



Engineering Design Standards and Specifications Manual

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PREFACE

The Town of Innisfil Engineering Design Standards and Specifications Manual (Town Standards) is intended to provide clarity to Engineers, Landscape Architects, Developers, and Contractors that are designing or installing municipal infrastructure within the Town of Innisfil ("Town"). The Town Standards are to be used as a guide to provide infrastructure design that meets Town approval. The Town Standards are not intended to replace sound engineering principles or relieve the Engineer of their responsibility for the design.

The Town Standards were prepared with a vision to ensure that the design of all municipal projects supports future growth, is environmentally responsible, considers operation and maintenance impacts, improves accessibility for those with disabilities, and utilizes sound engineering principles and practices.

The Town Standards reflect current design and construction practices and the evolving requirements of the Town, its residents, as well as its partners in the development and construction communities. In the preparation of this document, the Town has incorporated the latest applicable municipal, provincial, and federal legislation, guidelines, policies, and criteria.

In particular, there has been substantial progress made in the area of stormwater management. As a result, key revisions have been made to reflect the intent and objectives of the most recent version of the following documents:

1. *Lake Simcoe Region Conservation Authority Technical Guidelines for Stormwater Management Submissions, Approval Date June 24, 2016 and Effective Date September 1, 2016, or latest edition.*
2. *Nottawasaga Valley Conservation Authority Development Review Guidelines, Stormwater Management Technical Guide, December 2013 or latest edition.*
3. *Nottawasaga Valley Conservation Authority Development Review Guidelines, Stormwater Management Pond Planting, April 2006 or latest edition.*

SECTION 1.0: GENERAL INFORMATION

1.1. INTRODUCTION

These standards and specifications are intended as a guideline to provide a good engineering basis and consistent designs for all municipal and development projects within the Town of Innisfil. These standards are to be read in conjunction with the Town of Innisfil Engineering Design Standard Drawings as well as the Ontario Provincial Standard Specifications and Drawings (OPSS + OPSD). Where there are any apparent conflicts or discrepancies, the Town Engineering Design Standards, Specifications, and Standard Drawings shall take precedence.

The information provided in this manual is general in nature and is not intended to relieve the Developer or the Engineer of their responsibility to submit a finished product of competent engineering design and construction. For any form of consideration made to deviate from Town standards, the Engineer shall submit a detailed proposal outlining the deviation, with the necessary justification and analysis, for consideration by the Town prior to formal engineering submissions.

If there are any preliminary concerns that are not addressed within this document, the designer is to coordinate a pre-consultation meeting with the Town's Engineering and/or Planning staff to resolve any issues prior to the commencement of the engineering design.

1.2. ENGINEER'S ROLE

The design, all required engineering drawings, and associated reports must be signed and sealed by a qualified Professional Engineer, licensed to practice in the Province of Ontario.

1.3. SUPPORTING STUDIES AND SUPPORT

The following studies and reports may be required to support the design. It should be noted that the information provided is the minimum requirement and the studies and reports may need to include further details depending upon site-specific conditions. The following list is not intended to be all-encompassing. Additional reports or studies may be required at the discretion of the Town. The Engineering design shall incorporate the information and/or recommendations of the supporting studies and reports. A list of all reports or studies required to be submitted may include but is not limited to:

1.3.1 Geotechnical Report:

The Geotechnical Report shall be prepared at the time of Draft Plan approval and must examine and confirm subsurface conditions including soil type(s) and stratification, groundwater levels, depth to bedrock, soil bearing capacity, permeability, conductivity, and presence of any contaminants. The report shall address the adequacy of the Town's standard minimum pavement structure and sub-drainage system or recommend an increased pavement structure if conditions warrant.

The report shall assess the suitability of native soils for trench backfill and building foundation construction. It shall also address requirements for imported fill as well as construction methods for the use of both native and imported materials.

The report shall discuss the requirements for pipe bedding as well as engineered fill where necessary for building construction.

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The report shall be accompanied by a scaled drawing showing test pit and/or borehole locations complete with a detailed test pit and/or borehole log. During detail design stage an update of the Geotechnical Report may be required and will be confirmed by the Town.

The report shall be signed and sealed by a qualified Professional Engineer licensed to practice in the Province of Ontario.

1.3.2 Hydrogeological Assessment:

Hydrogeological studies for proposed projects must be conducted by a qualified Professional Engineer and/or Geoscientist to characterize the groundwater regime from a site-specific and regional perspective in order to address issues related to (as applicable):

- a) Impacts to existing well water supplies within the project area;
- b) Soil permeabilities and associated properties where the design of septic systems are concerned;
- c) Groundwater impact assessment to area aquifers from construction activities and/or discharge of waste or wastewater;
- d) Testwells and associated testing in accordance with Ministry of the Environment, Conservation and Parks (MECP) D-5-5 guidelines to address water taking impact sustainability;
- e) Impacts to nearby surface water bodies; and
- f) Specific technical review of well field or wellhead capture zones.

For general road and servicing construction, the report should consider the depth of services and identify likely areas where dewatering will be required, the rate of dewatering, requirements for dewatering, permits, and the strategy to achieve the required groundwater levels. If dewatering is necessary, the report should contain sufficient data on groundwater quality and temperature of the receiving watercourse.

Where applicable, the report should also provide an assessment of the use of sump pumps for building design.

1.3.3 Stormwater Management Report (SWM):

The Stormwater Management Report is to provide details and supporting calculations associated with the design of the minor and major drainage systems as well as the required source, conveyance, and end of pipe controls required to achieve the minimum standard targets established by this document as well as the Conservation Authority.

At a minimum, the following details must be included in the Report:

- a) Background Information;
- b) Stormwater Management Targets and Objectives;
- c) Review of climate change projections and infrastructure life cycle costs;
- d) Review of Low Impact Development Practices and their Applicability;
- e) Pre-Development and Post-Development Drainage Areas;
- f) Storm Drainage System Design;
- g) Design of End of Pipe Controls;
- h) Erosion and Sediment Control;
- i) Inspection and Maintenance Requirements;
- j) Calculations, Tables, Figures, Modeling, and Drawings; and

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- k) Operations and Maintenance Manual (Refer to Section 4.9.1).

The Stormwater Management Report is to follow these guidelines:

The Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual;

Comprehensive Stormwater Management Master Plan, Town of Innisfil, 2016.

Lake Simcoe Region Conservation Authority Technical Guidelines for Stormwater Management Submissions, Approval Date June 24, 2016, and Effective Date September 1, 2016, or latest edition.

Nottawasaga Valley Conservation Authority Development Review Guidelines, Stormwater Management Technical Guide, December 2013 or latest edition.

Nottawasaga Valley Conservation Authority Development Review Guidelines, Stormwater Management Pond Planting, April 2006 or latest edition.

Low Impact Development Stormwater Management Planning and Design Guide, CVC and TRCA, 2010.

Lake Simcoe Protection Plan, 2009.

Innisfil Our Place Official Plan, 2018.

1.3.4 Traffic Impact Assessment (TIA)

The Traffic Impact Assessment (TIA) refers to the generic requirement to address the potential traffic impacts of a proposed development on the existing road network. The traffic impact assessment will be in the form of a Traffic Impact Brief or Traffic Impact Study, whichever is deemed appropriate based on the thresholds contained herein and in consultation with the Town's Engineering Department. The following guideline is intended to provide direction to the developer with respect to establishing the appropriate scope of traffic impact assessment required.

A **Traffic Impact Brief** is a reduced scope traffic impact assessment, usually required for small-scale developments where little or no impact to the adjacent road network is anticipated.

A **Traffic Impact Study** is a comprehensive traffic impact assessment, usually required for medium and large-scale development where greater impacts to the adjacent road network are anticipated.

Traffic Impact Brief:

For developments expected to generate less than 100 vehicle trips during the peak hours (total of inbound and outbound trips), a Traffic Impact Brief may be considered, provided that the site of study area characteristics are not such that would otherwise indicate that traffic or other transportation issues/concerns are likely to arise given the proposed development.

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A Traffic Impact Brief has a reduced scope in the context of the anticipated trip generation of the development, and hence reduced the potential for impacts that may result. A Traffic Impact Brief should address the following:

1. **Study Area:** Inventory the existing road system to which the development fronts and/or in the immediate area of the development. This should include the number of lanes, speed limits, urban/rural cross-sections, etc. The study area is to be confirmed with the Town prior to commencing the assessment.
2. **Proposed Development:** Detail the proposed land use and phasing/completion year. Provide an overall plan illustrating the proposed access locations, the internal road network, building locations, parking, etc. as applicable.
3. **Site Traffic:** Based on the land uses, determine trip estimates for the most appropriate peak hours. Typically, these will be the weekday AM and PM peak hours of the adjacent road, although for commercial, entertainment, religious, institutional or sports facility uses, a weekend peak may be more appropriate. The trip estimates should be based on published trip rates, data from other representative sites, or based on sound engineering ("First Principles").
4. **Site Access Assessment:** The site access should be reviewed in consideration of the volume and type of vehicles to be generated by the site, and the proposed access location and configuration. Town Standards are to be referenced as applicable.
5. **Sight Line Assessment:** At each access point, the sight distance requirements should be determined based on appropriate standards (MTO or County), and the availability of sight distance determined from actual field measurements or engineering plans.
6. **Parking & Circulation:** The proposed parking supply should be confirmed as adequate in consideration of the corresponding Town parking requirements. The internal road and circulatory system should be reviewed in the context of the type of vehicles to be served (including emergency vehicles, garbage collection or other appropriate design vehicles) and the need for access internally.
7. **Documentation:** A letter report should be prepared to detail the findings related to the above. Relevant maps, graphs, tables, and figures should be provided. The Traffic Impact Brief should be able to provide a conclusive statement that the proposed development will not adversely affect the operations or the safety of the adjacent road system, and that the development plan (including the access, parking area, and internal circulatory system) is adequate to suit the site traffic.

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For developments expected to generate 100 or more vehicle trips during the peak hours (total of inbound and outbound trips), a Traffic Impact Study is required for review and approval by the Town. A Traffic Impact Study may also be required for a development that will generate less than 100 vehicle trips during the peak hours if the site of study area characteristics are such that traffic or other transportation issues or concerns may have to be addressed to accommodate the development.

A Traffic Impact Study should address the following:

1. **Study Area:** The study area should extend far enough, within reason, to contain all municipal and provincial roads that will be noticeably affected by the traffic volumes to be generated by the proposed development. The study area is to be confirmed with the Town prior to commencing the assessment. The Town reserves the right to establish the study area as may be deemed necessary.

A description of the existing transportation system in the study area, using a combination of maps and other documentation, should identify relevant information, such as:

- Existing parking areas, existing roads, number of lanes, on-street bike lanes, traffic signals, posted speed limits, and other important signage;
 - The lane configurations and control of the key intersections/roundabouts to be considered in the study;
 - The provision of on-street parking in the vicinity of the development site and the potential for this to impact key intersections being analyzed;
 - Existing transit routes, stops and terminals, and the future Metrolinx GO train station;
 - Other traffic controls and transportation facilities; and
 - Other features of interest such as designated trails, walkways, etc.
2. **Horizon Years & Period of Analysis:** The horizon years should coincide to the anticipated full build-out of the site, in addition to five (5) and ten (10) years beyond full build-out. Interim horizon years must also be considered as necessary for the staged implementation of the identified road system improvements. For large developments where five (5) and ten (10) year design horizon beyond full build-out is not feasible, the design horizon can begin at the period of anticipated initial occupancy but requires written approval from Town staff.
 3. Typically, the weekday AM and PM peak hours of the adjacent street will constitute the peak hours to be addressed. However, in the case of commercial, entertainment, religious, institutional or sports facility use, the weekend peak hours may be more appropriate. During the initial consultation process with the Town, the Consultant should determine the selected peak periods for analysis.

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4. Existing Traffic Volumes: Figures illustrating the existing traffic volumes and turning movements for the study area roads and intersections are required. Traffic volumes may be acquired for the Town, County or MTO, from other transportation studies in the area, or through traffic counts. To ensure representation of existing conditions, traffic count data should be no more than 3 years old.
5. Future Road Network & Background Volumes: Future traffic volumes should be prepared for each horizon year, with consideration for annual growth rates to reflect general growth in traffic in addition to the growth specific to new development.

General growth can be estimated based on historic growth in area traffic volumes, and/or future projections of area population and employment. Consideration can also be given to other area transportation studies and/or traffic models as appropriate.

All significant developments under construction, approved or in the approval process and that are likely to contribute additional traffic volumes within the horizon period, should be identified. The trips that are expected to be generated by these developments should be included in the future background volumes (trips can be established from a corresponding Traffic Impact Study or based on the land uses and published trip generation rates). Town staff should be consulted to establish the approved/active development proposals within the study area.

Future transportation improvements to the study area road network that are currently being considered should be identified. These improvements should be described to a level of detail sufficient to assess their implications for travel to/from the development site. In each case, identify the status and anticipated date of implementation for consideration in the Future Background and Future Total traffic conditions. The Traffic Impact Study should consider the findings and recommendations of the Town of Innisfil Transportation Master Plan to ensure consistency.

6. Proposed Development: The Traffic Impact Study should provide a full description of the proposed development, including the following as applicable:
 - Municipal address (if applicable);
 - Existing and proposed land uses;
 - Total development area and summary by use (e.g. type and number of residential units, commercial gross floor area, etc.)
 - Anticipated tenants;
 - Planned phasing and build-out period

A site plan, concept plan, or similar, is to be included in the Traffic Impact Study document. If the proposed development is to be constructed in phases, describe each phase and the proposed implementation timing for each.

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7. Site Traffic – Trip Generation: Unless advised by the Town, trip generation estimates are to be based on the proposed land uses, size of development and trip generation data from:
- The ITE Trip Generation Manual (most recent edition);
 - Trip generation surveys conducted at similar developments/proxy sites; or
 - “First Principles” calculations of anticipated trips to/from the site.

Where appropriate, it may be justified to reduce the base trip generation estimates to account for pass-by trips, internal/shared trips (in the case of a multi-use development), travel demand management practices, and transit use. The resulting estimates are referred to as “new” vehicle trips. All trip generation assumptions employed in the calculation of the “new” vehicle trips should be supported and well documented.

Sensitivity analysis should be undertaken where trip generation parameters have the potential to vary considerably and most probable values cannot be readily identified (i.e. the exact tenant or use of commercial space is not known). A trip generation table should be provided in the report to summarize the land uses and sizes, with the corresponding trip generation rates and the resulting number of trips. For large developments that will be phased in over time, the table should identify each significant phase separately.

8. Site Traffic - Trip Distribution & Assignment: Trip distribution assumptions should be supported by one or more of the following:
- Transportation Tomorrow Survey (TTS) data;
 - Origin-destination surveys;
 - Comprehensive travel surveys; or
 - Existing/anticipated travel patterns

Engineering judgement should be utilized to determine the most applicable of the above methodologies for each particular application. It is advised that Town staff be contacted regarding the trip distribution assumptions for site traffic requirements.

Trip assignments should consider logical routings, available and projected road capacities, and travel times. Trip assignments may be estimated using a transportation demand model or “hand assignment” based on knowledge of the proposed/future road network in the study area. The trip assignment should also take into consideration varying assignments for pass-by trips, link-diverted trips and internal trips.

9. Future Total Traffic Volumes: Future total traffic volumes are to be presented, representing the culmination of the future background traffic volumes and the site generated traffic volumes for each horizon year.
10. Traffic Impacts: An evaluation of the key signalized and un-signalized intersections within the study area for all relevant peak periods for the existing and future planning horizons (both with and without the subject development traffic) is required, and summaries are to be

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provided in a tabular format (e.g. level of service, volume to capacity ratio and delay). The intersection capacity/operational analysis should be completed using Synchro/Sim Traffic Simulation Software or the like. The objective should be to ensure that no new problem movements are created by the proposed development and that existing problem movements are not worsened to an unacceptable level with the addition of site generated traffic. Where intersections are closely located, queueing assessments should be included with respect to appropriate storage, queue encroachment, back to back left turns, etc.

Should operational issues result, means of mitigation and the operations with consideration for such, are to be presented (e.g. introduction of traffic signals, additional through lanes, turn lanes, etc.) Appropriate warrants for improvements and associated operational review worksheets should be appended to the report.

11. Site Access Assessment: The site access should be reviewed in consideration of the volume and type of vehicles to be generated by the site, and the proposed access location and configuration. Town standards are to be referenced as applicable. Access points should be evaluated in terms of capacity, safety and adequacy of queue storage capacity.

Should operational issues result at the site access, means of mitigation and the operations with consideration for such, are to be presented (e.g. introduction of traffic signals, additional through lanes, turn lanes, etc.) Appropriate warrants for improvements and associated operational review worksheets should be appended to the report.

12. Sight Line Assessment: At each access point and at each intersection where a new road is proposed, the sight distance requirements should be determined based on appropriate standards (MTO or County), and the availability of sight distance determined from actual field measurements or from engineering plans.
13. Documentation: The structure and format of the Traffic Impact Study should follow the guidelines outlined in this document as applicable. This format will facilitate review, discussion, and communication. Relevant maps, graphs, tables and figures should be provided.

1.3.5 Noise and Vibration Study (NVS):

The Noise and Vibration Study shall review all potential noise and vibration sources and evaluate the requirements to achieve compliance with MECP guidelines, NPC-300 guidelines considering air conditioning systems complying with NPC-216, applicable zoning by-law, as well as this document.

For attenuation of noise, the report should identify any mitigating measures to ensure that the sound level in the outdoor living area does not exceed 55 dBA. The receiver for the outdoor living area shall be assumed to be placed at a distance of 3.0 m from the rear wall of the house, at the midpoint of the rear yard width, and on the basis that the rear house wall will be set at the minimum lot line setbacks in accordance with the Town's zoning by-law.

Where noise fences are proposed, the report should detail the locations and height required to attain acceptable noise levels.

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A post-construction survey or report may be required by the Town to confirm that acceptable noise levels have been achieved.

For railway traffic, the report should also identify foundation requirements to attenuate vibration.

The report should consider the construction activities typically expected and provide guidance on the development of a pre-construction survey of adjacent buildings and structures.

A pre-construction survey of adjacent buildings and structures may be required when expected construction activities could potentially cause structural and/or cosmetic damage. The survey should identify cracks and other defects in existing exterior and interior walls. A portable seismograph is to be used to take such readings in the field during construction with which to measure “peak particle velocities” generated, if required.

If a damage complaint is made during or following construction, an individual post-construction inspection is required by a qualified person. The post-construction inspection shall be compared to the pre-construction survey to determine the validity of the complaint. The developer and/or contractor shall be liable for all verified damage complaints.

1.3.6 Environmental Impact Study (EIS):

The Environmental Impact Study shall be prepared by a qualified professional and will assess any potential impact of the proposed project upon the natural environment including, but not limited to, wetlands, woodlots, and natural habitats for threatened and/or endangered species. The report shall also characterize the impact and make recommendations for mitigation, if necessary. Additional details and requirements can be found in the Town’s Official Plan.

1.3.7 Environmental Site Assessment (ESA):

For any lands that are to be dedicated to or purchased by the Town, an Environmental Site Assessment will need to be completed.

If required, a Phase I ESA shall be undertaken by a “qualified person” as defined in O. Reg. 153/04 (or the latest revision thereof) and a report shall be completed in accordance with the requirements set out in the same regulation as well as the guidelines published by the Canadian Standards Association (CSA).

The report shall include, but not be limited to:

- a) Confirmation of Insurance coverage;
- b) Certification that the person undertaking the assessment and completing the report is a “qualified person”;
- c) The “qualified person’s” opinion as to whether a Phase II ESA is warranted based on the findings of the Phase I ESA;
- d) If the “qualified person’s” opinion is that a Phase II ESA is not required, the report shall expressly include a statement that “in his/her opinion and based on the findings of the Phase I ESA, a Phase II ESA is not necessary”; and
- e) Confirmation that the report may be relied upon by the Town in making the decision to accept ownership of the property.

SECTION 1.0: GENERAL INFORMATION**1.3.8 Archaeological Report:**

The Archaeological Report shall assess any significant historical features on the site and recommend a mitigation plan if necessary. The study shall follow the Ontario Ministry of Culture guidelines for determining the archaeological potential of the area impacted by construction. As a minimum, the report shall follow the requirements of a Phase 1 Archaeological survey and proceed with Phase 2 and 3, if necessary.

The Archaeological Report shall also consider “Built Heritage” and provide an inventory of any historically or culturally significant structures within the affected area. The Innisfil Historical Society shall be contacted during the preparation of the report and the report shall include any comments they may have on the affected area.

1.3.9 Functional Servicing Report (FSR):

The Functional Servicing Report (FSR) shall assess and describe the adequacy of the existing and proposed water distribution network, sanitary sewer servicing, storm sewer systems, and stormwater management features to satisfy the demands of the proposed development or the demands of an existing site that is undergoing significant alteration.

The FSR is intended to ensure that the proposed development or existing site that is undergoing significant alteration can be serviced for the intended use, and that all onsite and off-site servicing requirements are clearly identified. The report shall include, as required:

- a) fire flow calculations;
- b) domestic demand;
- c) sanitary flows for allocation;
- d) plant capacity; and
- e) confirmation of pipe sizes.

The FSR shall incorporate all relative existing information including Town standards, reports, studies, record information in addition to site-specific and staging information. The Functional Servicing Report shall identify how the land will be serviced, focusing on the following:

- a) Geotechnical Investigation;
- b) Area and Site Grading;
- c) Transportation Network and Roadways;
- d) Water Distribution System;
- e) Sanitary Sewer System;
- f) Storm Drainage System Major / Minor;
- g) Utilities (Gas, Electrical, etc.);
- h) Public Open Space; and
- i) Sustainability.

1.3.10 Additional Reports:

The Town may require additional reports and/or assessments for proposed developments or existing sites undergoing significant alteration, such as, but not limited to:

- a) Sun and Shadow Study;
- b) Odour Study;
- c) Sign Evaluation Study;
- d) Spill Contingency Plan; and

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e) Foundation Survey Report.

1.4. METROLINX CORRIDOR:

Where a project is located within an area subject to various Metrolinx Policies the Project Engineer is required to contact Metrolinx and confirm requirements for the site. General information can be obtained on the website:

www.gosite.ca/engineering_public

Typical works requiring confirmation are related to (but not limited to):

- Stormwater Management
- Crash Berms
- Noise Attenuation
- Ground Vibration

1.5. BARRIER FREE CONSIDERATIONS:

All design projects throughout the Town of Innisfil must give due consideration to the Accessibility for Ontarians with Disabilities Act (AODA) and must incorporate ways to remove barriers for the public.

1.6. REVISION INFORMATION:

The Town of Innisfil recognizes that revisions and updates to this document will be required from time to time.

A complete list of revisions is included in Appendix A. It is the responsibility of the designer to obtain and make use of the latest version of this document available at the time of design.

Any person may request a change or revision by submitting a written request to the Manager of Engineering using the form provided in Appendix A.

1.7. APPROVED MATERIALS:

Products that are for use in public infrastructure jobs including roads, water systems, sewer systems and traffic related products must be approved by the Town. The Town has developed a list of products that have worked well in the past and have included these products in our Lists of Approved Materials found in Appendix B.

The Town has does not have the resources to properly test and evaluate the many products in the marketplace. The Town has decided to adopt the Designated Sources for Materials (DSM) from the Ministry of Transportation (MTO) which is available from The Road Authority (TRA) web site as acceptable products for use in the Town of Innisfil. The MTO and the TRA have extensive resources to test and approve new products. Products that are currently on the Town's Lists of Approved Materials will be grandfathered and these products can be used even if they are not on the TRA's website.

The Town reserves the right to remove products or add additional products if staff has enough information to support the change.

SECTION 2.0: ROADWAYS

2.1 GENERAL

This section specifies the requirements for designing, constructing and restoring roadways and driveways within the Town of Innisfil. Amendments to the Ontario Provincial Standards are contained within these standards and should be read carefully to ensure compliance during construction.

2.2 DESIGN

2.2.1 Classification

All roadways shall be classified in accordance with the Town's Official Plan and the classification of each roadway shall be confirmed with the Town prior to the commencement of engineering design.

All roadways are to be designed to urban standards unless specific approval is received from the Town. For land development projects, new roadways designed to rural standards may only be considered for estate residential or industrial developments.

Right of ways shall be a minimum of 20 m for window streets and local streets, 26 m for minor and major collectors, and 30 m for arterial roadways. The Town recognizes that these standards may not coincide with the minimum right of way information contained within the Official Plan; however, these standards shall take precedence.

Where a development adjoins or incorporates an existing County Road or Town arterial roadway as per the Town's Official Plan, the Developer shall deed to the County or the Town the required widening, which may be in excess of 20 m.

2.2.2 Pavement Design

The minimum pavement structure for the various road classifications is provided in the table below:

TABLE 1 - Minimum Pavement Structure

ROAD CLASS	SURFACE ASPHALT	BASE ASPHALT	BASE COURSE	SUBBASE COURSE
Local	40 mm SP 12.5 Cat. B or Cat. C	60 mm SP 19.0 Cat. B or Cat. C	150 mm Granular "A"	400 mm Granular "B"
Minor Collector	40 mm SP 12.5 Cat. B or Cat. C	60 mm SP 19.0 Cat. B or Cat. C	150 mm Granular "A"	400 mm Granular "B"
Major Collector	40 mm SP 12.5 or SP 12.5 FC1 Cat. C	100 mm SP 19.0 Cat. C	150 mm Granular "A"	450 mm Granular "B"
Arterial	40 mm SP 12.5 or SP 12.5 FC1, FC2 Cat. C or Cat. D	100 mm SP 19.0 Cat. C Cat. D	150 mm Granular "A"	450 mm Granular "B"
Industrial	40 mm SP 12.5 Cat. C or Cat. D	110 mm SP 19.0 Cat. C Cat. D	150 mm Granular "A"	500 mm Granular "B"

Note: Granular materials to meet requirements of OPSS.MUNI 1010 and Town of Innisfil Engineering Design Standards and Specifications Section 2.5.1.

The pavement structures in Table 1 are sufficient for the following amounts of Equivalent Single Axel Loads (ESALs):

TABLE 2 - ESALs Corresponding to Pavement Structures in Table 1

ROAD CLASS	ESALs
Local	300,000
Minor Collector	300,000
Major Collector	1,500,000
Arterial	1,500,000
Industrial	2,500,000

Superpave mixes shall be used unless otherwise approved by the Town.

Table 1 identifies the minimum pavement structures. However, the Town will require the geotechnical engineer to recommend the depth of granular base, and type and thickness of asphalt based on site conditions for each project.

The pavement structures identified above are a minimum and the actual pavement structure may need to increase as a result of the following:

- Local conditions such as soil type or water table;
- Anticipated traffic loading;
- To ensure that there will be no half load restrictions on collector, arterial, or industrial roadways; and

Any other requirements identified in the geotechnical report.

The Town will consider, on a case-by-case basis, the use of geogrid products as a component of a pavement design strategy. Geogrid products shall be a minimum of a biaxial grid. All recommendations must be made and sealed by the geotechnical consultant with supporting design documentation provided to the Town. Alternatives to a specified design using a geogrid product will not be approved based on properties alone. Proposed design alternatives shall be sealed by a geotechnical professional with supporting design documentation provided to the Town. Geogrid shall not be used as an attempt to remediate weak subgrade as a result of poor construction practices, including but not limited to, improper compaction procedures.

All asphalt materials and work shall conform to OPSS 1150, OPSS.MUNI 1151, and OPSS.MUNI 1101, except as amended by the attached Asphalt Special Provision (Appendix F).

SECTION 2.0: ROADWAYS

2.2.3 Geometric Elements

The following geometric standards shall be applied:

TABLE 3 - Geometric Standards for Road Design

ROAD CLASS (CROSS SECTION)	ROW WIDTH (m)	MINIMUM DESIGN SPEED (km/h)	PAVEMENT WIDTH (m)	MIN./MAX. GRADE (gutter) (%)	MIN. HORIZONTAL C/L CURVATURE (m)	VERTICAL CURVATURE MIN. 'K' VALUE		MIN. TANGENT BETWEEN HORIZONTAL CURVES (m)
						Crest	Sag	
Arterial (Urban)	30	80	14.0	0.5/5	340	50	30	120
Collector (Major – Urban)	26	70	14.0	0.5/6	190	25	25	80
Collector (Minor – Urban)	26	60	12.0	0.5/6	190	15	8	80
Industrial (Urban)	26	50	10.0	0.5/6	40 (See Note 1)	15	12	50
Industrial (Rural)	26	50	8.0	0.5/6	40 (See Note 1)	8	12	50
Local (Urban)	20	50	8.5	0.5/7	20	8	6	50
Local (Rural)	20	50	7.0	0.5/5	30	8	12	50

Notes:

1. Shall provide pavement widening on horizontal curves as per *Geometric Design Standards for Ontario Highways*.
2. On rural roads, the cross-section will change to urban where centreline grades are equal to or greater than 5%.
3. "Sawtoothed" of a roadway is not preferable and will require approval by the Town on a case by case basis.
4. K values less than those listed above may be considered for stop approaches with artificial lighting.
5. Minimum gutter grade along curved portion of the road shall be 0.7% where the road bend exceeds 45%.

2.2.4 Other Design and Construction Elements**2.2.4.1 Vertical Curves**

For local streets, all changes in grade of 2% or more shall be accommodated through the use of a vertical curve.

For all other road classifications, a change in grade of 1% or more shall be accommodated through the use of a vertical curve.

SECTION 2.0: ROADWAYS

2.2.4.2 Crossfall

Finished roadways shall have a minimum crossfall of 2%.

2.2.4.3 Curb Radii and Daylighting Requirements

The curb return radii, measured from edge of pavement, and daylighting requirements at intersections shall be in accordance with the table below:

TABLE 4 - Minimum Curb Radii and Daylighting Requirements

ROAD CLASS	INTERSECTING ROAD CLASS	MIN. CURB RADII (m)	DAYLIGHTING (m)
Local	Local	9	3
	Collector (Minor & Major)	9	5
	Arterial	9	10
Collector (Minor & Major)	Local	9	5
	Collector (Minor & Major)	12	10
	Arterial	15	10
Arterial	Local	9	10
	Collector (Minor & Major)	15	10
	Arterial	* (See Below)	15
Industrial	Any Other Class	18	15

*A compound curve shall be provided in accordance with M.T.O. *Geometric Design Standards for Ontario Highways* to accommodate a Wb-15 vehicle.

2.2.4.4 Cul-de-Sacs

Where cul-de-sacs are used, a minimum radius of 20.75 m at the property line and 15.0 m at the edge of pavement shall be applied.

Cul-de-sacs are to be provided at all dead ends, where there is no proposed connection to an existing street.

2.2.4.5 Community Mailboxes

Provisions shall be included in the design for community mailboxes. While the final locations are subject to approval by the Town and Canada Post, the designer must propose locations that are conducive to the pedestrian and vehicular movements anticipated in the area. As a result, placement on collector or arterial roads should be avoided. Further, mailboxes are to be located a minimum of 30.0 m from the edge of the road allowance at any intersection, preferably on a lot line and giving consideration to other aboveground features such as streetlights, fire hydrants, transformers, etc. Community mailboxes must have direct sidewalk access and are to face the sidewalk (if present). In rural areas, where sidewalk is not present, access is to be provided from the roadway. All Mailboxes must conform to Canada Post's *Standard Drawings and Specifications* (Aug. 2014 or latest version).

2.2.4.6 Transitions

Where a new street is to connect to an existing street, whether the design includes an extension of the existing street or connects at an intersection, the design shall extend along all existing streets for a sufficient length to provide a satisfactory transition. In the case of an

SECTION 2.0: ROADWAYS

intersection, the distance must be equal to the greater of the required stopping sight distance or the turning lane development lengths, if applicable, for all legs of the intersection.

2.2.4.7 Curb and Gutter

For local streets, standard barrier curb as per OPSD 600.040 (single stage) or 600.070 (two-stage) is permitted. Semi-mountable curb as per OPSD 600.060 may be used provided full barrier curb is not required to convey stormwater within the road allowance. Curb cuts in residential areas shall be in accordance with OPSD 351.010.

For collectors, arterials, and industrial streets, standard barrier curb as per OPSD 600.040 (single stage) or 600.070 (two-stage) is required. Curb cuts in residential areas shall be in accordance with OPSD 351.010.

Concrete curb and gutter shall be in accordance with OPSS.MUNI 353, with the exception that all concrete shall be supplied in accordance with the "Performance Specification Alternative" of OPSS.MUNI 1350 and shall meet the requirements of CSA A23.1, Exposure Class C-2, with a minimum compressive strength of 32 MPa at 28 days.

Curb ramps shall be provided at all sidewalk intersections with curb line. The transition from curb ramp to full curb shall be carried out over a length of 0.6 m and the dropped curb shall extend 0.3 m beyond the width of the sidewalk. If the resulting full curb between two sections of dropped curb for a sidewalk will result in a full curb section less than 1.0 m in length, the dropped curb shall be continuous, and the sidewalk panel widened to be continuous along the curb line.

All curb ramps shall include tactile walking surface indicator plates (truncated dome type) which conform to the most recent versions of OPSS 351 and OPSD 310.039. Tactile walking surface indicators shall be set to final elevation according to the manufacturer's instructions. The lip between the concrete sidewalk surface and the tactile walking surface indicator plate shall not exceed 3.0 mm at any point.

Curb and sidewalk shall be extended across commercial and industrial entrances unless the entrance is signalized or is aligned with a municipal street on the opposite side of the street. Curb cuts in commercial and industrial areas shall be in accordance with OPSD 350.010.

2.2.4.8 Sidewalks

The requirements for a 1.5m wide concrete sidewalk shall be confirmed with the Town prior to commencing the roadway design. Sidewalks shall be constructed in the locations shown on the typical road cross-sections.

All sidewalks are to be constructed in a manner that provides maximum assistance to individuals with limited mobility and without creating hazards to individuals who are visually impaired. A maximum sidewalk grade of 7% and a maximum crossfall of 4% will be permitted. However, the designer should strive to limit the grade to no more than 5% and the crossfall to 2%, where possible.

Sidewalk construction shall be in accordance with OPSD 310.010.

SECTION 2.0: ROADWAYS

All sidewalk is to be constructed on a properly compacted foundation of a minimum of 150mm of Granular 'A' or approved equivalent compacted to a minimum of 98% Standard Proctor Density.

All sidewalks must have a minimum offset of 1.0m from edge of sidewalk to the side slope of the roadside ditch.

Concrete sidewalk shall be in accordance with OPSS 351, with the exception that all concrete shall be supplied in accordance with the "Performance Specification Alternative" of OPSS.MUNI 1350 and shall meet the requirements of CSA A23.1, Exposure Class C-2, with a minimum compressive strength of 32 MPa at twenty-eight (28) days.

Concrete sidewalk ramps shall be installed as per OPSD 310.030, 310.031, or 310.033, where applicable and OPSD 310.039 regarding tactile walking surfaces. One (1) acceptable product is the tactile walking surface indicators (safety detection system) supplied by Bibby-Ste-Croix.

At the intersection of two sidewalks or where the sidewalk turns 90° to intersect the curb line, 1.0 m chamfering shall be provided.

Where sidewalk is provided adjacent to the curb and gutter, the sidewalk width is to be increased to 1.8 m.

At the discretion of the Town, wider sidewalks (1.8 m or greater) may also be requested to accommodate large pedestrian volumes or shopping carts, etc.

2.2.4.9 Grading within Right-of-Way

The boulevard area from the curb to the property line shall be graded to provide positive drainage toward the roadway at a minimum of 2% and a maximum of 8%.

For roads having a rural design cross-section (i.e. estate residential or industrial), the area between the edge of the road shoulder and the street line shall be graded and the ditches cut with slopes of 3.0 m horizontal to 1.0 m vertical from the edge of the shoulder to the bottom of the ditch and from the bottom of the ditch to the original ground. In fill areas over 1.5 m measured vertically from the edge of shoulder to the toe of slope, the fill slope shall not be steeper than 2:1. The ditch shall be located at the toe of the fill slope.

The height of sod located between the back of curb and the "forward" edge of the sidewalk should be installed at an elevation equal to or slightly less than the sidewalk surface.

In areas where erosion control is required, aesthetically pleasing options such as reinforced sod are to be used rather than rip-rap, where possible.

2.2.4.10 Road Crossing and Entrance Culverts

The minimum sizes for entrance and road crossing culverts are 400 mm and 500 mm, respectively.

The conveyance capacity of the culvert must be sufficient to ensure that the maximum depth of ponding as indicated in Section 4.6, Table 7 is not exceeded.

SECTION 2.0: ROADWAYS

Where the conveyance capacity of the minimum size culvert is not sufficient, a larger diameter culvert is to be sized using the cross-sectional end area calculated by the rational design method. Detail drawings and calculations shall be submitted for approval by the Town.

The minimum length of culvert shall be that which is required to extend from centre of ditch to centre of ditch with matching slopes not exceeding 3:1.

The minimum length of entrance culverts shall depend on the width of the entrance but shall extend no less than 1.5m on either side of the entrance.

Headwalls or end treatments will only be permitted where a 3:1 slope cannot be achieved. Because the use of headwalls or end treatments will only be permitted in exceptional circumstances, their design must be approved by the Town on a case by case basis.

The minimum depth of cover for all culverts is 300 mm unless otherwise indicated by the Town.

Culverts shall be constructed with granular bedding and backfill in accordance with OPSD 802.014 or 802.034.

Refer to Appendix B for a list of approved materials.

2.2.4.11 Driveway and Entrance Design

2.2.4.11.1 Grades

The maximum grade for driveways and entrances shall be 7% except in site-specific cases that receive written approval from the Town. This maximum grade is not recommended and should be employed only in exceptional cases where conditions prohibit the use of lesser grades. The minimum grade permitted is 2%. Maximum grade change shall be 4% at curb or sidewalk and 1% per 2.0 m average.

2.2.4.11.2 Location

Urban

All residential driveways shall be located in accordance with the setbacks as identified in the Zoning By-law and the offsets as identified in Appendix C – Minimum Offset Matrix.

On corner residential lots, the edge of driveway is to be a minimum of 4.5 m from the end of the daylight triangle.

Non-residential entrances shall not be located within 15.0 m of any intersection and any ramps shall have a minimum level stopping distance of 6.0 m provided between the ramp and the street.

Rural

On rural roadways, the end of the driveway culvert shall not be closer than 1.5 m from the extension of the side yard property line.

The same conditions apply for rural non-residential entrances as those listed for urban non-residential above.

SECTION 2.0: ROADWAYS

For both urban and rural situations where frontage or other limitations interfere with standard locations, site-specific solutions shall be provided for review and approval by the Town.

2.2.4.11.3 Driveway Pairing

Pairing of driveways is required for all residential lots with a frontage of less than 14.0 m and where the road grade does not exceed 2.5%.

2.2.4.11.4 Driveway Width

For a residential driveway, the minimum width is 3.0 m and the maximum width shall be equal to 60% of the lot frontage to a maximum of 9.0 m between the street line and the curb line.

For a non-residential and high-density residential, two-way entrance, the minimum width is 7.0 m measured at street line. Site-specific zoning regulations apply.

Water service/curb stops are to be a minimum of 1.0 m from the edge of the driveway.

2.2.4.11.5 Radius

For non-residential entrances and high-density residential, the minimum curb radius is 6.0 m, but may need to be greater to accommodate truck traffic and emergency service vehicles. The end of the curb radius at street line should not extend beyond property line.

2.2.4.11.6 Driveway Edging

For residential driveways, raised edging using concrete curbing or other materials along the sides of the driveway is not permitted within the Town road allowance, but may be constructed on private property.

2.2.4.11.7 Medians/Islands

The use of medians or islands at intersections and entrances for signalization, entrance/exit control, or aesthetics will be considered by the Town on a case by case basis.

2.2.4.11.8 Driveway Entrances

For residential driveways, between the back of curb and property line, the driveway entrance shall have a minimum of 150 mm of Granular 'A' and 50 mm HL3 surface asphalt or another hard surface as approved by the Town.

For non-residential entrances, the minimum pavement structure shall be 300 mm of Granular 'B', 150 mm of Granular 'A', 50 mm HL4, and 40 mm HL3. For fire routes, the minimum pavement structure shall be 450 mm of Granular 'B', 150 mm Granular 'A', 80 mm HL8 and 40 mm HL3.

A more stringent pavement structure may be required and must be confirmed by the Geotechnical Engineer.

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A lesser pavement structure, with a single lift of asphalt, may be considered for general parking areas outside of the fire route, with consideration for delivery vehicle needs.

2.2.4.12 Walkways

The Town has various types of walkways and different requirements for each. It is recommended that the requirements for walkways be discussed with the Town prior to commencing the engineering design. The following provides general requirements for three typical walkways.

Pedestrian Walkways and Park Maintenance Pathways

Where the walkway block is to serve only pedestrians or where it is to be used as an entrance to an Open Space Block or Park Area and may be used by maintenance equipment, the walkway is to be 3.0 m wide with a 1.5 m high chain link fence along each side of the walkway block. The walkway shall be concrete for the full 3.0 m width with no crown or reverse crown. In general, the sidewalk standards under Section 2.0 shall apply. No bollards or entrance gates will be required at street line. (See TOISD 404).

Walkway/Service Corridor

Where the walkway block also incorporates watermain, sanitary sewers, or storm sewers, it shall have a minimum width of:

- 9 metres for one sewer (sewer centered on the easement)
- 12 metres for dual sewer installation
- 6 metres for a watermain (watermain centered on the easement)
- 10 metres for one sewer with a watermain (3m easement limit to watermain, 2.5m clearance between watermain and sewer and 4.5m sewer to easement)
- 12 metres for dual sewer installation with a watermain

The above easement widths are minimum requirements and may be increased depending on the depth and size of the pipes within the easement and/or soil conditions, topography, or operational needs. Please see Section 5.13 for additional information.

The corridor shall have a 1.5m high chain link fence along each side. It shall include a 3.0m wide concrete walkway and landscape strips along each side.

The depth of the services beneath the walkway is to be approved by the Town. If excavation for maintenance would impact on the footings of adjacent homes or buildings, then an easement is to be provided adjacent to the walkway or the footings of those buildings is to be extended or a combination of the two (2) measures. This impact will be assessed by a qualified geotechnical engineer and the proposed solution described in the "Geotechnical Report".

The spacing of the trunk services shall also be considered and, if necessary, the walkway block is to be widened to accommodate all services. The horizontal separation of services is to meet the recommendations of the MECP and the centreline of the service must not be closer than 1.5 m from the limit of the walkway block. (See TOISD 401).

SECTION 2.0: ROADWAYS**SWM Pond Maintenance Access/Walkway**

Where the walkway is intended to be used by pedestrians but the main objective is for maintenance access to SWM pond features such as sediment forebays, spillways, or outlet structures, the access/walkway from the street into the facility is to be 8.0 m wide, including a 4.0 m wide asphalt surface equivalent to that of a local street, including granular base, or other hard surface as approved by the Town, and a 2.0 m wide landscaped strip will be provided along each side. Once inside the facility, the access/walkway width is to remain at 4.0 m and a 6.0 m buffer strip is to be provided between the access/walkway and private property. (See TOISD 401).

A pedestrian access gate shall be provided at street line, with a minimum clearance as noted in the detail drawing.

The minimum and maximum grades permitted for walkways are 0.5% and 3.0%, respectively except the portion of the access/walkway in a SWM Facility that extends down into the forebay. A maximum grade of 10% can be used for this purpose.

2.2.4.13 Multi Use Trails

Multi Use trails shall be created as identified in the Town's Trails Master Plan. Location and width of the trails must be discussed with the Town during pre-consultation stage. Trail signage to include TOISD 815, Rb-71 and Rb-73.

2.2.4.14 Fencing

Standard 1.5 m galvanized chain link fence with top rail shall be placed along all walkways, steep slopes, adjacent to commercial properties, between stormwater management facilities and private property, and elsewhere as required by the Town. Fencing of 1.2m height will be considered on a case by case basis.

Standard 1.8 m galvanized chain link fence with top rail shall be placed adjacent to institutional properties, open spaces, and in parks. The mesh shall be placed facing Town property.

The Town will require that a 1.8 m high wood privacy fence be installed between development property/lots and existing residential properties, between residential and agricultural, between residential and commercial properties, between residential and institutional properties, or between commercial and institutional properties. Where the residential lot is fronting on travelled road the wood fences must terminate at the front line of the house, and if fencing is required, continue to the front property line as a chain link fence (maximum height of 1.2m) so that it does not impact the visibility of the front yard to drivers.

Gates for access from private property to municipal or EA property are not permitted to be installed in any fence. Further, no gates shall be permitted in an acoustical fence, unless written approval is received from the Town.

The requirement for, location, and extent of acoustical fence shall be defined in the noise and vibration study and must be approved by the Town. The maximum height of acoustical fence shall be 2.15m, or as approved by the Manager of Engineering. If the noise and vibration study conclude that additional height must be added to the acoustical fence to achieve the required noise levels, this must be accomplished by installing the fence atop a

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berm. Acoustical fences that are maintained, repaired, and replaced by the Town shall require a minimum 2.0 metre easement for Town's access.

Where an open space block, park, or stormwater management facility is adjacent to a municipal road allowance, a fence will not be required unless necessary as part of a park development plan or as a result of slopes in excess of 3H:1V.

Generally, fences are to be placed at a 0.15 m offset from the common property line on the development property side, unless otherwise specified on TOISD411 and/or approved by the Town.

Refer to TOISD 401 to TOISD 411 for fencing and gate details.

In rural areas, and only where written approval is received from the Town, the installation of highway fence (farm fence) as per OPSS 971.101 and OPSS.MUNI 771 may be permitted.

2.2.4.15 Signs and Pavement Markings**2.2.4.15.1 Street Name Signs**

Double unit street name signs of an approved design, green in colour (high intensity Scotchlite grade) with high intensity white Highway Gothic lettering, shall be erected on 3.6 m (1.2 m lower channel and 2.4 m upper channel), double-slide, "U-Channel" galvanized steel posts, embedded 0.9 m in the ground. Street name signs are not to be mounted on stop sign posts, but may be strapped to streetlight poles using aluminum brackets if the poles are properly positioned and upon receiving written approval from the Town.

Street name signs installed on posts must be installed using a breakaway system.

Street name signs are to include "911" emergency address ranges, as provided by the Town.

2.2.4.15.2 Traffic Signs

Signs of the standard type approved by the Ontario Ministry of Transportation *Ontario Traffic Manual* shall be mounted on 3.6 m (1.2 m lower channel and 2.4 m upper channel), double-slide, and "U-Channel" galvanized steel posts, embedded 0.9 m in the ground. All signage must be installed using a breakaway system. The signs shall be located as required by the Town after a By-law is passed for their installation.

2.2.4.15.3 Pavement Markings

Upon completion of the final asphalt and upon notification by the Town, pavement markings shall be painted conforming with the Standards of the Ontario Ministry of Transportation, *Ontario Traffic Manual Book 11 (Pavement, Hazard and Delineation Markings)* at all intersections, school crossings, walkways, bike lanes and railway crossings to clearly indicate the proper traffic zones, lanes and stop lines.

Lane markings are to be organic, solvent-based, or water borne traffic paint complete with glass beads. All lane marking applications to new asphalt require two applications of paint. The second application shall not be applied until the first is tack free. Pavement markings are to conform to OPSS 710 and OPSS 1712.

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Traffic lane symbols stop bars and pedestrian crosswalks are to be durable pavement markings or field reacted polymeric pavement markings in accordance with OPSS 710, OPSS 1713, and OPSS 1714.

All pavement marking removal required to prepare the area for final pavement marking shall be done by abrasion.

Local streets do not require centreline pavement marking, but stop bars are required with a minimum of 15.0 m of centreline marking.

2.2.4.16 Public Transit

The designer shall confirm with the Town if there will be any requirements for the provision of public transit facilities within the development prior to the commencement of the engineering design.

At a minimum, arterial and collector roads are to be designed to accommodate the potential installation of 9.0 m long concrete bus stop waiting pads between the sidewalks and curb. These bus stop areas are to be provided on both sides of the street, with a maximum spacing and distance from intersections as provided by the Town.

2.2.4.17 Bicycle Lanes

The requirements for bicycle lanes are to be discussed at the planning stage and within the Traffic Impact Study.

At a minimum, on any street where the average daily traffic volumes in one direction of travel exceed 5,000 vehicles, bicycle lanes must be provided. This can be accomplished by providing an exclusive 1.5 m wide bicycle lane on both sides of the street or by providing a minimum 3.0 m multi-use trail on one side of the street. All bicycle infrastructure whether on the road or off the road shall be in accordance with *Ontario Traffic Manual* Book 18.

For major collector or arterial streets with average daily traffic volumes less than 5,000 vehicles in one direction, the Town may still require the provision of bicycle lanes in accordance with the overall Transportation Master Plan and Trails Master Plan.

Dedicated bicycle lanes are generally not required on local streets unless noted in the Transportation Master Plan and Trails Master Plan.

The design for the bicycle lanes shall be in accordance with the Transportation Association of Canada (TAC) *Urban Supplement to the Geometric Design Guide for Canadian Roads*.

The designer shall confirm with the Town if there will be any requirements for the provision of bicycle lanes prior to the commencement of the engineering design.

2.2.4.18 Other Site Plan Considerations**2.2.4.18.1 Parking Design**

When designing the layout of parking lots, the designer shall consider the turning requirements for delivery vehicles and emergency vehicle access. They should also take into account queue development at the entrance, pedestrian flow through the parking area, and dropped curb with ramps at convenient locations for wheelchair accessibility.

SECTION 2.0: ROADWAYS

The designer shall meet the parking requirements identified in the Town Zoning By-law as well as setbacks from property line.

2.2.4.18.2 Grading

The grading of parking areas should not be less than 0.5% and not more than 5.0% with 1.0% preferred. Grades perpendicular to parked vehicles should not exceed 4%. The grading shall provide for an overland flow route to an adequate drainage outlet without exceeding a ponding depth of 0.3 m anywhere on the parking lot.

2.2.4.18.3 Parking Spaces and Laneways

The standard parking space dimension, perpendicular to the direction of traffic, shall be 6.0 m long by 3.0 m wide. Laneways between rows of parking shall be 6.0 m wide for two-way traffic and 4.0m wide for one-way traffic, subject to any approved changes to the Town's Zoning By-law. The 6.0 m parking stall length can be reduced to 5.7 m if there is suitable overhang at the curb line. The parallel parking stalls shall be a minimum of 7.0 m long and 2.75 m wide (excluding the width of the gutter).

Internal private condominium roadways shall have a minimum width of 6.0 m edge of asphalt to edge of asphalt.

Barrier-free parking spaces are to be provided at a ratio of 1:30. Where the application of this ratio results in a fraction of a parking space, the required number of spaces shall be increased to the next whole number. Each space is to be 3.0 m wide with a 1.5 m access aisle. All barrier-free parking spaces are to be signed with the accessible parking symbol painted on the asphalt of each space and with the By-Law sign posted in front of each space.

All access ramps to sidewalks shall be located so that they are in line with the access aisle and not obstructed by any parking space.

Parking spaces are to be delineated with 0.1 m wide yellow paint lines.

2.2.4.18.4 Layout

The parking lot layout shall provide an area for snow storage that does not impact accessible parking; does not reduce the total parking spaces by more than 5%; and has consideration for the features of the landscaping plan.

Where monolithic curb and sidewalk is used in a parking area, the minimum width of the sidewalk is to be increased to 1.8 m if a car bumper may overhang the curb.

2.2.4.18.5 Security and Lighting

Parking areas are to be located in highly visible areas of the site. For illumination of parking spaces, aisles, and driveways, the lighting shall be arranged to divert the light away from adjacent properties and streets and shall be downcast. See Section 3.3.2.2 for additional design criteria.

SECTION 2.0: ROADWAYS**2.2.4.18.6 Fire Routes**

A 6.0 m wide fire route, measured edge of asphalt to edge of asphalt, with a clear radii of 9.0 m (inside), 12.0 m (centreline), and 15.0 m (outside) must be provided and shall have a minimum pavement structure of 450 mm Granular 'B', 150 mm of Granular 'A', 80 mm of HL8, and 40 mm of HL3. The fire route is to be signed and no parking signs installed as required.

The fire route must also be designed to meet any and all requirements under the Ontario Building Code.

The fire route design is subject to approval by the Town and the Fire Department.

2.2.4.18.7 Landscaping

All landscape plans shall be prepared by an accredited professional Landscape Architect in good standing with the Ontario Association of Landscape Architects (OALA). The Landscape Architect shall coordinate and liaise with all other consulting professionals to ensure accurate representation of the site and the proposed development.

Existing vegetation should be incorporated where grading, drainage, and species allow for continued health of the vegetation. Existing vegetation which provides screening between residential areas and commercial/industrial/institutional and collector/arterial roads should be prioritized for retention. All healthy perimeter trees, defined as those immediately on the shared property boundary or on adjacent property with a canopy overhanging the property boundary, must be protected, unless written approval is provided by adjacent landowners for removal or unless it is deemed to be a road safety issue by the Town.

Landscaping shall be provided for the control of noise, wind, erosion, glare, and aesthetics. Natural features such as trees should be preserved and incorporated as much as possible into the design.

Refer to Section 8.0 for additional information.

2.2.5 Roadway Surface Maintenance and Rehabilitation

For the surface maintenance and rehabilitation of rural roadways, and only where approved by the Town, single or double surface treatment as well as cold in-place recycling with expanded asphalt may be permitted.

Surface treatment is to be completed in accordance with OPSS.MUNI 304 and OPSS.MUNI 1103. Cold in-place recycling with expanded asphalt is to be completed in accordance with OPSS.MUNI 335. At the discretion of the Town, surficial cracking of an asphalt roadway may be temporarily sealed through traditional route and seal methods (OPSS MUNI 341). Other methods may be recommended by a Geotechnical Engineer.

Upon completion of the Town of Innisfil asphalt inspection, a course of remedial action may be provided which may include, but not limited to, the utilization of asphalt reinforcement geosynthetics for pavements.

Crossings made on an existing roadway should be reinstated with fill materials approved by a geotechnical engineer, or unshrinkable fill up to sub-grade followed by the existing adjacent pavement structure. Where the existing pavement structure cannot be mimicked, or where

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unshrinkable fill extends into the frost penetration zone, frost tapers should be incorporated. Frost tapers should be a minimum of 10H: 1V in the direction of the roadway (parallel to road centerline). The existing asphalt should be milled to allow the new asphalt to be lapped at least 0.3 m with a tack coat.

2.3 SCHEDULING OF WORK

The contractor shall provide the Town with a detailed work schedule prior to the start of construction. The schedule should include all major project tasks, start date & task duration, and updates should be provided to the Town regularly, and during any significant scheduling changes. The schedule should also reference any project restrictions including; but not limited to, Reduced Load Periods, the limitations of the Town's Noise By-law, including no weekend work (unless a Saturday Noise Exemption Permit has been obtained), preventing unnecessary disruption to public traffic, deadlines for temperature sensitive work such as hot mix asphalt paving and concrete placement, etc.

The contractor shall schedule temporary restoration of the roadway to follow closely behind trench backfilling. Unless otherwise noted, permanent restoration may be delayed until all trenching has been completed.

All work should be scheduled in a way that excavations are not left open when adjacent to, or on an open lane of traffic at night, or when work is inactive.

2.4 MAINTENANCE

The contractor is responsible for maintenance of all Services in order to ensure the safety of vehicle traffic and pedestrians during construction, as well as during the maintenance period outlined in the contract.

In this section a Service is defined as; roads, curbs, gutters, sidewalks, buried infrastructure, drainage works, lighting, landscaping, erosion and sediment control measures, and any other works outlined in the project contract or plans and specifications.

Maintaining Services includes but is not limited to the following;

- Rectify, replace, or repair any Service not constructed in accordance with the approved plans and specifications.
- Maintain roads in a mud and dust free condition and free of debris and obstructions.
- Ramp all maintenance holes and catch basins with hot mix asphalt as required.
- Maintain adequate and safe traffic control measures to ensure the safety of workers, vehicles and pedestrians.

2.5 MATERIAL SPECIFICATIONS**2.5.1 Granular Materials & Soils**

The requirements of OPSS.MUNI 1010 shall apply for all granular material used to construct, restore, and maintain roadways and driveways except where amended herein.

The contractor shall provide to the Town the confirmed source of granular material or materials, a minimum of two weeks prior to construction. A sample of each material should be obtained and tested in order to confirm conformance with the contract and plans and specifications.

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2.5.1.1 Granular A

OPSS.MUNI 1010.05.02 (amended) – The Contractor shall supply Granular A produced by:

- a) Crushing quarried bedrock (100% crushed).
- b) Crushing quarried bedrock (100% crushed) including Reclaimed Asphalt Pavement (RAP) up to 30% by mass.

The blending of RAP with granular material shall only occur with the use of cold feed bins or a procedure approved by the Town. Prior to using granular material with RAP, QC/QA samples shall be obtained to determine the amount of asphalt-coated particles using MTO Test Method LS-621.

Granular A produced from naturally deposited sand, gravel, and cobbles may be permitted subject to receiving written permission by the Town.

2.5.1.2 Granular B

OPSS.MUNI 1010.05.03 (amended) – The Contractor shall supply **Granular B Type II** produced by:

- a) Crushing quarried bedrock (100% crushed).

Granular B Type I produced from naturally deposited sand, gravel, and cobbles, or quarried bedrock may be permitted subject to receiving written permission by the Town.

OPSS 1010 for Granular B Type I is amended as follows:

TABLE 5 - Amendment to OPSS1010

Sieve	Percent Passing by Mass
4.75 mm	20 – 90
1.18 mm	10 – 80
300 µm	2 – 55
150 µm	0 – 25

2.5.1.3 Recycled Materials

In some cases, the Town may permit the use of granular materials produced from Reclaimed Concrete Material (RCM). RCM may contain RAP up to a maximum of 30% by mass. Prior to using RCM, the contractor must receive written approval from the Town. Prior to using materials that contain RAP, QC/QA samples shall be obtained to determine the amount of asphalt-coated particles using MTO Test Method LS-621.

The Town does not permit granular products that contain glass or ceramic material.

Granular material shall not contain more than a combined total of 0.5% by mass of deleterious material. Deleterious materials include but are not limited to, wood, clay, brick, clay tile, gypsum, gypsum plaster, and wallboard.

2.5.1.4 Testing and Sampling

The contractor must provide the source of granular materials no later than two weeks prior to the start of construction. The contractor will be responsible for Quality Control (QC) testing unless otherwise noted in the contract documents. The Town may retain a Materials Testing

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& Inspection firm to conduct regular sampling and Quality Assurance (QA) testing on all materials from both the source, and project sites. Granular material shall be sampled and tested to confirm gradation, as well as the Maximum Dry Density, and Optimum Moisture Content at a minimum frequency of one sample for every 1,000 tonne of material placed, unless otherwise approved by the Town. Additional sampling and testing may be required due to changes to the supplier, or inconsistency of the imported material.

Sampling procedures shall be in accordance with the Ministry of Transportation Laboratory Testing Manual, Test Method LS-625 Guidelines for Sampling of Aggregate Materials.

Testing procedures should conform to the Ministry of Transportation Laboratory Testing Manual and / or the applicable CSA, ASTM, or AASHTO specifications.

2.5.2 Hot Mix Asphalt

The requirements of OPSS.MUNI 1150 and OPSS.MUNI 1151 shall apply to Hot Mix Asphalt (HMA) materials used to construct, restore, and maintain roadways and driveways except where amended herein.

The contractor shall provide the Town with the confirmed source of hot mix asphalt materials a minimum of two weeks prior to construction. A sample of each material should be obtained and tested to confirm conformance with the contract, plans and specifications.

2.5.2.1 Asphalt Cement

Performance Graded Asphalt Cement (PGAC) shall be supplied from an MTO Designated Source for Materials supplier and meet the requirements of OPSS.MUNI 1101 as amended herein.

Asphalt cement shall meet the Performance Grade PGAC 58-34XJ for local and collector streets, as well as non-commercial driveways.

Asphalt cement shall meet the Performance Grade PGAC 64-34XJ for arterial and industrial roads, as well as commercial driveways.

Reference *Town of Innisfil Engineering Design Standards and Specifications Manual Appendix F: Asphalt Special Provisions* for detailed specifications regarding asphalt cement, sampling and testing.

2.5.2.2 Asphalt Aggregates

Asphalt aggregates shall conform to OPSS.MUNI 1001 and OPSS.MUNI 1003.

The use of steel slag or blast furnace slag in asphalt mixtures is not permitted.

2.5.2.3 Asphalt Mix Designs

Mix designs shall be completed in accordance with OPSS.MUNI 1150 and OPSS.MUNI 1151. Superpave mixes shall be used unless otherwise specified and/or approved by the Town.

SECTION 2.0: ROADWAYS

Mix designs shall be submitted to the Town a minimum of two weeks prior to the start of paving. Unless otherwise stated in the contract documents, the mix design submission shall include, at a minimum, the following:

- a) A letter from the project Geotechnical or Materials Engineer confirming that the proposed mix conforms to the Town specifications.
- b) All documents listed in OPSS.MUNI 1150.04.02.03 and OPSS.MUNI 1151.04.05.
- c) Laboratory testing results that confirm the physical and Superpave consensus properties of the aggregates are in conformance with OPSS.MUNI 1001 and OPSS.MUNI 1003, except as amended in this document.

OPSS.MUNI 1150 is amended as follows:

TABLE 6 - Amendment to OPSS.MUNI 1150

Mix Type	Asphalt Cement Content (Min. %)	RAP (Max. %)
HL-1	5.2	0
HL-2	6.0	20
HL-3F	5.8	20
HL-3	5.3	0
HL-3HS	5.3	0
HL-4	5.3	20
HL-8	5.0	20
MDBC	5.0	20
HDBC	5.0	20

Note: Marshall mixes are only to be used when the Contractor receives written permission from the Town. Marshall mixes will generally be accepted in areas without regular traffic including but not limited to, driveways, walkways, maintenance roads, and parking lots.

OPSS.MUNI 1151 is amended as follows:

TABLE 7 - Amendment to OPSS.MUNI 1151

Mix Type	Asphalt Cement Content (Min. %)	RAP (Max. %)
SP 9.5	5.1	0 (Note 1)
SP 12.5, FC1, FC2	5.1	0
SP 19.0	4.9	20

Note 1: SP 9.5 may contain up to a maximum of 20% RAP when used for HMA padding, or curb infill during two stage curb construction.

SECTION 2.0: ROADWAYS**2.5.2.4 Asphalt QA/QC Testing**

The requirements of OPSS.MUNI 310, OPSS.MUNI 1150, and OPSS.MUNI 1151 for Hot Mix Asphalt sampling and testing shall apply except where amended herein.

The contractor shall, upon request, allow the Town, contract administrator or their representatives to enter upon the premises of any of the material manufacturers, suppliers, plants, laboratories, or equipment for purposes pertaining to the work, to carry out such inspection, sampling and testing as specified or requested by the Town, contract administrator or their representatives.

Prior to the start of production of HMA, the QA Technician must sample each aggregate identified in the approved mix design, including RAP, to conduct Aggregate Density Testing. Additional samples shall be taken immediately after the completion of 10,000 tonnes of HMA. Voids in Mineral Aggregate (VMA) shall be calculated based on the combined Bulk Relative Density (Gsb) of the blended aggregates tested by the QA Laboratory, and the Bulk Relative Density (BRD) of the HMA samples obtained on site.

Frequency of HMA sampling shall be in accordance with OPSS.MUNI 310 Table 6.

Samples of loose HMA shall be obtained using sampling plates. The QA/QC technician shall obtain at least three equal increments of HMA, selected at random, and combine to form a field sample that weighs a minimum of 10 kg for Marshall mixes, and a minimum of 20 kg for Superpave mixes. This process shall be repeated for each sample taken.

Core samples shall be a minimum of 150mm in diameter. Coring shall only be completed when written permission is provided by the Town.

Any disturbed area due to sampling procedures must be repaired immediately after sampling. HMA and compaction requirements for filling sample holes shall be the same as the adjacent undisturbed pavement. Sample holes shall be clean and dry prior to filling and shall be compacted using a mechanical self-powered compactor.

Samples shall be tested by a Canadian Council of Independent Laboratories (CCIL) certified laboratory to confirm that the HMA conforms to the Town specifications;

- a) For Marshall mixes, samples shall be used to determine compliance of asphalt cement content, aggregate gradation, air voids, flow, voids in mineral aggregate, and stability requirements.
- b) For Superpave mixes, samples shall be used to determine compliance of asphalt cement content, aggregate gradation, and Superpave mix properties in accordance to AASHTO M323.

OPSS.MUNI 310 is amended as follows:

All Acceptable results will remain as Acceptable. Borderline and Rejectable tolerances shall be identified as 'Unacceptable'. Unacceptable results will in most cases warrant removal of the asphalt or a payment reduction as instructed in writing by the Town.

SECTION 2.0: ROADWAYS**2.5.3 Concrete**

The requirements of OPSS.MUNI 1350 shall apply to ready mixed concrete materials used to construct, restore, and maintain any concrete object located within Town property or R.O.W. including but not limited to curb, sidewalk, and structures.

The contractor shall provide to the Town with the confirmed ready mixed concrete supplier a minimum of two weeks prior to construction.

Concrete suppliers shall provide a valid Certificate of Ready Mixed Concrete Production Facilities as issued by the Ready Mixed Concrete Association of Ontario (RMCAO).

The Town requires a minimum of 24 hours notice prior to placing concrete.

2.5.3.1 Concrete Mix Design

Mix designs shall be submitted to the Town a minimum of two weeks prior to concrete placement. The mix design submission shall include the following:

- a) A valid Certificate of Ready Mixed Concrete Production Facilities as issued by the Ready Mixed Concrete Association of Ontario (RMCAO).
- b) A summary of all materials, and sources used in each mix including, but not limited to; cement, supplementary cementing materials (slag, fly ash), coarse and fine aggregate, water, chemical admixtures, and air entrainment.
- c) A certificate or letter verifying the compatibility of the admixtures to be used in the concrete, if admixtures are supplied from different manufacturers.
- d) Target air content (%) and slump range (mm).
- e) Test data confirming the scaling resistance of concrete surfaces when the concrete mix is used to construct curb or sidewalk. Testing shall be in accordance with CSA A23.2-22C or MTO LS-412.

The Town may request additional documentation of the materials used in any concrete mixture before placement, or any time during the maintenance period. When requested in writing from the Town, the contractor shall supply testing results that confirm the gradation, physical requirements, and scaling resistance of the materials conform to OPSS.MUNI 1002.

Only ground granulated blast furnace slag (Type S) is permitted, up to a maximum of 25% in any concrete mix.

2.5.3.2 Concrete QC/QA Testing

Concrete sampling and testing should be in accordance with CSA A23.1:19/CSA A23.2:19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete. QC/QA sampling and testing shall only be performed by a Canadian Council of Independent Laboratories (CCIL) or American Concrete Institute (ACI) certified technician. Laboratory testing shall only be completed by a CCIL certified lab.

The contractor shall arrange for on-site quality control testing which shall conform to the **minimum** frequencies below:

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- a) **Compressive Strength** – Not less than one set of three cylinders for every 100m³ of concrete placed, with no less than one test for each class of concrete placed on any one day.
- b) **Slump** – Not less than the first five loads per mix per day, plus one test for every air test that is completed.
- c) **Air Content** – All concrete mixes should be tested for air content (whether air entrained or not). For classes C-2, C-1 and C-XL, the first five consecutive loads shall be tested to confirm consistency. Thereafter, testing may be performed every third load.
- d) **Temperature** – Temperature readings should be recorded every time a sample is taken for any of the aforementioned testing requirements. Temperature should be recorded to the nearest 0.5°C.

2.6 ROADWAY CONSTRUCTION

The contractor shall construct all Town roadways and driveways in accordance to the specifications in this section. This section contains amendments to the OPSS and should be read carefully to ensure compliance during construction.

2.6.1 Grading

Grading shall conform to OPSS.MUNI 206 except where amended herein.

Grading shall conform to the Town of Innisfil Standard Details (TOISD), and project drawings and specifications.

Grading tolerances are as follows:

- a) Subgrade / Trench Backfill +/- 20mm of proposed elevation.
- b) Granular Subbase (Granular B) +/- 15mm of proposed elevation.
- c) Granular Base (Granular A) +/- 10mm of proposed elevation.

2.6.2 Subgrade Preparation and Trench Backfilling

The use of site excavated inorganic soil is generally acceptable for use as a trench backfill, providing:

- a) Backfilling operations are carried out in a strict conformance with the requirements of OPSS.MUNI 401, using earth compacting equipment of appropriate type, size, and weight;
- b) The minimum compacted density within 1.0 metre of the final subgrade is to be compacted to 98% of the Standard Proctor Maximum Dry Density (SPMDD), with in-situ moisture content within 2% of the optimum value; and,
- c) Soil moisture content higher than the optimum value, is better suited for trench backfilling below the upper 1.0 metre of subgrade, as the degree of compaction required at this depth may be relaxed to 95 % SPMDD. The addition of water may be required, particularly during dry summer conditions, subject to the discretion of the Geotechnical Consultant and/or Town Inspector.

SECTION 2.0: ROADWAYS

During construction, a geotechnical consultant must inspect the condition of the roadway subgrade and supervise the installation of pipe bedding/embedment and the backfilling of all trenches within road allowances and easements.

The Geotechnical Consultant shall be present during trench backfilling and consolidation operations, ensuring that OPSS.MUNI 401 is strictly adhered to. The Geotechnical Consultant is to certify that he/she, or his/her designate, has conducted a sufficient number of tests to obtain a comprehensive summary of the degree of compaction achieved, and that all works were constructed in accordance with OPS.MUNI 401.

The Geotechnical Consultant's personnel must be on site at all times when two mainline or service construction crews are working. When there are more than two crews working on the site at the same time, additional personnel may be required.

The Town of Innisfil requires a compaction test on every fill layer placed. Testing of the roadway subgrade, granular materials, and asphalt shall be performed at a frequency not exceeding 20 linear metre intervals, utilizing a "Z" pattern which will ensure the testing of the entire roadway width. As a minimum, one compaction test on every fill layer within lateral service trenches is required. Backfill shall be placed to a minimum depth of 900 mm above the crown of the pipe before power operated tractors or rolling equipment shall be used for compacting. Fill layers placed shall not exceed 300 mm in thickness (loose). The results of all field density tests obtained shall be plotted on plan and profile drawings and provided to the Town.

Prior to placing granular materials, the road subgrade shall be heavily proof rolled to ensure uniform support for the pavement structure. Other elevations of the roadway may also be subject to proof rolling when requested by the Town. For proof rolling, a 20-tonne gross mass vehicle with pneumatic tires shall be used. The vehicle shall make a minimum of three separate passes to subject every point of the surface being inspected. Each pass shall not exceed an offset of more than one tire width and the speed of the vehicle shall be within 2 km/h and 5 km/h. Where elastic movement in excess of 25 mm that does not exhibit significant cracking is observed, the surface shall be scarified and allowed to dry prior to re-compaction. Once the material has dried and is re-compacted, another proof roll shall be completed. Where permanent rutting in excess of 25 mm is observed, or where elastic movement in excess of 25mm with significant cracking is observed, the surface shall be deemed as defective. Defective areas shall be removed and replaced as specified below.

All soft areas shall be excavated and backfilled with similar site available material and compacted to the required density specified in the approved drawings and / or geotechnical report. When on site material cannot be utilized, imported granular material such as Select Subgrade Material (SSM) or Granular B as per OPSS.MUNI 1010 may be substituted if approved by the Town. Frost tapers shall be provided at the perimeter of all repaired areas where site similar material was not utilized. Frost taper slopes shall be no steeper than 10H:1V in the longitudinal direction (parallel to the road centreline), and 4H:1V in the transverse direction (perpendicular to the road centreline).

All sub-excavated areas within the roadway should be clearly noted on the as-recorded drawings. The records should include the limits of excavation (length, width, and depth), what material was used as replacement, and if any subgrade stabilization methods were utilized (geogrid, geotextile, lime treatment, etc.).

SECTION 2.0: ROADWAYS

The subgrade shall be shaped to conform to the required longitudinal grade and cross-section and shall have a cross-fall of 3% from the centreline of roadway to each side unless otherwise approved by the Town. If considered necessary by the Town, the subgrade shall be re-compacted with suitable mechanical compaction equipment as required to produce a solid base for the road granular.

The final subgrade certification is to confirm that the final subgrade condition is equal to or better than that anticipated in the preparation of the pavement design. The certification letter is to display the Professional Engineer's Stamp for the Geotechnical Consultant.

The findings of the compaction reports and the aforementioned certification, in a form acceptable to the Town, shall be forwarded to, and acknowledged by the Town, prior to placement of the granular road materials.

2.6.3 Road Subdrains

Subdrains shall be a minimum 100 mm diameter and installed as per OPSS.MUNI 405. Subdrains shall be provided on both sides of the roadway for the purpose of draining the granular road base to a suitable outlet. Refer to Materials List in Appendix B for approved materials.

In general, the subdrains are to be connected to catch basins. When a subdrain is extended to discharge above grade, the last 3.0 m section shall be rigid pipe with a rodent grate and marker provided.

The connection of other piping and drainage systems such as sump pumps to the subdrain system is not permitted.

The Town may, at their sole discretion, order that all or any portion of the installed subdrains be inspected using CCTV equipment according to OPSS.MUNI 405.07.08 and OPSS.MUNI 409.

2.6.4 Placing Granular Materials

The requirements of OPSS.MUNI 314 shall apply for the placement of granular material except where amended herein.

The requirements of OPSS.MUNI 501 shall apply for compaction except where amended herein.

Granular materials shall only be placed on a properly prepared subgrade that has been inspected and approved by the geotechnical engineer and the Town. Prior to placing granular material, the contract administrator shall confirm that the prepared subgrade meets the aforementioned grading tolerances.

Remove and replace any areas where the materials have become segregated prior to compacting. For roadway base or subbase construction, lift thickness shall not exceed 150mm. Granular material shall be compacted to 100% SPMDD, unless otherwise specified in the approved plans and specifications.

SECTION 2.0: ROADWAYS**2.6.5 Asphalt Pavement Construction**

The requirements of OPSS.MUNI 310 shall apply for constructing, repairing, or replacing hot mix asphalt pavements except where amended herein.

Paving of both binder and surface asphaltic concrete courses is not permitted within the Town from November 15 through to March 31 of the following calendar year, inclusive, without prior written permission by the Town. In all cases, no paving shall be carried out when ambient temperatures at the surface are below those noted in OPSS.MUNI 310 for both binder and surface courses.

Prior to paving works, the contractor shall schedule a site meeting with the Town, Contract Administrator, and the Project Materials Testing Consultant. During the site meeting the existing surface conditions shall be inspected and the Contractor shall provide a detailed work plan to ensure the quality of materials and workmanship.

Saw cut existing asphalt full depth in neat, consistent, parallel lines and at 90° angles. Diagonal or meandering cuts are not permitted. Ensure saw cut edges are clean and vertical. Where the edge of a trench or cut is within 1.2 m of the edge of existing pavement, the asphalt shall be removed to said edge of pavement. This provision applies to all asphalt surfaces.

All abutting edges of existing pavement shall be prepared and coated with tack coat prior to placement of new asphalt. Tack coat shall be placed by the use of a mechanical (pump driven) spray wand that is capable of being heated for cold weather operation and applying the tack coat in a consistent uniform application. All longitudinal joints and transverse joints shall be tack-coated prior to placement of the adjacent pass of asphalt. No asphalt shall be placed on the tack-coated surface until the tack coat has cured. Tack Coat Materials, Sampling, and Application shall be in accordance with OPSS.MUNI 310 and OPSS.MUNI 1103.

The use of a Material Transfer Vehicle (MTV) is required when placing any asphalt mixture on a roadway. Where the use of an MTV is not practical due to physical constraints, the hot mix asphalt must be delivered with live bottom trailers. The physical restraints shall be identified at the pre-pave meeting and the Contractor shall receive written permission by the Town prior to eliminating an MTV from the scope of work.

The Contractor shall construct durable longitudinal and transverse joints. Any joint cracking occurring within the Warranty Period shall be deemed to be a deficiency and all costs associated with remedial work shall be the responsibility of the Contractor.

At all cold longitudinal and transverse joints in the new HMA pavement under-compacted material at an unconfined edge of the new asphalt mat shall be removed (a minimum 150mm from the unconfined edge) and a straight, clean vertical face constructed.

Longitudinal joints in the surface course shall be parallel to the demarcation between the driving lanes (i.e. line paint), wherever feasible, at an offset of 100 mm to 150 mm from the centerline of the demarcation (approximately 1.5 m away from the inner wheel path). The joint shall not be placed in the wheel paths. The compacted asphalt density at any joint shall be at least 91% Maximum Relative Density (MRD) when measured using a nuclear densometer or by checking percent core compaction.

SECTION 2.0: ROADWAYS

After final compaction, each course of HMA shall be of uniform texture and shall be free of segregation, fat spots, oil spills or any other defects. Defective areas shall be removed and replaced by the Contractor with acceptable hot mix of the same type and compacted to the satisfaction of the Town. When segregation is observed, the Contractor shall be immediately notified verbally, and shall take immediate corrective action. If the segregation continues, the Town may then issue a Stop Work Order until the problem is corrected.

Daily compaction tests for quality control purposes, using a nuclear densometer shall be performed at a minimum frequency of once per road, and no less than one test per twenty (20) linear metres. Daily compaction results shall be provided verbally to the on-site Inspector, followed by an email copy of the report to the Contract Administrator, and the Town within twenty-four (24) hours.

Compaction testing of the placed HMA shall meet the requirements of OPSS.MUNI 310 Table 10. Percent compaction shall be determined by comparing the density obtained using the nuclear densometer with the Maximum Relative Density (MRD) of the respective plate sample.

2.6.6 Gravel Surfaces

Gravel surfaces shall be constructed and restored as shown on the Contract Drawings or specified in the Special Provisions.

Granular material shall be placed in layers not exceeding 150 mm and compacted to 100% SPMDD. Prior to compaction each layer shall be graded to ensure a smooth surface.

A geotechnical consultant must be presented to confirm the degree of compaction during construction.

2.6.7 Surface Treated Areas

Surface treated areas shall be constructed or restored as shown on the Contract Drawings, or as directed by the Contract Administrator.

Surface treatment shall conform to OPSS.MUNI 304.

Hot mix asphalt may be used to patch surface treated roads.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

3.1 GENERAL

The location of all utilities must be established and resolved in conjunction with the Town and the Utility Companies, while generally following the locations shown on the typical road cross-sections.

Compaction of backfill for utility trenches shall be 95% Standard Proctor within boulevards and 100% for driveways and road crossings.

Design Engineer is required to prepare the Composite Utility Plans, secure approvals by all utility companies, including InnPower, and include in the set of Engineering Drawings being part of Subdivision Agreement. Composite Utility Plans must be available for review the latest at the 2nd submission of engineering drawings.

For information of all designers – as required by the Ontario Building Code, all residential properties must be equipped with the Electrical Vehicle Charging outlet. Design Engineer must familiarize himself with the most current charging facilities required by different manufacturers of the electric or hybrid vehicles. The additional load on the electrical system must be included in design of the entire network, including transformers and power cables. Joint consultation with InnPower and Town staff is required at the initial stage of designs.

Utility crossings shall be 1.0m minimum horizontally and 0.25m minimum vertically from any service connection (distance is based from the outside edge of utility crossing to the outside edge of the service connection).

3.1 UTILITIES

3.2.1 Telecommunications

Telephone, cable, and fibre optic services shall be underground in locations as shown on the typical road cross-sections and shall be installed by an approved utility Contractor.

3.2.2 Hydro

Hydro service shall be underground in locations as shown on the typical road cross-sections and shall be installed by Innisfil Hydro or an approved Contractor.

3.2.3 Gas

Gas service shall be underground in locations as shown on the typical road cross-sections and shall be installed by the Gas Company or an approved Contractor.

3.3 STREETLIGHTING

3.3.1 General

All roadways are to be lit, unless written approval is received from the Town. Streetlights shall be provided throughout all developments and may be required on roadways bordering developments if deemed necessary by the Town.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

A qualified engineering consultant shall prepare the streetlight design, including photometric layouts using an approved computer lighting program such as AGI 32, AutoLux, or equivalent.

All drawings must be sealed by a registered electrical Professional Engineer, licensed to practice in the Province of Ontario. Any attachments to hydro poles must have Hydro Authority approval and comply with Regulation 22/04 (or the latest revision thereof). All roadway lighting design and construction is subject to Electrical Safety Authority (ESA) inspection and approval.

The Transportation Association of Canada (TAC) "Guide for Design of Roadway Lighting", Volumes 1 and 2 provide comprehensive design guidelines and may be used for lighting devices for roadways and associated facilities.

3.3.2 Design Criteria**3.3.2.1 Within Public ROW**

Lighting design criteria for roadways, sidewalks, pedestrian walkways, and bikeways on public right-of-ways within the Town of Innisfil shall be based on the "American National Standard Practice for Roadway Lighting", ANSI/IESNA RP-8-14, or the latest revision thereof.

The lighting system shall provide the average maintained light levels and meet the recommended uniformities and veiling luminance ratios as indicated in Table 4 and 5.

"Luminance" criteria may be used for determining light levels on straight and level roads that have a minimum length of ten (10) luminaire mounting heights.

"Illuminance" criteria to be used for intersections, curvilinear road sections, pedestrian walkways, and bikeways.

The design criteria requirements for luminance, illuminance, and pedestrian conflict area classifications in Tables 4 and 5 are derived from ANSI/IES RP-8-14.

The criteria listed in Table 5, for intersections, is to be applied to cover the thirty-two (32) conflict points identified in ANSI/IES RP-8-14 (se. 5.1.2). The criteria listed in Table 4 would apply outside of this.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

TABLE 4 - Maintained Luminance for Mid-Block Street Sections (Non-Intersection Areas)

ROAD CLASSIFICATION	MINIMUM AVERAGE MAINTAINED LUMINANCE	MAXIMUM UNIFORMITY RATIOS	MAXIMUM LUMINANCE RATIOS	MAX. VEILING LUMINANCE RATIOS	PEDESTRIAN CONFLICT AREA CLASSIFICATION
	L_{avg} (cd/m ²)	L_{max} to L_{min}	L_{avg} to L_{min}	L_v to L_{avg}	
Arterial /Major Roads	0.6	6.0 to 1	3.5 to 1	0.3 to 1	LOW
Arterial/Major Roads	0.9	5.0 to 1	3.0 to 1	.3 to 1	MEDIUM
Collector (Minor) Roads	0.4	8.0 to 1	4.0 to 1	0.4 to 1	LOW
Collector (Major) Roads	0.6	6.0 to 1	3.5.0 to 1	0.4 to 1	MEDIUM
Local (Rural) Roads	0.3	10.0 to 1	6.0 to 1	0.4 to 1	LOW
Local Roads	0.5	10.0 to 1	6.0 to 1	0.4 to 1	MEDIUM

TABLE 5 - Maintained Illuminance for Street Corridors near Intersections, Curvilinear Sections and Pedestrian Walkways/Bikeways

Maintained Illuminance for Roadways near Intersections and Curvilinear Sections		
ROAD AND PEDESTRIAN CONFLICT AREA CLASSIFICATION	MINIMUM AVERAGE MAINTAINED ILLUMINANCE (HORIZONTAL ONLY) (R2 & R3 Pavements) E_{avg} in lux	MAXIMUM ILLUMINANCE UNIFORMITY RATIO E_{avg} to E_{min}
Arterial Roads - Low	9	3 to 1
Arterial Roads - Medium	13	3 to 1
Collector Roads (Minor) - Low	6	4 to 1
Collector Roads (Major) - Medium	9	4 to 1
Local Roads (Rural) - Low	4	6 to 1
Local Roads (Urban / Industrial) - Medium	7	6 to 1
Maintained Illuminance for Pedestrian Walkways/Bikeways		
ROAD AND PEDESTRIAN CONFLICT AREA CLASSIFICATION	MINIMUM AVERAGE MAINTAINED ILLUMINANCE (HORIZONTAL ONLY) (R2 & R3 Pavements) E_{avg} in lux	MAXIMUM ILLUMINANCE UNIFORMITY RATIO E_{avg} to E_{min}
Rural and Semi - Rural Areas	2	10 to 1
Pedestrian Areas – Low (2 or fewer dwelling units per acre or 5 units per ha)	3	6 to 1
Pedestrian Areas – Medium (2.1 to 6 dwelling units per acre or 5.1 to 15 units per ha)	5	4 to 1

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

Intersections shall have an illumination level equal to the sum of the recommended average illumination levels for each of the intersecting roadways. If it is not practical to achieve this level due to geometric constraints, then a minimum level of 50% higher than the recommended level for the main roadway may be acceptable, subject to the Town's approval. Alternatively, Town may request to follow Table 8 in ANSI/IES RP-8-14, or any update of this standard.

For illumination of crosswalks (mid-block or at intersections) refer to Section 5.3 of ANSI/IES RP-8-14.

Light levels shall be increased by 50% through school areas, libraries, recreation centres, medical centres, railway crossings, bridges and any other location where increased conflict is possible. The street lights shall typically be serviced with underground wiring in ducts between poles. The luminaires shall be alternated between circuits to maintain 50% illumination upon loss of one circuit feeder.

Light fixtures shall be cut-off type to reduce light pollution and shall be dark sky compliant.

Light source for roadway lighting shall be long life (minimum 100,000 hours).

Power supply shall be coordinated and arranged with the Supply Authority from the nearest feasible location. Power supply shall be unmetered and the street lights shall operate at 120 volts 60 Hz AC. Maximum voltage drop at the end of the lighting circuit shall not exceed 5% of the supply voltage.

The design drawings shall show all surface features, all street light pole complete with ID#, all power pedestals complete with ID#, the individual conduits from the power pedestal to the light-emitting diode (LED) lights, the conduit from street light pole to street light pole, all utility road crossings with dimensions from the road crossing to either a side lot line or a street light pole, and dimensions from the street light pole to the lot lines where the street light pole is not opposite a side lot line. The LED street light ID# shall include the type of LED lighting fixture, the circuit number, and the power pedestal number to which it is connected. The Legend shall include duct sizes and an explanation of the street light symbol/ID#'s.

On the single line drawing, there should be an electrical schematic for each power pedestal showing the transformer (complete with InnPower ID#) that supplies power to the power pedestal, the power pedestal cabinet contents (service breakers, service panel, grounding rods, etc.), each circuit and all of the LED street lights (complete with ID#) connected to that circuit with conductor lengths from the pedestal to the first light and from light to light, and all electrical components inside the LED street light fixtures. It should be noted that the maximum conductor length is 100 m.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

Lighting calculations shall be prepared for all outdoor site lighting and forwarded to the Municipality for approval.

All luminaires are to be provided with ANSI C136.41 compliant dimming photocontrol allowing at least three different settings for dimming levels and start times. Refer to Appendix B for a list of materials and specifications.

Streetlight designer should contact Town and confirm full set of criteria before the start of design.

3.3.2.2 Site Plans

Lighting should be controlled by automatic switching devices such as timers or photocells. The outdoor lighting shall be reduced by 75% after normal hours of operation until dawn.

Parking Lots

Parking lot illumination has to address good visibility for drivers and pedestrians, provide good colour rendition for security identification, and leave sufficient impact for customer attraction.

The recommended light levels for high activity community shopping developments are:

- Average maintained illuminance level 2.0 fc (20 lux) minimum. This could be increased up to 5.0 fc (50 lux), as is common practice for current commercial developments;
- Uniformity, average to minimum 4:1.

The minimum recommended light levels for parking lots are:

- Minimum horizontal illuminance level 0.2 fc (2 lux);
- Uniformity ratio, maximum to minimum 20:1.

Roadways

The recommended light levels for the site roadway zones are:

- Average maintained illuminance level 0.9 fc (9.0 lux);
- Uniformity, average to minimum 6:1.

Pedestrian Walkways

The recommended light levels for pedestrian walkways up to and surrounding any commercial buildings are:

- Average maintained illuminance level for medium activity areas 2.0 fc (20 lux) and high activity areas 4.0 fc (40 lux);
- Uniformity, average to minimum 4:1.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALSSite Restrictions

The recommended light levels projected onto a residential property (spill light) shall not exceed 0.1 vertical foot candles, measured line-of-site at the property line.

Light pollution, nuisance, and disability glare shall be restricted by use of full cut-off luminaires.

Pylon Signs

Externally illuminated pylon signs shall have the light source aimed downward towards the sign.

3.3.3 Lighting Configurations and Pole Offsets

All streets are to employ a staggered streetlight configuration with pole offsets from EP as per TAC criteria or on shoulder rounding.

In urban areas behind the face of a barrier curb with design speed of 70 km/h or less, pole offsets may be reduced to 1.5 m.

In rural areas where TAC pole offsets outside the clear zone are not possible, frangible breakaway bases may be used. Frangible bases are not permitted at intersections and areas where pedestrians are expected.

Pole offsets that are identified on the Town's Typical Road Cross Sections take precedence.

Lights at signalized intersections should be combined with joint-use traffic signal poles wherever possible.

On curved roadways, the light poles should be positioned on the inside of curves, if possible. Alternatively, light poles may be placed on the outside of curves, but shall be kept out of the vehicle overrun area (the extension of the tangent in the direction of vehicle travel).

Street lights and power pedestals should be located on the extension side lot lines where possible.

Refer to Appendix C for minimum offsets for streetlights from other aboveground infrastructure.

3.3.4 Materials

All materials used for street lighting must be CSA approved. Refer to Appendix B for a list of Materials and Specifications.

3.3.5 Installation

The installation of the street lighting system shall be in compliance with ESA, CSA, the Hydro Supply Authority requirements, the Town's standards and specifications, as well as the manufacturer's installation instructions.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALSDucts

Ducts shall be solvent welded together in trenches with minimum cover of 750 mm. Ducts shall be surrounded by 80 mm of brick sand and warning tape to cover width of trench.

Road crossings to be carried out by directional bore method using thickwall PVC duct.

Where open-cut road crossings are necessary, ducts shall be concrete encased.

Installation as per OPSD 2100.06 and OPSS 603.

Cables

Cables to be continuous without splices and shall be installed after trenches are back-filled.

Installation Specifications as per OPSS 604.

Fuses

Fuses in pole handholes as per OPSD 2255.020 and OPSS 617.

Grounding

Ground rods to be installed at power service disconnect (minimum 2 rods), at every fifth (5th) lighting pole, and at the last lighting pole in each circuit.

Installation Specifications as per OPSS 609.

Poles

Installation Specifications as per OPSS 615.

Brackets and Luminaires

Installation Specifications as per OPSS 617.

Power Service Disconnect

Installation Specifications as per OPSS 614.

Dimming control

Specifications as per ANSI C136.41. DIM-4 adjustable control.

3.4 TRAFFIC SIGNALS**3.4.1 General**

Traffic signal design is to be prepared in accordance with M.T.O. Traffic Manual Book 12 and the appropriate M.T.O. and electrical design codes. All work shall be performed in accordance with the current edition of the Ontario Electrical Code, including all appending bulletins issued by the Electrical Safety Authority which are applicable to the work. All work shall be governed by Federal, Provincial and Local laws and by-laws pertaining to the work, as well as by the latest issue of CSA Standards pertinent to the work. All electrical work is subject to inspection by the Electrical Safety Authority. In the event of a conflict between regulations, the strictest regulation shall apply.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

In addition to accommodation of traffic flow, the signalized intersection design shall include pedestrian requirements and accessibility features. All signalized crossings must be designed in accordance with the TAC "Guidelines for the Understanding, Use, and Implementation of Accessible Pedestrian Signals". Accessibility features must include gentle grades for sidewalks, drop curbs (painted yellow), and directional lines in the sidewalk to provide guidance for the visually impaired. Pedestrian crosswalk features shall include single head "walk/don't walk" heads, countdown heads, and audible pedestrian heads with tactile push button.

3.4.2 Materials and Installation

Refer to Appendix B for a list of approved materials.

The installation shall include the following features:

- a) Traffic signal controllers must be pad mounted and in a location that is not visually distracting;
- b) A separate power pedestal is to be provided;
- c) The power supply is to be metered;
- d) The traffic signals shall include emergency vehicle pre-emption;
- e) Twin 100 mm ducts are to be provided across the roadway approaches to the 600 mm diameter electrical handwells;
- f) Twin 100 mm ducts are to be provided from the controller cabinet to the first handwell;
- g) The controller cabinet shall be raised 450 mm above grade with a cabinet base extension;
- h) Loop detectors shall be placed in the base asphalt; and
- i) The controller shall conform to the NEMA standard TS2 Type 2 Standard capable of handling eight (8) phases, solid state, micro-processor-based traffic signal controller with LCD display.

3.4.3 Testing

Tests on electrical wiring and materials shall, unless otherwise specified, conform to the Canadian Electrical Code Part 1, and shall include insulation value readings and resistance to ground readings.

The following tests will be required:

- a) All conduits and duct systems shall be proven free of stones, dirt, water or other debris by pulling a test mandrel 1/4 inch (6.4 mm) smaller in diameter than the nominal conduit or duct size and 12 inches (300 mm) in length through each individual conduit or duct;
- b) All circuits shall be proven continuous and free of short circuits or ground faults;
- c) All circuits shall be proven free of unspecified grounds and the resistance to ground of all circuits shall be no less than fifty (50) megaohms; and
- d) The resistance to ground for all grounded equipment shall be proven to not exceed twenty-five (25) ohms.

3.4.4 Pavement Markings and Traffic Signs

Marking materials for stop bars, pedestrian crosswalks, direction arrows, and lane markings are to be durable hot applied thermoplastic pavement marking material, as per OPSS 1713.

All related traffic signal signing shall be as per the *Ontario Traffic Manual* Books 5, 6 & 7 including but not limited to:

- a) Advanced WB-102 “Traffic Signal Ahead” sign with WB-3 “New” sunburst sign on wood posts;
- b) WA-33L “Object” markers affixed to a median traffic pole; and
- c) A RB-125 “Keep Right” on wood posts located at the end of the median island. The signs shall be made upon 0.081 aluminum blanks with hi-intensity reflective sheeting.

OBSOLETE

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

4.1 GENERAL

The principles and design criteria in this section are intended to augment the guidelines, policies, and standards established in the latest version of the Ministry of Transportation (MTO) Drainage Management Manual, the MTO Highway Drainage Design Standards, the Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual, the Nottawasaga Valley Conservation Authority (NVCA) Development Review Guidelines, the Lake Simcoe Region Conservation Authority (LSRCA) Watershed Development Policies, the Lake Simcoe Protection Act, the LSRCA Technical Guidelines for Stormwater Management Submissions, LSRCA and Ontario Regulation 219/09 and MECP's Lake Simcoe Phosphorus Reduction Strategy.

Where the Town's Engineering Design Standards and Specifications Manual does not provide specific details, all designs should stay in conformity with the most current version of the above listed documents, including all Ministry of Transportation standards.

