# Town of Innisfil
# Lakeshore Water Treatment Phase 3 Expansion
## Environmental Study Report - Environmental Assessment Addendum

December 2014

Prepared by

CH2MHILL


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Town of Innisfil

# Lakeshore Water Treatment Plant Phase 3 Expansion Municipal Class Environmental Assessment Environmental Assessment Addendum

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**Date:**

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# Information on Part II Order Requests

Concerns regarding the revisions to the Lakeshore Water Treatment Plant Expansion should be brought to the attention of the proponent within the 30-day review period after the Notice of Filing of Addendum has been issued. If the concern is not resolved through discussion with the proponent, a person/party may submit a written request to the Minister of the Environment to make an order for the revisions to the Lakeshore Water Treatment Plant Expansion to comply with Part II of the Environmental Assessment (referred to as a Part II Order), which addresses individual environmental assessments. Submissions must be received within the 30-day review period with a copy forwarded to the proponent.

In considering a request for "Part II Orders", the Minister shall give consideration to the following issues:

- Extent and nature of public concern
- Potential for significant adverse environmental effects
- Need for broader consideration of alternatives by the proponent
- Considerations of urgency
- Participation of the requester in the planning process
- Nature of the request
- Degree to which public consultation and dispute resolution have taken place

Should a concern of a "Part II Order" request be resolved by a proponent to the satisfaction of the requester, it is the responsibility of the requester to withdraw the "Part II Order" request. Withdrawals should be in writing to the Minister, with a copy forwarded to the proponent.

# 1. Introduction

## 1.1 Background

The Town of Innisfil (Town) provides water to more than 7,000 residential and commercial units on the south end of Lake Simcoe. The Town services these areas primarily from the Lakeshore Water Treatment Plant (Lakeshore WTP) and several ground water well systems. The Lakeshore WTP is located north of the intersection of 25th Side Road in Alcona and Innisfil Beach Road. The WTP is surrounded by Innisfil Beach Park and a residential community. The original Lakeshore WTP was commissioned in 1996. The Towns of Bradford West Gwillimbury and Innisfil executed an agreement for water supply in 2004. The Lakeshore WTP was expanded to 26 ML/d in 2006. The treatment process uses enhanced coagulation and sedimentation, two-stage conventional media filtration, and chlorination. In 2008, the Lakeshore WTP was upgraded with GAC contactors for seasonal taste and odour control. Process residuals are equalized and pumped untreated to the sewer. A Low Lift Pumping Station (LLPS) at the beach pumps raw water to the Lakeshore WTP via a raw watermain that runs beneath Innisfil Beach Park.

In 2008, the Town concluded that, in order to accommodate growth in its serviced areas, an expansion to the Lakeshore WTP was necessary. The expansion would increase capacity to 100 ML/d, and take place in several phases in alignment with the Official Plan as well as for servicing Big Bay Point Resort (OPA #17), BWG Employment Lands (OPA #15) and BWG Bond Head Secondary Plan (OPA #16).

The expansion for increased capacity required that the Town complete a Municipal Class Environmental Assessment (Class EA). The Class EA was undertaken as a Schedule C Class EA, and the Environmental Study Report (ESR) was completed in 2011. The ESR identified 10 alternative expansion approaches using a combination of treatment technologies identified based on water quality and treatment objectives. An evaluation of the 10 alternatives was made based on criteria that encompassed all aspects of the environment (e.g. water quality criteria, technical operational criteria, social criteria, natural criteria, and economic considerations). Following the assessment of the alternatives, the ESR preferred solution was selected at the time to be an expansion to the:

- Lakeshore WTP and storage (including a new intake and raw watermain), LLPS, and a reduction in water demands. The components of the preferred solution were:

    1. Process that included dissolved air flotation (DAF), granular media filtration (GMF), ultraviolet disinfection (UV) and an advanced oxidation process (AOP)
    2. Residual Management Facility
    3. New 900 mm raw watermain (alignment twinning existing 750 mm raw watermain)
    4. Expansion of the Low Lift Pumping Station (LLPS) to the north
    5. New intake

### 1.1.1 New Recommended Solution

During the conceptual-design, a new recommended solution was identified that would result in improvements to the plans for the expansion. These revisions, including a new membrane treatment process, slight adjustment to raw watermain routing, and LLPS retrofit (within existing structure), were evaluated using the same evaluation criteria identified in the original assessment of expansion options. This evaluation confirmed

that the alterations would result in improvements to the plans for expansion. The new approach for treating water is described in Section 3 of this report, and the new waste disposal process is described in Section 4.

## 1.2 Class Environmental Assessment Addendum Process

The revisions to the drinking water treatment process, pumping station, and raw watermain represent changes to the preferred solution and mitigation measures outlined in the ESR. The Municipal Engineers Association's *Municipal Class Environmental Assessment* (revised 2011) requires that revisions to a selected solution (outlined within the ESR) must go through an addendum process. The addendum process includes documentation of the reasons for the change to the preferred solution, potential impacts, a description of how the impacts will be mitigated and addressed, and provision for public and agency participation.

This report documents the significant revisions to the preferred solution outlined in the ESR, the addendum process, and its results. This report will be placed on the public record for a period of at least 30 calendar days. During the 30-day review period, the public has an opportunity to review the Lakeshore WTP Phase 3A Expansion addendum and provide additional comments and input. If concerns arise regarding the revisions that cannot be resolved in discussion with the Town, a person/party may request that the Minister of the Environment make an order for revisions to the Lakeshore WTP Phase 3A Expansion addendum to comply with Part II of the Environmental Assessment Act (referred to as a "Part II Order"), which addresses individual environmental assessments. The Minister must receive requests for Part II Orders by the date indicated on the notice of filing. A copy of the Part II Order request must also be sent to:

Town of Innisfil
Town Hall
Customer Service
2101 Innisfil Beach Road
Innisfil, ON
Telephone: (705) 436-3740
Hours: Monday-Friday – 8:30am to 4:30pm

The ESR (2011) will also be made available with this report for background information.

## 1.3 Project Team

Revisions to the Lakeshore WTP Phase 3A Expansion addendum were initiated in April, 2014. The proponent for the study is the Town of Innisfil. The project team for the addendum includes the Town of Innisfil and its consultant, CH2M HILL Canada Limited.

## 1.4 Report Organization

The purpose of this report is to document the planning process for revisions made to the preferred approaches for drinking water treatment process and process waste disposal documented in the ESR, and their results, including public and agency consultation activities. The report is comprised of ten sections, which include:

Section 1 – Introduction

Section 2 – Environmental Inventory

Section 3 – Identification and Assessment of New Recommended Solution

Section 4 – Identification and Assessment of New Recommended Residuals Management Solution

Section 5 – Identification and Assessment of New Recommended LLPS Siting Solution

Section 6 – Identification and Assessment of New Recommended Raw Watermain Connection Solution

Section 7 – Identification and Assessment of New Recommended WTP Expansion Solution

Section 8 – Environmental Impacts and Mitigation

Section 9 – Public and Agency Consultation

Section 10 – Cost and Schedule

# 2. Environmental Inventory

## 2.1 Study Area

The study area is delineated roughly by the borders of the 62-acre Innisfil Beach Park; specifically, it is delineated by Park Road to the North, 25th Sideroad to the West, Innisfil Beach road to the South and Lake Simcoe to the East. The Class EA states that there are no known proposed changes to the area surrounding the Lakeshore WTP, however, the Town is stated to be master planning the Innisfil Beach Park.

A summary of the existing conditions are summarized in the subsequent sections. The complete Natural Sciences Report (completed by LGL Ltd.) can be found in Appendix A. The complete Stage 1 Archeological Assessment (Stage 1 AA) report (completed by Archeoworks Inc.) can be found in Appendix B.

## 2.2 Social/Cultural Environment

### 2.2.1 Built Environment

The built facilities within the boundary areas include a water treatment plant, a LLPS, a Fire Hall, and a park pavilion. Recreational facilities include athletic fields for baseball and soccer, a volleyball court, a toboggan hill, a boat launch, and a 2km trail loop; single-family residences lie outside of the study area. There are no observational studies or data presented to assess the number of park users or park user demographic. However, a comment sheet included in the ESR's Appendix C states that there are "many user groups year round."

### 2.2.2 Archaeological Assessment

The ESR states that the proximity of the area to Lake Simcoe and watercourses indicates "a strong potential for the discovery of archeological resources." However, the ESR indicates that there were no buildings designated as such under the Ontario Heritage Act.

A recent Stage 1 AA identified potential for the recovery of Aboriginal and Euro-Canadian archaeological remains within undisturbed portions of the study area due to the presence or proximity to the following features: water sources (an unnamed stream, Alcona Creek, Lake Simcoe); the known presence of a former homestead within the property; and two historic transportation routes, presently known as 25th Sideroad and Innisfil Beach Road.

Based on the established elevated archaeological potential, it is recommended that, following the finalization of project design and the delineation of construction impact/activity areas:

1. Portions identified as undisturbed be subjected to a Stage 2 AA employing test pit survey at five-metre intervals in accordance with Section 2.1.2 of the 2011 Standards and Guidelines for Consultant Archaeologists.
2. Portions identified as potentially disturbed be subjected to a judgmental Stage 2 test pit survey in accordance with Section 2.1.8 of the 2011 Standards and Guidelines for Consultant Archaeologists. Should any of these areas be identified in the field as undisturbed, test pit survey at standard five-metre intervals must be undertaken.
3. Portions classified as having low or no archaeological potential due to disturbances or physical features (e.g., permanently wet areas, steep slopes, etc.) be subjected to an on-site visual survey to confirm and document their nature and extent. Only then can these areas be exempt from Stage 2 test pit survey.

## 2.3 Natural Environment

The natural environment study area is comprised of the Lakeshore WTP, culturally planted woodlands, manicured grass and parkland, as well as a small tributary that flows to Lake Simcoe. Innisfil Beach Park, adjacent to the Lakeshore WTP, is composed mainly of sports facilities (i.e. tennis courts, baseball fields, soccer fields, etc.), with amenity trees dispersed throughout. Many mature trees are found along the margins of Alcona Creek, and in small patches within the park.

### 2.3.1 Vegetation and Vegetation Communities

A total of 110 species of flora were inventoried within the vegetation communities. There are three separate plantation communities within the study area, each of which has been left to naturalize for some time. There are multiple dead-standing conifers within all three plantation patches; the understory within these wooded areas has overgrown with young shrubs, while the groundcover is dominated by Poison Ivy. There are a few small patches of open vegetation within the study area, which have overgrown with cultural, weedy species. A wetland community follows the length of Alcona Creek that runs from 25 Sideroad to Lake Simcoe, and includes a small section following an intermittent tributary (manmade feature from the 1996 plant construction) that leads from the WTP.

### 2.3.2 Wildlife and Wildlife Habitat

A total of 19 species were documented through direct visual or auditory observations, and/or through indirect evidence such as burrows, scat, tracks, or trails. Of the 19 observed species, 15 are birds, while the remaining species are amphibians and invertebrates. All of the species observed are considered common, and widespread. No wildlife species at risk (SAR) were documented within the study area, and none of the species observed are considered locally uncommon.

Many of the vegetation communities observed on site are considered to be culturally influenced, and none are considered to be rare or providing significant sources of high quality habitat.

### 2.2.3 Aquatic Environment

Two watercourses were observed in the project area; one unnamed intermittent stream along the northern edge of the study area, and Alcona Creek which flows in an easterly direction across Innisfil Beach Park. Both features flow into Lake Simcoe.

The unnamed watercourse was investigated as it flowed through accessible properties under summer low flow condition on July 24, 2014. The 2011 ESR indicates that the Lake Simcoe Regional Conservation Authority (LSRCA) has identified the lower portion of the watercourse as providing nursery habitat for Northern Pike. The 2011 ESR also documents that permanent flow year-round may occur through this stream; however this was not the case as observed on July 24, 2014.

Alcona Creek represents a permanent stream with conditions observed on July 24, 2014 to be similar to what is documented in the ESR. Watercress at the overflow outlet suggests release water is cold in nature. Alcona Creek is documented to support a coldwater fish species assemblage in the upper creek in the vicinity of the overflow channel where a crossing of the watercourse associated with the raw watermain alignment may be necessary (ESR, 2011). In the original investigation of Alcona Creek outlined in the ESR, there were two sites of investigation: one upstream near the Lakeshore WTP discharge, and the other downstream with more direct influence from Lake Simcoe. Electrofishing was conducted to determine the fish community composition. The areas of assessment are illustrated in Figure 2.2.3.1 below.

*Figure 2.2.3 1: Areas of Fish Habitat Assessment*


## 2.2.4 Species of Significance

The only observed plant species that is listed at risk is the Butternut tree, currently listed as Endangered provincially and federally. Butternuts are currently listed as Endangered due to a canker disease that is considered lethal to most trees that are exposed. Four trees were documented on site.

# 2.4 Conclusions

All vegetation and wildlife species documented were screened for those listed as at risk locally, provincially, or federally. None of the wildlife observed are listed at risk. However, one plant species observed is listed at

risk; the Butternut tree is currently listed as Endangered provincially and federally, and four were found within the study area. As SAR and SAR habitat was identified on site, additional consultation with the Ministry of Natural Resources and Forestry (MNRF) in the form of an Information Gathering Form will be required.

