, 750m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN.dwg Date Plotted: February 5, 2019 - 1:35 PM



AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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Feb.13/19
PROVINCE OF ONTARIO

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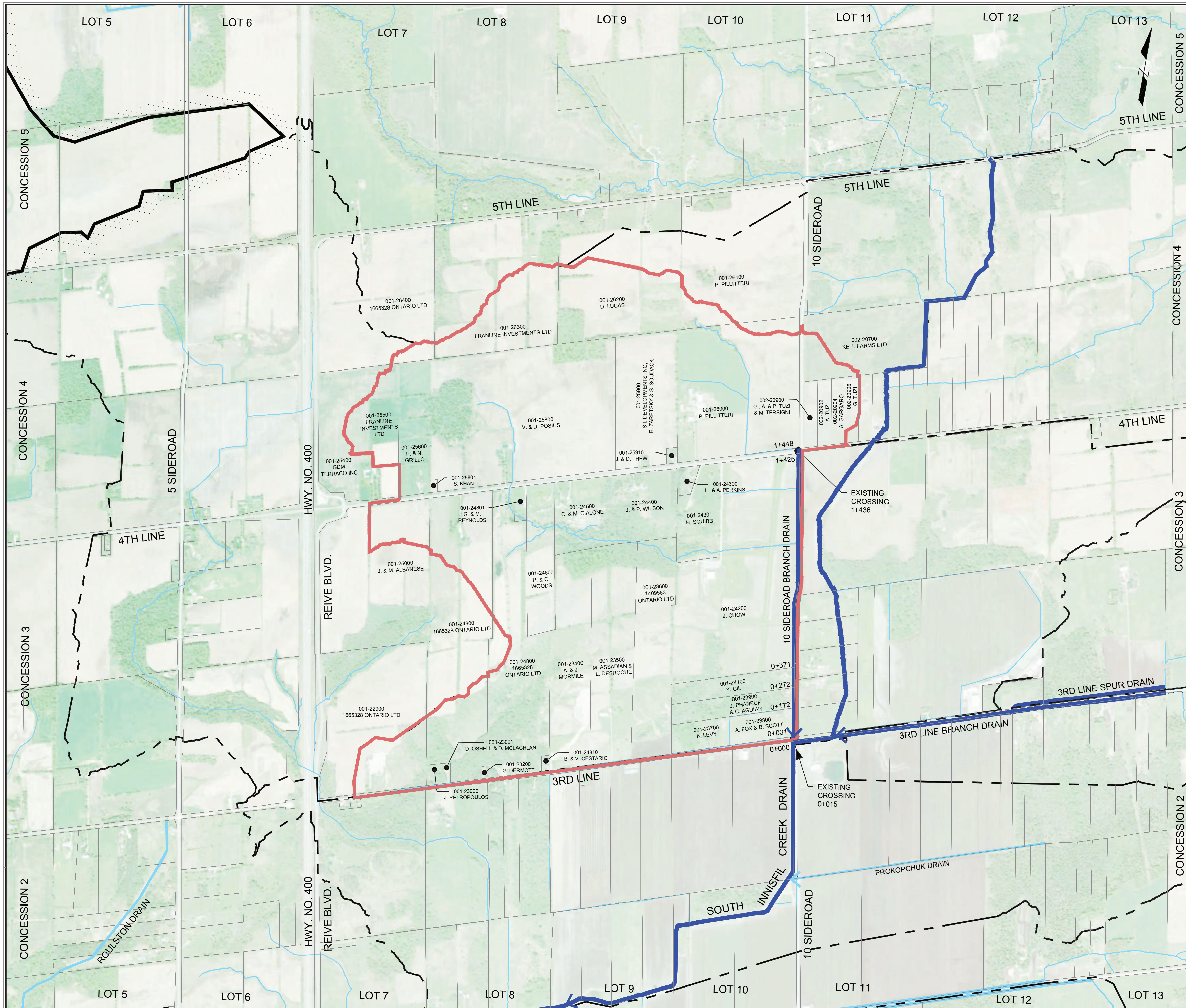
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

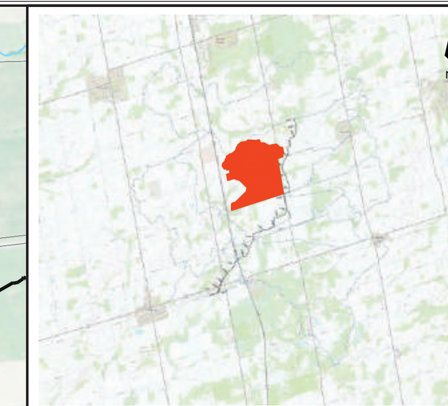
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - BRANCH 'A' DRAIN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	13 of 38
Date 02/13/2019		Project No. 300038790.0000		
Scale 1:12,500		0 250 500 750m		

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN (BRANCHES).dwg Date Plotted: February 5, 2019 - 1:37 PM





KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER	001-23414
LANDOWNER	M. VAN DER MAST

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J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

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Client

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2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title

SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 10 SIDEROAD BRANCH DRAIN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	14of38
Date		Project No.		
02/13/2019		300038790.0000		

Scale 1:12,500
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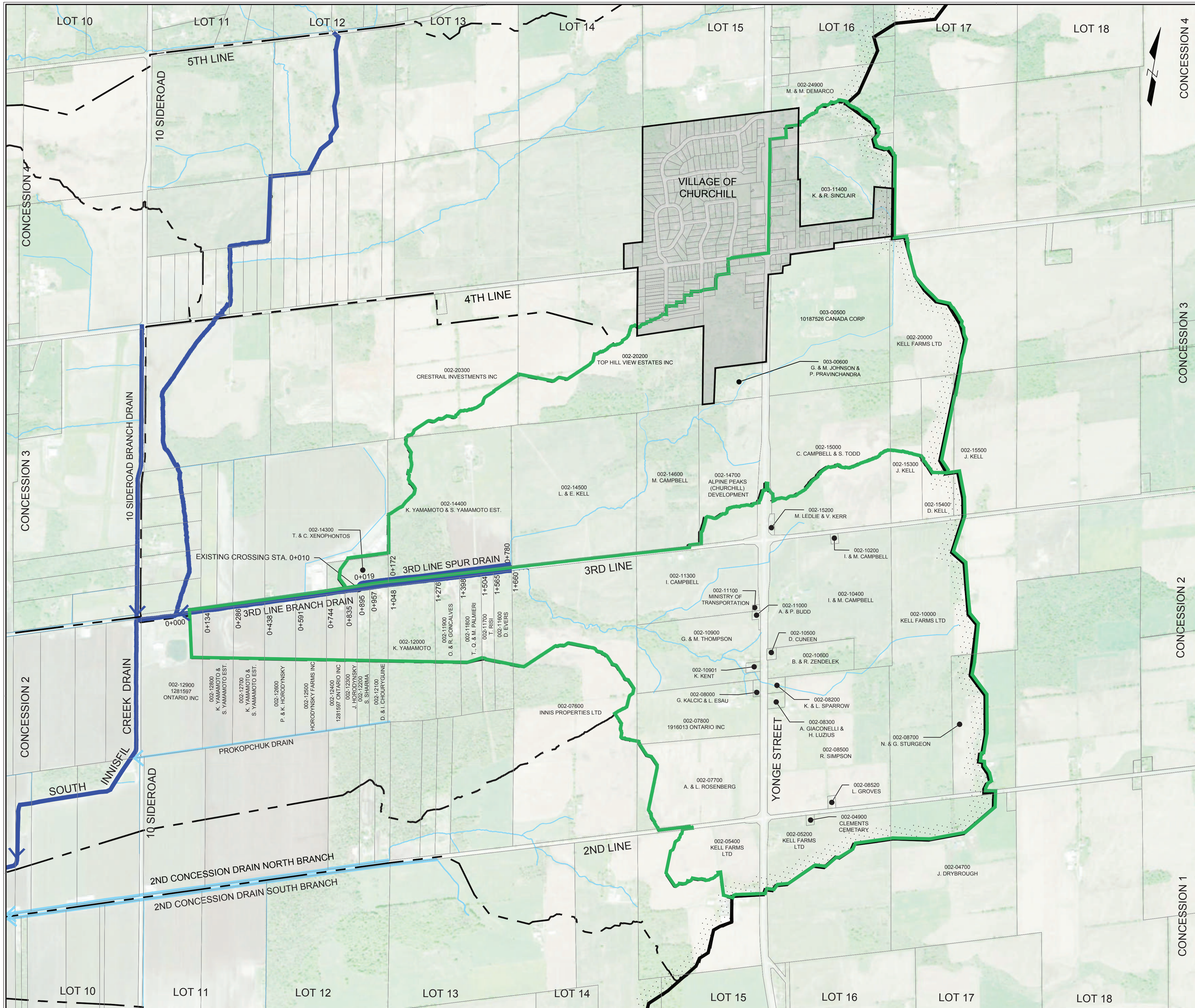
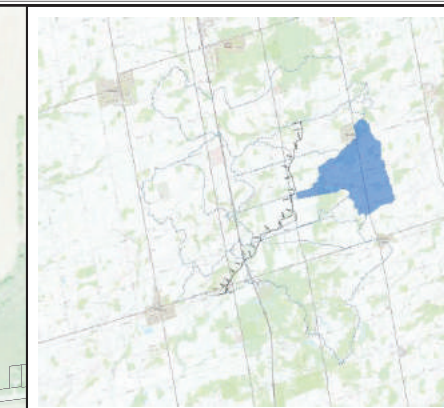


AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

WATERSHED BOUNDARY	
CATCHMENT AREA BOUNDARY	
SUB WATERSHED BOUNDARY	
DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

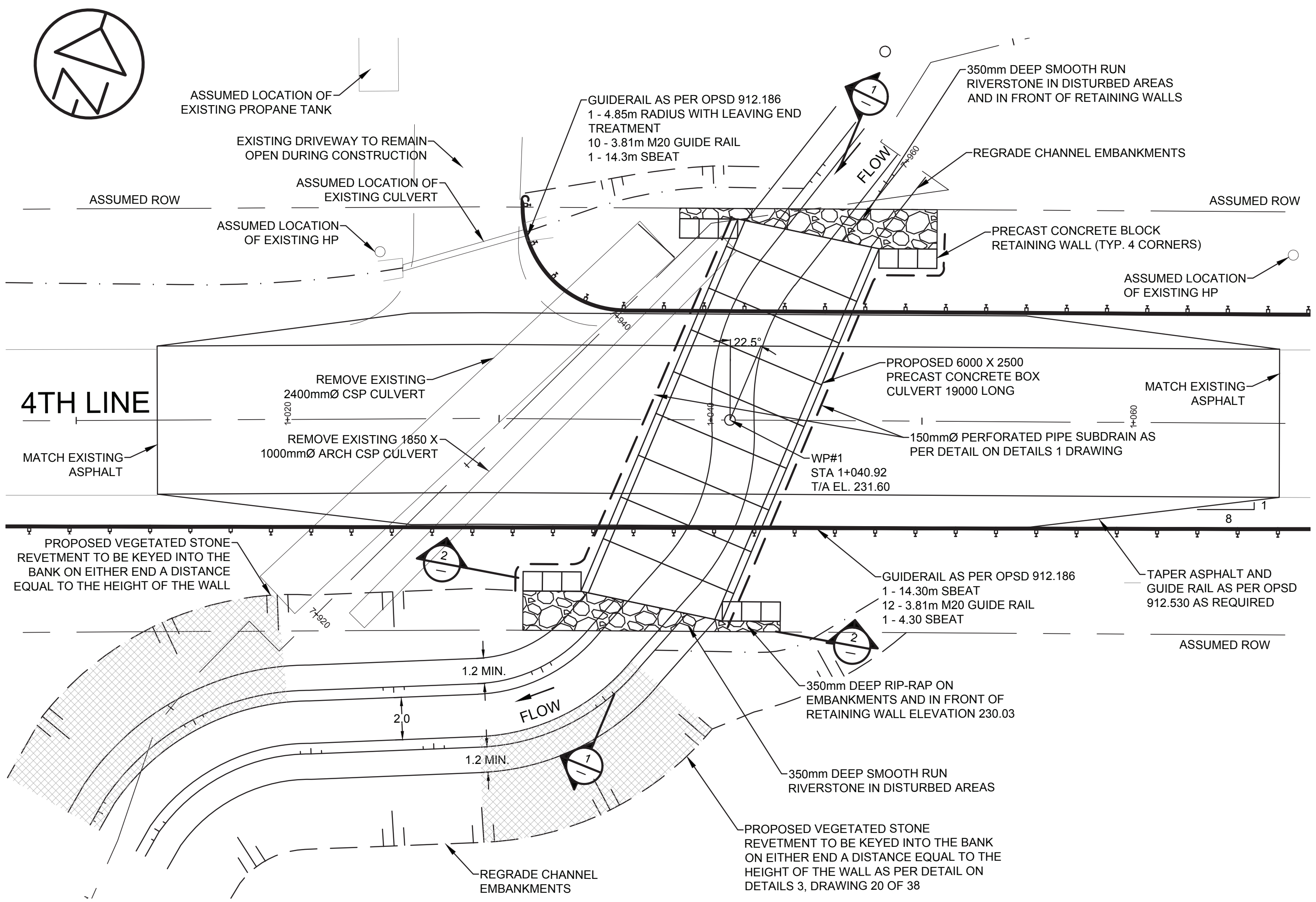
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
WATERSHED PLAN - 3RD LINE BRANCH AND 3RD LINE SPUR DRAIN

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	15of38
Date		Project No.		
02/13/2019		300038790.0000		

Scale
1:12,500
0 250 500 750m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_WATERSHED PLAN (BRANCHES).dwg Date Plotted: February 5, 2019 - 2:31 PM



PLAN
SCALE 1:200

GENERAL NOTES

1. PRECAST BOX CULVERT TO BE DESIGNED TO CANADIAN HIGHWAY BRIDGE CODE (CHBDC), CAN/CSA-S6-14, LIVE LOAD TRUCK TO CL-625-ONT.
2. CLASS OF CAST-IN-PLACE CONCRETE = 35MPa, EXPOSURE CLASS C-1.
3. CLEAR COVER TO REINFORCING STEEL:
   - APRON WALL 70+/- 20
   - DISTRIBUTION SLAB TOP 70 ± 20, BOTTOM 40 ± 10
   - PRECAST AS PER CHBDC
4. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - UNLESS SHOWN OTHERWISE, TENSION LAP SPLICES SHALL BE CLASS B.
   - BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS.
5. ALL EXPOSED CORNERS TO HAVE 20mm CHAMFER UNLESS NOTED OTHERWISE.
6. CONSTRUCTION NOTES:
   - BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND EACH SIDE OF CULVERT KEEPING THE HEIGHT OF BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
   - GEOTECHNICAL REPORT BY PETO MACCALLUM LTD. FILE #15BF045 DATED: OCTOBER, 2015.
7. ALL DIMENSIONS SHOWN ARE IN mm UNLESS NOTED OTHERWISE.

APPLICABLE OPSDs

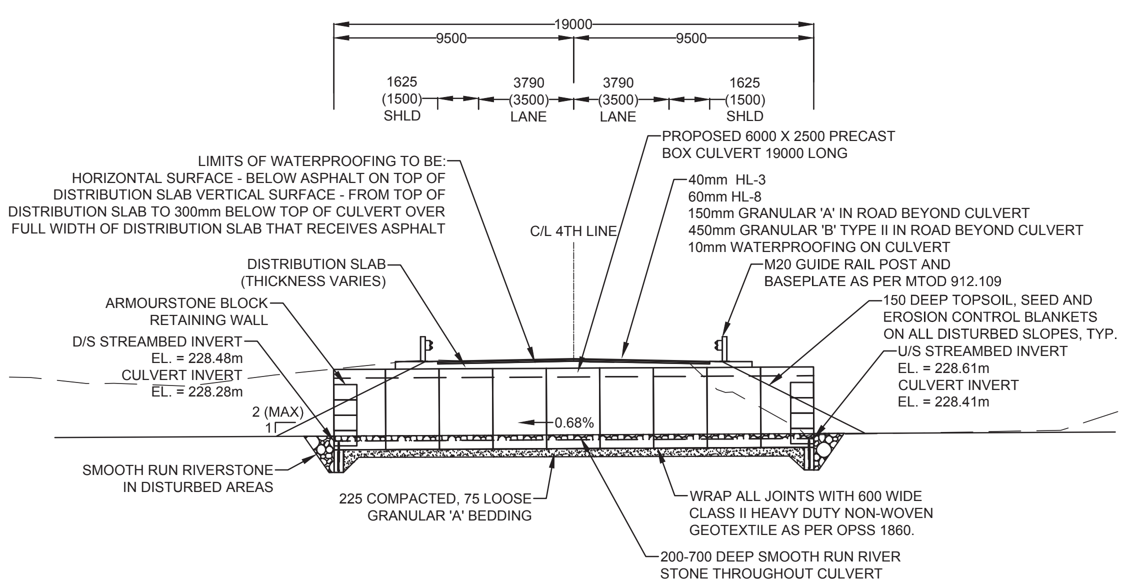
208.010 -	BENCHING OF EARTH SLOPES
219.130 -	HEAVY DUTY SILT FENCE BARRIER
219.180 -	STRAW BALE FLOW CHECK DAM
219.211 -	ROCK FLOW CHECK DAM, FLAT BOTTOM DITCH
221.020 -	TEMPORARY WATER PASSAGE SYSTEM, PUMPING AND PIPING
3101.150 -	BACKFILL MINIMUM GRANULAR REQUIREMENTS
912.186 -	STEEL BEAM GUIDE RAIL - TYPE M20 - ADJACENT TO 2H:1V SLOPE
912.530 -	GUIDE RAIL SYSTEM, STEEL BEAM STRUCTURE APPROACH
912.531 -	STEEL BEAM GUIDE RAIL - ENTRANCES AND INTERSECTING ROADWAYS
922.186 -	ENERGY ATTENUATOR, END TREATMENT, STEEL BEAM ENERGY ATTENUATING TERMINAL, MASH SEQUENTIAL KINKING TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION
984.201 -	ENERGY ATTENUATOR, END TREATMENT DELINEATION INSTALLATION - APPROACH END
3102.100 -	WALLS, ABUTMENT, BACKFILL DRAIN

LEGEND

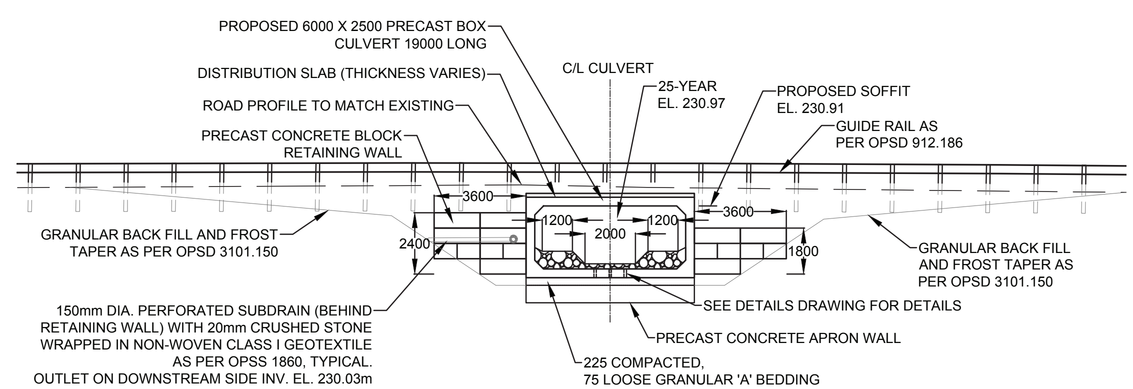
WP	WORKING POINT
TYP.	TYPICAL
MIN.	MINIMUM
RND	ROUNDING
SHLD	SHOULDER
EX.	EXISTING
PR.	PROPOSED
C/L	CENTRELINE
EL.	ELEVATION
R.O.W.	RIGHT OF WAY
BM	BENCHMARK
W.L.	WATER LEVEL
D/W	DRIVEWAY
U.O.N.	UNLESS OTHERWISE NOTED
T/A	TOP OF ASPHALT
U/S	UPSTREAM
D/S	DOWNSTREAM
SBGR	STEEL BEAM GUIDE RAIL
STA	STATION
F.F.	FRONT FACE
B/W	BOTTOM OF WALL
T/W	TOP OF WALL
INV	INVERT
CSP	CORRUGATED STEEL PIPE
BH	BOREHOLE
HP	HYDRO POLE
E/W	EACH WAY

RETAINING WALL ELEVATIONS

LOCATION	T/W ELEVATION	B/W ELEVATION
NE	230.61	228.01
NW	230.41	228.01
SE	230.41	227.88
SW	230.61	227.88



1 SECTION
SCALE 1:200



2 ELEVATION
SCALE 1:200

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NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
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8	FILE FINAL ENGINEER'S REPORT	02/13/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 fax (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

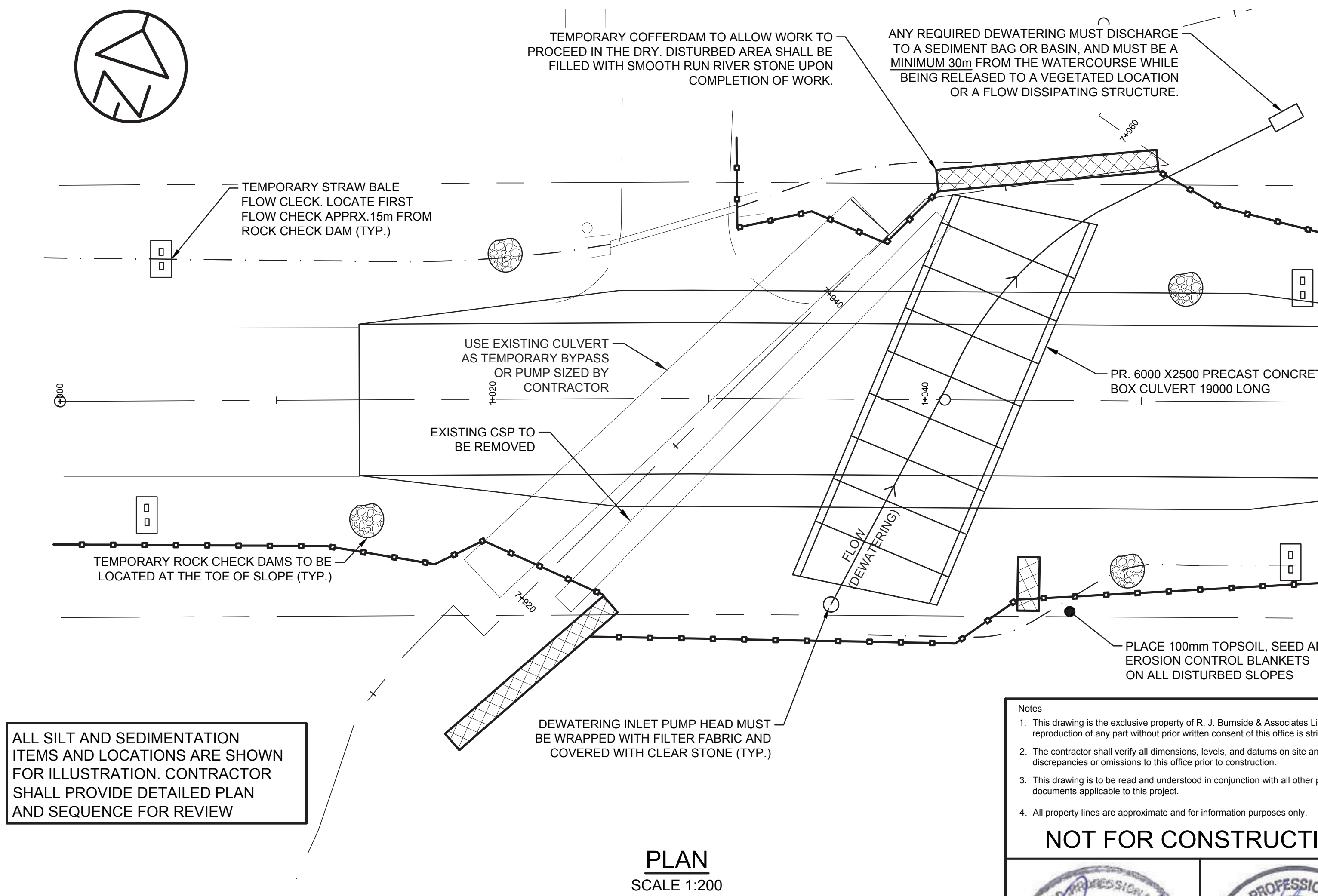
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT
GENERAL ARRANGEMENT

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	16 of 38
Date		Project No.		
02/13/2019		300038790.0000		
Scale				
AS NOTED				

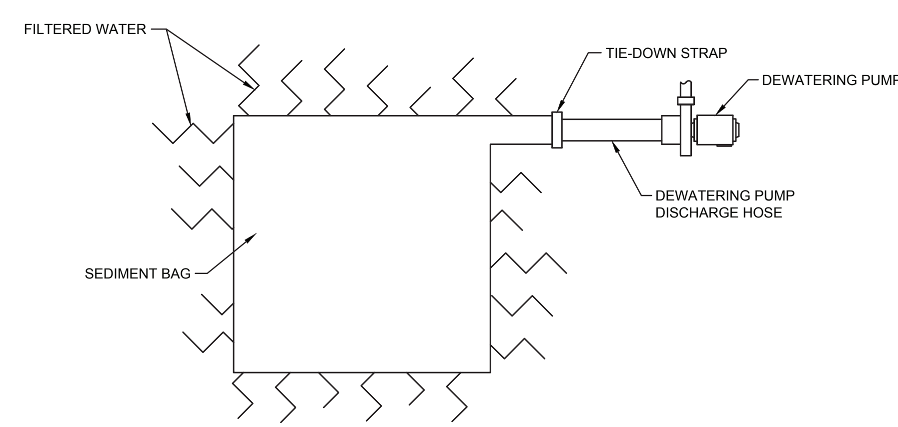
EROSION & SEDIMENTATION NOTES:

1. ALL SEDIMENTATION CONTROLS TO BE INSTALLED PRIOR TO EXECUTING ANY WORK.
2. ALL SEDIMENTATION CONTROLS TO BE INSPECTED DAILY AND REPAIRED/REPLACED AS NECESSARY.
3. ALL TEMPORARY EROSION & SEDIMENTATION CONTROLS SHALL REMAIN IN PLACE UNTIL SUCH TIME AS RE-VEGETATIVE MEASURES HAVE GERMINATED AND TAKEN HOLD.
4. ANY COFFERDAMS SHALL BE CONSTRUCTED OF CLEAN, NON-ERODIBLE MATERIALS SUCH AS, BUT NOT LIMITED TO; PEA GRAVEL BAGS, CLEAN GRAVEL AND PLASTIC SHEETING, PRECAST BARRIERS AND PLASTIC SHEETING, SHEET STEEL PILING, OR OTHER CLEAN MATERIAL APPROVED BY THE NVCA.
5. CONTROL OF CREEK BASE FLOWS AND STORM EVENT RUNOFF DURING CONSTRUCTION SHALL BE THE CONTRACTORS RESPONSIBILITY.
6. THE NATURAL STREAM COURSE SHALL BE PRESERVED AND REMAIN OPEN THROUGHOUT CONSTRUCTION.
7. COFFERDAM MATERIALS SHALL BE CLEAN, FREE OF DIRT OR DEBRIS, AND NON-ERODIBLE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF ANY CULVERT, PUMPS, CHANNELS OR ANY OTHER TEMPORARY MEASURES REQUIRED TO CONTROL THE FLOW. THE CONTRACTOR SHALL ASSESS THE RISK OF FLOODS, STORMS AND EVENTS THAT MAY AFFECT CONSTRUCTION AND DETERMINE THEIR OWN LEVEL OF RISK ASSOCIATED WITH ANY TEMPORARY WORK. THE CONTRACTOR MAY USE THE EXISTING CULVERT FOR THE BYPASS, HOWEVER, NO GUARANTEES ARE GIVEN THAT THE EXISTING CULVERT IS SUFFICIENT.
9. ALL EXCAVATIONS AND SUBSEQUENT WORK SHALL BE UNDERTAKEN IN THE DRY. GROUNDWATER FLOW AND SURFACE FLOW ENTERING ANY EXCAVATION SHALL BE REMOVED.
10. ALL DEWATERING/UNWATERING SHALL BE DISCHARGED INTO A FILTERED SUMP, SOCK OR SOAK PIT, LOCATED AT LEAST 30m FROM THE WATER COURSE.
11. STRAW BALE FLOW CHECKS AND TEMPORARY ROCK FLOW CHECKS, AS SPECIFIED, SHALL BE PLACED WHERE SUITABLE OR AS DIRECTED BY THE ENGINEER.
12. PROBABLE SILT FENCE BARRIER LOCATIONS ARE SHOWN. PROVIDE SILT FENCE BARRIERS WHERE REQUIRED AND AS MAY BE DIRECTED BY THE ENGINEER.
13. NOMINAL STONE SIZE TO BE 200mm. MAXIMUM STONE SIZE TO BE 1½ TIMES THE NOMINAL STONE SIZE. 80% OF STONES (BY MASS) MUST HAVE A DIAMETER OF AT LEAST 60% OF NOMINAL STONE SIZE. MINIMUM STONE SIZE TO BE 50 mm.
14. CONTINUALLY MONITOR PUMP OUTLET AREA AND STABILIZE IF REQUIRED.
15. THE ESC PLAN IS A DYNAMIC DOCUMENT, WHICH MAY BE SUBJECT TO CHANGE OR MODIFICATION AS A RESULT OF SITE DEVELOPMENTS OR CHANGES ON SITE. ANY DEVIATION FROM APPROVED PLANS MUST BE DESIGNED BY A QUALIFIED PROFESSIONAL. IT IS EVERYONE'S RESPONSIBILITY TO PREVENT CONSTRUCTION RELATED SEDIMENT FROM IMPACTING AQUATIC RESOURCES AND OTHER NATURAL FEATURES.
16. ALL SILT AND SEDIMENTATION ITEMS AND LOCATIONS ARE SHOWN FOR ILLUSTRATION. CONTRACTOR SHALL PROVIDE DETAILED PLAN AND SEQUENCE FOR ENGINEER & NVCA REVIEW.
17. ANY FISH OR AQUATIC LIFE SHALL BE REMOVED FROM THE CONSTRUCTION AREA BY A QUALIFIED ENVIRONMENTAL PROFESSIONAL. A "LICENSE TO COLLECT FISH" WILL BE OBTAINED FROM THE MINISTRY OF NATURAL RESOURCES AND FORESTS (MNRF) FOR AQUATIC LIFE SALVAGE PRIOR TO IN-WATER WORKS. PROVIDE A MINIMUM OF 48 HOURS NOTICE PRIOR TO REQUIRING FISH REMOVAL. IN THE EVENT OF FLOODING THAT REQUIRES ADDITIONAL REMOVAL OF FISH, THE CONTRACTOR WILL BE REQUIRED TO PAY FOR PROVIDING REMOVAL BY A QUALIFIED PROFESSIONAL. THE CONTRACTOR SHOULD SIZE THEIR WATERWAY CONTROL ACCORDINGLY.
18. A QUALIFIED PERSON SHALL BE ON -SITE DURING THE PLACEMENT OF RIVER STONE SUBSTRATE AND THE RESTORATION OF AQUATIC HABITATS. PROVIDE A MINIMUM OF 48 HOURS NOTICE PRIOR TO PLACING OF RIVER STONE AND BAFFLES IN THE CULVERT.

