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<td>M.Olsen</td>
<td>D.Addley</td>
<td>T.Brown</td>
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<td>2</td>
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<td>3</td>
<td>Final</td>
<td>D.Addley</td>
<td>T.Brown</td>
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Sign-off Sheet

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Senior Environmental Planner

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Travis Brown
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Executive Summary

The City of Barrie (the City) acquired 2,293 hectares (ha) of land from the Town of Innisfil in 2010 to facilitate a southward and eastward expansion of developable residential and employment lands. Following annexation of these lands, the City initiated infrastructure Master Plans to guide development within the entire City limits to 2031. The Multi-Modal Active Transportation Master Plan (MMATMP) was developed in 2014 as part of the City initiative.

The MMATMP was completed in accordance with Approach #2 of the Master Planning process, as described in Appendix 4 of the Municipal Engineers Association Municipal Class Environmental Assessment (EA) document (October 2000, as amended in 2007, 2011 & 2015). This type of Master Plan addresses Phase 1 (Identification of Problem or Opportunity) and Phase 2 (Alternative Solutions) of the Municipal Class EA process and forms the basis for future investigations for the specific Schedule C projects identified within it.

The purpose of this Municipal Class EA is to consider the recommended improvements to transportation infrastructure identified within the MMATMP along the arterial road sections situated within the Salem Secondary Plan Development Area. This Environmental Study Report (ESR) documents all activities undertaken during Phase 3 of the Municipal Class EA for the transportation projects recommended within the MMATMP for Salem Secondary Plan Development Area.

The Salem Secondary Plan Development Area Transportation Improvement limits are shown in the following figure:
Consultation

Consultation is a key component of the Municipal Class EA process. Consultation activities associated with Phases 1 and 2 of this Municipal Class EA are described in Section 1.5 and Appendix A of the MMATMP and generally included meetings with a Technical Advisory Committee, Parking Strategy and Rate Review Team and the general public. A series of Public Information Centres (PICs) were also held during the course of the MMATMP. Consultation activities undertaken as part of Phases 3 and 4 of this study consisted of the following:

- Posting project milestones on the City’s website (www.barrie.ca) including Notices of PICs #1 and #2 and Study Completion;
- Holding meetings with the County of Simcoe, Town of Innisfil, Nattawasag Valley Conservation Authority (NVCA), Lake Simcoe Region Conservation Authority (LSRCA), area developers and property owners at key points during the study;
- Publication of newspaper notices in the Barrie Examiner for all study milestones;
- Direct mailing of notices to stakeholders, affected land owners, general public and review agencies regarding project milestones;
- Holding two (2) PICs to engage and obtain input from property owners, the public and review agencies; and
- Placement of this ESR on the public record and distribution of the Notice of Study Completion to those included on the study mailing list.

Existing Conditions

In general, the existing mid-block traffic conditions are experiencing minimal delays and are well within capacity. Signalized intersections are generally operating well during the AM and PM peak hours. In addition, all movements are noted to be operating well within capacity, except for the intersection of Huronia Road and Lockhart Road. The un-signalized study area intersections all operate at acceptable levels of service with all movements operating within capacity. The City’s travel demand forecasting model indicates that substantial traffic growth is anticipated on the study area roadways. In addition, several recommendations were made as part of the MMATMP for transportation roadway improvements within the study area.

In addition to the problems and opportunities identified within the MMATMP, this Municipal Class EA seeks to improve and upgrade the existing transportation system within the Salem Secondary Plan Area, while protecting the environment, minimizing disruption to existing residents and businesses, and allowing for participation of stakeholders and agencies, and, more specifically, to determine:

- Right-of-way (ROW) requirements for the various roadways and transportation improvements;
- Transportation design elements such as sidewalks, cycling facilities, watercourse crossings, bus facilities, trails, roundabouts, etc.;
- Conceptual drainage and storm water management requirements; and
- Staging of infrastructure improvements.

A detailed inventory of the natural, engineering, social and cultural environments was also undertaken as part of this EA study.
Identification and Evaluation of Alternative Design Concepts

A series of Preliminary Alternative Designs were developed for each road section, in consideration of the MMATMP recommendations and the findings of the traffic operations assessment. Three (3) workshops were held during the development and assessment of the preliminary alternative designs to discuss preliminary alternative designs options and ‘screen out’ alternatives that were considered unsuitable and/or unable to adequately address the recommendations of the MMATMP.

Alternative Design Concepts were developed based on the results of the recommendations of the MMATMP, the screening of preliminary alternative designs and in consideration of the opportunity to provide Low Impact Development (LID) stormwater management (SWM) features. As such, two Alternative Design Concepts were developed for each road section.

### Alternative Design Concepts – Salem Road, Essa Road, McKay Road West, Huronia Road

<table>
<thead>
<tr>
<th>Alternative 1 – MMATMP Recommendations</th>
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<tbody>
<tr>
<td>• 27 m ROW</td>
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<tr>
<td>• 3 lane cross section, 1 lane in each direction</td>
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<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk on each side of roadway</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
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<table>
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<tr>
<th>Alternative 2 - MMATMP + 4 m additional ROW for LIDs</th>
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<tbody>
<tr>
<td>• 31 m ROW</td>
</tr>
<tr>
<td>• 3 lane cross section, 1 lane in each direction</td>
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<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk (one side of the road only)</td>
</tr>
<tr>
<td>• 3.0 m MUT (one side of the road only)</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
</tr>
<tr>
<td>• 2 m LID on each side</td>
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### Alternative Design Concepts – Veterans Drive, McKay Road East, Lockhart Road

<table>
<thead>
<tr>
<th>Alternative 1 - MMATMP Recommendations</th>
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<tbody>
<tr>
<td>• 34 m ROW</td>
</tr>
<tr>
<td>• 5 lane cross section, 2 lanes in each direction</td>
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<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk on each side of roadway</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
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</table>

<table>
<thead>
<tr>
<th>Alternative 2 - MMATMP + 4 m additional ROW for LIDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 38 m ROW</td>
</tr>
<tr>
<td>• 5 lane cross section, 2 lanes in each direction</td>
</tr>
<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk (one side of the roadway)</td>
</tr>
<tr>
<td>• 3.0 m MUT (one side of the roadway)</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
</tr>
<tr>
<td>• 2 m LID feature on each side of the roadway</td>
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The alternatives were subjected to a detailed comparative evaluation using a reasoned argument approach, which describes the advantages and disadvantages of each alternative in response to evaluation criteria. The evaluation criteria were developed based on City, regulatory, and stakeholder priorities and concerns, and environmental features.

Feedback received during and following PIC #1 identified the importance of LID features and consideration of the effects of climate change. In addition, a number of concerns were raised from property owners with respect to the potential loss of property in association with the design alternatives. As such, the study team re-designed Alternative 1 to include LID features, while maintaining the ROW width of the design and avoiding any additional direct impacts to private property. In addition, a second/discretionary PIC was held to review the changes to the design since PIC #1 and to review the Preferred Design.

**Preferred Design Concept**

Based on the findings of the evaluation of Alternative Design Concepts, Alternative 1, MMATMP recommendations as well as LID features within the existing ROW is recommended given that it is the least costly alternative and incurs the lowest impact to private property. While Alternative 2 would provide additional opportunities for enhanced LIDs and streetscaping, the greater area of land required is expected to impact existing natural heritage and habitat features situated adjacent to the roadways.

The Preferred Design comprises a multi-modal arterial road corridor, designed for cycling, pedestrians, automotive and transit use and includes the following key elements:

- 3.5 m vehicle lanes
- 1.2 m- 4.2 m raised median, painted median, or two-way left turn lane (TWLTL)
- 1.5 m on-road bicycle lanes plus 0.5 m buffer on both sides of roadway
- 2 m wide sidewalks on both sides of roadway
- 2.9 m boulevards
- LID SWM features
- Roundabout and signalized intersection arrangements
- Streetscape Design/LID

The City is presently reviewing the appropriateness of linear LID implementation on arterial roads due to concerns pertaining to impervious to practice ratios exceeding recommended limits, operational viability due to winter maintenance activities, soil contamination from application of deicing agents and high risk potential of contamination from spills resulting from vehicular collisions (as compared to local or collector roads). As part of detailed design, further assessment of appropriate LID measures will be completed. If deemed inappropriate for arterial road use; alternatives solutions may need to be considered including enhanced stormwater management ponds with potential enhancements such as an additional infiltration cell or wetland cell (where feasible).

**Interim Cross-Sections**

Both McKay Road East and Huronia Road will have interim works completed prior to 2031. The interim sections are rural sections with 3.5 m lanes and 2.0 m shoulders to accommodate active transportation in the interim. Stormwater will be conveyed to a roadside ditch drainage system.
Typical Cross Sections

The following typical sections are being proposed for each of the following ROW locations. The design criteria for these sections is based on the Transportation Association of Canada (TAC) – Geometric Design Guide for Canadian Roads, the City Design Standards, and the recommendations from the MMATMP.

**Typical 27m ROW Salem Road, Essa Road and McKay Road West**

- 3.5 m travel lanes, 1 in each direction
- 1.2 m – 4.2 m concrete median, TWLTL or painted median. Width of painted median will be based on LID alternative chosen during detailed design.
- 1.5 m + 0.5 m buffered bike lane (both sides)
- 0.50 m curb (both sides)
- 2.9 m boulevard with LIDs (both sides)
- 2 m sidewalk (both sides)
- 0.5 m clearance (both sides)

**Typical 34m ROW Veterans Drive, McKay Road East and Lockhart Road**

- 3.5 m travel lanes, 2 in each direction
- 1.2 m – 4.2 m concrete median, TWLTL or painted median. Width of painted median will be based on LID alternative chosen during detailed design.
- 1.5 m + 0.5 m buffered bike lane (both sides)
- 0.50 m curb (both sides)
- 2.9 m boulevard with LIDs (both sides)
- 2 m sidewalk (both sides)

Impacts, Mitigation Commitments, and Monitoring

The potential impacts and proposed mitigation measures were determined based on a detailed inventory of the study area environments. The detailed list of specific commitments to be carried forward to Phase 5 of the Municipal Class EA process (Detailed Design and Implementation) are presented in Table 7-1. Permits and approvals to be sought during detailed design are identified in Section 7.1 of this ESR. These following commitments have been developed with input and consultation with the public, LSRCA, NVCA, the County of Simcoe, Town of Innisfil, and other stakeholders.
<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>COSSARO</td>
<td>Committee on the Status of Species at Risk in Ontario</td>
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<tr>
<td>CR</td>
<td>County Road</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>ESR</td>
<td>Environmental Study Report</td>
</tr>
<tr>
<td>LID</td>
<td>Low Impact Development</td>
</tr>
<tr>
<td>LIO</td>
<td>Land Information Ontario</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of Service</td>
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<td>LSRCA</td>
<td>Lake Simcoe Region Conservation Authority</td>
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<tr>
<td>MBCA</td>
<td>Migratory Birds Convention Act</td>
</tr>
<tr>
<td>MMATMP</td>
<td>Multi-Modal Active Transportation Master Plan</td>
</tr>
<tr>
<td>MNRF</td>
<td>Ministry of Natural Resources and Forestry</td>
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<tr>
<td>MOECC</td>
<td>Ministry of the Environment and Climate Change</td>
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<td>MTCS</td>
<td>Ministry of Tourism, Culture, and Sport</td>
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<td>MTO</td>
<td>Ministry of Transportation Ontario</td>
</tr>
<tr>
<td>MUT</td>
<td>Multi-Use Trail</td>
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<tr>
<td>NVCA</td>
<td>Nottawasaga Valley Conservation Authority</td>
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<td>Public Information Centre</td>
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<td>Provincially Significant Wetland</td>
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</tr>
<tr>
<td>v/c</td>
<td>Volume-to-Capacity</td>
</tr>
<tr>
<td>VPH</td>
<td>Vehicles Per Hour</td>
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SALEM SECONDARY PLAN TRANSPORTATION IMPROVEMENTS ENVIRONMENTAL STUDY REPORT CITY OF BARRIE

Introduction
October 12, 2017

1.0 INTRODUCTION

1.1 MULTI-MODAL ACTIVE TRANSPORTATION MASTER PLAN

The City of Barrie (the City) acquired 2,293 hectares (ha) of land from the Town of Innisfil in 2010 to facilitate a southward and eastward expansion of developable residential and employment lands. Following annexation of these lands, the City initiated infrastructure Master Plans to guide development within the entire City limits to 2031. The Multi-Modal Active Transportation Master Plan (MMATMP) was developed in 2014 as part of the City initiative.

The MMATMP was completed in accordance with Approach #2 of the Master Planning process, as described in Appendix 4 of the Municipal Engineers Association Municipal Class Environmental Assessment (EA) document (October 2000, as amended in 2007, 2011 & 2015). This type of Master Plan addresses Phase 1 (Identification of Problem or Opportunity) and Phase 2 (Alternative Solutions) of the Municipal Class EA process and forms the basis for future investigations for the specific Schedule C projects identified within it. This Environmental Study Report (ESR) documents all activities undertaken during Phase 3 of the Municipal Class EA for the transportation projects recommended within the MMATMP for Salem Secondary Plan Development Area. An outline of the Municipal Class EA process, as shown in Figure 1.

The MMATMP examined the current natural, social, and economic environments of the City and conducted an inventory of all transportation infrastructure currently serving Barrie. Deficiencies were identified, including areas of current traffic congestion and missing links in the active transportation network.

The following Problem and Opportunity Statement was developed during Phase 1 of the MMATMP.

The City needs a transportation system that will accommodate growth to 2031 and beyond. An opportunity exists to plan a transportation system which:

- is safe, efficient and accessible with choices in mobility
- fosters the use and development of sustainable transportation network
- provides a public transit system that can offer a real alternative to private automobile use
- provides a network of on-road and off-road pedestrian and cycling facilities that allow the use of active transportation modes as an alternative to the automobile

The MMATMP includes analyses of two traffic models developed to assist in determining where transportation network improvements are required, considering other planned transportation projects that will affect the City’s transportation network. Three proposed land use options for the Annexed Lands were analyzed to determine which would best
meet the City’s transportation network goals. The road network for the preferred option was refined to further improve overall network connectivity.

The following multi-modal transportation network alternatives were developed during Phase 2 of the Municipal Class EA process and evaluated based on future modal share targets:

- Do nothing (active transportation modal share: <6%, transit modal share: <2.6%);
- Existing (low) modal share, auto-oriented (active transportation: 6%, transit: 2.6%);
- Medium modal share, increased emphasis on non-auto modes (active transportation: 12%, transit: 7%); and
- High modal share, strong emphasis on non-auto modes (active transportation: 20%, transit: 12%).

The network alternatives were subjected to a comparative analysis of planning and land use, transportation, natural, social and cultural environments, and financial considerations. The findings of the evaluation indicated that medium modal share was the preferred solution. Based on the objectives of the medium modal share solution (please refer to Appendix A), an active transportation plan was also developed as part of the MMATMP. The active transportation measures used to develop the active transportation network are summarized in Table 1-1.

### Table 1-1 Active Transportation Measures

<table>
<thead>
<tr>
<th>Area</th>
<th>Sidewalks</th>
<th>Cycling, Pathways, and Trails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annexed Lands</td>
<td>- Local roads (except for short cul-de-sacs) have sidewalks on both sides</td>
<td>• Integrated pathway network</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maximum on-road network mesh width: 1000 m – 1500 m</td>
</tr>
<tr>
<td>Citywide</td>
<td>- Arterial and collector roads have sidewalks on both sides (new sidewalks 2.0 m wide where feasible)</td>
<td>• Arterial and 4+ lane collector roads have buffered bicycle lanes only if road is widened or reconstructed; regular bicycle lanes or multi-use trails (MUT) to be installed if no widening is required</td>
</tr>
<tr>
<td></td>
<td>- Sidewalks on local streets 1.5 m wide</td>
<td>• 2-3 lane collector roads have bicycle lanes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Connecting links to schools</td>
</tr>
<tr>
<td>Pre-2010 Barrie</td>
<td>- Local streets have at least one sidewalk; two sidewalks if street segment is within approximately 250 m of a school</td>
<td>• Addition of pathways in major park corridors</td>
</tr>
<tr>
<td></td>
<td>- Infill program to implement additional sidewalks where road construction is not planned</td>
<td>• Ideal maximum on-road network mesh width: 1000 m – 1500 m, adjusted according to physical constraints (City of Barrie 2014a)</td>
</tr>
</tbody>
</table>

A copy of the preferred cycling, pathway, and trail system and the preferred sidewalk network for 2031 is shown in Appendix A.
Even with the prioritization of active transportation and transit, the most widely-used mode of transportation in 2031 is expected to be the automobile. The existing City road network will be unable to accommodate the predicted future traffic demands in many areas, and several road network improvements will be essential. The MMATMP also determined that the City will require improved connections and crossings of the Highway 400 corridor to accommodate expansion and development in the Annexed Lands.

Although the key planning horizon year in the MMATMP is 2031, the City also considered a 2051 scenario to identify locations that may exceed road capacity after 2031. A copy of the 2051 scenario is provided in Appendix A.

### 1.2 SALEM SECONDARY PLAN DEVELOPMENT AREA CLASS EA

The Town of Innisfil Annexed Lands are bounded by County Road (CR) 27 to the west, 20th Sideroad to the east, and the former southern City boundary in the north. The MMATMP divides the Annexed Lands at Huronia Road. The Salem Secondary Plan Development Area occupies the west portion of the Annexed Lands and the Hewitt’s Secondary Plan Development Area occupies the east portion.

The purpose of this Municipal Class EA is to consider the recommended improvements to transportation infrastructure identified within the MMATMP along the arterial road sections situated within the Salem Secondary Plan Development Area. Table 1-2 provides a summary of the recommended road improvements for each road section.

<table>
<thead>
<tr>
<th>Road Section</th>
<th>2031 Road Configuration Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salem Road:</td>
<td>3-lane urban section:</td>
</tr>
<tr>
<td>Veterans Drive to CR 27</td>
<td>One travel lane in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous Two-Way Left-Turn Lane</td>
</tr>
<tr>
<td></td>
<td>(TWLTL) or median</td>
</tr>
<tr>
<td>Lockhart Road:</td>
<td>5-lane urban section:</td>
</tr>
<tr>
<td>Highway 400 east limits to Huronia Road, including grade separated rail crossing</td>
<td>Two travel lanes in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
<tr>
<td>Essa Road:</td>
<td>3-lane urban section:</td>
</tr>
<tr>
<td>Mapleview Drive to CR 27</td>
<td>One travel lane in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
<tr>
<td>Veterans Drive: Salem Road to McKay Road</td>
<td>5-lane urban section:</td>
</tr>
<tr>
<td></td>
<td>Two travel lanes in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
<tr>
<td>Veterans Drive: McKay Road to 2031 Growth Boundary Limit</td>
<td>3-lane urban section:</td>
</tr>
<tr>
<td></td>
<td>One travel lane in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
</tbody>
</table>
SALEM SECONDARY PLAN TRANSPORTATION IMPROVEMENTS ENVIRONMENTAL STUDY REPORT CITY OF BARRIE

Introduction
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Table 1-2 MMATMP Recommended Improvements - 2031 Horizon

<table>
<thead>
<tr>
<th>Road Section</th>
<th>2031 Road Configuration Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huronia Road: Lockhart Road to 2031 Growth Boundary Limit</td>
<td>3-lane rural section:</td>
</tr>
<tr>
<td></td>
<td>One travel lane in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
<tr>
<td>McKay Road West: 2031 Growth Boundary Limit to Future Reid Drive</td>
<td>3-lane urban section:</td>
</tr>
<tr>
<td></td>
<td>One travel lane in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
<tr>
<td>McKay Road West: Future Reid Drive to Highway 400 West Limits</td>
<td>5-lane urban section:</td>
</tr>
<tr>
<td></td>
<td>Two travel lanes in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
<tr>
<td>McKay Road East: Highway 400 East Limits to Huronia Road, including at-grade rail crossing</td>
<td>5-lane urban section:</td>
</tr>
<tr>
<td></td>
<td>Two travel lanes in each direction</td>
</tr>
<tr>
<td></td>
<td>Continuous TWLTL or median</td>
</tr>
</tbody>
</table>

As noted in Section 1.1, the MMATMP fulfilled the requirements of Phases 1 and 2 of the Municipal Class EA process. This ESR documents all activities undertaken during Phase 3 (Alternative Design Concepts for the Preferred Solution) of the Municipal Class EA planning and design process (please refer to Figure 1) for the transportation projects recommended within the Salem Secondary Plan Development Area.
Figure 1 Municipal Class Environmental Assessment Planning and Design Process

NOTE: This flow chart is to be read in conjunction with the MEA October 2000, as amended in 2007 Municipal Class Environmental Assessment document.
The Salem Secondary Plan Transportation Improvements Municipal Class EA study was completed as part of the City’s Transportation Environmental Assessments Growth Development Projects. As such, Phases 3 and 4 of the Municipal Class EA process for improvements to transportation infrastructure within the Hewitt’s Secondary Plan (Assignment #3) and McKay and McKay Road East - Highway 400 interchange, Lockhart Road/Salem Road Crossing and Associated Works (Assignment #2) were completed concurrent to this study and are documented under separate cover.