# 3. Identification and Assessment of New Recommended Solution

## 3.1 Introduction

As part of conceptual design, the project team revised the preferred alternative outlined within the ESR, and identified a new recommended solution that was not previously considered. This section describes the ESR preferred solution and compares it to the new recommended solution developed during conceptual design, using the same evaluation criteria and approach.

## 3.2 Description of ESR Preferred Solution

Ten alternative solutions were identified in the ESR for addressing the Lakeshore WTP expansion. These include:

- Option 1 - Do Nothing
- Option 2 - Reduce Limits of Service Area
- Option 3 - Reduce Water Demands
- Option 4 - Increase Lakeshore WTP Capacity Rating
- Option 5 - Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station
- Option 6 - Construct New Surface WTP including New Intake and LLPS
- Option 7 - Develop New Groundwater Sources
- Option 8 - Obtain Treated Water from a Neighbouring Municipality (i.e. Barrie, New Tecumseth, and York Region)
- Option 9 - Construct Water Reuse Treatment Plant and Recharge Aquifer, Develop Well Supply System
- Option 10 - Implement Grey Water Systems

Option 5 (expand the Lakeshore WTP and storage including new intake and low lift pumping station) in conjunction with Option 3 (reduce water demands) was ranked as the preferred solution. This two-fold solution was chosen because it was considered to have the least amount of adverse effects on the natural and social/cultural environment. It was also considered to have the greatest potential in terms of technical value.

Eight treatment alternatives were identified in the ESR for the Lakeshore WTP expansion (see ***Notes*** below for brief process descriptions). These include:

- Option 1 – Mimic the Treatment Process at the existing plant, using packaged plants for clarification and filtration, and Granular Activated Carbon contactors for Taste and Odour

Control;

- Option 2 – Mimic the Treatment Process at the existing plant, except that new basins would be constructed in concrete to maximize possible construction savings due to common wall construction, and reduced plant footprint;
- Option 3a – Direct Granular Media Filtration, followed by Ultraviolet Disinfection / Advanced Oxidation Process;
- Option 3b - Direct Granular Media Filtration, followed by Granular Activated Carbon filtration;
- Option 4a – In-Filter Dissolved Air Flotation, followed by Advanced Oxidation Process;
- Option 4b – In Filter Dissolved Air Flotation, followed by Granular Activated Carbon filtration;
- Option 5a* – Separate Dissolved Air Flotation and Granular Media Filtration, followed by Advanced Oxidation Process;
- Option 5b – Separate Dissolved Air Flotation and Granular Media Filtration, followed by Granular Activated Carbon contactors;
- Option 6 – DAF, followed by Ozonation and Biologically Active Carbon;
- Option 7a – Coagulation and Low Pressure Membrane Filtration, followed by Advanced Oxidation Process;
- Option 7b – Coagulation and Low Pressure Membrane Filtration, followed by Granular Activated Carbon filtration;
- Option 7c – Coagulation and powdered activated carbon, with Low Pressure Membrane Filtration, followed by Advanced Oxidation Process;
- Option 8a – Coagulation and Dissolved Air Flotation, with Low Pressure Membrane Filtration, followed by Advanced Oxidation Process;
- Option 8b – Coagulation and Dissolved Air Flotation, with Low Pressure Membrane Filtration, followed by Granular Activated Carbon filtration; and
- Option 8c – Powdered activated carbon and Coagulation, with Dissolved Air Flotation, followed by Low Pressure Membrane Filtration.

* Henceforth referred to as DAF/F – UV/AOP

***Notes:***
*Dissolved air flotation:* Water treatment process that clarifies water by removing suspended matter, such as oil or solids.

*Granular Activated Carbon*: Carbon with microscopic pores that trap contaminants molecules found in water.

*Powdered Activated Carbon:* Carbon with smaller particle sizes than granular activated carbon, allowing for a large surface to volume ratio.

*Biological Activated Carbon:* Both ozonation and granular activated carbon create the biological activated carbon process.

*Low Pressure Membrane Filtration:* Microfiltration and ultrafiltration are low-pressure filtration processes.

*Ultraviolet Disinfection:* Means of inactivating microorganisms.

*Advanced Oxidation Process:* Chemical treatment procedures designed to remove organics (and sometimes inorganics) from water by oxidation through reactions with hydroxyl radicals.

Option 5a was ranked as the ESR preferred treatment solution. This treatment alternative included separate dissolved air flotation and granular media, followed by advanced oxidation process (DAF/F – UV/AOP).

## 3.3 Description of New Recommended Solution

The new recommended solution includes a small expansion to the south of the Lakeshore WTP, utilization of existing storage, and utilization of the existing LLPS. The Lakeshore WTP and LLPS would be internally retrofitted to minimize construction footprint and capital cost. The new recommended treatment solution uses direct membrane filtration, ultra violet disinfection, and granular activated carbon for seasonal taste and odour control (MF/UV - GAC (seasonal)).

## 3.4 Comparison to ESR Preferred Solution

In order to holistically evaluate the ESR preferred solution against the new recommended solution, the following criteria (identified through the ESR and public consultation process) was used.

*Table 3.4.1: Evaluation Criteria*

| Component | Evaluation Criteria |
|---|---|
| **Natural** | • Potential impacts to natural environment including siting and routing considerations. |
| **Social/Cultural Environment** | • Does the alternative conform with county and municipal development objectives?<br>• Short/medium term construction related impacts (e.g. noise, vibration, dust) including traffic, access and potential impacts from operations.<br>• Potential siting/routing considerations including impacts to existing and future land uses and cultural/heritage resources (e.g. archaeological).<br>• Likelihood of social acceptance. |
| **Economic/Financial** | • Relative capital costs.<br>• Relative incremental operations & maintenance costs. |
| **Legal/Jurisdictional** | • Land requirements.<br>• Degree of jurisdictional control over alternative. |
| **Technical** | • Ease of implementation and constructability of alternative.<br>• Allowance for future treatment and servicing needs:<br>  • Expandability;<br>  • Change in regulatory treatment requirements; and<br>  • Servicing feasibility.<br>• Degree to which alternative maximizes use of existing infrastructure.<br>• Complexity of regulatory approvals. |

Furthermore, the following rating symbols were used as part of the ESR's evaluation scheme:

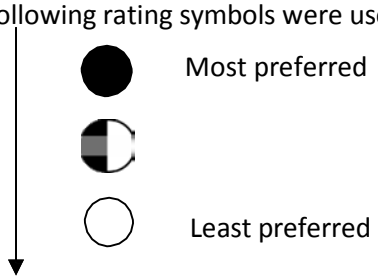



Table 3.4.2 provides a summarized evaluation of the ESR preferred solution against the new recommended solution, using the same approach as identified in the ESR.

*Table 3.4.2: Evaluation of Alternative Solutions*

| Alternative Solutions | Evaluation Criteria | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Natural Environment** | **Social/Cultural** | | | | **Economic/Financial** | | **Legal/Jurisdictional** | | **Technical** | | | |
| | Potential Impacts to the natural environment including siting and routing considerations | Does the alternative conform with county and municipal development objectives? | Short/medium term construction related impacts (e.g. noise, vibration, dust) including traffic, access and potential impacts from operations | Potential siting/routing considerations including impacts to existing and future land uses and cultural / heritage resources (i.e., archaeological) | Likelihood of Social Acceptability | Relative Capital Costs | Relative Incremental Operations & Maintenance Costs | Land Requirements | Degree of Jurisdictional Control over Alternative | Ease of Implementation and Constructability of Alternative | Allowance for future treatment and servicing needs<br>- Expandability<br>- Change in regulatory treatment requirements<br>- Servicing feasibility | Degree to which alternative maximizes use of existing infrastructure | Complexity of Regulatory Approvals |
| **ESR Preferred Alternative**<br>Reduce water demands and expand the Lakeshore WTP and storage including New Intake and low lift pumping station (LLPS), utilize DAF/F – UV/AOP | Moderate impacts to trees/vegetation and water resources (dependent on WTP expansion area and WTP component siting) | Yes | Moderate impact (dependent on WTP expansion area and WTP component siting) | Moderate impact on Innisfil Beach Park (dependent on WTP expansion area and WTP component siting) | Moderate | High | Moderate additional water distribution and pumping cost<br>Low additional WTP operation cost | Low land requirements for LLPS<br>Moderate land requirements (WTP site and expansion area owned by Town) | Within control of Town of Innisfil | Moderate construction difficulty | Addresses future treatment and servicing needs | High | Moderate |
| **New Recommended Alternative**<br>Reduce water demands and expand existing WTP, utilize existing storage and low lift pumping station (LLPS), retrofit with MF/UV - GAC (seasonal) | Minimal impact to trees/vegetation and water resources (dependent on siting) | Yes | Lesser impact than ESR Preferred Alternative due to smaller construction footprint and no LLPS expansion | Minimal impact on Innisfil Beach Park | High (due to reduced construction and reduced footprint) | High (lower than ESR Preferred Alternative) | Lower waste disposal and chemical costs<br>Lower Water Pollution Control Plant (WPCP) costs<br>Higher energy costs | No land requirements for LLPS<br>Low land requirements (WTP site and expansion area owned by Town) | Within control of Town of Innisfil | Moderate–High construction difficulty<br>Sequencing of construction very important | Addresses future treatment and servicing needs | Very High | Moderate |

Table 3.4.3 provides a summarized evaluation of the ESR preferred solution against the new recommended solution.

*Table 3.4.3: Evaluation Summary of ESR Preferred Solution and New Recommended Solution*

| Solutions | Summarized Benefits/Challenges |
|---|---|
| **Alternative 3 & 5:** Reduce water demands and Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station, utilize DAF/F – UV/AOP<br><br>**ESR Preferred Solution** | - Moderate impact to trees/vegetation and water resources (dependent on siting)<br>- Conforms with county and municipal development objectives<br>- Moderate impact on short term construction related impacts<br>- Moderate impact on Innisfil Beach Park<br>- Moderate likelihood of social acceptability (due to reduced construction/footprint)<br>- High capital cost, moderate additional water distribution and pumping cost, low additional WTP operation cost<br>- No land requirements for LLPS<br>- Moderate land requirements (WTP site and expansion area owned by Town)<br>- Moderate construction difficulty<br>- Addresses future treatment and servicing needs<br>- High use of existing infrastructure<br>- Moderate complexity of regulatory approvals |
| **New Recommended Solution** Reduce water demands and expand existing WTP, utilize existing storage and LLPS, retrofit with MF/UV - GAC (seasonal) | - Minimal impact to trees/vegetation and water resources (dependent on siting)<br>- Conforms with county and municipal development objectives<br>- Lesser impact than Alternative 5 due to smaller construction footprint and no LLPS expansion<br>- Minimal impact on Innisfil Beach Park<br>- High likelihood of social acceptability (due to reduced construction/footprint)<br>- High capital cost (lower than Alt.5), lower waste disposal and chemical costs, lower residual waste treatment costs, higher energy costs<br>- No land requirements for LLPS<br>- Low land requirements (WTP site and expansion area owned by Town)<br>- Moderate–High construction difficulty (sequencing of construction very important)<br>- Addresses future treatment and servicing needs<br>- Very high use of existing infrastructure<br>- Moderate complexity of regulatory approvals |

# 3.5 Comparison to ESR Preferred Treatment Solution

The project team compared the new recommended treatment solution to the ESR preferred treatment solution using the evaluation framework components below, collectively aimed at addressing each alternative from a holistic perspective.

*Table 1.5.1: Evaluation Framework Components*

| Component | Description |
|---|---|
| **Robustness of Process** | • A measure of how able the process is to handle changing water quality conditions, and overall to consistently meet treated water quality goals under all anticipated conditions. Processes considered more robust are granted a higher rating. |
| **Minimization of Waste Volumes** | • Considering that the wastes produced by all processes will need processing in some form, it is desirable to minimize total waste volumes, both to minimize impacts to the environment, and to minimize overall costs. Processes which produce a lower volume of waste are granted a higher rating. |
| **Ability to Meet More Stringent Regulations** | • Since standards for drinking water quality have continued to evolve over the years, this factor rates the ability of the process to handle future changes in regulations. Three specific water quality issues in particular are identified: Disinfection, Endocrine Disruptors, and Algal Toxins due to algae blooms that may occur in the future through increased nutrient loading to the Lake. Processes more able to deal with stringent future regulations in these areas are granted a higher rating. |
| **Flexibility for Future Expansion** | • Rates how the various process alternatives might allow space on the existing site for future physical expansion of the water treatment plant. Processes which occupy a smaller overall footprint are granted a higher rating. |
| **Ease of Operation** | • Reflects the operational complexity of the various processes, as well as the compatibility with the existing process. This must be distinguished from the operation and maintenance cost itself, which is factored into decision making process directly, but rather is an indicator of the operational and maintenance vigilance necessary to operate the process without an upset occurring, or having a major breakdown in a process due to high mechanical complexity. It also reflects an understandable comfort level the Town's operators may have with the existing water treatment processes at the Lakeshore WTP, and attempts to capture this by measuring the alternatives against the existing process in terms of similarity. Alternatives which are low in overall complexity, and/or which are similar to the existing process in terms of the individual unit processes involves score well under this criterion. |

The evaluation framework components outlined in Table 3.5.1 were used to compare and contrast alternative treatment solutions in the ESR. Table 3.5.2 provides a summarized evaluation of the ESR preferred treatment solution against the new recommended treatment solution using the same approach.