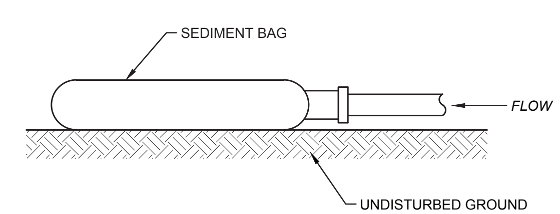


ALL SILT AND SEDIMENTATION ITEMS AND LOCATIONS ARE SHOWN FOR ILLUSTRATION. CONTRACTOR SHALL PROVIDE DETAILED PLAN AND SEQUENCE FOR REVIEW

PLAN
SCALE 1:200



SEDIMENT BAG - PLAN VIEW
N.T.S



SEDIMENT BAG - SECTION
N.T.S

LEGEND (TEMPORARY WORK)

- HEAVY DUTY SILT FENCE BARRIER AS PER OPSD 219.130.
- STRAW BALE FLOW CHECK AS PER OPSD 219.180
- ROCK CHECK DAMS AS PER OPSD 219.210 OR 219.211.
- TEMPORARY COFFERDAM

24-HR SCS	
EVENT	FLOW (M^3/S)
2-YEAR	5.44
5-YEAR	11.31
25-YEAR	22.45

FOR THE PROTECTION OF LOCAL FISH POPULATIONS DURING THEIR SPAWNING AND NURSERY PERIODS, CONSTRUCTION WORKS SHALL BE COMPLETED BETWEEN JULY 16TH AND SEPTEMBER 30TH.

ALL AQUATIC LIFE WILL BE SALVAGED UNDER A LICENCE TO COLLECT FISH (OBTAINED FROM THE MNRF) TO AVOID "SERIOUS HARM TO FISH" AS DESCRIBED IN THE FISHERIES ACT.

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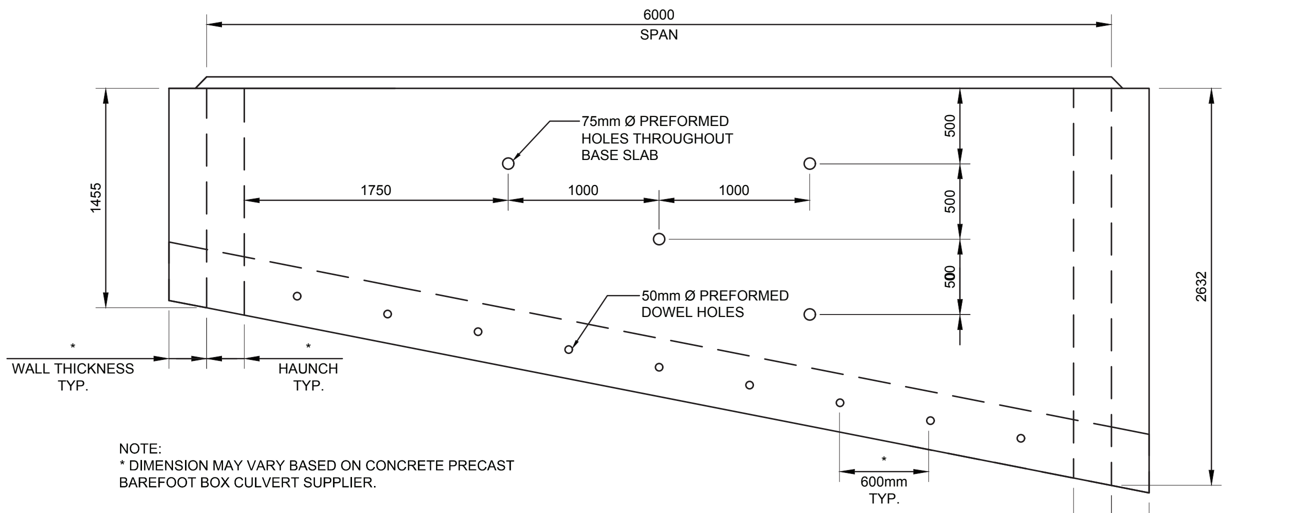
BURNSIDE
R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

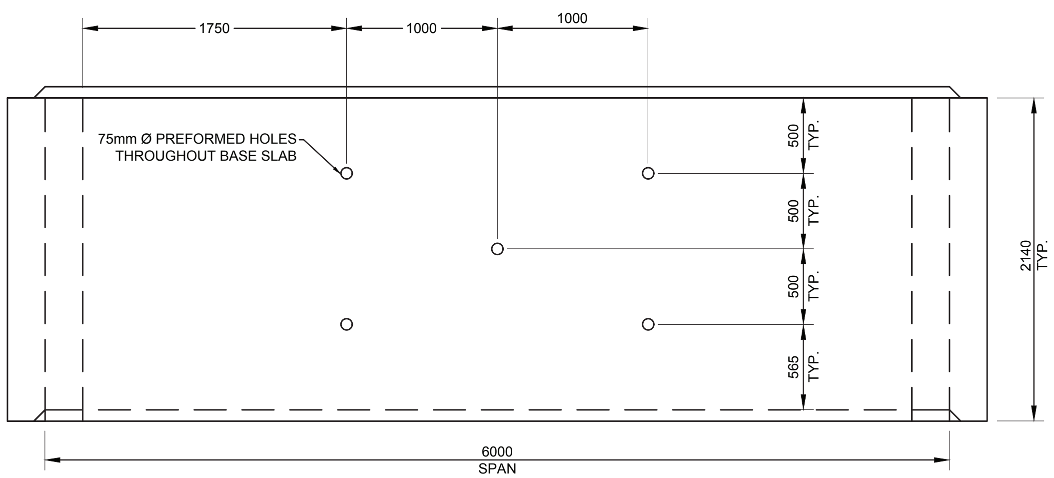
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT - EROSION AND SEDIMENT CONTROL PLAN

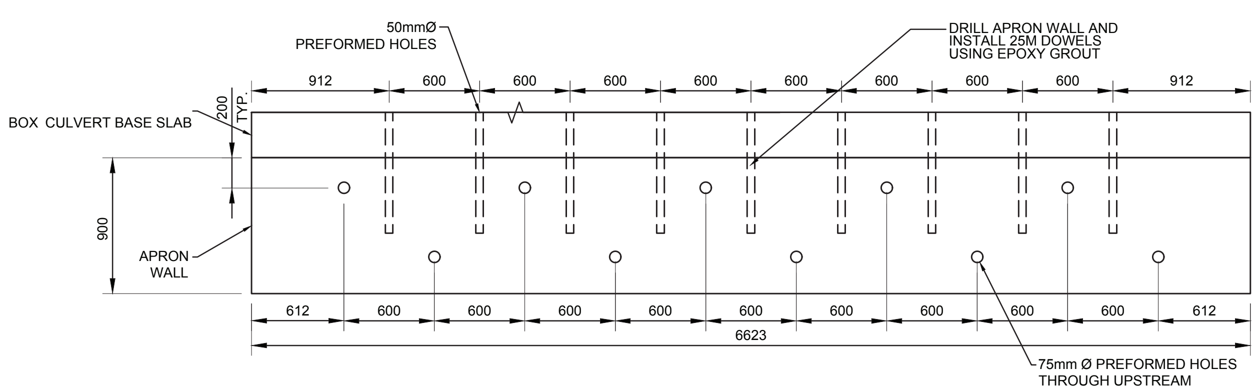
Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	17 of 38
Date		Project No.		
02/13/2019		300038790.0000		
Scale				
AS NOTED				



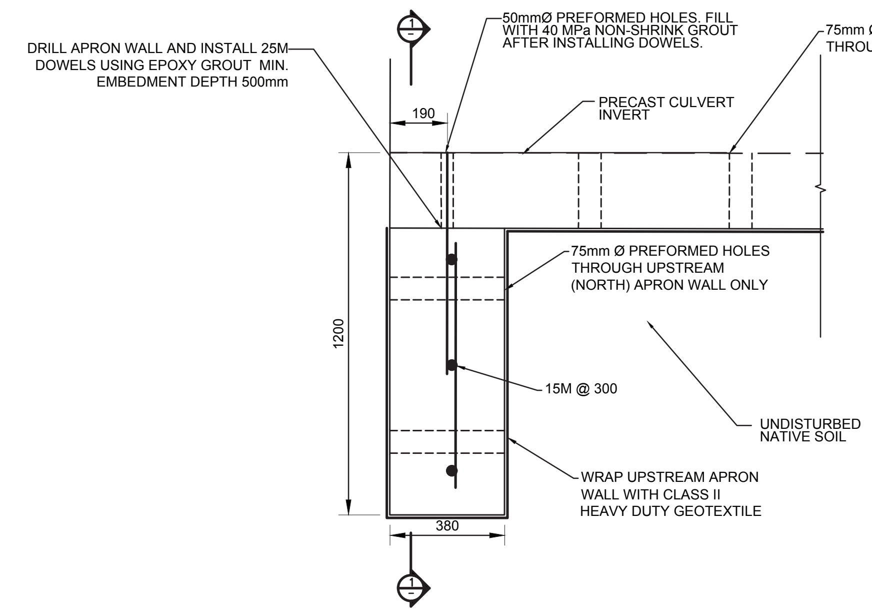
DETAIL - TYPICAL BOX END UNIT
N.T.S.



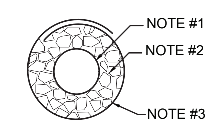
DETAIL - TYPICAL BOX MIDDLE UNIT
N.T.S.



1 - SECTION - APRON WALL DETAIL
N.T.S.



B APRON WALL SECTION DETAIL
N.T.S.



PERFORATED DRAIN DETAIL
N.T.S.

NOTE:

1. 150 mm PERFORATED CORRUGATED POLYETHYLENE PIPE CONFORMING TO OPSS 1840 WITH SOCK FILTER AS MANUFACTURED BY BIG 'O' INC. OR APPROVED EQUAL.

2. OPEN GRADED 19 mm CRUSHED ROCK IN ACCORDANCE WITH OPSS 1004. USE 0.05m³ IN VOLUME, PER METRE OF PIPE, EVENLY DISTRIBUTED AROUND PIPE.

3. NON-WOVEN GEOTEXTILE SHALL CONFORM TO OPSS 1860 CLASS 1.

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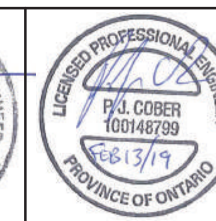

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BURNSIDE

R.J. Burnside & Associates Limited
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Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

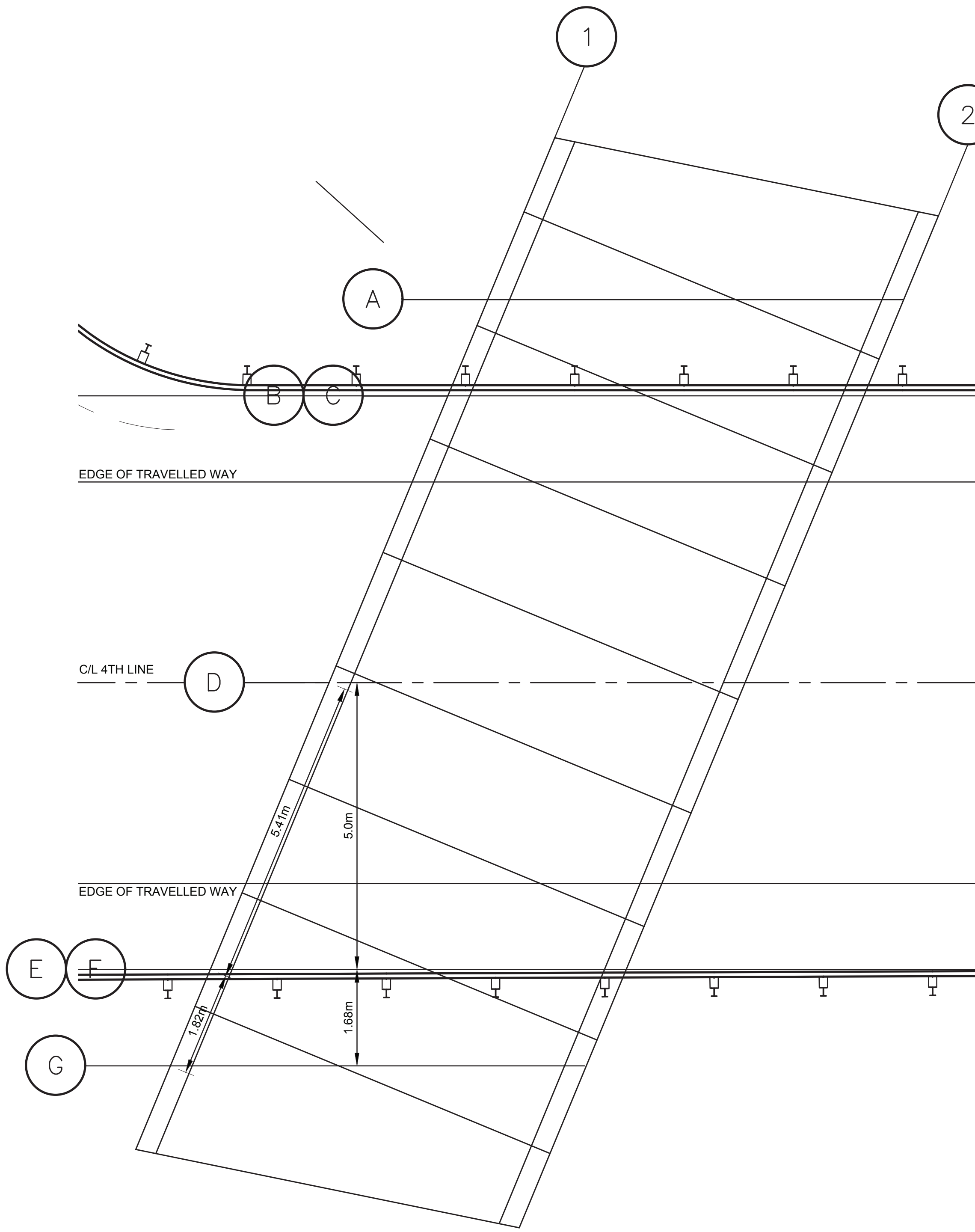
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT DETAILS 1

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	18 of 38
Date: 02/13/2019		Project No.: 300038790.0000		
Scale: AS NOTED				

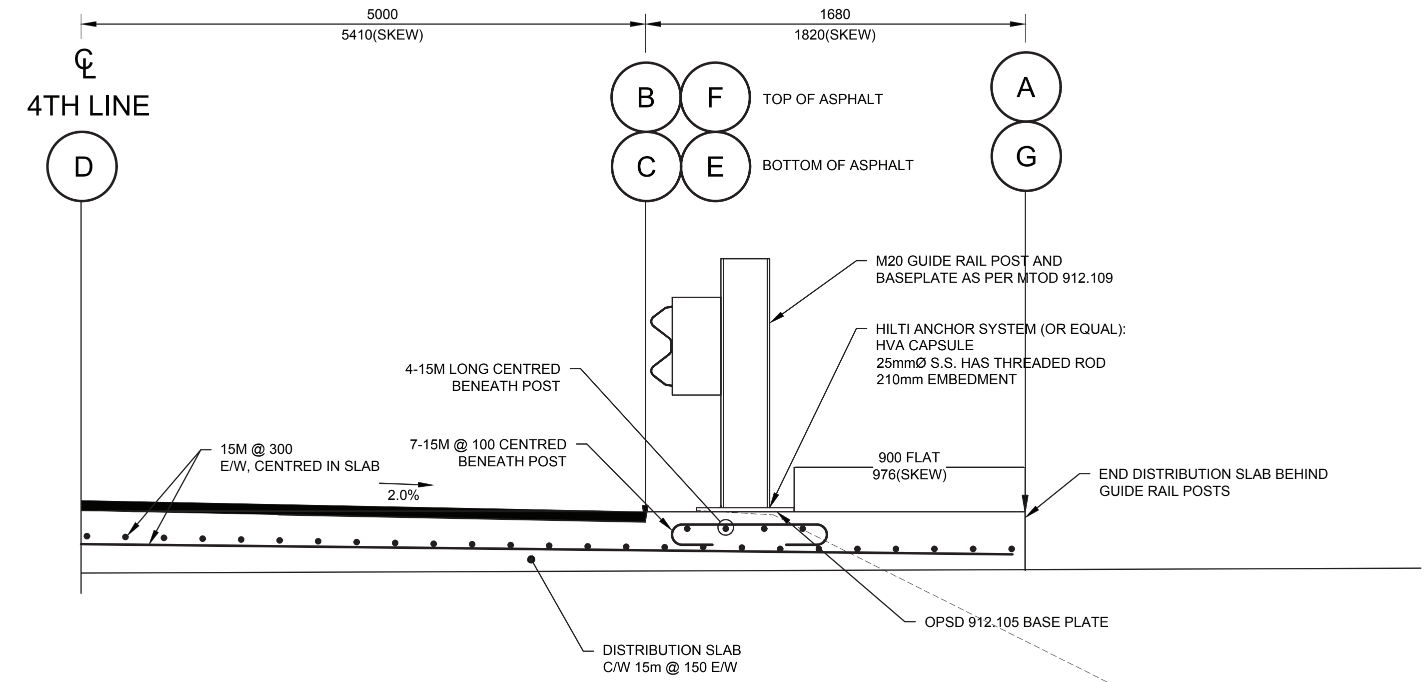
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_4TH LINE MAIN DRAIN CULVERT.dwg Date Plotted: February 6, 2019 - 12:05 PM



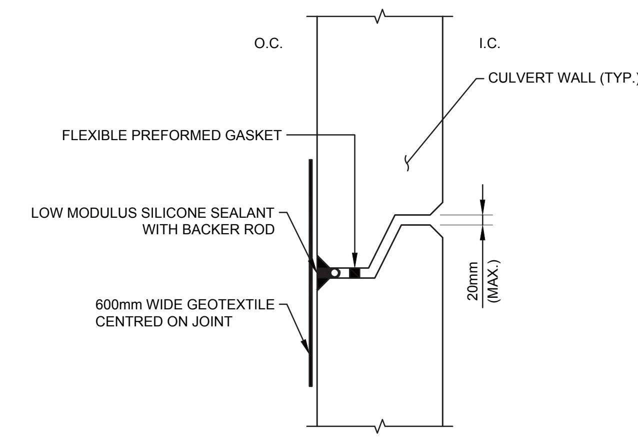
PLAN - SCREED ELEVATIONS
SCALE 1:75

SCREED ELEVATIONS (TOP OF DISTRIBUTION SLAB CONCRETE)		
LINE	1	2
A	231.490	231.490
B	231.490	231.490
C	231.390	231.390
D	231.490	231.490
E	231.390	231.390
F	231.490	231.490
G	231.490	231.490

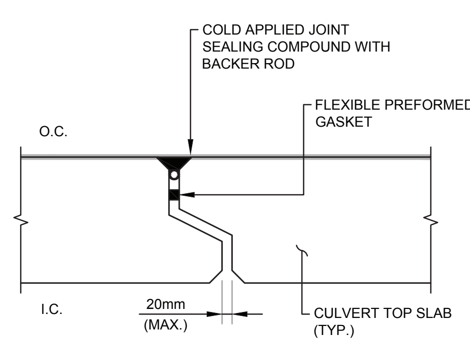
NOTE: ELEVATIONS TO BE CONFIRMED IN FUTURE AFTER COMPLETION OF DETAILED SURVEY.



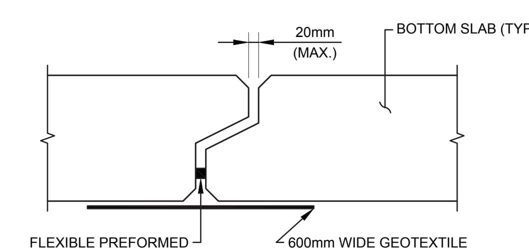
B DISTRIBUTION SLAB DETAIL
N.T.S.



JOINTS IN WALLS
N.T.S.



JOINTS IN TOP SLAB
N.T.S.



JOINTS IN BOTTOM SLAB
N.T.S.

D PRECAST CONCRETE CULVERT JOINT TREATMENT DETAILS
N.T.S.

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NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER D. G. McNALTY FEB 13/19 PROVINCE OF ONTARIO
LICENSED PROFESSIONAL ENGINEER P.J. COBER 100148799 FEB 13/19 PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
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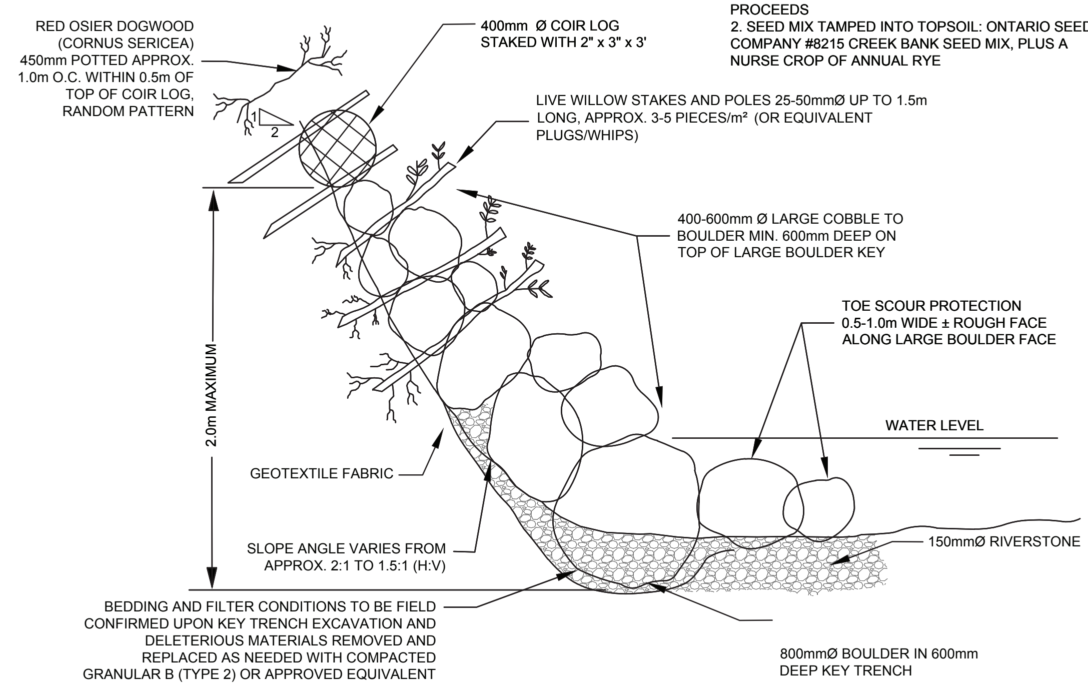
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT DETAILS 2

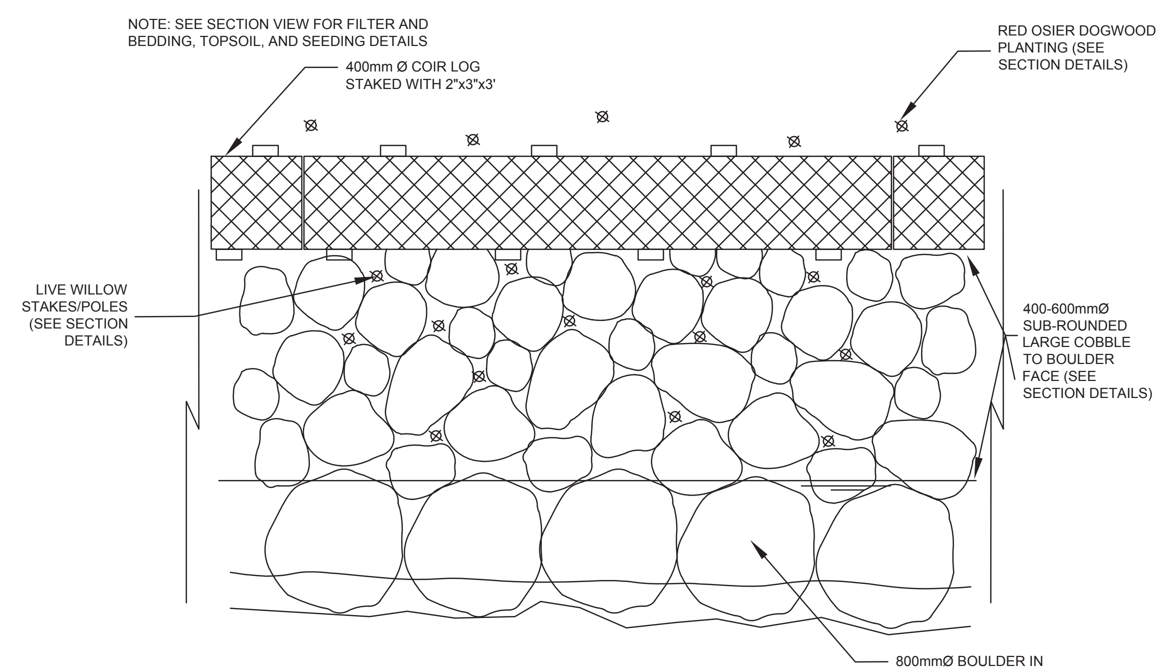
Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	19 of 38
Date 02/13/2019		Project No. 300038790.0000		
Scale AS NOTED				

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_4TH LINE MAIN DRAIN CULVERT.dwg Date Plotted: February 6, 2019 - 12:05 PM

NOTES
1. TOPSOIL TO BE MIXED WITH STONE AS PLACED TO FILL VOIDS AND TO BE WATERED IN AS WORK PROCEEDS
2. SEED MIX TAMPED INTO TOPSOIL: ONTARIO SEED COMPANY #8215 CREEK BANK SEED MIX, PLUS A NURSE CROP OF ANNUAL RYE



VEGETATED STONE REVETMENT
N.T.S.



