Environmental Study Report

6th Line Municipal Class Environmental Assessment

County Road 27 to St. John's Road

Town of Innisfil, ON

September 6, 2016

Executive Summary

Introduction

The Town of Innisfil (Town) retained HDR to conduct the 6th Line Municipal Class Environmental Assessment (EA) for transportation improvements to 6th Line from St. John's Road to County Road 27, approximately 15 km in length. The study was carried out as a Schedule 'C' undertaking in accordance with the Municipal Engineers Association, Municipal Class Environmental Assessment (October 2000, as amended).

Background

The Town of Innisfil is the "place to be in 2020" and improvements to the transportation infrastructure are required to support this vision. Located in Simcoe County, the Town is on the western shore of Lake Simcoe, and immediately south of the City of Barrie. Recent development and growth has also brought residential growth into the outlying rural areas which has and will continue to affect the roadway networks.

The existing 6th Line roadway, from St. John's Road westerly to County Road 27 is projected to be incapable of supporting the traffic growth in the area by the year 2031 with its current configuration and condition. Growth in the area is being driven by several development plans that have been submitted and are under review by the Town, including the Sleeping Lion Development. The Sleeping Lion Development is located on the north side of 6th Line between 20 Sideroad and Saint John's Road, directly to the east of the Barrie GO line (between Barrie South Station and Bradford Station), and south of an existing residential development. Sleeping Lion is a block within the Alcona South Secondary Plan area.

To implement the recommendations of the Town's Transportation Master Plan (TMP) completed in 2013, the Town is proposing to widen 6th Line from a 20 m wide, 2-lane local rural road to a 26 m wide, 4-lane urban major collector road between St. John's Road to 20 Sideroad and to a 30 m wide, 2-lane rural arterial road from 20 Sideroad to County Road 27.

Study Purpose

The purpose of this EA Study is to identify specific transportation improvements to 6th Line from County Road 27 to St. John's Road, and to address short term and long term transportation needs for all road users, including pedestrians, cyclists and motorists. The objectives of an EA are to minimize or avoid adverse environmental effects before they occur, and to incorporate environmental factors into decision making. Key principles of an EA include consultation with stakeholders and the general public, development and evaluation of a reasonable range of alternatives, and consideration of effects on all aspects of the environment. In this context, the environment is broadly defined to include the natural, social, cultural, built and economic environment.

Improvements will consider opportunities to better serve motorists, pedestrians, cyclists and to help manage increasing traffic resulting from development growth in the Town. Specifically, the Study will consider the need to widen the corridor from 2-lanes to 4-lanes and to support the Town's desire to develop a sustainable transportation system with a strong focus on active transportation and protection of future transit opportunities.

The study area generally extends 300 m north and south of 6th Line from the westerly right-of-way of County Road 27 to approximately 300 m east of St. John's Road and includes the following intersections / crossings:

- County Road 27 / 6th Line;
- 5 Sideroad / 6th Line;
- Highway 400 crossing;
- 10 Sideroad / 6th Line
- Yonge Street / 6th Line;
- 20 Sideroad / 6th Line;
- Barrie GO Train Line crossing;
- St. John's Road / 6th Line.

The study area is illustrated in **Figure A**.

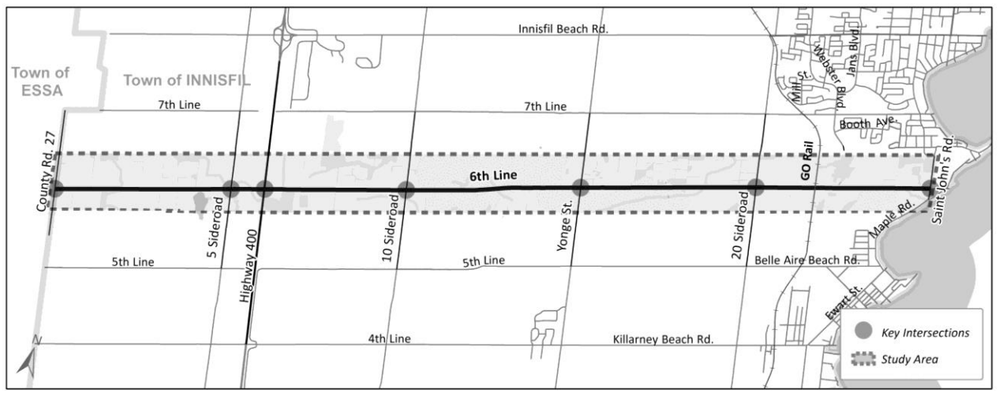


Figure A: Study Area

The area is typically rural with farms and some woodland adjacent to the roadway. However, planned residential development and urbanization of the area east of 20 Sideroad will have a

hdrinc.com 100 York Boulevard, Suite 300, Richmond Hill, ON, CA L4B 1J8
(289) 695-4600

significant impact on 6th Line and the necessary improvements to accommodate future total traffic conditions.

The Study corridor was divided into eight distinct segments (Segments 1 through 8) for evaluation based on the future needs of each segment. A summary of the segments and future needs is provided below, and illustrated in **Figure B**.

Segment 1: County Road 27 to 5 Sideroad
- TMP recommended reconstruction, paved shoulders and re-classification as an Arterial Road (30 m ROW);
- 2-lane Rural Arterial roadway with paved shoulders to accommodate cyclists and roadside ditches;
- Posted 80 km/h (Design Speed 100 km/h).

Segment 2: 5 Sideroad to 20 Sideroad
- TMP recommended reconstruction, paved shoulders and re-classification as Arterial Road (30 m ROW);
- Up to 4-lane Rural Arterial roadway with paved shoulders to accommodate cyclists and roadside ditches;
- Posted 80 km/h (Design Speed 100 km/h);
- Potential for new Interchange at Highway 400 (to be confirmed as part of a separate study, being undertaken by the Town of Innisfil in consultation with MTO).

Segment 3: 20 Sideroad to East of Future Alcona Road South
- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 5-lane Major Collector roadway (i.e. 4 travel lanes plus centre left turn/median lane) is required due to the proximity of existing and future intersections;
- The Town of Innisfil (TOI) has requested provision for multi-use path located on the north side of 6th Line to support active transportation needs for the proposed Sleeping Lion and Alcona South developments and a sidewalk on the south side;
- The desirable ROW for these cross-section elements is 32.5m;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 4: East of Future Alcona Road South to Barrie GO Train Line Crossing
- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 4-lane Major Collector roadway is required;
- TOI has requested provision for multi-use path located on the north side of 6th Line to support active transportation needs for the proposed Sleeping Lion and Alcona South developments and a sidewalk on the south side;
- The desirable ROW for these cross-section elements is 27.5 m;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 5: Barrie GO Train Line Crossing
- 4-lane bridge with multi-use path on the north side and sidewalk on the south side to be consistent with cross-section elements both west and east of the railway crossing.
- The desirable ROW for these cross-section elements is 23 m;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 6: Barrie GO Train Line Crossing to East of Future Street A (Sleeping Lion Development)
- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 5-lane Major Collector roadway (i.e. 4 travel lanes plus centre left turn/median lane) is required due to the proximity of existing and future intersections;
- TOI has requested provision for sidewalk on the south side (where feasible) and multi-use path located on the north side of 6th Line to support active transportation needs for the proposed Sleeping Lion and Alcona South developments;
- Negotiation (between the TOI and the Cortel Group) for the Sleeping Lion Development has identified a maximum ROW of 29 m for this segment;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 7: East of Future Street A (Sleeping Lion Development) to East of Future Street C (Sleeping Lion Development)
- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- Transition from 5-lane to 2-lane Major Collector roadway with multi-use path on the north side to support active transportation needs for the proposed Sleeping Lion and Alcona South developments;
- Due to the presence of a Provincially Significant Wetland (PSW) on the south side of 6th Line and negotiation (between the TOI and the Cortel Group) for the Sleeping Lion Development, a maximum ROW of 26 m has been identified for this segment;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 8: East of Future Street C (Sleeping Lion Development) to St. John's Road
- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 2-lane Major Collector roadway with multi-use path on the north side to support active transportation needs for the proposed Sleeping Lion and Alcona South developments;
- A maximum ROW of 20 m has been identified for this segment due to surrounding constraints (presence of nearby residences with manicured hedges/landscaping in close proximity to the road);
- Posted 50 to 60 km/h (Design Speed 70 km/h as per TOI standard for Urban

Major Collector).

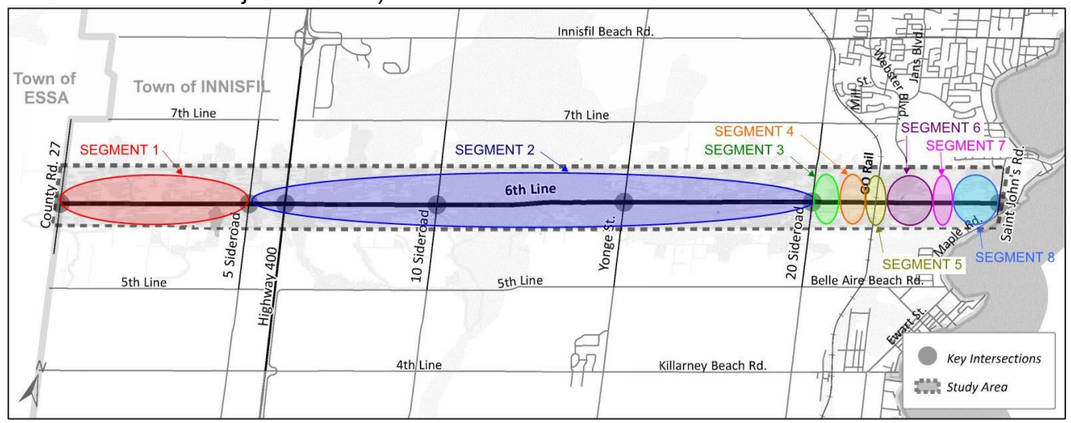


Figure B: 6th Line Corridor Segmentation

Needs Assessment

The needs assessment involves the identification and evaluation of existing and future needs of the transportation network with respect to accommodating all users (pedestrians, cyclists, motorists, and goods movement), network capacity, traffic safety and design and operation. The purpose of the Needs Assessment is to identify and define existing and future capacity, safety, and operational needs along 6th Line between County Road 27 and St. John's Road for all road users.

Transportation Needs

Based on the analysis conducted for the 6th Line EA the following recommendations are made:

- 2031 prior to the construction of the 6th Line / 400 interchange and local new development/growth:
  - County Road 27 to 20 Sideroad - reconstruction to 2 lanes with shoulders
  - 20 Sideroad to St. John's - urbanization and widening to 4 lanes
- 2031 and after construction of the 6th Line / 400 interchange and local new development/growth:
  - County Road 27 to 20 Sideroad - reconstruction to 2 lanes with shoulders
  - 20 Sideroad to St. John's - urbanization and widening to 4 lanes
- 2031 and beyond, and after construction of the 6th Line / 400 interchange, local new development/growth, and significant growth in the Barrie Annexed Lands Secondary Plan Area:
  - County Road 27 to 20 Sideroad - widening to 4 lanes
  - 20 Sideroad to St. John's - urbanization and widening to 4 lanes
- A Highway 400 interchange at 6th Line and corresponding improvements to 6th Line will reduce traffic congestion on Innisfil Beach Road and support development in future growth areas including Sleeping Lion and the Alcona South and Innisfil Heights expansion areas.

The EA will also examine pedestrian and cycling opportunities to meet the goals of creating an Active Travel environment.

Operational and Geometric Needs

The existing roadway geometry along 6th Line generally meets the Town of Innisfil engineering standards, except at the GO Railway overpass. At the GO Railway crossing, the grade is 8%, and the Town's maximum allowed grade is 6%. In the remaining areas, the roadway grades will be engineered to promote drainage, especially in the urbanized section.

Problem and Opportunity Statement

The Needs Analysis has concluded that the existing 6th Line corridor cannot sufficiently support the Town's Transportation Vision or the projected growth. The problems (or deficiencies) identified for the 6th Line Study Area are:

- Roadway infrastructure deficiencies (narrow lanes, narrow shoulders, poor riding surface, no lane markings, etc.);
- Potential constraints affect opportunities to widen;
- No current cyclist or pedestrian accommodations (Active Transportation facilities);
- Future potential need for a new interchange at Highway 400/6th Line to reduce the future stress on the Innisfil Beach Road interchange and to provide access to growing areas in the Town of Innisfil.

Public, Agency and First Nation Consultation

Public input is an important part of the 6th Line Class EA and a number of public and stakeholder consultation activities were held to provide opportunities for engagement. An overview of the key consultation milestones are provided as follows:

November 2014	Notice of Study Commencement
December 2014	Public Open House #1
May 2015	Public Open House #2
June-July 2015	Individual meetings with affected landowners
August 2016	Notice of Study Completion

Public outreach was conducted using a variety of methods to solicit feedback, including advertisements in local newspapers, direct mail, email notifications, project website updates, individual meetings with landowners, and public open houses.

As part of the Environmental Assessment process, multiple technical staff from the Town of Innisfil and partner agencies were consulted with on a regular basis. These agencies and staff members reviewed and provided input on all aspects of the study process, including: the problem and opportunity statement, evaluation criteria, development and evaluation of alternatives, and the preferred alternatives for the roads within the study area. Agency consultation consisted of letters, emails, phone calls, exchanges of information, and stakeholder meetings. Individual meetings with agencies were also held throughout the project.

First Nations representatives were included in the mailing list for the project, and were contacted via study notices throughout the study (including Notice of Commencement, Notice of Public Open Houses, and Notice of Completion). The mailing list was updated to add additional First Nations Representatives or update their contact information as requested throughout the study.

Alternative Solutions

Alternative solutions are different means of addressing the problem. The following alternative solutions were considered:

1. **Do Nothing** - Involves a continuation of existing conditions without changes or improvements to the corridor;
2. **Operational Improvements** – involving new pavement markings, improving traffic signage or adding active transportation signage;
3. **Physical Improvements** – involving road rehabilitation or reconstruction, widening to accommodate additional vehicle lane(s), improve shoulders; add sidewalks and/or multi-use path (i.e. pedestrian and cyclist accommodation); and intersection improvements for signalization.

The alternative solutions for each segment were evaluated based on the ability of the alternative to address the problem statement.

Generally, the “Do Nothing” option does not address the Problem and Opportunity Statement; therefore, this option is not recommended for any segment.

Each of the operational improvement options and physical improvement options can be considered individually or in combination with other operational or physical improvements. They have been identified as having the potential to address some of the issues and deficiencies identified throughout the study area; however, are not expected to address the needs assessment alone.

A combination of operational and physical improvements is recommended. Since conditions differ largely throughout the study area, the number and type of improvements will vary from one location to another. Some improvements will apply throughout the study area, whereas others will be localized in nature, where they best apply.

For each segment an alternative solution consisting of a typical cross section and alignment was developed to meet the needs assessment. In general, widening about the centerline was the initially desired or preferred alignment, and localized shifts to the north and south could be implemented as necessary to minimize impacts to individual constraints or features. This determination was made since widening about the centerline balances the impacts to features and property on both sides of the roadway and contains the impact of construction within the already disturbed area within or adjacent to the road right-of-way. Generally, the preferred solution also tried to follow the existing vertical profile unless existing conditions did not meet geometric design standards.

The recommended alternative solutions are summarized below:

Segment 1: County Road 27 to 5 Sideroad
- Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW)

Segment 2: 5 Sideroad to 20 Sideroad
- Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)

Segment 3: 20 Sideroad to East of Future Alcona Road South
- Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW)

Segment 4: East of Future Alcona Road South to Barrie GO Train Line Crossing
- Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW)

Segment 5: Barrie GO Train Line Crossing
- Alternative #5-1: 4-Lane Urban with Multi-Use Path & Sidewalk

Segment 6: Barrie GO Train Line Crossing to East of Future Street A (Sleeping Lion Development)
- Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)

Segment 7: East of Future Street A (Sleeping Lion Development) to East of Future Street C (Sleeping Lion Development)
- Alternative #7-1: 3-Lane Urban with Multi-Use Path (26m ROW)

Segment 8: East of Future Street C (Sleeping Lion Development) to St. John’s Road
- Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW)

These alternative solutions consist of cross-section elements that accommodate and balance the needs all road users, including cyclists and pedestrians, while minimizing impacts to the Natural and Socio-Economic Environments.

Highway 400 Interchange

Phase 2 of the EA reconsidered the connection of 6th Line with Highway 400 to confirm the recommendation from the TMP. It considered the following alternative solutions:

Alternative 1: Do Nothing (i.e. no connection to Hwy 400)

Alternative 2: Build a Connection to Highway 400

Based on the traffic analysis conducted as part of the EA Study, an interchange at 6th Line has the potential to relieve congestion on Innisfil Beach Road and to provide access to developing areas in Innisfil. A separate study with coordination with MTO will be required to confirm the timing, exact location, and design of the potential Highway 400 interchange.

Recommendations for road improvements as part of the 6th Line EA will not preclude a future interchange if it is determined to be required at this location as part of a separate study. However, the 6th Line EA will not make further recommendations about a potential interchange at this location.

Design Alternatives

To address the varying characteristics of the 6th Line corridor and recommendations carried forward from the alternative solutions, the recommended solutions were further refined as preferred design concepts for each segment of the corridor. The design options merge the horizontal and vertical alignments with the preferred cross-section, to develop a conceptual design. Horizontal and vertical alignments were adjusted as impacts were identified to determine if these impacts could be minimized using minor engineering changes within the allowable engineering standards. An iterative process was followed to arrive at the ultimate preferred design concept. Extensive consultation with agencies, stakeholders and property owners allowed the project team to refine the final designs and alignments. The recommended alternative design concepts for each segment are summarized in **Table A**.

Table A: Summary of Recommended Alternative Design Concepts

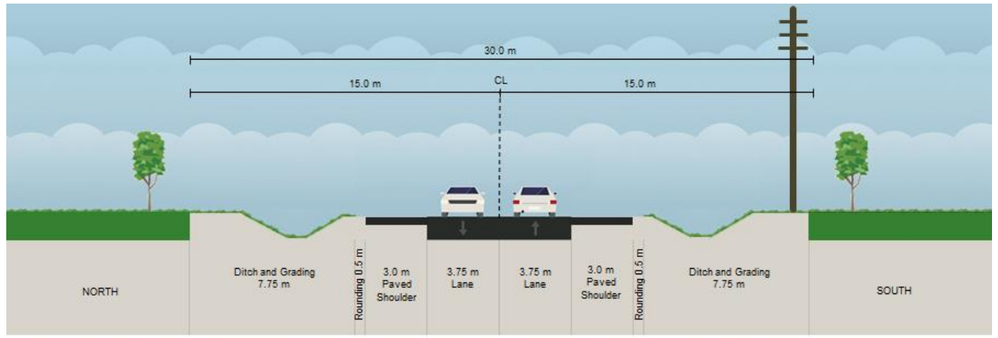
Segment	Preferred Cross Section	Preferred Road Alignment
1: County Road 27 to 5 Sideroad	2-Lane Rural with Paved Shoulders (30m ROW)	Widen about the centerline, with localized shift to the south west of 5 Sideroad
2: 5 Sideroad to 20 Sideroad	Generally: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) Modified Cross Section: 2-Lane Urban with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW). This modified cross-section applies at the following locations: • from west to east boundary of Lover's Creek PSW • from west of Yonge Street to east of Yonge Street • from west of Unevaluated Wetland to west of Banks Creek • from west 20 Sideroad to 20 Sideroad	Generally: Widen about the centerline Localized Shift to the north at the following locations: • from west of Yonge Street to east of Yonge Street • from west of Unevaluated Wetland to west of Banks Creek • from west 20 Sideroad to 20 Sideroad
3: 20 Sideroad to east of Future Alcona Road South	5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW)	Shift to the north
4: East of Future Alcona Road South to Barrie GO Train Crossing	4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW)	Shift to the south
5: Barrie GO Train Crossing	4-Lane Urban with Multi-Use Path & Sidewalk (23m ROW)	Shift to the south
6: Barrie GO Train Crossing to East of Future Street A (Sleeping Lion)	5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)	Shift from the south to the north
7: East of Future Street A to East of Future Street C (Sleeping Lion)	3-Lane Urban with Shoulders and Multi-Use Path (26m ROW)	Widen road platform to the north
8 – East of Future Street C (Sleeping Lion) to St. John's Road	2-Lane Urban with Multi-Use Path (20m ROW)	Widen about the centerline

Preferred Design

The preferred design for 6th Line was chosen after consideration of transportation service for all road users (pedestrians, cyclists, motorists, goods movement) and impacts to the environment, community impacts, cultural heritage impacts, safety, aesthetics, drainage, driveway access, property requirements, and capital construction and maintenance costs. The preferred design is one that best met the goals of the project and balanced the transportation service benefits with the anticipated impacts. The preferred design was selected, developed, and refined through extensive consultation with agencies, stakeholders and the public.

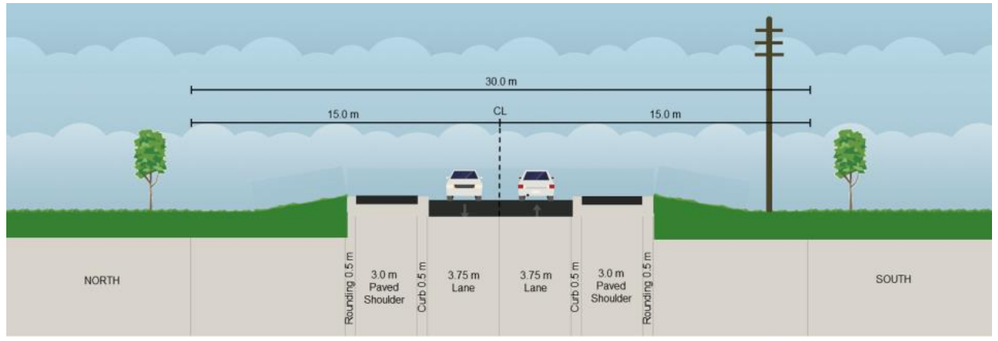
Proposed Cross-Sections

The following figures illustrate the recommended cross-sections, per the recommendations summarized in **Table A.**



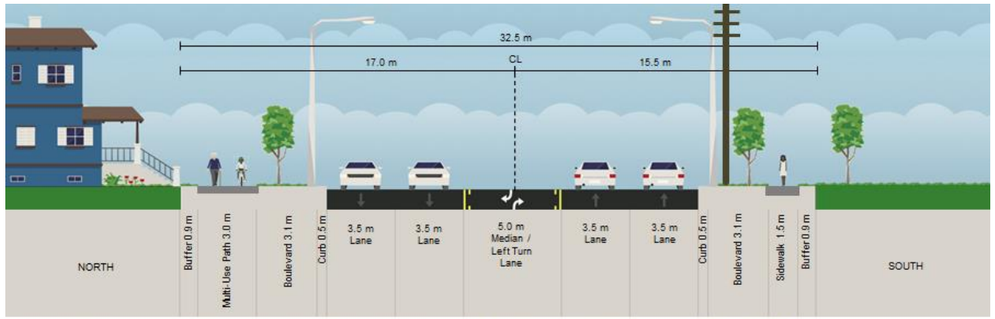
Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure C-1: 2-Lane Rural with Paved Shoulders (30m ROW):



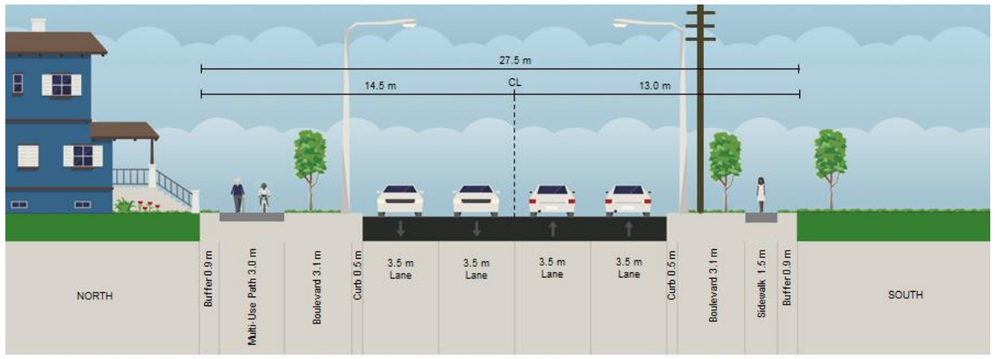
Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure C-2: 2-Lane Urban with Paved Shoulders (30m ROW)



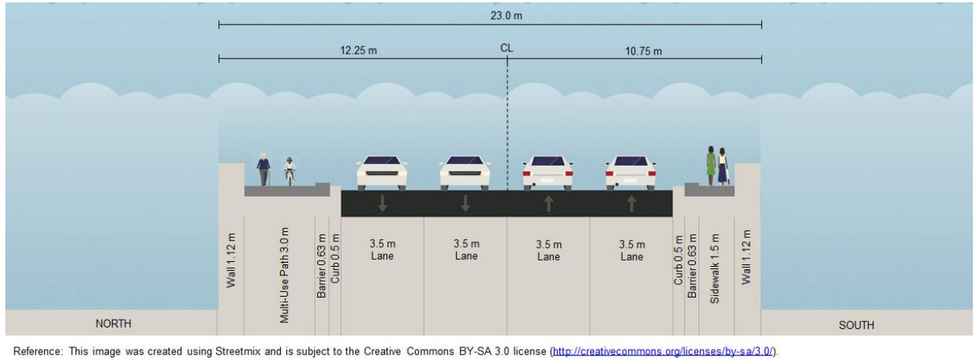
Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure C-3: 5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure C-4: 4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure C-5: 4-Lane Urban with Multi-Use Path & Sidewalk (Barrie GO Train Crossing) (23m ROW)

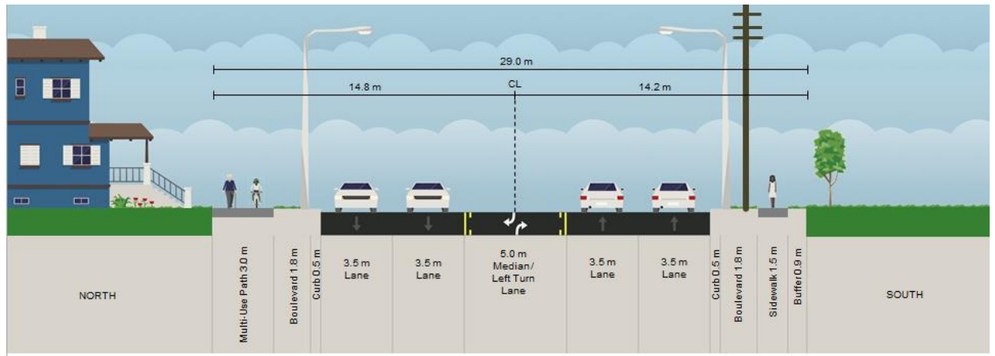


Figure C-6: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)

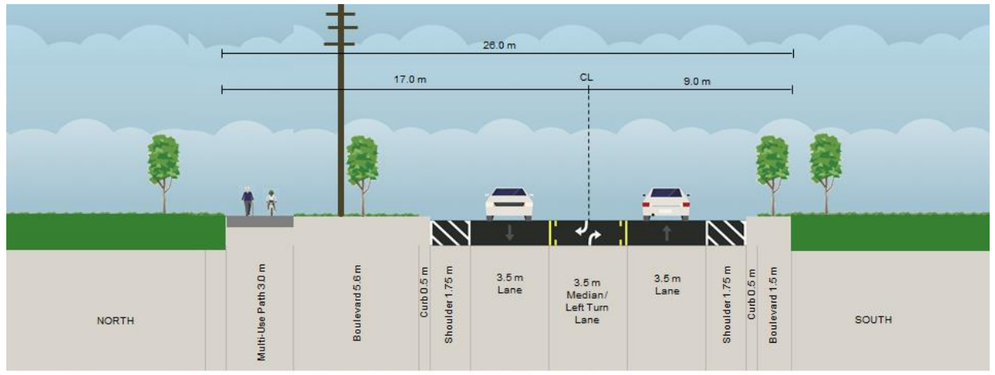


Figure C-7: 3-Lane Urban with Multi-Use Path (26m ROW)

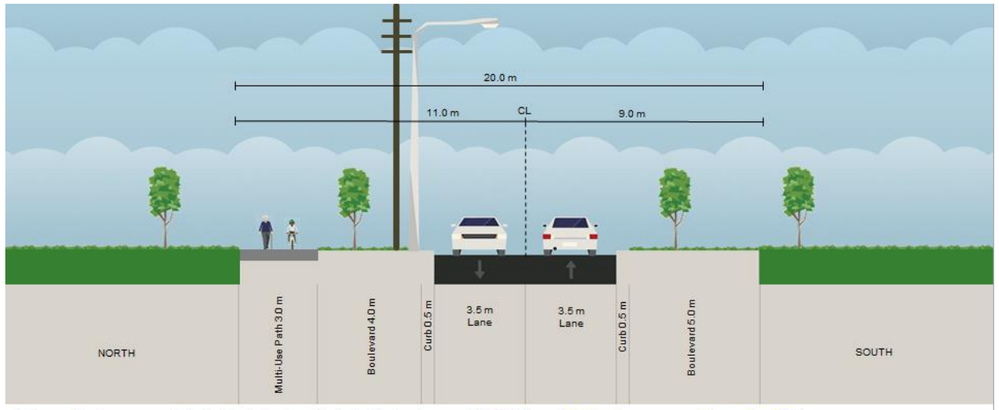


Figure C-8: 2-Lane Urban with Multi-Use Path (20m ROW)

Horizontal Alignment

The proposed design generally follows the existing road centreline with the exception of localized shifts to avoid constraints and minimize impacts to sensitive features, as summarized in **Table A**.

Vertical Alignment

The proposed vertical profile aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road to the extent possible. Deviations from the existing vertical alignment in excess of 1 metre are as a result of:

- Localized vertical shifts to meet geometric standards.
- Application of a 6% grade at Barrie GO Train Line Crossing to accommodate cyclists, pedestrians, and potential electrification of GO Line in the future. This vertical alignment minimizes impacts to nearby development, natural and socio-economic environments, and meets or exceeds minimum geometric standards.
- Localized vertical shifts to accommodate enclosed storm system in the vicinity of the Sleeping Lion Subdivision.

Active Transportation Facilities

Active transportation, including cycling and pedestrian activity, is accommodated through a combination of paved shoulders, sidewalks and multi-use paths within the boulevard.

Traffic Control Recommendations

The proposed design accommodates a 100 km/h design speed (80 km/h posted speed limit) between County Road 27 and 20 Sideroad and an 80 km/h design speed (50-60 km/h posted speed limit) between 20 Sideroad and St. John's Road. The posted speed limit is proposed to be reduced to 60 km/h between 20 Sideroad and Cedar Creek, and to 50 km/h between Cedar Creek and St. John's Road.

Signalization is proposed at the intersections of 6th Line/Yonge Street, 6th Line/20 Sideroad, 6th Line/Future Alcona Road South and 6th Line/Future Street A (Sleeping Lion Development). Stop control at all other intersections is proposed to remain as per existing conditions.

Left turn lanes are provided at all signalized intersections for safety, with standard left-turn storage lengths based on minimum geometric design standards based on TAC Guidelines, with the exception of the 6th Line/Yonge Street intersection which used a reduced storage length to minimize the impact to the existing properties and driveway entrances.

Drainage and Stormwater

The overall existing drainage patterns and locations will not be altered with the proposed roadway improvements. The proposed roadway drainage will be collected by roadside ditches or storm sewers that will outlet to a watercourse as per existing drainage pattern.

It is expected that the quantity of runoff from the paved section of the roadway will generally result only in a very minor increase in runoff, and as such, specific techniques to reduce the quantity and rate of runoff will be considered during detailed design stage. The roadway design should ensure that the major system runoff up to the 100-year event can be safely conveyed to watercourse locations and should allow one lane in each direction to be clear of any flooding.

There are a total of twenty-seven (27) crossing culverts within the study limits. Based on the Ministry of Transportation Design Guideline and the existing cross culverts hydraulic performance, the proposed improvements to 6th Line corridor will result the following crossing culverts improvements:

- Replace crossing culverts (same size): 01-04, 01-12, 01-13, 01-14, 01-18, 01-19, 03-02
- Replace crossing culverts (upgrading size): 01-01, 01-02, 01-05, 01-09, 01-10, 01-11, 01-15, 01-17, 01-22, 01-24, 03-02, 03-03
- Maintain culverts and provide culvert extension: 01-03, 01-06, 01-07, 01-08, 01-16, 01-20, 01-21, 01-23, 03-01

It should be noted that where feasible, open bottom culverts are preferred by the conservation authorities to minimize impact to the ecosystem.

The road segments within the NVCA jurisdiction area (west of Yonge Street) are mostly rural, where roadside ditches/grassed swales are the preferred options to provide water quality and water quantity control to a total pavement area 12.40 ha. Stormwater practices such as stormwater management pond, oil-grit separator and soil trench system will provide water quality and water quantity control to a total pavement area of 4.53 ha within the LSRCA jurisdiction area (east of Yonge Street).

It is recommended that roadside ditches and grassed swales be contained within the road right-of-way to minimize grading impacts to natural areas outside of the right-of-way limits.

Anticipated Impacts and Mitigation

Anticipated impacts to the natural, social/economic and cultural environments together with proposed mitigation measures were identified to address the implementation of the conceptual design. Socioeconomic impacts considered property requirements, noise, archaeology, built heritage and cultural landscape impacts. Natural environment impacts include consideration of wetlands, water quality, groundwater, fisheries and aquatic habitat, vegetation and vegetation communities, wildlife and wildlife habitat, soil removal and contaminants, and soil disturbance and potential for erosion. In general, impacts associated with the proposed 6th Line improvements are minor in nature and can be mitigated. Details of environmental impacts and mitigation are provided in **Section 8.14** of the ESR.

Timing of Implementation and Future Commitments

Timing of improvements is to be confirmed during detailed design. It is anticipated that implementation of improvements for the segment from 20 Sideroad to St. John's Road will take place first, followed by the segment between County Road 27 and 20 Sideroad.

The ESR identifies specific items to be reviewed and confirmed during detailed design. Some of these commitments will address specific concerns raised by property owners and review agencies during the EA process and are provided in **Section 9.4** of the ESR.

Table of Contents

Figures

Tables

Appendices

Appendix A: Public Consultation

Appendix B: Agency and First Nations Consultation

Appendix C: Stage 1 Archaeological Assessment

Appendix D: Cultural Heritage Resource Assessment

Appendix E: Noise Impact Report

Appendix F: Factual Geotechnical and Pavement Design Report

Appendix G: Desktop Study Foundation Assessment

Appendix H: Contamination Overview Study

Appendix I: Natural Heritage Assessment

Appendix J: Culvert Inspection Report

Appendix K: Preliminary Hydrogeology Assessment

Appendix L: Travel Demand Forecasting Memorandum

Appendix M: Stormwater Management Report

Appendix N: Conceptual Design Plates

Appendix O: High Level Cost Estimates

1 Introduction

The Town of Innisfil is the “place to be in 2020” and improvements to the transportation infrastructure are required to support this vision. Located in Simcoe County, the Town of Innisfil (Town) is on the western shore of Lake Simcoe, and immediately south of the City of Barrie. Recent development and growth has also brought residential growth into the outlying rural areas which has and will continue to affect the roadway networks.

The purpose of this study is to carry out a Schedule ‘C’ Municipal Class Environmental Assessment Study (Study) for transportation improvements to 6th Line from St. John’s Road to County Road 27, approximately 15 km in length. Today 6th Line is a 2-lane road with a posted speed of 80km/h.

To implement the recommendations of the Town’s Transportation Master Plan (TMP) completed in 2013, the Town is proposing to widen 6th Line from a 20 m wide, 2-lane local rural road to a 26 m wide, 4-lane urban major collector road between St. John’s Road to 20 Sideroad and to a 30 m wide, 2-lane rural arterial road from 20 Sideroad to County Road 27. Although the Town’s TMP does not provide specific recommendations about active transportation facilities along 6th Line, the project team understands that cyclists also travel along 6th Line and investigation during the EA Study may justify a cross-section design that includes a multi-use path or on-street bike lanes to support the Town’s goal of connectivity of residents, businesses, and community. The recently completed TMP provided the following recommendations along the Study corridor.

1. Upgrade 6th Line road classification from Local Road to Town Arterial Road from County Road 27 to 20 Sideroad
2. Upgrade 6th Line road classification from Local Road to an Urban Major Collector from 20 Sideroad to St. John’s Road
3. New interchange at Highway 400 and 6th Line by 2031
4. Reconstruct 6th Line from County Road 27 to 20 Sideroad by 2031
5. Urbanize 6th Line from 20 Sideroad to St. John’s Road by 2021

At the conclusion of this Municipal Class Environmental Assessment, the recommendations of the Transportation Master Plan will be confirmed, as well as identifying additional improvements and impacts.

1.1 Study Purpose

The existing 6th Line roadway, from St. John’s Road westerly to County Road 27 is projected to be incapable of supporting the traffic growth in the area by the year 2031 with its current configuration and condition. Growth in the area is being driven by several development plans that have been submitted, and are in their early stages of review with the Town.

The purpose of this Schedule ‘C’ Municipal Class Environmental Assessment Study is to identify the need for transportation improvements to 6th Line from County Road 27 to St. John’s Road. The objectives of an Environmental Assessment are to minimize or avoid adverse environmental effects before they occur, and to incorporate environmental factors into decision making. Key principles of an Environmental Assessment include consultation with stakeholders and the general public, development and evaluation of a reasonable range of alternatives, and consideration of effects on all aspects of the environment. In this context, the environment is broadly defined to include the natural, social, cultural, built and economic environment.

Improvements will consider opportunities to better serve motorists, pedestrians, cyclists and to help manage increasing traffic resulting from development growth in the Town. Specifically, the Study will consider the need to widen the corridor from 2-lanes to 4-lanes and to support the Town’s desire to develop a sustainable transportation system with a strong focus on active transportation and protection of future transit opportunities.

The Study will:

- Review existing conditions and future transportation needs along the corridor (Needs Assessment);
- Identify opportunities for improvement and offer possible solutions;
- Collect, document and assess input and feedback from residents and affected groups within the study area.

Specifically, the Needs Assessment involves the identification and evaluation of existing and future needs of the transportation network with respect to network capacity, traffic safety and design and operation. The purpose of the Needs Assessment is to identify and define:

- Existing and future capacity and operational needs along the corridor;
- Existing conditions with respect to transportation service, the natural environment (vegetation, wildlife, aquatic habitat, hydrogeology), the socio-economic environment (archaeology and built heritage, noise, contamination and waste), infrastructure (geotechnical / pavement, foundations, stormwater management, and structures);
- A problem and opportunity statement.

1.2 Study Area

The study area generally extends 300 m north and south of 6th Line from the westerly right-of-way of County Road 27 to approximately 300 m east of St. John’s Road and includes the following intersections / crossings:

- County Road 27 / 6th Line;
- 5 Sideroad / 6th Line;
- Highway 400 crossing;
- 10 Sideroad / 6th Line
- Yonge Street / 6th Line;
- 20 Sideroad / 6th Line;
- Barrie GO Train Line crossing;
- St. John's Road / 6th Line.

The study area is illustrated in **Figure 1-1** and further described in **Section 2**.

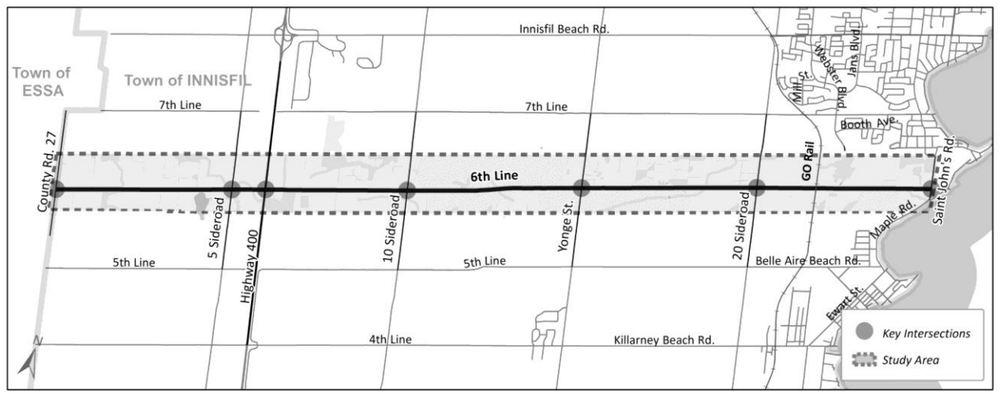


Figure 1-1: Study Area

The area is typically rural with farms and some woodland adjacent to the roadway. However, planned residential development and urbanization of the area east of 20 Sideroad will have a significant impact on 6th Line and the necessary improvements to accommodate future total traffic conditions.

1.3 Key Project Milestones

The study was initiated in October 2014. Key project milestones were as follows:

October 2014	Start 6th Line EA from County Road 27 to St. John's Road
November 2014	Notice of Study Commencement
December 2014	Public Open House #1
May 2015	Public Open House #2
June-July 2015	Individual meetings with affected landowners
August 2016	Notice of Study Completion
August 2016	Environmental Study Report (ESR) filing for 30 day review period

1.4 Project Team and Agency Participation

The Project Team consisted of staff from:

Town of Innisfil:

Scott MacKenzie	Project Manager / Development Engineer
Amber Leal	Senior Engineering Technologist
Carolyn Ali	Manager of Engineering
Tim Cane	Manager of Land Use Planning

Consultant Team:

Tyrone Gan	Project Manager – HDR
Cheryl Murray	Deputy Project Manager and Engineering Lead – HDR
Veronica Restrepo	Project Coordinator & Transportation Planning – HDR
Matthew Darling	Engineering-Road Design – HDR
Anthony Reitmeier	Drainage Lead – HDR
Michelle Li	Drainage Technical Support – HDR
Chris Blankson	Engineering-Structural Lead – HDR
Katie Chu	Engineering-Structural Technical Support – HDR
Alex Yablochnikov	Engineering-Electrical Lead – HDR
Carl Wong	Transportation Planning Lead – HDR
Jonathan Chai	Transportation Planning and Traffic Analysis – HDR
Barry Russell	Advisor-Rail – HDR
Dan Francey	Advisor-Metrolinx – HDR
Joseph Arcaro	Advisor-MTO – HDR
Tara Erwin	Quality Reviews – HDR
Paul Ritchie	Stage 1 Archaeology Assessment – ASI
Heidy Schopf	Cultural Heritage Assessment – ASI
Darrin Sellick	Geotechnical Lead – Golder
Joe Tomaselli	Noise Lead – Golder
Kevin Bentley	Foundations Lead – Golder
Christi Groves	Contamination / Waste Management Lead – Golder
Shawn Lytle	Hydrogeology Lead – Golder
Andrew C. Balasundaram	Pavement Engineering Lead – Golder
Al Murray	Topographic Survey - Murray Layout
Katherine Bibby	Natural Heritage – LGL
Joseph Cavallo	Natural Heritage – LGL

Agency Representatives:

Barb Perreault – Nottawasaga Valley Conservation Authority (NVCA)
Chris Hibberd – Nottawasaga Valley Conservation Authority (NVCA)
Tom Reeve – Nottawasaga Valley Conservation Authority (NVCA)
Ian Ockenden – Nottawasaga Valley Conservation Authority (NVCA)
Lee Bull – Nottawasaga Valley Conservation Authority (NVCA)
Lisa-Beth Bulford – Lake Simcoe Region Conservation Authority (LSRCA)
Tom Hogenbirk – Lake Simcoe Region Conservation Authority (LSRCA)
Shauna Fernandes – Lake Simcoe Region Conservation Authority (LSRCA)
Ken Cheney – Lake Simcoe Region Conservation Authority (LSRCA)
Jason Ryan – Metrolinx / GO Transit
Justin White – Ministry of Transportation (MTO)
Kim Benner – Ministry of Natural Resources and Forestry (MNRF)
Maria Jawaid – Ministry of Natural Resources and Forestry (MNRF)
Chunmei Liu – Ministry of the Environment and Climate Change (MOECC)
Rosi Zirger – Ministry of Tourism, Culture and Sport (MTCS)

1.5 Environmental Assessment Process

1.5.1 Municipal Class Environmental Assessment (MCEA) Process

This Municipal Class Environmental Assessment (EA) is being conducted in accordance with the guidelines of the Municipal Engineers Association ***Municipal Class Environmental Assessment*** (October 2000, as amended in 2007 and 2011). The EA is being conducted in compliance with a **Schedule "C"** project of the guidelines. A Schedule "C" project involves either the construction of new facilities or major expansions of existing facilities. For the existing facilities, this could include road widening, adjustments, and operational improvements. The Study has completed the first four phases of the five-phase Class Environmental Assessment Process.

Figure 1-2 illustrates the sequence of activities within the approved EA process leading to project implementation. The phases for this Study are described below:

- **Phase 1** – Identify the problem (deficiency) or opportunity.
- **Phase 2** – Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and review agency input.
- **Phase 3** – Examine alternative methods of implementing the preferred solution, based on the existing environment, public and review agency input, anticipated environmental effects, and methods of minimizing negative effects and maximizing positive effects.
- **Phase 4** – Document in an Environmental Study Report (ESR) a summary of the rationale, the planning, design, and consultation process of the project. Place the ESR on public record for a minimum 30 calendar days for review, and notify completion of the ESR and provision for Part II Order requests.
- **Phase 5**, which involves detailed design, preparation of contract drawings and tender documents, construction, operation, and monitoring, is not part of this study. The ESR provides information on the study background, problem statement, alternative solutions, alternative designs, and the public consultation process.

After the ESR is finalized, it is filed and placed on public record for a minimum of 30 calendar days for review by the public and review agencies. At the time the report is filed, a Notice of Completion of the Environmental Study Report will be advertised, to advise the public and other stakeholders where the Environmental Study Report may be seen and reviewed, and how to submit public comments. The Notice will also advise the public and other stakeholders of their right to request a Part II Order, and how and when such a request must be submitted.

Under the Environmental Assessment Act, members of the public, interest groups, agencies, and other stakeholders may submit a written request to the Minister of the Environment to require the proponent (Town of Innisfil) to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order) before proceeding with the proposed undertaking. Part II of the Act addresses Individual Environmental Assessments.

The request for a Part II Order must also be copied to the proponent at the same time it is submitted to the Minister. Written requests for a Part II Order must be submitted to the Minister within the minimum 30 calendar day review period. The Minister or delegate then reviews the Environmental Assessment Report to ensure that the Class EA process has been followed. The proponent and the requestor have an opportunity to discuss and resolve the issues. Once the proponent has satisfied the requestor's concerns a requestor should promptly withdraw a Part II Order request.

If the proponent and requestor are unable to resolve the concerns, the Minister or delegate will make a decision on a Part II Order:

1. Refer the matter to mediation before making a decision under the provisions of subsection 16(6) of the Environmental Assessment Act
2. Deny the request for an order and inform the proponent and requestor of the decision and rationale.
3. Deny the request for an order but impose conditions.
4. Require the proponent to comply with Part II of the Environmental Assessment Act which requires the preparation of a term of reference and an individual environmental assessment.

The Minister's decision on a Part II Order request is final.

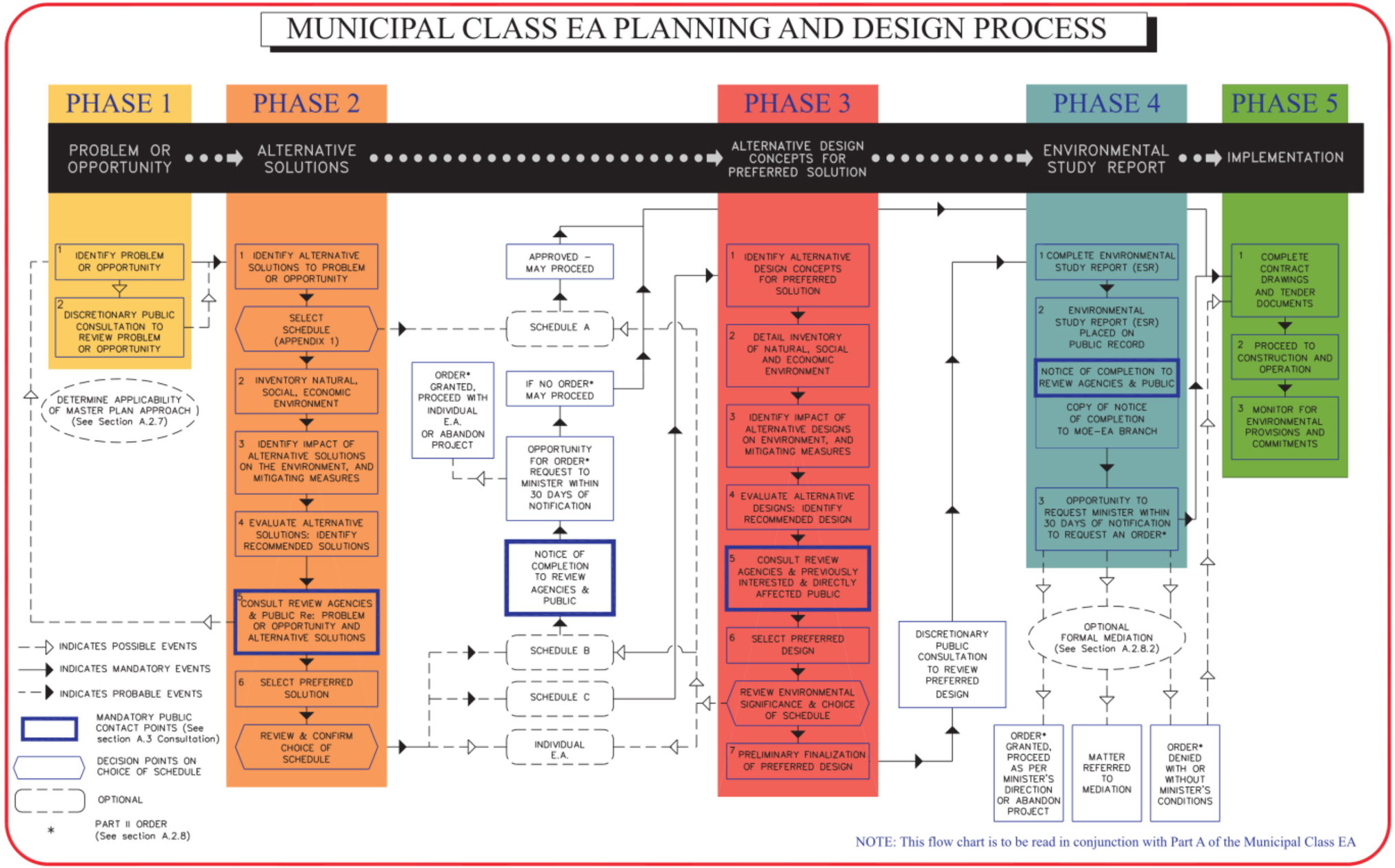


Figure 1-2: Municipal Class Environmental Assessment Planning and Design Process

1.5.2 Canadian Environmental Assessment Act (CEAA)

Under the ***Canadian Environmental Assessment Act, 2012 (CEAA 2012)***, a federal environmental assessment study may be required to the physical activities that constitute a "designated project", under the project list identified in the ***Regulations Amending the Regulations Designating Physical Activities, 2013***. This project list ensures that federal environmental assessments are focused on the major projects with the greatest potential for significant adverse environmental impacts to matters of federal jurisdiction.

The 6th Line Municipal Class EA does not constitute a "designated project" and therefore does not require an environmental assessment under the CEAA 2012. However, the Minister of the Environment may order an assessment for any project not included in the project list, where there may be adverse environmental effects related to federal jurisdiction.

1.6 Planning Context

Provincial, regional and local planning policies were reviewed to identify their relevance in the 6th Line EA Study.