*Table 3.5.2: Evaluation Summary of Treatment Solutions*

| Criterion | **ESR Preferred Solution** DAF-Filtration with UV/AOP | Evaluation | **New Recommended Solution** High Recovery MF-UV with seasonal GAC | Evaluation |
|---|---|---|---|---|
| **Robustness of Process** | Medium robustness – DAF not well suited to handle turbidity events, but is expected to perform better than contact clarification under conditions expected from this source; DAF is normally designed for comparable or lower loading rates and longer flocculation time than contact clarification. | ◕ | High robustness – process achieves virtually complete removal of suspended particles and pathogens larger than the nominal pore size of the membranes. | ● |
| **Minimization of Waste Volumes** | Medium waste volume – DAF is able to produce a very thick sludge directly from the surface (typically 2-3%). | ◕ | Very low waste volume – MF reduces waste flow to WPCP from 5-10% of total WTP flow to only 0.5-1% of total WTP flow (no coagulant used) | ● |
| **Ability to Address Endocrine Disruptors** | Medium ability to address endocrine disruptors – UV/AOP provides a protection against endocrine disruptors. | ◕ | High ability to address endocrine disruptors – GAC tends to be less selective than UV-AOP in achieving removal of EDCs (it would be expected to be more effective for a wider range of compounds). | ● |
| **Ability to Address More Stringent Disinfection** | High ability to address stringent disinfection goals – UV/AOP is a very robust barrier against Giardia and Cryptosporidium. | ● | High ability to address stringent disinfection goals – both membrane and UV processes are robust barriers against Giardia and Cryptosporidium. | ● |
| **Ability to Deal with Future Algae Blooms** | High ability to deal with algae blooms – DAF is considered the best available technology for algae removal. | ● | Medium ability to deal with algae bloom – membranes are able to physically remove most algae, but can foul under such conditions | ◕ |
| **Operational Complexity** | Medium operational complexity – option well suited for automation to lessen operational burden, however option necessitates tight operational control on chemistry for effective performance. | ◑ | Low operational complexity – highly automated process, no coagulation chemistry to deal with. | ◑ |

| | | | | |
|---|---|---|---|---|
| **Compatibility with Existing Process** | Low compatibility with existing process – the DAF/F process tankage is considerably deeper, due to stacking of the processes, and a new expansion using DAF/F would therefore have a different hydraulic profile than the existing plant. | ◑ | High compatibility with existing process – MF would be fully integrated into space provided by the removal of media filters (MF process would utilize existing GACs, actuators, valves, LLPS and HLPS). | ● |
| **Flexibility for Future Expansion** | Medium flexibility for future expansion – DAF/F is a highly space efficient solution | ◑ | High flexibility for future expansion – MF solution designed specifically to provide enhanced flexibility and ease of implementation for future capacity expansions. | ● |

# 4. Identification and Assessment of New Recommended Residuals Management Solution

## 4.1 Introduction

The existing WTP recovers 90% of the raw water as drinking water. All residual waste generated from the Lakeshore WTP is discharged to the Town's Water Pollution Control Plant (WPCP); treatment of wastewater, in particular when discharging to Lake Simcoe, is highly expensive due to stringent effluent nutrient levels. Residuals discharge into a sewer and flow to a pumping station before being conveyed to the WCPCP for treatment.

## 4.2 Description of Recommended ESR LLPS Design Approach

Four options for residuals management were identified in the ESR. These include:

- Option 1 - Continue to discharge all WTP residuals to WPCP
- Option 2 - Construct crude thickening basins (at the WTP site) to treat all process residuals, and then discharge thickened sludge to WCPC, and send supernatant back to the Lake
- Option 3 - Utilize Lamella thickening process to handle all process wastewater, discharge thickened sludge to WPCP, and recycle supernatant to the head of WTP
- Option 4 - Use centrifuges to dewater the thickened sludge from Lamella thickening process, discharge centrate to WPCP, and recycle supernatant from thickeners to the head of the WTP

The option to provide full residuals handling, including sludge thickening and mechanical dewatering on-site (aggregation of all four options) was ranked as the ESR preferred solution. This option was chosen because it was determined that continued discharge of all wastes to the sanitary sewer was not a cost effective approach.

## 4.3 Description of New Recommended Residuals Management Solution

The new recommended residuals management solution includes the use of high recovery membranes to achieve 99.0-99.5% recovery. This will produce the lowest quantity of chemical solids and the lowest volume of waste discharged to the WPCP, and eliminate the need for solids handling and disposal.

Therefore, the new recommended solution is to continue to discharge all WTP residuals to the Town's sewer system.

## 4.4 Comparison to ESR Preferred Solution

The project team assessed the preferred residuals management solution against the new recommended solution by way of the evaluation framework outlined in Table 3.5.1. Table 4.4.1 provides a summarized

evaluation of the ESR preferred residuals management solution against the new recommended residuals management solution.

Table 4.4.1: Evaluation Summary of Residual Management Solutions

| Criterion | **ESR Preferred Solution** Residuals Management Facility | Evaluation | **New Recommended Solution** High Recovery MF (+ Secondary) | Evaluation |
|---|---|---|---|---|
| **Robustness of Process** | High robustness of process – the residuals management facility would include thickening and dewatering on site for all waste | ● | High robustness of process – primary and secondary MFs provide reliable filtration and high flow recovery from WPCP | ● |
| **Minimization of Waste Volumes** | Medium waste volume – DAF is able to produce a very thick sludge directly from the surface (typically 2-3%). | ◕ | Very low waste volume – MF reduces waste flow to WPCP from 5-10% of total WTP flow to only 0.5-1% of total WTP flow (no coagulant used) | ● |
| **Operational Complexity** | High operational complexity – an independent residuals management facility requires a separate operations train and necessitates maintenance of all associated ancillary equipment and processes | ◑ | Low operational complexity – secondary MFs are highly automated and do not involve coagulation chemistry | ● |
| **Compatibility with Existing Process** | Low compatibility with existing process – the current WTP does not have a residuals management facility and would need to be realigned such that all wastes are redirected to the new handling facility (added complexity) | ◑ | Medium compatibility with existing process – secondary membranes would act as a new flow recovery strategy, but would be part of the overall process facility | ◕ |

# 5. Identification and Assessment of New LLPS Expansion Siting Solution

## 5.1 Introduction

The LLPS (located on Innisfil Beach Road) pumps raw water from Lake Simcoe through a raw watermain that delivers the water to the Lakeshore WTP for treatment. As part of the conceptual design, the project team looked at the ESR preferred solution, and identified a new recommended solution that involves less waterfront construction (smaller footprint). This section describes the new recommended solution and compares it to the ESR preferred solution using the original evaluation criteria outlined within the ESR.

## 5.2 Description of ESR Preferred LLPS Expansion Siting Solution

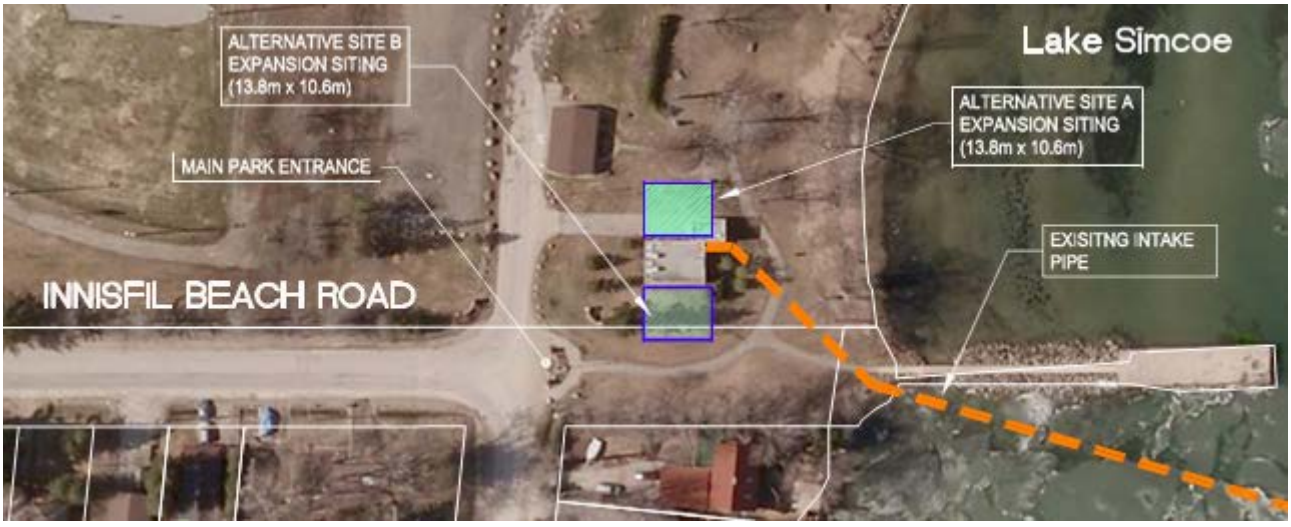
Two alternatives were identified in the ESR for the LLPS expansion siting. These include:

- Alternative 1 - Expand existing LLPS on north side

- Alternative 2 - Expand existing LLPS on south side

Alternative 1 (expand existing LLPS on north side) was ranked as the ESR preferred solution. This option was chosen because it provided opportunity for improving the existing LLPS building architectural design, complied with Innisfil Beach Road Urban Design Guidelines, and avoided raw watermain crossing (crossing of the old raw watermain with the new one). The ESR preferred solution is illustrated in Figure 5.2.1 (Alternative Site A Expansion Siting).

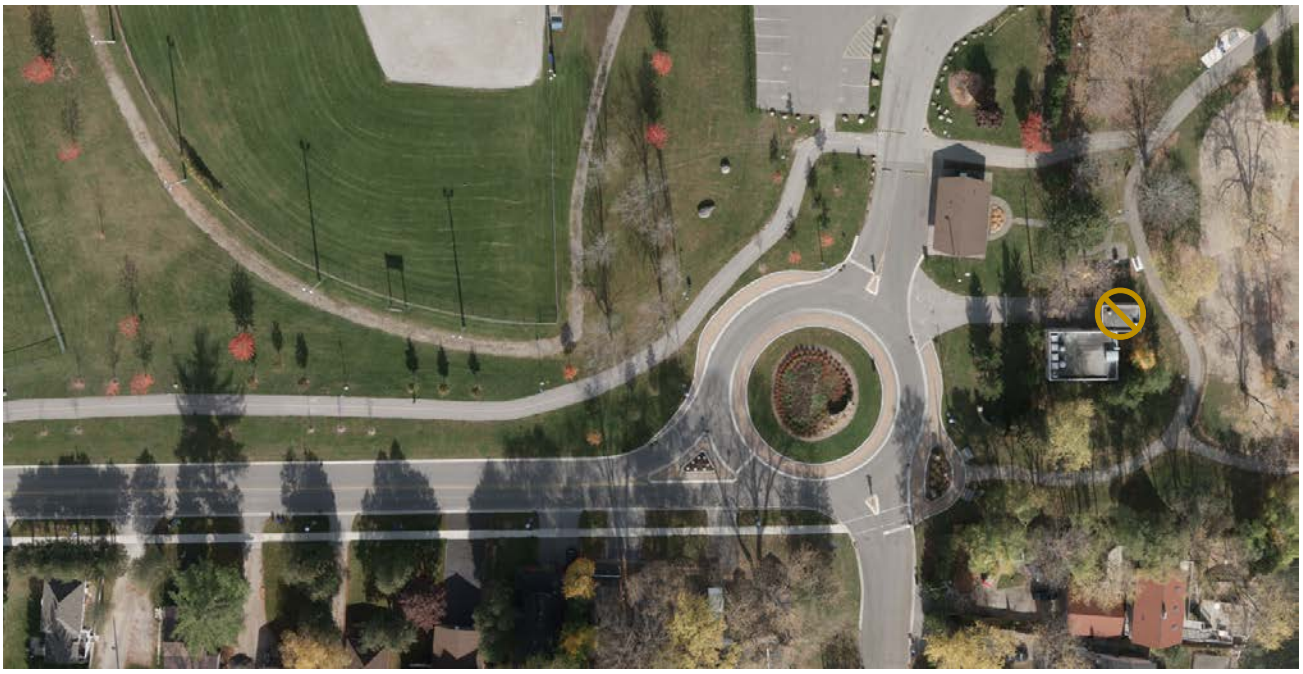
*Figure 5.2.1: ESR Preferred LLPS Expansion Siting Approach*



## 5.3 Description of New Recommended LLPS Expansion Siting Solution

The new recommended solution includes an internal retrofit of the existing LLPS (no added construction footprint at the waterfront), and the removal of the existing PAC building (currently attached to the LLPS at the north east corner). Figure 5.3.1 outlines the new recommended solution.

*Figure 5.3.1: New Recommended LLPS Expansion Siting Solution*



## 5.4 Comparison to ESR Preferred Solution

The project team assessed the ESR preferred LLPS expansion siting solution against the new recommended LLPS expansion siting solution by way of the original evaluation criteria outlined in the ESR.

Table 5.4.1 summarizes this assessment.