In addition to the problems and opportunities identified within the MMATMP, this Municipal Class EA seeks to improve and upgrade the existing transportation system within the Salem Secondary Plan Area, while protecting the environment, minimizing disruption to existing residents and businesses, and allowing for participation of stakeholders and agencies, and, more specifically, to determine:

- ROW requirements for the various roadways and transportation improvements;
- Transportation design elements such as sidewalks, cycling facilities, watercourse crossings, bus facilities, trails, roundabouts, etc.;
- Conceptual drainage and storm water management requirements; and
- Staging of infrastructure improvements.

The Salem Secondary Plan Development Area Transportation Improvement limits are shown in Figure 2.

**Figure 2 Study Area Road Sections**
1.3 CONSULTATION

Consultation is a key component of the Municipal Class EA process. Consultation activities associated with Phases 1 and 2 of this Municipal Class EA are described in Section 1.5 and Appendix A of the MMATMP and generally included meetings with a Technical Advisory Committee, Parking Strategy and Rate Review Team and the general public. A series of Public Information Centres (PICs) were also held during the course of the MMATMP. In general, the problems and opportunities (Phase 1) were presented at PICs 1 and 2 and the recommended solutions (Phase 2) were presented at PICs 3 and 4 of the MMATMP process.

A summary of the consultation activities undertaken as part of Phases 3 and 4 of the Salem Secondary Plan Transportation Improvement EA study is provided herein.

1.3.1 Public and Stakeholder Consultation

1.3.1.1 Study Notifications

Public notices were published in the Barrie Examiner newspaper to notify readers of the study and invite members of the public to comment and provide notification of the PICs. The public notices that were issued as part of this study are listed below. A copy of the notices is provided in Appendix B-1.

- Notice of PIC #1
- Notice of PIC #2
- Notice of Completion

In addition to local newspaper postings, notices were also distributed to relevant agencies, Indigenous communities and/or organizations (please refer to Section 1.3.3), study area property owners and through the study mail list comprising of individuals who expressed an interest during the course of this or previous studies. A copy of the study mailing list is also provided in Appendix B-1.

1.3.1.2 Public Information Centres

Two (2) PICs were held as part of Phase 3 of this study, as described in Sections 4.3 and 6.6 of this ESR. The first PIC was held on September 22, 2016 to introduce commencement of Phase 3, the limits of the study area and associated environments, the alternative designs considered and the recommended road network improvements. A second PIC was held on April 6, 2017, to present and solicit feedback on the Preferred Design, the potential impacts to the environment and the proposed mitigation measures. Attendees were encouraged to complete comment forms available at the PICs and were also given the opportunity to comment four weeks following the PIC. A copy of the information presented at PICs 1 and 2 is provided in Appendix B-2. In addition, copies of all comments received from the public and agencies, and associated responses are provided in Appendix B-3 and Appendix B-4, respectively.
1.3.1.3 Stakeholder Meetings

One (1) formal meeting was held with representatives from land development firms with an interest in the study area on April 13, 2016. The purpose of the meeting was to discuss and coordinate the Stormwater Management (SWM) and drainage aspects of the proposed development and the road improvement projects being planned. A copy of the stakeholder meeting minutes is provided in Appendix B-5.

1.3.2 Agency Consultation

Technical agencies, including federal, provincial, and municipal agencies and authorities, and utilities with a potential interest in the study were contacted during key points of the study. Formal meetings were held with key agencies at key points of the study, as described herein.

1.3.2.1 Agency Meetings

County of Simcoe

Two (2) meetings were held with the County of Simcoe in relation to this study. In general, the first meeting was held on July 12, 2016 to introduce Phases 3 and 4 of the Transportation Infrastructure studies and provide an overview of the proposed widenings and various cross-sections being considered for the study area. In addition, the potential intersection improvements were presented including single lane roundabouts at CR27 intersections with Salem Road and McKay Road. The County noted that the County of Simcoe TMP proposed the widening of CR 27 to 4 lanes, between the Innisfil Boundary and CR 90 in the short term. In addition, it was noted that CR 53 (Veteran’s) is proposed to be widened to 4 lanes to the Barrie city limits in the short term.

The second meeting was held on March 27, 2017 to present the Preferred Design. County staff did not have any concerns with the material presented at the meeting; however, requested that the City consider a two-lane roundabout at intersection of CR27 / Essa Road / McKay Road, as recommended in the County of Simcoe TMP.

Township of Innisfil

Two (2) meetings were held with the Township of Innisfil during the course of the study. The first meeting was held on July 19, 2016 to introduce the study and associated schedule. In addition, the purpose of the meeting was to discuss other City and Town initiatives.

A second meeting was held on March 24, 2017, to present the Preferred Design and associated City efforts to minimize impacts on the Town’s residents on the south side of Lockhart Road. Town staff did not have any technical concerns with the materials presented and discussed at the meeting.
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Conservation Authorities

Three meetings were held with the relevant Conservation Authorities (i.e., Lake Simcoe Region Conservation Authority (LSRCA) and Nottawasaga Valley Conservation Authority (NVCA)), as described herein.

The first meeting was held with the LSRCA on December 9, 2015, to introduce the study and associated schedule and identify any key issues and/or constraints early in the study process. In addition, the purpose of the meeting was to review and gather feedback on the natural environment and SWM work plans being undertaken as part of this study.

The second meeting was held with the LSRCA on March 31, 2017, to present the SWM Strategy for the Preferred Design. In general, the LSRCA concurred with the conceptual design. It was agreed that the City and LSRCA will continue to discuss LID implementation during the next phase of study (i.e., detailed design).

A third meeting was held with the LSRCA and NVCA on April 28, 2017, to discuss the SWM strategy for the Preferred Design. The key aspects of the strategy were discussed. Given the extent of the study area and the varying soil and water table conditions, specific recommendations could not be made and the City of Barrie did not formally agree that linear LIDs would be accepted on Arterial / Major Collectors at this time. The LSRCA and NVCA agreed that LID approaches could be further reviewed in consultation with the Conservation Authorities and landowners’ group during detailed design.

Copies of stakeholder meeting minutes are provided in Appendix B-5 of this ESR.

1.3.3 Indigenous Consultation

As noted in Section 1.3.1.1, Indigenous communities and organizations were notified of study consultation events through direct mail. The communities and organizations contacted as part of this study are listed in Appendix B-1.

One (1) response was received from the Chippewas of Rama First Nation on September 28, 2016. The response acknowledged receipt of the invitation to attend PIC #1 and indicated that the letter was shared with Council and the Coordinator for the Williams Treaties First Nations. It was further noted that the Coordinator would review the letter and take action, if required.

A copy of the response from the Chippewas of Rama First Nation is provided in Appendix B-6 of this ESR. No other responses were received from the Indigenous communities and/or organizations contacted as part of this study.

1.4 STUDY TEAM

The City retained Stantec as project consultants to carry out Phases 3 and 4 of this Municipal Class EA study. The core study team included representatives from the City. General direction was provided by City staff and study team meetings were held at key points in the study process.
and prior to presenting study findings to the public and other stakeholders. The study team consisted of the following representatives/organizations:

<table>
<thead>
<tr>
<th>City of Barrie</th>
<th>Stantec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>Project Management</td>
</tr>
<tr>
<td>Transportation</td>
<td>Engineering</td>
</tr>
<tr>
<td>Planning</td>
<td>Transportation Planning</td>
</tr>
<tr>
<td></td>
<td>Environmental Planning</td>
</tr>
</tbody>
</table>

It should be noted that WSP and Hatch Mott MacDonald were retained to carry out Phases 3 and 4 of the Schedule C Municipal Class EA studies for Assignments #2 and #3, respectively, of City’s Transportation Environmental Assessments Growth Development Projects. As such, key consultation events and study team meetings were carried out in a coordinated manner.
2.0 TRAFFIC OPERATIONS ASSESSMENT

A traffic operations assessment was conducted to evaluate existing and future traffic volumes through 2031, as well as identify road and intersection improvement needs in the study area. The objectives of the traffic operations assessment were to:

- Review all available background documents, and identify relevant information;
- Develop an understanding of the operation of the existing transportation facilities within the study area;
- Develop traffic forecasts for the 2021 and 2031 horizon years;
- Identify existing and future operational and safety deficiencies; and
- Identify interim and ultimate term operational and safety improvements.

The findings of the traffic operations assessment were used to develop and evaluate alternative design concepts for the preferred solution. A copy of the traffic operations assessment report is provided in Appendix C.

2.1 EXISTING CONDITIONS

The characteristics of the study area roadways and intersections are described below. With the exception of CR 27, which operates under the jurisdiction of the County of Simcoe, all study area roadways operate under the jurisdiction of the City.

2.1.1 Existing Road Network

Mapleview Drive West
Mapleview Drive West is an east-west arterial road with a posted maximum speed limit of 60 km/h within the study area. This portion of the roadway comprises an urban road cross-section with curb, gutter and roadside illumination. The section of Mapleview Drive West located immediately east of CR 27 comprises a three-lane cross-section, with one travel lane in each direction and a continuous centre TWLTL. This cross-section transitions into four-lanes, with two travel lanes in each direction east of Marsellus Drive/Garibaldi Drive. To the east of Essa Road, the road cross-section widens to seven lanes, with three travel lanes in each direction and a continuous centre TWLTL. This road configuration continues easterly beyond Huronia Road, where Mapleview Drive West narrows to a two-lane road with one travel lane in each direction.

Salem Road
Salem Road is an east-west local road situated between CR 27 and Veterans Drive. To the east of Veterans Drive, the roadway is classified as a major collector road and currently consists of two-lane road with one travel lane in each direction. In addition, the roadway comprises an asphalt-paved surface, gravel shoulders and a posted maximum speed limit of 80 km/h; however, no illumination is provided. Between CR 27 and Essa Road, there are no pavement markings present. Between Essa Road and Veterans Drive, white edge of pavement markings is
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present; however, are faded and in poor condition. Yellow centerline markings are present and include double solid yellow, hatched yellow to allow passing in each direction, and hatched yellow and solid yellow to allow passing in one direction only. Salem Road is discontinuous east of Veterans Drive and terminates prior to Highway 400. Lockhart Road continues on the same alignment as Salem Road, east of Highway 400.

**Lockhart Road**
Lockhart Road is an east-west two-lane major collector road with a posted maximum speed limit of 60 km/h. At present, the roadway consists of asphalt-paved surface and gravel shoulders with white edge of pavement markings and a solid yellow centerline; however, no roadside illumination is provided.

**McKay Road/10th Line**
McKay Road/10th Line is an east-west two-lane arterial road with a maximum posted speed limit of 80 km/h. Within the limits of the study area, the roadway consists of an asphalt-paved surface, with white edge of pavement and a solid yellow centerline markings and gravel shoulders. No roadside illumination is provided along McKay Road.

**CR 27**
CR 27 is a north-south primary arterial roadway comprising a two-lane cross-section with one travel lane in each direction and a maximum posted speed limit of 80 km/h. The roadway consists of an asphalt-paved surface with white edge of pavement and yellow centre lane markings and gravel shoulders. No roadside illumination is provided along CR 27.

**Essa Road**
Essa Road is a two-lane arterial road with one travel lane in each direction and a posted maximum speed limit of 60 km/h, north of Salem Road, and 80 km/h south of Salem Road. The roadway consists of an asphalt-paved surface with white edge of pavement and yellow centre lane markings and gravel shoulders. No roadside illumination is provided along Essa Road.

**Veterans Drive**
Veterans Drive is a north-south arterial road with a posted maximum speed limit of 60 km/h. Between Mapleview Drive West and Salem Road, Veterans Drive consists a five-lane cross-section with two travel lanes in each direction and a continuous centre TWLTL. Within this section, the road surface is asphalt-paved with curb and gutter, roadside illumination, and includes bicycle lanes on the east and west sides of the roadway. South of Salem Road, Veterans Drive transitions to a basic two-lane cross-section with one travel lane in each direction. In addition, the posted maximum speed limit increases to 80 km/h. The roadway surface is asphalt-paved and gravel shoulders are present; however, bicycle lanes and roadside illumination are no longer provided within this section.

**Huronia Road**
Huronia Road is a north-south arterial road with two-travel lanes in each direction. The posted maximum speed limit is 60 km/h north of Lockhart Road, and transitions to 80 km/h south of
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Lockhart Road. The road surface is asphalt-paved with white edge of pavement and solid yellow centerline markings. In addition, the shoulders are asphalt-paved north of Lockhart Road; however, consist of gravel south of Lockhart Road.

### 2.1.2 Existing Traffic Volumes

Existing traffic volumes were determined for the base morning (AM) and evening (PM) peak hours based on traffic data and signal timing plans provided by the City. In general, the existing mid-block traffic conditions are experiencing minimal delays and are well within capacity.

Existing AM and PM peak hour traffic volumes and associated traffic data is offered in Appendix A of the Traffic Operation Assessment report provided in Appendix C of this ESR.

### 2.1.3 Existing Safety Review

Stantec undertook a review of collision data for the years 2010 through 2015 inclusive. The findings of the review indicated that the intersection of Essa Road/Mapleview Drive West experienced the highest number of collisions for the six-year period examined as well as the highest intersection collision rate. At this intersection, the most common collision type was rear-end collisions. The rear-end collisions predominately occurred on the northbound and westbound approaches. These collisions may be attributed to the skewed intersection geometry. Drivers intending to make a northbound or westbound right-turn movement on red or at the yield marker are required to look over their shoulder at a wider angle in order to view oncoming traffic. This is a physically more challenging movement, which may make it more difficult to properly identify gaps and may result in vehicles moving in a less predictable fashion than anticipated by the motorist queued behind them.

The intersection of Huronia Road/Lockhart Road experienced a total of 40 collisions for the six-year period examined. Rear-end collisions were the prominent collision type accounting for 35% of all collisions. These collisions may be attributed to the lack of auxiliary turn lanes on each approach, as each approach has a shared left/through/right lane configuration.

At the other intersections, the collision data is generally unremarkable and no trends or patterns are evident. At the mid-block locations, the collision rates are low and are primarily single-motor vehicle type collisions which, is typical for low-volume rural roads.

### 2.1.4 Traffic Growth

While substantial development is expected throughout the study area, development plans are not sufficiently advanced to identify specific land use types, sizes, and access locations.

Future traffic volumes were developed for the 2021 and 2031 horizon years based on growth rates calculated from the City’s EMME transportation demand model, as presented in Table 2-1. The growth rates were applied to existing traffic volumes to develop the future 2021 and 2031 traffic forecasts (please refer to Figures 2 and 3 offered in the Traffic Operation Report and provided in Appendix C of this ESR).
At the intersection of Salem Road at Veterans Drive, existing traffic volumes are low on the westbound approach as there is currently no access to Norris Drive and the adjacent commercial developments. In anticipation of future development along Salem Road, as well as a connection to Norris Drive, the traffic volumes for the westbound approach were increased to match the eastbound approach at Huronia Road at Lockhart Road before the growth rates were applied.

### 2.1.5 Study Area Intersections

The following intersections were analyzed as part of the traffic operations assessment. The existing intersection configurations and controls are detailed in the Traffic Operations report, provided in Appendix C of this ESR:

- Huronia Road at Lockhart Road
- Huronia Road at McKay Road
- Veterans Drive at Salem Road
- Veterans Drive at McKay Road
- Essa Road at Mapleview Drive West
- Essa Road at Salem Road
- Essa Road at McKay Road
- Simcoe CR 27 at Salem Road
- Simcoe CR 27 at Essa Road

It should be noted that the MMATMP recommended that McKay Road be re-aligned to intersect with CR 27 and Essa Road forming the intersection of Essa Road at CR 27-McKay Road. However, no other realignments have been planned within the study area.

### 2.1.5.1 Existing Intersection Operations

The quality of intersection operations at signalized and unsignalized intersections is evaluated in terms of level of service (LOS) and Volume-to-Capacity (v/c), as defined by the Transportation Research Board’s *Highway Capacity Manual* (2010). LOS is evaluated on the basis of average control delay per vehicle and includes deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Capacity is evaluated in terms of ratio of demand flow to capacity with a capacity condition represented by a v/c ratio of 1.00 (i.e. volume demand
equals capacity). For signalized intersections, the LOS ranges from A for 10 second average delay or less to LOS F for delays greater than 80 seconds. The delay values for unsignalized intersections range from 10 seconds or less for LOS A to greater than 50 seconds for LOS F.

Acceptable operations are generally considered to be LOS C or better. However, during peak hours, a LOS D is considered acceptable for through movements and for the overall intersection operation, and a LOS E is considered acceptable for turning movements.

To assess the existing peak hour conditions, a LOS analysis was conducted using the Synchro/SimTraffic 9.0 software package, which implements the methods of the Highway Capacity Manual. The analysis considered the existing lane configurations in the study area. The key parameters used in the analysis include:

- Existing lane configurations;
- Heavy vehicle percentages as derived from existing traffic counts;
- Calculated peak hour factors. This factor adjusts the hourly volumes to represent conditions during the peak 15 minutes of intersection operations;
- Signal timings as provided by City staff;
- SimTraffic for the estimation of queues based on an average of 5 simulation runs, with a seeding interval of 15 minutes and a recorded analysis period of 60 minutes; and
- Synchro default values for all other inputs.

Based on the findings of the analysis, the signalized study area intersections are all operating overall at LOS C or better during the AM and PM peak hours. In addition, all movements are noted to be operating well within capacity and with virtually all v/c ratios less than 0.80. The only exception would be at the intersection of Huronia Road and Lockhart Road, where the southbound approach has a v/c ratio of 0.89 during the PM peak hour. The unsignalized study area intersections all operate at acceptable levels of service with all movements operating within capacity.

### 2.1.5.2 Future Intersection Operations

Traffic modelling carried out to determine operations at study area intersections for the years 2021 and 2031 during the weekday AM and PM peak hours assumed that the Salem Road-Lockhart Road crossing of Highway 400 would be constructed as recommended by the MMATMP.

For the 2021 horizon year, all movements and intersections are expected operate at acceptable levels of service and within capacity. For the 2031 horizon year at the Huronia Road and McKay Road intersection in the PM peak hour, the eastbound left-turn movement and the intersection would be approaching capacity with v/c ratios of 0.90 and 0.85, respectively. The results of the intersection operations analysis are further outlined in Tables 13 and 14 of the Traffic Operations Assessment report provided in Appendix C of this ESR.
2.6 **Intersection Improvements**

Several intersection improvements were recommended in the traffic operations assessment to ensure that the study area intersections can accommodate the projected traffic volumes in 2021 and 2031. These recommended improvements are summarized in Table 2-2.

### 2.1.6.1 Signalization Warrants

Signal justification warrants were reviewed for the unsignalized intersections in the study area, the results of which indicated that traffic signal would be warranted for the 2031 horizon year at the intersection of Veterans Drive at Salem Road. However, it would not be warranted for the 2021 horizon year. Similarly, a traffic signal would be warranted for the 2031 horizon year at the reconfigured intersection of Essa Road at CR 27-McKay Road. However, it would not be warranted for the 2021 horizon year. The remaining two unsignalized intersections would not warrant signals for either the 2021 or 2031 horizon year. A summary of the signal justification warrant review is shown in Table 2-2.

### 2.1.6.2 Roundabouts

An initial screening of the study area intersections was completed using the Ministry of Transportation Ontario’s (MTO) Roundabout Feasibility Initial Screening Tool to determine, at a planning level, whether single-lane roundabout or multi-lane roundabouts would be required (see Table 2-2). At this time, the City is only considering the implementation of single-lane roundabouts. Consideration for a multi-lane roundabouts in the future will ensure that once a single-lane roundabout is implemented and traffic volumes grow to the point where the intersection reaches capacity, additional lanes can be provided to accommodate the larger volume of traffic. As such, the intersections of Salem Road with CR 27 and Essa Road, and the newly reconfigured intersection of Essa Road at CR 27-McKay Road should be carried forward for further roundabout consideration. The other intersections will have conventional lane arrangements and traffic signal controls. The existing intersection of Salem Road at Essa Road has skewed intersection geometry. This layout is not ideal and potentially raises operational and safety concerns, which could be addressed by reconstructing the intersection as a roundabout intersection.