VEGETATED STONE REVETMENT FACE VIEW (TYPICAL)
N.T.S.

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NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
D. G. McNALTY
FEB 13/19
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. J. COBER
100148799
FEB 13/19
PROVINCE OF ONTARIO

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Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

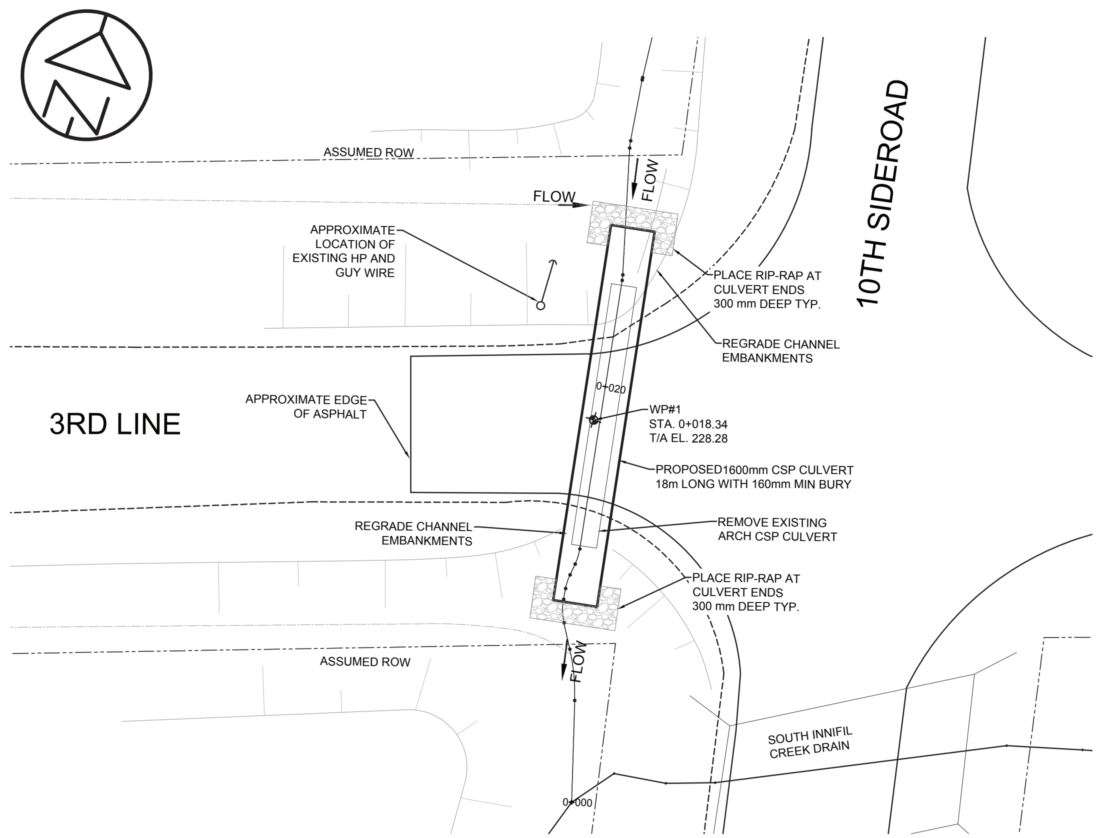
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN 4TH LINE CULVERT DETAILS 3

Designed	Checked	Drawn	Checked	Drawing No.
JC	MB	CT	JC	20of38
Date		Project No.		
02/13/2019		300038790.0000		

Scale
AS NOTED

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_ProductionDwg\038790_4TH LINE MAIN DRAIN CULVERT.dwg Date Plotted: February 6, 2019 - 12:05 PM



GENERAL NOTES

1. DESIGNED TO CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC) CAN/CSA-S6-06.
2. THE CONTRACTOR SHALL CONFIRM ALL DIMENSIONS AND DETAILS BEFORE STARTING WORK.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION AND PROTECTION OF ALL EXISTING UTILITIES, SERVICES, STRUCTURES, ROADWAYS, ETC. DURING CONSTRUCTION.

CORRUGATED STEEL PIPE CULVERT NOTES:

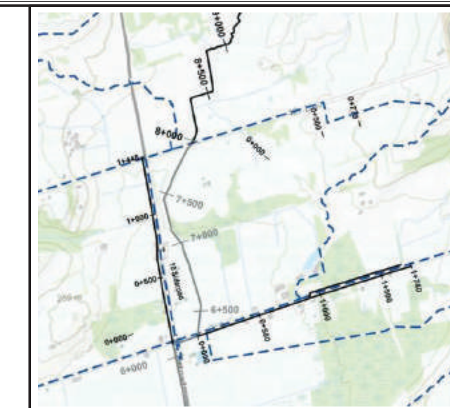
1. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND EACH SIDE OF THE CULVERT KEEPING THE HEIGHT OF BACKFILL APPROXIMATELY EQUAL. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 300mm. PLACE AND COMPACT GRANULAR BACKFILL IN 200mm LIFTS TO A MINIMUM OF 100% STANDARD PROCTOR DENSITY.
2. THE CONTRACTOR IS TO MEASURE THE RISE AND SPAN OF THE CULVERT AT SEVERAL LOCATIONS DURING THE BACKFILLING PROCESS TO ENSURE THAT CULVERT MAINTAINS ITS SHAPE THROUGHOUT CONSTRUCTION. AT NO POINT SHALL THE VERTICAL DIMENSION (RISE) INCREASE IN EXCESS OF 5% OF THE NOMINAL DIAMETER. ALSO THE HORIZONTAL DIMENSION (SPAN) SHALL NOT INCREASE IN EXCESS OF 3% GREATER THAN THE NOMINAL DIMENSION.
3. BEARING CAPACITY OF SOIL TO BE A MINIMUM OF 150kPa (ULS), TO BE VERIFIED BY CONTRACT ADMINISTRATOR PRIOR TO PLACEMENT OF CULVERT.

APPLICABLE OPSD'S

208.010	BENCHING OF EARTH SLOPES
219.130	HEAVY DUTY SILT FENCE
219.180	STRAW BALE FLOW CHECKS
219.210	ROCK FLOW CHECK DAM
802.010	FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION
810.010	RIP-RAP TREATMENT FOR SEWER AND CULVERT OUTLETS
912.130	GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST ASSEMBLY INSTALLATION - SINGLE RAIL
912.235	GUIDE RAIL SYSTEM, STEEL BEAM LEAVING END TREATMENT, INSTALLATION
912.240	GUIDE RAIL SYSTEM, STEEL BEAM TREATMENT AT CULVERTS WITH MINIMAL COVER
922.530	ENERGY ATTENUATOR, END TREATMENT EXTRUDER ASSEMBLY

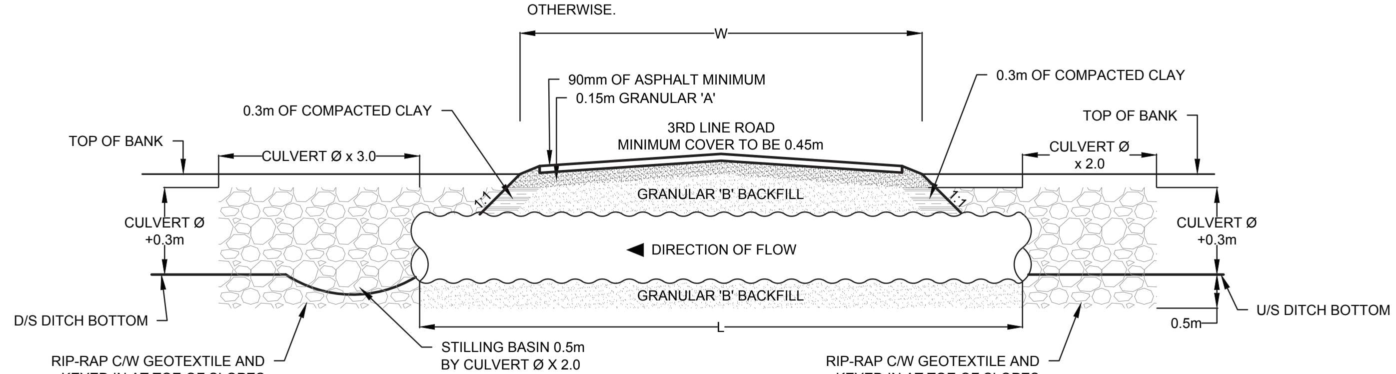
LEGEND

WP	WORKING POINT
TYP.	TYPICAL
MIN.	MINIMUM
RND	ROUNDING
SHLD	SHOULDER
EX.	EXISTING
PR.	PROPOSED
C/L	CENTRELINE
EL.	ELEVATION
R.O.W.	RIGHT OF WAY
BM	BENCHMARK
W.L.	WATER LEVEL
D/W	DRIVEWAY
U.O.N.	UNLESS OTHERWISE NOTED
T/A	TOP OF ASPHALT
U/S	UPSTREAM
D/S	DOWNSTREAM
SBGR	STEEL BEAM GUIDE RAIL
STA	STATION
F.F.	FRONT FACE
B/W	BOTTOM OF WALL
T/W	TOP OF WALL
INV	INVERT
CSP	CORRUGATED STEEL PIPE
BH	BOREHOLE
HP	HYDRO POLE
E/W	EACH WAY



KEY PLAN
SCALE: N.T.S.

LEGEND

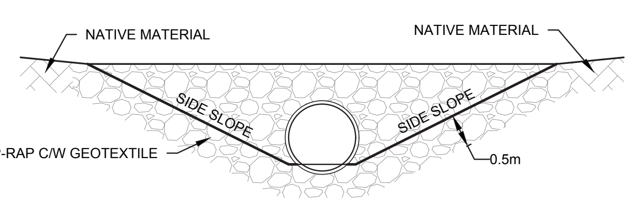


PROFILE
N.T.S.

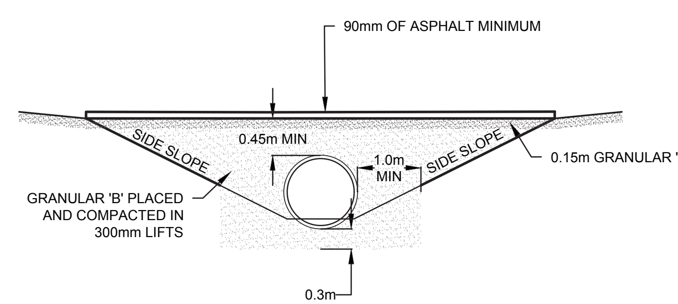
D/S DRAIN BOTTOM INVERT = 225.60
D/S CULVERT INVERT = 225.44

U/S DRAIN BOTTOM INVERT = 225.78
U/S CULVERT INVERT = 225.62

THE CULVERT SHALL BE ALUMINIZED TYPE II LOCKSEAM HEL-COR, 125x25 mm CORRUGATION (OR APPROVED EQUAL) C/W COUPLER(S) AS REQUIRED. THE CULVERT IS TO BE 18,000 mm LONG AND HAVE A 1,600 mm DIAMETER AND IS TO BE A MINIMUM OF 3.5 mm THICK.



ELEVATION
N.T.S.



SECTION
N.T.S.

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NOT FOR CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
P.J. COBER
100148799
FEB 13/19
PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD
8	FILE FINAL ENGINEER'S REPORT	02/13/2019	JRD

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telephone (519) 357-1521 fax (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

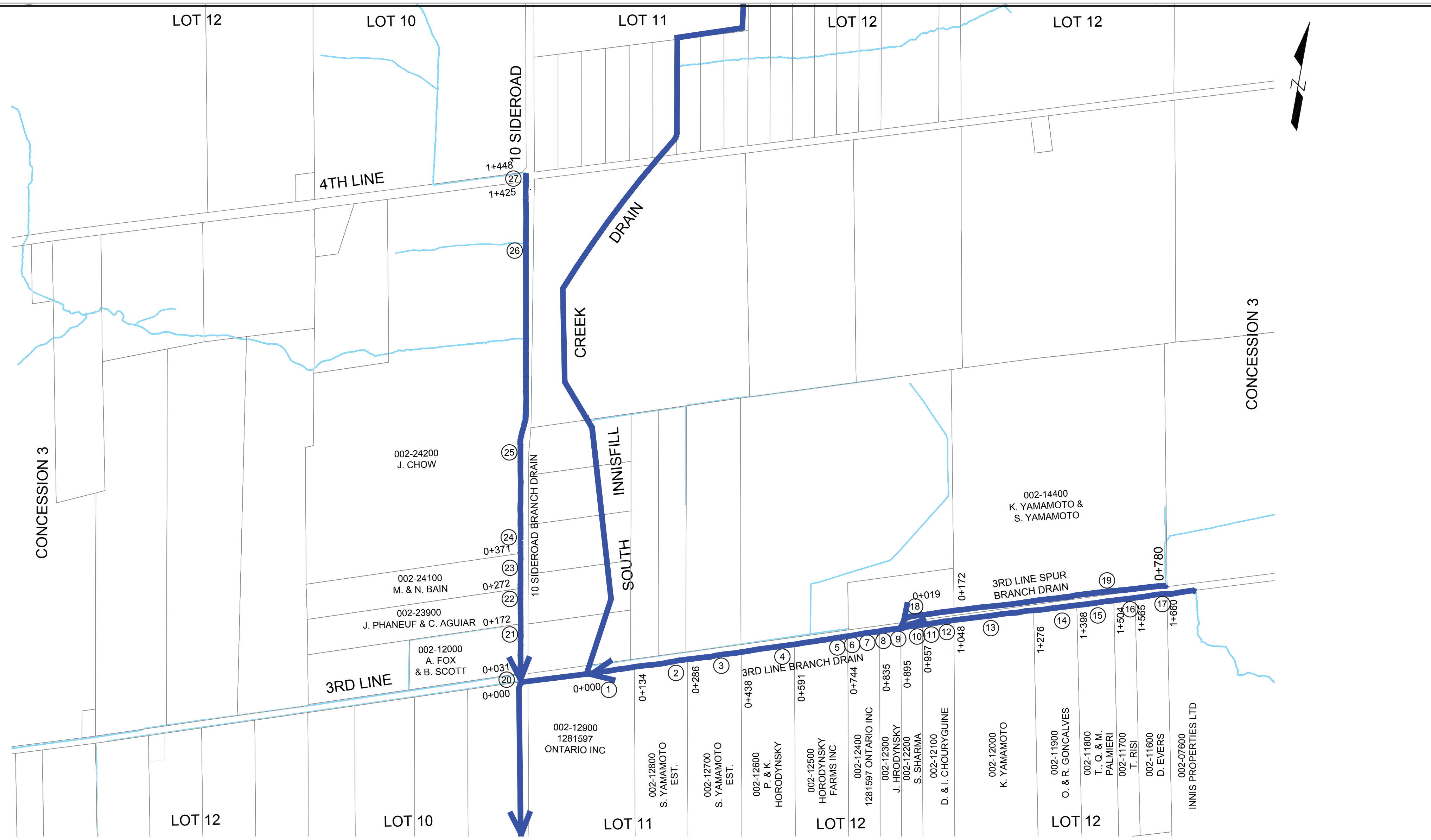
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
10TH SIDEROAD BRANCH DRAIN 3RD LINE CULVERT

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	21of38
Date		Project No.		
02/13/2019		300038790.0000		

Scale
1:5,000
0 50 100 200 300m

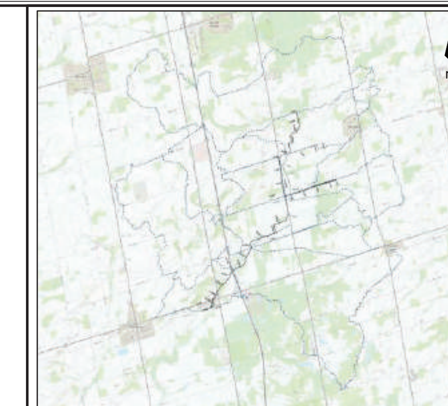
AERIAL PHOTOGRAPHY PROVIDED BY: ???. PARCELS PROVIDED BY: ???, DATED: ???



Branch Drain	Culvert No.	Station	Land Owner	Existing Size	Proposed Size	Sized For
3rd Line	1	35.8	1281597 Ontario Inc. (002-12900)	1400	1600mm CSP	2-Yr
	2	255.2	S. Yamamoto Est. (002-12800)	1500	1600mm CSP	2-Yr
	3	379.6	S. Yamamoto Est. (002-12800)	1500	1600mm CSP	2-Yr
	4	566.0	P. & K. Horodynsky (002-12600)	1350 x 1650	1600mm CSP	2-Yr
	5	709.8	Horodynsky Farms Inc. (002-12500)	2400	1600mm CSP	2-Yr*
	6	719.8	Horodynsky Farms Inc. (002-12500)	1830	1600mm CSP	2-Yr*
	7	762.0	1281597 Ontario Inc. (002-12400)	1500	1600mm CSP	2-Yr
	8	819.7	1281597 Ontario Inc. (002-12400)	1300 x 1000	1600mm CSP	2-Yr
	9	866.7	J. Horodynsky (002-12300)	2400	1600mm CSP	2-Yr
	10	905.8	S. Sharma (002-12200)	1200	1600mm CSP	2-Yr
	11	921.8	S. Sharma (002-12200)	1200	1600mm CSP	2-Yr
	12	999.0	D. & I. Choury Guine (002-12100)	1400	1600mm CSP	2-Yr
	13	1163.0	K. Yamamoto (002-12000)	1800 x 1100	1600mm CSP	2-Yr
	14	1346.0	O. & R. Goncalvse (002-1190)	1200	1600mm CSP	2-Yr
	15	1442.5	T., Q. & M. Palmeiri (002-11800)	1200	1600mm CSP	2-Yr
	16	1531.7	R. Tulio (002-11700)	800	2.4m x 1.2m Box with 200 bury	2-Yr
	17	1650.3	D. Evers (002-11600)	1499 span	1600mm CSP	2-Yr
3rd Line Spur	18	17.8	R.O.W.	1200	1400mm CSP	10-Yr
	19	601.4	S. Yamamoto Est. & K. Yamamoto (002-14400)	1500	1400mm CSP	2-Yr
10 Sideroad	20	31.0	R.O.W.	1800 x 1100	1600mm CSP	10-Yr
	21	144.8	A. Fox & B. Scott (001-23800)	800	1500mm CSP	5-yr
	22	268.5	J. Phaneuf & C. Aguiar (001-23900)	900	1500mm CSP	5-yr
	23	330.8	M. & N. Bain (001-24100)	1800	1500mm CSP	5-yr
	24	411.5	J. Chow (001-24200)	900	1200mm CSP	5-yr
	25	660.4	J. Chow (001-24200)	1200	1200mm CSP	5-yr
	26	1228.5	J. Chow (001-24200)	900	1000mm CSP	5-yr
	27	1436.7	R.O.W.	900	1000mm CSP	5-yr

NOTE: THERE SHALL BE 10% BURY ASSUMED FOR ALL CULVERTS.
* THESE TWO CULVERTS SHALL BE REPLACED WITH ONLY 1 PIPE OF ADEQUATE LENGTH AS APPROVED BY THE TOWN.

AERIAL PHOTOGRAPHY PROVIDED BY: SIMCOE COUNTY, DATED 2016. PARCELS PROVIDED BY: SIMCOE COUNTY, DATED: 2017



KEY PLAN
SCALE: N.T.S.

LEGEND

DRAIN LOCATION & DIRECTION	DRAIN NAME
OTHER MUNICIPAL DRAIN	DRAIN NAME
NATURAL WATERCOURSE	
ROLL NUMBER LANDOWNER	001-23414 M. VAN DER MAST

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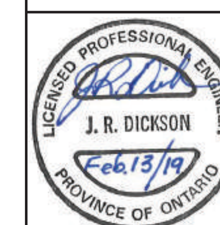

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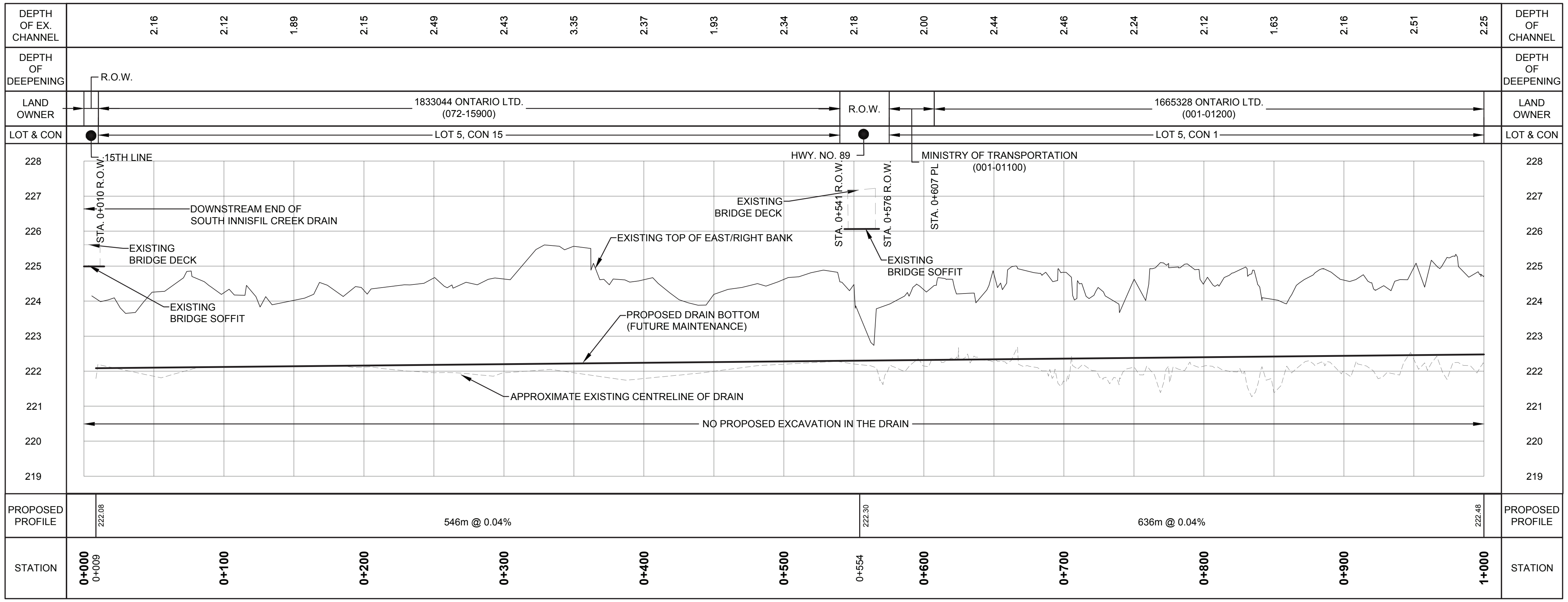
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

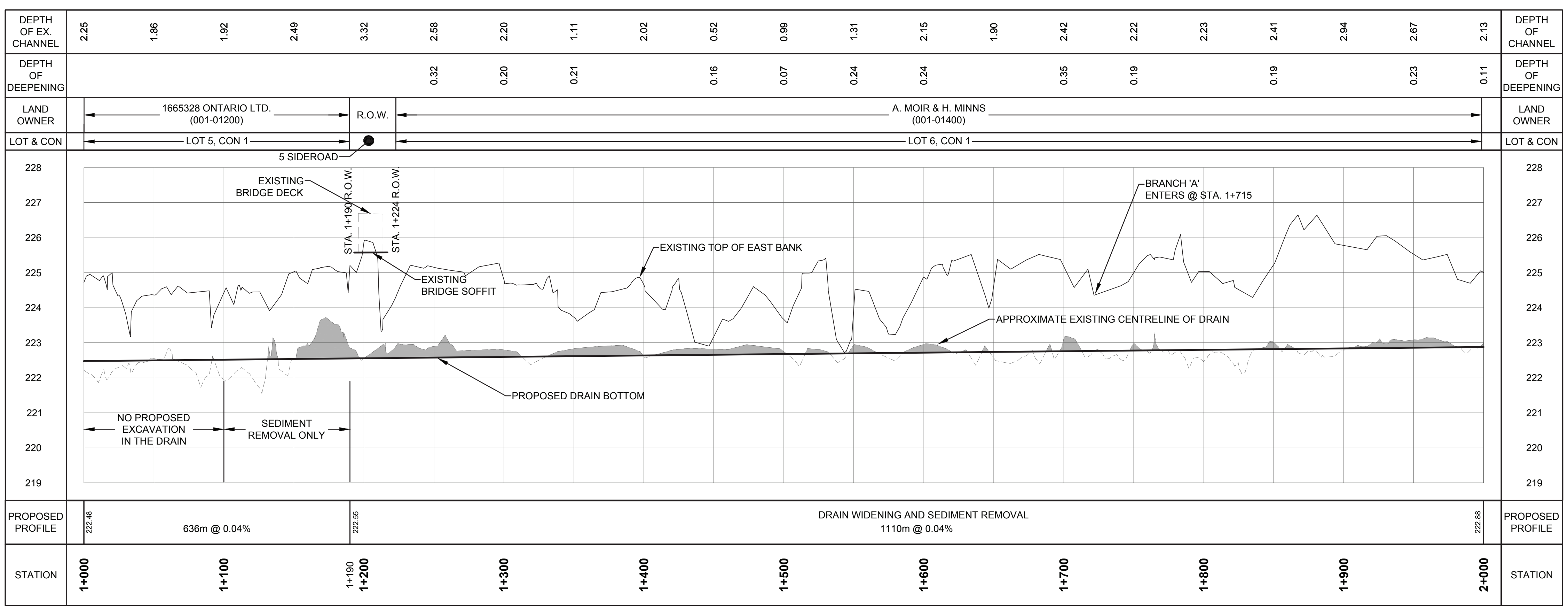
Innisfil

Drawing Title
SOUTH INNISFILL CREEK DRAIN
2019 IMPROVEMENT
CULVERT TABLE

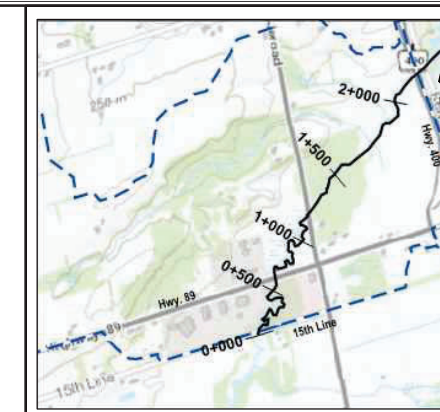
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	22 of 38
Date 02/13/2019		Project No. 300038790.0000		
Scale 1:5,000	0 50 100 200 300m			

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_CULVERT TABLE.dwg Date Plotted: February 5, 2019 - 1:43 PM





ALL ELEVATION AND TOPOGRAPHIC DATA USED TO CREATE THE VARIOUS PROFILES WAS PROVIDED BY DILLON CONSULTING TO THE TOWN OF INNISFIL AND COLLECTED AT THE SITE OF THE DRAIN CIRCA 2006.