*Table 5.4.1: Evaluation of Low Lift Pumping Station Siting Solutions*

| Alternative Low Lift Pumping Station Siting Options | Evaluation Criteria | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Natural Environment | | | Natural Environment Evaluation Summary | Social/Cultural | | Social/ Cultural Evaluation Summary | Economic/ Financial | Economic/ Financial Evaluation Summary | Technical | | Technical Evaluation Summary |
| | **Potential Effects on Groundwater**<br>Temporary change in groundwater quality and quantity during construction. | **Potential Effects on Surface Water Quality and the Aquatic Environment**<br>Direct or indirect loss of aquatic habitat and functions, aquatic species.<br>Impact on species at risk, including rare, threatened, endangered and species of local concern. | **Potential effects on the Terrestrial Environment**<br>Direct or indirect loss of terrestrial habitat and functions, terrestrial species.<br>Impact on species at risk, including rare, threatened, endangered and species of local concern. | | **Short Term Impacts: Potential for Disturbing Existing Residences, Businesses, and/or Community, Institutional and Recreational Facilities**<br>Temporary disturbance to traveling public, existing residences, businesses, archaeological/built heritage resources and/or community, institutional and recreational facilities. | **Long Term Impacts: Potential Impacts from Operations**<br>Visual impact, truck traffic. | | **Estimated Capital Costs, Operations and Maintenance Costs**<br>Construction costs.<br>Total operations and maintenance costs. | | **Ability to Implement Alternative**<br>Ease of Construction.<br>Allowance for future servicing needs.<br>Impacts to existing LLPS operations during construction.<br>Ease of future operations. | **Compatibility with Existing Facilities and Infrastructure**<br>Degree to which alternative maximizes use of existing infrastructure.<br>Modifications to existing infrastructure and impact on existing utilities. | |
| **Alternative A:**<br>Expand existing LLPS north side<br><br>**ESR Preferred Solution** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program. | • LLPS expansion within Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required.<br>• Potential impact to fish habitat related to construction (e.g., sedimentation and erosion, dewatering).<br>• No species at risk were found. | • Removal of 3-9 mature trees.<br>• No species at risk were found. | ◑ | • Moderate disturbances to park operations (i.e., relocate park gate house) and users during construction.<br>• Requires relocation of monuments.<br>• Complete a Stage 1 Archaeological Assessment. | • Provides opportunity to improve upon existing LLPS building appearance and architectural detail.<br>• Complies with Innisfil Beach Road Urban Design Guidelines (i.e., LLPS does not impact view of lake from Innisfil Beach Road).<br>• No truck traffic. | ◕ | • Potential higher cost related to park gate house relocation during constriction and relocation of monument.<br>• Similar LLPS construction cost. | ◑ | • Moderate impact on the existing LLPS operation and access.<br>• Avoids raw watermain crossing.<br>• Difficult to construct intake around pedestrian causeway. | • Will demolish the unused Powdered Activated Carbon (PAC) facility. | ◑ |
| **New Proposed Alternative:**<br>Retrofit existing LLPS internally and demolish unused Powdered Activated Carbon (PAC) facility superstructure | • No impact from pumping station<br>• Future intake expansion will require dewatering and monitoring program | • LLPS expansion within existing footprint | • No removal of trees or vegetation for LLPS expansion (internal retrofit)<br>• No species at risk were found | ● | • Construction will be scheduled outside of beach and park season to minimize impact to park operations and users | • No change to existing visual impact | ● | • Reduced construction costs | ● | • Construction more challenging due to work having to be carried out within the existing station while maintaining existing station operations<br>• Requires new raw watermain to cross existing raw watermain | • Will demolish the unused PAC facility superstructure<br>• Substructure to be used to facilitate construction of future intake connection | ● |

# 6. Identification and Assessment of New Recommended Raw Watermain Connection Approach

## 6.1 Introduction

In order meet the treatment potential of the Lakeshore WTP expansion, a larger raw watermain is needed to route and deliver increased amounts of raw water from the LLPS to the Lakeshore WTP. As part of the conceptual design, the project team assessed the ESR preferred raw watermain connection solution, and identified environmental implications previously not addressed. This section describes the new recommended raw watermain connection solution and compares it to the ESR preferred solution, using the same evaluation criteria as outlined in the ESR.

## 6.2 Description of ESR Preferred Raw Watermain Connection Solution

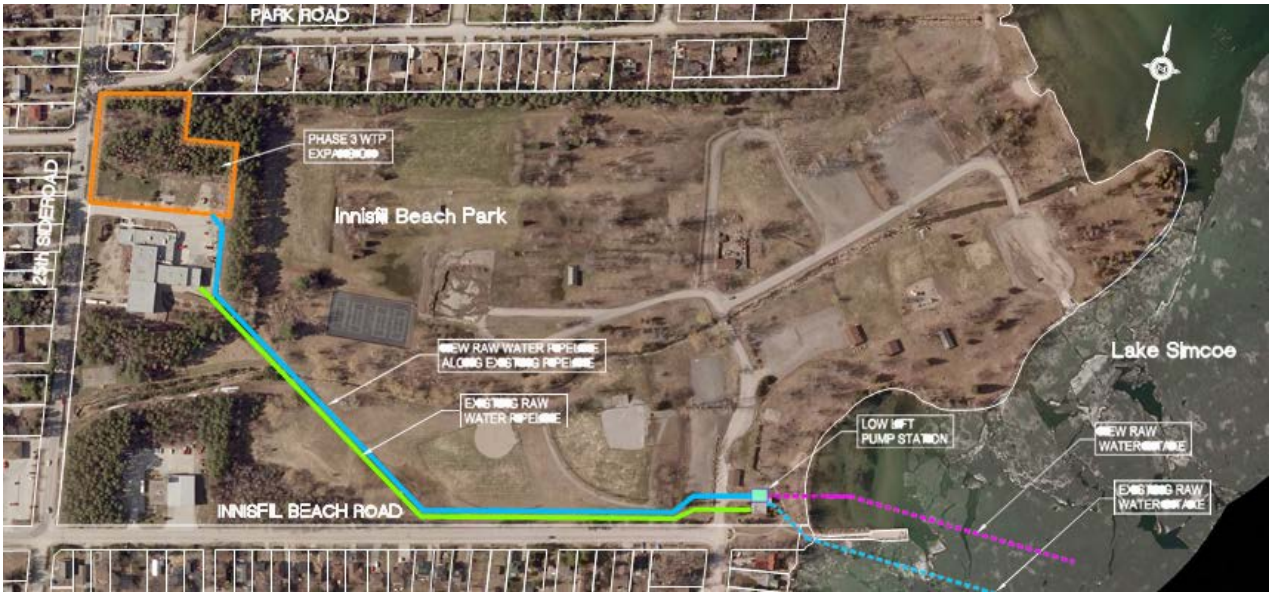
Two alternatives were identified in the ESR for the raw watermain connection. These include:

- Route 1 - Twin existing raw watermain between WTP and LLPS (follow existing raw watermain alignment through Innisfil Beach Park)

- Route 2 - New raw watermain to extend from LLPS and follow Innisfil Beach Road to 25th Sideroad connecting to new WTP expansion

Alternative 1 (twin existing raw watermain between WTP and LLPS) was ranked as the ESR preferred solution. This solution was chosen as it had lower construction costs and fewer impacts to residences and traveling public. The ESR preferred solution is illustrated in Figure 6.2.1.

*Figure 6.2.1: ESR Preferred Raw Watermain Connection Solution*

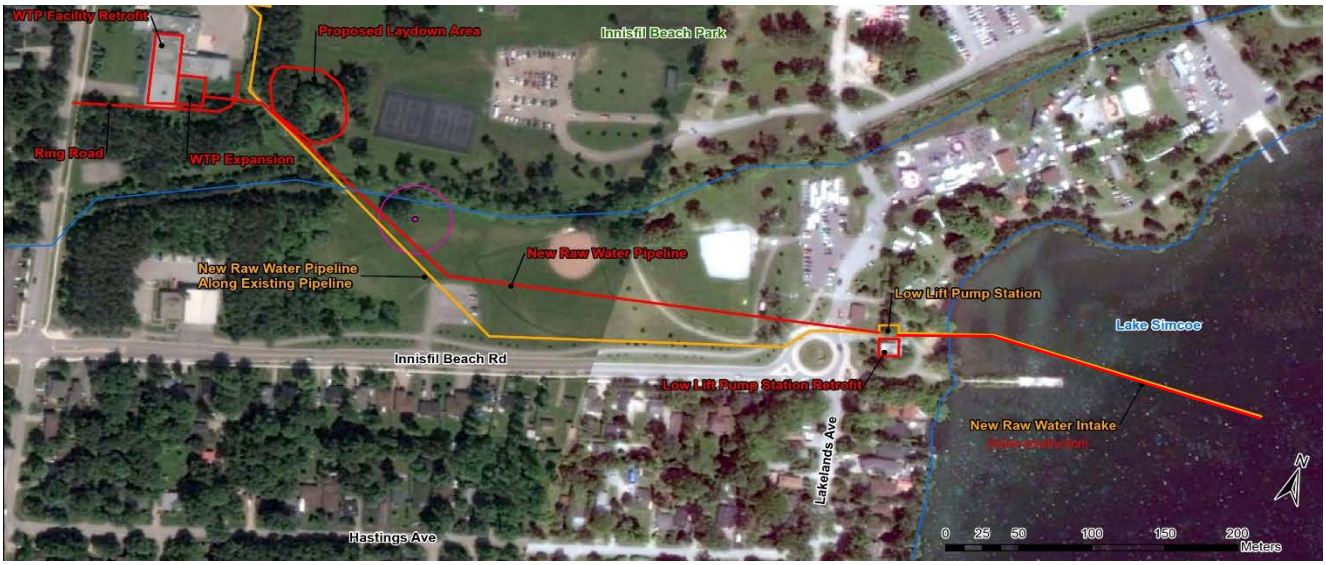


## 6.3 Description of New Recommended Raw Watermain Connection Solution

The new recommended solution is similar to the ESR preferred solution; it involves low construction costs and has few impacts on pedestrians and the residing community. Construction would take place after sports season (when park usage was slower), and construction area separation would be imposed to ensure both public safety and minimized pedestrian disturbance (pedestrian paths disturbed during construction would be rehabilitated and improved once construction is completed). Although the new recommended raw watermain connection solution runs through the Innisfil park baseball diamonds, it avoids running along Innisfil Beach Road; this avoids significant disruption to the road, sidewalk, and neighbouring trees, as well as a mitigates roadside restoration costs.

The new recommended raw watermain connection solution also addresses the environmental implications of disturbing a SAR tree; a butternut tree was identified during a recent natural inventory survey and was found to be in the path of both the ESR preferred raw watermain connection solution and the new recommended raw watermain connection solution. As such, the project team will engage in all necessary mitigation measures mandated by the MNRF to proceed with the new recommended raw watermain connection solution. The physical locations of both the ESR preferred raw watermain connection alignment (a twin of the existing raw watermain alignment) and the new recommended raw watermain connection alignment, as well as the 25m setback radius from the discovered butternut tree, are outlined in Figure 6.3.1.

*Figure 6.3.1: Raw Watermain Alignment and Butternut Tree Setback*




**LEGEND**

- Watercourse (LIO, Mar 2014)
- Butternut + 25m Buffer
- Alignment Option from ESR (2011) *
- Alignment Option from EA Addendum (Oct, 2014) *

## 6.4 Comparison to ESR Preferred Solution

The project team assessed the ESR preferred raw watermain connection solution against the new recommended LLPS raw watermain connection solution by way of the original evaluation criteria outlined in the ESR.

Table 6.4.1 summarizes this assessment.

*Table 6.4.1: Evaluation of Raw Watermain Connection Solutions*

| Alternative Raw Watermain Connection Options | Evaluation Criteria | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Natural Environment | | | Natural Environment Evaluation Summary | Social/Cultural | | Social/ Cultural Evaluation Summary | Economic/ Financial | Economic/ Financial Evaluation Summary | Technical | | Technical Evaluation Summary | Evaluation Summary |
| | **Potential Effects on Groundwater**<br>Temporary change in groundwater quality and quantity during construction | **Potential Effects on Surface Water Quality and the Aquatic Environment**<br>Direct or indirect loss of aquatic habitat and functions, aquatic species.<br>Impact on species at risk, including rare, threatened, endangered and species of local concern. | **Potential effects on the Terrestrial Environment**<br>Direct or indirect loss of terrestrial habitat and functions, terrestrial species.<br>Impact on species at risk, including rare, threatened, endangered and species of local concern. | | **Short Term Impacts: Potential for Disturbing Existing Residences, Businesses, and/or Community, Institutional and Recreational Facilities**<br>Temporary disturbance to traveling public, existing residences, businesses, archaeological/built heritage resources and/or community, institutional and recreational facilities. | **Long Term Impacts: Potential Impacts from Operations**<br>Visual impact, truck traffic. | | **Estimated Capital Costs, Operations and Maintenance Costs**<br>Construction costs.<br>Total operations and maintenance costs. | | **Ability to Implement Alternative**<br>Ease of Construction.<br>Allowance for future treatment expandability and servicing needs.<br>Impacts to existing plant operations during construction.<br>Ease of future operations. | **Compatibility with Existing Facilities and Infrastructure**<br>Degree to which alternative maximizes use of existing infrastructure.<br>Modifications to existing infrastructure and impact on existing utilities. | | Most preferred<br>●<br>◕<br>◑<br>◔<br>○<br>Least preferred |
| **Route 1:**<br>Twin existing raw watermain between WTP and LLPS (follow existing raw watermain alignment through Innisfil Beach Park).<br><br>**ESR Preferred Solution** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program. | • 1 directional drill watercourse crossing (in Innisfil Beach Park).<br>• Raw watermain crosses Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required.<br>• No species at risk were found. | • Requires some tree/vegetation removal.<br>• No species at risk were found.<br>* | ◑ | • Temporary disruption to park open space during construction.<br>• Avoids impact to Innisfil Fire Hall.<br>• No disruption to traveling public - avoids Innisfil Beach Road and 25th Sideroad (construction through Innisfil Beach Park).<br>• Complete Stage 1 Archaeological Assessment. | • No impacts from operations. | ◕ | • Lower cost due to shortest length<br>• Lower restoration cost.<br>• Lower energy requirements. | ◕ | • Somewhat difficult construction in order to avoid potential disturbance to existing raw water transmission.<br>• Easy restoration. | • No compatibility issues.<br>• Requires slight modifications to LLPS. | ◕ | ●<br>• No impacts to residences and traveling public.<br>• Construction can be timed for winter when park usage is lower.<br>• Low construction cost.<br>• Easy restoration. |
| **New Proposed Alternative:**<br>Twin existing raw watermain between WTP and LLPS (follow existing raw watermain alignment through Innisfil Beach Park). | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program. | • 1 directional drill watercourse crossing (in Innisfil Beach Park).<br>• Raw watermain crosses Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required.<br>• No species at risk were found. | • Recent natural inventory has identified a butternut tree (50-60 mm dia.) adjacent to the raw watermain<br>• Species mitigation will be provided | ◕ | • Temporary disruption to park open space during construction.<br>• Avoids impact to Innisfil Fire Hall.<br>• No disruption to traveling public - avoids Innisfil Beach Road and 25th Sideroad (construction through Innisfil Beach Park).<br>• Complete Stage 1 Archaeological Assessment. | • No impacts from operations. | ◕ | • Lower cost due to shortest length<br>• Lower restoration cost.<br>• Lower energy requirements. | ◕ | • Somewhat difficult construction in order to avoid potential disturbance to existing raw water transmission.<br>• Easy restoration. | • No compatibility issues.<br>• Requires slight modifications to LLPS. | ◕ | ●<br>• No impacts to residences and traveling public.<br>• Construction can be timed for winter when park usage is lower.<br>• Low construction cost.<br>• Easy restoration. |