### 2.1.6.3 Auxiliary Turn Lanes

Auxiliary left-turn lanes have been recommended for all approaches at each of the signalized intersections as a matter of best practice. The auxiliary turn lane recommendations are shown in Table 2-2.
Table 2-2 Recommended Intersection Improvements - 2031

<table>
<thead>
<tr>
<th>Intersection (Signal)</th>
<th>Signal Justification Warrant by Year</th>
<th>Auxiliary Turn Lane Recommendation</th>
</tr>
</thead>
</table>
| Veterans Drive at Salem Road (Unsignalized) | • 2021: Signal Not Warranted  
• 2031: Signal Warranted | • Eastbound left-turn lane  
• Westbound left-turn lane  
• Northbound left-turn and right-turn lanes  
• Southbound left-turn and right-turn lanes |
| Essa Road at Salem Road (Unsignalized) | • 2021: Signal Not Warranted  
• 2031: Signal Not Warranted | • No additional auxiliary turn lanes |
| Essa Road at CR 27-McKay Road (Unsignalized) | • 2021: Signal Not Warranted  
• 2031: Signal Warranted | • Eastbound left-turn and right-turn lanes  
• Westbound left-turn and right-turn lanes  
• Northbound right-turn lane  
• Southbound left-turn lane |
| CR 27 at Salem Road (Unsignalized) | • 2021: Signal Not Warranted  
• 2031: Signal Not Warranted | • Southbound left-turn lane |
| Mapleview Drive at Essa Road (Signalized) | N/A | • No additional auxiliary turn lanes |
| Lockhart Road at Huronia Road (Signalized) | N/A | • Eastbound left-turn and right-turn lanes  
• Westbound left-turn and right-turn lanes  
• Northbound left-turn and right-turn lanes  
• Southbound left-turn lane |
| McKay Road at Veterans Drive (Signalized) | N/A | • Eastbound left-turn lane  
• Westbound left-turn and right-turn lanes  
• Northbound left-turn and right-turn lanes  
• Southbound left-turn lane |
| McKay Road at Huronia Road (Signalized) | N/A | • Eastbound left-turn and right-turn lanes  
• Westbound left-turn and right-turn lanes  
• Northbound left-turn and right-turn lanes  
• Southbound left-turn and right-turn lanes |

A southbound auxiliary left-turn lane warrant is documented in Table 2-3 for the intersection of Huronia Road with the National Pines Golf Course access. Approaching and opposing volumes at the intersection of Huronia Road with the National Pines Golf Course access warrant an auxiliary left turn lane in both horizon years, assuming 5% of the approaching vehicles turn left into the golf course. It is noted that larger storage lengths would be warranted for higher proportions of left turns.

Table 2-3 Auxiliary Left Turn Lane Warrant, National Pines Golf Course

<table>
<thead>
<tr>
<th>Horizon Year</th>
<th>V_A</th>
<th>V_O</th>
<th>%LT (LT Vol)</th>
<th>Warrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>664</td>
<td>601</td>
<td>5% (33)</td>
<td>25 m warranted</td>
</tr>
<tr>
<td>2031</td>
<td>925</td>
<td>892</td>
<td>5% (46)</td>
<td>30 m warranted</td>
</tr>
</tbody>
</table>

Stantec
As noted in Section 1.3.2.1, Simcoe County requested that the City consider the provision of a two-lane roundabout at intersection of CR27 / Essa Road / McKay Road, due to future need for additional lanes on CR27 as projected in the County’s 2014 Transportation Master Plan Update.

According to best practices, the number of lanes through a roundabout are limited to the number of lanes required to meet the minimum functional requirements for traffic operations (i.e., for forecasted future peak-hour traffic volumes). That is, a higher number of vehicular lanes through a roundabout leads to increased speeds, reduced safety performance, greater property impacts, and higher construction and maintenance costs. This holds true in instances where roundabouts require fewer lanes than the approaching roads provide, including the scenario on CR27 at Essa Road, where a four-lane cross-section is envisaged as part of Simcoe Region planning, and only a single-lane roundabout is warranted. It should be noted that vehicular lanes can be added or removed upstream of the recommended single-lane roundabout at CR27 and Essa Road. Alternatively, the extra southbound approach lane could be converted to a right-turn bypass lane at the roundabout. Transition details between the four-lane cross-section and the single-lane roundabout can be further defined as part of future municipal initiative planning. In addition, the City and the County can discuss the possible implementation of a 2-lane roundabout as part of the 2051 scenario as part of on-going expansion discussions and detailed design assignments beyond the scope of this assignment.

2.1.6.4 McKay Road – Additional Intersections

As per the 2014 Salem Secondary Plan, properties located along McKay Road, between Essa Road and Veterans Drive, are being planned for future residential and commercial development. A traffic forecast exercise was undertaken to assess the future traffic operations at three intersections being planned in this area in association with this planned development. The exercise was based on preliminary planning characteristics and assumptions.

Based on the findings of traffic forecast exercise, the three additional intersections to be located along McKay Road are anticipated to operate well in the 2031 horizon year with the projected traffic volumes. In addition, signals are expected to be warranted at each of the intersections. However, it should be noted that an update to the traffic forecast is recommended once more information related to development in the area is confirmed.

2.1.7 Mid-Block Roadway Operations

A mid-block roadway analysis was completed by comparing the existing weekday AM and PM peak hour traffic volumes derived from the turning movement counts to a planning level arterial roadway capacity of 900 Vehicles Per Hour (VPH) per lane.

This information was used to calculate the existing v/c ratios for the mid-block road sections within the study area. The largest mid-block volumes between road sections were utilized for analysis as they would provide a more conservative estimate of existing road capacity. As noted in Section 2.1.2, the existing mid-block traffic conditions in the study area are generally experiencing minimal delays and are well within capacity.
For the 2021 and 2031 horizon years, all roadways at the mid-block locations operate within capacity during the AM and PM peak hours.

2.1.8 Mid-Block Roadway Improvements

As noted in Section 1.2, the MMATMP made numerous recommendations for transportation roadway improvements within the study area (please refer to Table 1-2).

2.1.9 Summary

The traffic operations assessment was completed to predict future traffic volumes through 2031, and to identify road and intersection improvements in the study area. The key findings of the traffic operations assessment are:

a) The City’s travel demand forecasting model indicates that substantial traffic growth is anticipated on the study area roadways.

b) The intersection of Salem Road at Veterans Drive meets the signal justification criteria for the 2031 horizon year but not the 2021 horizon year. None of the other current un-signalized intersections were found to warrant signalization by either 2021 or 2031.

c) Single-lane roundabouts may be an appropriate form of intersection design and control as they can provide significant safety, capacity, and cost benefits. Salem Road at CR 27, Salem Road at Essa Road, and CR27-McKay Road at Essa Road should be further investigated for roundabout implementation.

d) With the roadway widenings as recommended in the MMATMP and the auxiliary lanes outlined in Section 2.1.6.3, the study area intersections generally operate within capacity and at acceptable levels of service for the 2021 and 2031 horizon years.

e) An auxiliary left turn lane is warranted along the southbound approach to the intersection of Huronia Road with the National Pines Golf Course access based on forecast volumes and an assumption of 5% left turning vehicles.

f) The mid-block roadway analysis indicates that the Study Area roadways would operate within capacity in the 2021 and 2031 horizon years.
3.0 PROJECT ENVIRONMENTS

A description of the study area has been developed considering the Preliminary Alternative Design and the following environments:

- Engineering/Operational Environment;
- Natural Environment;
- Cultural Environment; and
- Social and Economic Environment.

3.1 ENGINEERING/OPERATIONAL ENVIRONMENT

3.1.1 Stormwater System

The study area is situated within two (2) watersheds and three (3) subwatersheds. The existing land cover consists predominately of agriculture land and natural areas such as woodlots and wetlands with pockets of rural residential. Institutional blocks as well as commercial and industrial blocks are also present. The existing roadway cross sections consist of asphalt lanes with gravel shoulders and vegetated roadside drainage ditches on both sides to convey stormwater runoff. Aside from these roadside drainage ditches, there does not appear to be any other SWM measures currently within or adjacent to the ROW to control either the quantity or quality of stormwater runoff within the study area.

3.1.1.1 Existing Culvert Capacity Assessments

An assessment of the existing crossings within the study area was undertaken to determine if culvert upgrades would be necessary to satisfy current engineering standards. The existing culverts were assessed using the future classification of the study area roadways (i.e., urban arterial) and the following engineering standards:

- MTO Drainage Design Standards WC-1, Design Flows (Bridges & Culverts) and WC-7 Culvert Crossings on a Watercourse: for an urban arterial roadway having a span of:
  1. less than or equal to 6m, a minimum freeboard of 1.0m is required during a 50-year storm; or
  2. greater than 6m, a minimum freeboard of 1.0m is required during a 100-year storm;
- City Guidelines: all culverts and bridges crossing arterial roads must be designed to prevent overtopping during the 100-Year storm; and
- Ministry of Natural Resources and Forestry (MNRF) Guidelines: the maximum flood depths that may be passed by pedestrian, passenger vehicles and emergency vehicles are 0.3 m, 0.3 m and 0.9 m respectively.

Ten (10) watercourse crossings are currently situated within the study area; three (3) at tributaries of Bear Creek, two (2) at tributaries of Thornton Creek and five (5) at tributaries of Lovers Creek.
For ease of reference, the culvert numbering convention utilized in the DSWMMP was maintained, with the exception of culvert 100, which was not assessed as part of the Drainage and SWM Master Plan (DSWMMP) prepared by others for the City in 2013.

The HEC-RAS model prepared as part of the DSWMMP was used to complete the current culvert capacity assessment. The results of the assessment are summarized in Table 3-1 below. Detailed assessment information is offered as part of the SWM Report, provided in Appendix D of this ESR.

Table 3-1 Existing Culverts Assessment

<table>
<thead>
<tr>
<th>Culvert Number</th>
<th>HEC-RAS Crossing Section</th>
<th>Culvert Description (mm)</th>
<th>Meets Applicable Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>MTO (50-Year)</td>
</tr>
<tr>
<td>Bear Creek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1963.4</td>
<td>500 Circular CMP</td>
<td>x</td>
</tr>
<tr>
<td>5</td>
<td>3145</td>
<td>900 Circular CMP</td>
<td>x</td>
</tr>
<tr>
<td>10</td>
<td>4092.76</td>
<td>800 Circular CMP</td>
<td>x</td>
</tr>
<tr>
<td>Thornton Creek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>8092.48</td>
<td>800 x 1290 Arch CMP</td>
<td>x</td>
</tr>
<tr>
<td>48</td>
<td>2635.65</td>
<td>810 x 1310 Arch CMP</td>
<td>x</td>
</tr>
<tr>
<td>Lovers Creek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3835</td>
<td>2000 x 1800 Concrete Box</td>
<td>v</td>
</tr>
<tr>
<td>21</td>
<td>256.034</td>
<td>1950 Circular CMP</td>
<td>x</td>
</tr>
<tr>
<td>23</td>
<td>150</td>
<td>1150 Circular CMP</td>
<td>x</td>
</tr>
<tr>
<td>27</td>
<td>718.305</td>
<td>1150 Circular CMP</td>
<td>x</td>
</tr>
<tr>
<td>201</td>
<td>521.018</td>
<td>2-3000 x 900 Concrete Box</td>
<td>x</td>
</tr>
</tbody>
</table>

In summary, one (1) out of the ten (10) existing crossings is considered hydraulically sufficient based on the current engineering guidelines.

3.1.1.2 Stormwater Management Criteria

Based on a review of relevant information and consultation with the LSRCA, the following SWM objectives and design criteria have been identified for future road modifications in the study area:

- Provide a SWM strategy at a conceptual level to the satisfaction of the City, LSRCA and NVCA;
- Maintain existing subwatershed boundaries to the extent possible;
• Provide Enhanced SWM quality controls as defined in the MOE Guidelines. This corresponds to a long-term average removal of 80% of total suspended solids;
• Use a SWM ‘treatment train’ approach wherever possible. Utilization of oil-grit separators (OGS) as standalone treatment devices will not be accepted to satisfy Enhanced treatment;
• Minimize post development impacts on phosphorus loads;
• Assess the feasibility of implementing of Low Impact Development (LID) measures. Linear and centralized LID measures are to be assessed. When assessing linear LIDs, only minor modifications to City Design Standards/Guidelines will be permitted;
• Identify preliminary land requirements and locations of centralized LID facilities;
• Capture and retain/treat onsite (volume reduction), where possible, the greater of:
  • Runoff from 12.5mm event from the total impervious surfaces; or
  • Runoff from a 25mm event from the net increase in impervious surface;
• Ensure post-development peak flow rates do not exceed the corresponding pre-development peak flow rates for the 2-year to 100-year storm events.
• Review opportunities to integrate with the Salem Landowners Group (SLG) SWM facilities;
• Identify preliminary land requirements and locations of quantity control facilities should they be required during detailed design; and
• Determine capacity of existing culverts and provide recommendations regarding replacement/upsizing and/or extensions.

3.1.2 Water Distribution

The existing water supply system is contained within the pre-2010 City boundary. Initial development in the Salem Secondary Plan Development Area will occur within the north portion of the study area. A new supply main will be required from the Mapleview Elevated Tank, located along Mapleview Drive West and south along Essa Road, to supply the western portion of the study area. A new transmission main is also required south along Veterans Drive. As residential development extends west along McKay Road West, the transmission main will be extended to follow the growth and eventually connect to local mains to create a redundancy supply loop. A booster pumping station and storage facility are proposed during this phase of development (i.e., between 2022 to 2026) to accommodate water demand and storage requirements for the current and future phases, and would require supply lines from the Surface Water Treatment Plant.

3.1.3 Wastewater Distribution

There are no existing wastewater collection systems currently in place within the study area. The City’s 2013 Wastewater Collection Master Plan was completed in 2013 to determine servicing needs in the City based on anticipated growth and recognized the need to expand waste water collection systems into the study area to accommodate future development.
3.1.4 Utilities

A TransCanada pipeline is present within the west portion of the study area, and generally spans in a southeast to northwest direction. The pipeline intersects McKay Road approximately 600 m east of CR 27, Essa Road approximately 420 m east of CR 27, and Salem Road approximately 130 m east of CR 27.

A Hydro One dual hydroelectric transmission corridor runs southeast to northwest within the eastern portion of the study area, starting from the Barrie-Collingwood Railway 600 m south of McKay Road to the west end of Lockhart Road. InnPower Corporation, Hydro One Networks Inc., and PowerStream all have transmission lines in the study area. InnPower is currently developing service routes for electricity transmission to future residential developments.

3.1.5 Street Lighting

Street lighting is not currently provided along the majority of roads within the study area, with the exception of Essa Road north of Athabaska Road and Veterans Drive north of Salem Road.

3.1.6 Sidewalk System

Since most of the study area currently consists of rural agricultural land, sidewalks are limited to 1.2 m concrete sidewalk along a portion of the east side of Essa Road, south of Mapleview Drive West, as well as on the east side of Veterans Drive north of Salem Road.

3.1.7 Driveway Access

At present, driveway access is provided via 22 entrances along McKay Road, 14 along Huronia Road, 14 along Lockhart Road, 25 s along Salem Road, 45 along Essa Road, and 7 along Veterans Drive. These entrances currently serve a mix of existing land uses in the area, including residential, agricultural, commercial, and industrial.

3.1.8 Lane Width

The existing roadway ROW widths in the study area generally consist of the following:

<table>
<thead>
<tr>
<th>Road</th>
<th>Width Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterans Drive</td>
<td>36 m north of Salem Road, 20 m south of Salem Road</td>
</tr>
<tr>
<td>McKay Road East</td>
<td>20 m</td>
</tr>
<tr>
<td>Lockhart Road</td>
<td>26 m</td>
</tr>
<tr>
<td>Essa Road</td>
<td>30 m north of Athabaska Road, 20 m south of Athabaska Road</td>
</tr>
<tr>
<td>Salem Road</td>
<td>20 m</td>
</tr>
<tr>
<td>McKay Road West</td>
<td>20 m</td>
</tr>
<tr>
<td>Huronia Road</td>
<td>30 m north of Lockhart Road, 20 m south of Lockhart Road</td>
</tr>
</tbody>
</table>
The through lanes in the study area road network must be capable of accommodating a variety of vehicles, often travelling in the same direction during peak traffic hours. For alternative designs that plan for TWLTL, the centre lane must be wide enough to accommodate vehicles turning in opposite directions, which requires a wider lane than usual to allow opposing vehicles to see around each other. Lane widths in the study area will follow the proposed City standards, where right-turn, left-turn, and through lanes are 3.5 m measured to both edges of the pavement. TWLTL are between 4.0 and 4.2 m, and separate on-road bicycle lanes are 1.5 m with a 0.5 m painted buffer. Left-turn lanes adjacent to medians will be 3.0 m. A 4.2 m median/TWLTL will accommodate a 3.0 m dedicated left turn with a 1.2 m raised centre median at signalized intersections. Centre medians are often implemented at intersections with 5 or more lanes in order to accommodate traffic signals and improve overall intersection safety. The 1.2 m median can also accommodate traffic signal poles.

### 3.1.9 Railway Crossings

The Beeton Spur, which branches from the main line of the Barrie-Collingwood Railway, crosses McKay Road East and Lockhart Road within the study area. The rail line is situated between Highway 400 and Huronia Road. The rail line crosses a rail bridge over Lockhart Road and crosses McKay Road at grade. The railway crossing at McKay Road is active, with bells and lights, however no gate is present.

### 3.1.10 Preliminary Foundation Investigation

A preliminary foundation investigation was undertaken in November 2016 to determine existing conditions and develop preliminary geotechnical recommendations for modifications to the above-grade rail crossing and three (3) existing culverts in the study area. The investigation consisted of a desktop review of existing subsurface information for the study area region and advancement of four boreholes at the BCRY Crossing, located on Lockhart Road approximately 385 m west of Rawson Avenue, and at three (3) existing culverts in the study. A copy of the preliminary foundation investigation is provided in Appendix E.

As part of the foundation investigation, four (4) boreholes were advanced in the vicinity of the existing study area structures, as shown in **Table 3-2**.

#### Table 3-2 Boreholes in Existing Study Area Structures

<table>
<thead>
<tr>
<th>Borehole</th>
<th>Location</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH1</td>
<td>Huronia Road, approximately 35 m south of Lockhart Road</td>
<td>1 m diameter, 20 m long Corrugated Steel Pipe (CSP) culvert beneath Huronia Road, south of Lockhart Road.</td>
</tr>
<tr>
<td>BH2</td>
<td>Lockhart Road, approximately 140 m west of Rawson Avenue</td>
<td>20 m long double box concrete culvert.</td>
</tr>
<tr>
<td>BH3</td>
<td>Railway Bridge over Lockhart Road, approximately 385 m west of Rawson Avenue</td>
<td>10 m long by 5 m wide single span railway bridge, with concrete abutments and wing walls.</td>
</tr>
</tbody>
</table>
Table 3-2 Boreholes in Existing Study Area Structures

<table>
<thead>
<tr>
<th>Borehole</th>
<th>Location</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH4</td>
<td>Essa Road, approximately 65 m south of Athabaska Road.</td>
<td>30 m long concrete box culvert.</td>
</tr>
</tbody>
</table>

Subsurface conditions encountered in the boreholes advanced as part of the investigation generally consisted of fill materials (i.e., sand and gravel to silty sand with trace gravel) underlain by either stiff to hard silty clay at two locations or loose to very dense silty sand. Groundwater was recorded at depths ranging from 1.5 m to 2.4 m bgs following drilling.

3.1.10.1 Existing Culvert Conditions

Visual observations at the time of the field investigation did not identify any obvious signs of distress to the existing culverts located in the vicinity of BHs 1, 2 and 4. There was no evidence of unusual or problematic cracking of the paved road surface above the culverts. Similarly, there was no obvious indication of settlement of the culverts or distortion of the road surface that could be construed as arising from consolidation settlement of the road embankment, the existing culverts, or the underlying soils.

3.1.10.2 Lockhart Road Bridge Rail Crossing

The existing rail bridge wing walls extend approximately 8 m from the edge of the abutment. It is inferred that the wingwalls were either added or rehabilitated since the original construction of the bridge. In addition, it is inferred that the existing abutments are founded on spread footings underlain by native sandy silt soils.