1.6.1 2014 Provincial Policy Statement

The 2014 *Provincial Policy Statement* (PPS) is issued under Section 3 of the *Planning Act, R.S.O. 1990, c. P.13* and came into effect on April 30, 2014, replacing the 2005 PPS. It provides policy direction on matters of Provincial interest related to land use planning and development. The PPS provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. The PPS promotes the use of active transportation and provides for connectivity among transportation modes. The PPS states that natural features and areas shall be protected for the long term, and development and site alteration shall not be permitted in significant wetlands or woodlands, significant wildlife habitat or fish habitat, significant areas of natural and scientific interest, or habitat of endangered species and threatened species, except in accordance with provincial and federal requirements. The PPS also states that significant built heritage resources and significant cultural heritage landscapes shall be conserved. Planning decisions are required to be consistent with the PPS. This EA follows a multi-modal, context sensitive approach, and aims to balance the interests and meet the needs of all road users, while minimizing negative impacts to the natural and cultural environment.

1.6.2 Growth Plan for the Greater Golden Horseshoe 2006 – Office Consolidation January 2012

The recently revised Ontario *Places to Grow, Growth Plan for the Greater Golden Horseshoe 2006 Office Consolidation, January 2012* ("Growth Plan") came into effect on January 19, 2012. The amended Chapter 6 of the Growth Plan affects the County of Simcoe Subarea (including the Town of Innisfil), in regard to addressing sprawl.

Schedule 7 of the Growth Plan indicates a forecast 2031 population of 56,000 for the Town of Innisfil, while the 2031 employment forecast is 13,100.

The Growth Plan also highlights two specific areas in Innisfil targeted for intensification: The Alcona Primary Settlement Area and the Innisfil Heights Strategic Settlement Employment Area, and these are illustrated in **Figure 1-3**, an excerpt from Schedule 8 of the Growth Plan.

Previously called an 'Urban Node', Primary Settlement Areas require towns to direct a significant portion of population and employment growth to the applicable areas. As stated in the Growth Plan, the exact location, uses, mix, areas and lots sizes in the Innisfil Heights Strategic Employment Area will be determined by the Minister of Infrastructure along with the municipalities and stakeholders.

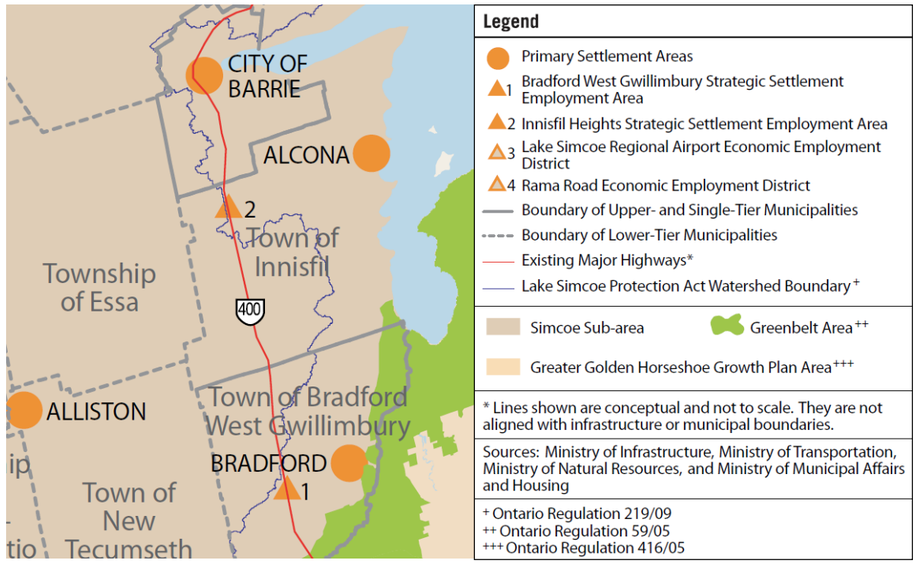
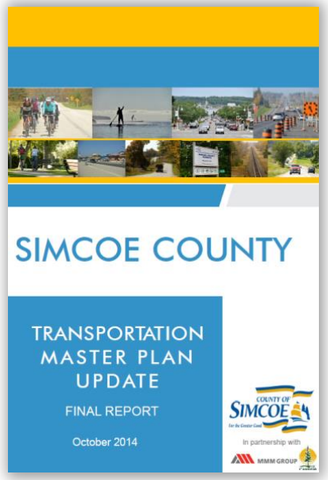


Figure 1-3: Ontario Growth Plan for the Simcoe Sub-area and the Town of Innisfil

1.6.3 Simcoe County Transportation Master Plan Update

The County of Simcoe undertook an update to the County's Transportation Master Plan (TMP) in October 2014 to provide direction for the planning, coordination and implementation of an integrated transportation network that considers roads, transit, active transportation amenities, goods movement and commuter facilities for the next 30 years and beyond.



The recommended transportation strategy, summarized below, promotes a balanced approach to transportation that:

- Provide connectivity between transportation modes to move people and goods sustainably, efficiently and safely based on hierarchical suite of mobility solutions
- Establish a sustainable integrated multi0modal transportation system that reduces reliance upon any single mode, and promotes walking, cycling and transit
- Solicit and integrate public consultation and contributions from across the County
- Coordinate and collaborate with private sector, government agencies and municipalities
- Define policies and long-term strategies that will result in the protection of transportation corridors for all modes of transportation to address current and projected population and employment growth.

The TMP developed a multi-modal vision for sustainable transportation within the County and assessed the following key areas:

- Roads
- Context-sensitive road designs
- Roundabouts
- Transit
- Active Transportation
- Other multi-modal transportation options
- Transportation demand management

Road improvement projects for the short, medium, and long term are illustrated in Figure 12.3.3-1 of the 2014 TMP, and in **Figure 1-4** of this document. Most notably with respect to 6th Line is the need to widen Innisfil Beach Road. The Barrie By-Pass, identified in this TMP and also carried forward in the Province's Simcoe Area Multi-modal Transportation Strategy, is another facility which may impact the need for improvements to 6th Line.

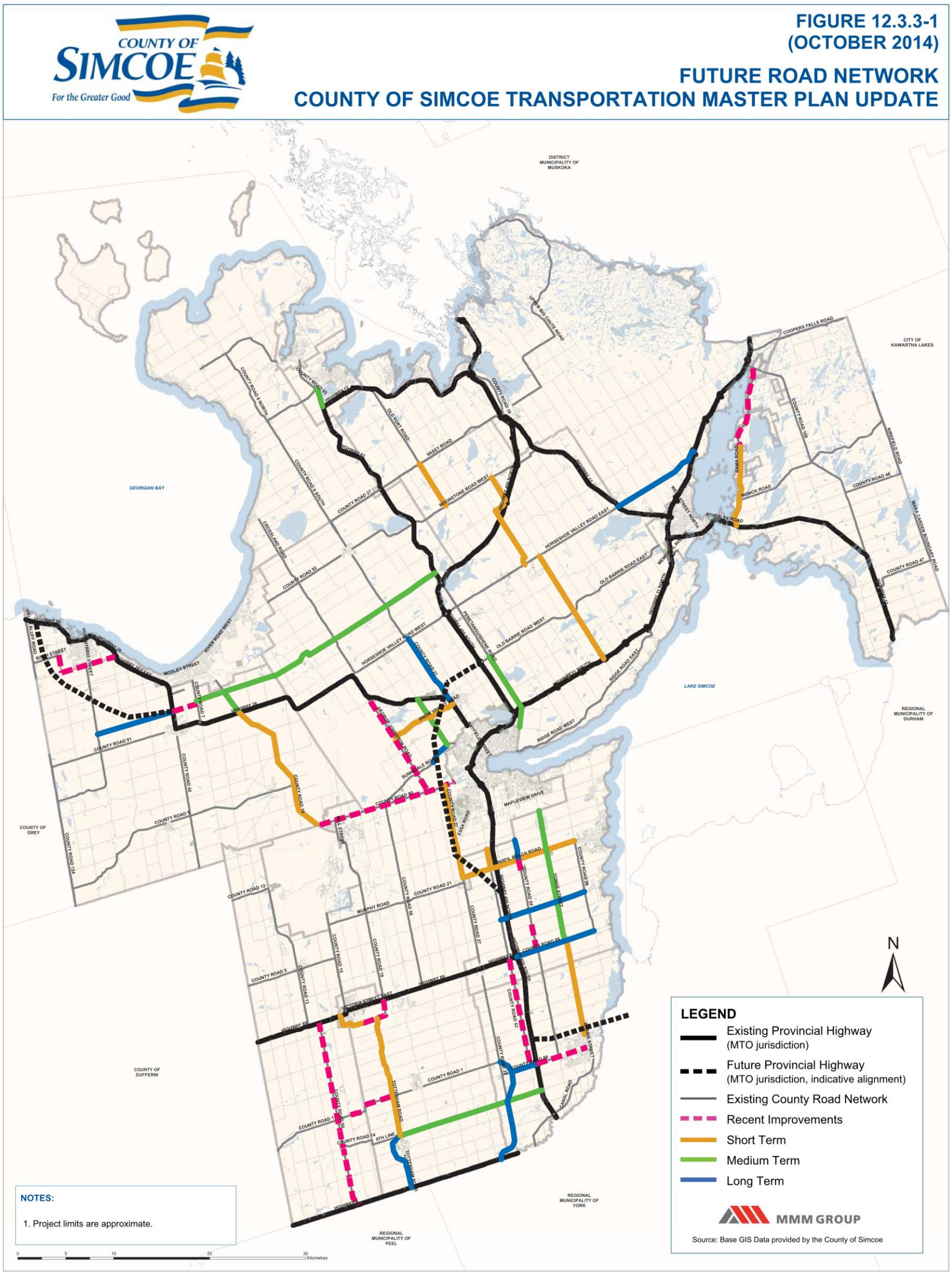


Figure 1-4: Simcoe County 2014 TMP Future Road Network

1.6.4 Simcoe Area Transportation Network Strategy

This strategy, initiated by the Ministry of Transportation, identifies transportation solutions to support implementation of the Growth Plan, County, and other provincial policies, manage future transportation demand, increase modal share of alternative transportation, improve connectivity, optimize efficiency and capacity of the existing transportation network, and ensure a coordinated approach to land use planning.

The strategy has identified a number of transit, Transportation System Management (TSM), and road projects to be carried forward for further study.

The strategy recommended the following transit projects to be carried forward relevant to the Town of Innisfil:

- All-day, two-way GO Rail to Barrie;
- Highway 400 Bus Rapid Transit;
- Expanded Park and Ride Lots;
- Intra-Regional Public Transit;
- Employer Transit Shuttles;
- Barrie Transit Service Expansion.

The strategy recommended the following TSM projects to be carried forward relevant to the Town of Innisfil:

- HOV/Transit Lanes on Highway 400;
- Interchange Improvements – including a new interchange to service future growth in Innisfil.

The strategy recommended the following road projects to be carried forward relevant to the Town of Innisfil:

- Bradford Bypass;
- Widen Highway 89;
- Highway 400 Expansion to 10 Lanes;
- Barrie Bypass;
- Highway 427 Extension;
- Widen County Road 21 (Innisfil Beach Road).

The road projects are illustrated in **Figure 1-5**.

Figure 1-5: Simcoe Area Multi-Modal Transportation Strategy – Road Projects

1.6.5 Town of Innisfil Official Plan

The Official Plan was last updated and approved by Council in 2006 and by the Ontario Municipal Board in 2009, 2010, and 2011. The Official Plan reflects growth and recommendations based on information current at that time. The Official Plan and the transportation network recommendations will updated by the Town in 2016, and are anticipated to contain recommendations contained in the 2013 Transportation Master Plan, adopted by Council in 2013.

The current Transportation Plan (Schedule C) of the Official Plan is provided in **Figure 1-6**.

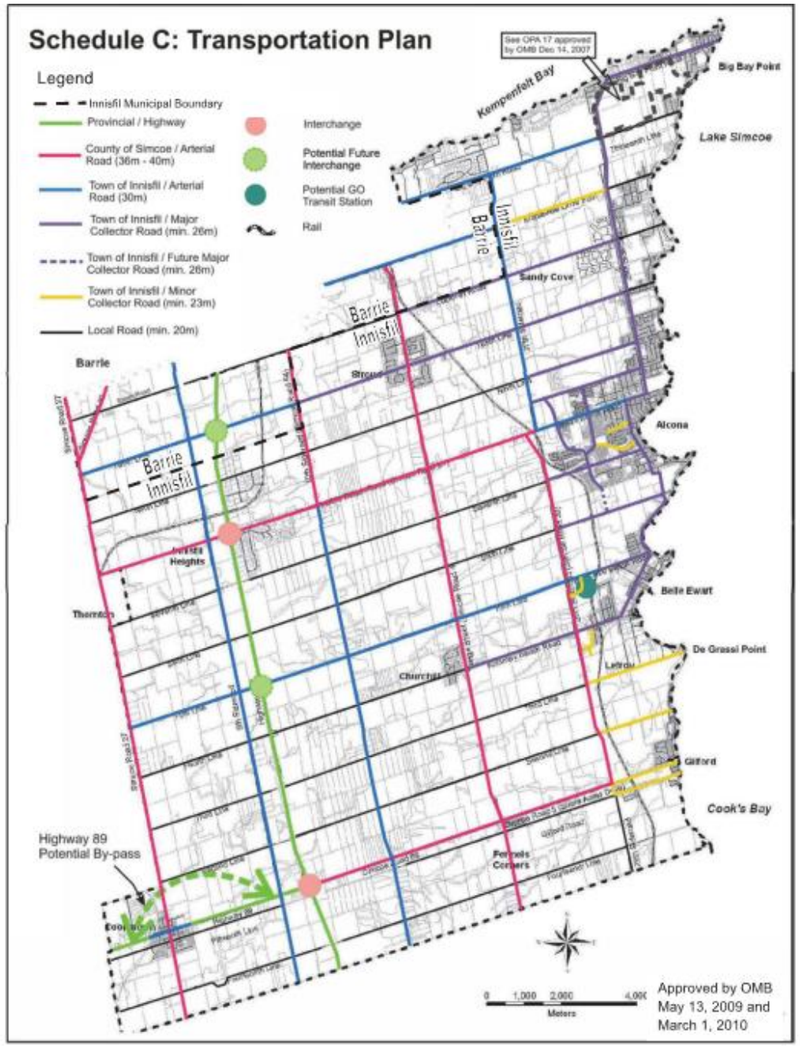


Figure 1-6: Innisfil Official Plan Schedule C – Transportation Plan

1.6.6 Town of Innisfil Transportation Master Plan

The Town of Innisfil Transportation Master Plan (TMP) was completed in 2013. The goal of the study was to prepare a long-term transportation strategy to accommodate anticipated growth in Innisfil.

The 2013 TMP made specific improvement recommendations from the TMP for 6th Line, including:

1. Upgrade 6th Line road classification from Local Road to Town Arterial Road from County Road 27 to 20 Sideroad;
2. Upgrade 6th Line road classification from Local Road to an Urban Major Collector from 20 Sideroad to St. John's Road;
3. New interchange at Highway 400 and 6th Line by 2031;
4. Reconstruct 6th Line from County Road 27 to 20 Sideroad by 2031;
5. Urbanize 6th Line from 20 Sideroad to St. John's Road by 2021.

These recommendations were approved by Council in May 2013. Recommended classification changes are summarized in **Figure 1-7**, while the specific improvements and implementation timing are illustrated in **Figure 1-8**.

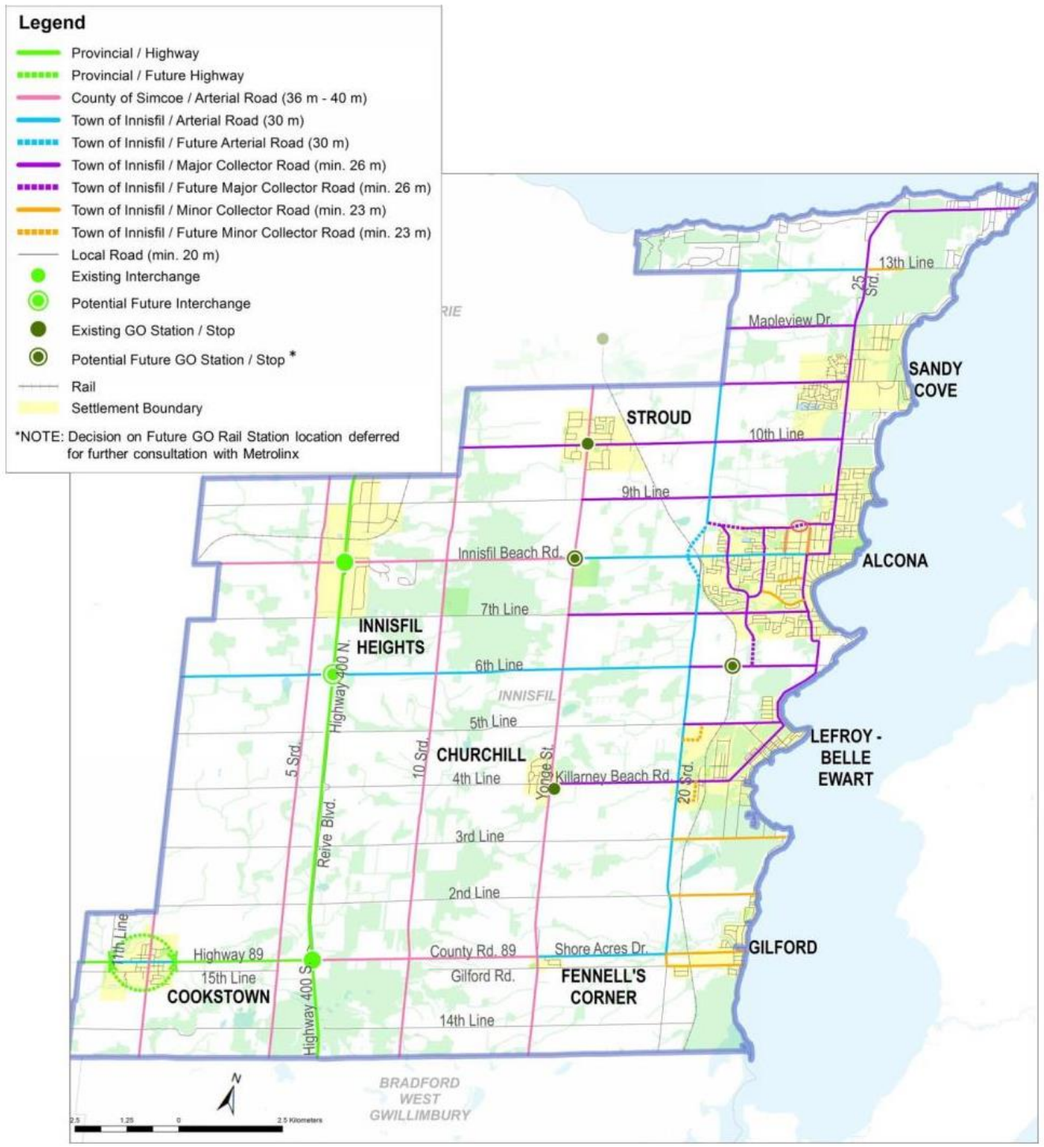


Figure 1-7: Innisfil TMP Recommended Road Classification

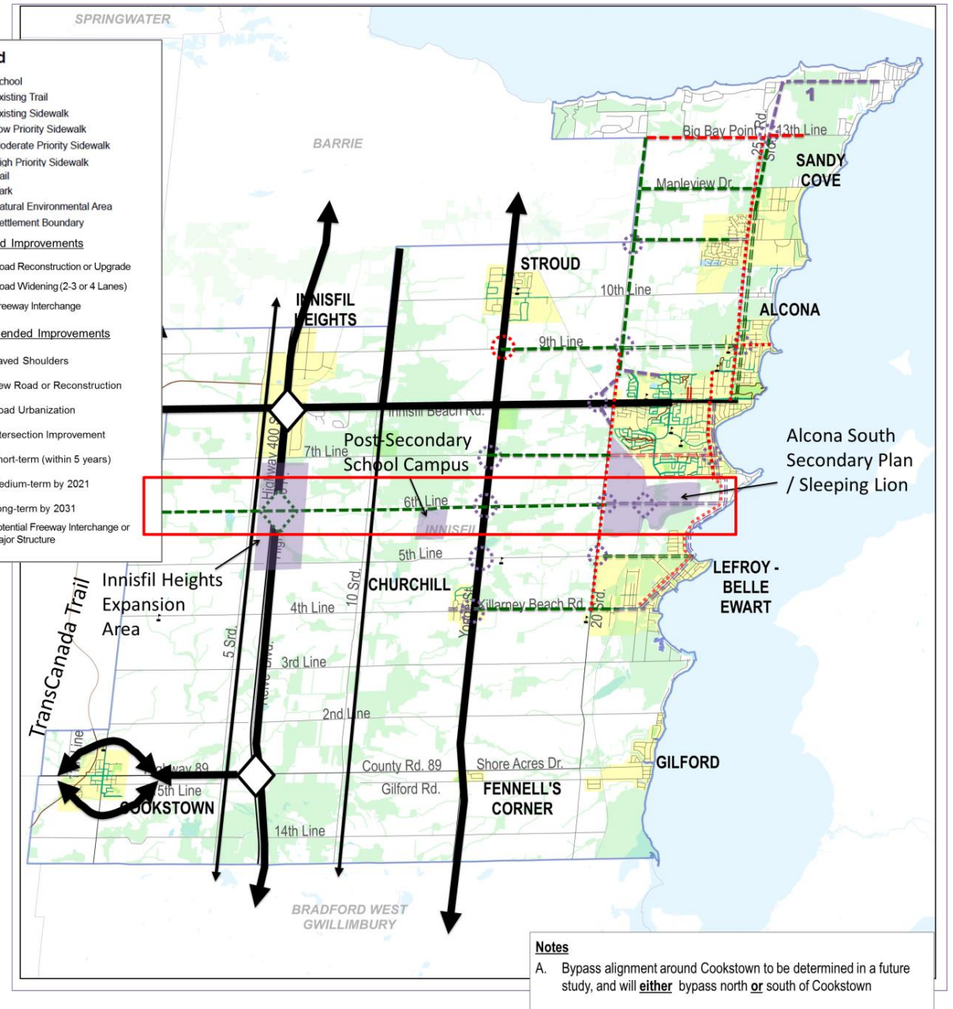


Figure 1-8: Innisfil TMP Recommended Improvements and Timing

1.6.7 GO Bradford to Barrie Class Environmental Assessment

This EA Study prepared by McCormick Rankin Corporation examined necessary upgrades to the rail infrastructure between Bradford and Barrie, preferred sites of three new rail stations, and the preferred site of a proposed layover facility in Barrie.

Two of these stations will be located in Barrie, one on the east side of Yonge Street north of Mapleview Drive, and the other east of Tiffin Street south of Lakeshore Drive. The third station

will be located within Innisfil, located south of Belle Aire Beach Road between 20 Sideroad and the rail corridor. This site was selected due to location within a planned future development area and site accesses along Belle Aire Beach Road with available capacity and potential expansion opportunities.

The Innisfil TMP has since reassessed the impacts of the proposed GO Station and desired location from the Town's perspective. The Town made a recommendation to revisit discussions with Metrolinx to inform them that either 6th Line or Belle Aire Beach Road was their preferred location of a potential Innisfil GO Station.

1.6.8 Highway 400 Preliminary Design and Environmental Assessment – Highway 89 to Highway 11

The Ministry of Transportation of Ontario has explored the need for improvements to Highway 400 from 1 km south of Highway 89 northerly 30 km to the junction of Highway 400 and Highway 11, in the County of Simcoe. Two separate reports were prepared:

- Highway 400 Planning and Preliminary Design Study – Preliminary Design Report (URS, May 2005)
- Highway 400 Planning and Preliminary Design Study – Class Environmental Assessment (Group 'B') – Transportation Environmental Study Report (URS, April 2004)

These reports endeavoured to determine required improvements and widening requirements along 30 km of Highway 400, including examining issues and opportunities related to existing interchanges at Highway 89, Innisfil Beach Road / Simcoe Road 21, Mapleview Drive (previously Molson Park Drive), Essa Road, Dunlop Street, Bayfield Street / Highway 26, and Duckworth Street.

The general recommendations are paraphrased below and include:

- Widening of Highway 400 to 8 or 10 lanes, with provisions for 10 lanes in some sections where 8 lanes are initially proposed;
- Provision for HOV lanes within the 10 lane cross sections;
- Interchange improvements including reconfiguration, geometric improvements, and operational improvements, for entire interchanges or specific ramps;
- Interchanges where improvements are recommended to be constructed to allow for 10 lane cross section;
- Additional improvements such as providing a concrete median barrier throughout the study area, new and retrofit noise barriers, illumination, sewer and culvert improvements, repaving, and a new commuter parking lot at Highway 89.

The 6th Line overpass was deemed in need of replacement by a longer and wider structure. No consideration for a new interchange at 6th Line was made during this assessment.

1.6.9 Sleeping Lion Plan of Subdivision

The Sleeping Lion Development is located on the north side of 6th Line between 20 Sideroad and Saint John's Road, directly to the east of the Barrie GO line (between Barrie South Station and Bradford Station), and south of an existing residential development. Sleeping Lion is a block within the Alcona South Secondary Plan area. The Draft Plan of Subdivision is illustrated in **Figure 1-9**. The report entitled Updated Transportation Impact Study (TIS) – Alcona South Secondary Plan – Sleeping Lion Development, was prepared by URS in April 2014, and outlined the anticipated transportation impacts and needs for the proposed subdivision development.

The analysis focused on the weekday AM and PM peak hours and forecasted operations to the phase 1 and phase 2 horizon years (2017 and 2021, respectively), plus 5 and 10 year ultimate horizons (2026 and 2031). The proposed Sleeping Lion Development is planned to include up to 1,758 low and medium density dwellings and 4.58 hectares of community commercial / mixed use / employment lands adjacent to 6th Line[1].

Access to the site was proposed via three accesses directly on 6th Line; Street A, Street B, and Street C. Two accesses were also proposed through the existing neighbourhood to the north, as extensions of Street A (to Webster Boulevard) and Street B (to Angus Street).

Assumed background road network improvements included:

<u>Medium-term (MT): 5-10 years:</u>

- 20 Sideroad from 9th Line to 4th Line – Paved Shoulders;
- 6th Line from 20 Sideroad to St. John's Road – Urbanization;

<u>Long-term (LT): 10+ years:</u>

- 7th Line from 20 Sideroad to St. John's Road – Urbanization;
- 6th Line from County Road 27 to 20 Sideroad – Urbanization; and
- 7th Line from Yonge Street to 20 Sideroad – Reconstruction.

In addition to these improvements, it was acknowledged that the 6th Line Environmental Assessment was underway and that 6th Line would likely be widened to 4 lanes coincident with development of the Sleeping Lion neighbourhood.

[1] Source: Updated Transportation Impact Study, Alcona South Secondary Plan, Sleeping Lion Development, Town of Innisfil (URS, April 2014)

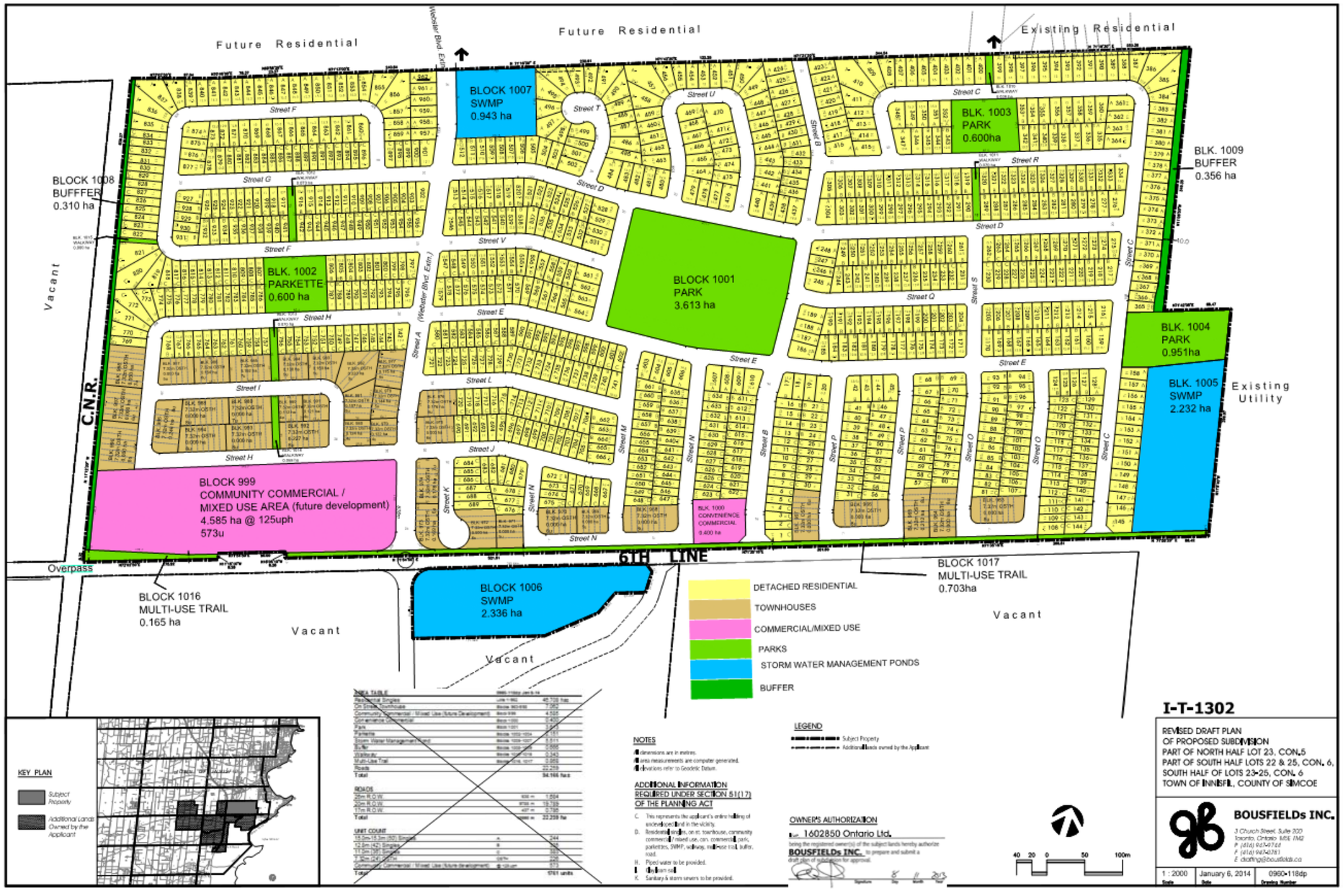


Figure 1-9: Sleeping Lion Draft Plan of Subdivision

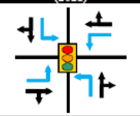
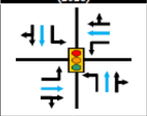
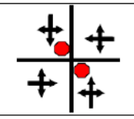
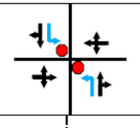
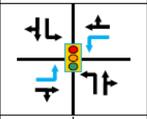
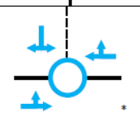
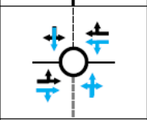
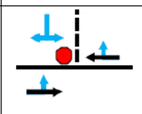
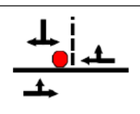
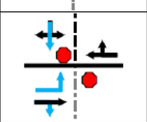
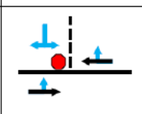
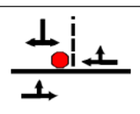
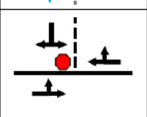
Background traffic included general background growth rates consistent with the County of Simcoe Transportation Master Plan. Specifically 2% annual growth was used on 20 Sideroad, and 1% annual growth was used on 6th Line and 7th Line. In addition to general background traffic growth, site traffic from the following three background developments was included in the 2026 and 2031 horizon year forecasts:

- Alcona South Secondary Plan (southeast quadrant) – 267 residential units;
- Alcona South Secondary Plan (northwest quadrant) – 264 residential units, 3.45 hectares of commercial use, and 3.32 hectares of GO Transit use; and
- Alcona South Secondary Plan (southwest quadrant) – 664 residential units, 12.58 hectares of commercial use, and 2.0 hectares of institutional use.

The Sleeping Lion study findings recommended the following road network improvements to support full build of the Sleeping Lion development by the 2026 horizon year:

- 6th Line – widening to a 4 lane cross section.
- 20 Sideroad – widening to a 4 lane cross section.
- 6th Line / 20 Sideroad – signalization, exclusive left-turn lanes on all approaches.
- 6th Line / Street A – roundabout control.
- 6th Line / Street B – stop control on minor approaches, exclusive eastbound left-turn lane. Analyzed with one through lane on 6th Line.
- 6th Line / Street C – stop control on minor approach. Analyzed with one through lane on 6th Line.
- 7th Line / Webster Boulevard – signalization, exclusive left-turn lanes on all approaches.

These improvements are summarized below in **Figure 1-10** as taken from the report. It is noted that the recommended improvements in **Figure 1-10** are preliminary in nature. When the development is approaching application to the Town of Innisfil for expansion into Phase 3, which would complete the Sleeping Lion build-out and the traffic numbers approach the upper limits shown in the TIS, the developer will perform traffic analysis to confirm the growth and traffic volumes, and determine the need for a traffic signal at Street A (Sleeping Lion). In addition, the developer will, at the Town's discretion, perform a comparison of traffic signal versus roundabout operations to confirm the recommended treatment.

INTERSECTION	EXISTING CONDITIONS	FUTURE IMPROVEMENTS (2017)	INITIATION	FUTURE IMPROVEMENTS (2021)	INITIATION	FUTURE IMPROVEMENTS (2026)	INITIATION
6th Line / 20 Sideroad		N/A	N/A		Development		Background Development
7th Line / Webster Boulevard		N/A	N/A		Development		Background Development
6th Line / Street 'A'		N/A	N/A	 *	Development		Background Development
6th Line / Street 'B'			Development		N/A		Development
6th Line / Street 'C'			Development		N/A		N/A

* - A two-lane roundabout is likely to be constructed from day one as 6th Line is to be widened to four lanes at the time of development construction.

Figure 1-10: Committed Future Road Network/Intersection Improvements

Consideration for a reduction of the posted speed limit from 80 km/h to 60 km/h was noted in the report, as it would support urbanization of 6th Line in the vicinity of the site.

The Sleeping Lion report also noted the potential for a future GO transit station between the Barrie South and Bradford GO stations, located just south of the Sleeping Lion neighbourhood, south of 6th Line, or further to the south near 5th Line.

Finally, sidewalks were proposed on 20 Sideroad, as well as 3 metre wide sidewalks (multi-use paths) along 6th Line in the vicinity of the Sleeping Lion development.

2 Public and Stakeholder Consultation Process

In accordance with the Municipal Class EA process, three mandatory points of contact with the public and review agencies are required for a Schedule C Municipal Class EA study to:

- Review the project and selection of the preferred solution towards the end of Phase 2 and obtain comment and input;
- Review alternatives to assist in the selection of the preferred design for the chosen solution and obtain comment and input; and
- Announce the completion of the Environmental Study Report (ESR) and placement of the ESR on public record for a minimum 30-day review period.

2.1 Public Consultation

Public consultation activities throughout the project included:

- Notice of Study Commencement;
- Two Public Open Houses;
- Individual meetings with affected landowners;
- Project Website via the following link: http://innisfil.ca/6th-line-improvements;
- Notice of Study Completion and ESR Filing.

Notices were sent to all those in close proximity to the project limits and those who expressed interest throughout the duration of the study.

All communication material related to public consultation activities is included in **Appendix A**.

2.1.1 Summary of Public Consultation Events

2.1.1.1 Public Open House #1

The first Public Open House was held on December 11, 2014 at the Town of Innisfil Town Hall from 5:00 to 8:00 p.m. Approximately 30 people attended. This Public Open House presented the preliminary findings of Phases 1 and 2 (Problem & Opportunity and Alternative Solutions) for the entire study area and part of Phase 3 (Development of Design Concepts for the Preferred Solution), for the urban segment of 6th Line between 20 Sideroad and St. John's Road, to the public and stakeholders.

Notice for the December 11, 2014 Public Information Centre was provided through the following:

- Mailing of notices to property owners fronting onto the 6th Line corridor between County Road 27 to St. John's Road, and all others on the project contact list;
- Project Study Web site;
- Local newspaper advertisement:
    - Innisfil Examiner on November 28, 2014 and December 5, 2014;
    - Innisfil Community Bulletin on November 28, 2014.

Key messages heard include:

- Concern for urbanization of the corridor and loss of farming;
- Concern for widening of the roadway that will cause a loss of personal property;
- Concern that the roadway would be constructed wider than needed;
- Increased traffic that will affect residents' access to properties;
- Requests for information concerning the interchange location at Hwy 400, and GO Station location on the Barrie Line;
- Requests for information regarding the residential development, Sleeping Lion;
- Concern for changes in the Official Plan that affect 5th Line;
- Concern for impacts to environment at Hwy 400 resulting from an interchange.

The project team returned on December 17, 2014 to speak with other members of the community who did not get a chance to attend the Open House on December 11, 2014 due to inclement weather. At this time, the same background displays were available for the public to view and discuss with the project team. Approximately 10 people attended the December 17 re-run of the Public Open House.

More details about Public Open House #1, including the notice and consultation summary report, can be found in **Appendix A**.

2.1.1.2 Public Open House #2

The second Public Open House was held on May 28, 2015 at the Town of Innisfil Town Hall from 5:00 to 8:00 p.m. Approximately 40 people attended. This Public Information Centre presented the recommended changes since the first Open House, and the preliminary findings of Phase 3 of the EA (Development of Design Concepts for the Preferred Solution), to the public and stakeholders.

Notice for the May 28, 2015 Public Information Centre was provided through the following:

- Mailing of notices to property owners fronting onto the 6th Line corridor between County Road 27 to St. John's Road, and all others on the project contact list;
- Project Study Web site;
- Local newspaper advertisement:
    - Innisfil Examiner on May 15, 2015 and May 22, 2015;
    - Innisfil Community Bulletin on May 15, 2015 and May 22, 2015.

Key messages heard include:

- Concern for urbanization of the corridor and loss of farming;

- Concern for widening of the roadway that will cause a loss of personal property;
- Concern for impacts to personal property, including wells and vegetation;
- Concern for roadway footprint being too close to personal property and buildings;
- Concern for impacts to culturally significant buildings;
- Request for additional information regarding the Town's plans to extend servicing (water/sewer) to 5 Sideroad potentially starting in 2018;
- Relief that cross-section recommendations have been updated for the segment between 5 Sideroad and 20 Sideroad, following input received at the first Public Open House in December 2014;
- Concern that increased traffic will affect residents' access to properties;
- Concern for impacts to environment and loss of personal property at Hwy 400 resulting from a potential future interchange at this location;
- Request to review impacts under consideration at three locations – homes immediately west of 5 Sideroad, at 6th Line and Yonge Street, and midway between Yonge Street and 20 Sideroad.

Following the May 28, 2015 Public Information Centre, the project team had meetings with affected property owners to better understand their concerns regarding proximity of the reconstruction to the features on their property. Meetings were held on the following dates:

- June 2, 2015 and June 5, 2015: Property owners at 3368 6th Line.
- June 10, 2015: Property owners at 2232 and 2150 6th Line.
- June 11, 2015: Property owners at 3654 and 3653 6th Line.
- June 12, 2015 and July 15, 2015: Property owners at 3654 6th Line.
- June 17, 2015: Property owners at 2051, 1973, 1961, 1825, 2048, 2062, 2010, 1974, 1954, and 1604 6th Line.
- July 15, 2015: Property owners at 1961, 1973, 1974, 2010, 2048, 2051, and 2062 6th Line.
- July 21, 2015: Property owners at 1961 and 1974 6th Line.

More details about Public Open House #2, including the notice and consultation summary report, can be found in **Appendix A**.

2.2 Agency Consultation

As part of the Environmental Assessment process, multiple technical staff from the Town of Innisfil and partner agencies were consulted with on a regular basis. These agencies and staff members reviewed and provided input on all aspects of the study process, including: the problem and opportunity statement, evaluation criteria, development and evaluation of alternatives, and the preferred alternatives for the roads within the study area.

The following agencies were contacted as part of the consultation process:

- Town of Innisfil Council
- Town of Innisfil Staff
- Ministry of Natural Resources and Forestry (MNRF)
- Nottawasaga Valley Conservation Authority (NVCA)
- Lake Simcoe Region Conservation Authority (LSRCA)
- Metrolinx
- Ministry of Transportation (MTO)
- Infrastructure Ontario
- Transport Canada
- Canadian Pacific Railway
- Environment Canada
- County of Simcoe
- Ministry of the Environment and Climate Change MOECC)
- Ministry of Agriculture, Food and Rural Affairs
- Ministry of Tourism, Culture, and Sport
- Ministry of Municipal Affairs and Housing
- Aboriginal Affairs and Northern Development Canada
- CN Great Lakes

In addition to meetings/conference calls with agencies such as Metrolinx, MTO, NVCA, LSRCA, MOECC and MNRF, the agency consultation process included correspondence with Innisfil Hydro, Enbridge Gas, Hydro One Networks Inc., Bell Canada, Rogers Communications, Atria Works, and Goderich-Exeter Railway. Community Groups, Consultants, and Developers were also contacted via study notices and newsletters throughout the study. These agencies included:

- Greater Innisfil Chamber of Commerce
- Cookstown and District Chamber of Commerce
- Bayview Beach Ratepayers Association
- Innisfil District Association
- Alcona Beach Club Inc.
- Degrassi Cove Association
- Innisfil Creek Golf Course
- Innisfil Heritage Committee
- Patson Holdings Ltd.
- Skelton Brumwell & Associates Inc.
- Belpark Homes
- Cookshill Developments
- Cortel Group
- Celeste Phillips Planning Inc.
- PGC Group of Companies
- Gilmore & Gilmore Professional Corporation
- Lormel Homes
- Urban Watershed Group (a member of the Greenland Group of Companies)

The agency stakeholder consultation was an ongoing process during the development and evaluation of options, where comments and concerns were incorporated or acknowledged throughout the study. Continual interaction between the study team and agency stakeholders shaped the development and evaluation of design options for the study. Agency consultation consisted of letters, emails, phone calls, exchanges of information, and meetings.

Individual meetings/conference calls were held with agency representatives as follows:

- LSRCA: meetings on February 24, 2015 and February 22, 2016
- NVCA: meetings on February 24, 2015 and February 22, 2016
- MNRF: meeting on February 29, 2016 and conference call on April 7, 2016

- Metrolinx: conference call on January 21, 2015
- MTO: conference call on May 25, 2015

Agency-specific correspondence is included in **Appendix B**.

2.3 First Nations Consultation

The First Nations consultation program for the EA study involved the following representatives and agencies who may have an interest in the study:

- Alderville First Nation
- Hiawatha First Nation
- Curve Lake First Nation
- Moose Deer Point First Nation
- Mississauga of Scugog First Nation
- Wahta Mohawks (Mohawks of Gibson)
- Georgian Bay Métis Council
- Métis Nation of Ontario
- Moon River Métis Council

All representatives were included in the mailing list for the project, and were contacted via all study notices and newsletters throughout the study.

Alderville First Nation and Hiawatha First Nation, acknowledged receipt of correspondence and indicated at the time of writing that they are not aware of any issues the 6th Line improvements would cause that would be of concern with respect to Traditional, Aboriginal and Treaty rights. The Six Nations of the Grand River acknowledged receipt of correspondence and indicated that they be notified of updates to the project. No response was received from the other First Nations representatives regarding any of the notices or newsletters sent throughout the study.

Correspondence with First Nation is included in **Appendix B**.

3 Existing Conditions

The following section documents current conditions including existing transportation facilities, the socio-economic environment, natural environment and existing infrastructure along the study corridor.

3.1 Existing Transportation Facilities

The current road, transit, cyclist, and pedestrian network for the 6th Line study area are described in the subsequent sections.

3.1.1 Road Network

Today 6th Line is a 2-lane rural local road under the jurisdiction of the Town of Innisfil, with a posted speed of 80 km/h. The shoulders are unpaved (grass), although some sections have a narrow band of gravel adjacent to the pavement. There is no ditch adjacent to the roadway for most sections of the roadway. Sidewalks and bike lanes are not provided. There is no illumination along the corridor for night time visibility. Lanes are not demarcated for the majority of the corridor, except for one section in the vicinity of the GO railway overpass east of 20 Sideroad, presumably for safety reasons due to the vertical curvature of the roadway. All intersections along 6th Line are under two-way stop control for the minor approach; the minor approach differs depending on the intersecting roadway. Sightlines are generally very good considering the land is generally flat and used for agriculture and farming. In some areas, significant woodland growth has encroached to the pavement edges, and visibility to see animals standing on the roadside is limited.

Pavement width along 6th Line is less than 7 metres west of 20 Sideroad and between 7 and 8 metres to the east of 20 Sideroad, as shown in the Transportation Master Plan Exhibit 4-2, excerpted in **Figure 3-1**, with the study area outlined in orange.

The existing road network and lane configurations are shown in **Figure 3-2**.

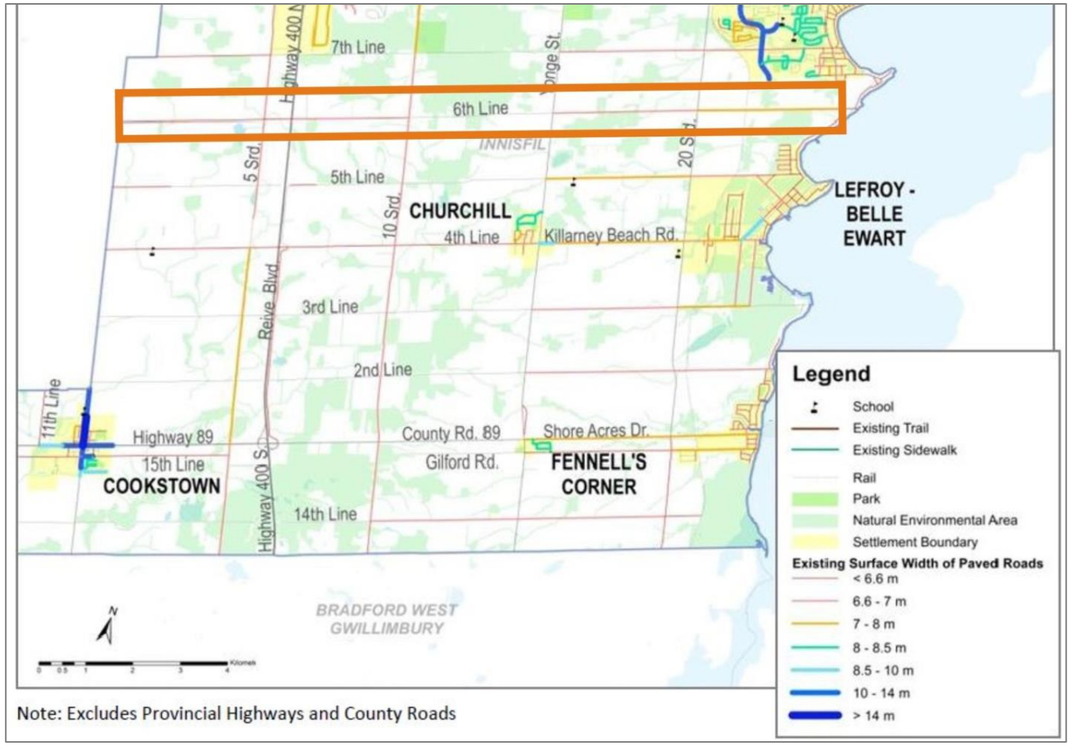


Figure 3-1: Innisfil's Transportation Network – Existing Pavement Width

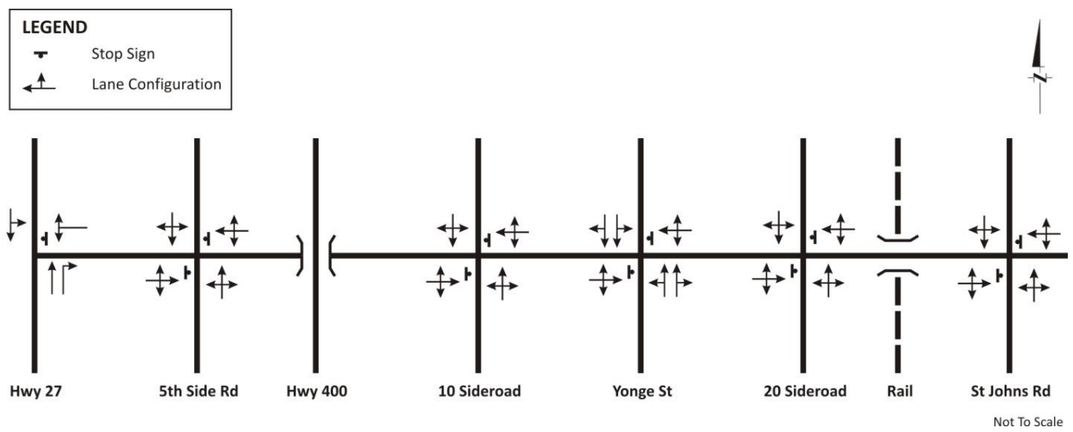


Figure 3-2: Existing Road Network

3.1.2 Existing Truck Restrictions

There are currently weight restrictions on 6th Line posted near major crossroads. Between March 1st to May 1st trucks are limited to 5 tonnes per axle.

3.1.3 Transit Network

Transit does not currently directly serve the immediate study area. However, GO Transit provides some transit coverage. Barrie South GO Station is located 6.5 kilometres directly north of 6th Line, and Bradford GO Station is located 18 kilometres to the south. Train service along the Barrie Line only operates in peak directions; southbound in the morning and northbound in the afternoon, with 30 minute headways.

A GO bus station is located at the intersection of Yonge Street and Killarney Beach Road (Churchill bus stop) on the Barrie GO Bus Route 68 and 68B, which operates between Newmarket bus terminal and Barrie bus terminal. Other stops along this route include Yonge Street/Innisfil Beach Road, Yonge Street/Victoria Street (Stroud), Yonge Street/Mapleview Drive (Barrie South GO Train Station), and Lakeshore Drive/Tiffin Street (Allandale Waterfront GO Train Station).

There is a taxi service within Innisfil (Innisfil Taxi) that currently serves residents.

3.1.4 Right-of-Way Characteristics

The existing 6th Line right-of-way is generally 20 m wide. East of the GO Rail crossing is one exception, where the right-of-way is approximately 28m wide for about 90m. In some areas the right-of-way is delineated by fence, and in other areas, the delineation is not clearly visible.

3.1.5 Existing Accesses

There are a number of driveway accesses to 6th Line. The majority of the driveways are connections to private properties with private residences and farms.

3.1.6 Pedestrian and Cycling Facilities

There are no cycling or pedestrian facilities on 6th Line. The shoulders of the roadway are not paved and cyclists and pedestrians must share travel lanes with vehicular traffic.

3.1.7 Network Connectivity and Continuity

6th Line is currently a low volume local road within the Town of Innisfil. There is currently no direct connection to Highway 400 via 6th Line. 6th Line currently terminates at Cook's Bay to the east, and County Road 27 to the west, and likely provides only local access to private properties along 6th Line, served mostly by north-south crossroads such as Yonge Street. Thus, 6th Line is probably not used by commuter through-traffic. However, with the

intensification of the Alcona South Lands and Lefroy, as well as the potential construction of a new GO train station at either 6th Line or 5th Line, this may change the travel patterns drastically. A map showing the context of the area surrounding the study limits is provided in **Figure 3-3**.