* Butternut trees were found (species at risk)

# 7. Identification and Assessment of New Recommended WTP Expansion Siting Solution

## 7.1 Introduction

In order to provide the physical space needed for process equipment that can treat the build-out capacity from both current and future Lakeshore WTP expansions, an extension to the existing treatment facility is required. As part of the conceptual design, the project team assessed the ESR preferred WTP expansion siting solution, and identified negative environmental implications of the approach. The project team has identified a new recommended WTP expansion siting solution, which is compared to the ESR preferred WTP expansion siting solution throughout this section, using the same evaluation criteria as presented in the ESR.

## 7.2 Description of ESR Preferred WTP Expansion Siting Solution

Two alternatives were identified in the ESR for the WTP expansion siting. These include:

- Alternative 1 - WTP expansion to the north of the existing WTP driveway (outside fenced area)

- Alternative 2 - WTP expansion to the east of the existing WTP driveway (outside fenced area)

Alternative 1 (expansion north of existing WTP) was ranked as the preferred solution. This alternative was chosen because it had fewer impacts on natural features (Alcona Creek regulated floodplain) and recreation (soccer fields), and was deemed to have moderate capital cost and easier treatment facility arrangement. The ESR preferred WTP expansion siting solution is illustrated in Figure 7.2.1 (outlined in orange).

*Figure 7.2.1: ESR Preferred WTP Expansion Siting Solution*

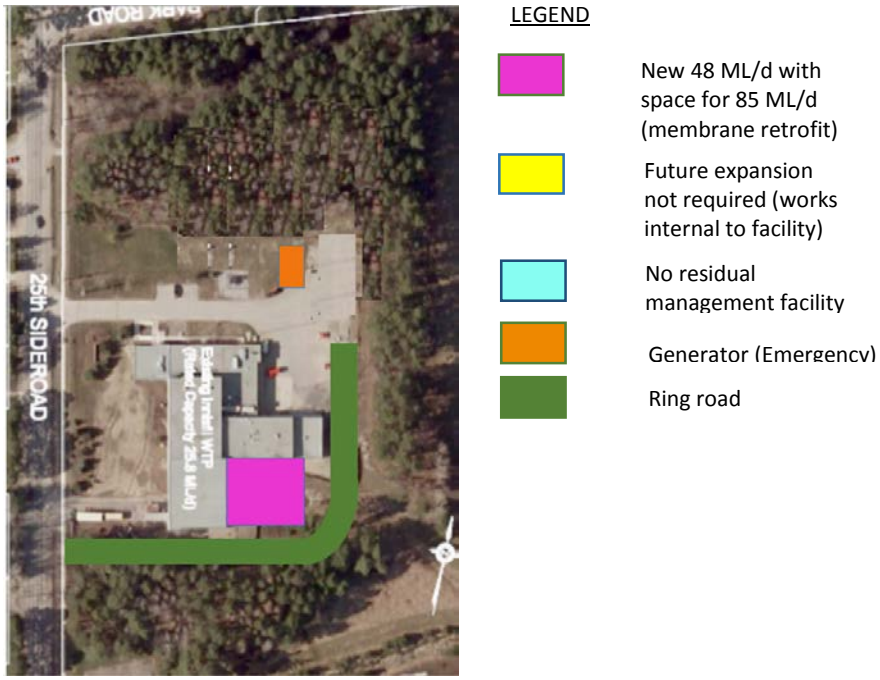
After a recent natural inventory assessment, multiple butternut trees (previously outlined as a SAR) were identified in the direct location of the ESR preferred WTP expansion siting boundary. The physical location as well as the 25m setback radius are identified in Figure 7.2.2 below.

*Figure 1.2.2: Butternut tree location and 25m radius setback*

## 7.3 Description of New Recommended WTP Expansion Siting Solution

The new preferred WTP expansion siting solution includes a small expansion to the south-east of the existing facility, as well as a ring road addition for improved flow of traffic and firefighting. The new recommended WTP expansion siting solution requires a significantly smaller construction footprint, a single construction phase at the plant, and avoids disturbance to the butternut trees, as illustrated in Figure 7.3.1.

*Figure 7.3.1: New Preferred WTP Expansion Approach*



# 7.4 Comparison to ESR Preferred Solution

Figure 7.4.1 below outline the ESR preferred WTP expansion siting solution as well as the new recommended WTP expansion siting solution.

*Figure 7.4.1: WTP Expansion Comparison*


Figure 7.4.2 below outlines a plan view of the ESR preferred WTP expansion siting solution (in yellow) in comparison with the new recommended WTP expansion siting solution alignment (in red).

*Figure 7.4.2: WTP Expansion Siting Solution Comparison*


The project team assessed the ESR WTP expansion siting solution against the new recommended WTP expansion siting solution by way of the original evaluation criteria outlined in the ESR. Table 7.4.1 summarizes this assessment.

*Table 7.4.1: Evaluation of Water Treatment Plant Expansion Siting Solutions*

| Alternative Water Treatment Plant Expansion Options | Evaluation Criteria | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Natural Environment | | | Natural Environment Evaluation Summary | Social/Cultural | | Social/ Cultural Evaluation Summary | Economic/ Financial | Economic/ Financial Evaluation Summary | Technical | | Technical Evaluation Summary | Evaluation Summary |
| | **Potential Effects on Groundwater**<br>Temporary change in groundwater quality and quantity during construction. | **Potential Effects on Surface Water Quality and the Aquatic Environment**<br>Direct or indirect loss of aquatic habitat and functions, aquatic species.<br>Impact on species at risk, including rare, threatened, endangered and species of local concern. | **Potential effects on the Terrestrial Environment**<br>Direct or indirect loss of terrestrial habitat and functions, terrestrial species.<br>Impact on species at risk, including rare, threatened, endangered and species of local concern. | | **Short Term Impacts: Potential for Disturbing Existing Residences, Businesses, and/or Community, Institutional and Recreational Facilities**<br>Temporary disturbance to traveling public, existing residences, businesses, archaeological/built heritage resources and/or community, institutional and recreational facilities. | **Long Term Impacts: Potential for Impacts from Operations**<br>Loss of parkland, Visual impact, truck traffic. | | **Estimated Capital Costs, Operations and Maintenance Costs**<br>Construction costs.<br>Total operations and maintenance costs. | | **Ability to Implement Alternative**<br>Ease of Construction.<br>Allowance for future treatment expandability and servicing needs.<br>Impacts to existing plant operations during construction.<br>Ease of future operations. | **Compatibility with Existing Facilities and Infrastructure**<br>Degree to which alternative maximizes use of existing infrastructure.<br>Modifications to existing infrastructure and impact on existing utilities | | Most preferred<br>Least preferred |
| **Alternative 1:**<br>WTP expansion to the north of existing WTP driveway (outside fenced area)<br>**ESR Preferred Solution** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program as per PTTW. | • Requires relocation of unnamed water feature that discharges to Park Road drainage system.<br>• Avoids expansion into regulated floodplain.<br>• Complies with Lake Simcoe Protection Plan.<br>• No species at risk were found. | • Encroachment into treed area north of existing WTP.<br>• Tree removal required - Scotch Pine plantation.<br>• No species at risk were found.<br>* | ◕ | • Will require relocation of existing pathway (25th Sideroad and Park Road and Innisfil Beach Park access point).<br>• Temporary disturbance (e.g., noise, dust and vibration) to adjacent residences.<br>• Moderate traffic impacts (i.e., increase in truck traffic during construction).<br>• Complete Stage 1 Archaeological Assessment. | • Loss of park forest.<br>• Visual impact from new WTP facilities on adjacent residences (loss of existing vegetation and screening).<br>• Moderate increase in weekly truck traffic.<br>• Good buffer for residuals management facility. | ◑ | • Moderate cost for unnamed water feature relocation and tree replacement.<br>• Moderate operations and maintenance costs. | ◕ | • No impacts. | • Potential impact on the existing transformer during construction. | ◕ | ●<br>• Loss of park forest.<br>• Avoids expansion into regulated floodplain.<br>• Moderate visual impact to adjacent residences.<br>• Moderate costs for relocation of unnamed water feature and tree replacement. |
| **New Proposed Alternative:**<br>WTP expansion to the south-east of existing WTP | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program as per PTTW. | • Close proximity to Watercourse No. 4 to the south that discharges through Innisfil Beach Park to Lake Simcoe.<br>• Part of WTP expansion falls within Watercourse No. 4 regulated floodplain (although extended construction footprint 90% smaller than Alternative 1) | • Encroachment into treed area north of existing WTP.<br>• Minimal tree loss<br>• No species at risk were found. | ● | • No disruption to park open space.<br>• Temporary use of park refuse area for contractor laydown will be upgraded to park space upon construction completion.<br>• Proposed ring road will simply construction traffic congestion.<br>• Complete Stage 1 Archaeological Assessment. | • No loss of park forest.<br>• Increased park land<br>• Lowest visual impact.<br>• No increase in weekly truck traffic. | ◔ | • Lowest construction cost. | ● | • Construction more complicated due to need for maintaining water production while retrofitting existing facility | • Maximum reuse of existing building infrastructure | ● | ●<br>• Increased net usable park land<br>• Minimum visual impact<br>• Part of WTP expansion falls within Watercourse No. 4 regulated floodplain<br>• Potential impact related to construction (although reduced footprint will reduce impact) |

* Butternut trees were found (species at risk)

# 8. Environmental Impacts and Mitigation

## 8.1 During Construction

The new recommended solution requires a much smaller construction footprint than the ESR preferred solution, and thus has fewer environmental impacts. Nonetheless, environmental mitigation/monitoring measures will be implemented to ensure that environmental impacts are mitigated. The following table outlines potential environmental impacts and associated mitigation measures that will be undertaken as part of the expansion project.