3.1.11 Topographic and Legal Surveys

The City provided the complete Topographic and Legal Survey base data for the work carried out on Phases 3 and 4 of this assignment. The data provided by the City provided sufficient detail to carry out the work required, including the area at the existing grade separation and large culvert locations. The existing grading provided in these areas presented the surface features required to create the conceptual plan and profile drawings for the Preferred Design alternative.

3.2 NATURAL ENVIRONMENT

A Natural Heritage Impact Assessment was completed, including the lands situated within 120 m of the existing ROW. The assessment included a desktop review of relevant/available information, including a natural heritage assessment completed for the study area and surrounding area by Natural Resource Solutions Inc (NSRI) in 2012. In addition, a total of nine (9) field visits were conducted in the study area in April, May, June, and July 2016. A summary of the findings is provided below, and the corresponding report is provided in Appendix F of this ESR.
3.2.1 Designated Natural Areas

The Lovers Creek Swamp Provincially Significant Wetland (PSW) intersects the study area at Veteran’s Drive and Huronia Road. The field investigation did not detect wetland habitat in the within the study area at Veteran’s Drive. The wooded area surrounding the Lovers Creek Swamp PSW is a Deer Wintering Area designated by Land Information Ontario (LIO; 2016). NVCA and LSRCA regulate lands within the Development Area. These lands coincide with sensitive natural features and hazards and fall under the jurisdiction of the corresponding conservation authority. The Development Area contains Natural Core Areas, Natural Linkage Areas, and Low, Medium, and High Constraint Stream Corridor Areas (City of Barrie 2013c).

3.2.2 Vegetation

An Ecological Land Classification Assessment (ELC) assessment was completed for the study area, the findings of which indicated that approximately 57% of the area is occupied by Cultural vegetation communities. The balance of vegetation communities consisted of forests, woodlands, wetlands, thickets, and meadows that were largely fragmented by agriculture and linear infrastructure. In general, vegetation communities within the study contain a high proportion of introduced species, and other evidence of anthropogenic factors, such as roadside mowing and ditch maintenance.

No Rare Vegetation Communities were identified within the study area.

3.2.3 Wildlife

Breeding Birds

In 2012, 113 bird species were identified within the broader Salem Secondary Plan Area, including three SAR (Bobolink [Dolichonyx oryzivorus], Eastern Meadowlark [Sturnella magna], and Barn Swallow [Hirundo rustica]) and two Species of Conservation Concern (SOCC) (Grasshopper Sparrow [Ammodramus savannarum] and Wood Thrush [Hylocichla mustelina]) (NSRI 2012a, b). These SAR were also identified during the 2016 field investigation completed by Stantec. However, the previously-documented SOCC were not identified during the targeted surveys, and therefore are considered absent from the study area.

The 2016 field investigation identified 44 bird species, including the three SAR (listed above) and one SOCC (Eastern Wood-Pewee [Contopus virens]). All species identified are ranked as Apparently Secure (S4), Secure (S5), or Introduced (SNA) in Ontario. While the single Eastern Wood-Pewee detection does not provide positive confirmation of breeding, the surrounding deciduous forest and clearings are considered candidate habitat for this SOCC. No other Significant Wildlife Habitat (SWH) associated with bird species were identified in the study area.

Mammals

Eleven (11) mammal species were identified by NSRI in 2012, all of which are ranked as Secure (S5) in Ontario. No mammals were identified in the study area at the time of the 2016 field
investigations; however, eight candidate maternity roost features were identified that have boundaries within or adjacent to the ROW.

**Amphibians**

NRSI identified seven amphibian species in 2012, including one SOCC (Western Chorus Frog [*Pseudacris triseriata*]). Western Chorus Frog is listed as Threatened federally. However, it is unclear whether this species was identified in the current study area or within the broader Salem Secondary Plan Area lands assessed by NRSI in 2012. Targeted surveys were conducted as part of the 2016 field investigation; however, Western Chorus Frog was not identified. As such, this species is considered absent from the study area.

Five amphibian species were identified within the study area during the 2016 field investigation, all of which are ranked Secure (S5). Four amphibian breeding habitats, including three for wetland species and one for woodland species, were confirmed within the study area. No Amphibian Movement Corridors were found within the study area.

**Reptiles**

NRSI identified two Secure (S5) species of snake during the 2012 study; however, no reptiles were identified in the study area during the 2016 field investigation. Seven candidate Turtle Wintering Areas were recorded at various wetlands across the study area.

**Insects**

NRSI identified 15 species of Odonata (dragonflies and damselflies) and 19 species of Lepidoptera (butterflies) during the 2012 study. All of the observed species are ranked Apparently Secure (S4) or Secure (S5) except for two SOCC (Pronghorn Clubtail [*Gomphus grasilinellus*] and Delta-spotted Spiketail [*Cordulegaster diastatops*]) which are ranked Vulnerable (S3). No insects were recorded in the study area during the 2016 investigation, and no associated SWH was observed.

### 3.2.4 Species at Risk

The 2016 field investigations aimed to determine the presence of habitat for any federally or provincially designated species, notably Species at Risk (SAR). Based on the findings of the background review completed in 2016, 13 SAR (5 vegetation SAR, 6 bird SAR, and 2 mammal SAR) and 25 SOCC (12 vegetation SOCC, 5 bird SOCC, 1 amphibian SOCC, 2 reptile SOCC, and 5 insect SOCC) have the potential to occur in the study area. The noted SAR and their preferred habitat were screened to determine whether potentially suitable habitat exists within the study area for these species.

### 3.2.5 Fish Habitat

The background data review did not identify aquatic SAR or SOCC in the study area. Current fish habitat in the study area was assessed via field investigations, conducted in 2016, the findings of which are described below. Field investigations included a review of existing habitat conditions and a fish sampling program completed in July 2016.
Lovers Creek Tributaries
Field surveys were completed at five locations on tributaries to Lovers Creek. Three locations support Brook Trout, confirming the coldwater thermal regime indicated in the background data. Although no trout spawning redds (spawning beds) were identified, coarse substrates at these locations provide potential spawning habitat. Habitat sensitivity at these locations was ranked as High in the Natural Heritage Systems Report completed by NSRI in 2012 and, at the Huronia Road crossing locations, the tributaries are within High Constraint stream corridors.

Bear Creek Tributaries
Field surveys were completed at three locations on tributaries to Bear Creek. Two locations provide seasonal fish habitat; however, were dry during the 2016 survey. NRSI ranked the habitat sensitivity at these locations as Medium. These tributaries are also considered Medium Constraint Stream Corridor Areas. Based on water temperature, Bear Creek does not provide suitable habitat for Brook Trout with respect to thermal regime. No fish were captured during the 2016 fish community sampling program.

Thornton Creek Tributaries
Field surveys were completed at two locations of tributaries to Thornton Creek, both of which provide seasonal fish habitat. One sampling station was dry during both the fall and summer surveys and the other was dry during the fall survey. The station in the wet Thornton Creek Tributary does not provide suitable habitat for Brook Trout with respect to thermal regime or spawning substrates. NRSI ranked these locations as Medium sensitivity. The stream corridor constraint ranking is Medium for both tributaries.

3.2.6 Fluvial Geomorphology
Channel stability, erosion thresholds, and the appropriate meander belt width were investigated by others at the same locations investigated as part of the current aquatic survey (described above). Stantec subsequently undertook field inspections in November 2015 to assess channel stability, verify the initial findings, and determine if channel conditions had changed since 2013. The findings of these inspections are provided in Table H2 of the Natural Heritage Report included in Appendix F, and briefly described herein.

Lovers Creek Tributaries
Stantec field surveys were undertaken at five road crossings on tributaries to Lovers Creek. Four stations are characterized by watercourses that exhibit fluvial characteristics and well-defined bed and banks. Three stations are transitional (i.e. transitioning to/from a stable (in regime) system from/to an unstable system) and indicate a moderate degree of instability. This condition remains unchanged from the previous surveys conducted by others at these sites. One station is located on a headwater tributary.

Bear Creek Tributaries
Background data and mapping identify three tributaries of Bear Creek that cross roads in the study area. Two of the watercourses were small drainage features where fluvial processes were
not observed and channel form was controlled by vegetation. Due to the lack of an alluvial channel at these two sites, rapid geomorphic assessments were not applicable. These observations are consistent with the background data sources, where the headwater origins of these watercourses were identified upstream of Salem Road (Amec Foster Wheeler 2013).

One channel was stable (in regime) with no excessive erosion or deposition. The culvert under Essa Road was a 3 m wide concrete box culvert. Substrate in the culvert was riverstone (coarse gravel and small cobble) with a defined low of channel that was approximately 2 m wide. Native sediment upstream and downstream of the culvert consisted of fine-textured silt, sand, and fine gravel. The bankfull width was approximately 1 m - 2 m.

Thornton Creek Tributaries
One station was located at a grassed drainage feature where alluvial processes were not observed and, therefore, a rapid geomorphic assessment was not applicable. Channel morphology at this site is vegetation-controlled. The headwater origin of this tributary is located approximately 250 m north of McKay Road West (NRSI 2012a).

The other station was a well-defined channel that was stable (in regime), apart from bank scour that was observed on both sides of the channel immediately downstream of the McKay Road West culvert. The scour indicates that the culvert (0.6 m wide) is undersized for the channel (estimated bankfull width was 3 m). The channel drains to an online pond located approximately 15 m downstream of McKay Road West. The headwater origin of this tributary is located approximately 250 m north of McKay Road West (NRSI 2012a).

3.2.7 Subsurface Conditions
Based on a desktop review of study area information, subsurface conditions generally consist of a stratum of granular soil (typically silty sand, sandy silt, and silt) characterized as loose to compact (and locally dense to very dense) underlain by a stratum of either granular or cohesive glacial till (typically silty sand with gravel to silty clay) characterized as either compact to very dense or tiff to hard. Previous borehole records have encountered groundwater at depths often less than 5 m bgs.

3.2.8 Source Water Protection
The study area is situated outside Well Head Protection Areas and/or Intake Protection Zones that serve the drinking water supplies for the City. As such, no Source Protection Plan policies apply to the project and/or study area.

3.2.9 Groundwater Resources
Existing land uses in the study area are not currently serviced by the City and therefore rely on private groundwater supply wells for potable and other uses. However, the study area will be fully serviced by municipal water supply once ultimate conditions/planned development in the area has been completed (please refer to Section 4.1.2).
3.3 CULTURAL ENVIRONMENT

3.3.1 Cultural Heritage Assessment

A Cultural Heritage Assessment (CHA) report was completed to identify potential built heritage and cultural heritage landscape resources present within and/or adjacent to the study area. As part of the CHA, a review of land use history, windshield survey, inventory and an evaluation of potential resources was undertaken in accordance with O.Reg. 9/06. In addition, the Ministry of Tourism, Culture, and Sport (MTCs), the Ontario Heritage Trust (OHT), and the City were contacted to identify properties that may be of cultural heritage value or interest in the study area.

Based on information provided by the MTCs, OHT and City, no designated or listed heritage properties or conservation easement sites are located within or adjacent to the study area. However, 34 potential cultural heritage resources were identified in the vicinity of the study area during a Cultural Heritage study completed by Untermann McPhail in 2011 for the broader Annexed Lands. These included a mix of cultural heritage landscapes and built heritage resources. The Hamlet of Vine is also considered a cultural heritage landscape. The balance of identified potential heritage resources consisted of a railway subway, the Canadian National Railway line, and the former Vine Railway Station which was converted to a residence. A field survey completed by Stantec in 2016 identified seven additional potential heritage resources, including a former church. The majority of the properties identified in 2011 and 2016 were constructed prior to 1920.

Stantec conducted further evaluation of the identified properties, twenty-six (26) of which were identified as cultural heritage resources (resources with cultural heritage value or interest) within or adjacent to the study area. The location of these resources is illustrated on Figure 7 of the Cultural Heritage Assessment report provided in Appendix G of this ESR.

3.3.2 Archaeological Assessment

A Stage 1 Archaeological Assessment (AA) was completed as part of the secondary plan and infrastructure master plans for the annexed lands in 2010; however, since the study areas were not congruous. As such, the Stage 1 AA recommended that a Stage 1-2AA be completed as part of subsequent planning.

A Stage 1-2 AA was completed in spring 2017 to determine the presence of archaeological resources within the study area, and whether any of the resources might be artifacts and archaeological sites with cultural heritage value or interest. The findings of the assessment identified three (3) Euro-Canadian archaeological sites within the study area, each of which contained more than 20 artifacts dating to a period of use to before 1900.

A copy of the Stage 1-2 AA is provided in Appendix H of this ESR.
3.4 SOCIAL AND ECONOMIC ENVIRONMENT

3.4.1 Land Use

Land uses within the study area primarily consist of agricultural with some areas used for light industrial and single-family residential purposes. However, the City’s vision for the Salem Secondary Plan Area is to provide a range of employment, housing, and a mix of other uses. This includes: general industrial around the Salem Road at Veterans Road intersection, as well at the Lockhart Road at Huronia Road intersection; a mixed-use node at the intersection of Salem Road at Essa Road; several residential properties located near the intersections of Salem Road at CR 27 and CR 27 at Essa Road; and mixed-used nodes along McKay Road west of Veterans Road. The Innisbrook Golf Course is located in proximity to the Lockhart Road at Huronia Road intersection. In addition, the National Pines Golf Course is located in proximity to the McKay Road and Huronia Road intersection.

3.4.2 Noise

A Traffic Noise Assessment was completed by Stantec to identify potential increases in sound levels associated with the recommended modifications to transportation in the study area. Anticipated changes in sound levels with and without road modifications were measured at representative outdoor living areas (OLAs) of noise sensitive land uses (e.g., residences and hospitals) within the study area, as per the applicable provincial noise guidelines provided by the Ministry of Transportation (MTO) and Ministry of the Environment and Climate Change (MOECC). In total, eight (8) receptor locations were identified adjacent to the study area roadways; however only four (4) were considered OLAs.

According to the provincial noise guidelines, should road modification projects introduce a change in ambient sound levels at or above 5 dBA or the project overall sound levels are greater than or equal to 65dBA, the proponent is required to investigate the feasibility of implementing noise control measures. Should the change (increase) in ambient sound levels be below 5 dBA, no noise mitigation efforts are required.

A copy of the Noise Assessment is provided in Appendix 1.
4.0 IDENTIFICATION AND EVALUATION OF ALTERNATIVE DESIGN CONCEPTS

4.1 SCREENING OF PRELIMINARY ALTERNATIVE DESIGNS

The MMATMP identified the need for improvements to transportation infrastructure in the study area to address anticipated growth in the City. The Preferred Solution included medium multi-modal share targets, the associated active transportation measures, and road configurations, including widening, to accommodate a range of employment, housing, and a mix of other land uses that allow residents to live, work and play in their community.

Alternative design concepts represent alternative ways of carrying out the Preferred Solution. A series of preliminary alternative designs were developed for each road section, in consideration of the MMATMP recommendations and the findings of the traffic operations assessment. In general, the following preliminary alternative design concepts were developed by the study team:

- Alternative active transportation infrastructure treatments (i.e., off-road MUT, on-road cycling lanes, buffered on-road cycling lanes, sidewalks (1.5 m to 2.5 m)
- Alternative median widths and treatments
- Alternative ROW widths

A brief description of the preliminary alternative concepts is provided in Table 4-1 below. Other design considerations consisted of the following:

- Minimize impacts to adjacent properties
- Minimize impacts to the natural environment
- Maximize traffic operations and safety
- Minimize construction costs
- Consider shifting the road alignment at existing grade separated rail crossing at Lockhart Road to the south the avoid impacts to the existing stream
- Widen Lockhart Road based on existing alignment, stream shifted to the south
- Widen Huronia Road based on existing alignment. Mitigate impacts to the west by shifting alignment to the east
- Widen existing at-grade rail crossing at McKay Road with 5 lane cross-section per MMATMP
- Consider widening existing at-grade rail crossing at McKay Road with narrow 4 lane section through this location to limit impacts

Three (3) workshops were held during the development and assessment of the preliminary alternative designs. Workshop attendees included representatives from the City, County of Simcoe, Township of Innisfill and Stantec, Hatch and WSP. The purpose of the workshops was to discuss preliminary alternative designs options and ‘screen out’ alternatives that were considered unsuitable and/or unable to adequately address the recommendations of the
Identification and Evaluation of Alternative Design Concepts
October 12, 2017

MMATMP. The results screening exercise identified two alternative designs for each road section. A copy of the workshop meeting minutes is provided in Appendix B-5 of this ESR.

4.2 IDENTIFICATION OF ALTERNATIVE DESIGN CONCEPTS

Alternative design concepts were developed based on the results of the recommendations of the MMATMP, the screening of preliminary alternative designs and in consideration of the opportunity to provide LID SWM features. As such, two alternative design concepts were developed for each road section, as outlined below. The alternative design concept drawings and cross sections for each roadway are provided in Appendix L.

Table 4-1 Alternative Design Concepts – Salem Road, Essa Road, McKay Road West, Huronia Road

<table>
<thead>
<tr>
<th>Alternative 1 – MMATMP Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 27 m ROW</td>
</tr>
<tr>
<td>• 3 lane cross section, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk on each side of roadway</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
</tr>
<tr>
<td>Alternative 2 - MMATMP + 4 m additional ROW for LIDs</td>
</tr>
<tr>
<td>• 31 m ROW</td>
</tr>
<tr>
<td>• 3 lane cross section, 1 lanes in each direction</td>
</tr>
<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk (one side of the road only)</td>
</tr>
<tr>
<td>• 3.0 m MUT (one side of the road only)</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
</tr>
<tr>
<td>• 2 m LID on each side</td>
</tr>
</tbody>
</table>

Table 4-2 Alternative Design Concepts – Veterans Drive, McKay Road East, Lockhart Road

<table>
<thead>
<tr>
<th>Alternative 1 - MMATMP Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 34 m ROW</td>
</tr>
<tr>
<td>• 5 lane cross section, 2 lanes in each direction</td>
</tr>
<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk on each side of roadway</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
</tr>
<tr>
<td>Alternative 2 - MMATMP + 4 m additional ROW for LIDs</td>
</tr>
<tr>
<td>• 38 m ROW</td>
</tr>
<tr>
<td>• 5 lane cross section, 2 lanes in each direction</td>
</tr>
<tr>
<td>• 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction</td>
</tr>
<tr>
<td>• 2.0 m sidewalk (one side of the roadway)</td>
</tr>
<tr>
<td>• 3.0 m MUT (one side of the roadway)</td>
</tr>
<tr>
<td>• 4.2 m TWLTL or landscaped median</td>
</tr>
<tr>
<td>• 2 m LID feature on each side of the roadway</td>
</tr>
</tbody>
</table>
4.3 EVALUATION OF ALTERNATIVE DESIGN CONCEPTS

4.3.1 Evaluation Criteria

The alternative design concepts were subjected to a detailed comparative evaluation using a reasoned argument approach, which describes the advantages and disadvantages of each alternative in response to evaluation criteria. The following evaluation criteria were developed based on City, regulatory, and stakeholder priorities and concerns, environmental features in the vicinity of the proposed ROWs, and engineering best management practices:

**Engineering/Operational Environment**
- Traffic operations
- Cycling operations
- Transit operations and service
- Pedestrian operations
- Municipal services
- Utilities
- Driveways
- SWM
- Constructability/Interim improvements
- Geotechnical and hydrogeological conditions
- Operations and maintenance requirements
- Structures

**Social Environment**
- Property acquisition
- Aesthetics
- Noise
- Construction
- Accessibility
- Public safety
- Local businesses

**Cultural Heritage Environment**
- Archaeological
- Cultural heritage
- First Nations

**Economic Environment**
- Project capital costs
- Life cycle costs
- Land acquisition costs

**Natural Environment**
- Watercourses, fisheries, and aquatics
- Wildlife and wildlife habitat
- SAR
- Vegetation
- Groundwater
- Wetlands
- Land use
- Environmental improvements

The evaluation focuses on the ability of each alternative to address the problems and opportunities and the recommendations of the MMATMP. Each alternative was ranked in terms of how well it responds to the criteria. Opportunities to incorporate mitigation to offset potential adverse impacts are also considered within this ranking process.
Identification and Evaluation of Alternative Design Concepts
October 12, 2017

The detailed evaluation of alternative design concepts is provided in Table 4-3 and summarized in Section 4.3.3.

4.3.2 Public Information Centre #1

As noted in Section 1.3, PICs were held during Phases 1 and 2 of the Municipal Class EA process as part of the MMATMP to present the problems and opportunities, the identification and evaluation of alternative solutions and the recommended solution.