In the planning and design of stormwater management facilities, the designer is to have full regard for the riparian rights of all surrounding, upstream and downstream landowners. Consideration of the surrounding topography, land uses, and environment and integration of the facility into such elements is paramount. Opportunities for linking these facilities with trail systems should be maximized.

4.2 LOW IMPACT DEVELOPMENT

The Town encourages the implementation of low impact development (LID) measures as defined by the Lake Simcoe Protection Plan (LSPP) and the United States Environmental Protection Agency (U.S. EPA, 2007) to minimize post development runoff volumes and maintain existing hydrological conditions within new developments. As such, the Town requires the stormwater management design of new and infill developments, as well as reconstruction and retrofit projects, to promote at-source control of post development runoff, thereby reducing the dependence on end-of-pipe controls where site conditions permit. However, due to the absence of definite Provincial and Conservation Authorities standards for the design of structural LID's, the implementation of these measures can be considered as a developing science. Local Conservation Authorities and the MECP are working towards the development of provincial standards, which upon their completion, will be incorporated into the Town's Engineering Design Standards and Specifications Manual. As a result, the Town will require that each construction project be assessed on a case by case basis.

To assess the applicability of incorporating structural LID as part of the stormwater management design, a comprehensive report prepared by a qualified engineer will be required for each project, which must include the following information:

- a) Describe existing site conditions, including significant environmental features as well as soil type, infiltration capacity, and depth to water table;
- b) Depending on the extent of the proposed project, prepare maps identifying the environmental features, soil conditions, and water table depth to show all aspects under consideration in the environmental design of the stormwater management system for the development;
- c) Complete single event and continuous (if required) simulation rainfall/runoff event models to establish the baseline quality and quantity of stormwater runoff originating

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

- from the development area under existing conditions as a framework for evaluating combinations of structural LID components with conventional end-of-pipe controls;
- d) Prepare an assessment of the various combinations and sizing requirements of LID components and end-of pipe controls based on their suitability for achieving the stormwater management control targets under typical post development conditions accounting for snow accumulation and frozen ground conditions;
 - e) Select a preferred alternative for achieving stormwater management control targets for consideration by the Town and the governing Conservation Authority prior to proceeding to detailed design; and
 - f) Prepare a monitoring program to assess the performance of the proposed design.

The assessment and recommendations can be included in the project SWM Report or be submitted as a separate document.

The implementation of any design that employs the use of Low Impact Development practices will be subject to Town and Conservation Authority Approval.

4.3 NUTRIENT MANAGEMENT STRATEGY AND WATER BALANCE

The Town, as an environmental leader, supports the reduction of phosphorous contributions from Greenfield development into the streams and lakes of the watershed within the Town. To achieve this goal, the Town encourages that effective measures be taken to mitigate and reduce phosphorous contributions from new developments wherever possible.

The Town also recognizes that reduced groundwater recharge because of new development can impact stream baseflows needed to sustain aquatic life and result in increased stream erosion.

As such, the Town will require that stormwater management design for new developments incorporate the most recent advances in phosphorus reduction and water balance technologies or strategies within the development proposal as per the most recent guidelines and standards as set out by the MECP and relevant Conservation Authority.

4.4 RAINFALL DATA

Stormwater management facilities should be designed based on the IDF tables developed by Environment Canada for Barrie WPCC based on rain gauge data for the period 1979 - 2003 including a 15% increase in rainfall intensity data to account for climate change. The adjusted Chicago distribution parameters for different return periods are provided below.

Barrie WPCC IDF Curve Parameters –Adjusted for Climate Change

Parameter	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
A	678.085	853.608	975.865	1146.275	1236.152	1426.408
B	4.699	4.699	4.699	4.922	4.699	5.273
C	0.781	0.766	0.760	0.757	0.751	0.759

Rainfall Intensity, I (mm/hr) = $A/(t+B)^C$, where t is time duration in minutes

Parameters based on rain gauge data for the period 1979 – 2003 for the Barrie WPCC Station #6110557

Based on a review of the literature, the IDF intensity values for Barrie WPCC Station were increased by 15% before calculating a, b, c values to account for climate change.

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Barrie WPCC 2003 Rainfall Intensity (mm/hr) + 15 % to Account for Climate Change

Return Period	Duration (min)								
	5	10	15	30	60	120	360	720	1440
2 years	115.5	81.5	67.4	43.1	25.3	15.5	7	3.9	2.3
5 years	150	107.9	89.9	56.2	32.8	21.9	9.9	5.4	3.2
10 years	173	125.5	104.9	65.1	37.6	26.1	11.8	6.3	3.8
25 years	201.8	147.4	123.7	76	43.8	31.4	14.3	7.6	4.5
50 years	223.3	163.9	137.7	84.3	48.4	35.4	16	8.5	5.1
100 years	244.7	180.1	151.6	92.3	53	39.3	17.7	9.4	5.5

Barrie WPCC 2003 Rainfall Depth (mm) + 15 % to Account for Climate Change

Return Period	Duration (min)								
	5	10	15	30	60	120	360	720	1440
2 years	9.7	13.6	16.8	21.5	25.3	31.1	42.3	46.7	55
5 years	12.5	17.9	22.4	28.2	32.8	43.8	59.5	64.3	76
10 years	14.4	20.9	26.2	32.5	37.6	52.2	70.8	76	89.9
25 years	16.8	24.6	30.9	38.1	43.8	62.9	85.2	90.7	107.5
50 years	18.6	27.3	34.4	42.1	48.4	70.7	95.9	101.7	120.6
100 years	20.4	30	37.8	46.2	53	78.5	106.5	112.5	133.6

4.5 STORMWATER MANAGEMENT SYSTEM - MINOR

Generally, storm drainage shall be accommodated by a system of curb and gutters as well as storm sewers, with the exception of rural roadways or estate residential subdivisions, where an open ditch system may be permitted if minimum design criteria can be realized.

Underground storm sewers are to be designed to convey a minimum of the 1:5-year storm without surcharge. However, when the major storm drainage system is inadequate, the Town may consider the approval of an underground storm sewer system designed to carry additional flows.

4.5.1 Service Area

The system shall be designed to accommodate all on-site drainage areas as well as all external tributary areas to their maximum future development capacity in accordance with the Town's Official Plan.

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4.5.2 Design Flows

The design flows used to size the storm sewer system or small developments (drainage area ≤ 50 ha) are to be calculated using the Rational Method, as follows:

$$Q = \frac{(c)(i)(A)}{360}$$

where:

Q	=	design flow (m ³ /s)
c	=	runoff coefficient (dimensionless)
i	=	average rainfall intensity (mm/hr)
A	=	drainage area (ha)

The average rainfall intensity is to be derived from the IDF curve from the Atmospheric Environment Service Branch of Environment Canada for the Barrie WPCC station 2003, adjusted for climate change, as follows:

$$I \text{ (mm/hr)} = A/(t+B)^C$$

where:

i	=	average rainfall intensity (mm/hr)
A	=	coefficient for the 5-year return period
t	=	time (minutes)
B	=	exponent for the 5-year return period
C	=	exponent for the 5-year return period

The time of concentration is to be calculated as the sum of the initial inlet and the travel time in the pipe, where the initial inlet time is to be ten (10) minutes for the five (5) year storm.

This shall apply where the upstream drainage area does not include large open space areas. Where peak flows from external areas enter a subdivision sewer system, the more critical case based on either the time of concentration including the external area or the time of concentration excluding the external area shall be used. Actual velocities of computed peak flows shall be used to estimate time of concentration.

A design evaluation of inlet times must be submitted to justify inlet times different from those specified above.

Runoff coefficients are given by components of surface treatment and by land use. The land use values are intended as a guide only and the designer is expected to develop an appropriate coefficient using an arithmetic composite calculation as shown below:

$$C = \frac{(A_1C_1) + (A_2C_2) + \dots}{A_t}$$

where:

C	=	composite runoff coefficient (dimensionless)
A _{1,2...}	=	area corresponding to specific land use or soils type (ha)
C _{1,2...}	=	runoff coefficient corresponding to A _{1,2...} (dimensionless)
A _t	=	total drainage area (ha)

Source: adapted from the Ministry of Transportation Drainage Management Manual, 1997, Equation 8.10.

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The higher of the arithmetic composite runoff coefficient or the minimum required runoff coefficient by land use, provided in the following table, shall be used to compute design flows.

TABLE 6 - Runoff Coefficients (Rational C) (5-yr to 10-yr) Based on Hydrologic Soil Group

Runoff Coefficient "C"			
Land Use	A-AB	B-BC	C-D
Cultivated Land, 0 - 5% grade	0.22	0.35	0.55
Cultivated Land, 5 - 10% grade	0.30	0.45	0.60
Cultivated Land, 10 - 30% grade	0.4	0.65	0.70
Pasture Land, 0 - 5% grade	0.1	0.28	0.40
Pasture Land, 5 - 10% grade	.015	0.35	0.45
Pasture Land, 10 - 30% grade	0.22	0.40	0.55
Woodlot or Cutover, 0 - 5% grade	0.08	0.25	0.35
Woodlot or Cutover, 5 - 10% grade	0.12	0.30	0.42
Woodlot or Cutover, 10 - 30% grade	0.18	0.35	0.52
Lakes and Wetlands	0.05	0.05	0.05
Impervious Area (i.e., buildings, roads, parking lots, etc.)	0.95	0.95	0.95
Gravel	0.40	0.50	0.60
Unimproved Areas	0.10	0.20	0.30
Lawn, < 2% grade	0.05	0.11	0.17
Lawn, 2 - 7% grade	0.10	0.16	0.22
Lawn, > 7% grade	0.15	0.25	0.35
Land Use	Recommended Minimum Coefficient		
Parks	0.25		
Single Family Residential	0.50 - 0.65		
Semi-Detached Residential	0.65		
Townhouses, Maisonettes, Row Houses, Apartments, etc.	0.75		
Institutional	0.75		
Industrial and Central Business District	0.80		
Commercial	0.90		
Paved Areas	0.90 to 1.00		

Run-off Coefficients shall be determined from the types of land uses within the drainage area.

The run-off coefficient values provided above are recommended minimum values; however, the Developer's Engineer should determine the appropriate coefficient of imperviousness based on the actual uses.

Adapted from Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual," MTO. (1997)

- Note: gravel parking or storage areas for new development should be considered as paved areas as they may be paved in the future

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Runoff coefficients (Rational C) for development such as single family, semi-detached, Duplex, Town housing, Commercial, Industrial, Institutional, Schools, Churches, and Park etc. shall be calculated using a weighted average of the runoff coefficients for the relative areas using the coefficients outlined in the table.

On a project specific basis, a detailed calculation of the run-off coefficient may be requested by the Town.

For estimating flows from storms larger than the 5-year event, the runoff coefficients should be increased to account for the increase in runoff due to saturation of the soil.

The runoff coefficient shall be adjusted for return period events greater than the 10-yr storm as follows:

Runoff Coefficient Adjustment for 25-yr to 100-yr Storms

Return Period	Runoff Coefficient "C"
25 years	$C_{25} = 1.1 * C_5$
50 years	$C_{50} = 1.2 * C_5$
100 years	$C_{100} = 1.25 * C_5$

Adapted from Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual," MTO. (1997).

Note: When applying the runoff coefficient adjustment, the maximum c-value should not exceed 1.0.

Barrie WPCC IDF curves as outlined above

$$I \text{ (mm/hr)} = A/(t+B)^C$$

where:	i	=	average rainfall intensity (mm/hr)
	a	=	coefficient from IDF tables
	t	=	time (minutes)
	B	=	exponent from the IDF tables
	C	=	exponent from the IDF tables

4.5.3 Pipe Capacity

Manning's Formula is to be used in calculating the full flow capacity of the storm sewer.

The roughness coefficients to be used in the calculation are as follows:

Concrete pipe, $n = 0.013$

PVC and Smooth walled PE pipe, $n = 0.013$

Corrugated pipe (for culvert use only), $n = 0.024$

Storm sewers are to be designed such that individual pipes only reach a maximum of 80% of their total capacity. On an individual as-needed basis, the Town will review designs where pipes reach a greater percentage of their total capacity.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.5.4 Velocities**

The minimum allowable actual velocity in a storm sewer shall be as follows:

- a) First run of a sewer shall be 0.45 m/s
- b) Second to fourth run of a sewer ("Interim" runs) shall be 0.6 m/s
- c) Fifth and subsequent runs of a sewer shall be 0.75 m/s

The maximum allowable actual velocity shall be 4.5 m/s.

4.5.5 Minimum and Maximum Pipe Slopes

The minimum pipe slope shall be that which is required to meet the minimum velocity, but shall not be less than 0.3%.

The maximum pipe slope shall be that which is required to meet the required capacity and maximum velocity.

4.5.6 Minimum Pipe Sizes

The minimum pipe size is 300 mm for mainline storm sewers.

4.5.7 Minimum Depth of Cover

The minimum depth of cover to be provided shall be the greater of:

- a) 1.5 m below the centreline of road or finished ground surface elevation to the spring line of the sewer; or
- b) 1.2 m to the obvert of the sewer, provided that there are no conflicts with utility crossings; or
- c) That which is required to provide gravity foundation drain connections.

Where sufficient cover does not exist, the Town may consider shallower insulated sewers on an individual basis.

The maximum height of fill is not to exceed applicable OPSD (805.010 through 807.050) unless pipe strength design calculations are provided for approval by the Town.

4.5.8 Bedding and Backfill

All storm sewers are to be installed with bedding (well graded OPSS Granular 'A' or as recommended and approved by the Geotechnical Engineer and the Town) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032 as applicable. Compaction is to be a minimum of 95% SPD or as indicated in the approved Geotechnical Report.

In soft or wet conditions, additional Geotechnical investigation may be necessary to determine the appropriate bedding and backfill measures.

4.5.9 Pipe Clearances

Minimum horizontal clearance between the outside wall of the adjacent sewer pipes (sanitary, or second storm) shall be 800mm. A minimum clearance of 500mm between the obvert of the sanitary sewer and invert of the storm sewer shall be provided if the sanitary connections are required to go under the storm sewer. Other minimum clearances shall be provided in accordance with MECP guidelines.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.5.10 Sewer Layout**

Storm sewers shall generally be located as per the typical road cross-sections.

Where storm sewers are located in easements, the easement width shall be a minimum of 9.0 m. However, the Town will review alternative easement widths on an individual basis in certain circumstances such as the utilization of a joint trench or installation of a sewer at a depth which is substantially greater than standard.

Where there is a rear yard catchbasin there is to be a 1.8 m easement on the lot with the rear catchbasin storm pipe and a 1.2 m easement on the adjacent, non-piped side of the property line.

4.5.11 Maintenance Holes

Maintenance holes shall be as per OPSD 701 and shall be placed at the beginning and end of each sewer line, at changes in pipe size and/or material, and at changes in grade and/or alignment. Curved (radius pipe) or properly deflected sewer lines may be permitted but written approval from the Town is required.

During design phase, at the Town's discretion, maintenance hole waterproofing may be required.

All maintenance holes sized up to and including 1200 mm diameter are to be pre-benched to spring-line by the supplier. All maintenance holes larger than 1200 mm diameter are to be benched to spring-line on-site after installation.

The maximum spacing between maintenance holes shall generally be according to the following:

Diameter	Maximum Spacing between Maintenance Holes
300 to 900 mm	90 m
> 900 mm	150 m

The maximum change in direction for pipes 825 mm and smaller is 90°. The maximum change in direction for pipes 900 mm diameter and larger is 45°.

A sufficient drop shall be provided across each maintenance hole to offset any hydraulic losses. The minimum drops across a maintenance hole shall be as follows:

Change in Direction	Minimum Drop
Straight run (0°)	0.03 m
1 - 45°	0.05 m
> 45°	0.08 m

All maintenance holes within an asphalt roadway shall include a self-adjustable autostable frame. Structures outside roadways or existing frame and grates in base asphalt which require adjustment for top lift asphalt may use lift rings (when approved by the Town). Otherwise, when adjusting the top elevation of maintenance holes, a minimum of one to a maximum of

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three adjustment units (Moduloc) shall be installed on the top of the structure. The maximum vertical adjustment of maintenance holes via Moduloc shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Drop structures shall be provided when the difference in the inlet and outlet inverts is equal to or greater than 0.9 m that cannot be eliminated by changing sewer grades. Use of an internal drop structure is not permitted for new maintenance holes.

Safety platforms shall be installed in accordance with OPSD 404.020 for all maintenance hole depths of 5.0 m or greater.

Obverts of inlet pipes shall not be lower than obverts of outlet pipes. Springline connection principle for the inlet and outlet pipes requires a written approval from the Town.

Where maintenance holes are located in areas to be flooded by the major storm design and surcharged sewer design is not used, maintenance hole covers shall be of the sealed variety. Where maintenance holes are located where the surcharged sewer design hydraulic grade line is higher than the rim elevation, maintenance hole covers shall be of the bolted variety. In all other areas, standard maintenance hole covers shall be used.

Frost straps to be installed as per OPSD 701.100.

Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

4.5.12 Catchbasins

Catchbasins shall be located upstream of pedestrian crossings and not within 1.0 m of any curb depressions. Preferably, catchbasins will be installed on projections of lot lines. Double catchbasins shall be located where flows are being received from more than one direction, such as at low points.

The maximum allowable spacing shall be in accordance with the following:

Pavement Width (m)	Maximum Spacing (m)	
	Slope $\leq 4.5\%$	Slope $>4.5\%$
8.5	90	60
12.0	70	50
14.0	60	40

Catchbasin capacities shall be determined in conjunction with the overall stormwater management system. On roadways, catchbasins shall have a minimum capacity to pass the runoff from the 5-year return frequency storm. Where the pipe system is required to convey flows in excess of the 5-year return frequency storm, sufficient catchbasin capacity shall be provided to permit the design flows to enter the sewer system. Inlet control devices may be used where the hydraulic grade line needs to be strictly controlled to prevent surcharging of the sewer line and to allow storm sewer house connections.

Where catchbasins are used as inlet controls, spacing shall be determined by design and must be approved by the Town.

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When adjusting the top elevation of catchbasins, a minimum of one to a maximum of three (3) adjustment units shall be installed on the top of the structure. The maximum vertical adjustment shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Leads shall be minimum 250 mm at 0.7% (1.0% is required to convey 60L/s that single CB can capture) grade for single catchbasins and 300 mm at 0.7% (1.5% is required for flows captured by double, or increase pipe to 375 mm) grade for double catchbasins.

Leads shall connect to maintenance holes where possible and shall have a minimum depth of cover of 1.2 m to the obvert.

4.5.13 Foundation Drainage System

In order to minimize the flow rate from foundation drains, a minimum distance of 0.5 m shall be provided between the underside of the basement floor slab and the measured seasonal high groundwater table. Subdivision applications shall clearly include this difference of elevation at the time of the "Draft Plan Application" and shall be updated during the detailed design process. For subdivisions, fluctuating groundwater elevations shall be monitored for a period of not less than two (2) years prior to detailed design submission.

Other methods of controlling foundation drain flow rate will be considered in consultation with Town staff.

A foundation drainage system is to be provided for each residential lot. The designer has three options to choose from:

1. A sump pump discharging to an underground storm sewer service connection as per TOISD 607
2. A gravity connection to the storm sewer, provided the 100-year hydraulic gradeline is minimum of 0.5 m below the finished basement floor elevation of the dwelling.
3. A sump pump or gravity connection to a third pipe (foundation drain) collection system that is separate from the storm sewer system, which discharges to a sufficient outlet, as per Section 4.5.3 or another approved location such as a valley or hillside.

4.5.14 Storm Service Connections

Single connections for residential lots shall be constructed in accordance with TOISD division 600 for each type of residential lot. Connections for commercial, institutional or multiple use will be considered on an individual basis.

The minimum depth of cover is 1.5 m and the minimum slope is 2.0%. Utility duct trench depths and other crossings must be considered in setting the depth of service connections.

Where a sump pump discharges to a storm service connection, a 25 mm air gap shall be provided at the building such that there is no direct connection between the building sump pump outlet and the storm service.

Where it can be shown to the satisfaction of the Town that groundwater conditions at footing level are unlikely to require more than two (2) sump basins and pumps for an entire townhouse

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block, storm service connections to the internal units in a townhouse block may be eliminated. However, storm service connections must be installed to the end units.

Single residential storm connections shall be 100 mm diameter with a 100 mm x 100 mm test fitting plugged and braced at the property line. Refer to TOISD 605.

Double "Y" residential storm connections shall have a 150 mm x 100 mm x 100 mm boot jack fitting with a 100 mm diameter test fitting to each individual connection plugged and braced at the property line. Refer to TOISD 606.

For new developments, the service shall be extended 3.0 m beyond property line, with an additional test fitting, plug, brace, and marker.

Roof leaders shall not be connected to the storm sewer system. Roof leaders are to be discharged to the ground surface onto splash blocks or extended by a minimum of 450mm outwards, and flows shall be directed away from the building in such a way as to prevent ponding or seepage into the foundation weeping tile.

Where flat roofs are used, as in commercial or industrial sites, detention roof hoppers requiring smaller or fewer roof leaders may be used as part of the stormwater management design. No connections are to be installed directly to storm sewers.

4.5.15 Testing

The following testing requirements apply to all new storm sewers. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Town.

4.5.15.1 Deflection Testing

All newly installed PVC and Polyethylene storm sewers shall be subjected to deflection testing in accordance with OPSS 410.

Deflection testing is not required for concrete storm sewers.

4.5.15.2 Infiltration/Exfiltration Testing

Infiltration/exfiltration testing of the storm sewer is not required.

4.5.15.3 CCTV Inspection

All newly installed storm sewers shall be subjected to a CCTV Inspection. Refer to Appendix D for the Town's CCTV Inspection Requirements.

4.5.15.4 Visual Inspection

All maintenance holes shall be visually inspected by the Town for deficiencies. When requested by the Town, maintenance hole scans shall be provided by a qualified third-party sewer inspection firm. Scans must be completed using 100% digital panoramic scanning equipment. The digital files provided must include a distortion-free virtual pan and tilt to view the MH from any angle and at any depth. The Town must be able to view all pan, tilt, and unfolded views. If specific software is required it must be provided to the Town with the digital files.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.5.16 Materials**

Refer to Appendix B for a list of materials and specifications.

4.6 STORMWATER MANAGEMENT SYSTEM – MAJOR

Runoff rates in excess of the design capacity of the minor system shall be conveyed via roadways, swales, walkways, drainage easements, and in special circumstances the storm sewer system, to a sufficient outlet, reference 4.6.3. The combination of the overland flow system and the minor system shall be designed to prevent flooding of private property with maximum level of road flooding and surface detention as defined in the table below.

It shall also be demonstrated that overland flow conditions resulting from the 100-year/Hazel storm will not cause unacceptable flooding damage to private property with a maximum level of road flooding and surface detention as outlined in the table below.

TABLE 7 - Maximum Allowable Flow Depths

LOCATION	STORM RETURN FREQUENCY (YEARS)		
	5	25	100/Hazel
Walkways	minor surface	as required	as required
Open Spaces	flow up to 25 mm on walkways	for overland flow outlets	for overland flow outlets
Local Roads (2 Lane)	No ponding	0.05m above crown	0.15m above crown
Collector (4 lane+), Local and Industrial Roads (extra wide lanes)	1.0 m wide in gutter or 0.10m deep at low point catchbasins	up to crown “contradictions” - discuss	0.10 m above crown maximum depth of flooding of 0.3 m
Arterial Roads (4 lane+)	1.0m wide in gutter or 0.1 m deep at low point catchbasins	1 lane clear	up to crown maximum depth of flooding of 0.3 m Typically, 1 lane clear is required for 100yr
Private Property	minor ponding in swales	no structural damage, ponding in yard areas below building openings - no basement flooding	no structural damage from overland flow

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LOCATION	STORM RETURN FREQUENCY (YEARS)		
	5	25	100/Hazel
Public Property	minor ponding in swales or ditches	no structural damage, ponding in flat areas, no erosion	no structural damage, ponding in flat areas, some erosion

In new subdivisions the limit of overland flow route floodlines for the 100 year/Hazel storm event shall not extend onto private property unless protected by a drainage easement. Development of the site must not increase flood levels upstream or downstream of the development.

For all classes of road, the product of depth of flow at the gutter (m) times the flow velocity (m/sec) shall not exceed 0.65 m²/sec.

Street grading must provide a continuous gradient to direct street flows to a safe outlet at low points. Outlets can be walkways or open sections of roadways leading to parks, open spaces or river valleys.

Pre-development peak flows shall be computed by an approved hydrologic model. Watershed definition and pre-development flows must be approved by the Town.

Preliminary estimates of post-development flow rates may be computed using the Rational Method.

For all systems and for the design of surcharged sewers and detention facilities, the latest version of the computer model OTTHYMO is recommended. Other hydrograph methods may be considered if it is demonstrated that the results are comparable to those from OTTHYMO. Post-development design flows may be determined using the Rational Method only where the design area is less than 40.0 ha and runoff control facilities are not considered. The Modified Rational method may be used to model runoff control facilities provided the tributary area to the facility is 5.0 ha or less.

4.6.1 Open Ditches

In rural areas, industrial areas, or estate residential subdivisions, open ditches may be permitted by the Town. Ditches shall be constructed a maximum of 0.5 m and a minimum of 0.15 m below the sub-grade of the roadway. Where this cannot be achieved, a sub-drain may be provided under the invert of the ditch and day-lighted once the minimum depth can be attained.

The minimum ditch grade shall be 0.5% and the maximum 5%. In exceptional cases and where ditches are on easements off the Road Allowance, ditches with grades greater than 5% may be allowed by the Town, but these shall be suitably protected against erosion to the satisfaction of the Town. Where ditch grades exceed 5%, the Town may require that an urban cross-section be applied for that road segment.

The minimum ditch protection on all ditches shall be 300 mm of topsoil and staked sod on the side slopes and bottom of the ditch regardless of the ditch gradient.

4.6.2 Open Channels

Open channels are to be utilized in the following circumstances:

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- a) For the Regional Storm where the upstream watershed area exceeds 1 square kilometre (100 ha);
- b) For a minimum 25-year return frequency storm with protection from erosion damage for larger storms if required by the Town;
- c) To maintain the natural storage characteristics of the watercourse;
- d) To maintain a natural appearance as far as possible; and
- e) To meet specific requirements of the Conservation Authority in each case.

4.6.3 Sufficient Outlet

All developments must demonstrate that the stormwater generated onsite is directed to a sufficient outlet.

A sufficient outlet typically constitutes a lake or permanently flowing watercourse. Sufficient outlet may also include public right-of-ways provided that written permission is obtained from the Town. In the case where the discharge is directed over private land, the developer must obtain a legal right of discharge registered on title. Copies of all written documentation such as a legal right of discharge registered on title and/or written permissions from the Town must accompany the design submission.

The designer shall provide calculations for the conveyance capacity of the downstream conveyance routes to demonstrate that upstream, downstream and adjacent landowners do not incur adverse impacts, including increased runoff volumes, and that the flow is conveyed in a safe manner.

4.7 STORMWATER MANAGEMENT FACILITIES

All stormwater management facilities are to be designed to ensure that post-development peak flows do not exceed pre-development levels for storm events up to and including the 1:100 year event applying the 4 hour Chicago storm and the 12 hour and 24 hour SCS Type 2 Storm. Further, in accordance with the Lake Simcoe Protection Plan and Ontario Regulation 219/09, all new stormwater management facilities are required to provide an Enhanced level of water quality protection.

The Town supports the design of stormwater management facilities using hydrologic computer programs including VISUAL OTTHYMO and SWMHYMO. Due to various industry standard software programs prior to submission the Town is to be contacted to confirm the current software packages which will be accepted in modelling submissions. If the submission does not use software that the Town has, the proponent could be directed to resubmit their analysis using the software in use at the Town. The Town also allows the use of the Modified Rational method as described in the Hydrology Handbook, Second Edition, for catchments that are less than 5 hectares as long as the following parameters are met:

- That there is no routing of catchments through other catchments to the outlet (e.g. rooftop to parking lot);
- The site doesn't include more than one catchment

All stormwater management facilities are to be designed in accordance with the preferred criteria listed in the most current MECP "Stormwater Management Planning and Design Manual" and the relevant requirements of the Nottawasaga Valley Conservation Authority (NVCA) and the Lake

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Simcoe Region Conservation Authority (LSRCA). The information provided below is intended to supplement the aforementioned manuals and requirements.

4.7.1 Stormwater Quantity and Quality Controls

Current stormwater management practice advocates the consideration of Stormwater Management Practices (SWMP's) on a hierarchical basis, whereby more pro-active techniques are considered first. The SWMP's are grouped under the following headings in order of preferred application:

1. Lot Level Techniques and Source Controls
2. Transport or Conveyance Controls
3. End-of-Pipe Controls

The philosophy behind this hierarchy is that stormwater management techniques are usually more effective when applied at the source. Development can result in negative impacts to the hydrologic cycle elements of evaporation, infiltration, soil storage, and runoff as well as runoff water quality and erosion of local water courses and water bodies. Low Impact Development (LID) measures and Storm Water Management (SWM) measures can help reduce the impacts of development by increasing infiltration, evaporation, soil storage, water reuse, and reducing runoff, detrimental water quality impacts, and downstream erosion.

In Ontario, the Low Impact Development Stormwater Management Planning and Design Guide (Version 1, CVC/TRCA, 2010) is a comprehensive guideline that provides guidance on planning, site selection, design, construction, and operations and maintenance of LIDs. This guidance document, commonly referred to as the "LID Guide", must be used to select, design, and maintain LID practices

The Town of Innisfil supports the progressive implementation of a wide range of stormwater management techniques. This range is expected to increase and change over time, as long-term monitoring results indicating the level of success of various techniques, become available. The Town also supports the integration of stormwater management facilities with passive recreational opportunities, where the intended function of either is not impaired.

The City of Barrie has produced a document entitled Low Impact Development, Interim Guidance Document, 2017. It provides further guidance on location opportunities for LID along with recommendation on the type of LID that would be acceptable, pre-treatment, flushing provisions, access requirements and special consideration. The Town of Innisfil will refer to this document as a guide in the implementation of LID in new development.

The following table provides the current perspective of the Town of Innisfil regarding available stormwater management practices, as well as special supporting documentation which is required for implementation of each technique.

Proponents must contact the Town prior to submitting formal applications to discuss specific LID and SWM objectives for each project. In the absence of specific design criteria, proponents must utilize the following criteria for development projects:

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Stormwater Management Technique	Town of Innisfil Perspective	Supporting Documentation
Lot Level Techniques and Source Controls		
Green roofs	On a case-by-case basis	Requires Town acceptance
Bioretention	Encouraged for clean source areas	Requires Town acceptance on municipal lands
Roof leader discharge to surface	Encouraged	Uses an elbow which either directs towards a splash pad or utilizes a 450mm extension outwards from the structure
Soakaway, infiltration trench	Encouraged	On site 5 m from buildings, clean or pre-treated runoff
Rear lawn ponding	Discouraged in residential land use due to maintenance and impacts on use of rear yards, including West Nile Virus	But occurring in Dry Ponds and Wetlands and to some extent in Wet Ponds – same problem will occur with West Nile Virus.
Roof top storage	On a case-by-case basis	Requires Town acceptance
Parking lot storage	On a case-by-case basis	Requires Town acceptance
Permeable pavement	Encouraged	On private property
Rainwater harvesting	Encouraged	On private property
Vegetated filter strips	Encouraged	On private property
Enhanced grass swales	Encouraged	On private property or Requires Town acceptance
Dry swales	Encouraged	On private property or Requires Town acceptance
Conveyance Controls		
Perforated pipe systems under asphalt	Not currently endorsed on public lands	
Perforated pipe systems under boulevard	Encouraged	Requires Town acceptance
Pervious catchbasins	Not currently endorsed	
Grassed swales	Encouraged	On private property or Requires Town acceptance
Oversized pipes	Encouraged	On private property or Requires Town acceptance
End of Pipe Controls		
Wet ponds	Encouraged	SWM Report
Wetland ponds	Encouraged	SWM Report
Hybrid ponds	Encouraged	SWM Report
Dry ponds	Hybrid ponds	Drainage areas <5 ha or infiltration > 25mm
Oil/grit separators	Encouraged	Drainage areas <5 ha
Infiltration basin	On a case-by-case basis	Requires Town acceptance

Note: Several criteria are inter-related, for example retaining the first 5 mm of precipitation on-site not only produces water balance benefits, it also provides runoff water quantity reduction, water quality improvements, and downstream erosion benefits.

Application of in-ground LID measures has to be evaluated taking into consideration the ground water levels observed in the project area.

4.7.2 Emergency Spillway

All stormwater management facilities shall be designed with an emergency spillway to allow drainage to safely exit the facility should the outfall structure fail to function, or should the storm event have a frequency lower than the 100-year storm. The emergency spillway shall be designed to convey the Regional Storm event post development routed peak flow with the invert of the spillway set, as a minimum, at the 100-year controlled water level (or Regional controlled water level for ponds where Regional control may be required). A freeboard of 0.30 meters shall be provided above the maximum routed Regional Storm water level to the top of the pond berm.

The emergency spillway shall incorporate erosion protection measures that are adequately designed to withstand the erosive velocity associated with the uncontrolled governing flow. The erosion protection shall be integrated with a natural vegetated surface treatment that is aesthetically pleasing.

Spillway side slopes shall not be steeper than 3:1 and shall be no steeper than 10% when incorporated into the access road. The spillway shall not be located directly above the outlet control structure and a minimum horizontal clearance of 3.0 m shall be provided.

4.7.3 Grading (Side Slopes)

Grading within stormwater management facilities shall be designed with the minimum slope requirements for the various components of the facility are as follows:

- Stormwater management facilities shall be designed with 4:1 above and below the safety shelf
- A safety shelf shall be provided with a slope of 7:1 extending 3m horizontally above and below the normal water level
- There must be a 3.0m flat buffer (2% to 5%) between the top bank of the facility and any existing or proposed private property
- 4:1 where the slope backs on to the rear yard lot line or an adjacent valley system
- 4:1 where the pond is adjacent to a municipal boundary
- 5:1 where the slope backs on to an adjacent road system
- 5:1 where the pond is being used as part of a trail system or passive recreation area

Retaining walls will not be permitted in the design of stormwater management facilities

4.7.4 Major System Overland Flow Routes

The major system overland flow route to the SWM facilities shall be designed to safely convey the Regulatory (i.e. the larger of the 100-yr storm and Hurricane Hazel or Timmins Storm) overland flow. Should the overland flow route to the SWM facility consist of the access road and path, then the flow depth shall not exceed 300 mm or a velocity of 0.65 m/s. Where feasible, the overland flow should not be directed into the forebay to avoid the re-suspension of settled sediments.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.7.5 Anti-seepage Collars**

Anti-seepage collars shall be installed on all outlet pipes or as directed by a geotechnical engineer.

4.7.6 Existing Groundwater Elevation

Within the stormwater block, at least one borehole shall be located near the center of the block as part of the geotechnical investigation, to assess the nature of existing soils and the groundwater elevation. The groundwater elevation shall be compared to the proposed permanent pool water elevation within the facility. Where soil conditions are very permeable and the groundwater elevation is below the permanent pool water level, lining of the permanent pool area with an impermeable material may be required to ensure permanent pool levels are maintained. A liner may also be required when groundwater contamination may be a result of the permeable soils and the water quality within the stormwater management facility. The type and thickness of lining material shall be based on Geotechnical recommendations; however, a clay liner is preferred over synthetic materials for stormwater management facilities.

Where the groundwater elevation is above the permanent pool water elevation, an investigation shall be undertaken to assess the impacts of a localized reduction in groundwater levels, potential impacts to groundwater aquifer systems and flow regimes, watercourse baseflow quantity and temperature, and to assess potential slope stability and groundwater seepage concerns within the facility. The scope of this investigation will be determined based on site specific conditions. The consultant shall consider all feasible design alternatives to limit or negate any impact to local groundwater levels to the satisfaction of the Town.

The forebay should always be lined where the majority of the contaminants are contained. If an impermeable liner is required, the liner is to be constructed of impermeable clay or silt as per the geotechnical engineer's recommendation. The use of a manufactured bentonite geosynthetic liner is not supported. The installation of the liner must be supervised and certified by the geotechnical engineer.

4.7.7 Fire Use

In certain locations of the Town (e.g., remote development locations where access to fire hydrants is not available), and subject to review by the Town, it may be desirable to utilize the SWM pond as a source of water for fire use by incorporating a dry hydrant design. The design must meet the requirements of the Ontario Building Code for dry hydrants which is currently in accordance with FPA 1142, Water Supplies for Suburban and Rural Fire Fighting.

4.7.8 Sediment Forebay Bottom

A berm shall be constructed with a forebay spillway invert at the NWL with appropriate erosion protection to enable, as a minimum, the flow of the water quality event (25 mm event) without overtopping any other part of the forebay into the main cell of the facility. The minimum top width of the berm shall be 1.0 m and side slopes 3:1.

A dewatering sump shall be installed in the forebay to enable the drawdown of the permanent pool for maintenance and sediment removal. Where feasible, the forebay sump shall be connected to the pond outlet structure with a control valve to drain by gravity. Where draining by gravity is not feasible, a dewatering sump shall be included and drained by pump.

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The sediment forebay bottom is to be lined with 500 mm of 25 mm crushed stone or approved alternative to assist in the maintenance operations of the facility. A Geotechnical Engineer must certify that the forebay bottom design has sufficient bearing capacity to support maintenance equipment assuming the forebay has been drained.

4.7.9 Sediment Drying Areas

Sediment drying areas are to be incorporated into the design of wet end of pipe stormwater management facilities such that water from the sediment drains back into the sediment forebay with a slope of 2% to 4%. The sediment drying area shall be designed to:

- accommodate 30% of the forebay volume
- have a maximum sediment stockpile depth of 1m
- have a maximum sediment side slopes of 10:1
- located in areas that avoid high publicity
- is accessible from the maintenance access road
- is located above the five (5) year water level
- setback a minimum of 6 m from property line

4.7.10 Inlet Structures

Inlet structures shall be installed with the invert set to the NWL or higher. Suitable erosion control and energy dissipation treatment shall be provided at all inlets to the pond. The sizing of rip rap or river stone shall be based on appropriate erosive velocity calculations. Maintenance access roads shall be provided to all inlet structures.

Headwalls, barricades and safety grating shall be installed at all inlets as per OPSD 804.040, OPSD 804.030, OPSD 980.101 and OPSD 804.050 respectively. SWM pond inlet elevations are to be designed such that the one (1) in five (5) year storm design sewer capacity as per the storm sewer design sheet is maintained and not reduced due to tail water conditions.

4.7.11 Outlet Control Structures

Outlet control structures shall be designed with flow regulating devices to control the flow and pond drawdown time. The standards for end of pipe stormwater management pond outlets are as follows:

- a) The Town is requesting one control maintenance hole with a central wall designed with an orifice and/or notches to provide flow control and located at the top of the berm outside of the emergency spillway. It can be located on the maintenance road if the road is paved and the maintenance hole fitted with autostables
- b) If feasible, the intake pipe will be sized for the 100-year flow have sufficient cover to prevent freezing. For larger catchments to reduce the intake pipe size, a grated inlet can be used preferably above the 25-year water level
- c) Where the permanent pool elevation is greater than 1 m above the obvert of the intake pipe, a reverse slope pipe shall be used. The intake pipe must be anchored and stabilized and be fitted with a grate of sufficient size that a swimmer would not be pinned against it at high flow

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- d) Where the permanent pool elevation is less than 1 m above the obvert of the intake pipe, the outlet should be designed with a heavy duty galvanized CSP riser with pre-punched perforations with 1.5 times the 100 year flow capacity, a lockable non-hinged lid and large riprap placed against the riser to provide protection and filtering of stormwater. No hickenbottom or flow controls shall be in the riser.
- e) The low flow orifice on the center wall should be designed with an adjustable knife gate valve to control the flow and pond drawdown time and be accessible for adjustment through a standard maintenance hole cover without entering the maintenance hole. This would provide the Town with the ability to:
 - i. Adjust the low flow discharge to set the draw down rate (details provided in the Operations and Maintenance Manual)
 - ii. Open the valve fully to clear any clogging in the inlet pipe
 - iii. Shut the valve to control any spills from moving downstream

The outlet should also include a maintenance pipe with shut off valve for draining the SWMF if possible

The minimum design orifice size is 75 mm with filtered stormwater, or 100 mm. Outlet structures are to be designed in a safe and aesthetically pleasing manner with the majority of the structure contained within the berm.

Suitable erosion control and energy dissipation treatment shall be provided at the pond outfall per Town of Innisfil Standard I-1002 where it discharges to the receiving body. The sizing of rip-rap or river stone at the outfall shall be based on appropriate erosive velocity calculations. Maintenance access roads shall be provided to all outlet structures.

The outlet structure should be designed to operate under free-flowing conditions where feasible. The return period water surface elevations of the receiving body must be determined and verified to ensure the proper operation of the outlet structure. Where it is not feasible to operate the outlet structure under free-flowing conditions, appropriate submergence calculations must be completed to ensure that the outlet structure is sized correctly.

4.7.12 Fencing and Gates

Fencing shall be installed where the stormwater management facilities abut private lots, municipal boundaries, elementary schools and active recreation areas frequented by young children unless maximum slopes of 6:1 are provided. Town may request to install fencing in other conditions on project by project basis. Where required, fencing shall be installed as per Town of Innisfil Engineering Design Standards and Specifications Manual.

All stormwater management facilities are to be designed such that perimeter fencing is not required where it is adjacent to municipal right of ways. Gates with a locking system shall be provided on all maintenance road access points

4.7.13 Signage

Town Standard Sign, TOISD 818, shall be clearly visible and erected at the stormwater management facility's maintenance access road entrances, as approved by the Town. Town

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Standard signs shall be supplied and installed by the developer and designed in accordance with Town standards.

Warning signs shall be clearly visible and erected at all access points (maintenance access roads or pedestrian trail access points) to the stormwater management facility. Warning signs shall be supplied and installed by the developer and designed in accordance with Town of Innisfil Standard TOISD 818.

4.7.14 Geotechnical Review

As part of final design, the geotechnical engineer should review the detailed design of the stormwater management facilities as well as the procedures outlined in the operation and maintenance manual and provide written certification confirming that they meet current geotechnical standards and are suitable from a geotechnical perspective. Drawing for the SWM facilities should include any geotechnical design parameters required such as soil and compaction specifications for berm construction, sub-base for maintenance roads and erosion protection materials. The same requirements are required for temporary erosion and sediment control facilities.

4.7.15 Aesthetics and Landscaping

The stormwater management facilities shall be constructed with acceptable building materials (e.g. no gabions) to ensure that the pond is an aesthetically pleasing component of the community. Stormwater management facilities shall be integrated with parks and trails where feasible. Access to the SWM ponds by unauthorized vehicles should be restricted by the placement of armour stone and large trees around the perimeter where there is no fencing

4.7.16 West Nile Virus

Reasonable measures should be incorporated in the design of wet ponds and wetlands to minimize the proliferation of mosquitoes and the potential spread of the West Nile virus and to reduce the need to apply larvicide. Such measures, which focus on creating habitat less suitable for mosquito breeding and survival, include the following (adapted from TRCA Innovative Stormwater Management Workshop, Culex Environmental, May 2008):

- Encourage a plant-dominated state as opposed to an algae-dominated state – A plant dominated state (i.e., lots of submerged and floating-leaved aquatic plants) provides habitat for predators whereas algae dominated state is less favourable for predators and more favourable for mosquitoes with increased availability of nutrients and turbidity as a food source and warmer water. In addition, mosquito larvae tend to avoid submerged and floating-leaved plants
- Introduce predators – Along with a plant-dominated state introduce predators that feed on mosquito eggs and larvae, such as: grazing invertebrates (e.g., snails, Mayfly larvae, Chironomids), neustonic insects (e.g., water striders, water boatmen, whirligig beetles), benthic invertebrates (e.g., flatworms, leeches, Asellus, shrimps), three-spined sticklebacks, fathead minnows, dragonfly nymphs, water beetles, Alderfly larvae, and frogs and toads. In addition, bird and bat houses should be erected to encourage the nesting of bats and birds such as swallows and purple martins which rely on flying insects including mosquitoes as their primary food source

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- Minimum water depths – Where possible, the minimum depth of water within the permanent pool should be 1.0 m or greater

4.7.17 Thermal Impacts

When discharging stormwater to a watercourse identified as a Cold Water Fishery, mitigation measures such as shoreline planting, shading with trees, bottom draw outlet pipes from deeper pools, or cooling trenches shall be implemented in SWM facilities to minimize thermal loading to the receiving watercourse. Bottom draw quality control pipes should have an inlet invert 500 mm above the bottom of the SWM facility to prevent sediment from entering the pipe. Cooling trenches should have a minimum length of 30 m.

4.7.18 Trails

Pedestrian circulation trails shall be incorporated into SWM facilities where public safety has been fully addressed in terms of access, side slopes and fencing requirements. The feasibility of connections to adjacent neighborhood parks, recreation areas and existing trail networks is to be explored as part of the initial SWM facility submission plans to the satisfaction of the Town. Wherever possible trails shall be co-located with maintenance access roads.

4.7.19 Operations and Maintenance Manual

A stand-alone operations and maintenance manual will be required as part of the design of each facility, including inspection checklists, maintenance descriptions and projected frequency, as well as recommendations for facility cleanup.

4.8 FACILITIES PLANTING GUIDELINES

The following section outlines the specific design criteria and planting requirements which are to be followed within stormwater management (SWM) facilities and/or wetlands within the Town of Innisfil. These criteria are in addition to the minimum standards outlined within the MOE's Stormwater Management, Planning and Design Manual and planting standards for both the LSRCA and the NVCA.

Landscaped areas shall consist of native species only as per the *Native Plant Species in Ontario* (Riley, 1989) provided in the *NVCA Pond Planting Guidelines* (NVCA, April 2006) with the exception of those unacceptable/invasive species identified by the LSRCA and included in **Appendix J**. If a development is located within an area where an overall SWM planning study (*i.e. Environmental Impact Study, Ministry of the Environment Special Provisions*) is available, the design criteria and recommendations as specified in the appropriate study must also be followed where specific direction is given.

4.8.1 Landscaping

In cases where there are residential lot(s) adjacent to a stormwater management facility, a minimum 6 m wide landscaping buffer with a maximum slope of 4:1 will be required between the maintenance access route and the residential lot(s) to provide separation between the stormwater management facility and private property. This buffer can be included within the stormwater management block.

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4.8.2 Planting Zones

SUBMERGENT (*Deep Water*) – Water depth 0.5 m to 2.0 m

- Planting is to consist of a combination of both floating and submergent species.
- Planting must include at least (3) three species each of robust, broadleaf and narrow leaf plant varieties

AQUATIC FRINGE (*Shallow Water*) – Water depth 0.0 m to 0.5 m

- Planting is to consist of a combination of both floating and submergent species.
- Planting must include at least (4) four species each of robust, broadleaf and narrow leaf plant varieties

SHORELINE FRINGE (*Extended Detention*) – 1.0 m (horizontal) from the permanent pool elevation

- Plantings zone appropriate wetland species must include perennial sedges, rushes and wild flowers in combination with shrubs and wetland seed mix
- The shoreline fringe is subject to fluctuations in water levels which will result in regular flooding and therefore plant selections must be flood tolerant

FLOOD FRINGE – 2.0 m (horizontal) from the limit of the shoreline fringe limit to the 100 year flood level

- Plantings must include a diverse variety of no less than five (5) flood tolerant species each of shrubs, deciduous trees and coniferous trees
- Trees and shrubs within the flood fringe will provide canopy structure to mitigate thermal effects on water temperature
- Herbaceous plant material may be provided by the use of an approved wet meadow seed mix which will be applied in combination with an annual rye nurse crop or suitable equivalent nurse crop
- UPLAND – includes all areas outside the flood fringe
- Plantings will include a minimum of seven (7) species each of drought tolerant shrubs, deciduous trees and coniferous trees
- Upland planting is intended to provide visual screening, aesthetic appeal, wind blockage and shading to mitigate thermal effects on water temperature
- Tree plantings to have no more than five (5) trees of the same species in a grouping
- Provide a minimum 1.5 m buffer between plantings and any structures such as maintenance roads and drying areas and fencing which abuts residentially zoned property
- Trees planted along fenced areas, bordering residential properties should be structurally sound, strong branched so to prevent falling branches into adjoining residential properties

4.8.3 Planting Guidelines

AQUATICS (Submergent and Aquatic Fringe)

- Spacing requirements for aquatics in plug form is five (5) units per m²
- Spacing requirements for aquatics in 100 cm potted form is four (4) units per m²
- Spacing requirements for aquatics in 150 cm potted form is three (3) units per m²
- Cattails (*Typha* spp.) will be planted as interim perimeter vegetation in sediment forebays to increase sediment trapping. The use of this material will not limit maintenance access and it is acceptable that this material will be removed during dredging operations
- Other aquatic species will not to be placed within the forebays as they would be less likely to re-colonize after dredging operations
- Plant material must be comprised of 100% native stock
- Protection from geese and other waterfowl may be required during initial aquatic plant installations
- Aquatic fringe plant installations should be installed one (1) full growing season after that of both the shoreline and flood fringe or at such time as a complete vegetative buffer is established around the pond perimeter as deterrence to geese

TERRESTRIAL (Shoreline Fringe, Flood Fringe and Upland)

- Do not utilize plant material which has been removed or harvested from natural wetlands or roadsides as they may contain invasive or non-native species
- Plant material must be comprised of 100% native stock from a reputable grower/supplier
- Plant shrubs in groupings of no less than 15 units [and no more than thirty (30) units] to promote both colonization and spreading
- Shrubs are to be no less than 60 cm height (container grown stock only)
- Deciduous trees within the flood fringe are to be no less than 50 mm caliper stock. Canopy to be structural sound with strong central leader, no co-dominant leaders will be accepted. Canopy to be healthy and balanced around main central trunk of tree with no rubbing branches nor damages/inclusions on bark. Bio-degradable support materials shall be as per Town standards or approved by project leader. Metal "T" bar and wire support will not be accepted
- Deciduous trees within the upland may utilize a combination of caliper material and whip stock where caliper trees are planted based on a rate of one unit per 25 m². Whip stock is to be installed at a rate of 6.25 units per 25 m²
- Whips and any bare root stock to be planted prior to the third Friday of May in any given year
- Coniferous material will be no less than 2000 mm in height where height is measured from the top of the root ball to the first whorl (does not include the leader)

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- Where applicable, shrubs, deciduous trees and coniferous trees are to be installed in accordance to current Town Standards
- Rodent protection will be installed around the base of all deciduous trees. It will be the installer's responsibility to remove rodent protection (2) two years prior to accepted/assumed. Biodegradable options will also be considered
- Weed abatement measures will be used around trunks of trees using mulch, coco fiber mats or Town approved substitute
- Bio-engineering (e.g. live staking) should be implemented on steep slopes in conjunction with other stabilization methods. Live staking will not be considered for use against density calculations for plant material

4.8.4 Calculation Table for Planting Density

Table 4.8 - Calculation Table for Planting Density

	A	B	C	D	E	F
ZONE	ZONE AREA	WATER'S EDGE	¹ QUANTITY OF AQUATIC SPECIES 35% Coverage	QUANTITY OF PLANT COVERAGE 50% Coverage	² NUMBER OF TREES REQUIRED	NUMBER OF SHRUBS REQUIRED
SUBMERGENT	n/a	B (lin. m)	$C = B \times 0.35$	n/a	n/a	n/a
AQUATIC FRINGE	n/a	B (lin. m)	$C = B \times 0.35$	n/a	n/a	n/a
SHORELINE FRINGE	A (m ²)	n/a	n/a	$D = A \times 0.05$	n/a	F = D
FLOOD FRINGE	A (m ²)	n/a	n/a	$D = A \times 0.05$	$E = (A/1000) \times 25$	F = D - (E * 15)
UPLAND	A (m ²)	n/a	n/a	$D = A \times 0.05$	$E = (A/1000) \times 25$	F = D - (E * 15)

1. Quantities are based on plugs (5 units per sq/m)

2. Quantities are based on caliper stock (1 unit per 25 m²)

4.8.5 Topsoil

- Topsoil must meet the current Ontario Provincial Standard Specification No.570 (OPSS-570)
- Topsoil will be laboratory tested and the subsequent findings forwarded to Parks Planning and Development for approval prior to placement of topsoil
- Testing must demonstrate that topsoil has sufficient organic and nutrient content and is suitable for sustaining plant material which is to be placed into the pond and/or wetland

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

- Soil amendments required as a result of laboratory testing must be completed prior to or during the placement of topsoil in accordance with laboratory findings and amendment requirements
- For terrestrial habitats in the flood fringe, provide 0.35 m of topsoil
- For terrestrial habitats in the upland area, provide 0.20 m of topsoil
- For aquatic habitats, provide 0.45 m of topsoil for the first 1 m from the permanent pool elevation
- Stabilize topsoil after placement prior to the installation of woody plant material. In the event that erosion control blankets are utilized in combination to approved seed mixes for stabilization purposes, the netting and blanket material will be 100% bio-degradable. Photo-degradable plastic or plastic netting is not permitted for ground stabilization
- If topsoil stabilizations cannot be completed within one (1) construction year's growing season, the topsoil should not be placed until the following spring. In this event, sediment controls must be in place to prevent erosion of stockpiled materials

4.8.6 Seeding

- All seed mixes are to be placed in combination with an annual rye nurse crop or suitable equivalent nurse crop and will be applied at a rate of 12 kg per hectare
- All upland areas are to be seeded using a 'Simcoe County Native Seed Mix' or seed mixture indigenous to the area and applied at a rate of 20 kg per hectare
- Shoreline Fringe and Flood Fringe areas are to be seeded using an approved 'Wet Meadow' or seasonally flooded annual/perennial seed mix which are to be applied at a rate of 20 kg per hectare
- Seed application is to follow directly after topsoil placement in order to establish vegetative cover quickly for stabilization of topsoil. Seed application should be done at a time of year to ensure the best possible germination and mitigate seed loss
- Erosion control blankets are to be placed over top of seeded areas immediately after application where required
- Contractor will insure 100% coverage and establishment within the stormwater facility throughout the warranty period

4.8.7 Guarantee Period

- All aquatics, perennials, trees and shrubs are to be guaranteed for a period of not less than one year from the beginning of the maintenance period
- If aquatics, perennials, trees and/or shrubs are found dead, diseased, missing or are deemed to be unhealthy within the guarantee period the defective plants are to be replaced and re-guaranteed for an additional two (2) years

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.8.8 Monitoring and Maintenance**

- Vegetation monitoring plans and schedules are required with all landscape plan submissions which will include monitoring of the performance and effectiveness of interim measures (e.g. nurse crops) and monitoring of plant health during droughts
- Monitoring reports for will be provided to the Town from the time of the initial plant installations until the end of the guarantee period. Inspections are to take place during September of each year and are to be provided to the Town no later than October 7th of each year
- Mulch saucers should be placed and maintained around the base of trees to retain water
- Watering activities should continue for the first two years after planting

4.8.9 Alternative Landscape Treatment for Low Impact Development

The Town of Innisfil supports a Low Impact Development approach to stormwater management. Given that this is an emerging and evolving technology, the Town will review landscape design requirements on a case-by-case basis.

4.9 FACILITIES MAINTENANCE AND INSPECTION PROTOCOL**4.9.1 Operations and Maintenance Manual**

Prior to final Site Plan or Plan of Subdivision approvals at the detailed design stage, a stand-alone Operation and Maintenance Manual shall be prepared for all proposed SWM facilities that identifies on-going operation protocol including inspection and maintenance issues, inspection checklists, maintenance descriptions and projected frequency, as well as recommendations for facility cleanup. The Toronto and Region Conservation Authority (TRCA) document entitled "Inspection and Maintenance Guide for Stormwater Management Ponds and Constructed Wetlands", dated April 2018, can be used as a guide for development of the Operations and Maintenance Manual. The specific requirements that must be included in SWM facility Operation and Maintenance Manuals submitted to the Town shall include, as a minimum, the items outlined below:

4.9.2 Background Information

Introductory material describing the property location, including both municipal and legal descriptions, and drainage area tributary to the facility.

4.9.3 Design Elements and General Description of Operation

- A general description describing the operation of the SWM facility and applicable water quality, erosion and quantity control criteria
- Indicate and describe the various design elements of the SWM facility (e.g. sediment forebay, permanent pool, extended detention and flood storage, drawdown time and how the facility operates under various storm events, inlet and outlet control structures including maintenance by-pass valve, drawdown valve and spill containment valve, if applicable)

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.9.4 Responsibility for Maintenance Activities**

Provide details as to who is responsible for SWM facility maintenance before and following assumption by the Town.

4.9.5 Inspection and Maintenance Procedures

Prepare a list of key inspection items including but not limited to the following:

- check inlet and outlet structures for accumulation of miscellaneous construction debris and other trash that may affect performance
- check for unusually long extended detention drawdown time that could indicate a blockage in the outlet structure
- check for sediment accumulation in the forebay and downstream of the facility
- note evidence of seepage along the berms
- check for vandalism including illegal access (e.g., gates) or encroachment around the perimeter of the facility
- confirm that safety and security measures are in good working order
- check for the presence of any unusual erosion around berms and inlet or outlet structures
- complete visual inspection to confirm that vegetation is healthy
- complete visual inspection to confirm no oil sheen present on water surface or the presence of other visible contaminants or odours
- check drawdown valve and spill containment valve (if applicable) for proper operation

Provide recommended maintenance procedures for items including but not limited to the following: grass cutting around walking trails; weed control; upland and fringe plantings; shoreline fringe plantings; aquatic vegetation replanting; outlet adjustments; bathymetric survey to assess the need for sediment removal; trash removal; and winter maintenance.

4.9.6 Monitoring Program and Performance Evaluation

- Prepare a recommended plan for water quality monitoring that will accurately characterize the average water quality treatment provided by the SWM facility per the Lake Simcoe Protection Plan and demonstrate that it is in accordance with the MOE Certificate of Approval
- Include recommended procedure to verify the rating curve of the outlet control structure
- Provide a recommended plan to complete a SWM facility bathymetric survey to determine the quantity of sediment to be removed (if any)
- Include a list of key structures to confirm as-constructed elevations and dimensions (e.g., inlet, outlet control structure components including weirs and orifices) and proper installation (e.g., safety and security measures, vegetation, erosion protection)

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.9.7 Removal and Disposal of SWM Facility Sediments.**

- Indicate the procedure required to dewater the permanent pool prior to sediment removal and how to divert storm flows away from the facility during maintenance operations
- Provide a sediment handling, removal and disposal plan including but not limited to the following: written notification to residents within 120 m of the SWM facility identifying maintenance works and duration; erosion and sediment control plan to prevent the release of TSS to the downstream receiver; treatment, sediment dewatering and drying techniques to be used; and the required chemical analyses to be completed in accordance with Ontario Regulation 558/00 prior to disposal

4.9.8 Estimated Annualized Operation and Maintenance Costs

Provide calculations of the estimated annualized operation and maintenance costs for the SWM facility. Costs should include but not be limited to the following: debris and litter removal; grass cutting and weed control (if applicable); maintenance of aquatic/shoreline fringe and upland/flood fringe vegetation; sediment testing; sediment removal and disposal; inlet/outlet structure repairs; side slope and access road repairs; and retaining wall repairs.

4.9.9 Primary Tables and Supporting Calculations

- SWM facility inspection check list.
- Estimated annualized operation and maintenance costs and supporting calculations
- Sediment accumulation cleanout frequency calculations

4.9.10 Primary Figures and Drawings

- SWM facility location plan.
- Post-development drainage area plan tributary to the SWM facility.
- SWM facility stage-storage-discharge relationship and curve.
- General plan for the SWM facility and detailed drawings of key elements (e.g., inlet, outlet control structure, maintenance valve, spill containment valve).

4.9.11 Stormwater Management Pond Post – Cleanout (Final Acceptance)

Following removal of accumulated sediment, the developer's engineer shall provide a survey of the cleaned out SWM facility and provide an As-Recorded SWM facility drawing which includes the following;

- A summary table with the design, pre, and post cleanout permanent pool volumes;
- A summary table with the design and as-recorded elevations of inlet headwall(s), outlet(s), weir(s), forebay berm inverts, emergency spillway inverts, and any other structures which are required for the facility to function as designed.
- Plan and sections of the pond which illustrate the maintenance access, hydraulic structures, and representative pond side slopes.

A geodetic monument shall be installed on the inlet headwall with the exact location and elevation included on the As-Recorded SWM Pond drawings set.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

All required warning signage shall be installed with proof of installation provided to the Town via timestamped photographs.

The developer's engineer shall provide the Town with an Engineering Certification letter which confirms that all of the components of the SWM facility are in good condition and do not require repair, and have been installed in general conformance with the approved SWM Facility design and final approved drawings. The additional information should be included in a package to the Town:

- The approved SWM Facility Report;
- All approvals associated with the SWM facility and associated infrastructure (e.g. outfall headwalls to the natural environment) shall be provided to the Town. Approvals should include the Ministry of Environment, Conservation and Parks (MECP), Environmental Compliance Approval (ECA), formerly called Certificate of Approval (COA), LSRCA Ontario Regulation 179/06 (works within a regulated area); possibly Ministry of Natural Resources and Forestry; and/or Fisheries and Oceans Canada (DFO).

The developer shall provide the Town with a Landscape Certification letter which confirms that all of the plantings associated with the SWM facility are in good condition and do not require replacement, and are in general conformance with the approved landscape plans. The additional information should be included in a package to the Town:

- The final approved Landscape plans associated with the SWM facility;
- All approvals associated with the landscape plans.

4.10 WATER QUALITY TREATMENT UNITS

4.10.1 Oil/Grit Separators (OGS)

Oil/grit separators are most appropriate for commercial/industrial land use and shall not be used as a standalone Stormwater Management Plan, but rather part of a "treatment train" approach to achieve the required water quality treatment. Oil/grit separators typically serve drainage areas under 2 ha and are predominantly encouraged by the Town to be used for spill control. Oil/grit separators are also appropriate for providing water quality control for redevelopment, or infill areas which typically have space limitations and where a stormwater management pond is not practical. Oil/grit separators should not be used as a substitute for an end of pipe SWM facility forebay. Standards as outlined by the LSCRA for OGS units will be applied.

The design for the OGS shall take into account climate change by adding 15% on to the precipitation data. Supporting calculations and anticipated maintenance requirements shall be provided to the Town along with certification of the design by a Professional Engineer. Additional documentation may be required on a case-by-case basis.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.10.2 Roof Top and Parking Lot Storage**

The use of rooftop and parking lot storage for stormwater management has some challenges. The two issues would be the potential for flood damage to private property and the continual functioning of such devices if on-site controls are altered after construction (e.g. rooftop flow control inadvertently removed).

The use of roof top or parking area to provide peak flow control is generally not preferred, and shall be considered on a site specific basis by the Town through pre-consultation. On-site controls should generally be avoided on school sites and other sensitive institutional uses. Water quality and quantity controls in new development areas should be provided in Township-owned municipal blocks or easements.

4.10.3 Roof Top Storage

When used, flat roofs may be used to store runoff to reduce peak flow rates to storm sewer systems to mitigate the need for downstream storm sewer size increases. Per the SWMPD Manual (MOE, 2003), rooftop storage can typically store 50 mm to 80 mm of runoff subject to the roof loading design. Detention time is typically between twelve (12) to twenty-four (24) hours.

Supporting calculations and design drawings must be provided to indicate the following:

- The total number and location of proposed roof drains and emergency overflow weirs
- The type of control device proposed (i.e. product name and manufacturer). Tamper proof devices are preferred where feasible (provision of shop drawings required)
- Unless otherwise deemed appropriate by the Town and/or CA, a maximum flow rate of 42 L/s/ha of roof area
- Product specifications (i.e. design release rates for identified control devices)
- Emergency overflow weirs shall be provided at the maximum design water level elevation
- The maximum ponding depth, storage volume, and drawdown time for roof top storage during the 2-yr through 100-yr design storms
- Roof top control devices may require registration on title as part of the Site Plan Agreement and/or Subdivision Agreement)
- Certification from the structural and mechanical engineers that the roof structure and vertical drain pipes are designed to account for the roof top storage.

4.10.4 Parking Lot Storage

Since vehicles may be flooded, with water entering the passenger compartment at depths of less than 0.3 m, the use of parking lot storage represents a significant liability risk. Where other options for stormwater management practices exist, it is the preference of the Town that alternatives to parking lot storage be used. Should parking lot storage be supported, the following conditions must be met:

- Parking lot storage may require registration on title as part of the Site Plan Agreement and/or Subdivision Agreement) to ensure they are properly

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maintained and cannot be removed or altered during future site alterations without the provision of adequate alternative storage

- The site owner is responsible for all liability related to the proposed parking lot storage system, including all damages resulting from the designed operating conditions and any downstream damages resulting from removal, modification or lack of maintenance to on-site controls;
- Parking lot storage must be controlled by pipe size reductions within the storm sewer network and not through the use of orifice plate restrictors to a minimum size of 100 mm
- Surface ponding is only allowable during storm events greater than the 1:5-year design storm
- The maximum allowable ponding depth within the parking lot is to be limited to 0.3 m; however, maximum ponding depths of 0.2 m are preferred
- The 100-year ponding elevation and storage volume provided at each ponding location must be shown on the design drawings
- An emergency overflow system and overland flow route must be provided to allow all runoff exceeding the 100-year storage to be safely routed from the site to a suitable outlet (i.e. municipal R.O.W.) This flow route must be shown on an engineering plan

4.11 END-OF-PIPE CONTROLS

End-of-pipe control facilities shall provide the required quantity and quality control in accordance with the governing guidelines which are currently documented in the Ministry of the Environment's Stormwater Management Planning and Design Manual (MOE, 2003), unless otherwise specified below by the Town.

The planning and design of each pond shall also focus on opportunities to integrate the pond with the surrounding topography and land uses. Ponds are to be created as public amenity features and are to be safe, significantly visible and accessible to the general public. Opportunities for linkages through the use of trails to larger open space, floodplain areas or other SWM facilities are to be maximized.

4.11.1 Wet Pond with Extended Detention

Wet ponds are typically the preferred end-of-pipe control facility for drainage areas greater than 5 ha. Wet ponds shall be designed in accordance with the governing guidelines unless otherwise specified in the Town's guidelines.

4.11.2 Wetland with Extended Detention

A constructed wetland is an acceptable stand-alone end-of-pipe control facility. Constructed wetlands shall be designed in accordance with the governing guidelines unless otherwise specified in the Town's guidelines.

4.11.3 Hybrid Wet Pond / Wetland with Extended Detention

A wet pond / constructed wetland hybrid is an acceptable stand-alone end-of-pipe control facility. Hybrid wet ponds / constructed wetlands shall be designed in accordance with the governing guidelines unless otherwise specified in the Town's guidelines.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.11.4 Dry Pond with Extended Detention**

Dry ponds servicing development larger than 5 ha will not be permitted unless Low Impact Development has been designed to infiltrate the runoff from the 25mm storm event. Dry ponds for smaller development may be used as a part of a treatment train approach provided that an enhanced level of water quality treatment is achieved.

4.11.5 Infiltration Basin

In general, infiltration basins shall not be accepted as a stand-alone end-of-pipe facility, unless as part of a treatment train approach or as an additional feature. Infiltration basins shall not be permitted for drainage areas > 5 ha.

4.11.6 End of Pipe Water Depths

The following water depths will be permitted in the End of Pipe facilities:

	Wet Pond	Wetland	Dry Pond
Maximum Permanent Pool Depth	2.5		
Average Permanent Pool Depth	1 to 2	150 to 300 mm, 1 m at inlet and outlet	
Extended Detention (Active Storage)	2	1 for storms < 10 yr	
Quality and Erosion Control	1		
Maximum Overall depth	3	3	2
Forebay Minimum Depth	1.5	1	1.5

4.11.7 Maintenance Access

Maintenance access roads are required to all inlet and outlet structures, sediment forebays, sediment drying areas (if applicable), and emergency spillways associated with the stormwater management facility. Co-location of access roads with trails shall be implemented wherever possible. Where feasible, two access points shall be provided from the municipal road allowance such that the access road is looped to key hydraulic features. In situations where this is not practical, dead end access roads shall be designed with a hammerhead turning area consisting of a minimum hammerhead width of 17.0 m and a 12.0 m centerline turning radius, however this option is not ideal.

Where the access road enters the forebay below the NWL, the forebay ramp shall be constructed consistent with the lining of the bottom of the forebay or as recommended by a geotechnical engineer. Minimum width of 4.0 m and a maximum grade of 10% should be used. Ramp access should favour “green” solutions.

The access roads shall provide for all-weather ingress and egress with a minimum width of 4.0 m and a maximum grade of 3%. The maintenance access road shall consist of 50 mm HL4 with a minimum base of 300 mm of compacted granular “A” (or as recommended by a geotechnical engineer) which extends 0.5 m on either side of the paved surface. Curves on

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all access roads shall have a minimum centerline radius of 12.0 m. Maintenance access roads shall be set a minimum of 300 mm above the maximum pond water level.

At locations where overland inlet flow routes or the emergency spillway cross the maintenance access, reinforcing measures shall be incorporated to strengthen the access route to carry truck loading and permit bike/stroller crossing.

4.11.8 Berming

Berms around wetlands and wet ponds shall be designed with a minimum top width of 3.0 m (where trails and access roads are not located) with a 3:1 maximum side slope on the outside. The core of the berms shall be constructed with engineered fill on the basis of the recommendations of a licensed geotechnical engineer. Topsoil is not permitted for berm construction except as a dressing to support vegetation on the top of the core.

For pond berms exceeding 2.0 m in height from the top of the berm to the toe of slope, the berm must be designed by a qualified professional engineer in accordance with the latest edition of the Ontario Dam Safety Guidelines (MNR).

4.12 EROSION AND SEDIMENT CONTROL

Sediment control measures have been required on construction sites for several decades, however, even on sites where recommended practices are applied, sediment continues to be discharged at concentrations above those required to protect aquatic life. It is important to consider that effective erosion and sediment control must move beyond the installation of devices such as silt fence and move towards an ongoing “process” within a project framework - from conception to construction.

A complete ESC plan includes the following:

1. Erosion and Sediment Control (ESC) Plans (report and drawings)
2. Spill Control and Response Plans
3. Inspection and Maintenance of ESC
4. Performance Monitoring and Reporting

This section presents the minimum criteria for the design of some commonly used erosion and sediment controls. For additional information and/or information on control options that have not been included in this section, please also refer to the latest revision of the Ministry of the Environment (MOE) *Stormwater Management Planning and Design Manual*, the Nottawasaga Valley Conservation Authority *Development Review Guidelines*, the Lake Simcoe Region Conservation Authority *Watershed Development Policies*, and the Greater Golden Horseshoe Area Conservation Authorities *Erosion and Sediment Control Guidelines for Urban Construction*.

Every control measure and all control plans must meet or exceed the specifications set out in these documents and must be designed to achieve adequate performance at all times. At final design submission, a stand-alone ESC report is required as outlined in the Greater Golden Horseshoe guidelines so that copies can be provided to all staff responsible to ESC on the construction site. The ESC report will include the following:

- a) Project Description
- b) Conditions of Existing Site
- c) Condition of Existing Receiving Water

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- d) Adjacent Areas and Features
- e) Soils
- f) Critical Areas
- g) Permanent Stabilization
- h) Design Details of ESC Measures
- i) Record Keeping Procedures
- j) Stockpile Details
- k) Emergency Contacts
- l) Stamped and Signed Report

A complete application submission requires ESC drawings that work with the ESC report to form a complete ESC Plan. The ESC Drawings should include the following:

- a) General Items
- b) Existing Contours
- c) Existing Vegetation
- d) Water Resources Locations (lakes, rivers etc.)
- e) Regional Storm Floodplain and CA Regulated Areas
- f) Critical Area
- g) Proposed Contours/Elevations
- h) Site Boundary Limits
- i) Existing and Proposed Drainage Systems
- j) Limits of Clearing and Grading
- k) Stockpiles and Berm Data
- l) ESC Measures Locations and Details
- m) Stormwater Management Systems
- n) Stormwater Discharge Locations
- o) Access Road
- p) Internal Haul Road
- q) Construction Phasing and Scheduling
- r) Inspection and Maintenance
- s) Signed and Stamped Drawings

The ESC controls should be designed using a phased approach whenever feasible to minimize the exposed area of the site at any given time. The ESC report should lay out the various phases of construction and any changes or additions to the ESC systems for each phase. Erosion prevention is the preferred mitigation measure for eliminating and/or reducing the potential for sedimentation. Topsoil stripping should be conducted in a logical sequence in order to minimize the areas where soil is exposed. Any areas that are scheduled to remain exposed for longer than thirty (30) days should be protected with vegetative cover. The method used to establish vegetative cover will vary depending on the soil type, site grading and time of year.

This section presents the minimum criteria for the design of some commonly used erosion and sediment controls. For additional information and/or information on control options that have not been included in this section, please also refer to the latest revision of the Ministry of the Environment and Climate Change (MOECC) *Stormwater Management Planning and Design Manual*, the Nottawasaga

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Valley Conservation Authority *Development Review Guidelines*, the Lake Simcoe Region Conservation Authority *Watershed Development Policies*, and the Greater Golden Horseshoe Area Conservation Authorities *Erosion and Sediment Control Guidelines for Urban Construction*.

Every control measure and all control plans must meet or exceed the specifications set out in this document and must be designed to achieve adequate performance at all times.

The controls should be designed using a phased approach whenever feasible to minimize the exposed area of the site at any given time. There must also be a contingency plan for repair, replacement and upgrading of control measures as required to achieve adequate performance at all times.

4.12.1 Runoff Control

The development of the control plan shall examine concentrated runoff from adjacent areas that will pass through the site and shall provide for the diversion of the runoff around disturbed areas. If this is not possible, the runoff shall be directed into armoured channels flanked by silt fencing with appropriate low point protection and shall outlet into a treatment facility prior to discharge.

For sites where sediment control ponds are not being proposed, sediment control fences and cut off swales/channels or equivalent control measures shall be placed along all down gradient boundaries of the site.

For sites adjacent to existing residential areas, a cut-off swale/channel shall be placed around the entire perimeter of the site to prevent drainage onto private lands. A 3.0 m wide buffer strip and/or sediment control fence shall be provided along the perimeter of the down gradient boundaries of the site.

4.12.2 Temporary Sediment Control Ponds

Temporary sediment control ponds are required for any project that has a construction area greater than 5.0 ha.

The location of the pond(s) shall intercept runoff from the entire disturbed area unless other controls are implemented, in conjunction with the pond, to ensure that adequate performance is achieved for the entire area.

In general, the pond shall consist of a:

- a) Permanent pool to contain accumulated sediment and post-storm waters;
- b) Water quality treatment volume that allows for settlement of suspended sediment from storms; and
- c) Forebay to quiet incoming flow if the construction project is anticipated to take place over more than one year.

The required active storage volume shall be designed with a minimum of 125 m³/hectare of contributing area.

The required permanent pool volume shall be designed with a minimum of 125 m³/hectare of contributing area.

The draw down time shall be a minimum of twenty-four (24) hours, or as required by the governing Conservation Authority.

The outlet works shall consist of a perforated riser system, with a minimum orifice diameter of 75 mm.

The forebay shall be designed with a minimum depth of 1 m, a maximum volume of 20% of the permanent pool, have a stable bottom to allow mechanical clean out, and incorporate sediment depth indicators.

The overall pond shall be designed with a minimum depth of 1.0 m, a maximum depth of 2.5 m, maximum side slopes of 4:1, and an emergency spillway sized to safely convey the 1:100 year storm event from the contributing area.

4.12.3 Silt Fences

Silt fence is to be installed on the perimeter and on the up-gradient side of sensitive areas, streams and rivers, and at the base of slopes. It should not be used in areas of high flows.

When silt fence is proposed, it shall be:

- a) Aligned with site contours;
- b) A minimum above grade height of 900 mm with a minimum of 300 mm of the fabric toed into the ground.
- c) Constructed of suitable woven UV stabilized fabric (with a weave density of 270R or greater) fastened with wire fasteners to 150 mm page wire fencing or acceptable equivalent.
- d) Supported by steel T bar fence posts with a separation distance of no more than 2.5 m.
- e) Accompanied by a vegetative buffer strip on the down gradient side.

4.12.4 Vegetative Buffer Strips

Vegetative Buffer Strips shall be provided between the site alteration area and every down gradient protected area. They shall be protected from up gradient erosion by silt fences and shall consist of established vegetation that is growing, whenever possible, on undisturbed soil. They are to be a minimum of 3.0 m wide between the perimeter of the property and a disturbed area and a minimum of 15.0 m wide between surface water and a disturbed area. Additional width may be required if the adjacent surface water is classified as a cold water source.

4.12.5 Non-Vegetative Buffer Strips

Non-Vegetative Buffer Strips shall be installed where there is not a minimum undisturbed area of established vegetation down gradient of the site alteration area. They shall be a minimum of 2.0 m wide between the perimeter of the property and a disturbed area and a minimum of 15.0 m wide between surface water and a disturbed area.

A second silt fence must be installed no closer than 1.0 m to the primary silt fence and there must be space provided for access to clean out trapped sediment and complete any repairs to the fence.

4.12.6 Channel Low Point Protection (Stone Silt Traps)

Channel Low Point Protection Devices shall be constructed in channels and ditches that will contain concentrated flows to reduce the velocity; thereby reducing erosion of the sides and invert. They shall be designed as follows:

- a) So that the crest of the downstream device is at the same elevation as the downstream base of the device further upstream;
- b) With 100 mm to 150 mm diameter rip rap, wrapped in geotextile fabric, from the invert of the channel or ditch to a maximum of 250 mm below the top of the channel or ditch;
- c) With a downstream slope not to exceed 4H:1V and an upstream slope not to exceed 1.5H:1V;
- d) With a 2.5 m long excavated sediment trap approximately 600 mm in depth at the upstream face.

4.12.7 Construction Access Mats

Construction Access Mats shall be installed at all exits from the site and shall be designed and maintained to remove most of the sediment accumulated on vehicle tires. They shall be designed as follows:

- a) 300 mm of 50 mm – 100 mm clear limestone placed on a geotextile fabric suitable for allowing ex-filtration of water and preventing the quarry stone from becoming contaminated with the substrate soil (Terrafix 270R or approved equal).
- b) To be a minimum of 6.0 m in width and extend a minimum of 30 m onto the site.
- c) To be flanked by silt fences and vegetative buffers from the property line to the start of any on-site roadways (refer to TOISD 505 for the detailed drawing).

4.12.8 Topsoil and Spoil Pile Management

Topsoil and spoil piles shall be designed such that they are not in low areas of a site where water may accumulate and they must be surrounded by one or more silt fences.

Any piles containing more than 100 m³ of material shall be a minimum of 15 m from a roadway or channel.

If topsoil or spoil piles are to be left in place for more than sixty (60) days, they shall be stabilized by mulching, vegetative cover, tarps or other equivalent means.

4.12.9 Drain Inlet and Catchbasin Protection

Protection of all potentially affected storm drain inlets and catchbasins shall be accounted for in the design.

Filter cloth protection may be used over the catchbasin inlet where ponding of water will not occur and where traffic will not affect the filter cloth. In all other cases, catchbasin inserts shall be used constructed of filter cloth with or without a metal support structure.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT**4.12.10 Site Dewatering**

Effluent from site dewatering operations must not discharge directly into receiving bodies of water or streams.

Water pumped from the site shall be treated by control devices such as a sediment control pond, grit chambers, sand filters, upflow chambers, swirl concentrators or other appropriate controls, and must not contain particles more than 40 microns in size, or more than 100 mg/L of suspended solids.

4.13 SALT MANAGEMENT

Road salt application is necessary to provide safe conditions during the winter on roads, parking lots and sidewalks, however it is a major source of sodium and chloride ions in the environment. Many studies have shown that road salts have a negative impact on the receiving environment and urban infrastructure. Reducing the need for salt use through design of parking lots and road along with better application practices will help to minimize the impacts. Development must submit a salt management plan at the detailed design.

4.13.1 Salt Management Plan

The main objective of a SMP is to ensure environmental protection while maintaining safe roadway and parking lot to the public. A SMP is intended to set out a policy and procedural framework for ensuring that site owners continuously improve the management of road salt used in winter maintenance operations. A SMP for a development should consist of the following components:

- Establish effective operating procedures (e.g. snow storage/disposal, plow routes, minimum required equipment etc.)
- Identify ice control products
- Recommend/establish effective salt application rates
- Establish a benchmark to assist the site owners to assess/mitigate their onsite use of road salt and the impact to the natural environment
- Training program
- Record keeping protocol

The SMP for private sites should consist of a letter, report or technical memorandum that address the required content and a Site Plan drawing of appropriate scale. The site plan drawing must include:

- North arrow and scale
- Building footprint including all entrances and exits and locations of all downspouts
- All parking areas
- Sidewalks and all wheelchair access areas
- Vegetated areas
- Site entrances and exists
- Stormwater management collection system
- Snow pile storage areas

- Any winter maintenance material storage areas
- Any sensitive areas to salt
- Municipal maintained areas

4.13.2 Parking Lot Design

4.13.2.1 Snow Pile Storage Location

Snow piles on parking lot that are not designed with winter maintenance and salt management in mind can lead to significant application of additional road salt as well as cause further adverse impacts to the local environment. Melt water from snow piles must be collected as close to the piles as possible to limit the travel distance and potential for refreeze. Snow piles can be a significant source of road salts and other typical road runoff pollution source. Therefore, special attention must be given to the water quality treatment solution for snow pile runoff.

Listed below are multiple design recommendations that designers should take into consideration and incorporate where feasible and practical. It is acknowledged that the design is optimized by taking into consideration multiple constraints and not all suggestions can always be accommodated.

- Snow storage piles should be located along the downgradient edges of parking lots and positioned as far away from major pedestrian destinations as possible. If possible, the main snow pile should be placed at the lowest point of the parking lot.
- Parking lots should be graded such that meltwater runoff from snow storage piles is transported away from high traffic areas.
- It is suggested to plan for a snow pile storage volume range of 500 to 1,500m³ per hectare of parking lot (LSRCA, 2017). Snow pile area and height will vary greatly depending on the size of the snow removal area and the snow removal equipment that is being used. For a maximum snow pile height of 3m (trucks with plow attachments), provide a snow storage area equivalent to 10% of the total area to be cleared on site. If specialized snow removal equipment is available, the snow pile heights will increase (safety permitting) and the required snow storage area will decrease.
- If groundwater recharge water quality is of major concern, then the snow storage locations can be designed using impervious surfaces to minimize infiltration (clay underlining of vegetated areas, asphalt pads, concrete pads etc.).
- Catch basins should be located directly downgradient and in the immediate vicinity of snow storage piles to minimize the parking lot area which is subject to meltwater runoff (this may require the construction of additional catch basins).
- Oil grit separators, vegetated filter strips and grassed swales (planted using salt tolerant vegetation) may be included downstream from snow disposal areas to attenuate runoff and reduce suspended solids, metals and petroleum hydrocarbon loads in parking lot runoff.

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- Meltwater collected by catch basins downstream from snow storage piles should be routed through an oil grit separator to reduce meltwater contaminant loads, as snow storage piles typically contain high concentrations of oil, sediment and other contaminants.
- If dedicated snow storage areas are not feasible, portions of the parking lot that may have lower winter month parking requirements can be designated as snow storage locations and drainage infrastructure in this area can be designed to maximize the capture of meltwater.
- Snow storage piles should be staged in areas which receive large amounts of solar radiation to promote more efficient melting.
- Snow storage piles should be located in areas which are easily accessible for plows and other mechanical snow and ice removal machinery. This may involve having multiple snow storage piles.
- Snow storage areas should be clearly marked with signage to inform winter maintenance contractors where to pile snow which is important if there is contractor change over. Example sign text: "These parking stalls are designated as snow pile storage areas during the winter months". Also consider painting/markings the snow storage areas on the pavement.
- The installation of mountable curbs (push points) can allow the contractor to push snow over the curb into designated snow storage area without the concern of causing damage to the curb.

4.13.2.2 Sidewalk Design and Pedestrian Flow

Careful consideration of location and layout of sidewalks/pedestrian walkways can eliminate over-salting of unused walkways. The design process should consider that pedestrians typically follow the path of shortest distance and don't necessarily use the designed walkways. Occasionally, this leads to pedestrians walking along the vehicle routes and not the designed walkways, especially in large parking lots with walkways around the outer edge. By re-thinking the pedestrian walkways and designing them in a way that is more direct and user friendly, the reduction of walkway footprint on a typical parking lot can be achieved. This in turn leads to a reduction of salt application.

On sites where multiple pedestrian pathways are essential during warmer months, consideration should be given to temporary closure of the low traffic walkways during winter months to reduce the required winter maintenance. However, it is noted that priority should be given to the proper planning and placement of walkways during the initial planning process to avoid unnecessary walkways.

Listed below are multiple design recommendations that designers should take into consideration and incorporate where feasible and practical. It is acknowledged that the design is optimized by taking into consideration multiple constraints and not all suggestions can always be accommodated.

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- Planners should verify that the number of sidewalks for the specific building/location is suitable for pedestrian traffic. Sidewalk layout should take into consideration pedestrian traffic flow to and from buildings, transportation corridors (such as bus stops), and connectivity to main pedestrian thoroughfares in addition to considerations for vehicular traffic. Pedestrian walkways should also be focused on family oriented locations: i.e. designated parking for families and elderly near the sidewalks.
- Vegetated islands can be used to help protect pedestrians from vehicular traffic. However, vegetated islands should be limited and strategically located so they do not create unnecessary obstacles for plows.
- Owners should look into the utilization of sidewalks and determine whether a sidewalk is primary or secondary. Consideration should only be given to the design of primary sidewalks. And where secondary sidewalks are required, consideration to temporary closing these during the winter months can lead to the reduction of salt application requirements.
- Partially covered walkways (i.e. overhang) can be eliminated and centralized fully covered walkways and main building entrances can be used where practical. Ensure that runoff from covered walkways is directed to appropriate stormwater management facilities, and not allowed to drain onto paved surfaces.
- Where possible, for major pedestrian thoroughfares, design the width to promote snow removal by conventional equipment and minimize manually shoveled areas (1.5 m minimum width).
- Snow storage locations for walkway clearing should be located to prevent melt water draining back over the walkway.
- Prevailing wind direction should be considered when selecting sidewalk location. When sidewalks are constructed on only one side of a roadway, consideration should be given to placing the sidewalk on either the north or west side.
- For mobility concerns, sidewalk plowing near transit stops should be a priority.
- The use of “rough” material that reduces slip risks without promoting heaving could prove beneficial. The use of darker materials can promote solar heating of walkways.
- By placing the building entrance near the road way, the length of sidewalk needed for primary pedestrian traffic walkways would decrease.
- Consider the use of heated walkways in front of the building. Heated entrances could limit the amount of salt applied.
- Where possible, pedestrian walkway design should consider plow routes.

4.13.2.3 Landscaping Features

Landscaping features such as vegetated swales or landscaped islands can lead to a reduced requirement of salt application by reducing the amount of paved surface. Vegetated swales, bio-retention or landscaped islands with curb cut inlets can be used to collect and retain melt water runoff, reducing melt water ponding and refreezing. The vegetation used in swales and landscaped islands should be salt tolerant and suited

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

to each site's soil, climate and moisture conditions. Additionally, using deciduous trees in the planting plan will provide shade during the hot summer months and allow the sun to directly hit the parking lot during winter months to help melt snow and ice. Where feasible, evergreen trees and/or shrubs can be used as treed windbreaks along the site perimeter, considering the predominant wind direction and adequate setback to avoid accumulation of snow drifts

Although vegetation varies in its reaction to salt-affected soils, salt generally reduces the ability of the roots of the plant to take up water and nutrients by impeding uptake of moisture from soil with salt-laden water. This phenomenon essentially mimics drought conditions for the plant. If salt is sprayed onto plants from automobile traffic it can reduce cold hardiness in buds and new twigs, which may then become more susceptible to freezing, mortality or deformation. Road salt can also be directly toxic to plants; the dissolved sodium and chloride ions separate, and the chloride ions can reach toxic levels as they are absorbed into roots and then build up in the leaves.

Listed below are multiple design recommendations that designers should take into consideration and incorporate where feasible and practical. It is acknowledged that the design is optimized by taking into consideration multiple constraints and not all suggestions can always be accommodated.

- Parking lot layouts should be conducive to mechanical snow removal by snow plows. This may involve minimizing the number of tight turns and obstacles that snow plows encounter by allowing them to plow in straight lines as much as possible. Landscaped islands can be kept to the outside/ends of parking aisles.
- Curb cuts can be installed around the perimeter of the parking lot to promote drainage into landscaped areas.
- All vegetation used in landscaping features should be non-invasive and tolerant to local climate and soil conditions. Preference should also be given to native plants where possible.
- All vegetated landscaping features should be composed of salt tolerant vegetation, for vegetated islands, filter strips and swales. Due to the mobility of salt in soils, in source water protection areas vegetated filter strips and grassed swales should be constructed with an impermeable base material (i.e. clay). Bioretention features should be combined with other upstream salt reduction design features.
- Bioswales should be installed in well-drained soils, or should include underdrain systems when installed in poorly drained soils (CVC and TRCA, 2010).
- If trees are included in the landscaping areas, consideration should be given to deciduous trees with high canopies to maximize solar energy to melt snow/ice during winter months and promote cooling of parking lots in summer months and maintaining visibility.
- During winter months, burlap can be used to protect trees and vegetation from damage.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

- Planting along the property boundary and the inclusion of various bio-retention features is encouraged, provided they don't promote snow drift accumulation directly adjacent to paved surfaces.
- Using raised planters can also protect vegetation from being exposed to increases in salt.

Where feasible, evergreen trees and/or shrubs can be used as treed windbreaks along the site perimeter, considering the predominant wind direction and adequate setback to avoid accumulation of snow drifts. A list of salt tolerant plant species for parking lot design can be provided upon request.

4.13.2.4 Permeable Pavers

Permeable pavers can reduce the need for salt application in parking lots by improving drainage and preventing melt water from ponding and refreezing (Drake, J et al., 2012). Permeable pavers consist of interlocking pavers with a permeable joint material in the voids between the pavers to promote infiltration. A storage bed of crushed stone and/or sand beneath the pavers collects runoff and allows for infiltration. An underdrain system may also be installed if permeable pavers are constructed on poorly drained native soils or if infiltration is not desired.

Similar to permeable pavers, turf and grass block pavers (also known as concrete or plastic grid pavers) can provide a similar solution for pedestrian or low vehicular use areas. The open weave design (honeycomb design) allows for grass or moss to grow through, preserving the look of a lawn while providing additional infiltration and structural support.

The installation of permeable pavement has been demonstrated to reduce salt application requirements for paved surfaces by up to 75% (University of New Hampshire Stormwater Center, 2007). Additionally, the highly porous joint and sub base materials, which surround and underlie permeable pavers, absorb and retain heat and further increases the efficiency of snow and ice melting from parking lot surfaces. Special consideration should also be given to the colour selection of the pavers/pavement. Dark coloured pavers will increase the absorption of solar radiation and lead to higher ice melting potential. For additional information on permeable pavers and turf and grass block pavers refer to CVC and TRCA, 2010.

4.13.2.5 Seasonally Closed Parking Areas

Shoppers naturally tend to choose parking spaces closest to the building. As a result, other than the peak shopping period around Christmas, there tends to be low use of the remote parts of large parking lots, including during the coldest parts of the winter (mid-January to end of February). Therefore, during the low customer periods there is the potential for closing some of the less used parking lot areas and not performing any winter maintenance in these locations. This can lead to a reduction of overall salt application, as the area requiring winter maintenance has been reduced. Additional

benefit can be achieved in these remote parts of the parking lots by using permeable features for stormwater improvements.

4.14 DE-ICING CHEMICALS

Several de-icing products are available in either liquid or solid form. The most commonly employed de-icing chemicals are chloride-based salts, but acetate-based deicers have also been used on winter roads. Airport de-icing operations typically use acetates and glycols for their pavements and aircrafts due to the corrosive nature of chloride-based salts. A brief summary of the most common liquid and solid de-icing chemicals are provided below.

4.14.1 Sodium Chloride

Sodium chloride is a naturally occurring mineral and is the most commonly used de-icing chemical. Sodium chloride has a practical working temperature as low as -9.4°C and a eutectic temperature of -21°C at a mixture of 23.3% by weight in solution with water; however, it is generally considered ineffective below -17°C . Typical application rate of 113 to 142 kg per 2-lane km is used and costs approximately \$27-91 per tonne. Sodium chloride is generally readily available, easy to store, handle and distribute.

Sodium chloride is highly mobile and can have adverse effects on vegetation, soil, aquatic species, wildlife, and water quality. Sodium chloride is also known to cause corrosion and other damages to vehicles and infrastructure.

4.14.2 Calcium Chloride (CaCl_2)

Calcium chloride in its natural state is a synthetic liquid brine solution but can be found as solid flakes. Calcium chloride is more effective as a de-icing chemical than sodium chloride and works at lower temperatures (practical working temperature -31.6°C and eutectic temperature of -51.1°C at a mixture of 29.8% by weight in solution with water). Recommended application rates are 28 to 55 kg per 2-lane kilometer and cost approximately \$110-270 per tonne.

Calcium chloride is known to have similar negative environmental impacts as sodium chloride, however, it is more corrosive to metal.

4.14.3 Potassium Chloride (KCl)

Potassium chloride is a common fertilizer and is less effective than sodium chloride and calcium chloride. It has a practical working temperature of -3.8°C and a eutectic temperature of -11.1°C at a mixture of 19.8% by weight in solution with water. Potassium chloride costs are similar to sodium chloride per tonne. Potassium chloride is slightly less toxic to vegetation and aquatic species but is slightly more corrosive to infrastructure than sodium chloride.

4.14.4 Magnesium Chloride (MgCl_2)

Magnesium chloride in its natural state is a synthetic liquid brine solution but can be found as solid flakes. It is only approximately 48% active. It has a practical working temperature of -15°C and a eutectic temperature of -33.6°C at a mixture of 21.6% by weight in solution with

water. Magnesium chloride costs approximately \$90 per tonne and has similar effect on the environment and corrosion.

4.14.5 Calcium Magnesium Acetate (CMA)

Calcium Magnesium Acetate (CMA) is a synthetic powder but can also be found in liquid form. It has a practical working temperature of -6°C and a eutectic temperature of -27°C at a mixture of 32.5% by weight in solution with water. CMA does not work by melting snow and ice, rather it turns it into a slush. Therefore, CMA must be combined with plowing activities and applied to prior to or near the onset of a winter storm event to function well in winter maintenance. CMA is a biodegradable substance and there is no evidence that it has an adverse impact on the environment. However, some studies have identified the potential for CMA to decrease dissolved oxygen as it decomposes. CMA is less corrosive to infrastructure than sodium chloride.