KEY PLAN
SCALE: N.T.S.

BENCHMARKS:		
No.	Elevation	Description
1	227.66	Temporary benchmark – top CL concrete curb, north end of 2nd Line bridge over South Innisfil Creek Drain.
2	228.81	Temporary benchmark – top CL concrete curb, east end of 10 Sideroad bridge over South Innisfil Creek Drain.
3	229.03	Temporary benchmark – top CL concrete curb, north end of 3rd Line bridge over South Innisfil Creek Drain.
4	236.98	Temporary benchmark – top CL concrete curb, south end of 5th Line bridge over South Innisfil Creek Drain.
5	227.41	MTO Monument approx. 410 m south of South Innisfil Creek Drain Sta. 2+280, on west bank of Hnydczak Drain – Main Branch
6	227.66	Temporary benchmark - top CL concrete curb, north end of 2nd line bridge over South Innisfil Creek Drain.
7	228.81	Temporary benchmark - top CL concrete curb, east end of 10 Side Road bridge over South Innisfil Creek Drain.
8	229.03	Temporary benchmark - top CL concrete curb, north end of South Innisfil Creek Drain.
9	236.98	Temporary benchmark - top CL concrete curb south end of 5th Line bridge over South Innisfil Creek Drain.

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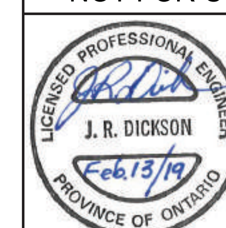

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web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

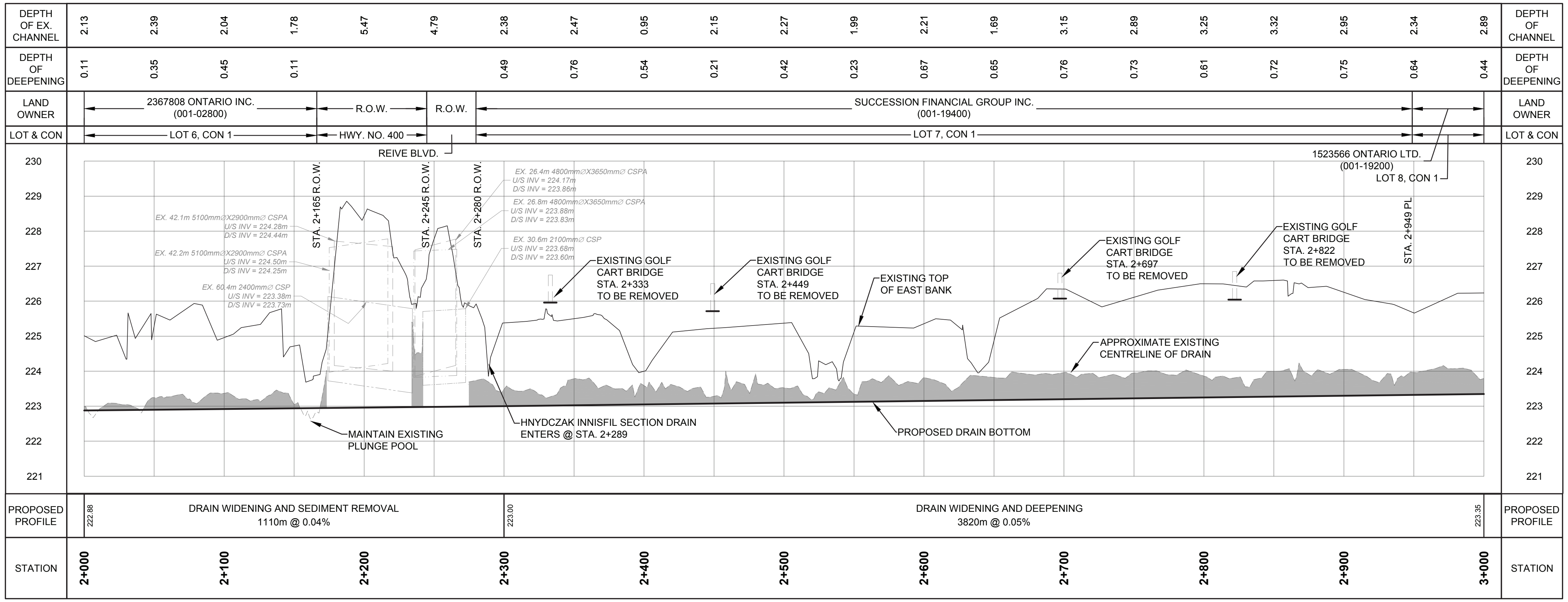
Innisfil

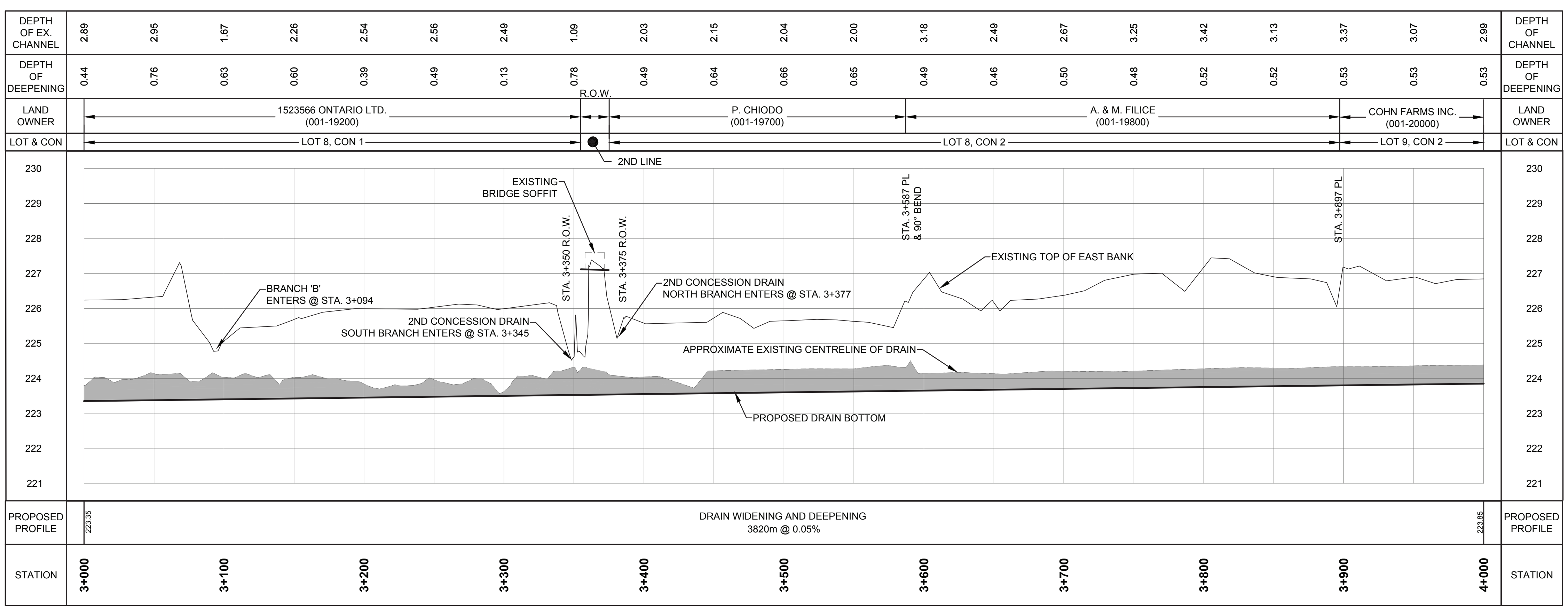
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN PROFILE 0+000 TO 2+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	23of38
Date		Project No.		
02/13/2019		300038790.0000		

Scale
Horizontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: February 5, 2019 - 1:49 PM





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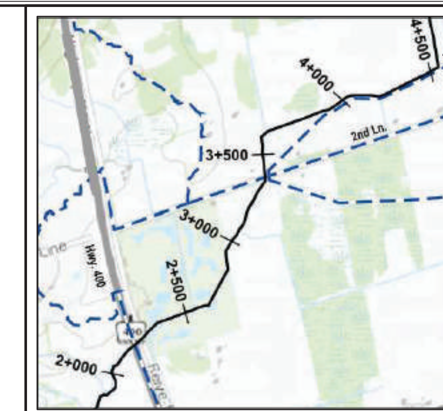

KEY PLAN
SCALE: N.T.S.

BENCHMARKS:

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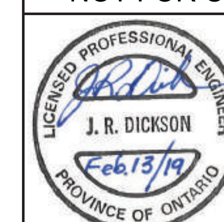

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2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN PROFILE 2+000 TO 4+000

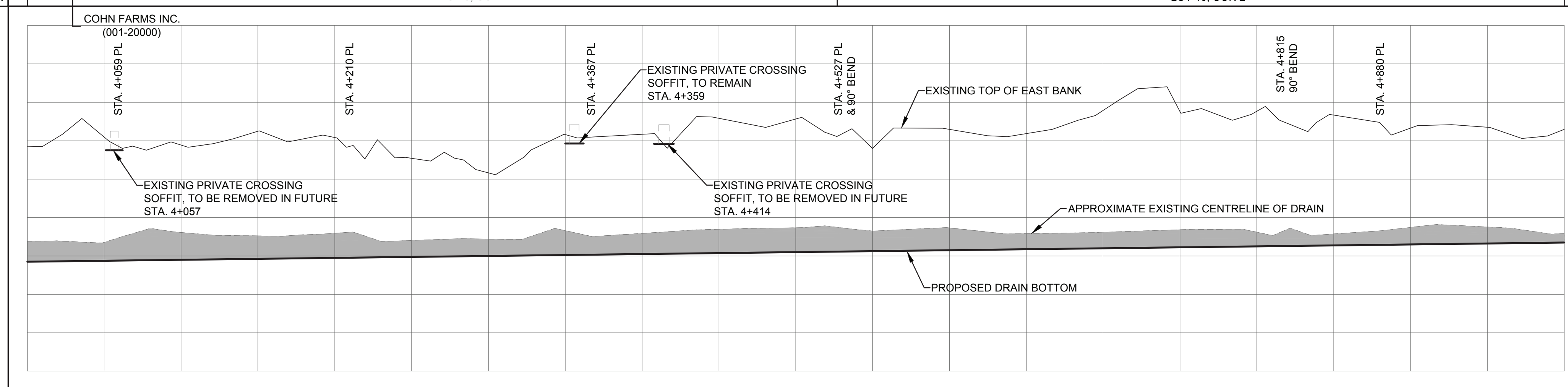
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	24of38
Date 02/13/2019		Project No. 300038790.0000		

Scale
Horizontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

DEPTH OF EX. CHANNEL	2.99	3.22	2.99	3.32	3.14	2.57	2.17	3.14	3.12	3.51	3.47	2.68	3.15	3.01	3.59	3.53	3.52	3.39	3.03	3.03	2.95	DEPTH OF CHANNEL
DEPTH OF DEEPENING	0.53	0.48	0.71	0.60	0.64	0.43	0.44	0.64	0.54	0.62	0.64	0.52	0.58	0.41	0.42	0.46	0.37	0.30	0.45	0.43	0.23	DEPTH OF DEEPENING

LAND OWNER: COHN FARMS INC. (001-20100) | MARQUES GARDENS LTD. (001-20300) | N. TASCA (001-20400) | N. TASCA (001-20500) | MARQUES GARDENS LTD. (001-20600)

LOT & CON: LOT 9, CON 2 | LOT 10, CON 2



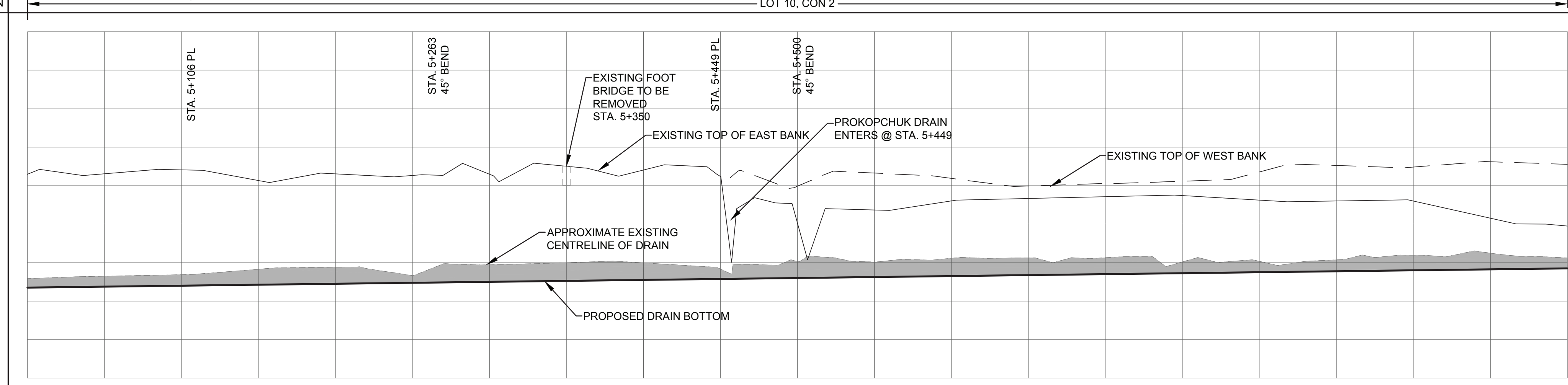
PROPOSED PROFILE: 223.85 — DRAIN WIDENING AND DEEPENING 3820m @ 0.05% — 224.35

STATION: 4+000 | 4+100 | 4+200 | 4+300 | 4+400 | 4+500 | 4+600 | 4+700 | 4+800 | 4+900 | 5+000

DEPTH OF EX. CHANNEL	2.95	2.93	3.01	2.71	2.86	2.79	2.80	2.98	2.86	2.66	1.43	1.74	1.95	1.99	2.01	2.02	1.88	1.83	1.80	1.33	1.10	DEPTH OF CHANNEL
DEPTH OF DEEPENING	0.23	0.27	0.29	0.40	0.43	0.20	0.45	0.47	0.44	0.26	0.43	0.39	0.46	0.45	0.43	0.29	0.29	0.30	0.39	0.42	0.27	DEPTH OF DEEPENING

LAND OWNER: MARQUES GARDENS LTD. (001-20600) | MARQUES GARDENS LTD. (001-20800) | HORODYNSKY FARMS INC. (001-20900)

LOT & CON: LOT 10, CON 2



PROPOSED PROFILE: 224.35 — DRAIN WIDENING AND DEEPENING 3820m @ 0.05% — 224.85

STATION: 5+000 | 5+100 | 5+200 | 5+300 | 5+400 | 5+500 | 5+600 | 5+700 | 5+800 | 5+900 | 6+000

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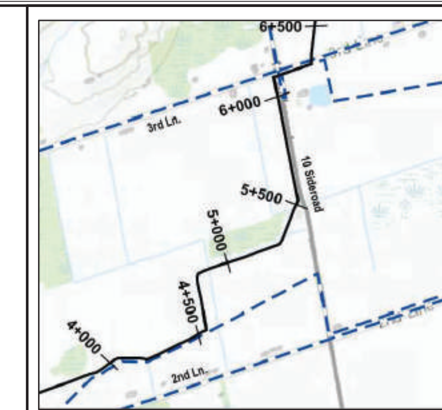

KEY PLAN
SCALE: N.T.S.

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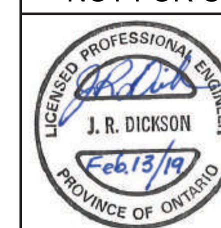

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R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 fax (519) 357-3624
web www.rjburnside.com

Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN PROFILE 4+000 TO 6+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	25 of 38
Date: 02/13/2019		Project No.: 300038790.0000		

Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

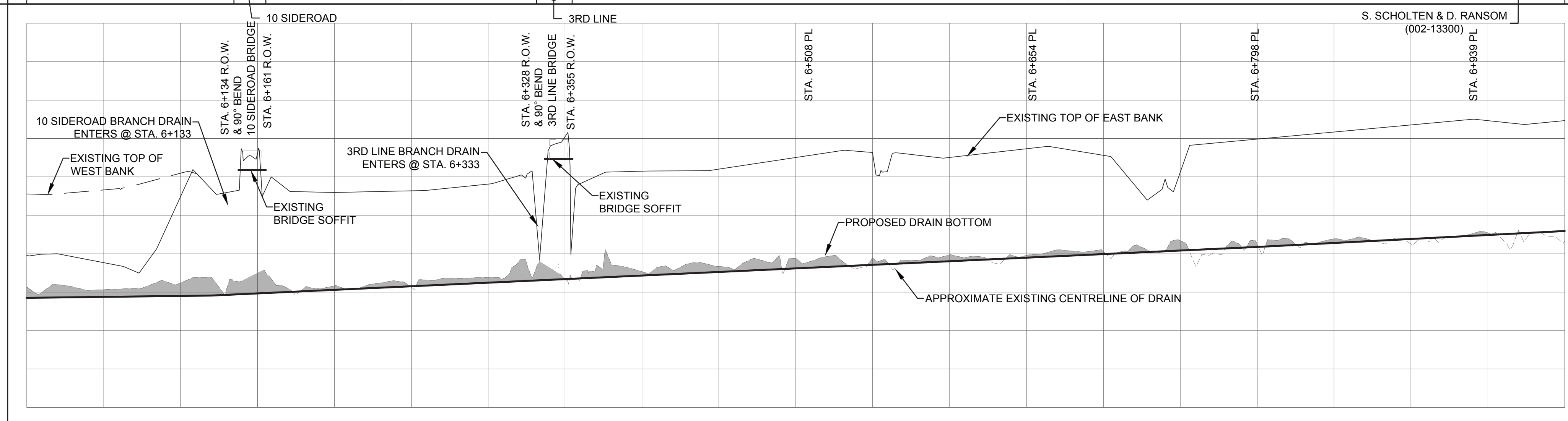
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: February 5, 2019 - 1:50 PM

Main Drain Profile 6+000 to 7+000

STATION	6+000	6+050	6+100	6+150	6+200	6+250	6+300	6+350	6+400	6+450	6+500	6+550	6+600	6+650	6+700	6+750	6+800	6+850	6+900	6+950	7+000
DEPTH OF EX. CHANNEL	1.10	0.89	2.59	3.65	2.53	2.49	2.57	3.71	2.72	2.68	2.89	2.89	2.70	2.84	2.57	2.04	2.81	2.89	2.97	2.98	2.88
DEPTH OF DEEPENING	0.27	0.19	0.34		0.10	-0.02	0.14		0.10	0.14	0.26	0.18	0.17	0.06	0.07	0.26	0.07	0.11		0.05	

LAND OWNER: HORODYNSKY FARMS INC. (001-20900) — R.O.W. — 1281597 ONTARIO INC. (002-12900) — R.O.W. — P. & D. EFSTATHIADIS, L. MARTINOVSKI (002-13700) — E. CARBONE (002-13600) — K. COSTAIN & D. GOODWIN (002-13500) — N. & M. MAKRIGIORGOS (002-13400) — S. SCHOLTEN & D. RANSOM (002-13300)

LOT & CON: LOT 10, CON 2 — LOT 11, CON 2 — LOT 11, CON 3



PROPOSED PROFILE:

Elev.	Description
224.85	DRAIN WIDENING AND DEEPENING 3820m @ 0.05%
224.91	DRAIN MINOR DEEPENING AND WIDENING 200m @ 0.19%
225.28	SPOT CLEANOUT & CHANNEL MAINTENANCE 480m @ 0.19%
226.17	SPOT CLEANOUT & CHANNEL MAINTENANCE 2400m @ 0.21%
226.59	

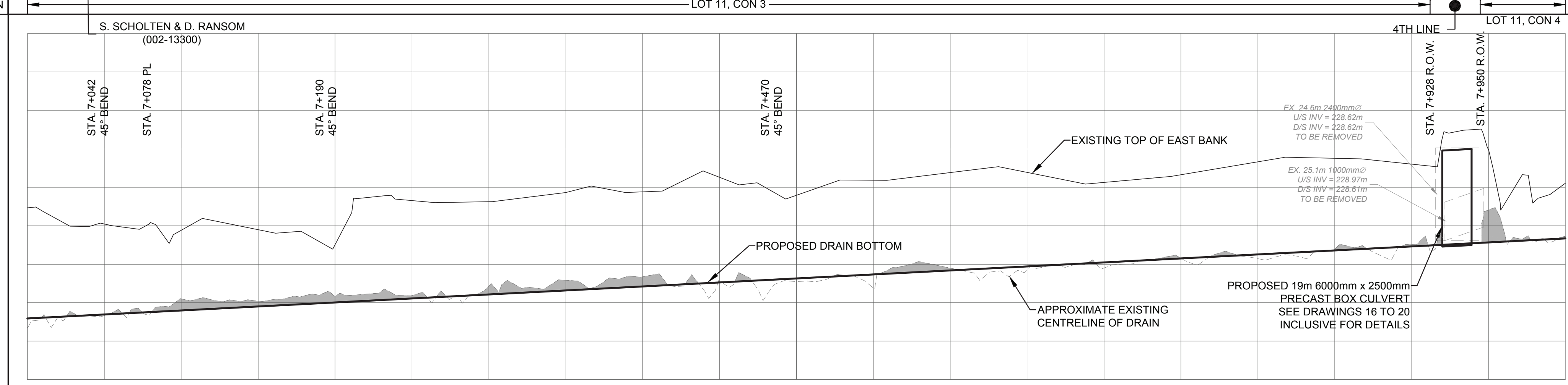
STATION: 6+000, 6+100, 6+120, 6+200, 6+300, 6+320, 6+400, 6+500, 6+600, 6+700, 6+800, 6+900, 7+000

Main Drain Profile 7+000 to 8+000

STATION	7+000	7+050	7+100	7+150	7+200	7+250	7+300	7+350	7+400	7+450	7+500	7+550	7+600	7+650	7+700	7+750	7+800	7+850	7+900	7+950	8+000
DEPTH OF EX. CHANNEL	2.88	2.35	2.09	2.00	1.50	2.55	2.41	2.55	2.46	2.73	2.16	2.45	2.55	2.45	2.08	2.18	2.41	2.40	2.14	2.41	1.44
DEPTH OF DEEPENING			0.30	0.13	0.15	0.08	0.22	0.27	0.25	0.03			0.06			0.01		0.03	0.05	0.85	0.05

LAND OWNER: S. SCHOLTEN & D. RANSOM (002-13300) — 9847723 CANADA CORPORATION (002-20600) — R.O.W. — K. GRAY (002-20910)

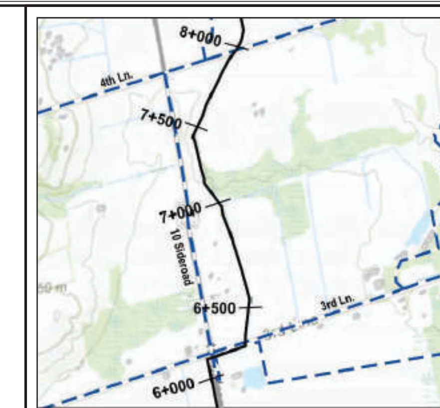
LOT & CON: LOT 11, CON 3 — 4TH LINE — LOT 11, CON 4



PROPOSED PROFILE: 226.59 — SPOT CLEANOUT & DRAIN MAINTENANCE 2400m @ 0.21% — 228.67

STATION: 7+000, 7+100, 7+200, 7+300, 7+400, 7+500, 7+600, 7+700, 7+800, 7+900, 8+000

ALL ELEVATION AND TOPOGRAPHIC DATA USED TO CREATE THE VARIOUS PROFILES WAS PROVIDED BY DILLON CONSULTING TO THE TOWN OF INNISFIL AND COLLECTED AT THE SITE OF THE DRAIN CIRCA 2006.



KEY PLAN
SCALE: N.T.S.

BENCHMARKS:

No.	Elevation	Description
1	227.66	Temporary benchmark – top CL concrete curb, north end of 2nd Line bridge over South Innisfil Creek Drain.
2	228.81	Temporary benchmark – top CL concrete curb, east end of 10 Sideroad bridge over South Innisfil Creek Drain.
3	229.03	Temporary benchmark – top CL concrete curb, north end of 3rd Line bridge over South Innisfil Creek Drain.
4	236.98	Temporary benchmark – top CL concrete curb, south end of 5th Line bridge over South Innisfil Creek Drain.
5	227.41	MTO Monument approx. 410 m south of South Innisfil Creek Drain Sta. 2+280, on west bank of Hnydczak Drain – Main Branch
6	227.66	Temporary benchmark - top CL concrete curb, north end of 2nd line bridge over South Innisfil Creek Drain.
7	228.81	Temporary benchmark - top CL concrete curb, east end of 10 Side Road bridge over South Innisfil Creek Drain.
8	229.03	Temporary benchmark - top CL concrete curb, north end of South Innisfil Creek Drain.
9	236.98	Temporary benchmark - top CL concrete curb south end of 5th Line bridge over South Innisfil Creek Drain.