| Impacts | Mitigation |
|---|---|
| Short Term Construction | |
| Impacts to water resources (surface water) and fisheries<br>• Interconnecting Raw Watermain<br>• WTP Expansion | • Use of trenchless technology for installation of raw watermain across watercourses.<br>• Appropriate setbacks should be applied to watercourses and wooded areas in order to maintain the character and quality of the natural areas providing habitat.<br>• Setbacks from natural features should be clearly demarcated with the installation of silt fencing along the disturbance limit. No construction activities are to occur outside of these fences (including overhead), nor the piling of construction materials.<br>• Control noise with location of construction and plywood hoarding enclosure at plant construction site.<br>• Minimize footprint of the construction zone within proximity to the Alcona Creek riparian zone.<br>• Consult with LSRCA and Permits (Development, Interference with Wetlands and Alteration to Shorelines and Watercourses).<br>• Develop and implement an Erosion and Sediment Control Plan to include monitoring in order to mitigate impacts of construction to watercourses.<br>• Prior to the commencement of construction, all appropriate erosion and sediment control measures (such as silt fencing) should be installed and maintained (with regular inspection) during construction and until the site has been stabilized<br>• Construct raw watermain in off-season to preserve baseball and soccer field activity during high pedestrian traffic months.<br>• Construct ring road to control truck traffic and associated disturbances.<br>• Restrict work hours, control dust, and meet Town By-Laws.<br>• Complete hydrogeological investigations to determine dewatering and groundwater control. |

| Impacts | Mitigation |
|---|---|
| | • For interconnecting raw watermain, establish appropriate clearance between bottom of Creek and top of pipe to prevent scouring.<br>• Adhere to construction timing windows to avoid impacts to fish where works are proposed within, or in proximity to, fish habitat. Coldwater timing window typically extends from June 15 to September 15; confirmation is required from MNRF.<br>• A Department of Fisheries and Oceans (DFO) screening is recommended for proposed construction within the regulated flood lines as the Conservation Authorities no longer have an agreement to screen projects on behalf of the DFO<br>• If required, provide straw-bale check dams at points of overland flow that cross or drain the raw watermain alignment area.<br>• Ensure proper onsite monitoring of erosion and sediment control, especially during in-water works.<br>• Any areas disturbed by construction will be restored to natural or better conditions and stabilized as soon as practically possible.<br>• Redirect creekside paths during raw watermain construction.<br>• Revamp proposed laydown area (currently park vegetation dump) park space.<br>• Refuelling of equipment and fuel storage will be conducted at a safe distance from the watercourses at a designated location, along with the implementation of spill protection. |
| Tree Protection and Removal | • Any vegetation removal (including dead standing trees) may be influenced by conditions set by the Migratory Birds Convention Act (MBCA) including, but not limited to, timing restrictions during breeding season for tree pruning or removal during construction activities. The breeding bird season typically extends from March 25 to August 31. Construction activities planned during the breeding season should only be completed after a qualified avian biologist has completed a bird nesting survey to ensure no impacts to breeding birds to maintain compliance with the MBCA.<br>• Use existing paved and gravel paths to access construction areas to reduce impacts to natural vegetation where feasible.<br>• Certified arborist to complete tree inventory/ construction impact assessment and prepare tree protection plan, as required. |

| Impacts | Mitigation |
|---|---|
| | • SAR tree species found will require a Butternut Health Assessment (BHA) if construction activities cannot avoid 25m protection zone around the tree. Further consultation with MNRF is required once the BHA is complete.<br>• Minimize the extent of vegetation removal possible through using existing open and manicured lawn areas. |
| Contamination of Soils Through Spills and Leaks | • Refuelling and maintenance of equipment and fuel storage will be conducted at a safe distance from the watercourses at a designated location, along with the implementation of spill protection.<br>• Spill contingency plan will be prepared and implemented prior to the beginning of construction. |
| Long Term Operations | |
| WTP Expansion | • Operational footprint of expansion will be limited to a small area at the back of the existing plant and the adjacent ring road. These facilities will continue to be screened from view by the surrounding wooded areas.<br>• Ring road will improve the flow of traffic and fire protection. |

# 9. Public and Agency Consultation

## 9.1 Agency Consultation

Consultation with government review agencies and the public is a necessary and important component of the Class EA process. The Town ensured that the public and review agencies were informed of the addendum and given the opportunity to contribute to the process. Specifically, the DFO, MNRF and LSRCA have been made aware of all aspects of this project that could potentially affect areas within their domains, and the Town will adhere to all necessary mitigation measures required by each to satisfy environmental compliance and stewardship (please refer to Appendix A – Natural Sciences Report (LGL, ltd.)).

This rest of this section outlines the public consultation process of the addendum.

## 9.2 Notice of Public Information Centre

A notice for a public information centre was mailed to all those on the original Class EA project mailing list. In addition, the Notice ran in September editions of the Bradford West Gwillimbury Times and the Innisfil Examiner. The meeting was also promoted on the City's website at http://innisfil.ca/. The Notice is included in Appendix C – Notice of Public Information Centre.

## 9.3 Public Information Centre

A Public Information Centre took place on Wednesday, October 8th, from 6 pm to 8 pm at Innisfil Town Hall (Main Floor Community Rooms), located at 2101 Innisfil Beach Road. Eight people attended the Public Information Centre and one comment sheet was received.

## 9.5 Website

The website http://innisfil.ca/projects-and-construction/municipal-water-infrastructure-projects/lakeshore-water-treatment-plant is a great resource for information on the Lakeshore Water Plant Expansion Project Class Environmental Assessment. The website contains project background information, copies of the information handed out to the public at the Open House and public notices. The website is updated as new public information becomes available. The website also contains contact information of City staff for any questions or concerns regarding the project.

## 9.6 Comments and Responses

| Comments | Responses |
|---|---|
| Great approach and has or be made cost effective | Comment was made – response not needed. |
| Assume[d] lower overall maintenance costs | Comment was made – response not needed. |
| [I] Understand no new staff required for operation | Comment was made – response not needed. |

| | |
|---|---|
| Future expansion will be considered as simple tee's and tap's | Comment was made – response not needed. |

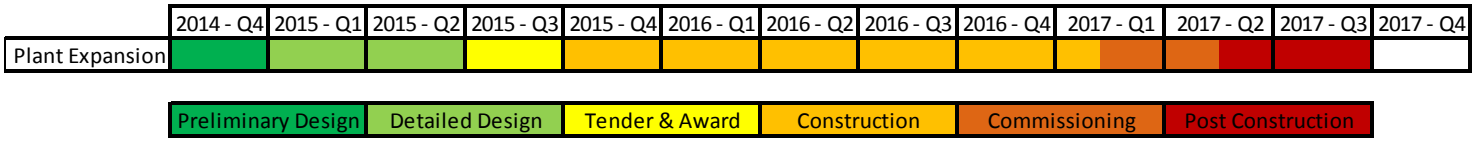
No objections were made with respect to the new recommended solution. Following a 30-day review period of the EA addendum filing without receipt of Part II Orders, the Town will proceed with the new recommended solution.

# 10. Cost and Schedule

The current schedule for the construction of the plant expansion is as follows:

- Detail Design: Conclusion of detailed design June 2015
- Tender: Beginning July 2015, complete September 2015
- Construction: Beginning October 2015, complete January 2017

*Note: tree clearing will take place before March 2015*




The current cost for the construction of the plant expansion is as follows:

| | **Phase 3A - 38 ML/d** | **Phase 3B - 85 ML/d** |
|---|---|---|
| Lowlift Pump Station and Future Intake | $2,950,000 | $3,880,000 |
| Water Treatment Plant and Highlift Pump station | $ 30,900,000 | $ 15,600,000 |
| Total Construction Cost | $ 33,900,000 | $ 19,400,000 |
| Engineering and Administration | $ 4,970,000 | $ 3,030,000 |
| Total Capital Cost | $ 38,900,000 | $ 22,500,000 |

The capital costs shown above (including Engineering and Administration) were developed with the following parameters: 10% Contractor profit; 3% mobilization; 5% general conditions; 3% insurance/bonds; 25% contingency; 13% HST.

This opinion of probable costs is a Class D estimate, consistent with the level of accuracy of information available at the conceptual design phase: -20%/+30%.

# Appendix A

## Natural Sciences Report (LGL Ltd.)

# LAKESHORE WATER TREATMENT PLANT

## SCHEDULE C
## ENVIRONMENTAL ASSESSMENT ADDENDUM
## NATURAL SCIENCES REPORT

***prepared for***

**CH2M HILL**

***on behalf of***

**TOWN OF INNISFIL**

***by***


**NOVEMBER 2014**

**LGL PROJECT TA8459**

# LAKESHORE WATER TREATMENT PLANT

## ENVIRONMENTAL ASSESSMENT ADDENDUM
## NATURAL SCIENCES REPORT

***prepared by:***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**Lynette Renzetti, B.Ed., Hons.B.Sc.**
**PLANNING ECOLOGIST**

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**Victoria Kennedy, Hons. B.Sc.**
**FIELD BIOLOGIST, BOTANIST**

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**Reviewed by Allison Featherstone, Hons.B.Sc.**
**SENIOR PLANNING ECOLOGIST,**
**MANAGER – CAMBRIDGE OFFICE**

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**NOVEMBER 2014**
**LGL PROJECT TA8459**

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# LIST OF APPENDICES

## 1.0 INTRODUCTION

LGL Limited has been retained by CH2M HILL Canada Ltd. to conduct a natural heritage study in support of the Addendum to the Lakeshore Water Treatment Plant Schedule C Class Environmental Assessment (EA). The Town of Innisfil has previously completed a Class EA with respect to the plant expansion to provide service to accommodate the growing community of Innisfil, through a proposed increase in rated capacity from 26ML/d to 100 ML/d (AECOM 2011). A new technical design has been identified to reduce the overall footprint of infrastructure associated with the plant expansion compared to what was identified as the preferred solution in the 2011 Environmental Study Report (ESR). This new recommended solution includes:

- Revisions to the treatment processes at the Water Treatment Plant that provides additional efficiencies and reduces the size of the construction footprint on-site.
- Minor adjustments to the watermain alignment, and
- Revisions to the Low Lift Pumping Station (LLPS), such that expansion occurs within the existing building structure.

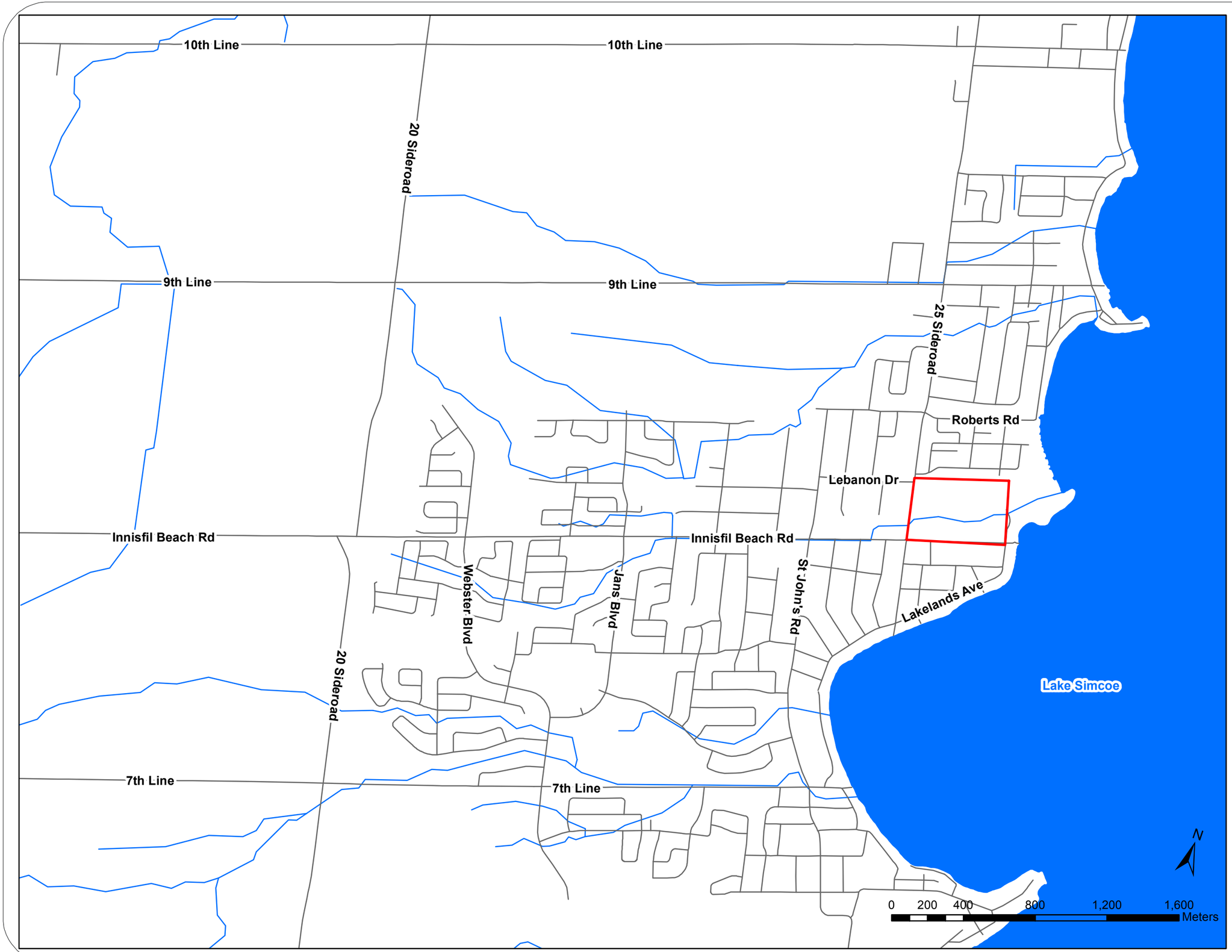
This natural sciences report provides a screening level review of existing natural environment conditions within the study area as defined in **Figure 1** to identify constraints and potential impacts associated with each of the above components of the new solution. As well, mitigation measures have been identified to avoid, where possible, or minimize potential impacts to the natural environment.

## 2.0 BACKGROUND REVIEW

The Lakeshore Water Treatment Plant (WTP) is located on 25$^{th}$ Sideroad in Innisfil, just north of Innisfil Beach Road. The site is bounded by 25$^{th}$ Sideroad to the west and Innisfil Beach Park to the north, south and east. Lake Simcoe is located approximately 500m to the east **(Figure 1)**. Secondary source information as it relates to the WTP and adjacent park and beachfront properties was reviewed by AECOM (2011) and is reported as part of existing conditions described in the ESR. After a review of the information contained in the ESR, LGL Limited identified the following two aspects of background review as in need of updating:

- Species at Risk information; and,
- Project considerations in relation to the amended Fisheries Act, as of June 29, 2012.

The following subsections detail the additional information.