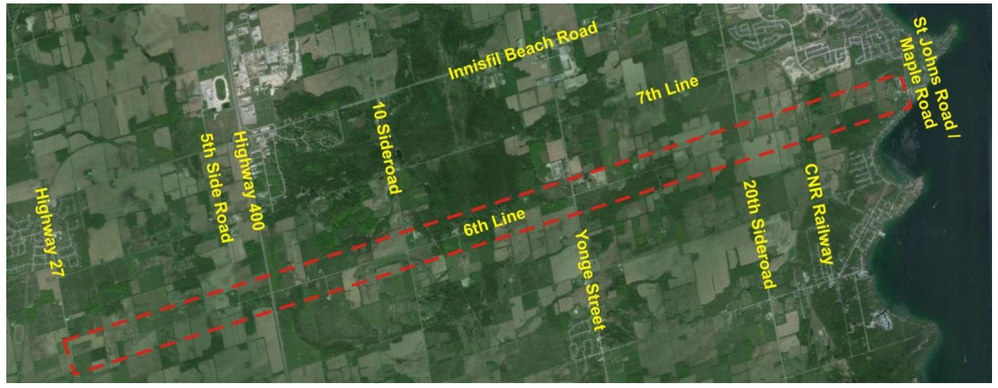


Figure 3-3: Surrounding Area Context

3.1.8 Road Geometry

The entire 6th Line corridor is fairly straight with very little horizontal curvature. There is some mild vertical curvature due to the natural rolling topography, and the grade generally drains towards Lake Simcoe. However, these vertical curves are relatively low grades. The largest vertical deflection occurs at the GO railway overpass east of 20 Sideroad. The existing grades over the GO railway are about 8%. The road geometry generally meets acceptable sight distances, except at the GO railway where it is a no-passing zone.

3.2 Socio-Economic Environment

3.2.1 Existing Land Use

Land uses adjacent to 6th Line through the study limits are rural, consisting of a mixture of agricultural lands, residential properties, and natural environment areas.

3.2.2 Archaeology

The study area is located within the traditional territory of the Huron-Wendat, and is considered to have potential for the presence of Aboriginal Euro-Canadian archaeological resources. Historic mapping indicates that the study area includes historic transportation routes. This indicates that the study area possesses potential for the recovery of Aboriginal and Euro-Canadian archaeological resources, depending on the degree to which the natural topography and soils in the study area have been disturbed by historic and modern development.

Background research and a property inspection indicated that nine previously registered archaeological sites are located within one kilometer of the Study Area. The majority of the study area has been documented to not retain archaeological potential on account of deep and extensive land disturbance, steeply sloping, or low and wet conditions, and does not require further archaeological assessment. However, any lands beyond the road right-of-way identified as possessing archaeological potential should be subject to a Stage 2 archaeological assessment prior to any proposed impacts by the project. A Euro-Canadian cemetery was identified adjacent to the study area (Yonge Street Intersection), and will therefore require avoidance and a Stage 3 cemetery investigation.

Details of the Stage 1 Archaeological Assessment are provided in **Appendix C**.

3.2.3 Built Heritage and Cultural Landscape Features

The results of the Cultural Heritage Resource Assessment revealed that the 6th Line study area is potentially rich in nineteenth-century and twentieth-century cultural heritage resources. The desktop assessment and field review from County Road 27 to 20 Sideroad indicated a total of 24 cultural heritage resources, consisting of two built heritage resources and 22 cultural heritage landscapes, are located within or adjacent to the study area. Between 20 Sideroad and St. John's Road, the desktop assessment and field review indicated a total of 13 cultural heritage resources, consisting of six built heritage resources and seven cultural heritage landscapes, are located within or adjacent to the study area.

Based on the results of background data collection and field review the following is recommended for 6th Line from 20 Sideroad to St. John's Road:

- Staging and construction activities should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources;
- BHR 2 and BHR 4 are expected to be significantly impacted through the potential demolition of structure, alteration to the landscape setting, and the introduction of elements that are not in keeping with the historic setting of these properties (i.e. construction of multi-use path and wider roads). A resource-specific heritage impact statement should be carried out for each resource prior to construction to evaluate the cultural heritage value of these resources, identify cultural heritage attributes, and develop appropriate mitigation measures. Potential mitigation measures may include landscape documentation prior to construction and post-construction landscaping to restore pre-construction conditions;
- The feasibility of implementing tree protection zones should be investigated for all identified cultural heritage resources where tree removals are planned. If possible tree protection zones should be implemented for BHR 2-3, BHR 5, and CHL 4;

- BHR 3, BHR 5, CHL 1, CHL 3, and CHL 4 are expected to be impacted through alteration to setting by the removal of replaceable landscape features (i.e. shrubs and young trees) and the introduction of elements that are not in keeping with the historic setting of these resources (i.e. construction wider road and/or multi-use path). A cultural heritage landscape documentation report should be prepared by a qualified heritage consultant in advance of construction activities to create a record of the existing conditions of these resources;
- Post-construction landscaping and rehabilitation plans should be undertaken in a manner that is sympathetic to the overall setting. Wherever possible, landscaping with appropriate/sympathetic historic plant materials is recommended, and fence rows should be preserved where extant. Post-construction landscaping is recommended for BHR 3, BHR 5, CHL 1, and CHL 3-4 and for all properties that will be subject to the removal of vegetation or replaceable landscape features (i.e. young trees, shrubs, and fence lines) during construction.

Based on the results of background data collection and field review the following is recommended for 6th Line from County Road 27 to 20 Sideroad:

- Staging and construction activities should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources;
- CHL 7 and CHL 9 are expected to be significantly impacted through the potential demolition of buildings, alteration to the landscape setting, and the introduction of elements that are not in keeping with the historic setting of these properties (i.e. construction of new sidewalks and reduced setbacks). A resource- specific heritage impact statement should be carried out for each resource prior to construction to evaluate the cultural heritage value of these resources, identify cultural heritage attributes, and develop appropriate mitigation measures. Potential mitigation measures may include landscape documentation prior to construction and post-construction landscaping to restore pre-construction conditions;
- A cemetery investigation is recommended for one resource (CHL 18) since construction activities are planned within the 6th Line right-of-way (ROW) adjacent to the cemetery. The cemetery investigation should be carried out to confirm the presence or absence of unmarked graves. Such an assessment typically entails mechanical striping of topsoil and examining the subsoil for the presence of grave shafts under the supervision of a licensed archaeologist. This work will be done in accordance with the MTCS's 2011 Standards and Guidelines for Consultant Archaeologists and the Ontario Cemeteries Act;
- The feasibility of implementing tree protection zones should be investigated for all identified cultural heritage resources where tree removals are planned. If possible, tree protection zones should be implemented for CHL 4, CHL 7, CHL 9, CHL 12-13, CHL 17, and CHL 19-22;
- CHL 1, CHL 12-13, CHL 17, and CHL 20- 22 are expected to be impacted through alteration to setting by the removal of replaceable landscape features (i.e. shrubs and young trees) and the introduction of elements that are not in keeping with the historic setting of these resources (i.e. road widening). A cultural heritage landscape documentation report should be prepared by a qualified heritage consultant in advance of construction activities to create a record of the existing conditions of these resources;
- At present, it is understood that there will be no impacts to the mature trees located adjacent to the 6th Line ROW at BHR 1. Should this change during detailed design, BHR 1 should be included in the cultural heritage landscape documentation report, described in the previous recommendation.
- Post-construction landscaping and rehabilitation plans should be undertaken in a manner that is sympathetic to the overall setting. Wherever possible, landscaping with appropriate/sympathetic historic plant materials is recommended, and fence rows should be preserved where extant. Post-construction landscaping is recommended for BHR 1, CHL 1,CHL 3- 6, CHL 8, CHL 10, CHL 12-17, and CHL 20-22 and for all properties that will be subject to the removal of vegetation or replaceable landscape features (i.e. young trees, shrubs, and fence lines) during construction; and,

Should future work require an expansion of the current study corridor and/or an additional study area, a qualified heritage consultant should be contacted in order to confirm impacts of the undertakings on potential cultural heritage resources.

More details on Built Heritage Resources and Cultural Landscape Features are provided in **Appendix D**.

3.2.4 Noise

A noise impact study was conducted to document existing noise levels that could then be compared to projected noise levels as a result of any potential road improvements.

The noise assessment identified the following:

- MTO's noise level limit criterion of 65 dBA has not been exceeded at any Outdoor Living Areas (OLAs) within the study area; however, due to a projected increase in the traffic volume, the noise levels within the study area are projected to increase by more than 5 dBA. As a result, mitigation is to be considered.
- Six OLAs are exposed to predicted 24-hour average levels in excess of the province's target of 55 dBA. Further, the provision of a continuous acoustic barrier is not expected to be technically feasible as an acoustic barrier with the required surface gap / break to provide safe access to residences is not expected to provide the recommended acoustical performance. Mitigation is therefore not recommended as a component of the Project.
- An outline regarding construction noise, a noise complaint process and the applicable noise by-law during the construction phase of the project is included in the noise assessment. Based on a review of available information, an exemption for the applicable by-law may be required and may be possible, as has been the case for other construction projects in the Town.

More details on the Noise Impact Study are provided in **Appendix E**.

3.3 Geotechnical Engineering

3.3.1 Pavement

The geotechnical and pavement design study summarizes the results of the preliminary geotechnical investigation. Based on the results of the field investigation carried out on April 15th and April 16th, 2015 and subsequent laboratory testing, the existing pavement on 6th Line is significantly structurally deficient to carry future traffic. The geotechnical and pavement design assessment identified the severity and density of pavement distresses, determined the underlying soil strengths, and provided recommendations for pavement reconstruction in accordance with the Town's engineering roadway standards for pavement surfacing. The report can be found in **Appendix F.**

The preliminary pavement designs recommendations provided in the Pavement Report should be reviewed during the detailed design stage.

3.3.2 Foundations

A foundation assessment study was conducted to summarize the results of a desktop study of available subsurface information and a limited site investigation, and provides preliminary foundation recommendations for the potential widening/replacement of the existing 6th Line/CN Rail (or GO Rail) overhead structure as well as the potential extension/replacement of the existing Highway 400/6th Line overpass structure.

Underlying the topsoil and fill materials, the native subsoil at the 6th Line/CN Rail (GO) overpass site generally consist of dense to very dense silt and sand till to sandy silt till. Based on these subsurface conditions, it is recommended that new foundations for the potential widening/replacement structure be founded on spread footings placed on dense to very dense silt and sand till to sandy silt till. Alternatively, abutment and pier foundations could be supported on steel H-piles driven into the very dense silt and sand till to sandy silt till. Difficulties penetrating through the glacial till soils and fill containing cobbles/boulders should be expected and pre-augering techniques may be required to achieve a minimum pile embedment length.

Underlying the asphalt and fill material, the native subsoil at the Highway 400/6th Line overpass site generally consist of hard clayey silt till, with SPT 'N'-values typically greater than 100 blows per 0.3m of penetrations. Based on these subsurface conditions, it is recommended that new foundations for the potential bridge extension/widening/replacement structure be founded on spread footings placed on the hard clayey silt till. Consideration could also be given to the use of perched abutments founded on spread footings placed on compacted granular pad above the clayey silt till soils within the approach embankments. Alternatively, for a new overpass or structurally-separate widening/extension, if required, new foundations could be supported on steel H-piles driven into the hard clayey silt till. Difficulties penetrating through the glacial till soils and fill containing cobbles/boulders should be expected and pre-augering techniques may be required to achieve a minimum embedment length. If perched footings or integral abutments supported on deep foundations are considered viable options, determination of the subsoil conditions between the Highway 400 grade and the 6th Line cut will be required during the detailed design stage.

Details of the desktop study foundation assessment can be found in **Appendix G**.

3.3.3 Contamination

A Contamination Overview Study was conducted to identify potential subsurface chemical contamination issues associated with the study area which are obvious from a visual examination of surface features through a desktop review of available sources or a "windshield" level reconnaissance. No soil, water, liquid, gas, product or chemical sampling and testing on, or in the vicinity of the study area, was conducted as part of this assessment. The Contamination Overview Study revealed that the study area contains twenty-two (22) properties with issues of potential environmental concern. If subsurface work is to be conducted in the vicinity of these properties, further intrusive investigations may be required during detailed design. If impact is encountered, it should be managed in consultation with a qualified professional. More details on these properties are provided in **Appendix H**.

3.4 Natural Environment

A summary of environmental constraints based on preliminary background research is provided in the following sections. More details are provided in **Appendix I.**

3.4.1 Fish and Fish Habitat

The study area is located within two watersheds, the Lake Simcoe Region Conservation Authority (LSCRA) and the Nottawasaga Valley Conservation Authority (NVCA) jurisdictions. Watercourses include: Cedar Creek, tributary of Nottawasaga River, tributaries of Innisfil Creek, and tributary of Banks Creek. A summary of fish and fish habitat at each watercourse crossing, based on field investigations and secondary source data is presented in **Table 3-1**.

Table 3-1: Fish and Fish Habitat at Watercourse Crossings

Watercourse	Summary of Fish and Fish Habitat
Crossing A (Tributary of Egbert Creek)	According to secondary source data, this watershed supports coldwater Brook Trout habitat approximately 2.5 km downstream of 6th Line. However, this watercourse within the study area supports seasonal flow and fish habitat indirectly. Conditions are degraded due to agricultural activities.

Watercourse	Summary of Fish and Fish Habitat
Crossing B (Tributary of Egbert Creek)	Although no critical habitat features were identified, fish were observed within this ditch, thus providing seasonal fish habitat. According to secondary source data, this watershed supports coldwater Brook Trout habitat approximately 2.5 km downstream of 6th Line. This watercourse however, within the study area supports seasonal flow and fish habitat. Conditions are degraded due to agricultural activities.
Crossing C (Tributary of Innisfil Creek - Wilson Drain)	Conditions are degraded throughout the channel. Fish were observed within this watercourse during the spring site visit, therefore this tributary should be classified as having seasonal flow and fish habitat. Conditions are degraded due to agricultural activities. According to secondary source data, this watershed supports coldwater Brook Trout habitat downstream of the study area.
Crossing D (Tributary of Innisfil Creek - Wilson Drain)	Cyprinids were observed within the channel during both the spring and summer site visits. Based on the field investigations, this channel supports seasonal flow and fish habitat. Conditions are degraded due to agricultural activities. According to secondary source data, this watershed supports coldwater Brook Trout habitat downstream of the study area.
Tributary of Innisfil Creek (Wilson Drain) crossing of Highway 400	Based on the field investigations, this channel supports seasonal flow and fish habitat. According to secondary source data, this watershed supports coldwater Brook Trout habitat downstream of the study area.
Crossing E (Tributary of Innisfil Creek)	Based on the field investigations, this watercourse is seasonal and provides fish habitat indirectly. According to secondary source data, this watershed supports coldwater Brook Trout habitat downstream of the study area.
Crossing F (Tributary of Innisfil Creek)	Creek Chub and Blacknose Dace were observed within this channel during the spring site investigation. Based on field investigations, this watercourse supports seasonal flow and fish habitat. According to secondary source data, this watershed supports coldwater Sculpin habitat downstream of the study area.
Crossing G (Tributary of Innisfil Creek)	Based on the field investigations, this watercourse crossing supports seasonal flow and indirect fish habitat. According to secondary source data, this watershed supports coldwater Sculpin habitat downstream of the study area.
Crossing H (Tributary of Banks Creek)	A small pool, 1.5 m wide, 30 cm depth was present immediately at the culvert outlet and several cyprinids were noted within this pool during the spring visit. During detailed design, the connection, or lack thereof to Banks Creek should be verified. Based on the field investigations, this watercourse crossing supports seasonal flow and fish habitat. According to secondary source data, Banks Creek supports a tolerant warmwater baitfish community.
Crossing I (Tributary of Banks Creek)	During detailed design, the connection, or lack thereof to Banks Creek, should be verified. Based on the field investigations, this watercourse crossing supports seasonal flow and indirect fish habitat. According to secondary source data, Banks Creek supports a tolerant warmwater baitfish community.
Crossing J (Tributary of Banks Creek)	Fathead minnows were observed and captured by dipnet at this crossing during the spring site visit. During the summer site visit, this watercourse was dry, with the exception of some standing water at the culvert outlet to the north of 6th Line. Based on the field investigations, this watercourse crossing supports seasonal flow and fish habitat. According to secondary source data, Banks Creek supports a tolerant warmwater baitfish community.
Cedar Creek	No critical habitat features were observed during the October 2014 site visit. Based on this single site visit, and a review of background sources to date, Cedar Creek should be classified as direct fish habitat from 600 m west of St. John's Road to the east. Due to the habitat features observed, it is likely that seasonal habitat exists further to the west, to approximately 1.2 km west of St. John's Road. A spring site visit will be required during detailed design to determine the extent of seasonal fish habitat. Due to the proximity of Lake Simcoe, data provided by MNRF and sampling conducted by Azimuth Consulting in 2005, the fish community in this watercourse can be classified as a mix of warm/coolwater lake and stream dwelling species.

Based upon a review of the MNRF Natural Heritage Information Centre database, Species at Risk data provided by MNRF, and the LSCRA/NVCA/Department of Fisheries and Oceans Species at Risk mapping 2014, and personal correspondence with MNRF, LCRCA and NVCA, there are no aquatic species at risk recorded within the study area.

3.4.2 Vegetation and Vegetation Communities

The study area is rural, with agricultural fields throughout, and patches and corridors of natural heritage features. Forest patches and valleylands are considered to be the more sensitive features within the study area.

Vegetation communities in the study area include: Dry-Moist Old Field Meadow (CUM1-1a and b), Mineral Cultural Thicket (CUT1), Mineral Cultural Woodland (CUW1), Fresh-Moist Poplar Deciduous Forest (FOD8-1), Ash Mineral Deciduous Swamp (SWD2), Silver Maple Organic Deciduous Swamp (SWD6-2), and Red-osier Mineral Thicket Swamp (SWT2-5). All of the vegetation communities identified within the study area are considered widespread and common in Ontario and are secure globally.

A total of 186 plant species have been recorded within the study area between County Road 27 and 20 Sideroad. Four of these plants could only be identified to genus and are not included in the following calculations. Of the 182 plants identified to species, 119 (65%) plant species identified are native to Ontario and 63 (35%) plant species are considered introduced and non-native to Ontario. A total of 136 plant species have been recorded within the study area between 20 Sideroad and St. John's Road. Five of these plants could only be identified to genus and are not included in the following calculations. Of the 131 plants identified to species, 78 (60%) plant species identified are native to Ontario and 53 (40%) plant species are considered introduced and non-native to Ontario.

One plant species regulated under the Ontario Endangered Species Act, 2007 was identified during LGL's botanical investigation. One butternut (*Juglans cinerea*) was identified on the north side of 6th Line west of 20 Sideroad. Butternut is regulated as Endangered under the Ontario Endangered Species Act, 2007. A butternut health assessment should be undertaken during detailed design to determine if the tree is a Category 1-3 tree. Since butternut is regulated as Endangered under the ESA, removal of any Category 2/3 butternut will require approval from the MNRF, and the Minister, where a Permit is required. In addition, a detailed butternut survey should be undertaken during detailed design to confirm the absence of additional trees within 50 m of the proposed construction limits, in accordance with MNRF guidelines.

Eleven plant species (between County Road 27 and 20 Sideroad) and five (between 20 Sideroad and St. John's Road) that are rare in Simcoe County were identified within the study area. Details are provided in **Appendix I**.

3.4.3 Tree Resources

A total of 30 tree species (between County Road 27 and 20 Sideroad) and 163 tree species (between 20 Sideroad and St. John's Road) were documented within the study area. Overall, trees within the study area were generally considered to be in good to fair condition with the exception of ash trees. Ash trees throughout the study area have varying levels of decline, which is most likely as a result of the Emerald Ash borer. In addition, epicormic branching and varying degrees of crown dieback were prevalent throughout the study area which is often an indication of stress in trees found in urban settings.

3.4.4 Wildlife and Wildlife Habitat

Based on field observations, 66 (between County Road 27 and 20 Sideroad) and 43 (between 20 Sideroad and St. John's Road) species of wildlife could be verified in the study area and the majority of these recordings came from identification (through calls and sightings) of bird species with more modest numbers of herpetofauna and mammal species identified.

Anuran breeding evidence was documented for seven (between County Road 27 and 20 Sideroad) and six (between 20 Sideroad and St. John's Road) species during 2015 surveys. Vocalizing male American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Spring Peeper (*Pseudacris crucifer*), Western Chorus Frog (*Pseudacris triseriata*), Wood Frog (*Lithobates sylvaticus*), Leopard Frog (*Lithobates pipiens*) and Green Frog (*Rana clamitans*) were noted within the study area or in the immediate vicinity.

Six (between County Road 27 and 20 Sideroad) and four (between 20 Sideroad and St. John's Road) mammal species were identified during field investigations in the study area. Northern racoon (*Procyon lotor*) tracks were commonly identified along the roadside, as well as eastern chipmunk (*Tamias striatus*) and red squirrel (*Tamiasciurus hudsonicus*). Eastern gray squirrel (*Sciurus carolinensis*) and eastern cottontail (*Sylvilagus floridanus*) were observed within wooded and residential areas .A road-killed beaver (*Castor canadensis*) and White-tailed deer (*Odocoileus virginianus*) were also observed. The mammal species documented represent an assemblage that readily utilizes human influenced landscapes.

Eight (between County Road 27 and 20 Sideroad) and six (between 20 Sideroad and St. John's Road) herpetofauna species were observed in the study area during field investigations. The majority of these species were identified during anuran call surveys conducted over three separate surveys.

Confirmed breeding by bird species was generally documented based on adults carrying food for young, including species such as Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospica melodia*), Savannah Sparrow (*Passerculus sanwichensis*), American Robin (*Turdus migratorius*), Barn Swallow (*Hirundo rustica*), Tree Swallow (*Tachycineta bicolor*), Yellow Warbler (*Setophaga petechia*), American Goldfinch (*Carduelis tristis*), European Starling (*Sturnus vulgaris*), American Crow (*Corvus brachyrhynchos*), and Eastern Kingbird (*Tyrannus tyrannus*). These same species which were confirmed as breeding were also commonly encountered species across the study area. Several Barn Swallow nesting colonies were identified during breeding bird surveys; however, they were generally observed several hundred meters from the study area. A single Cliff Swallow (*Petrochelidon pyrrhonota*) nest was found under the south side of the Highway 400 bridge structure.

Of the 66 (between County Road 27 and 20 Sideroad) and 43 (between 20 Sideroad and St. John's Road) wildlife species recorded within the study area, four are regulated under the Ontario Endangered Species Act, 2007 (ESA) and/or the federal Species at Risk Act. Bobolink, Eastern Meadowlark and Barn Swallow are all species regulated as 'Threatened' under the ESA and the Western Chorus Frog (*Pseudacris triseriata*) is regulated as 'Threatened' under the federal Species at Risk Act. One species, the Eastern Wood Pewee, is listed on the Species at Risk in Ontario List as 'Special Concern'; however, this species in not regulated and consequently does not receive habitat protection under the ESA. One additional species at

risk, the Eastern Musk Turtle (*Sternotherus odoratus*), has been identified as having potential to be present within the study area, based on records from the Natural Heritage Information Centre (NHIC) database (MNR 2015). An information request was sent to the MNRF Midhurst District on October 16, 2014 requesting information on species at risk previously identified within proximity to the study area. A response from MNRF on November 13, 2015 indicated that records for Blanding's Turtle (*Emydoidea blandingii*), Snapping Turtle (*Chelydra serpentina*), and Milksnake (*Lampropeltis triangulum*) exist within the vicinity of the study area.

Each of the eight species identified above, their respective legal status, biological requirements, habitat suitability of the study area, likelihood of presence within the study area and survey results (if completed) are discussed in detail in **Appendix I**.

3.4.5 Designated Natural Areas

The Lover's Creek Provincially Significant Wetland (PSW) is a large wetland complex located on the north and south sides of 6th Line between 10 Sideroad and Yonge Street. The Lover's Creek PSW is comprised of four individual wetlands and two wetland types including swamp and marsh. The Lover's Creek PSW provides breeding and/or feeding habitat for the provincially significant marsh hawk, regionally significant slender wedge grass, and black duck. In addition, the Lover's Creek PSW provides the following ecological values: active feeding area for Great Blue Herons; winter cover for locally significant for deer; locally significant waterfowl production; and, brook and rainbow trout spawning and rearing habitat.

The Little Cedar Point Provincially Significant Wetland (PSW) is located on the south side of 6th Line west of Saint John's Sideroad. The Little Cedar Point PSW is comprised of three individual wetlands and two wetland types including swamp and marsh.

A number of unevaluated wetlands are also present in the vicinity of the study area including on the south side of 6th Line east of Highway 400, on the north and south sides of 6th Line west of 20 Sideroad and on the south side of 6th Line east of County Road 27th.

A review of the Town of Innisfil Official Plan (2011) identifies the forest, deciduous and coniferous wetland communities and Little Cedar Point within the study area as 'significant woodland.'

3.5 Drainage

Within the project limits, 6th Line crosses several creeks and two wetlands. These include:

- Tributaries of Egbert Creek – multiple crossings between County Road 27 and 5 Sideroad
- Tributaries of Innisfil Creek – multiple crossings between 5 Sideroad and 10 Sideroad
- Lover's Creek PSW – located primarily north of 6th Line, between 10 Sideroad and Yonge Street
- Tributary of Innisfil Creek – crossing between 10 Sideroad and Yonge Street, meandering through Lovers Creek PSW
- Tributary of Banks Creek – crossing between Yonge Street and 20 Sideroad
- Cedar Creek – crossing and runs parallel to 6th Line between GO Rail and St. John's Road
- Little Cedar Point PSW – located south of 6th Line, between GO Rail and St. John's Road

A field review of the existing centreline culverts at 6th Line between County Road 27 and St. John's Road involved the physical assessment of twenty-four (24) culverts. The results of the field review are summarized below.

- Extensive sediment accumulation was observed in Culverts 1-01 through 1-20 and 1-22. To maintain the functionality of this system it is recommended that all culverts be flushed and cleaned out.
- Due to the sediment it was difficult to assess the corrosion of some culverts but significant rusting was still visible for 1-05, 1-08, 1-11, and 1-22
- Severe deformation of culverts 1-05, 1-11, 1-18 and, 1-22 were observed. Replacements of these culverts are recommended.
- Culverts 1-10, 1-17, 1-19 and 1-23 were not accessed during the site visit (severe hiking conditions). Further field investigation may be required during detailed design as complete surveying was not possible.

An inventory of all culverts, including size, type and drainage is presented in **Appendix J**.

Modifications to culvert crossings will be examined to determine if they require a Permit under the Ontario Regulation 166/06 (Development, Interference with Wetlands and Alterations to Shorelines and Watercourses).

All watercourses within the study area are part of the Innisfil Creek watershed. The study area west of Yonge Street is under the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA), and the area east of Yonge Street is under the jurisdiction of Lake Simcoe Region Conservation Authority (LSRCA). The study area includes watercourse crossings over the tributaries of Egbert Creek, Innisfil Creek, Banks Creek and Cedar Creek, which are located within the Nottawasaga Valley Conservation Authority and Lake Simcoe Region Conservation regulated floodplain area.

The stormwater run-off for the project will be managed in two different ways. From County Road 27 to 20 Sideroad, where the proposed section is a rural section, storm water will collected, stored, and infiltrated using vegetated swales and roadside ditches. These ditch systems will offer water quality treatment for run-off before the water is allowed to enter the watershed.

For the urbanized section of roadway from 20 Sideroad to St. John's Road, a subsurface drainage system consisting of catch basins, pipes and subdrains will be proposed to collect and convey both the granular base material and surface runoff, and to discharge to designated discharge outfalls that maintain the existing subwatershed drainage pattern. The sewer system draining the pavement for the ultimate roadway configuration is to be designed to 5 year design storm standard. The major drainage system for the roadway is to be designed to convey overland flow to the adjacent watercourses.

Due to geographical barriers, the urbanized segment will be broken into several sub-basins: 20 Sideroad to the GO Railway; GO Railway to Cedar Creek crossing; and Cedar Creek crossing to St. John's Road. These pipe networks were developed to a conceptual level, including approximate rough sizing of pond facilities, as presented in Section 8.8..

3.6 Hydrogeology

A preliminary hydrogeological assessment was conducted to identify constraints to the construction of the improvements and possible impacts related to the project on existing groundwater resources within the Study Area. Based on the review of available published information, a windshield reconnaissance, and the expected construction activities, there is potential for impact to groundwater resources as a result of:

- Construction de-watering;
- Reduction in groundwater recharge associated with expanded pavement surfaces;
- Installation of sewers, water mains, culvert and bridge foundations and drainage improvements below the water table;
- Increased use of road salt over a larger area associated with the expanded road and increased traffic.

It is recommended that the potential impacts be re-assessed along with more detailed site specific hydrogeological data at the detailed design stage of the project and appropriate mitigation measures incorporated into the design. Based on the findings of the re-assessment, Permits to Take Water for construction should be applied for and a pre-construction survey and baseline water quality assessment be implemented as necessary prior to construction.

Details of the preliminary hydrogeology assessment can be found in **Appendix K**.

3.6.1 Source Water Protection

Based on mapping available on-line from the County of Simcoe and Town of Innisfil, there are no wellhead protection areas or municipal wells within the study area. A review of the South Georgian Bay Lake Simcoe Source Protection Region, Approved Source Protection Plan as amended May 14, 2015 and on-line source water protection mapping from the Government of Ontario (http://www.applications.ene.gov.on.ca/swp) indicates the study area has no source water protection vulnerable areas. As such, risk management plans for the threats identified in the Approved Source Protection Plan are not expected to be required.

3.7 Utilities and Other Services

There are existing utilities within the existing corridor, including a hydro pole line, Bell Canada, and a gas line. The planned subdivision, Sleeping Lion, also plans to install water and sewer facilities from their subdivision easterly towards St. John's Road where it will connect into existing facilities. A new pump station is proposed by the Town at the northwest quadrant of St. John's Road and 6th Line.

An inventory of existing utilities was compiled for the study area. The following agencies were contacted to retain the location of existing or proposed utilities within the study area:

- Bell Canada
- Enbridge
- Hydro One
- Innisfil Water and Sewer
- Rogers Communication
- TransCanada
- Innisfil Hydro
- Union Gas

4 Needs Assessment

4.1 Existing Transportation Conditions

Existing traffic operation conditions are documented in the following sections. Variables include traffic volumes and intersection operations.

4.1.1 Traffic Volumes

A traffic impact study entitled ***Updated Transportation Impact Study – Alcona South Secondary Plan – Sleeping Lion Development – Town of Innisfil*** (Project No. 33017500.TRAFFIC, URS, April 2014) was referenced for existing traffic volumes, as well as the ***Town of Innisfil Transportation Master Plan – Final Report*** (HDR Corporation, August 2013). The Sleeping Lion Transportation Impact Study is discussed in detail in **Section 1.6.9** and the Innisfil Transportation Master Plan is discussed in more detail in **Section 1.6.6**.

Traffic volume sources used in the above noted reports are detailed in **Table 4-1**.

Table 4-1: Turning Movement Count Locations and Dates

Count Location	Count Date
Yonge Street @ 6th Line	Tuesday September 11th, 2012
20 Sideroad @ 6th Line	Thursday November 7th, 2013

In addition to turning movement counts, daily two-way traffic volume data was available from the Transportation Master Plan for four locations along 6th Line.

Existing weekday AM and PM peak hour traffic volumes as well as daily traffic volumes are shown in **Figure 4-1**.

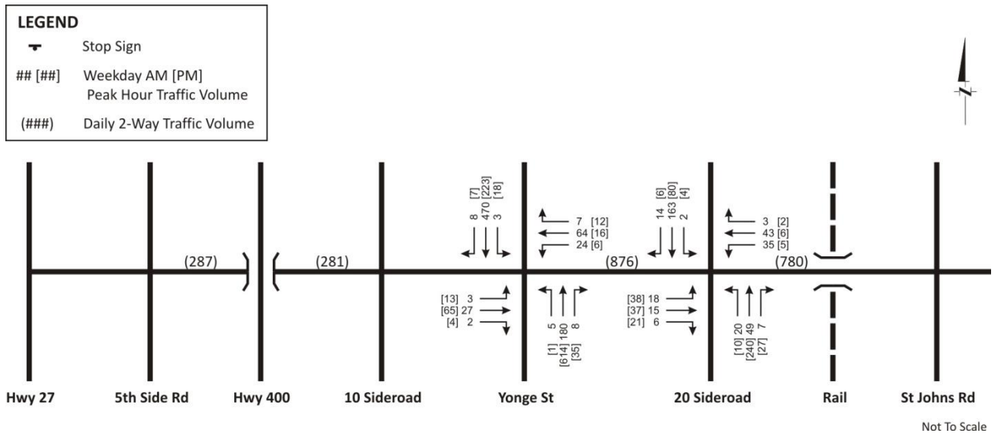


Figure 4-1: Existing 2014 Traffic Volumes

4.1.2 Intersection Operations

Existing traffic operations based on the traffic volumes shown in **Figure 4-1** and the road network described previously (**Figure 3-2)** were assessed in the Sleeping Lion Transportation Impact Study and the Town of Innisfil Transportation Master Plan. The analysis results are shown in **Figure 4-2**.

Intersection and Movement	Weekday AM Peak Hour Delay	LOS	v/c	95th Q	Weekday PM Peak Hour Delay	LOS	v/c	95th Q
Yonge Street & 6th Line								
Northbound Left-Through	8.5	A	0.00	0.01	7.7	A	0.00	0.00
Northbound Through-Right	-	-	-	-	-	-	-	-
Southbound Left-Through	7.6	A	0.00	0.01	9.3	A	0.02	0.06
Southbound Through-Right	-	-	-	-	-	-	-	-
Westbound Left-Through-Right	19.7	C	0.31	1.32	18.2	C	0.11	0.37
Eastbound Left-Through-Right	17.9	C	0.11	0.38	23.5	C	0.30	1.28

INTERSECTIONS	OVERALL/ CRITICAL MOVEMENT	OPERATIONS (LOS, Delay, V/C Ratio) A.M. Peak Hour				P.M. Peak Hour			
Unsignalized Intersection(s)									
6th Line / 20 Sideroad	Intersection	B		11.7	0.14	B		12.5	0.18
	Movement	EBLTR	B	11.2	0.07	EBLTR	B	12.5	0.18
		WBLTR	B	11.7	0.14	WBLTR	B	11.9	0.03
		NBLTR	A	7.7	0.02	NBLTR	A	7.4	0.01
		SBLTR	A	7.3	0	SBLTR	A	7.8	0

Figure 4-2: Existing Traffic Operations

Traffic volumes along 6th Line are very low. Based on a theoretical two-way capacity of 10,000 vehicles per day, the Town of Innisfil transportation Master Plan indicates 6th Line has an arterial volume to capacity ratio of only 0.03 in the vicinity of the Highway 400 overpass, and 0.08 to 0.09 in the vicinity of 20 Sideroad. Under existing conditions there are currently no capacity concerns at the study intersections. Level of service for all movements is currently LOS 'C' or better, as shown in **Figure 4-2**. Similar operations are anticipated along the entire corridor.

4.1.3 Transit Use and Mode Share

Transit does not currently serve the study area. Therefore, it is anticipated that there are no transit trips originating in or being destined for the study area, and transit use and mode share are not expected to be of a significant magnitude. However, under future conditions this may change as GO Transit expands service in this area with construction of a new train station.

4.1.4 Pedestrian Activity

Based on the available traffic count information, there is little to no pedestrian activity in the study corridor. This is consistent with the existing rural setting of the area, and pedestrian activity is anticipated to increase as development occurs. Pedestrian activity would be highest near the intersection of St. John's Road due to the number of single family residences, but is still expected to be quite low.

4.1.5 Cycling Activity

Cycling activity along the corridor is low, however, according to the traffic count undertaken at Yonge Street in 2012, there were 4 cyclists observed on the south side of the road during the weekday AM peak period (7:00am to 8:00am) and 11 cyclists on the south side of the road in the PM peak period (2:30pm to 4:30pm). These trips could represent commuter trips since they appear to occur in the westbound direction – away from residential areas of the Town of Innisfil – during the morning, and eastbound direction – returning – in the afternoon.

4.2 Future Conditions

Conditions surrounding 6th Line are anticipated to change significantly by 2021 and 2031, with development planned both north and south of 6th Line within the Part A study limits, as well as at various locations in Part B. Future population and employment growth, planned transportation improvements and future travel demand are documented in the following sections.

4.2.1 Future Population and Employment Growth

The Town of Innisfil as a whole is anticipating significant growth by 2031. While the Provincial Growth Plan calls for 56,000 population and 13,100 employment by 2031, the Town's own forecasts identify over 80,000 population and 15,000 employment factoring in the development of growth areas in Alcona North, Alcona South, and Innisfil Heights expansion areas. These lands are subject to Official Plan Amendment No.1. Further to growth within the Town of Innisfil, the City of Barrie has plans to develop the lands immediately north of the Town boundary, adding approximately 41,000 population and 7,000 employment by 2031.

Town of Innisfil anticipated 2011, 2021, and 2031 population and employment growth are illustrated in **Figure 4-3**.

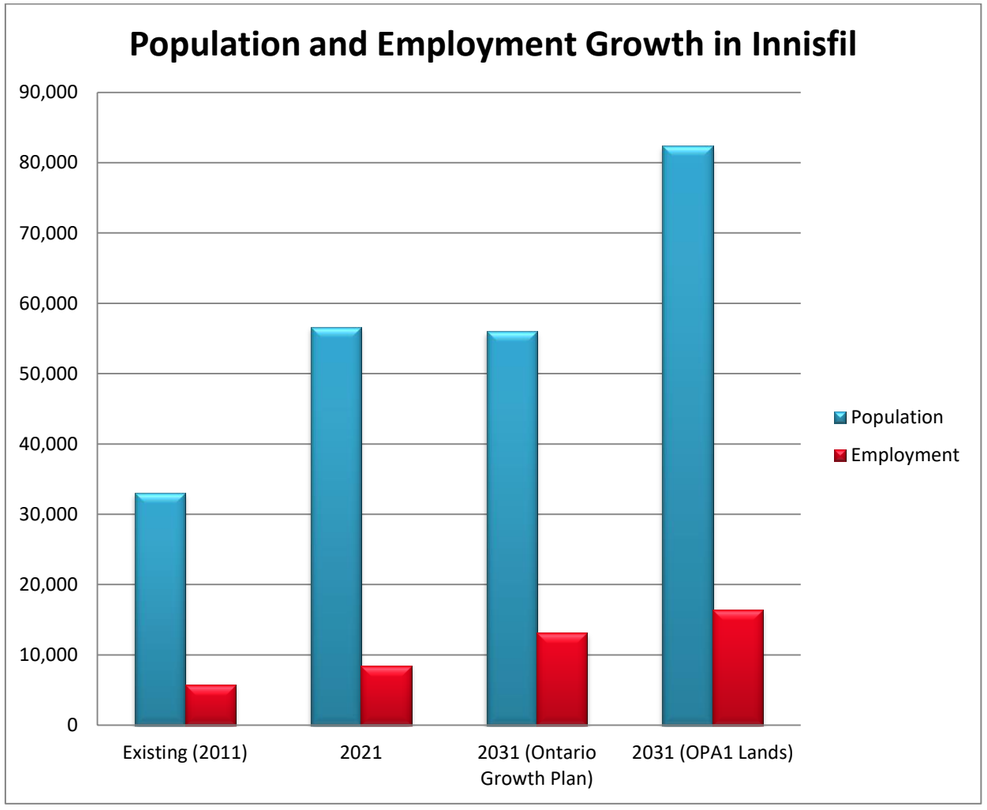
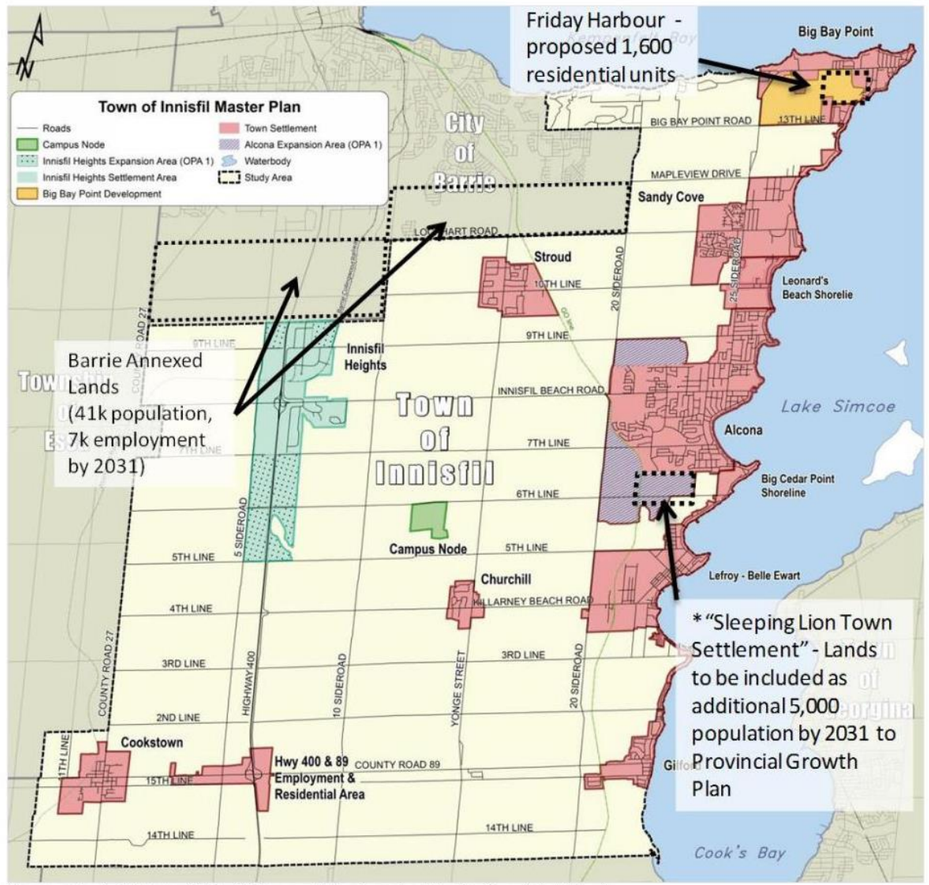


Figure 4-3: Population and Employment Growth in the Town of Innisfil

All of the Alcona North, Alcona South and Innisfil Heights expansion areas are located adjacent to 6th Line. In addition, a "Campus Node" has been identified as a site for future institutional land use. This Campus Node has not been included in travel demand forecasting for this study as details regarding the future land use at this site are unclear at this time. As such any recommendations based on demand forecasts prepared for this study must consider the potential development of this site as an additional traffic generator. These locations are illustrated in **Figure 4-4**, while the population and employment forecasts specific to each are provided in **Table 4-2** and **Table 4-3**.



(Source: Innisfil Town-Wide Water and Wastewater Master Servicing Plan)

Figure 4-4: 2013 Transportation Master Plan Future Growth Areas

Table 4-2: Population Forecasts for Areas Adjacent to 6th Line

Population	2006	2021	2031
Alcona	13,870	23,850	23,850
Sleeping Lion	0	5,000	5,000
Alcona South Expansion Area	0	0	11,500
Alcona North Expansion Area	0	0	5,460
Innisfil Heights	321	321	321
Innisfil Heights Expansion Area	0	0	0
Campus Node	0	0	0
Total	**14,191**	**29,171**	**46,131**

Table 4-3: Employment Forecasts for Areas Adjacent to 6th Line

Employment	2006	2021	2031
Alcona	1,630	1,680	1,729
Sleeping Lion	0	0	0
Alcona South Expansion Area	0	0	2,500
Alcona North Expansion Area	0	0	850
Innisfil Heights	2,388	4,388	5,388
Innisfil Heights Expansion Area	0	0	2,400
Campus Node	0	0	0
Total	**4,018**	**6,068**	**12,867**

4.2.2 Future Road Network

The Town of Innisfil Official Plan recommends upgrading of 6th Line, east of 20 Sideroad, to a Major Collector Road with a minimum right-of-way of 26 metres. To the west of 20 Sideroad 6th Line would remain a local road with a minimum right-of-way of 20 metres. An excerpt from the Town of Innisfil Official Plan Schedule C: Transportation Plan is shown in **Figure 4-5** with the 6th Line study area outlined in orange. The Official Plan considered the potential for a new Highway 400 interchange at 5th Line, as well as the potential for a new GO Station near the intersection of 5th Line and 20 Sideroad.

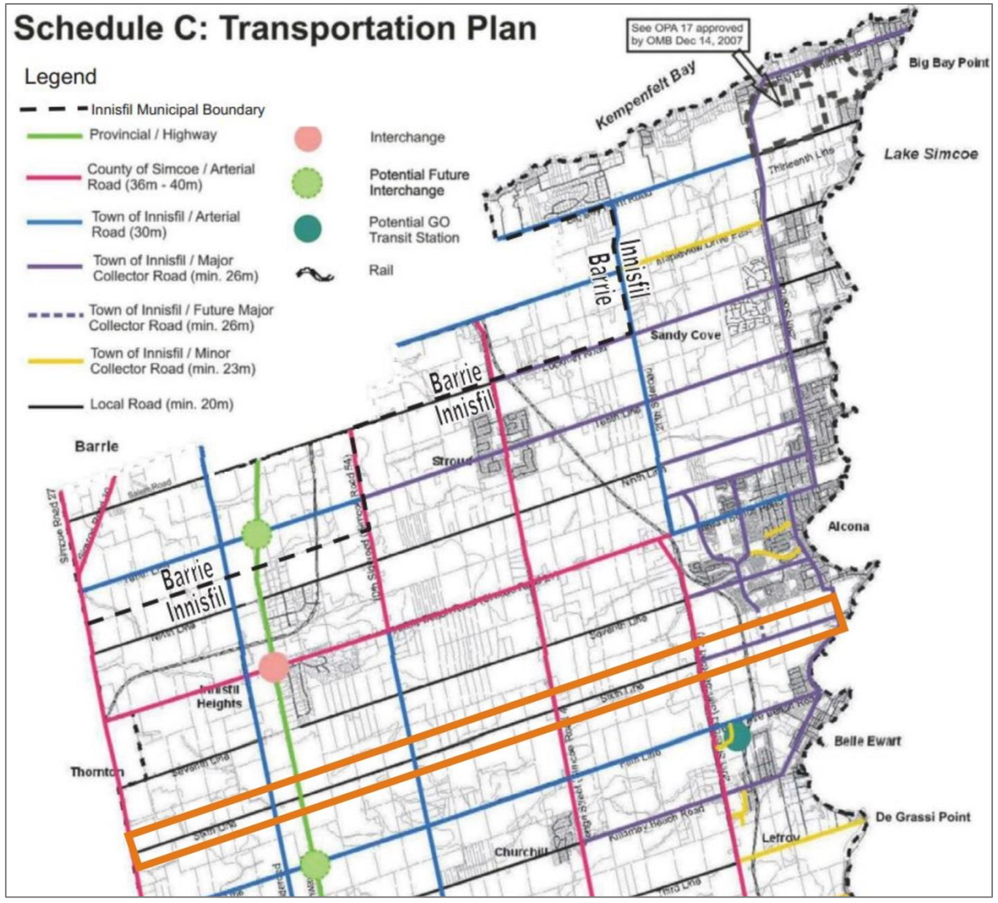


Figure 4-5: Town of Innisfil Official Plan Schedule C: Transportation Plan

The Official Plan Schedule C however was developed in 2005, and approved by Council in 2006. Since the analysis in 2005, the province released the Growth Plan which identified Alcona as an Urban Growth Node, and further to that plan the Town initiated the Transportation Master Plan (TMP) study to identify the transportation improvements required to support the vision of Alcona as a growth node.

The TMP identified a change to the recommended location of a future new Highway 400 interchange from 5th Line to 6th Line as well as a corresponding change to a Town Arterial Road standard for 6th Line from County Road 27 to 20 Sideroad.

An excerpt of the Transportation Master Plan Exhibit D: Recommended 2031 Road Network Improvements, is shown in **Figure 4-6** with the study area outlined in orange. The Town of Innisfil Transportation Master Plan identified several opportunities along the 6th Line corridor as well as some changes from the Official Plan, including:

- Urbanization of 6th Line between St. John's Road and 20 Sideroad (#25 on the graphic below)
- Reconstruction of 6th Line west of 20 Sideroad (#26 on the graphic below)
- A potential Highway 400 interchange at 6th Line (#41 on the graphic below)
- Intersection improvements at 20 Sideroad and Yonge Street (not numbered)

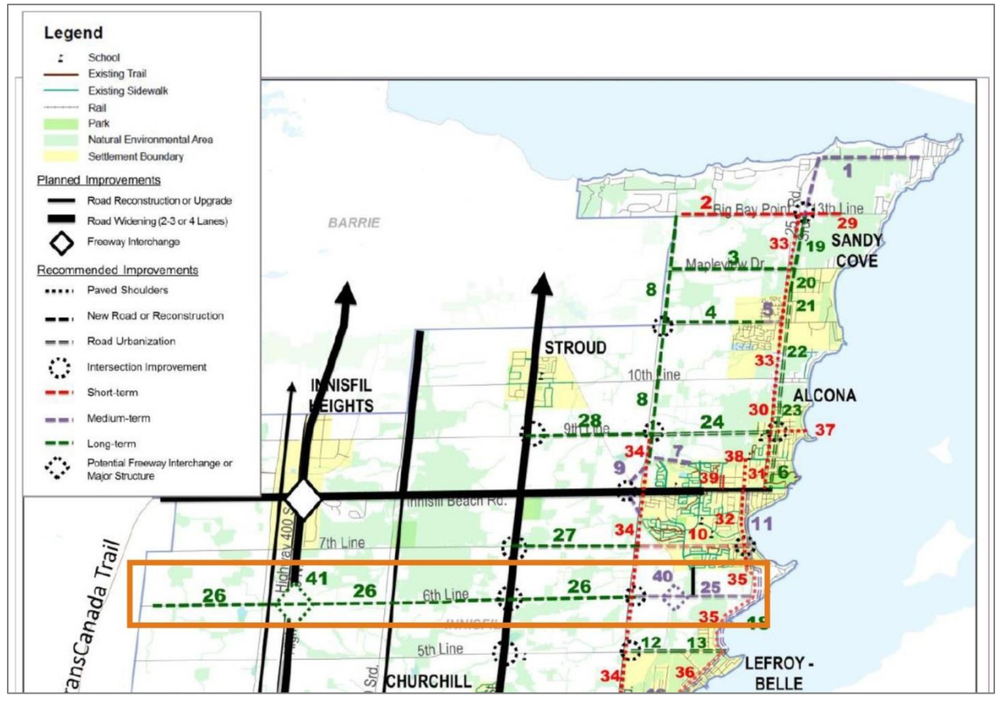


Figure 4-6: Town of Innisfil Transportation Master Plan Exhibit D: Recommended 2031 Road Network Improvements

The above improvements to 6th Line are all identified as medium to long term improvements.