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NOT FOR CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD
8	FILE FINAL ENGINEER'S REPORT	02/13/2019	JRD

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INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
MAIN DRAIN PROFILE 6+000 TO 8+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	26 of 38
Date: 02/13/2019		Project No.: 300038790.0000		

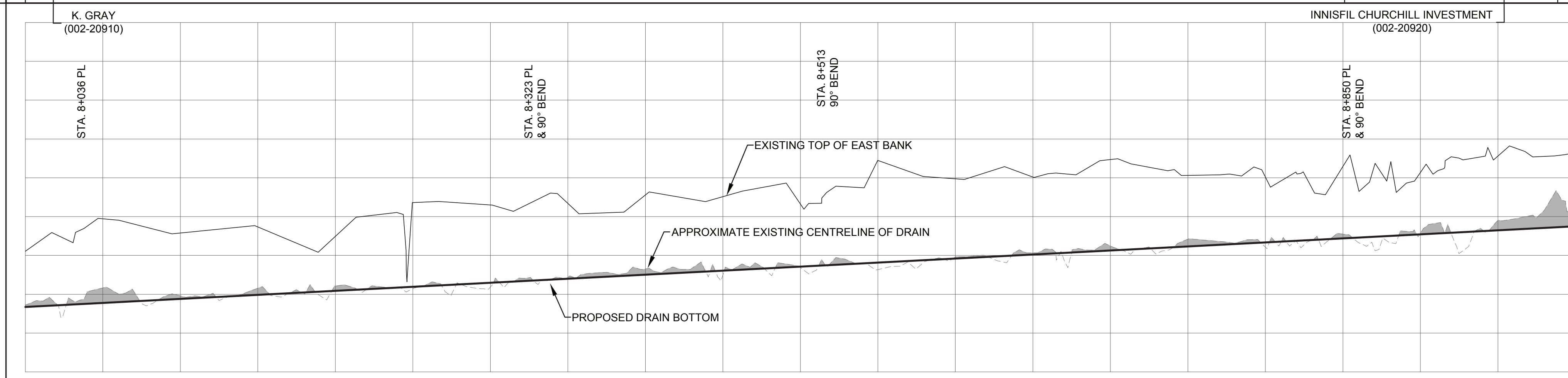
Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

MAIN DRAIN PROFILE 8+000 TO 9+000

Station	8+000	8+050	8+100	8+150	8+200	8+250	8+300	8+350	8+400	8+450	8+500	8+550	8+600	8+650	8+700	8+750	8+800	8+850	8+900	8+950	9+000
DEPTH OF EX. CHANNEL	1.44	2.17	1.70	1.75	1.41	2.17	2.01	1.94	2.05	1.91	1.61	2.63	2.06	2.00	2.34	1.83	1.68	1.85	1.59	1.91	1.90
DEPTH OF DEEPENING	0.05	0.39	0.08	0.17	0.13			0.04	0.15				0.04	0.05	0.12	0.19		0.11	0.03	0.26	0.34

LAND OWNER: M. & M. ALVES (002-20912); KELL FARMS LTD. (002-20700); M. & L. VALENTE (002-20918); K. GRAY (002-20910); INNISFIL CHURCHILL INVESTMENT (002-20920)

LOT & CON: LOT 11, CON 4; LOT 12, CON 4



PROPOSED PROFILE: 228.67 — SPOT CLEANOUT AND CHANNEL MAINTENANCE 2400m @ 0.21% — 230.75

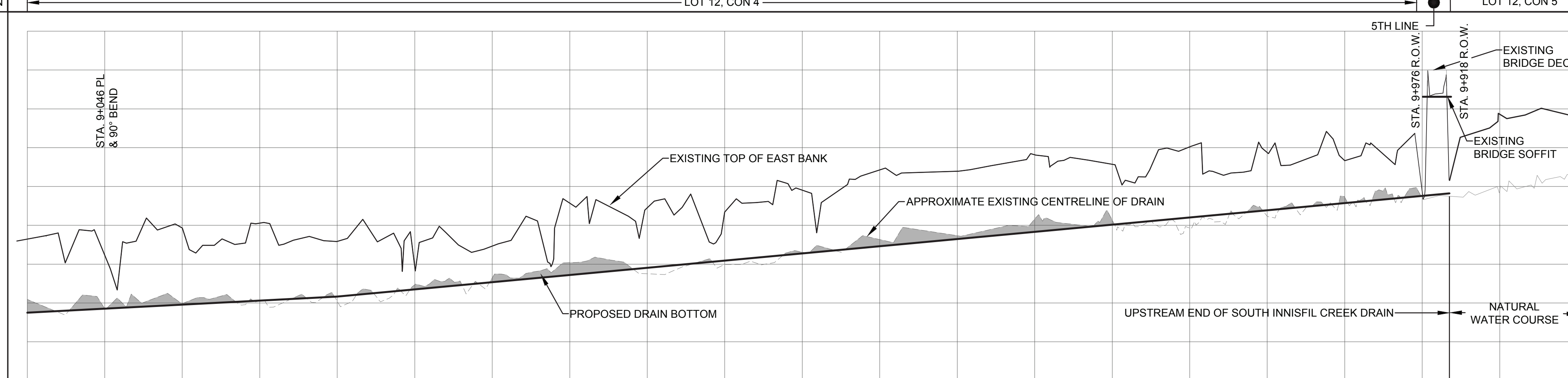
STATION: 8+000, 8+100, 8+200, 8+300, 8+400, 8+500, 8+600, 8+700, 8+800, 8+900, 9+000

MAIN DRAIN PROFILE 9+000 TO 10+000

Station	9+000	9+050	9+100	9+150	9+200	9+250	9+300	9+350	9+400	9+450	9+500	9+550	9+600	9+650	9+700	9+750	9+800	9+850	9+900	9+950	10+000
DEPTH OF EX. CHANNEL	1.90	1.38	1.97	1.99	1.42	0.58	0.93	1.85	1.54	1.25	1.63	1.97	1.75	1.98	1.55	1.82	1.49	1.09	0.12		
DEPTH OF DEEPENING	0.34	0.00	0.03	-0.01	-0.12	0.12	0.11	0.32	-0.15	-0.10	0.03	0.17	0.09	0.33	0.11			0.15			

LAND OWNER: A. TUZI (002-20922); 1665328 ONTARIO LTD. (002-26300); R.O.W.

LOT & CON: LOT 12, CON 4; LOT 12, CON 5



PROPOSED PROFILE: 230.75 — SPOT CLEANOUT AND CHANNEL MAINTENANCE 2400m @ 0.21% — 231.17 — SPOT CLEANOUT AND CHANNEL MAINTENANCE 718m @ 0.37% — 233.82

STATION: 9+000, 9+100, 9+200, 9+300, 9+400, 9+500, 9+600, 9+700, 9+800, 9+900, 9+918, 10+000

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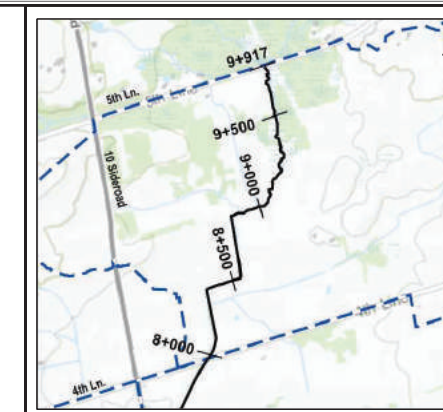

KEY PLAN
SCALE: N.T.S.

BENCHMARKS:

No.	Elevation	Description
1	227.66	Temporary benchmark – top CL concrete curb, north end of 2nd Line bridge over South Innisfil Creek Drain.
2	228.81	Temporary benchmark – top CL concrete curb, east end of 10 Sideroad bridge over South Innisfil Creek Drain.
3	229.03	Temporary benchmark – top CL concrete curb, north end of 3rd Line bridge over South Innisfil Creek Drain.
4	236.98	Temporary benchmark – top CL concrete curb, south end of 5th Line bridge over South Innisfil Creek Drain.
5	227.41	MTO Monument approx. 410 m south of South Innisfil Creek Drain Sta. 2+280, on west bank of Hnydczak Drain – Main Branch
6	227.66	Temporary benchmark - top CL concrete curb, north end of 2nd line bridge over South Innisfil Creek Drain.
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9	236.98	Temporary benchmark - top CL concrete curb south end of 5th Line bridge over South Innisfil Creek Drain.

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NOT FOR CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
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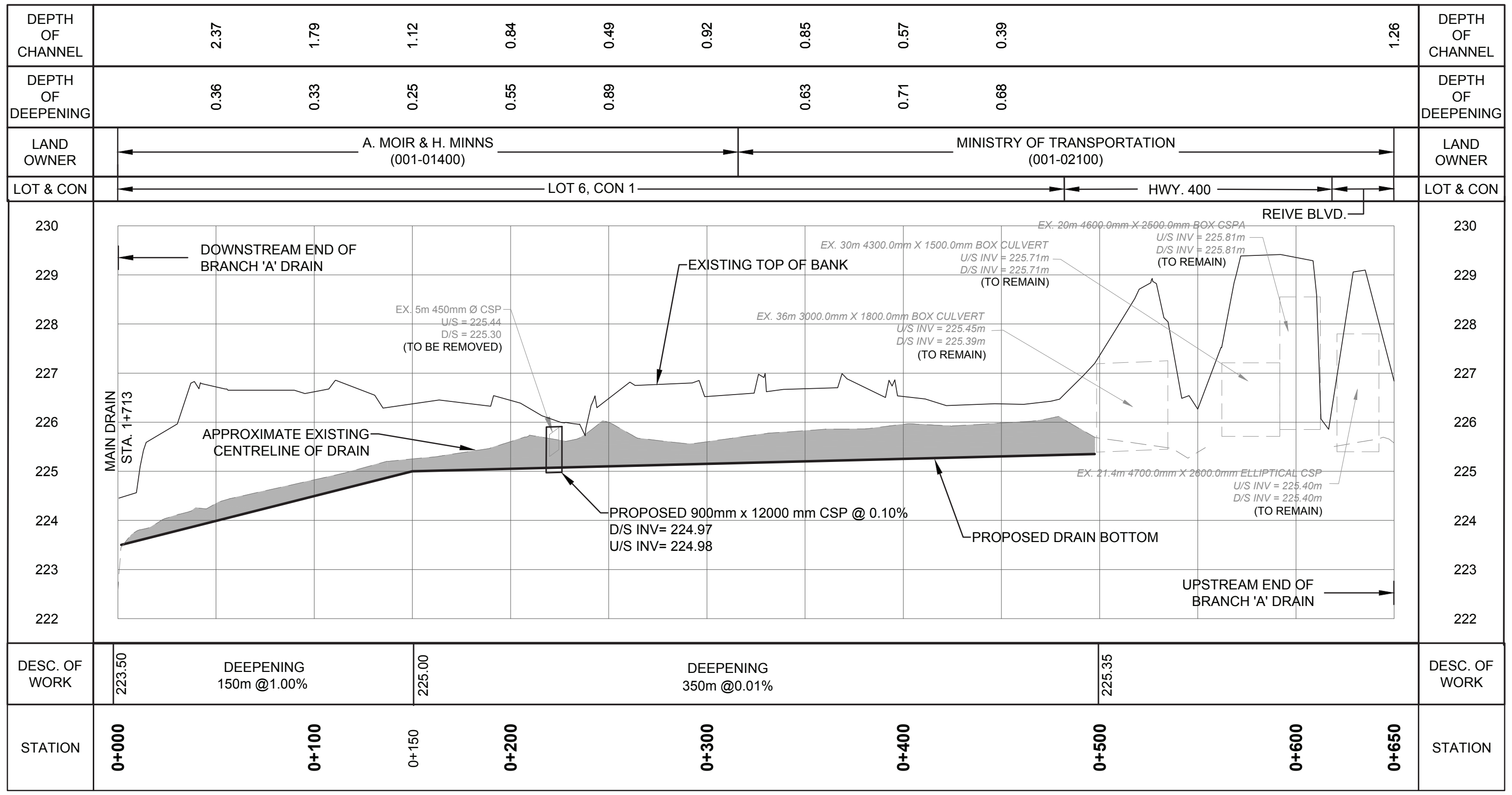
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MAIN DRAIN PROFILE 8+000 TO 10+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	27 of 38
Date: 02/13/2019		Project No.: 300038790.0000		

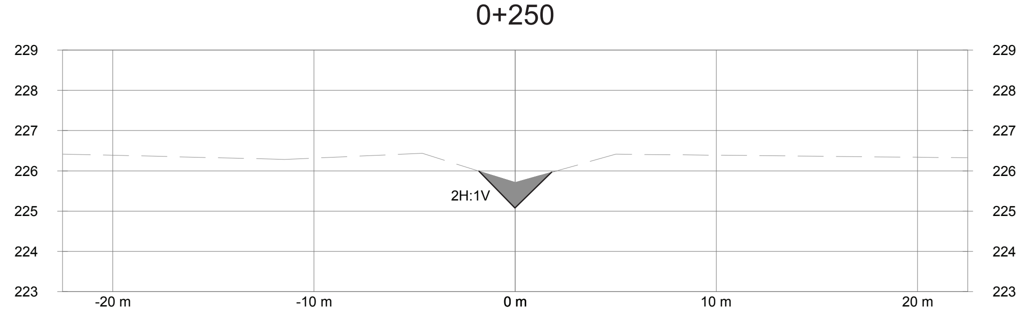
Scale
Horizontal 1:2,500 — 0, 50, 100, 150m
Vertical 1:100 — 0, 2.0, 4.0, 6.0m

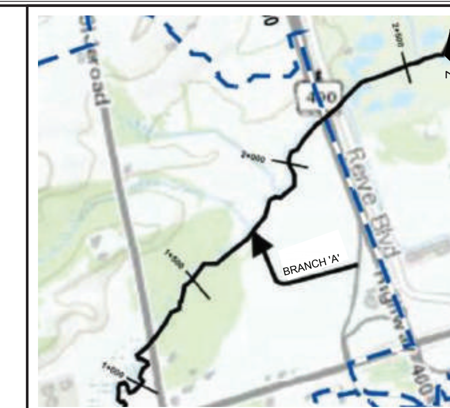
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\4\03_Production\Dwg\038790_PROFILE.dwg Date Plotted: February 5, 2019 - 1:51 PM



BRANCH 'A' DRAIN
CROSS-SECTION

0+250





KEY PLAN
SCALE: N.T.S.

THERE ARE A LIMITED NUMBER OF EXISTING (DILLON) BENCHMARKS. BURNSIDE WILL ESTABLISH A COMPLETE AND EXTENSIVE CONSTRUCTION BENCHMARK DATABASE PRIOR TO CONSTRUCTION.

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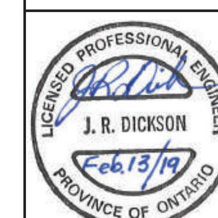

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INNISFIL, ONTARIO
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
BRANCH 'A' PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	28 of 38
Date		Project No.		
02/13/2019		300038790.0000		

Scale
Horizontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

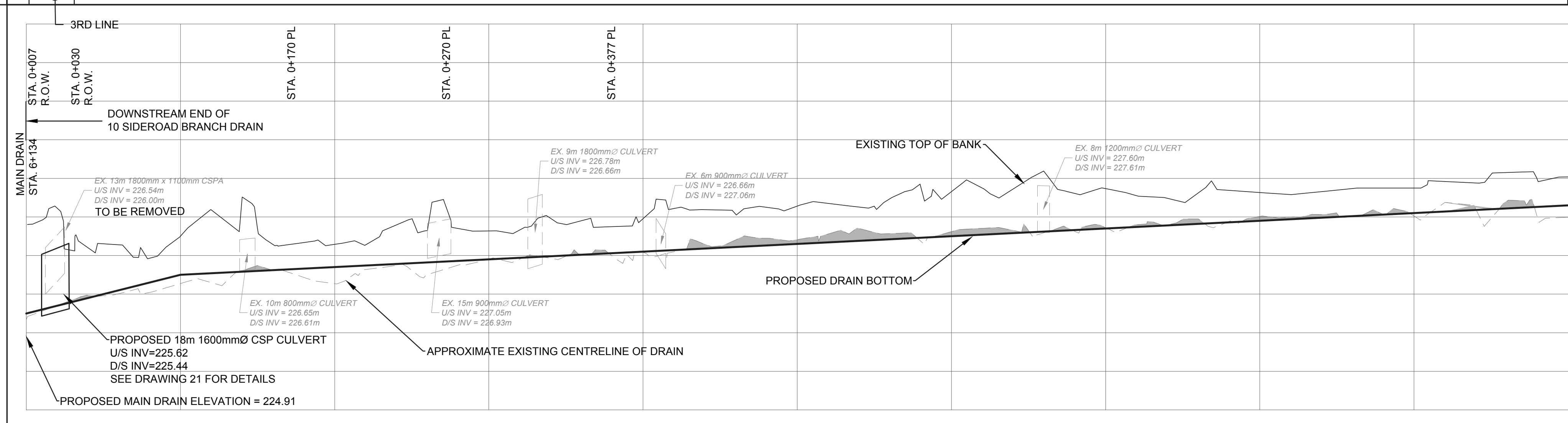
File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE_3RD LINE SPUR DRAIN & HYNDICK.dwg Date Plotted: February 5, 2019 - 1:56 PM

10 SIDEROAD BRANCH DRAIN PROFILE (STA. 0+000 TO 1+000)

STATION	0+050	0+100	0+150	0+200	0+250	0+300	0+350	0+400	0+450	0+500	0+550	0+600	0+650	0+700	0+750	0+800	0+850	0+900	0+950	1+000
DEPTH OF CHANNEL	1.31	1.00	1.09	0.59	1.15	0.74	0.80	0.85	0.98	0.98	0.87	1.16	1.38	1.03	0.59	0.73	0.70	0.65	0.90	0.74
DEPTH OF DEEPENING			0.14			0.01			0.05	0.11	0.20	0.12	0.04	0.02	0.14	0.11	0.09			

LAND OWNER: R.O.W. | B. SCOTT (001-23800) | J. PHANEUF & C. AGUIAR (001-23900) | M. & N. BAIN (001-24100) | J. CHOW (001-24200)

LOT & CON: LOT 10, CON 3



DESC. OF WORK: 225.50 DITCH BOTTOM ONLY 100m @1.00% | 226.50 DITCH BOTTOM ONLY CLEANOUT 900m @0.20% | 228.30

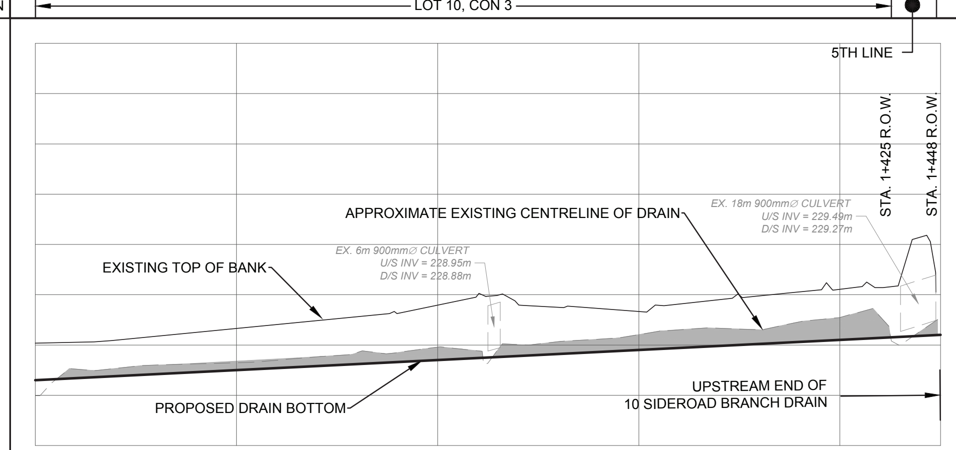
STATION: 0+000, 0+100, 0+200, 0+300, 0+400, 0+500, 0+600, 0+700, 0+800, 0+900, 1+000

10 SIDEROAD BRANCH DRAIN PROFILE (STA. 1+000 TO 1+450)

STATION	1+000	1+050	1+100	1+150	1+200	1+250	1+300	1+350	1+400
DEPTH OF CHANNEL	0.74	0.74	0.83	0.92	1.09	0.97	0.77	0.99	1.01
DEPTH OF DEEPENING		0.18	0.15	0.19	0.26	0.22	0.31	0.32	0.45

LAND OWNER: J.CHOW (001-24200) | R.O.W.

LOT & CON: LOT 10, CON 3

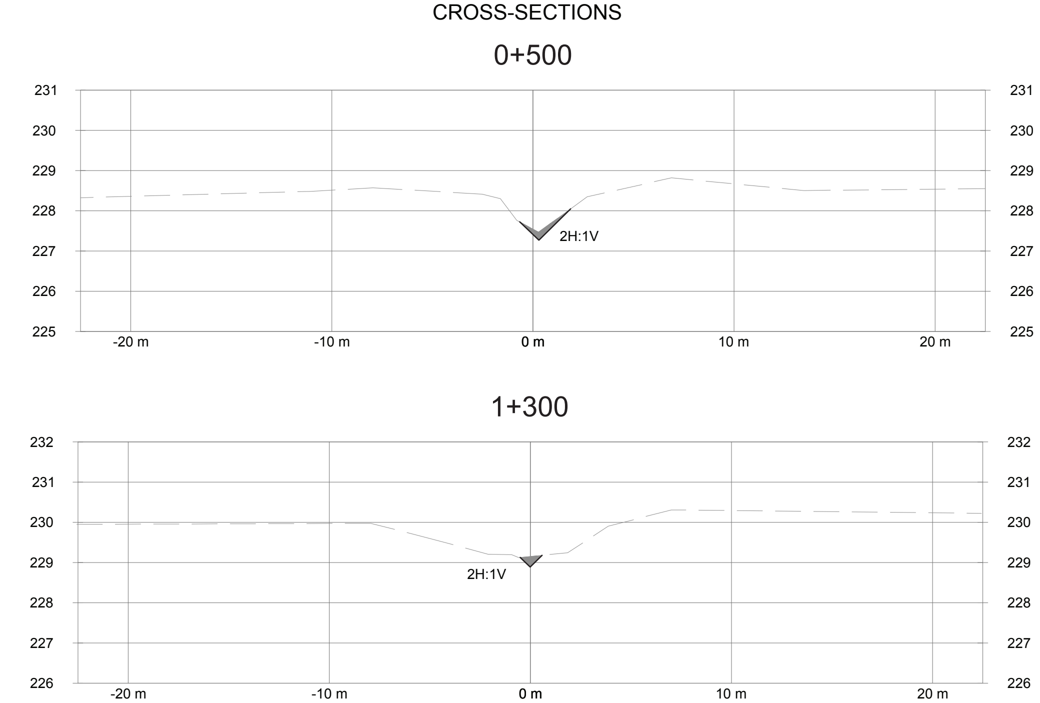


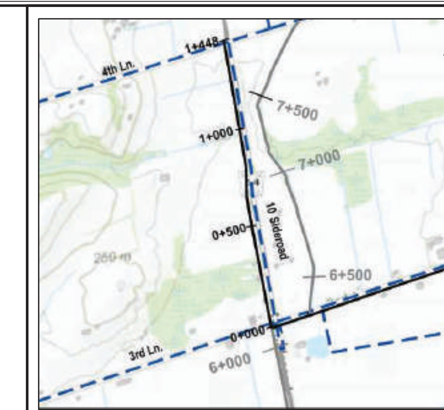
DESC. OF WORK: 228.30 DITCH BOTTOM ONLY DEEPENING 450m @0.20% 229.20

STATION: 1+000, 1+100, 1+200, 1+300, 1+400, 1+450

NOTES:
1. SEE DRAWING 22 FOR (FUTURE) PROPOSED CULVERT SIZE.

10 SIDEROAD BRANCH DRAIN
CROSS-SECTIONS





KEY PLAN
SCALE: N.T.S.

THERE ARE A LIMITED NUMBER OF EXISTING (DILLON) BENCHMARKS. BURNSIDE WILL ESTABLISH A COMPLETE AND EXTENSIVE CONSTRUCTION BENCHMARK DATABASE PRIOR TO CONSTRUCTION.

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BURNSIDE

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15 Townline
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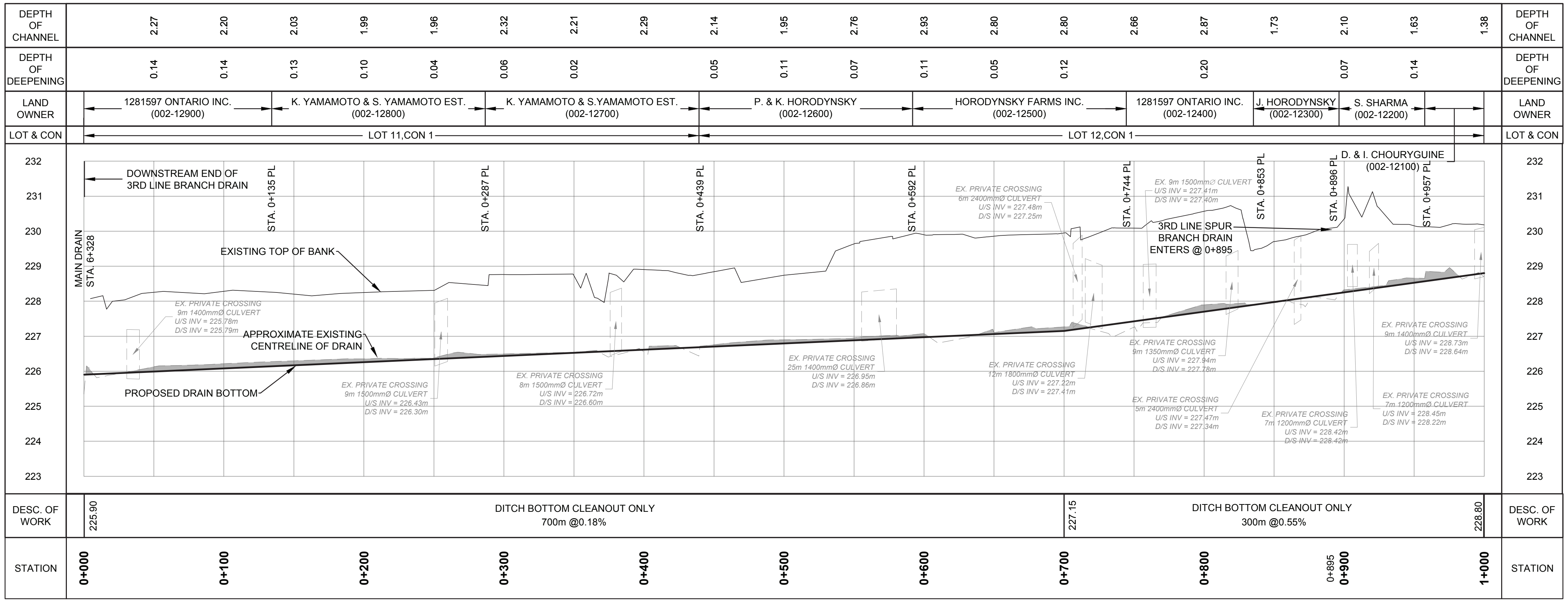
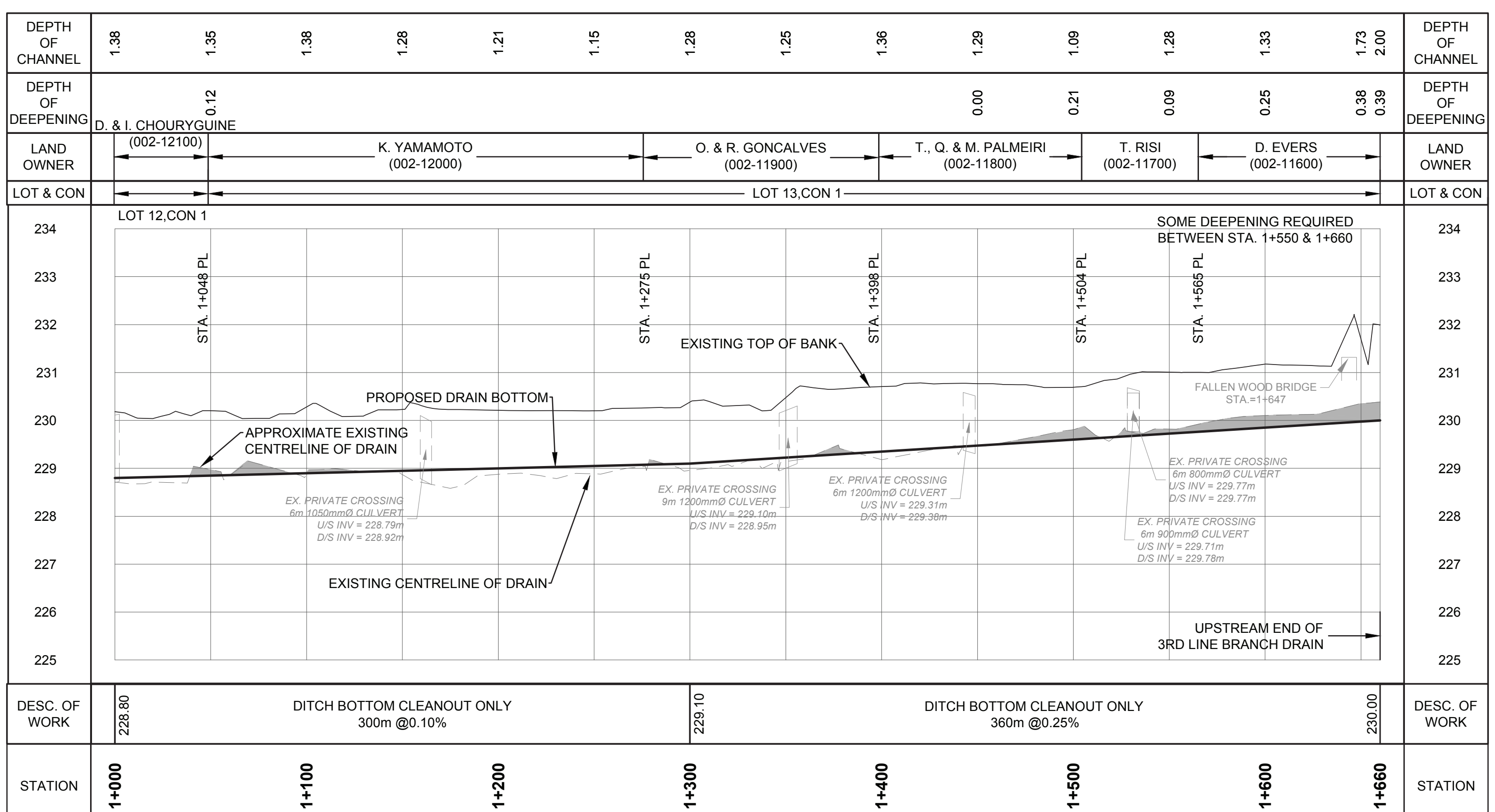
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
10 SIDEROAD BRANCH DRAIN PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	29of38
Date 02/13/2019		Project No. 300038790.0000		

Scale
Horizontal 1:2,500 (0, 50, 100, 150m)
Vertical 1:100 (0, 2.0, 4.0, 6.0m)





NOTES:
1. SEE DRAWING 22 FOR (FUTURE) PROPOSED CULVERT SIZE.
2. SEE DRAWING 31 FOR CROSS SECTIONS.