## LEGEND

- Study Area
- Waterbody (LIO, Mar 2014)
- Watercourse (LIO, Mar 2014)

# Innisfil Water Treatment Plant

*Key Map*

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| | | | |
|---|---|---|---|
| **Project** | TA8459 | **Figure** | 1 |
| **Date** | October 2014 | **Prepared By:** | VLG |
| **Scale** | 1:20,000 | **Verified By:** | LKR |

## 2.1 SPECIES AT RISK

The ESR for the Class EA did not identify any Species at Risk (SAR) concerns for the project. Given the time passed since that reporting, LGL determined that a SAR screening was warranted for the study area. The following resources were used to conduct the screening:

- Ministry of Natural Resources and Forestry (MNRF) website to obtain the list of SAR with potential to occur in the Simcoe Region, and study area;
- Search of MNRF's Natural Heritage Information Centre database for SAR records in vicinity of the study area; and,
- Department of Fisheries and Oceans (DFO) mapping of habitat for SAR fish and SAR mussels.

The MNRF's list of SAR for the Simcoe Region was used to compile information related to the species status and habitat preference to compare against the description of vegetation communities in the 2011 ESR and subsequent field observations made by LGL of available habitat on the project site (Appendix E, **Table 1**).

The results of a search of the MNRF's NHIC database for records of rare species within a 9 km$^2$ area to include the study area (as shown in **Appendix A**) was limited to a historical record (1959) for a dragonfly - Plains Emerald (*Somatochlora ensigera*), ranked provincially as S1 (critically imperilled because of extreme rarity). No records of SAR were found within the database for the area searched.

The DFO mapping for the area indicates that all of Lake Simcoe is potential habitat for American Eel and Lake Sturgeon **(Figure 2)**. American Eel (*Anguilla rostrata*) is listed provincially as Endangered and federally as Threatened; while the Lake Sturgeon (*Acipenser fulvenscens*) is listed both provincially and federally as Threatened. DFO indicates that records for Lake Sturgeon for the lake are somewhat dated such that the species may be considered extirpated from the lake (D. Balint, DFO, pers. comm.).

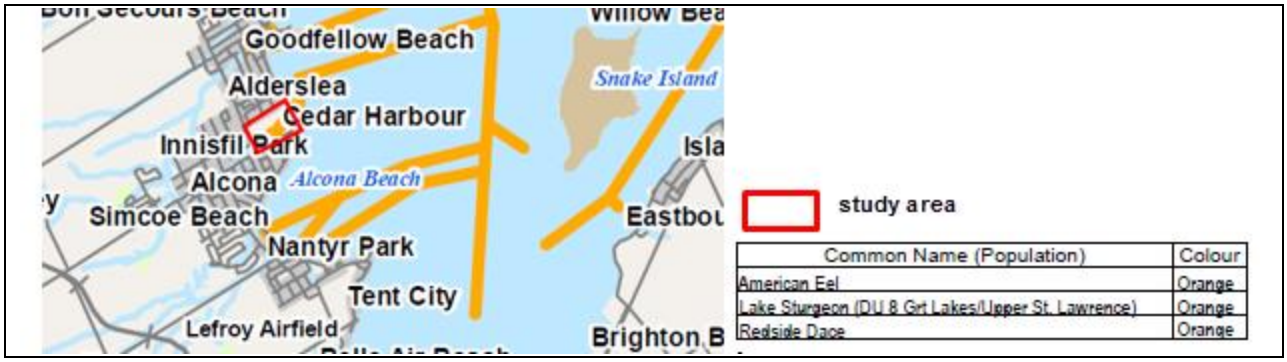



**Figure 2 Department of Fisheries and Oceans (DFO) m=mapping for fish species at risk in the vicinity of the study area.**

Further consultation with MNRF Midhurst District determined that the records for Lake Sturgeon in Lake Simcoe are dated and that the Lake Simcoe Fisheries Assessment Unit indicates that the species is considered extirpated from the lake (MNRF 2014b, **Appendix F**). In the case of American Eel, although a couple of individuals have been observed in the Holland Marsh canals and during a Lake Trout egg collection trap netting effort, the speices is not considered to have a productive population within Lake Simcoe and tributaries in the study area are not considered to provide suitable haibtats critical to the species' life history.

## 2.2 FISH AND FISH HABITAT

A change in the administration of the Fisheries Act has occurred since the 2011 ESR was written in that the Lake Simcoe Region Conservation Authority (LSRCA) no longer has a Level III agreement with Fisheries and Oceans Canada (DFO). Instead, a self-assessment of potential impacts of project works to fish habitat would be required for any works in, or in the vicinity of watercourses known to support fish or fish habitat to determine if a DFO Authorization is necessary.

# 3.0 EXISTING CONDITIONS

Through review of the 2011 ESR against the proposed new design for expansion, LGL identified the need for field investigation to:

- Determine the extent of vegetation communities;
- Confirm watercourse and fish habitat conditions under low flow;
- Document incidental wildlife and use of available habitat in the proposed footprint area by breeding birds;
- Screen proposed footprint for plant SAR; and,
- Screen potential SAR list for the Simcoe Region against available habitat on the project site.

The following subsections document the results of the above listed activities.

## 3.1 VEGETATION AND VEGETATION COMMUNITIES

### 3.1.1 Methodology

Field investigations were completed by LGL biologists on July 24th, 2014 to document the existing vegetation conditions present on the property proposed for upgrades to the existing water treatment plant and along the watermain alignment **(Figure 1)**. Pedestrian survey of the site was completed, with a focus on the more naturalized areas surrounding the current treatment plant footprint, and those areas proposed for work. Species observations were screened for those listed as at risk.

Vegetation communities were classified according to the *Ecological Land Classification for Southern Ontario: First Approximation and Its Application* (Lee *et al*. 1998). Vegetation communities were sampled using a plotless method for the purpose of determining general composition and structure of the vegetation. Local plant species status was reviewed for Simcoe Region (Riley, 1999). Vegetation community status was reviewed for Ontario (NHIC 1997). Vascular plant nomenclature follows Newmaster *et al*. (1998) with a few exceptions that have been updated to Newmaster 2008.

### 3.1.2 Existing Vegetation & Vegetation Communities

The study area is currently comprised of the WTP, culturally planted woodlands, manicured grass and parkland, as well as a small tributary that flows to Lake Simcoe. Innisfil Beach Park adjacent to the WTP is composed mainly of sports facilities (i.e. tennis courts, baseball fields, soccer fields, etc.), with amenity trees dispersed throughout. Many mature trees are found along the margins of Alcona Creek, and in small patches within the park.

Flora

A total of 110 species were inventoried within the vegetation communities displayed in **Figure 3** and summarized in **Table 1**. A complete list of vascular plant species documented can be seen in **Appendix C.** A total of 63% of the plant species identified on sire are considered native to Ontario while the remaining 37% are considered introduced and non-native to Ontario. The majority of the species found are common within Simcoe Region.

Scotch Pine Cultural Plantation/Dry-Fresh Poplar-Birch Deciduous Forest (CUP3-3/FOD3)

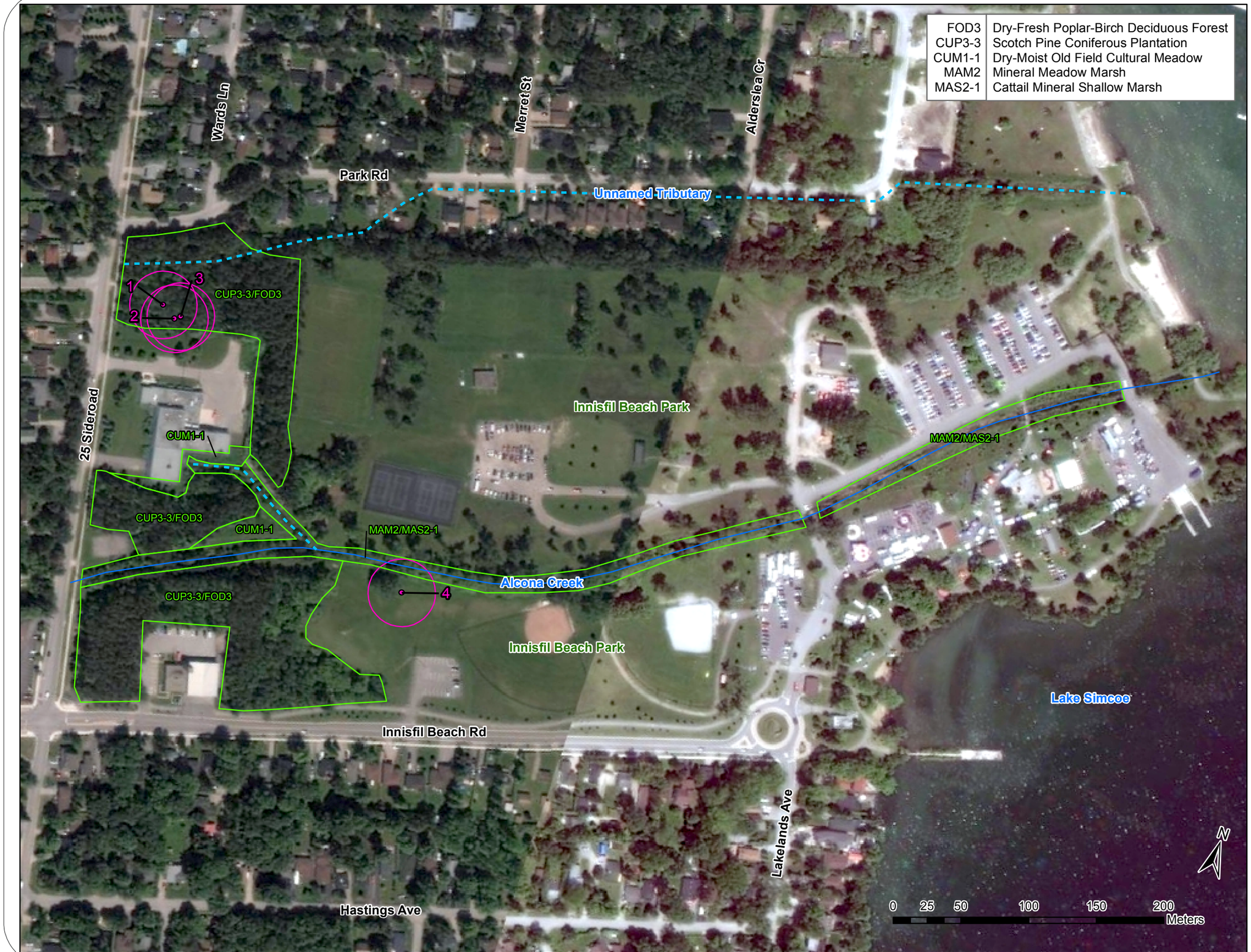
There are three separate plantation communities within the study area. These plantations have been left to naturalize for some time, as there are patches of early-successional deciduous forest infiltrating into the conifer plantations. There are multiple dead-standing conifers within all three plantation patches. The understory within these wooded areas has overgrown with young shrubs, while the groundcover is dominated by Poison Ivy (*Toxicodendron radicans*) in many areas. While these areas have been left to naturalize over time, there is still an obvious cultural influence within these communities.

Dry-Moist Old Field Cultural Meadow (CUM1-1)

There are a few small patches of open vegetation within the study area as seen in **Figure 3**. These areas have overgrown with cultural, weedy species. Both Cultural Meadow communities are small in size, with each measuring well under 0.5ha. Of the 42 species documented within these communities, 24 (57%) of those are considered introduced or non-native species.

Mineral Meadow Marsh/Cattail Shallow Marsh (MAM2/MAS2-1)

This wetland community follows the length of Alcona Creek that runs from 25 Sideroad to Lake Simcoe, and includes a small section following an intermittent tributary that leads from the WTP. The small tributary and associated wetland features are intersected by a manicured pedestrian path to Innisfil Beach Park. Sections of the creek that are further to the east, between the park road that crosses Alcona Creek and east towards Lake Simcoe, appear to have had restoration planting completed. This wetland community provides a small buffer between the creek, and nearby anthropogenic features (i.e. paths, roads, parkland). The width of this wetland ranges from about 10-15m, with mature trees along the margins.