CMA is typically used in powder form and as such difficult to handle and store (as it is less dense than sodium chloride and requires approximately 60% more space). CMA has also been known to cause skin irritation. CMA is typically applied at approximately 70 to 113 kg per 2-lane kilometer and costs \$550-1,800 per tonne.

4.14.6 Potassium Acetate

Potassium acetate is typically found in liquid form but can be found in solid form. It is generally considered to perform better than CMA. It has a practical working temperature of -26°C and a freezing point of -60°C .

It is biodegradable and non-corrosive, but as it decomposes to potassium and acetate which exerts a slight Biological Oxygen Demand (BOD). Potassium Acetate must be kept in a clean sealed container or it can prematurely biodegrade. Potassium acetate costs approximately \$550-1,100 per tonne.

4.14.7 Urea Co (NH_2)

Urea is a common synthetic fertilizer comprised of ammonia and carbon dioxide, which is typically found in pellet or liquid form. Urea is less active than sodium chloride and calcium chloride. It has a practical working temperature of -3.8°C and a eutectic temperature of -11.6°C .

Urea can lead to eutrophic condition in water and as it degrades it converts to ammonia, which is toxic to aquatic life. Urea is less corrosive than chlorides.

Urea is typically applied at 113 to 142 kg per 2-lane km and costs approximately \$180 per tonne.

4.14.8 Sodium Formate (HCOONa)

Sodium formate is a waste by-product and found in solid form. It has a similar performance as sodium chloride, with respect to de-icing speed, temperature range and longevity, but it has a eutectic point of -18°C . Sodium formate has similar environmental impacts with regards to

sodium ions (i.e. can damage soil structure and contributes to roadway vegetation burn). However, it is a non-corrosive material and costs approximately \$180-320 per tonne.

OBSOLETE

SECTION 5.0: SANITARY SEWER SYSTEM

5.1 GENERAL

In any project where sanitary sewers are required, the sewer system is to be designed to carry domestic, commercial, and industrial sewage for the area under consideration. Flow is to be by gravity and pumping. Low pressure sewer systems will only be considered where other alternatives are not possible and only with written approval from the Town.

If a pumping station concept is approved by the Town, it shall be designed in accordance with the current MECP guidelines and to the satisfaction of the Town and InnServices.

5.2 CONFIRMATION OF AVAILABLE CAPACITY

Prior to the commencement of any design, the developer and/or designer must contact the Town and confirm that there is adequate capacity to accommodate the proposed project.

5.3 SERVICE AREA

The system shall be designed to accommodate all on site drainage areas as well as all external areas to their maximum future development capacity in accordance with the Town's Official Plan. Sanitary Drainage Plans identifying the internal and external drainage areas will be required.

5.4 DESIGN FLOWS

All sewers shall be sized for peak design flows, including an allowance for infiltration based on the following:

Residential:

Population per unit = 2.65 people (all unit types)

Recommended Wastewater Design Criteria		
Criteria	Lakeshore System	Cookstown System
Average Daily Flows (incl. Average I/I)		
Existing Residential (L/person/day)	350	350
Proposed Residential (L/person/day)	325	325
Commercial and Industrial	20 m ³ /ha/day or site specific calculation	
Peak Flows		
Existing Residential Domestic (L/person/day)	300 x Harmon Factor	
Existing Residential Peak I/I (L/person/day)	600	800
Proposed Residential Domestic (L/person/day)	275 x Harmon Factor	
Proposed Residential Peak I/I (L/person/day)	400	
Commercial and Industrial (incl. Peak I/I)	40 m ³ /ha/day or site specific calculations	

Designer is to consult the Town prior to starting work on the project and discuss potential impacts of the groundwater levels on the new system.

All parameters, including potential infiltration of groundwater into the sewer pipes, maintenance holes and service connections, are to be confirmed with Town and InnServices prior to start of preliminary and detailed design.

High Density (apartment dwellings) population per unit rate may be set specifically for each project based on other policies.

Commercial, Industrial, and Institutional:

Equivalent domestic flows for land uses other than residential shall be calculated based on a building floor area, or the lot area or the population basis and approved by the Town prior to the start of the project.

5.5 PEAK FLOWS

Unless specifically defined in a standard flow rate, peak design flows shall be determined by applying a peaking factor to the average daily flows, based on the Harmon Formula, as follows:

$$M = \frac{1 + 14}{4 + p^{0.5}}$$

where M = Harmon Peaking Factor
p = Population (in thousands)

Peak factors:

- 4 – Residential uses
- 2 – Commercial and Institutional uses
- Rate between 2 to 4 set by designer in consultation with Town and InnServices

The design population shall be derived using a density of 2.65 persons per unit for detached, semi-detached, and townhouse dwellings.

In the absence of detailed information, populations should be estimated based on drainage areas and proposed land uses identified in the Town's Official Plan or in the applicable Master Servicing Studies.

5.6 PIPE CAPACITY

The pipe capacity under full flow conditions is to be calculated using Manning's formula and a roughness coefficient of $n = 0.013$.

Sanitary sewers shall be upsized when flows exceed 85% of full flow under future peak flow conditions during inflow and infiltration.

5.7 VELOCITIES

The minimum velocity for sewers operating partially full shall result in self-cleansing equivalent to that produced by flow in a 200 mm diameter sewer operating full at a velocity of 0.6 m/s.

The maximum allowable velocity shall be 4.0 m/s at full flow.

5.8 PIPE SLOPES

The minimum pipe slope shall not be less than 0.5% or that which is required to meet the minimum velocity. Further reductions of the minimum slope must be approved by the Town and InnServices.

The first upstream leg of sanitary sewer shall have a slope of not less than 1.0%.

SECTION 5.0: SANITARY SEWER SYSTEM

The maximum pipe slope shall be that which is required to meet the maximum velocity.

5.9 MINIMUM PIPE SIZE

The minimum pipe size, including those constructed on private property (condominiums, etc.) shall be 200 mm.

5.10 DEPTH OF COVER

A minimum depth of cover of 2.8 m below the centreline road elevation shall be provided or sufficient depth to connect basement floor drains by gravity using minimum pipe grade of 2% (use longest possible run).

Where sufficient cover does not exist, the Town may consider shallower insulated sewers on an individual basis.

The maximum depth of cover is not to exceed applicable OPSD related to the pipe material unless pipe strength design calculations are provided for approval by the Town.

5.11 BEDDING AND BACKFILL

All sanitary sewers are to be installed with bedding (well graded OPSS Granular 'A' or as recommended and approved by the Geotechnical Engineer and the Town) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032, as applicable. Compaction is to be a minimum of 95% SPD or as indicated in the approved Geotechnical Report. In soft or wet conditions, additional Geotechnical investigation and testing may be necessary to determine the appropriate bedding and backfill measures.

In areas where the invert of the pipe is below the groundwater table, clay or bentonite seals shall be installed at 50 m intervals as per OPSS 1205 and OPSD 802.095, and the Geotechnical Engineer's recommendation. Seals are to be 1.0 m thick measured along the pipe and are to replace the bedding and backfill.

Sanitary sewers installed lower than 0.5 m below the seasonally high groundwater elevation shall be designed to minimize inflow and infiltration. The pipe shall be designed to forcemains standards.

5.12 PIPE CLEARANCES

The minimum horizontal clearances shall be provided in accordance with MECP guidelines.

Whether the watermain crosses above or below the sewer, a minimum vertical distance of 0.5m between the outside edge of the watermain and the outside edge of the sewer must be provided. Generally, the watermain shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the watermain and sewer pipes.

When there is conflict with the elevation of the sewer and the watermain such that the watermain cannot pass over the sewer, then the watermain shall be designed such that it passes under the sewer subject to the following conditions:

- a) There shall be a minimum vertical separation of 0.5m between the bottom of the sewer pipe and the top of the watermain;

SECTION 5.0: SANITARY SEWER SYSTEM

- b) The watermain shall be lowered below the sewer using vertical thrust blocks and restraining joints;
- c) The length of the watermain pipe shall be centered at the point of crossing so that the joints are equidistant and as far as possible from the sewer, and;
- d) The sewer shall be adequately supported to prevent joint deflection and settling.

5.13 SEWER LAYOUT

Sanitary sewers shall generally be located as per the typical road cross-sections. Maintenance holes shall be located, whenever possible, with a minimum 1.0m clearance away from face of curb and/or any other service.

Where sanitary sewers are located in easements, the easement width shall be a minimum of 9.0m. However, the Town will review alternative easement widths on an individual basis in certain circumstances such as the utilization of a joint trench or installation of a sewer at a depth which is substantially greater than standard.

5.14 FORCEMAIN TRACER WIRE

Tracer wire shall be #12 AWG (0.0808" diameter" high strength copper clad steel conductor (HS-CCS), insulated with a 30 mm high density polyethylene (HDPE) insulation, rated for direct burial use at 30 volts.

Tracer wire shall be installed on forcemains for locate purposes. Tracer wire shall be brought to the surface every 300 meters using a test station. Each 300 m section of tracer wire is to be tested and confirmed acceptable prior to further pipe installation as per Contract or Agreement requirements.

Forcemains installed by trenchless technologies shall use heavier gage tracer wire or install inside a fused HDPE sleeve.

5.15 MAINTENANCE HOLES

Maintenance holes shall be as per OPSD 701 and are to be placed at the beginning and end of each sewer line, at changes in pipe size and/or material, and at changes in grade and/or alignment. Curved or properly deflected sewer lines may be permitted but written approval from the Town is required.

A straight through maintenance hole with similar upstream and downstream sloped sewers shall be provided between new subdivisions and the existing municipal system for the purposes of flow monitoring.

All maintenance holes shall be pre-benched up to obvert, to the satisfaction of the Town.

The maximum spacing between maintenance holes shall be 90 m for all pipe sizes.

A waterproofing membrane or petrolatum tape shall be applied externally around all joints of maintenance holes and chambers, including all modoloc, and is to be overlapped halfway up the structure frame. The membrane shall be installed as per manufacturer's specifications and protected during backfill operations.

All maintenance holes within an asphalt roadway or maintenance access shall include a self-adjustable auto-stable frame. Structures outside roadways or existing frame and grates in base

SECTION 5.0: SANITARY SEWER SYSTEM

asphalt which require adjustment for top lift asphalt may use lift rings (when approved by the Town). Otherwise when adjusting the top elevation of maintenance holes, a minimum of one to a maximum of three adjustment units shall be installed on the top of the structure. The maximum vertical adjustment of maintenance holes via Moduloc shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Sanitary sewers under construction shall be bulk headed to prevent infiltration or flushing water from entering the existing sewers. Bulkheads are to remain in place until the first occupancy has been permitted. Written approval from InnServices is required prior to the removal of bulkheads. Once the bulkheads have been removed a flow meter will be installed, monitored and maintained by InnServices, at the Owner's expense, in the last downstream maintenance hole connecting to the existing sewer. Removal of flow meters is at the discretion of InnServices and must be coordinated accordingly.

Tee maintenance holes may be permitted for straight runs on pipe diameters of 1200 mm and greater; however, written approval is required from the Town.

A sufficient drop shall be provided across each maintenance hole to offset any hydraulic losses. The minimum drops across a maintenance hole shall be as follows:

Change in Direction	Minimum Drop
Straight run (0°)	0.02 m
1 - 45°	0.04 m
> 45°	0.06 m

The maximum change in direction permitted in a maintenance hole is 90°.

Drop structures shall be provided when the difference in the inlet and outlet inverts is equal to or greater than 0.9 m that cannot be eliminated by changing sewer grades. For new maintenance hole the internal drop structures are not permitted.

Safety platforms shall be installed in accordance with OPSD 404.020 for all maintenance hole depths of 5.0 m or greater.

Obverts of inlet pipes shall not be lower than obverts of outlet pipes.

Where maintenance holes are located in areas to be flooded by the major storm design, low traffic areas or grassed areas, maintenance hole frame and covers shall be watertight. In all other areas, standard maintenance hole covers shall be used.

Frost straps are required at the discretion of InnServices.

Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

A maintenance hole will be required on the private property side for sanitary services to commercial, industrial, and institutional properties.

Foundation drains shall not be connected to the sanitary sewer.

Maintenance hole numbers will be assigned by the Town during detailed design.

5.16 FUTURE SANITARY CONNECTIONS

Where a sanitary sewer is to be stubbed, a sanitary maintenance hole will be required to limit infiltration into the existing system.

5.17 SANITARY SERVICE CONNECTIONS

Single connections for residential and industrial use shall be located in accordance with TOISD Division 600 for each type of residential lot.

All sanitary service connections shall be single type 125 mm diameter, with a 125 mm x 100 mm test fitting at property line. For new developments, the service shall be extended 3.0 m beyond property line, with an additional test fitting, plug, brace, and marker. Refer to TOISD 605.

Connections for commercial, industrial and institutional will be considered on an individual basis but will generally be 150 mm diameter with a maintenance hole just beyond property line.

The minimum slope for all service connections shall be 2.0%.

Tees shall be installed at a 45° angle to the main, where possible, such that the invert of the tee is at the springline of the main.

Service connections shall be located at a minimum depth of cover of 2.6 m or sufficient depth for basement floor drains and frost cover. Service connections should cross under watermain.

Residential service connections are not permitted to connect directly to sanitary maintenance holes. Connections must occur on the sanitary main, a minimum of 1.0m away from the edge of the maintenance hole to ensure the structure of the main does not become compromised and result in issues with infiltration.

Where sanitary main is deeper than 5 m use of sanitary riser is required, maximum height of it should not exceed 5 m.

All floor drains are to be connected to the sanitary service connection. Foundation drains and roof water leaders are not to be connected to the sanitary system.

5.18 TESTING

The following testing requirements apply to all new sanitary sewers. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Town.

5.18.1 Deflection Testing

All newly installed PVC sanitary sewers shall be subjected to deflection testing in accordance with OPSS 410.

5.18.2 Infiltration/Exfiltration Testing

All newly installed sanitary sewers shall be subjected to infiltration/exfiltration testing in accordance with OPSS 410.

SECTION 5.0: SANITARY SEWER SYSTEM**5.18.3 CCTV Inspection**

All newly installed sanitary sewers shall be subjected to a CCTV Inspection. Refer to Appendix D for CCTV Inspection Requirements.

5.18.4 Visual Inspection

All maintenance holes shall be visually inspected by the Town for deficiencies. When requested by the Town, maintenance hole scans shall be provided by a qualified third-party sewer inspection firm. Scans must be completed using 100% digital panoramic scanning equipment. The digital files provided must include a distortion-free virtual pan and tilt to view the MH from any angle and at any depth. The Town must be able to view all pan, tilt, and unfolded views. If specific software is required, it must be provided to the Town with the digital files.

5.19 MATERIALS

Refer to Appendix B for a list of materials and specifications.

OBSOLETE

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

6.1 GENERAL

The water distribution system is to be designed as a network system to meet the water demand for each area or development under consideration. To ensure reliability, a looped system must be provided to the satisfaction of the Town.

6.2 CONFIRMATION OF AVAILABLE CAPACITY

Prior to the commencement of any design, the developer and/or designer must contact the Town and InnServices and confirm that there is adequate system capacity to accommodate the proposed project.

6.3 SERVICE AREA

The system shall be designed to service all areas within the development to their maximum future capacity in accordance with the Town's Official Plan. Allowance shall be made for connection to appropriate watermains in adjacent developments or future growth areas. The exact location for these connections shall be approved by the Town.

6.4 DESIGN FLOWS

The estimated populations and development areas shall be in accordance with the Town's Official Plan.

Watermains shall be designed to meet the greater of the maximum day demand plus fire flows or peak hour demand.

Fire flows are to be determined based on the most recent publication of the Fire Underwriters Survey of the Insurance Bureau of Canada or AWWA Manual M31 – Distribution System Requirements for Fire Protection.

The fire flows shall meet the following criteria:

- Residential Single Family streets – minimum 57 L/s (750 gpm) @ 138 kPa residual (20 psi); preferred – 76 L/s (1000 gpm) @ 140 kPa residual (20 psi)
- Institutional/Convenience type Commercial – minimum 91 L/s (1200 gpm) @ 138 kPa residual (20 psi); preferred – 114 L/s (1500 gpm) @ 140 kPa residual (20 psi)
- Industrial/Commercial Sites – minimum 136 L/s (1800 gpm) @ 138 kPa residual (20 psi); preferred – 152 L/s (2000 gpm) @ 140 kPa residual (20 psi)

The average daily demand shall be:

- Lakeshore Water System - 250 litres/capita/day
- Churchill Water System - 275 litres/capita/day
- Stroud Water System - 275 litres/capita/day
- Innisfil Heights Water System - 275 litres/capita/day
- Commercial and Industrial – 20m³/ha/day (or site specific calculations)

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

The maximum daily demand factor shall be determined from the current MECP design guidelines; however, a minimum of 1.8 is to be used.

Peak demands for land use other than residential shall be determined on an individual basis and approved by the Town.

6.5 WATERMAIN SIZING

The Hazen-Williams formula shall be used for computing friction losses and subsequently sizing the watermains.

For new mains, the Hazen-Williams factors, "C", shall be as follows:

C	=	100	for 150 mm diameter
C	=	110	for 200 mm and 250 mm diameter
C	=	120	for 300 mm diameter and greater

The minimum size of watermain shall be 150 mm diameter in residential developments, except beyond last hydrant on cul-de-sacs where the minimum diameter of watermains shall be 50mm. The minimum size of watermain shall be 200 mm diameter in industrial, commercial, and institutional developments.

For distribution systems that are not designed to provide fire protection, the minimum diameter of the watermain line shall be 75mm.

A hydraulic network analysis of the water distribution system shall be carried out by the Town & InnServices Modelling Engineer based upon the information received from the designer.

6.6 WATERMAIN PRESSURE

The minimum pressure during maximum daily demand (MDD) shall be 345 kPa (50 psi)
The minimum pressure during the peak hourly demand (PHD) shall be 275 kPa (40 psi).

The minimum pressure when the system is tested under fire flow conditions in conjunction with the maximum daily demand shall be 140 kPa (20 psi).

The maximum pressure under static load or during the minimum hourly demand shall be 550 kPa (80 psi).

6.7 OVERSIZING

Oversizing of watermains will be provided as required to provide for adjacent areas where service is expected to be extended, and to provide fire flow requirements including oversizing of hydrants, openings and leads as required.

6.8 WATERMAIN LAYOUT

Watermains shall generally be located as per the typical road cross-section.

When watermains are located within the boulevards, standard positions being on north and west side of the street. It is preferred to locate watermain on the opposite side of the road from the hydro distribution system. Refer to typical road cross-section for general guidance.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

When watermains are located in easements, the easement width shall be 6.0 metres minimum. However, the Town will review alternative easement widths on an individual basis in certain circumstances such as the utilization of a joint trench or installation of a sewer at a depth which is substantially greater than standard.

6.9 MINIMUM DEPTH OF COVER

For urbanized roads a minimum depth of cover of the 1.7 m below finished ground surface or 1.9 m below road centreline, whichever is greater, is required.

Along open ditches, or unimproved roads, an increased cover may be requested by the Town to allow for future road improvements or lowering of road profile when urbanization occurs.

The maximum height of fill is not to exceed OPSD 808.010 unless pipe strength design calculations are provided for approval by the Town.

In zones where minimum cover cannot be provided design of pipe insulation must be submitted by the Engineer for approval by the Town.

The as-built elevations should be shown at every bend, tee, and every 20m on straight sections on the as-built plans.

6.10 PIPE CLEARANCE

Minimum clearances between other types of services (i.e. sanitary/storm) shall be provided in accordance with MECP guidelines.

6.11 BEDDING AND BACKFILL

All watermain and appurtenances are to be installed with bedding (sand or other as recommended and approved by the Geotechnical Engineer and the Town) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032, as applicable. Compaction shall be to a minimum of 95% SPD or as indicated in the approved Geotechnical Report.

In soft or wet conditions, additional Geotechnical investigation and testing may be necessary to determine the appropriate bedding and backfill measures.

6.12 RESTRAINING

All joints are to be mechanically restrained in fill areas, as per manufacturer's recommendations.

Concrete thrust blocking shall be installed at all tees, vertical and horizontal bends, hydrants, ends of watermain and connections 100 mm and larger, as per OPSD 1103.010 and OPSD 1103.020.

All watermain and thrust restraints shall be designed to withstand the maximum operating pressure, plus the transient pressure to which it will be subjected. The value of transient pressure will not be less than the pressure surge that would be created by immediate stoppage of water column moving at 0.6m/s. The design pressure shall not be less than 150psi (1034kPa) in any case.

6.13 DEFLECTION OF WATERMAIN

If it is necessary to deflect a watermain to avoid a conflict with other infrastructure, the designer will be required to provide detailed drawings and calculations for approval by the Town.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

The maximum permissible vertical bend shall be 45° and the minimum length of the deflected watermain shall be 1.5 m.

Using 90° horizontal bends should be avoided where alternatives exist.

All fittings installed along watermain should not be located under any under service line, utility line, concrete curb or any other element restricting direct access to the pipe.

6.14 SUPPORTING OF WATERMAIN

Where crossing an existing watermain, if more than 0.9 m of the watermain will be exposed, the designer will be required to provide detailed drawings showing how the watermain will be supported during construction for approval by the Town.

6.15 TERMINATION OF WATERMAIN

Design proposal for the watermain system shall ensure that adequate water quality requirements are met. Water distribution systems should be designed without any dead-end pipes. Sizing of watermain in cul-de-sacs shall be done as described in Section 6.5 and engineering calculation for the size of looping pipe must be submitted for review.

Where dead-end watermain pipe is allowed, it must be terminated with a valve and hydrant, both in locations approved by InnServices. The use of blow-offs may be permitted at the discretion of InnServices.

6.16 FIRE HYDRANTS

Hydrants shall be installed in accordance with TOISD 703, complete with thrust blocks and mechanical restrainers. Driveway hydrants shall be installed in accordance with TOISD 725.

Hydrants shall be located as per the typical road cross-section and generally on projections of lot lines, at the end of all cul-de-sacs, and at dead ends. On rural cross-sections, hydrant access behind the ditch, complete with culvert, is to be provided. Refer to Appendix C for minimum clearances from other above grade features.

The maximum spacing for hydrants shall be a 120 m radius for single family residential areas. 90 m spacing shall be practiced for town house development areas, industrial, commercial and institutional land uses, or as required by the Town and InnServices.

Hydrant flanges shall be set such that the final elevation is 100 mm maximum above finished grade. The as-constructed elevation of the top of flange should be labelled in the set of as-built drawings. Hydrant extensions are not allowed unless approval is given by InnServices.

In areas where the water table is known to be high, the Town may request that the drain holes of the hydrant be internally plugged. Yellow stripe to be painted on hydrant if drain port is plugged as per TOISD 703.

All hydrants are to be fixed with anti-tampering devices and hydrant markers. Hydrant numbers will be stencilled on the top of all hydrants by the Town.

Paint specifications are subject to Town approval. Refer to Section 6.25.7 for testing and painting requirements.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

Refer to Appendix B for a list of approved materials and specifications.

6.17 VALVES

The size of main line valves shall be equivalent to the size of the watermain.

Valves shall be located as required to meet spacing and intersection requirements, or as required by the Town.

Generally, four (4) valves shall be placed at cross-intersections and three (3) valves at tee intersections, such that sections can be isolated without jeopardizing flow to other sections. Possibility to eliminate some of the valves will be confirmed during early stage of review of the engineering drawings.

Valves shall be spaced such that no more than forty (40) dwelling units are isolated at one time. In addition, the maximum permissible spacing between valves shall be 300 m for distribution/servicing watermains, and 400 m for trunk supply watermains.

All valves 450 mm diameter or greater shall be installed in a concrete valve chamber.

Air release valves shall be provided at high points of all trunk watermains and, where possible, installed together with valves in valve chambers. Further, where possible, fire hydrants shall be located at all highpoints to minimize the negative impacts of trapped air.

Drain valves shall be provided at low points of all trunk watermains and, where possible, installed together with valves in valve chambers. Drain Chambers should be connected to a storm sewer maintenance hole, or to another technically feasible outlet point.

Where confirmed by the water modelling calculations, a pressure reducing valve shall be installed in an aboveground enclosure complete with an internal watermain bypass. Aboveground enclosures shall be sized appropriately to accommodate the pressure reducing valve, watermain bypass and all appurtenances to the satisfaction of the Town. Detailed requirements will be confirmed by the Town at the time of completion of the water modelling report.

A waterproofing membrane or petrolatum tape shall be applied externally around all joints of chambers and is to be overlapped halfway up the structure frame. The membrane shall be installed as per manufacturers specifications and protected during backfill operations.

Watermains crossing creeks, railways and provincial highways shall have a valve on each side of the crossing.

6.18 WATER SERVICES

Single 25 mm diameter Type k cooper water services with a curb stop at 0.3 m in front the property line is to be installed to each residential property.

Water services to commercial, industrial, institutional, and multiple use shall be sized for the specific land use and approved by the Town.

A minimum 25 mm water service shall be provided to park areas with a non-freeze post hydrant. Actual size of the service will be confirmed during design process based on type of facilities being installed in the park.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

Single services for a residential lot shall be located in accordance with TOISD Division 600. The location of a water service for commercial, institutional, or industrial use will be considered on an individual basis.

Water services shall be located at a minimum depth of cover of 1.7 m with the curb stop being at least 1.0 m away from the future driveway. If a three (3) car garage is allowed by the zoning By-Law, and may be constructed on a lot, water services and curb stop should be installed with offset to accommodate such options. Any curb stop/water service must be relocated if found to be within the driveway or at unacceptable separation during the construction stage. If a curb stop cannot be relocated, InnServices Water Operations must be notified and contacted for an inspection before the driveway is paved to ensure a frost collar has been installed.

When water service line is in conflict with any main service pipe (typically storm sewer main), the water service must be installed below the storm sewer with separation as required by MECP. Creation of high points along water service line is not allowed, with exception of horizontal goose neck, established near main stops.

Where minimum pressure rates cannot be met use of house-based water booster pump maybe allowed. Such system may be allowed as temporary solution after consultations with the Town.

6.19 WATER SAMPLING

Water sampling stations shall be provided where directed by the Town. In general, one (1) sampling station is required at a rate of one (1) per three-hundred (300) units. Sampling Station should be located within municipal ROW or in a corner area of municipal blocks (e.g. parks, parkettes). Locations in the intersection areas are not allowed.

6.20 FIRE DEPARTMENT CONNECTIONS

Fire department connections may be required for industrial, commercial, or institutional developments. Configuration of the fire and domestic water service connection is to be confirmed by the Town during pre-submission consultations.

6.21 FIRE SERVICE BACKFLOW PREVENTION

On private property, where a private fire service main is installed with private fire hydrant(s), a backflow prevention device shall be installed on the private fire service main to provide premise isolation to guard against possible cross-contamination of the municipal water system.

The selected backflow prevention device shall be determined by the Owners Consultant Engineering based on CSA B64.10 series standards, AWWA Canadian Cross-Connection Control Manual, Ontario Building Code and be in accordance with NFPA 24.

If determined by the Owners Consultant Engineer that a Double Check Valve Assembly (DCVA) or Reduced Pressure Principle (RP) backflow preventer is required, such backflow preventer shall be installed in an above ground enclosure and follow the requirements listed in Section 26 - Backflow Prevention.

If determined by the Owners Consultant Engineer that a Single Check Valve Assembly for Fire Systems (SCVAF) is acceptable, the SCVAF shall be installed in an above ground enclosure or an underground chamber.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

If installed in an underground chamber, the chamber housing the SCVAF shall adhere to the following as a minimum:

- The chamber shall be located on private property, 0.3m minimum from property line.
- The chamber shall be located in a grassed area, not permitted in a driveway or laneway.
- To protect the valve and piping from freezing, the chamber shall have 50mm rigid insulation on the underside of top cap, on the interior walls to a minimum depth of 1.2m below grade and the access riser shall have a 50mm of removable rigid insulation.
- The chamber shall be designed to ensure a dry condition is maintained.
- Chamber design shall be subject to the approval of InnServices and the Town.

The property Owner shall be fully responsible for private fire service main, enclosure or chamber, backflow preventer, hydrant(s) and all appurtenances, including but not limited to, all maintenance, inspection, testing, repair or replacement.

6.22 WATER METERS

A water meter is required for each water service. The water meter will be sized by the Town using the peak instantaneous flow provided by the designer.

6.23 TRACER WIRE

Tracer wire shall be installed on all watermains, and hydrant laterals, except where such service is of copper material.

Tracer wire shall be #12 AWG (0.0808" in diameter) high strength copper clad steel conductor (HC-CCS), insulated with a 30 mm high density polyethylene (HDPE) insulation rated for direct burial use at 30 volts. Tracer wire shall not be wrapped around bolts or components along mainline and shall not be placed under any pipe or appurtenance. Tracer wire shall be laid flat and securely affixed with mastic tape to the top of the watermain at 5.0 m intervals.

Breaks or cuts in the tracer wire are only permitted at the following prescribed locations:

- hydrant laterals,
- water services (fire and domestic),
- tees and crosses.

Tracer wire shall be looped at each hydrant such that the tracer wire is brought above ground in a 1" rigid PVC conduit placed at the back of the hydrant and looped back down the hydrant lead to the mainline. The looped wires are to be tightly taped together and left untouched in a hydrant Three Terminal Test Station, which is to be installed at the back of each hydrant and bolted at the flange.

Tracer wire shall not be brought up any mainline or secondary valves.

In areas where more than one watermain exists on a single street, such as a transmission main and a distribution main, the tracer wire must be brought up at intervals of no greater than 350 m using a test station when no other connection points are available. Tracer wire running from the mainline to a connection post shall be in a 1" rigid PVC conduit. The test station shall be installed 1.0 to 1.2 meters above grade and shall be colour coded blue.

Refer to Appendix B for a list of approved materials and specifications.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM**6.24 CATHODIC PROTECTION**

Sacrificial caps are to be provided on every bolt of all mechanical joints and restrainers. The bolt lengths shall be sufficient to accommodate the caps.

At their discretion, the Town may also require zinc anodes or other corrosion protection measures.

6.25 CAUTION TAPE

When the watermain has been installed in non-standard locations, blue caution tape is to be installed, along its length, between 0.3 m and 0.5 m above the watermain.

6.26 BACKFLOW PREVENTION

Backflow prevention devices must be installed and maintained on all existing and/or proposed water services to industrial, commercial, institutional and multi-residential buildings to prevent the flow of contaminants into the municipal drinking water system.

Where a private water system is connected to the municipal water system, the municipal water system shall be protected through premise isolation of the private system by installation of a backflow prevention device in an aboveground enclosure. The use of underground chambers to house backflow preventer devices shall not be permitted, unless approved by InnServices.

Backflow prevention devices must be installed downstream of the property's water meter, or in the case of a fire protection system, where the fire protection system enters the building.

Aboveground enclosures are to be located on private property, as close to the property line as possible, with adequate clearance around the enclosure for access during testing and maintenance.

Enclosures shall be sized to accommodate the selected backflow preventer and water meter as applicable and to the satisfaction of InnServices. Enclosures shall be prefabricated, insulated and heated to maintain temperatures above freezing and in accordance with ASSE 1060 Standards.

All backflow prevention devices, appurtenances and enclosures must be selected and maintained in accordance with the manufacturer's specifications, and the guidelines set out in the most recent version as well as AWWA, Canadian Cross Connection Control Manual, CSA Standards, Ontario Building Code and applicable Provincial Regulations.

6.27 TESTING AND DISINFECTION

The following testing requirements apply to all new sections of watermain. Any sections which fail to meet the requirements shall be repaired or replaced at the direction of the Town.

A temporary bypass connection is to be installed to permit testing of the system.

6.27.1 Swabbing

All watermains 600 mm diameter and less shall be swabbed. All swabs are to be new and a minimum of one (1) size larger than the watermain diameter. For diameters larger than 600 mm in diameter, swabbing is to be discussed and approved in conjunction with the Town.

6.27.2 Hydrostatic Testing

Hydrostatic testing shall be performed on the completed distribution system in accordance with AWWA C605. For polyethylene pipe, the testing shall be completed in accordance with OPSS 441. Testing of sections that consist of varying pipe materials will not be permitted.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

All fire hydrant valves and main line valves must be open during testing with the exception of those main line valves being used to divide the system into sections for the purposes of testing.

A copy of the Town's Standard Testing Form is included in Appendix E.

6.27.3 Disinfection

The system shall be disinfected using the "continuous feed" method in accordance with AWWA C651. Following the required twenty-four (24) hour contact time, the system is to be flushed. The chlorinated water must be neutralized using an appropriate chemical such as sodium thiosulphate. The receiving body for the discharged water must be approved by the Town.

6.27.4 Bacteriological Testing

Samples for bacteriological testing shall be collected, by the Town, a minimum of twenty-four (24) hours after flushing is completed, in accordance with AWWA C651.

Following the receipt of two consecutive sets of acceptable test results, the Town will provide written notification that a final connection can be made to the existing distribution system.

For a test result to be deemed acceptable, the bacterial analysis of sampled water must indicate the following:

Total Coliform - 0 CFU/100ml

E. coli - 0 CFU/100ml

Background - <200 CFU/100ml

Should the results of the sampling be deemed unacceptable, additional swabbing, disinfection, flushing, and sampling may be required at the Town's discretion.

In the event that the final connection is not made within ten (10) days of the Town providing the aforementioned notification, the Town will take a residual chlorine reading. If the residual free chlorine has fallen below 0.05 mg/L the Town will require additional flushing and sampling of the system prior to final connection.

6.27.5 Final Connection

The final connection shall not be made until all of the required testing and disinfection has been satisfactorily completed and the Town/InnServices has provided written notification to proceed.

The length of pipe required to connect the new water system to the existing distribution system shall not exceed 5.5 m and shall be disinfected prior to installation in accordance with AWWA C651.

6.27.6 Continuity Testing

A continuity test of the tracer wire shall be completed by the Contractor's forces with point to point readings recorded and approved by the Town.

6.27.7 Fire Hydrant Flow Testing

Hydrants are to be flow tested, by an organization approved by InnServices, to determine performance while maintaining a minimum residual system pressure of 140 kPa (20 psi), in accordance with NFPA Standard 291.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

All hydrants are to be painted as follows:

- a) Body – Tremclad fire engine red
- b) Font Nozzle – Tremclad black
- c) Top and side nozzle caps – as per the results of the flow testing noted below

CLASS	CAPACITY	COLOUR
Class AA	> 5680 L/min (>95 L/sec)	Tremclad - Safety Light Blue
Class A	3785 L/min to 5675 L/min (63 L/sec to 95 L/sec)	Tremclad – John Deere Green
Class B	1900 L/min to 3780 L/min (32-63L/sec)	Tremclad - Safety Orange
Class C	< 1900 L/min (<32 L/sec)	Tremclad - Safety Red

Flow testing shall be coordinated with InnServices.

6.28 MATERIALS

Refer to Appendix B for a list of approved materials and specifications.

SECTION 7.0: GRADING AND DRAINAGE

7.1 GENERAL

The grading and drainage design, whether it is being prepared for an individual lot, small site, or entire development, should be completed with the following objectives:

- a) to provide positive drainage and maximize the use of land while minimizing maintenance requirements;
- b) to complement the land and suit the type of structure that is to be constructed;
- c) to accommodate runoff from adjacent lands and to ensure that the adjacent and downstream properties are not adversely affected;
- d) to minimize the perimeter disturbance and preserve existing trees, where required; and
- e) to minimize the use of rear lot catchbasins and retaining walls.

Where the overall grading of an area, such as a park or townhouse block, cannot be completed until after the area is fully developed, for example in the case of a phased development, the designer will be required to develop an interim grading and drainage design for that area, to the satisfaction of the Town.

7.2 GENERAL GRADING

For residential lots and blocks, it is preferable to have one consistent slope of between 2% - 5% for the entire rear yard area; however, where this is not possible, lots are to be provided with a rear yard amenity area in which a slope of between 2% - 5% is provided for a minimum of 5.0 m or 75% of the average rear yard length from the rear of the house, whichever is greater. Slopes from the end of the rear yard amenity area to the rear lot line shall not exceed 4:1. All exceptions must receive written approval from the Town.

All other areas shall have a minimum slope of 2% and a maximum slope of 3:1, to a maximum vertical difference of 1.0 m. Where the vertical difference is greater than 1.0 m, a retaining wall system designed and certified by a Structural Engineer shall be implemented.

Any lot with a 10% average grade may require a split-level dwelling and cross sections may be required.

7.3 SWALES

All swales are to be designed with a minimum slope equal to or exceeding 2.0% and a maximum slope of 5.0% with maximum side slopes of 3:1. If a slope equal to or exceeding 2.0% cannot be met due to grading constraints, a minimum of 1.5% can be considered if a perforated subdrain of 100mm in diameter covered in 19mm clear stone and wrapped in filter cloth is provided beneath the swale to reduce surface ponding. The subdrain must outlet to grade or a catchbasin.

All swales shall have a minimum depth of 0.15 m. The maximum depth for side yard and rear yard swales shall be 0.3 m and 0.4 m respectively.

The maximum contributing area to a side yard swale shall be 500 m². For rear yard swales, the maximum contributing area shall be 1,000 m² and the maximum length shall be 60 m. The flows from the contributing areas should be calculated and the capacity of the swale confirmed to ensure adequate conveyance.

SECTION 7.0: GRADING AND DRAINAGE**7.4 REAR YARD CATCHBASINS**

Rear yard catchbasins are discouraged and will only be considered where necessary and where all structures are protected from flooding if the inlet is blocked or surcharged by a major storm event.

Where the rear yard catchbasin lead extends between houses, the rear yard catchbasin shall be placed on a 3.0 m wide easement. The easement shall extend 1.8 m onto the lot which includes the catchbasin storm piping and 1.2 m onto the adjacent lot. The catchbasin lateral shall be placed such that the centre is 0.5 m off the common lot line. The catchbasin shall be placed such that the centre is 1.5 m offset from the rear lot line.

Where the rear yard catchbasin lead extends across the rear yard of a corner lot, the rear yard catchbasin shall be placed on a 3.0 m wide easement with the catchbasin placed such that the centre is 1.5 m offset from the rear lot line.

Rear yard catchbasin leads can be concrete or PVC. The minimum size of the connection shall be 300 mm in diameter. Minimum slope shall be 0.5%. No inlet control devices are to be used in locations where the rear lot catchbasin is connected to the road catchbasin or the maintenance hole.

Where the lead goes between the houses, it shall be concrete encased between front building line and rear building line.

Maintenance holes on the mainline sewer shall be placed, where possible and applicable, at the intersection of rear lot catchbasin leads and the mainline to facilitate access to the rear lot catchbasin pipe. For locations where placement of maintenance hole at the inlet of rear yard catchbasin lead is not possible or feasible, such lead must be connected to road catchbasin which connects to a main line (without maintenance hole). The pipe connecting the road catchbasin with the main line must be of a diameter accommodating flows from the rear yard and the road surface.

7.5 RETAINING WALLS

Retaining walls considered "Designated Structures" within the scope of the Ontario Building Code (OBC) will require a building permit from the Town of Innisfil's Community Development Standards Branch. All other structures shall require engineering drawings stamped by a licensed professional engineer and shall conform to the following requirements:

For the purposes of this section, the height (h) of a retaining wall shall be measured from the finished ground level to the highest point of the wall and, if the height on one end of the wall is different from the height on the other end, the greater of the two shall apply.

- a) Retaining walls are to be constructed entirely on the upper lot so that the tiebacks, backfill, or wall system does not cross property boundaries of the lower graded lot.
- b) Retaining walls greater than 1.0 m in height are discouraged and will be reviewed by the Town only when the overall grading design warrants such grading differentials.
- c) If a retaining wall is required, a detailed drawing indicating the design, location, property line, height, tiebacks, etc. shall be submitted for approval. Construction details of retaining walls, including filter fabric and subdrain or alternative drainage, must be noted on both grading control and individual lot grading drawings and approved by the Town. Subject to detailed design and review at the building permit stage retaining walls may be either removed or added to the Lot Grading Plan.

SECTION 7.0: GRADING AND DRAINAGE

- d) Retaining walls are not to be constructed of wood materials and must be stone with stackable connection blocks to provide an acceptable structural design.
- e) A minimum setback of 500 mm should be maintained from retaining wall tiebacks to the foundation of any structure. If the grading does not permit this setback, a Professional Engineer, licensed in the province of Ontario, shall provide a detailed design for Town consideration.
- f) All retaining walls with an exposed face height of 1.0 m or greater shall be designed and certified by a Professional Engineer, licensed in the province of Ontario specializing in structural engineering. The design must be accompanied by calculations clearly demonstrating that it is structurally satisfactory for the particular location and soil type.
- g) Any and all retaining walls shall have their construction certified by the Design Engineer prior to the release of grading securities and to commence the maintenance period.
- h) All retaining walls with an exposed face height of 1.0 m or greater shall incorporate a 1.5m high chain link fence or approved equivalent at the top. The structural stability of the retaining wall in use must be able to withstand any extra forces exerted by the fence as well as the earth loads.
- i) The detailed drawing shall include the following notes and illustrate:
 - i. Note 1: The walls have been designed in accordance with accepted engineering principles;
 - ii. Note 2: That the wall is suitable for the geotechnical condition of the site and for the loading type;
 - iii. Weeping tile must be directed to a positive outlet;
 - iv. A filter cloth envelope surrounding the compacted free draining granular material;
 - v. Sufficient top of wall and bottom of wall elevations;
 - vi. Type and material of wall;
 - vii. A cross-section for the length, type, and location of any tiebacks;
 - viii. Surcharge load used and appropriate design calculation;
 - ix. A swale at the top of wall, if drainage directs to the wall.
- j) Retaining walls equal or higher than 1.0 m shall additionally include the following:
 - i. Must be set back from the nearest property line or adjacent retaining wall a minimum distance of 0.6m;

SECTION 7.0: GRADING AND DRAINAGE

- ii. The Design Engineer shall be responsible for ensuring all set-back and zone of influence issues are resolved to the satisfaction of the Town;
 - iii. If adjacent to a public property access to a building, or private property to which the public is admitted, a building permit shall be required (refer to Article 1.1.2.2. (2) of the Ontario Building Code);
 - iv. Shall be designed inspected during construction and certified by a Structural Engineer and a Geotechnical Engineer. Certification is to be submitted to the Town prior to the release of any financial securities;
 - v. The location, type, and fastening of the 1.5m chain link fence, or approved equivalent, must meet the manufacturer's recommendations; and
 - vi. It is advised that Town Staff be contacted regarding the required retaining wall set-backs.
- k) Retaining walls that are maintained, repaired, and replaced by the Town shall require a minimum 2.0m easement for Town's access.

Shop drawings will be required for the retaining walls and appurtenances prior to construction. The retaining wall manufacturer and designer shall provide structural approval by a Professional Engineer licensed in Ontario to the satisfaction of the Town.

The safety fencing required for the retaining walls shall be designed with a top and bottom rail and be structurally designed by a Professional Engineer licensed in Ontario for placement on top of the retaining wall as per the retaining wall manufacturer's specifications. Material, post spacing, brace posts, and wire mesh shall be designed and approved by a structural engineer, to the satisfaction of the Town, to meet industry standards for strength and safety requirements applicable to the Development location.

The Town of Innisfil shall be notified forty-eight (48) hours prior to the construction of all retaining walls in order to arrange for an inspection.

7.6 DRIVEWAYS

The minimum slope on any driveway shall be 2%. For residential lots, this minimum shall be measured from the garage to the property line as well as on the driveway apron, which is the area within the municipal road allowance. The preferred maximum slope for any driveway is 5%; however, an absolute maximum of 7% may be permitted where necessary.

7.7 PARKS AND OPEN SPACE

In parks or other open space areas, slopes of 2% shall be applied to provide a usable area for recreation purposes. Grading designs employing steeper slopes must be approved by the Town on a case by case basis.

Temporary topsoil stockpiles are not to be in open space or park areas.

SECTION 7.0: GRADING AND DRAINAGE**7.8 PARKING LOTS**

The desirable surface grade for an asphalt parking lot is 1.0%; the minimum grade shall be no less than 0.5% and no greater than 5.0%.

7.9 TOPSOIL AND SOD

The requirements in OPSS 802 & OPSS 803 shall apply except as amended herein;

7.9.1 Topsoil Materials

OPSS 802.05 - All topsoil shall be screened using 35mm (1 ½") size screen. This applies to all topsoil whether acquired from the jobsite or imported from offsite. The topsoil shall be a fertile, friable natural loam containing not less than 4% of organic matter for clay loams and not less than 2% for sandy loams. Topsoil shall have an acidity value ranging from PH 6.0 to 7.5, and capable of sustaining vigorous plant growth. It shall be free of any admixtures of subsoil, clay lumps and free of stones, roots and other extraneous matter. If this is not attainable from the topsoil on site, then either this topsoil shall not be used, or it shall be mixed with imported material to attain the above-mentioned specification.

7.9.2 Placing Topsoil

Subsection 802.07.03 – Topsoil shall be placed to a uniform depth of 150mm for local/collector residential areas, and 150mm on arterial roads and in commercial/industrial collector roads.

The topsoil shall be rolled with a 50kg roller for compaction. The finished topsoil surface shall be smooth and firm against footprints.

7.9.3 Stockpiling Topsoil

Subsection 802.07.01 is hereby amended by the addition of the following:

Topsoil shall be salvaged and stockpiled on-site at a location approved by the Contract Administrator. Stockpiled topsoil shall be stored in mounds not greater than 6.0m in height, with the side slopes graded no steeper than 2H:1V.

Topsoil stockpiles should be stabilized by covering with geotextile material to prevent soil erosion and contamination by weeds during storage. Where stockpiles are intended to store topsoil for periods longer than one-year, temporary ground cover vegetation composed of a non-invasive stabilizing ground cover (such as annual rye grass) will be requested.

The Contractor shall supply and install erosion and sediment control fencing as per TOISD 503 around all stockpiles. If deemed necessary by the Town, additional erosion and sediment control measures may be requested.

7.9.4 Sod

OPSS 803.05.01 is hereby amended by the following:

Sod shall be rolls of No. 1 premium grade nursery cultivated turf-grass sod, Kentucky Blue Grass/Fine Fescue.

7.9.5 Scheduling

Turf-grass sod shall be installed within 24 hours of delivery, and within 36 hours of harvest, unless otherwise authorized by the Town, and a suitable preservation method is approved prior to delivery.

SECTION 7.0: GRADING AND DRAINAGE

Sod not installed within 36 hours of harvesting or within 24 hours of delivery may be rejected by the Town of Innisfil if there is any evidence of deterioration

7.9.6 Placement of Sod

OPSS 803.07.04 is hereby amended with the addition of the following:

Sod shall be placed in boulevards between the sidewalk and curbs, adjacent to concrete sidewalk abutting commercial or residential buildings, driveways and walkways, the bottom of swales and ditches, or as directed by the Contract Administrator.

Placement of sod shall include supply and placement of No. 1 premium grade nursery cultivated turf-grass sod, pegging, rolling, watering, and maintenance as necessary. Topsoil shall be included in the item for sod.

7.9.7 Staking Sod

OPSS 803.07.04 is hereby amended by the addition of following:

Sod shall be staked on slopes steeper than 2.5H:1V and in the bottom of all swales or ditches. Sod shall be laid at right angles to slopes or the flow of water. Sodding shall start at the bottom of the slope and shall be laid crosswise and staggered on the slope. Every row shall be pegged with wooden lath pegs, of sufficient length to ensure satisfactory anchorage of the sod, and at intervals of not more than 0.5m (1.5ft.). Pegs shall be driven flush with the sod.

Before pedestrian traffic is permitted on any staked turf, and after the turf is well rooted into the growing medium, pegs or stakes shall be removed or driven at least 5cm (2in.) below the sod surface.

7.9.8 Maintenance of Completed Sod

OPSS 803.07.05 is hereby amended by the following:

Sod shall be maintained for 60 Days following completion of placement. During this period, the placed sod shall be kept healthy, actively growing, and green in leaf colour. This requirement shall be suspended during the winter dormant period defined as November 1 to April 30 inclusive for Southern Ontario.

7.9.9 Performance Measure

OPSS 803.08.01 is hereby amended by the following:

At the end of the 60-Day maintenance period, the Contract Administrator shall make an inspection of all placed sod. The condition of the sod shall be as specified in the Maintenance of Completed Sodding subsection. The sod shall be in the same location as originally placed and shall not have moved, eroded, slipped, or sloughed. Sod shall show evidence of rooting into the underlying soil. The sod shall be of sufficient density that no surface soil is visible and there shall be no competitive growth, beyond that specified in the Sod subsection, emerging from the sod or from between the sod joints.

SECTION 8.0: PARKS AND LANDSCAPING

8.1 TREE PRESERVATION

This section provides policies, general standards and guidelines for the protection of existing trees during construction and for the planting of new trees. The section outlines tree inventory, preservation and protection requirements to ensure existing vegetation is retained where required, and measures to ensure damage to existing vegetation is minimized.

8.1.1 Tree Inventory Requirements

The Tree Inventory drawing should be utilizing the most current available boundary survey as a base layer reference. For the entire property to be developed, the Proponent shall submit a Tree Inventory drawing for all trees greater than 100 mm diameter-at breast-height (dbh) on the subject property as well as for any trees on adjacent property whose canopies extend onto the property to be developed. For forests or other continually treed areas that are to be protected, the detailed inventory shall extend into the forest 15 m from the edge while the remainder of the forest shall be described on the basis of species present and range of sizes (dbh) for each species. For forests or other continually treed areas that are to be removed in their entirety, a general inventory shall be provided as described above. At the discretion of Town Staff, a sampling procedure may be used to prepare the inventory for well-treed lots. A sampling procedure may be used to estimate the tree inventory within a woodlot setting, with a minimum area of 200m² or 5% of the total lot area, whichever is greater. In all instances, any rare or endangered tree species of any size shall be identified and accurately located on the plans. The Town may require, at its discretion that significant trees must be individually inventoried and assessed, even when they occur within large stands. **It is advised that Town Staff be contacted regarding the required scope for tree inventory requirements.**

Inventoried trees shall be numbered, and these numbers must correspond to the arborist report and the Tree Protection Plan as outlined below.

8.1.2 Tree Protection & Report

An arborist report shall be prepared by an ISA Certified Arborist or Registered Professional Forester which details specific and accurate information about trees that may be impacted by the development initiative and identifies the nature of the work to be undertaken, and appropriate protection measures. For all trees that must be individually inventoried, as described above, the report is to include:

- Tree number;
- Species (Scientific and Common Name);
- Diameter at Breast Height;
- Canopy Diameter;
- Assessment of Condition, including health, vigour, and structural integrity;
- Suitability for Retention; and
- Minimum Tree Protection Zone (TPZ) (radius in metres).

Additionally, the report should confirm the presence and location of any rare or endangered species and provide recommendations for protection. The arborist assessment should also inventory and assess any areas requiring a general inventory, as described above, and

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provide an assessment of the impacts of the proposed works and recommendations for retention or preservation. The report should include recommendations for tree protection measures and all aspects of tree health including tree pruning, fertilization, mulching, irrigation and long-term monitoring and maintenance. Trees identified for removal for health or hazard reasons should first establish that the problem cannot be corrected by pruning or other treatments.

A Tree Protection Plan shall interpret the recommendations of the arborist report, designating trees to be removed, preserved, and compensated on the subject and adjacent property. It shall provide clear direction to the Contractor. The Tree Protection Plan and Tree Inventory may be combined, depending on the complexity of the project and at the discretion of the Town.

8.1.3 Tree Preservation Measures

Lot grading should demonstrate best efforts to minimize perimeter disturbance and preserve existing trees. Through the site layout design the developer should attempt to incorporate design alternatives, such as adjustments to grade, which minimize the impact to vegetation. Grading Plans are the preferred base layer reference for Tree Preservation and Tree Compensation drawings.

Tree protection fencing is to conform to TOISD 905 and shall be erected at the minimum of 0.3m outside of the dripline prior to commencement of any clearing, grading or other construction activity. All supports and bracing used to secure the barrier should be located outside the Tree Protection Zone to minimize damage to roots.

In instances where a specimen tree is to be retained in proximity to a construction area, wood hoarding will be required.

Tree protection shall not be removed until completion of all construction activity.

Where protection barrier is on slopes greater than 4%, provide a ditch on the elevated side of the fence, lined with filter fabric and backfill to prevent erosion.

Tree protection signage must be mounted on all sides of a Tree Protection Barrier. The sign should be a minimum of 40 cm x 60 cm and made of white gator board or equivalent material. The sign shall be in accordance with TOISD 906.

No grade change, storage of materials or equipment is permitted within this zone. Tree protection barrier must not be removed without the written authorization of Town of Innisfil.

8.1.4 Trenching and Tunneling

No trenching is to occur within Tree Protection Zones. Excavations under the dripline of a tree should be executed with a trencher, vacuum truck, or other method approved by the Town. Roots encountered during trenching operations that are greater than 50 mm are to be pruned by a certified arborist.

Directional boring or micro-tunneling are permitted within a Tree Protection Zone provided that they are in accordance with the arborist report and meet the following standards:

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- They occur at a minimum depth of 1.0 m;
- The bore or tunnel is a minimum of 1.0 m horizontally from the outside edge of the trunk of the tree; and
- The open excavation occurs outside the Tree Protection Zone.

All other Tree Protection Zone requirements (e.g. no storage of equipment or materials, no operation of equipment, etc.) shall continue to apply.

8.2 TREE COMPENSATION REQUIREMENTS

Tree compensation calculation methods will be at the discretion of the Town on a case-by-case basis. Town Staff will consider a combination of factors including but not limited to canopy area, lot size, tree density, cultural importance, and/or land designation. Where applicable, the ecological offsetting strategy shall conform to the LSRCA's Ecological Offsetting Policy for development within the Lake Simcoe watershed. The ecological offsetting strategy shall be prepared to the satisfaction of the Town in consultation with the LSRCA, and shall have regard for other offsetting programs and policies. It is advised that Town Staff be contacted regarding the required tree compensation rate requirements.

Where the LSRCA Ecological Offsetting Policy does not apply, the standard compensation rate for trees removed from a landscape setting are calculated using the chart below. The replacement value of a tree is determined by its caliper at breast height, corresponding replacement caliper range, and compensation rate. Trees that have been removed prior to being inventoried will be compensated at the discretion of the Town, to ensure the principle of 'no net loss of trees' is followed.

Removed Tree DBH	Compensation Ratio
100mm - 150mm	1 to 1
151mm - 350mm	2 to 1
351mm – 500mm	3 to 1
>501mm	4 to 1

All replacement trees should be provided at nursery stock standards unless smaller stock is deemed appropriate.

A tree health coefficient is applied to each tree prior to calculation of total compensation. The coefficient is multiplied to the replacement rate for that tree to determine a compensation rate relative to a healthy specimen. The total replacement rate is accumulated and rounded to the next whole number.

Heath of Tree	Health Coefficient
Dead	0
Hazard or Infected	0.25
Poor	0.5
Fair	0.75
Good	1.0

If the minimum number of replacement trees cannot reasonably be met, as determined by Town Staff, tree compensation shall be in the form of shrubs at a compensation ratio of 5 shrubs to 1 tree.

If compensation cannot be provided, a cash in lieu agreement may be entered by the Developer. The rate for cash in lieu will be \$500 per replacement tree not planted on the site.

8.3 LANDSCAPE REQUIREMENTS

All landscape plans shall be prepared by an accredited professional Landscape Architect in good standing with the *Ontario Association of Landscape Architects* (OALA). The Landscape Architect shall coordinate and liaise with all other consulting professionals to ensure accurate representation of the site and the proposed development.

This section provides guidelines, policies of procedure and practice that are to be adopted by the proponent. Specific guidelines are included for plant materials, including nursery grown trees, topsoil, shrubs, groundcovers, sod and seed mixtures.

8.3.1 Topsoil & Seed Requirements

8.3.1.1 Topsoil

Topsoil shall conform to OPSS 802. Additional to the specifications, the subgrade is to be loosened to a depth of 100 mm immediately prior to topsoil application and the topsoil is to be placed no longer than seven (7) days prior to seeding or sodding. Topsoil depth requirements (after settlement or compaction to 85% SPD) are as follows:

Vegetation	Topsoil Depth Requirements
Boulevards	300 mm minimum continuous depth
Shrub Planting Beds	500 mm minimum continuous depth
Tree Planting Pits/Beds	500 mm minimum continuous depth
Sodded/Seeded Areas (non-boulevard)	200 mm minimum continuous depth

8.3.1.2 Topsoil Stockpiles

Topsoil stockpiles containing more than 100 m³ of material shall be located a minimum of 10.0 m away from any roadway, drainage channel or an occupied residential lot. Topsoil shall not be stockpiled on slopes steeper than 2H:1V and the stockpile height shall not exceed 6.0 m. Runoff from all topsoil stockpiles shall be controlled by a sediment control fence or other approved devices.

Perform weed control, when necessary, in accordance with relevant government chemical pesticide application legislation. Temporary seeding of topsoil with cover crops may be required by the Town to prevent weed growth.

Screen stockpiled topsoil, as necessary. Use a screener having a wire mesh screen size opening of minimum 10 mm and maximum 19 mm to remove stones, soil lumps, foreign material, debris, undesirable plants and roots. Stockpile topsoil shall be reasonably free of weed growth before placement on site.

Temporary topsoil stockpiles are not to be located in open space or park areas.

SECTION 8: PARKS AND LANDSCAPING**8.3.1.3 Seed Mixes**

Refer to Appendix B for approved seed mix designs.

8.3.2 Plant Material Considerations**8.3.2.1 Stock**

All plant material shall be nursery grown and conform to the Canadian Standards for Nursery Stock (latest edition).

The minimum size requirements for plant material are as follows:

Plant Material	Minimum Size
Deciduous trees	50 mm caliper, Wire Basket
Coniferous trees	200 cm tall, Wire Basket
Deciduous shrubs	50 cm tall, 3 gallon pot
Coniferous shrubs	50 cm wide, 3 gallon pot
Perennials and Ornamental Grasses	1 gallon pot

Whips (bare-root stocks measuring 1.0 m to 1.5 m in height) may be planted in low-profile, rural areas, and stormwater management facilities, provided that they meet the requirements of the applicable Conservation Authority Guidelines. Seedlings or whips may be used for naturalization or restoration areas.

8.3.2.2 Form Vigour of Trees

All trees shall be true to type, structurally sound with no evidence of dead branches, sun scald, frost cracks, abraded or broken bark, and be free of insect or disease infestation.

All trees shall have a full, well-developed symmetrical crown with one distinctive vertical leader, branches appropriately spaced, and a root system typical of the species. All parts shall be moist and show active green cambium when cut.

All trees must meet these specifications at the time of planting and final inspection by the Town's designate. Trees that are rejected will be replaced at the Proponent's expense.

8.3.2.3 Planting

All tree and shrub plantings shall be in accordance with the Town Standard Planting Details.

8.3.2.4 Pruning

The crown of the tree shall be pruned from the bottom up at the time of planting to remove all dead and damaged branches and to address any structural weaknesses, such as codominant branches, multiple branches arising from one point, included bark, etc. All pruning is to be performed by an International Society of Arboriculture Certified Arborist and is to conform to ANSI A300 Pruning Standards.

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After pruning, the tree should have a symmetrical and full crown. Trees that do not meet these requirements will be rejected.

8.3.2.5 Staking

Tree stakes shall be heavy duty gauge T-bars, 50 mm x 50 mm x 1800 mm long.

Ties shall be 50 mm burlap strips or a proprietary flexible tie system which allow the tree a reasonable degree of movement to help build trunk taper. Plastic hoses and wire ties are not acceptable.

Ties are to be removed after one year.

8.3.2.6 Mulching

Mulch shall be shredded cedar bark, free of dyes and chemicals that inhibit plant growth.

8.3.2.7 Rodent Guards

Rodent guards shall be used on deciduous trees for all naturalization plantings, including storm water pond plantings. Rodent guards shall consist of white plastic spiral wrap wound around the base of trunk, up to a height of 60 cm or for seedlings, shall consist of 1200 mm long polypropylene tree shelters, twisted 50 mm into the ground. These guards must be installed after planting and inspection and then removed after two (2) years of growth (for spiral guard) or when seedlings grow taller than the tree shelter.

8.3.2.8 Deer Grazing Protection

In rural areas and stormwater management facilities, new plantings are to be protected with snow fencing in order to reduce incidents of deer grazing.

8.3.3 Acceptance and Warranty

All plant materials shall be maintained by the Proponent, from the time of planting until acceptance by the Town.

A maintenance regime shall consist of proper cultivation, weeding, watering and pruning to establish and maintain plant material in a healthy growing condition.

The Proponent shall arrange a time to have the plant material accepted following the guarantee period. At the time of inspection, all beds and tree pits shall be freshly cultivated, weeded and in a tidy condition, with all rubbish, leaves and dead plant debris removed.

8.4 DESIGN CONSIDERATIONS

In this section the requirements relative to acceptable tree species and related landscaping components with respect to specific applications are provided.

8.4.1 Acceptable Trees

Refer to Appendix B for a list of Acceptable Trees. Varieties and cultivars of the species listed will be reviewed pending specific site conditions and design applications.

In selecting trees for specific applications, consider the following factors:

- Assess conflicts with power lines, sidewalks and underground utilities;
- Select large trees where space is available to maximize planting effect;
- Encourage diversity of species to reduce susceptibility to disease;
- Utilize native species as much as possible;
- Consider long-term maintenance pruning requirements of trees;
- Select species with respect to soil microclimate requirements;
- Select species with respect to salt tolerance and specific moisture requirements.

8.4.2 Mixture and Proportion of Species

The planting of monocultures (dependence on one plant species) within the streetscape is detrimental to the maintenance of tree health, and increases a tree's overall susceptibility to pests and diseases.

As such, the Town encourages biodiversity in the streetscape, stormwater management, and restoration plantings by implementing the following measures:

- The random sequencing of tree species is encouraged within a planting scheme.
- The planting of any one individual species is limited to eight (8) consecutive trees in any given planting scheme, including both sides of a road allowance.
- To ensure diversity, the amount of one tree genus shall not exceed more than 20% of all plantings, and the amount of one tree species shall not exceed more than 10% of all plantings.
- The number of species required in a planting scheme shall be determined by the overall number of trees in the planting, as conforming to the following table.

TABLE 10
Number of Trees and Species in Planting

Number of Trees in Planting	Minimum Number of Species
1-8	1
9-15	2
16-30	3
31-40	4
41-50	5
51-100	6
101+	8

8.4.3 Tree Siting and Setback Requirements

Boulevard tree siting requirements are as follows:

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- Boulevard trees are to be large crown trees, optimally planted at intervals ranging from 12.0 m to 15.0 m.
- In single family detached residential developments as well as multi-unit developments, one (1) shade tree per lot is required. Where a tree cannot be accommodated on a lot, the tree may be planted on other public land within the development property, as directed by the Town. Should the tree not be accommodated on the development property, the Town will accept five-hundred dollars (\$500) cash in lieu for each tree not planted.
- Where overhead utilities or other constraints require the use of smaller trees, they may be used at the discretion of the Town, at a spacing of 6.0 m to 8.0 m on center.

When planting near utilities, the location and species of the plant material must be coordinated with engineering plans to ensure the non-obstruction of storm and sanitary sewers, water service, hydro, telephone, gas lines and other services. All utilities must be demarcated by the Proponent prior to any excavation. Refer to Appendix C for minimum clearance requirements from other above grade features.

8.4.4 Landscape Strip Requirements – Residential Development

The following landscape treatments are guidelines for the location and use of plant material, fencing, berming on private lands adjacent the public road Right-of-Way. The planting density formulae establishes the desirable quantity of each type of plant material based on the proposed land use and the total site area. The following table outlines the landscape strip standards utilized by the Town for residential development adjacent to various road classifications and abutting land uses.

TABLE 11 - Landscape Strip Requirements

ABUTTING USE	MIN. LANDSCAPE STRIP WIDTH	LANDSCAPE TREATMENT GUIDELINES
Highway 400	12 m	<ul style="list-style-type: none"> • Noise attenuation fencing • Mixed Deciduous and Evergreen trees • 2.0 m high berm with shrub massing • Foundation planting
Arterial/Parkway /Major Collector	6 m	<ul style="list-style-type: none"> • Entry feature/ornamental fencing • Mixed Deciduous and Evergreen trees • Berming and shrub beds • Foundation planting
Minor Collector/Local	3 m	<ul style="list-style-type: none"> • Entry feature/ornamental fencing • Mixed Deciduous and Evergreen trees • Berming and shrub beds • Foundation planting
Schools	3 m	<ul style="list-style-type: none"> • 1.8 m high chain link fence • Mixed Deciduous and Evergreen trees • Mixed shrub bed or hedging

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ABUTTING USE	MIN. LANDSCAPE STRIP WIDTH	LANDSCAPE TREATMENT GUIDELINES
Other Institutional	3 m	<ul style="list-style-type: none"> Mixed Deciduous and Evergreen trees Mixed shrub bed or hedging 1.8 m high solid fence (with 150 mm x 150 mm posts)
Residential	3 m	<ul style="list-style-type: none"> Mixed Deciduous and Evergreen trees Mixed shrub bed or hedging
Commercial	3 m	<ul style="list-style-type: none"> 1.8 m high solid fence (with 150 mm x 150 mm posts) Mixed Deciduous and Evergreen trees Mixed shrub bed or hedging
Industrial	3 m	<ul style="list-style-type: none"> 1.8 m high solid fence (with 150 mm x 150 mm posts) Mixed Deciduous and Evergreen trees Mixed shrub bed or hedging
Open Space/E.P.	3 m	<ul style="list-style-type: none"> 1.2 m high chain link fence Mixed Deciduous and Evergreen trees Mixed shrub bed or hedging

Planting Density Formula Guideline

Total Site Area (m²) ÷ 200 = # of Deciduous Trees 50 mm caliper

Total Site Area (m²) ÷ 400 = # of Evergreen Trees 2.0 m in height

Total Site Area (m²) ÷ 50 = # of Deciduous Shrubs 0.6 m - 1.2 m in height

Total Site Area (m²) ÷ 100 = # of Evergreen Shrubs 0.45 m SPR/1.2 m in height

8.4.5 Park and Playground Requirements**8.4.5.1 Minimum Park Requirements for Residential Developments**

Components of Parkland and other Open Space considerations are as follows:

- Park display sign to be 1.8 m wide by 1.2 m high installed on two 0.75m aluminum or hot-dip galvanized steel poles. Park display sign to be as per the "RT07 Wayfinding Signage Standards and Specifications" page 7-1.1 (Drawing – Pd-1a Urban Pedestrian RTO 7 Map Directory). The sign text and image information will be provided by the Town for each park display sign.
- Park servicing: minimum 25 mm water service, 125 mm sanitary sewer service, 250 mm storm sewer service, and a hydro service are minimum requirements. The Town will provide minimum sizes specific to the project in early stage of designs.
- Park grading: minimum slopes of 2% graded to maintain proper drainage. Using slopes steeper than 4% is undesired.
- Park fencing: 1.8m high chain link fence.
- Must have street frontage
- Park turf: sodding is the minimum standard.

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- Development construction: undeveloped, disturbed blocks shall be graded, seeded, and maintained by the Proponent until construction commences thereon.
- Park property shall not be used for storage of material or equipment during construction on development.

8.4.5.2 Development Adjacent to Park Property

Where development abuts a Park or Open Space, runoff from the development property shall not drain into the Park or Open Space. A rear lot catch basin may be required.

8.4.5.3 Park and Open Space Features

Required park and open space features include:

- Chain link fence (1.8 m) to Town standards where Park property is adjacent to private lots. No gates into parks, open spaces, or stormwater management facilities are permitted from private property. Park frontage on streets is not fenced.
- Site furniture, including benches and trash cans.
- Park walkways that are to be maintained in the winter must be 3 m width, asphalt surfaced. Otherwise, park walkway material is stone dust.
- Lighting of Park walkways in Neighbourhood Parks is generally not recommended.
- Lighting of sports facilities in Neighbourhood Parks is generally not recommended.
- Playgrounds must conform to the latest Canadian Standards Association (CSA) standards for play spaces and equipment.
- At least one (1) light standard must be provided at playgrounds for security.

8.4.5.4 Parking Supply Standards

Parking lots may be required for Neighbourhood Parks, if there is no adjacent parking.

Parking Supply Standards for Community or Town-wide parks:

- Sixteen (16) spaces per ball field, thirty-two (32) spaces if fields are lit.
- Sixteen (16) spaces per soccer field, thirty-two (32) spaces if fields are lit.
- Fifteen (15) spaces for general park users.
- Twelve (12) spaces (four (4) per court) per group of tennis courts.

8.4.5.5 Park Development Standards

All Parks and Open Space developed in the Town of Innisfil shall comply with the following standards:

Can/CSA Standard Z614 – Children's Playspaces and Equipment (latest edition).

Accessibility for Ontarians with Disabilities Act (AODA), 2005, including all associated Regulations. Refer to *US Guide to ADA Guidelines for Accessible Play Areas for clarification and requirements of "accessible" play features*.

8.4.5.6 Playground Equipment Standards

The playground will be separated into distinct play area sections: a Junior play area for children eighteen (18) months to five (5) years old and a Senior play area for children five (5) years to twelve (12) years old.

It is acceptable to mix products from different manufacturers on a project site.

Specify steel posts, not aluminum for lower costs. Timber and wood components are not acceptable.

All playgrounds must have a minimum 1.5 m wide, hard surface pathway from the street or sidewalk to the play area for accessibility.

All playground equipment must be installed by a certified playground installer and must meet CSA standards.

8.4.5.7 Typical Playground Requirements

A typical program for a Neighbourhood Park must include at a minimum:

- Swings – two (2) seats for toddlers, four (4) belt seats, and one (1) accessible seat.
- Jr. creative structure: two to three (2-3) decks with minimum one (1) roof, transfer station & stairs, two (2) plastic slides – single and dual track, climber, tunnel or bridge between decks, three to four (3 - 4) activity panels, and talk tube or alternate.
- Sr. creative structure: three to six (3-6) decks with minimum one (1) roof, transfer station with stairs, accessibility ramp, two (2) plastic slides – straight and spiral both open, three (3) climbers, rock wall or similar activity, four to five (4-5) activity panels, and sliding pole.
- Spring/spinning toys: two (2) units varying types.

A typical program for a Community Park must include at a minimum:

- Swings – five (5) seats for toddlers, six (6) belt seats, and one (1) accessible seat.
- Jr. creative structure: two to three (2-3) decks with minimum one (1) roof, transfer station & stairs, two (2) plastic slides – single and dual track, climber, tunnel or bridge between decks, three to four (3-4) activity panels, and talk tube or alternate.
- Sr. creative structure: five to seven (5-7) decks with minimum one (1) roof, transfer station with stairs, accessibility ramp, two to three (2-3) plastic slides – straight and spiral both open, three to four (3-4) climbers, rock wall or similar activity, five to seven (5-7) activity panels, and sliding pole.
- Spring/spinning toys: three to four (3-4) units varying types.

8.4.5.8 Creative Play Structures

Only certified playground suppliers are permitted to supply and install play structures. Playground structures are subject to inspection by a registered playground inspector.

SECTION 8: PARKS AND LANDSCAPINGDecks:

- Steel with plastisol coating preferred or plastic wood is acceptable.
- Provide a transfer deck on structure to make it accessible.
- Provide minimum one (1) set of stairs.

Climbers:

- Chain net, cable net, and cargo net climbers shall have one piece coupling or nut and bolt couplings. Screw couplings are not acceptable.

Activity Panels:

- Do not place a poly panel at the end of a ramp.
- Use steel bars at ends of ramps.
- Vary steel bars, poly windows, activity panels to add interest to structure.
- Provide 40% of activity panels on ground level for wheelchair users.

Percussion musical panels are not permitted, except in low vandalized areas. All other activity panels will be considered but must be approved by the Town.

8.4.5.9 Play AreasPerimeter:

Playground play area borders are to be cast-in-place concrete curbs or concrete sidewalks.

Ensure minimum setbacks are provided from each piece of play equipment as per CSA standards.

Drainage:

Provide a subdrain system comprised of a minimum 100 mm (4") diameter corrugated poly drain pipe with filter sock embedded in a French drain of 300 mm wide x 400 mm deep 19 mm diameter clear stone set into the subgrade.

Slope subgrade to drain towards drain pipe at 1.0%.

Provide a non-woven geotextile filter fabric between the safety surface and French drain.

Provide a minimum three (3) legs of drain pipe to cover all sides and centre of play area.

Slope drain pipe a minimum 0.5% to drain towards a catch basin or discharge into a swale.

Ensure placement of drainage pipe does not interfere with play equipment footings.

In poorly drained areas: In addition to above, provide a drainage layer immediately beneath the safety surfacing comprised of 100 – 150 mm (4"- 6") 19mm diameter clear drain stone with a non-woven geotextile filter fabric.

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Safety Surfacing:

Refer to Appendix B for a list of approved materials.

8.4.5.10 Play EquipmentSpring Toys:

Spring Toys must be removable by Parks Maintenance personnel.

Swing Standards:

All swing posts shall be embedded in footings (anchor footing to bedrock where depth of cover is not at least 1200 mm).

Top cross bar shall be min. 2440 mm (8'-0") above finished grade.

All swing chains shall be ¼" galvanized steel.

Refer to Appendix B for a list of approved materials.

Slide Standards:

Must be attached to creative play structures.

Poly slides are to be used except in highly vandalized areas, where stainless steel slides may be used.

8.4.5.11 Fencing

Commercial grade, galvanized steel, chain link fence or our black vinyl coated chain-link shall be the preferred option within residential developments, however, this should be confirmed by the Town.

Park, soccer and ballfield perimeter - #9 gauge [3.5 mm]

Baseball field backstops – 50 mm (2") square mesh, #6 gauge [5 mm]

Basketball/multi-purpose court – 3.0 m (10 ft.) high

8.5 STORMWATER MANAGEMENT FACILITIES

Refer to Section 4.8.

8.6 INVASIVE SPECIES CONTROL PLAN

An Invasive Species Control Plan (ISCP) will be required when invasive plant species are present on the lands which, in the opinion of the Town, could cause adverse effects to human health, degrade ecosystems, or cause adverse economic impacts to the Town. Such species may include, but are not limited to, Giant Hogweed (*Heracleum mantegazzianum*), Invasive Phragmites (*Phragmites australis* subsp. *Australis*), Dog Strangling Vine (*Cynanchum rossicum*) and Poison Ivy (*Rhus radicans*).

Prior to implementation, the ISCP shall be accepted by the Town and any necessary permits and licenses shall be obtained from the Ministry of Natural Resources and Forestry (MNRF), the MECP, and the Conservation Authority, as applicable.

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The plan shall identify:

- Species to be controlled;
- Methods of control;
- Required permits / licenses / Letter of Opinion;
- Timing restrictions (e.g., for effectiveness and to reduce impacts to native plants and wildlife);
- Management frequency;
- Monitoring; and
- Reporting.

Pending approval of the ISCP and receipt of applicable permits, the control measures are to commence immediately and extend until the invasive species has been effectively controlled. Should the invasive species not be controlled at the time of municipal Assumption, the Town will determine an acceptable solution, at its discretion.

OBSOLETE

APPENDIX A: REVISION INFORMATION

OBSOLETE

LIST OF REVISIONS

The Town of Innisfil recognizes that revisions and updates to this document will be required from time to time. An up to date record of all revisions to this document is provided in the table below:

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	Manual	May 2022	Revise Section 1.3.3
	Manual	July 2022	Revise Section 2.2.1.14 – add TOISD reference to fences
	Manual	May 2022	Revise Table 1 in Section 2.2.2
	Manual	May 2022	Revise Section 2.2.4.12
	Manual	May 2022	Revise Section 2.5.2.1
	Manual	May 2022	Revise Section 2.5.2.3
	Manual	May 2022	Revise Table 6 in Section 2.2.2.3 and add Table 7
	Manual	May 2022	Revise Section 2.5.3.1
	Manual	May 2022	Correct typo in Section 4.2
	Manual	May 2022	Revise Section 4.10.1
	Manual	May 2022	Revise Section 5.13 – Revision Removed following DLG comment
	Manual	May 2022	Revise Section 5.15
	Manual	May 2022	Revise Section 5.17
	Manual	May 2022	Revise Section 6.14 – Revision Removed following DLG comment
	Manual	May 2022	Revise Section 6.15
	Manual	May 2022	Revise Section 6.27.7
	Appendix B4	May 2022	Revise Section 1.0, 2.0, and 3.0
	Appendix B5	May 2022	Revise Section 1.0, 5.0, and 20.0

APPENDIX A: REVISION INFORMATION

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	Appendix B7	May 2022	Revise Section 3.0
	Appendix D	May 2022	Revise Section 1.4
	Appendix F	May 2022	Add Section – PGAC Supply Documentation
	Appendix F	May 2022	Revise Quality Assurance – Sampling Section
	Appendix F	May 2022	Revise Table 1 – Low Temperature Limiting Grade
	TOISD407	May 2022	Revise Post Details
	TOISD605	May 2022	Revise Detail and Notes
	TOISD609	May 2022	Revise Notes
	TOISD704	May 2022	Revise Note 4
	TOISD705	May 2022	Revise Detail and Notes
	TOISD706	May 2022	Revise Notes
	TOISD726	May 2022	Revise Detail and Notes
	TOISD818	May 2022	Correct Formatting Issue
	TOISD819	May 2022	Correct Formatting Issue
	TOISD820	May 2022	Correct Formatting Issue
	TOISD821	May 2022	Correct Formatting Issue
	TOISD822	May 2022	Correct Formatting Issue
	TOISD823	May 2022	Correct Formatting Issue
	TOISD901	May 2022	Correct Formatting Issue
	TOISD902	May 2022	Correct Formatting Issue

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	TOISD903	May 2022	Correct Formatting Issue
	TOISD904	May 2022	Correct Formatting Issue
	Manual	May 2021	Revise Section 2.2.2
	Manual	May 2021	Revise Section 2.2.4.8
	Manual	May 2021	Revise Section 2.2.4.18.3
	Manual	May 2021	Revise Section 2.2.4.18.6
	Manual	May 2021	Revise Section 2.5.2.3
	Manual	May 2021	Revise Section 2.5.2.4
	Manual	May 2021	Add e) to Section 2.5.3.1
	Manual	May 2021	Revise Section 2.6.3
	Manual	May 2021	Revise Section 2.6.5
	Manual	May 2021	Revise Section 4.5.11
	Manual	May 2021	Revise Section 4.5.15.4
	Manual	May 2021	Revise Section 4.7.3
	Manual	May 2021	Revise Section 5.4
	Manual	May 2021	Revise Section 5.5
	Manual	May 2021	Revise Section 5.6
	Manual	May 2021	Revise Section 5.11
	Manual	May 2021	Add New Section 5.14 – Forcemain Tracer Wire

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
	Manual	May 2021	Add New Section 5.16 – Future Sanitary Connections
	Manual	May 2021	Revise Section 5.15 – Maintenance Holes
	Manual	May 2021	Renumber Sections 5.14 to 5.19
	Manual	May 2021	Revise Section 5.18.4 – Visual Inspection
	Manual	May 2021	Revise Section 6.4
	Manual	May 2021	Revise Section 6.17
	Manual	May 2021	Revise Section 6.18
	Manual	May 2021	Add New Section 6.21 – Fire Service Backflow Prevention
	Manual	May 2021	Revise Section 6.23 – Tracer Wire
	Manual	May 2021	Add New Section 6.26 – Backflow Prevention
	Manual	May 2021	Renumber Section 6.21 to 6.28
	Manual	May 2021	Delete item e) from Section 7.5
	Appendix B3	May 2021	Revise Section 1.0
	Appendix B4	May 2021	Revise Sections 1.0, 2.0, 3.0, 4.0, 6.0, 8.0, and 10.0
	Appendix B4	May 2021	Add Section 11.0, 12.0, 13.0, 14.0, 15.0, and 16.0
	Appendix B5	May 2021	Revise Sections 1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, 11.0, 12.0, 14.0, 15.0, 18.0, 19.0, and 21.0
	Appendix B5	May 2021	Add Section 24.0
	Appendix D	May 2021	Add Item 1 and Revise Items 1.11 and 1.12
	Appendix F	May 2021	Complete Revision
	TOISD 213	May 2021	Text Correction

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	TOISD 701	May 2021	Delete Tracer Wire to Surface
	TOISD 703	May 2021	Delete Tracer Wire to Surface & Add Test Station
	TOISD 705	May 2021	Label Correction
	TOISD 706	May 2021	Revise Supply Line Size
	TOISD 717	May 2021	Delete
	TOISD 718	May 2021	Delete
	TOISD 719	May 2021	Delete
	TOISD 720	May 2021	Delete
	TOISD 721	May 2021	Revise Detail Name
	TOISD 722	May 2021	Revise Detail Name
	TOISD 723	May 2021	Revise Detail Name
	TOISD 724	May 2021	Revise Detail Name
	TOISD 725	May 2021	Delete Redundant Note
	TOISD 726	May 2021	New Detail
	TOISD 818	May 2021	Text Correction
	TOISD 823	May 2021	New Detail
	Manual	May 2020	Add Section 1.7
	Manual	May 2020	Revise and Reorganise Section 2
	Manual	May 2020	Revise Section 4.7.2

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	Manual	May 2020	Add Section 4.9.11
	Manual	May 2020	Revise Section 7.3
	Manual	May 2020	Revise Section 7.5
	Manual	May 2020	Add Section 7.9
	Manual	May 2020	Revise Section 8.2
	Appendix B1	May 2020	Revise Item 4.3
	Appendix H	May 2020	Add TOISD609 and TOISD610
	Appendix H	May 2020	Revise TOISD213
	Appendix H	May 2020	Revise TOISD401
	Appendix H	May 2020	Revise TOISD818
	Appendix H	May 2020	Revise TOISD901
	Appendix H	May 2020	Revise TOISD902
	Appendix H	May 2020	Revise TOISD903
	Appendix H	May 2020	Revise TOISD904
	Manual	May 2019	Preface section has been updated.
	Manual	May 2019	Section 1 General Information section has been updated.
	Manual	May 2019	Section 2 Roadways section has been updated.
	Manual	May 2019	Section 3 Utilities, Streetlighting, and Traffic Signals section has been updated.
	Manual	May 2019	Section 4 Storm Drainage and Stormwater Management section has been updated.
	Manual	May 2019	Section 5 Sanitary Sewer System section has been updated.

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
	Manual	May 2019	Section 6 Water Supply and Distribution System section has been updated.
	Manual	May 2019	Section 7 Grading and Drainage section has been updated.
	Manual	May 2019	Section 8 Parks and Landscaping section has been updated.
	Appendix B2	May 2019	Item 1.1: Manufacturer and catalogue no. have been updated to reflect current standards.
	Appendix B2	May 2019	Item 1.1: Controller has been revised from Naztec to Trafficware.
	Appendix B	May 2019	Item 8.0: open cover has been changed to closed cover to reflect current Town Standards.
	Appendix B5	May 2019	Item 5.0 has been updated to reflect current standards.
	Appendix B5	May 2019	Item 8.0 has been updated to reflect current standards.
	Appendix B5	May 2019	Item 20.0 has been updated to reflect current standards.
	Appendix B5	May 2019	Item 21.0 has been updated to reflect current standards.
	Appendix B7	May 2019	Item 1.7 has been updated to reflect current standards.
	Appendix D	May 2019	Item 1.4, 1.10, 1.11, 2.13 have been updated to reflect current standards.
	Appendix D	May 2019	Item 1.5, 2.15 have been added to reflect current standards.
	Appendix D	May 2019	Format changes
	Appendix G	May 2019	Heading change to "Appendix G"
	Appendix G	May 2019	Underline in final acceptance heading has been removed.

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	TOISD 207	May 2019	Drawing updated to show the extension of the watermain.
	TOISD 202	May 2019	To reflect current Town Standards
	TOISD 203	May 2019	To reflect current Town Standards
	TOISD 204	May 2019	To reflect current Town Standards
	TOISD 205	May 2019	To reflect current Town Standards
	TOISD 206	May 2019	Drawing updated
	TOISD 207	May 2019	To reflect current Town Standards
	TOISD 208	May 2019	To reflect current Town Standards
	TOISD 210	May 2019	Revised notes and dimensions
	TOISD 211	May 2019	Revised accuracy of radius.
	TOISD 212	May 2019	Revised accuracy of radius.
	TOISD 301	May 2019	Modified to show stop bar and 15m of yellow line.
	TOISD 302	May 2019	<ul style="list-style-type: none"> Changed font to Clearview Hwy 2b. Note added "Sheeting to be diamond grade silver with electrolyte green film overlay".
	TOISD 402	May 2019	To reflect current Town Standards
	TOISD 407	May 2019	Added note "located 0.15m from PL"

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	TOISD 408	May 2019	Change note from “concrete” to “clay” regarding the brick columns and added notes to reflect current Town Standards.
	TOISD 410	May 2019	Revised notes
	TOISD 501	May 2019	Filter fabric line thickened.
	TOISD 502	May 2019	Filter fabric line thickened. Hatch pattern changed.
	TOISD 505	May 2019	Temporary asphalt hatch added.
	TOISD 506	May 2019	To reflect current Town Standards.
	TOISD 703	May 2019	<ul style="list-style-type: none"> Note 4 updated to “Hydrant marker to be 48” in height and fluorescent yellow in colour. Marker to be attached to side port of the hydrant”. Changed note from “100mm from grade to bottom of flange” to “maximum 100mm from grade to bottom of flange”. Note 10 added, “All hydrants are to face adjacent paved surface.”
	TOISD 706	May 2019	Updated to reflect current Town Standards
	TOISD 710	May 2019	Drawing Updated
	TOISD 711	May 2019	Revised note 2 to “aluminum- cast housing”.
	TOISD 713	May 2019	Concrete hatch pattern added.
	TOISD 714	May 2019	Concrete hatch pattern added.
	TOISD 715	May 2019	Concrete hatch pattern added
	TOISD 716	May 2019	Concrete hatch pattern added.

REV. NO.	DOC.	DATE	DETAILS OF REVISION
	TOISD 717	May 2019	Concrete hatch pattern added.
	TOISD 718	May 2019	Concrete hatch pattern added.
	TOISD 719	May 2019	Concrete hatch pattern added.
	TOISD 720	May 2019	Concrete hatch pattern added.
	TOISD 721	May 2019	Concrete hatch pattern added.
	TOISD 722	May 2019	Concrete hatch pattern added.
	TOISD 725	May 2019	<ul style="list-style-type: none"> Note added "Hydrant driveway to be 50mm HL3 as per InnServices". Existing property line extended.
	TOISD 808	May 2019	Removed. TOISD 818 Updated
	TOISD 809	May 2019	Removed. TOISD 818 Updated
	TOISD 810	May 2019	Removed. See 8.4.5.1 Minimum Park Requirements for Residential Developments
	TOISD 812	May 2019	Removed. See 8.4.5.1 Minimum Park Requirements for Residential Developments
	TOISD 813	May 2019	Updated concrete enclose pole.
	TOISD 818	May 2019	New Pond Sign
	Manual	May 2018	Preface section has been updated.
	Manual	May 2018	Section 1 General Information section has been updated
	Manual	May 2018	Section 2 Roadways section has been updated.

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
	Manual	May 2018	Section 3 Utilities, Streetlighting, and Traffic Signals section has been updated
	Manual	May 2018	Section 4 Storm Drainage and Stormwater Management section has been updated.
	Manual	May 2018	Section 5 Sanitary Sewer System section has been updated.
	Manual	May 2018	Section 6 Water Supply and Distribution System section has been updated.
	Manual	May 2018	Section 7 Grading and Drainage section has been updated.
	Manual	May 2018	Section 8 Parks and Landscaping section has been updated.
	Appendix B3	May 2018	Item 8.0. Sigma has been removed.
	Appendix B4	May 2018	Item 8.0. Added a watertight manhole and frame. Sigma has been removed.
	Appendix B5	May 2018	Item 1.0. Revised to reflect currently standards.
	Appendix B5	May 2018	Item 5.0. Revised to reflect Town standards regarding hydrant painting.
	Appendix B5	May 2018	Item 6.0. Added "bibby adjustable valve box upper section".
	Appendix B5	May 2018	Item 9.0. Added "clow tuf grip dual wedge" as a restraining device.
	Appendix B7	May 2018	Item 1.1. Added PVC fence and remove wood.
	Appendix B7	May 2018	Item 2.1. Added "black vinyl coated fencing".
	Appendix D	May 2018	Text changes to item 1.1, 1.4, 2.2 and a new section added to item 2.14 stating that the lateral videos are to be provided to the Town thirty (30) days prior to occupancy.
	Appendix G	May 2018	Heading changed to "Appendix G".
	Appendix G	May 2018	Text change to Table 1 "PGAC Grades 58-34 and 64-34". Heading changed to "Appendix G".
	Appendix H	May 2018	New appendix added "As-Recorded Requirements".
	Appendix I	May 2018	New appendix added "Service Record Sheet".

REV. NO.	DOC.	DATE	DETAILS OF REVISION
2	TOISD 101	May 2018	Note D. Text change to "Operations Services".
2	TOISD 201	May 2018	Note 9 added "designer shall contact the town before initiating design of utilities to confirm use of I.T. ducts within the joint use utility trench. Note 3 revised to reflect asphalt depths.
2	TOISD 202	May 2018	Note 10 added "designer shall contact the Town before initiating design of utilities to confirm use of I.T. ducts within the joint use utility trench. Note 3 revised to reflect asphalt depths.
2	TOISD 203	May 2018	Note 9 added "designer shall contact the town before initiating design of utilities to confirm use of I.T. ducts within the joint use utility trench. Note 3 revised to reflect asphalt depths.
2	TOISD 204	May 2018	Note 10 added "designer shall contact the town before initiating design of utilities to confirm use of I.T. ducts within the joint use utility trench. Note 3 revised to reflect asphalt depths.
2	TOISD 205	May 2018	Note 10 added "designer shall contact the town before initiating design of utilities to confirm use of I.T. ducts within the joint use utility trench. Note 3 revised to reflect asphalt depths.
2	TOISD 206	May 2018	Revised notes for asphalt depths.
2	TOISD 207	May 2018	Revised notes for asphalt depths.
2	TOISD 208	May 2018	Revised notes for asphalt depths.
2	TOISD 210	May 2018	Revised Note 1.
2	TOISD 214	May 2018	Revised to eliminate raised edging in boulevard to match Town Standards.
4	TOISD 301	May 2018	Note 8, 9 and 10 added to reflected breakaway signage requirement, stop sign location in urban and rural areas. Revise Notes 2 and 4.
	TOISD 401	May 2018	Drawing updated to clarify the reflective tape colours.
3	TOISD 405	May 2018	Post footing details adjusted to accommodate minimum frost protection depth.
2	TOISD 406	May 2018	Note 3 added to reflect the height of a 1.2m chainlink fence.
2	TOISD 408	May 2018	Revised fence height to match Town Standards.

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
1	TOISD 506	May 2018	Revised to reflect OBC minimum separation.
3	TOISD 601	May 2018	Text added to ensure there is a minimum of 0.5m between the storm and sanitary service.
3	TOISD 602	May 2018	Text added to ensure there is a minimum of 0.5m between the storm and sanitary service.
3	TOISD 603	May 2018	Text added to ensure there is a minimum of 0.5m between the storm and sanitary service.
3	TOISD 604	May 2018	Text added to ensure there is a minimum of 0.5m between the storm and sanitary service.
2	TOISD 607	May 2018	Text added so ensure the storm sewer is accessible for flushing and videoing.
	TOISD 609	May 2018	Added a new drawing on foundation wall detail.
	TOISD 610	May 2018	Added a new drawing on foundation wall typical waterproofing detail.
2	TOISD 701	May 2018	Note 4 added "no valve to be installed in the driveway". Text added to remove marker, sacrificial caps to be installed on every bolt and for the tracer wire to be brought to the surface for every water valve.
2	TOISD 702	May 2018	Note 3 added to specify asphalt requirements.
3	TOISD 703	May 2018	Note 7 added regarding sacrificial caps. Text added regarding hydrant colour, drain port, breakaway flange and to have a minimum of 600mm between the hydrant and the secondary water valve.
2	TOISD 705	May 2018	Water service size increased from 19mm to 25mm to reflect Town Standards.
2	TOISD 706	May 2018	Note 10 added "water meter to be a minimum 600mm from any wall or immovable object". Text added to have remote touchpad beside hydro meter.
2	TOISD 707	May 2018	Text added to clarify which valve requires a lock.
2	TOISD 708	May 2018	Text added to clarify which valve requires a lock.
2	TOISD 710	May 2018	Drawing as been edited to clarify the OPSD sections.
3	TOISD 711	May 2018	Flip the sampling station so that the drain pipe is facing the Towns right of way.
2	TOISD 713	May 2018	Note 6 added regarding vent pipe requirements and vent piping adjusted on drawing to reflect requirements. Tracer wire location and exterior coating text added.