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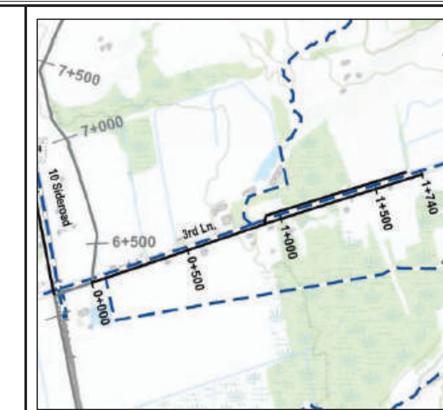

KEY PLAN
SCALE: N.T.S.

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NOT FOR CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb 13/19
PROVINCE OF ONTARIO

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
5	ISSUED FOR SITE INSPECTION (DFO)	10/02/2018	JRD
6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD
8	FILE FINAL ENGINEER'S REPORT	02/13/2019	JRD

BURNSIDE

R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

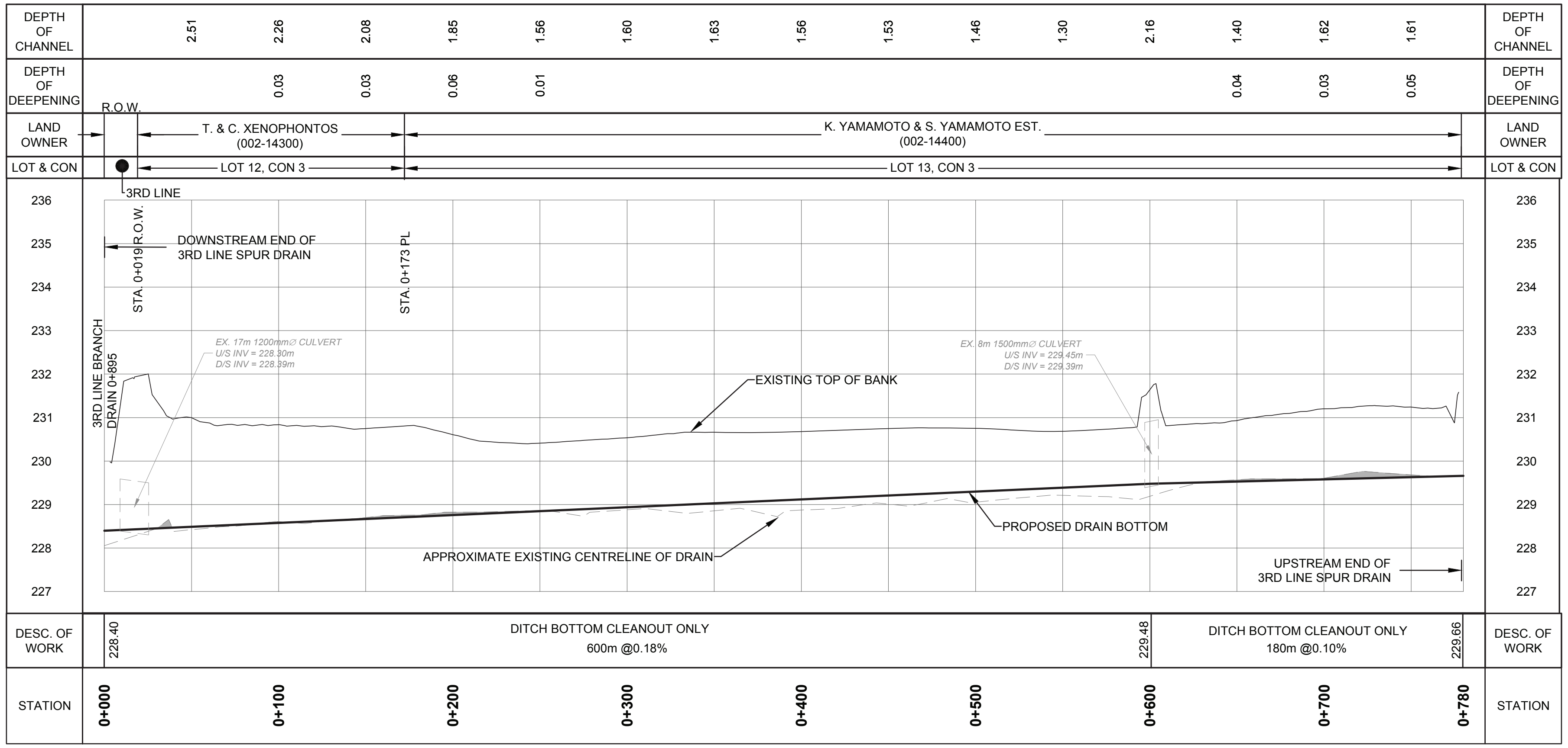
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
3RD LINE BRANCH DRAIN PROFILE

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	30 of 38
Date 02/13/2019		Project No. 300038790.0000		

Scale
Horizontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_PROFILE_3RD LINE.dwg Date Plotted: February 5, 2019 - 2:03 PM

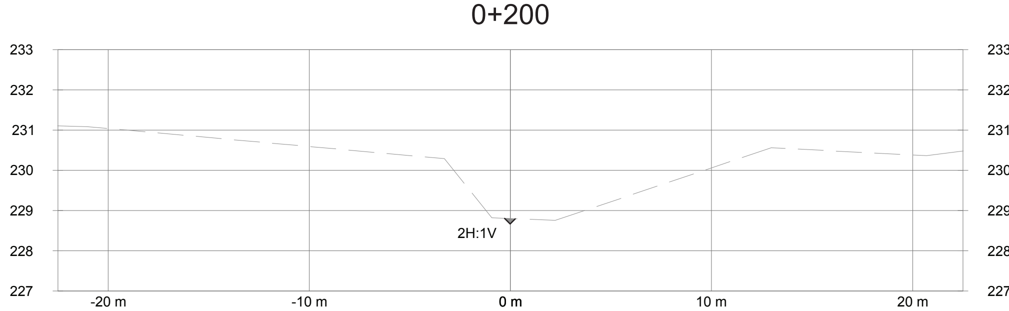


NOTES:

1. SEE DRAWING 22 FOR (FUTURE) PROPOSED CULVERT SIZES

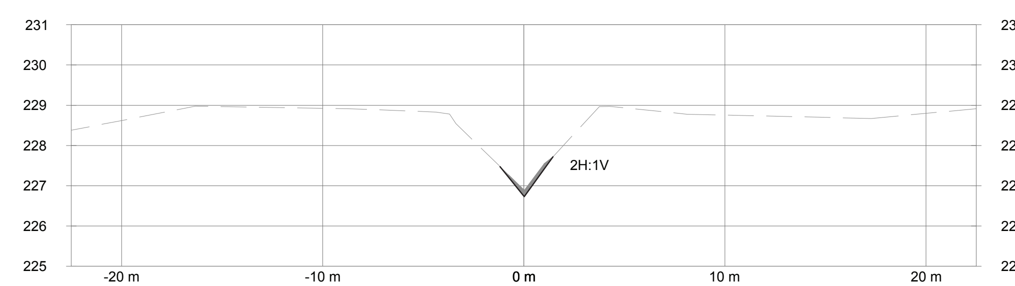
3RD LINE SPUR BRANCH DRAIN
CROSS-SECTION

0+200

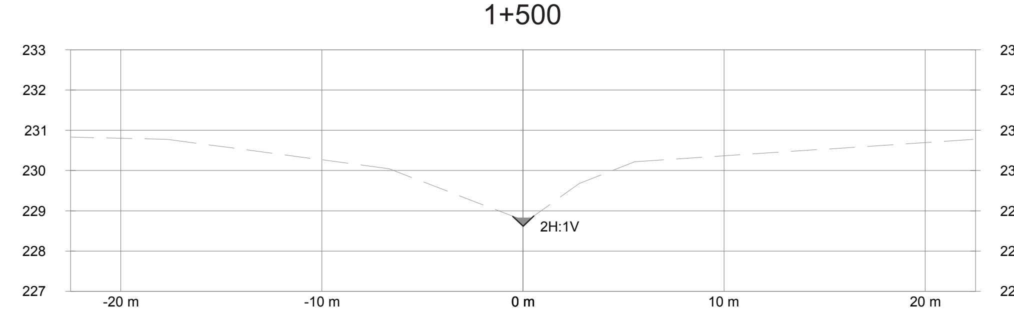


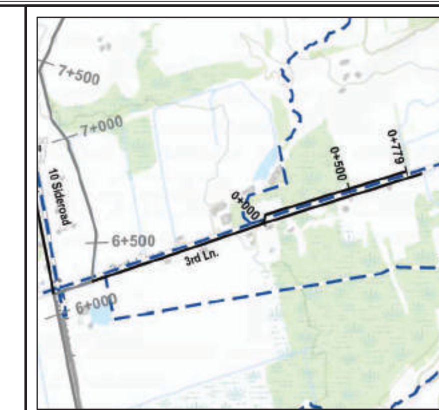
3RD LINE BRANCH DRAIN
CROSS-SECTIONS

0+550



1+500





KEY PLAN
SCALE: N.T.S.

THERE ARE A LIMITED NUMBER OF EXISTING (DILLON) BENCHMARKS. BURNSIDE WILL ESTABLISH A COMPLETE AND EXTENSIVE CONSTRUCTION BENCHMARK DATABASE PRIOR TO CONSTRUCTION.

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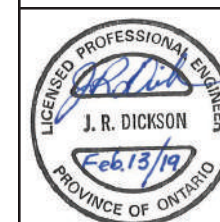

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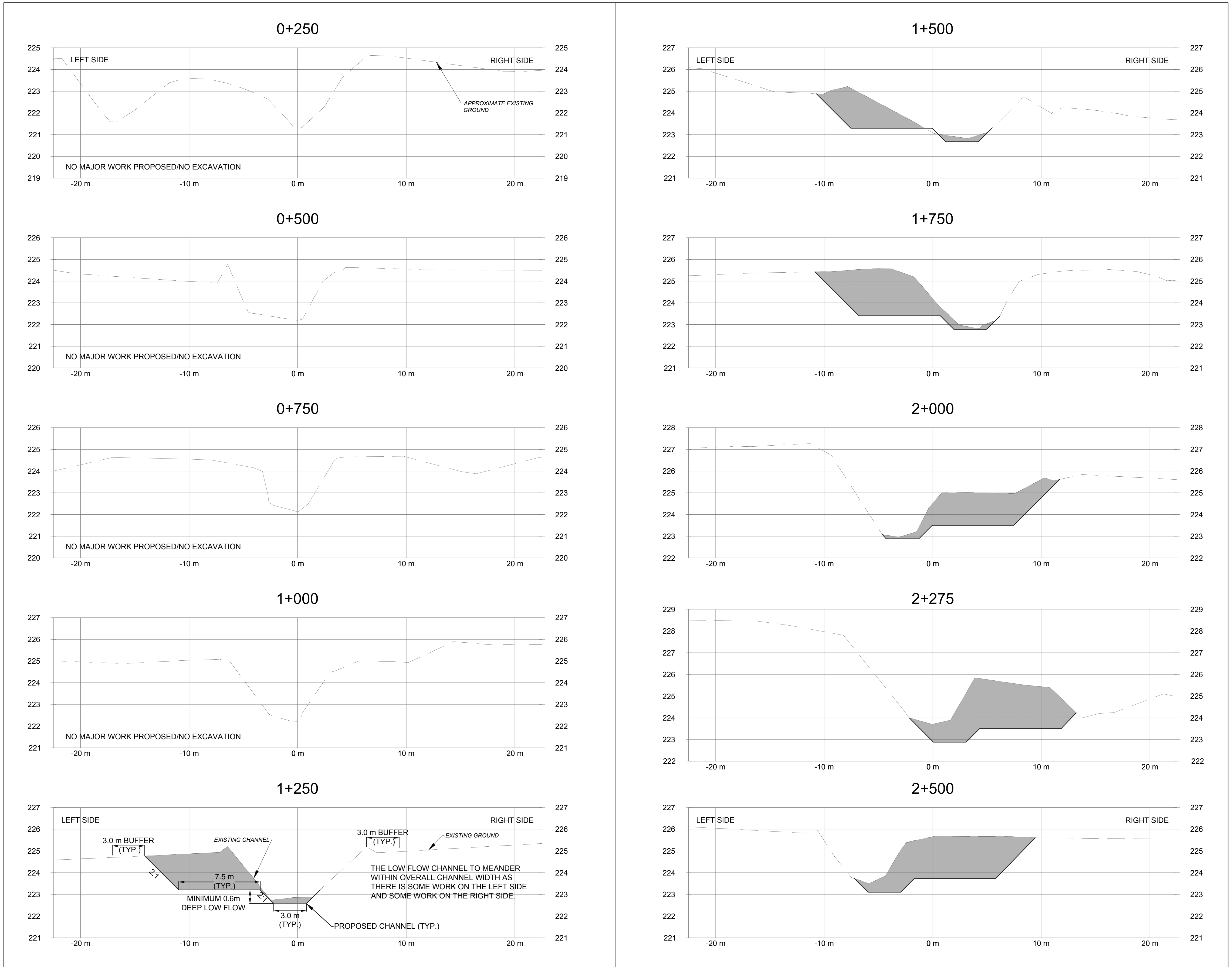
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
3RD LINE SPUR DRAIN PROFILE

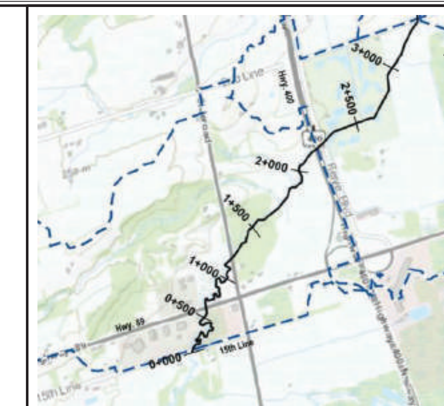
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	31 of 38
Date 02/13/2019		Project No. 300038790.0000		

Scale
Horizontal 1:2,500 — 0 50 100 150m
Vertical 1:100 — 0 2.0 4.0 6.0m

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvement\03_Production\Dwg\038790_PROFILE_3RD LINE SPUR DRAIN & HYNDOKAK.dwg Date Plotted: February 5, 2019 - 2:08 PM



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM



KEY PLAN
SCALE: N.T.S.

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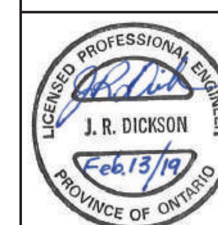

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Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1

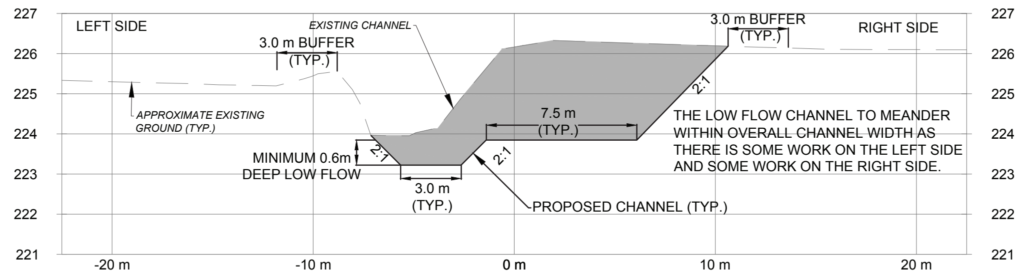
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
CROSS SECTIONS STA. 0+250 TO STA. 2+500

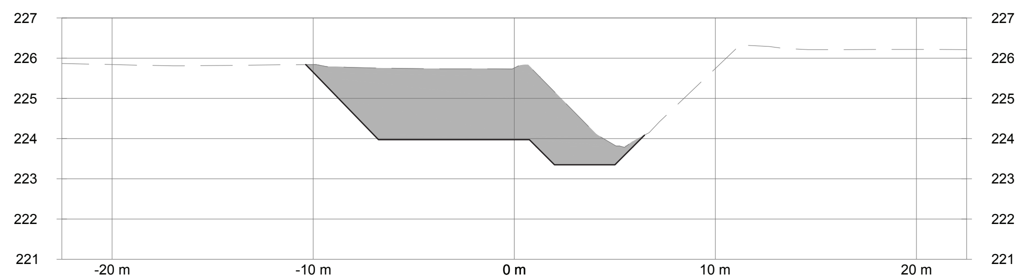
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	32of38
Date: 02/13/2019		Project No.: 300038790.0000		

Scale H 1:250 V 1:125 — 0, 5.0, 10.0, 15.0m / 0, 2.5, 5.0, 7.5m

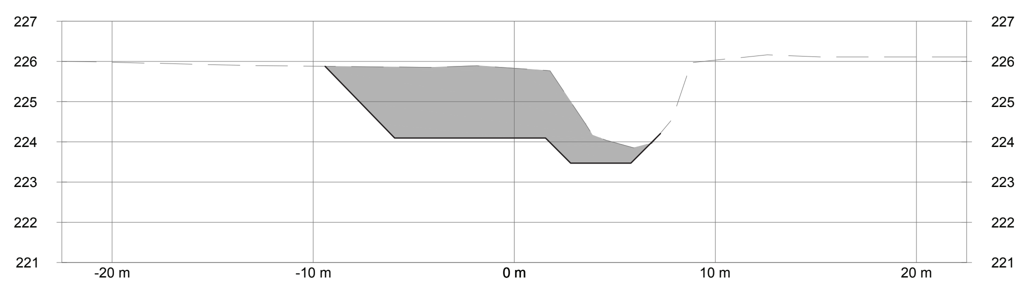
2+750



3+000



3+250



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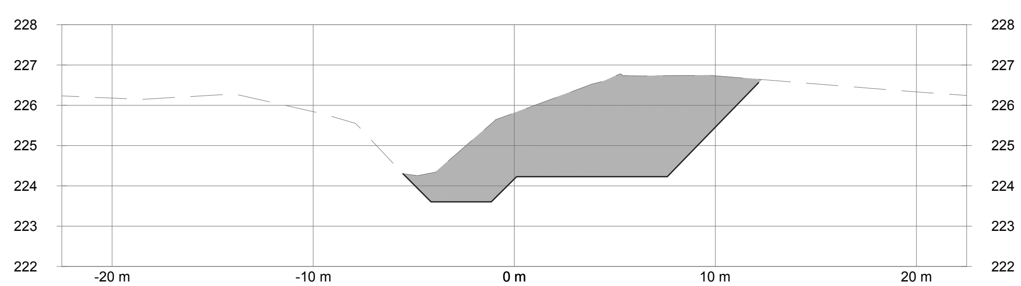

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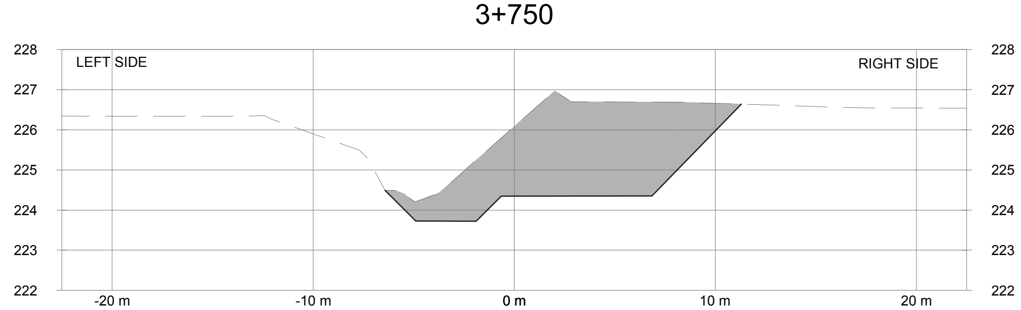
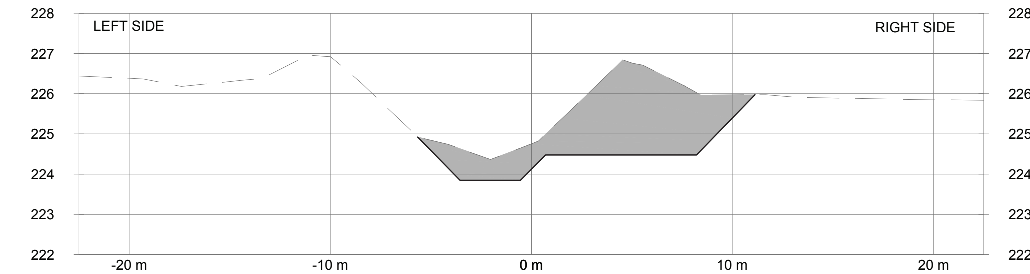


4+000



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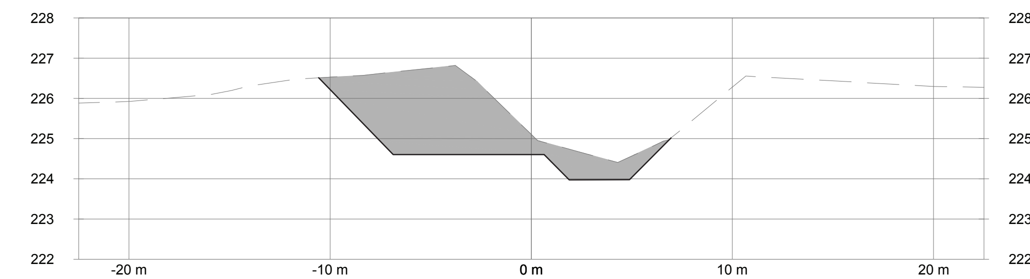

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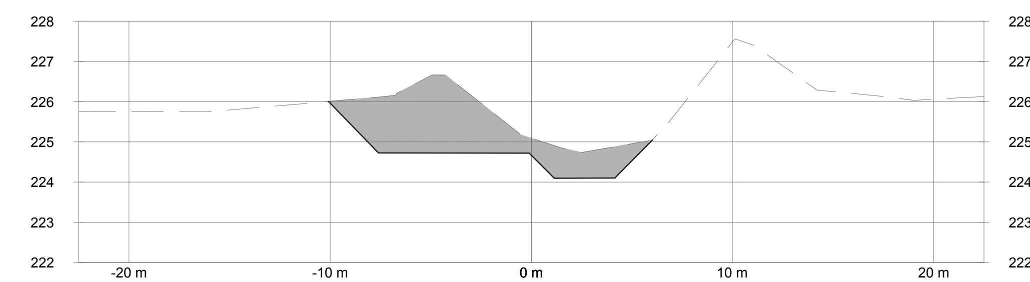

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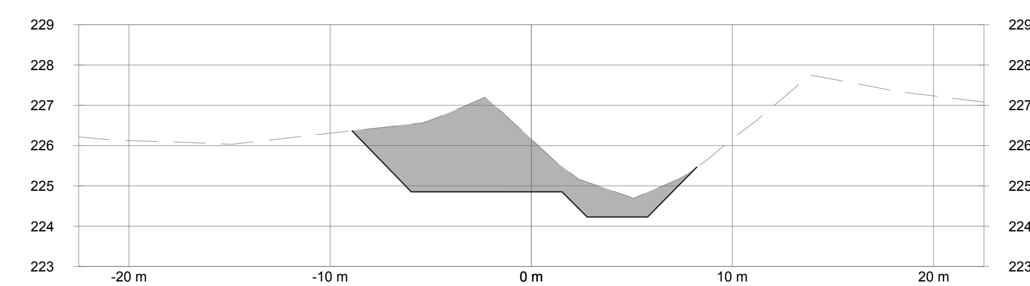
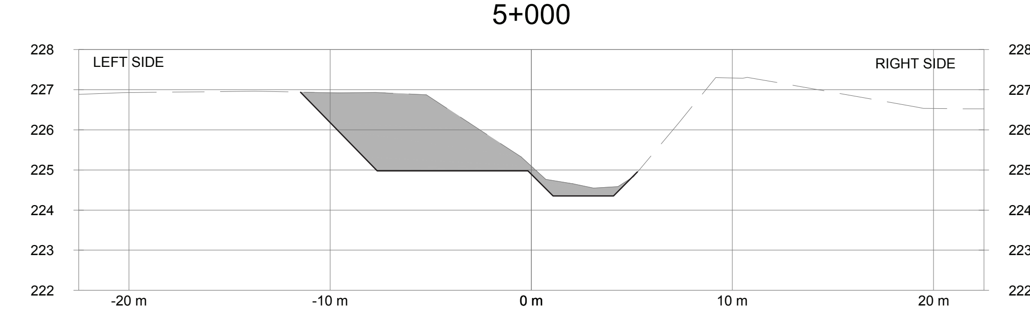
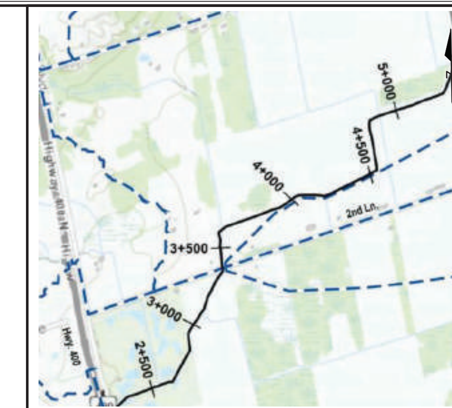


5+000



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM



KEY PLAN
SCALE: N.T.S.