A PIC was held as part of Phase 3 of the current study on September 22, 2016 at the Liberty North Banquet Hall from 4:00 pm to 7:00 pm to provide an opportunity for stakeholders and other members of the public to review and provide comments on the identification and evaluation of alternative designs and the potential interim transportation solutions for the Salem Secondary Plan Area. The Notice of PIC #1 was mailed and/or hand delivered to agencies, businesses, property owners, and tenants that may have an interest in the study on September 9, 2016. The Notice was also placed in The Barrie Examiner on September 15 and 17, 2016.

Members of the Project Team were present at the PIC to respond to any questions posed by attendees. In total, approximately sixty-one (61) attendees signed in to the PIC. However, as noted previously, the PIC was held in coordination with the consultation activities associated with the Hewitt’s Secondary Plan and McKay Road East - Highway 400 interchange, Lockhart Road/Salem Road Crossing and Associated Works.

Comment forms were available for attendees to provide comments on the alternative design concepts and intersection treatment options. Approximately fourteen (14) comment forms were received by the requested submission date of October 21, 2016. In addition, approximately 10 comments were received via telephone or email. A copy of the correspondence received at/following PIC #1 is provided in Appendix B-3 of this report. A summary of the key responses and/or common themes, and how they have been considered as part of this study is provided in Table 6-3

4.3.2.1 Changes to the Alternative Design Concepts

As noted, feedback received at/following PIC #1 identified the importance of LID features and consideration of the effects of climate change. In addition, a number of concerns were raised from property owners with respect to the potential loss of property in association with the design alternatives. As such, the study team re-designed Alternative 1 to include LID features, while maintaining the ROW width of the design and avoiding any additional direct impacts to private property. In addition, a second/discretionary PIC was held to review the changes to the design since PIC #1 and to review the Preferred Design (please refer to Section 6.6). These changes are illustrated in Figure 3 below and were considered in the evaluation of Alternative Design Concepts.
Figure 3 Changes to the Alternative Design Concepts

PIC #1 – Alternative 1

3-lane Cross Section with On-Road Bicycle Lanes, Sidewalks, in a 27 metre ROW

Changes Since PIC #1

3-lane Cross Section with On-Road Bicycle Lanes, Sidewalks, and LIDs within a 27 metre ROW

5-lane Cross Section with On-Road Bicycle Lanes, Sidewalks, 34 metre ROW

5-lane Cross Section with On-Road Bicycle Lanes, Sidewalks, and LIDs within a 34 metre ROW
### Table 4-3 Evaluation of Alternative Design Concepts

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>How Criteria Are Being Assessed</th>
<th>Alternative 1 (MMATMP + LIDs within existing ROW)</th>
<th>Alternative 2 (MMATMP + 4 m additional ROW for LIDs)</th>
</tr>
</thead>
</table>
| **Traffic operations (MMATMP, safety, capacity, congestion, etc.)** | Based on ability to:  
- Improve connectivity to existing road network  
- Meet Barrie’s MMATMP requirements  
- Improve traffic safety  
- Improve traffic operations (increase capacity, reduce congestion and delays) | Improved connectivity to the existing road network, meets the requirements of the MMATMP | Improved connectivity to the existing road network, meets the requirements of the MMATMP |
| **Cycling operations**                   | Adequacy to accommodate cyclists                                                              | Provides cycling facilities as per MMATMP                                                                       | Allows for off-street cycling facilities (i.e. MUT)                                                               |
| **Transit operations/service**          | Adequacy for transit operations/service                                                        | No significant difference between alternatives                                                                 | No significant difference between alternatives                                                                   |
| **Pedestrian operations**                | Adequacy to accommodate pedestrians                                                           | Wider sidewalks and improved boulevard space                                                                     | Wider sidewalks and improved boulevard space                                                                     |
| **Utilities (conflicts, operations)**    | Extent of utility relocation required                                                         | Full utility relocation required                                                                                   | Full utility relocation required                                                                                   |
| **Driveways**                           | Impacts on driveway accessibility and operations                                               | Moderate impacts to driveways, improved accessibility with addition of TWLTL                                    | Moderate impacts to driveways, improved accessibility with addition of TWLTL                                    |
| **Stormwater management**                | Ability to accommodate drainage and SWM Use of LID                                           | Drainage and SWM objectives met using linear LID to meet conservation authority standards                        | Drainage and SWM objectives met using linear LID to meet conservation authority standards                        |
| **Constructability**                    | Feasibility and ease of construction                                                          | No significant difference between alternatives                                                                   | No significant difference between alternatives                                                                   |
| **Interim improvements**                | Ability to implement interim improvements                                                      | Interim improvements can be accommodated                                                                         | Interim improvements can be accommodated                                                                         |
| **Geotechnical/hydrogeological conditions** | Impact to groundwater  
Suitability of ground conditions                                        | No significant difference between alternatives                                                                   | No significant difference between alternatives                                                                   |
| **Operations and maintenance requirements** | Ease and cost of operations and maintenance requirements                                      | No significant difference between alternatives                                                                   | No significant difference between alternatives                                                                   |
| **Structures**                          | Impact on structures and other infrastructure (i.e. railways)                                | Structures including the existing grade-separated crossing on Lockhart Road will require replacement and a widened permanent structure | Additional widening to be considered to accommodate the LID                                                       |

**ENGINEERING / OPERATIONAL ENVIRONMENT SCORE:**  
Alternative 1: 74  
Alternative 2: 73
### Table 4-4 Evaluation of Alternative Design Concepts

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>How Criteria Are Being Assessed</th>
<th>Alternative 1 (MMATMP + LIDs within existing ROW)</th>
<th>Alternative 2 (MMATMP + 4 m additional ROW for LIDs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural Environment</strong></td>
<td></td>
<td>Fish habitat in study area watercourses (Brook Trout in Lovers Creek tributaries)</td>
<td>Fish habitat in study area watercourses (Brook Trout in Lovers Creek tributaries)</td>
</tr>
<tr>
<td>Watercourses/fisheries/aquatics</td>
<td>Potential impact on watercourses, fish (Brook Trout), and fish habitat</td>
<td>Fish habitat in study area watercourses (Brook Trout in Lovers Creek tributaries)</td>
<td>Fish habitat in study area watercourses (Brook Trout in Lovers Creek tributaries)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential for temporary effects during construction</td>
<td>Potential for temporary effects during construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential for habitat effects due to culvert replacements or extensions where required</td>
<td>Potential for habitat effects due to culvert replacements or extensions where required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rain gardens provide surface water attenuation and quality control without expanding the ROW</td>
<td>Rain gardens are expected to provide greater surface water attenuation and quality control, and slow the rate of surface runoff to the watercourses and thus reduce erosion potential</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alternative 2 includes a MUT and rain gardens that require 4.0 m of additional ROW, and will displace more habitat than Alternative 1</td>
</tr>
<tr>
<td>Wildlife and wildlife habitat</td>
<td>Potential impact on SWH, including SOCC</td>
<td>Confirmed SWH for forest breeding birds and amphibian breeding habitat in the study area</td>
<td>Confirmed SWH for forest breeding birds and amphibian breeding habitat in the study area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other candidate SWH features are associated with woodlands and wetlands</td>
<td>Other candidate SWH features are associated with woodlands and wetlands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential for temporary effects during construction</td>
<td>Potential for temporary effects during construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential for loss of edge habitat within the ROW</td>
<td>Potential for loss of edge habitat within the ROW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rain gardens provide surface water attenuation and quality control without expanding the ROW</td>
<td>Rain gardens provide surface water attenuation and quality control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alternative 2 includes a MUT and rain gardens that require 4.0 m of additional ROW, and will displace more habitat than Alternative 1</td>
</tr>
<tr>
<td>Species at Risk</td>
<td>Potential impact on SAR (habitat and species)</td>
<td>Breeding and foraging habitat for grassland bird SAR was confirmed in the study area and edges of habitat features may overlap with ROW</td>
<td>Breeding and foraging habitat for grassland bird SAR was confirmed in the study area and edges of habitat features may overlap with ROW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proposed activities in the ROW are not anticipated to affect habitat suitability for grassland birds</td>
<td>Proposed activities in the ROW are not anticipated to affect habitat suitability for grassland birds</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Potential impact on woodlands and other areas of natural vegetation communities (excluding wetlands)</td>
<td>Woodlands, thickets, and meadows are present throughout the study area</td>
<td>Woodlands, thickets, and meadows are present throughout the study area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential for temporary effects during construction</td>
<td>Potential for temporary effects during construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential for loss of edge habitat within the ROW</td>
<td>Potential for loss of edge habitat within the ROW</td>
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<tr>
<td></td>
<td></td>
<td>Rain gardens provide surface water attenuation and quality control without expanding the ROW</td>
<td>Rain gardens provide surface water attenuation and quality control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alternative 2 includes a MUT and rain gardens that require 4.0 m of additional ROW, and will displace more habitat than Alternative 1</td>
</tr>
</tbody>
</table>

4.7
Table 4.4 Evaluation of Alternative Design Concepts

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>How Criteria Are Being Assessed</th>
<th>Alternative 1 (MMATMP + LIDs within existing ROW)</th>
<th>Alternative 2 (MMATMP + 4 m additional ROW for LIDs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No significant difference between alternatives</td>
<td>No significant difference between alternatives</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Potential impact to groundwater</td>
<td>Lovers Creek PSW Complex overlaps the study area Other unvaluated wetlands are present throughout the study area Potential for temporary effects during construction Potential for loss of edge habitat within the ROW Rain gardens provide surface water attenuation and quality control without expanding the ROW</td>
<td>Lovers Creek PSW Complex overlaps the study area Other unvaluated wetlands are present throughout the study area Potential for temporary effects during construction Potential for loss of edge habitat within the ROW Rain gardens provide surface water attenuation and quality control Alternative 2 includes a MUT and rain gardens that require 4.0 m of additional ROW, and will displace more habitat than Alternative 1</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Potential impact on Lovers Creek PSW Complex, locally significant wetlands, and un evaluates wetlands</td>
<td>Lovers Creek PSW Complex overlaps the study area Other unvaluated wetlands are present throughout the study area Potential for temporary effects during construction Potential for loss of edge habitat within the ROW Rain gardens provide surface water attenuation and quality control without expanding the ROW</td>
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</tr>
<tr>
<td>Land use</td>
<td>Compatibility with existing and future land use</td>
<td>Some property acquisition required</td>
<td>Additional ROW requires property acquisition</td>
</tr>
<tr>
<td>Environmental improvements</td>
<td>Opportunities to enhance aquatic/terrestrial features</td>
<td>Rain gardens provide surface water attenuation and quality control without expanding the ROW Creates opportunities to mitigate wildlife road mortality at strategic crossing locations</td>
<td>Rain gardens provide surface water attenuation and quality control Alternative 2 includes a MUT and rain gardens that require 4.0 m of additional ROW, and will displace more habitat than Alternative 1 Creates opportunities to mitigate wildlife road mortality at strategic crossing locations</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>NATURAL ENVIRONMENT SCORE:</td>
<td>45</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Environment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property acquisition</td>
<td>Degree of property required and households/businesses affected</td>
<td>Least impact to adjacent properties</td>
<td>Greatest impact to adjacent properties</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Ability to improve visual aesthetics of roadway and community</td>
<td>Improved boulevard with the urbanization of the corridor</td>
<td>Improved boulevard with the urbanization of the corridor</td>
</tr>
<tr>
<td>Noise</td>
<td>Number of noise walls or mitigation measures required</td>
<td>No significant difference between alternatives</td>
<td>No significant difference between alternatives</td>
</tr>
<tr>
<td>Construction</td>
<td>Noise, dust, traffic disruptions, feasibility, and ease of construction</td>
<td>No significant difference between alternatives</td>
<td>No significant difference between alternatives</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Compliance with AODA</td>
<td>AODA-compliant design</td>
<td>AODA-compliant design</td>
</tr>
<tr>
<td>Public safety</td>
<td>Elimination of conflict points; improved infrastructure for all users</td>
<td>No significant difference between alternatives</td>
<td>No significant difference between alternatives</td>
</tr>
<tr>
<td>Local businesses</td>
<td>Disruption/permanent impact to businesses</td>
<td>No significant difference between alternatives</td>
<td>No significant difference between alternatives</td>
</tr>
<tr>
<td>SOCIAL ENVIRONMENT SCORE:</td>
<td>41</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
### Table 4-4 Evaluation of Alternative Design Concepts

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>How Criteria Are Being Assessed</th>
<th>Alternative 1 (MMATMP + LIDs within existing ROW)</th>
<th>Alternative 2 (MMATMP + 4 m additional ROW for LIDs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cultural Heritage Environment</strong></td>
<td></td>
<td>Anticipated to impact a smaller area of land identified as having archaeological potential, when compared to Alternative 1</td>
<td>Anticipated to impact a greater area of land identified as having archaeological potential, when compared to Alternative 2</td>
</tr>
<tr>
<td>Archaeological</td>
<td>Extent of archaeology impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural heritage</td>
<td>Extent of cultural heritage impacts</td>
<td>Potential to directly impact Lockhart Road rail crossing, McKay Road East and one identified property.</td>
<td>Potential to indirectly impact a higher number of potential cultural heritage resources, when compared to Alternative 1</td>
</tr>
<tr>
<td>First Nations</td>
<td>Potential impact to First Nations heritage</td>
<td>No significant difference between alternatives identified</td>
<td>No significant difference between alternatives identified</td>
</tr>
</tbody>
</table>

**CULTURAL HERITAGE ENVIRONMENT SCORE:**
- Alternative 1: 13
- Alternative 2: 11

**Economic Environment**
- Project capital costs: Least costly to construct
- Life cycle costs (25-year): No significant difference between alternatives
- Land acquisition costs: Least land acquisition cost

**ECONOMIC ENVIRONMENT SCORE:**
- Alternative 1: 7
- Alternative 2: 7

**TOTAL SCORE:**
- Alternative 1: 182
- Alternative 2: 169

**RECOMMENDED ALTERNATIVE DESIGN:**
- Alternative 1: 169

---

<table>
<thead>
<tr>
<th>Greatest</th>
<th>Negative Impact</th>
<th>Least</th>
<th>Neutral Impact</th>
<th>Positive Impact</th>
<th>Greatest</th>
</tr>
</thead>
<tbody>
<tr>
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<td><img src="image2" alt="Negative Impact" /></td>
<td><img src="image3" alt="Least" /></td>
<td><img src="image4" alt="Neutral Impact" /></td>
<td><img src="image5" alt="Positive Impact" /></td>
<td><img src="image6" alt="Greatest" /></td>
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</table>

**RANK FOR SCORING PURPOSES**
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
Identification and Evaluation of Alternative Design Concepts
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4.3.3 Evaluation of Alternative Design Concepts

As per the Problem and Opportunity Statement established as part of the MMATMP, both Alternative 1 and Alternative 2 offer a transportation system that is safe, efficient, and accessible with choices in mobility, and that will accommodate growth to 2031. Several criteria and factors were utilized to evaluate the Alternative Design concepts, including transportation, engineering/operational, natural, social, and cultural heritage environments. The key findings of the evaluation of alternative design concepts is summarized herein.

Alternative 1: MMATMP Recommendations and LID (Existing ROW)
While Alternative 2 provides additional opportunities to enhance the roadway cross-section, Alternative 1 provides sufficient ROW to accommodate the multi-modal transportation infrastructure envisaged as part of the MMATMP, as well as LID features. In addition, Alternative 1: displaces a smaller area of private property, vegetation, aquatic and terrestrial habitat; is expected to incur lower capital costs; and imposes less impacts to potential cultural heritage resources and areas identified as having archaeological potential, when compared to Alternative 2.

Alternative 2: MMATMP Recommendations and LID (Plus 4 m Additional ROW)
While widening the roadway ROW an additional 4 m provides more opportunities to provide enhanced LIDs and streetscaping, the greater area of land required to accommodate this alternative is expected to: displace a greater area of private land, vegetation, aquatic and terrestrial habitat; incur higher capital costs; and impact a greater area of land having archaeological and cultural heritage potential, when compared to Alternative 1.
5.0 PREFERRED DESIGN CONCEPT

Based on the Evaluation of Alternative Design Concepts, Alternative 1 is the preferred alternative as it addresses the future multi-modal transportation needs of the study area, as envisaged in the MMATMP, and it is the least costly, incurs the lowest impact to private property and natural and cultural heritage features.

5.1 DESCRIPTION OF THE PREFERRED DESIGN CONCEPT

The Preferred Design comprises a multi-modal arterial road corridor, designed for cycling, pedestrians, automotive and transit use and includes the following key elements:

- 3.5 m vehicle lanes
- 1.2 m-4.2 m raised median, painted median, or TWLTL
- 1.5 m on-road bicycle lanes plus 0.5 m buffer on both sides of roadway
- 2 m wide sidewalks on both sides of roadway
- 2.9 m boulevards
- LID SWM features
- Roundabout and signalized intersection arrangements
- Streetscape Design/LID

The centre lane width is variable to accommodate LIDs. The final configuration of the centre lane (i.e., raised median, painted median and/or two-way left turn lane) and associated LID treatments will be determined during detailed design.

5.1.1 Design Criteria

Design criteria associated with the Preferred Design was established based on input from the City, the recommendations in the MMATMP, Design Standards from Transportation Association of Canada (TAC) – Geometric Design Guide for Canadian Roads and TAC guidelines. A copy of the design criteria is included in Appendix M of this ESR.

5.1.2 Road Alignment

The Horizontal and Vertical alignment have been established for the conceptual design based on the TAC – Geometric Design Guide for Canadian Roads as the primary source for the proposed standards. Due to design constraints on Lockhart Road a slight exemption from the maximum vertical slope was required in the area just east of Saunders Road. In this section, a 7.0% grade was used to accommodate the local constraints including the tie-in to the new fly-over Hwy 400 and the tie-ins to the existing driveways on the north side of this stretch of roadway. Due to drainage conditions in the area on McKay Road West from Veterans Drive to the new connection at Essa Road, the landowners group provided a proposed profile raised from existing. The new profile is shown in Appendix N, the City reviewed an accepted the landowners design given the importance of the design on the overall drainage in the area.
Further to the east on Lockhart, at the location of the existing rail grade separation the horizontal alignment has been shifted to the south to accommodate the existing creek alignment on the north side of Lockhart at this location. Through the section of the new rail carrying structure the ROW alignment has been widened to the full 41 m allowance to accommodate the new bridge and maintain the creek in the existing location. The creek conveys water (likely cold) to downstream areas so that will have to be maintained. Also, this creek location has been straightened such that it is in the ditch line of the road. The first option for the creek at this location would be to lower the creek elevation at the east bridge location to match the ditching for the proposed Lockhart Road elevation just east of the grade separation. This lowered creek profile will match into the existing profile approximately 70m east and cross at the proposed culvert further downstream. There are a few options for the downstream treatment at the end of the existing culvert at the rail crossing including placement of a headwall, alternatively the existing culvert can be replaced providing an increased slope under the tracks reducing the elevation change, this could also be supported by a small pool at the downstream end of pipe. As noted previously the road in this section has been shifted to the south this shift could allow an alternative option to maintain the creek in its current position and additional width for any additional future flows. The plans are shown on the L1 Preferred Design drawings in Appendix N.

The creek would need to be marked during construction in order to keep vehicles out of it and prevent the entry of sediment etc. Also, there may be groundwater near the surface in that area so that may complicate excavation. Groundwater discharge to the creek should be maintained following construction.

Plan and Profile drawings for the Preferred Design are provided on Drawings E1, H1, L1, M1_M2, M3, S1 and V1_V2, provided in Appendix N of this ESR.

### 5.1.3 Interim Typical Cross-Sections

Both Huronia Road and McKay Road East will have interim works completed prior to 2031. The interim sections are rural sections with 3.5 m lanes and 2.0 m shoulders to accommodate active transportation in the interim. The ultimate sections (post 2031) are discussed in section 4.2.2.
5.3

Figure 4 Huronia Road (H1) Interim Typical Cross-Section

Figure 5 McKay Road East (M3) Interim Typical Cross-Section
5.1.4 Typical Cross-Sections

The following typical sections are being proposed for each of the following ROW locations. The design criteria for these sections is based on the TAC – Geometric Design Guide for Canadian Roads, the City Design Standards and the recommendations from the MMATMP.