REV. NO.	DOC.	DATE	DETAILS OF REVISION
2	TOISD 714	May 2018	Text added to clarify "Sump" location.
2	TOISD 715	May 2018	Note 6 added regarding vent pipe requirements and vent piping adjusted on drawing to reflect requirements. Tracer wire location and exterior coating text added.
2	TOISD 716	May 2018	Text added to clarify "Sump" location.
2	TOISD 717	May 2018	Text added for tracer wire location and exterior coating.
2	TOISD 718	May 2018	Text added to clarify "Sump" location.
2	TOISD 719	May 2018	Text added for tracer wire location and exterior coating.
2	TOISD 720	May 2018	Text added to clarify "Sump" location.
2	TOISD 721	May 2018	Larger valve chamber (1800 x 3000) to accommodate the second valve that is now required.
2	TOISD 722	May 2018	Larger valve chamber (1800 x 3000) to accommodate the second valve that is now required.
2	TOISD 723	May 2018	Larger valve chamber (1800 x 3000) to accommodate the second valve that is now required.
2	TOISD 724	May 2018	Change to item 2 "two valves required for NRS by-pass gate valve". Larger valve chamber (1800 x 3000) to accommodate the second valve that is now required.
2	TOISD 805	May 2018	Road text change to "2% +/- 0.5".
1	TOISD 821	May 2018	Text change to show "Fibar Engineered Wood Fibre or Approved Equivalent at 450m Depth".
	TOISD 822	May 2018	New drawing added for "Accessible Ramp Section and Accessible Plan View".
3	Manual	May 2016	Updated "Preface" to include 2016 updates to Technical Guidelines for SWM Submissions (LSRCA)
1	Manual	May 2016	Asphalt section replaced. Road geometry revisions (Section 2.0)
1	Manual	May 2016	Revised Curb Ramp surface details (2.4.1.1)
1	Manual	May 2016	Revised wording (2.4.4.14)

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
2	Manual	May 2016	Removed portion of text from 3.3.2.1 that exemplified practicing HPS and added that light source must be long life.
2	Manual	May 2016	Updated name of hydro ID number to account for InnPower. (3.3.2.1)
1	Manual	May 2016	Moved sentence about lighting calculations from 3.3.2.2 to 3.3.2.1
2	Manual	May 2016	Added average rainfall intensity calculation (4.4.2)
2	Manual	May 2016	Updated Residential design flows and changed wording for Commercial, Industrial, and Institutional (5.4)
1	Manual	May 2016	Added max height for sanitary riser (5.14)
2	Manual	May 2016	Updated wording (6.6)
1	Manual	May 2016	Added requirement for as-builts. (6.15)
2	Manual	May 2016	Updated wording regarding pressure reducing valves (6.16)
2	Manual	May 2016	Added wording about drain chambers (6.16)
2	Manual	May 2016	Updated wording regarding water sampling station requirements. (6.17)
2	Manual	May 2016	Added requirement for tracer wire to be brought to surface at hydrant secondary valve (Section 6.19)
2	Manual	May 2016	Revised catchbasin requirements (7.4)
1	Manual	May 2016	Added wording to ensure all landscape work to be done by an accredited landscape architect (Section 8.2).
1	Manual	May 2016	References to MUCTD corrected to <i>Ontario Traffic Manual</i> .
2	App. B1	May 2016	Changed ground wire feature (Section 1.3) Changed Local Road lighting pole spec (Section 2.1). Adjusted Photocontroller spec (4.1.3)
3	App. B3	May 2016	Replaced all Meuller Canada Products with EJ Canada's SELFLEVEL-MC401010243 (Section 8.0 - FRAMES & GRATES – MAINTENANCE HOLES) Added OPSD 400.1000 as standard drawing for Concrete catch basin (Section 8.0)
3	App. B4	May 2016	Replaced all Meuller Canada Products with EJ Canada's SELFLEVEL-MC401010243 (Section 8.0)

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
			FRAMES & GRATES). Revised PVC certification for Forcemains (10.0)
3	App. B5	May 2016	Removed Royal Building Products as manufacturer and removed Bulldog as a catalogue for Joint Restraint System In-line for PVC Water Main (Section 8.0). Replaced Kupferle's Eclipse No. 88 with Regal Waterworks' Test Tap in Section 21.0 (Sampling Station). Replaced all Mueller Canada Products with EJ Canada's SELFLEVEL-MC401010243 (Section 22.0)
1	App. C	May 2016	Changed Gas, Hydro and Bell/TV offset from Water Service from 2.5m to 1.0m
0	App. G	May 2016	Added Appendix G containing Asphalt Special Provision
3	TOISD 301	May 2016	Removed yield sign from standard. Changed stop sign reference from Re-1 to Ra-1. Changed max height of stop sign from 2.7m to 2.5m. Made no exit signs necessary on both sides of entrance to dead end street. Changed no exit sign reference from W4-3 to Wa-31. Moved street name blades to other side of entrance, and allowed final location (side of intersection) to be decided by Town. Updated distance from edge of pavement to sign.
2	TOISD 401	May 2016	Revised dimensions and specifications.
2	TOISD 402	May 2016	Revised dimensions.
2	TOISD 405	May 2016	Revised dimensions. Added mandatory brace bar along bottom of fence for corner and first panels.
0	TOISD 411	May 2016	Added drawing to Standards.
2	TOISD 601	May 2016	Moved Gas and Hydro out from under pavement. Revised dimensions.
2	TOISD 602	May 2016	Moved Gas and Hydro out from under pavement. Revised dimensions.
2	TOISD 604	May 2016	Moved Gas and Hydro out from under pavement. Revised dimensions.
2	TOISD 603	May 2016	Moved Gas and Hydro out from under pavement. Revised dimensions.
2	TOISD 703	May 2016	Revised location of tracer wire.
2	TOISD 709	May 2016	Added flow meter after check valve.

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
2	TOISD 711	May 2016	Changed design and specifications of Sampling Station to match a Test Tapby Regal Waterworks. Changed drawing to show three shrubs. Changed depth of mulch from 75mm to 100mm. Removed bonemeal from planting soil mix. Removed Note #4: "For trees planed within planting or shrub beds, delete saucer from around base of tree."
0	TOISD 819	May 2016	Added DWG "Park Bench Concrete Pad, 1 Bench with Wheelchair Parking"
0	TOISD 820	May 2016	Added DWG "Park Bench Concrete Pad, 2 Benches with Wheelchair Parking"
0	TOISD 821	May 2016	Added DWG "Play Area (Engineered Wood Surface) C.I.P. Concrete Curb (Section)"
0	TOISD 822	May 2016	Added DWG "Play Area Accessible Ramp"
3	TOISD 901	May 2016	Removed T-bars and replaced with wood stakes. Removed trunk guard. Removed bonemeal from planting soil. Removed "clean sharp edge between saucer and adjacent surface". Changed depth of mulch from 75mm to 100mm. Added note: "Bare root stock will not be accepted"
3	TOISD 902	May 2016	Removed T-bars and replaced with wood stakes. Removed bonemeal from planting soil. Removed "clean sharp edge between saucer and adjacent surface". Changed depth of mulch from 75mm to 100mm. Added note: "Bare root stock will not be accepted"
0	TOISD 903	May 2016	Tree Planting on Slope dwg. to replace Bare Root dwg. as TOISD 903. It has been decided that bare root stock will not be accepted in 2016, therefore the dwg. has been removed from the Standards.
1	TOISD 904	May 2016	Changed drawing to show three shrubs. Changed depth of mulch from 75mm to 100mm. Removed bonemeal from planting soil mix. Removed Note #4: "For trees planed within planting or shrub beds, delete saucer from around base of tree."
1	Manual	April 2015	Added new Town Logo and revised formatting (Cover page)
2	Manual	April 2015	Revised Technical Guidelines in Preface (Page VII).
1	Manual	April 2015	Added sentence allowing the request for additional reports (Section 1.3). Revised Stormwater Management Report Criteria (Section 1.3).

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
			Revised Traffic Impact Study Criteria and Name (Section 1.3). Added reference to applicable zoning by-law in Noise and Vibration Study Criteria (Section 1.3).
1	Manual	April 2015	Renamed column 2 title in Table 1 (Section 2.2). Revised OPSS Reference (Section 2.2).
1	Manual	April 2015	Added Requirement to conform to Canada Post Standard Drawings and Specifications (Section 2.4.5).
1	Manual	April 2015	Added OPSD References (Section 2.4.8).
1	Manual	April 2015	Specified required sidewalk base (Section 2.4.9).
1	Manual	April 2015	Replaced list of setbacks with reference to Appendix C (Section 2.4.12.2).
1	Manual	April 2015	Revised Driveway Width (Section 2.4.12.4).
1	Manual	April 2015	Revised required non-residential entrance radius (Section 2.4.12.5).
1	Manual	April 2015	Clarified width of walkway block and specified location of fencing along walkway (Section 2.4.13).
1	Manual	April 2015	Included provision to install fencing between residential and institutional properties (Section 2.4.14). Added minimum depth of cover for fence posts (Section 2.4.14). Revised OPSS Reference (Section 2.4.14).
1	Manual	April 2015	Revised OPSS References (Section 2.4.15.3).
1	Manual	April 2015	Added clarification for parking dimensions, added parallel parking stall dimensions and added paint line widths (Section 2.4.18.1).
1	Manual	April 2015	Revised OPSS Reference (Section 2.5).
1	Manual	April 2015	Added sidewalks to the list of areas where the lighting design criteria shall apply and added additional design criteria requirements (Section 3.3.2.1).
1	Manual	April 2015	Updated guidelines and policies (Section 4.1).
1	Manual	April 2015	Added reference to relevant Conservation Authority Requirements and added clarification for submission of assessment and recommendations (Section 4.2).
1	Manual	April 2015	Revised wording (Section 4.4).

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
1	Manual	April 2015	Added paver stones to bricked area runoff coefficient, revised run off coefficients in Table 6 and added provision for request of run-off coefficient calculation (Section 4.4.2).
1	Manual	April 2015	Added requirement to have storm sewers designed for 80% of pipe capacity (Section 4.4.3).
1	Manual	April 2015	New minimum and maximum velocities added (Section 4.4.4).
1	Manual	April 2015	Revised OPSD Reference (Section 4.4.7).
1	Manual	April 2015	Added provision allowing the review of non-standard storm and RLCB easement widths and added required easement size for rear lot catch basins (Section 4.4.10).
2	Manual	April 2015	Revised wording and added requirement for Town approval for spring line connection principle (Section 4.4.11).
2	Manual	April 2015	Revised lead slopes (Section 4.4.12).
1	Manual	April 2015	Added TOISD Reference (Section 4.4.13).
1	Manual	April 2015	Revised wording (Section 4.4.14).
1	Manual	April 2015	Added Specification for Local Road in Table 7 (Section 4.5).
1	Manual	April 2015	Revised required topsoil depths (Section 4.5.1).
1	Manual	April 2015	Added 100 ha. to part a) (Section 4.5.2).
1	Manual	April 2015	Added references to relevant Conservation Authorities (Section 4.6).
1	Manual	April 2015	Revised Construction Access Mat requirements (Section 4.8.7).
1	Manual	April 2015	Revised domestic flow calculation procedure and revised wording (Section 5.4).
1	Manual	April 2015	New minimum and maximum velocities added (Section 5.6).
1	Manual	April 2015	Added MOE reference (Section 5.9). Revised OPSD Reference (Section 5.9).
1	Manual	April 2015	Added note allowing review of non-standard easement widths (Section 5.12).

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REV. NO.	DOC.	DATE	DETAILS OF REVISION
1	Manual	April 2015	Clarification for drop structures (Section 5.13).
1	Manual	April 2015	Revised wording (Section 6.4).
1	Manual	April 2015	Added minimum pipe size for commercial and institutional lands (Section 6.5).
1	Manual	April 2015	Added psi conversions (Section 6.6).
1	Manual	April 2015	Added note allowing review of non-standard easement widths (Section 6.8).
1	Manual	April 2015	Revised valve spacing and added condition that all pressure reducing valves are to be installed in concrete chambers (Section 6.16).
1	Manual	April 2015	Revised TOISD and added requirement for Town approval on water and fire service configuration (Section 6.17).
2	Manual	April 2015	Revised OPSS Reference (Section 6.22.2).
1	Manual	April 2015	Added maximum cross fall for rear yard amenity areas (Section 7.2).
1	Manual	April 2015	Added easement widths and revised RLCB Specifications (Section 7.4).
1	Manual	April 2015	Added Retaining Walls Requirements (Section 7.5).
1	Manual	April 2015	Revised Section Reference (Section 7.8).
1	Manual	April 2015	Revised requirements for the Tree Protection Zone Sign and added reference to TOISD 906: Tree Protection Zone Sign (Section 8.1.2).
1	Manual	April 2015	Added reference to SWM and restoration plantings in the Species Mixture Section (Section 8.3.2).
1	Manual	April 2015	Revised reference to technical guidelines (Section 8.4.1).
1	App. B1	April 2015	Updated Street Lighting Material List.
2	App. B3	April 2015	Updated Storm Sewer System Material List.
2	App. B4	April 2015	Updated Wastewater System Material List (Added Forcemain Section and approved material).
2	App. B5	April 2015	Updated Water Distribution System Material List.

APPENDIX A: REVISION INFORMATION

REV. NO.	DOC.	DATE	DETAILS OF REVISION
1	App. D	April 2015	Updated CCTV Inspection Requirements.
1	TOISD 201	April 2015	Added Water Service Boxes, note regarding granular sidewalk base, and revised note regarding asphalt.
1	TOISD 202	April 2015	Added Water Service Boxes, note regarding granular sidewalk base, and revised note regarding asphalt.
1	TOISD 203	April 2015	Added Water Service Boxes, note regarding granular sidewalk base, and revised note regarding asphalt.
1	TOISD 204	April 2015	Added Water Service Boxes, note regarding granular sidewalk base, and revised note regarding asphalt.
1	TOISD 205	April 2015	Added Water Service Boxes, note regarding granular sidewalk base, and revised note regarding asphalt.
1	TOISD 206	April 2015	Added Water Service Boxes, note regarding granular sidewalk base, and revised note regarding asphalt.
1	TOISD 207	April 2015	Added Water Service Boxes, and revised note regarding asphalt.
1	TOISD 208	April 2015	Added Water Service Boxes and revised note regarding asphalt.
1	TOISD 210	April 2015	Revised Note 1 to reflect update to Section 2.4.12.4.
1	TOISD 211	April 2015	Revised Type 'B' Cul-de-sac.
1	TOISD 212	April 2015	Revised Type 'B' Cul-de-sac.
1	TOISD 304	April 2015	Removed from Standards.
1	TOISD 305	April 2015	Removed from Standards.
1	TOISD 306	April 2015	Removed from Standards.
1	TOISD 307	April 2015	Revised to TOISD 304.
0	TOISD 305	April 2015	New Drawing - Temporary Street Sign Detail.
1	TOISD 401	April 2015	Revised TOISD reference.
1	TOISD 402	April 2015	Revised TOISD reference.
1	TOISD 406	April 2015	Revised OPSD reference.

REV. NO.	DOC.	DATE	DETAILS OF REVISION
0	TOISD 503	April 2015	Added new Silt Fence Detail.
0	TOISD 504	April 2015	Added new Silt Fence Detail.
0	TOISD 505	April 2015	Added new Construction Mud Mat Detail.
0	TOISD 506	April 2015	Added new Soak Away Pit Detail.
1	TOISD 601	April 2015	Revised Water Service Extension.
1	TOISD 602	April 2015	Revised Water Service Extension.
1	TOISD 603	April 2015	Revised Water Service Extension.
1	TOISD 604	April 2015	Revised Water Service Extension.
1	TOISD 703	April 2015	Revised Hydrant Sign Detail and Flange Elevation.
1	TOISD 705	April 2015	Added Frost Collar with Note.
1	TOISD 714	April 2015	Revised OPSD reference.
1	TOISD 716	April 2015	Revised OPSD reference.
1	TOISD 718	April 2015	Revised OPSD reference.
1	TOISD 719	April 2015	Revised OPSD reference.
1	TOISD 720	April 2015	Revised OPSD reference.
1	TOISD 805	April 2015	Added note six (6) regarding walkway width.
1	TOISD 807	April 2015	Revised OPSD Reference.
1	TOISD 813	April 2015	Revised Drawings Referenced in the Title Block.
1	TOISD 818	April 2015	Removed from Standards.
1	TOISD 819	April 2015	Revised to TOISD 818.

APPENDIX A: REVISION INFORMATION

REV. NO.	DOC.	DATE	DETAILS OF REVISION
1	TOISD 905	April 2015	Added reference to TOISD 906.
0	TOISD 906	April 2015	New Drawing - Tree Protection Zone Sign Detail.
NA	All TOISD	April 2015	Added new Town logo to all Standard Drawings.
1	Manual	May 2014	Added "Landscape Architects" to Preface (Page VII).
1	Manual	May 2014	Added specific green colour and lettering style for street name signs (Section 2.4.15.1).
1	Manual	May 2014	Added reference to MTO Book 18 for bicycle lanes (Section 2.4.17).
1	Manual	May 2014	Added Landscaping section (Section 2.4.18.3).
1	Manual	May 2014	Added minimum and maximum number of Moduloc and note for autostable frames (Sections 4.4.11, 4.4.12 & 5.13).
1	Manual	May 2014	Revised maximum vertical bend in a watermain to 45 degrees (Section 6.13).
1	Manual	May 2014	Moved information for fire hydrant flow testing to new Section 6.22.7 (from Section 6.15).
1	Manual	May 2014	Revised tracer wire note (section 6.19).
1	Manual	May 2014	Added note to raise fire hydrants prior to pressure testing (Section 6.22.2).
1	Manual	May 2014	Revised wording to "where required" (Section 7.1(d)).
1	Manual	May 2014	Removed 1.5 % slope and add note regarding topsoil location (Section 7.6).
1	Manual	May 2014	Revised entire Section 8.0: Parks and Landscaping.
1	App. B3	May 2014	Updated Storm Sewer System Material List.
1	App. B4	May 2014	Updated Wastewater System Material List.

APPENDIX A: REVISION INFORMATION

REV. NO.	DOC.	DATE	DETAILS OF REVISION
1	App. B5	May 2014	Updated Water Distribution System Material List.
1	App. B8	May 2014	Updated Seed Mix and Tree Species Material List.
1	TOISD 301	May 2014	Revised Street Name Sign Elevation; revised Top View and removed Side View.
0	TOISD 307	May 2014	Added new Standard Street Name Sign and Poppy Detail.
1	TOISD 410	May 2014	Revised colour scheme to black and white.
0	TOISD 819	May 2014	Added new Typical Storm Water Management Pond Sign Detail.
1	TOISD 901	May 2014	Revised detail, dimensions and notes.
1	TOISD 902	May 2014	Revised detail, dimensions and notes.
1	TOISD 903	May 2014	Revised detail, dimensions and notes.
1	TOISD 904	May 2014	Revised detail, dimensions and notes.

Any person may request a change or revision to this document by submitting a written request using the form provided on the following page to:

Town Engineer, Town of Innisfil
 2101 Innisfil Beach Road
 Innisfil, Ontario L9S 1A1
 Phone: (705) 436-3710
 Fax: (705) 436-7120

TOWN OF INNISFIL
ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS
REVISION REQUEST FORM

Section A: Contact Information (To be filled in by the Requesting Party)

Contact Name:	
Organization:	
Telephone:	
Fax:	
Email:	

Section B: Requested Revisions (To be filled in by the Requesting Party)

Section of Document:	
Current Description:	
Suggested Revisions:	
Reasoning:	

Please check, if applicable:

☐ Additional Information/Documentation Attached

☐ Red Lined Detail Drawing Attached

Signature: _____

Date: _____

Section C: Revision Review (To be filled in by the Responding Party)

The Town of Innisfil has reviewed the requested revision to the Engineering Design Standards and Specifications and has decided to:

☐ Deny the Request

☐ Support the Request

☐ Request a Meeting to Discuss

Additional Details:

Reviewed By: _____

Date: _____

Approved By: _____
 (Town Engineer)

Date: _____

APPENDIX B: LISTS OF APPROVED MATERIALS

- B1 – Street Lighting**
- B2 – Traffic Signals**
- B3 – Storm Sewer System**
- B4 – Wastewater System**
- B5 – Water Distribution System**
- B6 – Parks and Landscaping**
- B7 – Fencing**
- B8 – Seed Mixes & Tree Species**

APPENDIX B: LISTS OF APPROVED MATERIALS

B1 – Street Lighting

APPENDIX B1

STREETLIGHTING MATERIAL LIST

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.0 LIGHTING				
1.1	Electrical Handholes	CSA	Precast concrete type complete with cover, 460mm Dia., as per OPSD 2112.02.	
1.2	Ducts	CSA C22.2, No.211.1 CSA C22.2, No.211.2 CSA Standard B137.1, Series 75 or ENT CSA C22.2, No.227.1	In boulevard, rigid PVC DB2 duct, 53mm Dia. Below roadways, rigid PVC Thickwall duct, 53mm Dia. Flexible duct (Polypipe) to be used for protection of cables entering the wiring aperture in the concrete poles.	
1.3	Cables	CSA C22.2 No.38	Power supply cables shall be 3-#2 AWG copper RWU90 (including ground wire), with cross- linked polyethylene insulation rated 600 volt. Street light cables shall be 1-2C#6	

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>AWG copper and #10 AWG copper GND, 60°C, NMWU; or 2-#6 AWG copper RW90 and #8AWG copper GND RW90</p> <p>Riser wires from pole handhole to luminaire shall be #12 AWG stranded copper type RWU90 insulation.</p> <p>Insulation colour for line conductors for 1-phase, 3-wire 240/120V system shall be “Red” and “Black” and for 1 phase, 2-wire 120V system shall be “Red”. Insulation colour of all neutral conductors shall be “White”.</p> <p>Cable connectors in pole handholes shall be compression connectors with insulating covers.</p>		
1.4	Fuses		Fuse holders in pole handholes shall be in-line break-away type rated 600V complete with 10 amp KTK fuse.		
1.5	Grounding	CSA C22.2 No.41	Ground rods shall be solid steel, 19mm Dia., 3.0m long, copper clad for full length.		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
2.0 POLES					
2.1	Standard Roadway Lighting Poles	CSA A14-M1979	<p>Direct Buried, Class “B” spun concrete, tapered round with natural concrete smooth mold finish, complete with handhole cover plate, nameplate and ground lug.</p> <p>Arterial Roads – 12.2m (40Ft.) Collector Roads – 10.7m (35 ft.) or 12.2m Local Roads – 7.5m (25ft.) or 10.7m</p> <p>Base mounted galvanized octagonal steel poles as per OPSD-2415.010.</p> <p>Arterial Roads – 10.5m Collector Roads – 9.0m/10.5m Local Roads – 7.5m/9.0m</p>	StressCrete Sky Cast U.S.I.	
2.2	Poles for Walkways/Bikeways		<p>Base mounted contemporary pole with high tensile carbon steel shaft round (76mm) welded to top and bottom of anchor plate.</p> <p>Pole to be black semi-gloss powder coat finish complete with base cover assembled with</p>		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>stainless steel hardware.</p> <p>Photobutton light control recessed near top of pole.</p>		
2.3	Poles for Commercial Sites	<p>Poles shall be metal type square or round to suit the luminaire style and shall be base mounted. Poles shall have durable powder coat finish, colour to match the luminaire.</p> <p>Poles in parking areas shall be restricted to 30 ft. (9.1m) in height. Poles may be reduced in height down to 12 ft. (3.65m) level for pedestrian pathway applications.</p> <p>Wherever feasible, poles shall be located off the edge of pavement, behind barrier curbs (islands).</p> <p>Concrete bases in parking areas shall be protected by bollards or shall be raised to minimum 900mm above grade and be 760mm diameter.</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
3.0 BRACKETS					
3.1	Standard Roadway Lighting Brackets		<p>Tapered elliptical aluminium brackets as per OPSD 2420.01. The length of the bracket depends on offset from pavement and pole height.</p> <p>Arterial Roads – 2.4m (10Ft.) preferred, 3.0m maximum Collector Roads – 1.8m (8 ft.) preferred Local Roads – 1.2m (6 ft.) preferred.</p>		
3.2	Walkways/Bikeways Brackets		Single or double brackets with bend aluminum tubing with decorative aluminum rod, welded assembly and cast aluminum adaptor.		
4.0 LUMINAIRES					
4.1	<p>Standard Roadway Luminaires: High Pressure Sodium</p> <p>NOTE – HPS fixtures were allowed in the past. Currently all luminaires are to be LED type. This section is kept for general information only. Designer to consult the Town at the project start-up to confirm all design parameters.</p>				

	MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
4.1.1	Arterial/Industrial Roads		<p>“Cobra Head” style, type II or III distribution pattern, medium cut-off, internally shielded with flat tempered glass lens and photocontrol receptacle.</p> <p>Lamp wattage to be long life 200W to 400W high pressure sodium.</p> <p>Luminaire housing to be die-cast aluminum with latch and standard grey polyester powder coat finish. Permanent type marking to be applied on underside of the luminaire housing for lamp wattage identification, (Yellow for HPS).</p> <p>Ballast to be C.W.I., 120 volt, 60Hz.</p>	<p>Cooper Lighting (OVF)</p> <p>AEL (series 315)</p> <p>GE (M-400A)</p>	
4.1.2	Local and Collector Roads		<p>“Cobra Head” style, type II or III distribution pattern, medium cut-off, internally shielded with flat tempered glass lens and photocontrol receptacle .</p> <p>Lamp wattage to be long life 70W</p>	<p>Cooper Lighting (OVH)</p> <p>AEL (Series 315)</p> <p>GE (M-250R2)</p>	

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>to 150W high pressure sodium.</p> <p>Luminaire housing to be die-cast aluminum, with latch and standard grey polyester powder coat finish. Permanent type marking to be applied on underside of the luminaire housing for lamp wattage identification, (Yellow for HPS).</p> <p>Ballast to be C.W.I., 120 volt, 60Hz.</p>		
4.1.3	Photocontroller		<p>Model TRS-1</p> <p>Photocontroller to have minimum surge protection of 40,000 amps and a minimum load rating of 1,000W/1,800 VA.</p> <p>Must have operating strength of 5,000 volts, and the photocell must be silicon sensor in glass and metal hermetic enclosure.</p> <p>Photocells shall be rated for a</p>	FP Outdoor Lighting Controls/Sunrise Technologies	

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			minimum of 100,000 operational hours		
4.2	Standard Roadway Luminaires: LED – Cobra Head		<p>Luminaire – Cobra Head style, type 2 or 3 distribution pattern, rugged die cast aluminum housing with surge and brown-out protection, LED drivers and electronic transfer switch. Temperature control by robust heat sink ensuring a minimum of 80,000 hours L70 at 40C operating ambient.</p> <p>Operating range from – 40 to + 50C with light engines meeting the dust and moisture rating of IP-66. Luminaire design to meet CSA-C22.2 number 250 for 40C, wet location and to be ROHS compliant. Maximum total harmonic distortion to conform to ANSI C82.77: 2002.</p> <p>Solid state 120 volt 60 Hz electronic drivers with extended</p>	<p>CREE</p> <p>Cooper Lighting</p> <p>GE Lighting</p> <p>Leotek Green Cobra LED Family</p>	<p>XSP Series LED Street Luminaire</p> <p>XNV1/XNV2 LED Navion LED Verdeen LED</p> <p>GE Evolve LED</p> <p>G CJ, GCM, GCL, GC2</p>

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>life to 100,000 hours minimum.</p> <p>LED colour temperature 4000 K nominal.</p> <p>All luminaires to be provided with a Dimming Module</p> <p>5 year limited warranty on LED light engine, LED drivers and all non-electrical components.</p>		
4.3	Standard Roadway Luminaires: LED - Decorative		<p>Luminaire – Decorative lantern style, available in numerous distribution patterns to meet project specific requirements, rugged die cast aluminum housing with surge and brown-out protection, LED drivers.</p> <p>Operating range from – 40 to + 40C, LED luminaire to meet IP65 rating. Luminaire design to meet CSA-C22.2 number 250 for 40C, wet location and to be ROHS compliant. Maximum total harmonic distortion to conform to ANSI C82.77: 2002.</p>	Cooper Lighting Sternberg Lighting	UTLD Post Top Decorative LED Springdale Arm Mount Decorative LED S640- XRLED Seville Series Decorative LED

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>Solid state 120 volt 60 Hz electronic drivers with extended life to 100,000 hours minimum. Temperature control by robust heat sink ensuring a minimum of 100,000 hours L70 at 40C operating ambient</p> <p>LED colour temperature 4000 K nominal.</p> <p>All luminaires to be provided with a Dimming Module Minimum 7 year limited warranty (10 year preferred) on LED light engine, LED drivers and all non-electrical components.</p>	<p>King LED</p> <p>Cyclone Lighting</p>	<p>King Luminaire K601 Decorative LED</p> <p>Hudson Post Top HUD4T4-NL Sidemount HUDS4A-NL</p>
4.4	Park Walkway/Bikeway Luminaires:		50W pulse start metal halide.		
4.5	Commercial Site Luminaires: Metal halide		<p>In general shall be of the "Architectural Site Lighting" style, contributing a cohesive look to the overall site lighting system.</p> <p>The architectural outdoor luminaries may be shoe-box or round type with good optics and</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>full cut-off with optional house side shielding.</p> <p>Luminaires at lower mounting heights shall have a vandal proof lens. The luminaires shall be post top arm mounted suitable for 1A to 4C configurations and also be suitable for optional wall mount applications.</p> <p>Luminaire housings shall be die-cast type with durable powder coat finish colour to match site architectural features.</p> <p>Lamp wattage for parking lot and site roadway lighting shall be in the 150 to 400 watt range, subject to application. Lamp wattage for pedestrian scale pathway and building zone lighting may be reduced to 70 watt metal halide.</p>		
5.0 POWER SUPPLY DISCONNECT					
5.1	Pole Mounted Disconnects		Pole mounted power supply disconnects shall be outdoor weatherproof type 240/120 V rated	Square 'D' (CQO)	

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			100 amps with 60 amp 2 pole main breaker suitable for service entrance.		
5.2	Pedestal Mounted Disconnects		<p>Pedestal mounted power supply disconnect shall be outdoor heavy gauge galvanized steel with lockable removable front cover complete with precast concrete base.</p> <p>Colour to be equipment green with powder coat finish.</p> <p>Interior power supply disconnect shall be 240/120 V rated 100 amps with 60 amp 2 pole main breaker suitable for service entrance. Branch breakers to be 30 amps 1 pole 120V.</p>	Pedestal Solutions Inc.	

APPENDIX B: LISTS OF APPROVED MATERIALS

B2 – Traffic Signals

APPENDIX B2

TRAFFIC SIGNALS MATERIAL LIST

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.0 TRAFFIC SIGNAL CONTROLLER					
1.1	Street Intersections	NEMA Standards Publication No. TS2-2016, TS2-Type 2 design specifications and all revisions	<p>8 phase, solid state, LCD display, microprocessor traffic based controller timer</p> <p>Programmable to start up in Phase 2 and 6 "Amber" and phase 4 and 8 "Red" intervals</p> <p>Capable of providing vehicle extensions of the actuated phases and capable of holding 4 different timing plans</p> <p>A "NEMA Plus" solid state 12 channel conflict monitor complete with LCD display and fault memory with RS-232 port and cable, EDI Model No. SSM-12LE.</p> <p>Include fully wired 12 position back panel set up to operate on the approximate number of vehicle and pedestrian phases</p> <p>Include wired 8 position detector rack</p>	McCain	ATC eX2 TS2 Type 2

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>Cabinet power supply to provide regulated DC power, unregulated AC power and a line frequency reference for the detector racks, load switches and auxiliary equipment.</p> <p>All time clocks to have a minimum of 12 hour power reserve complete with LCD display and fault memory, with RS-232 port and cable, EDI Model No. SSM-12LE.</p> <p>Twelve (12) solid state load switches with PDC for vehicle and pedestrian indications only, EDI Model No. 200 or approved equivalent. Indication lights showing the condition of "Green (Walk)", "Yellow" or "Red (Don't Walk)" drive turned "ON" at the load switch shall be provided integral with the load switch.</p> <p>Provisions for future dial-in communication access (Bell Canada) and a 1200 baud FSK modem.</p> <p>Two (2) rack-mount pedestrian, 2-channel, DC Isolator cards, EDI Model 242, or approved equivalent.</p> <p>Four (4) Loop detector units (2 channel), EDI LM 222 series, or</p>		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>approved equivalent.</p> <p>Two (2) spare rack-mount slots wired for future emergency pre-emption cards.</p> <p>Police panel complete with a manual/auto switch, flash switch, and signal on/off switch.</p> <p>Thermostatically controlled 250W strip heater and fan which can be manually controlled.</p> <p>Four (4) Transfer Relays.</p> <p>NEMA solid state, 15A, 2-pole flasher, EDI Model #204 or approved equivalent.</p> <p>Radio interference filter.</p> <p>Two (2) internal circuit breakers for power feed:</p> <ul style="list-style-type: none"> • One 40 Amp for traffic signal system; and • One 15 Amp for cabinet accessories. <p>Duplex ground fault type convenience outlet.</p> <p>Lamp receptacle, complete with hand held lamp, bulb and switch.</p> <p>Switches inside the cabinet to simulate vehicle and pedestrian</p>		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>detector inputs directly to the controller.</p> <p>Switches for stop timing and flash toggle shall also be provided.</p> <p>Power surge protective device for filtering lightning and high voltage surges to ground, EDCO Model No. SHA-1210 or approved equivalent.</p> <p>Aluminium air vent cover, complete with dust filter.</p> <p>Two (2) Conflict Monitor check sheets verifying shop testing.</p> <p>Two (2) sets of equipment drawings, one (1) original bounded Manufacturer's operation manual with blank timing sheets, water-proof document bag, and two keys for the cabinet.</p> <p>The controller timer and cabinet shall be supplied completely wired and programmed to facilitate the mode of operation. Wiring drawings and connection instructions shall be included with the unit.</p> <p>Neoprene gasket installed between the base of a pad mounted cabinet and the concrete foundation.</p>		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>All external input wiring within the cabinet shall be Mylar tagged, labelled, grouped, and neatly tied in an organized fashion. There is not to be any loose or excessive wiring.</p> <p>Where the controller is for a pedestrian activated crosswalk the controller will be Trafficware Model 980 TS-2 Type 2 Traffic Controller and shall have vehicle pre-emption and time based co-ordination capability with an EDI NEMA 6 Channel CMU with Canadian Fast Flash capability. It shall include a minimum 4 position detector rack with 2-2 channel rack detectors. There shall also be a single card rack to support the addition of an Optical Pre-emption card. The controller cabinet shall be type "G" if pole mounted and type "M" if base mounted. The assembly shall include a 8 position back panel, 8 NEMA Load Switches, 1-NEMA Flasher, Internal lighting, GFI convenience outlet, internal test switches including auto/flash, stop time and interval advance. There</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			shall be a police door on the front door of the cabinet and shall include auto/flash, manual/auto, and a police cord for manual control.		
2.0 CONTROLLER CABINET					
2.1	Pad Mounted		Aluminum door in door Type M-1 pad mount cabinet with base extension		
2.2	Pole Mounted		Type G		
3.0 CONCRETE POLE BASES					
3.1	For poles greater than 3.7 m		760 mm Dia. OPSD 2200.01 and with anchorage assemblies as per OPSD 2215.02 and 2215.03		
3.2	For poles 3.7 m and less		450 mm Dia as per OPSD 2200.04 An X is to be marked atop the concrete to show location of conduit entry A 20 mm sleeve to be provided in the concrete pole base for installation of ground wire		
4.0 TRAFFIC SIGNAL POLES					
4.1	Octagonal Steel Poles		Where a separate controller cabinet pole is required, the pole shall be 3.6		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>metre (Powco Steel #8312) hot dipped galvanized heavy duty octagonal, base mount pole, complete with handhole cover and top cap.</p> <p>Poles shall be 6.1 metre (Powco Steel #8620) hot dipped galvanized heavy duty octagonal, base mount poles, complete with handhole covers and top cap. The pole is to be situated such that the final mast arm position is perpendicular to the roadway and such that the hand hole is on the opposite side of the roadway.</p> <p>Combination Traffic Signal / Luminaire Pole</p> <p>Poles shall be 9.1 metre (Powco Steel #8535) hot dipped galvanized heavy duty octagonal, base mount pole, complete with handhole covers and top cap. The pole is to be situated such that the final mast arm position is perpendicular to the roadway and such that the handhole is on the opposite side of the roadway.</p> <p>On higher speed roads the use of yielding poles may need to be considered.</p>		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
5.0 ELECTRICAL CHAMBERS				
		<p>Electrical chamber for the electrical systems shall be round precast concrete handwells, complete with cast iron frame and grate. The inside diameter of handwell shall be:</p> <ul style="list-style-type: none"> • 460mm ID for three (3) conduit inserts or less (OPSD 2112.02), and • 675mm ID for four (4) conduit inserts (OPSD 2112.03). <p>Electrical chamber for vehicle loop detection connections only shall be 300mm ID round precast concrete complete with cast iron frame and grate (OPSD 2112.01).</p> <p>Each electrical chamber shall be separately grounded to a ground rod positioned 600mm from the outside of the structure. The ground wire shall be a #6 bare stranded and affixed to the frame using 70amp SLU solderless connector. System ground ties within the electrical chamber shall be made with split bolts or thermal weld "T" taps.</p>		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
6.0 TRAFFIC SIGNAL ARMS				
		<p>Traffic single member arms shall be tapered spun aluminium, complete with mounting hardware and mounted so that traffic signal head clearances above the roadway are 5.2 metres. Approved manufacturers of traffic single member arms are:</p> <ul style="list-style-type: none"> • Sentinel Pole and Traffic Equipment Limited - TR Series; • Powerlite - SMA Series, <p>Or approved equal.</p>		
7.0 TRAFFIC SIGNAL HEADS				
		<p>Shall have polycarbonate "Special Highway" type signal heads with yellow door and housing, backboards, cowl visors, bird stops, plumbizer hanger system and steel reinforcing plates placed between the "Red" and "Amber" sections at locations indications on the Contract Drawings. Traffic signal heads shall have 300mm diameter "Red", "Amber" and "Green" sections with LED lamp indications.</p>		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>The traffic signal heads shall be installed on plumbizer signal hanger.</p> <p><u>SPECIAL TRAFFIC HEADS</u></p> <p>Shall have polycarbonate "Type 9", "Type 9A", "Type 10", "Type 10A", "Type 11" and "Type 11A" traffic signal heads with yellow door and housing, backboards, cowl visors, bird stops, plumbizer hanger system and steel reinforcing plates placed between the "Amber" and "Green" sections at locations indications on the Contract Drawings. The traffic signal head sections shall be fitted with LED lamp indications, unless otherwise noted on drawings.</p> <p>The traffic signal heads shall be installed on plumbizer signal hanger</p> <p><u>LIGHT EMITTING DIODE (LED) LAMP UNITS</u></p> <p>shall have LED lamp indications for the traffic and pedestrian signal heads. The LED lamp units shall be meet the requirements of the:</p> <ul style="list-style-type: none"> • ITE Specification for ITE Publication No. ST-017B-2001 - Equipment and Material Standards of the 		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>Institute of Transportation Engineers, and</p> <ul style="list-style-type: none"> • ITE Specification for ITE Publication – Traffic Control Signal Heads – Part 2: LED Pedestrian Traffic Signal Modules (March 2004). • ITE Specification for ITE Publication – Traffic Control Signal Heads – Part 3: LED Vehicle Arrow Traffic Signal Modules (March 2004). • ITE Specification for ITE Publication – Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement (June 2005). <p>The following manufacturers of LED lamp units are approved for installation:</p> <ul style="list-style-type: none"> • Daylight – Distributed by Innovated Traffic Solutions Inc. • Leotek Electronic Corporation – Distributed by Electromega Ltd. • GELcore – Distributed by Tacel Limited. 		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
8.0 PEDESTRIAN HEADS AND MOUNTING BRACKETS				
		Shall have single section pedestrian heads complete with mounting hardware and LED lamp unit, installed in accordance with OPSD 2505.01 and OPSD 2524.01, providing a clearance from the bottom of signal to ground level of 2.75 metres.		
9.0 PEDESTRIAN PUSH BUTTONS AND SIGNS				
		<p>Push buttons shall be "Pelco" rectangular, yellow, freeze-proof, pedestrian push button assembly for pole mounting complete with stainless steel vandal proof screws, with diaphragm, at a mounting height of 1.1m. Anti-seize compound is to be applied to the face plate and mounting screws. It shall include Ra-12 (13 x 20cm) signs at all push buttons with an arrow indicating the direction of pedestrian crossing.</p> <p>EXTRA LOW VOLTAGE (ELV) CABLES FOR PEDESTRIAN PUSHBUTTONS</p> <p>Supply be four (4) conductor #18 AWG extra low voltage cable, in shielded core from the pedestrian</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>pushbuttons to the controller cabinet, including 3.0 metres of spare cable in each electrical chamber.</p> <p>The cable shall meet the requirements of OPSS Specification No. 2420 and shall be installed in accordance with OPSD 2528.01 and OPSD 2529.01. The cable shall be "3M Company", Catalogue No. Canoga CC 30003 or approved equal.</p> <p>All groups of ELV pedestrian pushbutton cables in the controller cabinet, are to be tagged and labelled indicating phase number and leg of intersection.</p>		
10.0 LOW VOLTAGE LUMINAIRE CABLE					
			<p>The luminaire wire shall be #12 TWU single conductor, stranded copper, low voltage cable, rated 600 volts. Low voltage wire shall meet the requirements of OPSS 604, or type RWU 90 - cross link meeting the requirements of CSA Standard C22.2, No. 38. The luminaire runner cable shall be #8 TWU-90.</p> <p>The luminaire wire shall be sized so as to satisfy voltage drop</p>		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>requirements of the electrical equipment and shall not exceed 5%.</p> <p>All wire apertures drilled in steel or aluminium poles / mast arms shall be deburred and painted with grey zinc rich paint. Rubber grommets will be installed after the paint is dry.</p> <p>All joints in the luminaire wire shall be made above ground in the pole handholes or junction boxes unless otherwise specified. All equipment is to be adequately grounded, using a brass ground fitting attached to the pole ground lug.</p> <p>The riser wires inside the poles and in the mast arms shall be included in this item and shall be connected to the external wiring circuit in the underground conduit by means of one single pole waterproof fuse holder "Bussman -Tron", Catalogue No. "HEB-AA" with rubber boots, or approved equal, with one 10 amp midget ferrule fuse, "Buss" type "KTK" or approved equal. A fuse holder shall be installed inside the pole handhole and shall be secured to the connector clip supplied in the pole.</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			The luminaire wire shall be brought back and connected to the circuit breaker supplied and installed at the service pole.		
11.0 GROUND WIRE					
			<p>All ground wire splices inside electrical chambers and in poles shall be connected using a split bolt. Ground wire connections to ground rods shall be made with Thermit Weld connections.</p> <p>System Ground - shall be continuous #6 AWG TWH green, stranded copper ground wire through the entire main conduit system. The system ground wire is to be connected to all steel poles and maintenance hole / handwell frames (using 70amp SLU solderless connectors), junction boxes on wood poles, and the ground rods for each maintenance hole / handwell.</p> <p>Pole Grounding - shall be continuous #6 AWG TWH green, stranded copper ground wire from the ground lug in the steel pole (using 70amp SLU solderless connectors) to the ground rod</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>located adjacent to the pole.</p> <p>Power Service Ground - A continuous #6 AWG bare, stranded copper ground wire will be installed from the service enclosure to the four (4) ground rods located 1000mm from pole, the second rod 3 metres from the first.</p> <p>A continuous #12 AWG TWH green, stranded copper ground wire shall be installed from the proposed luminaire fixture to the ground lug in the luminaire poles.</p> <p><u>GROUND RODS</u></p> <p>shall be 20mm x 3.0m copper clad ground rods where necessary to provide adequate system grounding. The ground rods driven into the ground shall be buried so that the top of the ground rods are 300mm below the finished grade.</p> <p>Grounds rods shall be driven on the exterior of electrical chambers.</p>		
12.0 UNDERGROUND CONDUIT					
			Shall be Rigid PVC conduit or High Density Polyethylene Pipe (HDPE) ducts runs. Sections of conduit are		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>to be joined together using solvent weld cement recommended by the conduit supplier. Depth shall be as per OPSD 2103.02 and installed below any existing subdrains.</p> <p>Open Cut Installation</p> <p>Rigid conduit systems installed by open cut, direct buried and subsurface installation shall be rigid polyvinyl chloride (PVC), unplasticized conduit conforming to CSA Standard C22.2 No. 211.0-03 and CSA Standard C22.2 No. 211.2-M1984 (R2003), except where otherwise indicated.</p> <p>Directional Boring</p> <p>Polyethylene duct installed by directional boring method shall be High Density Polyethylene Pipe (HDPE) in accordance with:</p> <ul style="list-style-type: none"> • United Laboratories, UL 651B – Standard Specification for Continuous Length HDPE Conduit • American Society for Testing and Materials International, ASTM F2160 – Standard Specification for Solid Wall High Density Polyethylene Conduit Based on Controlled 		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>Outside Diameter; and</p> <ul style="list-style-type: none"> National Electrical Manufacturers Association, NEMA TC 7-2005 – Smooth-Wall Coilable Electrical Polyethylene Conduit <p>All road crossing trenches are to be backfilled with unshrinkable material as per OPSS 603.07 and OPSD 2103.03.</p> <p>The conduit layout shall be as follows install 2-100mm (4 inch) conduits between electrical chambers in road crossings, a 75 mm (3 inch) Rigid PVC conduit for traffic signal cabling and a 50mm (2 inch) Rigid PVC conduit for lighting cabling, when necessary from electrical chambers to traffic poles, 2-100 mm Rigid PVC conduits between the controller cabinet and closest electrical chambers. A 25mm Rigid PVC conduit shall be used for loop lead-in wires between the edge of pavement and nearest electrical chamber.</p>		
13.0 LOOP DETECTORS					
			Loops shall be sized and installed as		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>shown on the Contract Drawings and as per OPSD 2520.01 and OPSD 2520.02.</p> <p>Loop wire size shall be #14 AWG stranded RWU90 type.</p> <p>Loop home-run cable from electrical chamber to the controller cabinet shall be 2 conductor, #14 AWG extra low voltage cable with shielded twisted pair conductors, a high density polyethylene insulation and ground wire. Approved cables are Belden #8719 or Detector Systems, #DSI 1602, or approved equal.</p> <p>All loop splices are to be soldered and sealed with waterproof "3M Scotchcast", "Raycam", "KLICKIT II" kit, or approved equivalent.</p> <p>All single loops are to be wound 4 times. Quadrupole loops are to be wound 2-4-2.</p> <p>Saw slots should be 50mm to 75mm deep.</p> <p>Loops connected in the series are to be wound alternately in opposite rotation.</p> <p>Pieces of 150mm plastic foam backer rod are to be tightly packed within the sawcut slot every 2 metres</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>of the loop and lead-in sawcuts.</p> <p>Loop wire leads are to have a minimum of 5 twists per foot after leaving the loop saw slot.</p> <p>Loop sawcuts shall be fully sealed with hot applied tar or approved equivalent, and protected from traffic until completely dried.</p> <p>A loop inductance and leakage test is to be performed on the finished loop installation at the splice prior to being sealed. Loop inductance measurement shall be between 20 and 2,500 microhenries. Leakage resistance shall be equal to or greater than 100 megohms.</p>		
14.0 SIGNAL CABLE					
			<p>Shall be fourteen (14) gauge colour coded, traffic signal runner and riser cables to accommodate all equipment and installation operations specified in the Contract, including 3.0 metres of spare wire within each electrical chamber.</p> <p>The traffic signal cable shall meet the requirements of OPSS 2409.</p> <p>Traffic signal cable shall be installed</p>		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		<p>in the underground conduit system in accordance with the Standard Drawings OPSD 2528.01 and OPSD 2529.03 (Note B omitted), except that the conductor cable be changed to:</p> <ul style="list-style-type: none"> • All riser cables for traffic signal heads shall be seven (7) conductor, #14 AWG. • All riser cables for pedestrian heads shall be five (5) conductor, #14 AWG. • All runner cables for traffic signal heads and pedestrian heads shall be twelve (12) conductor #14 AWG, and installed in accordance with OPSD 2529.03 except that Note B be omitted. Suggest OPSD 2925.11 <p>The traffic signal heads on all legs of the intersection shall be wired separately to allow the addition of advance green or split phases without additional wiring being required.</p> <p>The traffic signal cable for each pedestrian phase will be brought back to the controller separately to accommodate separate "Walk" and</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>"Don't Walk" movements for each phase.</p> <p>Label all groups of traffic signal conductors in the controller cabinet indicating phase number, direction, and movement.</p> <p>All wire apertures drilled in steel or aluminum poles/ mast arms shall be deburred and painted with grey zinc rich paint. Rubber grommets will be installed after the paint is dry.</p>		
15.0 EQUIPMENT FOR POWER SUPPLY					
			<p>The power supply disconnect facility shall be installed to service the traffic signal control device and the related intersection lighting mounted on the traffic signal poles.</p> <p>Shall be a Square-D Model #CQ018M100RB load centre complete with circuit breakers at the supply location. The load centre shall include a 120/240V, 100A, 1Ø, 3 Wire assembly with:</p> <ul style="list-style-type: none"> 1 - Main Circuit Breaker - 2 pole - 240V - 100A common trip circuit breaker, Square D, Catalogue # QO-2100 or approved equal. 		

APPENDIX B2: LISTS OF APPROVED MATERIALS

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<ul style="list-style-type: none"> 4 - Lighting Circuit Breakers - 1 pole - 120/240 V - 30 A circuit breaker, Square D, Catalogue # QO-130 or approved equal. 1 - Traffic Signal Circuit Breaker - 1 pole - 120/240 V - 60 A circuit breaker, Square D, Catalogue # QO-160 or approved equal. Secondary Surge Suppressor, 650V Vac 2-pole secondary lightning arrester, Square D, Catalogue # QO2775SB or approved equal. <p>Or approved equivalent.</p> <ul style="list-style-type: none"> There shall be sufficient length of 3-1/C #2 AWG (Black & White) copper stranded RWU (-40°C) wire coiled at the weather head for the connection to the secondary supply / transformer on the service pole. 		
16.0 EMERGENCY PRE-EMPTION DETECTOR SYSTEM					

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			Shall be two “3M Optical Pre-emption detector Model 721”, Two Channel, 2 Directions with “Discriminator Model 452” Actuator card including harness, wiring, hardware, and testing and install sufficient optical pre-emption detector cable manufactured by “3M Company (Model #138)” and connect each optical detector to the controller cabinet.		
17.0 LUMINAIRES					
			<p>Luminaires shall be I.E.S. Type III-MSCO photometric curve, 250 Watt H.P.S. fixture housing, 250 Watt CWI ballast, for 120 Volt operation, complete with integral ballast, 250 Watt H.P.S. lamp, photo control receptacle, ground lug and photocell. The following luminaires are approved for installation:</p> <ul style="list-style-type: none"> American Electric - Catalogue # 125 25 S CT DT1 R3 DG, or General Electric – Catalogue # M-400 25 S 1 P 1 2 R MS3 U 		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p><u>LUMINAIRE ELLIPTICAL BRACKETS</u></p> <p>Luminaire elliptical brackets shall be aluminum tapered elliptical mast arms, complete with mounting brackets and conform to OPSS 2420. Elliptical brackets shall be mounted in accordance with OPSD 2250.01. The following aluminum tapered elliptical brackets are approved for installation:</p> <ul style="list-style-type: none"> • 3.0 m Tapered Elliptical Bracket - Powerlite RE-10MA - 3mm Wall, 60mm x 100mm OD, <p>Or approved equal.</p>		

APPENDIX B: LISTS OF APPROVED MATERIALS

B3 – Storm Sewer System

APPENDIX B3

STORM SEWER SYSTEM MATERIAL LIST

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 SEWER MAIN				
PVC (300mm to 450mm)	CSA B182.2	<ul style="list-style-type: none"> - DR 35 - Rubber gasket in integral bell and spigot joints - Green in colour 	IPEX NAPCO Royal Pipe & Fittings Diamond Plastics	As per individual manufacturer
Concrete	CSA A257.2	<ul style="list-style-type: none"> - Rubber gasket type joints certified to CSA A257.3 	OCPA Plant Prequalification Member	
PVC	CSA B182.4	<ul style="list-style-type: none"> - PVC Profile Pipe 	NAPCO Royal Pipe & Fittings IPEX	Kor-Flo Ultra-Rib
SaniTite HP pipe	CSA B182.13	<ul style="list-style-type: none"> - ASTM F2764, dual gaskets, compatible with INSERTA TEE connections 	ADS	As per individual manufacturer
2.0 CONNECTION TEES				
PVC Sewer Main	CSA B182.2	<ul style="list-style-type: none"> - DR 28 - Injection molded (100 mm dia. to 300 mm dia.) or factory-fabricated gasketed tee (375 mm dia. and larger) 	IPEX NAPCO Royal Pipe & Fittings	As per individual manufacturer
Concrete Sewer Main	CSA A257.2,3	<ul style="list-style-type: none"> - Factory-fabricated tee 	OCPA Plant Prequalification Member	
PVC	CSA B182.4	<ul style="list-style-type: none"> - PVC Profile Fittings 	NAPCO Royal Pipe & Fittings	Kor-Flo

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			IPEX	Ultra-Rib
3.0 SERVICE LATERALS				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR 28 - Rubber gasket in integral bell and spigot joints - White or grey in colour 	IPEX NAPCO Royal Pipe & Fittings Diamond Plastics	As per individual manufacturer
4.0 TEST FITTINGS				
PVC	CSA B182.2	<ul style="list-style-type: none"> - Bootjack Fitting for double connections - Straight test fitting at property line 	IPEX	As per individual manufacturer
Cast Iron	CSA B70	<ul style="list-style-type: none"> - Bootjack Fitting for double connections - Straight test fitting at property line 	Crowle	As per individual manufacturer
5.0 CATCHBASIN LEADS				
Concrete	CSA A257.2	<ul style="list-style-type: none"> - Rubber gasket type joints certified to CSA A257.3 	OCPA Plant Prequalification Member	
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR 35 - Rubber gasket in integral bell and spigot joints 	IPEX NAPCO Royal Pipe & Fittings Diamond Plastics	As per individual manufacturer
PVC	CSA B182.4	<ul style="list-style-type: none"> - PVC Profile Fittings 	NAPCO Royal Pipe & Fittings IPEX	Kor-Flo Ultra-Rib

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
6.0 SUB-DRAINS				
HDPE	OPSS 1840	<ul style="list-style-type: none">- 210 kPa pipe stiffness- Perforated, with geo-textile sock filter	Armtec	Big “O”
7.0 MAINTENANCE HOLES				
Concrete	CSA A257.4	<ul style="list-style-type: none">- Rubber gasket type joints certified to CSA A257.3	OCPA Plan Pre-Qualification Member	
8.0 FRAMES & GRATES – MAINTENANCE HOLES				
Cast Iron	OPSS 1850	<ul style="list-style-type: none">- Storm grate as per OPSD 401.010 (closed cover) with date and “STORM” cast into the cover	Bibby-Ste-Croix Star Pipe Canada, Inc.	As per individual manufacturer
Ductile Iron		<ul style="list-style-type: none">- Adjustable/Autostable Frame- C-50M-ONT- SELFLEVEL – MC401010243	Bibby-Ste-Croix EJ Canada	
9.0 CATCHBASINS				
Concrete	CSA A257.4	<ul style="list-style-type: none">- Use pre-cast concrete grade adjustment units with Moduloc tape between layers- Frame & grate as per OPSD-400.020 or OPSD 400.1000- Rear yard catchbasin frame & grate as per OPSD-400.120	OCPA Plant Pre-Qualification Member	
	OPSS 1850			

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
10.0 CULVERTS				
Concrete	CSA A257.2		OCPA Plant Prequalification Member	
CSP	CSA G401	<ul style="list-style-type: none"> - Galvanized - Wall thickness as recommended by manufacturer for H20 loading. - Minimum wall thickness 2.0 mm for road crossing, 1.6 mm for entrance. 		
HDPE (up to 600 mm)	CSA B182.6-02	<ul style="list-style-type: none"> - 320 kPa pipe stiffness - Smooth Interior Wall 	Armtec	As per manufacturer
11.0 HEADWALL AND ENDWALL TREATMENTS (Only if Approved by the Town)				
Concrete			OCPA Plant Prequalification Member	As per individual manufacturer
12.0 ADJUSTMENT UNITS				
Concrete	CSA A257.4	<ul style="list-style-type: none"> - Pre-cast concrete grade adjustment units with Modoloc tape between layers - Riser rings (only to be used when approved by the Town) - IPEX Lifesaver adjustment units 	OCPA Plant Pre-qualification Member	As per individual manufacturer
Ductile			Sigma	MH-640102 DI (38 mm)
HDPE			IPEX	MH-640102 DI (51 mm) Lifesaver

APPENDIX B: LISTS OF APPROVED MATERIALS

B4 – Wastewater System

APPENDIX B4

WASTEWATER SYSTEM MATERIAL LIST

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 SEWER MAIN				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR35 - Colour: green - Rubber gasket in integral bell and spigot joints - "Kor-n-seal" gaskets on all pipes entering manholes 	IPEX NAPCO Next Polymers Diamond Plastics	As per individual manufacturer
2.0 CONNECTION TEES				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR28 - Injection molded or factory-fabricated gasketed tees 	IPEX NAPCO Next Polymers Diamond Plastics	As per individual manufacturer
3.0 SERVICE LATERALS				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR28 - Colour: green or black - Rubber gasket in integral bell and spigot joints 	IPEX NAPCO Next Polymers Diamond Plastics	As per individual manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
4.0 VERTICAL RISERS				
PVC	CSA B182.2	- For use with sewer main depths in excess of 5 m	NAPCO	As per manufacturer (varies by size) 4" vertical riser kit with adapter to 5"
5.0 TEST FITTINGS				
PVC	CSA B182.2	- Straight test fitting at property line	IPEX	As per individual manufacturer
Cast Iron	CSA B70	- Straight test fitting at property line	Crowle	As per individual manufacturer
6.0 SERVICE SADDLES				
PVC	CSA B182.2	- For use as a new service connection to an existing municipal sewer only - SDR35 Gasket Hub x Gasket Saddle Tee c/w Stainless Steel Clamps and Short Skirt	NAPCO Galaxy Plastics Ltd. IPEX	As per manufacturer (varies by size)
7.0 MAINTENANCE HOLES				
Concrete	CSA A257.4	- Rubber gasket type joints certified to CSA A257.3 - "Kor-n-seal" gaskets on all pipes entering manholes	OCPA Plant Pre-qualification Member	As per individual manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
8.0 FRAMES & GRATES				
Cast Iron	OPSS 1850	- Grate as per OPSD 401.010 (closed cover) with date and "SANITARY" cast into the cover	Bibby-Ste-Croix Star Pipe Canada	As per individual manufacturer
Ductile Iron	OPSS 1850	- Adjustable/Autostable Frame - C-50M-ONT - C-50M-ONT (Watertight Option) - SELFLEVEL – MC401010243	Bibby-Ste-Croix EJ Canada	
9.0 ADJUSTMENT UNITS				
Concrete	CSA A257.4	- Pre-cast concrete grade adjustment units with Moduloc tape between layers	OCPA Plant Pre-qualification Member	As per individual manufacturer
Ductile Iron		- Riser rings (only to be used when approved by the Town)	Sigma	MH-640102 DI (38 mm) MH-640102 DI (51 mm)
10.0 FORCEMAIN				
PVC	CSA B137.3 AWWA C900 or, AWWA C905	- SDR26 - Colour; White	IPEX NAPCO	As per individual manufacturer
11.0 WATERTIGHT FRAME & GRATE				
Watertight Frame & Grate	ASTM D2240, ASTM D412, ASTM D573,		Hamilton-Kent	The Life Span System

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
	ASTM D395, ASTM D746			
12.0 WATERPROOF MEMBRANE				
Waterproof Membrane/ Petrolatum Tape	ASTM D412, ASTM E96, ASTM E154		Blueskin R.W. Meadows Denso Petrolatum Tape	WP200 Mel-Roll as per manufacturer
13.0 SERVICE ABANDONMENT SLEEVE				
Service Abandonment Sleeve		Stainless Steel	Link-Pipe	As per manufacturer
14.0 FORCEMAIN TRACER WIRE				
Forcemain Tracer Wire		#12 AWG (0.0808" diameter" high strength copper clad steel conductor (HS-CCS), insulated with a 30 mm high density polyethylene (HDPE) insulation, rated for direct burial use at 30 volts	Electrical Suppliers Bren Technologies Canada Wire Copperhead Phillips Pirelli	As per manufacturer
15.0 TRACER WIRE WATERPROOF CONNECTOR				
Tracer Wire Waterproof Connector	ASTM D1248, ASTM B910/B910M		Copperhead	Low-voltage Ace Connectors (SC-PB-01)
16.0 TRACER WIRE TEST STATION				
Tracer Wire Test Station		Colour Coded Green	Rhino	72" RhinoDome Test Station

APPENDIX B: LISTS OF APPROVED MATERIALS

B5 – Water Distribution System

APPENDIX B5

WATER DISTRIBUTION SYSTEM MATERIAL LIST

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 WATERMAIN				
PVC Pipe	AWWA C900 (Pipe ≤ 350mm) AWWA C900 (Pipe ≥ 350mm) CSA B137.3	<ul style="list-style-type: none"> - DR18, Class 235 - Rubber gasket in integral bell and spigot joints - Colour coded "Blue" - 6 m pipe length - CI OD 	IPEX NAPCO Next Polymers Diamond Pipe National Pipe	As per individual manufacturer
Ductile Iron	AWWA C151/A21.51 AWWA C104/A21.4 AWWA C111	<ul style="list-style-type: none"> - Minimum Pressure Class 350 (100 mm to 300 mm diameter) - Cement Mortar Lined - Rubber gasket in integral bell and spigot joints - Polyethylene encasement in aggressive soil - 6 m pipe length 	U.S. Pipe Canada Pipe Clow McWane	As per individual manufacturer
HDPE		<ul style="list-style-type: none"> - DR11 		As per individual manufacturer
Polyethylene	AWWA C906 CSA B137.1	<ul style="list-style-type: none"> - DR17, Class 100 - Thermal butt fusion joining of pipe - CI OD 	Infra Pipe Solutions	As per individual manufacturer
Concrete	AWWA C301(L)	<ul style="list-style-type: none"> - Pre-stressed concrete lined cylinder pipe 	Decast Forterra	As per individual manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
Concrete	AWWA C301(E)	- Pre-stressed concrete lined embedded cylinder pipe	Decast Forterra	As per individual manufacturer
2.0 WATER SERVICES				
Copper	ASTM B88-88	- Type 'K' - Heavy wall - Soft copper - Horizontal gooseneck	Great Lakes Copper Inc.	As per manufacturer
3.0 WATERMAIN FITTINGS				
Ductile Iron Compact Ductile Iron	AWWA C110/A21.10 AWWA C153/A21.53 AWWA C104/A21.4 AWWA C111/A21.11	- Minimum Pressure Class 350 - Cement Mortar Lined - Mechanical joint	Magotteax Sigma Star Bibby St. Croix Tyler Pipe	As per manufacturer
4.0 WATERMAIN VALVES				
Gate Valves	AWWA C509 AWWA C515 AWWA C111/A21.11	- Non-rising stem and 50 mm square operating nut - Open counter clockwise - Resilient seat gate - Epoxy coating internal and external per AWWA C550 - Mechanical joints with restrainers - Bond breaker between concrete support and valve body - Stainless steel bolts	Mueller Clow AVK Bibby AFC	A2360 F-6100 Series 25/00 As per manufacturer Series 65
Pressure Reducing Valves	AWWA C530	- Flanged - Epoxy coating internal and	Singer OCV	As per manufacturer As per manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
		external as per AWWA C116/ A21.16		
Reduced Pressure Principle Back Flow Preventer	AWWA C511		Watts	#909 Series
Air Release Valve	NSF 61 AWWA C512-07		Apco CLA-VAL A.R.I.	As per manufacturer 34AR-332-3/4" As per manufacturer
Swing Check Valves	AWWA C508	Gravity operated, bronze or stainless steel disc facing, stainless-steel bolts, epoxy coated interior and exterior	Muller Clow Val-Matic	As per individual manufacturer
5.0 FIRE HYDRANTS				
Fire Hydrant	AWWA C502 AWWA C509-01	<ul style="list-style-type: none"> - 1.98 m barrel length - Post type dry barrel compression shutoff with ball valve closing with flow, opening counter clockwise - M.J elbow - 125mm valve ball - 2 side outlets with 2.5" CSA standard hose nozzle threads - 1 - 4" Storz pumper nozzle outlet - Breakaway flange - Self draining - PVC DR18 Hydrant laterals - Bond breaker between concrete support and fittings 	Mueller Clow Tremclad - Benjamin Moore (paint)	Century 67-M

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
Hydrant Marker		<ul style="list-style-type: none"> - Hydrant colour shall be Fire Engine Red - Top and side nozzle caps shall be painted based on hydrant flows (front storz nozzle to remain black). - Anti-tamper device - 48" in height fluorescent yellow - Installed on side port 	<p>Flexstake</p> <p>LHS Inc.</p>	<p>FH 800 Series</p> <p>Pretzel Hydrant Marker</p>
6.0 VALVE BOXES				
		- 150 mm cover	Bibby Sigma or approved equivalent	VB800 As per manufacturer
		- Guide Plate	Bibby Sigma or approved equivalent	VB875 VB4500
		- Extension 300 mm	Bibby Sigma or approved equivalent	VB700 VB4253,VB4512
		- Extension 450 mm	Bibby Sigma or approved equivalent	VB705 VB4401, VB4518
		- Extension 600 mm	Bibby Sigma	VB710 VB4400, VB4524

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			or approved equivalent	
		- Adjustable valve box upper section	Bibby Sigma or approved equivalent	VB404-7393 As per manufacturer
7.0 VALVE STEM EXTENSIONS				
		- Required for additional depth over 1.7 m - 52 mm top operating c/w set screw	Bibby or approved equivalent	VB950
8.0 JOINT RESTRAINT DEVICES				
MJ Restraining Gland for Ductile Iron Water Main		- Colour code black for ductile iron use	Uni-Flange Stargrip EBAA Iron	Series 1400 Series 3000 Series 1100
MJ Restraining Gland for PVC Water Main	- ASTM standard F1674-96 - ANSI/AWWA C111/A21.11 where applicable	- Ni-bell standard UNI-B-13-94	Uni-Flange Stargrip EBAA Iron Sigma	Series 1300 Series 4000 Series 2000 As per manufacturer
Split Ring Restrainers and Tie Bolts		- The split ring restraint design shall incorporate a series of non-directional machined serrations (not 'as cast') on the inside diameter to provide positive restraint, exact fit, 360 degree contact and support of	Uni-Flange Stargrip EBAA Iron	Series 1390 Stargrip 1100C Series 1500

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
		the pipe wall. - if machined serrations are directional, additional safeguards must be built into casting.		
Joint Restraint System In-line for PVC Water Main	- AWWA standard C900 - CSA standard B137.3 - ASTM F1674 - NSF 61	- Integral Joint Restraint System for use with 100 mm to 300 mm dia. PVC Water Main - PVC DR18 pressure pipe	IPEX NAPCO Royal Pipe & Fittings	Terrabrute Cobra Lock
Mechanical Restraint	- ANSI/AWWA C111/A21.11	- Cam-Lock and Bell-Lock joint restraints - One-Lok Series joint restraint	Smith-Blair Sigma Corporation	As per individual manufacturer
9.0 FITTING RESTRAINT DEVICES				
Mechanical Joint (MJ fitting restrainers)	- AWWA standard C111 - ANSI A21.11 - ASTM A536	- Body must be epoxy coated or equivalent - Corrosion protection coatings	Smith-Blair Sigma Corporation Stargrip EBAA Iron Clow (TUF Grip Dual Wedge)	As per manufacturer
10.0 CATHODIC PROTECTION				
Cathodic Nuts and Sacrificial Caps		- 99.9% high grade Zinc - Steel core - Coated with low resistant depolarizing material: 175 grams ASTM B-418-73-type II	Bren Technologies	SAP Cap

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
11.0 METALLIC CAUTION TAPE				
		<ul style="list-style-type: none"> - Mylar marking tape c/w metallic backing - Metallic Backing Tape "Caution Water Main" Blue and Silver 	Bren Technologies	As per manufacturer
12.0 TRACER WIRE				
Tracer Wire		#12 AWG (0.0808" diameter" high strength copper clad steel conductor (HS-CCS), insulated with a 30 mm high density polyethylene (HDPE) insulation, rated for direct burial use at 30 volts	Electrical Suppliers Bren Technologies Canada Wire Copperhead Phillips Pirelli	As per individual manufacturer
Tracer Wire Waterproof Connector	ASTM D1248 ASTM B910/B910M		Copperhead	Low-voltage Ace Connectors (SC-PB-01)
Tracer Wire Test Station		Colour Coded Blue	Rhino	72" RhinoDome Test Station
Hydrant Three Terminal Test Station		Blue in Colour	Copperhead	Cobra T3 Hydrant Flange Package
13.0 TIE RODS (19mm)				
		- Stainless Steel		As per manufacturer
14.0 SERVICE BOXES				
		- Steel boot only	Mueller Clow Bibby	As per manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			Sigma	
15.0 SERVICE BOX RODS				
		<ul style="list-style-type: none"> - 36" stainless steel - Stainless steel cotter pins 	Mueller Clow Bibby	As per manufacturer
16.0 SERVICE SADDLES				
PVC Water Main (19 mm to 50 mm)		<ul style="list-style-type: none"> - Cast bronze service saddle - Double strap 	Robar Cambridge Brass	2706 Series 812
Ductile Iron Water Main (19 mm to 50 mm)				
Tapping Sleeve – PVC and Ductile Iron Water Main	NSF/ANSI 61	<ul style="list-style-type: none"> - Stainless Steel, Type 663 	Smith-Blair AFC Robar	As per manufacturer 6606
17.0 SPACERS				
Casing End		<ul style="list-style-type: none"> - Seal-virgin SBR and Bands - T-304 stainless steel 	Cascade PSI	As per manufacturer As per manufacturer
Casing Spacers		<ul style="list-style-type: none"> - Fusion coated steel casing insulators 	Cascade PSI	As per manufacturer As per manufacturer
18.0 MAIN STOPS				
19mm	AWWA C800		Mueller Cambridge Brass Ford	H25008 301-A3H3 19mm-FB1000-3-Q

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
				17072 Compression
25mm	AWWA C800		McDonald Brass Mueller Cambridge Brass Ford	4701B-T H25008 301-A4H4 25mm-FB1000-4-Q 17072 Compression
38mm	AWWA C800		McDonald Brass Mueller Cambridge Brass Ford	4701B-T H25008 301-A6H6 38mm-FB1000-6-Q 17072 Compression
52mm	AWWA C800		McDonald Brass Mueller Cambridge Brass Ford	4701B-T H25008 301-A7H7 52mm-FB1000-7-Q 17072 Compression
19.0 CURB STOPS				
19mm	AWWA C800	- Non Self-draining	Mueller Cambridge Brass Ford	B-25209N 202-H3H3 B44-333
25mm	AWWA C800	- Non Self-draining	Mueller Cambridge Brass Ford	B-25209N 202-H4H4 B44-444
38mm	AWWA C800	- Non Self-draining	Mueller Cambridge Brass Ford	B-25209N 202-H6H6 B44-666

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
52mm	AWWA C800	- Non Self-draining	Mueller Cambridge Brass Ford	B-25209N 202-H7H7 B44-777
20.0 COUPLINGS				
19mm	AWWA C800		Mueller Cambridge Brass Ford McDonald Brass	H-15-403 118-H3H3 C44-33 4758T
25mm	AWWA C800		Mueller Cambridge Brass Ford McDonald Brass	H-15-403 118-H4H4 C44-44 4758T
38mm	AWWA C800		Mueller Cambridge Brass Ford McDonald Brass	H-15-403 118-H6H6 C44-66 4758T
52mm	AWWA C800		Mueller Cambridge Brass Ford McDonald Brass	H-15-403 118-H7H7 C44-77 4758T
Asbestos to PVC Cast Iron to PVC	NSF/ANSI 61	- Hymax 2000 Coupling and Hymax 2100 Flanged Adapter - Omni Coupling System Cast Couplings	Krausz Industries Smith-Blair GF multi joint	As per individual manufacturer
HDPE to PVC		-	GF multi joint or approved equivalent	As per individual manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
21.0 SAMPLING STATION				
		1.7 m minimum depth of bury	Kupferle	Eclipse #88-SS
22.0 FRAMES & GRATES – VALVE CHAMBER MAINTENANCE HOLE				
Cast Iron	OPSS 1850	<ul style="list-style-type: none">- Grate as per OPSD 401.010 (closed cover) with date cast into the cover- Adjustable/Autostable Frame- C-50M-ONT- MH62502-D- SELFLEVEL – MC401010243	Bibby-Ste-Croix Star Pipe Canada, Inc.	As per individual manufacturer
Ductile Iron	OPSS 1850		Bibby-Ste-Croix Sigma EJ Canada	
23.0 ADJUSTMENT UNITS				
Concrete	CSA A257.4	<ul style="list-style-type: none">- Pre-cast concrete grade adjustment units with Moduloc tape between layers- Riser rings (only to be used when approved by the Town)	OCPA Plant Pre-qualification Member	As per individual manufacturer MH-640102 DI (38 mm) MH-640102 DI (51 mm)
Ductile			Sigma	
24.0 WATERPROOF MEMBRANE/PETROLATUM TAPE				
Waterproof Membrane/ Petrolatum Tape			Blueskin R.W. Meadows Denso Petrolatum Tape	WP200 Mel-Roll as per manufacturer

APPENDIX B: LISTS OF APPROVED MATERIALS

B6 – Parks and Landscaping

APPENDIX B6

PARKS AND LANDSCAPING MATERIAL LIST

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 PLAYGROUND EQUIPMENT				
1.1 Swings	<p>CAN/CSA Standards Z614 – Children’s Playspaces and Equipment (latest edition)</p> <p>Accessibility for Ontarians with Disabilities Act, 2005 and Ontarians with Disabilities Act, 2001</p>	<p>Neighbourhood Park: 2 seats for toddlers, 4 belt seats, and 1 accessible seat for children with disabilities</p> <p>Community Park: 5 seats for toddlers, 6 belt seats, and 1 accessible seat for children with disabilities</p> <ul style="list-style-type: none"> - All styles approved, prefer rubber over wood. - All swing posts shall be embedded in footings (anchor footing to bedrock where depth of cover is not at least 1200mm) - Top cross bar shall be min. 2440mm above finished grade 	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
		<ul style="list-style-type: none"> - Minimum 4 seats provided in one unit or two separate units - Minimum 2 belt seats, 1 toddler seat, 1 seat for a disabled child - All swing chains shall be 1/4" galvanized 		
1.2 Junior Creative Structure	<p>CAN/CSA Standards Z614 – Children’s Playspaces and Equipment (latest edition)</p> <p>Accessibility for Ontarians with Disabilities Act, 2005 and Ontarians with Disabilities Act, 2001</p>	<p><u>Neighbourhood Park:</u> 2-3 decks with min. 1 roof, transfer station & stairs, 2 plastic slides – single and dual track, climber, tunnel or bridge between decks, 3-4 activity panels, and talk tube or alternate</p> <p><u>Community Park:</u> 2-3 decks with min. 1 roof, transfer station & stairs, 2 plastic slides – single and dual track, climber, tunnel or bridge between decks, 3-4 activity panels, and talk tube or alternate</p>	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.3 Senior Creative Structure	CAN/CSA Standards Z614 – Children’s Playspaces and Equipment (latest edition) Accessibility for Ontarians with Disabilities Act, 2005 and Ontarians with Disabilities Act, 2001	<u>Neighbourhood Park:</u> 3-6 decks with min. 1 roof, transfer station with stairs, accessibility ramp, 2 plastic slides – straight and spiral both open, 3 climbers, rock wall or similar activity, 4-5 activity panels, and sliding pole <u>Community Park:</u> 5-7 decks with min. 1 roof, transfer station with stairs, accessibility ramp, 2-3 plastic slides – straight and spiral both open, 3-4 climbers, rock wall or similar activity, 5-7 activity panels, and sliding pole	Certified playground suppliers	
Spring / Spinning Toy		<u>Neighbourhood Park:</u> 2 units varying types <u>Community Park:</u> 3 - 4 units varying types - Spring toy see saws - Saddlemates, dino, fire chief car	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
		<ul style="list-style-type: none"> - Spring rider, giant see saw, 4-way rock-a-bout - Selected spring products 		
Slide		<ul style="list-style-type: none"> - Attached to creative structures, no independent slides - High vandalized areas, specify stainless steel slide - All other areas specify poly slides - Open slides are required, slide tubes are not approved - Straight, wavy and spirals are acceptable 	Certified playground suppliers	
Decks		<ul style="list-style-type: none"> - Steel with plastisol coating preferred; plastic wood or Trex is acceptable - Provide minimum 1 set of stairs 	Certified playground suppliers	
Climbers		<ul style="list-style-type: none"> - Chain net, cable net, and cargo net climbers shall have one piece coupling or nut and bolt couplings. Screw 	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
		couplings are not acceptable - Finish: zinc bath, polyester powder coat		
Activity Panels		<ul style="list-style-type: none"> - Steel bars at ends of ramps - Mix up steel bars, poly windows, activity panels - Provide 40% of activity panels on ground level for wheelchair users - Percussion musical panels permitted in low vandalized areas - (Tic tac toe, Mirror, Little Tikes 7 station panel, Poly windows, Steering wheel) 	Certified playground suppliers	
Fibre		- engineered wood fibres minimum 300mm (12") deep	Certified playground suppliers	
Crushed granite sand	CSA Compliant			

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
Rubber			Certified playground suppliers	

OBSOLETE

APPENDIX B: LISTS OF APPROVED MATERIALS

B7 – Fencing

APPENDIX B7
FENCING MATERIAL LIST

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.0 ACOUSTICAL FENCE					
1.1 Polyvinyl Chloride (PVC)					
	PVC	AASHTO "Guide Specifications for Structural Design of Sound Barriers"	<ul style="list-style-type: none"> - Silent Protector for absorptive applications. - Tuf-Barrier for reflective applications. 	Atlantic Industries Limited (AIL).	
1.2 Infill					
		MOE (minimum surface density requirement of 20kg/m ²)	<ul style="list-style-type: none"> - 57mm x 130mm T & G select tight knot NLGA pattern 18-200 - dressed both sides - Bevelled edges on both sides - Gaps shall not exceed 6mm - Members shall be tight and free of rattling 		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.3 Horizontal Members					
			<ul style="list-style-type: none"> - 38mm x 140mm dressed to pattern - NLGA 204B select tight knot grade 		
1.4 Posts					
			<ul style="list-style-type: none"> - 140mm x 140mm dressed to pattern - NLGA 131B*1 structural post and timber 		
1.5 Stain					
			<ul style="list-style-type: none"> - Latex Solid Stain - Rockport grey - 2 coats on dry wood - Apply outdoors when temperature is between 5°C and 21°C for a period of 48 hours following application 	<ul style="list-style-type: none"> - Benjamin Moore Colour Code HC-105 	
1.6 Fasteners					
	Ardox Nails Bolts Nuts Washers Anchors		<ul style="list-style-type: none"> - Hot dipped galvanized steel 		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.7 Brick Column					
			<ul style="list-style-type: none"> - 600mm x 600mm concrete brick column - Flashing, weephole vents and damp proof membrane - Mortar joints to be concave and smooth (mortar type N High Bond) - Provide drip groove 		
	Clay Brick	CAN 3-A165.2 – M94	<ul style="list-style-type: none"> - 257mm x 79mm - “Old School” colour and pattern 	Brampton Brick	
	Wall Ties	CSA A370 Level II	<ul style="list-style-type: none"> - Hot dipped galvanized 		
2.0 CHAIN LINK FENCE					
2.1 Fabric and Wire					
	Steel Wire hot dipped galvanized after weaving Steel Wire electro galvanized before weaving Black Vinyl Coated		<ul style="list-style-type: none"> - Minimum requirement for zinc coating – 0.5 kg/m² - 38 mm wire mesh - 3.4 mm (9 gauge) steel wire fabric 		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
2.2 Post and Rails					
	Galvanized Steel	ASTM Designation A 120	<ul style="list-style-type: none"> - Schedule 40 Pipe - Conforming to current specifications for black and hot dipped, zinc coated, welded and seamless pipe - Minimum requirement for zinc coating – 0.5 kg/m² 		
2.3 Fittings and Hardware					
	Frames and Braces Cast Fittings Other Fittings	ASTM Specifications (A 152)	Suitable Aluminum Alloy or Steel Ductile Iron <ul style="list-style-type: none"> - Minimum requirement for zinc coating – 0.5 kg/m² for frames and braces - Minimum requirement for zinc coating – 0.6 kg/m² for cast and other fittings 		
3.0 WOOD PRIVACY FENCE					
	Construction grade cedar Approved brown pressure treated wood		<ul style="list-style-type: none"> - Zinc coated twisted steel nails #11 Gauge 		

APPENDIX B: LISTS OF APPROVED MATERIALS

B8 – Seed Mixes & Tree Species

APPENDIX B8

SEED MIX AND TREE SPECIES MATERIAL LIST

RECOMMENDED SEED MIXES

For undeveloped open space that is not adjacent to sensitive areas:

- 45% Creeping Red Fescue
- 30% Kentucky Blue Grass
- 25% Perennial Rye Grass

For stormwater management ponds and channels, refer to the Conservation Authority planting Guidelines or use:

Lowland

- 2% Awl Sedge (*Carex stipata*)
- 5% Bebb's Sedge (*Carex bebbi*)
- 1% Purple Stemmed Aster (*Aster puniceus*)
- 25% Fowl Bluegrass (*Poa palustris*)
- 40% Fox Sedge (*Carex vulpinoidea*)
- 5% Great Blue Lobelia (*Lobelia siphilitica*)
- 1% New England Aster (*Aster novae-angliae*)
- 1% Path Rush (*Juncus tenuis*)
- 7% Canada Goldenrod (*Solidago canadensis*)
- 10% Soft Rush (*Juncus effusus*)
- 1% Tall Manna Grass (*Glyceria grandis*)
- 1% Virginia Wild Rye (*Elymus virginicus*)
- 1% Wild Bergamot (*Monarda fistulosa*)

Upland

- 25% Canada Wild Rye (*Elymus canadensis*)
- 25% Indian Grass (*Sorghastrum nutans*)
- 20% Little Bluestem (*Schizachyrium scoparium*)
- 12% Black Eyed Susan (*Rudbeckia fulgida*)
- 10% Sand Dropseed (*Sporobolus cryptandrus*)
- 4% Canada Goldenrod (*Solidago Canadensis*)
- 2% New England Aster (*Aster novae-angliae*)
- 1% Heath Aster (*Aster ericoides*)
- 1% Wild Bergamot (*Monarda fistulosa*)

RECOMMENDED BOULEVARD TREES

Botanical Name	Common Name
<i>Acer x freemanii</i> cvs.	Freeman Maple
<i>Acer rubrum</i>	Red Maple
<i>Acer saccharum</i>	Sugar Maple
<i>Amelanchier</i> spp.*	Serviceberry
<i>Celtis occidentalis</i>	Nothorn Hackberry
<i>Gleditsia triacanthos</i> var. <i>inermis</i>	Honeylocust
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree (male cultivar)
<i>Malus</i> cvs.*	Flowering Crabapple (non-fruiting, disease resistant)
<i>Prunus virginiana</i> 'Schubert'*	Schubert ChokeCherry
<i>Pyrus calleryana</i>	Ornamental Pear (not Bradford cultivar)
<i>Quercus alba</i>	White Oak
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus macrocarpa</i>	Bur Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Tilia cordata</i>	Littleleaf Linden
<i>Ulmus carpinifolia</i>	Homestead Elm
<i>Zelkova serrata</i>	Japanese Zelkova

* Small trees are to be used only in situations where space is constrained.

RECOMMENDED PARK TREES

The Town of Innisfil recommends the use of native trees in parks, when appropriate. The Town will review the proposed species on a case-by-case basis.

APPENDIX C: MINIMUM OFFSET MATRIX

OBSOLETE

APPENDIX C

TABLE OF MINIMUM CLEARANCES

(As measured in linear metres between the outside most edges of each feature/object)

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
		Water Service	Sanitary Service	Storm Service	Fire Hydrant	Watermain Valve	Boulevard Trees	Street Light (SL)	SL Power Pedestal	Hydro Transformer/Switch Gear	Bell/CATV Pedestal	Driveway	Community Mailbox	Stop Sign on Local Street	Stop Sign on Collector/Arterial	Hydro Service	Bell/CATV Service	Gas Service	Side Property Line
1.	Water Service	---	2.5	2.5	1.0	1.0	1.0	1.0	1.0	1.5	1.0	1.0	3.0	1.0	1.0	1.0	1.0	1.0	2.0
2.	Sanitary Service	2.5	---	0.5	1.0	1.0	1.0	1.0	1.0	1.5	1.0	N/A	3.0	1.0	1.0	0.5	0.5	1.0	2.0
3.	Storm Service	2.5	0.5	---	1.0	1.0	1.0	1.0	1.0	1.5	1.0	N/A	3.0	1.0	1.0	0.5	0.5	1.0	2.0
4.	Fire Hydrant	1.0	1.0	1.0	---	1.5	3.0	3.0	3.0	5.0/1.5*	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	N/A
5.	Watermain Valve	1.0	1.0	1.0	1.5	---	3.0	3.0	3.0	3.0	3.0	1.5	3.0	3.0	3.0	1.0	1.0	1.0	N/A
6.	Boulevard Trees	1.0	1.0	1.0	3.0	3.0	---	4.6	1.0	5.0/1.5*	1.0	1.5	3.0	20.0	60.0	1.0	1.0	1.0	N/A
7.	Street Lights (SL)	1.0	1.0	1.0	3.0	3.0	4.6	---	1.0	5.0/1.5*	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A
8.	SL Power Pedestal	1.0	1.0	1.0	3.0	3.0	1.0	1.0	---	0.0	0.0	1.0	3.0	3.0	3.0	1.0	1.0	1.0	N/A
9.	Hydro Transformer/Switch Gear	1.5	1.5	1.5	5.0/1.5*	3.0	5.0/1.5*	5.0/1.5*	0.0	---	0.0	1.5	5.0/1.5*	N/A	N/A	N/A	N/A	N/A	N/A
10.	Bell/CATV Pedestal	1.0	1.0	1.0	3.0	3.0	1.0	1.0	0.0	0.0	---	1.0	3.0	3.0	3.0	1.0	1.0	1.0	N/A
11.	Driveway	1.0	N/A	N/A	3.0	1.5	1.5	1.0	1.0	1.5	1.0	---	3.0	N/A	N/A	N/A	N/A	N/A	1.2/0.6**

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
		Water Service	Sanitary Service	Storm Service	Fire Hydrant	Watermain Valve	Boulevard Trees	Street Light (SL)	SL Power Pedestal	Hydro Transformer/ Switch Gear	Bell/CATV Pedestal	Driveway	Community Mailbox	Stop Sign on Local Street	Stop Sign on Collector/ Arterial	Hydro Service	Bell/CATV Service	Gas Service	Side Property Line
12.	Community Mailbox	3.0	3.0	3.0	3.0	3.0	3.0	1.0	3.0	5.0/1.5*	3.0	3.0	--	20.0	60.0	1.0	1.0	1.0	N/A
13.	Stop Sign on Local Street	1.0	1.0	1.0	3.0	3.0	20.0	1.0	3.0	N/A	3.0	N/A	30.0	---	N/A	1.0	1.0	1.0	N/A
14.	Stop Sign on Collector/ Arterial	1.0	1.0	1.0	3.0	3.0	60.0	1.0	3.0	N/A	3.0	N/A	N/A	N/A	---	1.0	1.0	1.0	N/A
15.	Hydro Service	1.0	0.5	0.5	1.0	1.0	1.0	1.0	1.0	N/A	1.0	N/A	1.0	1.0	1.0	---	0.5	0.5	0.5
16.	Bell/CATV Service	1.0	0.5	0.5	1.0	1.0	1.0	1.0	1.0	N/A	1.0	N/A	1.0	1.0	1.0	0.5	---	0.5	0.5
17.	Gas Service	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	1.0	N/A	1.0	1.0	1.0	0.5	0.5	---	0.5
18.	Side Property Line	2.0	2.0	2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.2/0.6**	N/A	N/A	N/A	0.5	0.5	0.5	---

* 5.0m to hydro transformer/switch gear vault access door, 1.5m on other sides.
** Standard of 1.2m can be reduced to 0.6m where zoning allows 0.6m sideyard setback of the garage.

APPENDIX D: CCTV INSPECTION REQUIREMENTS

OBSOLETE

APPENDIX D

SEWER CAMERA INSPECTION REQUIREMENTS

This document outlines the Town's requirements for all Sewer Camera Inspection submissions. All data recorded must be validated according to the Water Research Centre (WRC) guidelines and the guidelines set out in this document. The Contractor must provide proof of PACP certification for each camera operator recording observations in the database.

1. USB Flash Drives/Reports

- 1.1 Pipes shall be cleaned and flushed immediately prior to CCTV inspection.
- 1.2 All silt, debris and other foreign substances are to be removed from the sewer prior to commencing video inspection. If any of these items are discovered during an inspection, the inspection will be erased and the lines are to be cleaned and re-videoed.
- 1.3 Storm and sanitary sewers are to be inspected separately and be submitted on separate USB Flash Drives with separate reports.
- 1.4 Each USB Flash Drive is to be accompanied by a printed report containing the observations made during inspection. The video is to be good quality and in focus. All CCTV files shall be provided to the Town in .mp4 format; other file types will not be accepted. Videos that are of poor quality or that cannot be played will be rejected by the Town.
- 1.5 The Developer's Engineer shall review the USB Flash Drives and reports prior to submission to ensure completeness and accuracy, and to ensure videos meet Town Standards.
- 1.6 Should repairs be required, the Developer's Engineer is to provide repair methodology for Town's approval. Re-video is required after approval is granted and the repair is complete.
- 1.7 USB Flash Drive labels and covering page of the report are to include the name of the subdivision, Town subdivision number, USB Flash Drive/report identification number, street names if possible, and the name of the Contractor performing the inspection. The label is not to include the name or job number of the general contractor.
- 1.8 The videos on USB Flash Drives shall have alpha-numeric data recorded on it before the inspection of any sewer section. The data will be recorded for 2030 seconds, during which time the camera is to be stationary and have the distance counter set to 0.0.

APPENDIX D: CCTV INSPECTION REQUIREMENTS

The information shall be in the format of the example shown below.

WEBSTER BOULEVARD	=	street being inspected
BENSON ST TO RANKIN WAY	=	streets bordering the street being inspected
1A TO 4A	=	which manhole to manhole section is being inspected (Town Numbering as per Engineering Drawings)
200 mm SAN	=	diameter of sewer (metric only) and sewer type
JUNE 01 2010	=	date of inspection
??	=	camera distance counter

- 1.9 The video on USB Flash Drive will have alpha-numeric data on it while the camera is travelling through the sewer. The information shall be in the format of the example shown below.

WEBSTER BOULEVARD	=	street being inspected
1A TO 4A	=	which manhole to manhole section is being Inspected
JUNE 01 2010	=	date of inspection
+004.9	=	camera distance counter

The alpha-numeric data will be displayed at all times in the bottom left corner of the screen. The background feature will be used when necessary to ensure the data is easily readable.

When the camera stops to view a pipe defect and/or a lateral, and the alphanumeric data is found to obstruct the defect, the camera will be moved a maximum of 0.1 meters forward or backward so the defect can properly be seen.

- 1.10 The entire length of the sewer, from starting to finishing manhole wall, will be shown on tape whenever possible. The section of pipe between the start manhole and the location where the distance counter is set shall be recorded on tape with the distance counter set at 0.0. If an observation is found before the distance counter is set, an estimated distance will be used.
- 1.11 All Sanitary Sewers within the roadway right-of-way and in any Town easements including all laterals are to be video inspected. Laterals shall be videoed from the main to 3.0m beyond the property line.

APPENDIX D: CCTV INSPECTION REQUIREMENTS

- 1.12 All Storm Sewers within the roadway right-of-way/SWM blocks and in any Town easements including all catchbasin leads, rear lot catchbasin leads and any laterals are to be video inspected. Laterals shall be videoed from the main to 3.0m beyond the property line.
- 1.13 The tape numbering, or contract field, is to be comprised of the Town's Subdivision Number and the last two digits of the year of the inspection.

2. INSPECTIONS

- 2.1 Sewers are normally to be inspected only when flow levels do not cover or splash up on the camera lens. An inspection showing high effluent levels will only be allowed when the camera is travelling through a sump.
- 2.2 Inspections will normally be done with the camera travelling with the flow direction.
- 2.3 Against-the-flow inspections can only be done under one of the following circumstances
- a) Effluent levels are minimal. Effluent does not cover or splash up on the camera lens,
 - b) The inspection can't be done with the flow because the upstream manhole
 - i) Is not found,
 - ii) Is inaccessible,
 - iii) Has a high effluent level,
 - iv) Has a high debris level, or
 - v) Has benching that will not allow camera entry.
- 2.4 If debris piles onto the camera lens and can't be shaken off, the inspection shall be terminated and restarted following sufficient cleaning/flushing of the line to remove debris.
- 2.5 A self-levelling camera is to be located at springline.
- 2.6 The pan and tilt feature is to be used on all connections and / or defects. Defects are to include but not limited to cracks, infiltration, questionable pipe joints, and scarring etc. When reviewing connections, the camera is to focus as far up the lateral as possible. Panning is to be stationary for 5 seconds. If the panning does not show the outer edge of the entire lateral, the camera is to be rotated to provide a complete view. Additional time is to be taken to investigate suspicious flows at laterals that are constant.
- 2.7 Lighting is to be of sufficient strength so that the field of view is clear (no shadows).
- 2.8 No inspection can be recorded when fog is on the camera lens.
- 2.9 No inspection can be recorded when fog in the sewer significantly affects the quality of the video image. The fan shall be used to attempt to clear the fog when necessary. If possible, sewers containing fog will be left until a time when the fog will no longer be present (i.e. warmer weather).

APPENDIX D: CCTV INSPECTION REQUIREMENTS

- 2.10 The camera distance counter is to measure distances from the centre of the lid of the start manhole to the centre of the lid of the finish manhole.
- 2.11 The distance measured by the camera between two manholes (surveyed distance) is to be confirmed by using a measuring wheel between the same manholes (surface distance).
- 2.12 All recorded completed inspections must have a surveyed and surface distance that does not differ by more than 1%. If it is confirmed that the surveyed distance has been recorded with an incorrect value, the inspection will be deleted and redone.
- 2.13 All street catch basin, rear yard catch basin, ditch inlet and leads are to be video inspected.
- 2.14 All storm and sanitary lateral videos are to be reviewed and approved by the Developer's Engineer and provided to the Town thirty (30) days prior to occupancy.
- 2.15 Inspections are required prior to UGC and after AGC but before top asphalt.