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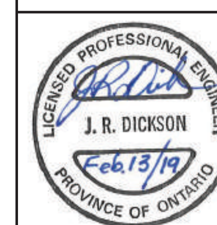

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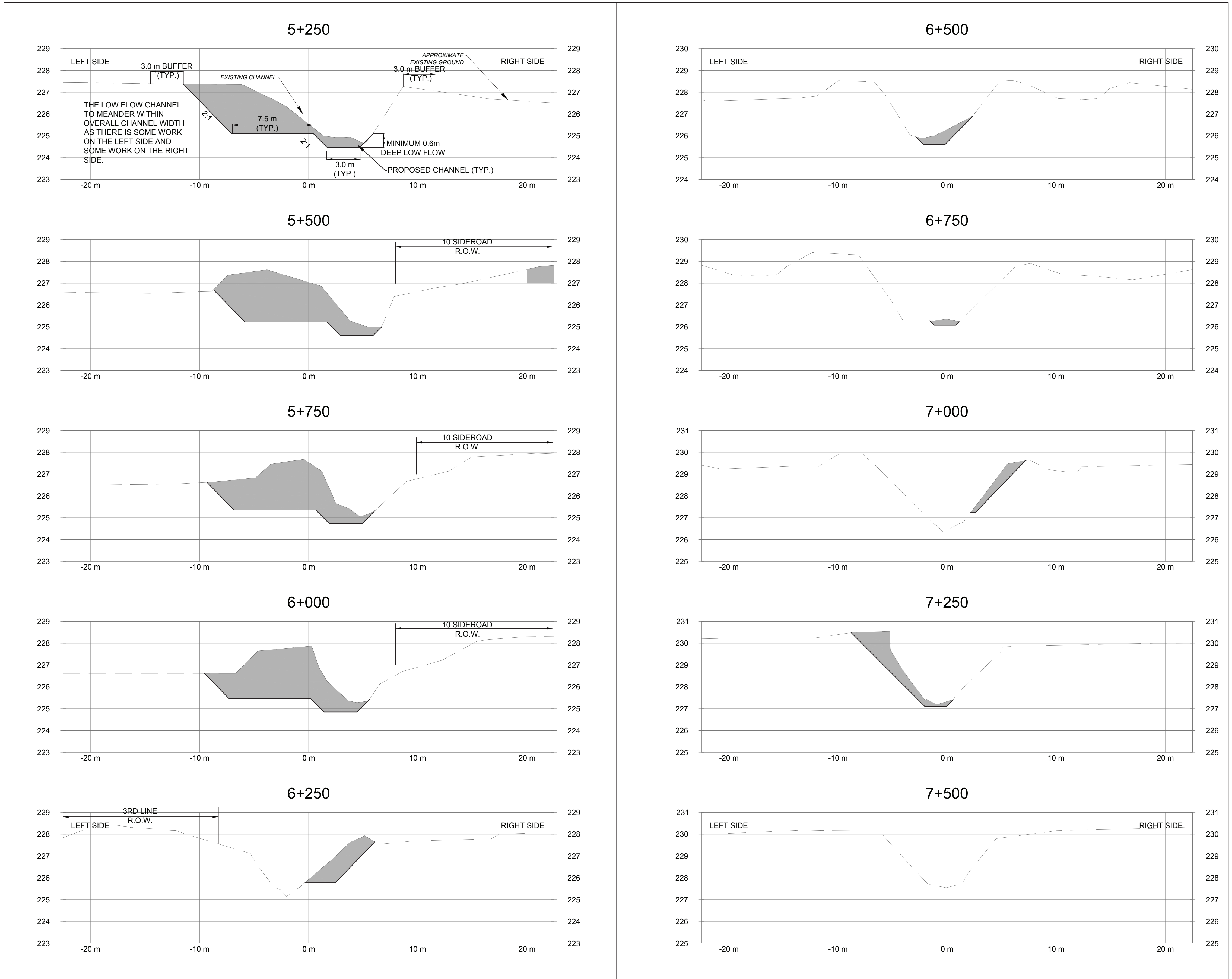
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
CROSS SECTIONS STA. 2+750 TO STA. 5+000

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	33 of 38
Date 02/13/2019		Project No. 300038790.0000		

Scale H 1:250 V 1:125 — 0 5.0 10.0 15.0m; 0 2.5 5.0 7.5m

File: I:\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_SECTIONS.dwg Date Plotted: February 5, 2019 - 2:13 PM



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM

KEY PLAN
SCALE: N.T.S.

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NOT FOR CONSTRUCTION

LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

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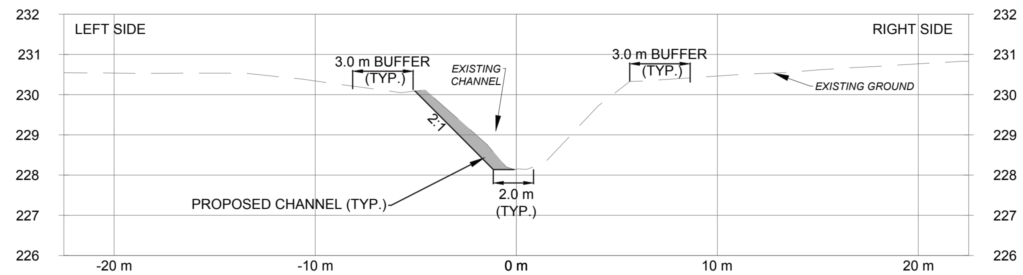
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

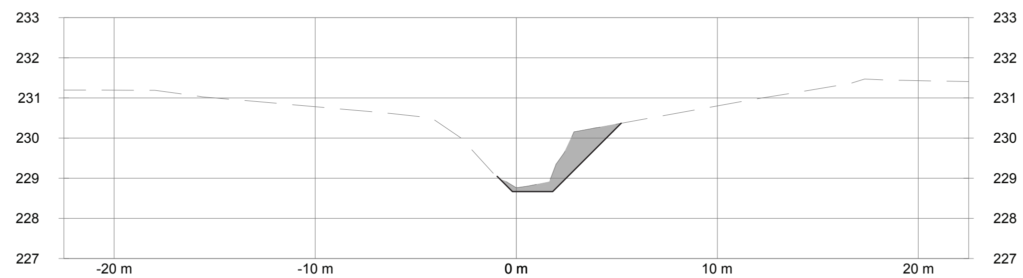
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
CROSS SECTIONS STA. 5+250 TO STA. 7+500

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	34of38
Date 02/13/2019		Project No. 300038790.0000		
Scale H 1:250 V 1:125				

7+750



8+000



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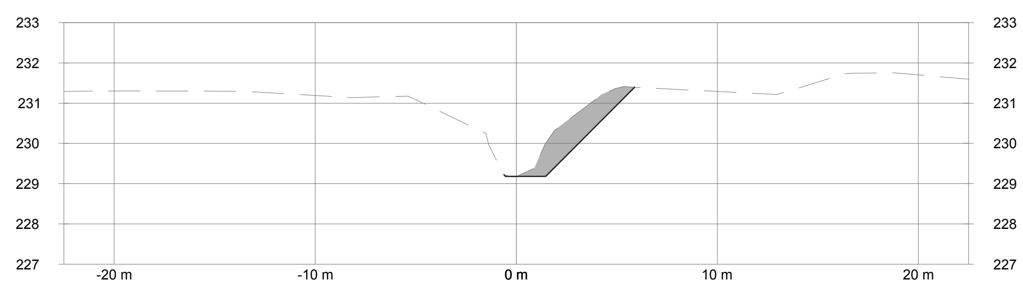

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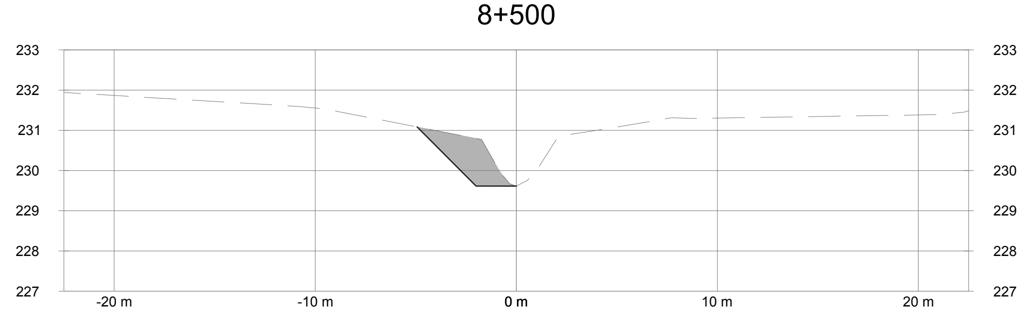

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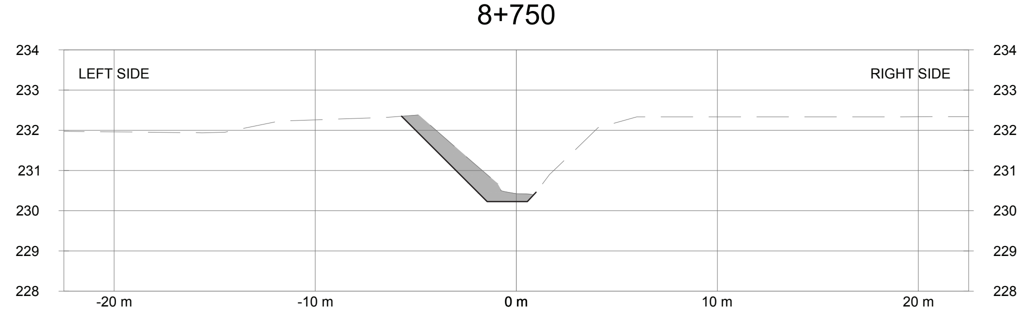
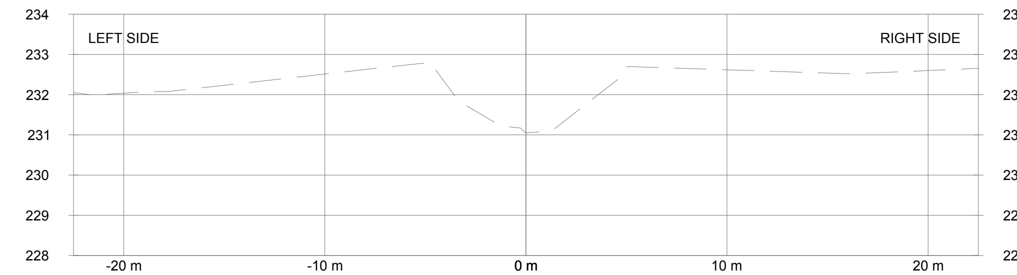
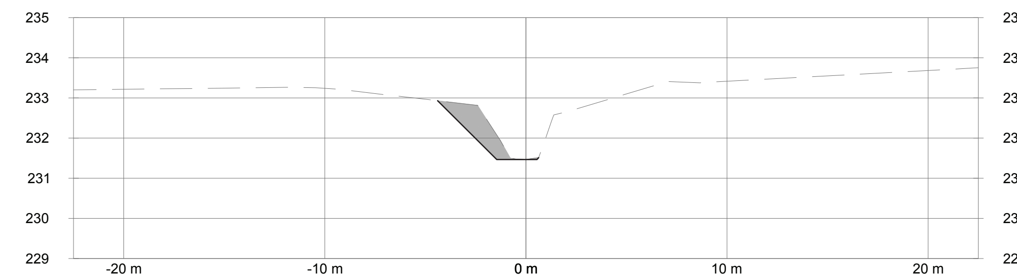


9+000



9+250



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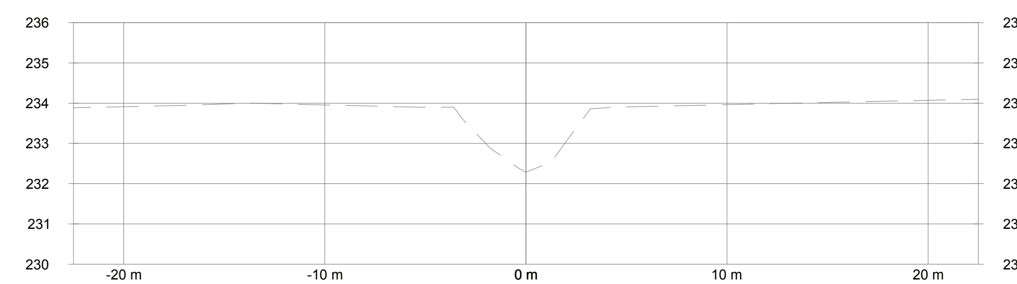
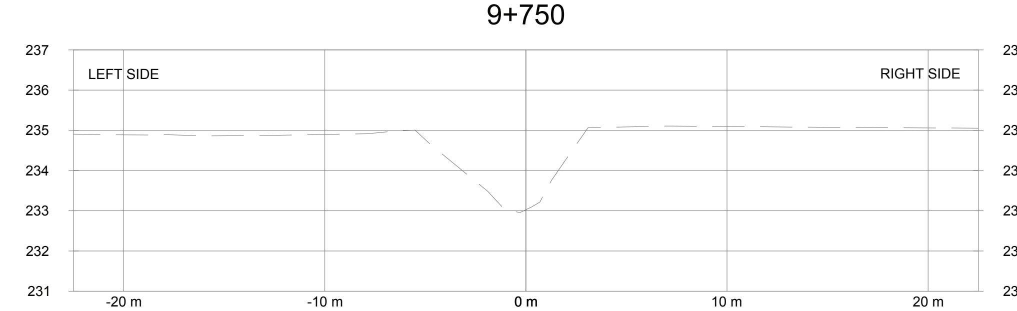
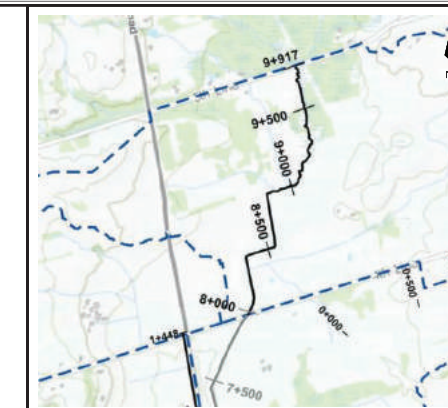


9+750



NOTE: ALL CROSS SECTIONS SHOWN LOOKING UPSTREAM



KEY PLAN
SCALE: N.T.S.

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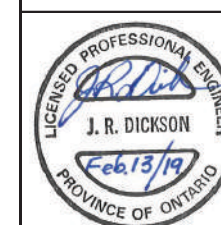

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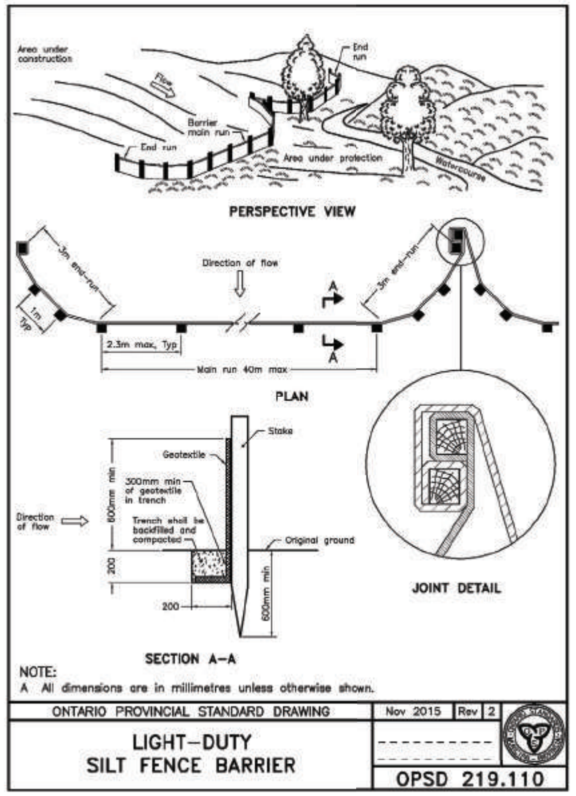
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO
L9S 1A1
Innisfil

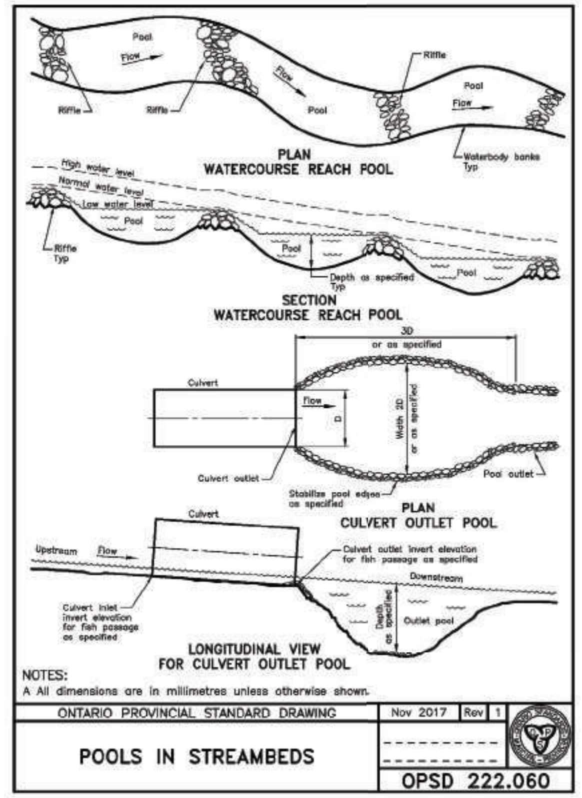
Drawing Title
SOUTH INNISFIL CREEK DRAIN 2019 IMPROVEMENT
CROSS SECTIONS STA. 7+750 TO STA. 9+750

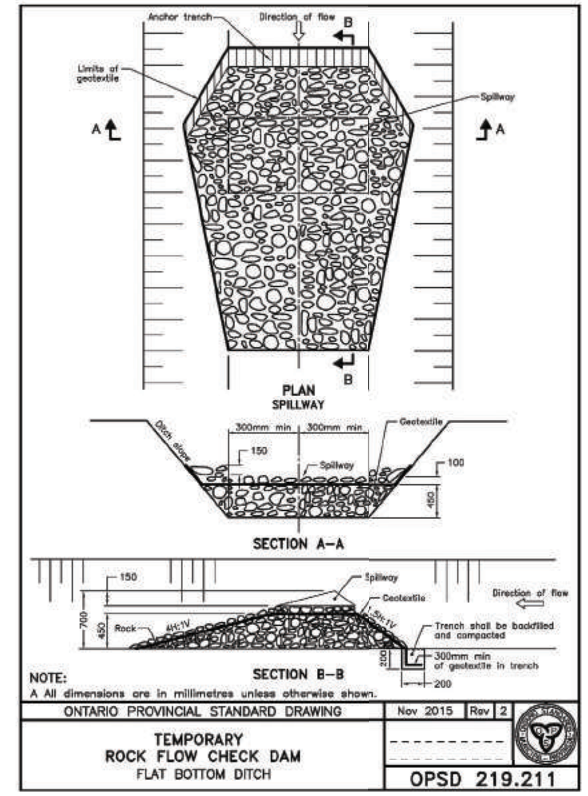
Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	35 of 38
Date 02/13/2019		Project No. 300038790.0000		

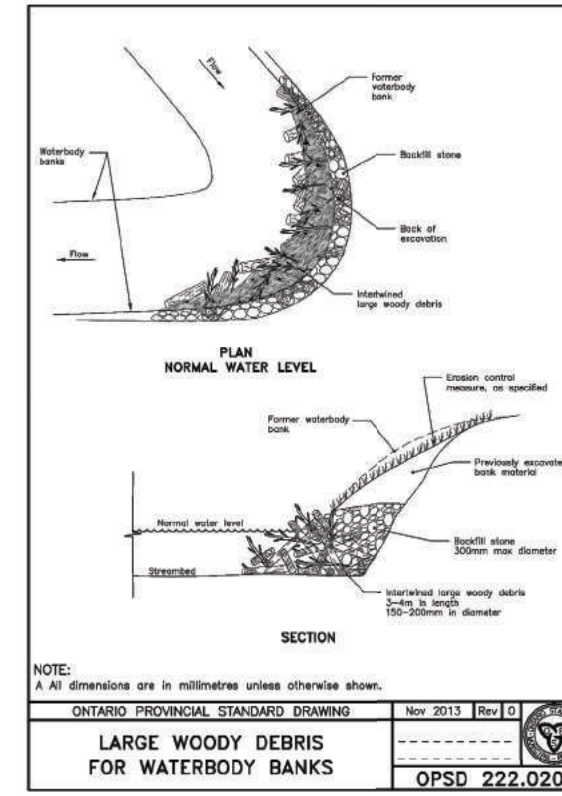
Scale H 1:250 (0, 5.0, 10.0, 15.0m) V 1:125 (0, 2.5, 5.0, 7.5m)

File: \\COLLINGWOOD\Shared Work Areas\038790 - South Innisfil Creek Drain & Branches Improvements\03_Production\Dwg\038790_SECTIONS.dwg Date Plotted: February 5, 2019 - 2:14 PM









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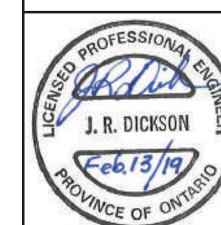
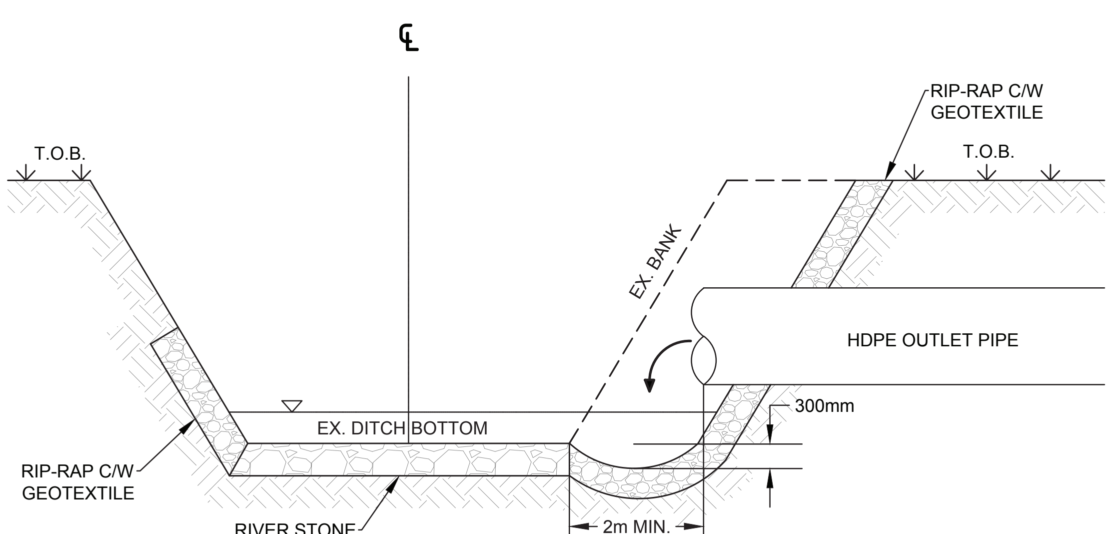
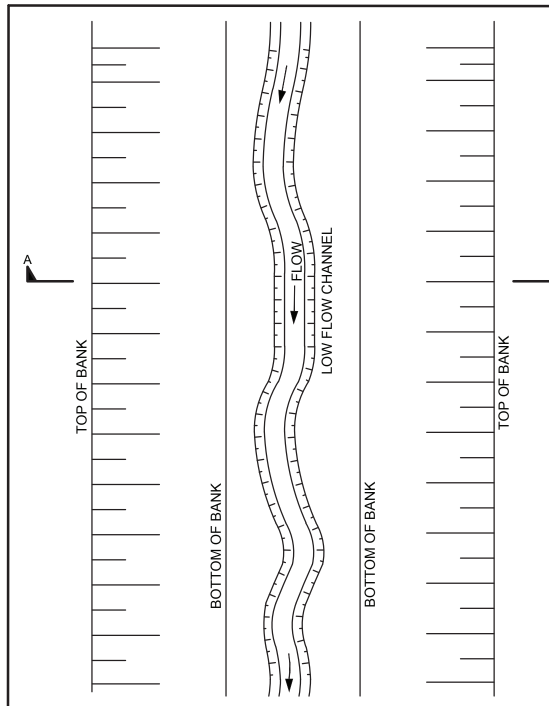
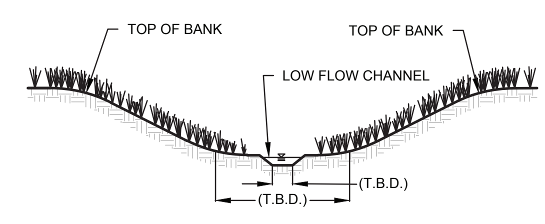




OUTLET DETAIL - PROFILE
N.T.S.



PLAN
N.T.S.



SECTION A-A
N.T.S.

NOTES:
1. LOW FLOW CHANNEL ALIGNMENT WILL BE EXCAVATED / CONSTRUCTED BASED ON GUIDANCE FROM AQUATIC ECOLOGIST.
2. DURING CONSTRUCTION, ON-SITE AQUATIC ECOLOGIST WILL CONFIRM THE SUITABILITY OF NATIVE SUBSTRATES , AVAILABLE FIELD STONE, OR IMPORTED RIVER STONE. IF SUITABLE SUBSTRATE IS ENCOUNTERED RIVER STONE MAY NOT BE REQUIRED, OTHERWISE CONSTRUCTION TO BE AS PER GUIDANCE FROM THE AQUATIC ECOLOGIST AND APPROVED DESIGN BY THE DRAINAGE ENGINEER.
3. T.B.D. - TO BE DETERMINED BASED ON LOW FLOW CONDITIONS AND APPROVED HYDRAULIC MODEL.

LINEAR DRAINAGE CHANNEL WITH MEANDERING LOW FLOW CHANNEL
N.T.S.