Exhibit E from the Transportation Master Plan (Recommended Revisions to Official Plan Schedule C – Transportation Network), shown in **Figure 4-7** updates the Official Plan recommendations with some major changes:

- 6th Line to the west of 20 Sideroad is recommended to be upgraded to a Town of Innisfil Arterial Road with a minimum right-of-way of 30 metres
- A Highway 400 interchange is considered at the intersection of 6th Line
- The location for the future GO station stop has been moved to 6th Line near the Sleeping Lion Development, in the Alcona South lands (location deferred for further coordination with Metrolinx)

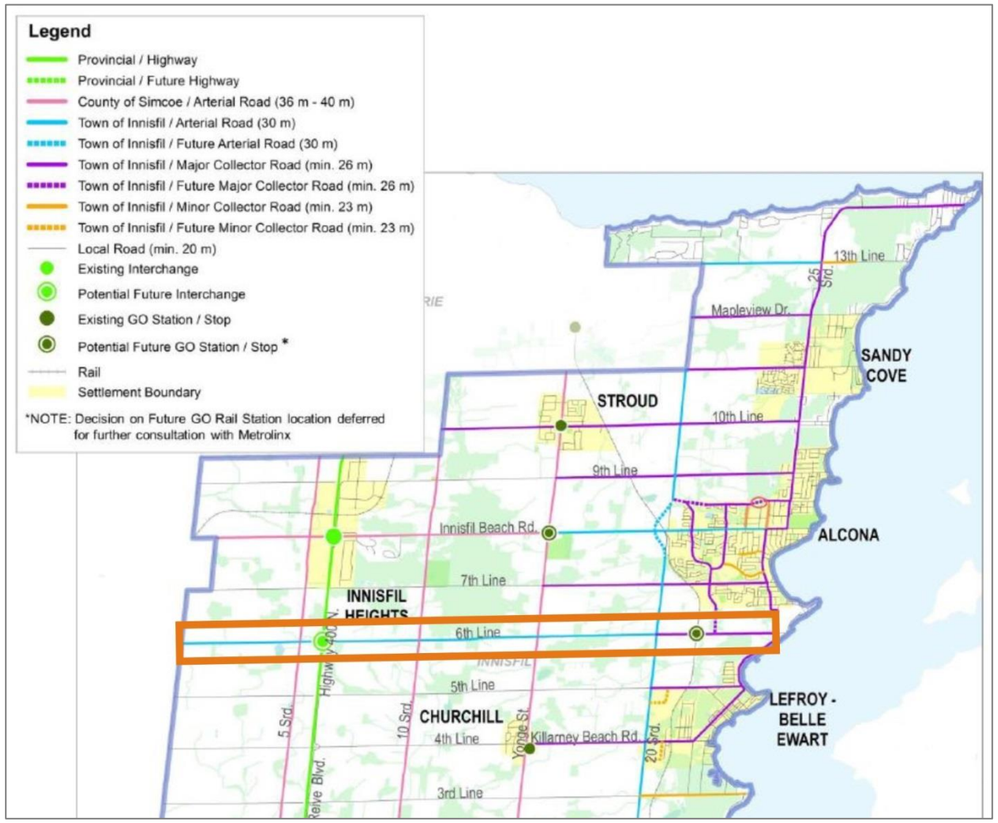


Figure 4-7: Exhibit E Transportation Master Plan Recommended Revisions to Official Plan Schedule C – Transportation Network

4.2.3 Future Pedestrian and Cyclist Network

There are no formal plans for trails or sidewalks along 6th Line by either the Town of Innisfil or Simcoe County, except as needed to meet the urbanization standards identified in the Town engineering standards. This EA will examine pedestrian and cycling opportunities to meet the goals of creating an Active Travel environment.

4.2.4 Future Transit Service

Simcoe County plans for transit improvements within the study area are limited to a proposed inter-municipal bus service along Yonge Street which would have a higher frequency than the current GO bus services and would focus on serving the local communities.

4.2.5 Transportation Model Refinements and Scenarios

To assess future traffic conditions, a travel demand forecasting model was utilized. The Simcoe County TransCAD model used for the 2008 Simcoe TMP was obtained and modified for use in the 2013 Innisfil Transportation Master Plan (TMP) study. The model forecasts daily traffic and is meant to be used as a tool to guide decisions on the future needs of the Town. It is noted that the County updated their TMP and traffic model in 2014, however the updated model was not made available for this EA Study.

The Simcoe model covers the entire Greater Toronto Area plus Simcoe County, and is comprised of 150 traffic zones, 6 of which are within Innisfil. For the Town of Innisfil TMP, traffic zone disaggregation was undertaken, and 26 new zones were added within Innisfil. Within the Alcona Urban Growth node, 8 new zones were added including the expansion areas (Alcona North and Alcona South).

The model was further modified for the purposes of the 6th Line Environmental Assessment. Details on specific inputs and modifications to the model including population and employment assumptions, traffic zone system, transportation network assumptions, and forecast results are documented in **Appendix L.**

The assumed road network used to produce the demand forecasts for 6th Line is the preferred road network as identified in the Town's TMP.

In order to determine the need for improvements to 6th Line, a "Do Nothing" future horizon scenario was tested first. In this scenario, the model forecasted traffic on 6th Line with one lane in each direction with an assumed daily capacity of 5,000 vpdpl (vehicles per day per lane) with a free-flow speed of 40km/h between County Road 27 and 20 Sideroad. Although the actual free flow speed today is 80km/h, the Simcoe county model is calibrated to 40km/h speeds on all of Innisfil's Local Roads / Lines – therefore this model is calibrated similarly.

Innisfil Beach Road is currently the main east-west arterial road connecting the Alcona Community to Highway 400. It was assumed that Innisfil Beach Road will operate with two lanes in each direction with a daily capacity of 10,000 vpdpl east of Highway 400 and a free-flow speed of 80 km/h west of 20 Sideroad and 60 km/h east of 20 Sideroad.

In total, seven scenarios were tested, as identified in **Table 4-4**.

Table 4-4: Transportation Scenarios

Scenario #	Scenario	Speed (west of 20 Sdrd / east of 20 Sdrd)	Lanes (per direction)	Capacity - vpdpl (west of 20 Sdrd / east of 20 Sdrd)	Highway 400 IC?
1A	Do Nothing	40 km/h / 40 km/h	1	5,000 / 5,000	No
1B	Reconstruction	40 km/h / 40 km/h	1	6,500 / 5,000	No
1C	Base Case / Currently Planned	60 km/h / 40 km/h	1	6,500 / 5,000	No
2	Higher Speed and Capacity	80 km/h / 60 km/h	1	10,000 / 6,500	No
3	Base case plus Highway 400 IC	60 km/h / 40 km/h	1	6,500 / 5,000	Yes
4	Higher Speed and Capacity plus Highway 400 IC	80 km/h / 60 km/h	1	10,000 / 6,500	Yes
5	Widening, Higher Speed and Capacity, and Highway 400 IC	80 km/h / 60 km/h	2	10,000 / 6,500	Yes

4.2.6 Future Travel Demand

Results for the seven scenarios are provided in the following sections.

4.2.6.1 Scenario 1A: Do Nothing

Figure 4-8 is a plot containing the results for Scenario 1A, which is the Do Nothing scenario. The links are coloured to illustrate their projected volume / capacity ratio in 2031 while the text indicates the forecast daily auto volume. With no change to the roadway, traffic from the Sleeping Lion development and other Alcona South development areas adjacent to 6th Line will increase traffic on 6th Line beyond capacity east of Yonge Street. Innisfil Beach Road exceeds capacity for the entire length between Highway 400 and Webster Blvd.

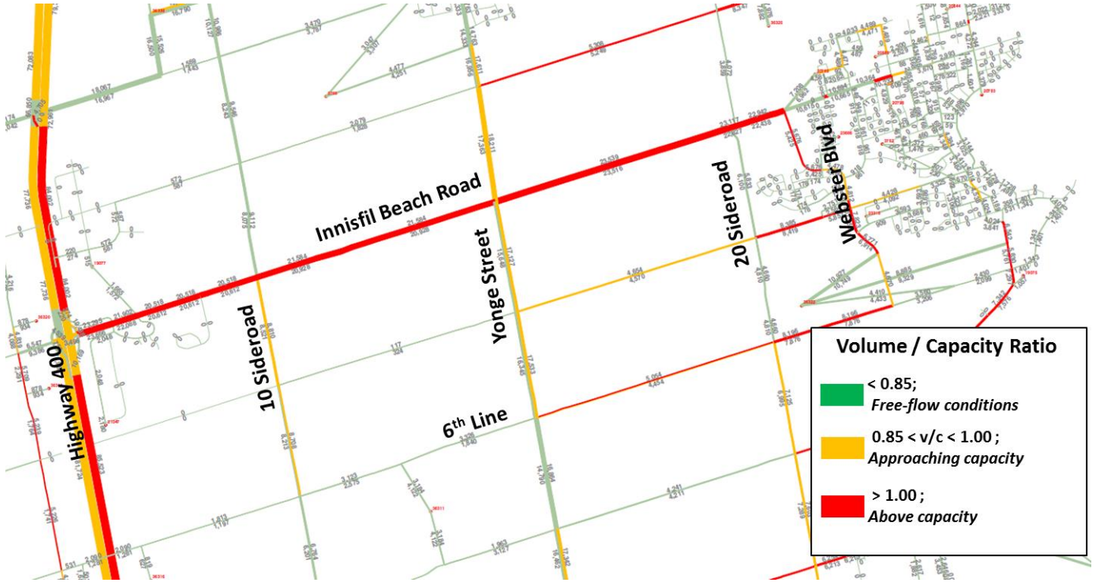


Figure 4-8: Scenario 1A – Do Nothing Auto Volume and Volume / Capacity Results

4.2.6.2 Scenario 1B: Reconstruction

Figure 4-9 is a plot containing the results for Scenario 1B, which proposes to reconstruct 6th Line through the Study Area. The reconstruction could increase capacity by providing wider lanes and paved shoulders. With this improved capacity, 6th Line is still approaching capacity, but operations are improved over Scenario 1A on 6th Line, while Innisfil Beach Road remains above capacity.

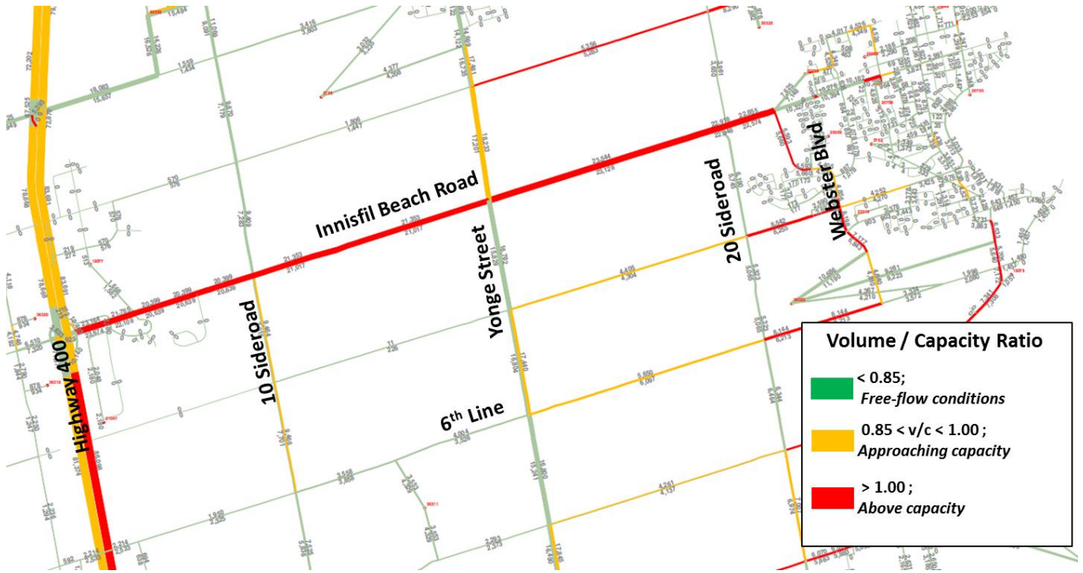


Figure 4-9: Scenario 1B – Reconstruction Auto Volume and Volume / Capacity Results

4.2.6.3 Scenario 1C: Base Case / Currently Planned

Figure 4-10 is a plot containing the results for Scenario 1C, and as per TMP recommendations, the assumed travel speed on 6th Line is increased to 60km/h which results in demand exceeding capacity east of Yonge Street. Innisfil Beach Road also remains above capacity for nearly the entire length between Highway 400 and Webster Blvd.

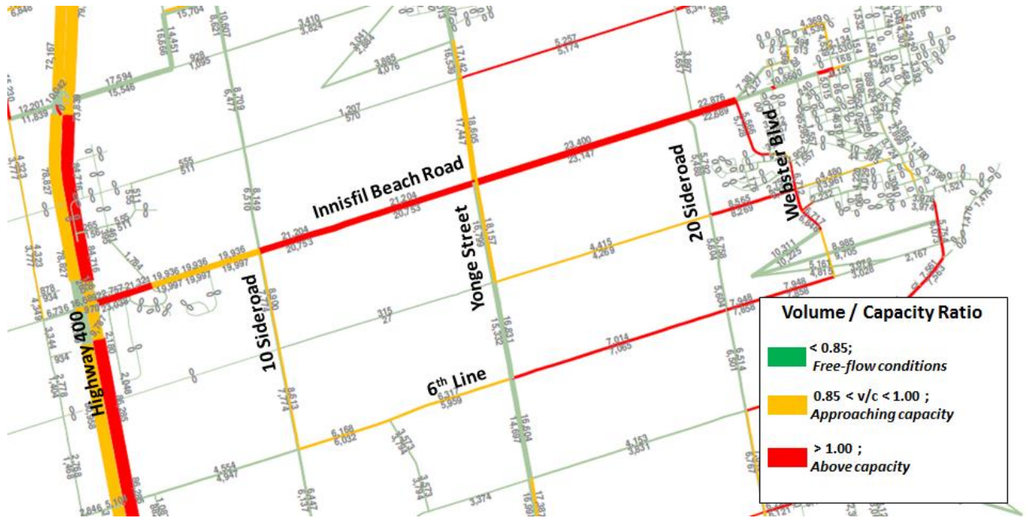


Figure 4-10: Scenario 1C – Base Case / Currently Planned Auto Volume and Volume / Capacity Results

4.2.6.4 Scenario 2: Capacity and Speed Improvements

The plot for Scenario 2, which assumed improved lane capacity and free-flow speed on 6th Line is presented in **Figure 4-11.** 6th Line becomes a more attractive travel route between Alcona and Highway 400 due to the travel time savings that arise with a higher free-flow speed. However due to the increase in demand, 6th Line is projected to operate above the assumed two-way daily capacity between 10 Sideroad and 20 Sideroad. Meanwhile Innisfil Beach Road will also continue to operate above its capacity, however there is some diverted traffic forecasted from Innisfil Beach Road to 6th Line.

In summary, the results of Scenarios 1 and 2 reveal that even if the interchange at Highway 400 is not constructed, 6th Line will continue to be congested if not widened to 4 lanes, particularly east of 20 Sideroad, with even worse congestion occurring on Innisfil Beach Road.

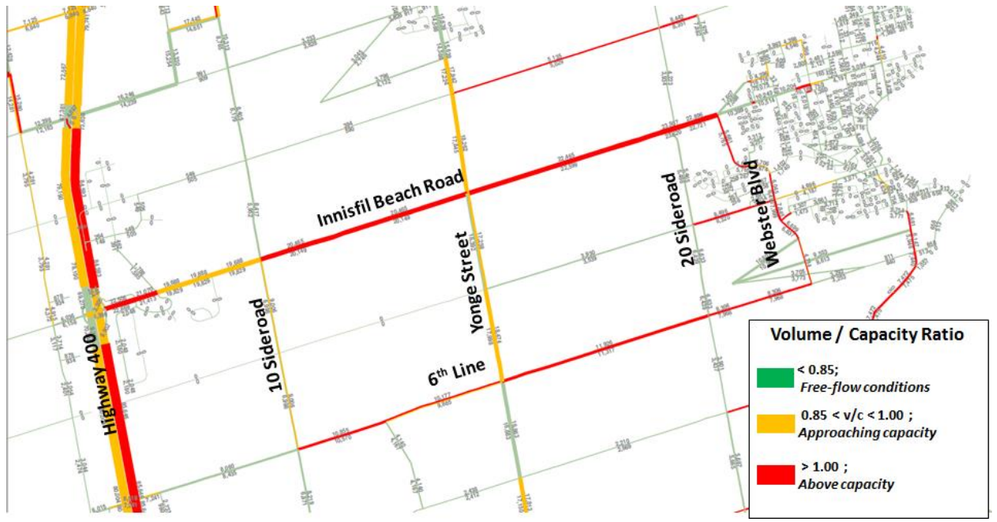


Figure 4-11: Scenario 2 – Capacity and Speed Improvements - Auto Volume and Volume / Capacity Results

4.2.6.5 Scenario 3: Base Case plus Highway 400 IC

Figure 4-12 is a plot containing the results for Scenario 3, which is the base case where 6th Line has an interchange to connect to Highway 400. East of Yonge Street to Webster Blvd, 6th Line is projected to carry demands above its capacity, while west of Yonge Street it is projected to be at or near capacity all the way to Highway 400. Meanwhile Innisfil Beach Road is projected to above its capacity for nearly the entire length between Highway 400 and Webster Blvd.

The benefit of the interchange at Highway 400 and 6th Line can be observed in that traffic volumes are projected to significantly decrease on 10 Side Road and Yonge Street. Traffic will not need to use these north/south roads in order to access Highway 400 at Innisfil Beach Road.

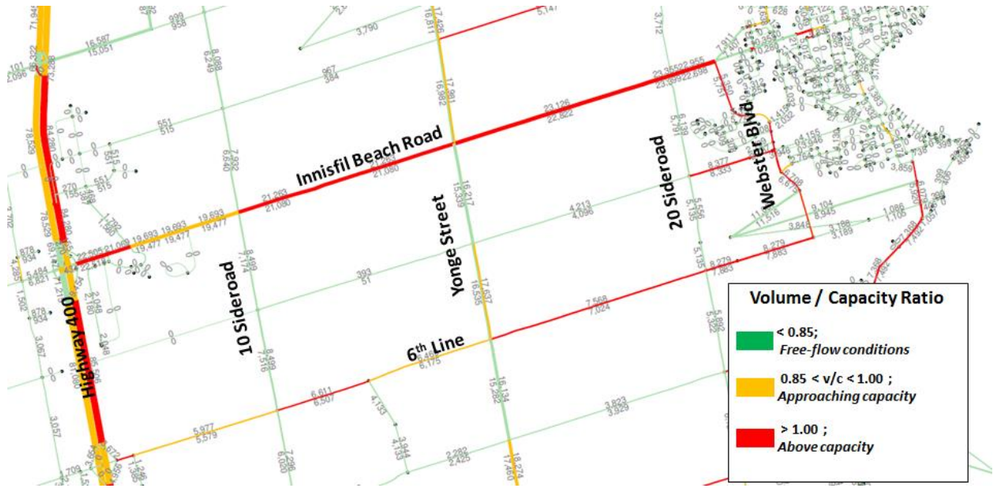


Figure 4-12: Scenario 3 - Base/Do Nothing plus Highway 400 IC Auto Volume and Volume / Capacity Results

4.2.6.6 Scenario 4: Capacity and Speed Improvements plus Highway 400 IC

The results for Scenario 4, which assumed increased lane capacity and free-flow speed on 6th Line are illustrated in **Figure 4-13.** Due to the increased free-flow speed as a result of cross-sectional improvements, nearly the entire length of 6th Line is at or above its practical daily capacity, even if the capacity per lane is also increased. The travel time savings that arise due to improved free-flow speeds make 6th Line an attractive route compared to parallel rural roads. There is also some reduction in traffic projected along Innisfil Beach Road.

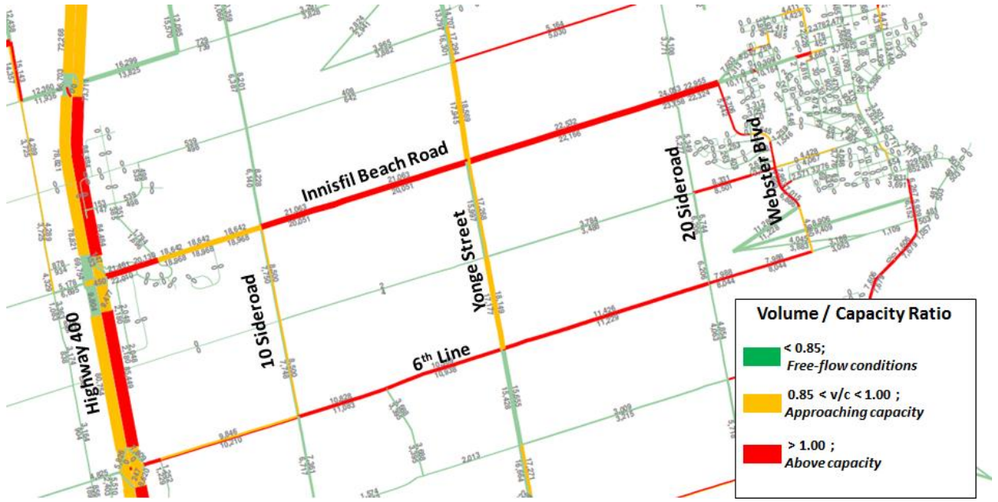


Figure 4-13: Scenario 4 - Capacity and Speed Improvements with Highway 400 IC Auto Volume and Volume / Capacity Results

4.2.6.7 Scenario5: Widening with Capacity and Speed Improvements and Highway 400 IC

Scenario 5, which assumes two lanes per direction on 6th Line, capacity and speed improvements on 6th Line and the Highway 400 interchange, performs the best from both a corridor and network perspective as shown in **Figure 4-14.** 6th Line is projected to carry about 18,000 vehicles per day per direction by 2031, which is below its capacity of 20,000 vehicles per day between Highway 400 and 20 Sideroad. However the portion east of 20 Sideroad will be above its capacity.

Meanwhile Innisfil Beach Road from east of Highway 400 to Yonge Street will also be relieved such that it will operate below its practical capacity as it is likely vehicles will be diverting to the widened 6th Line.

Therefore not only does a 4-lane 6th Line improves operations along 6th Line it will also provide a network benefit.

Figure 4-14: Scenario 5 – Widening with Capacity and Speed Improvements Auto Volume and Volume / Capacity Results

4.2.6.8 Summary Tables

Table 4-5, **Table 4-6** and **Table 4-7** summarize the results discussed above in tabular screenline format for eastbound traffic. Westbound traffic tables are similar as the model represents daily traffic which is typically similar for different directions. It is noted in all 6th Line improvement scenarios, Innisfil Beach Road will likely be very congested in the future if all planned developments in the Town of Innisfil are built. The widening of 6th Line to 4 lanes plus a Highway 400 interchange (Scenario 5) provides the greatest amount of relief to Innisfil Beach Road while improving 6th Line to carry a high volume of traffic.

Should the Highway 400 interchange not be built, traffic volumes will still increase on 6th Line, particularly between Yonge Street and 20 Sideroad, but given the number of alternative routes to access Yonge Street, there isn't a strong need to widen 6th Line west of 20 Sideroad unless a major piece of infrastructure such as a Highway 400 Interchange is built on 6th Line.

East of 20 Sideroad, varying modeling scenarios has made it clear that an improvement such as road widening of 6th Line is needed to support the planned development, even without an interchange at Highway 400.

Table 4-5: Screenline Capacity Summary Table

Eastbound	Total Capacity (vehicles per day) Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Link / Screenline	**East of 400**						
Innisfil Beach Road	20,000	20,000	20,000	20,000	20,000	20,000	20,000
7th Line	5,000	5,000	5,000	5,000	5,000	5,000	5,000
6th Line	5,000	6,500	6,500	10,000	6,500	10,000	20,000
TOTAL	**31,500**	**31,500**	**31,500**	**35,000**	**31,500**	**35,000**	**45,000**
Link / Screenline	**West of Yonge**						
Innisfil Beach Road	20,000	20,000	20,000	20,000	20,000	20,000	20,000
7th Line	5,000	5,000	5,000	5,000	5,000	5,000	5,000
6th Line	5,000	6,500	6,500	10,000	6,500	10,000	20,000
TOTAL	**31,500**	**31,500**	**31,500**	**35,000**	**31,500**	**35,000**	**45,000**
Link / Screenline	**East of Yonge**						
Innisfil Beach Road	20,000	20,000	20,000	20,000	20,000	20,000	20,000
7th Line	5,000	5,000	5,000	5,000	5,000	5,000	5,000
6th Line	5,000	6,500	6,500	10,000	6,500	10,000	20,000
TOTAL	**31,500**	**31,500**	**31,500**	**35,000**	**31,500**	**35,000**	**45,000**
Link / Screenline	**East of 20 Sideroad**						
Innisfil Beach Road	13,000	13,000	13,000	13,000	13,000	13,000	13,000
7th Line	5,000	5,000	5,000	5,000	5,000	5,000	5,000
6th Line	5,000	6,500	6,500	6,500	5,000	6,500	13,000
TOTAL	**23,000**	**24,500**	**24,500**	**24,500**	**23,000**	**24,500**	**31,000**

Table 4-6: Screenline Auto Volume Summary Table

Eastbound	Auto Volume Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Link / Screenline	**East of 400**						
Innisfil Beach Road	23,666	23,674	23,038	22,869	22,518	22,010	20,960
7th Line	0	0	0	0	0	0	0
6th Line	1,281	2,325	5,292	7,241	6,618	11,008	18,902
TOTAL	**24,947**	**25,999**	**28,330**	**30,110**	**29,136**	**33,018**	**39,862**
Link / Screenline	**West of Yonge**						
Innisfil Beach Road	20,928	21,017	20,753	20,149	21,080	20,051	18,843
7th Line	324	226	27	0	51	4	0
6th Line	1,840	3,528	5,959	9,865	6,175	10,938	19,395
TOTAL	**23,092**	**24,771**	**26,739**	**30,014**	**27,306**	**30,993**	**38,238**
Link / Screenline	**East of Yonge**						
Innisfil Beach Road	23,516	23,128	23,147	22,599	22,822	22,166	21,440
7th Line	4,570	4,304	4,269	3,539	4,096	3,488	1,398
6th Line	4,454	6,097	7,065	11,317	7,024	11,229	19,065
TOTAL	**32,540**	**33,529**	**34,481**	**37,455**	**33,942**	**36,883**	**41,903**
Link / Screenline	**East of 20 Sideroad**						
Innisfil Beach Road	22,438	22,574	22,875	22,896	22,955	22,955	19,888
7th Line	8,419	8,255	8,269	8,320	8,333	8,501	7,166
6th Line	7,876	8,213	7,858	7,968	7,883	8,044	17,141
TOTAL	**38,733**	**39,042**	**39,002**	**39,184**	**39,171**	**39,500**	**44,195**

Table 4-7: Screenline Volume to Capacity Ratio Summary Table

Eastbound	Volume / Capacity Ratio						
	Scenario 1A	Scenario 1B	Scenario 1C	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Link / Screenline	**East of 400**						
Innisfil Beach Road	**1.18**	**1.18**	**1.15**	**1.14**	**1.13**	**1.10**	**1.05**
7th Line	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6th Line	0.20	0.36	0.81	0.72	**1.02**	**1.10**	**0.95**
TOTAL	0.79	0.83	**0.90**	**0.86**	**0.92**	**0.94**	**0.89**
Link / Screenline	**West of Yonge**						
Innisfil Beach Road	**1.05**	**1.05**	**1.04**	**1.01**	**1.05**	**1.00**	**0.94**
7th Line	0.06	0.05	0.01	0.00	0.01	0.00	0.00
6th Line	0.28	0.54	**0.92**	**0.99**	**0.95**	**1.09**	**0.97**
TOTAL	0.73	0.79	0.85	**0.86**	**0.87**	**0.89**	0.85
Link / Screenline	**East of Yonge**						
Innisfil Beach Road	**1.18**	**1.16**	**1.16**	**1.13**	**1.14**	**1.11**	**1.07**
7th Line	**0.91**	**0.86**	**0.85**	0.71	0.82	0.70	0.28
6th Line	**0.89**	**0.94**	**1.09**	**1.13**	**1.08**	**1.12**	**0.95**
TOTAL	**1.03**	**1.06**	**1.09**	**1.07**	**1.08**	**1.05**	**0.93**
Link / Screenline	**East of 20 Sideroad**						
Innisfil Beach Road	**1.73**	**1.74**	**1.76**	**1.76**	**1.77**	**1.77**	**1.53**
7th Line	**1.68**	**1.65**	**1.65**	**1.66**	**1.67**	**1.70**	**1.43**
6th Line	**1.58**	**1.26**	**1.21**	**1.23**	**1.58**	**1.24**	**1.32**
TOTAL	**1.68**	**1.59**	**1.59**	**1.60**	**1.70**	**1.61**	**1.43**

4.2.7 Future Intersection Considerations

Intersection operations along 6th Line are anticipated to be acceptable at County Road 27, 5 Sideroad, 10 Sideroad, and St. John's Road, and therefore these intersections can remain stop-controlled. The intersections of 6th Line at Yonge Street, and 6th Line at 20 Sideroad were recommended for traffic signals in the Town's TMP and these recommendations are carried forward in this EA Study. The intersection of 6th Line at the Future Alcona Road, and 6th Line at Future Street A (Sleeping Lion Development) were recommended for traffic signals in the April 2014 Sleeping Lion Traffic Study, and these recommendations are also carried forward in this EA Study. Left turn lanes should be provided for all movements for safety, with standard left-turn storage lengths based on minimum geometric design standards as per TAC Guidelines (Table 1.2.5.3, Page 2.3.8.7, and Table 2.3.8.1).

4.2.8 Transportation Recommendations

Based on the analysis conducted for the 6th Line EA the following recommendations are made:

- 2031 prior to the construction of the 6th Line / 400 interchange and local new development/growth:
  - County Road 27 to 20 Sideroad - reconstruction to 2 lanes with shoulders
  - 20 Sideroad to St. John's - urbanization and widening to 4 lanes
- 2031 and after construction of the 6th Line / 400 interchange and local new development/growth:
  - County Road 27 to 20 Sideroad - reconstruction to 2 lanes with shoulders
  - 20 Sideroad to St. John's - urbanization and widening to 4 lanes
- 2031 and beyond, and after construction of the 6th Line / 400 interchange, local new development/growth, and significant growth in the Barrie Annexed Lands Secondary Plan Area:
  - County Road 27 to 20 Sideroad - widening to 4 lanes
  - 20 Sideroad to St. John's - urbanization and widening to 4 lanes
- A Highway 400 interchange at 6th Line and corresponding improvements to 6th Line will reduce traffic congestion on Innisfil Beach Road and support development in future growth areas including Sleeping Lion and the Alcona South and Innisfil Heights expansion areas.

4.3 Operational and Geometric Needs

4.3.1 Driveway and Access Management

Driveways and other accesses to 6th Line can have an impact on operations and be impacted by improvements to the study corridor. Driveway and access management were developed in consultation with the developers, property owners and other stakeholders and is documented in **Section 7.2**.

4.3.2 Vertical and Horizontal Alignment

The existing roadway geometry generally meets the Town of Innisfil engineering standards, with one exception. At the GO Railway crossing, the grade is 8%, and the Town's maximum allowed grade is 6%. In the remaining areas, the roadway grades will be engineered to promote drainage, especially in the urbanized section. The existing horizontal alignment is generally tangent and meets the Town's engineering standards. Refer **to Sections 8.3** and **8.4** for the recommended conceptual designs.

5 Problem and Opportunity Statement

The Needs Analysis has concluded that the 6th Line corridor cannot sufficiently support the Town's Transportation Vision or the projected growth. The problems (or deficiencies) identified for the 6th Line Study Area are:

- Roadway infrastructure deficiencies (narrow lanes, narrow shoulders, poor riding surface, no lane markings, etc.);
- Insufficient existing capacity east of 20 Sideroad to support planned development and meet projected traffic volumes;
- Potential constraints affect opportunities to widen;
- No current cyclist or pedestrian accommodations (Active Transportation facilities);
- Future potential need for a new interchange at Highway 400/6th Line to reduce the future stress on the Innisfil Beach Road interchange and to provide access to growing areas in the Town of Innisfil.

6 Identification and Evaluation of Alternative Solutions

The Class EA process requires documentation and examination of all reasonable alternatives, or means to address the problem, referred to as alternative solutions.

6.1 List of Alternative Solutions

To assist the project team in generating alternative solutions to address the problem statement, the following guiding principles were considered recognizing that different users may have competing interests:

- Balance interests and meet needs of all road users – motorists, pedestrians, and cyclists
- Minimize and balance impacts on surrounding properties
- Minimize impact on heritage / cultural / archaeological features
- Preserve / enhance the natural environment

As a result, the following alternative solutions to the undertaking were considered:

1. **Do Nothing** - Involves a continuation of existing conditions without changes or improvements to the corridor;
2. **Operational Improvements** – involving new pavement markings, improving traffic signage or adding active transportation signage;
3. **Physical Improvements** – involving road rehabilitation or reconstruction, widening to accommodate additional vehicle lane(s), improve shoulders; add sidewalks and/or multi-use path (i.e. pedestrian and cyclist accommodation); and intersection improvements for signalization.

6.2 Corridor Segmentation

Alternative cross-sections were developed for each segment based on the identified needs in the problem and opportunity statement. The Town of Innisfil's Standard Drawing TOISD 205 (Urban Arterial Road 30.0m Road Allowance 14.0 m pavement width) served as the basis for the development of the urbanized section, and the Simcoe County standards were used to develop a rural arterial section.

The Study corridor was divided into eight distinct segments (Segments 1 through 8) for evaluation based on the future needs of each segment. A summary of the segments and future needs is provided below, and illustrated in **Figure 6-1**.

Segment 1: County Road 27 to 5 Sideroad

- TMP recommended reconstruction, paved shoulders and re-classification as an Arterial Road (30 m ROW);
- 2-lane Rural Arterial roadway with paved shoulders to accommodate cyclists and roadside ditches;
- Posted 80 km/h (Design Speed 100 km/h).

Segment 2: 5 Sideroad to 20 Sideroad

- TMP recommended reconstruction, paved shoulders and re-classification as Arterial Road (30 m ROW);
- Up to 4-lane Rural Arterial roadway with paved shoulders to accommodate cyclists and roadside ditches;
- Posted 80 km/h (Design Speed 100 km/h);
- Potential for new Interchange at Highway 400 (to be confirmed as part of a separate study).

Segment 3: 20 Sideroad to East of Future Alcona Road South

- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 5-lane Major Collector roadway (i.e. 4 travel lanes plus centre left turn/median lane) is required due to the proximity of existing and future intersections;
- The Town of Innisfil (TOI) has requested provision for multi-use path located on the north side of 6th Line to support active transportation needs for the proposed Sleeping Lion and Alcona South developments and a sidewalk on the south side;
- The desirable ROW for these cross-section elements is 32.5m;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 4: East of Future Alcona Road South to Barrie GO Train Line Crossing

- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 4-lane Major Collector roadway is required;
- TOI has requested provision for multi-use path located on the north side of 6th Line to support active transportation needs for the proposed Sleeping Lion and Alcona South developments and a sidewalk on the south side;
- The desirable ROW for these cross-section elements is 27.5 m;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 5: Barrie GO Train Line Crossing

- 4-lane bridge with multi-use path on the north side and sidewalk on the south side to be consistent with cross-section elements both west and east of the railway crossing.
- The desirable ROW for these cross-section elements is 23 m;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 6: Barrie GO Train Line Crossing to East of Future Street A (Sleeping Lion Development)

- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 5-lane Major Collector roadway (i.e. 4 travel lanes plus centre left turn/median lane) is required due to the proximity of existing and future intersections;
- TOI has requested provision for sidewalk on the south side (where feasible) and multi-use path located on the north side of 6th Line to support active transportation needs for the proposed Sleeping Lion and Alcona South developments;
- Negotiation (between the TOI and the Cortel Group) for the Sleeping Lion Development has identified a maximum ROW of 29 m for this segment;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 7: East of Future Street A (Sleeping Lion Development) to East of Future Street C (Sleeping Lion Development)

- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- Transition from 5-lane to 2-lane Major Collector roadway with multi-use path on the north side to support active transportation needs for the proposed Sleeping Lion and Alcona South developments;
- Due to the presence of a Provincially Significant Wetland (PSW) on the south side of 6th Line and negotiation (between the TOI and the Cortel Group) for the Sleeping Lion Development, a maximum ROW of 26 m has been identified for this segment;
- Posted 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

Segment 8: East of Future Street C (Sleeping Lion Development) to St. John's Road

- TMP recommended urbanization and re-classification as Urban Major Collector (26 m ROW);
- 2-lane Major Collector roadway with multi-use path on the north side to support active transportation needs for the proposed Sleeping Lion and Alcona South developments;
- A maximum ROW of 20 m has been identified for this segment due to surrounding constraints (presence of nearby residences with manicured hedges/landscaping in close proximity to the road);
- Posted 50 to 60 km/h (Design Speed 70 km/h as per TOI standard for Urban Major Collector).

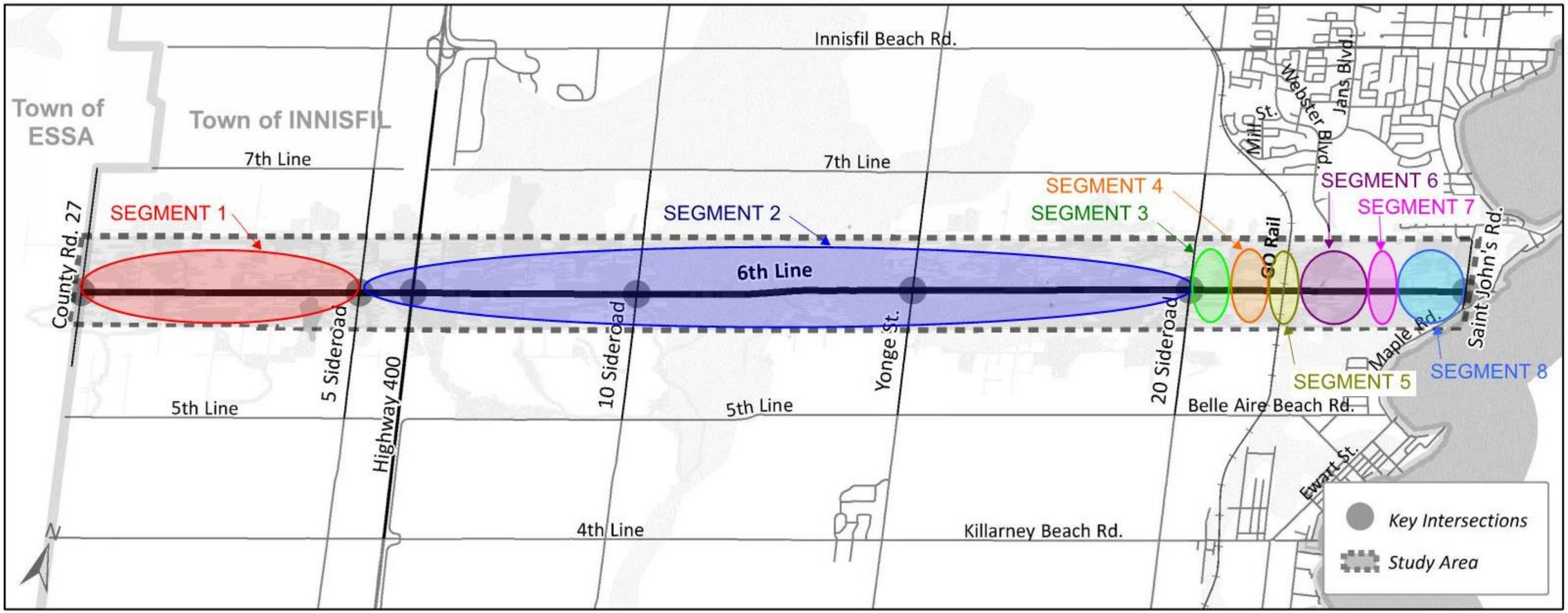


Figure 6-1: 6th Line Corridor Segmentation

6.3 Evaluation of Alternative Solutions

The alternative solutions for each segment were evaluated based on the ability of the alternative to address the problem statement.

As previously discussed, existing conditions consist of narrow travel lanes, narrow and unpaved shoulders, and several natural and cultural heritage constraints along localized segments, on the north and south side of the corridor.

Generally, the “Do Nothing” option does not address the Problem and Opportunity Statement; therefore, this option is not recommended for any segment.

Each of the operational improvement options and physical improvement options can be considered individually or in combination with other operational or physical improvements. They have been identified as having the potential to address some of the issues and deficiencies identified throughout the study area; however, are not expected to address the needs assessment alone.

A combination of operational and physical improvements is recommended. Since conditions differ largely throughout the study area, the number and type of improvements will vary from one location to another. Some improvements will apply throughout the study area, whereas others will be localized in nature, where they best apply.

For each segment an alternative solution consisting of a typical cross section and alignment was developed to meet the needs assessment. Three preferred alignments (widen to the north, widen to the south, and widen about the centreline) were considered for each segment, and a high level screening determined that widening about the centerline would be the initially desired or preferred alignment, and localized shifts to the north and south could be implemented as necessary to minimize impacts to individual constraints or features. This determination was made since widening about the centerline balances the impacts to features and property on both sides of the roadway and generally contains the impact of construction within the already disturbed area within or adjacent to the road right-of-way. Generally, the preferred solution also follows the existing vertical profile except where existing conditions did not meet geometric design standards or where accommodation of underground infrastructure required a profile alteration.

6.4 Evaluation Methodology

To determine the most appropriate solution for the corridor, the advantages and disadvantages of each alternative cross-section were evaluated using the information collected from the existing conditions review. A list of criteria to compare alternatives was developed, and the measure of the alternative success was its ability to correct, minimize or mitigate impacts and / or meet the study goals.

The following criteria (**Table 6-1**) were used to evaluate the Alternative Solutions and develop the design alternatives considered in Phase 3 of the EA process.

Table 6-1: Evaluation Criteria

Criteria	Description	Evaluation Measure
Natural Environment	Degree to which the alternative impacts the natural environment.	Relative / subjective impact to environmentally significant areas. • Vegetation / Natural Heritage Systems • Wildlife • Fisheries and Aquatic Habitat
Social-Economic Environment	Degree to which the alternative impacts the socio-economic environment and accommodates planned development and growth	Relative / subjective impacts to • Ability to accommodate planned development and growth • Business areas / access • Agricultural / Farming Operations • Archaeological Features • Cultural Heritage Features • Visual Aesthetics / Community Character
Transportation Service	Degree to which the alternative can accommodate existing and projected traffic volumes to the 2031 horizon.	• Ability to accommodate project traffic volumes to the 2031 horizon year • Ability to accommodate Active Transportation goals
Infrastructure Design	Degree to which the alternative impacts existing infrastructure	• Relative / subjective impacts to Existing utilities • Driver expectation / speed limits / Road character • Construction disruption

The detailed analysis of the alternative cross-sections and associated summary evaluation tables were completed based on the evaluation criteria and the ability of each alternative to address the Problem and Opportunity Statement. Analysis of the alternative cross-sections was completed based on a conceptual level of detail. Grading footprints were not determined for each alternative cross-section; therefore potential impacts are representative of impacts associated with the proposed right-of-way width and widening about the existing 6th Line centerline.

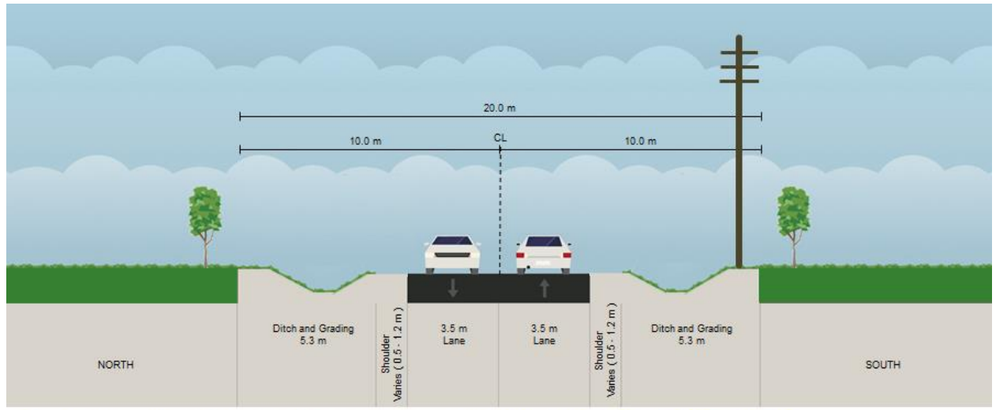
6.5 Segment Cross Section Solutions

The following sections describe the desirable typical cross sections that were developed to meet the needs assessment for each segment. Each of these preferred solutions was further refined through detailed evaluations in Phase 3 of the EA to address each constraint on a case-by-case basis.

6.5.1 Segment 1 – County Road 27 to 5 Sideroad

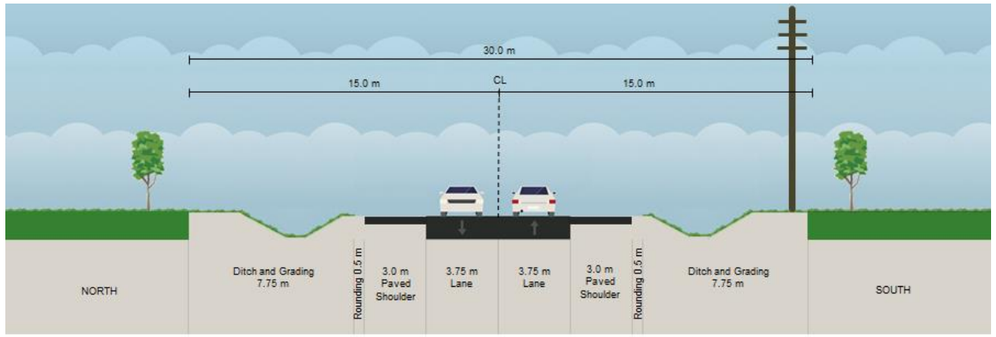
The following alternative cross-sections were developed for Segment 1 and are evaluated in **Table 6-2.**

- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-2**).
- **Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities (**Figure 6-3**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-2: Alternative #DN: Do Nothing (20m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-3: Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW) – RECOMMENDED

Table 6-2: Segment 1 - County Road 27 to 5 Sideroad

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW)
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Impact to vegetation and wooded areas along the north and south sides of 6th Line due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. • Potential impact to Unevaluated Wetland on the south side of 6th Line.
Wildlife	• No anticipated impact on wildlife.	• Potential impact on wildlife habitat along 6th Line. • There is the potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Breeding bird surveys will confirm presence/absence of this species in 2015.
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat.	• Potential impact to watercourse crossing on 6th Line (Tributary of Nottawasaga River), approximately 1.2 km east of County Road 27, due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. • Potential impact to watercourse crossing of 5th Line (Tributary of Innisfil Creek), approximately 15 m north of 6th Line.
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area (road widening to accommodate paved shoulders).
Socio Economic Environment	✓	✗
Future development & growth accommodation	• Will accommodate future development & growth.	• Will accommodate future development & growth.
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).	• N/A (no existing commercial businesses in this segment).

Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• Potential impact to twelve (12) agricultural / farming properties along 6th Line:
		  • Six (6) on the north side.
		  • Six (6) on the south side.

Residential Impacts (areas & access)	• No change to existing driveway locations.	• No change to existing driveway locations. • Potential minor impacts during construction. • Potential property impacts on north and south side.
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW)

Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to grading disturbance and ditching:
		  • CHL 1 (6th Line Roadscape)
		  • CHL 2 (Farm Complex at 6831 County Road 27 – property on northeast corner of 6th Line / County Road 27)
		  • CHL 3 (Farm Complex at 6711 County Road 27 – property on southeast corner of 6th Line / County Road 27)
		  • CHL 4 (Farm Complex at 4100 6th Line, on the north side)
		  • CHL 5 (Farm Complex at 3996 6th Line, on the north side)
		  • CHL 6 (Farm Complex at 6784 5 Sideroad – property on northwest corner of 6th Line / 5 Sideroad)
		  • CHL 7 (Farm Complex at 3653 6th Line – property on southwest corner of 6th Line / 5 Sideroad)
		  • BHR 1 (Schoolhouse at 3654 6th Line, on the north side)

Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon).	• Will accommodate future traffic volumes (2031 Horizon).
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.
Infrastructure Design	✗	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure, therefore no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).	• Improvement to road infrastructure (reconstruction of existing 2-Lane rural cross-section with widened and paved shoulders). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).
Construction Disruption	• No change to road infrastructure, therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW)
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Is not consistent with Town's re-classification of 6th Line to an Arterial Road (30 m ROW).	• **Recommended** • Achieves Town goal for cyclist accommodation with implementation of wider paved shoulders. • Road character and design is consistent with Town's re-classification of 6th Line to an Arterial Road (30 m ROW). • Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications.

6.5.2 Segment 2 – 5 Sideroad to 20 Sideroad

The following alternative cross-sections were developed for Segment 2 and are evaluated in **Table 6-3.**

- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-4**).
- **Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)** - Reconstruction of 4-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities (**Figure 6-5**).
- **Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities, with protection for 4 lanes if required in the future (**Figure 6-6**).

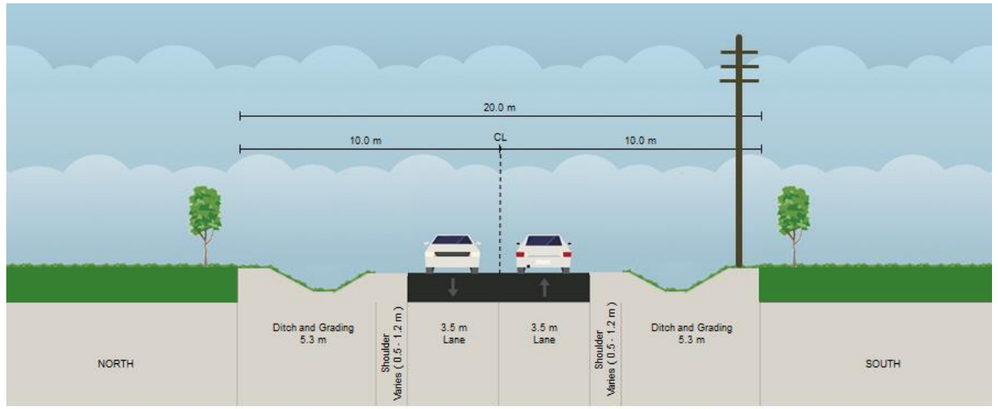


Figure 6-4: Alternative #DN: Do Nothing (20m ROW)

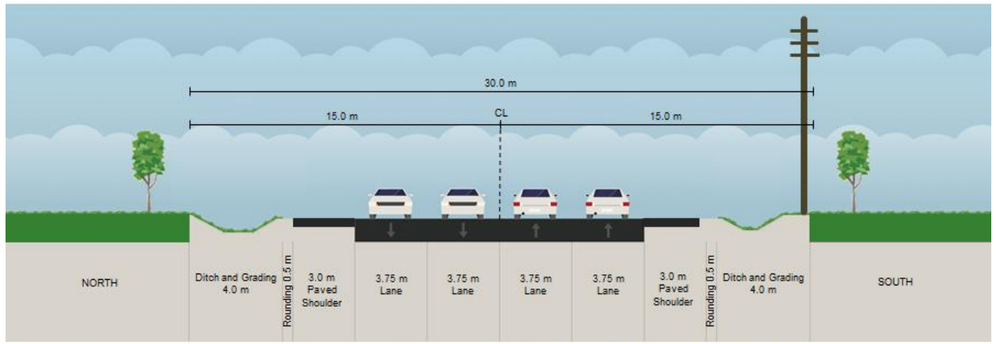


Figure 6-5: Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)

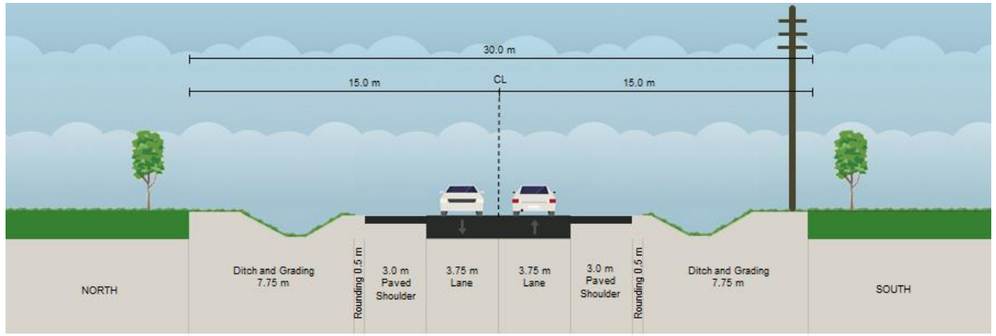


Figure 6-6: Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED

Alternative #2-2 was developed based on input received at the December 2014 Public Open House. A revised analysis of the segment and additional traffic analysis revealed that a 4-lane cross-section is not required until:

- Growth in the Town of Innisfil and Alcona area are achieved, plus the additional pressures resulting from increased growth to the north,
- Significant traffic growth is achieved resulting from new development along 6th Line, and
- An interchange at Highway 400 is built

Table 6-3: Segment 2 - 5 Sideroad to 20 Sideroad – Cross-Section Evaluation

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)	Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)
Natural Environment	✓	✗	✓
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Impact to vegetation and wooded areas along the north and south sides of 6th Line due to road widening (to accommodate new 4 lane rural section with paved shoulders) and grading disturbance for roadside ditching.	• Minimal impact to vegetation and wooded areas along the north and south sides of 6th Line due to marginal road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching.
Wildlife	• No anticipated impact on wildlife. • Wildlife visibility near roadside adjacent to woodlands and wetlands might be an issue.	• Potential impact on wildlife habitat along 6th Line. • There is the potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Breeding bird surveys will confirm presence/absence of this species in 2015.	• Minimal potential impact on wildlife habitat along 6th Line.
Wetlands	• No anticipated impact on wetlands.	• Potential impact to Provincially Significant Wetland (Lover's Creek) on the north and south sides of 6th Line (between 10 Sideroad and Yonge Street). • Potential impact to two Unevaluated Wetlands on the north and south side of 6th Line: the first east of Yonge Street, the second west of 20 Sideroad).	• Minimal potential impact to Provincially Significant Wetland (Lover's Creek) on the north and south sides of 6th Line (between 10 Sideroad and Yonge Street). • Minimal potential impact to two Unevaluated Wetlands on the north and south side of 6th Line: the first east of Yonge Street, the second west of 20 Sideroad).

Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat.	• Potential impact to three watercourse crossings on 6th Line due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching.
		  • Tributary of Innisfil creek, approximately 300 m east of Highway 400;
		  • Tributary of Innisfil Creek approximately 1.5 km east of 10 Sideroad;
		  • Tributary of Banks Creek approximately 900 m west of 20 Sideroad.
			• Minimal potential impact to three watercourse crossings on 6th Line due to marginal road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching.
			  • Tributary of Innisfil creek, approximately 300 m east of Highway 400;
			  • Tributary of Innisfil Creek approximately 1.5 km east of 10 Sideroad;
			  • Tributary of Banks Creek approximately 900 m west of 20 Sideroad.

Stormwater	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area (road widening to accommodate paved shoulders).	• Potential minor impact to stormwater quantity as a result of marginally increased hard surface area (road widening to accommodate paved shoulders).

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)	Alternative #2-2: 2 Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)
Socio Economic Environment	✗	✗	✓
Future development & growth accommodation	• Will <u>not</u> accommodate future development & growth (2 travel lanes).	• Will accommodate future development & growth (4 travel lanes).	• Will accommodate future development & growth (2 travel lanes with protection for 4 travel lanes if required in the future).
Impacts to Sleeping Lion development	• Does not apply to this segment		
Business Impacts (areas & access)	• No change to existing driveway locations. • Increased difficulty to access 6th Line to / from business areas and driveways due to traffic congestion and lack of available gaps in traffic.	• No change to existing driveway locations. • Improvement to access 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction.	
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• Potential impact to twenty-three (23) agricultural / farming properties along 6th Line: • Twelve (12) on the north side. • Eleven (11) on the south side.	
Residential Impacts (areas & access)	• No change to existing driveway locations. • Increased difficulty to access 6th Line to / from business areas and driveways due to traffic congestion and lack of available gaps in traffic.	• No change to existing driveway locations. • Improvement to access 6th Line to / from residential driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction. • Potential property impacts on north and south side.	
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.	• Minor potential impact to areas with archaeological potential.
Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to platform widening, grading disturbance and ditching: • CHL 1 (6th Line Roadscape) • CHL 8 (Historical Agricultural Landscape – property on northeast corner of 6th Line / 5 Sideroad) • CHL 9 (Farm Complex at 3573 6th Sideroad – property on southeast corner of 6th Line / 5 Sideroad) • CHL 10 (Farm Complex at 3424 6th Line – property on northeast corner of 6th Line / Highway 400) • CHL 11 (Farm Complex at 3325 6th Line, on the south side) • CHL 12 (Farm Complex at 3190 6th Line, on the north side) • CHL 13 (Farm Complex at 3179 6th Line, on	• Minor potential impact to Cultural Heritage Landscapes and Built Heritage Resource identified for Alternative 2-1, due to marginal widening to accommodate paved shoulders, grading disturbance and ditching.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)	Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)
		the south side) • CHL 14 (Farm Complex at 6906 10 Sideroad – property on southwest corner of 6th Line / 10 Sideroad) • CHL 15 (Farm Complex at 6875 10 Sideroad – property on southeast corner of 6th Line / 10 Sideroad) • CHL 16 (Farm Complex at 2693 6th Line, on the south side) • CHL 17 (Farm Complex at 2386 6th Line, on the north side) • CHL 18 (Cemetery at southwest corner of 6th Line / Yonge Street) • CHL 19 (Farm Complex at 2150 6th Line – property on northeast corner of 6th Line / Yonge Street) • CHL 20 (Farm Complex at 2062 6th Line, on the north side) • CHL 21 (Farm Complex at 1778 6th Line, on the north side) • CHL 22 (Farm Complex at 1617 6th Line – property on southwest corner of 6th Line / 20 Sideroad) • BHR 2 (Highway 400 Bridge)	
Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate 4 lanes and paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.	• Minor impact to visual aesthetics (i.e. vegetation removal) due to marginal road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.
Air, Noise, Vibration Impacts	• No anticipated air, noise, vibration impacts during construction • Deteriorated air quality and increased noise and vibration impacts as congestion becomes critical	• Moderate air, noise, vibration impacts anticipated during construction • Accommodation of all road users results in improved air quality and decreased noise and vibration as traffic volumes increase	
Transportation Service	✗	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will not accommodate future traffic volumes (2031 Horizon).	• Will accommodate future traffic volumes (2031 Horizon).	• Will accommodate future traffic volumes (2031 Horizon) by protecting for 4 lanes if required.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)	Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.	
Meets Geometric Standards	• Varying lane widths and lack of paved shoulders do not meet standards	• Cross-section elements (lane widths, paved shoulders, active transportation facilities) meet or exceed minimum Town of Innisfil standards	
Infrastructure Design	✓	✓	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.	
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure, therefore no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).	• Improvement to road infrastructure (reconstruction to 4-Lane rural cross-section with widened and paved shoulders). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).	• Improvement to road infrastructure (reconstruction of 2-Lane rural cross-section with widened and paved shoulders, and protection for future widening if required). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated	
Cost	✓	✗	✓
Capital Cost	• No capital costs	• Significant capital costs	• Moderate capital costs
Operations / Maintenance Cost	• Increase in cost due to road maintenance requirements	• Reduction in operation and maintenance cost due to improvements	• Reduction in operation and maintenance cost due to improvements
Property Acquisition Cost	• No property acquisition required	• Property acquisition and easements anticipated for improvements	• Minimal or no property acquisition and easements anticipated for immediate improvements • Protection for future widening may result in potential property acquisition and easements in the future if widening to 4 lanes is required

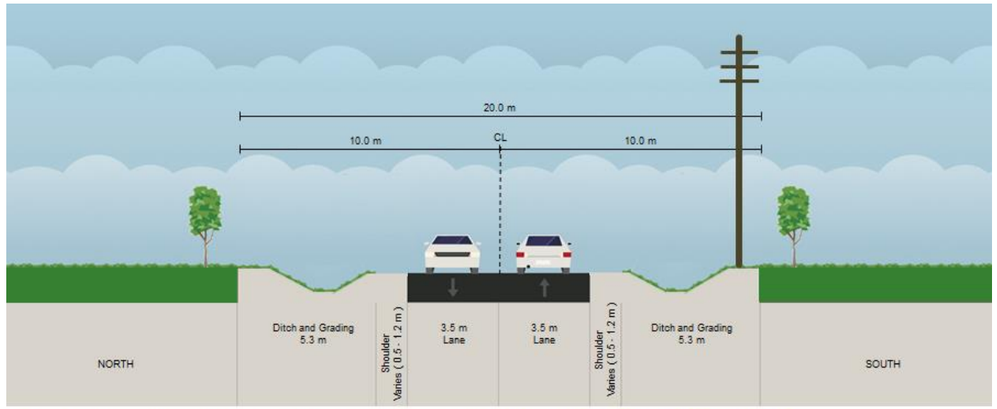
Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #2-1: 4-Lane Rural with Paved Shoulders (30m ROW)	Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)
Recommendation	✗	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Arterial Road (30 m ROW).	• **Not Recommended** • Achieves Town goal for cyclist accommodation with implementation of wider paved shoulders. • Accommodates future traffic volumes and development growth, but provides more capacity than what is required at the moment. • Road character and design is consistent with Town's re-classification of 6th Line to an Arterial Road (30 m ROW). • However, results in significant impacts to the Natural and Socio-Economic Environments.	• **Recommended** • Achieves Town goal for cyclist accommodation with implementation of wider paved shoulders. • Accommodates future traffic volumes and development growth, by protecting for future widening if required. • Road character and design is consistent with Town's re-classification of 6th Line to an Arterial Road (30 m ROW). • Minimizes impacts by only widening to accommodate paved shoulders, and protecting for future widening to 4 lanes if required. Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications.

6.5.3 Segment 3 – 20 Sideroad to East of Future Alcona Road South

The following alternative cross-sections were developed for Segment 3 and are evaluated in **Table 6-4.**

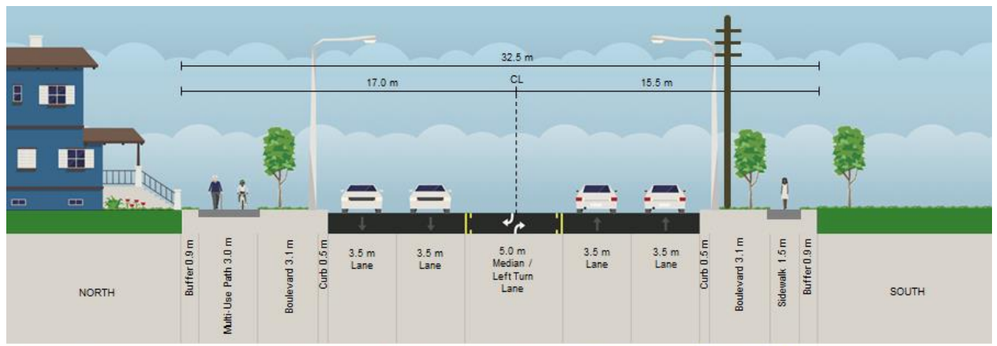
- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-7**).

- **Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW) – RECOMMENDED** – Construction of 5-Lane urban cross-section with multi-use path on the north side and sidewalk on the south side to support Active Transportation activities (**Figure 6-8**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-7: Alternative #DN: Do Nothing (20m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-8: Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW) – RECOMMENDED

Table 6-4: Segment 3 - 20 Sideroad to East of Future Alcona Road South

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (Desirable 32.5m ROW)
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Impact to vegetation areas along the north and south sides of 6th Line due to road widening (to accommodate new 5 lane urban section with multi-use path and sidewalk) and grading disturbance. • All of the vegetation communities identified within the study area are considered widespread and common in Ontario and are secure globally • No plant species that are regulated under the Ontario Endangered Species Act or the Canada Species at Risk Act were encountered during LGL's botanical investigation within the subject area (those plant species regulated as Endangered, Threatened, or Special Concern). • Eight plant species that are rare in Simcoe County were identified within the study area.
Wildlife	• No anticipated impact on wildlife.	• Potential impact on wildlife habitat along 6th Line. • Wildlife species documented in the study area included four birds and three mammals. One bird, Black-capped Chickadee (*Poecile atricapillus*), is identified as a priority species for conservation by Bird Studies Canada. • There is a low to moderately diverse assemblage of wildlife species which are generally considered urban or tolerant of anthropogenic features and disturbance. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat (no watercourses in this segment).	• No anticipated impact on aquatic habitat (no watercourses in this segment).
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area. • Stormwater management required.
Socio Economic Environment	✗	✓
Future development & growth accommodation	• Will not accommodate future development & growth.	• Will accommodate future development & growth.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (Desirable 32.5m ROW)
Business Impacts (areas & access)	• No change to existing driveway locations. • Increased difficulty to access 6th Line to / from business areas and driveways due to traffic congestion and lack of available gaps in traffic.	• No change to existing driveway locations. • Improvement to access 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction.

Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• Potential impact to four (4) agricultural / farming properties along 6th Line:
		  • Two (2) on the north side.
		  • Two (2) on the south side.

Residential Impacts (areas & access)	• No change to existing driveway locations. • Increased difficulty to access 6th Line to / from business areas and driveways due to traffic congestion and lack of available gaps in traffic.	• No change to existing driveway locations. • Improvement to access 6th Line to / from residential driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction. • Potential property impacts on north and south side.
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.

Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to widening and grading disturbance:
		  • CHL 1 – 6th Line Roadscape
		  • BHR 1 – residence at 1475 6th Line

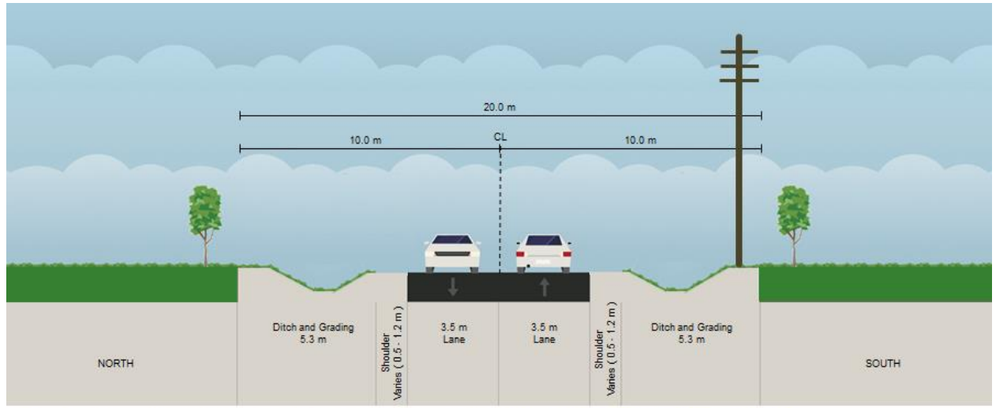
Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics change from rural to urban corridor and vegetation removal due to road widening and grading disturbance. Opportunities for landscape improvements will be considered.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will not accommodate future traffic volumes (2031 Horizon) • Will not accommodate need for turning lanes at existing and future intersections.	• Will accommodate future traffic volumes (2031 Horizon). • Will accommodate need for turning lanes at existing and future intersections.
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • No pedestrian accommodation (no existing sidewalks). • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of sidewalks and multi-use path to accommodate pedestrians and cyclists.
Infrastructure Design	✓	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (Desirable 32.5m ROW)
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure, therefore no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Urban Major Collector (min. 26 m ROW and proposed speed limit of 60 km/h). • Driver expectation may not be consistent with surrounding development (i.e. drivers may still expect high speed rural environment, which is not consistent with proposed future lower speed urban environment).	• Improvement to road infrastructure (reconstruction and urbanization to 5-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver expectation should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Urban Major Collector (min. 26 m ROW).	• **Recommended** • Achieves Town goal for cyclist and pedestrian accommodation with implementation of multi-use path and sidewalks. • Accommodates future traffic volumes and development growth. • Road character and design is consistent with Town's re-classification of 6th Line to a Major Urban Collector. • Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications; reduction of boulevard widths to 1.6 m for constrained areas.

6.5.4 Segment 4 – East of Future Alcona Road South to Barrie GO Train Crossing

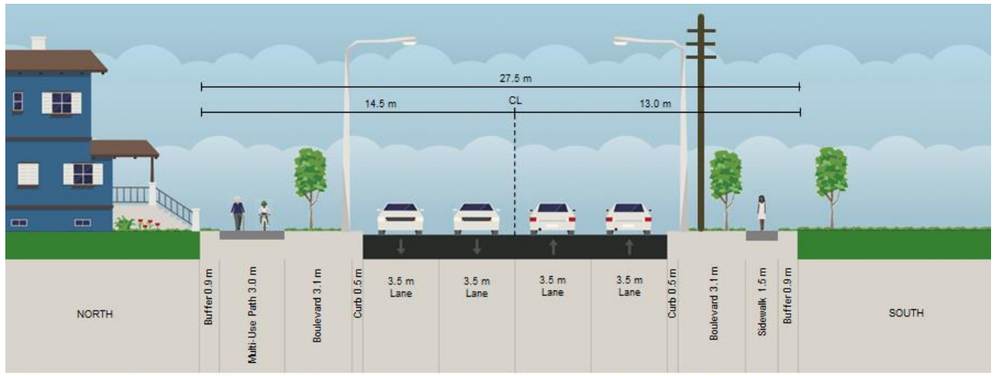
The following alternative cross-sections were developed for Segment 4 and are evaluated in **Table 6-5**.

- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-9**).
- **Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW) – RECOMMENDED** – Construction of 4-Lane urban cross-section with multi-use path on the north side and sidewalk on the south side to support Active Transportation activities (**Figure 6-10**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-9: Alternative #DN: Do Nothing (20m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-10: Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW) – RECOMMENDED

Table 6-5: Segment 4 - Future Alcona Road South to GO Train Line

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (Desirable 27.5m ROW)
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Impact to vegetation areas along the north and south sides of 6th Line due to road widening (to accommodate new 4 lane urban section with multi-use path and sidewalk) and grading disturbance. • All of the vegetation communities identified within the study area are considered widespread and common in Ontario and are secure globally • No plant species that are regulated under the Ontario Endangered Species Act or the Canada Species at Risk Act were encountered during LGL's botanical investigation within the subject area (those plant species regulated as Endangered, Threatened, or Special Concern). • Eight plant species that are rare in Simcoe County were identified within the study area.
Wildlife	• No anticipated impact on wildlife.	• Potential impact on wildlife habitat along 6th Line. • Wildlife species documented in the study area included four birds and three mammals. One bird, Black-capped Chickadee (Poecile atricapillus), is identified as a priority species for conservation by Bird Studies Canada. • There is a low to moderately diverse assemblage of wildlife species which are generally considered urban or tolerant of anthropogenic features and disturbance. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat (no watercourses in this segment).	• No anticipated impact on aquatic habitat (no watercourses in this segment).
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area. • Stormwater management required.
Socio Economic Environment	✗	✓
Future development & growth accommodation	• Will not accommodate future development & growth.	• Will accommodate future development & growth.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (Desirable 27.5m ROW)
Business Impacts (areas & access)	• No change to existing driveway locations. • Increased difficulty to access 6th Line to / from business areas and driveways due to traffic congestion and lack of available gaps in traffic.	• No change to existing driveway locations. • Improvement to access 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction.

Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• Potential impact to two (2) agricultural / farming properties along 6th Line:
		  • One (1) on the north side
		  • One (1) on the south side

Residential Impacts (areas & access)	• No change to existing driveway locations. • Increased difficulty to access 6th Line to / from business areas and driveways due to traffic congestion and lack of available gaps in traffic.	• No change to existing driveway locations. • Improvement to access 6th Line to / from residential driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction. • Potential property impacts on north and south side.
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.

Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to widening and grading disturbance:
		  • BHR 2 – residence at 1350 6th Line
		  • BHR 3 – residence at 1323 6th Line
		  • CHL 1 – 6th Line Roadscape

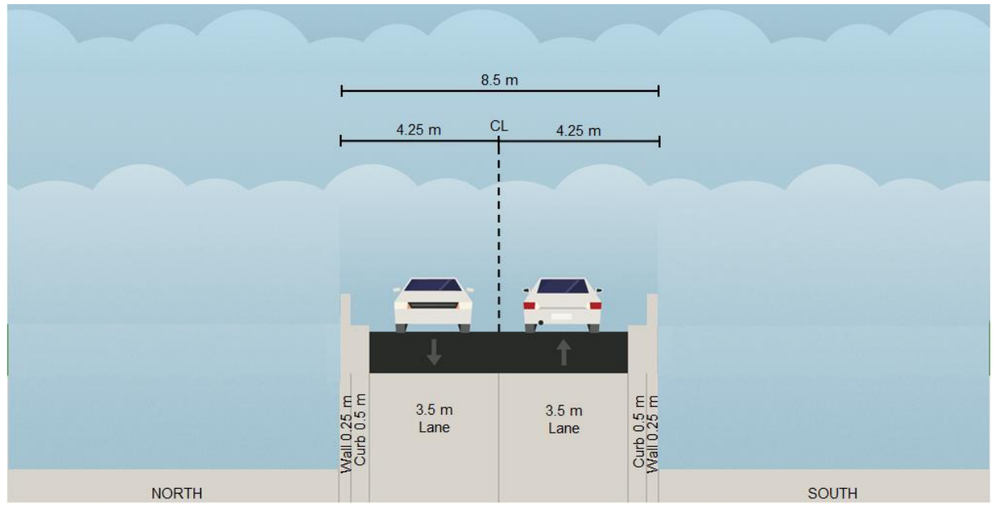
Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics change from rural to urban corridor and vegetation removal due to road widening and grading disturbance. Opportunities for landscape improvements will be considered.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will not accommodate future traffic volumes (2031 Horizon) • Will not accommodate need for turning lanes at existing and future intersections.	• Will accommodate future traffic volumes (2031 Horizon). • Will accommodate need for turning lanes at existing and future intersections.
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • No pedestrian accommodation (no existing sidewalks). • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of sidewalks and multi-use path to accommodate pedestrians and cyclists.
Infrastructure Design	✓	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (Desirable 27.5m ROW)
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure, therefore no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Urban Major Collector (min. 26 m ROW and proposed speed limit of 60 km/h). • Driver expectation may not be consistent with surrounding development (i.e. drivers may still expect high speed rural environment, which is not consistent with proposed future lower speed urban environment).	• Improvement to road infrastructure (reconstruction and urbanization to 5-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Urban Major Collector (min. 26 m ROW).	• **Recommended** • Achieves Town goal for cyclist and pedestrian accommodation with implementation of multi-use path and sidewalks. • Accommodates future traffic volumes and development growth. • Road character and design is consistent with Town's re-classification of 6th Line to a Major Urban Collector. • Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications; reduction of boulevard widths to 1.6 m for constrained areas.

6.5.5 Segment 5 – Barrie GO Train Crossing

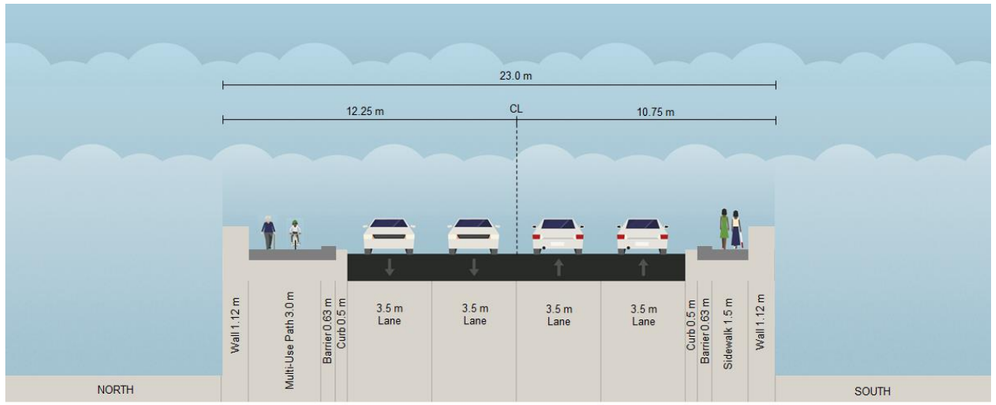
The following alternative cross-sections were developed for Segment 5 and are evaluated in **Table 6-6**.

- **Alternative #DN: Do Nothing** – Use existing structure (**Figure 6-11**).
- **Alternative #5-1: 4-Lane Urban with Multi-Use Path & Sidewalk – RECOMMENDED** – Construction of a new structure with 4 travel lanes, multi-use path on the north side and sidewalk on the south side (**Figure 6-12**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-11: Alternative #DN: Do Nothing (Use Existing Structure)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-12: Alternative #5-1: 4-Lane Urban with Multi-Use Path & Sidewalk – RECOMMENDED

Table 6-6: Segment 5 - GO Train Line

Criteria	Alternative #DN: Do Nothing	Alternative #5-1: 4-Lane Urban with Multi-Use Path & Sidewalk
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Impact to vegetation and wooded areas along the north and south sides of 6th Line due to road widening and accommodation of grading.
Wildlife	• No anticipated impact on wildlife.	• Potential impact on wildlife habitat along 6th Line.
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat.	• No anticipated impact on aquatic habitat.
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quality or quantity.
Socio Economic Environment	✓	✗
Future development & growth accommodation	• Will not accommodate future development & growth	• Will accommodate future development & growth
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).	• N/A (no existing commercial businesses in this segment).
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• Potential impact to farming operations due to property requirements for grading
Residential Impacts (areas & access)	• N/A	• N/A
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.

Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to widening and grading disturbance:
		  • BHR 4 – CN Rail Line Bridge
		  • CHL 1 – 6th Line Roadscape
		  • CHL 2 – CN Rail Line Railscape

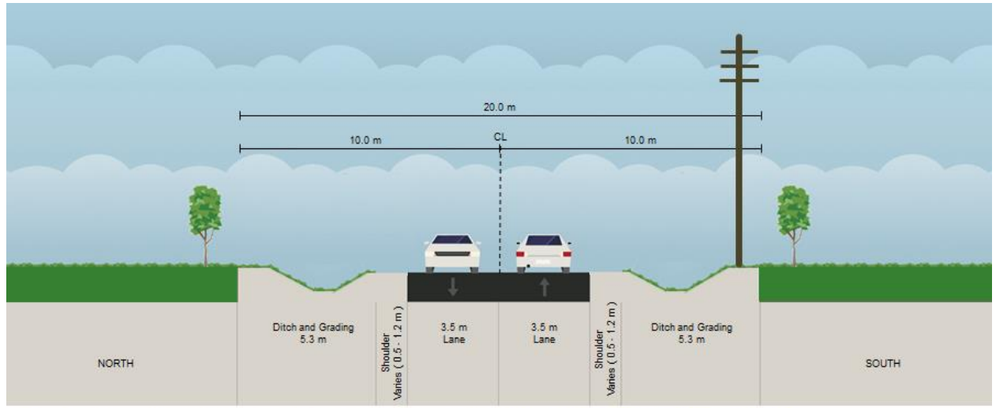
Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics (i.e. vegetation removal) due to road and structure widening.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will not accommodate future traffic volumes (2031 Horizon).	• Will accommodate future traffic volumes
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • No pedestrian accommodation (no existing sidewalks). • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of sidewalks and multi-use path to accommodate pedestrians and cyclists.

Criteria	Alternative #DN: Do Nothing	Alternative #5-1: 4-Lane Urban with Multi-Use Path & Sidewalk
Infrastructure Design	✗	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities.
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure, therefore no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Urban Major Collector. • Drivers may not expect to see pedestrians or cyclists on the structure. • Driver expectation may not be consistent with surrounding development (i.e. drivers may still expect high speed rural environment, which is not consistent with proposed future lower speed urban environment).	• Improvement to bridge / road infrastructure (reconstruction and urbanization to 4-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver expectation should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment and potential to encounter pedestrians and cyclists).
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated.
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Arterial Road (30 m ROW).	• **Recommended** • Achieves Town goal for cyclist accommodation with implementation of wider paved shoulders. • Accommodates future traffic volumes and development growth. • Road character and design is consistent with Town's re-classification of 6th Line to an Urban Major Collector

6.5.6 Segment 6 – Barrie GO Train Crossing to East of Future Street A (Sleeping Lion)

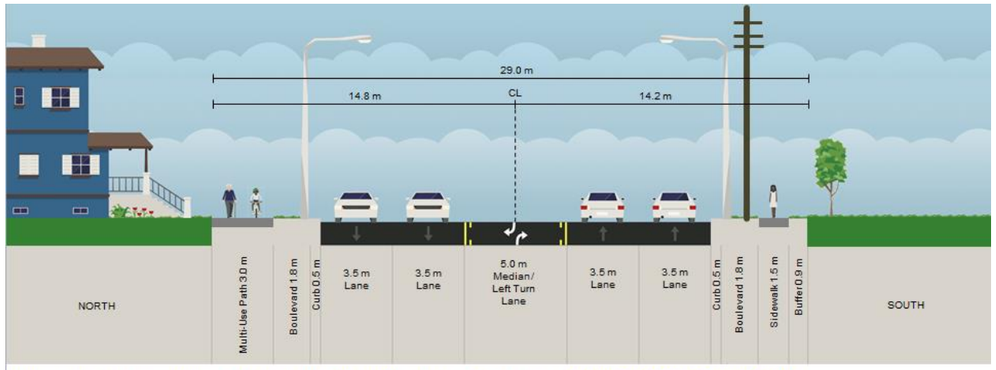
The following alternative cross-sections were developed for Segment 6 and are evaluated in **Table 6-7**.

- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-13**).
- **Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW) – RECOMMENDED** – Construction of 5-Lane urban cross-section with multi-use path on the north side and sidewalk on the south side to support Active Transportation activities (**Figure 6-14**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-13: Alternative #DN: Do Nothing (20m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-14: Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW) – RECOMMENDED

Table 6-7: Segment 6 - GO Train Line to East of Future Street A

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Impact to vegetation areas along the north and south sides of 6th Line due to road widening (to accommodate new 5 lane urban section with multi-use path and sidewalk) and grading disturbance. • All of the vegetation communities identified within the study area are considered widespread and common in Ontario and are secure globally. • No plant species that are regulated under the Ontario Endangered Species Act or the Canada Species at Risk Act were encountered during LGL's botanical investigation within the subject area (those plant species regulated as Endangered, Threatened, or Special Concern). • Eight plant species that are rare in Simcoe County were identified within the study area. • This area is also being impacted by the Sleeping Lion Development
Wildlife	• No anticipated impact on wildlife.	• Potential impact on wildlife habitat along 6th Line. • Wildlife species documented in the study area included four birds and three mammals. One bird, Black-capped Chickadee (Poecile atricapillus), is identified as a priority species for conservation by Bird Studies Canada. • There is a low to moderately diverse assemblage of wildlife species which are generally considered urban or tolerant of anthropogenic features and disturbance. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat (no watercourses in this segment).	• No anticipated impact on aquatic habitat (no watercourses in this segment).
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area. • Stormwater management required.
Socio Economic Environment	✗	✓
Future development & growth accommodation	• Will <u>not</u> accommodate future development & growth.	• Will accommodate future development & growth.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)
Business Impacts (areas & access)	• No existing businesses • Increased difficulty to access 6th Line to / from future business areas and driveways due to traffic congestion and lack of available gaps in traffic	• No existing businesses • North side and part of south side is slated for development (Sleeping Lion) • This alternative will improve future access to 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• No anticipated impact to agricultural / farming operations; north side and part of south side is slated for development (Sleeping Lion)
Residential Impacts (areas & access)	• Increased difficulty to access 6th Line to / from residential areas and driveways due to traffic congestion and lack of available gaps in traffic.	• North side and part of south side is slated for development (Sleeping Lion) – existing residential will be removed by this development. • This alternative will improve future access to 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.
Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to one Cultural Heritage Landscape (CHL 1 – 6th Line Roadscape) due to widening and grading disturbance. • No identified Built Heritage Resources in this road segment.
Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics change from rural to urban corridor and vegetation removal due to road widening and grading disturbance. Opportunities for landscape improvements will be considered.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will not accommodate future traffic volumes (2031 Horizon). • Will not accommodate need for turning lanes at existing and future intersections.	• Will accommodate future traffic volumes (2031 Horizon). • Will accommodate need for turning lanes at existing and future intersections.
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • No pedestrian accommodation (no existing sidewalks). • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of sidewalks and multi-use path to accommodate pedestrians and cyclists.
Infrastructure Design	✓	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.

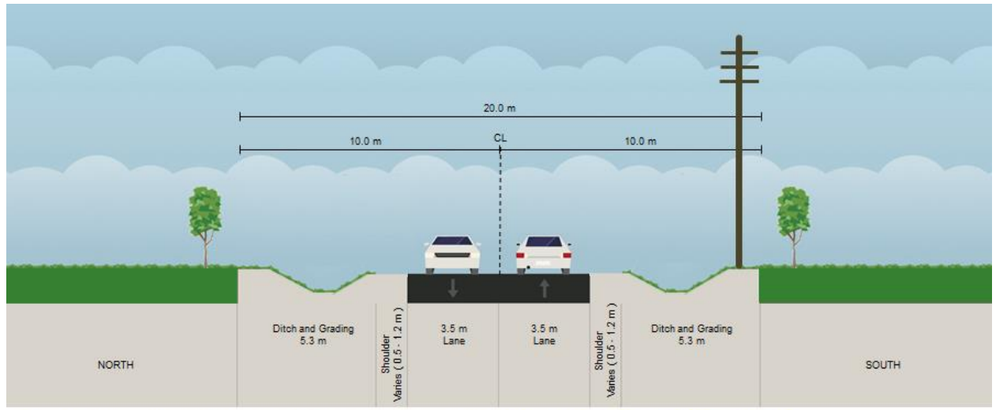
Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure, therefore no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Urban Major Collector (min. 26 m ROW and proposed speed limit of 60 km/h). • Driver expectation may not be consistent with surrounding development (i.e. drivers may still expect high speed rural environment, which is not consistent with proposed future lower speed urban environment).	• Improvement to road infrastructure (reconstruction and urbanization to 5-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Urban Major Collector (min. 26 m ROW). • Is not consistent with Town's vision and discussions with Sleeping Lion developer.	• **Recommended** • Achieves Town goal for cyclist and pedestrian accommodation with implementation of multi-use path and sidewalks. • Accommodates future traffic volumes and development growth. • Road character and design is consistent with Town's re-classification of 6th Line to a Major Urban Collector. • Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications.

6.5.7 Segment 7 – East of Future Street A to East of Future Street C (Sleeping Lion)

The following alternative cross-sections were developed for Segment 7 and are evaluated in **Table 6-8.**

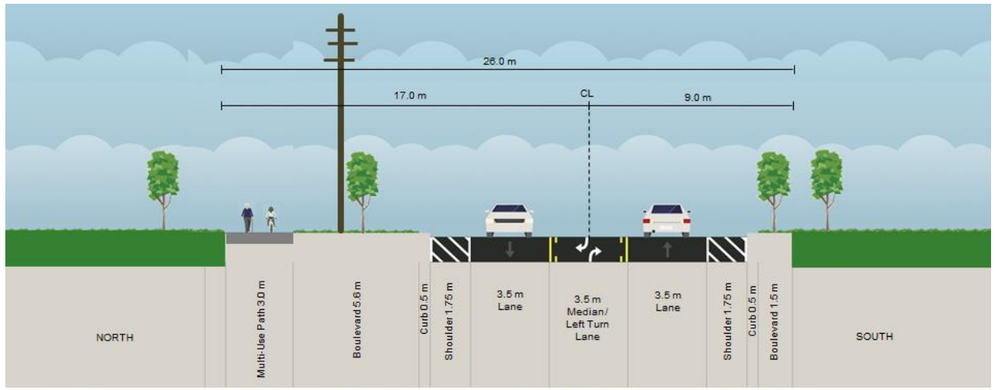
- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-15**).

- **Alternative #7-1: 3-Lane Urban with Multi-Use Path (26m ROW) – RECOMMENDED** – Construction of 3-Lane urban cross-section with multi-use path on the north side to support Active Transportation activities (**Figure 6-16**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-15: Alternative #DN: Do Nothing (20m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-16: Alternative #6-1: 3-Lane Urban with Multi-Use Path (26m ROW) – RECOMMENDED

Table 6-8: Segment 7 - East of Future Street A to East of Future Street C

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #7-1: 3-Lane Urban with Multi-Use Path (26m ROW)
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Potential minor impact to Provincially Significant Wetland (Little Cedar Point) along the south side of 6th Line. • Impact to vegetation areas along the north and south sides of 6th Line due to road widening (to accommodate new 3 lane urban section with multi-use path and shoulders) and grading disturbance. • All of the vegetation communities identified within the study area are considered widespread and common in Ontario and are secure globally. • No plant species that are regulated under the Ontario Endangered Species Act or the Canada Species at Risk Act were encountered during LGL's botanical investigation within the subject area (those plant species regulated as Endangered, Threatened, or Special Concern). • Eight plant species that are rare in Simcoe County were identified within the study area. • This area is also being impacted by the Sleeping Lion Development
Wildlife	• No anticipated impact on wildlife.	• Potential impact on wildlife habitat along 6th Line. • Wildlife species documented in the study area included four birds and three mammals. One bird, Black-capped Chickadee (Poecile atricapillus), is identified as a priority species for conservation by Bird Studies Canada. • There is a low to moderately diverse assemblage of wildlife species which are generally considered urban or tolerant of anthropogenic features and disturbance. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature. • This area is also being impacted by the Sleeping Lion Development
Fisheries and Aquatic Habitat	• No anticipated impact on watercourse or aquatic habitat.	• Potential impact to Cedar Creek watercourse crossing (west of Future Street B) and watercourse located on the south side of 6th Line due to road widening and grading disturbance.
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area. • Stormwater management required.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #7-1: 3-Lane Urban with Multi-Use Path (26m ROW)
Socio Economic Environment	✗	✓
Future development & growth accommodation	• Will not accommodate future development & growth.	• Will accommodate future development & growth.
Business Impacts (areas & access)	• No existing businesses • Increased difficulty to access 6th Line to / from future business areas and driveways due to traffic congestion and lack of available gaps in traffic	• No existing businesses • North side and part of south side is slated for development (Sleeping Lion) • This alternative will improve future access to 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• No anticipated impact to agricultural / farming operations; north side and part of south side is slated for development (Sleeping Lion)
Residential Impacts (areas & access)	• Increased difficulty to access 6th Line to / from residential areas and driveways due to traffic congestion and lack of available gaps in traffic.	• North side and part of south side is slated for development (Sleeping Lion) – existing residential will be removed by this development. • This alternative will improve future access to 6th Line to / from business areas and driveways resulting from accommodation of future traffic growth and reduced congestion. • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential impact to areas with archaeological potential.

Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes due to widening and grading disturbance:
		  • CHL 1 – 6th Line Roadscape
		  • CHL 3 – farm complex at 1010 6th Line
		• No identified Built Heritage Resources in this road segment.

Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics change from rural to urban corridor and vegetation removal due to road widening and grading disturbance. Opportunities for landscape improvements will be considered.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will not accommodate future traffic volumes (2031 Horizon) • Will not accommodate need for turning lanes at existing and future intersections.	• Will accommodate future traffic volumes (2031 Horizon). • Will accommodate need for turning lanes at existing and future intersections.

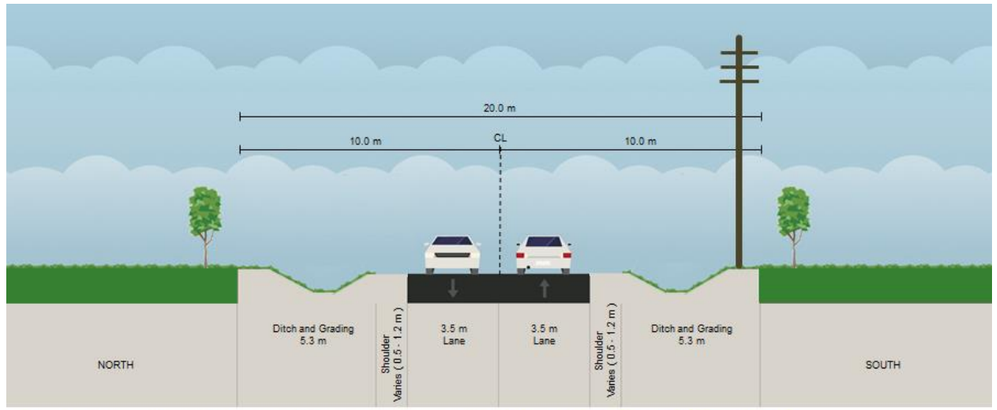
Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #7-1: 3-Lane Urban with Multi-Use Path (26m ROW)
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • No pedestrian accommodation (no existing sidewalks). • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of sidewalks and multi-use path to accommodate pedestrians and cyclists.
Infrastructure Design	✓	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure therefore, no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Urban Major Collector (min. 26 m ROW and proposed speed limit of 60 km/h). • Driver expectation may not be consistent with surrounding development (i.e. drivers may still expect high speed rural environment, which is not consistent with proposed future lower speed urban environment).	• Improvement to road infrastructure (reconstruction and urbanization to 3-Lane urban cross-section with multi-use path and shoulders). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Urban Major Collector (min. 26 m ROW). • Is not consistent with TOI vision and discussions with Sleeping Lion developer.	• **Recommended** • Achieves Town goal for cyclist and pedestrian accommodation with implementation of multi-use path and shoulders. • Accommodates future traffic volumes and development growth. • Road character and design is consistent with Town's re-classification of 6th Line to a Major Urban Collector. • Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications and cross-section element review. Avoidance of PSW where feasible.

6.5.8 Segment 8 – East of Future Street C (Sleeping Lion) to St. John's Road

The following alternative cross-sections were developed for Segment 8 and are evaluated in **Table 6-9.**

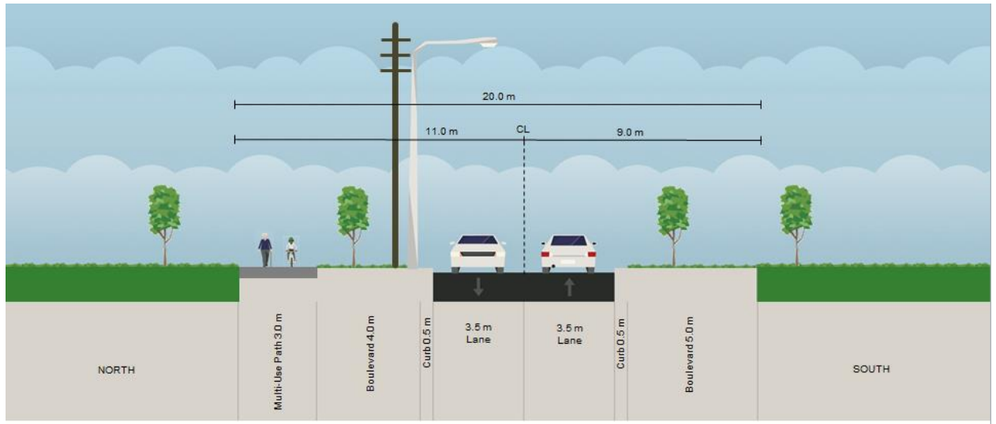
- **Alternative #DN: Do Nothing (20m ROW)** - Maintain existing 2-Lane rural cross-section with narrow gravel shoulders in a 20m ROW (**Figure 6-17**).

- **Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW) – RECOMMENDED** – Construction of 2-Lane urban cross-section with multi-use path on the north side to support Active Transportation activities (**Figure 6-18**).



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-17: Alternative #DN: Do Nothing (20m ROW)



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 6-18: Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW) – RECOMMENDED

Table 6-9: Segment 8 - East of Future Street C to St. John's Road

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW)
Natural Environment	✓	✗
Vegetation / Natural Heritage	• No anticipated impact on vegetation.	• Potential minor impact to vegetation areas along the north and south sides of 6th Line due to grading disturbance (goal to maintain existing ROW). • All of the vegetation communities identified within the study area are considered widespread and common in Ontario and are secure globally. • No plant species that are regulated under the Ontario Endangered Species Act or the Canada Species at Risk Act were encountered during LGL's botanical investigation within the subject area (those plant species regulated as Endangered, Threatened, or Special Concern). • Eight plant species that are rare in Simcoe County were identified within the study area.
Wildlife	• No anticipated impact on wildlife.	• Potential minor impact on wildlife habitat along 6th Line. • Wildlife species documented in the study area included four birds and three mammals. One bird, Black-capped Chickadee (Poecile atricapillus), is identified as a priority species for conservation by Bird Studies Canada. • There is a low to moderately diverse assemblage of wildlife species which are generally considered urban or tolerant of anthropogenic features and disturbance. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.
Fisheries and Aquatic Habitat	• No anticipated impact on watercourse or aquatic habitat.	• Potential impact to Cedar Creek watercourse located on the south side of 6th Line due to road widening and grading disturbance.
Surface Water	• No anticipated impact to stormwater quality or quantity.	• Potential minor impact to stormwater quantity as a result of increased hard surface area. • Stormwater management required.
Socio Economic Environment	✓	✗
Future development & growth accommodation	• Will not accommodate future development & growth.	• Will accommodate future development & growth.
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).	• N/A (no existing commercial businesses in this segment).

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW)
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations.	• No anticipated impact to one (1) agricultural / farming property (north side).
Residential Impacts (areas & access)	• No change to existing driveway locations.	• No change to existing driveway locations. • Potential minor impact to property (due to grading disturbance). • Potential minor impacts during construction. • Potential property impacts on north and south side.
Archaeological Impacts	• No anticipated impact to areas with archaeological potential.	• Potential minor impact to areas with archaeological potential (due to grading disturbance).

Cultural Heritage Impacts	• No impact to Cultural Heritage resources.	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to grading disturbance:
		  • CHL 1 (6th Line Roadscape)
		  • CHL 4 (Farm Complex directly east of 840 6th Line – property on northwest corner of 6th Line / St. John's Road)
		  • BHR 5 (Residence at 853 6th Line)

Visual Aesthetics / Community Character Impacts	• No change to visual aesthetics / community character.	• Impact to visual aesthetics change from rural to urban corridor and vegetation removal due to road widening and grading disturbance. Opportunities for landscape improvements will be considered.
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon) • Will not accommodate need for turning lanes to improve safety.	• Will accommodate future traffic volumes (2031 Horizon). • Will accommodate need for turning lanes at existing and future intersections.
Accommodation of Active Transportation Facilities	• No improvement to active transportation facilities. • No pedestrian accommodation (no existing sidewalks). • Poor environment for cyclists who must travel in shared lanes with general traffic.	• Improvement to active transportation facilities through implementation of multi-use path to accommodate pedestrians and cyclists.
Infrastructure Design	✓	✓
Utility Impacts	• No change to road infrastructure, therefore no anticipated utility impacts.	• Potential impact to utilities along 6th Line.

Criteria	Alternative #DN: Do Nothing (20m ROW)	Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW)
Driver Expectation / Speed Limits / Road Character	• No change to road infrastructure therefore, no improvement to existing pavement or cross-section geometrics; road character will not be consistent with roadway re-classification to an Urban Major Collector and proposed speed limit of 50 to 60 km/h). • Driver expectation may not be consistent with surrounding development (i.e. drivers may still expect high speed rural environment, which is not consistent with proposed future lower speed urban environment).	• Improvement to road infrastructure (reconstruction and urbanization to 2-Lane urban cross-section with multi-use path). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (where the existing is 80 km/h), and maintained at 50 km/h (where existing is 50 km/h). • Driver should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.
Construction Disruption	• No change to road infrastructure therefore no anticipated construction disruption along 6th Line.	• Construction disruption anticipated
Recommendation	✗	✓
	• **Not Recommended** • Does not achieve Town goals to accommodate Active Transportation Facilities. • Does not accommodate future traffic volumes and development growth. • Is not consistent with Town's re-classification of 6th Line to an Urban Major Collector.	• **Recommended** • Achieves Town goal for cyclist and pedestrian accommodation with implementation of multi-use path. • Accommodates future traffic volumes and development growth. • Road character and design is consistent with Town's re-classification of 6th Line to a Major Urban Collector. • Avoidance / mitigation measures will be considered during the next stage of design (where feasible) to avoid / minimize impacts to the Natural and Socio-Economic Environments. Potential measures include horizontal and vertical alignment modifications and cross-section element review.

6.6 Summary of Recommended Alternatives

The recommended alternative solutions are summarized below:

Segment 1: County Road 27 to 5 Sideroad
- Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW)

Segment 2: 5 Sideroad to 20 Sideroad
- Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)

Segment 3: 20 Sideroad to East of Future Alcona Road South
- Alternative #3-1: 5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW)

Segment 4: East of Future Alcona Road South to Barrie GO Train Line Crossing
- Alternative #4-1: 4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW)

Segment 5: Barrie GO Train Line Crossing
- Alternative #5-1: 4-Lane Urban with Multi-Use Path & Sidewalk

Segment 6: Barrie GO Train Line Crossing to East of Future Street A (Sleeping Lion Development)
- Alternative #6-1: 5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)

Segment 7: East of Future Street A (Sleeping Lion Development) to East of Future Street C (Sleeping Lion Development)
- Alternative #7-1: 3-Lane Urban with Multi-Use Path (26m ROW)

Segment 8: East of Future Street C (Sleeping Lion Development) to St. John's Road
- Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW)

These alternative solutions consist of cross-section elements that accommodate and balance the needs all road users, including cyclists and pedestrians, while minimizing impacts to the Natural and Socio-Economic Environments.

6.7 Highway 400 Interchange

Phase 2 of the EA reconsidered the connection of 6th Line with Highway 400 to confirm the recommendation from the TMP. It considered the following alternative solutions:

Alt. 1: Do Nothing (i.e. no connection to Hwy 400)

Alt. 2: Build a Connection to Highway 400

Based on the traffic analysis summarized in **Section 4.2.7**, an interchange at 6th Line has the potential to relieve congestion on Innisfil Beach Road and to provide access to developing areas in Innisfil. A separate study with coordination with MTO will be required to confirm the timing, exact location, and design of the potential Highway 400 interchange.

Recommendations for road improvements as part of the 6th Line EA will not preclude a future interchange if it is determined to be required at this location as part of a separate study. However, the 6th Line EA will not make further recommendations about a potential interchange at this location.

7 Identification and Evaluation of Alternative Design Concepts

The recommended solutions presented in **Section 6.6** have been further refined as preferred design concepts.

The design options merge the horizontal and vertical alignments with the preferred cross-section, to develop a conceptual design. Horizontal and vertical alignments were adjusted as impacts were identified to determine if these impacts could be minimized using minor engineering changes within the allowable engineering standards. The process by which these adjustments were made to arrive at the ultimate preferred design concept is detailed in **Figure 7-1.** Extensive consultation with property owners allowed the project team to refine the final designs and alignments.