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APPENDIX E: WATERMAIN HYDROSTATIC TESTING FORM

OBSOLETE

Town of Innisfil
Watermain Hydrostatic Test in Accordance with latest version of ANSI/AWWA C605

File: _____ Date: _____
Project: _____
Inspector: _____ Location: _____

Services

A. Diameter of Services: _____ mm
Length of Services: _____ @ _____ m = _____ km
_____ @ _____ m = _____ km

B. Diameter of Services: _____ mm
Length of Services: _____ @ _____ m = _____ km
_____ @ _____ m = _____ km

Main

C. Diameter of Watermain: _____ mm
Length of Watermain: _____ km

Pressure

Initial Pressure _____ psi @ _____
Intermediate 1 _____ psi @ _____
Intermediate 2 _____ psi @ _____
Final Pressure _____ psi @ _____

Allowable Leakage for Main

(Metric) $Q_m = \frac{LD\sqrt{P}}{795\,000} \times 2$

Where: (150 psi = 1034.21 kPa)

Q_m = quantity of makeup water – *litres per 2 hrs*

L = length of pipe section being tested – *in meters*

D = nominal diameter of pipe being tested - *in mm*

P = average test pressure during leakage test – *kPa*

Measured Leakage for Main

$$V = \frac{\pi D^2 \times H}{4}$$

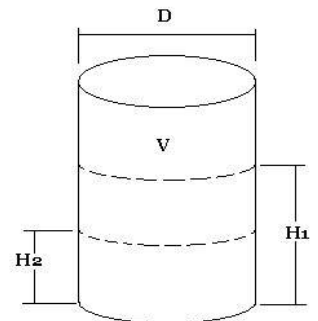
Where: (litres / 1000 = m³)

V = volume of measured leakage – *in m³*

D = diameter of cylinder – *in m*

H = difference in height of water – *in m*

(H = H₁ – H₂)



Allowable Leakage = _____ (L / 2hr) Measured Leakage = _____ (L / 2hr)

PASS or FAIL

Sketch of System being Tested

APPENDIX F: SPECIAL ASPHALT PROVISIONS

OBSOLETE

APPENDIX F

SPECIAL PROVISIONS – ASPHALT

REFERENCES

This specification refers to the following standards, specifications, and publications:

Ontario Provincial Standard Specifications (OPSS)

OPSS.MUNI 310 Hot Mix Asphalt

OPSS.MUNI 1101 Material Specification for Performance Graded Asphalt Cement

Ontario Ministry of Transportation Publications

LS-227 Determination of Ash Content

LS-299 Determining Asphalt Cement's Resistance to Ductile Failure Using Double Edge Notched Tension Test (DENT)

LS-308 Determination of Performance Grade of Physically Aged Asphalt Cement Using Extended Bending Beam Rheometer (BBR) Method

LS-319 Determining the Cross-Over Temperature of Asphalt Cement

LS-320 Determining the Low Temperature Critical Spread of Asphalt Cement

MERO Field Guide for the Acceptance of Hot Mix Asphalt and Bridge Deck Waterproofing

PH-CC-249 Recovered Asphalt Cement (RAC) Test Reporting Sheet

PH-CC-250 PGAC Test Reporting Sheet

ASTM International

D 3665-12 Standard Practice for Random Sampling of Construction Materials

D 7343-12 Standard Practice for Optimization, Sample Handling, Calibration, and Validation of X-Ray Fluorescence Spectrometry Methods for Elemental Analysis of Petroleum Products and Lubricants

American Association of State Highway and Transportation Officials (AASHTO)

M 320-10 Standard Specification for Performance Graded Asphalt Binder

M 332-14 Standard Specification for Performance Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test

R 29-14 Grading or Verifying the Performance Grade of an Asphalt Binder

T 40-02 Sampling Bituminous Materials

T 350-14 Standard Method of Test for Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)

Note: Always reference the latest version of the documents listed above.

DESIGN AND SUBMISSION REQUIREMENTS

PGAC Test Documentation

For each grade of PGAC specified in the Contract Documents, the Contractor shall supply the following items to the Town at least two (2) weeks prior to the use of each product:

- a) The PGAC supplier, facility type, and location that the product shall be supplied from.
- b) Applicable mixing and compaction temperatures for the product.
- c) Documentation of construction, storage and handling requirements, including the Safety Data Sheets (SDS), re-compaction temperature, mix discharge temperature, and recommended extraction procedures.
- d) When the asphalt cement contains any zinc oxide, iron carboxylates, or a combination, added as Hydrogen Sulfide (H₂S) scavengers, they must be declared.
- e) When the PGAC contains any polyphosphoric acid (PPA) and a liquid anti-stripping additive is incorporated into the PGAC at the PGAC supplier's depot, the documentation must include:
 - i. Information on how much anti-stripping additive was added to the PGAC.
 - ii. Documentation from the PGAC supplier stating that the PPA-modified PGAC, with the liquid anti-stripping additive added at the PGAC supplier's depot, shall meet all asphalt cement material requirements specified in the Contract Documents, including AASHTO M 320 for the PGAC grade specified.
- f) A letter from the PGAC supplier declaring that the PGAC does not contain any of the banned materials listed in the "Materials" section below.

PGAC Supply Documentation

For each grade of PGAC specified, the following items shall be supplied to the Town prior to the commencement of HMA production:

- a) All PGAC documentation from the PGAC supplier in the form of bill of lading and certificate of analysis, confirming the grade of PGAC. The bill of lading and certificate of analysis shall also be supplied for each subsequent delivery of PGAC that will be used for the HMA production.
- b) Documentation identifying the PGAC storage tank at the HMA plant that will be supplying the PGAC during production of HMA for the project. The Town shall be notified and provided updated documentation prior to changing the storage tank that is being used to supply PGAC for the HMA production at the HMA plant.

Materials

PGAC shall comply with the requirements of OPSS.MUNI 1101.

PGAC shall be according to AASHTO M 320 for the performance grades specified in the Contract Documents when tested using the methods designated in AASHTO R 29.

PGAC shall be homogeneous, free of water and any contamination, and shall not foam when heated to the temperatures specified by the manufacturer for the safe handling and use of the product. Silicone oils are allowed as anti-foaming agents at less than five parts per million. Zinc oxide and iron carboxylates may be used as hydrogen sulfide (H₂S) scavengers.

APPENDIX F: ASPHALT SPECIAL PROVISIONS

PGAC shall not contain more than 0.3% polyphosphoric acid (PPA) or 0.3% elemental sulfur (S) in addition to the typical sulfur that is naturally present in the asphalt cement, and these shall only be used as catalysts for the purpose of modification with epoxy (E)-type or styrene-butadiene (SB)-type polymer modifiers. PGAC shall not contain any orthophosphoric acid.

PGAC shall not be air blown or catalytically oxidized in any manner. PGAC shall not contain any air blown or catalytically oxidized residues.

The asphalt cement shall not contain any of the following additives added for PGAC modification: atactic polypropylene; carbon black; polyisobutylene; polyisoprene; natural rubber; alkaline bases; insoluble particulates or fibres; salts of iron, copper, manganese and/or cobalt; silicates; styrene-butadiene rubber (random copolymer latex); synthetic waxes (paraffin waxes, naphthenic waxes); synthetic and saturated oils (including but not limited to the following: vegetable oils or modified vegetable oils, paraffin oils, polyalphaolefins (PAO), lube oils, and re-refined lube oils, waste oils (including but not limited to the following: cracked residues, re-refined high vacuum distillate oils; tall oils, vacuum tower asphalt extenders, waste cooking oils, waste engine oils, and waste engine oil residues).

If modifiers or additives other than styrene-butadiene (e.g., SB diblock, SBS triblock, SBS radial, SBS high vinyl, SB tapered, etc.) or epoxy-type polymers (e.g. reactive elastomeric terpolymers) are used for the modification of neat asphalt cement, pre-approval from the Owner is required.

Organic bases may be contained in the PGAC provided they are used as anti-stripping or warm mix additives or both. If organic bases are present in anti-stripping and/or warm mix asphalt additives, they shall be declared at the time of mix submission.

PGAC grades shall meet the additional requirements shown in Table 1.

QUALITY ASSURANCE**Sampling**

Unless otherwise specified in the Contract Documents, the Town shall determine the frequency of sampling and testing based on Random Sampling Procedures. Lot and subplot sizes for each grade of PGAC shall be communicated with the Contractor during the Pre-Pave Meeting. The Town retains sole discretion to select lot and subplot sizes and the frequency of sampling.

Samples used for testing the original asphalt cement shall be obtained during the production of the asphalt mix from the storage tank which is directly feeding the production of the asphalt mix. All test samples shall be obtained by the Contractor in the presence of the Town according to AASHTO R 66, ASTM D 3665, and the asphalt plant's health and safety plan. The asphalt plant's health and safety plan and procedure for sampling shall be reviewed at the pre-pave meeting.

Sample Containers shall be supplied by the Contractor. QA and Referee samples shall be obtained at the same time and shall be a minimum of 2 litres each.

Quality Assurance Testing

APPENDIX F: ASPHALT SPECIAL PROVISIONS

When the QA and Referee samples arrive at the QA Laboratory, a representative from the QA Laboratory shall randomly select one sample for testing. The additional sample shall be retained for possible Referee Testing.

Test results shall be categorized as Acceptable or Rejectable based on performance grading requirements. "Borderline" results as per OPSS will be considered Rejectable and in most cases will require full removal and replacement of the HMA.

Test results shall be reported on MTO Form PH-CC-250 PGAC Test Reporting Sheet. Other forms are acceptable but must include the Complex Shear Modulus (G^*) and Phase Angles (δ) for all DSR test results. The Cross Over Temperature (LS-319) and Low Temperature Critical Spread (LS-320) shall also be reported for information purposes only. Testing of 40 hour PAV residue is not required unless specified in the Contract Documents.

Referee Testing

Referee testing may be invoked within 5 business days of the Contractor receiving QA test results. Referee testing shall be completed by a mutually agreed-upon, third-party laboratory. The same requirements for testing and reporting apply as stated above in Quality Assurance Testing.

Referee testing will be completed in the presence of the Town. The Contractor may observe the testing, however, there will be no cost to the Town stemming from the Contractor's observation. When referee testing shows that the PGAC is Rejectable, the HMA containing the Rejectable PGAC shall be fully removed and replaced from the work area.

Payment for referee testing and any associated construction or administrative costs shall be made in accordance with the Contract Documents.

Recovered Asphalt Cement (RAC)

Recovered Asphalt Cement (RAC) means the asphalt cement extracted from an asphalt mix.

Sampling for RAC shall be in accordance with typical sampling procedures for loose HMA samples. The frequency of RAC sampling shall be in accordance with the Town's PGAC sampling procedures. RAC samples shall be used in place of rolling thin film oven (RTFO) residue and only aged in a pressure aging vessel (PAV) as required for the requirements listed in this specification.

Extraction of asphalt cement samples shall be carried out in accordance with MTO LS-284 from loose HMA samples or sawcut samples from the finished pavement. Fines shall be removed using a high-speed centrifuge prior to recovery.

Extraction must be completed using reagent grade trichloroethylene or toluene. The extraction solvent used must be reported on the RAC test reporting sheet.

Test results shall be categorized as Acceptable or Rejectable based on performance grading requirements. The RAC must also meet the additional requirements of Table 1. "Borderline" results as per OPSS will be considered Rejectable and in most cases will require full removal and replacement of the HMA.

APPENDIX F: ASPHALT SPECIAL PROVISIONS

Test results shall be reported on MTO Form PH-CC-249 Recovered Asphalt Cement (RAC) Test Reporting Sheet. Other forms are acceptable but must include the Complex Shear Modulus (G^*) and Phase Angles (δ) for all DSR test results. The Cross Over Temperature (LS-319) and Low Temperature Critical Spread (LS-320) shall also be reported for information purposes only. Testing of 40 hour PAV residue is not required unless specified in the Contract Documents.

Table 1
Testing Requirements and Acceptance Criteria for PGAC Grades 58-34 and 64-34

PGAC Grade XX-YY	Property and Attributes (Unit)	Test Method	Results Reported Rounded to the Nearest	Acceptance Criteria	Rejectable
All PGAC Grades	Ash Content, % by mass of residue (%)	LS-227	0.1	≤ 0.6	> 0.6
	Low temperature limiting grade (LTLG) ($^{\circ}\text{C}$)	LS-308	0.1	$\leq (-YY + 1.5)$	$> (-YY + 1.5)$
	Grade Loss ($^{\circ}\text{C}$)	LS-308	0.1	≤ 6.0	> 6.0
	Non-recoverable creep compliance at 3.2 kPa ($J_{nr-3.2}$) (kPa^{-1})	Multiple Stress Creep and Recovery (MSCR) testing according to AASHTO TP 70 testing conducted at a temperature of 58 $^{\circ}\text{C}$	0.01	< 4.0	≥ 4.0
	Average percent recovery at 3.2 kPa ($R_{3.2}$) (%)		0.1	$> \text{the lesser of } [(29.371)(J_{nr-3.2})^{-0.2633}] \text{ or } 55$	$\leq \text{the lesser of } [(29.371)(J_{nr-3.2})^{-0.2633} - 10] \text{ or } 50$
	Average critical crack tip opening displacement (δ_t) (mm)	LS-299	0.1	> 12.0	< 12.0
	Cross-Over Temperature ($T_{\delta 45}$), $^{\circ}\text{C}$	LS-319	0.1	For Information	
	Low Temperature Critical Spread (ΔTC), $^{\circ}\text{C}$	LS-320	0.1	For Information	

APPENDIX G: AS-RECORDED REQUIREMENTS

OBSOLETE

Town of Innisfil As – Recorded Drawing Requirements

Underground Certificate As-Recorded Drawing Submission Package

1.1 General Requirements

All As-Recorded drawing submissions to the Town must comply with all of the general requirements listed below:

- One (1) hard copy of As-Recorded drawings shall be submitted to the Town for review;
- Once the drawings have been reviewed, one (1) final hard copy, one (1) digital copy set, including the AutoCAD file, are to be provided to the Town;
- Cover page shall be labelled “As-recorded” and shall refer to the Town file number and M-Plan number. The cover sheet shall have a list of all drawings submitted and all drawings that are not included are to have a “strike through”;
- Removal of all verbiage related to “temporary” items (temporary road barricades, temporary fencing, etc.);
- Side profile elevations on the plan and profile are to match the as-recorded drawings submitted by the developer;
- Legend should indicate difference between “proposed” and “as-recorded”;
- The locations of manholes/valves/hydrants, etc. which have been installed in significantly different locations from the original design will require updating on the plan and profile.

1.2 Cover Page

Cover page shall be labelled “As-Recorded” and shall refer to the Town file number and M-Plan number. The cover sheet shall have a list of all drawings submitted all drawings that are not included in the submission are to consist of a “strike through”.

1.3 Plan and Profile Drawings

Sanitary Sewer

- Class and type of sanitary sewer to be confirmed and provided on the plan and profile drawings;
- Sanitary sewer lengths and slope percentages to be updated on the plan and profile drawings;
- Sanitary sewer inverts to be provided on the plan and profile drawings (strike through techniques are to be utilized as a comparison between proposed and constructed);

APPENDIX G: AS-RECORDED REQUIREMENTS

- Service Record sheets must be provided within the submission and must include the following information:
 - The registered plan number, lot number, municipal street address, service pipe size, service pipe length, and service pipe material type;
 - Invert elevations at the main line, property line, and three (3) metre extension;
 - Locations to be confirmed in relation to permanent structures and appurtenances (maintenance holes, gate valves, catch basins, etc.).
- Sanitary sewer bedding type to be provided on the as-recorded drawings in addition to the OPSD reference/class type;
- Tie-ins to any existing sanitary sewer to be displayed on plan and profile drawings with pipe lengths, pipe locations, location of sleeves, and type of backfill;
- Lateral extension to be drawn three (3) metres beyond property line on plan;
- Maintenance hole sizing must to be confirmed and noted on the plan and profile drawings;
- Legend to be provided for the “auto stable/selflevel” frame and cover and type to be confirmed as part of the plan and profile drawing set;
- GPS coordinates for all street furniture (sanitary laterals, sanitary manholes, etc.) to be provided for input into the Town’s GIS system;
- Utilization of materials recommended by the geotechnical consultant during construction (example – geo-grid, filter fabric, stone wrapped in filter fabric, unshrinkable fill, etc.) should be noted on the drawings;
- Anti-seepage collar elevations, locations, and type to be provided on profile drawings;
- Sanitary plugs to be noted on the drawings.

Storm Sewer

- Class and type of storm sewer to be confirmed and provided on the plan and profile drawings;
- Storm sewer lengths and slope percentages to be updated on the plan and profile drawings;
- Storm sewer inverts to be provided on the plan and profile drawings (strike through techniques are to be utilized as a comparison between proposed and constructed);
- Service Record sheets must be provided within the submission and must include the following information:
 - The registered plan number, lot number, municipal street address, service pipe size, service pipe length, and service pipe material type;
 - Invert elevations at the main line, property line, and three (3) metre extension;
 - Locations to be confirmed in relation to permanent structures and appurtenances (maintenance holes, gate valves, catch basins, etc.);
- Storm sewer bedding type to be provided on the as-recorded drawings in addition to the OPSD reference/class type;

APPENDIX G: AS-RECORDED REQUIREMENTS

- Tie-ins to any existing storm sewer are to be displayed on plan and profile drawings with pipe lengths, pipe locations, location of sleeves, and type of backfill;
- Lateral extension to be drawn three (3) metres beyond property line on plan;
- Maintenance hole sizing is to be confirmed and noted on the profile drawings;
- Storm invert elevations for all rear lot catch basins to be provided at the mainline and at the rear lot catch basin;
- Maintenance hole sizing is to be confirmed and noted on the profile drawings;
- Storm invert elevations for all catch basin and double catch basin leads to be provided at the mainline and the structure;
- Utilization of materials recommended by the geotechnical consultant during construction (example – geo-grid, filter fabric, stone wrapped in filter fabric, unshrinkable fill, etc.) should be noted on the drawings;
- Anti-seepage collar elevations, locations, and type are to be provided on profile drawings;
- GPS coordinates for all street furniture (storm laterals, storm manholes, catch basins, etc.) to be provided for input into the Town's GIS system;
- Legend to be provided for the "auto stable/selflevel" frame and cover and type to be confirmed as part of the plan and profile drawing set;
- Bulkheads to be noted on drawings.

Water main and Appurtenances

- Class and type of water main pipe to be confirmed and provided on the plan and profile drawings;
- Water main bedding type to be provided on the as-recorded drawings in addition to the OPSD reference/class type;
- Top of water main elevations to be provided for all appurtenances (mainline valves, tees, crosses, etc.) and at a minimum of twenty (20) metre increments. Profile drawing to either be adjusted to show the contours of the water main or markers placed on the profile drawings to confirm elevations and location;
- Service Record sheets must be provided within the submission and must include the following information:
 - The registered plan number, lot number, municipal street address, service pipe size, service pipe length, and service pipe material type;
 - Obvert elevations at the main line and property line;
 - Locations to be confirmed in relation to permanent structures and appurtenances (maintenance holes, gate valves, catch basins, etc.);
- Distances to be confirmed in the field between bends/valves/tees should be recorded on the as-recorded drawings;
- Restraints on the water main should be accurately noted on the profile drawings for any engineer fill areas or as recommended by the geotechnical engineer;
- Restraints utilized out of tees, bends, valves, etc. should be accurately noted on the as-recorded drawings;
- Legend to reflect the hydrant type;

APPENDIX G: AS-RECORDED REQUIREMENTS

- Hydrant flange elevations are to be provided on the plan and profile drawings;
- Utilization of materials recommended by the geotechnical consultant during construction (example – geo-grid, filter fabric, stone wrapped in filter fabric, unshrinkable fill, etc.) should be noted on the drawings;
- Insulated water services to be noted on the as-recorded drawings;
- Water sampling stations to be noted on the plan and profile drawings and the legend;
- Water main “tie ins” to be noted on the as-recorded drawings including pipe lengths, pipe location, type and location of sleeves, and type of backfill that has been utilized;
- If water main appurtenances were not installed please “strike through” the text and reconfigure the alignment;
- Top of water main elevations for vertical bends to be provided with vertical distances to adjacent infrastructure;
- GPS coordinates for all street furniture (water service laterals, water boxes, hydrants hydrant secondary valves, mainline valves, valve chambers, etc.) to be provided for input to the Town’s GIS system;
- Note on legend required for any “non-draining” fire hydrants.

Roads

- Right of way must be shown and will include road width from EP to EP on drawings;
- Base asphalt elevations to be provided and updated on profile drawings and utilization of “strike through” technique as required;
- Road structure matrix to be provided on the drawings in order to provide information;
- Sub excavated areas of the road are to be identified on the plan and profile drawings;
- Utilization of materials recommended by the geotechnical consultant during construction (example – geo-grid, filter fabric, stone wrapped in filter fabric, unshrinkable fill, etc.) should be noted on the drawings with accurate chain age;
- Culvert invert elevations, grade, type, length, and location to be provided;
- Utility crossing locations to be noted on the plan and profile drawings.

SWM Pond Drawings

- GPS coordinates of all street furniture within the SWM pond to be provided;
- As-recorded invert elevations for all of the SWM pond structures to be gathered and “strike through” is to be utilized;
- Volume calculations of entire SWM pond to be quantified and certified by a Professional Engineer to verify conformance to approved drawings and SWM report;
- As-recorded elevations for all of the pond contours to be provided including the access road elevations (elevations prior to pavement commencement and base and top asphalt elevations);
- Access road make-up to be documented on the plan and profile drawings;

APPENDIX G: AS-RECORDED REQUIREMENTS

- Clarification of any pond products (cable mats, turf stone, concrete liner in fore bay, etc.) to be included on the plan and profile drawings

“Final Acceptance” – As-Recorded Drawing Submission Package**2.1 General Requirements**

- Cover page with all of the required drawings from the “List of Drawings” and “List of Reports” from the subdivision agreement (and any amendments) are to be provided;
- All as-recorded lot, block, and street names should be noted as per the Registered M-Plan
- Revision block within the title block of all drawings shall have an entry indicating that the drawing is “As-Recorded” with the date;
- Confirmation by developer’s engineer that all infrastructure meets Town standard “set back” requirements.

2.2 Plan and Profiles**Sanitary Sewer**

- Location of the sanitary lateral (at property line) is to be reviewed by utilizing the GPS coordinates and depth to invert to be confirmed and the lateral invert chart is to be updated;
- Top of grate elevations for the sanitary sewer to be gathered after top asphalt placement.

Storm Sewer

- Location of the storm lateral (at property line) is to be reviewed utilizing the GPS coordinates and depth to invert to be confirmed and the lateral invert chart is to be updated;
- Top of grate elevations are to be provided for the storm manholes, all catch basins (including rear lots if applicable).

Water main and Appurtenances

- Location of the water service lateral (at property line) is to be confirmed utilizing the GPS coordinates;
- Locations of all mainline valves, hydrant valves, hydrants, valve chambers, air release chambers, etc. are to be confirmed and drawings are to be updated accordingly.

APPENDIX G: AS-RECORDED REQUIREMENTS**Composite Utility Plans**

- Review all utility plans including electrical street lighting drawings for all above ground utilities, landscape features, driveways, sidewalks, mailboxes, utility boxes, street lights, hydro transformers, etc. to confirm locations and update drawings accordingly;
- GPS coordinates of all of the utility structures to be gathered and locations of proposed are to be confirmed and updated accordingly.

Roads

- GPS coordinates of the manholes/catch basins to be gathered once the top asphalt has been placed;
- Top asphalt elevations are to be provided once works have been completed;
- Curb and gutter elevations to be provided and slopes to be compared with proposed on the plan and profile drawings

Landscaping

- Tree species and GPS coordinates to be provided;
- Record of planting dates to be provided (tracking device regarding planting history);
- Landscape/entry features to have a plant/tree inventory provided.

Grading

- Grading plans need only show significant alterations to the grading design or changes in “run off”;
- Retaining Walls require clarification of type, length, height, and it should be noted if they were removed from the plan.

SWM Pond Drawings

- Pond survey along with the access road top asphalt and all street furniture, emergency spill way, and all other inlet/outlet structures and adjacent areas;
- Volume calculations of entire SWM pond to be quantified and certified by a Professional Engineer to verify conformance to approved drawings and SWM report;
- All of the trees within the SWM pond are to be identified by species along with GPS coordinates to be gathered as part of the tree inventory.

APPENDIX H: DETAIL DRAWINGS

OBSOLETE

DRAWING INDEX

DIVISION**TITLE****100****GENERAL NOTES****200****ROADWAYS****300****TRAFFIC CONTROL****400****FENCES****500****SEDIMENT CONTROL****600****SANITARY AND STORM SEWERS****700****WATERMAIN****800****PARKS AND LANDSCAPING****900****PLANTING**

INDEX

DIVISION 100: GENERAL NOTES

TOISD NO.	REV.	TITLE
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101	3	GENERAL NOTES
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OBSOLETE

INDEX

DIVISION 200: ROADWAYS

TOISD NO.	REV.	TITLE
201	3	URBAN LOCAL ROAD 20.0m ROAD ALLOWANCE 8.5m PAVEMENT WIDTH
202	3	WINDOW STREET 20.0m ROAD ALLOWANCE 8.5m PAVEMENT WIDTH
203	3	URBAN MINOR COLLECTOR ROAD 26.0m ROAD ALLOWANCE 12.0m PAVEMENT WIDTH
204	3	URBAN MAJOR COLLECTOR ROAD 26.0m ROAD ALLOWANCE 14.0m PAVEMENT WIDTH
205	3	URBAN ARTERIAL ROAD 30.0m ROAD ALLOWANCE 14.0m PAVEMENT WIDTH
206	3	URBAN INDUSTRIAL ROAD 26.0m ROAD ALLOWANCE 10.0m PAVEMENT WIDTH
207	2	RURAL LOCAL ROAD 20.0m ROAD ALLOWANCE 7.0m PAVEMENT WIDTH
208	2	RURAL INDUSTRIAL ROAD 26.0m ROAD ALLOWANCE 8.0m PAVEMENT WIDTH
209	1	RURAL INDUSTRIAL ROAD INTERSECTION - 18.0m RADIUS 26.0m ROAD ALLOWANCE
210	3	TYPICAL ENTRANCE LOCATION
211	2	PERMANENT CUL-DE-SAC
212	2	TEMPORARY CUL-DE-SAC
213	3	ACCESSIBLE PARKING
214	2	RESIDENTIAL DRIVEWAY EDGING

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DIVISION 300: TRAFFIC CONTROL

TOISD NO.	REV.	TITLE
301	5	STANDARD STREET NAME SIGN AND REGULATORY SIGNS
302	2	INTERSECTION STREET SIGN DETAIL (ATTACHED TO STREET LIGHTS)
303	2	TEMPORARY BARREL & GUIDEPOST "ROAD CLOSED" BARRICADE
304	1	STANDARD STREET NAME SIGN AND POPPY DETAIL
305		TEMPORARY STREET SIGN DETAIL

INDEX

DIVISION 400: FENCES

TOISD NO.	REV.	TITLE
401	4	PEDESTRIAN ACCESS GATE AND WALKWAY/ACCESS DETAIL
402	3	PEDESTRIAN ACCESS GATE WALKWAY FENCE CONNECTION
403	1	PEDESTRIAN ACCESS GATE LOCK PIN DETAIL
404	1	PEDESTRIAN WALKWAY AND PARK MAINTENANCE PATHWAY
405	3	CHAIN LINK FENCE
406	2	CHAIN LINK FENCE GATES
407	3	1.8m HIGH WOOD PRIVACY FENCE
408	3	ACOUSTICAL FENCE
409	1	ACOUSTICAL FENCE DETAILS
410	3	ACOUSTICAL FENCE GENERAL NOTES
411		FENCING LOCATIONS

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DIVISION 500: SEDIMENT CONTROL

TOISD NO.	REV.	TITLE
501	3	STONE SILT TRAP FOR ROADSIDE DITCHES & DRAINAGE DITCHES
502	2	TEMPORARY ROCK CHECK DAM FOR DETENTION PONDS & STORM OUTLETS
503	1	SILT FENCE DETAIL
504		SILT FENCE DETAIL
505	1	CONSTRUCTION MUD MAT DETAIL
506	2	SOAK AWAY PIT DETAIL

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DIVISION 600: SANITARY AND STORM SEWERS

TOISD NO.	REV.	TITLE
601	3	TYPICAL DETACHED UNIT SERVICE ARRANGEMENT
602	3	TYPICAL SEMI-DETACHED UNIT SERVICE ARRANGEMENT DRIVEWAYS SIDE BY SIDE
603	3	TYPICAL SEMI-DETACHED UNIT SERVICE ARRANGEMENT DRIVEWAYS ON OPPOSITE SIDES
604	3	TYPICAL TOWNHOUSE UNIT SERVICE ARRANGEMENT
605	2	TYPICAL SEWER SERVICE LATERAL CONNECTION DETAIL RESIDENTIAL EXTENSION
606	1	TYPICAL DOUBLE STORM SEWER TOWNHOUSE SERVICE CONNECTION
607	2	SUMP PUMP DISCHARGE CONNECTION TO STORM SEWER
608	2	SERVICE MANHOLES NON-RESIDENTIAL OR MULTI-RESIDENTIAL
609	2	FOUNDATION WALL DETAIL
610	1	FOUNDATION WALL TYPICAL WATERPROOFING DETAIL

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DIVISION 700: WATERMAIN

TOISD NO.	REV.	TITLE
701	3	GATE VALVE & EXTENDABLE VALVE BOX
702	2	STANDARD VALVE STEM & BOX
703	5	TYPICAL HYDRANT DETAIL
704	2	STANDARD FIRE LINE & SERVICE CONNECTION
705	4	WATER SERVICE CONNECTION DETAIL RESIDENTIAL EXTENSION
706	5	TYPICAL METER INSTALLATION (19mm TO 25mm)
707	2	INSTALLATION DETAILS FOR COMPOUND WATER METER
708	2	TYPICAL WATER METER INSTALLATION (40mm AND UP)
709	2	TYPICAL TEMPORARY BY-PASS CONNECTION FOR WATERMAINS
710	3	TYPICAL RESTRAINER INSTALLATION
711	3	SAMPLING STATION INSTALLATION
712	1	NON-FREEZE POST HYDRANT DETAIL
713	4	AIR RELEASE/AIR & VACUUM RELEASE VALVE IN CHAMBER SECTION
714	3	AIR RELEASE/AIR & VACUUM RELEASE VALVE IN CHAMBER PLAN
715	4	VALVE & AIR RELEASE VALVE IN CHAMBER SECTION
716	3	VALVE & AIR RELEASE VALVE IN CHAMBER PLAN
717		DELETED
718		DELETED
719		DELETED
720		DELETED
721	4	PRECAST VALVE CHAMBER PLAN
722	4	PRECAST VALVE CHAMBER SECTION
723	3	PRECAST VALVE CHAMBER CAP DETAIL
724	3	PRECAST VALVE CHAMBER GENERAL NOTES

725	5	TYPICAL HYDRANT DRIVEWAY DETAIL
726	1	BACKFLOW PREVENTER ENCLOSURE

OBSOLETE

INDEX

DIVISION 800: PARKS AND LANDSCAPING

TOISD NO.	REV.	TITLE
801	1	BASEBALL DIAMOND
802	1	OUTDOOR BASKETBALL
803	1	SOCCER MASTER PLAN
804	1	TENNIS COURT
805	2	ASPHALT WALKWAY (MULTI USE TRAIL)
806	1	FOOTBRIDGE PLAN
807	1	FOOTBRIDGE SECTION & DETAILS
811	1	TYPICAL PARK ENTRANCE SIGN BACK DETAILS
813	1	WARNING SIGN POST DETAIL FOR SIGNS 814 TO 818 INCLUSIVE
814	1	NO WINTER MAINTENANCE SIGN DETAIL
815	1	NO MOTORIZED VEHICLES SIGN DETAIL
816	1	STOOP & SCOOP SIGN DETAIL
817	1	PEDESTRIANS ONLY SIGN DETAIL
818	3	TYPICAL STORMWATER MANAGEMENT POND SIGN DETAIL
819		WARNING SIGN POST DETAIL FOR SIGNS 814 TO 818 INCLUSIVE
820		PARK BENCH CONCRETE PAD, 1 BENCH WITH WHEELCHAIR PARKING
821	1	PLAY AREA (ENGINEERED WOOD SURFACE) C.I.P. CONCRETE CURB (SECTION)
822	1	PLAY AREA ACCESSIBLE RAMP
823	1	STANDARD AND ACCESSIBLE PICNIC TABLE PAD

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DIVISION 900: PLANTING

TOISD NO.	REV.	TITLE
901	4	DECIDUOUS TREE PLANTING
902	4	CONIFEROUS TREE PLANTING
903	1	BARE ROOT TREE PLANTING
904	2	SHRUB PLANTING
905	1	TREE PROTECTION BARRIER
906		TREE PROTECTION ZONE SIGN DETAIL

INDEX**DIVISION 1000: STREETLIGHTING**

TOISD NO.	REV.	TITLE
1001	1	ROADWAY LIGHTING STANDARD DIRECT BURIED
1002	1	POWER SERVICE DISCONNECT AND STREETLIGHTING ON HYDRO POLE
1003	1	TYPICAL UNDERGROUND TRENCH DETAIL IN BOULEVARD
1004	1	ROADWAY LIGHTING DISTRIBUTION SINGLE LINE DIAGRAM

GENERAL NOTES - GENERAL

1. GENERAL

- A. ALL WORK SHALL BE IN ACCORDANCE WITH CURRENT TOWN OF INNISFIL STANDARD SPECIFICATIONS AND DRAWINGS (TOISD).
- B. ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY TOISD, AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).
- C. LOCATION OF EXISTING SERVICES ARE NOT GUARANTEED. THE CONTRACTOR IS REQUIRED TO OBTAIN ALL LOCATES & NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.
- D. A ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE OPERATIONS SERVICES/INNSERVICES PRIOR TO WORKING WITHIN ANY EXISTING TOWN RIGHT-OF-WAY.
- E. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- F. GRANULAR MATERIAL, USED FOR BACKFILL, SHALL BE APPROVED BY THE TOWN & PLACED IN LAYERS 150mm IN DEPTH MAXIMUM AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.
- G. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION.
- H. ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE AND THE GRASS IS ESTABLISHED, SUBJECT TO APPROVAL OF THE TOWN ENGINEER.
- I. WHERE FROST WEDGE REQUIRED USE MINIMUM 4:1 SLOPE.

3.	REVISED NOTES	TOI	APRIL 2019
2.	NOTE D. TEXT CHANGE	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



GENERAL NOTES

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

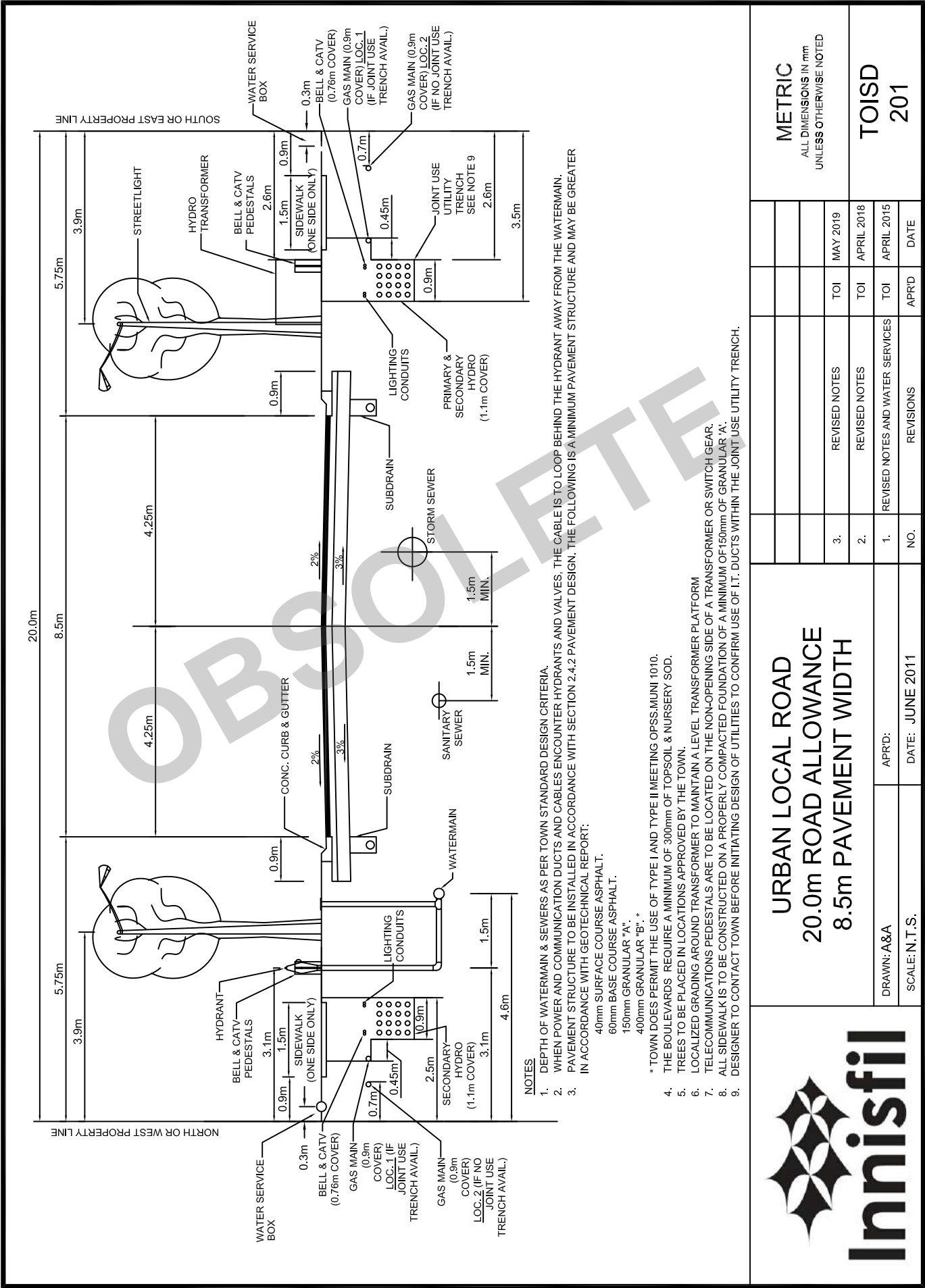
TOISD
101

DRAWN: A&A

APR'D:

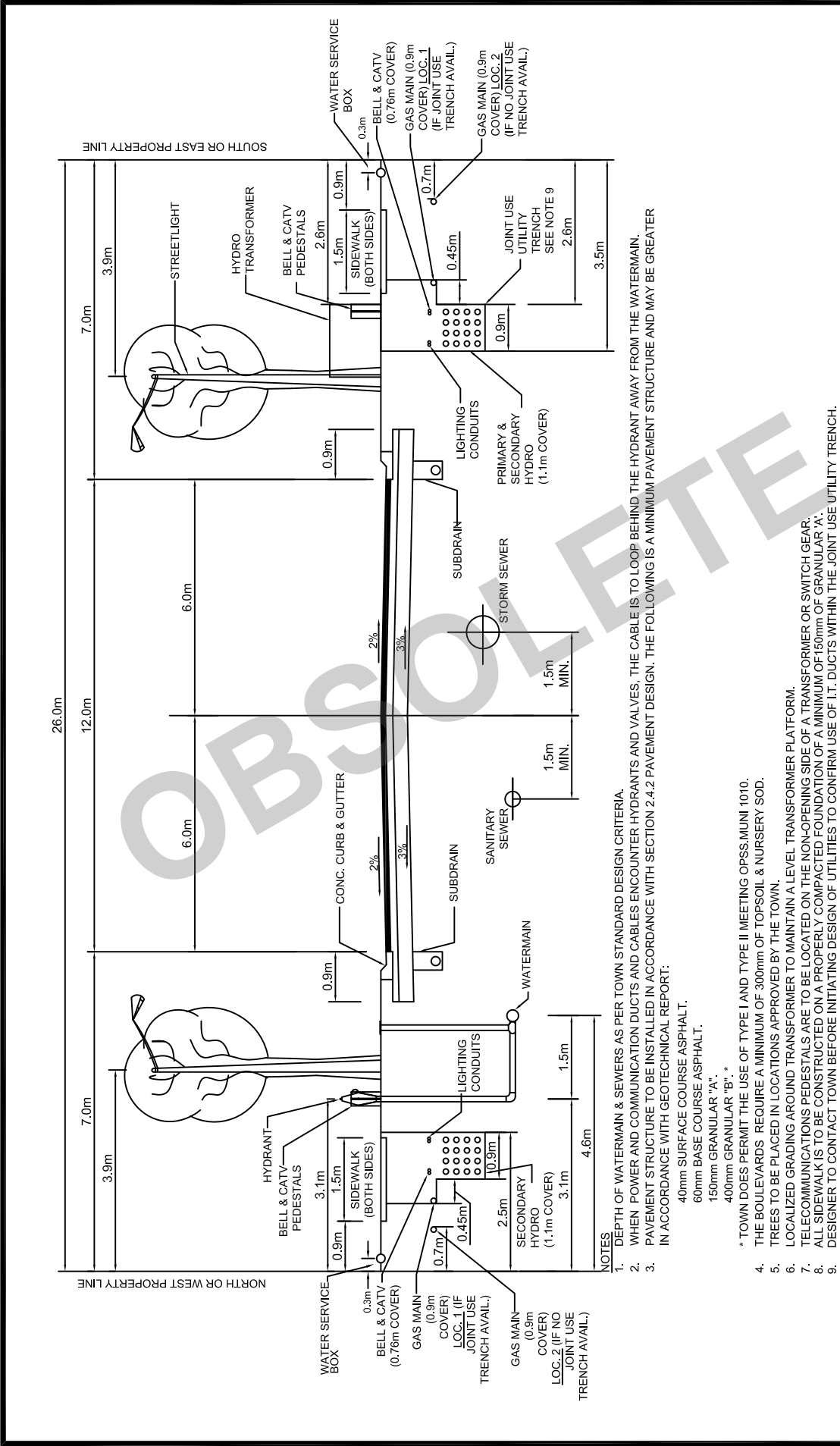
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DATE: JUNE 2011

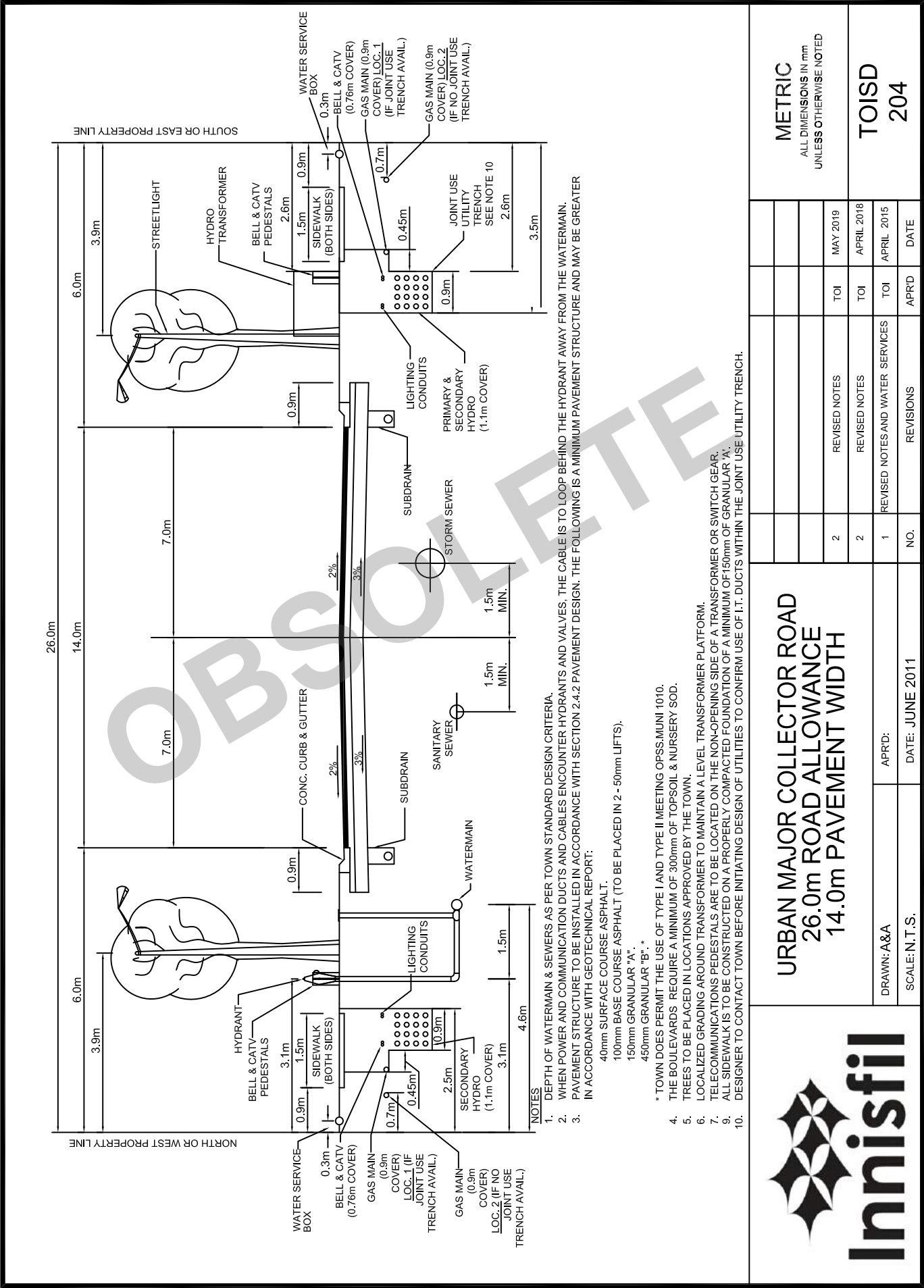


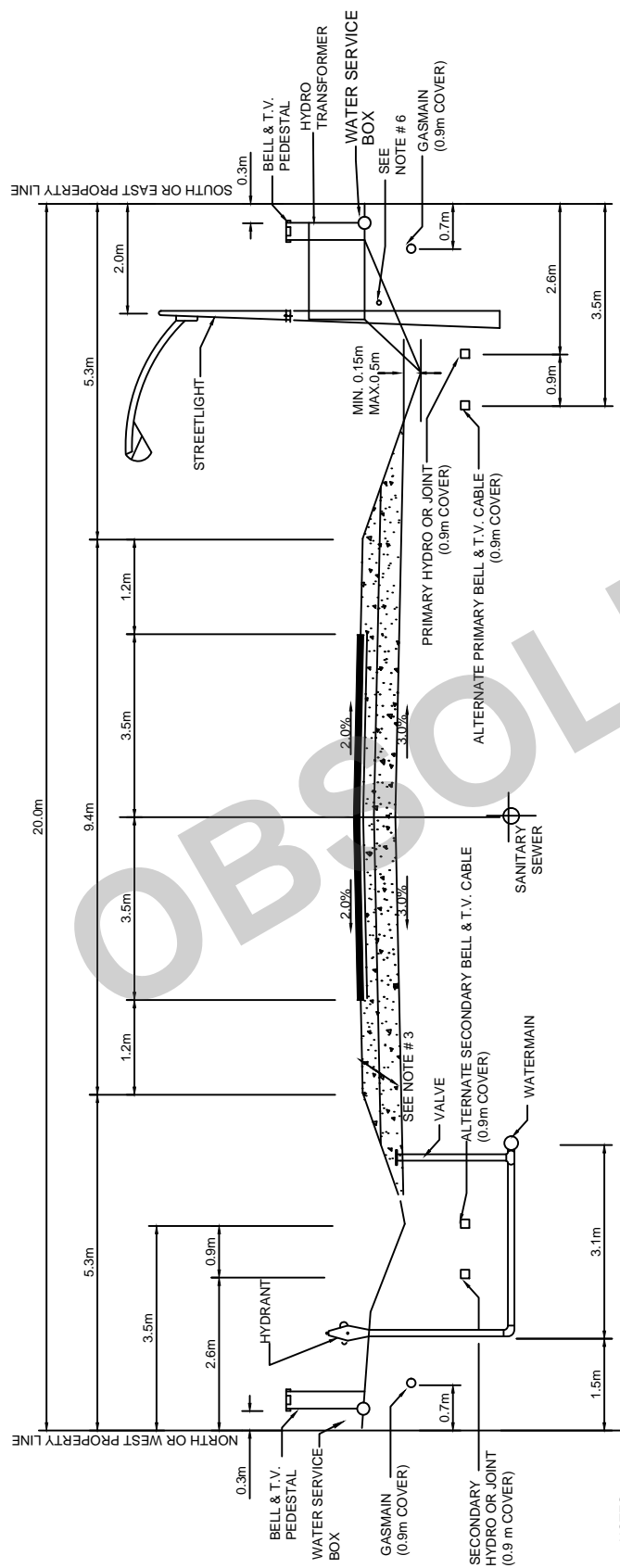
URBAN LOCAL ROAD
20.0m ROAD ALLOWANCE
8.5m PAVEMENT WIDTH

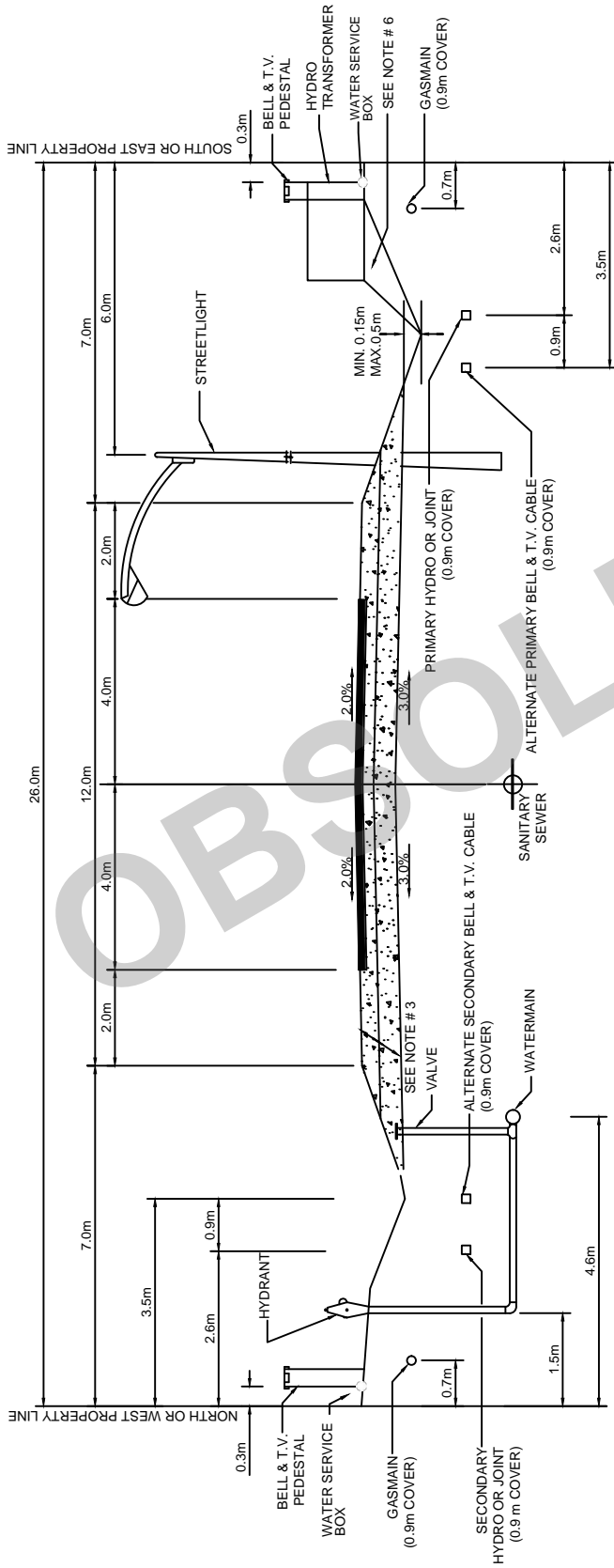
URBAN LOCAL ROAD 20.0m ROAD ALLOWANCE 8.5m PAVEMENT WIDTH										METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
						</				



		URBAN MINOR COLLECTOR ROAD 26.0m ROAD ALLOWANCE 12.0m PAVEMENT WIDTH		METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED	
DRAWN: A&A		APRD:		TOI	
SCALE: N.T.S.		DATE: JUNE 2011		MAY 2019	
		NO.		TOI	
		REVISED NOTES AND WATER SERVICES		APRIL 2018	
		REVISIONS		APRIL 2015	
		DATE: JUNE 2011		DATE	
				TOISD	
				203	



APR'D: _____
DATE: JUNE 2011



NOTES

1. DEPTH OF WATERMAIN & SEWERS AS PER TOWN STANDARD DESIGN CRITERIA.
2. WHEN POWER AND COMMUNICATION DUCTS AND CABLES ENCOUNTER HYDRANTS AND VALVES, THE CABLE IS TO LOOP BEHIND THE HYDRANT AWAY FROM THE WATERMAIN.
3. PAVEMENT STRUCTURE TO BE INSTALLED IN ACCORDANCE WITH SECTION 2.2 PAVEMENT DESIGN. THE FOLLOWING IS A MINIMUM PAVEMENT STRUCTURE AND MAY BE GREATER IN ACCORDANCE WITH GEOTECHNICAL REPORT:

40mm SURFACE COURSE ASPHALT:
 110mm BASE COURSE ASPHALT (TO BE PLACED IN 2 LIFTS - 50mm and 60mm).

150mm GRANULAR "A".

500mm GRANULAR "B". *

* TOWN DOES PERMIT THE USE OF TYPE I AND TYPE II MEETING OPSS MUNI 1010.

4. THE BOULEVARDS AND DITCHES REQUIRE A MINIMUM OF 300mm OF TOPSOIL & NURSERY SOD.

5. LOCALIZED GRADING AROUND TRANSFORMER TO MAINTAIN A LEVEL TRANSFORMER PLATFORM.

6. DITCH DEPTH AS PER DESIGN

7. HYDRANT WALKWAY AND CULVERT REQUIRED UNLESS OTHERWISE DIRECTED BY THE TOWN.

8. TRANSFORMER ACCESS AND CULVERT REQUIRED UNLESS OTHERWISE DIRECTED BY THE TOWN.

9. TELECOMMUNICATIONS PEDESTALS ARE TO BE LOCATED ON THE NON-OPENING SIDE OF A TRANSFORMER OR SWITCH GEAR.



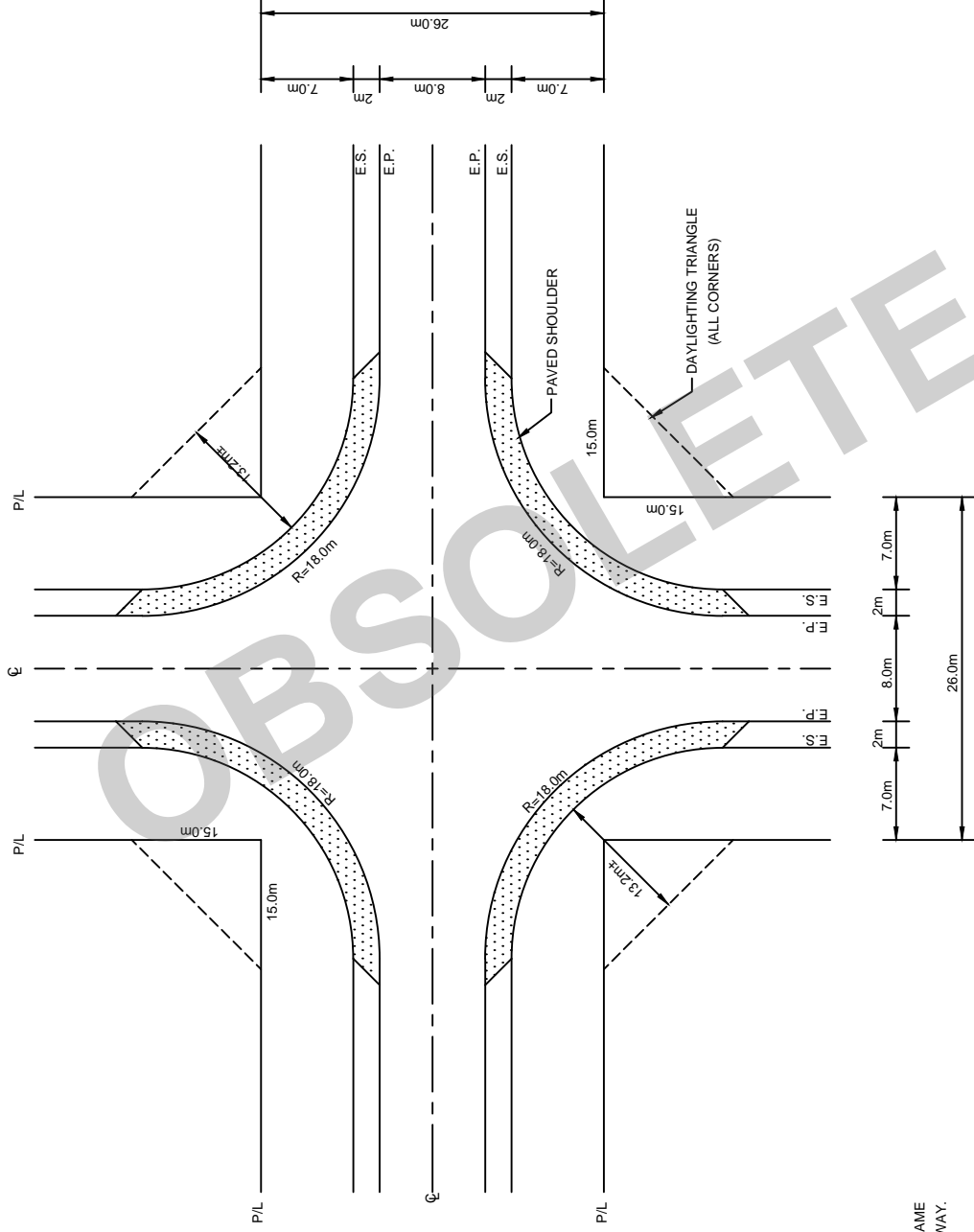
RURAL INDUSTRIAL ROAD
26.0m ROAD ALLOWANCE
8.0m PAVEMENT WIDTH

METRIC
 ALL DIMENSIONS IN mm
 UNLESS OTHERWISE NOTED

TOISD
208

DRAWN: A&A
 SCALE: N.T.S.
 APR'D: DATE: JUNE 2011

NO.	REVISIONS	APR'D	DATE
1	REVISED NOTES AND WATER SERVICES	TOI	APRIL 2015
2	REVISED NOTES	TOI	APRIL 2018



RURAL INDUSTRIAL ROAD INTERSECTION - 18.0m RADIUS 26.0m ROAD ALLOWANCE

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
209

DRAWN: A&A
SCALE: N.T.S.

APRD:
DATE: JUNE 2011

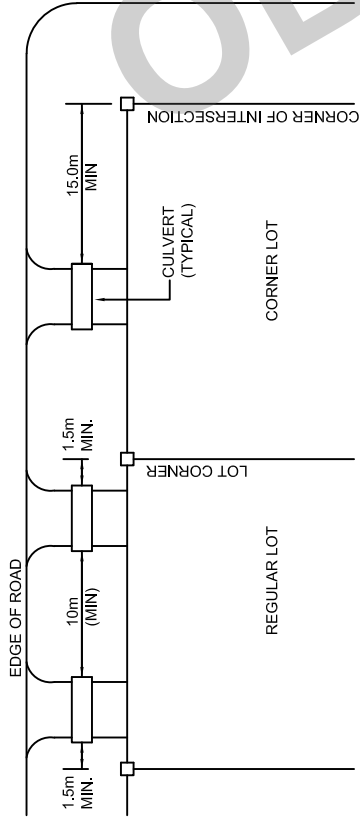
NO.

REVISIONS

TOI
APRD
DATE

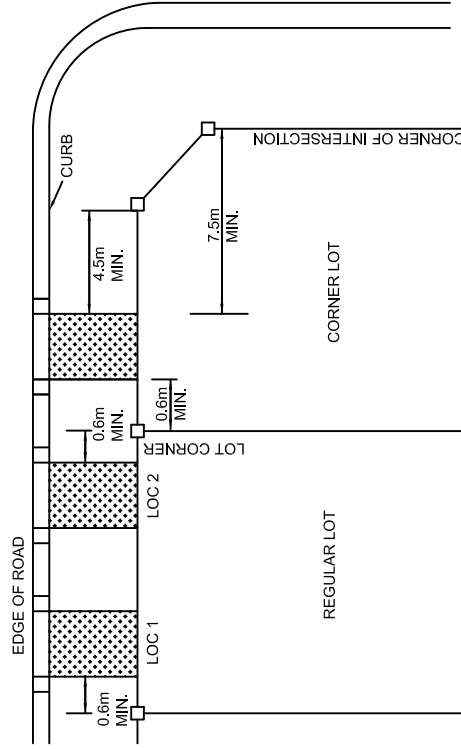
APRIL 2015

STREET



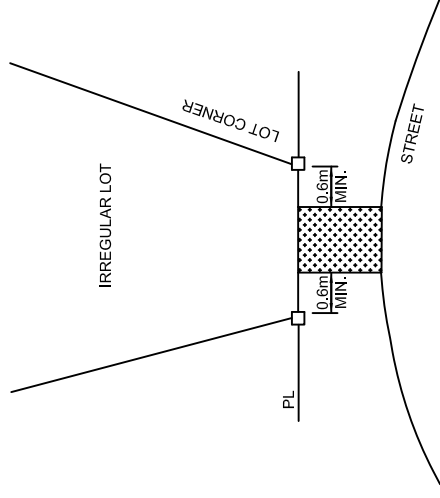
RURAL TYPE ROAD

STREET



URBAN TYPE ROAD

EXCEPTIONS:



NOTES:

1. FOR RESIDENTIAL LOTS, THE PERMITTED DRIVEWAY WIDTH SHALL BE AS INDICATED IN THE ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS.
2. REFER TO THE TOWN DESIGN STANDARDS FOR MINIMUM OFFSET REQUIREMENTS FROM VARIOUS OTHER INFRASTRUCTURE.
3. IN URBAN AREAS, PAIRING OF DRIVEWAYS IS REQUIRED FOR ALL RESIDENTIAL LOTS WITH A FRONTAGE LESS THAN 14.0m WHERE THE ROAD GRADE DOES NOT EXCEED 2.5%.



TYPICAL ENTRANCE LOCATION

DRAWN: A&A

APR'D:

DATE: JUNE 2011

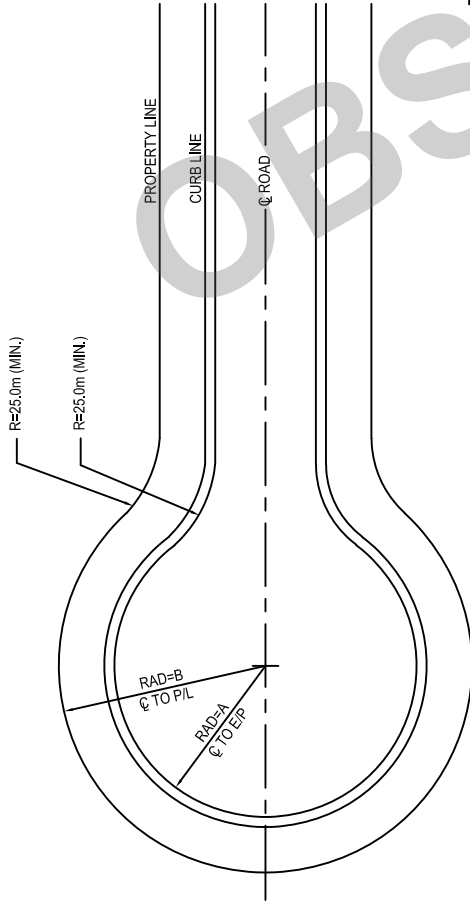
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METRIC

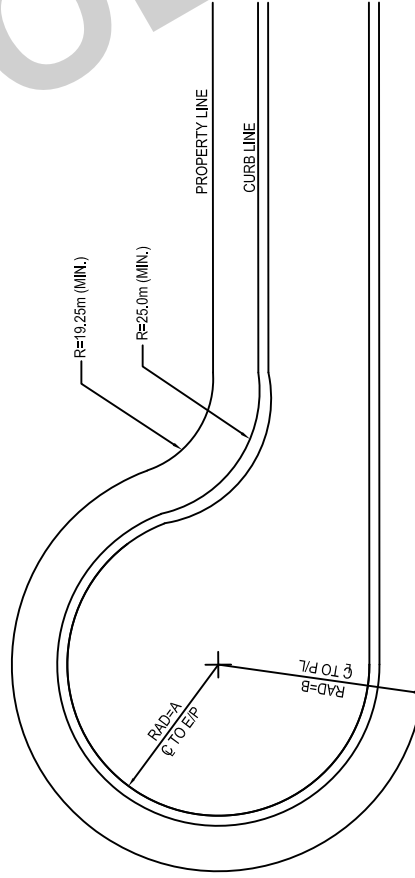
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
210

3.	TO REFLECT TOWN STANDARDS	TOI	MAY 2019
2.	REVISED NOTES	TOI	APRIL 2018
1	REVISED NOTE 1 TO REFLECT APRIL 2015 UPDATE	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TYPE 'A'



TYPE 'B'

OFFSET

MINIMUM RADIUS		
ROAD TYPE	A	B
RESIDENTIAL	15.0m	20.75m
INDUSTRIAL	15.0m	20.75m



PERMANENT CUL-DE-SAC

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
211

TOI

TOI

MAY 2019

APR'D

DATE

REVISIONS

NO.

1

2

REVISED TYPE 'B' CUL-DE-SAC

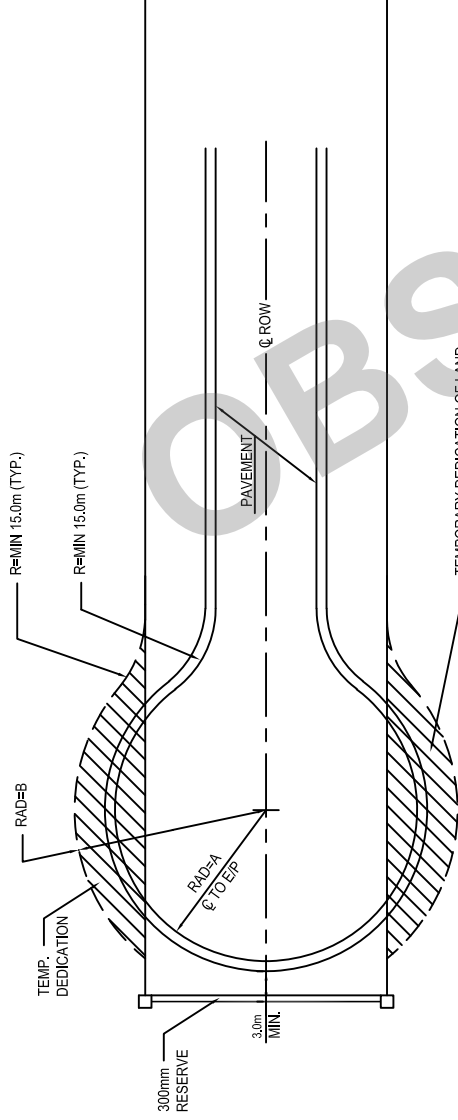
REVISED RADIUS

TOI

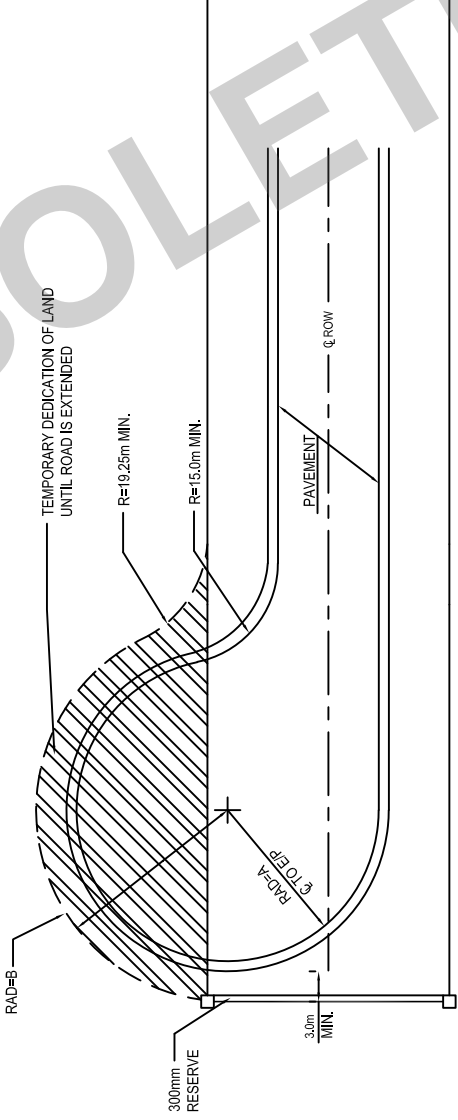
TOI

APR'D

DATE



TYPE 'A'



TYPE 'B'

OFFSET

ROAD TYPE	MINIMUM RADIUS	
	A	B
	15.0m	20.75m

NOTES

1. ASPHALT CURB & GUTTER MAY BE PERMITTED ON THE RADIUS OF A TEMPORARY CUL-DE-SAC THAT IS INTERNAL TO A DEVELOPMENT BUT WILL NOT BE PERMITTED ON TEMPORARY CUL-DE-SACS AT LIMITS OF A DEVELOPMENT.



TEMPORARY CUL-DE-SAC

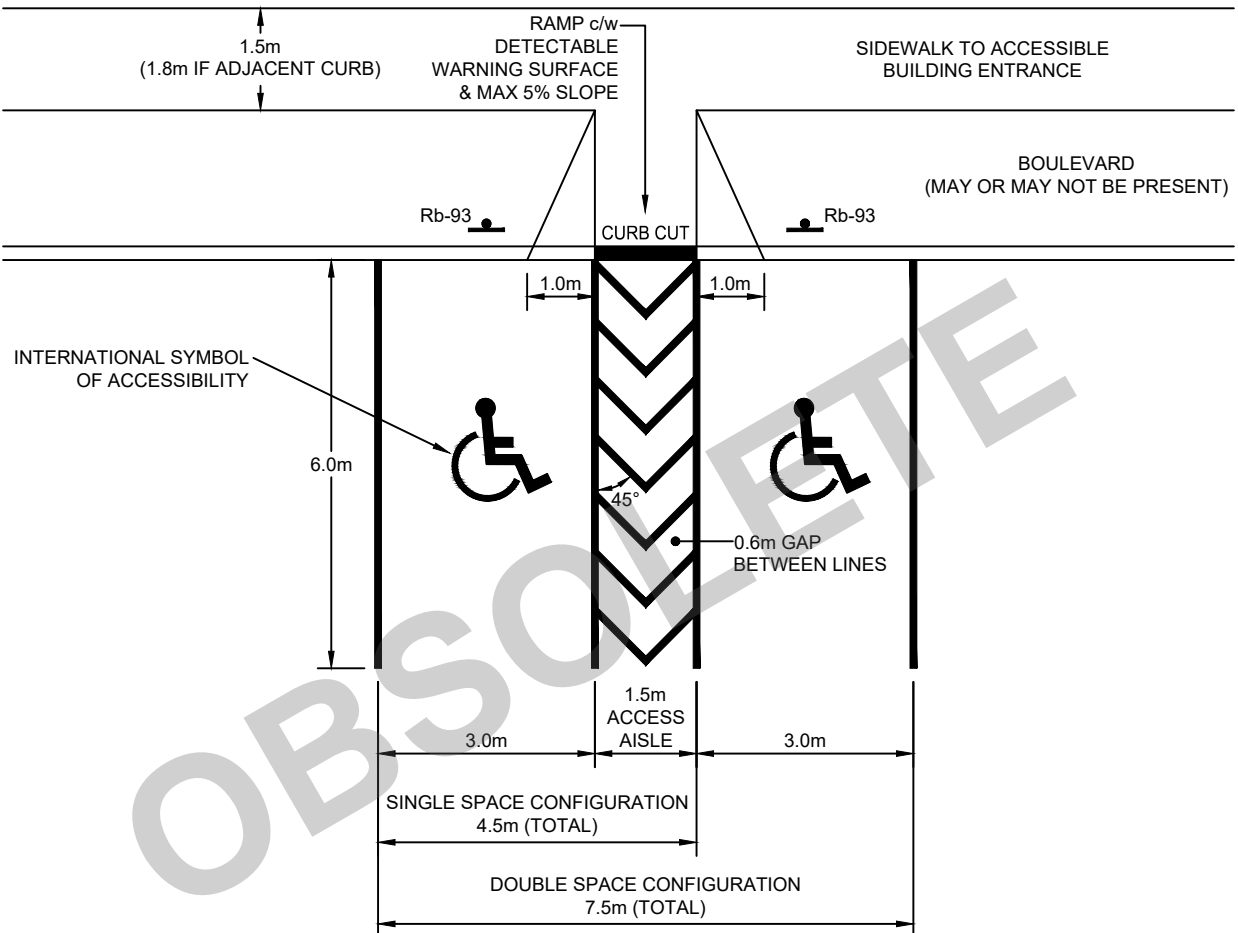
METRIC

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
212

2.	REFLECT TOWN STANDARDS	TOI	MAY 2019
1	REVISED TYPE 'B' CUL-DE-SAC	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE

DRAWN: A&A	APR'D:
SCALE: N.T.S.	DATE: JUNE 2011



NOTES:

1. ALL ACCESSIBLE PARKING SPACES ARE TO HAVE A HARD, LEVEL SURFACE WITH A MAXIMUM SLOPE OF 1.5% AND A MAXIMUM CROSS FALL OF 1%.
2. ALL ACCESSIBLE PARKING SPACES ARE TO BE LOCATED ON THE SHORTEST ACCESSIBLE ROUTE OF TRAVEL FROM AN ACCESSIBLE BUILDING ENTRANCE. WHERE BUILDINGS HAVE MULTIPLE ACCESSIBLE ENTRANCES, THE SPACES MAY BE DISPERSED EQUALLY AROUND THE ENTRANCES.
3. WHERE THERE ARE MORE THAN TWO ACCESSIBLE SPACES LOCATED TOGETHER, THIS STANDARD IS TO BE REPEATED.
4. LINE PAINTING:
 - ALL LINES ARE TO BE YELLOW IN COLOUR AND 100mm IN WIDTH.
 - THE INTERNATIONAL SYMBOL OF ACCESSIBILITY IS TO BE WHITE IN COLOUR

3	CORRECTED TYPO	TOI	MAY 2021
2	REVISED WIDTH DIMENSION	TOI	APRIL 2020
1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



DETAIL FOR ACCESSIBLE PARKING

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

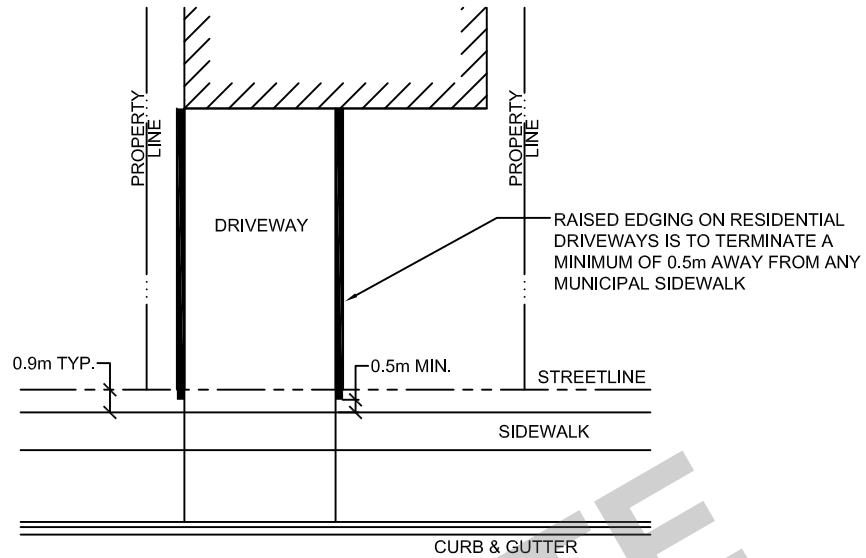
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213**

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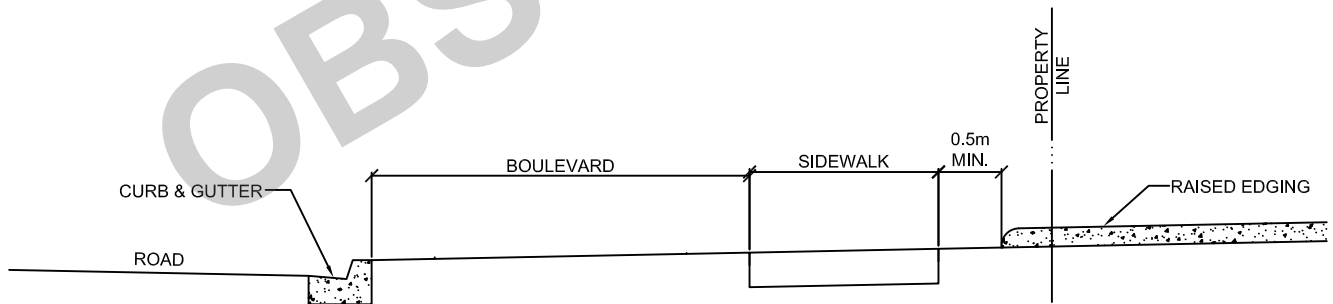
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



PLAN



SECTION

2	REVISED SPEC	TOI	APRIL 2018
1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



RESIDENTIAL DRIVEWAY EDGING

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

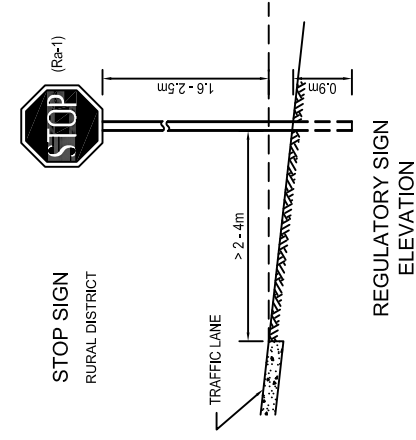
**TOISD
214**

DRAWN: A&A

APR'D:

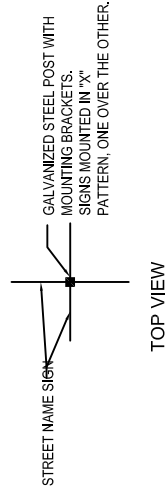
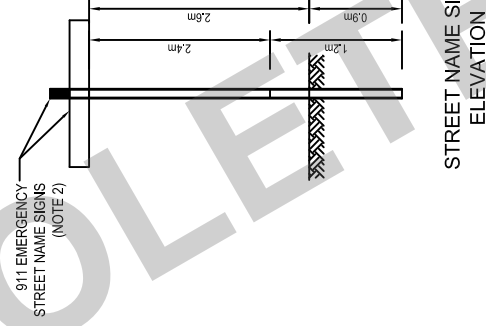
SCALE: N.T.S.

DATE: JUNE 2011



LOCATION PLAN
2 LANE INTERSECTING LOCAL ROADWAYS
END STREET:

1. REFER TO TOWN ENGINEERING STANDARDS FOR LIST OF MATERIALS & SPECS.
2. REFER TO TOISD 307 FOR DETAILS OF 911 NUMBERING AND STREET NAMES INCLUDING POPPY DETAIL.
3. SIGNS MAY BE STRAPPED TO STREET LIGHT POLES USING ALUMINUM BRACKETS IF THE POLES ARE PROPERLY POSITIONED AND UPON RECEIVING WRITTEN APPROVAL FROM THE TOWN.
4. STREET NAME SIGNS ARE NOT TO BE MOUNTED ON STOP SIGNS.
5. ALL MOUNTING IS TO BE COMPLETED USING GALVANIZED NUTS, BOLTS & SPACERS.
6. 911 NUMBERS TO BE PROVIDED BY THE TOWN.
7. ACTUAL LOCATION OF STREET NAME BLADES TO BE CONFIRMED BY TOWN.
8. ALL SIGNAGE MUST BE INSTALLED USING A BREAKAWAY SYSTEM.
9. HORIZONTAL MOUNTING OFFSET FOR URBAN OR RESIDENTIAL AREAS WITH RAISED CURBS. 30 CM TO 2 M FROM THE CURB LINE.
10. HORIZONTAL MOUNTING OFFSET FOR RURAL AREAS WITHOUT RAISED CURBS. 2 M TO 4 M FROM THE OUTSIDE EDGE OF THE RURAL TRAFFIC LANE.



STANDARD STREET NAME SIGN AND REGULATORY SIGNS

DRAWN: A&A

SCALE: N.T.S.

STANDARD STREET NAME SIGN AND REGULATORY SIGNS						METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED	
DRAWN: A&A	APRD:	5.	STOP SIGN AND 30M OF YELLOW LINE	TOI		MAY 2019	
		4.	NOTES CHANGED	TOI		APRIL 2018	
		3.	TO REFLECT TOWN STANDARDS	TOI		MAY 2016	
		2.	REVISED TOWN LOGO	TOI		APRIL 2015	
		1.	TO REFLECT TOWN STANDARDS	TOI		MAY 2014	
SCALE: N.T.S.	DATE: JUNE 2011	NO.	REVISIONS	APRD	DATE	TOISD 301	



FONT: CLEARVIEW HWY 2b




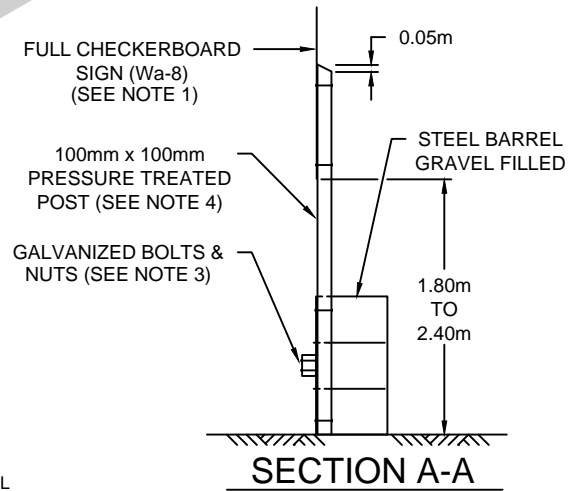
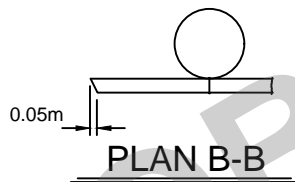
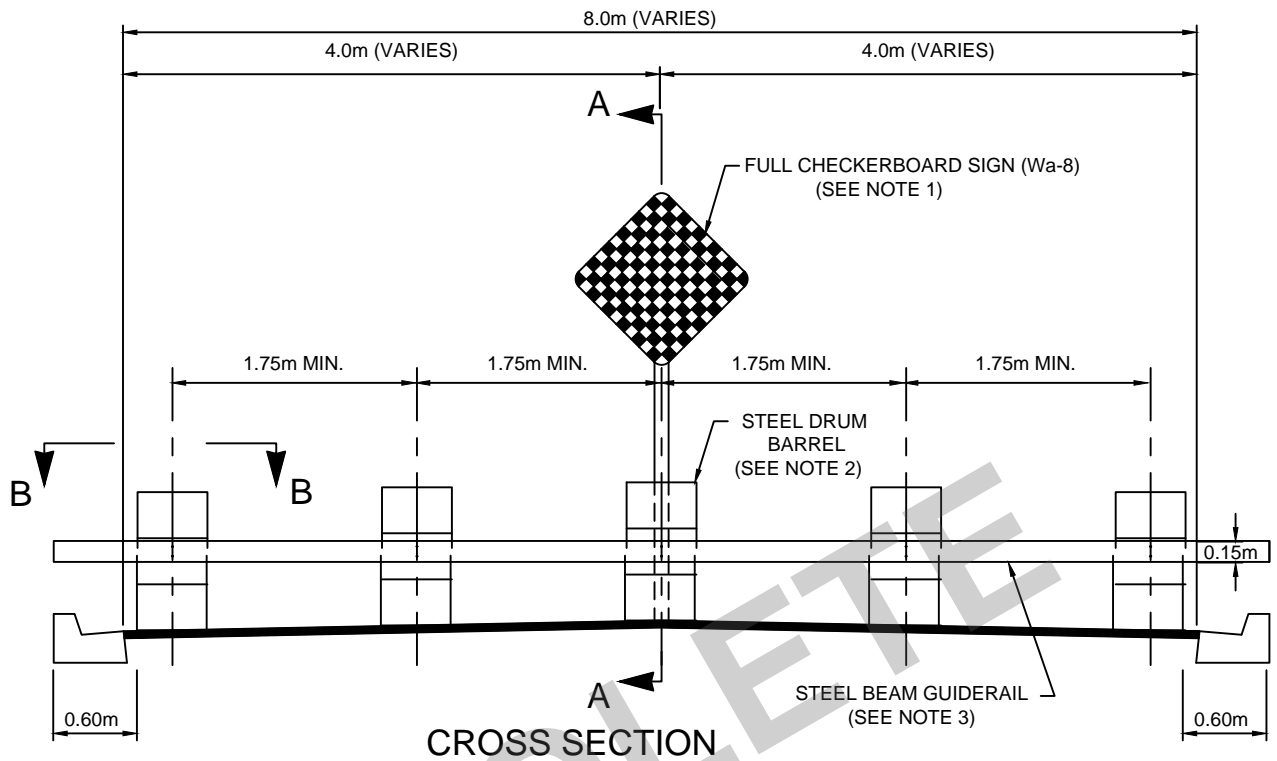
NOTES:

SIGN MATERIAL	ALUMINUM
SIGN THICKNESS	0.125mm
SIGN MATERIAL	300mm
STREET NAME LETTERING HEIGHT	200mm
911 NUMBERING HEIGHT	75mm

-THE SIGN IS TO HAVE ROUND CORNERS AND A GREEN, HIGH INTENSITY, REFLECTIVE BACKGROUND ON THE LETTERING SIDE.
 -THE LETTERING IS TO BE IN "CLEARVIEW HWY 2B" FONT AND IS TO BE WHITE IN COLOUR.
 SHEETING TO BE DIAMOND GRADE SILVER WITH ELECTROLYTE GREEN FILM OVERLAY

2	FONT	TOI	MAY 2019
1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE

	INTERSECTION STREET SIGN DETAIL (ATTACHED TO STREET LIGHTS)		METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
			TOISD 302
	DRAWN: A&A SCALE: N.T.S.	APR'D: DATE: JUNE 2011	



NOTES:

1. WARNING SIGN TO BE AS PER "THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES IN ONTARIO". FULL CHECKERBOARD Wa-8 (90cm x 90cm) YELLOW REFLECTORIZED BACKGROUND SIGN TO BE FASTENED TO POST WITH 12mmØ GALVANIZED BOLTS.
2. STEEL DRUMS TO BE FILLED WITH GRAVEL AFTER SET IN PLACE AND GUIDERAIL BOLTED TO EACH BARREL. STANDARD 205 LITRE BARRELS TO BE USED. ALL BARRELS TO BE PAINTED FLOURESCENT YELLOW AND TO BE APPROVED BY TOWN.
3. GUIDERAIL TO BE FASTENED TO STEEL DRUMS WITH MINIMUM 2-16mmØ GALVANIZED BOLTS & NUTS. NOTE, BARRIER TO BE ATTACHED PRIOR TO POST INSTALLATION.
4. 100mm x 100mm PRESSURE TREATED POST TO BE FASTENED TO STEEL DRUM WITH GALVANIZED 16mmØ BOLTS & NUTS.

2.	REVISED TOWN LOGO	TOI	APRIL 2015
1.	NOTE 1 - FULL CHECKERBOARD SIGN		MAR/97
NO.	REVISIONS	APR'D	DATE



TEMPORARY BARREL & GUIDEPOST "ROAD CLOSED" BARRICADE

DRAWN: A&A

APR'D:

SCALE: N.T.S.

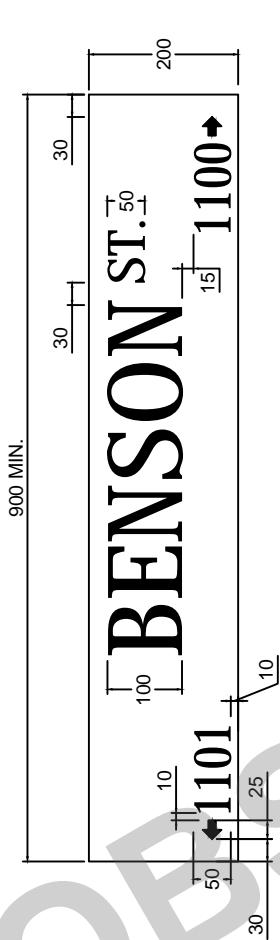
DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
303**

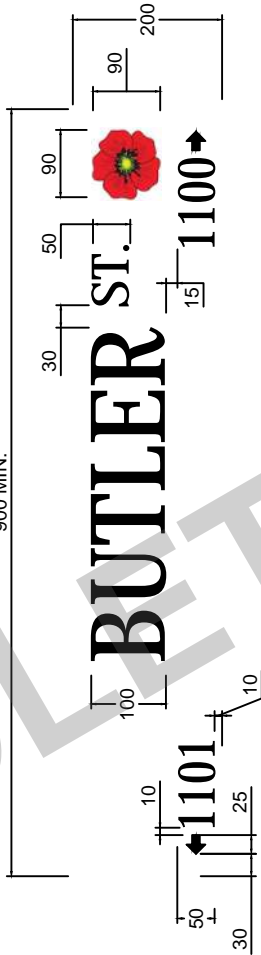
NOTES

1. THE ROAD NAME IS TO BE IN UPPER CASE ('100) WITH SUFFIX BEING UPPERCASE (50), ABBREVIATED AND ALIGNED WITH THE TOP OF THE STREET NAME.
2. CENTRE STREET NAME ON SIGN AND LOCATE ALL NUMBERS ON EACH END.
3. LETTERING SHALL BE ON BOTH SIDES OF THE SIGN.



NOTES

1. STREET NAMES WITH POPPY DETAIL AS DIRECTED BY THE TOWN.
2. POPPY DETAIL AVAILABLE FROM THE TOWN ON REQUEST.



STANDARD STREET NAME SIGN
AND POPPY DETAIL

DRAWN: CCTA

APRD:

DATE: MAY 2014

SCALE: N.T.S.

1.

NO.

REVISED TOWN LOGO

REVISIONS

TOI

APRD

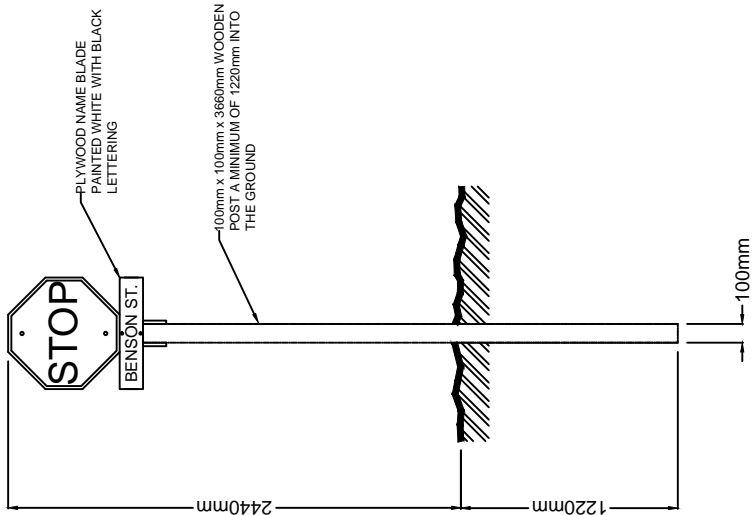
APRIL 2015

DATE

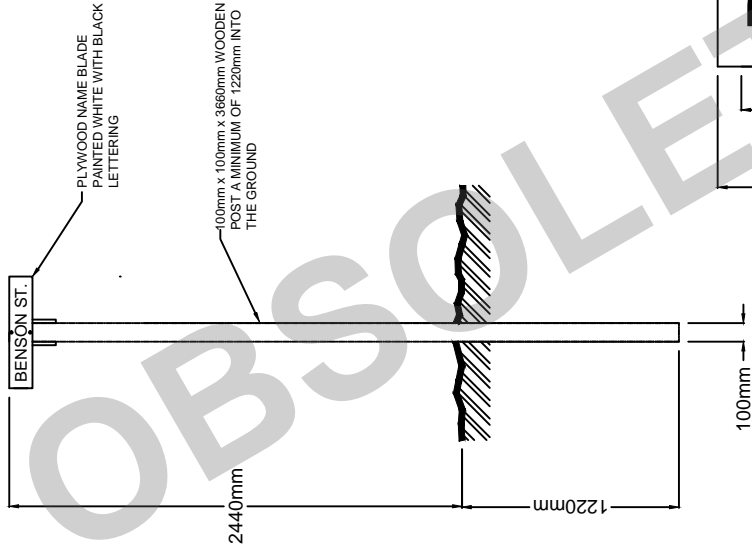
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
304

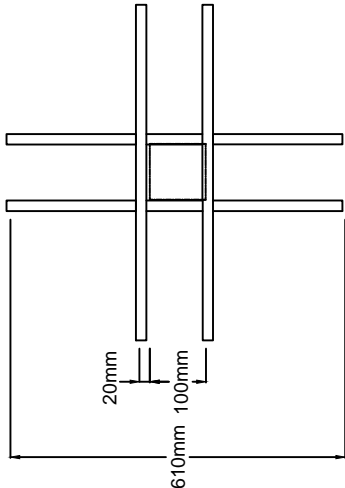
TEMPORARY STREET SIGN WITH STOP SIGN



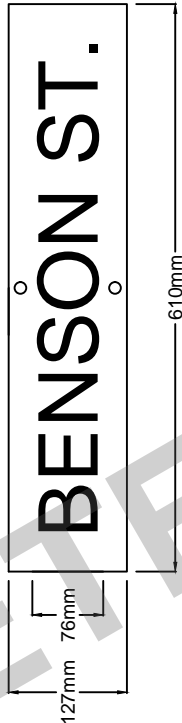
TEMPORARY STREET SIGN WITHOUT STOP SIGN



PLAN VIEW



SIGN DETAIL



NOTES:

1. THE SIGN FACES MUST BE SECURED TO THE POST WITH TWO GALVANIZED 12 1/2mm HEX HEAD BOLTS & NUTS WITH FLAT WASHERS ON BOTH SIDES.
2. ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANIZED.



TEMPORARY STREET SIGNS

DRAWN: TOI
SCALE: N.T.S.

APRD:
DATE: APRIL 2015

NO.