**Typical 27m ROW Salem Road, Essa Road and McKay Road West**

- 3.5 m travel lanes, 1 in each direction
- 1.2 m – 4.2 m concrete median, TWLTL or painted median. Width will be based on LID alternative chosen during detailed design.
- 1.5 m + 0.5 m buffered bike lane (both sides)
- 0.50 m curb (both sides)
- 2.9 m boulevard with LIDs (both sides)
- 2 m sidewalk (both sides)
- 0.5 m clearance (both sides)

**Figure 6 Typical 27m ROW (MMATMP)**
Typical 34m ROW Veterans Drive, McKay Road East and Lockhart Road

- 3.5 m travel lanes, 2 in each direction
- 1.2 m – 4.2 m concrete median, TWLTL or painted median. Width of painted median will be based on LID alternative chosen during detailed design.
- 1.5 m + 0.5 m buffered bike lane (both sides)
- 0.5 m curb (both sides)
- 2.9 m boulevard with LIDs (both sides)
- 2 m sidewalk (both sides)
- 2 m sidewalk (both sides)
5.1.5 Transit
The study area will support future transit operations. As such, bus stops may be provided at key study area intersections. The locations of future transit bays are not known at this time; however, it should be noted that additional ROW may be required to accommodate these types of transit improvements.

5.1.6 Rail Crossings

5.1.6.1 McKay Road - Mile 79.17 Beeton Spur
The Preferred Design on McKay Road East consists of a five-lane cross-section, comprising four travel lanes, bicycle lanes in each direction and centre turning lane. The centre lane will be dropped through an approach transition for both EB and WB traffic at the rail crossing, this is consistent with the interim section avoiding re-constructing the rail crossing again in its entirety in the future build-out. The existing crossing warning device will need to be modified to provide both front and back lights for each travelled lane, including the bicycle lane. Light units will be required to be mounted on a cantilever structure over the roadway.

5.1.6.2 Lockhart Road Rail Crossing, Mile 80.13
A grade separated rail crossing is the most viable crossing treatment at this location given the current difference in grade between the roadway and rail line does not facilitate the construction of level crossing and that a road closure would not meet the needs of users.
The Preferred Design shifts the centre roadway to the south to allow the north edge of the road to be maintained to avoid encroaching on an existing watercourse, and carries this cross-section beneath the rail corridor. The profile of the road would be lowered to allow for, at a minimum, a vertical clearance of 5.3 m (as is typically required by all railways).

The following is recommended for the new structure, as well as to correct the identified deficiencies:

- Provide sufficient length to accommodate full width lanes
- Provide a minimum vertical clearance of at least 5.3 m
- The bridge abutment and driveway at McKay Road East should have sufficient separation to provide adequate visibility for a vehicle exiting the residence. Construction of a centre pier may further restrict visibility. Relocation of the driveway to a point further west may be required.
- Fencing should be installed to deter access to the rail corridor and rail carrying structure. In addition, the installation of “No Trespassing” signs are recommended.
- The new structure should be constructed with trainman’s walkways equipped with handrails.

The final configuration of the grade separated rail crossing will be confirmed during detailed design.

### 5.1.7 Construction Staging

Construction of a new grade separation while maintaining the use of the existing road and rail line will present some challenges. There are several construction methods available as noted below and summarized in Table 5-1.

#### 5.1.7.1 Temporary Diversions

Construction of a road under rail grade separation is typically completed by building a road detour and rail diversion to clear the footprint of the construction zone and the new structure. Construction of a road detour at this location would not be practical given the difference in elevation between the road and rail. A rail diversion could be constructed on the east side of the current rail line and if Lockhart Road must remain open during construction a temporary bridge would need to be constructed on the diversion allowing the road to pass under the tracks as it does now. If a temporary road closure is permissible an embankment could be constructed to carry the rail diversion which would save the cost of the temporary spans.

#### 5.1.7.2 Permanent Realignment

Another option would entail the permanent relocation of the rail line by construction of the new abutments and superstructure next to the existing bridge. This would allow the road to remain open during construction but may require additional property. An additional benefit of this construction method would be an increase in separation between the future structure and the existing driveway in the northwest quadrant.
5.8

5.2 STORM AND SANITARY SEWER DESIGN

A conceptual design for the recommended alignment for the trunk and local sanitary sewers within the Preferred Design was developed to establish the corridors for these services and determine capacity requirements, as described herein.

5.2.1 Watermain Design

As part of the Study, a conceptual design study was undertaken using the City Design Guidelines in conjunction with the findings and recommendations documented in the City Water Storage and Distribution Master Plan (WSDMP) for a trunk watermain. The WSDMP identified a number of system upgrades and expansions within the Salem Secondary Plan Area. The conceptual watermain sections have been designed in accordance with the City Water Transmission and Distribution Policies and Design Guidelines (WTDPDG) with additional guidance from the MOECC requirements for the separation of sewers and watermains.

The proposed trunk distribution system required to meet Maximum Day potable water and Fire Flow demands throughout the study area includes the following:

- 500 mm north-south main on Veterans Drive from Salem Road to McKay Road West
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- 400 mm east-west main on McKay Road from McKay study boundary to East of Street I
- 400 mm east-west main on McKay Road from east limit of Interchange to Street K
- 500 mm east-west main on Salem Road from Veterans to Essa Road
- 400 mm main on Essa Road from Mapleview Drive West to the Phase 1 Boundary south of Salem Road
- 750 mm feedermain on Lockhart Road from Saunders to Huronia
- 750 mm feedermain on Huronia Road from PS3 to Lockhart Road

Based on the City's Water Transmission and Distribution Policies and Design Guidelines, the maximum allowable velocity for watermains is not to exceed 1.5 m/s and the maximum Head Loss Gradient under normal operating pressures is 2.5 m/km. Stantec confirmed through the City's Hydraulic Model runs that all proposed watermains are within these parameters, indicating that at the Conceptual Design stage, sizing of the proposed watermains is sufficient. The operation pressures of the proposed watermain will be confirmed during detailed design.

The proposed watermain and all system components will be designed and constructed in accordance with all applicable City standards and guidelines

5.2.1.1 Crossing Considerations

Based on the alignment of the proposed watermain and sanitary sewers, possible trenchless crossings include the following:

- Rail Line:
  - 750 mm diameter watermain along Lockhart Road
  - Sanitary sewer along McKay Road East

- Major water courses:
  - 750 mm diameter watermain along Lockhart Road
  - 750 mm diameter watermain along Huronia Road
  - 500 mm diameter watermain along Veterans Drive
  - 400 mm diameter watermain along Essa Road

5.2.2 Sanitary Sewer Design

A conceptual design for a trunk sanitary sewer has been developed in accordance with the City's Sanitary Sewer and Collection Systems Policies and Design Guidelines (SSCSPDG) with additional guidance from the MOECC Design Guide for Sewage Works.

Based on the Wastewater Collection Master Plan (October 2013) prepared by AMEC Environment & Infrastructure, the proposed trunk sanitary sewer improvements for the Salem Road study include:

- Huronia Road from Lockhart Road to Municipal Boundary
- McKay Road from Huronia Road to east limits of McKay Interchange.
- McKay Road from the west limits of the McKay Interchange to Street F.
A copy of the Conceptual Servicing Design Report is provided in Appendix K of this ESR. The proposed sanitary sewers are illustrated on the Plan and Profile drawings, provided in Appendix N. The proposed design is based on the City's standards, with an alignment along the centre-line of the road. The sanitary sewer sizing is dependent on final development types and future locations of roads, etc. and should be further refined during preliminary and detailed design phases.

The trunk sanitary sewer and all system components will be designed and constructed in accordance with all applicable City standards and guidelines.

### 5.2.3 Cost Estimate

A preliminary cost estimate of the Preferred Design for each road segment is summarized in Table 5-2 below. Given the preliminary nature of the design, the approximate cost for utilities is based on % construction. The detailed preliminary cost estimate for the interim works on McKay Road East and Huronia Road are provided in Appendix O of this ESR.
### Table 5-2 Preliminary Cost Estimate

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<th>Item</th>
<th>3-Lane Section</th>
<th>5-Lane Section</th>
<th>Combined</th>
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<td>Essa Road</td>
<td>Salem Road</td>
<td>McKay Road West</td>
</tr>
<tr>
<td>New Roadway - Including excavation</td>
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<td>Concrete Sidewalk, Median, Curb and Gutter</td>
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<td>Storm Sewer System, including Ditch and Culvert</td>
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<td>Roundabout</td>
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<td>Retaining Walls</td>
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<td>Removals of Existing Roadway</td>
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<td>Other Minor Items/Utilities/Contingencies</td>
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<td>Electrical</td>
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<td>$26,952,130.00</td>
<td>$32,241,414.81</td>
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</table>
6.0 IMPACTS, MITIGATION, AND MONITORING

6.1 ENGINEERING/OPERATIONAL ENVIRONMENT

6.1.1 Existing Structures

The preliminary geotechnical parameters and recommendations for the existing culvert crossings and rail crossing are discussed in detail in the Foundation Investigation Report, provided in Appendix E of this ESR.

6.1.1.1 Existing Culvert Foundations

The existing culverts investigated will be replaced any/all existing fill materials will be removed from below the new culverts. Subject to the design elevations for the culverts, the culverts can be placed on the prepared surface of the native silty clay or silty sand. Engineered fill can be placed on the prepared surface of the native silty clay or native silty sand to develop the design founding level if and as required. Should this be considered, the engineered fill should consist of OPSS Granular A or Granular B, Type II uniformly compacted to achieve 100% of the material’s Standard Proctor Maximum Dry Density (SPMDD).

6.1.1.2 Lockhart Road Rail Crossing

The existing above grade crossing will be expanded/extended. In consideration of the conditions encountered during the foundation investigation, it is anticipated that the use of conventional spread footings will be satisfactory to support of the abutments. An alternative for the use of a pile foundation system can be considered if the design requirements warrant.

6.1.2 Rail Crossing/Operations

McKay Road - Mile 79.17 Beeton Spur

Re-construction of a crossing and crossing warning devices can have an impact on both road and rail users of the crossing. Closure of the road for a 48-hour period while there are no scheduled trains could allow complete construction of the crossing with minimal temporary works such as a road staging or temporary relocation of the existing crossing warning devices.

Construction activities will necessitate temporary track outages; however, impacts can be minimized by scheduling construction activities to days when trains are not operated on the Beeton Spur.

Increased maintenance requirements are anticipated for the crossing warning devices given the need for additional light units. The Canadian Transportation Agency set rates for crossing maintenance is $6,645 annually for 2017 for a crossing with an active warning device, which does not include gates. This cost includes direct labour rates, direct material rates, electricity costs, overhead rates, and vehicle costs, but does not necessarily cover the railway’s costs.
addition, the railway operator (BCRY) may be required to pay for a portion of the costs associated with the modifications at the crossing.

**Lockhart Road Rail Crossing, Mile 80.13**
Flagging protection will be required to ensure the safety of construction and train operations do not overlap and that safety is not jeopardized. This may require a representative of the railway to be present for the duration of the construction activities.

The duration of the construction of the rail carrying structure will exceed the interval between trains. To minimize the impact of the bridge replacement activities, a temporary diversion may be required. Alternatively, accelerated construction activities at the crossing may lessen the duration of the track outage and mitigate customer service impacts.

Construction of the new grade separated crossing will be reviewed during detailed design to ensure that the use of the roadway and existing railway is maintained to the extent possible. Preliminary considerations include: Temporary Diversions by building road and rail diversions to clear the footprint of the construction zone and the new structure; Permanent Realignment of the railway line by construction of the new abutments and superstructure next to the existing bridge; implementation of temporary spans to allow the road to remain open during construction; build temporary bridge spans to allow construction of the piers beneath the rails; and, closure of both the rail and road to allow unimpeded access to the construction area with minimal temporary works.

Construction considerations and cost sharing will be further reviewed during detailed design.

**6.1.3 Utilities**

The potential relocation of existing utility infrastructure (i.e. hydro poles, utility pedestals, natural gas pipelines, etc.) and requirements for grading of adjacent driveways are considered in the assessment.

**6.1.4 Stormwater Management**

**6.1.4.1 Potential Impacts**

The Preferred Design and revised road profiles will impact the existing drainage pattern as seven (7) outlets will be eliminated and flows will be redirected to other outlets. In addition, one (1) new outlet has been created. Stormwater drainage in the study area will now be directed to twenty-six (26) outlets.

The Preferred Design will increase the amount of impervious surface area and will revise the existing drainage pattern which has the potential to impact receiving watercourses by:

- generating a greater volume and rate of surface water runoff being directed to the receiving watercourse;
- increasing flows at some outlets due to drainage area diversions because of the elimination of outlets; and
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- increasing the amount of pollutants which are commonly found in roadway runoff. Pollutants include, but are not necessarily limited to: TSS, phosphorus, hydrocarbons, metals, chlorides, and various nutrients, all of which can impair the aquatic ecosystem of the receiving watercourse.

6.1.4.2 Mitigation

SWM practices for the management of roadway runoff generally fall into the categories of water quality, volume reduction (capture and retain/treat on site) and water quantity. As noted in Section 4.1.1.2, SWM design criteria were identified based on a review of the background documents and discussions between Stantec, LSRCA and the City. As part of these criteria, the modifications to the study area road sections are required to capture and retain/treat a specified volume of water (volume reduction target) on-site. The volume reduction target is the greater of runoff from a 12.5 mm event from the total impervious surfaces or runoff from a 25 mm event from the net increase in impervious surface. The volume reduction target was calculated using the 12.5 mm over the total impervious area. It was also determined that post-development peak flow rates must not exceed the corresponding pre-development peak flow rates for the 2-year to 100-year storm events. The Modified Rational Method was used to estimate the required 100-year storage volume to meet this predevelopment flow rate and is further detailed in the SWM Report, provided in Appendix D of this ESR.

Low Impact Development (LID)

LID is a more holistic approach to SWM that seeks to maintain the existing hydrology of the site after development by promoting infiltration, filtration, evaporation as well as detaining runoff and preventing pollution.

LID is most effective during the small, frequent rain events, typically the events that comprise 90% of the rainfall events seen during a typical year. During these events LID absorbs a significant portion of the runoff and treats the first flush. While LID do not remove the need for downstream infrastructure like detention ponds, there are clear benefits in water quality treatment and volume reduction (through infiltration). Table 6-1 outlines relevant LID practices that will be reviewed during the detailed design. These can be incorporated linearly within the ROW or situated centrally and adjacent to the proposed outlets.

The City’s ROW Standard Details are currently under review to determine the best location for linear LID infrastructure. LIDs could potentially be incorporated into the boulevards adjacent to the curbs or within the center median as shown.
### 6.4 Table 6-1 LID Options

<table>
<thead>
<tr>
<th>LID Practice</th>
<th>Description</th>
<th>Considerations</th>
</tr>
</thead>
</table>
| Bioretention  | Bioretention uses the natural properties of soils, plants and associated microbial activity to infiltrate water and remove pollutants from stormwater runoff. They do this through filtration by soil media and uptake by plant roots, and reduce runoff volume through evapo-transpiration. The practice provides aesthetic benefits and can easily be modified to fit a wide variety of space and drainage contexts. Bioretention can be designed with full (no underdrain), partial (underdrain) or no infiltration (high groundwater). | • Can be integrated with site landscaping.  
• Risk of shallow groundwater contamination, particularly from deicing agents.  
• Footprint is typically 10-20% of the contributing drainage area.  
• Location must be relatively flat.  
• Pre-treatment should be provided to remove sediment and debris  
• Periodic removal of accumulated sediment is required. |
| Infiltration Rock Trenches | Infiltration trenches are excavations lined with geotextile fabric and filled with clean granular stone.                                                                                             | • Risk of shallow groundwater contamination, particularly from deicing agents.  
• High groundwater level can limit the use of this measure  
• Pre-treatment must be provided to remove sediment and debris.  
• Often used when surface area not available. |
| Infiltration Chambers | Infiltration chamber are large open structures that create temporarily storage of stormwater for infiltration.                                                                                       | • Risk of shallow groundwater contamination, particularly from deicing agents.  
• Pre-treatment must be provided to remove sediment and debris.  
• Often used when surface area not available.  
• Able to detain more stormwater runoff than a trench |
| Perforated Pipe Systems | Perforated pipe systems can be thought of as long infiltration trenches, that are designed for both conveyance and infiltration of stormwater runoff. They are underground stormwater conveyance systems designed to attenuate runoff volume and thereby, reduce contaminant loads to receiving waters. | • Risk of shallow groundwater contamination, particularly from deicing agents.  
• High groundwater level can limit the use of this measure  
• Pre-treatment must be provided to remove sediment and debris.  
• Design and construction costs may be significant. |
| Enhanced Grass Swales | Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff. Check dams help slow and filter water to enhance sedimentation, soil infiltration and evapotranspiration by plants and grass. | • Footprint is typically 5-15% of the contributing drainage area.  
• Typical ratio ranges of impervious area to swale area of 5:1 to 10:1. |
Table 6-1 LID Options

<table>
<thead>
<tr>
<th>LID Practice</th>
<th>Description</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amended</td>
<td>A mixture of higher permeability materials like sand and gravel, with lower</td>
<td>• Can be used within the boulevard</td>
</tr>
<tr>
<td>Topsoils</td>
<td>percentage of clays.</td>
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</tr>
</tbody>
</table>

**Stormwater Quantity Control**

Various SWM practices are available to address the quantity of runoff from roadways and generally include the following:

- SWM facilities located adjacent to roadways;
- Off-site SWM facilities; and
- On-site controls such as (oversized pipes or storage chambers).

The use of SWM facilities located within the Salem Secondary Plan Development Area is preferred, where possible; however, should the road development occur prior to the construction of the SWM facilities, interim SWM families could be used. Further refinement and coordination will be required with the Salem Secondary Plan Landowners’ Group to ensure that the drainage boundaries to the proposed SWM facilities are properly defined and that SWM facilities are sized appropriately. The location and approximate size of the combined SWM and centralized LID facilities are illustrated on Figure 9. To ensure enough land is secured, the combined facilities are being proposed outside the private pond blocks. This will allow the landowner to construct the pond without interfering with the operation of the interim pond and provide the City with sufficient land for a centralized LID facility, if that approach is chosen. During detailed design, the grading and servicing can be designed such that throw away costs are minimized.

Given natural heritage and area constraints in the study area, it is not possible to locate combined SWM facilities on the downstream side of the road. As such, additional crossing may be required and should be sized in accordance with MTO Drainage Design Standards SD-1, Design Flows for Surface Drainage Systems and SD-7 Design Flows and Freeboards for Culverts not on a Watercourse. In addition, an easement may be required at four (4) outlet locations (i.e., Outlets E6, V3, M4 and H3/M6) to construct an outlet from the combined facility to the creek. During detailed design an easement width will be established in accordance with the City of Barrie’s Storm Drainage and SWM polies and guidelines, which specifies the minimum width of the easement based on the size and depth of the outlet pipe. An anticipated easement width would be 5 m or 6 m. For Outlets E2, E3, E5, E6, S1, S2, H1, H2, H4 and H6 where the required 100-year required volume is small, on-site controls should be implemented. On-site controls could consist of up-sized storm sewers or underground storage chambers.
Figure 9  Combined Centralized LID Facilities and SWM Pond Location Plan
SALEM SECONDARY PLAN TRANSPORTATION IMPROVEMENTS ENVIRONMENTAL STUDY REPORT CITY OF BARRIE

Impacts, Mitigation, and Monitoring
October 12, 2017

Proposed Culvert Capacity
As noted, nine (9) out of the ten (10) watercourse crossings are insufficiently sized based on current engineering standards. The results of the culvert assessment are summarized in Table 6-2.

<table>
<thead>
<tr>
<th>Culvert Number</th>
<th>HEC-RAS Crossing Section</th>
<th>Culvert Description (mm)</th>
<th>Meets Applicable Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>MTO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(50-Year)</td>
</tr>
<tr>
<td>Bear Creek</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td>1963.4</td>
<td>2000 x 750 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>2000 x 1800 High Span</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>3145</td>
<td>5000 x 100 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>10</td>
<td>4092.76</td>
<td>2000 x 750 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>Thornton Creek</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>13</td>
<td>8092.48</td>
<td>4000 x 800 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>48</td>
<td>2635.65</td>
<td>Not included as part of Proposed Study Area</td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>N/A</td>
<td>3660 x 1220 High Span</td>
<td>N/A</td>
</tr>
<tr>
<td>Lovers Creek</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>12</td>
<td>3835</td>
<td>2000 x 1800 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>21</td>
<td>256.034</td>
<td>3-3000 x 2100 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>23</td>
<td>150</td>
<td>3000 x 1500 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>27</td>
<td>718.305</td>
<td>2-3000 x 1500 High Span</td>
<td>✓</td>
</tr>
<tr>
<td>201</td>
<td>521.018</td>
<td>To be determined</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes:
1. No watercourse present. Proposed as part of NHS strategy in DSWMPP.
2. Proposed as part of the Salem SIS, not included as part of the DSWMPP.
3. To be sized during Detail Design

During a Regional event, four culverts will not meet the MNRF maximum depth requirement for the safe passage of pedestrians and passenger vehicles. During detailed design, the proposed Regional flows to the culverts should be confirmed with the SLG and culvert sizes can be further reviewed to optimize the site-specific configuration. At that time, the resulting proposed Regional Floodplain elevations will need to be approved by the Conservation Authorities.