No.	Issue / Revision	Date	Auth.
4	ISSUED WITH "DRAFT" REPORT	08/03/2018	JRD
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6	"FINAL DRAFT" HYDRAULICS REPORT	12/14/2018	JRD
7	APPLICATION FOR DFO AUTHORIZATION	01/30/2019	JRD
8	FILE FINAL ENGINEER'S REPORT	02/13/2019	JRD

BURNSIDE
R.J. Burnside & Associates Limited
449 Josephine St., P.O. Box 10
Wingham, Ontario, N0G 2W0
telephone (519) 357-1521 **fax** (519) 357-3624
web www.rjburnside.com

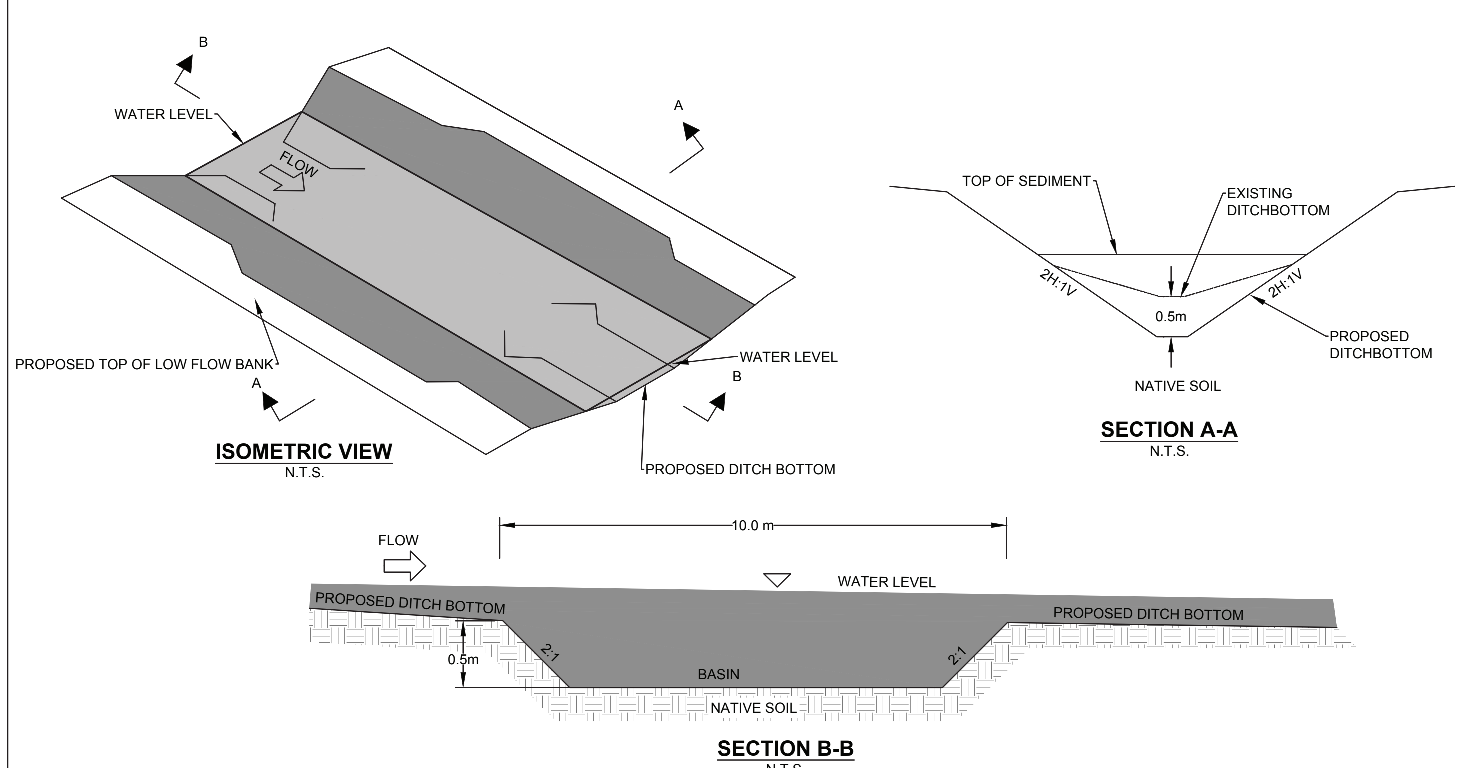
Client
TOWN OF INNISFIL
2101 INNISFIL BEACH ROAD
INNSIFIL, ONTARIO
L9S 1A1

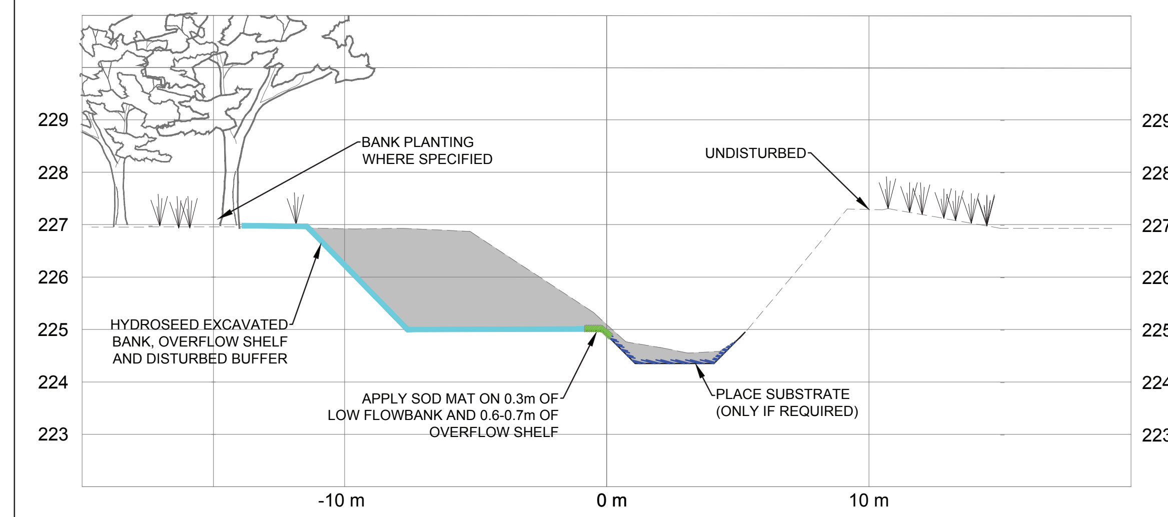
Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MUNICIPAL DRAIN DETAILS

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	**36** of **38**
Date		Project No.		
02/13/2019		300038790.0000		

Scale
H 1:250 V 1:50 — 0, 5.0, 10.0, 15.0m

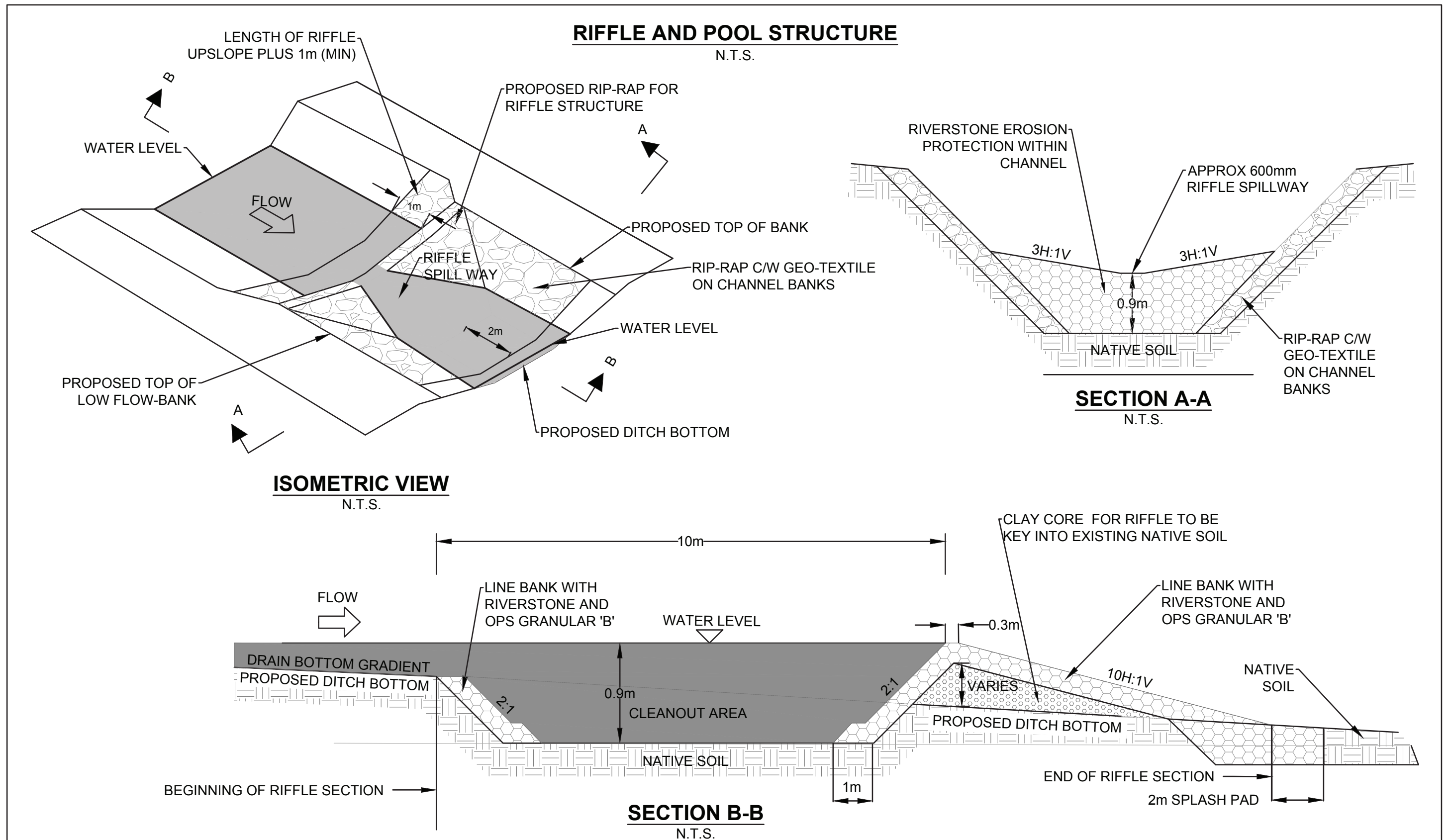
SEDIMENT BASIN DETAIL
N.T.S.



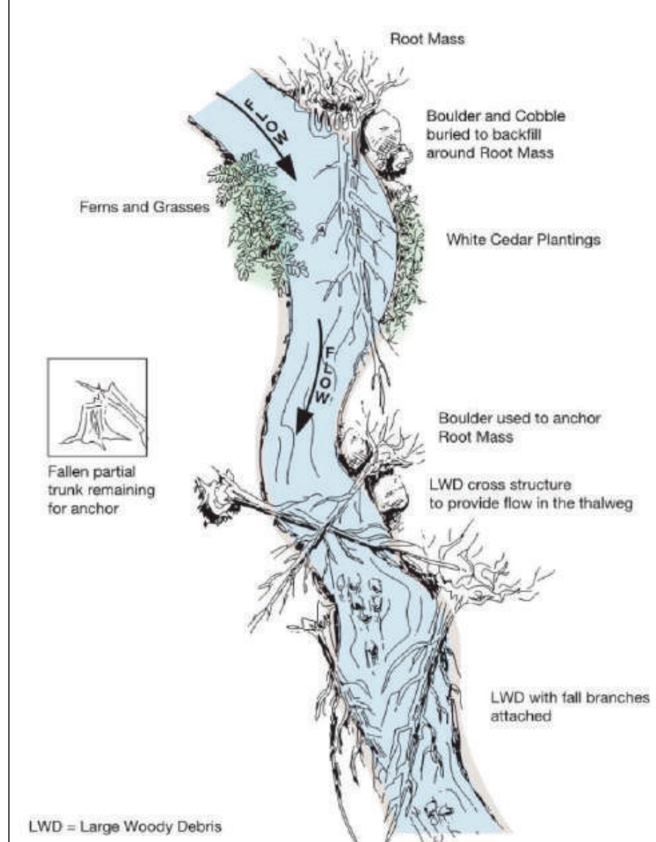


TYPICAL CHANNEL RESTORATION CROSS SECTION
N.T.S.

RIFFLE AND POOL STRUCTURE
N.T.S.



Use of Large Woody Debris in Channel Design



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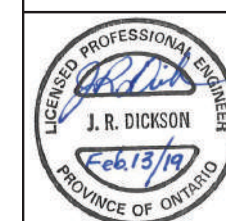
NOT FOR CONSTRUCTION



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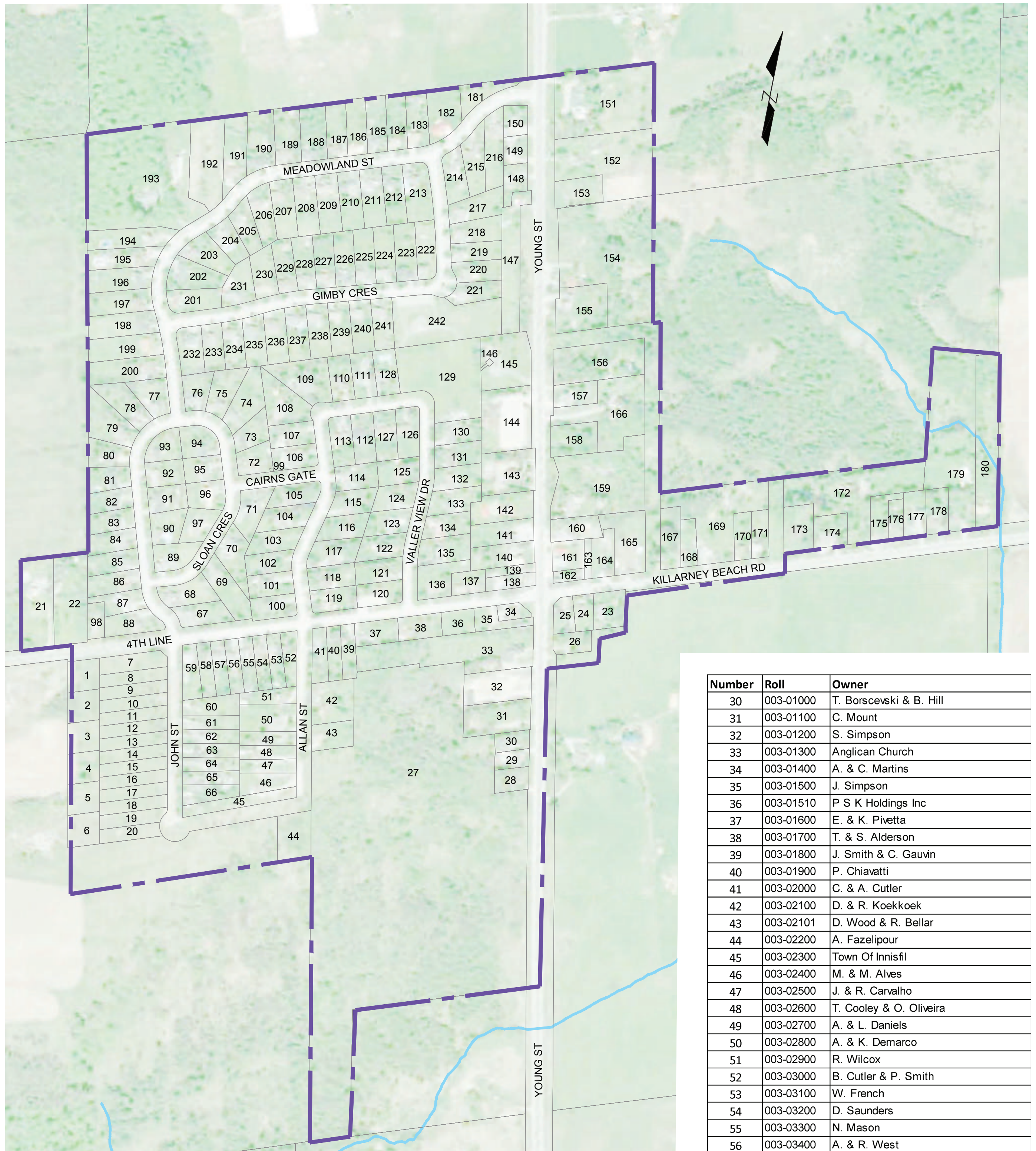
L9S 1A1

Innisfil

Drawing Title
SOUTH INNISFIL CREEK DRAIN
2019 IMPROVEMENT
MUNICIPAL DRAIN DETAILS

Designed	Checked	Drawn	Checked	Drawing No.
TL	DM/JD	TR/AB/NC	DM/JD	37 of 38
Date		Project No.		
02/13/2019		300038790.0000		

Scale
H 1:250 V 1:50
0 5.0 10.0 15.0m



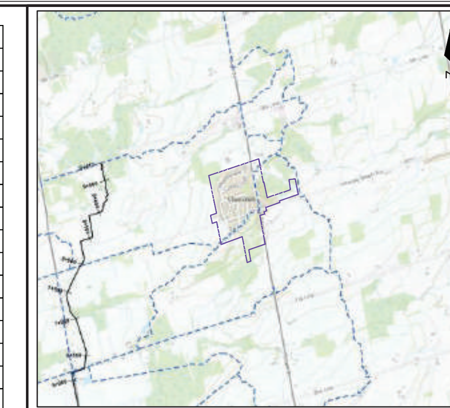
Number	Roll	Owner
1	002-20204	First View Homes (Scarborough)
2	002-20208	First View Homes (Scarborough)
3	002-20212	First View Homes (Scarborough)
4	002-20216	First View Homes (Scarborough)
5	002-20220	First View Homes (Scarborough)
6	002-20224	First View Homes (Scarborough)
7	002-20228	First View Homes (Scarborough)
8	002-20229	First View Homes (Scarborough)
9	002-20230	First View Homes (Scarborough)
10	002-20233	First View Homes (Scarborough)
11	002-20234	First View Homes (Scarborough)
12	002-20237	First View Homes (Scarborough)
13	002-20238	First View Homes (Scarborough)
14	002-20241	First View Homes (Scarborough)
15	002-20242	First View Homes (Scarborough)

Number	Roll	Owner
16	002-20243	First View Homes (Scarborough)
17	002-20246	First View Homes (Scarborough)
18	002-20247	First View Homes (Scarborough)
19	002-20250	D. & T. Garofalo
20	002-20251	First View Homes (Scarborough)
21	002-21300	J. Jambor
22	002-21400	D. & S. Mann
23	003-00100	J. Leblanc
24	003-00200	G. Ciccone
25	003-00300	M. Baker
26	003-00400	United Church
27	003-00700	Fernbrook Homes (Churchill) Ltd
28	003-00800	B. Doughty
29	003-00900	A. Dawson
30	003-01000	T. Borscevski & B. Hill

Number	Roll	Owner
30	003-01000	T. Borscevski & B. Hill
31	003-01100	C. Mount
32	003-01200	S. Simpson
33	003-01300	Anglican Church
34	003-01400	A. & C. Martins
35	003-01500	J. Simpson
36	003-01510	P S K Holdings Inc
37	003-01600	E. & K. Pivetta
38	003-01700	T. & S. Alderson
39	003-01800	J. Smith & C. Gauvin
40	003-01900	P. Chiavatti
41	003-02000	C. & A. Cutler
42	003-02100	D. & R. Koekkoek
43	003-02101	D. Wood & R. Bellar
44	003-02200	A. Fazelipour
45	003-02300	Town Of Innisfil
46	003-02400	M. & M. Alves
47	003-02500	J. & R. Carvalho
48	003-02600	T. Cooley & O. Oliveira
49	003-02700	A. & L. Daniels
50	003-02800	A. & K. Demarco
51	003-02900	R. Wilcox
52	003-03000	B. Cutler & P. Smith
53	003-03100	W. French
54	003-03200	D. Saunders
55	003-03300	N. Mason
56	003-03400	A. & R. West
57	003-03500	B. & K. Bourget
58	003-03600	S. Simpson
59	003-03700	E. Waite
60	003-03800	A. & J. Asselstine
61	003-03900	M. Brown
62	003-04000	S. & K. Bowen
63	003-04100	D. & C. Bell
64	003-04200	K. & A. Wright
65	003-04300	C. Bell
66	003-04400	N. Gundert & R. Grant
67	003-04600	D. Dare
68	003-04602	P.Boer & S. Forsythe
69	003-04604	S. Small & L. Henderson
70	003-04606	M. & A. Dicesare
71	003-04608	R. Flemming
72	003-04610	M. Simpson & S. Roberts
73	003-04614	S. De Beaucamp
74	003-04616	R. & E. Moore

Number	Roll	Owner
75	003-04618	M. Chabrzynski & S. Henderson
76	003-04620	R. & J. Lenehan
77	003-04622	G. & K. Farr
78	003-04624	N. & J. Stacey
79	003-04626	T. & E. Roomere
80	003-04628	D. & D. Wittick
81	003-04630	J. Philp & P. Murphy
82	003-04632	A. & J. Domenegato
83	003-04634	D. Veitch & R. Hopkins
84	003-04636	P. & L. Demers
85	003-04638	J. Quinn, J. Rabot & M. Quinn-Rabot
86	003-04640	J. & U. Zubrzycka
87	003-04642	T. & L. Moroz
88	003-04644	P. Whissell & H. Lostchuck
89	003-04646	R. & S. Laird
90	003-04648	B. & M. Rutledge
91	003-04650	L. & S. Smith
92	003-04652	W. & D. Mann
93	003-04654	T. & S. Breen
94	003-04656	W. & V. Toole
95	003-04658	R. & D. Sloan
96	003-04660	M. & I. Fruhstuck
97	003-04662	W. & D. Mayerhofer
98	003-04664	Town Of Innisfil
99	003-04666	Town Of Innisfil
100	003-04700	E. & C. Hawkes
101	003-04800	J. & J. Calvert
102	003-04900	R. & C. Thew
103	003-05000	P. & S. Hrynyk
104	003-05100	R. & T. Kirkwood
105	003-05200	J. & W. Campbell
106	003-05300	S. & L. Manley
107	003-05400	C. Schreider & A. Teskey
108	003-05500	D. Greenman & E. Stuart
109	003-05600	G. & D. Adair
110	003-05700	L. Mendrek
111	003-05800	M. & J. Cristicini
112	003-05900	K. Wisch
113	003-06000	W. & P. Simpson
114	003-06100	A. & L. Kamrath
115	003-06200	M. Sallach
116	003-06300	E. Madden
117	003-06400	R. & L. Cuggy
118	003-06500	P. & W. Belgue
119	003-06600	J. & D. Van Donkelaar
120	003-06700	Town Of Innisfil
121	003-06800	G. Roesler
122	003-06900	A. & S. Gismondi
123	003-07000	L. & J. Columbus
124	003-07100	U. Agarunov
125	003-07200	J. MacEachern
126	003-07300	W. Vankempen & D. Williamson
127	003-07400	K. & C. Mortelliti
128	003-07500	K. Russel & J. Johnson
129	003-07600	Town Of Innisfil
130	003-07700	B. & R. Witkowski
131	003-07800	C. Moore
132	003-07900	B. & B. Pearce
133	003-08000	C. & G. Prospero & A. Volpe
134	003-08100	K. Humphris & N. Upham
135	003-08200	D. & L. MacDonell
136	003-08300	D. & D. Scott
137	003-08301	J. & A. Calderon
138	003-08400	Woodsview Property Management
139	003-08500	A. Azan
140	003-08600	R. Drennan & M. Schell
141	003-08700	2367633 Ontario Inc
142	003-08800	S. Sanderson
143	003-08900	United Church
144	003-09000	Town Of Innisfil
145	003-09100	D. Hogarth
146	003-09200	Town Of Innisfil
147	003-09400	S. Mark
148	003-09500	A. Drugovic & G. Jenkinson
149	003-09600	S. Mikkola & K. Lamonday
150	003-09700	M. MacPhail & T. Nolan
151	003-09900	R. & P. Sampaio
152	003-10000	B. Deputat & C. Braney
153	003-10010	A. & M. Stepanova
154	003-10100	C. Radulovici
155	003-10200	H. Rahimimoghadam
156	003-10300	M. Slocombe
157	003-10400	S. & R. Thomas
158	003-10500	A. Zlender
159	003-10600	C. & T. Asselstine

Number	Roll	Owner
160	003-10700	B. Hoseman & K. Hoseman
161	003-10800	L. Burke
162	003-10900	S. & L. Gucciardi
163	003-11000	Renaissance Nouveau Design Inc
164	003-11100	A. & D. Whiteside
165	003-11200	D. Napper
166	003-11300	V. & Z. Iacob
167	003-11500	C. & T. Asselstine
168	003-11600	C. Mark
169	003-11700	R. Schweymaier
170	003-11800	D. & M. Wilson
171	003-11900	C. Cheganças
172	003-12000	D. & L. Fairhead
173	003-12100	F. Minici
174	003-12200	E. & I. Gyorfi
175	003-12300	P. Savard
176	003-12400	D. & M. Bowen
177	003-12500	J. Giannitti & M. Giannitti Est.
178	003-12600	C. Asselstine & M. Marshall
179	003-12700	P. & D. McMillan
180	003-12800	M. Mindle & E. Gulyas
181	003-25600	Town Of Innisfil
182	003-25602	J. & C. Ang
183	003-25604	P. & S. Kubas
184	003-25606	S. & T. Smith
185	003-25608	R. & C. Cavaco
186	003-25610	S. & W. Mays
187	003-25612	N. Geddes
188	003-25614	S. & N. Gill
189	003-25616	D. & T. Carlson
190	003-25618	S. & T. Chatland
191	003-25620	L. Truong
192	003-25622	Town Of Innisfil
193	003-25624	J. Stubbs
194	003-25626	J. & C. Fabing
195	003-25628	R. & E. Stukas
196	003-25630	M. Iammatteo
197	003-25632	D. & L. Ficher
198	003-25634	D. & S. Cake
199	003-25636	L. Philipp
200	003-25638	R. & D. Young
201	003-25640	A. & N. Bell
202	003-25642	A. Buttrum
203	003-25644	A. & A. Simpson
204	003-25646	C. & J. Van Nispen
205	003-25648	G. Clubine
206	003-25650	C. & C. Kidd
207	003-25652	K. & M. Moores
208	003-25654	F. Guttridge & L. Etherton
209	003-25656	D. & E. Ciccia
210	003-25658	B. & J. Laval
211	003-25660	J. & C. Molenhuis
212	003-25662	C. Damianakis & R. Cooper
213	003-25664	M. & D. Twardowski
214	003-25666	M. & L. Snowball
215	003-25668	R. Mateus
216	003-25670	M. & S. Davenport
217	003-25672	B. & S. Bingley
218	003-25674	S. Jenssen-Brown
219	003-25676	D. Lajoie
220	003-25678	R. & K. Carlin
221	003-25680	E. & B. Rideout
222	003-25682	R. Cressman
223	003-25684	C. & L. Vitale
224	003-25686	E. & F. Arantes
225	003-25688	A. & A. Takacs
226	003-25690	N. & P. Blanchet
227	003-25692	J. & C. Conti
228	003-25694	C. Douglas
229	003-25696	T. & M. Tokarski
230	003-25698	G. Werth
231	003-25702	J. & L. Knox
232	003-25704	M. & M. Goodchild
233	003-25706	G. Gogos
234	003-25708	J. Reindl
235	003-25710	D. & A. Stopyra
236	003-25712	D. & E. Magri
237	003-25714	V. & K. Hamilton
238	003-25716	M. Doyle & S. McInnis
239	003-25718	R. Weeks
240	003-25720	A. & S. Ginzburg
241	003-25722	E. & S. Ernest
242	003-25724	Town Of Innisfil



KEY PLAN
SCALE: N.T.S.

LEGEND

CHURCHILL BOUNDARY
NATURAL WATERCOURSE

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LICENSED PROFESSIONAL ENGINEER
J. R. DICKSON
Feb.13/19
PROVINCE OF ONTARIO

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VILLAGE OF CHURCHILL PLAN

Designed	Checked	Drawn	Checked	Drawing No.
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Date 02/13/2019		Project No. 300038790.0000		
Scale 1:5,000		0 50 100 200 300m		

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