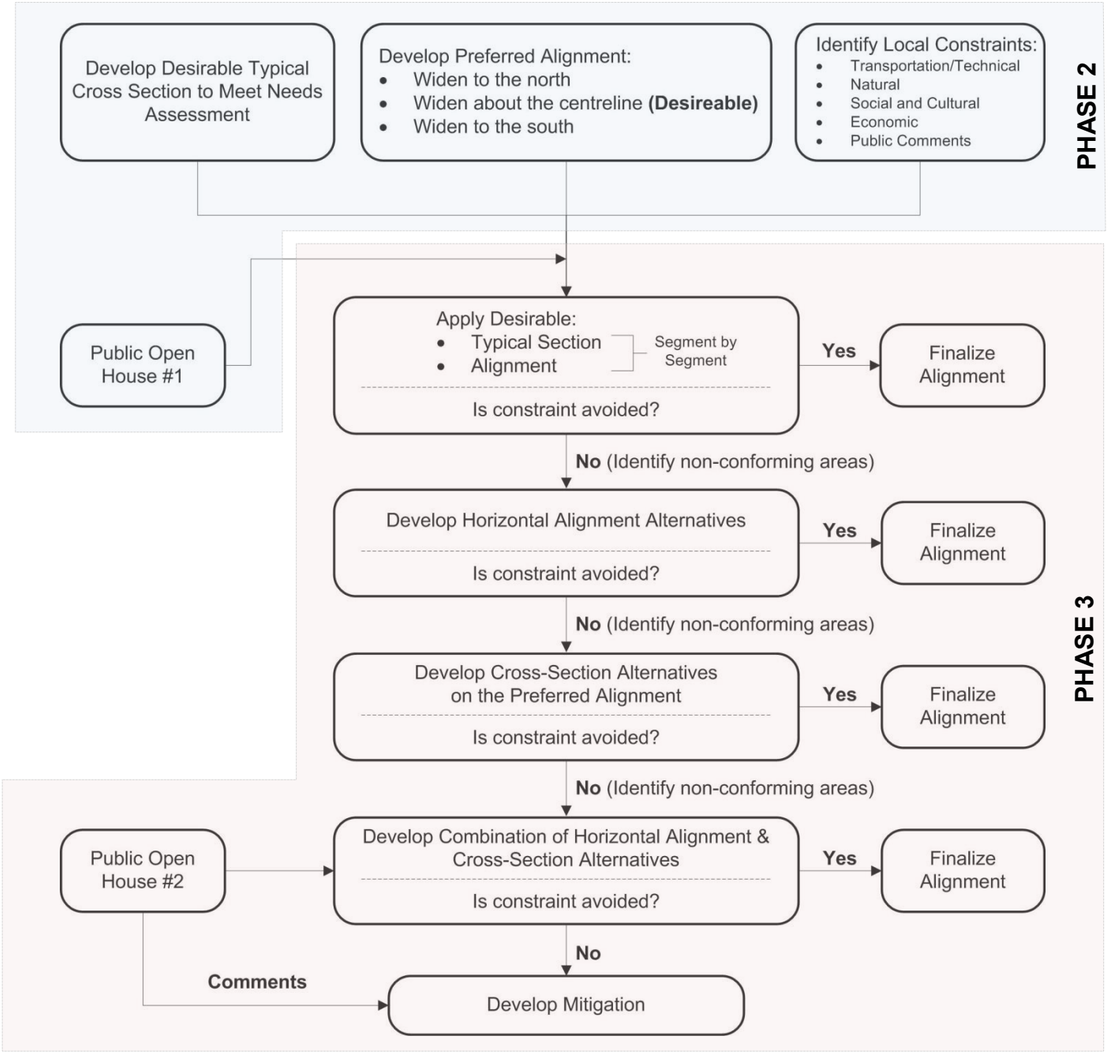


Figure 7-1: Design Decision Flowchart

7.1 Evaluation of Alternative Design Concepts

This section will present the conceptual design and associated footprint, will measure the impacts associated with the conceptual design, and make recommendations regarding further modifications, per the design decision flowchart presented in **Figure 7-1**. Further design refinements to the recommendations presented in this section, based on discussions with property owners, are documented in **Section 7.2**.

7.1.1 Segment 1 – County Road 27 to 5 Sideroad

The recommended alternative design concept for Segment 1 (**Figure 7-2**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline as it minimizes impacts on constrains and the environment. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.1** for the detailed evaluation table for this segment and **Figure 6-3** for the preferred cross section design concept.

- **Alternative #1-1: 2-Lane Rural with Paved Shoulders (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities.

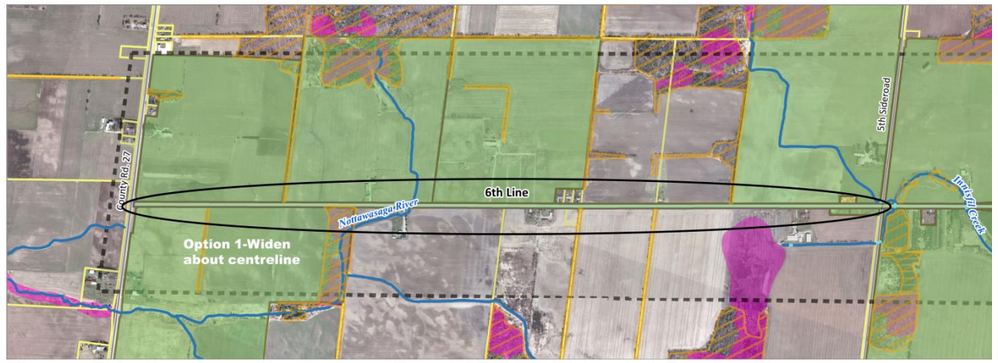


Figure 7-2: Segment 1 – County Road 27 to 5 Sideroad Design Concept

7.1.2 Segment 2 – 5 Sideroad to 20 Sideroad

This segment was further divided into sub-segments in order to evaluate localized alignment shifts or modified cross-sections where applicable, per the design decision flowchart presented in **Figure 7-1**. The following sections discuss the design options considered and recommendations for each sub-segment.

7.1.2.1 Sub-Section 2-1: 5 Sideroad to 10 Sideroad

The recommended alternative design concept for sub-section 2-1 (**Figure 7-3**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline as it minimizes impacts on constrains and the environment. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.2** for the detailed evaluation table for this segment and **Figure 6-6** for the preferred cross section design concept.

- **Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities, with protection for 4 lanes if required in the future.

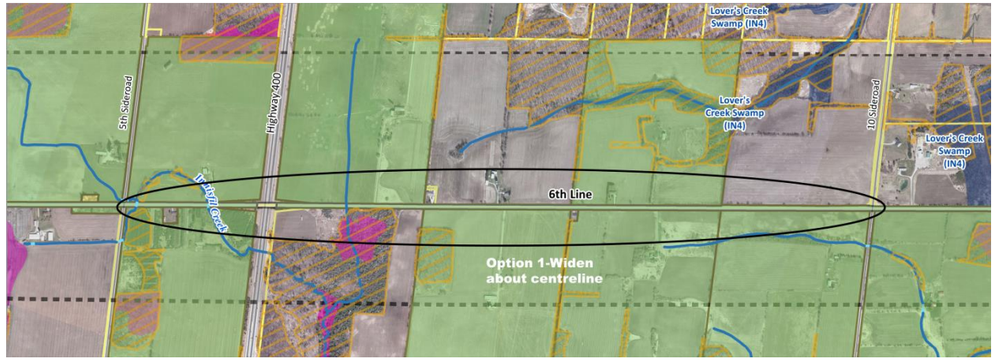


Figure 7-3: Sub-Section 2-1 – 5 Sideroad to 10 Sideroad

7.1.2.2 Sub-Section 2-2: 10 Sideroad to West Boundary of Lover's Creek PSW

The recommended alternative design concept for Segment 2-2 (**Figure 7-4**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline as it minimizes impacts on adjacent lands and environmental features. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.2** for the detailed evaluation table for this segment and **Figure 6-6** for the preferred cross section design concept.

- **Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities, with protection for 4 lanes if required in the future.

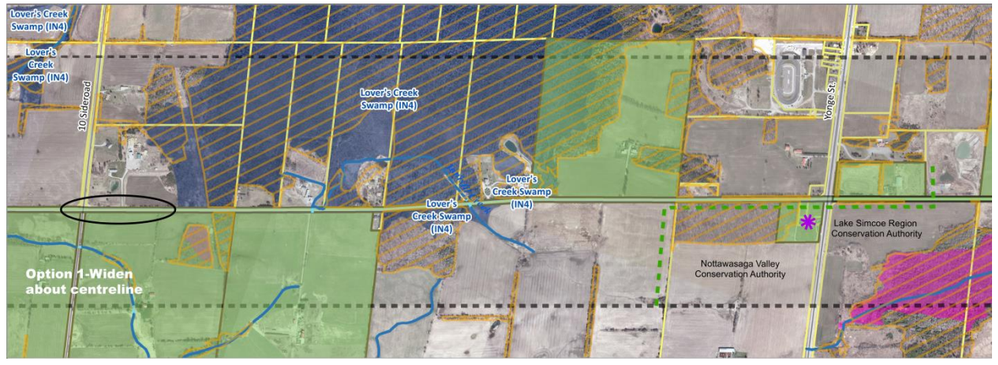


Figure 7-4: Sub-Section 2-2 – 10 Sideroad to West Boundary of Lover's Creek PSW

7.1.2.3 Sub-Section 2-3: West to East Boundary of Lover's Creek PSW

Due to the presence of the PSW on the north side, the following design concepts were developed for Segment 2-3 (**Figure 7-5**) based on the recommended alternative solution carried forward, and are evaluated in **Table 7-1:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the south
- **Option 3:** Modify cross section (**Figure 7-6**) **– RECOMMENDED**

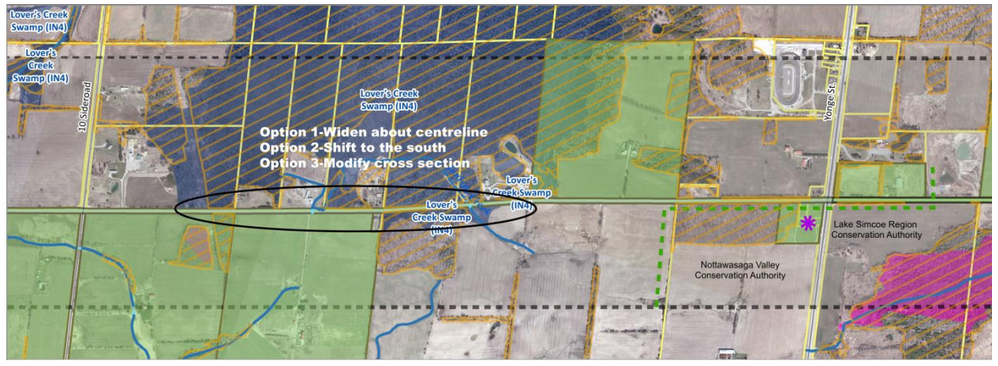
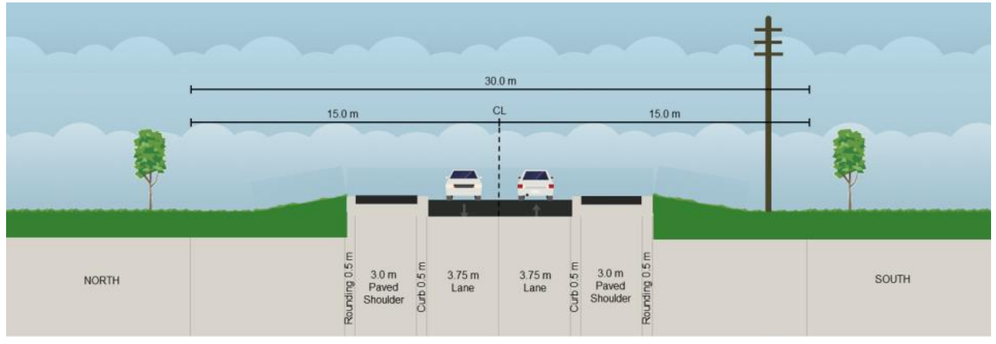


Figure 7-5: Sub-Section 2-3 – West to East Boundary of Lover's Creek PSW

The preferred design concept is a modification of the original preferred cross section presented in **Section 6.5.2.** The modified version combines widening about the centerline and using an urban cross-section to eliminate the need for drainage ditches and minimize the footprint of impacts on adjacent properties. The modified cross section is shown in **Figure 7-6**.



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 7-6: Sub-Section 2-3 – Modified Cross Section

Table 7-1: Segment 2-3 - West to East Boundary of Lover's Creek PSW

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the south	Option 3: Modify cross section
Natural Environment	✗	✓	✓
Vegetation / Natural Heritage	• Significant impacts to vegetation and wooded areas along the north and south sides of 6th Line due to road widening (to accommodate new 2 lane rural section with paved shoulders) and grading disturbance for roadside ditching.	• Minimizes impacts to wetland along the north and side of 6th Line by shifting to the south.	• Minimizes impacts to vegetation and wooded areas along the north and south sides of 6th Line by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Wildlife	• Potential impact on wildlife habitat along 6th Line. There is the potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area.	• Minimizes impacts to potential wildlife along the north and side of 6th Line by shifting to the south.	• Minimizes impacts to wildlife along the north and south sides of 6th Line by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Wetlands	• Greatest potential impact to Provincially Significant Wetland (Lover's Creek) on the north and south sides of 6th Line	• Potential impact to Provincially Significant Wetland (Lover's Creek) on the south side of 6th Line	• Minimizes impact to Provincially Significant Wetland (Lover's Creek) on the north and south sides of 6th Line
Fisheries and Aquatic Habitat	• Potential impact to watercourse crossing on 6th Line due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. ○ Tributary of Innisfil Creek approximately 1.5 km east of 10 Sideroad.		• Minimizes impacts to the watercourse crossing by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Stormwater	• No anticipated impacts to stormwater management.		• Requires connections to areas with roadside ditches for stormwater management.
Socio Economic Environment	✓	✗	✓
Future development & growth accommodation	• Will accommodate future development & growth.		
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).		
Agricultural / Farming Operations	• Potential impact to agricultural / farming operations on north and south side.	• Potential impact to agricultural / farming properties along 6th Line on south side.	• Minimizes anticipated impact to agricultural / farming operations.
Residential Impacts (areas & access)	• No change to existing driveway locations. • Potential minor impacts during construction. • Potential property acquisition on north and south sides.		
Archaeological Impacts	• Potential impact to areas with archaeological potential.		

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the south	Option 3: Modify cross section
Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resources due to grading disturbance and ditching: • CHL 1 (6th Line Roadscape) • CHL 15 (Farm Complex) • CHL 16 (Farm Complex) • CHL 17 (Farm Complex)	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to grading disturbance and ditching (impacts are considered more significant compared to Option 1 as Option 2 results in greater encroachment on these CHLs): • CHL 1 (6th Line Roadscape) • CHL 15 (Farm Complex) • CHL 16 (Farm Complex)	• Minimizes impacts to Cultural Heritage resources by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Visual Aesthetics / Community Character Impacts	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.		• Urban cross-section will eliminate the need for drainage ditches but may visually change the character of the road.
Air, Noise, Vibration Impacts	• Air, noise, vibration impacts anticipated during construction		
Transportation Service	✓	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon).		
Accommodation of Active Transportation Facilities	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.		
Meets Geometric Standards	• All options meet or exceed minimum Town of Innisfil geometric designs standards.		
Safety	• No anticipated safety concerns as a result of the horizontal alignment.		
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed.		
Infrastructure Design	✓	✗	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer). • Requires connections to areas with roadside ditches for stormwater management.
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction of existing 2-Lane rural cross-section with widened and paved shoulders). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).		
Construction Disruption	• Construction disruption anticipated		

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the south	Option 3: Modify cross section
Cost	✓	✓	✓
Capital Cost	• Minimizes capital costs.		• Higher capital cost associated with construction of urban cross-section.
Operations/Maintenance Cost	• Reduction in operation and maintenance cost due to improvements		
Property Acquisition Cost	• Higher property acquisition costs associated with rural cross-section.		• Minimizes amount of land required by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Recommendation	✗	✗	✓
Notes	• **Not Recommended** • Results in significant impacts to the natural environment, including Lover's Creek PSW	• **Not Recommended** • Results in significant impacts to cultural heritage features	• **Recommended** • Minimizes impacts to natural, social and cultural environments • Accommodates ultimate alignment for future (water and sewer) servicing.

7.1.2.4 Sub-Section 2-4: East Boundary of Lover's Creek PSW to west of Yonge Street

The recommended alternative design concept for Segment 2-4 (**Figure 7-7**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline, as it minimizes impacts on constrains and the environment. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.2** for the detailed evaluation table for this segment and **Figure 6-6** for the preferred cross section design concept.

- **Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities, with protection for 4 lanes if required in the future.

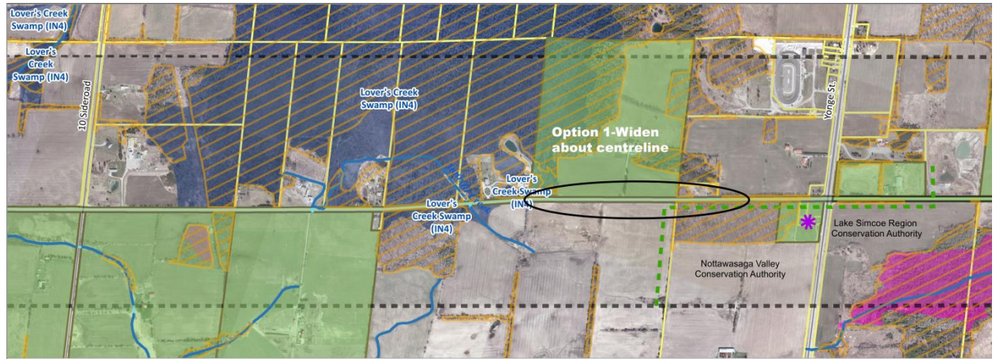


Figure 7-7: Sub-Section 2-4 – East Boundary of Lover's Creek PSW to west of Yonge Street

7.1.2.5 Sub-Section 2-5: West of Yonge Street to east of Yonge Street

Due to the presence of the cemetery on the south side, the following design concepts were developed for Segment 2-5 (**Figure 7-8**) based on the recommended alternative solution carried forward and are evaluated in **Table 7-2:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the north – **RECOMMENDED in part**
- **Option 3:** Modify cross section (**Figure 7-9**) – **RECOMMENDED in part**

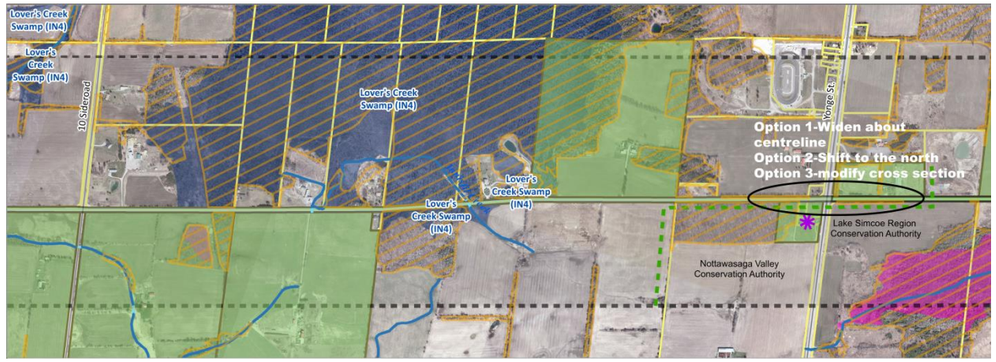
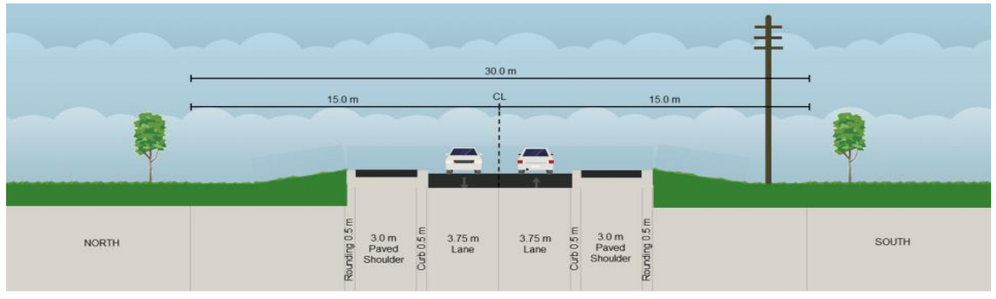


Figure 7-8: Sub-Section 2-5 – West of Yonge Street to east of Yonge Street

The preferred design concept is a combination of Options 2 and 3. A combination of the two minimizes the impact to the wooded area and cemetery on the south side and also minimizes the impacts to residential property on the north side. The modified cross section is shown in **Figure 7-9**.



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 7-9: Sub-Section 2-5 – Modified Cross Section

Table 7-2: Segment 2-5 - West of Yonge Street to east of Yonge Street

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Natural Environment	✗	✓	✓
Vegetation / Natural Heritage	• Significant impacts to vegetation and wooded areas along the north and south sides.	• Minimizes impacts to vegetation and wooded areas along the south side of 6th Line.	• Minimizes impacts to vegetation and wooded areas along the north and south sides of 6th Line by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Wildlife	• Potential impact on wildlife habitat along 6th Line. There is the potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area.	• Minimizes impact on potential wildlife habitat by shifting to the north to avoid wooded area on the south side.	• Minimizes impact on potential wildlife habitat by using urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Fisheries and Aquatic Habitat	• N/A (no watercourse crossings in this segment).		
Wetlands	• N/A (no wetlands in this segment).		
Stormwater	• No anticipated impacts to stormwater management.		• Requires connections to areas with roadside ditches for stormwater management.
Socio Economic Environment	✗	✗	✓
Future development & growth accommodation	• Will accommodate future development & growth.		
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).		
Agricultural / Farming Operations	• Potential impact to agricultural / farming operations on north and south side.	• Minimizes potential impact to agricultural / farming properties along 6th Line on south side.	• Minimizes anticipated impact to agricultural / farming operations.
Residential Impacts (areas & access)	• No change to existing driveway locations. • Potential minor impacts during construction.		
Archaeological Impacts	• Potential impact to areas with archaeological potential.		

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to grading disturbance and ditching:
	  • CHL 1 (6th Line Roadscape)
	  • CHL 18 (Cemetery)
	  • CHL 19 (Farm Complex)
		• Minimizes impact to CHL 18 (Cemetery) by shifting to the north but results in greater impacts to CHL 19 on north side.	• Minimizes impacts to Cultural Heritage resources on north and south side by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Visual Aesthetics / Community Character Impacts	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered. • Continues to accommodate snowmobile travel on the shoulder east of the cemetery.	• Urban cross-section will eliminate the need for drainage ditches but may visually change the character of the road.
Air, Noise, Vibration Impacts	• Air, noise, vibration impacts anticipated during construction.		
Transportation Service	✓	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon).		• Will accommodate future traffic volumes (2031 Horizon). • Accommodates a left turn lane within a reduced impact footprint
Accommodation of Active Transportation Facilities and Alternative Modes of Travel	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists. • Continues to accommodate snowmobile travel on the shoulder east of the cemetery.	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.
Meets Geometric Standards	• All options meet or exceed minimum Town of Innisfil geometric designs standards.		
Safety	• No anticipated safety concerns as a result of the horizontal alignment.		
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed.		
Infrastructure Design	✓	✗	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).6th	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer). • Requires connections to areas with roadside ditches for stormwater management.
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction of existing 2-Lane rural cross-section with widened and paved shoulders). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).		
Construction Disruption	• Construction disruption anticipated		

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Cost	✓	✓	✓
Capital Cost	• Minimizes capital costs.		• Higher capital cost associated with construction of urban cross-section.
Operations/Maintenance Cost	• Reduction in operation and maintenance cost due to improvements		
Property Acquisition Cost	• Higher property acquisition costs associated with rural cross-section.		• Minimizes amount of land required by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Recommendation	✗	✓	✓
Notes	• **Not Recommended**	• **Recommended in combination with Option 3**	• **Recommended in combination with Option 2**
	• Results in significant impacts to the natural environment, including wooded area on the south side • Results in impacts to the cemetery on the south side	• Minimize impacts to natural environment, including wooded area on the south side • Minimize impacts to the cemetery on the south side and the residential property on the north side • Combination of Option 2 and Option 3 allows for a less northerly alignment, thus accommodating a left turn lane within a reduced impact footprint	

7.1.2.6 Sub-Section 2-6: East of Yonge Street to west of Unevaluated Wetland

The recommended alternative design concept for Segment 2-6 (**Figure 7-10**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline as it minimizes impacts on constrains and the environment. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.2** for the detailed evaluation table for this segment and **Figure 6-6** for the preferred cross section design concept.

- **Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities, with protection for 4 lanes if required in the future.

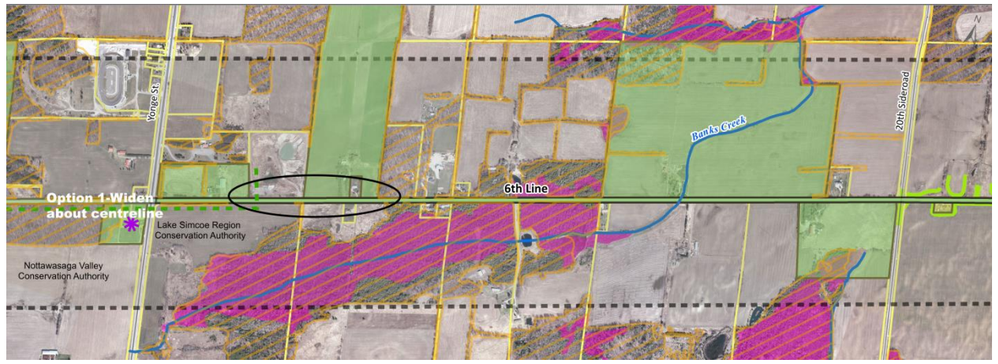


Figure 7-10: Sub-Section 2-6 – East of Yonge Street to west of Unevaluated Wetland

7.1.2.7 Sub-Section 2-7: West of Unevaluated Wetland to west of Banks Creek

Due to the presence of the unevaluated wetland on the south side, the following design concepts were developed for Segment 2-5 (**Figure 7-11**) based on the alternative solution carried forward and are evaluated in **Table 7-3:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the north
- **Option 3:** Modify cross section (**Figure 7-12**) – **RECOMMENDED**

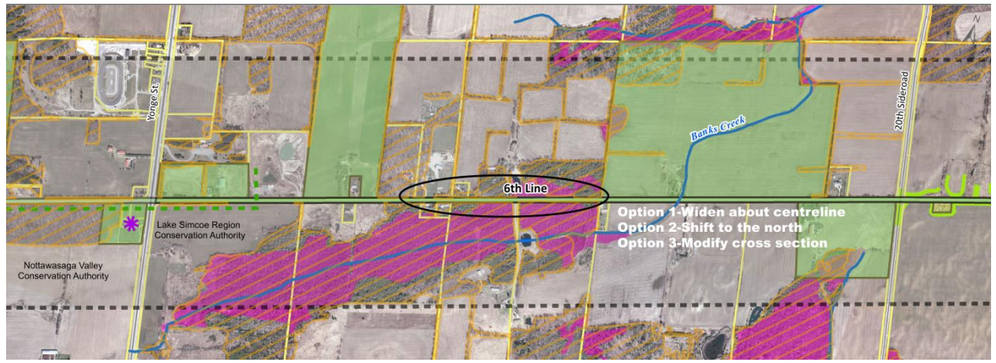
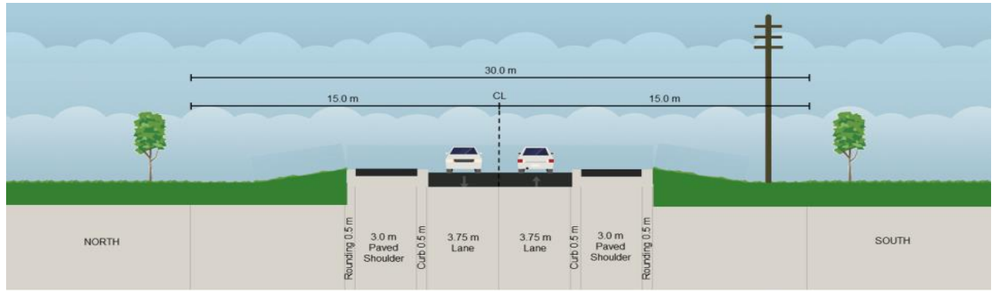


Figure 7-11: Sub-Section 2-7: West of Unevaluated Wetland to west of Banks Creek

The preferred design concept is Option 3. This option minimizes impacts to the natural, social, and cultural environment while accommodating the ultimate alignment for future servicing. The modified cross section, widened about the existing centreline, also maintains a tangent roadway. The modified cross section is shown in **Figure 7-12**.



Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).

Figure 7-12: Sub-Section 2-7 – Modified Cross Section

Table 7-3: Sub-Section 2-7: West of Unevaluated Wetland to west of Banks Creek

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Natural Environment	✗	✓	✓
Vegetation / Natural Heritage	• Significant impacts to vegetation and wooded areas along the north and south sides.	• Concentrated impacts to the smaller fragmented wooded area on the north side.	• Minimizes impacts to vegetation and wooded areas along the north and south sides of 6th Line by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Wildlife	• Potential impact on wildlife habitat along 6th Line. There is the potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area.	• Minimizes impact on potential wildlife habitat by shifting to the north to avoid larger wooded area and wetland on the south side.	• Minimizes impact on potential wildlife habitat by using urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Fisheries and Aquatic Habitat	• N/A (no watercourse crossings in this segment).		
Wetlands	• Impacts to wetland on north and south side.	• Minimizes impact to larger wetland on south side.	• Minimizes impacts to wetland on north and south side.
Stormwater	• No anticipated impacts to stormwater management.		• Requires connections to areas with roadside ditches for stormwater management.
Socio Economic Environment	✗	✗	✓
Future development & growth accommodation	• Will accommodate future development & growth.		
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).		
Agricultural / Farming Operations	• Potential impact to agricultural / farming operations on north and south side.	• Minimizes potential impact to agricultural / farming properties along 6th Line on south side.	• Minimizes anticipated impact to agricultural / farming operations.
Residential Impacts (areas & access)	• No change to existing driveway locations. • Potential minor impacts during construction.		
Archaeological Impacts	• Potential impact to areas with archaeological potential.		

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to grading disturbance and ditching:
	  • CHL 1 (6th Line Roadscape)
	  • CHL 20 (Farm Complex)
	  • CHL 21 (Farm Complex)
			• Minimizes impacts to Cultural Heritage resources on north side. Can be extended from wooded area to further minimize impacts to residential properties.

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Visual Aesthetics / Community Character Impacts	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.		• Urban cross-section will eliminate the need for drainage ditches but may visually change the character of the road.
Air, Noise, Vibration Impacts	• Air, noise, vibration impacts anticipated during construction.		
Transportation Service	✓	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon).		
Accommodation of Active Transportation Facilities and Alternative Modes of Travel	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.		
Meets Geometric Standards	• All options meet or exceed minimum Town of Innisfil geometric designs standards.		
Safety	• No anticipated safety concerns as a result of the horizontal alignment.		
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed.		
Infrastructure Design	✓	✗	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).
Roadway Design	• Maintains tangential roadway.	• Introduction of horizontal curves into an otherwise tangent roadway.	• Maintains tangential roadway.
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction of existing 2-Lane rural cross-section with widened and paved shoulders). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).		
Construction Disruption	• Construction disruption anticipated		
Cost	✓	✓	✓
Capital Cost	• Minimizes capital costs.		• Higher capital cost associated with construction of urban cross-section.
Operations/Maintenance Cost	• Reduction in operation and maintenance cost due to improvements		

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Property Acquisition Cost	• Higher property acquisition costs associated with rural cross-section.		• Minimizes amount of land required by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Recommendation	✗	✗	✓
Notes	• **Not Recommended** • Results in significant impact to natural environment, including wooded areas, vegetation, and wetland on north and south sides • Results in potential impacts to residential properties and cultural heritage resources on the north side	• **Not Recommended** • Results in potential impacts to residential properties and cultural heritage resources on the north side • Does not accommodate interim and ultimate alignment for future servicing. • Introduces horizontal curves into an otherwise tangent roadway.	• **Recommended** • Minimizes impacts to natural, social and cultural environment • Accommodates interim and ultimate alignment for future servicing. • Maintains tangent roadway

7.1.2.8 Sub-Section 2-8: West of Banks Creek to west of 20 Sideroad

The recommended alternative design concept for Segment 2-8 (**Figure 7-13**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline, as it minimizes impacts on constrains and the environment. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.2** for the detailed evaluation table for this segment and **Figure 6-6** for the preferred cross section design concept.

- **Alternative #2-2: 2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW) – RECOMMENDED** - Reconstruction of 2-Lane rural cross-section with widened and paved shoulders to support Active Transportation activities, with protection for 4 lanes if required in the future.

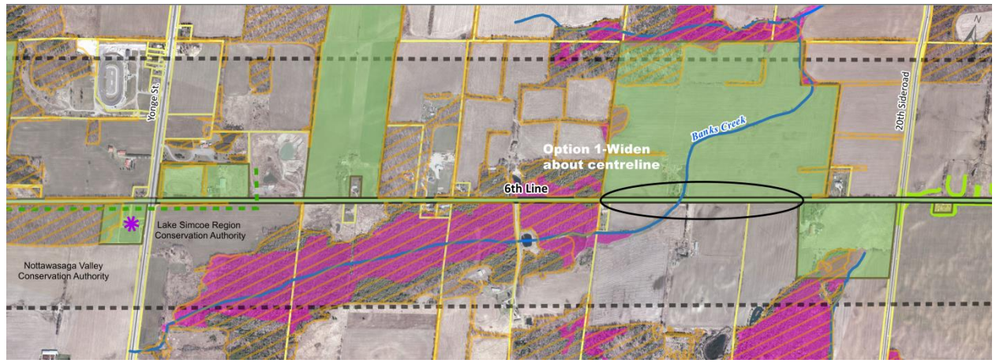


Figure 7-13: Sub-Section 2- 8 – West of Banks Creek to west of 20 Sideroad

7.1.2.9 Sub-Section 2-9: West of 20 Sideroad to 20 Sideroad

Due to the existing built heritage resources and residential properties within this segment, the following design concepts were developed for Segment 2-9 (**Figure 7-14**) based on the alternative solution carried forward and are evaluated in **Table 7-4:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the north – **RECOMMENDED in part**
- **Option 3:** Modify cross section (**Figure 7-15**) – **RECOMMENDED in part**

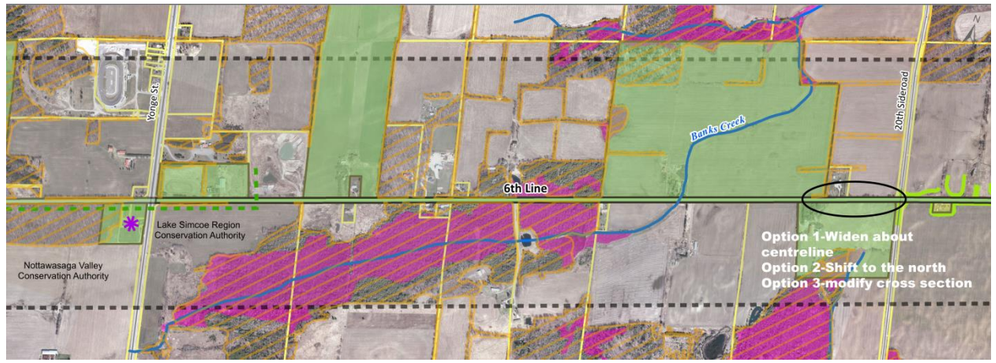


Figure 7-14: Sub-Section 2-9: West of 20 Sideroad to 20 Sideroad

The preferred design concept is a combination of Options 2 and 3. A combination of the two minimizes the impact to the residential property and built heritage resource east of 20 Sideroad on the south side and also minimizes the impacts to residential properties west of 20 Sideroad. The modified cross section also maintains a generally tangent roadway. The modified cross section is shown in **Figure 7-15**.

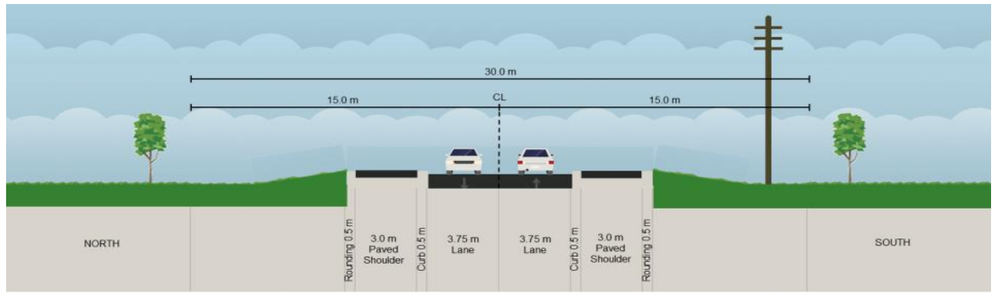


Figure 7-15: Sub-Section 2-9 – Modified Cross Section

Table 7-4: Sub-Section 2-9: West of 20 Sideroad to 20 Sideroad

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Natural Environment	✗	✓	✓
Vegetation / Natural Heritage	• Impacts to vegetation and wooded areas along the north and south sides.	• Minimizes impacts to vegetation on the south side.	• Minimizes impacts to vegetation and wooded areas along the north and south sides of 6th Line by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Wildlife	• Potential impact on wildlife habitat along 6th Line. There is the potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area.	• Minimizes impact on potential wildlife habitat by shifting to the north to avoid larger wooded area on the south side.	• Minimizes impact on potential wildlife habitat by using urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Fisheries and Aquatic Habitat	• N/A (no watercourse crossings in this segment).		
Wetlands	• N/A (no wetlands in this segment).		
Stormwater	• No anticipated impacts to stormwater management.		• Requires connections to areas with roadside ditches for stormwater management.
Socio Economic Environment	✗	✓	✗
Future development & growth accommodation	• Will accommodate future development & growth.		
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).		
Agricultural / Farming Operations	• Potential impact to agricultural / farming operations on north and south side.	• Minimizes potential impact to agricultural / farming properties along 6th Line on south side.	• Minimizes anticipated impact to agricultural / farming operations.
Residential Impacts (areas & access)	• No change to existing driveway locations. • Potential minor impacts during construction.		
Archaeological Impacts	• Potential impact to areas with archaeological potential.		

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to grading disturbance and ditching:
	  • CHL 1 (6th Line Roadscape)
	  • CHL 22 (Farm Complex)
		• Minimizes impacts to residential property and CHL 22 on the south side by shifting to the north.	• Potential impacts to residential property and CHL 22 on the south side.

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Visual Aesthetics / Community Character Impacts	• Impact to visual aesthetics (i.e. vegetation removal) due to road widening (to accommodate paved shoulders) and grading disturbance for roadside ditching. However, rural cross-section will be maintained and opportunities for landscape improvements will be considered.		• Urban cross-section will eliminate the need for drainage ditches but may visually change the character of the road.
Air, Noise, Vibration Impacts	• Air, noise, vibration impacts anticipated during construction.		
Transportation Service	✓	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon).		
Accommodation of Active Transportation Facilities and Alternative Modes of Travel	• Improvement to active transportation facilities through implementation of widened paved shoulders to accommodate cyclists.		
Meets Geometric Standards	• All options meet or exceed minimum Town of Innisfil geometric designs standards.		
Safety	• No anticipated safety concerns as a result of the horizontal alignment.		
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed.		
Infrastructure Design	✓	✗	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).6th	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).
Roadway Design	• Maintains tangent roadway.	• Introduction of horizontal curves into an otherwise tangent roadway.	• Maintains tangent roadway.
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction of existing 2-Lane rural cross-section with widened and paved shoulders). • Road character will be consistent with roadway re-classification to an Arterial Road (with a 30 m ROW). • Existing speed limit will be maintained (80 km/h). • No anticipated change to driver expectations (i.e. expect high speed rural environment will be maintained).		
Construction Disruption	• Construction disruption anticipated		
Cost	✓	✓	✓
Capital Cost	• Minimizes capital costs.		• Higher capital cost associated with construction of urban cross-section.
Operations/Maintenance Cost	• Reduction in operation and maintenance cost due to improvements		

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north	Option 3: Modify cross section
Property Acquisition Cost	• Higher property acquisition costs associated with rural cross-section.		• Minimizes amount of land required by using an urban cross-section to eliminate the need for drainage ditches, thus reducing the design footprint.
Recommendation	✗	✓	✓
Notes	• **Not Recommended**	• **Recommended in combination with Option 3**	• **Recommended in combination with Option 2**
	• Results in significant impacts to vegetation on the north and south sides • Results in potential impacts to residential property and Built Heritage Resource east of 20 Sideroad, on the south side	• Minimize impacts to natural environment • Minimize impacts to the residential properties and built heritage resources, including residential property and Built Heritage Resource east of 20 Sideroad, on the south side	

7.1.3 Segment 3: 20 Sideroad to east of Future Alcona Road South

Due to the presence of built heritage resources within this segment, the following design concepts were developed for Segment 3 (**Figure 7-16**) based on the alternative solution carried forward and are evaluated in **Table 7-5:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the north - **RECOMMENDED**

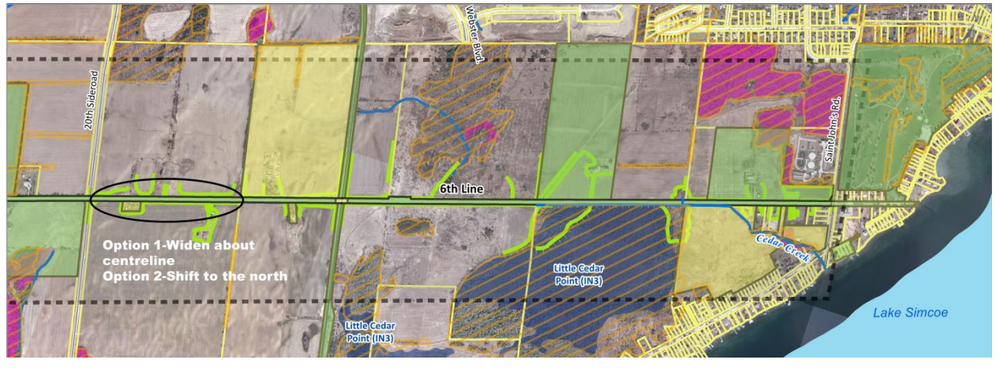


Figure 7-16: Segment 3 – 20 Sideroad to east of Future Alcona Road South

The preferred design concept is Option 2. Shifting the roadway alignment to the north minimizes impacts to the natural environment and the residential property and Built Heritage Resource on the south side.

The recommended cross section for Segment 3 from the evaluation of alternative solutions was carried forward as the preferred cross section along with shifting the road alignment to the north to avoid or minimize constraints. Refer to **Section 6.5.3** for the cross section evaluation table and **Figure 6-8** for the preferred cross section design concept.

Table 7-5: Segment 3 – 20 Sideroad to east of Future Alcona Road South

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north
Natural Environment	✗	✓
Vegetation / Natural Heritage	• Impact to vegetation areas along the north and south sides of 6th Line due to road widening (to accommodate new 5 lane urban section with multi-use path and sidewalk) and grading disturbance.	• Minimizes impacts to vegetation on the south side by shifting to the north.
Wildlife	• Potential impact on wildlife habitat along 6th Line. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.	
Wetlands	• No anticipated impact on wetlands (no wetlands in this segment).	
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat (no watercourses in this segment).	
Stormwater	• No difference in stormwater quantity as a result of alignment location.	
Socio Economic Environment	✗	✓
Future development & growth accommodation	• Will accommodate future development & growth.	
Business Impacts (areas & access)	• Does not apply to this segment (no businesses in this segment)	
Agricultural / Farming Operations	• Potential impact to agricultural / farming properties along 6th Line	
Residential Impacts (areas & access)	• No change to existing driveway locations. • 6thPotential minor impacts during construction.	• Similar impacts to driveways and access compared to Option 1. However, shift to the north minimizes impact to residential property on the south side. • Potential minor impacts during construction.
Archaeological Impacts	• Potential impact to areas with archaeological potential.	

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resources due to widening and grading disturbance:
	  • CHL 1 – 6th Line Roadscape
	  • BHR – residence at 1475 6th Line
		• Potential impact to CHL 1 – 6th Line Roadscape.
		• Shift to the north to minimize impact to Built Heritage Resource (BHR 1 – residence at 1475 6th Line) on the south side.

Visual Aesthetics / Community Character Impacts	• Similar impacts to visual aesthetics / community character (driven by cross-section).	
Air, Noise, Vibration Impacts	• Similar air, noise, vibration impacts anticipated during construction	
Transportation Service	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon) equally (driven by cross-section).	

Criteria	Option 1: Widen about the centerline	Option 2: Shift to the north
Accommodation of Active Transportation Facilities	• Will accommodate active transportation equally (driven by cross-section).	
Meets Geometric Standards	• Horizontal alignment meets or exceeds minimum Town of Innisfil standards	
Safety	• No anticipated safety concerns as a result of the horizontal alignment	
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed	
Infrastructure Design	✓	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).6th	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction and urbanization to 5-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver expectation should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.	
Construction Disruption	• Construction disruption anticipated	
Cost	✓	✓
Capital Cost	• Comparable capital costs	
Operations / Maintenance Cost	• Reduction in operation and maintenance cost due to improvements	
Property Acquisition Cost	• Amount of property acquisition comparable for both alternatives, as the road platform width is the same regardless of the alignment	
Recommendation	✗	✓
Notes	• **Not Recommended** • Results in greater potential impacts to the natural environment • Results in greater potential impacts to residential property and built heritage resource on the south side	• **Recommended** • Minimizes impacts to the natural environment • Minimizes impacts to residential property and built heritage resource on the south side

7.1.4 Segment 4: East of Future Alcona Road South to Barrie GO Train Crossing

Due to the residential properties and built heritage resources within this segment, the following design concepts were developed for Segment 4 (**Figure 7-17**) based on the alternative solution carried forward and are evaluated in **Table 7-6:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the south – **RECOMMENDED**
- **Option 3:** Shift to the north

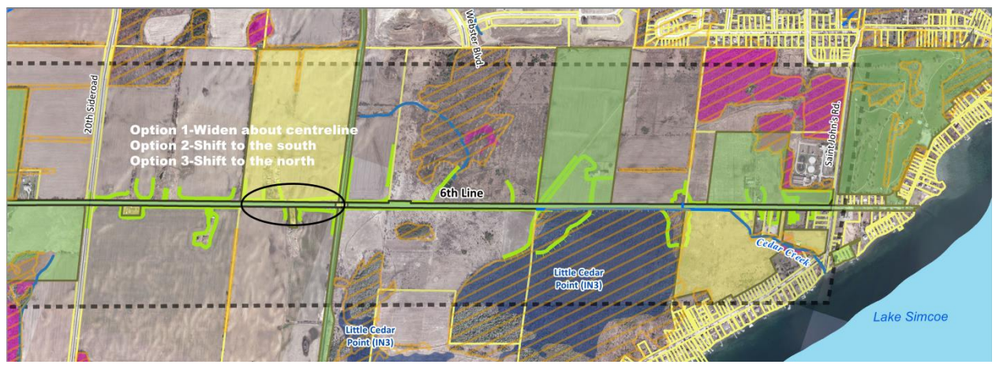


Figure 7-17: Segment 4 – East of Future Alcona Road South to Barrie GO Train Crossing

The preferred design concept is Option 2. Shifting the roadway alignment to the south minimizes impacts to the residential property and Built Heritage Resource on the north side.

The recommended cross section for Segment 4 from the evaluation of alternative solutions was carried forward as the preferred cross section along with shifting the road alignment to the south to avoid or minimize constraints. Refer to **Section 6.5.4** for the cross section evaluation table and **Figure 6-10** for the preferred cross section design concept.

Table 7-6: Segment 4 – East of Future Alcona Road South to Barrie GO Train Crossing

Criteria	Option 1: Widen about the centreline	Option 2: Shift to the south	Option 3: Shift to the north
Natural Environment	✓	✓	✓
Vegetation / Natural Heritage	• Impact to vegetation areas along the north and south sides 6th	• Similar impacts compared to Option 1.Shift to the south may result in slightly greater impacts to vegetation on the south side; however, impacts are anticipated along already disturbed edge.	• Similar impacts compared to Option 1.Shift to the south may result in slightly greater impacts to vegetation on the north side; however, impacts are anticipated along already disturbed edge.
Wildlife	• Potential impact on wildlife habitat along 6th Line. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.		
Wetlands	• No anticipated impact on wetlands (no wetlands in this segment).		
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat (no watercourses in this segment).		
Stormwater	• No difference in stormwater quantity as a result of alignment location.		
Socio Economic Environment	✗	✓	✗
Future development & growth accommodation	• Will accommodate future development & growth.		
Business Impacts (areas & access)	• No change to existing driveway locations. • 6thPotential minor impacts during construction.		

Agricultural / Farming Operations	• Potential impact to two (2) agricultural / farming properties along 6th Line:
	  ○ One (1) on the north side
	  ○ One (1) on the south side		

Residential Impacts (areas & access)	• No change to existing driveway locations. • 6thPotential minor impacts during construction.	• Similar impacts compared to Option 1.However, shift to the south minimizes impacts to residential property on the north side. Although this shift moves the road closer to the residential property on the south side, this property is set back further from the existing road.	• Impacts to residential property on the north side. Minimizes impacts to residential property on the south side.
Archaeological Impacts	• Potential impact to areas with archaeological potential.		

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resources due to widening and grading disturbance:
	  • BHR 2 – residence at 1350 6th Line
	  • BHR 3 – residence at 1323 6th Line
	  • CHL 1 – 6th Line Roadscape
		• Shift to the south minimizes impacts to BHR 2 on the north side. Although this shift moves the road closer to BHR 3 on the south side, this property is set back further from the existing road.	• Shift to the north minimizes impacts to BHR 3 on the south side. This shift moves the road closer to BHR 2 on the north side, which is closer to the existing road, therefore impacts are more significant.

Criteria	Option 1: Widen about the centreline	Option 2: Shift to the south	Option 3: Shift to the north
Visual Aesthetics / Community Character Impacts	• Similar impacts to visual aesthetics / community character (driven by cross-section).		
Air, Noise, Vibration Impacts	• Similar air, noise, vibration impacts anticipated during construction		
Transportation Service	✓	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon) equally (driven by cross-section).		
Accommodation of Active Transportation Facilities	• Will accommodate active transportation equally (driven by cross-section).		
Meets Geometric Standards	• Horizontal alignment meets or exceeds minimum Town of Innisfil standards		
Safety	• No anticipated safety concerns as a result of the horizontal alignment		
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed		
Infrastructure Design	✓	✗	✗
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).6th	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction and urbanization to 5-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.		
Construction Disruption	• Construction disruption anticipated		
Cost	✓	✓	✓
Capital Cost	• Comparable capital costs		
Operations / Maintenance Cost	• Reduction in operation and maintenance cost due to improvements		
Property Acquisition Cost	• Amount of property acquisition comparable for both alternatives, as the road platform width is the same regardless of the alignment		

Criteria	Option 1: Widen about the centreline	Option 2: Shift to the south	Option 3: Shift to the north
Recommendation	✗	✓	✗
Notes	• **Not Recommended** • Results in impacts to the residential property and built heritage resource on the north side	• **Recommended** • Minimizes impacts to residential properties and built heritage resources	• **Not Recommended** • Results in impacts to the residential property and built heritage resource on the north side • Does not accommodate interim and ultimate alignments for future servicing

7.1.5 Segment 5: Barrie GO Train Crossing

Due to the existing Barrie GO Train line crossing in this segment and the built heritage resource to the west, the following design concepts were developed for Segment 5 (**Figure 7-18**) based on the alternative solution carried forward and are evaluated in **Table 7-7:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift to the south – **RECOMMENDED**
- **Option 3:** Shift to the north

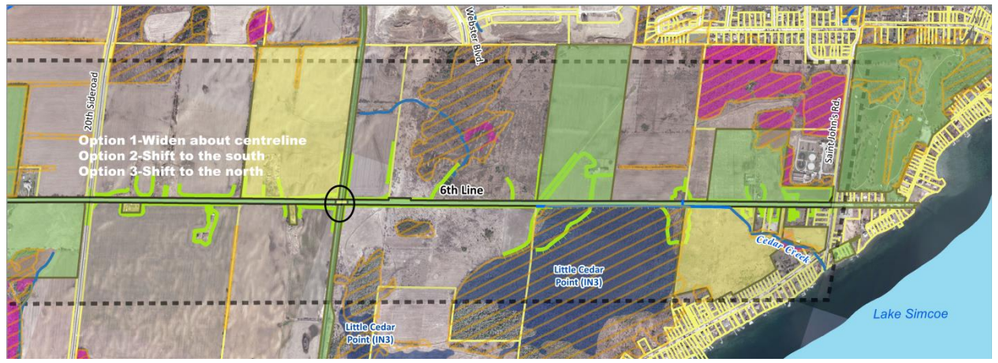


Figure 7-18: Segment 5 – Barrie GO Train Crossing

The preferred design concept is Option 2. Shifting the roadway alignment to the south minimizes impacts to the residential property and Built Heritage Resource on the north side, west of Barrie GO Train line crossing. Furthermore, Option 2 can accommodate construction staging along the bridge.