6.1.5 Water and Wastewater

Construction of the watermain and sanitary sewer will be undertaken via open cut methodology and trenchless crossings. At connection points with existing infrastructure, and where existing infrastructure is in place, a SUE Level ‘B’ investigation should be completed. Construction of the
watermain and sanitary sewer will be dictated by construction of the Preferred Design. Appropriate utilities and authorities will be engaged during detailed design to confirm vertical and horizontal clearances to existing and future utilities. In addition, a Commissioning Plan is recommended to be completed during detailed design to support development of a valve testing plan and details regarding source water available for testing.

6.2 NATURAL ENVIRONMENT

6.2.1 Vegetation

6.2.1.1 Potential Impacts

Direct loss of vegetation will occur where the Project overlays natural areas and vegetation removal is required to facilitate construction, including temporary work areas. Permanent loss of vegetation will be restricted to areas within the proposed ROWs. Clearing of work areas may also result in short-term disturbance, but no permanent loss or degradation of terrestrial vegetation is anticipated.

No SAR or SOCC plants were identified in the existing ROW. However, there is potential for SAR and SOCC to be present in the study area outside of the existing ROW.

Field investigations did not identify any part of the Lovers Creek Swamp PSW in the existing ROW. Other wetlands were identified in the existing ROW on all roads except McKay Road East. There will be no increased fragmentation of wetlands, as the Project is restricted to existing road corridors.

Other potential impacts associated with the Project are limited, but could include siltation of natural communities and spills of deleterious substances into natural communities. Sedimentation and spills may alter species composition in adjacent areas by smothering vegetation and introducing toxins and other substances that are harmful to vegetation and wildlife. Additional disturbance may be required to facilitate clean-up activities. Where they occur, these impacts are expected to be localized to the construction area and adjacent areas.

6.2.1.2 Mitigation

Direct loss of vegetation will be confined to the proposed ROW. Given the disturbed nature of this habitat, the anticipated loss is not considered to be significant to the value of the natural environment features. It is recommended that barrier fencing be placed along the construction boundary where it intersects with natural areas to prevent accidental encroachment into these features.

Areas to be cleared of existing vegetation and wetlands should be reduced to the smallest area that is reasonable. This area should be clearly marked to prevent unnecessary clearing. Where natural features occur adjacent to construction activities, barrier fencing should be erected to
protect vegetation that is to be retained. The construction contractor should ensure that heavy equipment and other construction activity does not occur beyond barrier fencing. Natural areas that are temporarily disturbed for access or construction should be restored to natural self-sustaining conditions. Topsoil should be stored separately to preserve local seed banks if appropriate, and for use on final grades.

Trees that are planned for removal should be inventoried to compensate with an appropriate landscape planting plan, using native species. The tree inventory should be implemented to address the City By-law regulating protection of trees (By-law 2014-116).

Areas disturbed during construction should be treated with a suitable seed mix to stabilize soil and establish self-sustaining native vegetation as soon as possible following disturbance. Seed mixes should include fast-growing, short-lived perennial cover crop to stabilize soil and reduce competition from weeding exotics. Native seed mixes and cover crops are preferred, particularly where disturbance is contiguous with natural areas. A light (2 cm) layer of mulch (e.g., woodchips) is recommended to retain soil moisture and improve germination rates; however, the layer should be sparse enough to retain approximately 20% to 40% visible soil. An erosion mat may also be used to stabilize final grades where necessary, and should be applied post seeding and mulch application. Manufacturer specifications should indicate that the erosion mat is made of biodegradable material and designed to allow sufficient light penetration for seed germination.

All seed mixes and other planting lists should be designed to include species adapted to the site conditions, including soil type, moisture, and sun exposure. Seed and other material should be from local sources where possible. Exceptions may include plantings in harsh urban environments, such as parking lots, etc. Invasive non-native species should not be seeded anywhere. Seeding efforts should receive water either through precipitation or irrigation after every seven successive days without rainfall for the first two months after planting.

Qualitative vegetation monitoring should be completed annually for 2 years following the implementation of revegetation plans, to document the establishment of planted material, and implement adaptive management to correct deficiencies. Adaptive management may be triggered by poor survival of planted material, insufficient vegetation cover and the presence of unacceptable non-native and invasive species. Adaptive strategies may include supplemental plantings, and/or control of unacceptable species. An annual monitoring report should be prepared to document monitoring methods, findings, triggers for adaptive management and adaptive actions implemented (if any). The annual monitoring report should be prepared to the satisfaction of the City, and the appropriate CA if regulated areas are present.

6.2.2 Wildlife and Wildlife Habitat

6.2.2.1 Potential Impacts

Loss of suitable habitat for SWH features occurs where habitat removal is required to facilitate construction. Twenty candidate or confirmed SWH features (representing four SWH categories)
were identified for the study area. SWH include candidate turtle wintering areas, candidate bat maternity roost, habitat for SOCC species (Eastern Wood Pewee), and confirmed amphibian breeding habitat.

There is potential for construction to disturb or destroy nests of migratory birds, particularly during vegetation clearing and structural removal. Other slow-moving and ground-dwelling wildlife could be encountered in work areas during construction, including reptiles (snakes and turtles) and amphibians.

**6.2.2.2 Mitigation**

Protection of nesting birds is provided by implementing the timing restrictions for vegetation/structure removal identified for Migratory Bird Convention Act (MBCA) protected species. The MBCA protects nests of migratory birds from damage while they are active, including nests in vegetation and on structures. The Primary Nesting Period (PNP; the period when the percent of total nesting species is greater than 10%) for this study area is between April 10 through August 9, although nesting also infrequently occurs outside of this period (ECCC 2016). If work is scheduled to occur outside the PNP restricted period, no mitigation will be required.

If vegetation/structure clearing is required during the PNP, an avian biologist should be retained to search suitable areas prior to work. The biologist should search for nests to manage risks to active nests protected by the MBCA. Nest searches should be completed within seven days of the proposed works. If work is not completed within seven days following the nest search, the search should be repeated to determine that birds have not established new nests during that period.

If no nests or signs of nesting are found, clearing or other activities may proceed in the area searched. If a nest is located, a designated buffer should be delineated, within which no activity will be allowed while the nest is active. The radius of the buffer will range from 5 m – 60 m depending on the sensitivity of the nesting species. The nest should be checked every few days to determine its status. Once the nest is determined to be inactive (e.g., the young are no longer active in the nest area), clearing and other activities in the area may proceed.

The potential for loss of ecological function at SWH for turtles and amphibians in the study area is considered to be low when paired with standard mitigation measures and design standards. However, Contractors should be aware of potential encounters with wildlife, including reptiles (snakes and turtles), and amphibians, and avoid them to the extent possible. Generally, sediment and construction fencing will also prevent wildlife access; however, there is some potential that individuals may enter the limits of construction. A thorough visual search for wildlife should be conducted in all work areas before work commences each day. Visual searches should include inspection of machinery and equipment for snakes prior to starting equipment, particularly during the peak snake activity period (generally April 30 to October 31). If slow moving wildlife are encountered during construction, they should be permitted
reasonable time to flee the area. If an animal must be moved outside the construction zone, a qualified biologist should be consulted to determine appropriate handling protocols.

6.2.3 Species at Risk

6.2.3.1 Potential Impacts

Loss of suitable habitat for SAR occurs where habitat removal is required to facilitate construction. Three SAR birds and one SOCC bird were identified for the study area. SAR and SOCC locations are mapped on Figure 5, Appendix A of the Natural Environment Report, provided in Appendix F of this ESR. The Project is anticipated to cause temporary (less than 1 year) disturbance to the edge of suitable habitats within the existing ROW, resulting in negligible impacts to the habitat. There is also potential for construction to disturb or destroy nests of migratory birds, SAR birds, and roosts of SAR bats while in use, particularly during vegetation clearing and structural removal.

6.2.3.2 Mitigation

In addition to the measure for migratory birds, where suitable habitat for Barn Swallow, Eastern Meadowlark and Bobolink is present in the Project footprint, timing restrictions for vegetation/structure removal should be modified to match the species-specific active season as defined by O. Reg. 242/08.

Tree clearing in candidate Bat Maternity Colony habitats should take place outside of the period when maternity roosts are active (May 1 to August 31). If tree clearing is required during the restricted window, a qualified biologist will conduct a maternity roost occupancy survey per MNRF guidance to confirm the absence of bats prior to the clearing.

6.3 AQUATIC ENVIRONMENT

6.3.1 Fish Habitat and Fluvial Geomorphology

6.3.1.1 Potential Impacts

There is potential for direct impacts on fish and fish habitat at watercourses where culvert replacements or extensions are required and if channel realignments are necessary. During construction (culvert replacements, extensions, channel realignments, watermain crossings, sanitary sewer crossings) there is potential for sediment transport from disturbed areas to enter surface waters, which can affect water quality, fish, and fish habitat. Potential effects of the project can include changes to surface water flows due to changes in drainage patterns or groundwater contributions to receiving watercourses.

High Constraint Stream Corridor areas intersect the study area at Essa Road, Huronia Road and Lockhart Road. Habitat loss should be reduced to the extent possible during detailed design.
6.3.1.2 Mitigation

The following measures are consistent with DFO’s Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2016).

- Where culvert extensions or replacements are required, design culverts to maintain fish passage and reduce the culvert footprint to the extent possible.
- Where culvert extensions or replacements are required, design culvert such that width is at least as wide as the bankfull width. This will reduce the potential for excessive channel scour and erosion downstream of undersized culverts.
- For active channels that require modifications or channel relocations, design and construct channels with an appropriate bankfull width and depth to reduce the potential for excessive erosion or deposition that would contribute to instability. Restoration plans should be designed to enhance fish habitat.
- Sediment and erosion controls measures should be designed to reduce the risk of the entry of sediment and deleterious substances from the Project into surface water features.
- Implement timing restrictions for in-water works to avoid and protect sensitive life periods of fish (e.g., spawning). The In-Water Work Timing Window Guidelines (MNR 2013b) for waterbodies in MNRF’s Southern Region are based on resident fish species and are as follows (period when in-water work is restricted) but should be confirmed during Detail Design for specific sites:
  - Brook Trout (Coldwater): October 1 to May 31
  - Unknown Spring Spawning Species: March 15 to July 15
- Design and implement isolation plan to isolate temporary in-water work zones to maintain clean flow to downstream/around the work zone at all times (e.g., dam and pump bypass, flume bypass).
- Rescue and relocate fish from the work area. Equip intakes of pumping hoses with an appropriate device to avoid entraining and impinging fish.
- Manage water from dewatering operations to reduce the risk of erosion and/or release of sediment laden or contaminated water to watercourses (e.g., use settling basin, filter bag, energy dispersion measures)
- Restabilize banks of watercourses disturbed during construction to pre-construction configuration and condition (or better).

The following site-specific considerations are recommended for the protection and enhancement of channel stability and fish habitat:

- The channel at Site BKT-000 flows through a 2 m culvert, which appears to be undersized (bankfull width is 4-4.5 m). If an extension is required, extending the culvert downstream may cause a new scour pool to form, resulting in instability. This potential for instability may be reduced by extending the culvert upstream or replacing the culvert with a wider culvert that is at least equal to the bankfull width of the watercourse.
- Upstream of Station BKT-009, the channel flows along the west side of Huronia Road for approximately 230 m. The watercourse provides fish habitat which must be considered if relocation is required for infrastructure improvements on Huronia Road.
- Restore channel dimension, slope, and alignment of the Lovers Creek Tributary at Lockhart Road (Station BKT-010).
6.3.2 Erosion and Sediment Control

The following mitigation measures are consistent with BMPs and standards, and are recommended:

- Vegetation removal should be minimized to the extent feasible. Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas. No equipment should be permitted to enter any natural areas beyond the protection fencing.
- Silt fencing should be used to protect sensitive natural areas (e.g., wetlands, watercourses and waterbodies), and in areas of fill placement or earth grubbing to contain sediment generated from exposed soils.
- All sediment and erosion controls should be monitored regularly and properly maintained, as required. Additional silt fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency. Controls should be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is reestablished.
- All exposed soil areas should be stabilized and revegetated promptly upon completion of construction activities. Disturbed areas where slopes are ≥10% should be stabilized with the installation of erosion control blankets.
- All toxic material should be stored in secure enclosures away from sensitive natural areas to prevent leaks and spills into the environment. Equipment should be refueled at minimum 30 m away from any sensitive natural areas to avoid potential impacts in the event that an accidental spill occurs.
- An adequate supply of spills cleanup materials should be maintained at the work site. Spills and leaks should be captured, contained and cleaned up immediately.
- Contaminant spills should be reported as per the Environmental Protection Act. All toxic chemicals and contaminants must be disposed of offsite in approved disposal sites under appropriate MOECC regulations.
- An on-site Environmental Specialist should monitor the construction activities to verify that the contract constraints and provisions are adhered to and to recommend remedial action in the event of an emergency or unforeseen situation.

6.4 CULTURAL ENVIRONMENT

6.4.1 Cultural Heritage Assessment

6.4.1.1 Potential Impacts

The Preferred Design may incur direct impacts to potential cultural heritage resources, resulting from destruction and alteration, and indirect impacts resulting from land disturbance. Potential impacts associated with construction vibration have also been identified.

The potential direct and indirect impact impacts to cultural resources associated with implementation of the Preferred Design are summarized in Table 6-3 and Table 6-4.
### Table 6-3 Direct Impacts

<table>
<thead>
<tr>
<th>Property Location</th>
<th>Description of Potential Direct Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lockhart Road/BCRY Bridge (CHR16)</strong></td>
<td>The bridge is a steel girder subway that appears to be over 40 years old based on design and materials. The existing rail subway and the BCRY (CHR 16) will be removed and replaced as part of the Preferred Design. In addition, property acquisition is planned along the south side of the road adjacent to this resource.</td>
</tr>
<tr>
<td><strong>McKay Road East (CHR 21)</strong></td>
<td>Road widening activities are planned within the historical limits of the Hamlet of Vine. Heritage attributes associated with this resource include the former railway station (CHR 20), the rail line, and nearby residences (i.e., 149, 170, 180, 186, and 197 McKay Road East or CHRs 25, 22, 20, 19 and 29). Impacts related to these heritage attributes include alteration to the landscape context of the Hamlet of Vine and indirect impacts resulting from vibrations during construction activities. Road widening activities within this area will include property acquisition on both sides of the road, and the removal of landscape features such as trees and fences.</td>
</tr>
<tr>
<td><strong>7735 County Road 27 (CHR 3)</strong></td>
<td>Evaluation determined that the structure is a representative example of a mid-19th century vernacular residence. The Preferred Design traverses the property; however, approximately 100 metres from the residence. Accordingly, the construction of the new road will result in the alteration of the landscape setting of this resource and land disturbances.</td>
</tr>
</tbody>
</table>

### Table 6-4 Indirect Impacts

<table>
<thead>
<tr>
<th>Property Location</th>
<th>Description of Potential Indirect Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>901 Essa Road (CHR 1)</strong></td>
<td>The residence is located at the limits of the 15 m buffer of project activities. There may be potential for indirect impacts due to the proximity of construction activities, including but not limited to vibration, alteration or damage from machinery, and ground disturbance.</td>
</tr>
<tr>
<td><strong>180 McKay Road East (CHR20)</strong></td>
<td>The residence is located at the limits of the 15 m buffer of project activities. There may be potential for indirect impacts due to the proximity of construction activities, including but not limited to vibration, alteration or damage from machinery, and ground disturbance.</td>
</tr>
<tr>
<td><strong>110 McKay Road East (CHR 23)</strong></td>
<td>The residence is located at the limits of the 15 m buffer of project activities. There may be potential for indirect impacts due to the proximity of construction activities, including but not limited to vibration, alteration or damage from machinery, and ground disturbance.</td>
</tr>
<tr>
<td><strong>149 McKay Road East (CHR 25)</strong></td>
<td>The residence is located at the limits of the 15 m buffer of project activities. There may be potential for indirect impacts due to the proximity of construction activities, including but not limited to vibration, alteration or damage from machinery, and ground disturbance.</td>
</tr>
</tbody>
</table>
Mitigation

The MTCS suggest methods of minimizing or avoiding negative direct or indirect impacts including, but not limited to:

- Alternative development approaches
- Isolating development and site alteration from significant built and natural features and vistas
- Design guidelines that harmonize mass, setback, setting, and materials
- Limiting height and density
- Allowing only compatible infill and additions
- Reversible alterations
- Buffer zones, site plan control, and other planning mechanisms

The following mitigation measures have been developed in consideration of these methods.

Mitigation – Direct Impacts

Landscape Documentation

Detailed documentation is often a preferred mitigation strategy where site impacts cannot be avoided. Documentation creates a public record of a structure or site, which provides researchers, and the public, with a land use history, construction details, and photographic record of the resource. Documentation acknowledges the heritage attributes in their current context and creates a record of the existing conditions prior to change.

Landscape documentation should be carried out to capture the existing conditions of the property located at 7735 Country Road 27 and spatial relationship of the residence to other built elements, landscape features, and the adjacent roadways. Landscape documentation should be carried out prior to construction.

Landscape documentation should be carried out to capture the existing conditions of the Hamlet of Vine settlement and spatial relationship of the former railway station, railway, nearby residences, and landscape features associated with the roadway. Landscape documentation should be carried out prior to construction.

Cultural Heritage Evaluation Report

The subway bridge at the intersection of the BCRY railway and Lockhart Road (CHR 16) will be replaced. This bridge should be subject to a Cultural Heritage Evaluation Report (CHER) to evaluate the bridge against O. Reg. 9/06 of the OHA. Once the CHVI of the bridge is established, a Heritage Impact Assessment should be prepared, if warranted.
Mitigation – Indirect Impacts

Efforts to prevent adverse indirect impacts to heritage resources should be isolated from Project activities as described below. In addition, monitoring should take place to proactively prevent damage.

To prevent negative indirect impacts, the heritage resources should be isolated from construction activities through a site control plan and the installation of temporary fencing to indicate where project activities are restricted.

Pre-and post-construction condition surveys be carried out for the four properties within the 15 m buffer. The pre-construction condition survey report will highlight existing deficiencies and the post-construction condition survey shall be conducted after completion of construction for comparison purposes.

Vibration monitoring during construction should be carried out for the four CHRs within the 15 m buffer zone. Vibration monitoring should consist of monitoring the ground-borne vibration levels, in peak particle velocity (PPV), at a location representative of heritage structure while construction activities take place. The vibration monitoring program should include determination of vibration assessment criteria suitable for these heritage structures, installation of vibration monitor and relocation as needed as construction progresses. Vibration monitoring personnel should be on-site during construction activities to direct and assess appropriate vibration levels as needed.

6.4.2 Archaeological Assessment

The findings of the Stage 1-2 AA identified three (3) Euro-Canadian archaeological sites within the study area, each of which contained more than 20 artifacts that date to a period of use to before 1900. As such, a Stage 3 archaeological investigation is required to be completed in accordance with the MTCS 2011 Standards and Guidelines for Consultant Archaeologists, prior to construction.

A Stage 3 investigation will be carried out at the identified locations during detailed design. No construction activities will take place until the MTCS has confirmed in writing that all archaeological licensing and technical review requirements have been satisfied.

6.4.3 Groundwater Resources

Existing land uses in the study area are not currently serviced by the City, and therefore rely on private groundwater supply wells for potable and other uses. However, the study area will be fully serviced by municipal water supply once ultimate conditions/planned development in the area has been completed. In addition, no significant cut changes to the roadway profile are required to accommodate the proposed modifications. It should be further noted that SWM measures and LID features will be planned in compliance with design criteria defined by the
City, LSRCA and NVCA during detailed design. As such, no significant impacts to groundwater are anticipated in association with this project.

### 6.5 SOCIAL AND ECONOMIC ENVIRONMENTS

#### 6.5.1 Property Impacts

**6.5.1.1 Impacts**

Impacts to private property in association with the Preferred Design include: temporary grading activities; changes to property accesses; and acquisition of approximately 15.47 hectares (38.22 acres) of private property to accommodate the widened ROW and daylighting. Land uses that will be directly impacted by the project include a mix of residential, light industrial/commercial, retail, and agricultural; however, it should be noted that no property owners are anticipated to be displaced in association with the project.