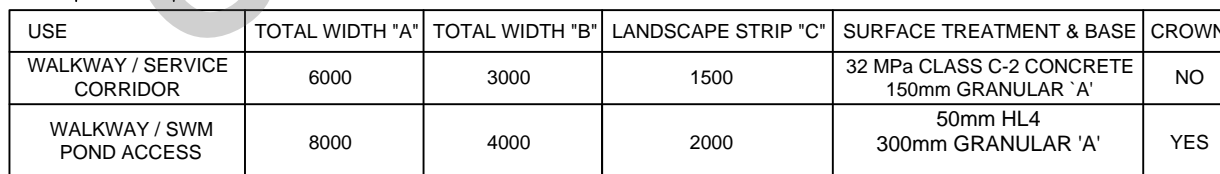
REVISIONS

APRD

DATE

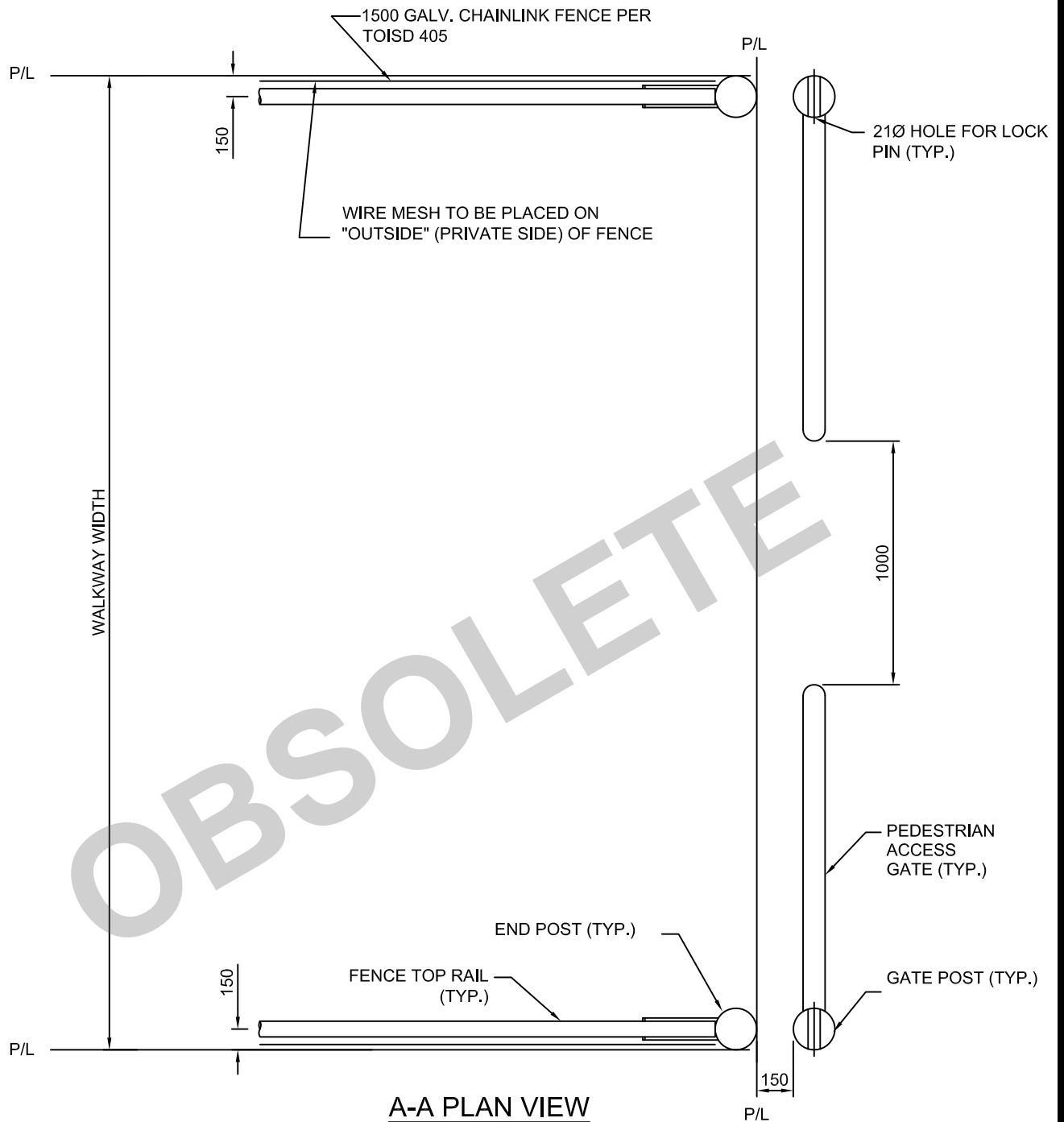
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
305



4.	REVISE LOCKING PIN AND SWM POND ACCESS SURFACE	TOI	APRIL 2020
3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED TOISD REFERENCE	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE

TOISD
401



A-A PLAN VIEW
TOISD 401

3	TEXT CHANGE	TOI	MAY 2019
2	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1	REVISED TOISD REFERENCE	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



**PEDESTRIAN ACCESS GATE
WALKWAY FENCE CONNECTION**

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

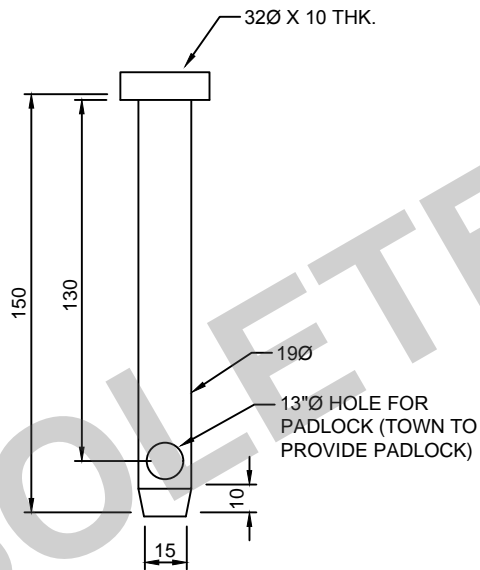
**TOISD
402**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



STAINLESS STEEL LOCK PIN

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



PEDESTRIAN ACCESS GATE
LOCK PIN DETAIL

DRAWN: A&A

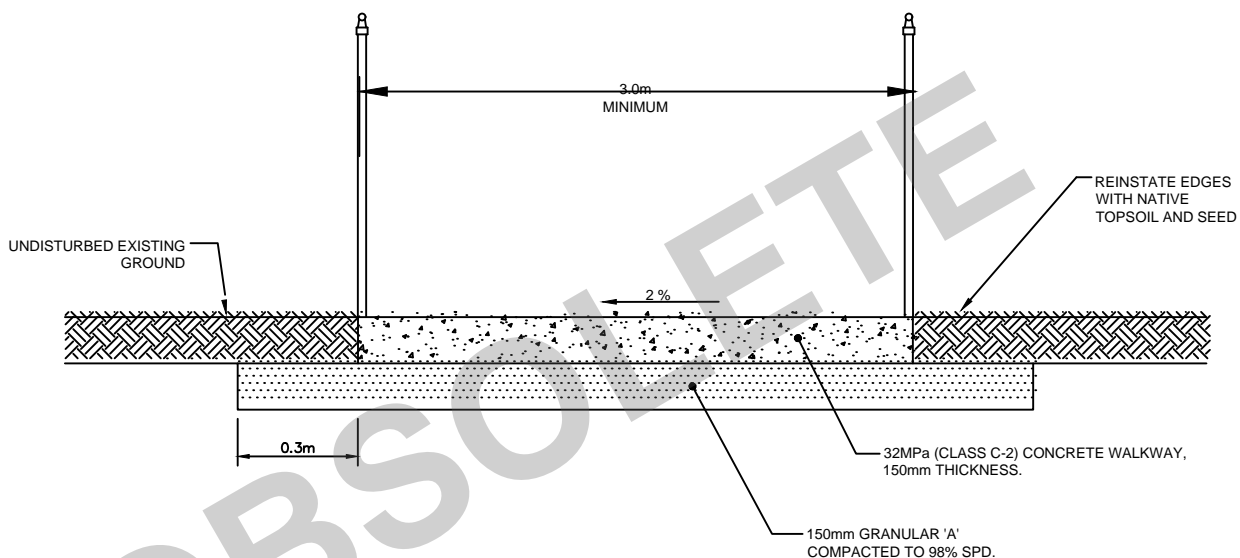
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
403**



NOTES:

1. WHERE APPROVED BY TOWN AND ONLY WHERE THE WALKWAY SLOPE IS LESS THAN 4% AND WILL NOT BE USED BY MAINTENANCE VEHICLES, THE CONCRETE MAY BE REPLACED BY 50mm OF LIMESTONE SCREENINGS COMPACTED TO 98% SPD.
2. ALIGNMENT AND WIDTH OF WALKWAY TO BE APPROVED BY THE TOWN OF INNISFIL.
3. ALIGNMENT TO AVOID DISTURBANCE OF NATURAL TERRAIN AND MATURE TREES AS MUCH AS POSSIBLE.
4. EROSION AND SEDIMENT CONTROL DEVICES TO BE IN PLACE DURING CONSTRUCTION OF THE WALKWAY AND APPROVED BY THE TOWN OF INNISFIL.

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



**PEDESTRIAN WALKWAY AND
PARK MAINTENANCE PATHWAY**

DRAWN: A&A

SCALE: N.T.S.

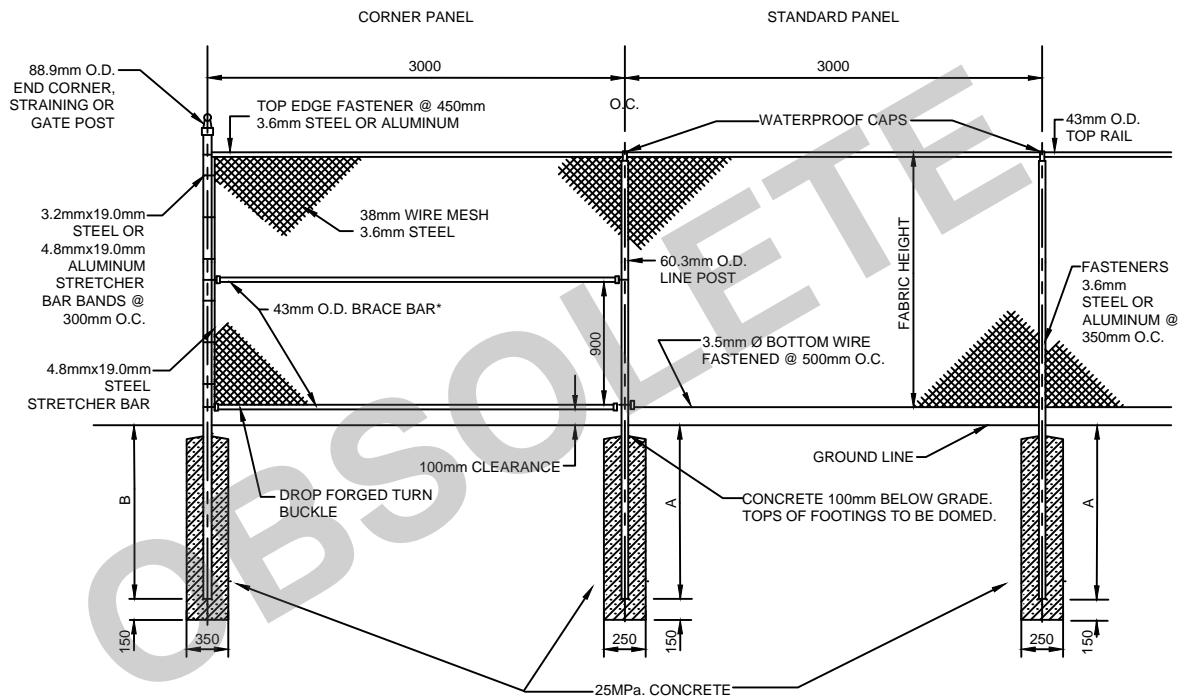
APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
404**

POST FOOTING DETAILS		
FABRIC HEIGHT	A	B
1200	1100	1100
1500	1100	1250
1800	1200	1370



* ONLY REQUIRED FOR 1800mm FENCE. FIRST AND/OR CORNER PANELS TO HAVE BRACE BAR ALONG BOTTOM INSTEAD OF GUIDE WIRE.

NOTES:

- ALL FABRIC SHALL BE 3.6mm KNUCKLED AT TOP AND BOTTOM AND ONE OF THE FOLLOWING MATERIALS:
(A) STEEL WIRE, HOT DIP GALVANIZED AFTER WEAVING
(B) STEEL WIRE, ELECTRO GALVANIZED BEFORE WEAVING.
- ALL POST AND RAILS SHALL BE GALVANIZED STEEL "SCHEDULE 40 PIPE", CONFORMING TO CURRENT SPECIFICATIONS FOR BLACK & HOT DIPPED ZINC COATED (GALVANIZED) WELDED AND SEAMLESS PIPE. FOR ORDINARY USES, ASTM. DESIGNATION A 120.
- ALL REQUIRED FITTINGS AND HARDWARE SHALL BE OF A SUITABLE ALUMINUM ALLOY OR OF A STEEL DUCTILE IRON. ASTM. SPECIFICATIONS (A 152)
- MINIMUM REQUIREMENTS FOR ZINC COATING:
FABRIC AND WIRE 0.5 kg/M²
POST AND RAILS 0.5 kg/M²
FRAMES AND BRACES 0.5 kg/M²
CAST FITTINGS 0.6 kg/M²
OTHER FITTINGS 0.6 kg/M²

3.	POST FOOTING DETAILS ADJUSTED	TOI	APRIL 2018
2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



CHAIN LINK FENCE

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

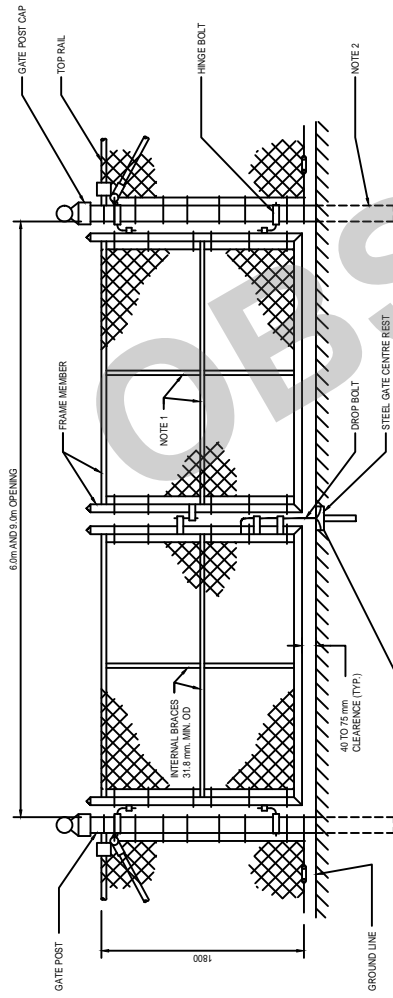
TOISD
405

DRAWN: A&A

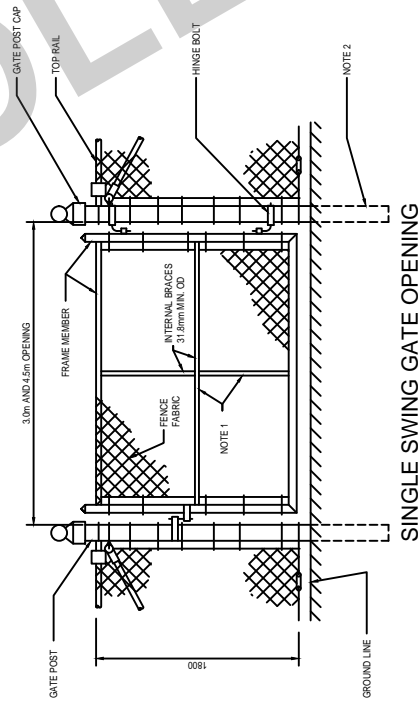
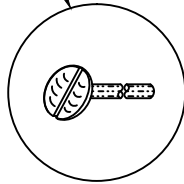
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



DOUBLE SWING GATE OPENING



GATE AND GATE POST DETAILS

GATE AND GATE POST DETAILS			
GATE TYPE AND MAX. OPENING (m)	FRAME MEMBER MIN. OD (mm)	POST DIA. MIN. OD (mm)	POST LENGTH STANDARD (m)
SINGLE SWING 3.0 DOUBLE SWING 6.0	42.9	86.9	2.6
SINGLE SWING 4.5 DOUBLE SWING 9.0	48.3	114.3	2.9

NOTES

1. GATE LEAVES GREATER THAN 3.6 m IN WIDTH ARE SUPPLIED WITH DIAGONAL BRACES.
2. FOR FOOTING DETAILS REFER TO OPSD 972.132.
3. FOR A 1.2 METRE CHAIN-LINK FENCE USE APPROPRIATE SIZE GATES SO THAT THE TOP RAIL OF THE FENCE IS THE SAME HEIGHT AS THE HORIZONTAL TOP FRAME OF THE GATE.

CHAIN LINK FENCE GATES



Innisfil

METRIC

Innisti

DRAWN: A&A	APR'D:
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2.

TO REFLECT TOWN STANDARDS

TOI	APRIL 2018
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APRIL 2018

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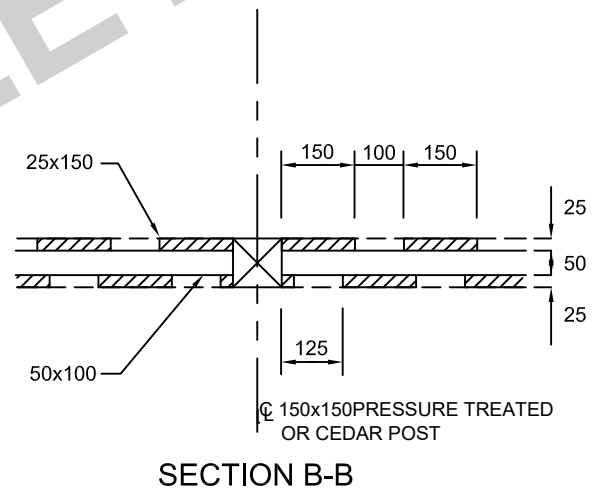
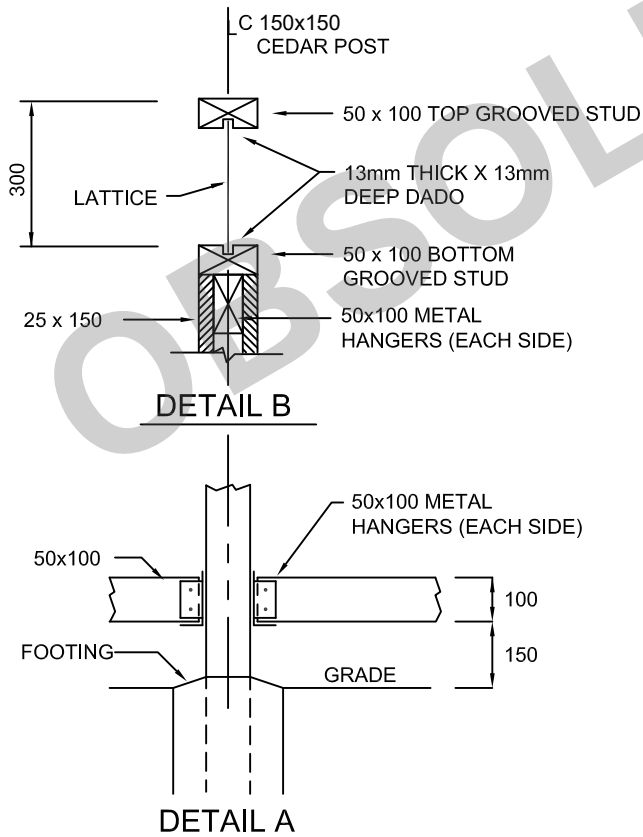
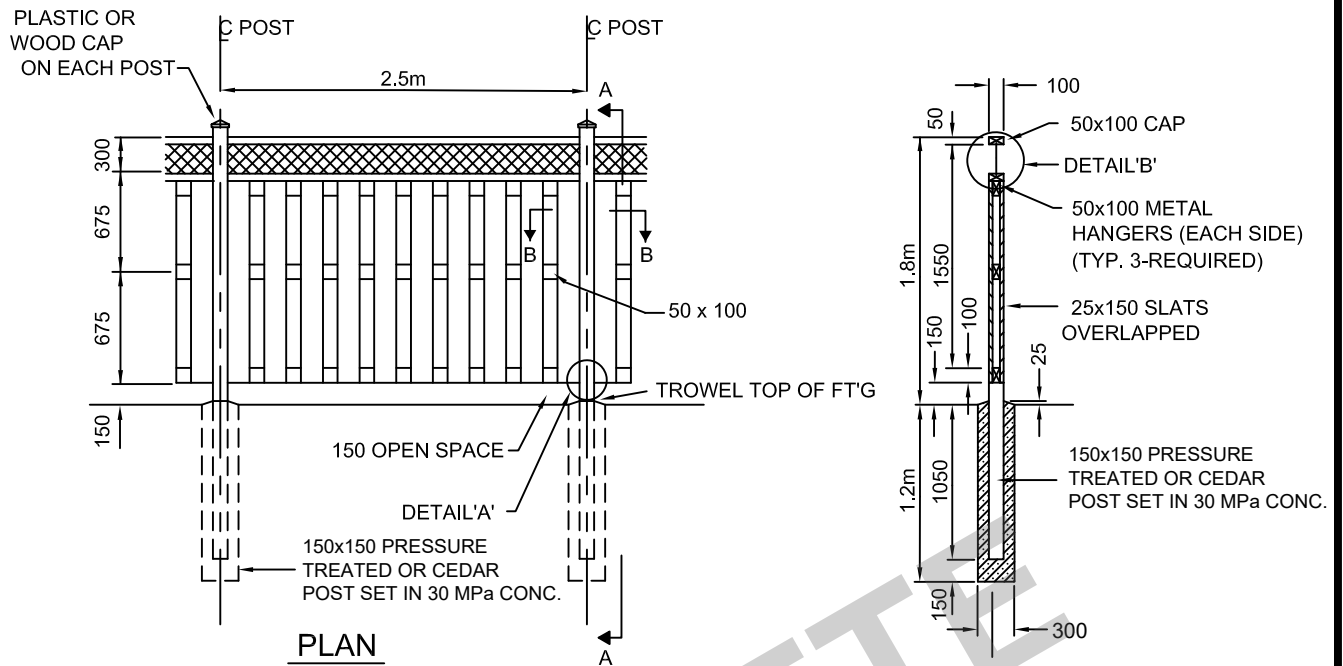
TOI	APRIL 2018
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APRIL 2018

TOI	APRIL 2018
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APRIL 2018

TOI	APRIL 2018
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NOTES

1. REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS.
2. ZINC COATED TWISTED STEEL NAILS #11 GAUGE TO BE USED
3. LOCATED 0.15M FROM PROPERTY LINE

NO.	REVISIONS	APR'D	DATE
3	REVISED POSTS	TOI	FEB 2022
2	ADDED NOTE 3	TOI	MAY 2019
1	REVISED TOWN LOGO	TOI	APRIL 2015



1.8m HIGH WOOD PRIVACY FENCE

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
407**


DRAWN: A&A

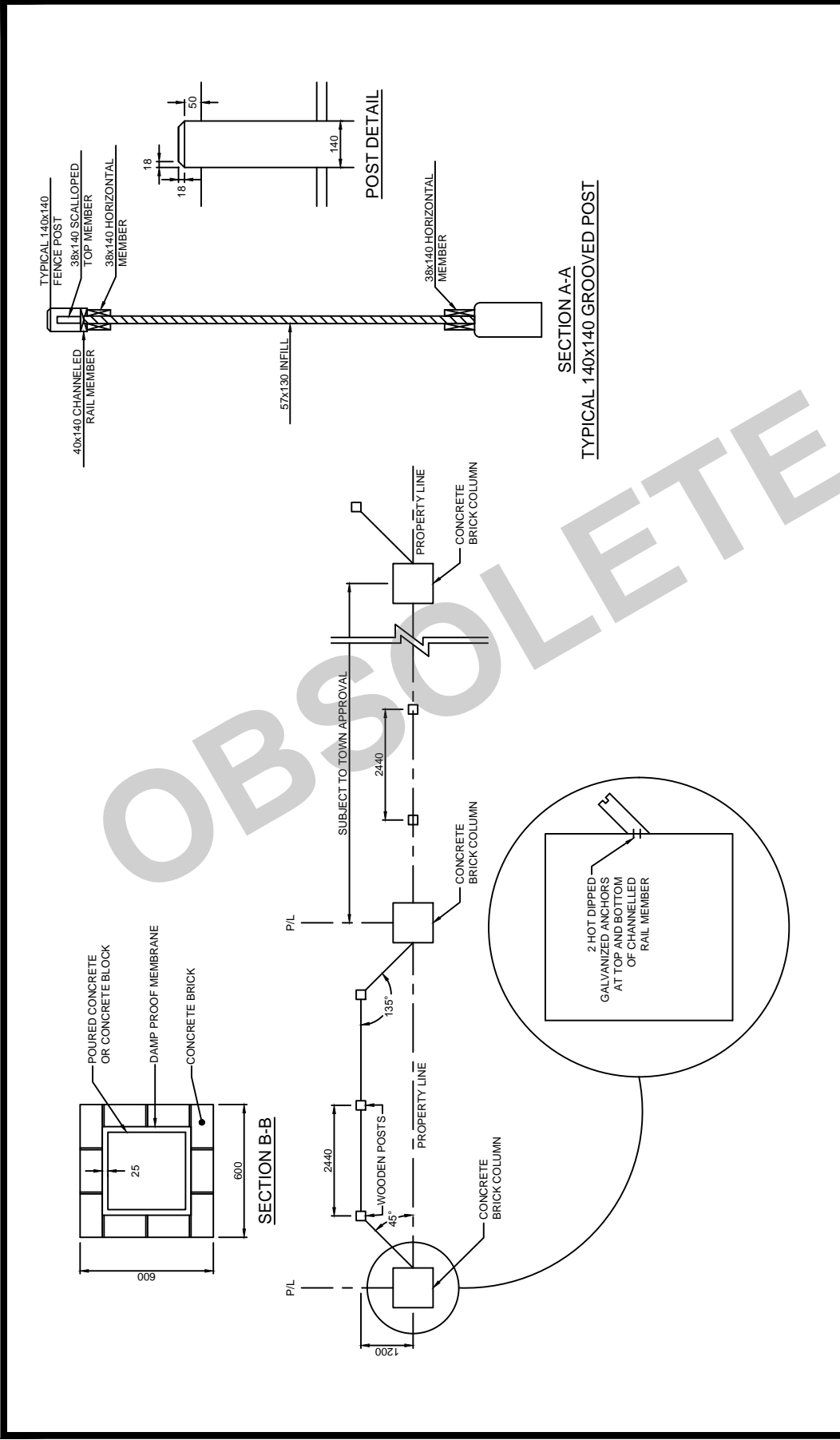
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



 Innisfil	ACOUSTICAL FENCE									METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
	DRAWN: A&A		APRD:	3	TEXT CHANGE AND ADDED NOTES	TOI	MAY 2019	TOISD 408		
				2	REVISED MAX HEIGHT	TOI	MAY 2018			
SCALE: N.T.S.			1	REVISED TOWN LOGO	TOI	APRIL 2015				
		DATE: JUNE 2011	NO.	REVISIONS	APRD	DATE				



		ACOUSTICAL FENCE DETAILS				METRIC ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED	
		DRAWN: A&A				TOISD 409	
		APR'D: DATE: JUNE 2011				TOI	
		SCALE: N.T.S.				APR D	
		NO.				REVISIONS	
		1				APRIL 2015	
						DATE	

MATERIALS

REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS

EXECUTION

SOIL

WITHIN IMMEDIATE AREA OF FOOTINGS SHALL BE 95% STANDARD PROCTOR DENSITY.

POSTS

SHALL BE PLUMB WITHIN 5mm/m

INFILL

MEMBERS SHALL BE TIGHT FITTED AND NAILED AT REGULAR INTERVALS TO ELIMINATE ALL GAPS AND RATTLING.

STEP FENCE

ON SLOPES (MINIMUM 3' STEPS).

DOUBLE POST

ALL DIRECTION CHANGES GREATER THAN 20°.

STAIN APPLICATION

APPLY TWO COATS ON CLEAN DRY WOOD USING SPRAY, BRUSH OR DIPPING METHODS TO ACHIEVE FULL COVERAGE OF ALL EXPOSED SURFACES. APPLY OUTDOORS ONLY IN SUITABLE WEATHER CONDITIONS DURING WHICH THE TEMPERATURE IS BETWEEN 5° C AND 21° C FOR A PERIOD OF 48 HOURS FOLLOWING APPLICATIONS.

FASTENERS

INCLUDING ARDOX NAILS, BOLTS, NUTS AND WASHERS, SHALL BE HOT DIPPED GALVAIZED STEEL.

CONCRETE FOOTINGS

SHALL BE 25MPa AT 28 DAYS MINIMUM.

WARRANTY

THE FENCE SHALL BE GUARANTEED FOR THREE YEARS AS FOLLOWS:
5mm/m ON PLUMB OF POSTS AND LEVEL OF INFILL MEMBERS.
GAPS BETWEEN INFILL MEMBERS SHALL NOT EXCEED 6mm (1/4")
INFILL MEMBERS SHALL BE TIGHT AND FREE OF RATTLING.

BRICK COLUMN NOTES

- 1.) REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS
- 2.) CONCRETE FOR FOOTING TO BE 25MPa AT 28 DAYS.
- 3.) CONCRETE FOOTINGS AND CONCRETE BASE OF BRICK COLUMNS TO BE POURED IN PLACE.
- 4.) FOOTINGS TO BE FOUNDED ON COMPACTED SUBGRADE 95% S.P.M.D. OR UNDISTURBED SOIL.
- 5.) GRADES ADJACENT TO COLUMNS TO SLOPE AWAY FROM COLUMNS.
- 6.) BRICK WORK TO START A MINIMUM 150mm ABOVE GRADE.
- 7.) INTERIOR OF COLUMN TO BE POURED IN PLACE 25MPa CONCRETE OR CONCRETE BLOCKS COMPLETELY FILLED WITH 25MPa CONCRETE.
- 8.) PROVIDE FLASHING, WEEP HOLE VENTS AND DAMP PROOF MEMBRANE.
- 9.) MORTAR JOINT PROFILES TO BE CONCAVE AND SMOOTH. MORTAR TYPE N HIGH BOND.
- 10.) PROVIDE DRIP GROOVE ON ALL SIDES OF CAP
- 11.) CONNECT STONE CAP TO COLUMN WITH HOT DIPPED GALVANIZED ANCHORS.
- 12.) COLUMN SPACING TO BE REVIEWED AND APPROVED BY THE TOWN PRIOR TO INSTALLATION.



ACOUSTICAL FENCE GENERAL NOTES

DRAWN: A&A

APRD:

SCALE: N.T.S.

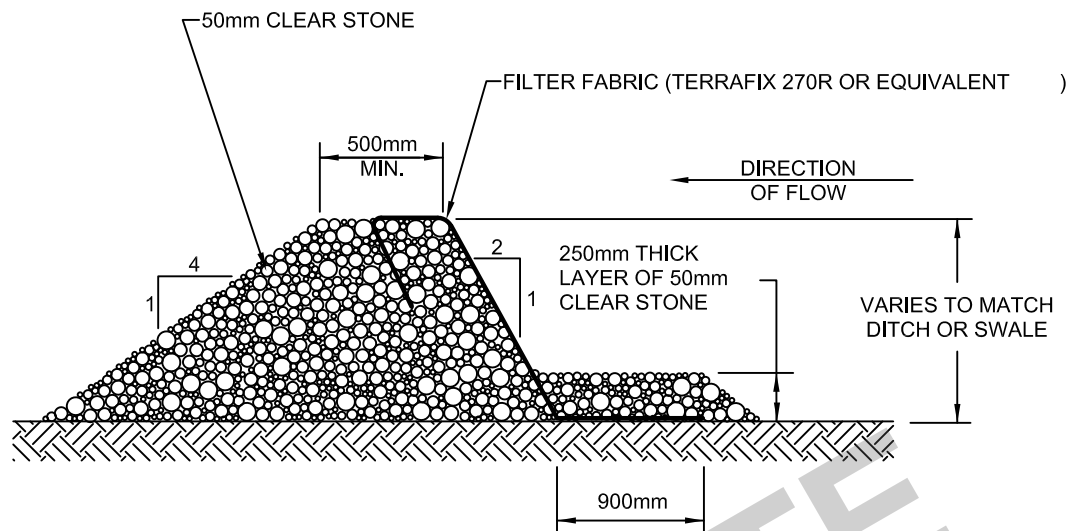
DATE: JUNE 2011

METRIC

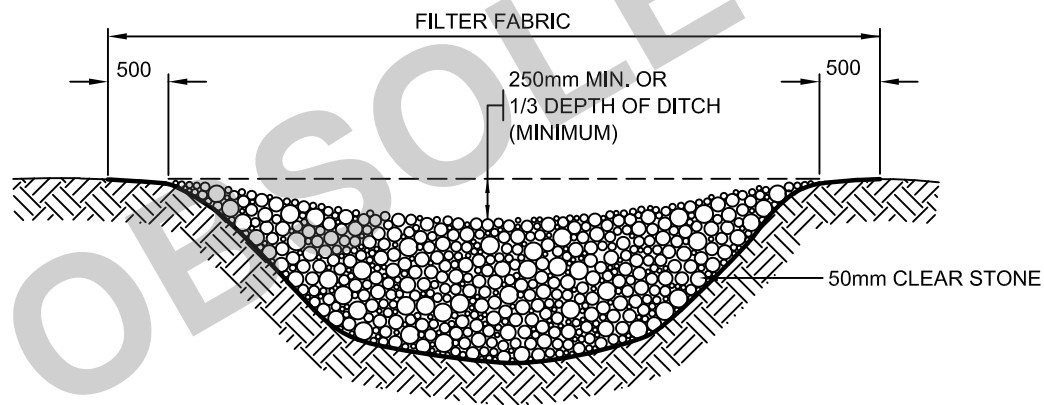
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
410

NO.	REVISIONS	APRD	DATE
3.	REVISED NOTES	TOI	MAY 2019
2.	REVISED TOWN LOGO	TOI	APRIL 2015
1.	REVISE COLOUR OF TEXT FOR READABILITY		MAY/14



SIDE VIEW



FRONT VIEW

NOTES:

1. REGULAR MAINTENANCE MUST BE SCHEDULED FOR THE STONE SILT TRAP.
2. TO BE INSTALLED IN ALL ROADSIDE DITCHES AND DRAINAGE DITCHES AT MAX. 100m SPACING.
3. ACCUMULATED SEDIMENT MUST BE REMOVED PRIOR TO REMOVAL OF FILTER FABRIC.
4. FILTER FABRIC MUST BE REPLACED AS REQUIRED.

3.	DARKENED FILTER FABRIC LINE	TOI	MAY 2019
2.	REVISED TOWN LOGO	TOI	APRIL 2015
1.	250mm MINIMUM OVERFLOW DEPTH		MAR/92
NO.	REVISIONS	APR'D	DATE



**STONE SILT TRAP
FOR ROADSIDE DITCHES
& DRAINAGE DITCHES**

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

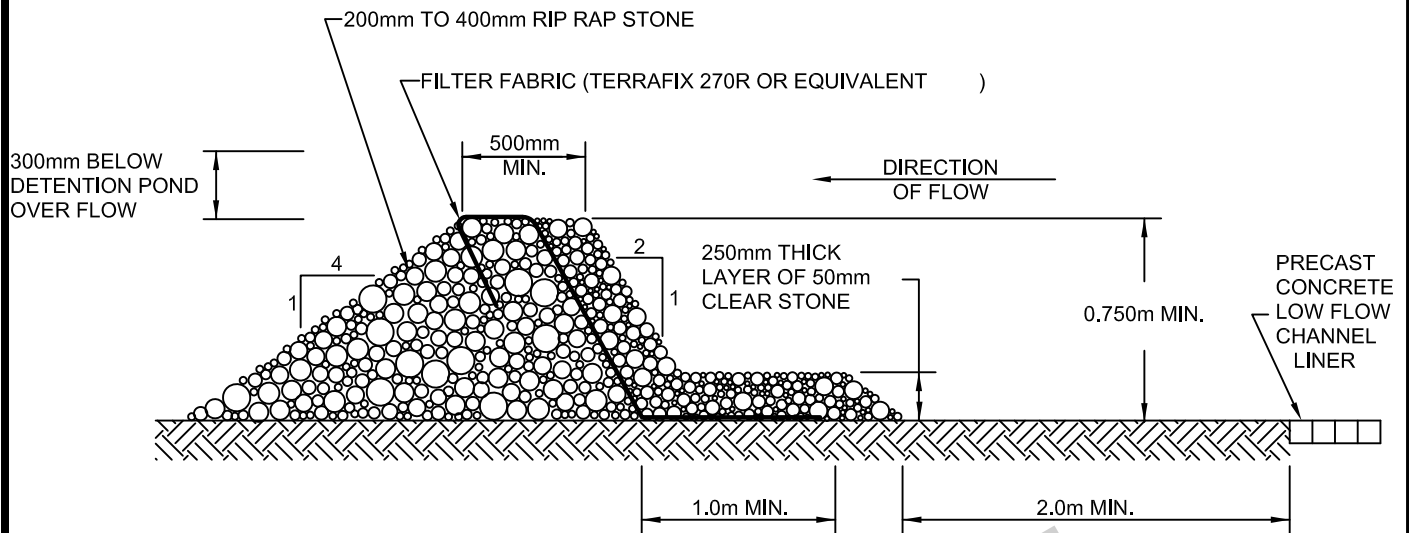
**TOISD
501**

DRAWN: A&A

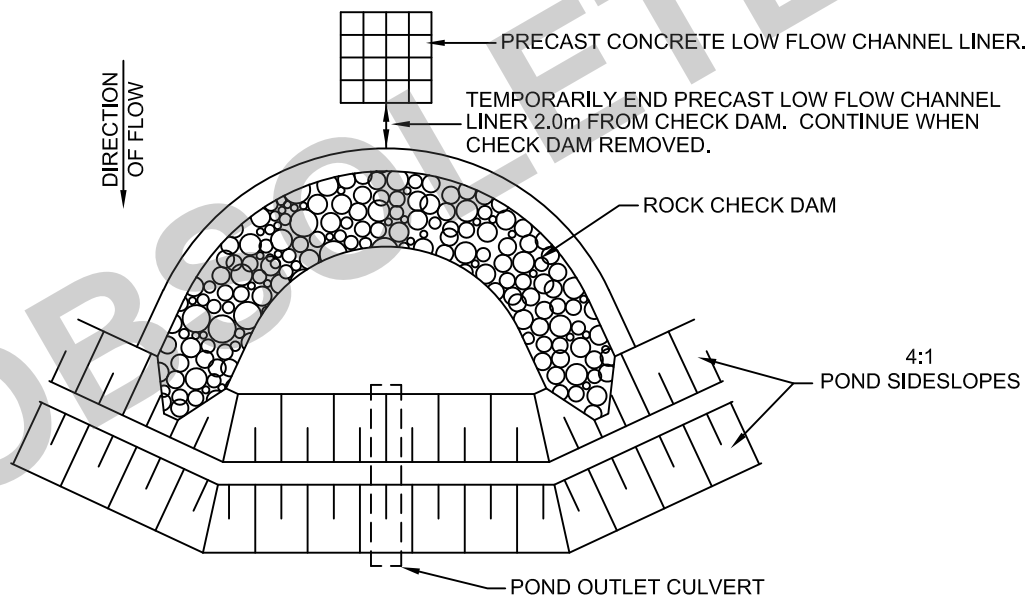
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



ROCK CHECK DAM
SIDE VIEW



ROCK CHECK DAM
PLAN

NOTES:

1. ROCK CHECK DAM TO BE MAINTAINED REGULARLY TO REMOVE ALL SILT UNTIL THE CONSTRUCTION IS COMPLETE.
2. TO BE INSTALLED IN ALL DETENTION PONDS AND STORM OUTLETS.
3. ACCUMULATED SEDIMENT MUST BE REMOVED PRIOR TO REMOVAL OF FILTER CLOTH.
4. FILTER CLOTH MUST BE REPLACED AS REQUIRED.

2.	DARKENED FILTER FABRIC LINE REVISED HATCH PATTERN	TOI	MAY 2019
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



**TEMPORARY ROCK CHECK DAM
FOR DETENTION PONDS
& STORM OUTLETS**

DRAWN: A&A

SCALE: N.T.S.

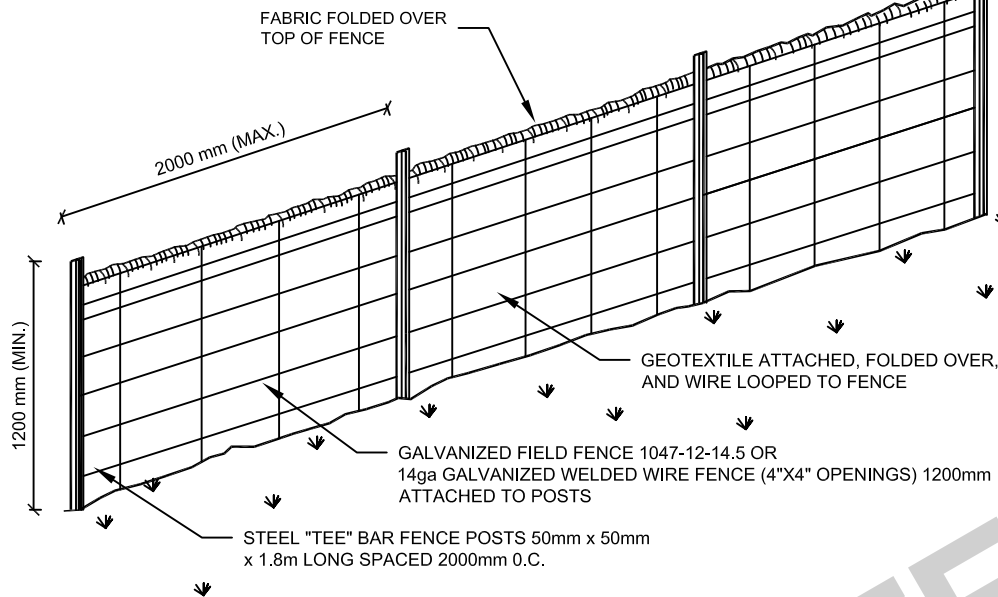
APR'D:

DATE: JUNE 2011

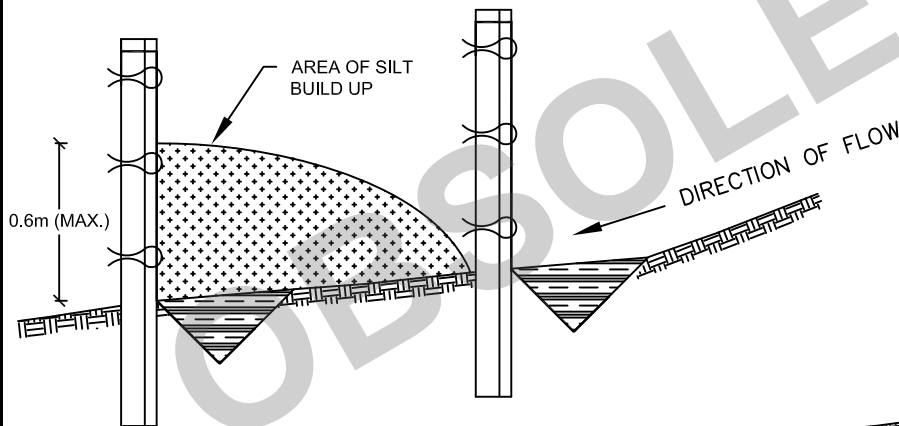
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
502**

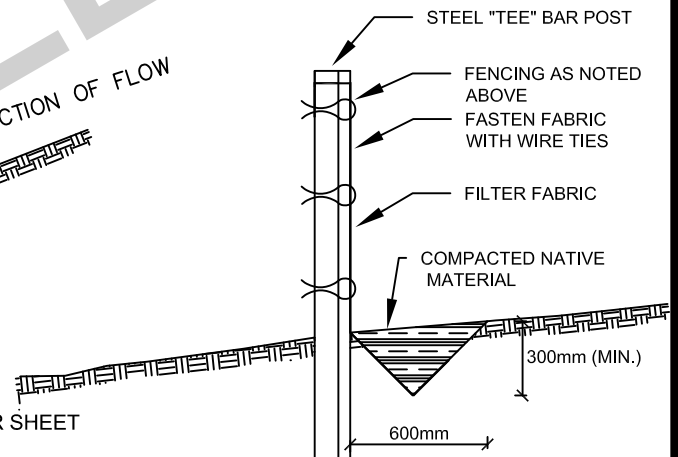
TYPICAL SILT FENCE SET-UP



REPLACEMENT FENCE LOCATION



SILT FENCE PROFILE



NOTES:

1. SILT CONTROL FENCE SHALL BE ALIGNED WITH CONTOURS FOR SHEET OVERLAND FLOW.
2. SILT CONTROL FENCE SHALL BE USED IN AREAS OF LOW SEDIMENT YIELD ON SLOPE THAT CONFORM TO MTO DRAINAGE MANUAL VOLUME 2 "CHART F4-3C TOPOGRAPHIC FACTOR LS BASED ON SLOPE LENGTH AND GRADIENT."
3. SILT CONTROL FENCE SHALL BE INSTALLED WITH FILTER FABRIC EXTENDING TO A HEIGHT OF 1200mm AND TOED INTO THE SOIL A MINIMUM DEPTH OF 300mm BY EITHER STATIC SLICING OR TRENCH METHODS WITH COMPACTION OF TRENCH MATERIAL MEETING 95% INSITU SOIL STRENGTH.
4. STEEL "TEE" BAR POSTS ARE TO BE SPACED MAX. 2.0m ON CENTRE.
5. FILTER FABRIC SHALL BE BACKFILLED WITH COMPACTED 19mm CRUSHER RUN LIMESTONE IN FROZEN CONDITIONS.
6. GEOTEXTILE FABRIC SHALL BE TERRATEX SD NON-WOVEN OR APPROVED EQUIVALENT COMPOSED OF NON-WOVEN U.V. STABILIZED MATERIAL.
7. FILTER FABRIC SHALL BE FOLDED OVER THE TOP OF THE FENCE AND FASTENED AT 300mm INTERVALS.

1.	REVISED NOTES	TOI	MAY 2019
NO.	REVISIONS	APR'D	DATE



SILTATION CONTROL FENCING

DRAWN: A&A

SCALE: N.T.S.

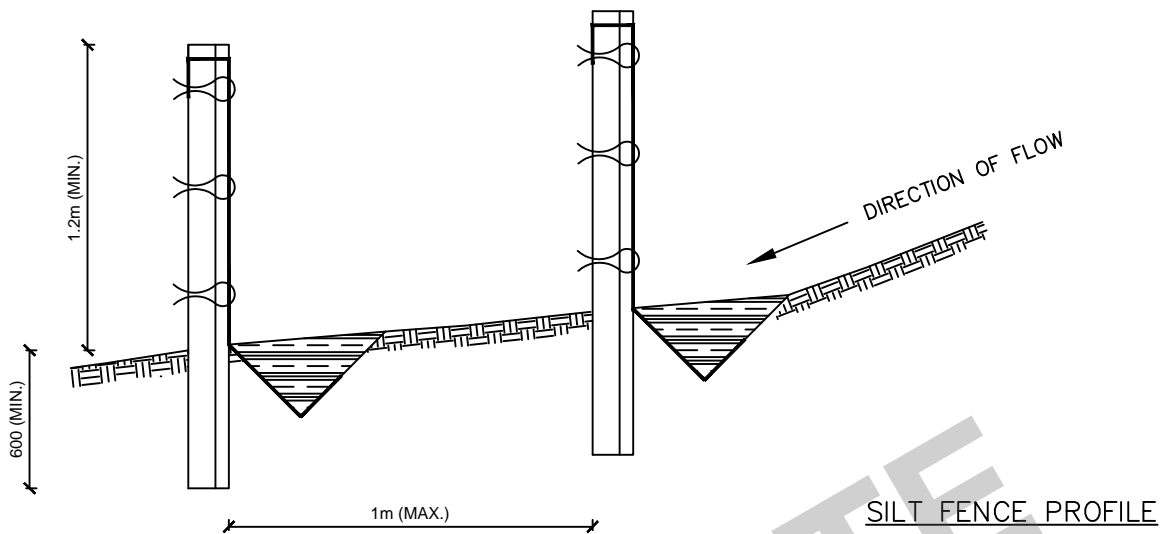
APR'D:

DATE: APRIL 2015

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
503

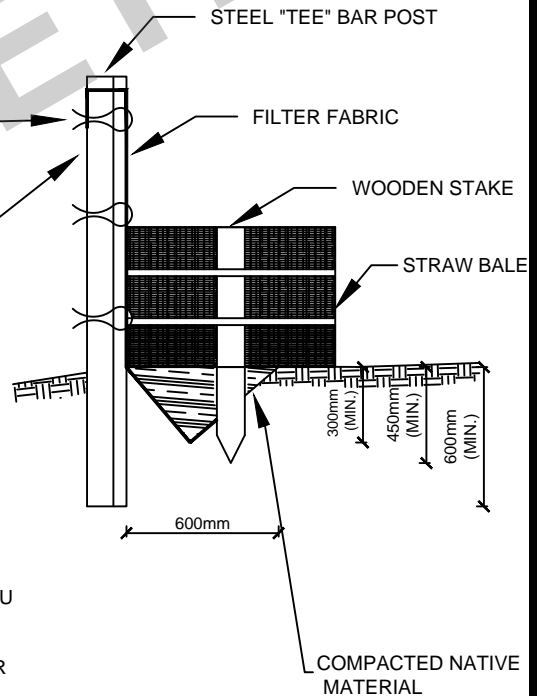
DOUBLE SILT FENCE DETAIL



GALVANIZED FIELD FENCE 1047-12-14.5 OR
14ga GALVANIZED WELDED WIRE FENCE (4"X4" OPENINGS) 1200mm
ATTACHED TO POSTS

NOTES:

1. SILT CONTROL FENCE SHALL BE ALIGNED WITH CONTOURS FOR SHEET OVERLAND FLOW.
2. SILT CONTROL FENCE SHALL BE USED IN AREAS OF LOW SEDIMENT YIELD ON SLOPE THAT CONFORM TO MTO DRAINAGE MANUAL VOLUME 2 "CHART F4-3C TOPOGRAPHIC FACTOR LS BASED ON SLOPE LENGTH AND GRADIENT."
3. SILT CONTROL FENCE SHALL BE INSTALLED WITH FILTER FABRIC EXTENDING TO A HEIGHT OF 1200mm AND TOED INTO THE SOIL A MINIMUM DEPTH OF 300mm BY EITHER STATIC SLICING OR TRENCH METHODS WITH COMPACTION OF TRENCH MATERIAL MEETING 95% INSITU SOIL STRENGTH.
4. STEEL "TEE" BAR POSTS ARE TO BE SPACED MAX. 2000mm ON CENTRE.
5. FILTER FABRIC SHALL BE BACKFILLED WITH COMPACTED 19mm CRUSHER RUN LIMESTONE IN FROZEN CONDITIONS.
6. GEOTEXTILE FABRIC SHALL BE TERRATEX SD NON-WOVEN OR APPROVED EQUIVALENT COMPOSED OF NON-WOVEN U.V. STABILIZED MATERIAL.
7. FILTER FABRIC SHALL BE FOLDED OVER THE TOP OF THE FENCE AND FASTENED AT 300mm INTERVALS.
8. 2" BY 2" WOODEN STAKE OR #4 REBAR, 2 PER BALE INSTALLED A MINIMUM OF 450mm DEEP
9. STAKE OR REBAR SHALL BE INSTALLED SUCH THAT THE TOP IS FLUSH WITH THE TOP OF STRAW BALE TO DECREASE THE RISK FOR UNJURY



NO.	REVISIONS	APR'D	DATE



SILTATION CONTROL FENCING (ALTERNATE)

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

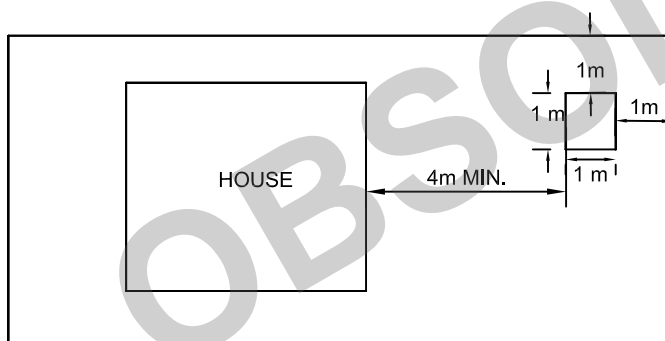
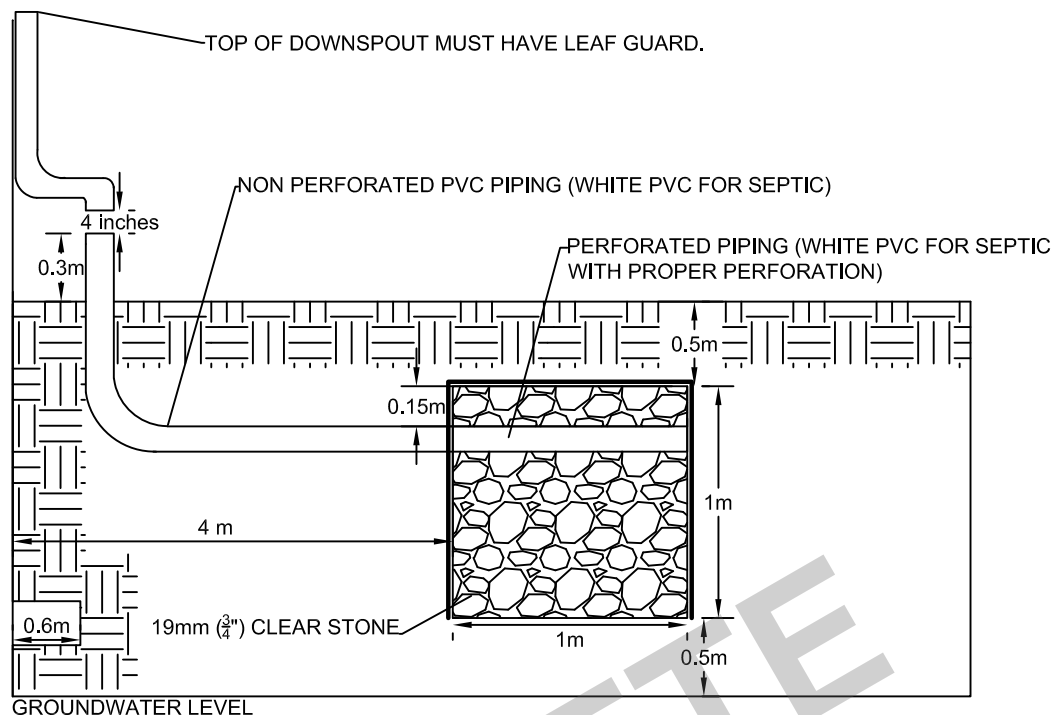
DRAWN: TOI

APR'D:

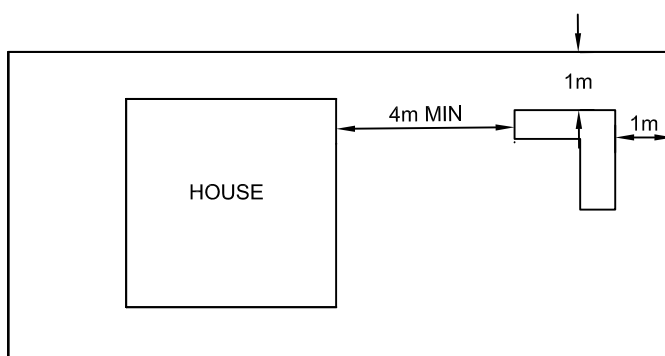
SCALE: N.T.S.

DATE: APRIL 2015

TOISD
504



1. SOAKAWAY PITS ARE TO BE MIN 2M³ (2X1X1)
2. FILTER FABRIC IS TO ONLY BE LOCATED ON THE SIDES AND TOP OF THE PROPOSED PIT.
3. LARGE SOAKAWAY PITS MAY REQUIRE A PIPE HEADER AND MULTIPLE LEADERS IN THE PIT TO DISTRIBUTE RUNOFF
4. MINIMUM OFFSET FROM ANY PROPERTY LINE IS 1.0M. MINIMUM OFFSET FROM HOUSE IS 5.0M.



2.	ADDED NOTE 4, FILTER FABRIC	TOI	MAY 2019
1.	REVISED TO REFLECT OBC	TOI	APRIL 2018
NO.	REVISIONS	APR'D	DATE



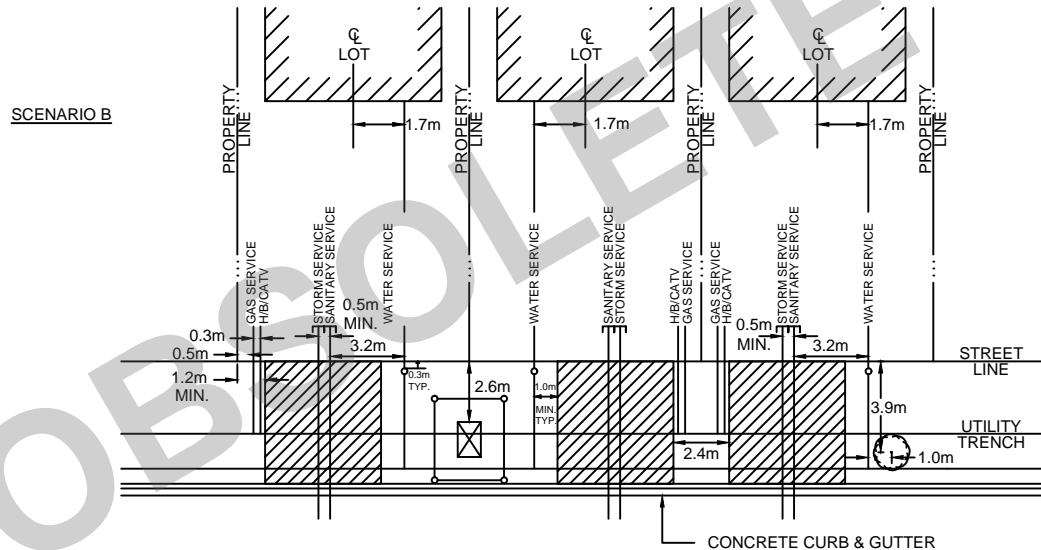
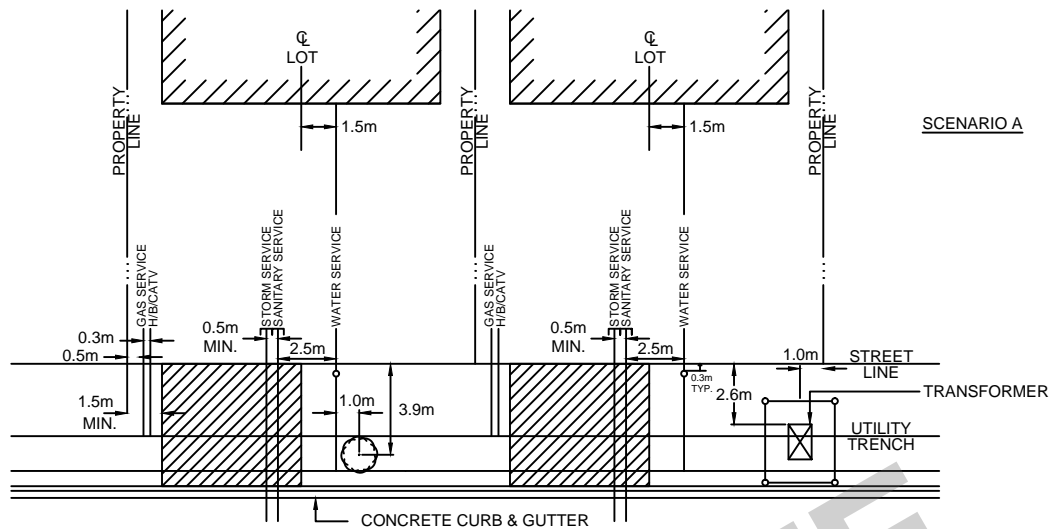
SOAKAWAY PIT DETAIL

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
506**

DRAWN: A&A
SCALE: N.T.S.

APR'D:
DATE: APRIL 2015



NOTES

1. TYPICAL DRIVEWAY MAXIMUM WIDTH IS 60% OF LOT FRONTAGE BUT NOT MORE THAN 9m. ZONING BY-LAW REGULATIONS APPLY.
2. TRANSFORMER SPACE TO BE USED ALTERNATIVELY BY HYDRANTS OR STREET LIGHTS.
3. SERVICE LATERALS TO BE INSTALLED PERPENDICULAR TO THE MAINS.
4. REFER TO TOISD 605 FOR SANITARY AND STORM SERVICE CONNECTION DETAIL.
5. REFER TO TOISD 705 FOR WATER SERVICE CONNECTION DETAIL.
6. FOR LOTS LESS THAN 14.0m WIDE & WHERE ROAD GRADE IS 2.5% OR LESS, DRIVEWAYS MUST BE PAIRED AS PER SCENARIO B.
7. FOR LOTS 14.0m AND GREATER IN WIDTH OR WHERE ROAD GRADE EXCEEDS 2.5%, DRIVEWAYS MUST BE AS PER SCENARIO A.
8. WATER SERVICE LINES MUST BE POSITIONED MIN. 0.5M ABOVE SANITARY AND STORM SERVICE LEVEL IF HORIZONTAL SEPARATION IS LESS THAN 2.5M.

NO.	REVISIONS	APR'D	DATE
3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED WATER LATERAL LENGTH	TOI	APRIL 2015



TYPICAL DETACHED UNIT SERVICE ARRANGEMENT

DRAWN: A&A

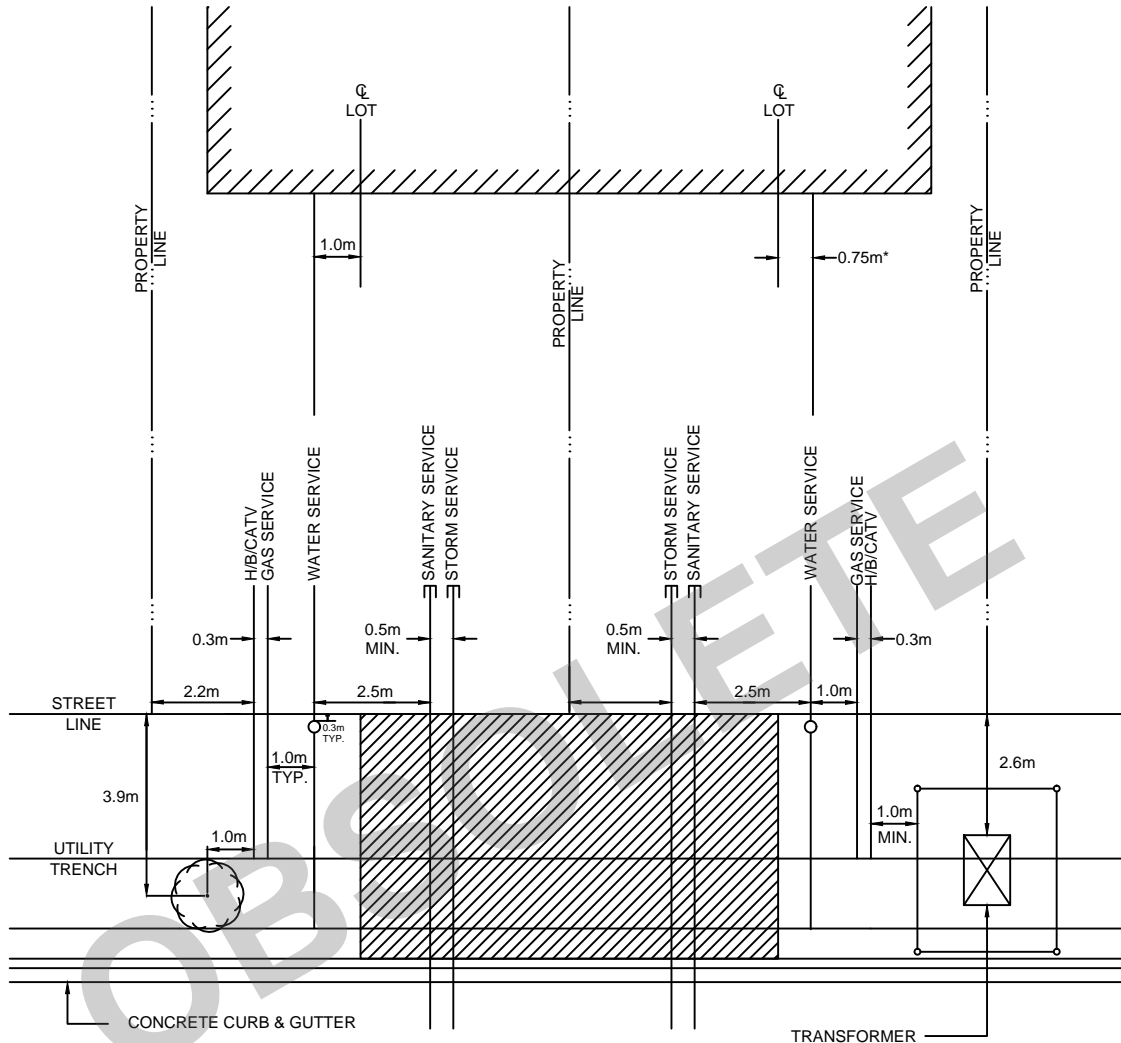
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
601**



NOTES

1. TYPICAL DRIVEWAY MAXIMUM WIDTH IS 60% OF LOT FRONTAGE BUT NOT MORE THAN 9m. ZONING BY-LAW REGULATIONS APPLY.
2. TRANSFORMER SPACE TO BE USED ALTERNATIVELY BY HYDRANTS OR STREET LIGHTS.
3. SERVICE LATERALS TO BE INSTALLED PERPENDICULAR TO THE MAINS.
4. REFER TO TOISD 605 FOR SANITARY AND STORM SERVICE CONNECTION DETAIL.
5. REFER TO TOISD 705 FOR WATER SERVICE CONNECTION DETAIL.
6. **WATER SERVICE MUST BE POSITIONED MIN. 0.5M ABOVE SANITARY AND STORM LEVEL IF HORIZONTAL SEPARATION IS LESS THAN 2.5M.**

*MINIMUM HORIZONTAL DISTANCE OF 1.0m REQUIRED BETWEEN WATER SERVICE AND DRIVEWAY WHEN TRANSFORMER IS NOT PRESENT.

3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED WATER LATERAL LENGTH	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TYPICAL SEMI-DETACHED UNIT SERVICE ARRANGEMENT DRIVEWAYS SIDE BY SIDE

DRAWN: A&A

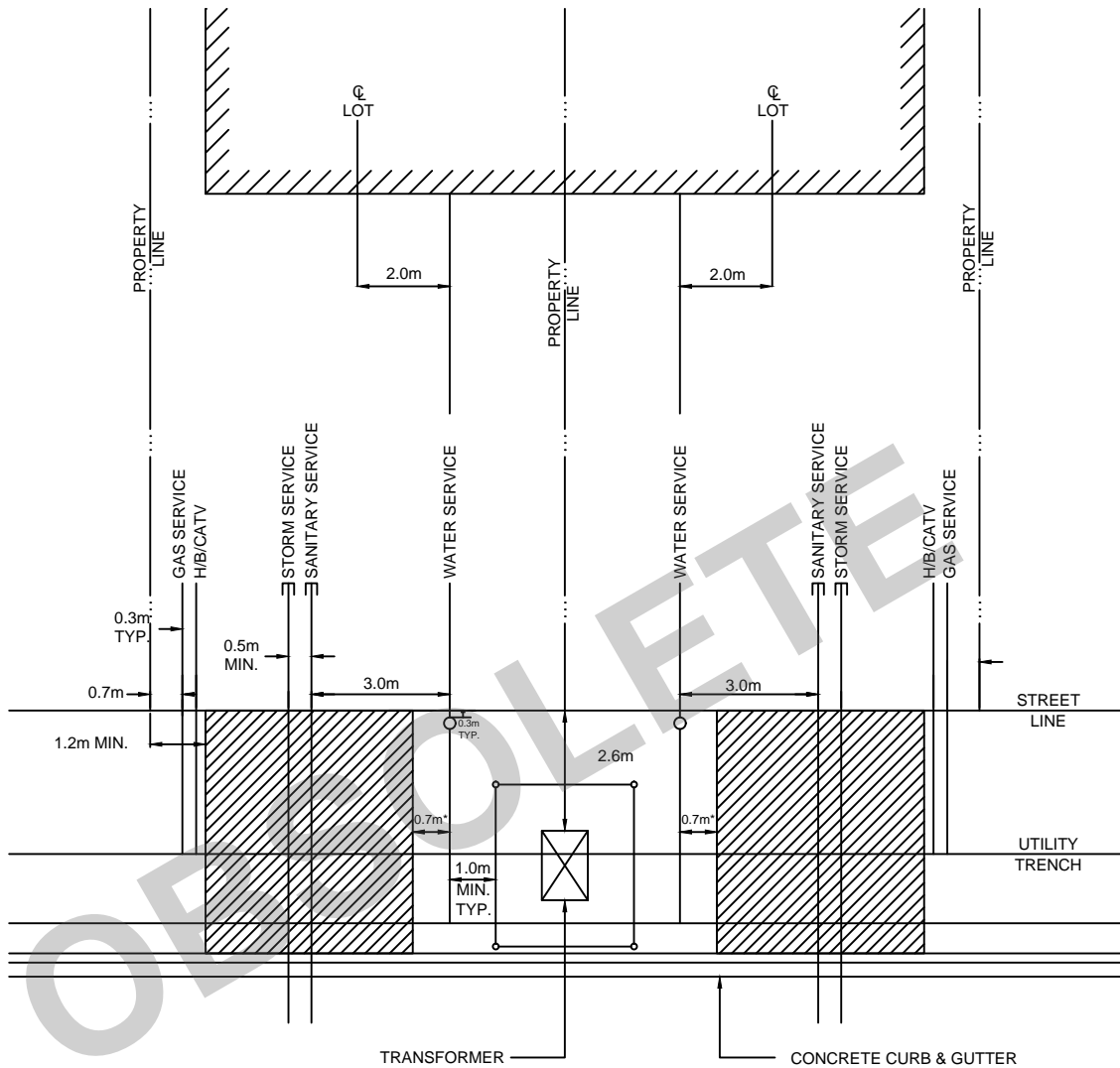
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
602**



NOTES

1. TYPICAL DRIVEWAY MAXIMUM WIDTH IS 60% OF LOT FRONTAGE BUT NOT MORE THAN 9m. ZONING BY-LAW REGULATIONS APPLY.
2. TRANSFORMER SPACE TO BE USED ALTERNATIVELY BY HYDRANTS OR STREET LIGHTS.
3. SERVICE LATERALS TO BE INSTALLED PERPENDICULAR TO THE MAINS.
4. REFER TO TOISD 605 FOR SANITARY AND STORM SERVICE CONNECTION DETAIL.
5. REFER TO TOISD 705 FOR WATER SERVICE CONNECTION DETAIL.
6. **WATER SERVICE LINES MUST BE POSITIONED MIN 0.5M ABOVE SANITARY AND STORM SERVICE LEVEL IF HORIZONTAL SEPARATION IS LESS THAN 2.5M.**

*MINIMUM HORIZONTAL DISTANCE OF 1.0m REQUIRED BETWEEN WATER SERVICE AND DRIVEWAY WHEN TRANSFORMER IS NOT PRESENT.

3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED WATER LATERAL LENGTH	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TYPICAL SEMI-DETACHED UNIT SERVICE ARRANGEMENT DRIVEWAYS ON OPPOSITE SIDES

DRAWN: A&A

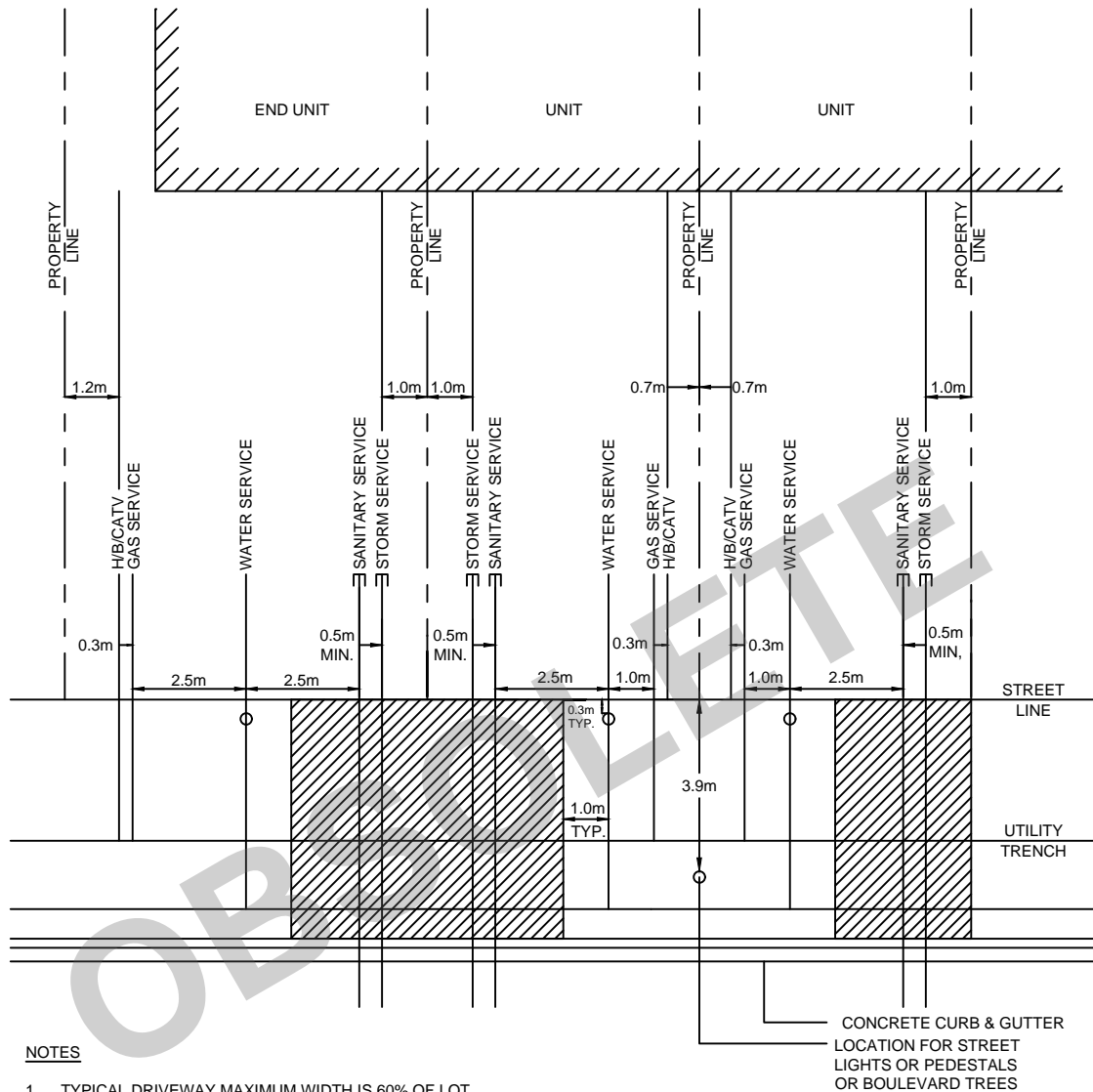
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
603**



NOTES

1. TYPICAL DRIVEWAY MAXIMUM WIDTH IS 60% OF LOT FRONTAGE BUT NOT MORE THAN 9m. ZONING BY-LAW REGULATIONS APPLY.
2. TRANSFORMER SPACE TO BE USED ALTERNATIVELY BY HYDRANTS OR STREET LIGHTS.
3. SERVICE LATERALS TO BE INSTALLED PERPENDICULAR TO THE MAINS.
4. REFER TO TOISD 605 FOR SANITARY AND STORM SERVICE CONNECTION DETAIL.
5. REFER TO TOISD 705 FOR WATER SERVICE CONNECTION DETAIL.
6. WATER SERVICE LINES MUST BE POSITIONED MIN. 0.5M ABOVE SANITARY AND STORM SERVICE LEVEL IF HORIZONTAL SEPARATION IS LESS THAN 2.5M.

3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED WATER LATERAL LENGTH	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TYPICAL TOWNHOUSE UNIT SERVICE ARRANGEMENT

DRAWN: A&A

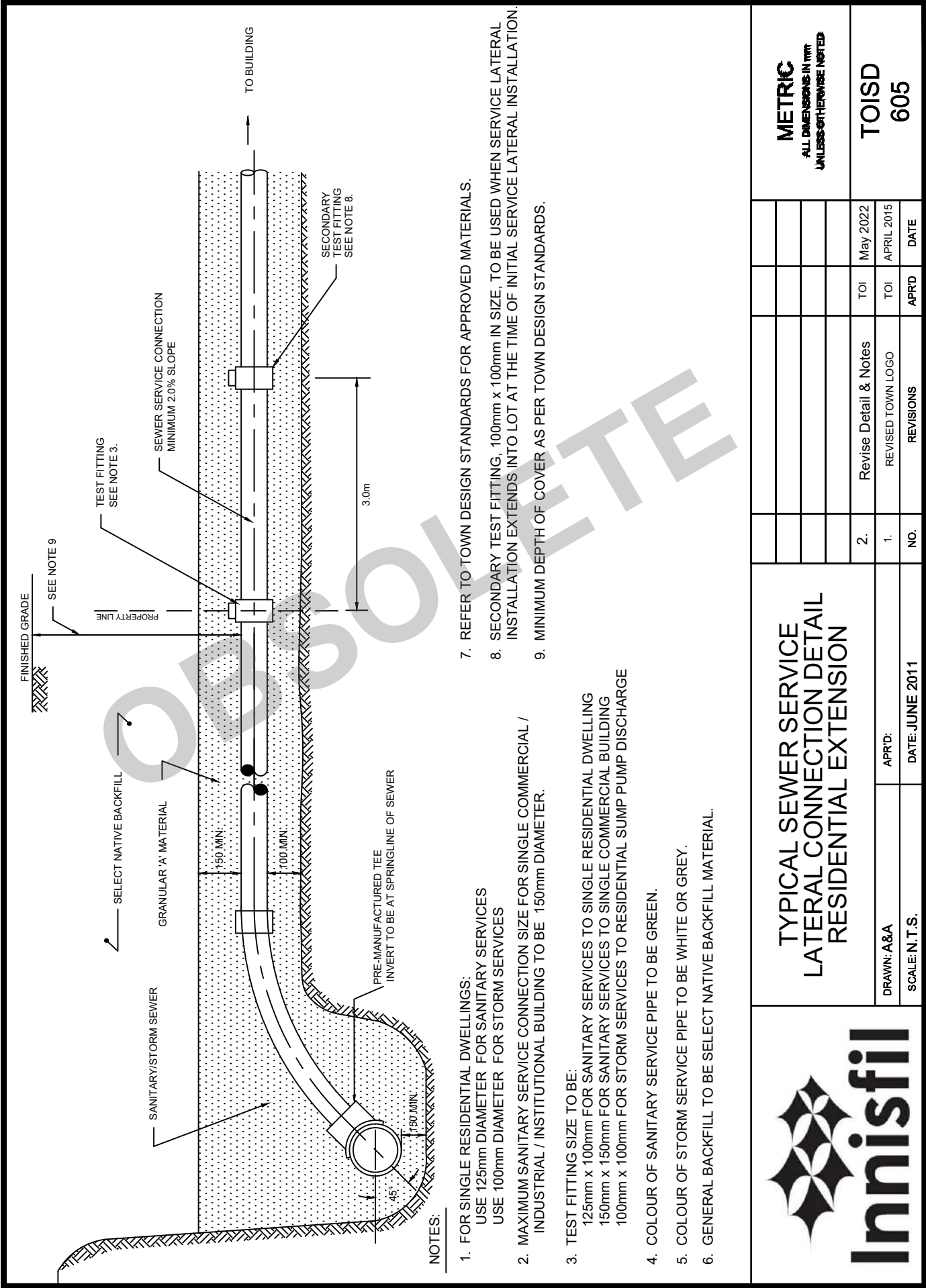
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
604**



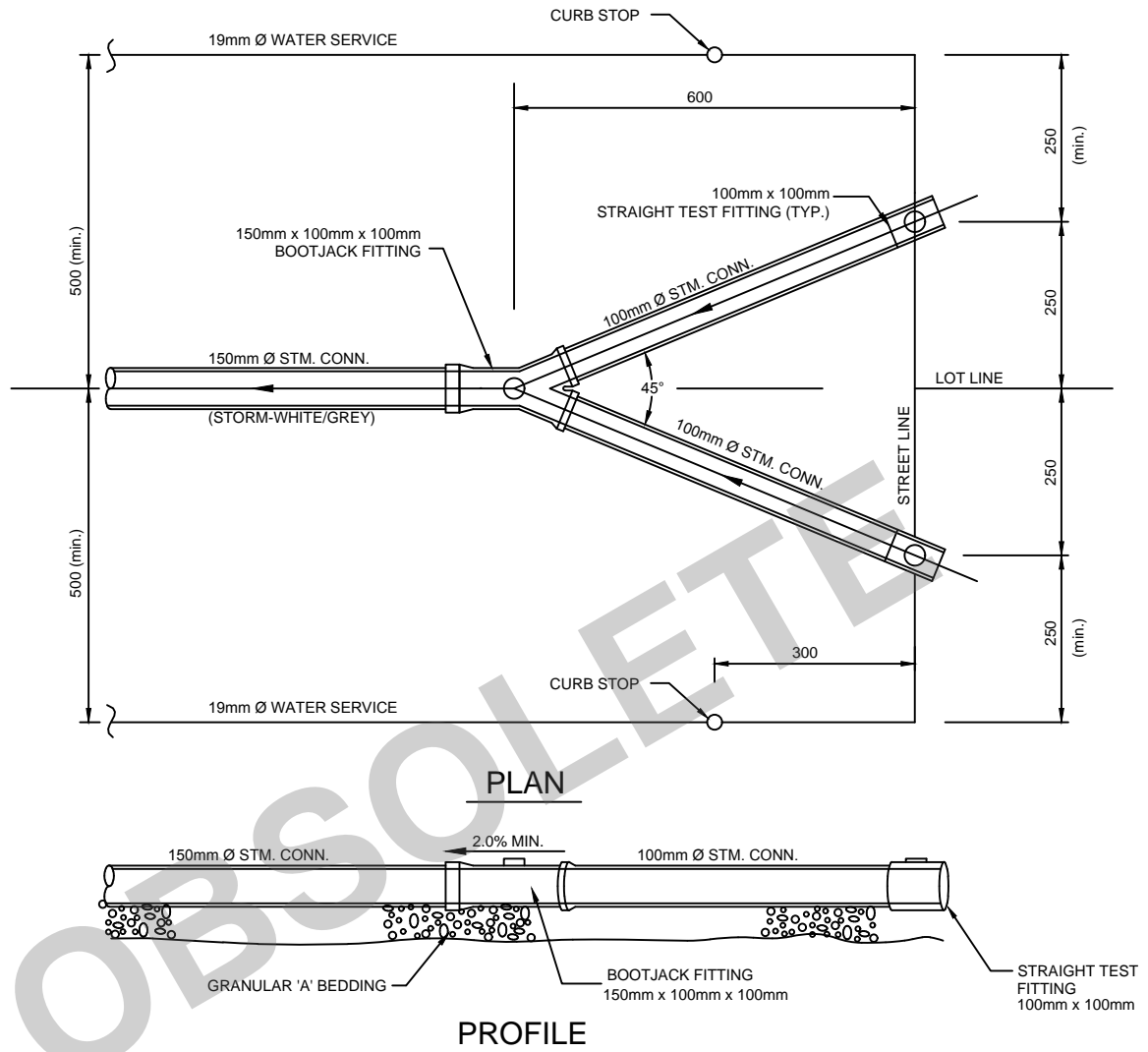
TYPICAL SEWER SERVICE LATERAL CONNECTION DETAIL RESIDENTIAL EXTENSION

DRAWN: A&A
SCALE: N.T.S.
APRD:
DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
605

NO.	REVISIONS	APRD	DATE
2.	Revise Detail & Notes	TOI	May 2022
1.	REVISED TOWN LOGO	TOI	APRIL 2015



NOTES

1. MINIMUM DEPTH OF COVER AS PER TOWN DESIGN STANDARDS.
2. REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS.
3. BEDDING & BACKFILL AS PER OPSD 802.010.

1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TYPICAL DOUBLE STORM SEWER TOWNHOUSE SERVICE CONNECTION

DRAWN: A&A

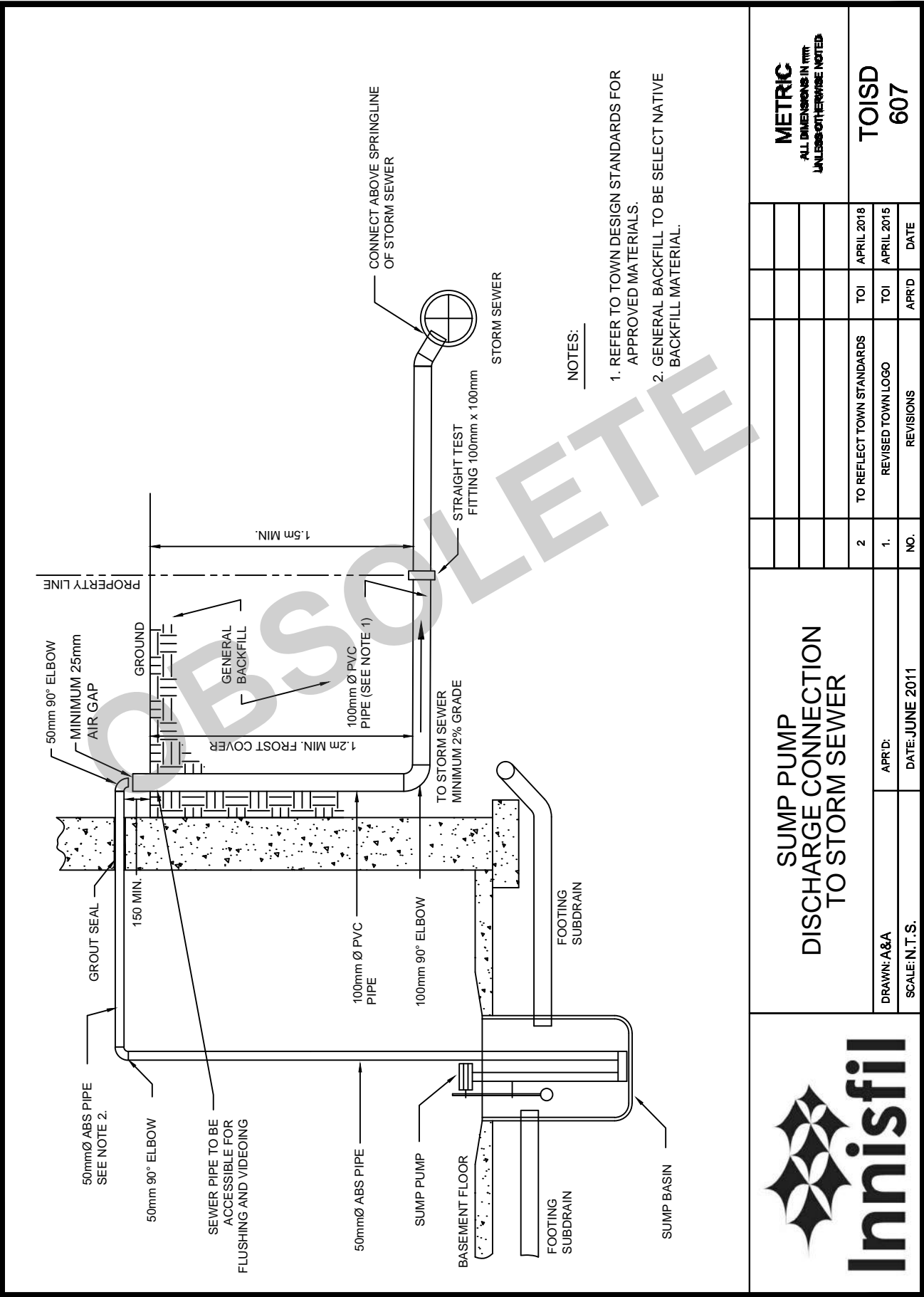
APR'D:


SCALE: N.T.S.

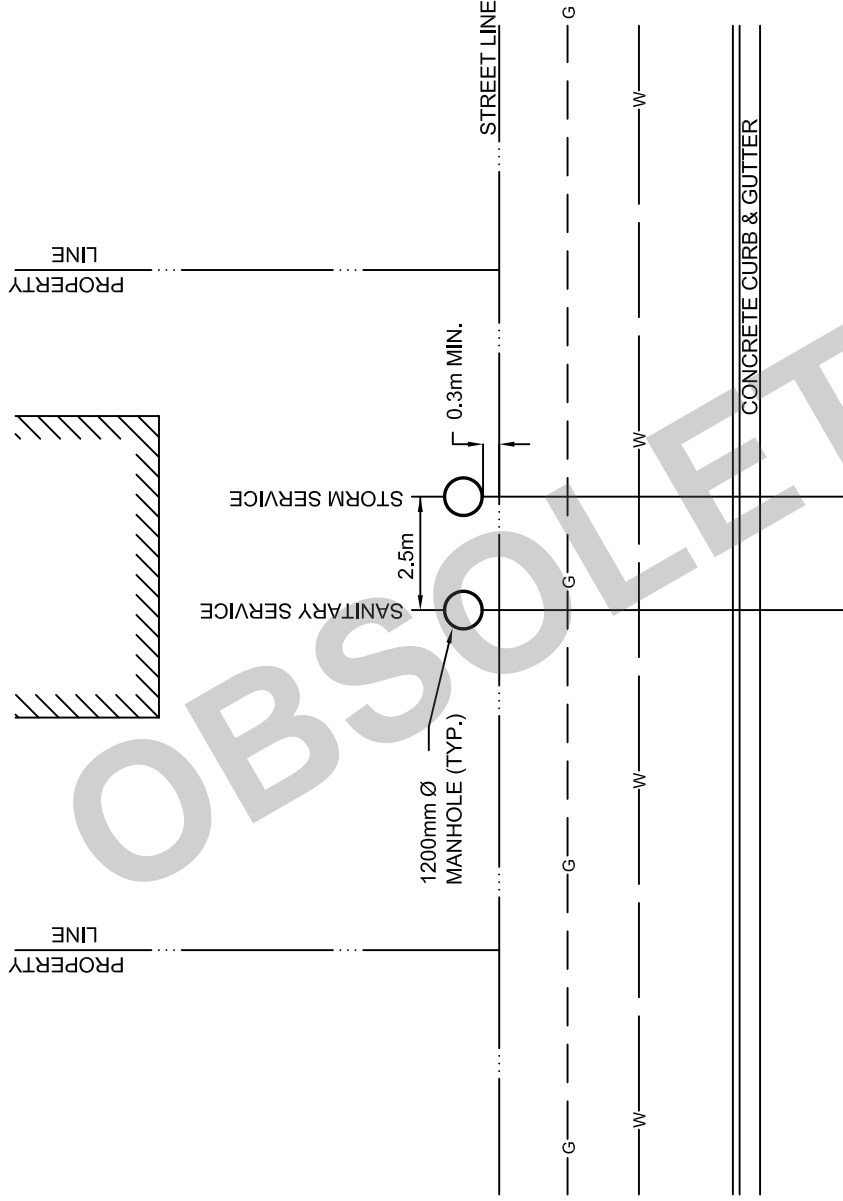
DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
606**




		SUMP PUMP DISCHARGE CONNECTION TO STORM SEWER		METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED	
				TOISD 607	
DRAWN: A&A		APR'D:		TOI	APRIL 2018
SCALE: N.T.S.		DATE: JUNE 2011		TOI	APRIL 2015
				APR'D	DATE
				TO REFLECT TOWN STANDARDS	
				REVISED TOWN LOGO	
				REVISIONS	
				NO.	
				1.	
				2	



NOTES

1. MANHOLE LOCATION TO BE APPROVED BY THE TOWN.
2. ALL STORM AND SANITARY MANHOLES TO BE OPSD 701.010

	SERVICE MANHOLES NON-RESIDENTIAL OR MULTI-RESIDENTIAL			METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED		
	DRAWN: A&A	APR'D:		2.	REVISED NOTE 2	TOI
	SCALE: N.T.S.	DATE: JUNE 2011		1.	REVISED TOWN LOGO	TOI
				NO.	REVISIONS	APRD
						MAY 2019
						APRIL 2015
						DATE
						TOISD 608

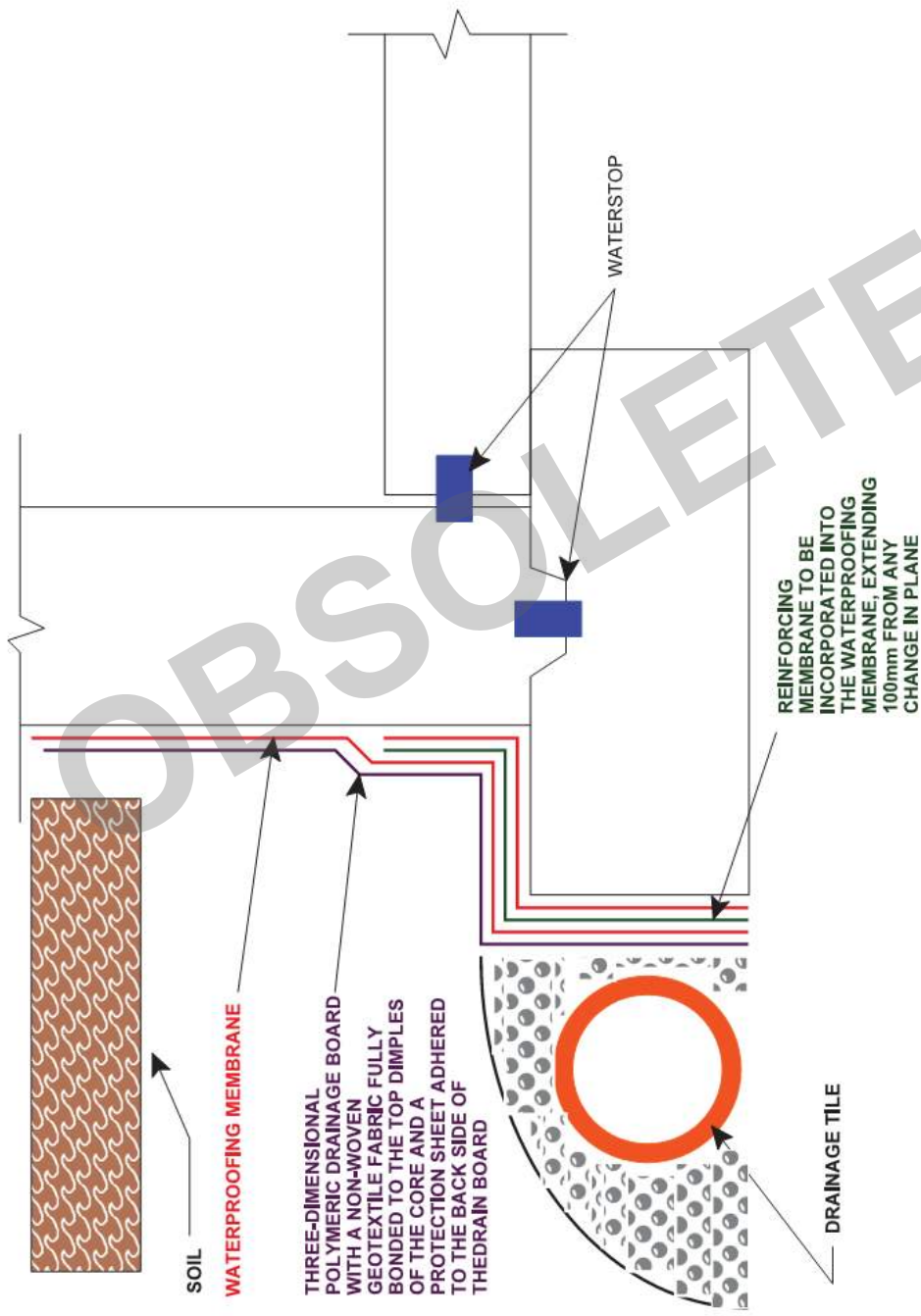


- 
- Innisfil**

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
609

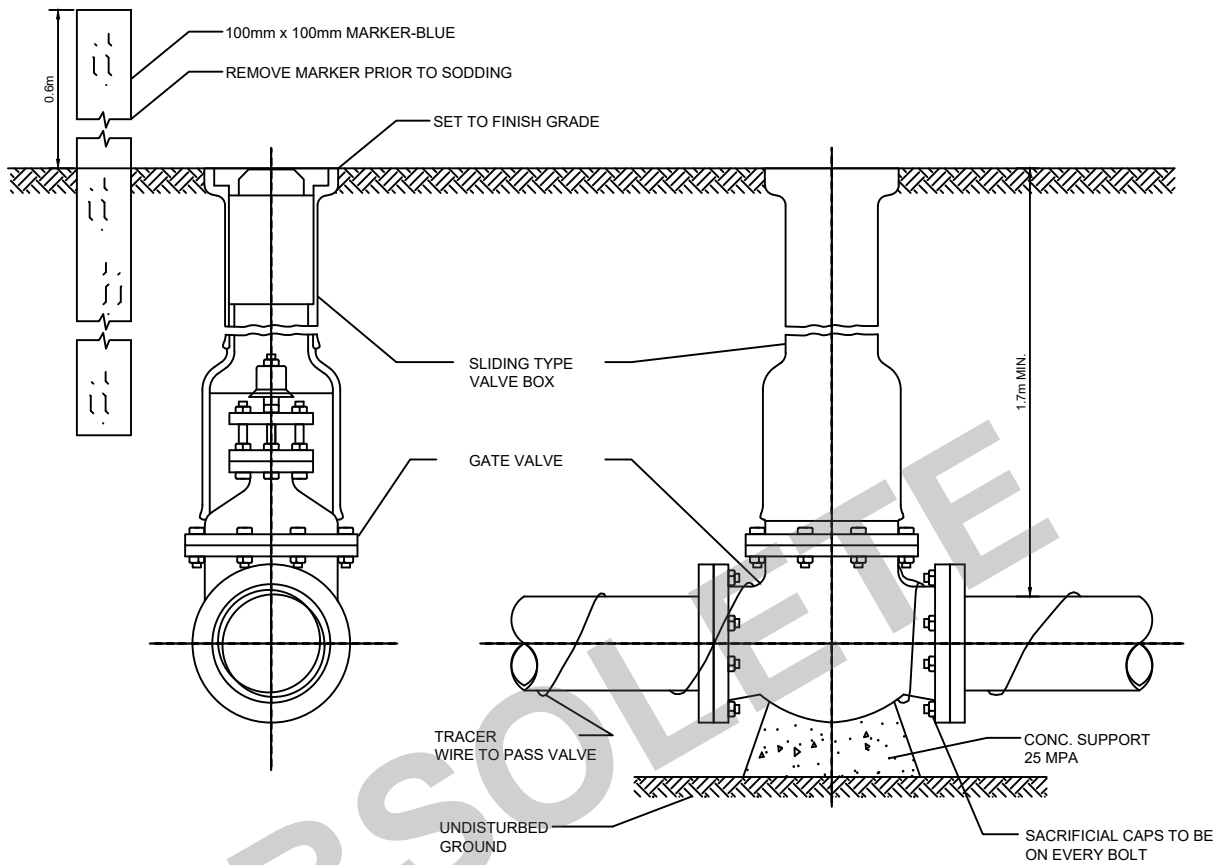
DRAWN: A&A		APR'D:		2.	REVISE NOTES 1, 3 AND 4	TOI	FEB 2022
SCALE: N.T.S.		DATE: APRIL 2018		1.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
				NO.	REVISIONS	APR'D	DATE



FOUNDATION WALL TYPICAL WATERPROOFING DETAIL

DRAWN: A&A
SCALE: N.T.S.
APRD:
DATE: APRIL 2018

METRIC				TOISD			
ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED				610			
						APRIL 2018	
						APRD	DATE
						TOI	
						TO REFLECT TOWN STANDARDS	
						REVISIONS	
1.						NO.	