The recommended cross section for Segment 5 from the evaluation of alternative solutions was carried forward as the preferred cross section with a modification to shift the road alignment to the south to avoid or minimize constraints. Refer to **Section 6.5.5** for the cross section evaluation table and **Figure 6-12** for the preferred cross section design concept.

Table 7-7: Segment 5 – Barrie GO Train Crossing

Criteria	Option 1: Widen about the centreline	Option 2: Shift to the south	Option 3: Shift to the north
Natural Environment	✓	✓	✓
Vegetation / Natural Heritage	• Impact to vegetation and wooded areas on the north and south sides 6th	• Impact to vegetation and wooded areas on the south side 6th	• Impact to vegetation and wooded areas on the north side 6th
Wildlife	• Potential impact on wildlife habitat along 6th Line.		
Wetlands	• No anticipated impact on wetlands (no wetlands along this segment).		
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat.		
Stormwater	• No difference in stormwater quantity as a result of alignment location.		
Socio Economic Environment	✗	✓	✗
Future development & growth accommodation	• Will accommodate future development & growth		
Business Impacts (areas & access)	• N/A (no existing commercial businesses in this segment).		
Agricultural / Farming Operations	• Potential impact to farming operations due to property requirements for grading		
Residential Impacts (areas & access)	• Potential property acquisition on the north and south sides.	• Property acquisition predominantly on the south side.	• Property acquisition predominantly on the north side.
Archaeological Impacts	• Potential impact to areas with archaeological potential.		

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes and Built Heritage Resource due to widening and grading disturbance:
	  • BHR 4 – CN Rail Line Bridge
	  • CHL 1 – 6th Line Roadscape
	  • CHL 2 – CN Rail Line Railscape
	  • In addition, widening about the centreline results in impacts to BHR 2 (residence at 1350 6th Line) on the north side, immediately west of Segment 5.
		• Widening to the south minimizes impacts to BHR 2 (residence at 1350 6th Line) on the north side, immediately west of Segment 5.	• Shift to the north results in impacts to BHR 2 (residence at 1350 6th Line) on the north side, immediately west of Segment 5.

Visual Aesthetics / Community Character Impacts	• Similar impacts to visual aesthetics / community character (driven by cross-section).		

Criteria	Option 1: Widen about the centreline	Option 2: Shift to the south	Option 3: Shift to the north
Air, Noise, Vibration Impacts	• Similar air, noise, vibration impacts anticipated during construction		
Transportation Service	✓	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon) equally (driven by cross-section).		
Accommodation of Active Transportation Facilities	• Will accommodate active transportation equally (driven by cross-section).		
Meets Geometric Standards	• Horizontal alignment meets or exceeds minimum Town of Innisfil standards		
Safety	• No anticipated safety concerns as a result of the horizontal alignment		
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed		
Infrastructure Design	✗	✓	✗
Utility Impacts	• Potential impact to utilities along 6th Line. • Accommodates both the interim and ultimate alignment for future servicing (water and sewer).6th	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).	• Potential impact to utilities along 6th Line. • Does not accommodate both the interim and ultimate alignment for future servicing (water and sewer).
Driver Expectation / Speed Limits / Road Character	• Improvement to bridge / road infrastructure (reconstruction and urbanization to 4-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver expectation should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment and potential to encounter pedestrians and cyclists).		
Construction Disruption	• Construction disruption anticipated	• Construction disruption anticipated • Option 2 can accommodate new structure construction while keeping existing structure in service.	• Construction disruption anticipated
Cost	✓	✓	✓
Capital Cost	• Comparable capital costs, as bridge needs to be replaced regardless of the alignment		
Operations / Maintenance Cost	• Reduction in operation and maintenance cost due to improvements		
Property Acquisition Cost	• Amount of property acquisition comparable for both alternatives, as the road platform width is the same regardless of the alignment		

Criteria	Option 1: Widen about the centreline	Option 2: Shift to the south	Option 3: Shift to the north
Recommendation	✗	✓	✗
Notes	• **Not Recommended** • Results in impacts to residential property (Built Heritage Resource) on the north side, west of Barrie GO Train Line crossing • Construction staging is more challenging	• **Recommended** • Minimizes impacts to residential property and Built Heritage Resource on the north side, west of Barrie GO Train Line crossing • Can accommodate construction staging	• **Not Recommended** • Results in impacts to residential property (Built Heritage Resource) on the north side, west of Barrie GO Train Line crossing

7.1.6 Segment 6: Barrie GO Train Crossing to East of Future Street A (Sleeping Lion)

Due to the various constraints within and adjacent to this segment, including the Barrie GO Train line crossing, built heritage resources, and the PSW to the east, the following design concepts were developed for Segment 6 (**Figure 7-19**) based on the alternative solution carried forward and are evaluated in **Table 7-8:**

- **Option 1:** Widen about the centerline
- **Option 2:** Shift from the south to the north – **RECOMMENDED**

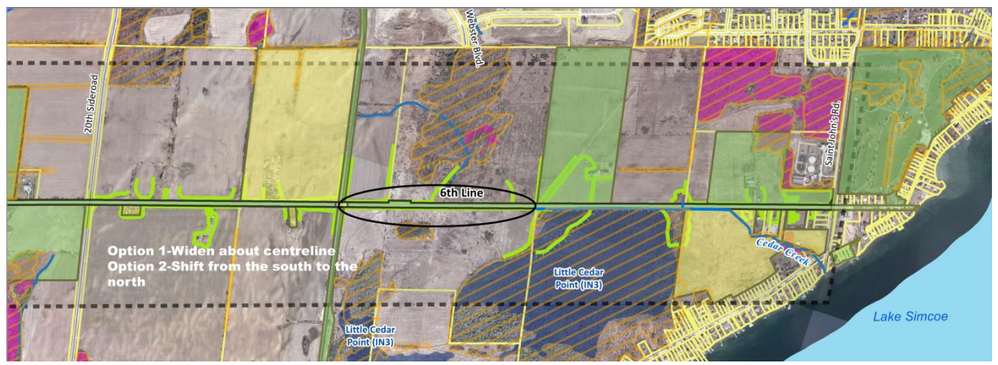


Figure 7-19: Segment 6 – Barrie GO Train Crossing to East of Future Street A (Sleeping Lion)

The preferred design concept is Option 2. Shifting the roadway alignment from the south to the north provides an adequate alignment for transition between the shift to the south to minimize impacts to the Built Heritage Resource west of the Barrie GO Train Line crossing, and the shift to the north to minimize impacts to the wetland to the east.

The recommended cross section for Segment 6 from the evaluation of alternative solutions was carried forward as the preferred cross section with a modification to shift the road alignment from the south to the north to avoid or minimize constraints. Refer to **Section 6.5.6** for the cross section evaluation table and **Figure 6-14** for the preferred cross section design concept.

Table 7-8: Segment 6 – Barrie GO Train Crossing to East of Future Street A (Sleeping Lion)

Criteria	Option 1: Widen about the centreline	Option 2: Shift from the south to the north
Natural Environment	✗	✓
Vegetation / Natural Heritage	• Impact to vegetation areas on the north and south sides 6th • This area is also being impacted by the Sleeping Lion Development	• Similar impacts compared to Option 1. This segment is a transition between a shift to the south at the rail crossing (Segment 5) and a shift to the north to minimize impacts to wetland on the south side along Segment 7.
Wildlife	• Potential impact on wildlife habitat along 6th Line. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature.	
Wetlands	• Potential minor impact to Provincially Significant Wetland (Little Cedar Point) along the south side of 6th Line, to the east of Segment 6.	• Shift from the south to the north provides adequate transition to minimize impact to Provincially Significant Wetland (Little Cedar Point) along the south side of 6th Line, east of Segment 6.
Fisheries and Aquatic Habitat	• No anticipated impact on aquatic habitat (no watercourses in this segment).	
Stormwater	• No difference in stormwater quantity as a result of alignment location	
Socio Economic Environment	✓	✓
Future development & growth accommodation	• Will accommodate future development & growth.	
Impacts to Sleeping Lion development	• Accommodates Sleeping Lion development	• Accommodates Sleeping Lion development • Shift to the north results in road being closer to the proposed development (agreements/negotiations between the developers and the Town of Innisfil may be required) and development plans are to be planned accordingly.
Business Impacts (areas & access)	• No existing businesses • North side and part of south side is slated for development (Sleeping Lion) • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.	
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations; north side and part of south side is slated for development (Sleeping Lion)	
Residential Impacts (areas & access)	• North side and part of south side is slated for development (Sleeping Lion) – existing residential will be removed by this development. • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.	• Similar impacts compared to Option 1. Shift to the north to minimize impacts to wetland on the south side along Segment 7 will result in road being closer to the proposed development, and development plans are to be planned accordingly.
Archaeological Impacts	• Potential impact to areas with archaeological potential.	

Criteria	Option 1: Widen about the centreline	Option 2: Shift from the south to the north
Cultural Heritage Impacts	• Potential impact to one Cultural Heritage Landscape (CHL 1 – 6th Line Roadscape) due to widening and grading disturbance. • No identified Built Heritage Resources in this road segment.	
Visual Aesthetics / Community Character Impacts	• Similar impacts to visual aesthetics / community character (driven by cross-section).	
Air, Noise, Vibration Impacts	• Similar air, noise, vibration impacts anticipated during construction	
Transportation Service	✗	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon) equally (driven by cross-section).	
Accommodation of Active Transportation Facilities	• Will accommodate active transportation equally (driven by cross-section).	
Meets Geometric Standards	• Challenge to provide appropriate transition between Segment 5 (shift to the south) and Segment 7 (shift to the north), while meeting or exceeding minimum Town of Innisfil geometric standards and remaining centered about the existing road centreline	• Horizontal alignment meets or exceeds minimum Town of Innisfil standards • Provides appropriate transition between Segment 5 (shift to the south) and Segment 7 (shift to the north)
Safety	• No anticipated safety concerns as a result of the horizontal alignment	
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed	
Infrastructure Design	✓	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • New servicing (water & sewer) is planned for same time as roadway works. No interim vs. ultimate servicing alignment conflicts along this segment.	
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction and urbanization to 5-Lane urban cross-section with multi-use path and sidewalks). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver expectation should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility. • Option 2 introduces new horizontal curves, but will be consistent with the new roadway character and geometric meet standards and driver expectation.	
Construction Disruption	• Construction disruption anticipated	
Cost	✓	✓
Capital Cost	• Comparable capital costs	
Operations / Maintenance Cost	• Reduction in operation and maintenance cost due to improvements	
Property Acquisition Cost	• Amount of property acquisition comparable for both alternatives, as the road platform width is the same regardless of the alignment	

Criteria	Option 1: Widen about the centreline	Option 2: Shift from the south to the north
Recommendation	✗	✓
Notes	• **Not Recommended** • Challenge to provide appropriate transition between Segment 5 (shift to the south) and Segment 7 (shift to the north), while meeting or exceeding minimum Town of Innisfil geometric standards and remaining centered about the existing road centreline	• **Recommended** • Provides an adequate alignment for transition between the shift to the south to minimize impacts to the Built Heritage Resource west of the Barrie GO Train Line crossing, and the shift to the north to minimize impacts to the wetland to the east

7.1.7 Segment 7: East of Future Street A to East of Future Street C (Sleeping Lion)

Due to the presence of the PSW to the south, the following design concepts were developed for Segment 7 (**Figure 7-20**) based on the alternative solution carried forward and are evaluated in **Table 7-9:**

- **Option 1:** Widen about the centerline
- **Option 2:** Widen road platform to the north – **RECOMMENDED**

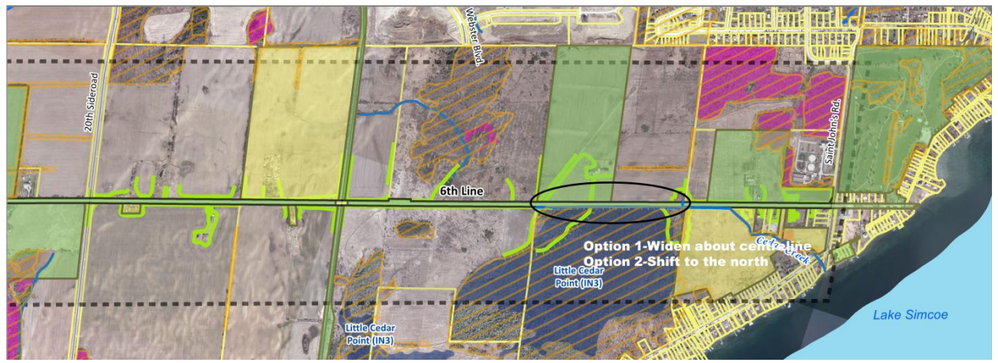


Figure 7-20: Segment 7 – East of Future Street A to East of Future Street C (Sleeping Lion)

The preferred design concept is Option 2. Widening the roadway platform to the north minimizes impacts to vegetation, the watercourse and Provincially Significant Wetland (PSW) on the south side.

The recommended cross section for Segment 7 from the evaluation of alternative solutions was carried forward as the preferred cross section with a modification to widen the roadway platform to the north to avoid or minimize constraints. Refer to **Section 6.5.7** for the cross section evaluation table and **Figure 6-16** for the preferred cross section design concept.

Table 7-9: Segment 7 – East of Future Street A to East of Future Street C (Sleeping Lion)

Criteria	Option 1: Widen about the centreline	Option 2: Widen road platform to the north
Natural Environment	✗	✓
Vegetation / Natural Heritage	• Impact to vegetation areas on the north and south sides of 6th Line This area is also being impacted by the Sleeping Lion Development	• Similar impacts compared to Option 1. However, shift to the north minimizes impact to vegetation associated with wetland on the south side.
Wildlife	• Potential impact on wildlife habitat along 6th Line. • There is potential for Bobolink, Eastern Meadowlark and Barn Swallow, Threatened species under the Ontario Endangered Species Act, within the study area. Surveys should be conducted during detailed design to confirm the location and extent of habitat for these species, as their habitat is transitional in nature. • This area is also being impacted by the Sleeping Lion Development	
Wetlands	• Potential impact to Provincially Significant Wetland (Little Cedar Point) along the south side of 6th Line.	• Shift to the north to minimize impact to Provincially Significant Wetland (Little Cedar Point) along the south side of 6th Line.
Fisheries and Aquatic Habitat	• Potential impact to Cedar Creek watercourse crossing (west of Future Street B) and watercourse located on the south side of 6th Line due to road widening and grading disturbance.	• Shift to the north to minimize impact to watercourse located on the south side of 6th Line.
Stormwater	• No difference in stormwater quantity as a result of alignment location	
Socio Economic Environment	✓	✓
Future development & growth accommodation	• Will accommodate future development & growth.	
Impacts to Sleeping Lion development	• Accommodates Sleeping Lion development	• Accommodates Sleeping Lion development • Shift to the north results in road being closer to the proposed development (agreements/negotiations between the developers and the Town of Innisfil may be required) and development plans are to be planned accordingly.
Business Impacts (areas & access)	• No existing businesses • North side and part of south side is slated for development (Sleeping Lion) • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.	
Agricultural / Farming Operations	• No anticipated impact to agricultural / farming operations; north side and part of south side is slated for development (Sleeping Lion)	
Residential Impacts (areas & access)	• North side and part of south side is slated for development (Sleeping Lion) – existing residential will be removed by this development. • Potential minor impacts during construction if Sleeping Lion developed before 6th Line improvements.	• Similar impacts compared to Option 1. Shift to the north to minimize impacts to wetland on the south side will result in road being closer to the proposed development, and development plans are to be planned accordingly.
Archaeological Impacts	• Potential impact to areas with archaeological potential.	

Criteria	Option 1: Widen about the centreline	Option 2: Widen road platform to the north

Cultural Heritage Impacts	• Potential impact to the following Cultural Heritage Landscapes due to widening and grading disturbance:
	  • CHL 1 – 6th Line Roadscape
	  • CHL 3 – farm complex at 1010 6th Line
	• No identified Built Heritage Resources in this road segment.	

Visual Aesthetics / Community Character Impacts	• Similar impacts to visual aesthetics / community character (driven by cross-section).	
Air, Noise, Vibration Impacts	• Similar air, noise, vibration impacts anticipated during construction	
Transportation Service	✓	✓
Accommodation of Future Traffic Volumes (2031 Horizon)	• Will accommodate future traffic volumes (2031 Horizon) equally (driven by cross-section).	
Accommodation of Active Transportation Facilities	• Will accommodate active transportation equally (driven by cross-section).	
Meets Geometric Standards	• Horizontal alignment meets or exceeds minimum Town of Innisfil standards	
Safety	• No anticipated safety concerns as a result of the horizontal alignment	
Pavement Conditions	• Pavement reconstruction / rehabilitation as needed	
Infrastructure Design	✓	✓
Utility Impacts	• Potential impact to utilities along 6th Line. • New servicing (water & sewer) is planned for same time as roadway works. No interim vs. ultimate servicing alignment conflicts along this segment.	
Driver Expectation / Speed Limits / Road Character	• Improvement to road infrastructure (reconstruction and urbanization to 3-Lane urban cross-section with multi-use path and shoulders). • Road character will be consistent with roadway re-classification to a Major Urban Collector and suit / support future surrounding land use (Alcona South and Sleeping Lion development). • Speed limit will be reduced to 60 km/h (existing 80 km/h). • Driver expectation should be consistent with proposed future surrounding development (i.e. drivers should expect a lower speed urban environment). • Road side illumination will improve night-time visibility.	
Construction Disruption	• Construction disruption anticipated	
Cost	✓	✓
Capital Cost	• Comparable capital costs	
Operations / Maintenance Cost	• Reduction in operation and maintenance cost due to improvements	
Property Acquisition Cost	• Amount of property acquisition comparable for both alternatives, as the road platform width is the same regardless of the alignment	

Criteria	Option 1: Widen about the centreline	Option 2: Widen road platform to the north
Recommendation	✗	✓
Notes	• **Not Recommended** • Results in significant impacts to vegetation, watercourse and Provincially Significant Wetland on the south side	• **Recommended** • Minimizes impacts to vegetation, watercourse and Provincially Significant Wetland on the south side

7.1.8 Segment 8 – East of Future Street C (Sleeping Lion) to St. John's Road

The recommended alternative design concept for Segment 8 (**Figure 7-21**) from the evaluation of alternative solutions was carried forward as the preferred design concept with widening about the centerline, as it minimizes impacts on constrains and the environment. It was confirmed that widening about the centreline is preferred and no alignment shifts are required through this road segment. Refer to **Section 6.5.8** for the detailed evaluation table for this segment and **Figure 6-18** for the preferred cross section design concept.

- **Alternative #8-1: 2-Lane Urban with Multi-Use Path (20m ROW) – RECOMMENDED** – Construction of 2-Lane urban cross-section with multi-use path on the north side to support Active Transportation activities (**Figure 6-18**).

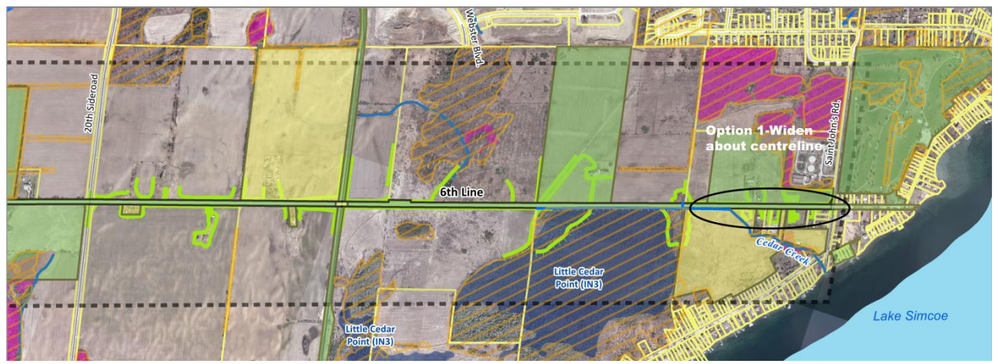


Figure 7-21: Segment 8 – East of Future Street C (Sleeping Lion) to St. John's Road

7.2 Design Refinements Based on Property Owner Consultation

The alternative design concepts identified in **Section 7.1** including the team's recommendations, were presented at the second Open House in May 2015. Based on the information presented and initial comments received from the public at the Open House, some additional property owner meetings were held to discuss specific landowners' concerns and potential design refinements at the following locations:

- 5 Sideroad intersection
- Yonge Street intersection (in proximity to the cemetery in southwest quadrant of the intersection)
- Between east of Yonge Street and west of Banks Creek (sub-section 2-7)

7.2.1 5 Sideroad Intersection

Property owner concerns at this location included the proximity of the proposed new edge of pavement to their homes, noise, access and increased traffic volumes. The design presented at the May 2015 Open House was based on widening about the existing road centreline, balancing impacts between the north and south side of the road. This design resulted in impacts to both properties, both occupied by residences.

The property on the north side was identified as a Built Heritage Resource, but is not a Provincially listed property. The structure is a circa 1910 schoolhouse, but didn't appear to have retained its original features or landscaping. The design presented at the May 2015 Open House would not impact the building, but would result in a loss of the shielding vegetation. The property owner at this location suggested an alignment shift to the south to fully avoid impacts to their property.

The property on the south side runs generally parallel to the roadway, and has more frontage than depth. There are existing sheds and landscaping that currently straddle the right-of-way

line. The design presented at the May 2015 Open House would impact the sheds and landscaping, and significantly reduce the depth of the lot, which the property owner interpreted as a loss of their home. However, the landowner expressed general agreement with an alignment shift to the south, as they interpreted the reduction in impacts to the property on the north side to be more significant than the additional impact to their property, and that the split impacts also resulted in loss of use of their property as a residence.

Recommendation at this location: the alignment was shifted to the south by approx. 4 m. Due to the proximity of the aforementioned properties to the 5 Sideroad intersection, and neighbouring homes, this shift was minimized to the greatest extent possible to avoid further impacts to properties east and west of the intersection. This shift results in an increase to the intersection skew angle by approximately one degree. The overall impacted area is similar to that presented at the May 2015 Open House.

7.2.2 Yonge Street Intersection

Property owner concerns at this location included the proximity of the proposed new edge of pavement to their homes, noise, access and increased traffic volumes. The roadway alignment is also constrained by the cemetery in the southwest quadrant of the intersection. Property owners also noted that snowmobiles ride on the shoulder adjacent to the cemetery and cross to the north side of the road east of Yonge Street. There does not appear to be sufficient shoulder width for snowmobiles on the south side of the road east of Yonge Street due to overgrown vegetation in the right-of-way. The design presented at the May 2015 Open House was based on a modified cross-section and widening to the north, with the goal of avoiding the cemetery on the south side and minimizing impacts to the properties on the north side (both west and east of Yonge Street).

With this design the building on the northwest quadrant of the intersection is avoided; however there is significant encroachment onto the property. Further, trees in the front yard of the property would obstruct the sight lines (existing and proposed) at the intersection and the driveway would be within the left turn storage length of the intersection restricting turning movements to the property. Although a further constrained 2-lane cross-section that directly abuts the cemetery could be developed at this location, any future widening to a 4-lane cross-section or future improvements on Yonge Street to install a traffic signal would further impact this property, and the snowmobile traffic may not be accommodated. Therefore, this landowner agreed that the design presented at the Open House consisting of a modified cross-section and widening to the north was the preferred option.

On the northeast quadrant of the intersection, the proposed 30 m right-of-way encroaches into the front yard of the property. The front yard is elevated above the roadway, contains a drainage field, and includes a roadside ditch. The beginning of the left turn lane taper, as presented at the May 2015 Open House, is in close proximity to the driveway entrance, and causes a slight encroachment into the yard area.

Recommendation at this location: move forward with modified cross-section with approx. 6 m shift to the north, protect for 2m of space between the edge of pavement and future fence to accommodate snowmobiles adjacent to the cemetery. This shift results in a reduction of the intersection skew angle by approximately two degrees. On the east side of the intersection, the left turn lane taper length was maintained at the minimum 112.5 m, but the parallel storage length was reduced to 105 m (from the minimum desirable length of 175 m) in order to minimize driveway access conflicts and reduce yard encroachments.

7.2.3 Between East of Yonge Street and West of Banks Creek (Hamlet area)

Multiple land owners were met with concurrently to discuss this road segment. Landowners expressed concerns about the high speed of existing traffic traveling through the area, drivers who pass on the left when drivers are making left turns into their driveways, and the inability for kids to safely cross the road. The design presented at the May 2015 Open House was based on widening about the road centreline, balancing impacts between the north and south sides of the road.

The homes on the south are generally located closer to the roadway than the homes on the north. The project team and land owners discussed alternatives that shift the road northerly. One landowner on the south expressed a desire to maintain the shielding trees located within the existing right-of-way, in place, to the greatest extent possible. In general, the homeowners to the north were receptive to the idea of shifting the road alignment to the north.

Recommendation at this location: the alignment was shifted to the north by approx. 2 m. This alignment shift results in greater property requirements from the north side (approx. 8 m) compared to property requirements from the south side (approx. 2 m). The vertical profile was modified slightly to reduce the grade and reduce the grading footprint to further reduce impacts to the trees providing shielding within the right-of-way.

7.3 Summary of Recommended Design Concepts

The recommended alternative design concepts for each segment are summarized in **Table 7-10**.

Table 7-10: Summary of Recommended Alternative Design Concepts

Segment	Preferred Cross Section	Preferred Road Alignment
1: County Road 27 to 5 Sideroad	2-Lane Rural with Paved Shoulders (30m ROW)	Widen about the centerline, with localized shift to the south west of 5 Sideroad
2-1: 5 Sideroad to 10 Sideroad	2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Widen about the centerline
2-2: 10 Sideroad to West Boundary of Lover's Creek PSW	2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Widen about the centerline
2-3: West to East Boundary of Lover's Creek PSW	Modified Cross Section: 2-Lane Urban with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Widen about the centerline
2-4: East Boundary of Lover's Creek PSW to west of Yonge Street	2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Widen about the centerline
2-5: West of Yonge Street to east of Yonge Street	Modified Cross Section: 2-Lane Urban with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Shift to the north
2-6: East of Yonge Street to west of Unevaluated Wetland	2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Widen about the centerline
2-7: West of Unevaluated Wetland to west of Banks Creek	Modified Cross Section: 2-Lane Urban with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Shift to the north
2-8: West of Banks Creek to west of 20 Sideroad	2-Lane Rural with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Widen about the centerline
2-9: West 20 Sideroad to 20 Sideroad	Modified Cross Section: 2-Lane Urban with Paved Shoulders and Protection for 4 Lanes if Required in the Future (30m ROW)	Shift to the north
3: 20 Sideroad to east of Future Alcona Road South	5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW)	Shift to the north
4: East of Future Alcona Road South to Barrie GO Train Crossing	4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW)	Shift to the south
5: Barrie GO Train Crossing	4-Lane Urban with Multi-Use Path & Sidewalk (23m ROW)	Shift to the south
6: Barrie GO Train Crossing to East of Future Street A (Sleeping Lion)	5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)	Shift from the south to the north
7: East of Future Street A to East of Future Street C (Sleeping Lion)	3-Lane Urban with Shoulders and Multi-Use Path (26m ROW)	Widen road platform to the north
8 – East of Future Street C (Sleeping Lion) to St. John's Road	2-Lane Urban with Multi-Use Path (20m ROW)	Widen about the centerline

8 Preferred Design Concepts

The preferred designs were chosen with consideration to environmental impacts, cultural heritage impacts, safety, aesthetics, drainage, entrance access and property impacts, and capital construction and maintenance costs. This section presents the preferred designs that best incorporate these parameters. Consultation with agencies and the public helped arrive at the preferred designs discussed in this section.

8.1 Design Criteria

The design criteria for 6th Line are summarized in **Table 8-1** for County Road 27 to 20 Sideroad and in **Table 8-2** for 20 Sideroad to east of St. John's Road.

The proposed design accommodates a 100 km/h design speed (80 km/h posted speed limit) between County Road 27 and 20 Sideroad and an 80 km/h design speed (50-60 km/h posted speed limit) between 20 Sideroad and St. John's Road. The posted speed limit is proposed to be reduced to 60 km/h between 20 Sideroad and Cedar Creek, and to 50 km/h between Cedar Creek and St. John's Road.

Table 8-1: Design Criteria for 6th Line from County Road 27 to 20 Sideroad

	PRESENT CONDITIONS	PRESENT DESIGN STANDARDS	DESIRED DESIGN STANDARDS	PROPOSED DESIGN STANDARDS	REFERENCE
HIGHWAY CLASSIFICATION	RCU 100	RCU 100	RCU 100	RCU 100	
DESIGN SPEED		100 km/h	100 km/h	100 km/h	
POSTED SPEED	80 km/h	100 km/h	80 km/h	80 km/h	
MINIMUM STOPPING SIGHT DISTANCE	N/A	160-210 m	160-210 m	160-210 m	(TAC – page 1.2.5.4 Table 1.2.5.3)
MIN. EQUIV. VERTICAL CURVE (CREST)	N/A	45-80 m	45-80 m	45-80 m	Innisfil Design Standards Pg.7 (TAC – page 2.1.3.6 Table 2.1.3.2)
MIN. EQUIV. VERTICAL CURVE (SAG)	N/A	37-50 m (Headlight) 18-25 m (Comfort)	18-25 m (Comfort)	18-25 m (Comfort)	Innisfil Design Standards Pg.7 (TAC-Page 2.1.3.9. Table 2.1.3.4)
MININUM / MAXIMUM GRADIENT	N/A	0.5-7%	0.5-6%	0.5-6%	Innisfil Design Standards Pg.7 (TAC-Page 2.1.3.3) (TAC – page 2.1.3.2 Table 2.1.3.1)
MINIMUM CURVATURE	N/A	440 m	440 m	440 m	Innisfil Design Standards Pg.7 (TAC – page 2.1.2.8 Table 2.1.2.3)
SUPERELEVATION (ON CURVE)	N/A	6%	6%	6%	(TAC – page 2.1.2.3) (TAC – page 2.1.2.4)
LANE WIDTH	3.5 m approx.	3.5-3.7 m	3.75 m	3.75 m	Simcoe County Design Standards Pg.51 (TAC – page 2.2.2.1 Table 2.2.2.1)
LEFT TURN LANE WIDTH	N/A	N/A	3.5 m	3.5 m	
SHOULDER WIDTH	0.5 M	3.0 m shoulder 1.0 m (paved)	3.0 m shoulder 1.0 m (paved)	3.0 m paved shoulder	County of Simcoe Standards DWG no. ST-001
DRAINAGE ZONE					
R.O.W. WIDTH	20 m		30 m	30 m	Innisfil Design Standards Pg.7)

[1]Applies only at some locations
[2]Applies for the majority of the study area
NOTE 1: CROSS-SECTION ELEMENT WIDTHS MAY CHANGE DEPENDING ON AVAILABLE ROW WIDTHS
NOTE 2: ALTHOUGH HIGHER DESIGN SPEEDS ARE DESIRABLE, THEY MAY NOT BE ACHIEVABLE DUE TO EXISTING TERRAIN

Table 8-2: Design Criteria for 6th Line from 20 Sideroad to East of St. John's Road

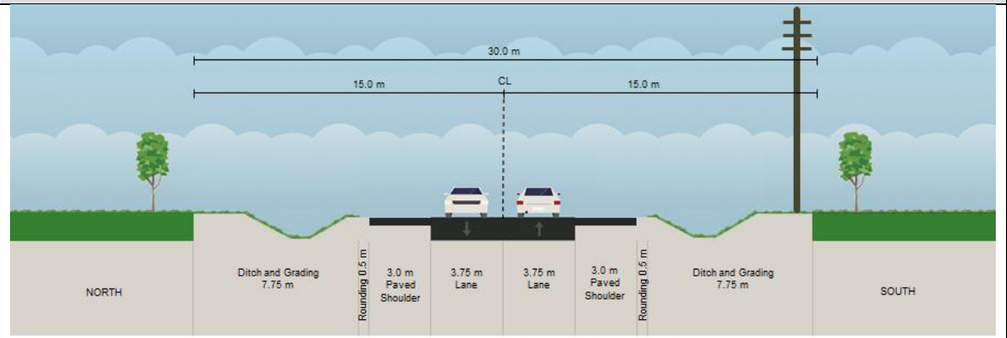
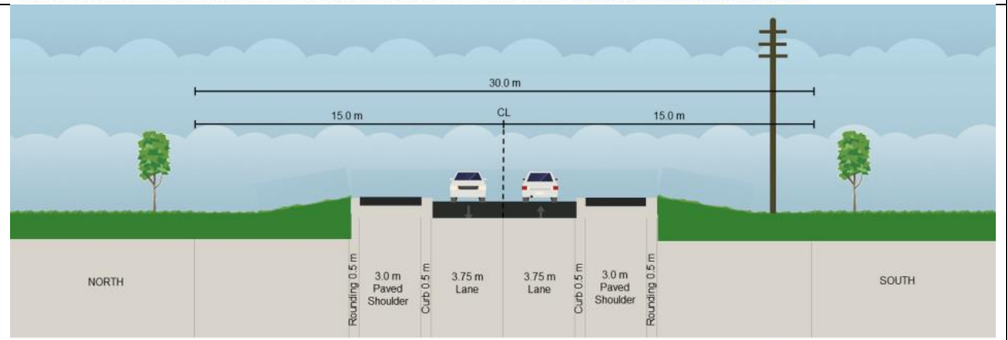
	PRESENT CONDITIONS	PRESENT DESIGN STANDARDS	DESIRED DESIGN STANDARDS	PROPOSED DESIGN STANDARDS	REFERENCE
HIGHWAY CLASSIFICATION	RCU 100	RCU 100	UCU 80	UCU 80	
DESIGN SPEED		100 km/h	80 km/h	80 km/h	
POSTED SPEED	50/80 km/h	100 km/h	60 km/h	50/60 km/h	
MINIMUM STOPPING SIGHT DISTANCE	N/A	160-210 m	115-140 m	115-140 m	(TAC – page 1.2.5.4 Table 1.2.5.3)
MIN. EQUIV. VERTICAL CURVE (CREST)	N/A	45-80 m	25 m	25 m	Innisfil Design Standards Pg.7 (TAC – page 2.1.3.6 Table 2.1.3.2) (TAC-Page 2.1.3.9. Table 2.1.3.4)
MIN. EQUIV. VERTICAL CURVE (SAG)	N/A	37-50 m (Headlight) 18-25 m (Comfort)	12 m (Comfort)	12 m (Comfort)	Innisfil Design Standards Pg.7 (TAC – page 2.1.3.6 Table 2.1.3.2) (TAC-Page 2.1.3.9. Table 2.1.3.4)
MININUM / MAXIMUM GRADIENT	N/A	0.5-7%	0.5-6%	0.5-6%	Innisfil Design Standards Pg.7 (TAC-Page 2.1.3.3) (TAC – page 2.1.3.2 Table 2.1.3.1)
MINIMUM CURVATURE	N/A	440 m	190 m	190 m	Innisfil Design Standards Pg.7 (TAC – page 2.1.2.8 Table 2.1.2.3)
SUPERELEVATION (ON CURVE)	N/A	6%	4%	4%	(TAC – page 2.1.2.3) (TAC – page 2.1.2.4)
LANE WIDTH	3.5 m approx.	3.5-3.7 m	3.5 m	3.5 m	Innisfil Design Standards Pg.7 (TAC – page 2.2.2.1 Table 2.2.2.1)
LEFT TURN LANE WIDTH	N/A	N/A	3.5 m	3.5 m	
SHOULDER WIDTH	0.5 m	3.0 m shoulder 1.0 m (paved)	N/A	N/A	County of Simcoe Standards DWG no. ST-004
DRAINAGE ZONE					
R.O.W. WIDTH	20 m		30 m	20-30 m	Innisfil Design Standards Pg.7

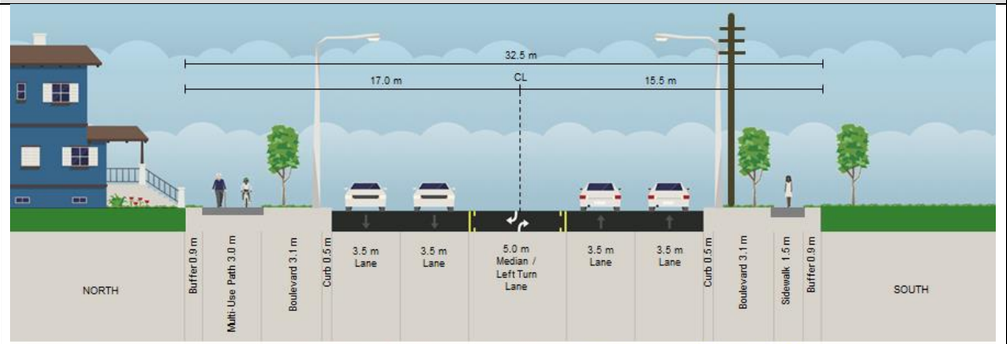
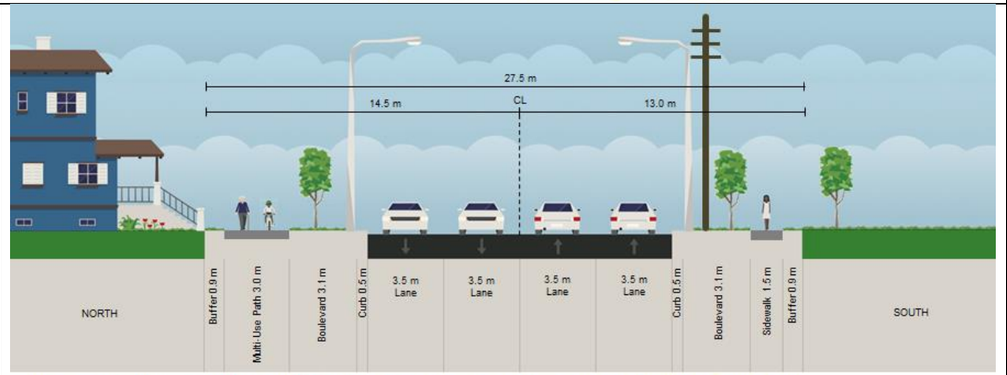
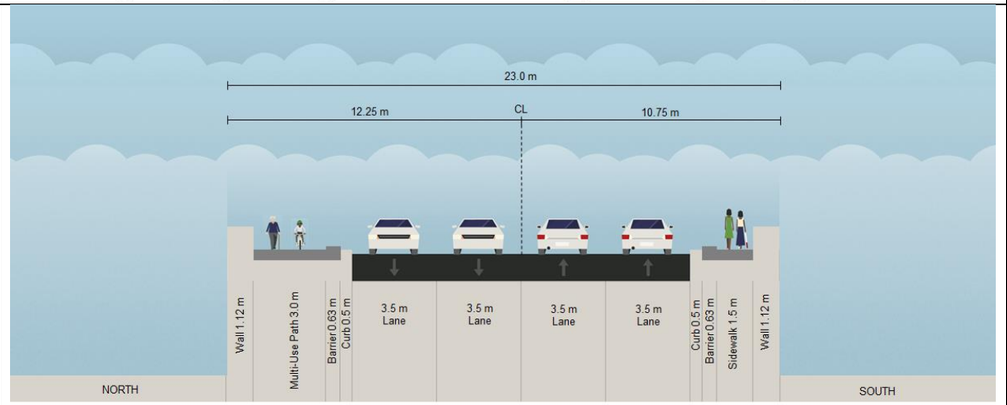
[1]Applies only at some locations
[2]Applies for the majority of the study area
NOTE 1: CROSS-SECTION ELEMENT WIDTHS MAY CHANGE DEPENDING ON AVAILABLE ROW WIDTHS
NOTE 2: ALTHOUGH HIGHER DESIGN SPEEDS ARE DESIRABLE, THEY MAY NOT BE ACHIEVABLE DUE TO EXISTING TERRAIN

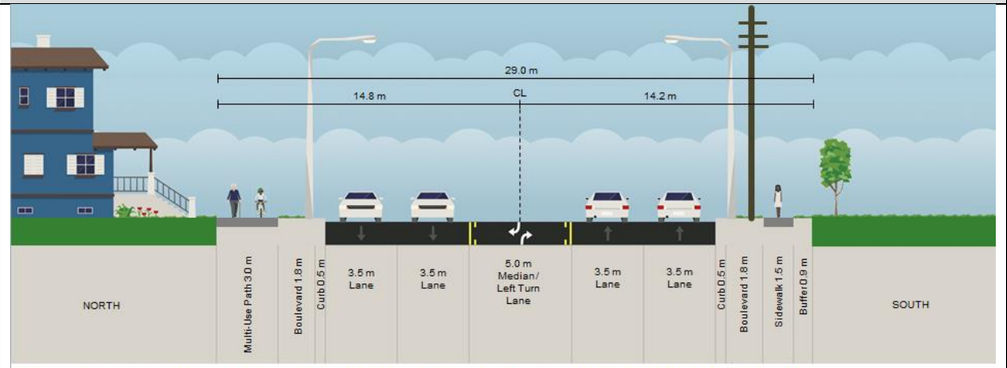
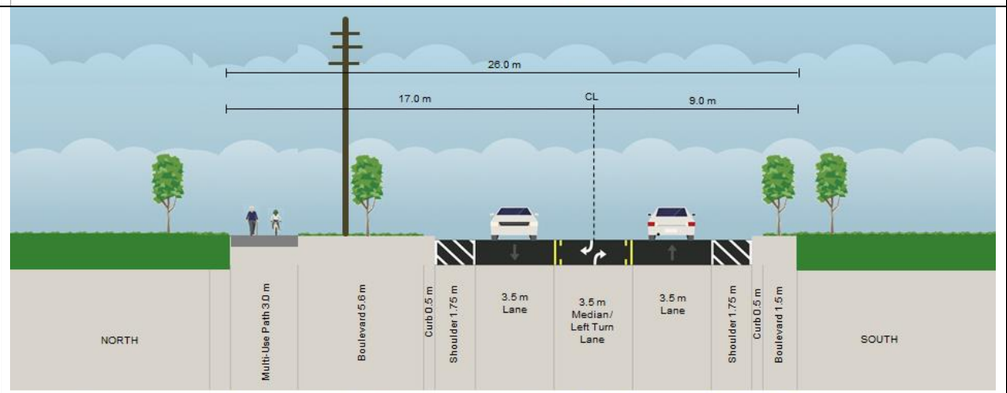
8.2 Typical Cross-Section

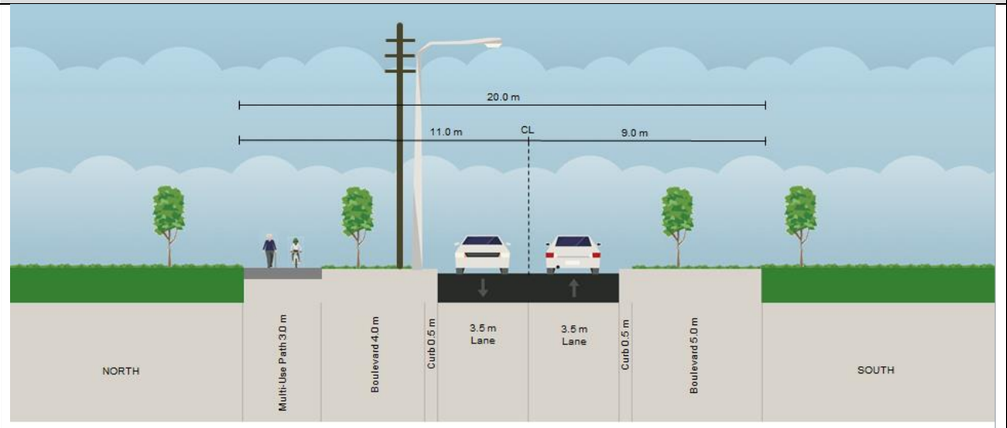
Multiple cross-sections were developed with variations amongst the different segments to accommodate active transportation facilities, protect for future widening if required, and minimize grading impacts to adjacent properties and features (see Sections 6 and 7). The preferred cross-sections are summarized in **Table 8-3.**

Table 8-3: Typical Cross-Sections

Description	Typical Cross-Section	Segment (s)
2-Lane Rural with Paved Shoulders (30m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **1** • **2-1** • **2-2** • **2-4** • **2-6** • **2-8**
2-Lane Urban with Paved Shoulders (30m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **2-3** • **2-5** • **2-7** • **2-9**

Description	Typical Cross-Section	Segment (s)
5-Lane Urban with Multi-Use Path & Sidewalk (32.5m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **3**
4-Lane Urban with Multi-Use Path & Sidewalk (27.5m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **4**
4-Lane Urban with Multi-Use Path & Sidewalk (Barrie GO Train Crossing) (23m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **5**

Description	Typical Cross-Section	Segment (s)
5-Lane Urban with Multi-Use Path & Sidewalk (29m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **6**
3-Lane Urban with Multi-Use Path (26m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **7**

Description	Typical Cross-Section	Segment (s)
2-Lane Urban with Multi-Use Path (20m ROW)	 Reference: This image was created using Streetmix and is subject to the Creative Commons BY-SA 3.0 license (http://creativecommons.org/licenses/by-sa/3.0/).	• **8**

8.3 Horizontal Alignment

The proposed horizontal alignment generally follows the existing road centreline with the exception of localized shifts to avoid constraints and minimize impacts to sensitive features, as described in the evaluation presented in **Section 7.1**. **Table 8-4** identifies the approximate location of these shifts and the proposed horizontal alignment is illustrated on the conceptual design plates described in **Section 8.10** and provided in **Appendix N**.

Table 8-4: Location of Localized Shifts in Horizontal Alignment

From (Station)	To (Station)	Preferred Alignment (Horizontal)
12+660	13+220	Shift to the south by up to 4m to minimize impacts to property on the north side.
18+800	19+500	Shift to the north by up to 6m to minimize impacts to the wooded area and cemetery on the south side.
20+140	20+740	Shift to the north by up to 2m to balance impacts to properties on both sides of the road.
22+000	22+900	Shift to the north by up to 6m to minimize impact to vegetation and the residential property and built heritage resource east of 20 Sideroad on the south side. This alignment shift also minimizes impacts to residential properties west of 20 Sideroad.
22+900	23+700	Shift to the south by up to 3.5m to minimize impacts to built heritage resources and residential properties on the north side and accommodate staging of bridge construction.

8.4 Vertical Alignment

The proposed vertical profile aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road to the extent possible. The proposed vertical alignment follows the design criteria in **Section 8.1**. **Table 8-5** identifies the approximate location of deviations from the existing vertical alignment in excess of 1 metre. The proposed vertical alignment is illustrated on the conceptual design plates presented in **Section 8.10**.

Table 8-5: Location of Localized Shifts in Vertical Alignment

From (Station)	To (Station)	Preferred Alignment (Vertical)
13+420	13+480	Shift to meet geometric standards.
13+820	13+860	Shift to meet geometric standards.
13+940	14+00	Shift to meet geometric standards.
18+120	18+620	Shift to meet geometric standards.
19+040	19+100	Shift to meet geometric standards.
23+200	23+720	Apply a 6% grade at Barrie GO Train Line Crossing to accommodate cyclists, pedestrians, and potential electrification of GO Line in the future. Minimize impacts to nearby development, natural and socio-economic environments. Meets or exceeds minimum geometric standards.
24+000	24+100	Shift to accommodate enclosed storm system.
24+420	24+560	Shift to accommodate enclosed storm system.

8.5 Active Transportation Facilities

Active transportation, including cycling and pedestrian activity, is accommodated through a combination of paved shoulders, sidewalks and multi-use paths within the boulevard as summarized in **Table 8-6**.

Table 8-6: Summary of Active Transportation Facilities

Segment	Active Transportation Facility
County Road 27 to 20 Sideroad	Paved Shoulders
20 Sideroad to east of Future Street A (Sleeping Lion)	Multi-use path on north side and sidewalk on south side
East of Future Street A (Sleeping Lion) to St. John's Road	Multi-use path on north side.

Paved shoulders are generally provided in the more rural areas, with sidewalks and multi-use paths provided in locations with planned development. East of Future Street A (Sleeping Lion), the sidewalk on the south side was excluded to minimize impacts to the adjacent wetland. A multi-use path is still provided on the north side along this segment, adjacent to the Sleeping Lion development. The exact placement of the active transportation facilities within the boulevard can be revisited/optimized during detailed design to minimize impacts to utilities and the adjacent development.

8.6 Intersection Recommendations

Signalization is proposed at the intersections of 6th Line/Yonge Street, 6th Line/20 Sideroad, 6th Line/Future Alcona Road South and 6th Line/Future Street A (Sleeping Lion Development). Stop control at all other intersections is proposed to remain as per existing conditions.

Left turn lanes are provided at all signalized intersections for safety, with standard left-turn storage lengths based on minimum geometric design standards based on TAC Guidelines (Table 1.2.5.3, Page 2.3.8.7, and Table 2.3.8.1), with the exception of the 6th Line/Yonge Street intersection which used a reduced storage length to minimize the impact to the existing properties and driveway entrances.

8.7 Geotechnical Recommendations

8.7.1 Foundations

Highway 400 / 6th Line Overpass

The existing native subsoil at the Highway 400/6th Line Overpass generally consists of hard clayey silt till, with SPT 'N'-values typically greater than 100 blows per 0.3 m of penetration. Based on these subsurface conditions, it is recommended that new foundations, if required for a potential bridge extension/widening/replacement structure, be founded on spread footing placed on the hard clayey silt till. Consideration could also be given to the use of perched abutments founded on spread footings placed on a compacted granular pad above the clayey silt till soils within the approach embankments.

Metrolinx / 6th Line Overpass

The existing native subsoil at the 6th Line/Metrolinx Overpass generally consist of dense to very dense silt and sand till to sandy silt till. Based on these subsurface conditions, it is recommended that new foundations for the proposed widened /replaced structure be founded on spread footings placed on the dense to very dense silt and sand till to sandy silt till.

Detailed recommendations related to the preliminary foundation options are provided in **Appendix G**.

8.7.2 Pavement

The existing pavement conditions along 6th Line are described in **Section 3.3.1.** Based on the results of the pavement investigation and laboratory testing, the existing pavement on 6th Line is significantly structurally deficient to carry future traffic.

Based on the traffic load and pavement structural analysis, the following reconstruction / widening strategies are recommended for 6th Line between County Road 27 and 20 Sideroad:

Option 1 (Grade raise of ~ 440 mm)

Remove the existing surface treatment to provide for:

- 40 mm HL-3 Surface course
- 100 mm HL-8 Binder course (in two 50 mm lifts)
- 300 mm Granular A, Base

Option 2 (Full Depth Reconstruction)

- 40 mm HL-3 Surface course
- 100 mm HL-8 Binder course (in two 50 mm lifts)
- 150 mm Granular A, Base
- 500 mm Granular B, Type I, Sub-base (minimum)

Based on the traffic load and pavement structural analysis, the following reconstruction / widening strategies are recommended for 6th Line between 20 Sideroad and St. John's Road:

Option 1 (Grade raise greater than 440 mm)

Remove the existing surface treatment to provide for:

- 40 mm HL-3 Surface course
- 100 mm HL-8 Binder course (in two 50 mm lifts)
- 300 mm Granular A, Base

Option 2 (Full Depth Reconstruction and Grade Raise Less than 440 mm)

- 40 mm HL-3 Surface course
- 100 mm HL-8 Binder course (in two 50 mm lifts)
- 150 mm Granular A, Base
- 450 mm Granular B, Type I, Sub-base (minimum)

Detailed recommendations related to the pavement designs are provided in **Appendix F**.