The approximate area of property anticipated to be required is illustrated on Drawings PP1 through PP58, DP1 through DP15 and TS1 through TS11, provided in Appendix N of this ESR, and Drawings 2.0 to 2.4 located in Appendix A of the Stormwater Management Report.

**6.5.1.2 Mitigation**

Grading limits on individual properties will be finalized during detailed design. The City will contact property owners well in advance of construction activities to seek permission to grade on private lands.

The area of private property required to accommodate the road modifications will be reviewed and confirmed during detailed design, at which time the City will confirm the SWM strategy and engage affected property owners.

#### 6.5.2 Noise

Based on the findings of the Traffic Noise Assessment, the change in noise levels associated with implementation of the road modifications is expected to be less than 5 dBA. As such, noise mitigation is not warranted in association with the Preferred Alternative Designs.

### 6.6 PUBLIC INFORMATION CENTRE #2

A second PIC was held on April 6, 2017 at the Liberty North Banquet Hall from 4:00 pm to 7:00 pm to provide an opportunity for stakeholders and other members of the public to review and provide comments on the information presented at PIC #1, the Preferred Alternative Design, the potential impacts to the environment and proposed mitigation measures. As noted in Section 4.3.2, this additional PIC also offered an opportunity for the public and other stakeholders to review the changes to the design since PIC #1.
The Notice of PIC #2 was mailed and/or hand delivered to Indigenous communities, agencies, businesses, property owners, and tenants that may have an interest in the study (and those who have expressed an interest in the study to date) on March 23, 2017. The Notice was also placed in The Barrie Examiner on March 23 and 25, 2017.

Approximately fifty-two (52) attendees signed in to the PIC. However, as noted previously, the PIC was held in coordination with the consultation activities associated with the Hewitt’s Secondary Plan and McKay Road East - Highway 400 interchange, Lockhart Road/Salem Road Crossing and Associated Works.

Comment forms were available for attendees to provide comments on the alternative design concepts and intersection treatment options. Approximately three (3) comment forms were received by the requested submission date of April 28, 2017. In addition, approximately 2 comments were received via email. A copy of the correspondence received at/following PIC #2 and associated responses is provided in Appendix B-1 of this report. A summary of the key responses and/or common themes, and how they have been considered as part of this study is provided in Table 6-3.

6.7 SUMMARY OF PUBLIC CONCERNS AND ASSOCIATED CONSIDERATION

A number of comments have been received during the course of this study, many of which focus on prevalent themes that have played an important role in the EA study process. Table 6-5 provides a summary of the main comments received and a description of how these comments were considered as part of this EA study.

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>LID features are important as heavy rain and flooding become more common</td>
<td>The alternative design concepts presented at PIC #1 included: a 3 or 5 lane cross section, cycling lanes and sidewalks (Alternative 1) and a 3 or 5 lane cross section, cycling lanes, sidewalks, and LID features (Alternative 2). Given the feedback received at/following PIC #1, the study team re-designed Alternative 1 to include LID features within the same ROW width.</td>
</tr>
<tr>
<td>MUTs are not a good substitute for dedicated bike lanes.</td>
<td>The Preferred Design includes 1.5 m bicycle lanes plus 0.5 m buffer located on either side of the roadway.</td>
</tr>
</tbody>
</table>
Table 6-5 Summary of Key Comments Received and Associated Considerations

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>The existing speed limit on Salem Road is unsafe.</td>
<td>Salem Road will be re-designated as an Arterial road through the study area. These types of roadways are primarily traffic carrying facilities designed to provide through routes across and within the City. In addition, the posted speed limit on these types of roadways is typically 50 km/hr to 60 km/hr. The City will review appropriate speed limits in the study area during detailed design. Traffic safety was considered as part of evaluation of alternatives and selection of the Preferred Design. Roundabouts are being implemented at three study area intersections, in part to manage vehicle speeds.</td>
</tr>
<tr>
<td>Impacts to private property</td>
<td>Potential impacts to property were considered during the evaluation of alternatives, and selection of the Preferred Design. Amendment 38 further indicates that a maximum 41 m ROW is permitted for Arterial roadways. The Preferred Design is consistent with the ROW recommendations outlined in the MMATMP (i.e., 27 m for 3 lane cross section and 34 m for a 5 lane cross section, with the exception that LID features have also been included in the design, where possible. Impacts to private property will be further reviewed during detailed design, at which time the City will engage affect property owners.</td>
</tr>
<tr>
<td>Larger ROWs add cost.</td>
<td>The Preferred Design was selected in part because it less costly and imposes less impact to private properties.</td>
</tr>
<tr>
<td>Roundabouts</td>
<td>Traffic safety was considered as part of evaluation of alternatives and selection of the Preferred Design. Roundabouts are being proposed at three (3) study area intersections, in part to manage vehicle speeds.</td>
</tr>
<tr>
<td>Impacts to businesses.</td>
<td>The road alignment was shifted where possible to limits the impacts to commercial property, where feasible.</td>
</tr>
<tr>
<td>Impacts to driveways/private property access.</td>
<td>Revisions undertaken for the Preferred Design where possible. Impacts to private property will be further reviewed during detailed design, at which time the City will engage affect property owners.</td>
</tr>
</tbody>
</table>
Mitigation Commitments and Monitoring

October 12, 2017

7.0 MITIGATION COMMITMENTS AND MONITORING

The potential impacts and proposed mitigation measures are described in Section 6.0 of this ESR. The detailed list of specific commitments to be carried forward to Phase 5 of the Municipal Class EA process (Detailed Design and Implementation) are presented in Table 7-1. These commitments have been developed from input and consultation with the public, LSRCA, NVCA, the County of Simcoe, Town of Innisfil, and other stakeholders.

Table 7-1 Detailed Design and Implementation Commitments

<table>
<thead>
<tr>
<th>Wildlife</th>
<th>Fish/Fish Habitat</th>
</tr>
</thead>
</table>
| • Construction activities will be completed outside of the Primary Nesting Period for this study area (i.e., between April 10 and August 9).  
• If work is required within the Primary Nesting Period, an avian biologist will be retained to search for nests within seven days of the proposed construction.  
• Contractors will be made aware of the potential to encounter wildlife, including reptiles and amphibians.  
• A thorough search for wildlife will be conducted daily within all work areas, including inspection of machinery and equipment for snakes prior to starting equipment during the peak snake activity period (April 30 to October 31).  |
| • A DFO Self-Assessment will be completed at the road crossing locations where fish habitat was identified.  A Request for Review form will be prepared and submitted to the DFO if the self-assessment criteria cannot be met.  
• Site-specific mitigation measures will be developed during detailed design.  The DFO’s Measures to Avoid Causing Harm to Fish and Fish Habitat (2016) will be followed to protect channel stability and fish and fish habitat.  
• A detailed erosion and sediment control plan will be prepared and maintained throughout the course of the project.  
• Should dewatering be required, a water quality management plan is necessary to ensure that turbid water does not flow back into watercourses.  This management plan includes procuring any necessary permits.  
• Equipment maintenance areas will be located 30 m from watercourses.  
• Appropriate spill response materials will be kept on-site.  
• New culverts will be designed to maintain fish passage and reduce footprints to the extent possible.  
• Culverts will be designed such that width is at least as wide as the bankfull width to reduce the potential for excessive channel scour and erosion.  
• Channel modifications will be designed and constructed with an appropriate bankfull width.  
• Restoration plans will be designed to enhance fish habitat.  
• Sediment and erosion controls measures should be designed to reduce the risk of the entry of sediment and deleterious substances from the Project into surface water features.  
• Appropriate timing windows for construction activities will be adhered to.  Specific timing restrictions will be confirmed in consultation with the MNRF during detailed design.  
• An isolation plan will be prepared to isolate temporary in-water work zones and maintain clean flow to downstream/around the work zone.  
• Fish will be rescued and relocated from the work area.  Pump intakes will be equipped with appropriate prevention device to avoid impinging fish.  
• Watercourse banks disturbed during construction will be restored to pre-construction configuration and condition (or better). |
### Mitigation Commitments and Monitoring

**October 12, 2017**

#### Table 7-1 Detailed Design and Implementation Commitments

<table>
<thead>
<tr>
<th>Species at Risk</th>
<th>Activities</th>
</tr>
</thead>
</table>
| Barn Swallow    | - Where suitable habitat for Barn Swallow, Eastern Meadowlark and Bobolink is present, timing restrictions will be modified as per O. Reg. 242/08 (i.e., May 1 to August 31 (Barn Swallow) and May 1 to July 31 (Bobolink and Eastern Meadowlark)).
|                 | - Tree clearing will place outside of the maternity bat roosting period (May 1 to August 31).                                               |
|                 | - If tree clearing is required during the restricted window, a qualified biologist will conduct a maternity roost occupancy survey per MNRF standards to confirm the absence of bats prior to the clearing. |
| Eastern Meadowlark | - Tree clearing will place outside of the maternity bat roosting period (May 1 to August 31).                                           |
| Bobolink        | - Tree clearing will place outside of the maternity bat roosting period (May 1 to August 31).                                               |

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Areas to be cleared will be clearly marked and reduced to the smallest reasonable area.</td>
</tr>
<tr>
<td></td>
<td>- Construction activities will not occur beyond barrier fencing.</td>
</tr>
<tr>
<td></td>
<td>- Natural areas that are temporarily disturbed will be restored to natural self-sustaining conditions.</td>
</tr>
<tr>
<td></td>
<td>- Topsoil will be stored separately to preserve local seed banks if appropriate, and for use on final grades.</td>
</tr>
<tr>
<td></td>
<td>- Barrier fencing will be placed along the construction boundary where it intersects with natural areas to prevent accidental encroachment into these features.</td>
</tr>
<tr>
<td></td>
<td>- A tree inventory will be completed in accordance with the City By-law regulating protection of trees (By-law 2014-116).</td>
</tr>
<tr>
<td></td>
<td>- A landscape planting plan will be prepared using native species and/or include species adapted to the site conditions (where possible).</td>
</tr>
<tr>
<td></td>
<td>- Areas disturbed during construction will be treated with a suitable seed mix to stabilize soil and establish self-sustaining native vegetation as soon as possible following disturbance.</td>
</tr>
<tr>
<td></td>
<td>- Native seed mixes and cover crops will be used where disturbance is contiguous with natural areas.</td>
</tr>
<tr>
<td></td>
<td>- A light (2 cm) layer of mulch (e.g., woodchips) will be placed to retain soil moisture and improve germination rates.</td>
</tr>
<tr>
<td></td>
<td>- An erosion mat may also be used to stabilize final grades where necessary, and should be applied post seeding and mulch application.</td>
</tr>
<tr>
<td></td>
<td>- Qualitative vegetation monitoring will be completed annually for 2 years following the implementation of revegetation plans.</td>
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<tr>
<td></td>
<td>- An adaptive management strategy will be implemented if required.</td>
</tr>
<tr>
<td></td>
<td>- An annual monitoring report will be prepared to the satisfaction of the City, and the appropriate CA if regulated areas are present.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stormwater</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- The City will continue to review ROW Standard Details to determine the best approach to accommodate linear LID infrastructure.</td>
</tr>
<tr>
<td></td>
<td>- LID practices will be further reviewed during detailed design, in consultation with the LSRCA and NVCA.</td>
</tr>
<tr>
<td></td>
<td>- All tree plantings on the boulevard or centre medians will be connected to LIDs, where possible.</td>
</tr>
<tr>
<td></td>
<td>- A 30 m setback from woodlots and streams will be used for LID consideration.</td>
</tr>
<tr>
<td></td>
<td>- Catchbasins will be pretreated with catchbasin insert to capture silt. A raised overflow will be installed to allow heavy flows to flow to the storm sewer.</td>
</tr>
<tr>
<td></td>
<td>- The City will continue to engage with the Salem Secondary Plan Landowners’ Group to ensure that the drainage boundaries are properly defined and SWM facilities are appropriately sized.</td>
</tr>
<tr>
<td></td>
<td>- All road crossings will be designed in accordance with Section 3.4.3 of the current City of Barrie Storm Drainage and Stormwater Management Policies and Guidelines and in consideration of the LSRCA, NVCA, MNRF and DFO design requirements.</td>
</tr>
</tbody>
</table>
Mitigation Commitments and Monitoring  
October 12, 2017

**Table 7-1 Detailed Design and Implementation Commitments**

<table>
<thead>
<tr>
<th>Category</th>
<th>Commitments</th>
</tr>
</thead>
</table>
| **Noise**      | • Culvert design will be further reviewed during detailed design and will conform to the City’s Storm Drainage Design Guidelines. Regional Floodplain elevations will be approved by the LSRCA and NVCA.  
• Quality controls will be confirmed during detailed design.  
• The City will be responsible for implementing SWM measures during the interim condition. |
| **Air Quality**| • All equipment shall be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.  
• The Contract Documents shall contain a provision that any initial noise complaint will trigger verification that the general noise control measures agreed to are in effect.  
• In the presence of persistent noise complaints, all construction equipment shall be verified to comply with MOECC NPC-115 guidelines.  
• In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures during construction may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration shall be given to the technical, administrative, and economic feasibility of the various alternatives.  
• Easements will be established to construct an outlet from the facility to the creek at Outlets E6, V3, M4, and H3/M6 in accordance with the City of Barrie’s Storm Drainage and SWM policies and guidelines;  
• During construction, vehicles/machinery and equipment shall be in good repair, equipped with emission controls, as applicable, properly maintained and operated within regulatory requirements.  
• Water and non-chloride dust suppressants will be applied during construction to protect air quality due to dust.  
• Best management practices to mitigate any air quality impacts caused by dust will be applied during construction. |
| **Cultural Heritage** | • Landscape documentation will be completed for 7735 County Road 27 and McKay Road East, prior to construction activities.  
• A Cultural Heritage Evaluation Report will be completed for the above-grade rail crossing at Lockhart Road. A Heritage Impact Assessment will be subsequently completed, if warranted.  
• A Site Control Plan will be completed for 901 Essa Road, 180 McKay Road East, 110 McKay Road East, and 149 McKay Road East during detailed design.  
• Pre- and post-construction survey will be completed during detailed design for the properties where indirect impacts have been identified.  
• Vibration monitoring will be undertaken during construction. Vibration monitoring personnel will be on-site during construction. |
| **Archaeology** | • A Stage 3 investigation will be carried out at the identified locations during detailed design.  
• No construction activities will take place until the Ministry of Tourism, Culture and Sport has confirmed in writing that all archaeological licensing and technical review requirements have been satisfied. |
Mitigation Commitments and Monitoring
October 12, 2017

**Table 7-1 Detailed Design and Implementation Commitments**

<table>
<thead>
<tr>
<th>Construction Monitoring</th>
<th>• Mitigation measures shall be implemented and maintained through on-site inspections by the City staff to ensure that the natural, social, and economic environments are not impacted by the construction activities and/or that impacts are minimized.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCRY</td>
<td>• Construction considerations and cost sharing will be further reviewed during detailed design.</td>
</tr>
</tbody>
</table>
| Excess Soils/Materials Management | • Excavated soils will be handled in accordance with the MOECC’s guidance document entitled, “Management of Excess Soil – A Guide for Best Management Practices”.  
  • Should any spills occur during construction, the Spills Action Centre of the Ministry of Environment and Climate Change will be contacted immediately.  
  • Should any excess soils be generated during construction activities, appropriate tests to determine contaminant levels will be undertaken. If the excess soil exceeds the applicable MOECC Standard, it will be disposed of in accordance with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04.  
  • All waste generated during construction will be disposed of in accordance with MOECC requirements. |
| Servicing                | • The proposed watermain and all system components will be designed and constructed in accordance with all applicable City standards and guidelines  
  • Existing geotechnical information collected at the double-box concrete culvert is sufficient; however, additional geotechnical investigations are required for the trenchless or open cut methodology.  
  • A SUE Level ‘B’ investigation will be completed at connection points with existing infrastructure and where existing infrastructure is in place, prior to detailed design.  
  • BCRY will be further engaged during detailed design of the trenchless crossing.  
  • Utility and agency stakeholders including MTO, Union Gas, PowerStream Inc., and Bell will be engaged to provide input during detailed design of the alignment.  
  • A detailed Commissioning Plan will be developed during detailed design and used to develop a valve testing plan, in advance of construction.  
  • The Commissioning Plan shall include details on source water available for testing. |

### 7.1 PERMITS AND APPROVALS

The following permits and approvals may be required as part of detailed design:

- A permit from the LSRCA and/or NVCA for development or interference with wetlands and alterations to shorelines and watercourses;
- A DFO Self-Assessment will be completed for each water crossing location. If the Self-Assessment criteria cannot be met, a Request for Review form will be prepared and submitted to DFO to determine if a * Fisheries Act Authorization is required;
- MOECC – ECA for sanitary sewer, Form 1 for watermain, and EASR registration (or PTTW);
- *Ontario Heritage Act* requirements for Archaeological Clearance;
- Health and safety requirements during construction under Ontario’s *Occupational Health and Safety Act*; and
Mitigation Commitments and Monitoring
October 12, 2017

- Notification and potential permissions from respective utilities with facilities in the area.

No Threatened or Endangered species under the SARA were detected in the study area, and no permitting is anticipated to be required under SARA.

ESA authorization is not likely to be required as long as all mitigation measures described in this report are implemented. Consultation with MNRF is recommended to confirm authorization is not required under the ESA.

7.2 NEXT STEPS

The filing of the ESR for public review will complete the planning and preliminary design stage for this Schedule ‘C’ project. The ESR will be available for public review for a thirty (30) calendar day period. A Notice of Completion is published to announce the review period. Copies of the ESR will be available for review and comment, at the following locations during normal business hours, and at any time on the City website:

<table>
<thead>
<tr>
<th>City of Barrie City Hall</th>
<th>Barrie Public Library</th>
<th>Barrie Public Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Floor City Hall</td>
<td>Downtown Location</td>
<td>Painswick Location</td>
</tr>
<tr>
<td>70 Collier Street</td>
<td>60 Worsley Street</td>
<td>48 Dean Avenue</td>
</tr>
<tr>
<td>Barrie, ON</td>
<td>Barrie, ON</td>
<td>Barrie, ON</td>
</tr>
<tr>
<td>Mon-Fri: 8:30 am to 4:30 pm</td>
<td>Mon-Thur: 9:30 am to 9:00 pm</td>
<td>Mon: 10:00 am to 5:00 pm</td>
</tr>
<tr>
<td></td>
<td>Fri: 9:30 am to 5:00 pm</td>
<td>Tues-Fri: 10:00 am to 9:00 pm</td>
</tr>
<tr>
<td></td>
<td>Sat: 9:30 am to 5:00 pm</td>
<td>Sat: 10:00 am to 5:00 pm</td>
</tr>
<tr>
<td></td>
<td>Sun: 12:00 pm to 5:00 pm</td>
<td>Sun: 12:00 pm to 5:00 pm</td>
</tr>
</tbody>
</table>

If no outstanding concerns are brought forward during the review period, the City may proceed to Phase 5 of the Class EA process (i.e., detailed design and construction).

If concerns are raised that cannot be resolved through discussion with the City, the MOECC may be requested to order the City to complete an Individual EA to comply with Part II of the Environmental Assessment Act, 1990 (referred to as a Part II Order). Anyone wishing to request a Part II Order must submit a written request within the thirty (30) calendar day review period, to the MOECC with a copy to the Director, Environmental Approvals Branch and the City Clerk:

<table>
<thead>
<tr>
<th>Honorable Chris Ballard</th>
<th>Director, Environmental Approvals Branch</th>
<th>Dawn McAlpine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minister of Environment and Climate Change</td>
<td>Ministry of the Environment and Climate Change</td>
<td>City Clerk and Director</td>
</tr>
<tr>
<td>77 Wellesley Street West</td>
<td>135 St. Clair Avenue West</td>
<td>City of Barrie</td>
</tr>
<tr>
<td>11th Floor</td>
<td>1st Floor</td>
<td>70 Collier Street</td>
</tr>
<tr>
<td>Toronto, ON M7A 2T5</td>
<td>Toronto, ON M4V 1P5</td>
<td>P.O. Box 400</td>
</tr>
<tr>
<td><a href="mailto:EAASIBgen.moe@ontario.ca">EAASIBgen.moe@ontario.ca</a></td>
<td></td>
<td>Barrie, ON L4M 4T5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:cityclerks@barrie.ca">cityclerks@barrie.ca</a></td>
</tr>
</tbody>
</table>