NOTES

1. VALVE TO HAVE MECHANICAL JOINTS WITH RESTRAINERS.
2. PROVIDE BOND BREAKER BETWEEN CONCRETE AND VALVE BODY.
3. REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS.
4. NO VALVES TO BE INSTALLED IN THE DRIVEWAY.

3.	DELETE TRACER WIRE TO SURFACE	TOI	MAY 2021
2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



GATE VALVE AND EXTENDABLE VALVE BOX

DRAWN: A&A

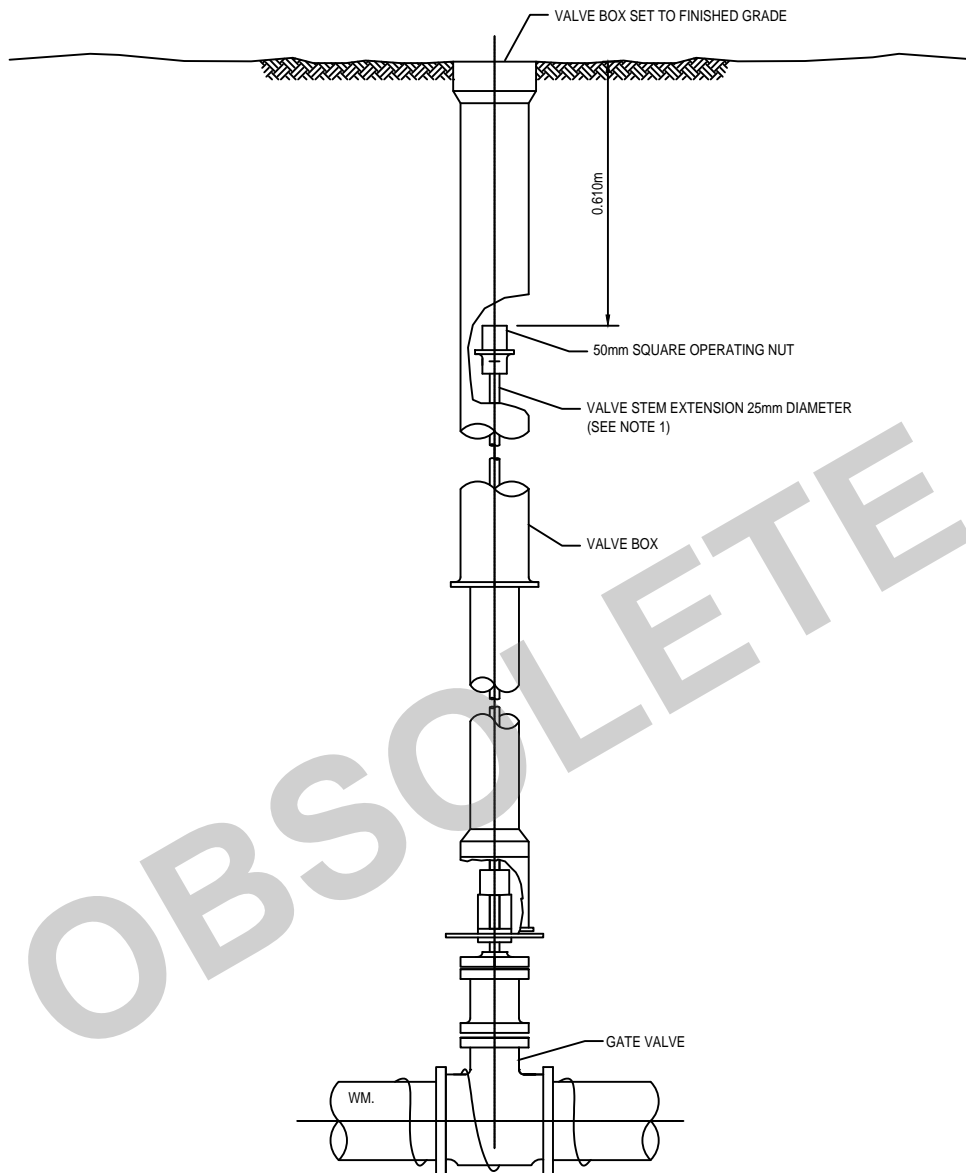
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
701**



NOTES

1. EXTENSION REQUIRED WHEN DISTANCE FROM TOP OF VALVE TO FINISHED GRADE IS MORE THAN 2.40m.
2. REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS.
3. ASPHALT TO BE PLACED AROUND ALL MAIN LINE AND SECONDARY VALVES THAT ARE WITHIN GRAVEL PORTIONS OF ROADWAYS.

2.	NOTES REVISED	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



STANDARD VALVE STEM & BOX

DRAWN: A&A

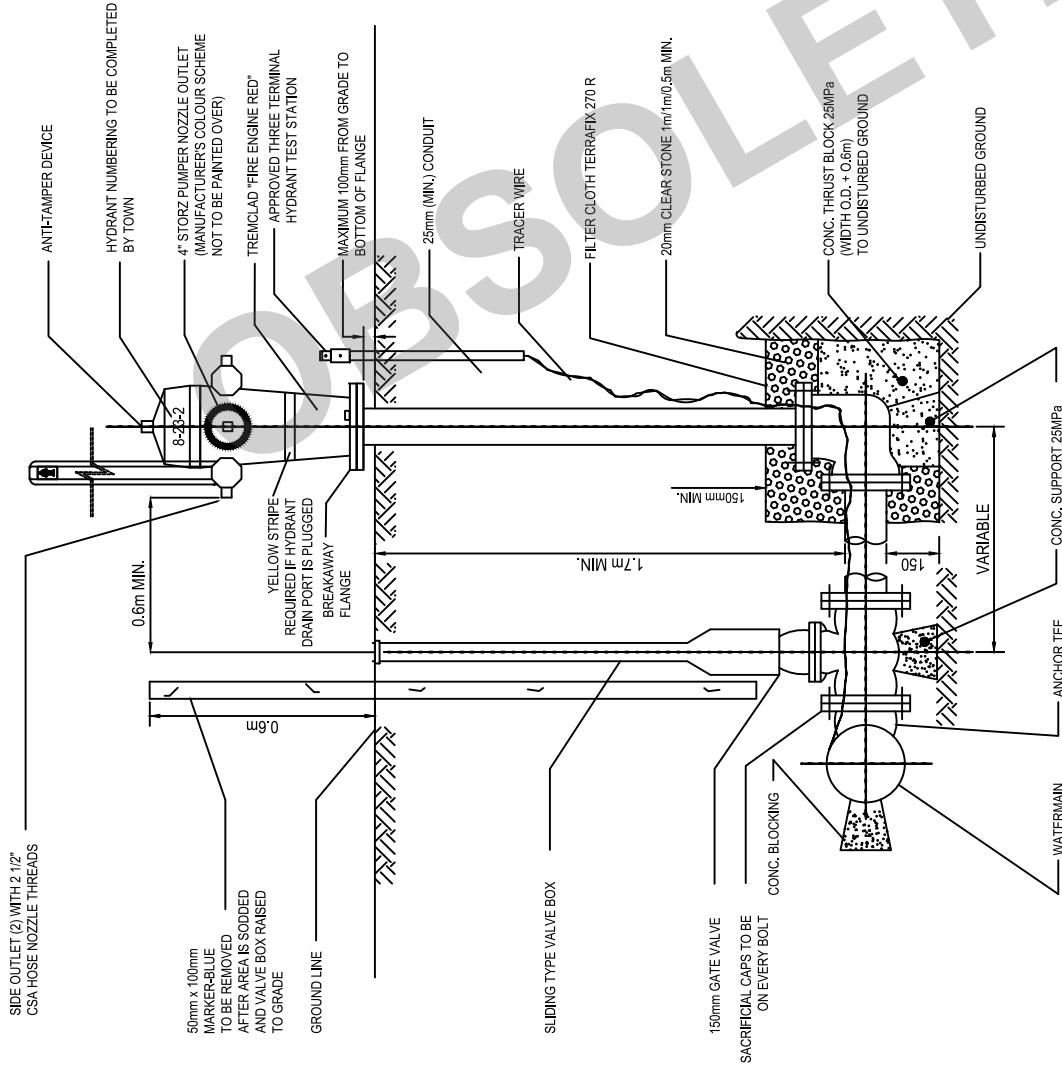
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
702**



NOTES

- REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS.
- REFER TO TOWN DESIGN STANDARDS FOR HYDRANT PAINTING REQUIREMENTS.
- ALL HYDRANTS ARE SELF DRAINING UNLESS OTHERWISE SPECIFIED.
- HYDRANT MARKER TO BE 48" IN HEIGHT AND FLUORESCENT YELLOW IN COLOUR. MARKER TO BE ATTACHED TO SIDE PORT OF HYDRANT.
- ALL MECHANICAL JOINTS TO BE RESTRAINED.
- PROVIDE BOND BREAKER BETWEEN CONCRETE AND FITTINGS.
- SACRIFICIAL CAPS ARE TO BE PROVIDED ON EVERY BOLT OF ALL MECHANICAL JOINTS AND RESTRAINERS.
- TO BE PAINTED AS PER SECTION 6.25.7.
- ALL NUTS ARE TO BE ZINC UNLESS OTHERWISE APPROVED.
- ALL HYDRANTS ARE TO FACE ADJACENT PAVED SURFACE.

(FRONT VIEW)

(SIDE VIEW)



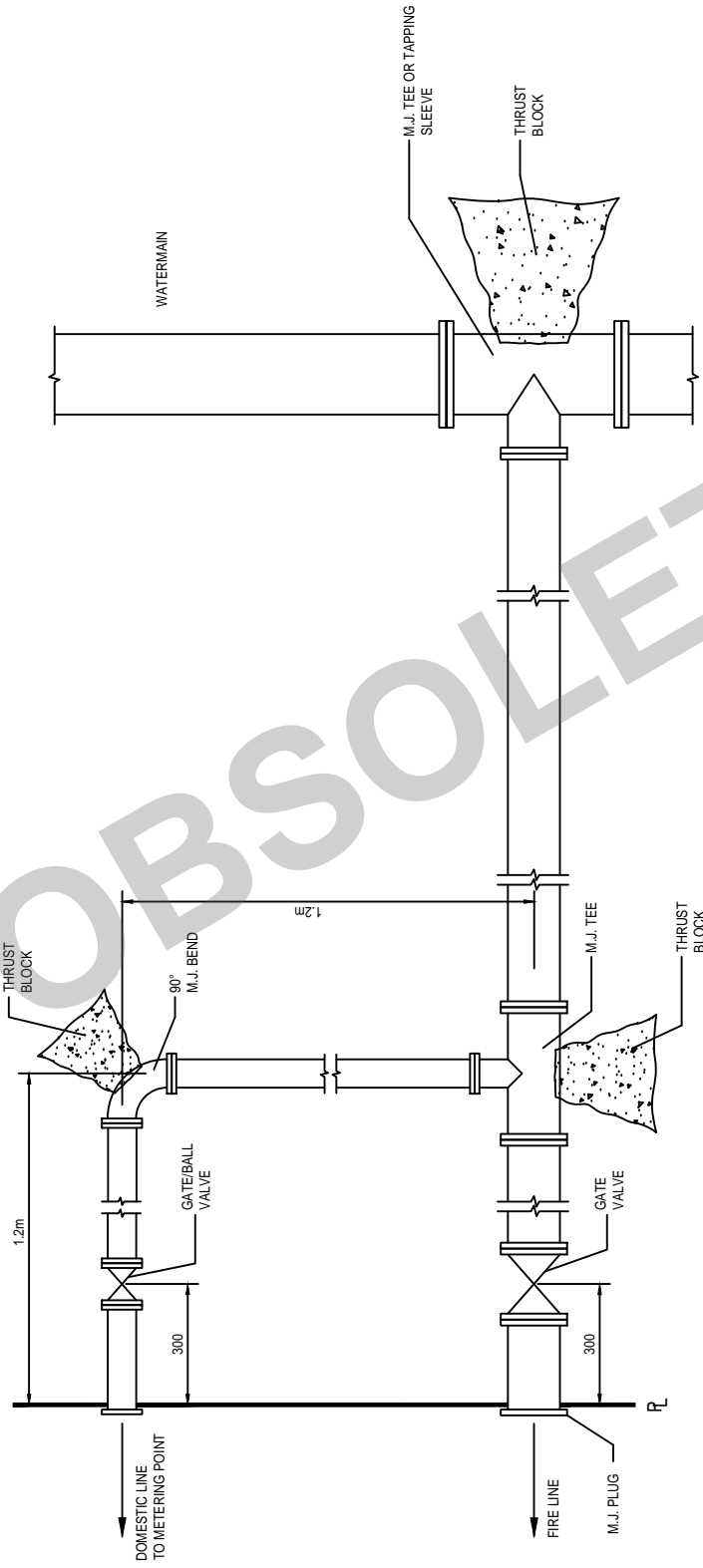
TYPICAL HYDRANT DETAIL

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
703

NO.	REVISIONS	APRD	DATE
5	DELETE TRACER WIRE UP VALVE AND ADD TEST STATION	TOI	MAY 2021
4.	HYDRANT MARKER	TOI	MAY 2019
3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	MODIFIED TRACER WIRE	TOI	MAY 2016
1.	MODIFIED HYDRANT SIGN AND FLANGE ELEVATION	TOI	APRIL 2015
NO.		APRD	DATE

DRAWN: A&A
SCALE: N.T.S.
APRD: DATE: JUNE 2011



NOTES

1. ALL MECHANICAL JOINTS TO BE RESTRAINED.
2. PROVIDE BOND BREAKER BETWEEN CONCRETE AND FITTINGS.
3. REFER TO TOWN DESIGN STANDARDS FOR APPROVED MATERIALS.
4. REFER TO TOWN DESIGN STANDARDS FOR ADDITIONAL REQUIREMENTS IF PRIVATE FIRE HYDRANTS ARE BEING PROVIDED.



STANDARD FIRE LINE AND
SERVICE CONNECTION

DRAWN: A&A
SCALE: N.T.S.

APRD:
DATE: JUNE 2011

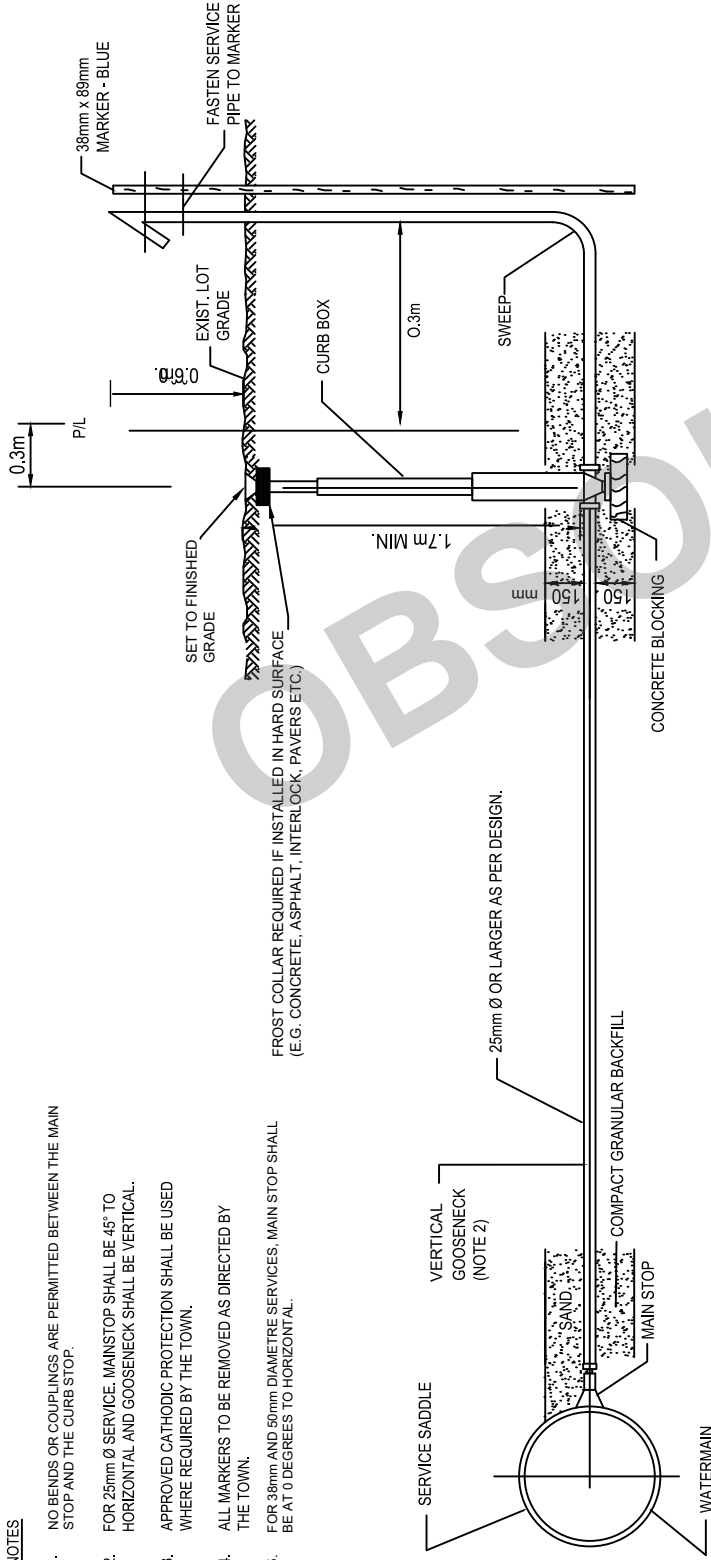
METRIC
ALL DIMENSIONS IN MM
UNLESS OTHERWISE NOTED

**TOISD
704**

NO.	REVISIONS	APRD	DATE
2.	ADDED NOTE 4	TOI	FEB 2022
1.	REVISED TOWN LOGO	TOI	APRIL 2015

NOTES

1. NO BENDS OR COUPLINGS ARE PERMITTED BETWEEN THE MAIN STOP AND THE CURB STOP.
2. FOR 25mm Ø SERVICE, MAINSTOP SHALL BE 45° TO HORIZONTAL AND GOOSENECK SHALL BE VERTICAL.
3. APPROVED CATHODIC PROTECTION SHALL BE USED WHERE REQUIRED BY THE TOWN.
4. ALL MARKERS TO BE REMOVED AS DIRECTED BY THE TOWN.
5. FOR 38mm AND 50mm DIAMETRE SERVICES, MAIN STOP SHALL BE AT 0 DEGREES TO HORIZONTAL.



COPPER WATER SERVICE CONNECTION DETAIL 25mm, 38mm AND 50mm DIAMETRE SIZES

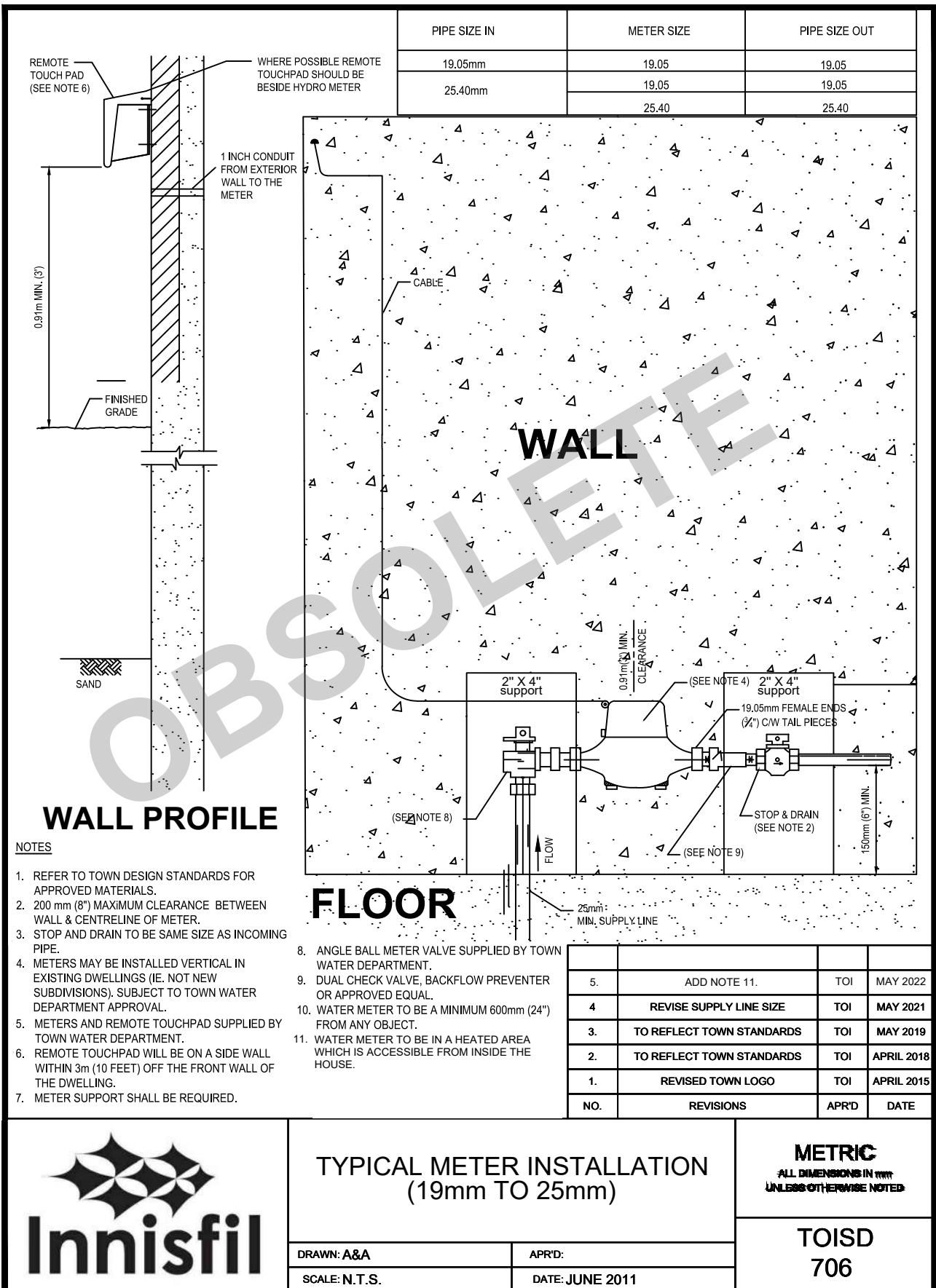
DRAWN: A&A
SCALE: N.T.S.

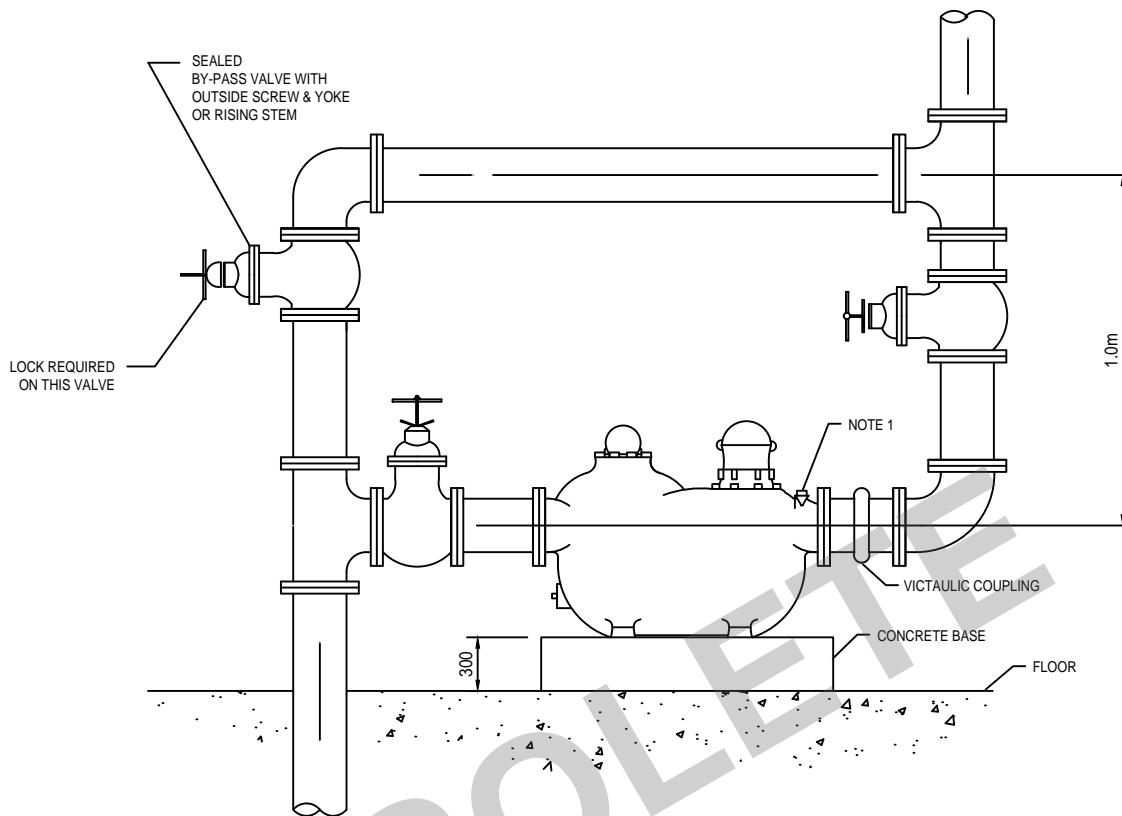
APRD:
DATE: JUNE 2011

NO.		REVISIONS		APRD	DATE
4	UPDATED TO NEW STANDARD	TOI	MAY 2022		
3	LABEL CORRECTION	TOI	MAY 2021		
2	WATER SERVICE SIZE UPDATED TO TOWN STANDARD	TOI	APRIL 2018		
1	ADDED FROST COLLAR WITH NOTE	TOI	APRIL 2015		

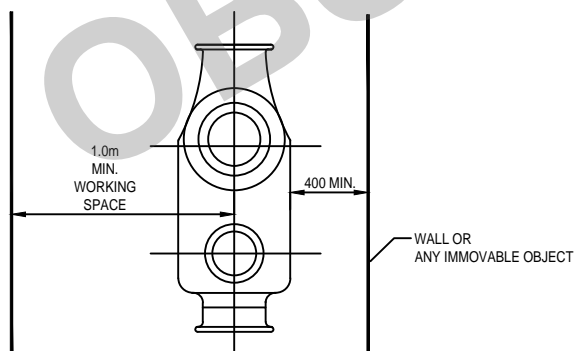
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
705





SIDE VIEW



**TOP VIEW
OF METER**

NOTES

1. USE 50mm GATE VALVE AND PLUG FOR TESTING WHERE REQUIRED.
- 1.A. CONCRETE TO BE 20 MPa COMPRESSIVE STRENGTH.
- 1.B. FLANGED FITTINGS ARE REQUIRED FOR ALL COMPOUND METERS.
- 1.C. BY-PASS LINE SIZE TO BE SAME AS METER LINE.
- 1.D. WORKING SPACE IN FRONT OF METER MUST HAVE 2.0m HEAD CLEARANCE.
- 1.E. ALL CHECK VALVES, BACK-FLOW PREVENTERS, AND PRESSURE REDUCING VALVES, MUST BE LOCATED BEYOND THE BY-PASS.

2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



**INSTALLATION DETAILS FOR
COMPOUND WATER METER**

DRAWN: A&A

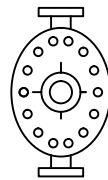
SCALE: N.T.S.

APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED


**TOISD
707**

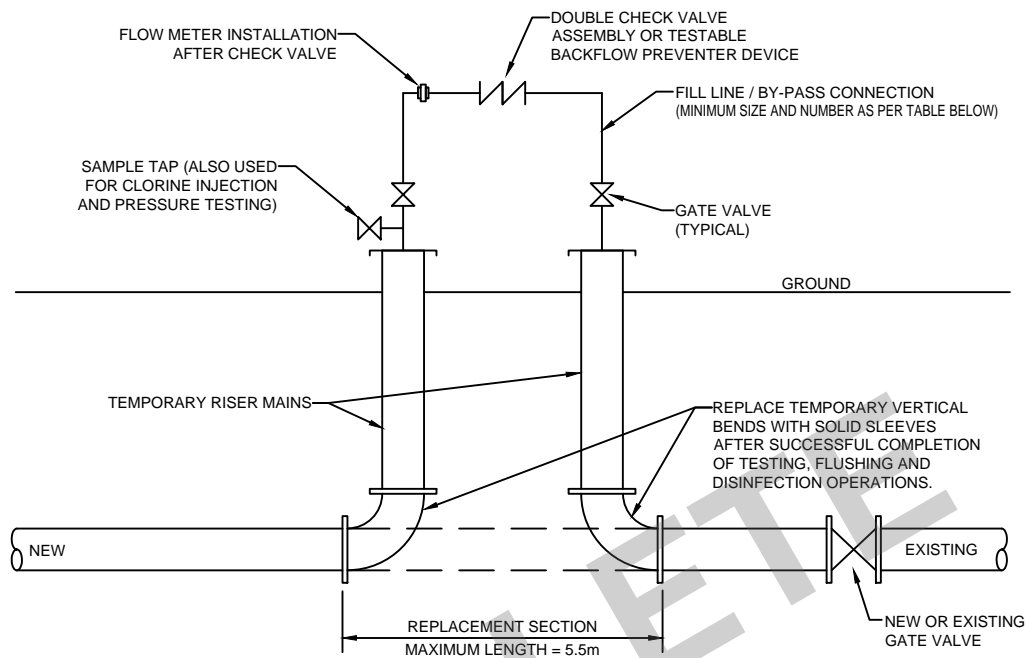


FLANGE END METER

NOTES

1. WATER METER TO BE A MINIMUM 600mm FROM ANY WALL OR IMMOVABLE OBJECT.
2. DOMESTIC WATER SERVICE AND BY-PASS TO BE EQUAL IN SIZE.
3. ALL CHECK VALVES - BACK - FLOW PREVENTERS AND PRESSURE REDUCING VALVES MUST BE LOCATED BEYOND THE BY-PASS.
4. METERS 40 mm AND LARGER TO HAVE REMOVABLE SUPPORTS.

	TYPICAL WATER METER INSTALLATION (40mm AND UP)											METRIC ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED	
	DRAWN: A&A	APRD:	2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018	TOISD 708						
	SCALE: N.T.S.		1.	REVISED TOWN LOGO	TOI	APRIL 2015							
	DATE: JUNE 2011	NO.	REVISIONS	APRD	DATE								



PIPE DIAMETER	FLOW REQUIRED TO PRODUCE 0.76m/s (APPROX.) VELOCITY IN MAIN	SIZE OF TAP (mm)			NUMBER OF OPEN 64mm (2 1/2") HYDRANT SIDE OUTLETS
		25	38	51	
mm	l/s	NUMBER OF TAPS ON PIPE			
100	6.3	1	-	-	1
150	12.6	-	1	-	1
200	25.2	-	2	1	1
250	37.9	-	3	2	1
300	56.8	-	-	2	2
400	109.9	-	-	4	2

NOTE

REQUIRED FLOW AND OPENINGS TO FLUSH PIPELINES
(276 kPa/40 PSI RESIDUAL PRESURE IN WATERMAIN)

2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TYPICAL TEMPORARY BY-PASS CONNECTION FOR WATERMAINS

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
709**

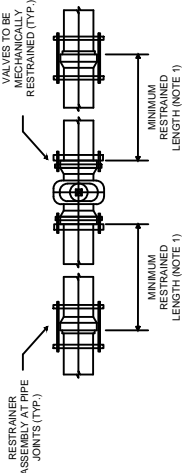
DRAWN: A&A

APR'D:

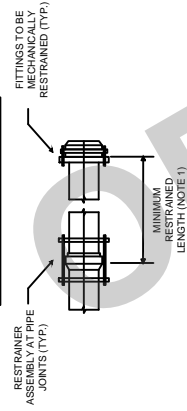
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DATE: JUNE 2011

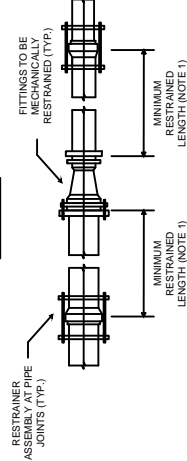
GATE VALVES



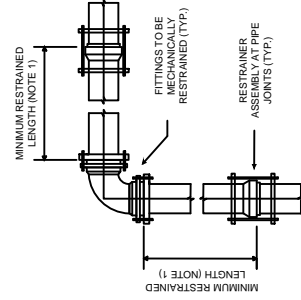
DEAD END (PLUGS OR CAPS)



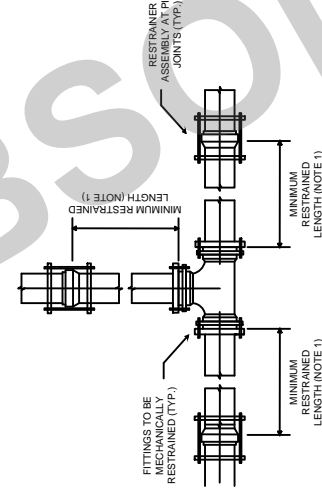
REDUCERS



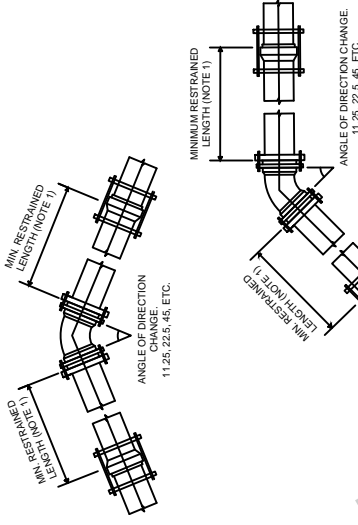
90° BENDS



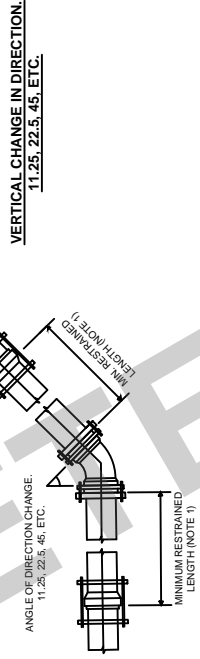
TEES



HORIZONTAL CHANGE IN DIRECTION



VERTICAL CHANGE IN DIRECTION



NOTES:

1. THE MINIMUM RESTRAINED LENGTHS ARE TO BE CALCULATED BASED ON THE MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF THE TOWN.
2. IN ADDITION TO NOTE 1, A MINIMUM OF ONE (1) PIPE JOINT SHALL BE RESTRAINED ON EACH SIDE OF THE FOLLOWING:
 - a) ALL HORIZONTAL BENDS
 - b) ALL VERTICAL BENDS
 - c) ALL DEAD ENDS (PLUGS & CAPS)
 - d) EVERY PIPE JOINT WITHIN A HYDRANT LEAD
 - e) ALL VALVES
 - f) ALL REDUCERS
 - g) ALL SLEEVES
3. 90 DEGREE BENDS SHOULD BE AVOIDED WHERE POSSIBLE.
4. FOR ADDITIONAL WATERMAIN SPECIFICATIONS, REFERENCE THE TOWN OF INNISFIL ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS MANUAL SECTION NO. 6.
5. TYPES AND MANUFACTURERS OF RESTRAINT DEVICES SHALL BE AS PER APPENDIX 'B5' OF THE TOWN OF INNISFIL ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS MANUAL.
6. REFERENCE OP/SD 1103.010 & OP/SD 1103.020 FOR THRUST BLOCK SPECIFICATIONS.



TYPICAL RESTRAINER INSTALLATION

METRIC
ALL DIMENSIONS IN **MM**
UNLESS OTHERWISE NOTED

TOISD
710

DRAWN: A&A
SCALE: N.T.S.

APRD: DATE: JUNE 2011

NO.

REVISIONS

APRD

DATE

TOI

APRIL 2015

TOI

APRIL 2018

TOI

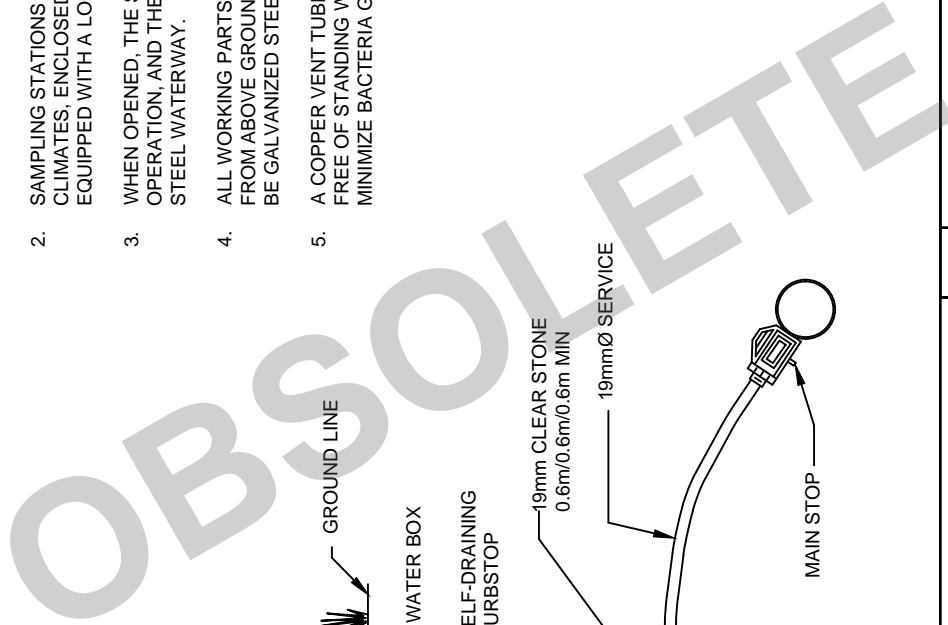
MAY 2019

TOI

2019 STANDARDS UPDATE

The diagram illustrates the installation of a self-draining urinal. It shows a cross-section of the urinal unit, which is labeled 'SELF-DRAINING URINAL'. The urinal is connected to a 'WATER BOX' and a 'GROUND LINE'. A 'MAIN STOP' is indicated on the urinal's outlet. A '19mm CLEAR STONE 0.6m/0.6m/0.6m MIN' line is shown leading from the urinal to the '19mm Ø SERVICE' line. The urinal is shown in a 'SELF-DRAINING' position, with the water level inside the urinal bowl indicated by a dashed line.


-
- The diagram illustrates the installation of a self-draining urinal. It shows a cross-section of the urinal unit, which is labeled 'SELF-DRAINING URINAL'. The urinal is connected to a 'WATER BOX' and a 'GROUND LINE'. A 'MAIN STOP' is indicated on the urinal's outlet. A '19mm CLEAR STONE 0.6m/0.6m/0.6m MIN' line is shown leading from the urinal to the '19mm Ø SERVICE' line. The urinal is shown in a 'SELF-DRAINING' position, with the water level inside the urinal bowl indicated by a dashed line.

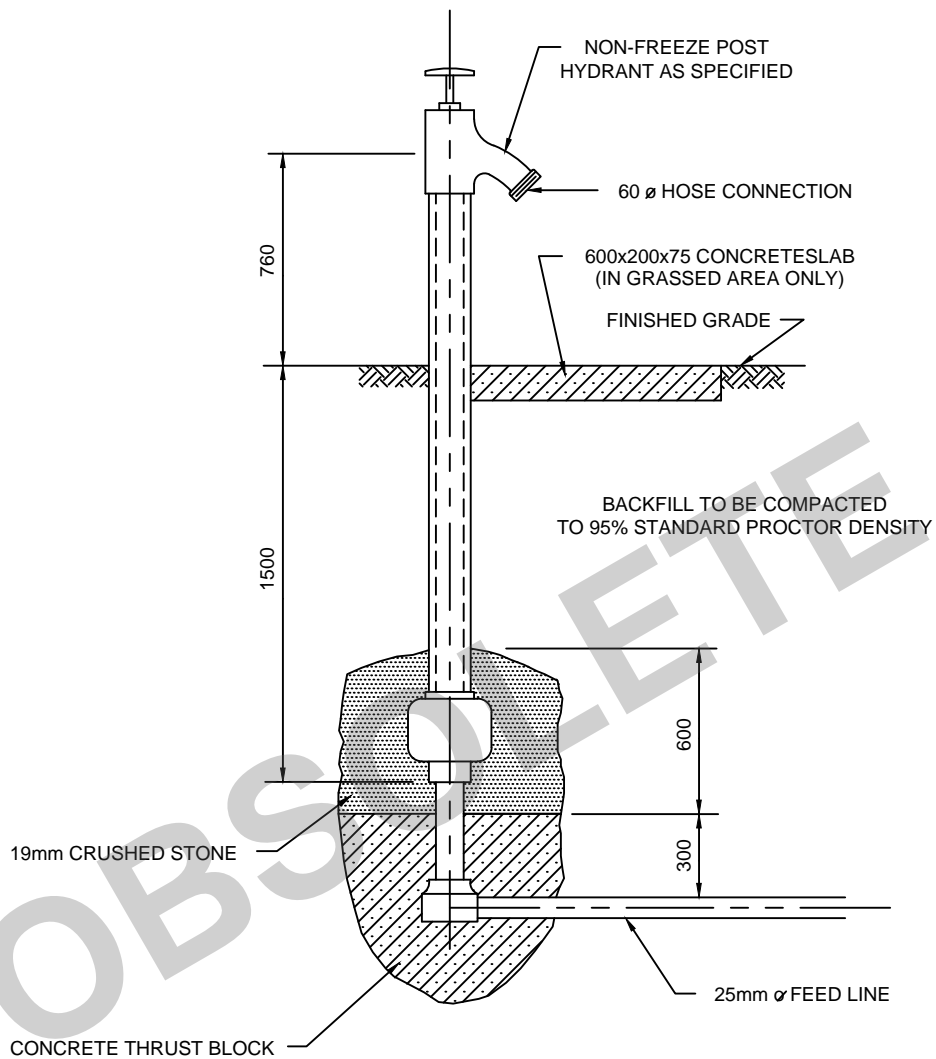


	G STATION LLATION	c	TO REFLECT YOUR STANDAR

	APR'D:	1.	REVISED TOWN LOGO
	DATE: JUNE 2011	NO.	REVISIONS

	APR'D:	1.	REVISED TOWN LOGO
	DATE: JUNE 2011	NO.	REVISIONS

		<div>SAMPLING STATION INSTALLATION</div>								METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
						3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018	
						2.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016	
DRAWN: A&A		APRD:	1.	REVISED TOWN LOGO	TOI	APRIL 2015			TOISD 711	
			NO.	REVISIONS	APRD	DATE				
SCALE: N.T.S.		DATE: JUNE 2011								



NOTE

CURB STOP TO BE PROVIDED AT STREET LINE.

1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



**NON-FREEZE POST HYDRANT
DETAIL**

DRAWN: A&A

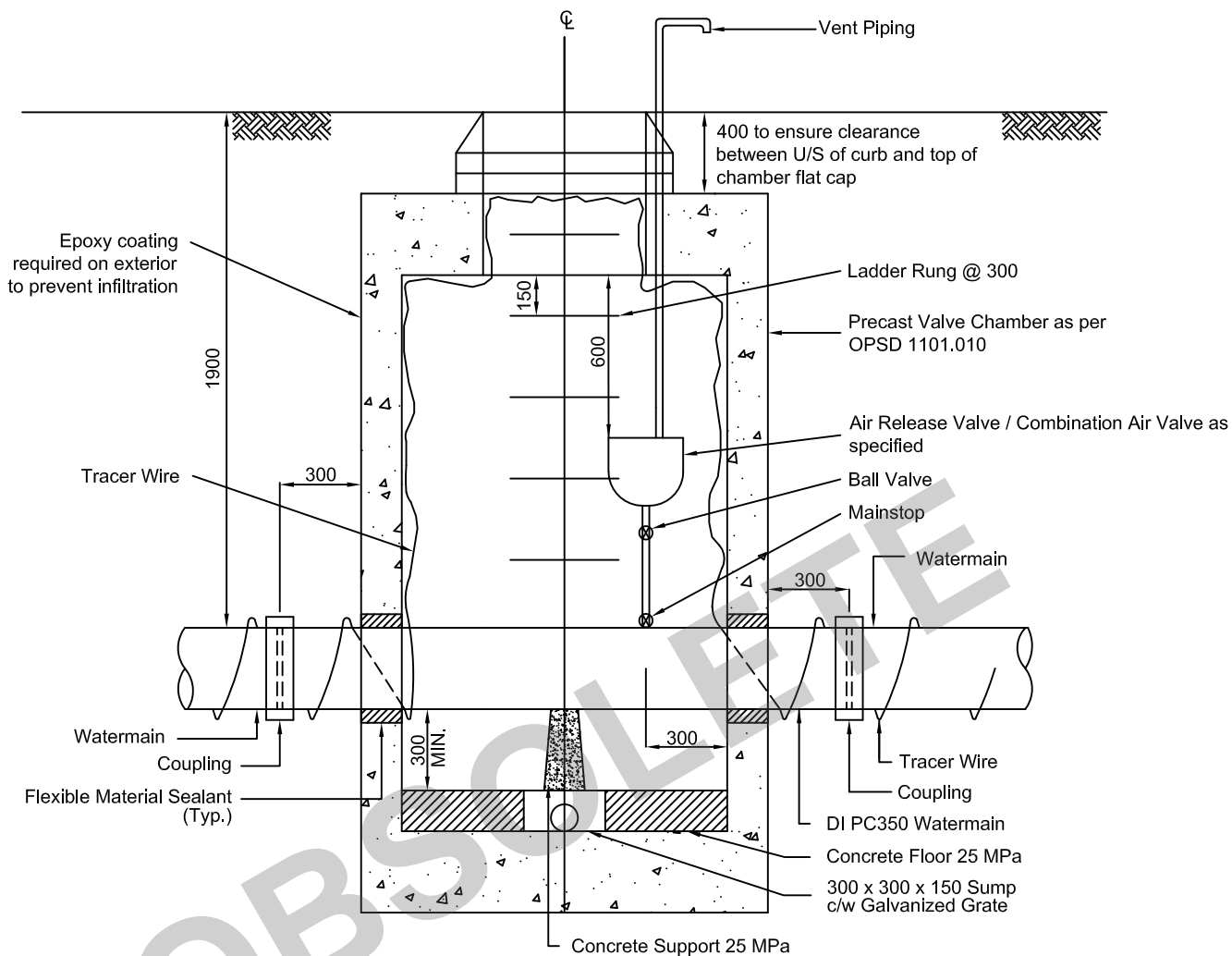
SCALE: N.T.S.

APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
712**



NOTES

1. PROVIDE BOND BREAKER BETWEEN CONCRETE AND WATERMAIN PIPE.
2. TRACER WIRE TO BE CONTINUOUS WITH THE WATERMAIN AND SHALL BE FASTENED TO THE INSIDE WALLS OF THE CHAMBER.
3. AIR RELEASE VALVE AND PIPING SHALL BE 25MMØ FOR WATERMAINS 300MMØ AND SMALLER, AND 50MMØ FOR WATERMAINS LARGER THAN 300MMØ.
4. PIPING & FITTINGS SHALL BE THREADED STAINLESS STEEL.
5. FROST RESTRAINER CLAMPS ARE TO BE USED AS PER OPSD 701.100.
6. VENT PIPE SHOULD BE MINIMUM OF 600MM ABOVE GROUND ELEVATION, SITE INSPECTION REQUIRED TO CLARIFY ACTUAL VENT PIPE HEIGHT. AIR MUST ENTER OR BE DISCHARGED FROM AIR RELEASE CHAMBER, WHERE THIS IS NOT POSSIBLE VENTING IS TO BE AS CLOSE TO THE CHAMBER LID RUNNING UP THE BACKSIDE OF THE ACCESS LADDER.

Watermain Size	Chamber Size
100mm to 250mm	1200mmØ
300mm to 400mm	1500mmØ

NO.	REVISIONS	APR'D	DATE
4.	ADDED CONCRETE HATCH	TOI	MAY 2019
3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	NOTE 6 ADDED	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015



AIR RELEASE / AIR & VACUUM RELEASE VALVE IN CHAMBER SECTION

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

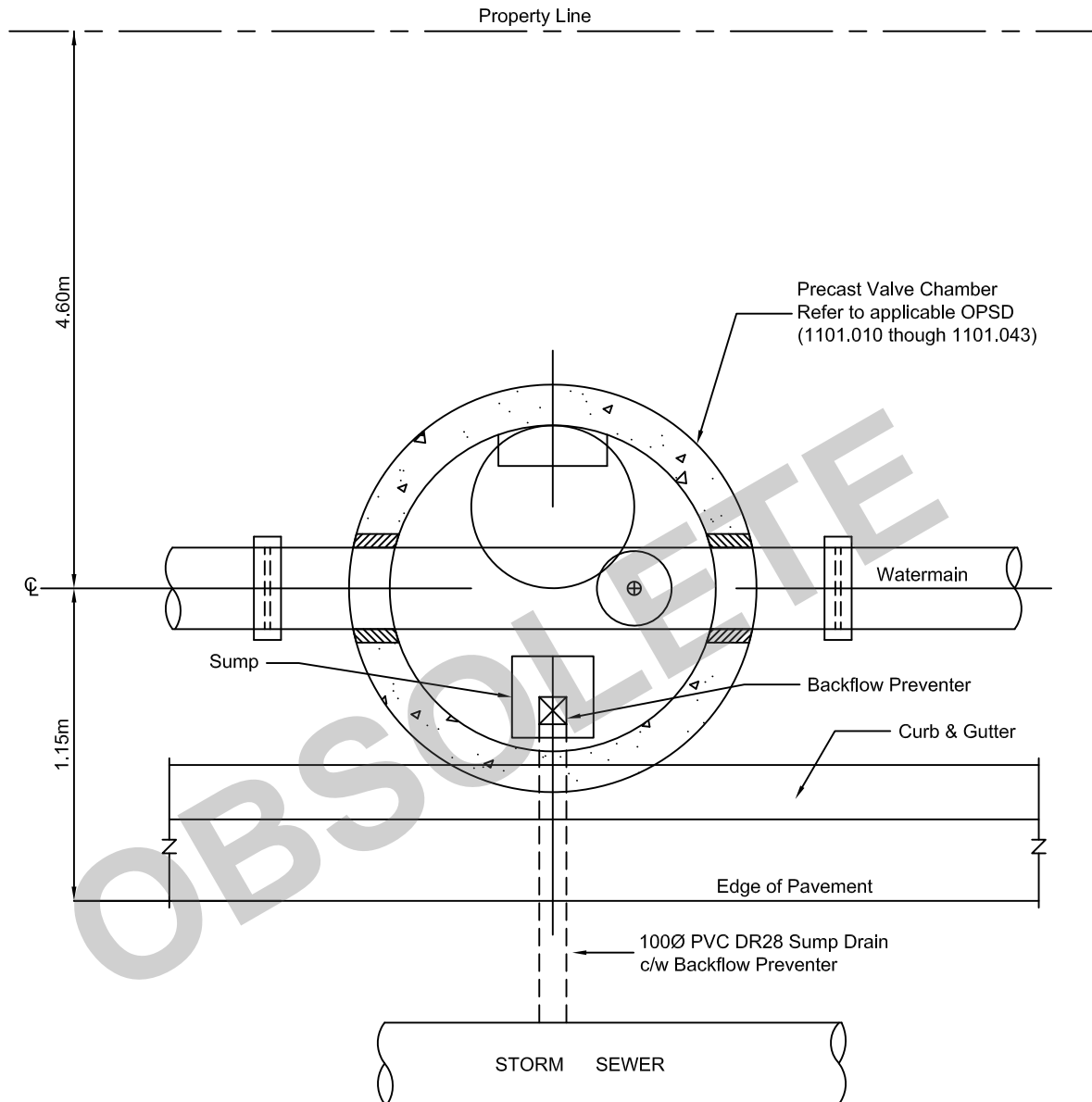
TOISD
713

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



3.	ADDED CONCRETE HATCH	TOI	MAY 2019
2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
1.	REVISED OPD REFERENCE	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



AIR RELEASE / AIR & VACUUM RELEASE VALVE IN CHAMBER PLAN

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

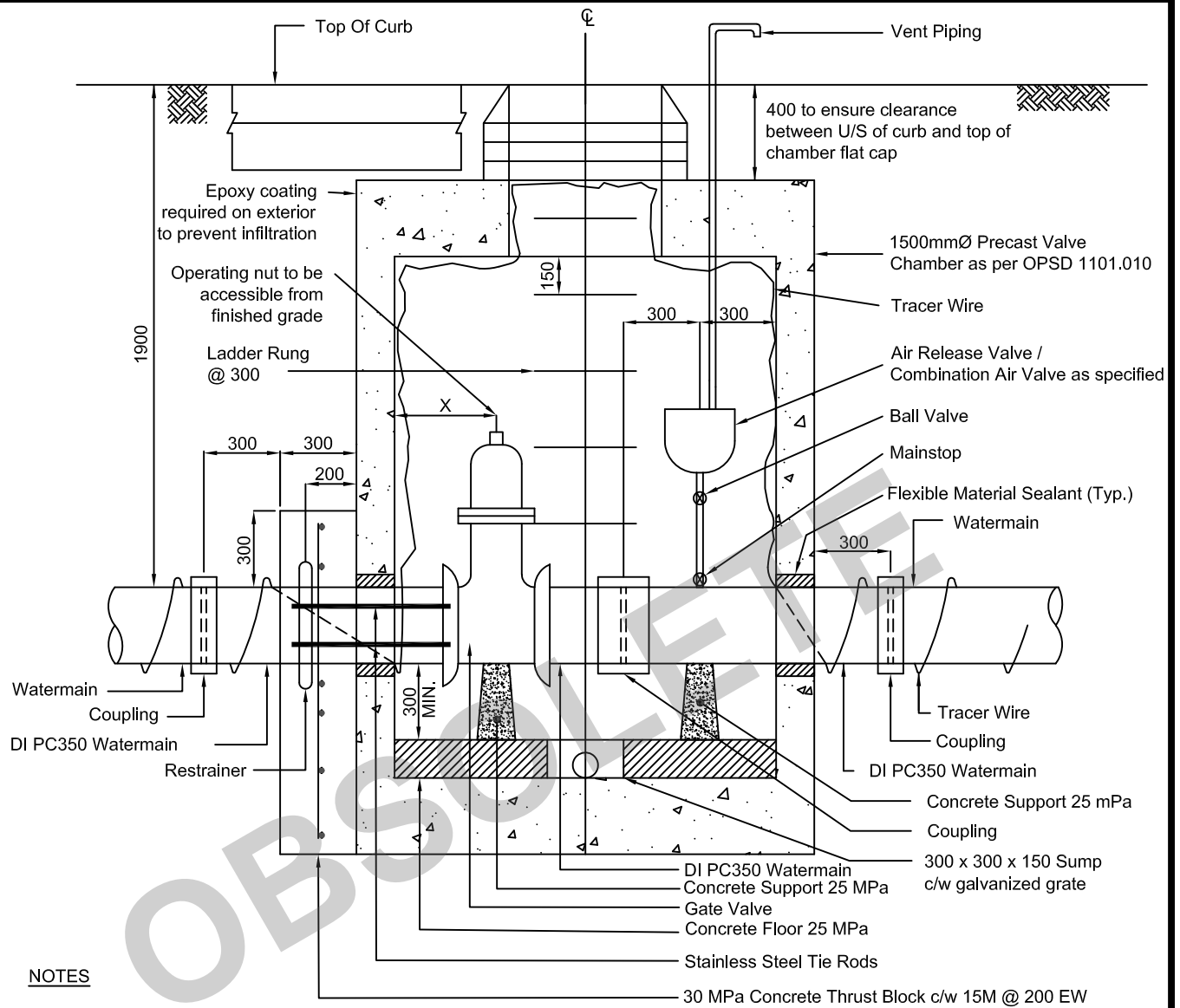
**TOISD
714**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



Watermain Size	Chamber Size	Dimension
100mm to 200mm	1500mmØ	X = 400mm
250mm to 400mm	1800mmØ	X = 550mm

NO.	REVISIONS	APR'D	DATE
4.	ADDED CONCRETE HATCH	TOI	MAY 2019
3.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
2.	NOTE 6 ADDED	TOI	MAY 2017
1.	REVISED TOWN LOGO	TOI	APRIL 2018



VALVE & AIR RELEASE VALVE IN CHAMBER SECTION

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

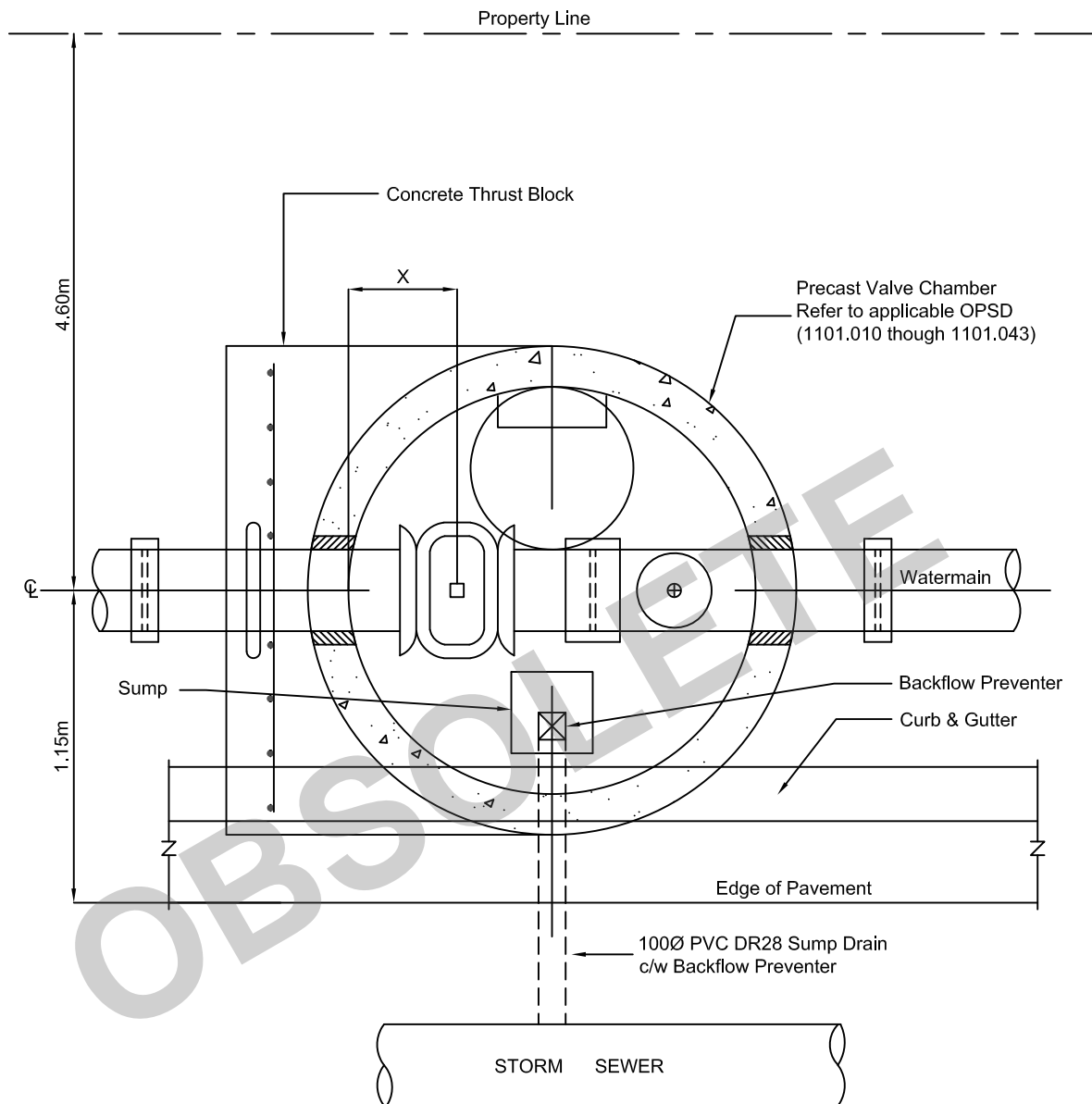
**TOISD
715**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



Watermain Size	Chamber Size	Dimension
100mm to 200mm	1500mmØ	X = 400mm
250mm to 400mm	1800mmØ	X = 550mm

NO.	REVISIONS	APR'D	DATE
3.	ADDED CONCRETE HATCH	TOI	MAY 2019
2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
1.	REVISED OPSD REFERENCE	TOI	APRIL 2015



VALVE & AIR RELEASE VALVE IN CHAMBER PLAN

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

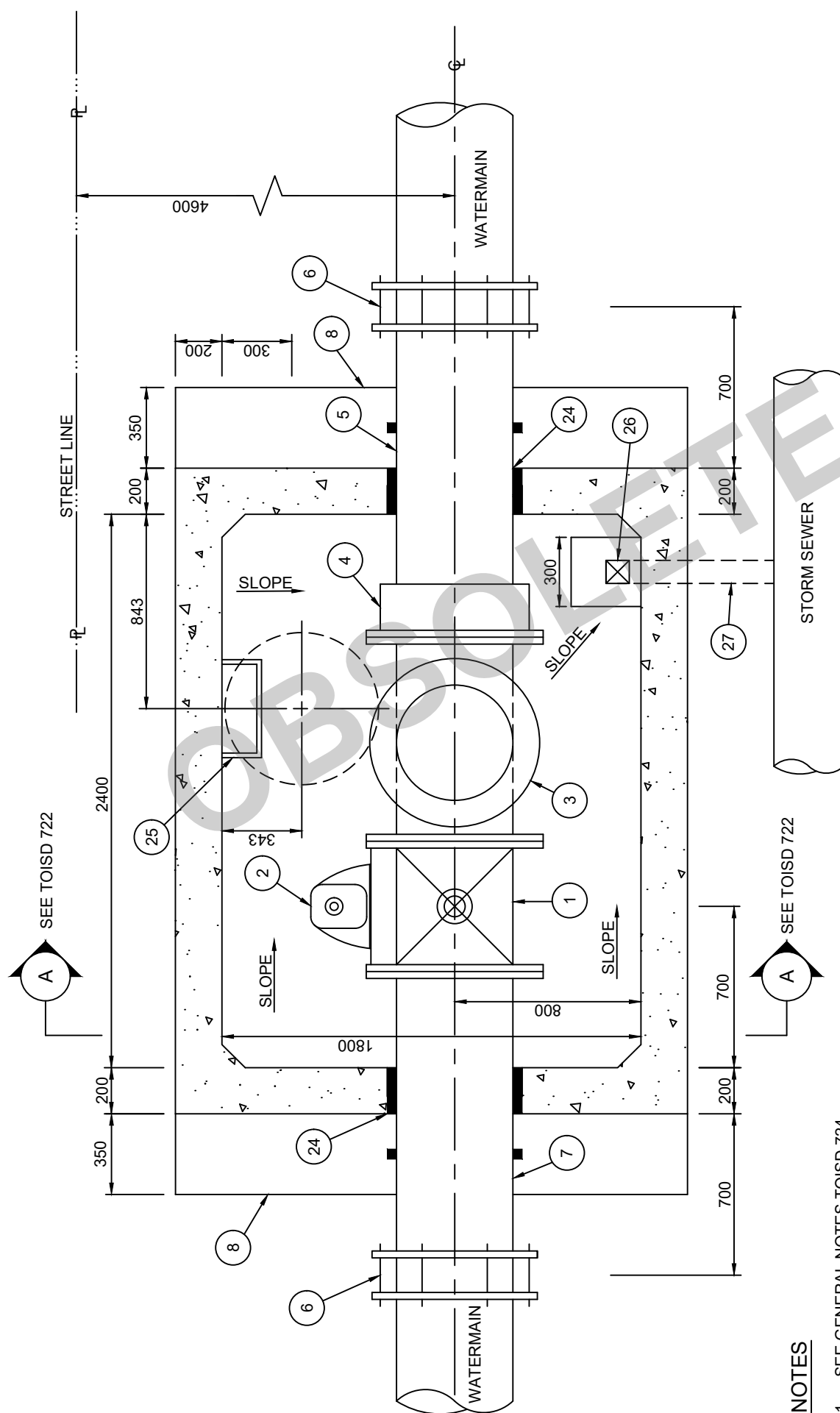
**TOISD
716**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

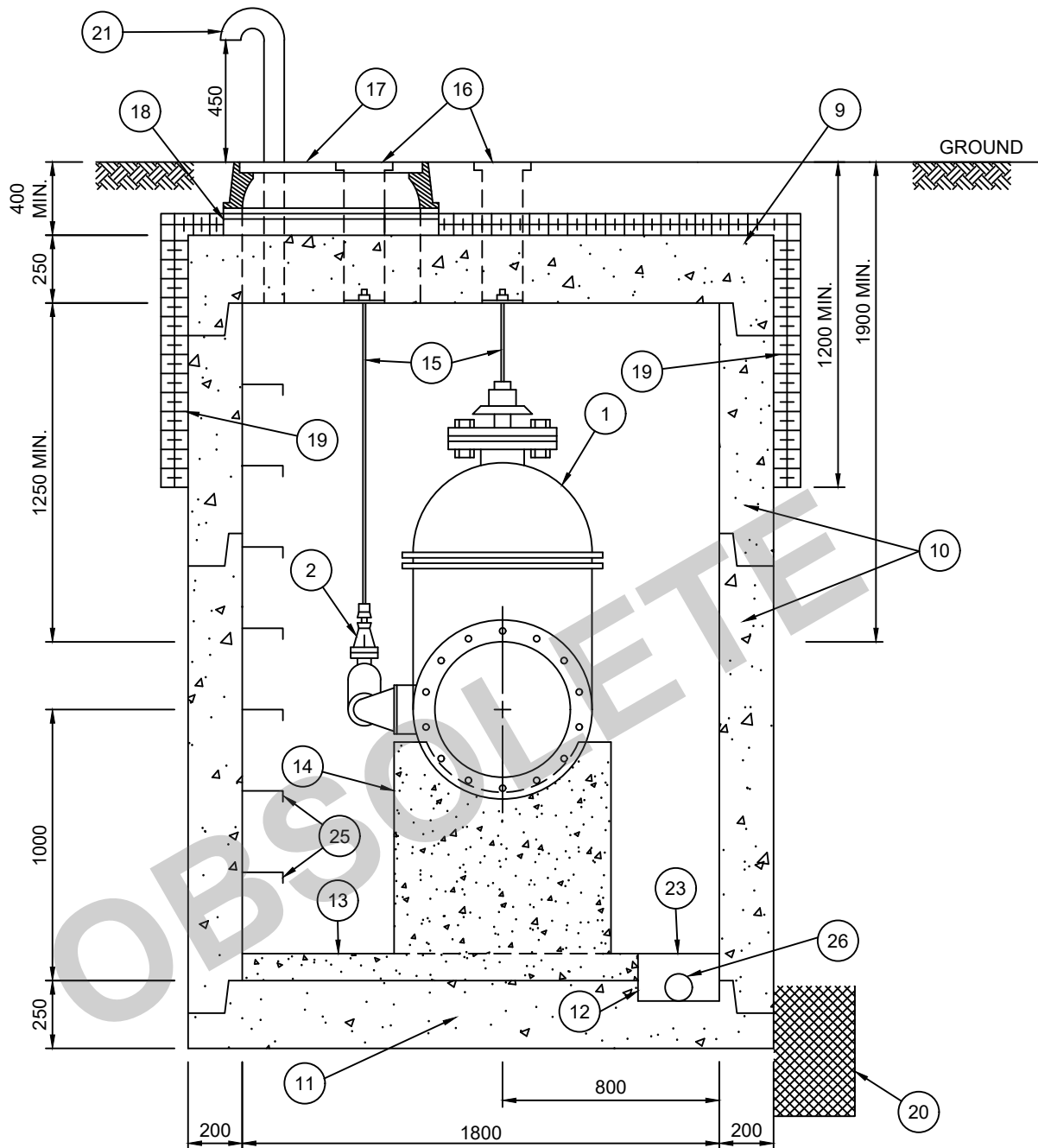
DATE: JUNE 2011



1. SEE GENERAL NOTES TOISD 724

PRECAST VALVE CHAMBER FOR 450 & 500mmØ WATERMANS PLAN

		APRD:	2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
			1.	REVISED TOWN LOGO	TOI	APRIL 2015
DRAWN: A&A			NO.	REVISIONS	APR'D	DATE
SCALE: N.T.S.		DATE: JUNE 2011				



NOTES

1. SEE GENERAL NOTES TOISD 724

4	REVISED DETAIL NAME	TOI	MAY 2021
3.	TO REFLECT TOWN STANDARDS	TOI	MAY 2019
2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



PRECAST VALVE CHAMBER FOR 450 & 500mmØ WATERMAINS SECTION

DRAWN: A&A

APR'D:

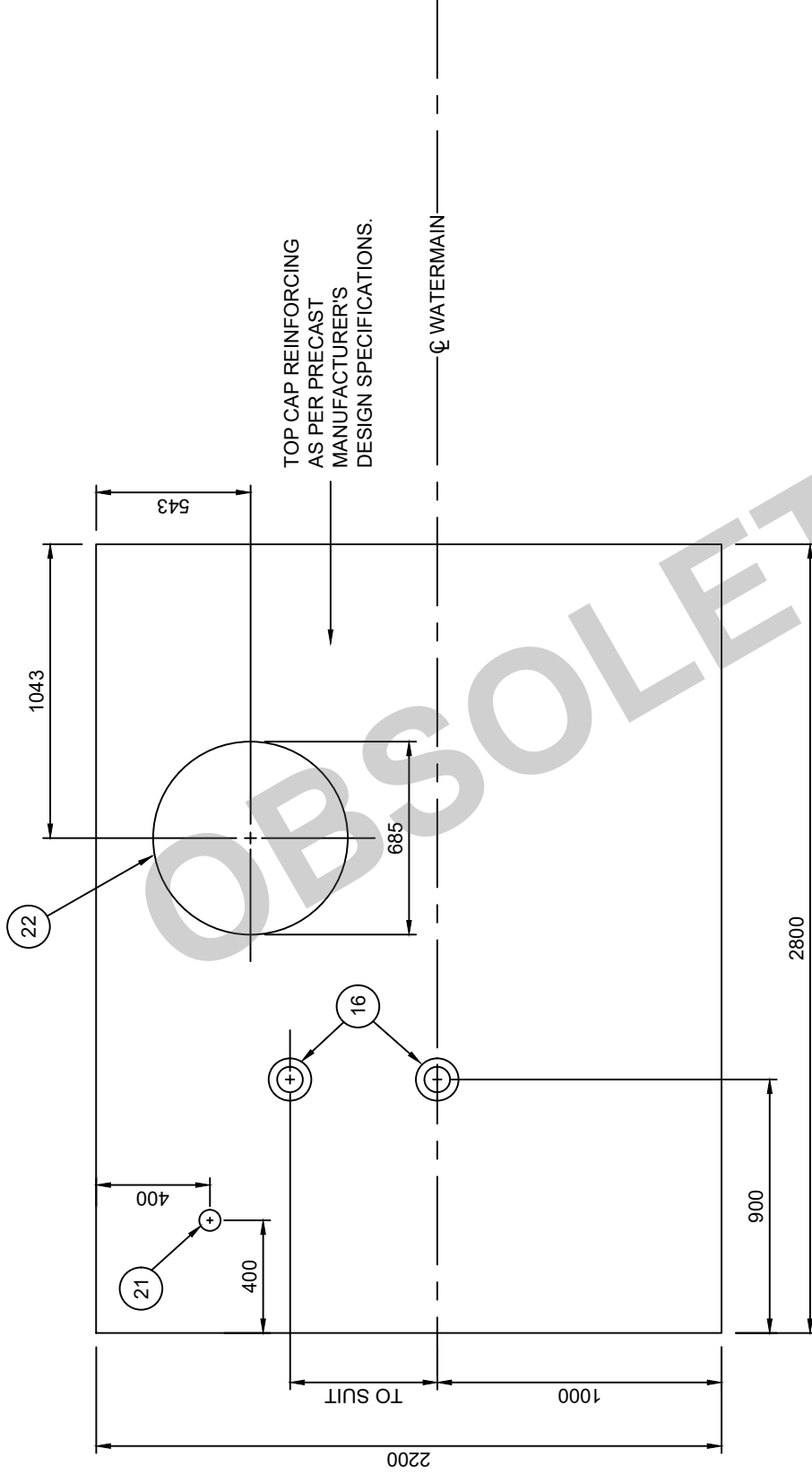
SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED


**TOISD
722**

STREET LINE L T P



NOTES

- SEE GENERAL NOTES TOISD 724

<div><div>Innisfil</div></div> <div>PRECAST VALVE CHAMBER FOR 450 & 500mmØ WATERMAINS CAP DETAIL</div>		<div><div>METRIC</div><div>ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED</div></div>		<div><div>TOISD</div><div>723</div></div>					
		3	REVISED DETAIL NAME	TOI	MAY 2021				
		2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018				
DRAWN: A&A			REVISED TOWN LOGO	TOI	APRIL 2015				
SCALE: N.T.S.		NO.	REVISIONS	APRD	DATE				

GENERAL NOTES

- ① FLANGED NRS GATE VALVE WITH INTEGRAL BY-PASS. SEE ②
- ② TWO VALVES REQUIRED FOR NRS BY-PASS GATE VALVE
- ③ FLANGED DUCTILE IRON TEE, COMPLETE WITH BLIND FLANGE
- ④ FLANGED COUPLING ADAPTOR
- ⑤ DI SC54 PIPE c/w THRUST FLANGE ON PIPE
- ⑥ COUPLING
- ⑦ DI SC54 FLxPE PIPE c/w THRUST FLANGE ON PIPE
- ⑧ THRUST BLOCK AS PER OPSD 1101.014
- ⑨ PRECAST REINFORCED CONCRETE TOP CAP SECTION AS PER OPSD 1101.015
- ⑩ PRECAST REINFORCED CONCRETE RISER SECTIONS AS PER OPSD 1101.013
- ⑪ PRECAST REINFORCED CONCRETE BASE SLAB AS PER OPSD 1101.013
- ⑫ 300 X 300 X 175 SUMP
- ⑬ 25MPa POURED CONCRETE FLOOR, MINIMUM 50mm THICK, TO BE HAND FINISHED. FLOOR TO DRAIN TO SUMP
- ⑭ 25MPa CONCRETE FLOOR SUPPORT BLOCK FOR GATE VALVE & TEE. PROVIDE BOND BREAKER BETWEEN CONCRETE VALVE BODY AND FITTING BODY
- ⑮ VALVE STEM EXTENSION AS PER OPSD 1101.020
- ⑯ VALVE BOX ASSEMBLY AS PER OPSD 1101.020. ADJUST TO SUIT GRADE
- ⑰ MANHOLE COVER AND SQUARE FRAME AS PER OPSD 401.010 TO BE SET IN CEMENT MORTAR
- ⑱ MODULOC EXTENSIONS (1 MIN, 3 MAX) WITH ALUMINUM STEP
- ⑲ TWO LAYERS 50mm THICK SM RIGID INSULATION (TYPICAL)
- ⑳ GRANULAR BACKFILL TO BE MINIMUM 300mm THICKNESS ON ALL SIDES OF PRECAST CHAMBER AND GRANULAR BEDDING COMPACTED TO 100%% SPMDD
- ㉑ 75mm Ø STAINLESS STEEL VENT WITH VENT COVER
- ㉒ 685mm Ø VALVE CHAMBER CAP OPENING
- ㉓ GALVANIZED GRATE FOR SUMP
- ㉔ FLEXIBLE MATERIAL SEALANT
- ㉕ ALUMINUM STEPS AS PER OPSD 405.010
- ㉖ BACKFLOW PREVENTER
- ㉗ 100mmØ PVC DR28 SUMP DRAIN

3	REVISED DETAIL NAME	TOI	MAY 2021
2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
1.	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



PRECAST VALVE CHAMBER FOR 450 & 500mmØ WATERMAINS GENERAL NOTES

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

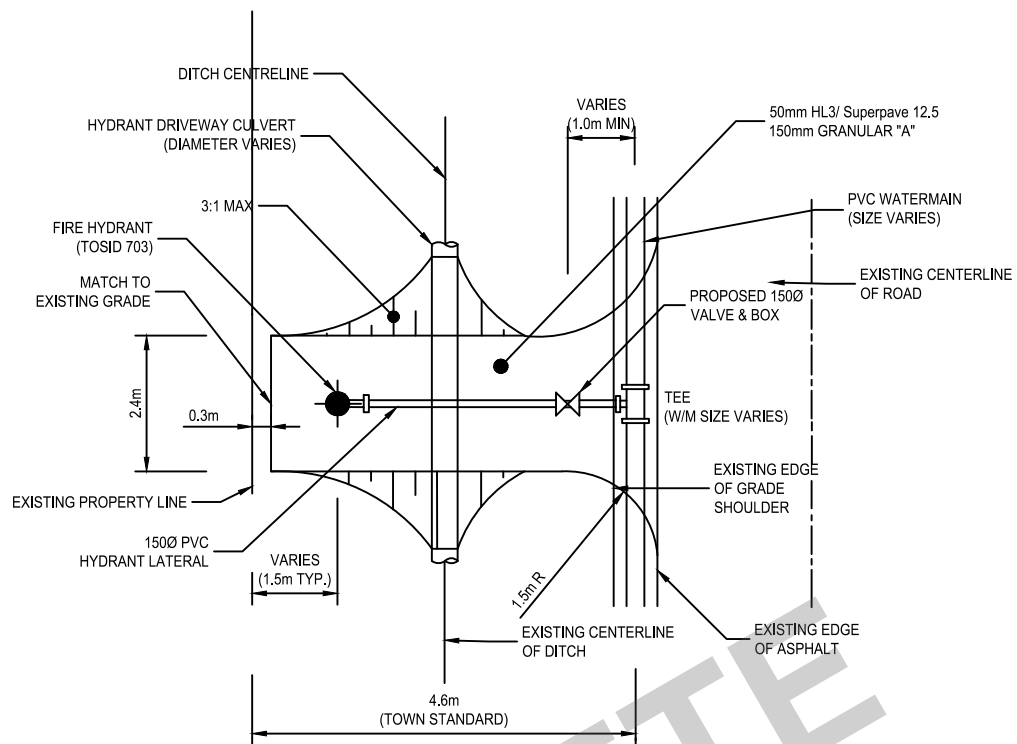
**TOISD
724**

DRAWN: A&A

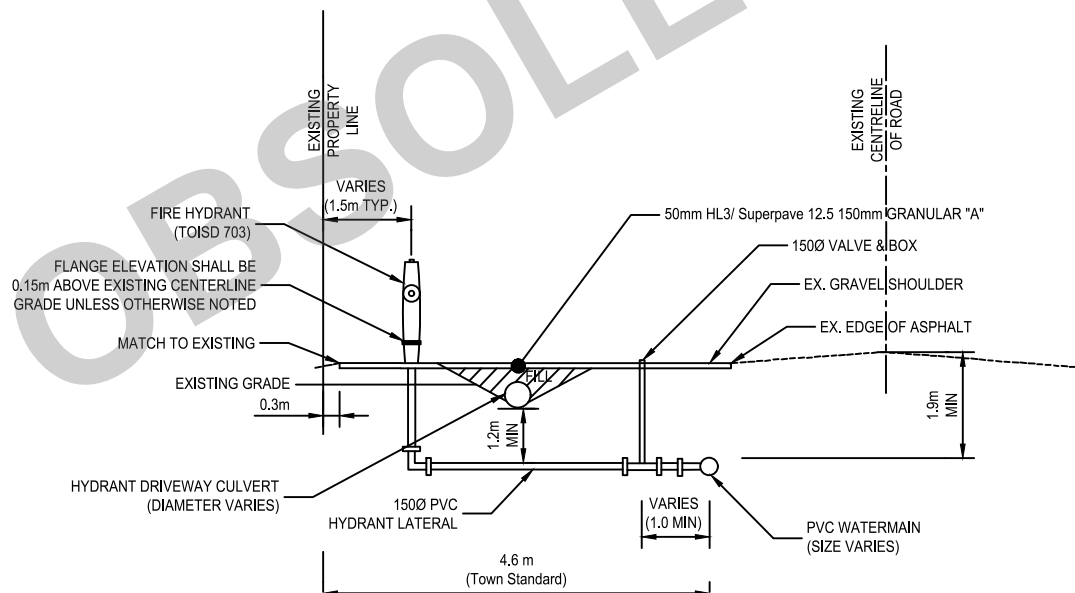
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



PLAN



PROFILE

NO.	REVISIONS	APR'D	DATE
5	DELETED REDUNDANT NOTE	TOI	MAY 2021
4.	ASPHALT SPECIFICATION	TOI	MAY 2019
3.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
2.	REVISED TOWN LOGO	TOI	APRIL 2015
1.	TO REFLECT TOWN STANDARDS		MAY/14



TYPICAL HYDRANT DRIVEWAY DETAIL

DRAWN: A&A

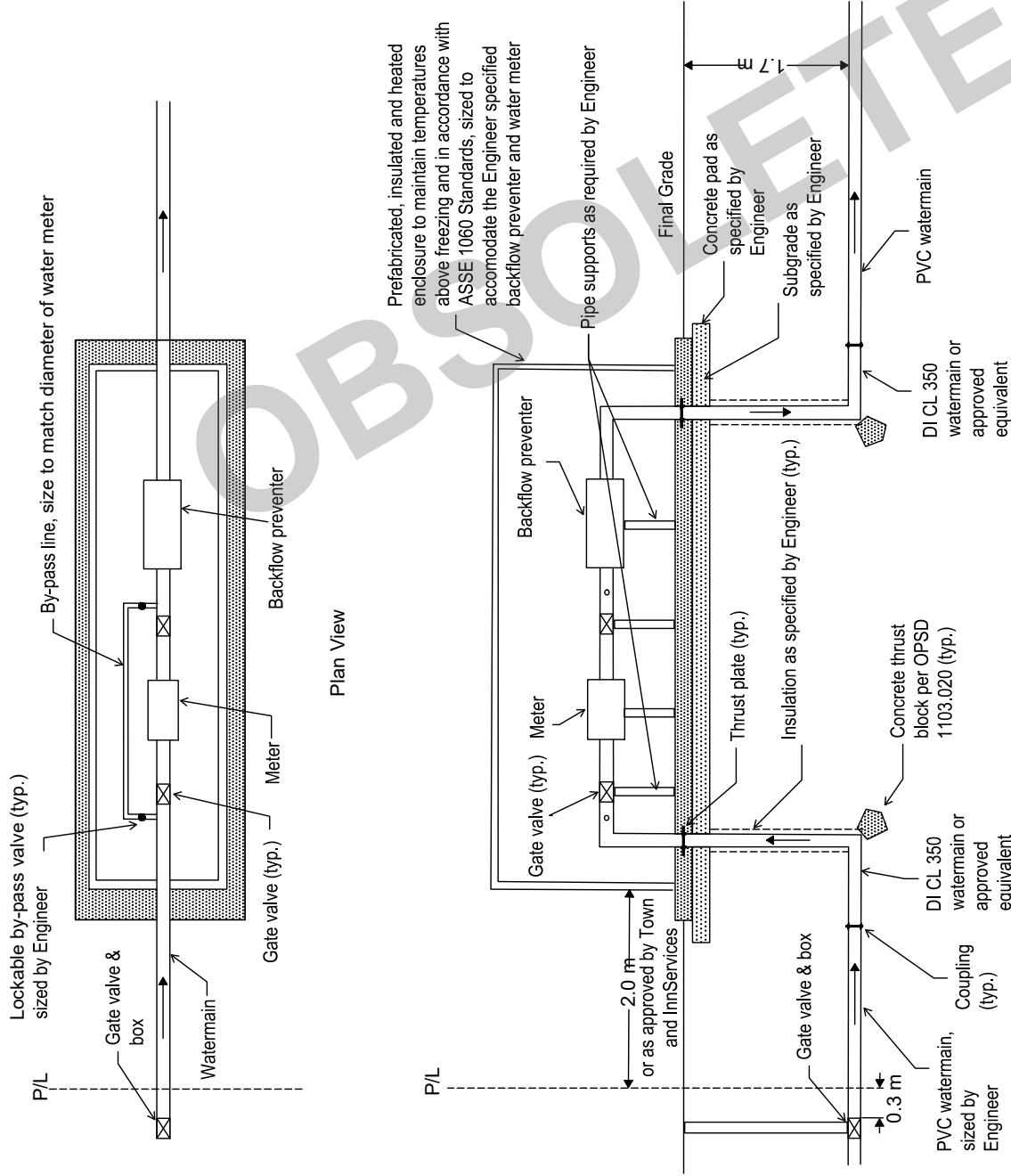
SCALE: N.T.S.

APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

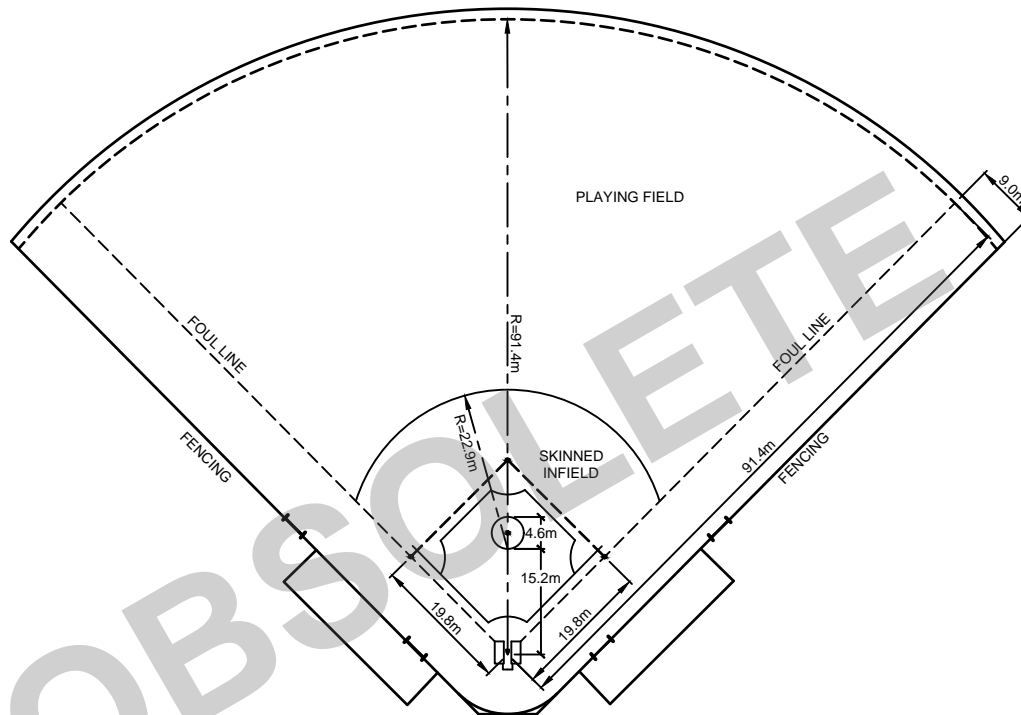
**TOISD
725**



NOTES:

1. INNSERVICES SHALL BE ALLOWED ACCESS TO THE ENCLOSURE AT ALL TIMES TO INSPECT/MAINTAIN THE WATER METER. DOOR ACCESS TO BE PROVIDED AT THE SIDE OF METER.
2. ADEQUATE CLEARANCE MUST BE PROVIDED AROUND THE ENCLOSURE FOR INNSERVICES TO ACCESS DURING TESTING AND MAINTENANCE OF THE METER.
3. A WATER METER TOUCHPAD READER IS TO BE MOUNTED OUTSIDE OF THE ENCLOSURE.
4. WATER METER SHALL BE SELECTED BY THE ENGINEER AND SHALL BE APPROVED BY INNSERVICES. ENGINEER TO ENSURE REQUIRED DISTANCE OF STRAIGHT PIPE PRIOR TO AND AFTER METER IS PROVIDED.
5. ENCLOSURE SIZE SHALL VARY FOR METER SIZES AND BACKFLOW PREVENTER SIZES AS PER MANUFACTURER SPECIFICATIONS AND TO THE SATISFACTION OF THE TOWN AND INNSERVICES. A PROJECT SPECIFIC ENCLOSURE DETAIL SHALL BE PROVIDED BY THE ENGINEER BASED ON REQUIREMENTS IN TOISD 726.
6. THE BACKFLOW PREVENTION DEVICE, APPURTENANCES AND ENCLOSURE MUST BE SELECTED AND MAINTAINED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS, AND THE GUIDELINES SET OUT IN THE MOST RECENT VERSION OF THE AWWA CANADIAN CROSS CONNECTION CONTROL MANUAL, CSA STANDARDS, ONTARIO BUILDING CODE AND APPLICABLE PROVINCIAL REGULATIONS. THE BACKFLOW PREVENTION DEVICE SHALL BE RATED FOR THE REQUIRED DOMESTIC DEMAND PLUS FIRE FLOWS. BOND BREAKER REQUIRED BETWEEN PIPE/METER AND SUPPORT IF CONCRETE PIPE SUPPORTS ARE USED.
8. NO CONNECTIONS ARE PERMITTED BETWEEN THE WATER METER (AND IT'S BY-PASS) AND THE BACKFLOW PREVENTER.
9. BACKFLOW PREVENTER MUST BE INSTALLED NO MORE THAN 1.5M DOWNSTREAM OF WATER METER.

		BACKFLOW PREVENTER ENCLOSURE		METRIC ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED	
		DRAWN: CCTA APRD: TOI		TOISD 726	
		SCALE: N.T.S. DATE: MAY 2021		TOI	MAY 2022
		NO. REVISIONS		APRD	DATE



NOTES

1. FACILITY SIZE: 91.4m HOME TO FOUL LINE
2. PLAYOUT ZONE: 9m TO BACKSTOP.
3. SETBACK TO RESIDENCES: 40m.
4. DISTANCE BETWEEN FACILITIES: 30m.