8.8 Drainage and Stormwater Management Plan

The following sub-sections detail the recommended stormwater management approach for the preferred design of the 6th Line corridor between County Road 27 to St. John's Road.

8.8.1 Minor and Major Drainage System

The proposed roadway corridor improvements will consist of rural and urban roadway cross-sections. The overall existing drainage patterns and locations will not be altered with the proposed roadway improvements. The proposed roadway drainage will be collected by roadside ditches or storm sewers that will outlet to a watercourse as per existing drainage pattern.

It is expected that the quantity of runoff from the paved section of the roadway will generally result only in a very minor increase in runoff, and as such, specific techniques to reduce the quantity and rate of runoff will be considered during detailed design stage. The roadway design should ensure that the major system runoff up to the 100-year event can be safely conveyed to watercourse locations and should allow one lane in each direction to be clear of any flooding. At detailed design, quantity control will be required to control the 2 through 100 year storm events to pre-development rates.

8.8.2 Crossing Culverts

There are a total of twenty-seven (27) crossing culverts within the study limits. Based on the Ministry of Transportation Design Guideline and the existing cross culverts hydraulic performance, the proposed improvements to 6th Line corridor will result the following crossing culverts improvements:

- Replace crossing culverts (same size): 01-04, 01-12, 01-13, 01-14, 01-18, 01-19, 03-02
- Replace crossing culverts (upgrading size): 01-01, 01-02, 01-05, 01-09, 01-10, 01-11, 01-15, 01-17, 01-22, 01-24, 03-02, 03-03
- Maintain culverts and provide culvert extension: 01-03, 01-06, 01-07, 01-08, 01-16, 01-20, 01-21, 01-23, 03-01

It should be noted that where feasible, open bottom culverts are preferred by the conservation authorities to minimize impact to the ecosystem.

It should also be noted that during a regional storm, there is a regulated spill entering Watercourse 6 from Watercourse 7. This spill should be taken into account during detailed design to show that there will be no adverse effects to the watercourse, natural heritage features, extent of floodplain limits, the 6th Line and associated infrastructure such as culverts.

For details of the culvert recommendations, refer to the Stormwater Management Report provided in **Appendix M**. These recommendations are to be confirmed during detailed design.

8.8.3 Stormwater Management Plan

The stormwater management plan has been designed to comply with the MOE Stormwater Management Planning and Design Manual (March 2003), Town of Innisfil Engineering Design Standards and Specifications Manual (June 2011), NVCA Stormwater Technical Guide (December 2013), and LSRCA Technical Guideline for Stormwater Management Submission (April 2013). Stormwater management (water quality) measures within the study limits will be designed to provide "Enhanced" protection (Level 1), to augment, as a minimum, the increased pavement area project-wide.

Stormwater Management Practices (SWMP's) for the management of roadway runoff generally fall into two categories; those that address water quantity and those that manage water quality of surface runoff. Water quantity management issues relate to properly sizing watercourse crossings of the roadway corridor, as well as the conveyance of roadway runoff along the roadway corridor for minor and major storm events. In addition, water quantity management strategies can include the need for facilities to address downstream flood and erosion potential from the development (expansion) of the roadway right-of-way.

Due to the nature of this facility (i.e. linear transportation corridor) and the limited space within the roadway right-of-way, various Best Management Practices (BMPs) for stormwater management were reviewed and assessed for their applicability to address both the quantity and quality control of runoff from roadway improvements. There are a number of SWMP's which can be used to treat runoff and / or control peak flows from roadway surfaces. These include the following:

1. Roadside Ditch/Grassed Swales
2. Curb & Gutter/Catch Basins
3. Oil Grit Separator
4. Underground Seepage Beds
5. Soil Trench System – Underground Modular Cell Matrix
6. Stormwater Management Pond

The stormwater best management practices options were assessed based on existing drainage patterns and the proposed roadway improvements proposed for each segment of the corridor.

The road segments within the NVCA jurisdiction area are rural, where roadside ditches/grassed swales are the preferred options to provide water quality and water quantity control to a total pavement area 12.40 ha. The stormwater management approach within the

LSRCA watershed will include Low Impact Development (LID) features as part of a treatment train approach to manage water quality and quantity to a total pavement area of 4.53 ha within the LSRCA jurisdictional area.

It is recommended that roadside ditches and grassed swales be contained within the road right-of-way to minimize grading impacts to natural areas outside of the right-of-way limits.

Details of the stormwater management strategies are included in the Stormwater Management Report (**Appendix M**). Stormwater management strategies shall be confirmed during detailed design and follow the most current LSRCA Technical Guidelines and other guidelines/manuals as appropriate at the time of detailed design.

8.9 Utilities

As noted in the **Section 3.7**, several utilities are located within the study corridor. The utility assessment determined the location of existing and planned utilities and identified potential conflicts, including the need to relocate hydro poles. The location and alignment of existing municipal services and formal definition of impacts on utilities are to be confirmed during detailed design. Coordination of utility relocations is not within the scope of this EA; however, coordination with the various utility agencies will be undertaken during the detailed design stage.

All utility information should be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary. During detailed design, meetings will be held with utility companies as required where potential impacts to existing or future services are identified.

8.10 Constructability and Staging

The construction staging will focus on being able to maintain vehicular traffic movements equal to preconstruction levels whenever possible during construction. Impacts will be temporary in nature and the Town will attempt to mitigate impacts as much as possible. Access to all properties during construction is to be maintained at all times.

During detailed design, a traffic management plan should be developed to determine how traffic access will be accommodated during construction and how access to properties adjacent to 6th Line will be maintained.

8.11 Construction Monitoring and Maintenance Considerations

The reconstruction of 6th Line should be staged to maintain both local and through traffic within the Study Area to the extent possible, and minimize disruptions. Any necessary interruptions to traffic should be kept brief and to a minimum.

Property owners and tenants may experience temporary interruptions to their property access during construction. To reduce this impact, all property owners should be notified prior to construction and in advance of work related to their access. Detailed design plans should include details to describe how temporary accesses will be maintained, and contract specifications should specify the allowable lengths of closures and the notification requirements to property owners.

Construction of the improvements has the potential to create noise and dust for the adjacent property owners. Construction noise is temporary noise and will vary periodically during the construction depending on the specific activities being performed. Contract specifications should include provisions to define the allowable work hours, in accordance with local ordinances, to minimize impacts to the adjacent landowners in the evenings. However, some consideration should be given to the ability of completing the work in a lesser duration by allowing longer work hours. The impact of construction noise will vary based on the type of equipment used, number of pieces of equipment, time and duration of operation, and the proximity to noise sensitive receivers in question. Construction noise can be kept to a minimum through the use of well maintained equipment with appropriate noise controls by the contractors.

It is recommended that during the construction period, the following be considered:

- All pertinent noise by-laws to be adhered to.
- General noise control measures to be included in contract documents where applicable.
- Any noise complaints or concerns to be investigated to ensure compliance with the noise control measures as recommended in the contract documents. The contractor shall be warned for non-compliance and the contract shall be enforced.
- Additional noise control measures are to be investigated in accordance with the MOECC sound level criteria for construction equipment if a persistent complaint has been made.

Removal of the existing paved surface and existing landscaping will expose native soils to wind and rain erosion, and result in a temporary increase in dust in the project area. This dust can become airborne as construction traffic runs on the exposed ground, and may be noticeable by the adjacent property owners. This increase in dust levels will be temporary, and the application of best management practices, including the application of non-chloride dust suppressants, by the contractor during his normal operations can help to minimize the exposure of native soils to wind and rain erosion, and mitigate any air quality impacts caused by construction dust.

All waste generated during construction must be disposed of in accordance with ministry requirements and best management practices. Contractors must be made aware of all

environmental considerations so that all environmental standards and commitments for both construction and operation are met.

Construction and post-construction monitoring plans should be developed during detailed design in consultation with MOECC and other regulatory agencies.

8.12 Conceptual Design Plates

Refer to **Appendix N** for plan and profile design plates illustrating the preferred conceptual design for 6th Line.

8.13 High Level Cost Estimate

High level cost estimates for the recommended designs are summarized in **Table 8-7**. More details on the high level cost estimate for each road segment are provided in **Appendix O**.

Table 8-7: Preliminary Cost Estimate

Road Segment	Cost ($ million)
County Road 27 to 5 Sideroad	11.4
5 Sideroad to 10 Sideroad	11.3
10 Sideroad to Yonge Street	10.5
Yonge Street to 20 Sideroad	12.2
20 Sideroad to St. John's Road	21.7
Total	*67.1*

8.14 Impacts and Mitigation

A summary of the potential impacts to the natural, social/economic and cultural environments together with recommended mitigation measures is provided in **Table 8-8**, based on the details provided in the previous sections.

Table 8-8: Summary of Anticipated Impacts and Proposed Mitigation Measures

Factor	Anticipated Impact	Proposed Mitigation
Social Environment		
Land Use and Socio-Economic Impacts	• Impacts on residents during construction.	• Prior to construction, specific notices and contact information should be delivered to area residents and property owners informing them of construction details. • Maintain access to individual driveways during construction.
Archaeology	• Potential for identification of Aboriginal Euro-Canadian archaeological resources.	• Lands beyond the road right-of-way identified as possessing archaeological potential should be subject to a Stage 2 archaeological assessment prior to any proposed impacts by the project. • A Euro-Canadian cemetery was identified adjacent to the study area (Yonge Street Intersection), and will therefore require avoidance and a Stage 3 cemetery investigation.
Noise	• Due to a projected increase in the traffic volume, the noise levels within the study area are projected to increase by more than 5 dBA. • Potential for construction related noise impacts.	• The provision of a continuous acoustic barrier is not expected to be technically feasible, as an acoustic barrier with the required surface gap / break to provide safe access to residences is not expected to provide the recommended acoustical performance. Mitigation is therefore not recommended as a component of the Project. • An outline regarding construction noise, a noise complaint process, and the applicable noise by-law during the construction phase of the project has been provided in **Appendix E**. Based on a review of available information, an exemption for the applicable by-law may be required and may be possible, as has been the case for other construction projects in the Town.
Property Requirements	• Property acquisition and construction easements as a result of the proposed design.	• During detailed design, permanent easements could be considered, and modifications to grading slopes (in accordance with geotechnical recommendations) to reduce the amount of area required, or in some cases a retaining wall or other type of soil retention feature could be considered to minimize the grading footprint.
Safety	• Safety for corridor users	• Changes to horizontal and vertical profiles will maintain or improve upon existing conditions to provide sufficient stopping sight distance in accordance with the Town's geometric standards, Simcoe geometric standards, and/or TAC geometric standards, as appropriate. • New signalized intersections and added left-turn lanes will facilitate safer turning movements into and out of proposed developments and crossing roads.

Factor	Anticipated Impact	Proposed Mitigation
Utilities	• Potential impacts to existing utilities.	• Coordination of utility relocations is not within the scope of this EA; however, coordination with the various utility agencies will be undertaken during the detailed design stage.
Built Heritage and Cultural Landscapes	County Road 27 to 20 Sideroad: • CHL 7 and CHL 9 are expected to be significantly impacted through the potential demolition of buildings, alteration to the landscape setting, and the introduction of elements that are not in keeping with the historic setting of these properties (i.e. construction of new sidewalks and reduced setbacks). • Potential impacts to cemetery adjacent to 6th Line (CHL 18). • Potential impacts to trees, including tree removals. • CHL 1, CHL 12-13, CHL 17, and CHL 20- 22 are expected to be impacted through alteration to setting by the removal of replaceable landscape features (i.e. shrubs and young trees) and the introduction of elements that are not in keeping with the historic setting of these resources (i.e. road widening). • At present, it is understood that there will be no impacts to the mature trees located adjacent to the 6th Line ROW at BHR 1. Should this change during detailed design, BHR 1 should be included in the cultural heritage landscape documentation report.	• Staging and construction activities should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources. • A resource-specific heritage impact statement should be carried out for CHL 7 and 9 prior to construction to evaluate the cultural heritage value of these resources, identify cultural heritage attributes, and develop appropriate mitigation measures. Potential mitigation measures may include landscape documentation prior to construction and post-construction landscaping to restore pre-construction conditions. • A cemetery investigation is recommended for one resource (CHL 18) since construction activities are planned within the 6th Line right-of-way (ROW) adjacent to the cemetery. The cemetery investigation should be carried out to confirm the presence or absence of unmarked graves. Such an assessment typically entails mechanical striping of topsoil and examining the subsoil for the presence of grave shafts under the supervision of a licensed archaeologist. This work will be done in accordance with the MTCS's 2011 Standards and Guidelines for Consultant Archaeologists and the Ontario Cemeteries Act. • The feasibility of implementing tree protection zones should be investigated for all identified cultural heritage resources where tree removals are planned. • A cultural heritage landscape documentation report should be prepared for CHL 1, CHL 12-13, CHL 17, and CHL 20- 22 by a qualified heritage consultant in advance of construction activities to create a record of the existing conditions of these resources.

Factor	Anticipated Impact	Proposed Mitigation
	20 Sideroad to St. John's Road • BHR 2 and BHR 4 are expected to be significantly impacted through the potential demolition of structure, alteration to the landscape setting, and the introduction of elements that are not in keeping with the historic setting of these properties (i.e. construction of multi-use path and wider roads). • Potential impacts to trees, including tree removals. • BHR 3, BHR 5, CHL 1, CHL 3, and CHL 4 are expected to be impacted through alteration to setting by the removal of replaceable landscape features (i.e. shrubs and young trees) and the introduction of elements that are not in keeping with the historic setting of these resources (i.e. construction wider road and/or multi-use path).	• Staging and construction activities should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources. • A resource-specific heritage impact statement should be carried out for BHR 2 and 4 prior to construction to evaluate the cultural heritage value of these resources, identify cultural heritage attributes, and develop appropriate mitigation measures. Potential mitigation measures may include landscape documentation prior to construction and post-construction landscaping to restore pre-construction conditions. • The feasibility of implementing tree protection zones should be investigated for all identified cultural heritage resources where tree removals are planned. • A cultural heritage landscape documentation report should be prepared for BHR 3, BHR 5, CHL 1, CHL 3, and CHL 4 by a qualified heritage consultant in advance of construction activities to create a record of the existing conditions of these resources. • Post-construction landscaping and rehabilitation plans should be undertaken in a manner that is sympathetic to the overall setting. Wherever possible, landscaping with appropriate/sympathetic historic plant materials is recommended, and fence rows should be preserved where extant. Post-construction landscaping is recommended for BHR 3, BHR 5, CHL 1, and CHL 3-4 and for all properties that will be subject to the removal of vegetation or replaceable landscape features (i.e. young trees, shrubs, and fence lines) during construction.
Natural Environment		
Wetlands	• A total of seven (7) wetland community types will be impact as a result of the improvements to 6th Line. These communities include Forb-Mineral Meadow Marsh (MAM2-10), Cattail Mineral Shallow Marsh (MAS2-1), White Cedar Mineral Coniferous Swamp (SWC1-1), Deciduous Swamp (SWD), Green Ash Mineral Deciduous Swamp (SWD2-2), Mineral Thicket Swamp (SWT2), and Willow Mineral Swamp Thicket (SWT2-2). • Impacts to the swamp communities will result in the removal of a small portion of the communities adjacent to the existing 6th Line right-of-way creating a new community edge. Impacts to the Ash Deciduous Swamp (SWD2-2) and White Cedar Coniferous Swamp (SWC1-1) will result in the removal of a small portion of the Lover's Creek PSW Complex.	• Proposed designs have been developed in consultation with MNRF, NVCA, and LSRCA, and have aimed to minimize impacts to wetlands by shifting the road alignment and/or modifying the cross-section to reduce the construction footprint. • Edge management techniques using suitable plant species should be employed to mitigate any negative impacts to these vegetation communities. During detailed design, appropriate edge management measures will be developed. Overall, impacts resulting from the proposed improvements to 6th Line will not have a negative impact on the remaining portions of swamp communities throughout the study area. • Compensation for the loss of wetland should be determined in consultation with the Town of Innisfil, LSRCA and NVCA staff. LSRCA has recommended that the wetland lost as a result of this project be compensated for at a 3:1 ratio as per the LSRCA Ecological Offsetting Strategy. The negotiation of a wetland compensation ratio based on LSRCA policy, and other details related to this task should be finalized at the detailed design stage. • At detailed design, a mitigation plan will be provided to account for any impacts and unavoidable loss to natural heritage features such as wetlands and woodlands, to the satisfaction of the LRCA and NVCA.

Factor	Anticipated Impact	Proposed Mitigation
Soil Removal and Contaminants	• The Contamination Overview Study revealed that the study area contains twenty-two (22) properties with issues of potential environmental concern.	• If subsurface work is to be conducted in the vicinity of these properties, further intrusive investigations may be required. If impact is encountered, it should be managed in consultation with a qualified professional.

Soil Disturbance and Potential for Erosion	• Soil disturbance within the 6th Line study area will be limited to the previously disturbed areas, with some exceptions, where grading will be required in natural areas. Impacts resulting from any excavating or cut and fill operations will be temporary in nature.	• Erosion and sedimentation mitigation measures will be implemented prior to and during the construction phase.
		• A Sediment and Erosion Control Plan will be prepared during detailed design. These control measures will include:
		  ○ Limiting the geographical extent and duration that soils are exposed to the elements;
		  ○ Implementing standard erosion and sedimentation control measures in accordance with Ontario Provincial Standard Specification (OPSS) 805 Construction Specification for Temporary Erosion and Sediment Control Measures. These standard measures include: silt fence placed along the margins of areas of soil disturbance; applying conventional seed and mulch and/or erosion control blanket in areas of soil disturbance to provide adequate slope protection and long term slope stabilization; and,
		• Managing surface water outside of work areas to prevent water from coming in contact with exposed soils.

Fisheries and Aquatic Habitat	• The proposed widening of 6th Line will directly affect fish habitat within the project limits. All watercourses within the study area support seasonal or indirect fish habitat. Crossings B, C, D, F, H, and J within the project limits support seasonal fish habitat, and crossings A, E, G, and I support indirect fish habitat.
	• Cedar Creek flows east along the south ditch of 6th Line and supports direct fish habitat downstream of Crossing 2 and seasonal direct fish habitat downstream of Crossing 1. According to the conceptual design, the grading limits are being extended to the north and south of 6th Line, and therefore will be encroaching into Cedar Creek. In addition, one entrance culvert which provides direct fish habitat at Cedar Creek to the South of 6th Line, labelled as (CUL_02-74) in the HDR Culvert Inspection Report is also being affected.
	• Because the watercourse within the grading limits, and at the crossing locations provide fish habitat, the proposed widening works have the potential to result in 'serious harm' to fish habitat due to the following effects:
	  ○ temporary disruption of site-specific habitat
	  ○ changes to water quality and quantity
	  ○ changes in water temperature
	  ○ barriers to fish passage
	• Refer to **Table 8-9** for summary of proposed works and anticipated impacts at specific watercourse crossing locations.
		• The proposed conceptual design works at all crossings along 6th Line verified as fish habitat do not meet the self-assessment criteria, due to the necessity of culvert extensions to facilitate the road widening. DFO review will be required, and 'serious harm' to fish may occur. A 'Request for Review' will be submitted to DFO during detailed design to determine if an authorization under the Fisheries Act is required. If it is required, the completed Application Form for Paragraph 35(2) (b) Fisheries Act Authorization (Normal Circumstances) will be submitted to DFO for review. This submission will be made during detailed design. Preliminary assessment in the natural heritage report indicates that serious harm is not likely, however this is to be confirmed during detailed design.
		• Refer to **Table 8-9** for summary of proposed works and site-specific mitigation measures. Details are included in the natural heritage report in **Appendix I**.
		• In-water work timing windows will be confirmed during detailed design.
		• Fish isolated by construction activities will be captured and safely released to the watercourse. A Licence to Collect Fish for Scientific Purposes under the *Fish and Wildlife Conservation Act (1997)* is required from the MNRF to capture and transfer fish.
		• Where watercourse realignments are required, natural channel design options will be proposed. Where proposed realignment may impact adjacent natural heritage features (i.e. wetlands, woodlands, etc.) an evaluation will be completed to determine appropriate mitigation and design to minimize impacts, to the satisfaction of the Conservation Authority.

Factor	Anticipated Impact	Proposed Mitigation
Water Quality	• The construction associated with the proposed works has the potential to alter water quality through on-site erosion of exposed materials and the subsequent impairment of downstream water quality with sediments and other contaminants.	• Changes to water quality will be mitigated through construction occurring during the driest time of the year, isolation of the work areas behind cofferdams, the treatment of effluent from unwatering prior to its release back into the receiving watercourses, and the deployment and maintenance of erosion and sediment controls (silt fencing, flow checks, etc.) which will prevent sediments from reaching the watercourses from exposed soils upslope. • Refuelling and construction staging areas where contaminants are handled should be located off-site where possible, or well away from the waterbodies. Equipment refuelling should take place on impermeable pads or buried liners designed to allow full containment of spills. • A treatment train approach that includes Low Impact Development (LID) features will be incorporated into the design to achieve water quality targets. Enhanced bio-swales and/or oil grit separators are examples of possible treatment options to be considered to treat water prior to it entering a watercourse. In addition, all exposed areas will be vegetated as quickly as possible once work is completed.
Water Quantity	• The construction associated with the proposed works has the potential to alter water quantity through the addition of paved surface.	• Quantity control will be required to control the 2 through 100 year storm events to pre-development rates.
Groundwater	• There is potential for impact to groundwater resources as a result of: o Construction de-watering; o Reduction in groundwater recharge associated with expanded pavement surfaces; o Installation of sewers, water mains, culvert and bridge foundations and drainage improvements below the water table; o Road profile lowering in areas of high water table; • Increased use of road salt over a larger area associated with the expanded road and increased traffic.	• It is recommended that the potential impacts be re-assessed along with more detailed site specific hydrogeological data at the detailed design stage of the project and appropriate mitigation measures incorporated into the design. Based on the findings of the re-assessment, Permits to Take Water for construction should be applied for and a pre-construction survey and baseline water quality assessment be implemented as necessary prior to construction. • Groundwater condition is to be further investigated during detailed design to confirm any future work will ensure groundwater quantity and quality are maintained.
Wildlife and Wildlife Habitat	• Modification and widening of 6th Line have the potential to result in the displacement of and disturbance to wildlife and wildlife habitat. Effects on wildlife related to these modifications may include: o displacement of wildlife and wildlife habitat; o barrier effects on wildlife passage; o wildlife/vehicle conflicts; o disturbance to wildlife from noise, light and visual intrusion; o potential impacts to migratory birds; and, o Displacement of rare, threatened, or endangered wildlife and significant wildlife habitat. • The MNRF has identified a deer core/shelter (stratum 1) wintering area at the south end of the Lover's Creek PSW. Potential deer/vehicle collisions resulting from the road widening could represent a significant social and species specific concern.	• Only minimal infringement to the edge of natural heritage features will occur as a result of road modification and widening of 6th Line. Modification and widening of 6th Line within and beyond the right-of-way is not expected to have any significant impact on wildlife and/or wildlife habitat. • Opportunities for facilitation of wildlife passage (target species likely small mammals and herpetofauna) should be explored at detailed design at the culvert replacement locations. • Construction duration and disturbance in the vicinity of culverts and bridges should be minimized to the extent possible to reduce the potential for increase in road mortality caused by wildlife avoidance of these structures. • Given that wildlife are acclimatized to the presence of the existing 6th Line right-of-way in the study area, the tolerance of the wildlife assemblage to human activities and the limited zone of influence of the proposed widening, disturbance to wildlife from noise, light and visual intrusion will have no significant adverse effects.

Factor	Anticipated Impact	Proposed Mitigation
		• It is recommended that disturbance, clearing or disruption of vegetation where birds may be nesting should be completed outside the window of April 1 to August 31 to avoid the breeding bird season for the majority of the bird species protected under the act. In the event that these activities must be undertaken from April 1 to August 31, a nest screening survey will be conducted by a qualified avian biologist. If an active nest is located, a mitigation plan shall be developed and provided to Environment Canada – Ontario Region for review prior to implementation. As noted in earlier sections of this report, a single Cliff Swallow nest was found under the south side of the Highway 400 bridge structure. The Cliff Swallow is protected under the MBCA. • Further correspondence with the MNRF will be required during detailed design to discuss the species at risk located within the study area, to confirm the impacts to the Bobolink and Eastern Meadowlark habitats are avoided (to the extent possible), and to develop appropriate environmental protection/mitigation measures in order to meet MNRF's regulations under the ESA. • An evaluation of deer movement across 6th Line, and in particular the area near the deer wintering area, should be completed at the detailed design stage. If studies reveal significant deer movement in this area, mitigation measures will need to be incorporated.
Vegetation and Vegetation Communities	• Improvements to 6th Line have the potential to result in impacts to vegetation and vegetation communities. Effects on vegetation related to these modifications could include: o Displacement of / disturbance to vegetation and vegetation communities; and, o Displacement of rare, threatened, or endangered vegetation or significant vegetation communities. • Potential impacts to trees may include removal, physical injury, severing of roots, and soil compaction. • As noted above, one butternut tree was identified within the study area during the botanical investigation. Based on the conceptual design grading limits, the butternut will need to be removed as a result of the proposed improvements to 6th Line.	• Forest Edge Management is recommended where new forest edges are exposed, and forest edge management techniques should be implemented to mitigate the associated impacts to the Deciduous Forest (FOD) and Sugar Maple Deciduous Forest (FOD5) communities. As part of the Forest Edge Management, mitigation measures should include, but not be limited to the following. o The limits of clearing, grubbing and grading shall be clearly marked in the field using construction fencing or equivalent in accordance with OPSS 801, Construction Specification for the Protection of Trees. Close cut clearing should be used in lieu of grubbing, where feasible. o Planting of appropriate native trees, shrubs and ground flora shall be undertaken as soon as possible following vegetation removals. Plantings along the disturbed forest edges will provide a protective buffer. Newly exposed forest edges become exposed to a greater potential for aggressive and invasive species infiltration further into the forest interior causing greater impacts. Micro-habitat conditions are also altered due to a greater incident of light penetrating further into the forest resulting with decreases in soil moisture and increased windthrow. Plant species used within the buffer shall be somewhat similar to those in the adjacent habitat and be non-invasive in nature. o Grading within areas where edges will be newly created shall be designed to meet existing grades a minimum of 3 m away from the tree drip-line.

Factor	Anticipated Impact	Proposed Mitigation
		○ Compaction of soils on lands immediately adjacent to the newly exposed forest edge will be minimized to the extent possible. Construction activities can result in cut roots, and soil compaction due to re-grading and fill placement. Cut tree roots can reduce a tree's capacity to uptake and transfer water and nutrients, and soil compaction can result in a decrease in air spaces within the soil which can reduce the infiltration capacity of the soil, limits soil oxygen, and limits root penetration. Decompaction efforts and methodology shall be site specific. Where decompaction is required, it shall extend to a minimum depth of approximately 25 cm. ○ Drainage patterns adjacent to newly created edges shall be maintained to avoid changes in soil moisture, this is especially important around wetland areas and forest communities with substrates that maintain increased moisture capacity. • An in season butternut health assessment should be conducted per the most recent policy direction during detailed design to determine if the tree is a Category 1, 2 or 3. A Notice of Butternut Impact Form and compensation plantings will be required for the removal of a Category 1 or 2 tree. A permit under the Ontario Endangered Species at Risk Act will be required if it is determined the butternut is a Category 3. • A detailed tree survey should be undertaken during detailed design to determine impacts to trees within the study area and to identify tree-specific mitigation measures. Designation of a Tree Protection Zone (TPZ) is imperative for the protection of trees (roots, trunks, branches) adjacent to construction works. The TPZ will restrict construction related machinery and activities from damaging trees identified for protection. This protection zone is the minimum distance from the tree trunk required for protection, and it varies depending on tree size and species. At a minimum the tree protection zone should be 1 metre beyond the dripline of the tree. • If impacts are unavoidable, it is recommended that regionally and locally significant plant species, including individual shrub and trees that measure less than 10 cm DBH be transplanted into suitable habitat conditions. Where possible, these plants should be transplanted into the newly created edges of those impacted communities, but outside the limit of disturbance. • At detailed design, a mitigation plan will be provided to account for any impacts and unavoidable loss to natural heritage features such as wetlands and woodlands, to the satisfaction of the LRCA and NVCA.

Table 8-9: Summary of Proposed Works and Site-Specific Mitigation for Aquatic Habitats and Communities

Name	Fish Habitat	Existing	Proposed	Net Environmental Effects	Site Specific Mitigation
Crossing A (CUL_01_03): Tributary of Egbert Creek	• Seasonal Flow • Indirect Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter: 1100 mm Culvert Length: 12.4 m	• 3.75 m culvert extension to the new ditch alignment • New culvert length 15. 8 m	• The new structure will enclose approximately an additional 4.1 m^2 of indirect fish habitat based on the current design. • Alteration of ~100 linear metres of indirect fish habitat along the north ditch of 6th Line due to the road widening • Exact dimensions of impacts will be determined during detail design	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry” • Realigned channel should replicate functions with low impact development measures • Realigned channel should be relocated away from the road platform to the extent possible
Crossing B (CUL_01_04): Tributary of Egbert Creek	• Seasonal Flow • Seasonal Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter: 1800 mm Culvert Length: 12.5 m	• Culvert replacement, length to be increased to match the new ditch alignment • New culvert length 21.6 m	• The new structure will enclose approximately an additional 16.4 m^2 of seasonal fish habitat based on the current design. • Alteration of ~85 linear metres of seasonal fish habitat along the north ditch of 6th Line due to the road widening • Exact dimensions of impacts will be determined during detail design	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry” • Realigned channel should replicate surface/groundwater contributions • Realigned channel should be relocated away from the road platform to the extent possible • Natural channel design should be used to replace existing habitat
Crossing C (CUL_01_06): Tributary of Innisfil Creek	• Seasonal Flow • Seasonal Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter: 800 mm Culvert Length: 13 m	• Culvert extension to the new ditch alignment • If hydraulic analysis reveals that Culvert 2 has adequate capacity to carry flow, this culvert will be removed	• The potential structure removal would result in a net gain of approximately 10.4 m^2 of seasonal fish habitat.	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Crossing C: Tributary of Innisfil Creek (Culvert 2)(CUL_01_07)	• Not Fish Habitat currently • If channel is realigned into culvert, it will support Seasonal Fish Habitat	Concrete box Dimensions: 1200*800 mm Culvert Length: 9.5 m	• 16.5 m culvert extension to the new ditch alignment • New culvert length 26.0 m • Potential channel realignment into this culvert	• The new structure will enclose approximately an additional 19.8 m^2 of seasonal fish habitat if the structure is extended and channel is realigned into this structure.	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry”

Name	Fish Habitat	Existing	Proposed	Net Environmental Effects	Site Specific Mitigation
Crossing C: Sideroad 5 culvert, north of 6th Line (CUL_03-01)	• Seasonal flow • Seasonal Fish habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter: 1500 mm Culvert Length: 15.5 m	• Culvert extension to the new ditch alignment (unknown length) • A channel realignment will be necessary between CUL_03_01 and CUL_01_06	• The new structure will enclose additional seasonal fish habitat. Length at this time is unknown. • Alteration of ~45 m of seasonal fish habitat along the north ditch of 6th Line due to the Road widening	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry” • Realigned channel should replicate surface/groundwater contributions • Realigned channel should be relocated away from the road platform to the extent possible • Natural channel design should be used to replace existing habitat
Crossing D:Tributary of Innisfil Creek (CUL_01_08)	• Seasonal Flow • Seasonal Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter: 1800 mm Culvert Length:17.8 m	• 3.5 m extension of the culvert to match the new ditch alignment • New culvert length 21.3 m •	• The new structure will enclose approximately 6.3 m^2 of seasonal fish habitat	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Crossing E:Tributary of Innisfil Creek (CUL_01_09)	• Seasonal Flow • Indirect Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter: 500 mm Culvert Length: 12.4 m	• Replace existing culvert to match the new ditch alignment New culvert will be a twin structure, length 17.7 m	• The new structure will enclose approximately 2.7 m^2 of indirect fish habitat	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Crossing F:Tributary of Innisfil Creek (CUL_01_12)	• Seasonal Flow • Seasonal Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe Diameter 1200 mm Culvert Length: 14.2 m	• Replace existing culvert to match the new ditch alignment • New culvert length 25.0 m	• The new structure will enclose approximately 13 m^2 of seasonal fish habitat	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Crossing G: Tributary of Innisfil Creek (CUL_01_13)	• Seasonal Flow • Indirect Fish Habitat • Coldwater fishery downstream of the study area	Corrugated Steel Pipe (with wooden retaining structure) Diameter: 800 mm Culvert Length: 10 m	• Replace existing culvert to match the new ditch alignment • New culvert length 15.4 m	• The new structure will enclose approximately 4.3 m^2 of indirect fish habitat Alteration of ~110 linear metres of indirect fish habitat along the south ditch of 6th Line due to the Road widening	• All works to be conducted within the coldwater timing window (July 1-September 15)*. • Work will be done “in the dry” • Realigned channel should Replicate functions with low impact development measures • Realigned channel should be relocated away from the road platform to the extent possible

Name	Fish Habitat	Existing	Proposed	Net Environmental Effects	Site Specific Mitigation
Crossing H: Tributary of Banks Creek (CUL_01_15)	• Seasonal Flow • Seasonal Fish Habitat • Tolerant, Warmwater Fishery	Corrugated Steel Pipe Diameter: 400 mm Culvert Length: 10.6 m	• Replace existing culvert to match the new ditch alignment • New culvert will be a twin structure, length 19.9 m	• The new structure will enclose approximately 3.7 m^2 of seasonal fish habitat • Alteration of ~190 linear metres of seasonal fish habitat along the north ditch of 6th Line due to the road widening	• All works to be conducted within the warmwater timing window (July 1-March 31)*. • Work will be done “in the dry” • Realigned channel should replicate surface/groundwater contributions • Realigned channel should be relocated away from the road platform to the extent possible • Natural channel design should be used
Entrance Culvert, north of 6th Line (CUL 02-49)	• Seasonal Flow • Seasonal Fish Habitat • Tolerant, Warmwater Fishery	Corrugated Steel Pipe Diameter: 400 mm Culvert Length: 7.5 m	• Replace the culvert	• No permanent effects if culvert remains the same length	• All works to be conducted within the warmwater timing window (July 1-March 31)*. • Work will be done “in the dry”
Crossing I: Tributary of Banks Creek (CUL_01_16)	• Seasonal Flow • Indirect Fish Habitat • Tolerant, Warmwater Fishery	Corrugated Steel Pipe Diameter: 600 mm Culvert Length: 13.6 mm	• Replace existing culvert to match the new ditch alignment • New culvert length 21.0 m	• The new structure will enclose approximately 4.4 m^2 of indirect fish habitat	• All works to be conducted within the warmwater timing window (July 1-March 31)*. • Work will be done “in the dry”
Crossing J: Banks Creek (CUL_01_17)	• Seasonal Flow • Seasonal Fish Habitat • Tolerant, Warmwater Fishery	Corrugated Steel Pipe Diameter: 600 mm Culvert Length: 12.3 m	• Replace existing culvert to match the new ditch alignment • New culvert length 20.3 m	• The new structure will enclose approximately 4.8 m^2 of seasonal fish habitat	• All works to be conducted within the warmwater timing window (July 1-March 31)*. • Work will be done “in the dry”
Crossing 1: Cedar Creek (CUL_01_21)	• Seasonal Flow • Seasonal Fish Habitat • Warm/Coolwater Fishery	Corrugated Steel Pipe Diameter: 600 mm Culvert Length: 15.4 m	• Culvert extension to match the new ditch alignment • New culvert length 34.3 m	• The new structure will enclose approximately an additional 11.3 m^2 of seasonal fish habitat	• All works to be conducted within the coolwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Crossing 2: Cedar Creek (CUL_01_22)	• Permanent Flow • Direct Fish Habitat • Warm/Coolwater Fishery	Corrugated Steel Pipe Diameter: 400 m Culvert Length: 14.8 m	• Culvert replacement to the new ditch alignment • New culvert length 33.6 m	• The new structure will enclose approximately an additional 7.5 m^2 of direct fish habitat	• All works to be conducted within the coolwater timing window (July 1-September 15)*. • Work will be done “in the dry”

Name	Fish Habitat	Existing	Proposed	Net Environmental Effects	Site Specific Mitigation
Entrance Culvert (CUL 02-74)	• Permanent Flow • Direct Fish Habitat • Warm/Coolwater Fishery	Corrugated Steel Pipe Diameter: 1200 mm Culvert Length: ~10 m	• Culvert removal	• The removal of this structure will open up approximately 12 m^2 of direct fish habitat	• All works to be conducted within the coolwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Crossing 3: Cedar Creek (CUL_01_23)	• Permanent Flow • Direct Fish Habitat • Warm/Coolwater Fishery	Corrugated Steel Pipe Diameter: 800 mm Culvert Length: 14.2 m	• 19.4 m culvert extension to the new ditch alignment • Extended culvert will measure 33.6 m •	• The new structure will enclose approximately an additional 15.5 m^2 of direct fish habitat	• All works to be conducted within the coolwater timing window (July 1-September 15)*. • Work will be done “in the dry”
Cedar Creek	• Direct Fish Habitat from where channel enters study area to 600 m west of St. Johns Road • Seasonal Fish habitat from 600 m west of St. Johns Road to 1.2 km west of St. Johns Road (To be confirmed during detail design) • Warm/Coolwater Fishery	Functioning as a roadside ditch to the south of 6th Line.	• Realignment of channel due to the widened grading limits.	• Alteration of approximately 180 linear metres of direct fish habitat • Alteration of approximately 600 linear m of seasonal fish habitat (to be confirmed during detail design) • Channel realignment will be an overall benefit to the watercourse: Channel can be relocated away from the road platform, natural channel design can be implemented, entrance culvert is to be removed	• All works to be conducted within the coolwater timing window (July 1-September 15)*. • Work will be done “in the dry” • Natural channel design shall be utilized and designed by a fluvial geomorphologist • Realigned channel should replicate surface/groundwater contributions

* Note: In-water work timing windows will be confirmed during detailed design.

8.14.1 Property Requirements

The Town of Innisfil Official Plan, Schedule C recommends upgrading 6th Line east of 20 Sideroad to a Major Collector Road with a minimum right-of-way of 26 metres. To the west of 20 Sideroad, 6th Line would remain a local road with a minimum right-of-way of 20 metres.

The proposed design attempts to minimize property requirements. Potential property acquisition and easements as a result of the proposed design are shown on the conceptual design plates (**Appendix N**) and summarized in **Table 8-10**.

Table 8-10: Approximate Property Requirements

Location and Description of Property Requirement	Approximate Area Required	
	Property Required (ha)	Grading Easement (ha)
County Road 27 to 5 Sideroad (North Side)	1.17	0.00
County Road 27 to 5 Sideroad (South Side)	1.86	0.00
5 Sideroad to 10 Sideroad (North Side)	1.38	0.16
5 Sideroad to 10 Sideroad (South Side)	1.42	0.20
10 Sideroad to Yonge Street (North Side)	1.97	0.04
10 Sideroad to Yonge Street (South Side)	1.79	0.00
Yonge Street to 20 Sideroad (North Side)	1.78	0.17
Yonge Street to 20 Sideroad (South Side)	1.27	0.00
20 Sideroad to Fut. Alcona Road (North Side)	0.52	0.16
20 Sideroad to Fut. Alcona Road (South Side)	0.09	0.16
Fut. Alcona Road to Fut. Street A (North Side)	1.12	0.07
Fut. Alcona Road to Fut. Street A (South Side)	1.51	0.16
Fut. Street A to Fut. Street B (North Side)	0.43	0.20
Fut. Street A to Fut. Street B (South Side)	0.11	0.16
Fut. Street B to Fut. Street C (North Side)	0.35	0.18
Fut. Street B to Fut. Street C (South Side)	0.00	0.17
Fut. Street C to St. John's Road (North Side)	0.11	0.26
Fut. Street C to St. John's Road (South Side)	0.00	0.03
Total	**16.87**	**2.11**

During detailed design, opportunities to optimize design and cross-sectional elements can be reviewed to identify potential to minimize impacts at constrained locations.

Property acquisition can be mitigated through permanent easements, modifications to grading slopes (in accordance with geotechnical recommendations) to reduce the amount of area required, or in some cases considering a retaining wall or other type of soil retention feature. Property and easement requirements identified in this section and shown on the conceptual design plates are preliminary and are to be confirmed during detailed design.

9 Timing of Implementation and Future Commitments

9.1 Project Schedule

As part of the Environmental Assessment process, this Environmental Study Report (ESR) is to be filed with the Municipal Clerk and placed on the public record for at least 30 calendar days for review by the public and review agencies.

After the review period, provided that no Part II Orders are received, the Town may proceed to Phase 5 of the Class EA process, design and construction. Property acquisition and utility relocation will then be scheduled, followed by construction.

9.2 Lapse of Time

According to the Municipal Class EA, "If the period of time from the filing of the Notice of Completion of ESR in the public record or the MOECC's denial of a Part II Order request(s), to the proposed commencement of construction for the project exceeds ten (10) years, the proponent shall review the planning and design process and the current environmental setting to ensure that the project and the mitigation measures are still valid given the current planning period. The review shall be recorded in an addendum to the ESR which shall be placed on the public record."

Notice of Filing of Addendum shall be placed on the public record with the ESR, and shall be given to the public and review agencies, for a minimum 30-day public review period. The notice shall include the public's right to request a Part II Order during the 30-day review period. If no Part II Order request is received the proponent is free to proceed with implementation and construction.

9.3 Timing of Improvements

Timing of improvements is to be confirmed during detailed design. It is anticipated that implementation of improvements for the segment from 20 Sideroad to St. John's Road will take place first, followed by the segment between County Road 27 and 20 Sideroad.

9.4 Future Commitments

9.4.1 Watercourse Crossings

During detailed design, the connection of Crossing H (Tributary of Banks Creek) and Crossing I (Tributary of Banks Creek), or lack thereof to Banks Creek should be verified.

Where watercourse realignments are required to accommodate the proposed road improvements, natural channel design options will be proposed. Where proposed realignment may impact adjacent natural heritage features (i.e. wetlands, woodlands, etc.) an evaluation will be completed to determine appropriate mitigation and design to minimize impacts, to the satisfaction of the Conservation Authority. Specific criteria at the time of detailed design is to be followed.

The regulated spill entering Watercourse 6 from Watercourse 7 should be taken into account during detailed design to show that there will be no adverse effects to the watercourse, natural heritage features, extent of floodplain limits, the 6th Line and associated infrastructure such as culverts.

9.4.2 Species at Risk

An in season butternut health assessment should be conducted per the most recent policy direction during detailed design to determine if the butternut tree identified in the study area is a Category 1, 2 or 3. A detailed butternut survey should be undertaken during detailed design to confirm the absence of additional trees within 50 m of the proposed construction limits, in accordance with MNRF guidelines.

Any buildings or structures that are to be demolished are to be screened for species at risk.

Continued discussions with MNRF regarding all species at risk that have potential to be present in the study area should take place during detailed design.

9.4.3 Soil Disturbance and Potential for Erosion

A Sediment and Erosion Control Plan will be prepared during detailed design. These control measures will include:

- Limiting the geographical extent and duration that soils are exposed to the elements;
- Implementing standard erosion and sedimentation control measures in accordance with Ontario Provincial Standard Specification (OPSS) 805 Construction Specification for Temporary Erosion and Sediment Control Measures. These standard measures include: silt fence placed along the margins of areas of soil disturbance; applying conventional seed and mulch and/or erosion control blanket in areas of soil disturbance to provide adequate slope protection and long term slope stabilization; and,
- Managing surface water outside of work areas to prevent water from coming in contact with exposed soils.

Monitoring of these erosion and sedimentation control measures during and after construction will be implemented to ensure their effectiveness. These environmental measures will greatly reduce/minimize adverse environmental impacts.

9.4.4 Aquatic Habitats and Communities

The proposed conceptual design works at all crossings along 6th Line verified as fish habitat do not meet the self-assessment criteria, due to the necessity of culvert extensions to facilitate the road widening. DFO review will be required during detailed design, and 'serious harm' to fish may occur. A 'Request for Review' will be submitted to DFO during detailed design to determine if an authorization under the Fisheries Act is required. If it is required, the completed Application Form for Paragraph 35(2) (b) Fisheries Act Authorization (Normal Circumstances) will be submitted to DFO for review. This submission will be made during detailed design.

Timing windows for in-water work were determined based on the secondary source review, and field investigations for fish communities at 6th Line, and downstream of the study area. These timing windows will need to be confirmed by MNRF during detailed design.

At a minimum, the following should be employed as restoration/enhancement during the detailed design phase of the project for the works at all crossings:

- Banks and riparian areas will be planted with native grasses and shrubs;
- Management guidelines should be followed for channel realignments based on the CVC/TRCA Headwater Management Guide (2014);
- Where possible, watercourses currently functioning as roadside ditches should be realigned away from the road platform thus minimizing roadside impacts such as oil, grime, and salt inputs into the system. These restoration and enhancement works will increase the diversity of habitat in relation to what is present by increasing riparian cover, increasing habitat diversity and providing good floodplain connectivity; and
- Fish isolated by construction activities will be captured and safely released to the watercourse. A Licence to Collect Fish for Scientific Purposes under the *Fish and Wildlife Conservation Act (1997)* is required from the MNRF to capture and transfer fish.

9.4.5 Wetland Compensation

Compensation for the loss of wetland should be determined in consultation with the Town of Innisfil, LSRCA and NVCA staff. LSRCA has recommended that the wetland lost as a result of this project be compensated for at a 3:1 ratio as per the LSRCA Ecological Offsetting Strategy. The negotiation of a wetland compensation ratio based on LSRCA policy, and other details related to this task including the preparation of an overall offsetting concept plan, should be finalized at the detailed design stage.

At detailed design, a mitigation plan will be provided to account for any impacts and unavoidable loss to natural heritage features such as wetlands and woodlands, to the satisfaction of the LSRCA and NVCA.

9.4.6 Tree Protection Measures

Compensation for the removal of trees should be determined in consultation with the Town of Innisfil, NVCA, and LSRCA staff. At a minimum those trees removed within the NVCA and LSRCA regulation limits should be replaced at the greatest extent, either through a 3:1 tree replacement ratio or by area at a ratio of 2:1 to the satisfaction of the conservation authorities, and amenity trees planted along the roadside and residents' yards should be replaced at a ratio of 1:1. Also as per LSRCA guidance, consideration should be given to preserving trees of 50 cm dbh or greater, as feasible.

Suitable planting locations for the replacement trees are along the roadway as a streetscape feature (where they currently do not exist), within naturalized areas of the tributaries, and within compensation areas identified by the Town of Innisfil, NVCA and LSRCA. These locations will be determined in consultation with NVCA, LSRCA and the Town of Innisfil during detailed design.

At detailed design, a mitigation plan will be provided to account for any impacts and unavoidable loss to natural heritage features such as wetlands and woodlands, to the satisfaction of the LRCA and NVCA.

9.4.7 Wildlife and Wildlife Habitat

More detailed field investigations may be required during detailed design, to further investigate the presence of Eastern Meadowlark and Eastern Meadowlark habitat as well as Bobolink and Bobolink habitat within the impacted area (i.e. detailed Bobolink surveys as per MNRF protocol). Further correspondence with the MNRF will be required during detailed design to discuss the species at risk located within the study area, to confirm the impacts to the Bobolink habitat are avoided (to the extent possible), and to develop appropriate environmental protection/mitigation measures in order to meet MNRF's regulations under the ESA.

Follow-up field surveys may be required to further assess presence/absence of Barn Swallow nests and potential habitat function of lands within the study area.

An analysis of deer movement across the roadway in the vicinity of the deer wintering area should be completed at the detailed design stage. If studies reveal significant deer movement in this area, mitigation measures will need to be incorporated.

9.4.8 Drainage and Stormwater Management

Flows for the cross culverts were determined based on the available information at the time of the EA. The assessment results should be reviewed during detailed design to confirm the design peak flow calculations by comparing based on the best available mapping information at that time, and culvert recommendations should be confirmed.

Stormwater management strategies are to be confirmed during detailed design to ensure water quality and quantity are addressed adequately prior to discharging into nearby watercourses.

If the 6th Line improvements proceed ahead of the anticipated developments, interim controls will be needed to meet the required stormwater quantity and quality targets. These will be reviewed and confirmed during detailed design.

9.4.9 Groundwater

Groundwater conditions are to be further reviewed during detailed design to confirm that any future work is not expected to impact groundwater quantity and quality, or impact adjacent dug out wells and water supplies.

If dewatering is required, a well survey is to be undertaken during construction to determine preconstruction conditions, and monitor for potential impacts during dewatering activities.

9.4.10 Utilities

Location of existing utilities and resulting impacts and required relocations are to be confirmed. Coordination with the various utility agencies will be undertaken during the detailed design stage.

9.4.11 Archaeology

Lands beyond the road right-of-way identified as possessing archaeological potential should be subject to a Stage 2 archaeological assessment prior to any proposed impacts by the project.

The Sixth Line Cemetery lands should be subject to Protection and Avoidance from any proposed impacts by the project. Lands 10 metres from the documented extent of the cemetery require Cemetery Investigation, in accordance with Provincial regulations.

Findings from subsequent archaeological assessments are to be filed with the Ministry of Tourism, Culture and Sport (MTCS) to obtain clearance for archaeology.

9.4.12 Additional Consultation and Coordination

Consultation with affected property owners will be required, including those where property is required or where access to their property will be impacted. Permission to Enter Agreements are to be obtained from landowners where temporary access to their property is required.

Additional consultation with regulatory agencies, conservation authorities, and individual municipalities should take place during detailed design as required.

Coordination with developers should take place during detailed design as required.

9.4.13 Summary of Potential Permit Requirements

Fisheries Act

As a result of recent changes to the Fisheries Act, the DFO has introduced a self-assessment process for proponents to determine if ‘serious harm’ to fish or fish habitat is expected as a result of activities from the project. With the new process, proponents use the DFO screening criteria to determine if a review of the project by DFO is required. This review will be carried out during detailed design once the specific requirements for culvert replacement and modifications and channel realignments are confirmed.

Fish and Wildlife Conservation Act (1997)

Should fish isolated by construction activities need to be captured and safely released to the watercourse, a Licence to Collect Fish for Scientific Purposes under the *Fish and Wildlife Conservation Act (1997)* is required from the MNRF to capture and transfer fish.

Endangered Species Act

An Information Gathering Form will be submitted to the MNRF during detailed design to determine permit requirements under the Ontario Endangered Species Act. If required, the necessary permit(s) will be secured during detailed design.

LSRCA Ontario Regulation 179/06 and NVCA Ontario Regulation 172/06

Based on a review of LSRCA and NVCA mapping, portions of the study area are subject to Ontario Regulations 179/06 (LSRCA) and 172/06 (NVCA) Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. During detailed design, a permit from the LSRCA and NVCA will be required for all development and site alteration work within these regulated areas.

Permit to Take Water (PTTW) under the Ontario Water Resources Act

Permits to Take Water for any water takings that exceed 50,000 litres per day should be applied for and a pre-construction survey and baseline water quality assessment should be implemented as necessary prior to construction.