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



BASEBALL DIAMOND

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

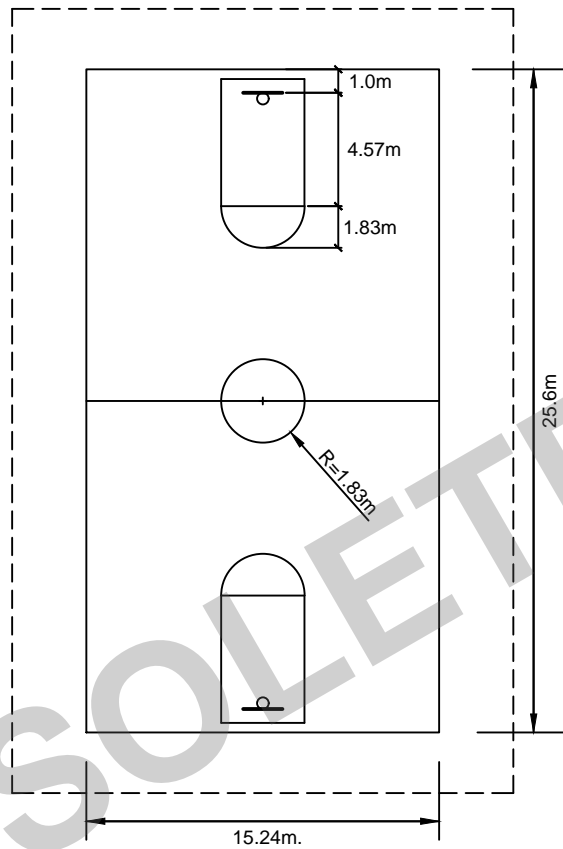
**TOISD
801**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



NOTES

1. FACILITY SIZE:
FULL COURT: 15.24m x 25.60m
HALF COURT: 15.24m x 12.80m
2. PLAYOUT ZONE:
2m (AT END)
3m (AT SIDE)
3. SETBACK TO RESIDENCES: 30m.
4. DISTANCE BETWEEN FACILITIES: 5m.
5. MUST HAVE HARD SURFACE SUCH AS ASPHALT, CONCRETE, PERMEABLE PAVERS, ETC. AS APPROVED BY THE TOWN.

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



OUTDOOR BASKETBALL

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

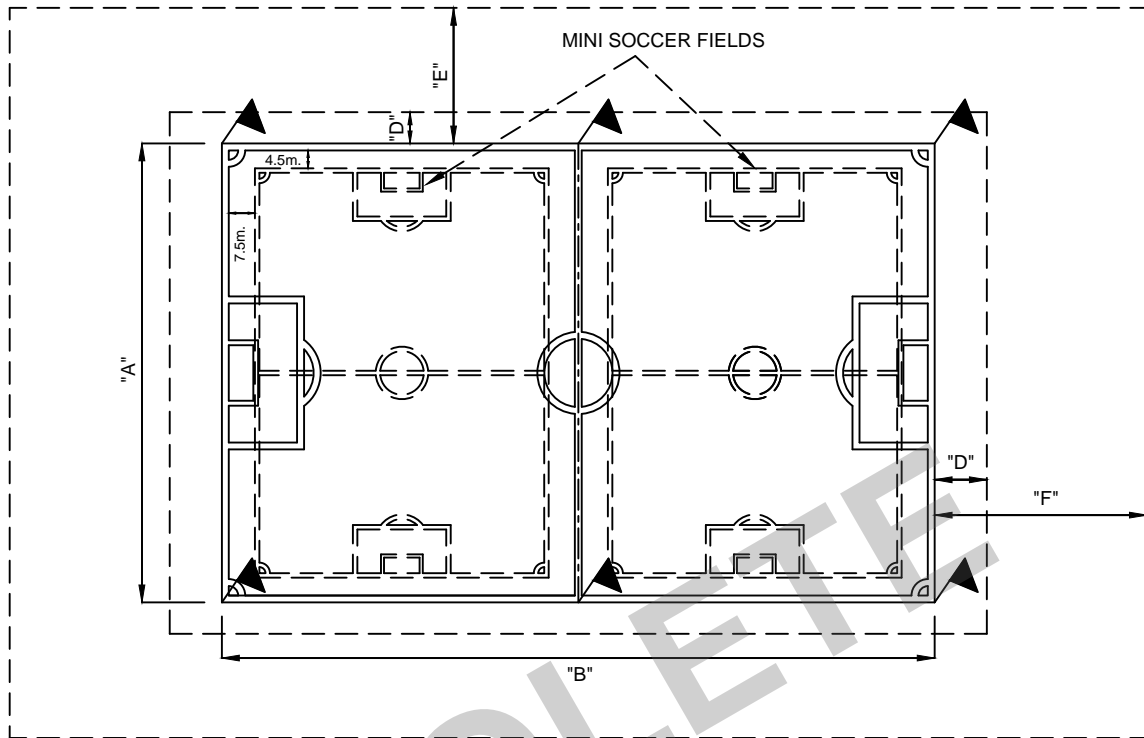
TOISD
802

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



DIMENSION LIST

REQUIRED FACILITIES	FACILITY SIZES		PLAYOUT ZONE		SETBACK TO FACILITIES & RESIDENCES	
	"A"	"B"	"C"	"D"	"E"	"F"
SENIOR SOCCER	64m	100.5m	7.5m	4.5m	10.5m	15m
JUNIOR SOCCER	45.7m	73.1m	7.5m	4.5m	10.5m	7.5m
MINI SOCCER	40m	55m	7.5m	4.5m	5.5m	15m

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



SOCCER MASTER PLAN

METRIC
ALL DIMENSIONS IN METERS
UNLESS OTHERWISE NOTED

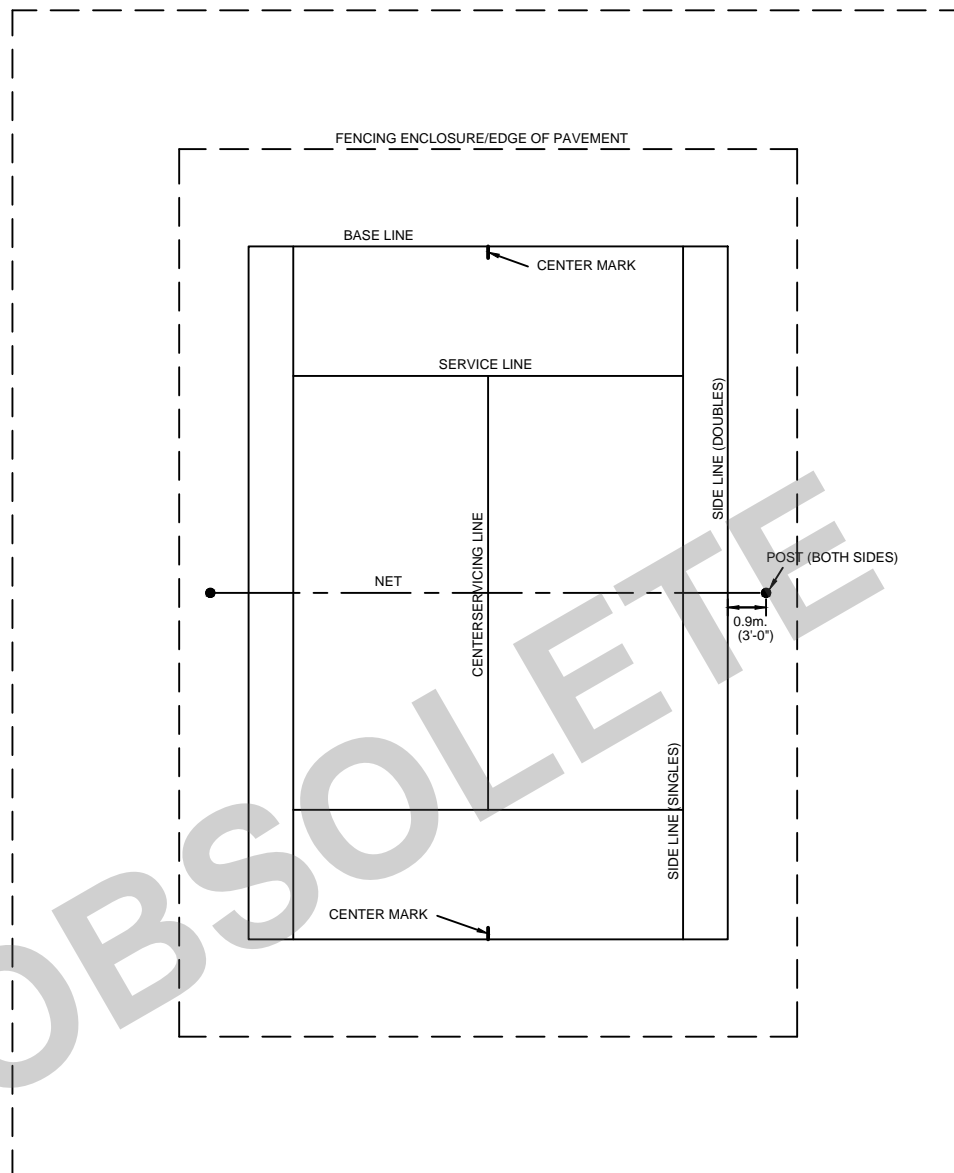
**TOISD
803**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



NOTES

1. FACILITY SIZE:
COURT: 10.97m X 23.77m
2. PLAYOUT ZONE:
6-8m (AT ENDS)
4m (AT SIDES)
3. SETBACK TO RESIDENCES: 15m ALL SIDES.
4. DISTANCE BETWEEN FACILITIES: 30m.

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TENNIS COURT

DRAWN: A&A

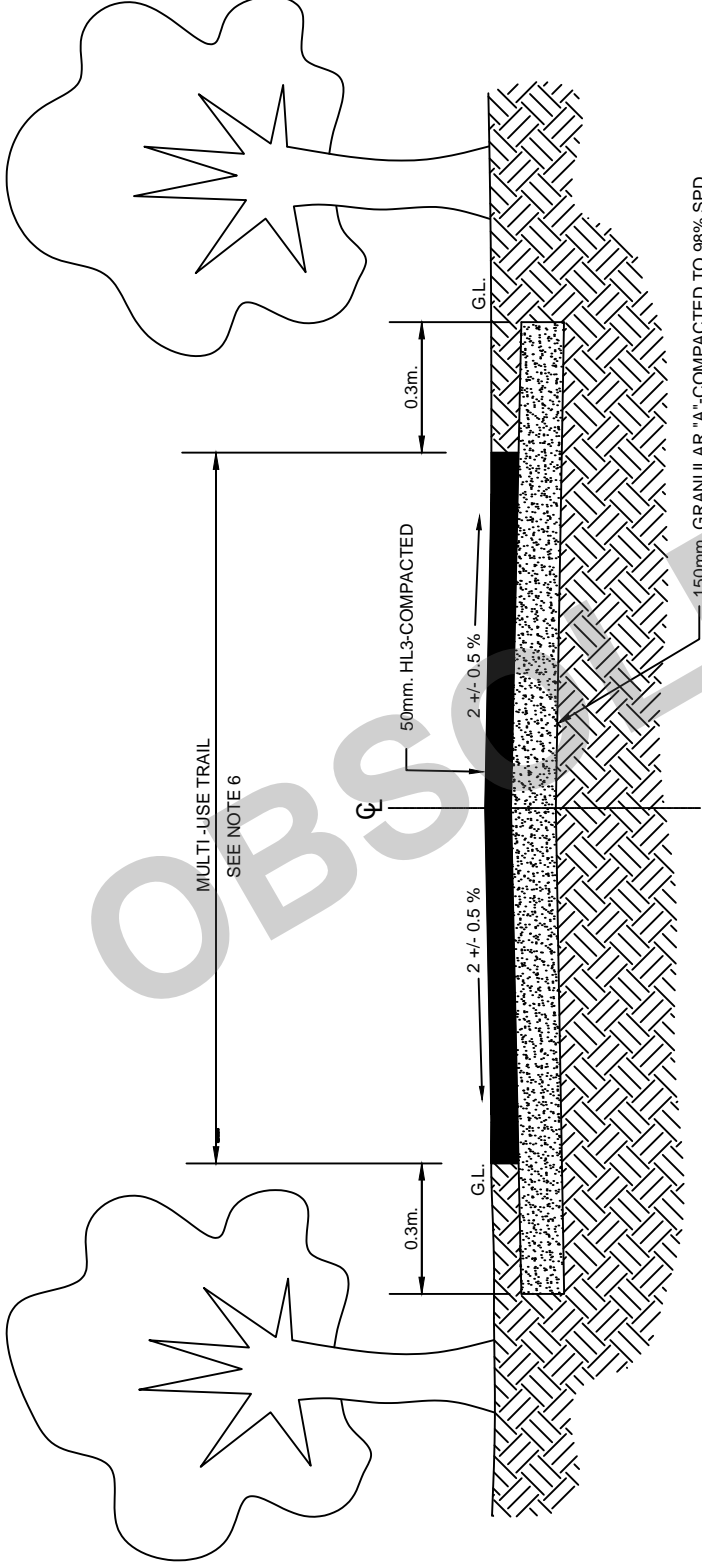
APR'D:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
804



NOTES:

- 1) Remove organics and other unsuitable subgrade materials. Root mass not to be disturbed.
- 2) Alignment and width of HL3 asphalt walkway should be approved by Town of Innisfil.
- 3) Alignment to avoid disturbance of natural terrain and mature trees as much as possible.
- 4) Erosion and sediment control devices to be in place during construction of the walkway and approved by the Town of Innisfil.
- 5) Proper signs and line marking must apply to meet Town of Innisfil requirements.
- 6) Width of walkway to be approved by the Town on an individual case-by-case basis.

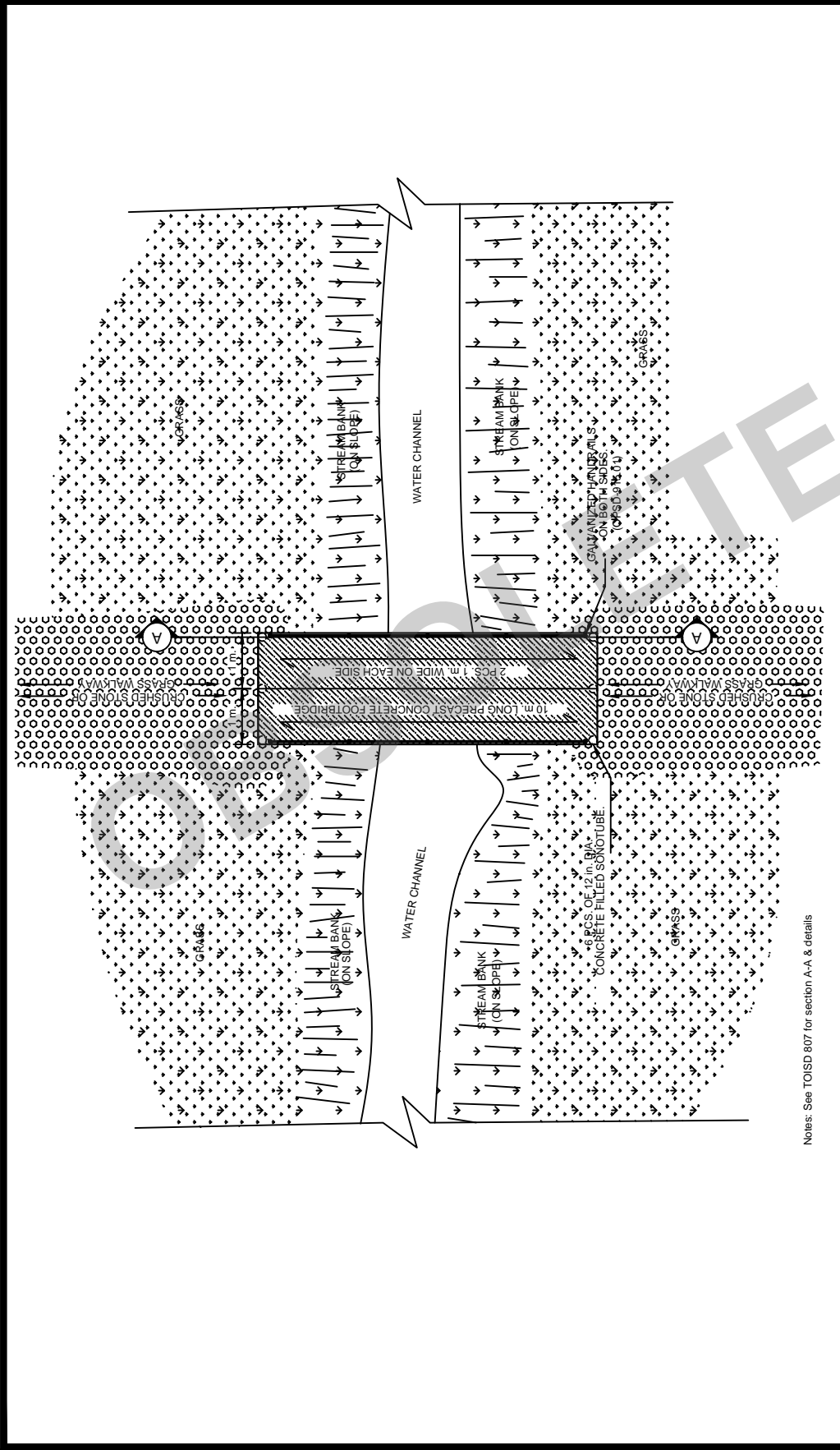


**ASPHALT WALKWAY
(MULTI USE TRAIL)**

DRAWN: A&A
SCALE: N.T.S.

APR D:
DATE: JUNE 2011

METRIC		TOISD	
ALL DIMENSIONS IN mm		805	
UNLESS OTHERWISE NOTED			
		TOI	APRIL 2018
		TOI	APRIL 2015
		APRD	DATE
		ADJUSTED CROSSFALL LABEL	
2.		ADDED NOTE 6	
1.		REVISIONS	
NO.			

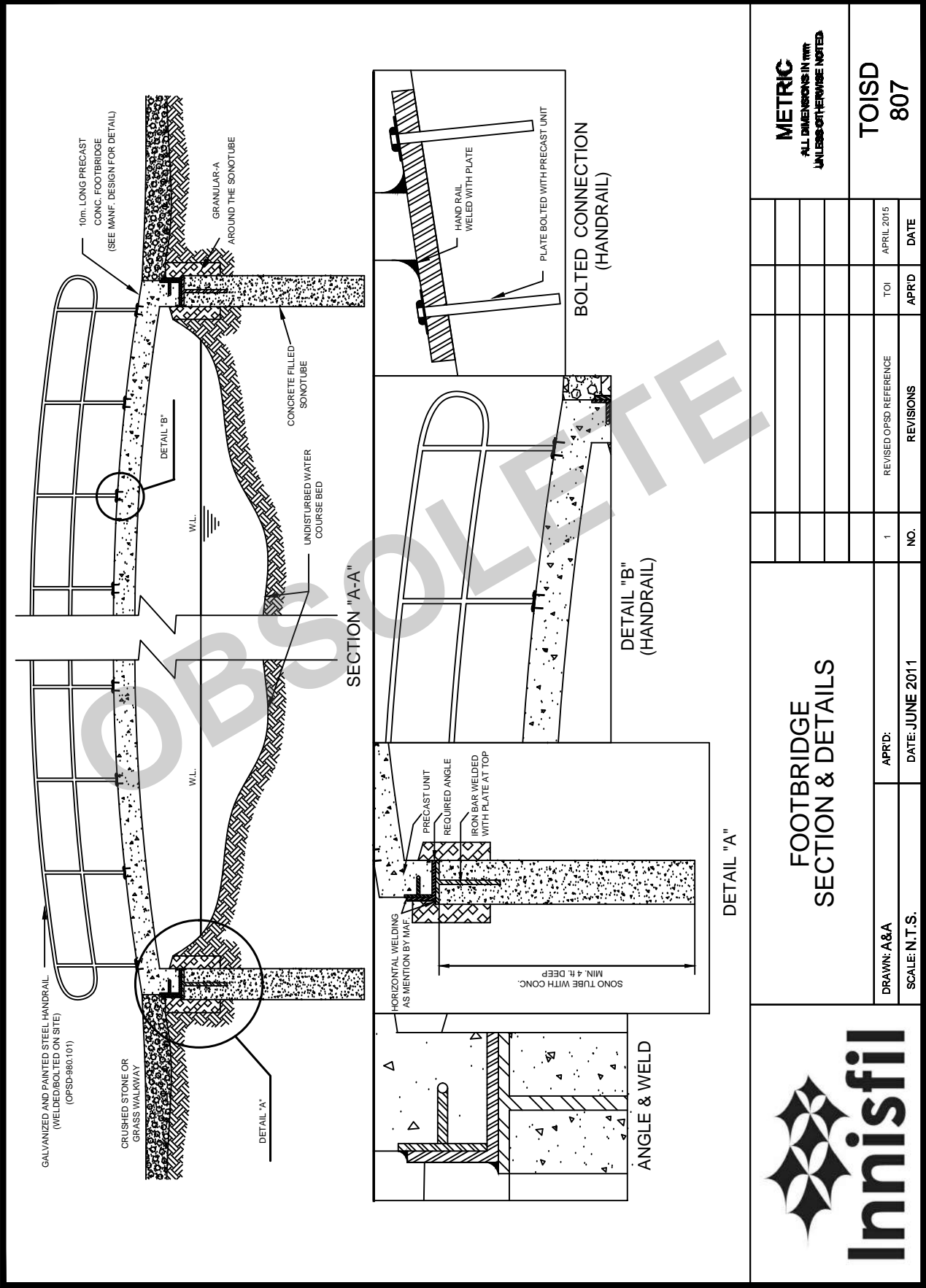


Notes: See TOISD 807 for section A-A & details





FOOTBRIDGE PLAN

DRAWN: A&A SCALE: N.T.S.	APRD: DATE: JUNE 2011			METRIC ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED			
	NO.			TOISD 806			
	REVISED TOWN LOGO			TOI			
	REVISIONS			APRD DATE			
1	NO.			APRIL 2015			



ALL DIMENSIONS AND FONT TYPE REMAINS
SAME UNLESS OTHERWISE NOTIFIED.





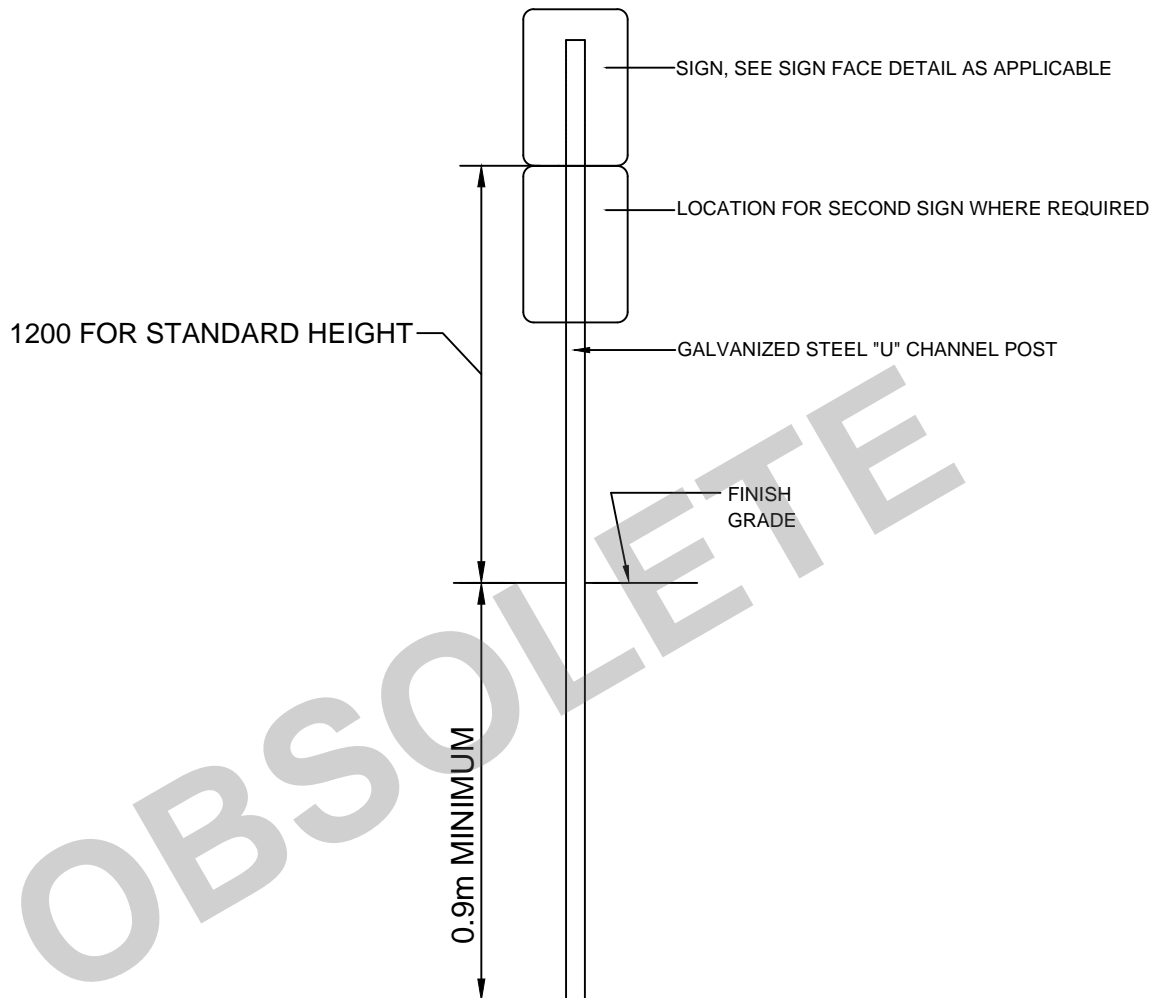
NOTICE

UNSUPERVISED PLAYGROUND

- * Parents and Guardians must supervise children using the play equipment.
- * All users assume all the risks and responsibilities for the proper use of age - appropriate equipment.
- * Play equipment not intended for winter use.
- * Inspect the park each visit for any damage or hazards and report to

Town of Innisfil.
Parks and Recreation Department.
436-3710

		TYPICAL PARK ENTRANCE SIGN BACK DETAILS		<div> <div> DRAWN: A&A SCALE: N.T.S. </div> <div> APRD: DATE: JUNE 2011 </div> </div>		<div> <div>1</div> <div>NO.</div> </div>		<div> <div>REVISED TOWN LOGO</div> <div>REVISIONS</div> </div>		<div> <div>TOI</div> <div>APRD</div> </div>		<div> <div>APRIL 2015</div> <div>DATE</div> </div>		METRIC <small>ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED</small>	
														TOISD 811	



MOUNTING

- 1) THE SIGN FACE MUST BE SECURED TO THE POST WITH TWO GALVANIZED 12 1/2 mm HEX HEAD BOLTS & NUTS WITH FLAT WASHERS ON BOTH SIDES.
- 2) ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANIZED

1	REVISED DRAWINGS REFERENCED IN TITLE BLOCK	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



WARNING SIGN POST DETAIL FOR SIGNS 814 TO 817 INCLUSIVE

DRAWN: A&A

SCALE: N.T.S.

APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
813**



RED REFLECTIVE BACKGROUND

WHITE LETTERS & BORDER

0.064 GAUGE ALUMINUM SIGN BLANK C/W HOLES - METRO PUNCH

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



NO WINTER MAINTENANCE SIGN DETAIL

DRAWN: A&A

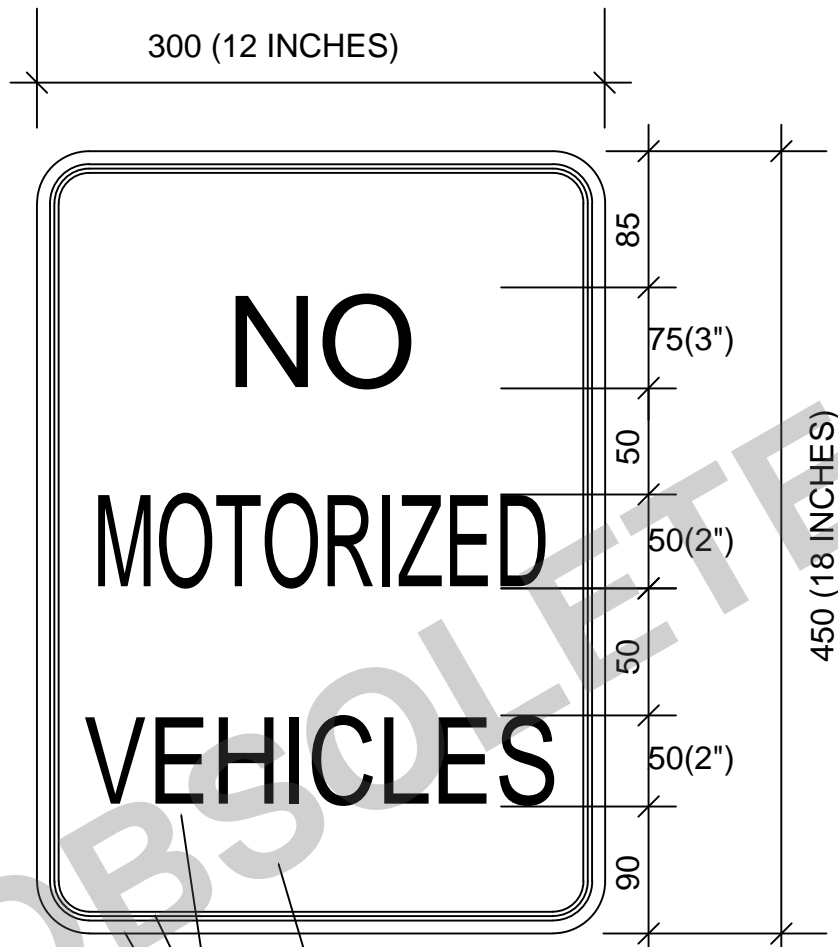
SCALE: N.T.S.

APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
814**



RED REFLECTIVE BACKGROUND

WHITE LETTERS & BORDER

0.064 GAUGE ALUMINUM SIGN BLANK C/W
HOLES - METRO PUNCH

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



NO MOTORIZED VEHICLES SIGN DETAIL

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
815**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



RED REFLECTIVE BACKGROUND

WHITE LETTERS, BORDER & IMAGE

0.064 GAUGE ALUMINUM SIGN BLANK C/W HOLES - METRO PUNCH

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



STOOP & SCOOP SIGN DETAIL

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

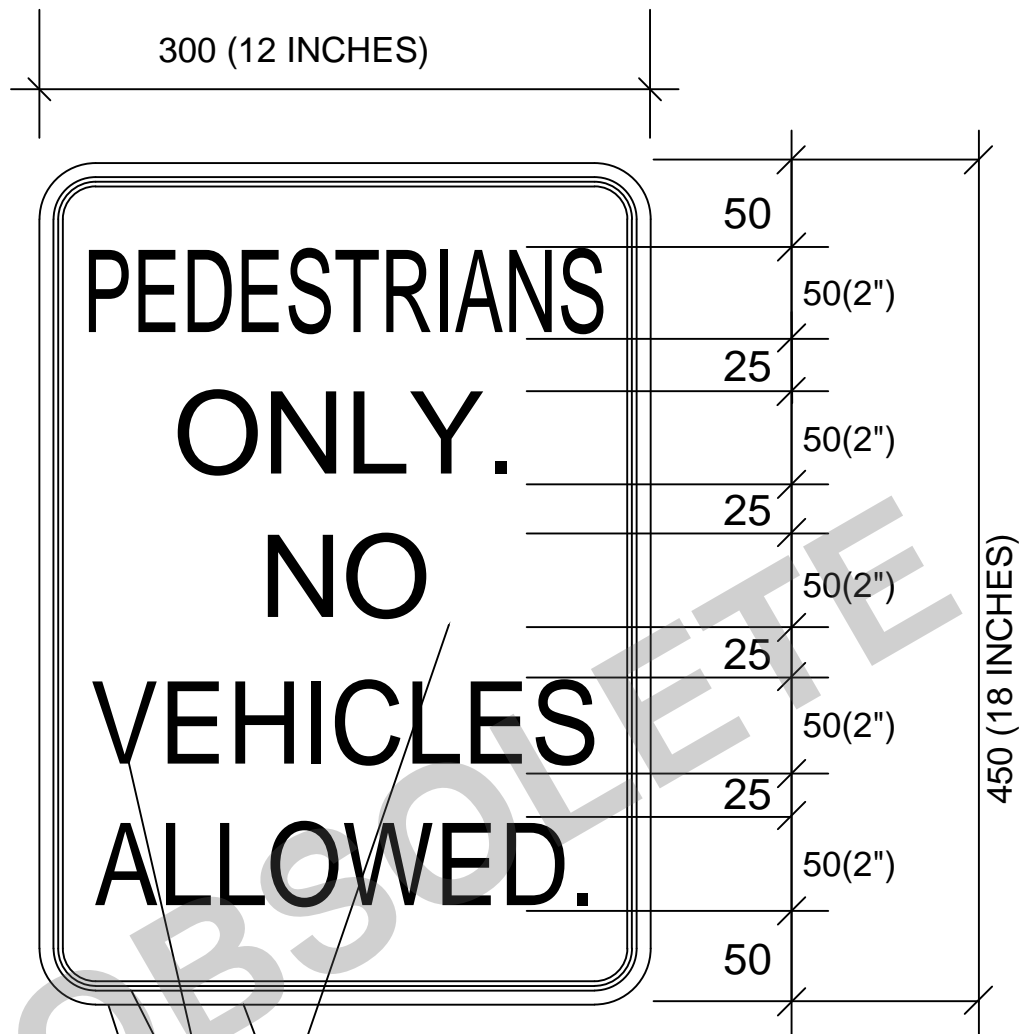
**TOISD
816**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



RED REFLECTIVE BACKGROUND

WHITE LETTERS & BORDER

0.064 GAUGE ALUMINUM SIGN BLANK C/W
HOLES - METRO PUNCH

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



PEDESTRIANS ONLY SIGN DETAIL

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
817**

DRAWN: A&A

APR'D:

SCALE: N.T.S.

DATE: JUNE 2011



STORM WATER MANAGEMENT FACILITY #(SEE NOTE 1)

This pond has been (see note 2) to improve the water quality in the watershed. To ensure continued success of the pond no motorized vehicles are permitted as per By-Law 039-16.

WARNING: Swimming and skating are prohibited due to fluctuating water levels, water quality, and thin ice.

FOR FURTHER INFORMATION OR TO REPORT A BY-LAW INFRACTION,
PLEASE CALL THE TOWN OF INNISFIL AT 705-436-3710 FOR EMERGENCIES CALL 911



To Learn More Please Visit www.innisfil.ca/ProtectingLakeSimcoe

NOTES

1. TOWN ENGINEERING TO PROVIDE SWM FACILITY NUMBER.
2. USE WORDING "RETROFITTED" FOR EXISTING POND OR "CONSTRUCTED" FOR NEW POND.
3. SIGN TO BE LOCATED AT THE ENTRANCE TO THE FACILITY, AS APPROVED BY THE TOWN.
4. SIGN TO BE INSTALLED ON TWO 150 MM SQUARE CEDAR POSTS.
5. SIGN TO BE 1.22m HIGH BY 2.44m WIDE.
6. SIGN TEXT DIMENSIONS AND DETAILS TO BE PROVIDED BY THE TOWN.
7. SIGN STORM WATER MANAGEMENT FACILITY NUMBER TO BE PROVIDED BY THE TOWN.
8. SIGN TO BE LOCATED AT THE ENTRANCE TO THE FACILITY, AS APPROVED BY THE TOWN.



TYPICAL STORM WATER MANAGEMENT POND SIGN DETAIL

DRAWN: CCTA

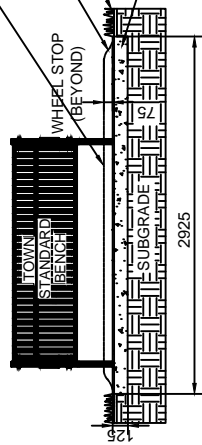
APRD:

SCALE: N.T.S.

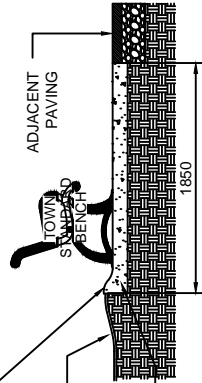
DATE: MAY 2014

							METRIC ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
4	CORRECTED SPELLING	TOI				MAY 2021	TOISD 818
3	REVISED SIGN SIZE	TOI				APRIL 2020	
2	REVISED SIGN AND NOTES	TOI				MAY 2019	
1	REVISED TOWN LOGO	TOI				APRIL 2015	
NO.	REVISIONS	APRD				DATE	

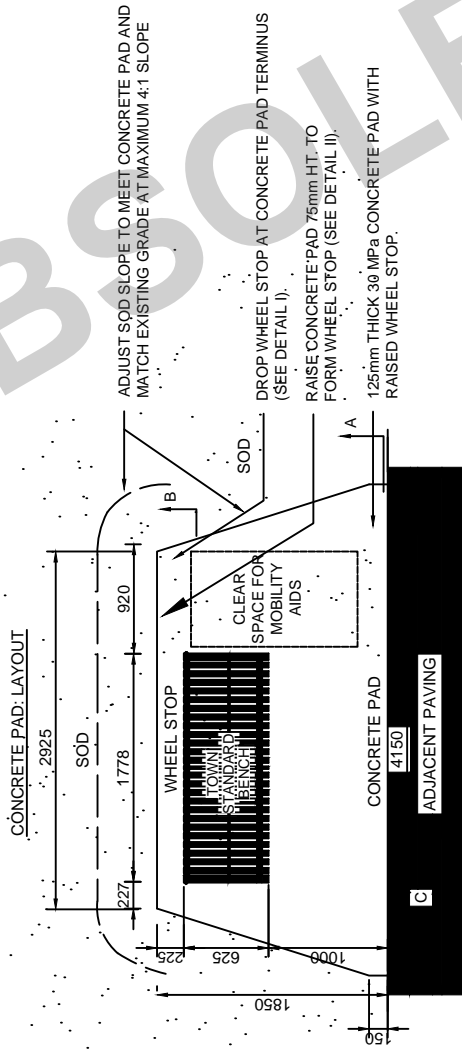
CONCRETE PAD: SECTION B-B



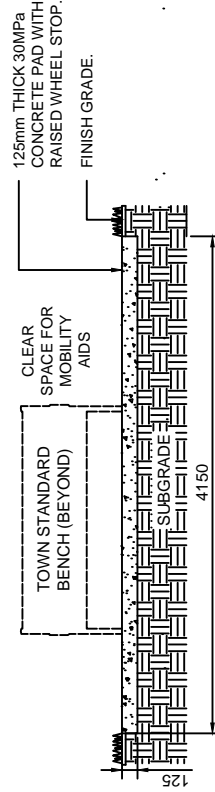
CONCRETE PAD: SECTION C-C



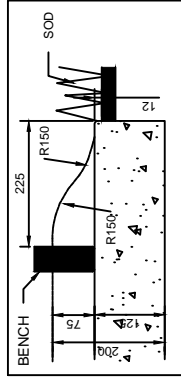
CONCRETE PAD: LAYOUT



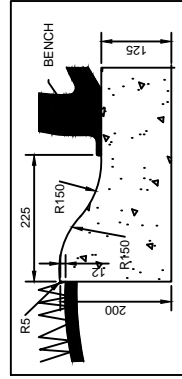
CONCRETE PAD: SECTION A-A



ENLARGEMENT DETAIL I



ENLARGEMENT DETAIL II



NOTES:

1. INSTALL BENCHES AS PER MANUFACTURER'S SPECIFICATIONS. SEE SPECIFICATIONS FOR MODEL AND MANUFACTURER.
2. INSTALL BENCHES WITH 10mm LAG BOLTS AND MATCHING CONCRETE ANCHORED INSERTS.
3. BENCH PAD TO BE SYMMETRICAL UNLESS NOTED OTHERWISE.
4. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.



PARK BENCH CONCRETE PAD, 1
BENCH WITH WHEELCHAIR
PARKING

DRAWN: D.S.L.

APRD: O.P.M.

SCALE: N.T.S.

DATE: APRIL 2016

NO.

REVISIONS

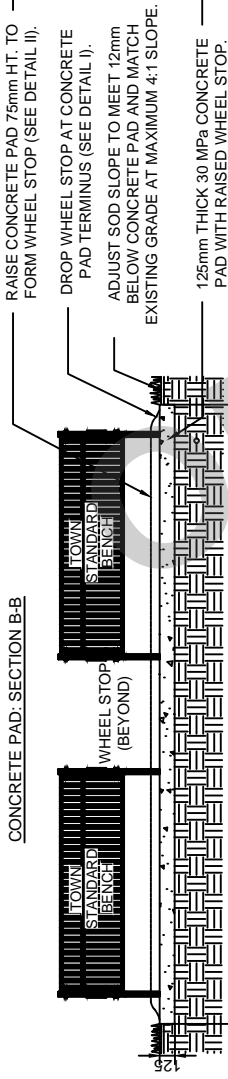
APRD

DATE

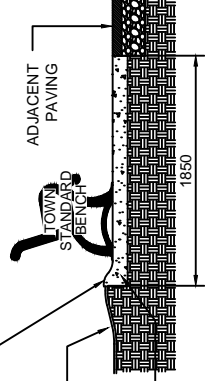
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
819

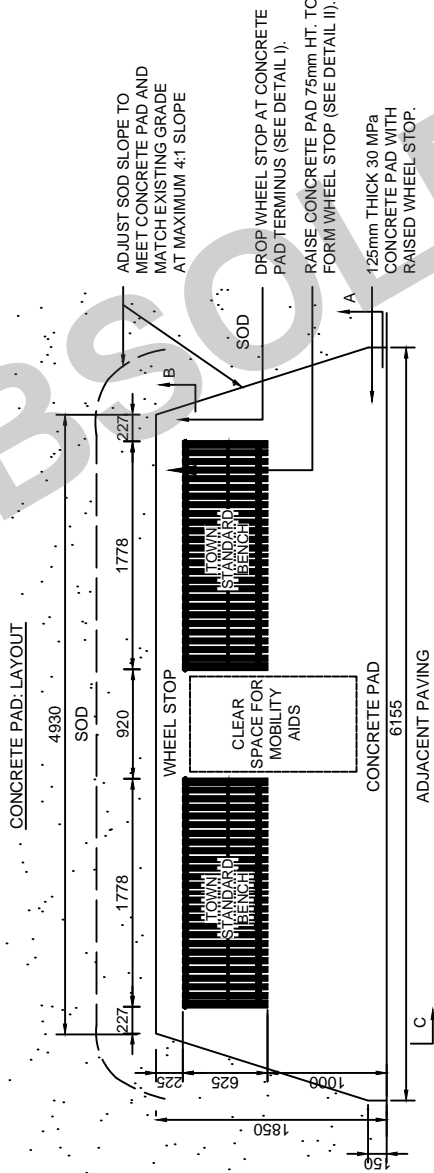
CONCRETE PAD: SECTION B-B



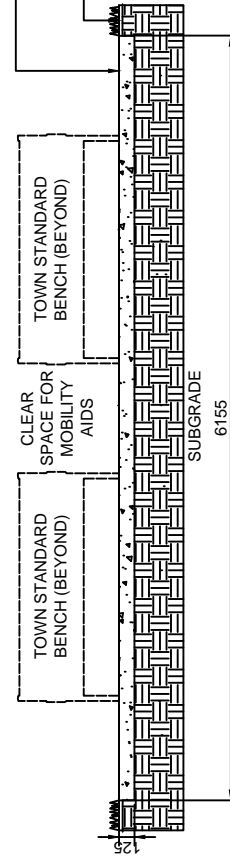
CONCRETE PAD: SECTION C-C



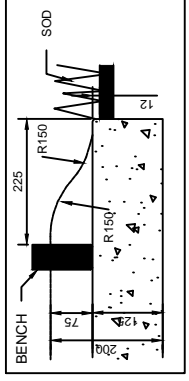
CONCRETE PAD: LAYOUT



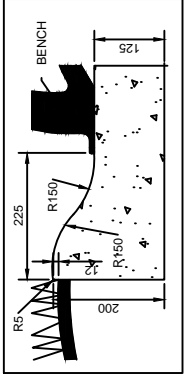
CONCRETE PAD: SECTION A-A



ENLARGEMENT DETAIL I



ENLARGEMENT DETAIL II



NOTES:

1. INSTALL BENCHES AS PER MANUFACTURER'S SPECIFICATIONS. SEE SPECIFICATIONS FOR MODEL AND MANUFACTURER.
2. INSTALL BENCHES WITH 10mm LAG BOLTS AND MATCHING CONCRETE ANCHORED INSERTS.
3. BENCH PAD TO BE SYMMETRICAL UNLESS NOTED OTHERWISE.
4. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.



PARK BENCH CONCRETE PAD, 2
BENCHES WITH WHEELCHAIR
PARKING

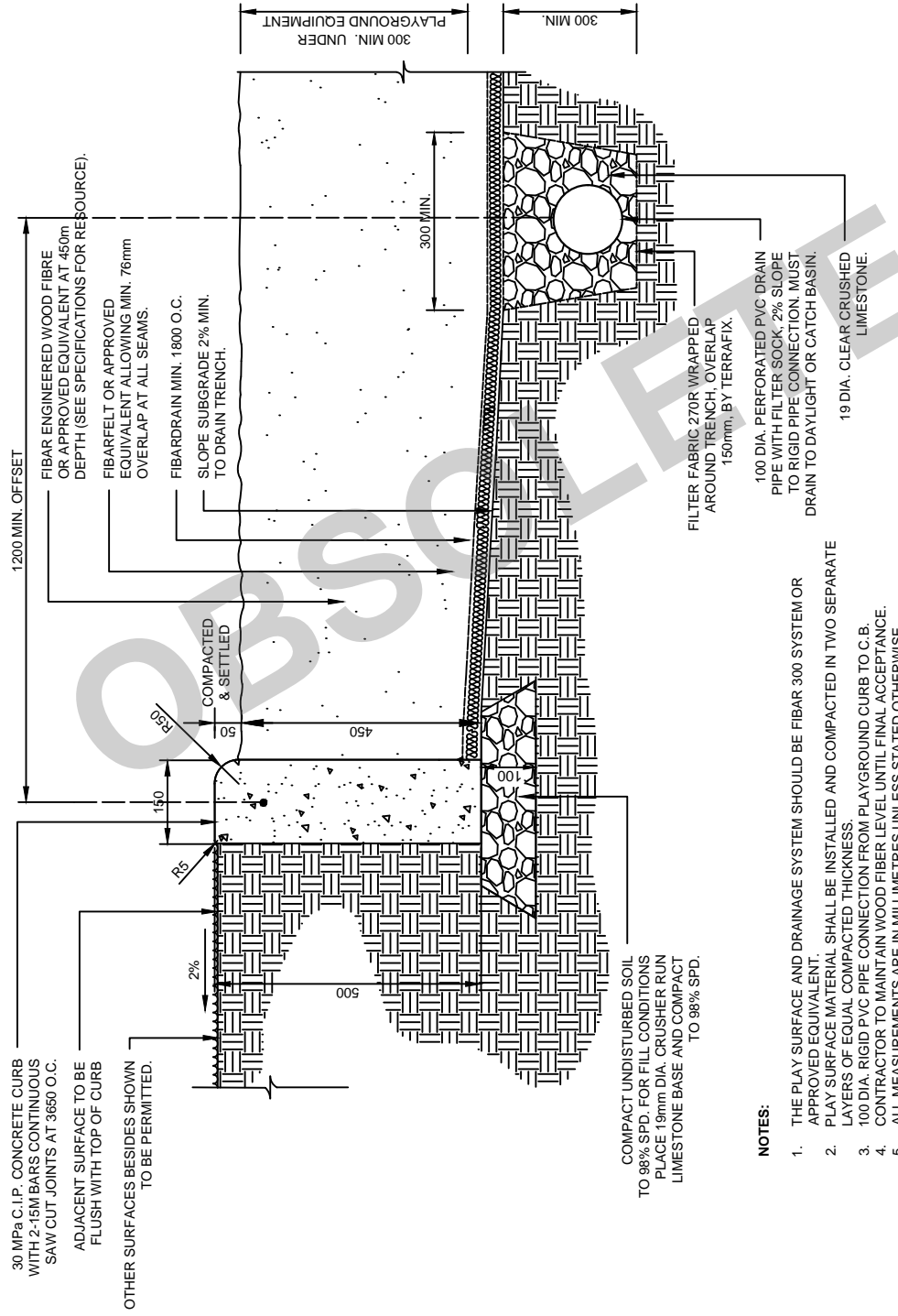
DRAWN: D.S.L.
SCALE: N.T.S.

APRD: O.P.M.
DATE: APRIL 2016

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED


TOISD
820

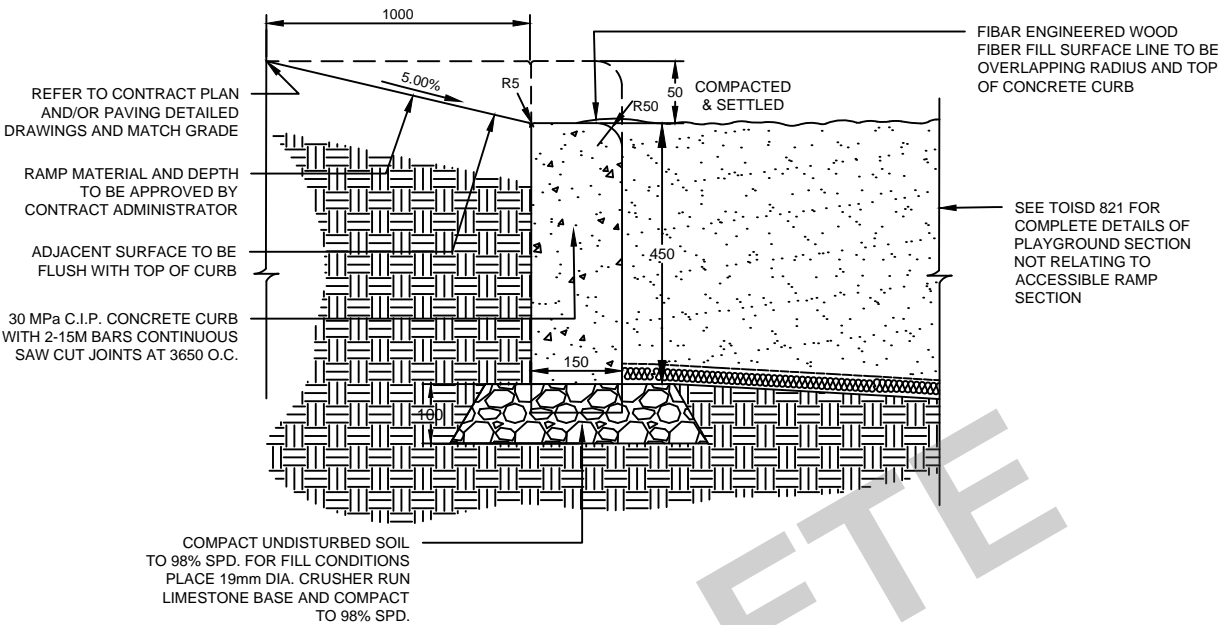
NO.	REVISIONS	APRD	DATE



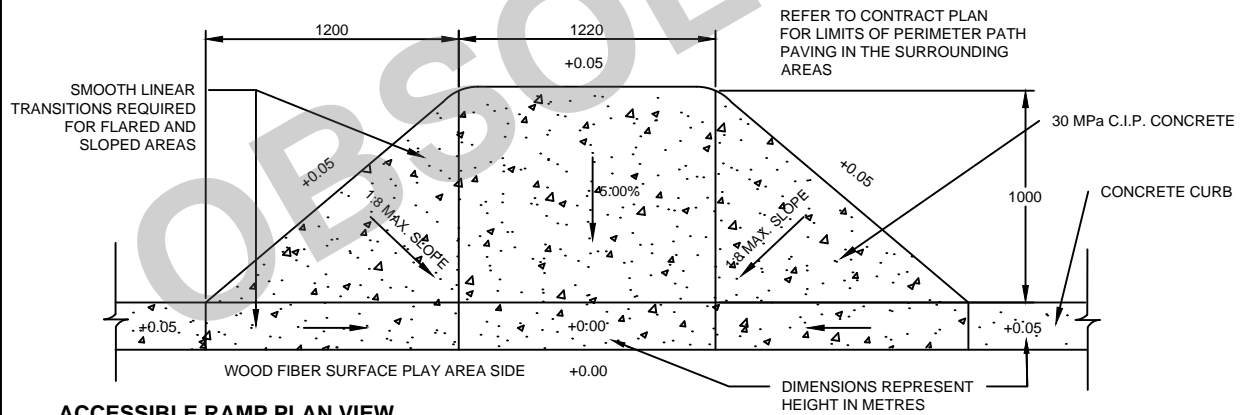
NOTES:

1. THE PLAY SURFACE AND DRAINAGE SYSTEM SHOULD BE FIBAR 300 SYSTEM OR APPROVED EQUIVALENT.
2. PLAY SURFACE MATERIAL SHALL BE INSTALLED AND COMPACTED IN TWO SEPARATE LAYERS OF EQUAL COMPACTED THICKNESS.
3. 100 DIA. RIGID PVC PIPE CONNECTION FROM PLAYGROUND CURB TO C.B.
4. CONTRACTOR TO MAINTAIN WOOD FIBER LEVEL UNTIL FINAL ACCEPTANCE.
5. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

		PLAY AREA (ENGINEERED WOOD SURFACE) C.I.P. CONCRETE CURB (SECTION)		METRIC <small>ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED</small>	
		DRAWN: D.S.L. SCALE: N.T.S.	APR'D: DATE: APRIL 2016	TOI APR'D DATE	TOISD 821



ACCESSIBLE RAMP SECTION



ACCESSIBLE RAMP PLAN VIEW

NOTES:

1. ACCESSIBLE RAMP LAYOUT SHALL ALLOW FOR ALTERNATE CURB OR EDGE DESIGN.
2. FIBAR WOOD ENGINEERED FIBRE OR APPROVED EQUIVALENT INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. SOME SITUATIONS MAY REQUIRE AN ALTERNATIVE DESIGN, TO BE APPROVED BY THE TOWN.
4. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

1.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2018
NO.	REVISIONS	APR'D	DATE



PLAY AREA ACCESSIBLE RAMP

DRAWN: A&A

APR'D:

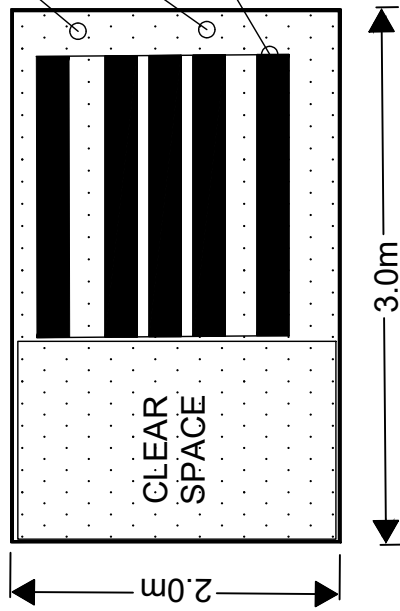
SCALE: N.T.S.

DATE: MARCH 2016

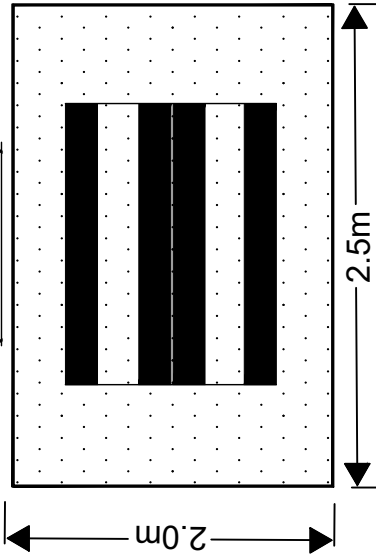
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
822

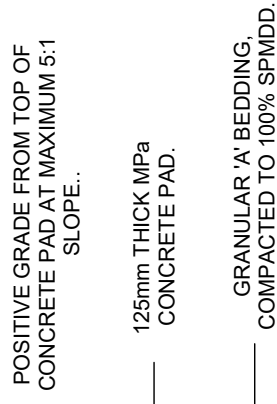
ACCESSIBLE PICNIC TABLE PAD (PLAN VIEW)



STANDARD PICNIC TABLE PAD (PLAN VIEW)



PICNIC TABLE PAD (SECTION)



NOTES:

1. INSTALL PICNIC TABLE AS PER MANUFACTURER'S SPECIFICATIONS. SEE SPECIFICATIONS FOR MODEL AND MANUFACTURER.
2. CONCRETE PAD TO BE INSTALLED HIGHER THAN THE SURROUNDING ELEVATIONS WITH SOD GRADE SLOPED AWAY FROM PAD.
3. WALKWAY MUST ENTER ACCESSIBLE PICNIC TABLE PAD AT THE CLEAR SPACE SIDE.



STANDARD AND ACCESSIBLE PICNIC TABLE PAD

DRAWN: CCTA
SCALE: N.T.S.

APRD: TOI
DATE: MAY 2021

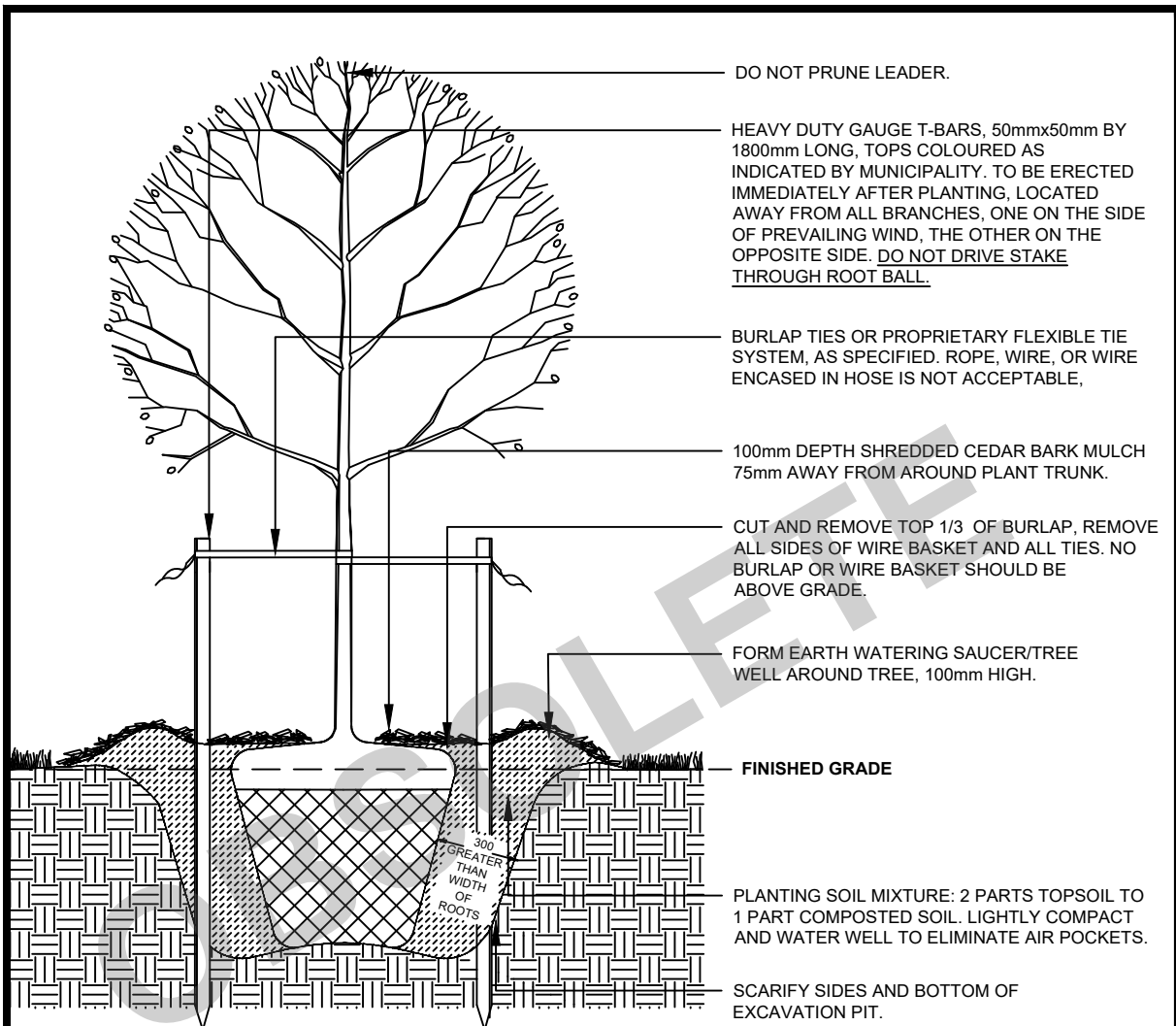
NO. 1

TO REFLECT TOWN STANDARDS
REVISIONS

TOI
APRD
MAY 2021
DATE

**TOISD
823**

METRIC
ALL DIMENSIONS IN MM
UNLESS OTHERWISE NOTED



NOTES

1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
2. POSITION CROWN OF ROOT BALL 100mm ABOVE FINISHED GRADE TO ALLOW FOR SETTLING.
3. DO CORRECTIVE PRUNING TO RETAIN NATURAL FORM OF TREE AS DIRECTED BY THE ARBORIST OR LANDSCAPE ARCHITECT, INCLUDING REMOVAL OF DEAD, BROKEN, OR CROSSING BRANCHES OR CODOMINANT LEADERS. DO NOT REMOVE MORE THAN 20% OF LIVE CANOPY.
4. PRUNE GIRDLING ROOTS.
5. WHEN TREES ARE PLANTED ON SLOPES, SEE DRAWING TOISD 903. BOTTOM OF PLANTING PIT TO BE SLOPED TO PROVIDE POSITIVE DRAINAGE.
6. NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.
7. STAKES AND TIES TO BE REMOVED ONE YEAR AFTER PLANTING. TREES SHOULD BE STRAIGHT AND HAVE A MINIMUM OF 50mm DBH.
8. TREE SHOULD HAVE A STRONG LEADER.
9. BARE ROOT STOCK WILL NOT BE ACCEPTED.

4	TO REFLECT TOWN STANDARDS	TOI	APRIL 2020
3.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
2.	REVISED TOWN LOGO	TOI	APRIL 2015
1.	TO REFLECT TOWN STANDARDS		MAY/14
NO.	REVISIONS	APRD	DATE



DECIDUOUS TREE PLANTING

DRAWN: A&A

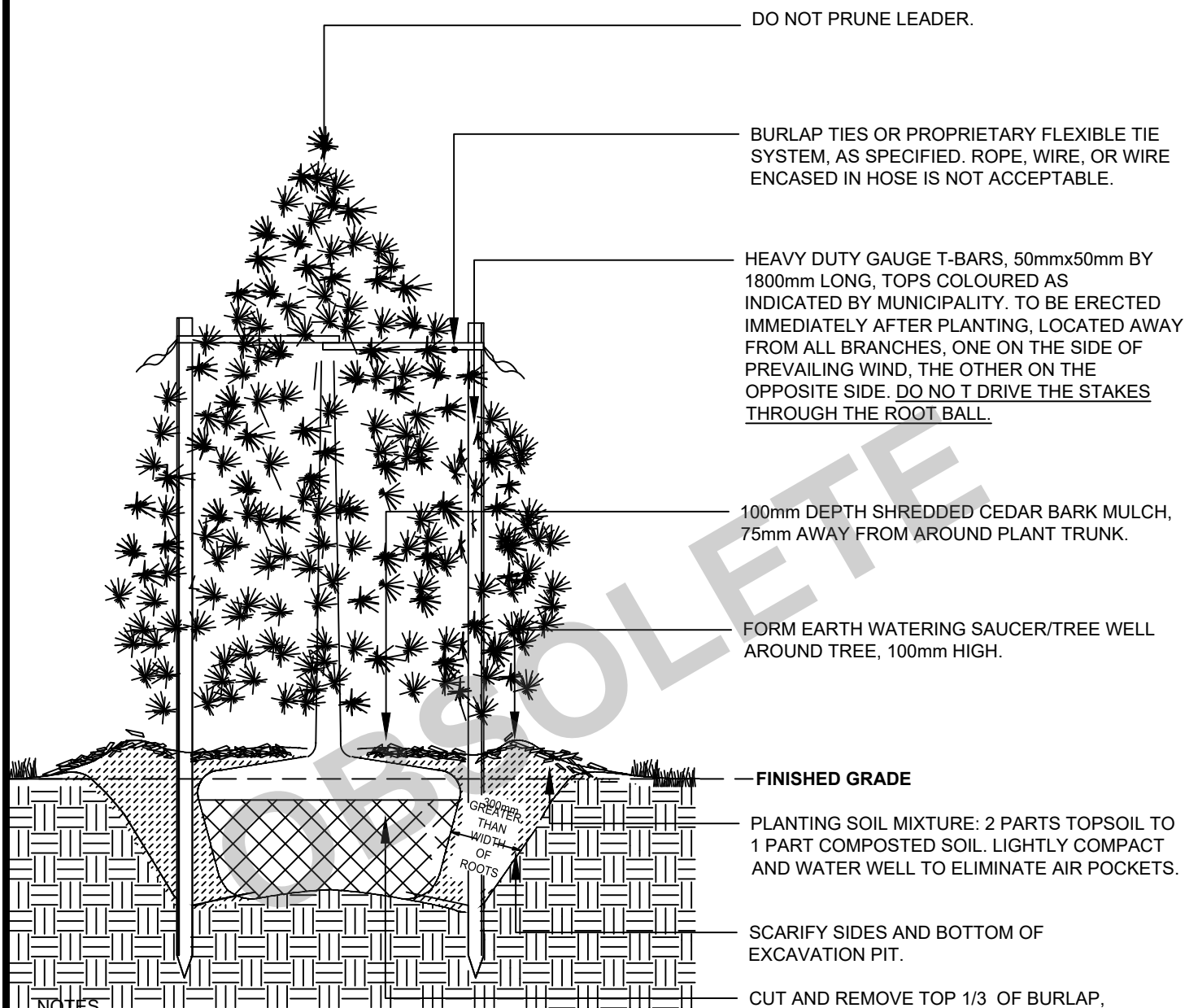
APRD:

SCALE: N.T.S.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
901**



NOTES

- DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
- POSITION CROWN OF ROOT BALL 100mm ABOVE FINISHED GRADE TO ALLOW FOR SETTLING.
- DO CORRECTIVE PRUNING TO RETAIN NATURAL FORM OF TREE AS DIRECTED BY THE ARBORIST OR LANDSCAPE ARCHITECT, INCLUDING REMOVAL OF DEAD, BROKEN, OR CROSSING BRANCHES OR CODOMINANT LEADERS. DO NOT REMOVE MORE THAN 20% OF LIVE CANOPY.
- PRUNE GIRDLING ROOTS.
- WHEN TREES ARE PLANTED ON SLOPES, SEE DRAWING TOISD 903. BOTTOM OF PLANTING PIT TO BE SLOPED TO PROVIDE POSITIVE DRAINAGE.
- NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.
- STAKES AND TIES TO BE REMOVED ONE YEAR AFTER PLANTING.
- TREE SHOULD BE STRAIGHT AND BE A MINIMUM OF 200mm TALL.
- TREE SHOULD HAVE A STRONG LEADER.
- BARE ROOT STOCK WILL NOT BE ACCEPTED.

4	TO REFLECT TOWN STANDARDS	TOI	APRIL 2020
3.	TO REFLECT TOWN STANDARDS	TOI	MAY 2016
2.	REVISED TOWN LOGO	TOI	APRIL 2015
1.	TO REFLECT TOWN STANDARDS		MAY/14
NO.	REVISIONS	APR'D	DATE



CONIFEROUS TREE PLANTING

DRAWN: A&A

APR'D:

SCALE: N.T.S.

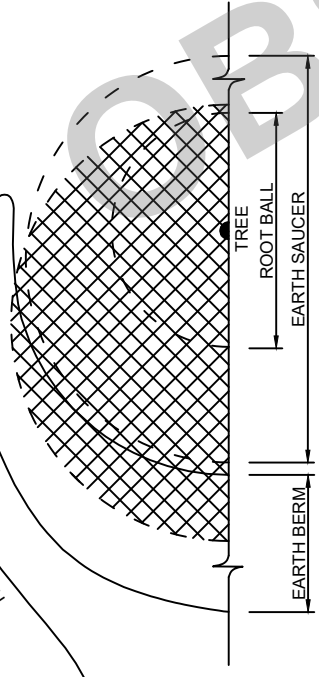
DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
902**

SLOPE

RUN OFF



PLAN

100mm DEPTH MULCH AS PER SPECIFICATION, 75mm AWAY FROM AROUND TREE. SHREDDED CEDAR BARK MULCH

HEAVY DUTY GAUGE T-BARS, 50mmx50mm BY 1800mm LONG, TOPS COLOURED AS INDICATED BY MUNICIPALITY. TO BE ERECTED IMMEDIATELY AFTER PLANTING, LOCATED AWAY FROM ALL BRANCHES, ONE ON THE SIDE OF PREVAILING WIND, THE OTHER ON THE OPPOSITE SIDE.

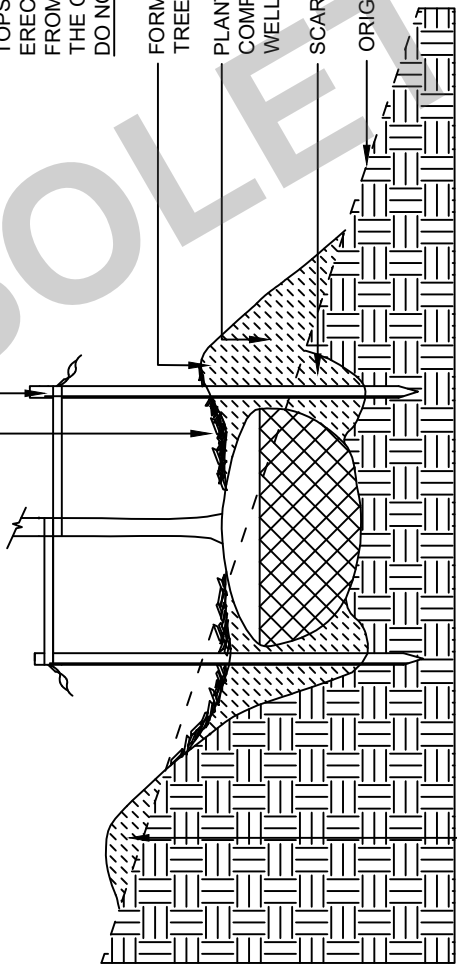
DO NOT DRIVE STAKES THROUGH ROOT BALL.

FORM EARTH WATERING SAUCER / TREE WELL AROUND TREE, 150mm HIGH.

PLANTING SOIL MIXTURE: 2 PARTS TOPSOIL TO 1 PART COMPOSTED SOIL. LIGHTLY COMPACT AND WATER VERY WELL TO ELIMINATE AIR POCKETS.

SCARIFY SIDES AND BOTTOM OF EXCAVATION PIT.

ORIGINAL GRADE OF SLOPE.



SECTION

150mm MIN. HIGH EARTH BERM.

NOTES:

1. THE USE OF AUGERS OR TREE SPADES FOR EXCAVATING PITS IS NOT PERMITTED.
2. TOP OF ROOT BALL TO BE ELEVATED 100mm ABOVE GRADE.
3. DO NOT ALLOW FOR AIR POCKETS WHEN BACKFILLING.
4. NO TREE PITS ARE TO BE LEFT OPEN OVERNIGHT.
5. STAKES AND TIES TO BE REMOVED ONE YEAR AFTER PLANTING.
6. PLANTINGS FOR DECIDUOUS AND CONIFEROUS TREES MUST ALSO ADHERE TO TOISD 901 AND TOISD 902 RESPECTIVELY.



TREE PLANTING ON SLOPE

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
903

DRAWN: TOI
SCALE: N.T.S.

APRD: DATE: MARCH 2016

NO.	TO REFLECT TOWN STANDARDS	TOI	APRD	DATE
1				APRIL 2020
	REVISIONS			

NOTES:

1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
2. POSITION CROWN OF ROOT BALL 50mm ABOVE FINISHED GRADE TO ALLOW FOR SETTLING.
3. DO CORRECTIVE PRUNING TO RETAIN NATURAL FORM OF ARCHITECT, INCLUDING REMOVAL OF DEAD, BROKEN OR CROSSING BRANCHES. DO NOT REMOVE MORE THAN 20% OF LIVE CANOPY.
4. SHRUB GROUPINGS ARE TO BE PLANTED IN A CONTINUOUS MULCHED PLANTING BED EXCEPT IN NATURALIZATION AREAS WHERE SHRUBS MAY BE PLANTED IN INDIVIDUAL HOLES WITH A CONTINUOUS MULCHED UNDERSTOREY. PLANT SPACING MUST BE DETERMINED BY A CERTIFIED HORTICULTURIST OR LANDSCAPE ARCHITECT. TOWN TO HAVE FINAL APPROVAL.

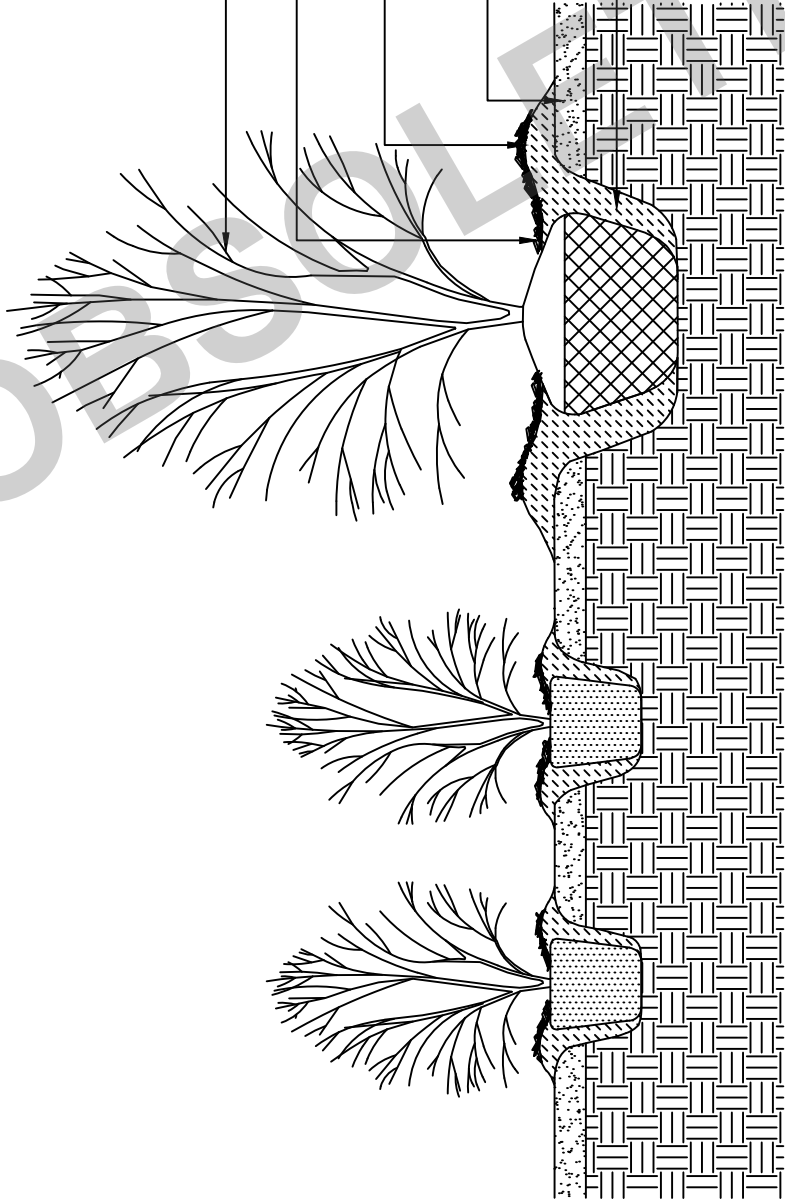
PRUNE DEAD BRANCHES.

100mm MIN. DEPTH SHREDDED CEDAR BARK MULCH.

FORM EARTH WATERING SAUCER AROUND PLANT, 100mm HIGH.

TOPSOIL

PLANTING SOIL MIXTURE: 2 PARTS TOPSOIL TO 1 PART COMPOSTED SOIL. LIGHTLY COMPACT AND WATER WELL TO ELIMINATE AIR POCKETS.



SHRUB PLANTING

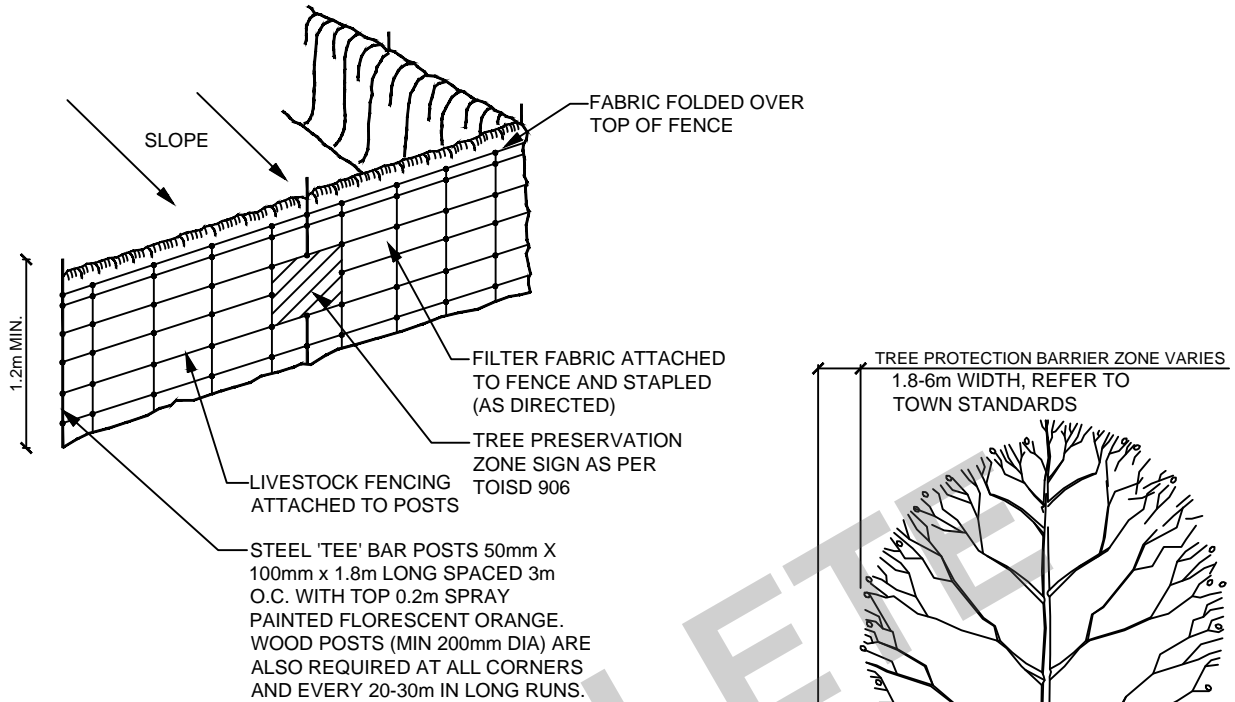
METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
904

DRAWN: TOI
SCALE: N.T.S.

APRD:
DATE: APRIL 2016

NO.	REVISIONS	APRD	DATE
1.	TO REFLECT TOWN STANDARDS		MAY 2016
2.	TO REFLECT TOWN STANDARDS	TOI	APRIL 2020



NOTES:

1. FOR LAYOUT, SEE APPROVED SUBDIVISION / SITEPLAN / ENGINEERING / TREE PRESERVATION PLANS
2. TREE PROTECTION BARRIERS MUST BE 1.2m HIGH
3. FILTER FABRIC REQUIRED FOR EROSION CONTROL AS DIRECTED.
4. WHERE SOME EXCAVATE OR FILL HAS TO BE TEMPORARILY LOCATED NEAR A TREE PROTECTION BARRIER, FILTER FABRIC OR PLYWOOD MUST BE USED TO ENSURE NO MATERIAL ENTERS THE PROTECTION ZONE.
5. ALL SUPPORTS AND BRACING SHOULD BE OUTSIDE THE PROTECTION ZONE. ALL SUCH SUPPORTS SHOULD MINIMIZE DAMAGING ROOTS OUTSIDE THE TREE PROTECTION BARRIER.
6. NO CONSTRUCTION ACTIVITY, GRADE CHANGES, SURFACE TREATMENT OR EXCAVATIONS OF ANY KIND ARE PERMITTED WITHIN THE TREE PROTECTION ZONE.

FILTER FABRIC LAID IN DITCH ON ELEVATED SIDE OF FENCE & BACKFILLED TO PREVENT RUNOFF UNDERMINING FENCE (AS DIRECTED)

1	ADDED REFERENCE TO TOISD 906	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



TREE PROTECTION BARRIER

DRAWN: A&A

SCALE: N.T.S.

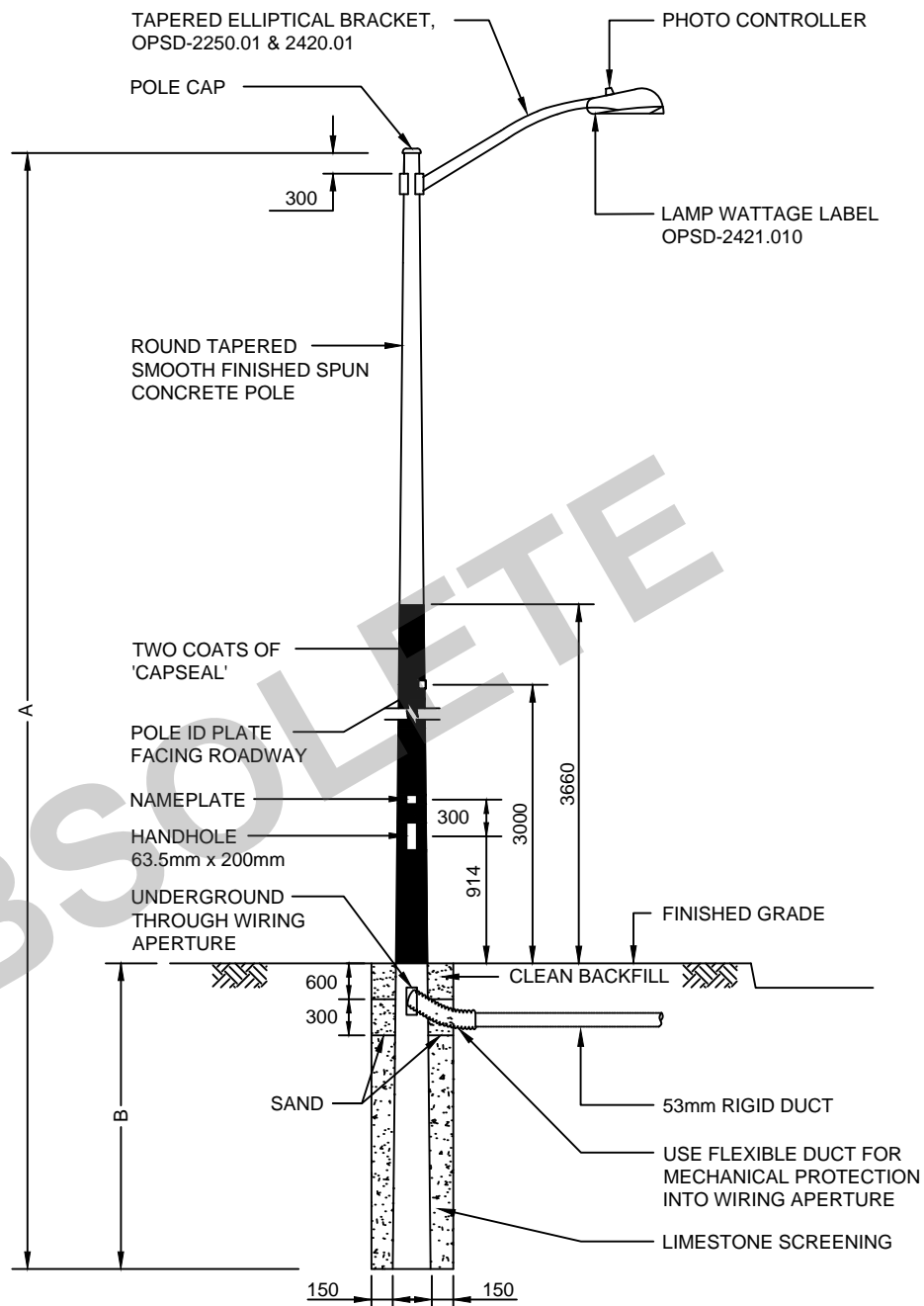
APR'D:

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
905**

CONCRETE LIGHTING POLE INSTALLATION DATA	
POLE LENGTH A	BURIAL DEPTH B
7.6	1.65
9.9	1.7
10.7	1.7
12.2	1.9



NOTES:

- A. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS SHOWN.
 B. PROVIDE GROUND ROD AS PER PLAN.
 C. COMPACT ALL BACKFILL IN LAYERS.

NO.	REVISIONS	APR'D	DATE
1	REVISED TOWN LOGO	TOI	APRIL 2015



ROADWAY LIGHTING STANDARD
DIRECT BURIED

DRAWN: D.S.L.

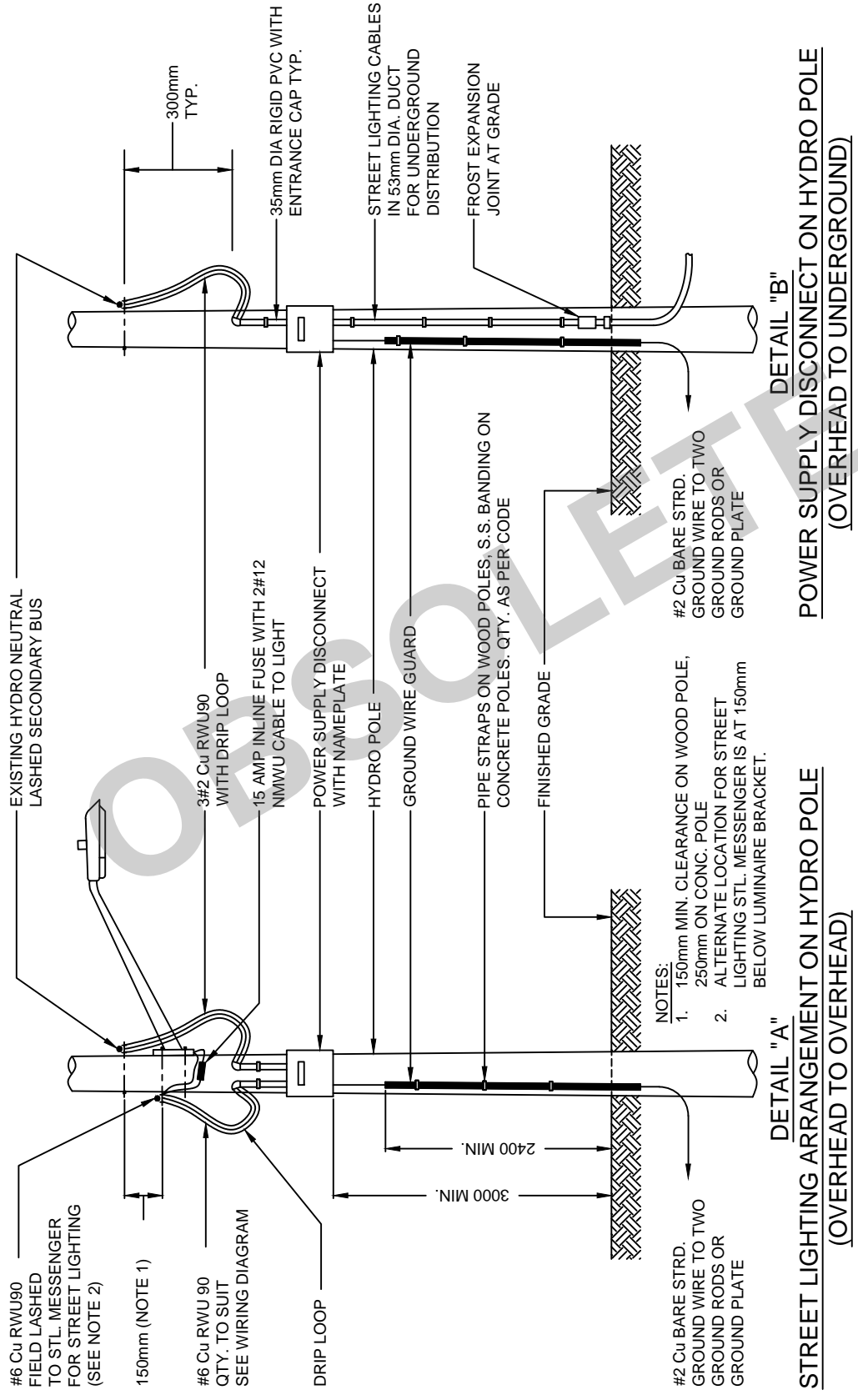
SCALE: N.T.S.

APR'D: O.P.M.

DATE: JUNE 2011

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
1001**

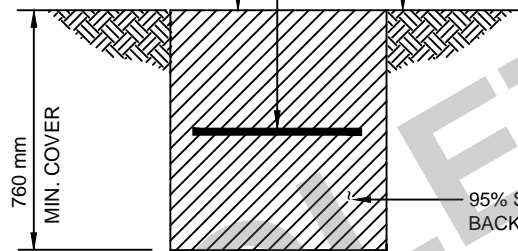


		POWER SERVICE DISCONNECT AND STREET LIGHTING ON HYDRO POLE				METRIC <small>ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED</small>	
		DRAWN: D.S.L. SCALE: N.T.S.	APRD: O.P.M. DATE: JUNE 2011	1 NO.	REVISED TOWN LOGO REVISIONS	TOI APR'D DATE	TOISD 1002

RESTORE SURFACE TO
ORIGINAL CONDITION

PVC WARNING TAPE

EXISTING GRADE



95% STANDARD PROCTOR CLEAN
BACKFILL COMPACTED

RIGID PVC DB2 DUCT

80mm BEDDING ABOVE AND BELOW
DUCT, 6mm SCREENED SAND OR
SCREENED EARTH

COMPACTED TRENCH BOTTOM 98%
PROCTOR DENSITY

NOTES:

1. FOR JOINT USE TRENCH INSTALLATIONS REFER TO THE TOWN'S ROAD ALLOWANCE CROSS SECTIONS.

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



**TYPICAL UNDERGROUND
TRENCH DETAIL
IN BOULEVARD**

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

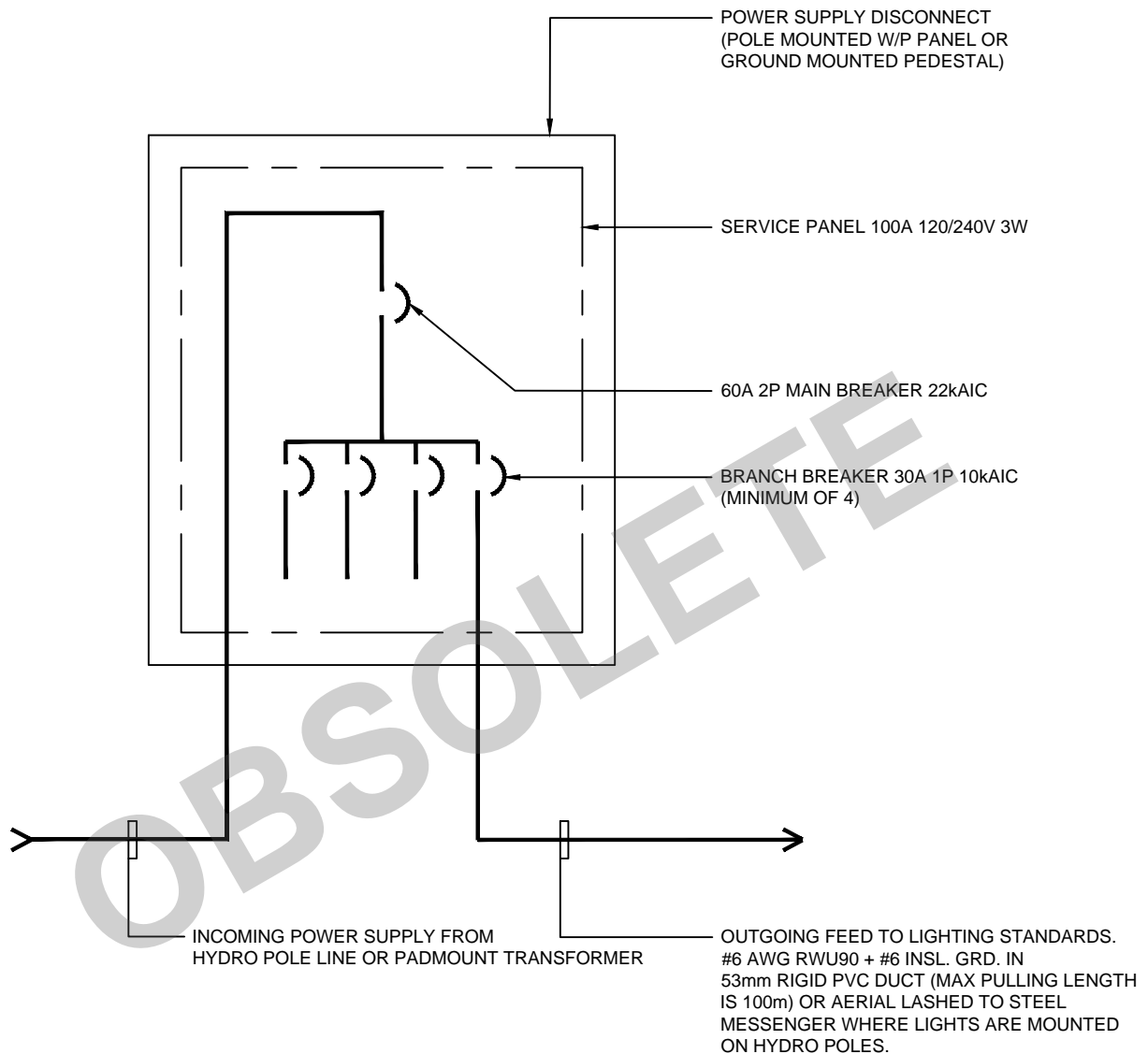
**TOISD
1003**

DRAWN: D.S.L.

APR'D: O.P.M.

SCALE: N.T.S.

DATE: JUNE 2011



NOTES:

1. POLE MOUNTED POWER SUPPLY DISCONNECT SHALL BE SQUARE 'D' CQO TYPE 3R WEATHERPROOF OR REVIEWED EQUIVALENT.
2. GROUND MOUNTED PEDESTAL SHALL BE PEDESTAL SOLUTIONS INC. SL42 NON-METERED WITH PRECAST CONCRETE BASE OR REVIEWED EQUIVALENT.
3. METERED PEDESTALS FOR RECEPTACLE LOADS SHALL BE PEDESTAL SOLUTIONS INC. SLM42 OR REVIEWED EQUIVALENT.

1	REVISED TOWN LOGO	TOI	APRIL 2015
NO.	REVISIONS	APR'D	DATE



ROADWAY LIGHTING
DISTRIBUTION
SINGLE LINE DIAGRAM

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

**TOISD
1004**

DRAWN: D.S.L.

APR'D: O.P.M.

SCALE: N.T.S.

DATE: JUNE 2011