## LEGEND

- ELC Community Boundary
- Watercourse
- Intermittent Watercourse
- Butternut + 25m Buffer

# Innisfil Water Treatment Plant

*Existing Conditions*

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| | | | |
|---|---|---|---|
| **Project** | TA8459 | **Figure** | 3 |
| **Date** | October 2014 | **Prepared By:** | VLG |
| **Scale** | 1:2,700 | **Verified By:** | LKR |

**Table 1 Summary of Ecological Land Classification (ELC) Vegetation Communities for the Lakeshore Water Treatment Plant Site (as shown in Figure 2).**

| ELC Code | Vegetation Type | Species Association | Comments |
|---|---|---|---|
| **Terrestrial – Cultural** | | | |
| CUP | CULTURAL PLANTATION | | |
| CUP3-3/FOD3 | Scotch Pine Cultural Plantation/Dry-Fresh Poplar Birch Deciduous Forest | **Canopy:** Scotch Pine (*Pinus sylvestris*), Austrian Pine (*Pinus nigra*), White Spruce (*Picea glauca*)<br>**Under storey:** Eastern White Cedar (*Thuja occidentalis*), Staghorn Sumac (*Rhus hirta*), Choke Cherry (*Prunus virginiana*)<br>**Ground Cover:** Poison Ivy (*Toxicodendron radicans*), Lily of the Valley (*Convallaria majalis*), Wild Lily of the Valley (*Maianthemum canadensis*) | • Cultural community<br>• Contains naturalized areas that include early-successional young Poplar and Maple.<br>• Moderate number of dead standing conifers<br>• Largest community to the north contains Butternut (*Juglans cinerea*) |
| CUM | CULTURAL MEADOW | | |
| CUM1-1 | Dry-Moist Old Field Meadow | **Under storey:** Staghorn Sumac, White Ash (*Fraxinus americana*),<br>**Ground Cover:** Canada Goldenrod (*Solidago canadensis*), Wild Carrot (*Daucus carota*), Tufted Vetch (*Vicia cracca*) | • Cultural community<br>• Covers minimal sections of study area<br>• Contains majority non-native species. |
| **Wetland** | | | |
| MAM/MAS | MEADOW MARSH/SHALLOW MARSH | | |
| MAM2/MAS2-1 | Mineral Meadow Marsh/Cattail Shallow Marsh | **Canopy:** Red Ash (*Fraxinus pennsylvanica*), Black Walnut (*Juglans nigra*)<br>**Under storey:** Missouri Willow (*Salix eriocephala*), Trembling Aspen (*Populus tremuloides*)<br>**Ground Cover:** Jewelweed (*Impatiens capensis*), Great Hairy Willowherb (*Epilobium hirsutum*), Broad-leaved Cattails (*Typha latifolia*) | • Follows length of Alcona Creek and associated tributaries<br>• Varies between 10-15m wide, with treed margins through parkland.<br>• Intersected by manicured pedestrian path where tributary meets creek and at various crossing locations along the length to Lake Simcoe. |

## 3.2 WILDLIFE AND WILDLIFE HABITAT

A review of wildlife habitat and wildlife communities within and around the study area was completed in concurrence with the pedestrian vegetation and aquatics surveys done on July 24th, 2014. A total of 19 species were documented through direct visual or auditory observations, and/or through indirect evidence such as burrows, scat, tracks, or trails (**Appendix D**). The lower number of species observations can be attributed to mid to late summer survey. Typically, the highest level of observable activity, particularly for birds, occurs during May and June when breeding activity is peaking. However, the breeding bird window for this area does extend from March 25-August 31 (Environment Canada 2014). The low wildlife activity observed may also be attributed to the highly cultural nature of the majority of the study area and small patch sizes of natural or semi-natural vegetation communities. Of the 19 observed species, 15 are birds, while the remaining species are amphibians and invertebrates. All of the species observed are considered common, and widespread. Many of the species observed are typically found in anthropogenic areas, as they are tolerant of a higher level of sustained disturbance. No wildlife species at risk were documented within the study area, and none of the species observed are considered locally uncommon.

Many of the vegetation communities observed on site are considered to be culturally influenced, and none are considered to be rare or providing significant sources of high quality habitat. The larger communities, such as the Cultural Plantations (CUP3-3/FOD3) may provide habitat for some nesting birds, as well as small mammals or cavity nesting birds. The two Cultural Meadow (CUM1-1) communities are too small (<0.5ha each) to provide large enough habitat for grassland birds also. The wetland community that follows along the length of the Alcona Creek is only about 10-15m wide and may provide limited habitat for amphibians within pool areas, however, the community is narrow and bordered by open parkland and may server as a minor corridor for local and common wildlife.

## 3.3 FISH AND FISH HABITAT

LGL conducted a pedestrian survey of the study area to locate watercourses and confirmed conditions as described in the 2011 ESR. Consistent with the 2011 reporting, two watercourses were observed in the study area; one unnamed intermittent stream along the northern edge of the study area, and Alcona Creek which flows in an easterly direction across Innisfil Beach Park. Both features flow into Lake Simcoe.

### 3.3.1 Unnamed Watercourse

The unnamed watercourse was investigated as it flowed through accessible properties under summer low flow condition on July 24, 2014. Roadside drainage is received by the Scotch pine plantation north of the WTP facility through a culvert crossing of 25th Sideroad. Evidence of an ill-defined channel was observed through the woodland in the form of saturate soils at the time of survey (**Appendix B, Photo 2**). The channel continues in a north-easterly direction through private residential properties to a roadside ditch along Park Road. Standing water was evident at the time of survey in the channel as it traversed the private property (**Appendix B, Photo 3**). At the terminus of Park Road the channel crosses back into Innisfil Beach Park through a small wooded area where water was pooled (approximately 5-10 cm deep) before continuing toward Lake Simcoe, through a cattail lined channel (**Appendix B, Photos 5 and 6)**. The outlet to the lake

appears to have been through twinned CSPs; however, at the time of survey one of the CSPs was almost fully submerged under sand (**Appendix B, Photo 7**). No flow was detected at the time of survey from the CSP to the lake; the sandy topography had created a barrier to fish movement into the channel under the low flow condition observed (**Appendix B, Photo 8**). The 2011 ESR indicates that the LSRCA has identified this lower portion of the watercourse as providing nursery habitat for Northern Pike. The 2011 ESR also documents that permanent flow year-round may occur through this stream; however this was not the case as observed on July 24, 2014.

### 3.3.2 Alcona Creek

Alcona Creek represents a permanent stream with conditions observed on July 24, 2014 to be similar to what is documented in the ESR. Under the low flow condition creek levels in the upper portion were less than 10cm (**Appendix B, Photo 12**) and in the lower portion of the creek although water levels were deeper, very little in the way of flow could detected (**Appendix B, Photo 13**). The creek receives occasional input from the outlet channel at the WTP, through a marsh created as a result of intermittent release of water from the plant (**Appendix B, Photos 9 and 10**). Watercress at the outlet channel suggests coldwater is present in the area, possibly from discharge. Alcona Creek is documented to support a coldwater fish species assemblage in the upper creek in the vicinity of the outlet channel where a crossing of the watercourse associated with the watermain alignment may be necessary (AECOM 2011). The fish habitat assessment conducted by AECOM (2011) as described in the ESR does not include fish collection in the outlet channel. Observations made by LGL (2014) of the berm associated with the gravel path that runs adjacent to the creek (**Appendix B, Photo 25**) to cross the outlet channel, suggest the berm acts as a barrier to fish movement. Therefore, it is assumed that the channel provides contributing fish habitat as a result of intermittent flow, to influence the water quality and other aspects of Alcona Creek associated with allochthonous inputs.

## 3.4 SPECIES AT RISK

The information obtained from the additional background review conducted as described in Section 2.0 was further considered in the context of existing conditions documented during the July 24, 2014 field investigation to confirm where SAR are located and where potential habitat for SAR exists on the project site.

### 3.4.1 Field Observations

All vegetation and wildlife species documented were screened for those listed as at risk locally, provincially, or federally. None of the wildlife observed are listed at risk. Only one plant species observed is listed at risk; the Butternut (*Juglans cinerea*). This tree is currently listed as Endangered provincially and federally. Butternuts are currently listed as Endangered due to a canker (*Sirococcus clavigignenti-juglandacearum*) disease that is considered lethal to most trees that are exposed. Four trees were documented on site. Three trees ranging in size from about 3-13cm diameter at breast height (DBH) were found within the CUP3-3/FOD3 community to the north of the WTP, while another young tree (~6cm DBH) was documented within a small patch of Poplars within the park area, just south of Alcona Creek.

The locations of the observed trees can be seen in **Figure 3**, and is considered accurate to within ±3m. All four observed trees are currently in apparently good condition and health. Butternut trees and a surrounding 25m buffer are considered protected. Encroachment or construction within this area may require a Butternut Health Assessment by a qualified Assessor, and/or permit requirements under the ESA.

Two other documented plant species are considered locally rare according to Riley, 1999; Black Walnut (*Juglans nigra*), and Red-panicled Dogwood (*Cornus racemosa*).

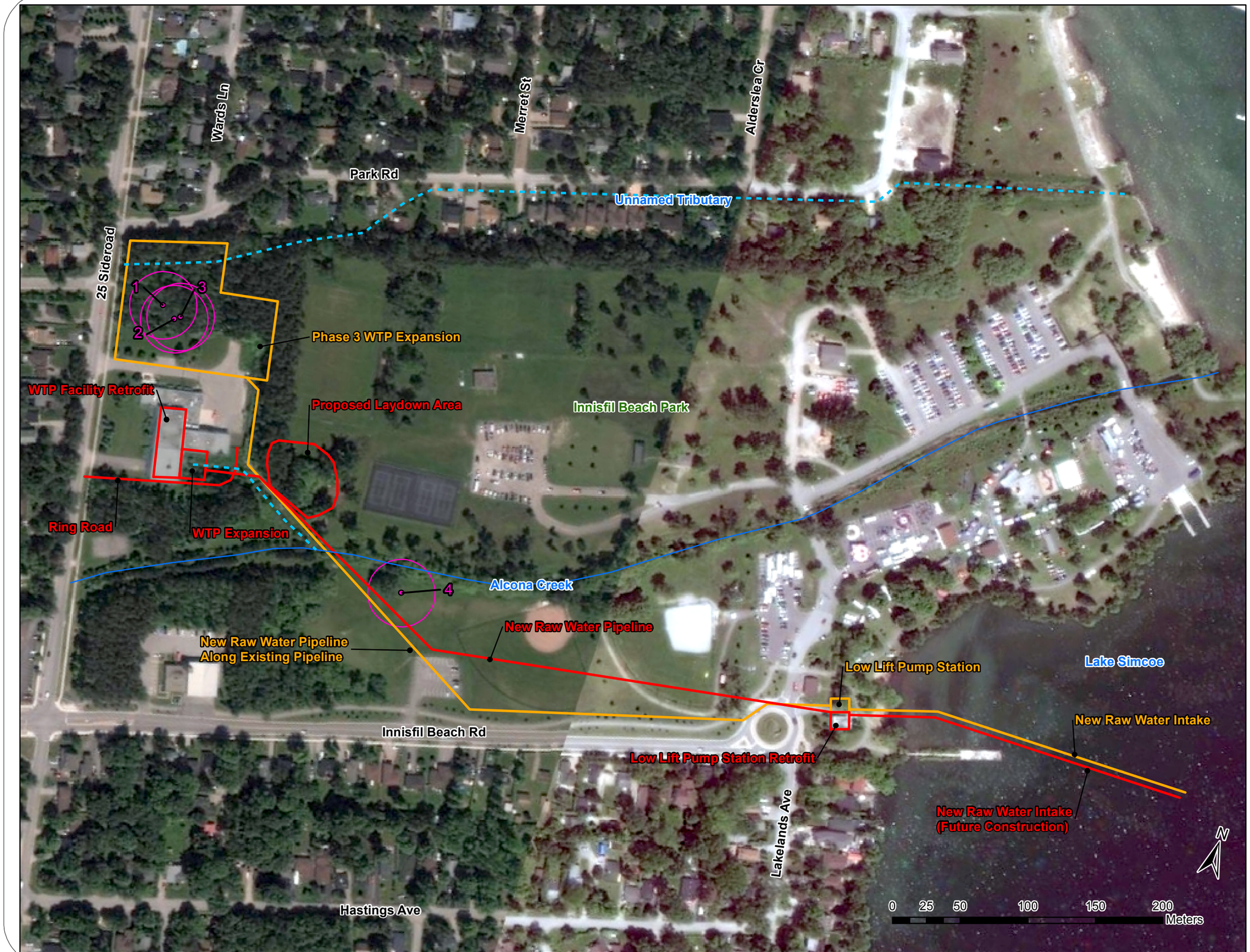
### 3.4.2 Species at Risk (SAR) Screening

In order to determine the potential for SAR to occur within the study area study, a review of secondary source background information was conducted to identify species listed under the provincial Endangered Species Act, 2007 (described in Section 2.0) with potential to occur. In addition, field investigation of the study area was conducted as described in Section 3.0 to document occurrence of SAR or potential SAR habitat. A list of SAR with potential to occur in the study area was then compiled (**Appendix E, Table 1**) to summarize existing records and provide recommendations for further consideration based where suitable habitat was present.

No targeted SAR surveys were conducted as part of the field effort reported herein, except in the case of plant SAR within and directly adjacent to the footprint of the WTP expansion, watermain alignment and pumping station as shown in **Figure 4**. Mitigation measures, as identified in Appendix E, Table 1 and summarized in Section 5.0, are intended to avoid impacts to SAR with potential to utilize habitat associated with trees proposed for removal within and adjacent to the cultural plantation/forest community. Butternut has been identified within 25m of the construction footprint, and consultation with MNRF to ensure compliance with the Endangered Species Act, 2007 is ongoing in this regard.

# 4.0 NATURAL ENVIRONMENT IMPACT ASSESSMENT OF CONCEPTUAL DESIGN ALTERNATIVES

An assessment on the natural environment impacts based on existing conditions documented within the ESR for the project (AECOM 2011) and the additional data collected in July 2014 as provided herein was undertaken for the new solution compared with the preferred alternative from the Lakeshore Water Treatment Plant Municipal Class EA ESR (AECOM 2011). The components of the ESR and new alternative are shown in Figure 4**,** while the results of the assessment are shown in **Table 2** below. The LLPS for the new alternative requires no new construction outside the existing building, and as such there will be no impacts to natural features. The new design for the WTP will greatly reduce the footprint for expansion, which avoids intrusion into natural features (e.g. butternut). Minor vegetation removal is proposed in the area of laydown/staging for construction purposes and in the area associated with the construction of a new ring road (**Figure 4**). The ring road is also associated with a crossing of the WTP's outlet channel. This channel is identified in LSRCA mapping as a watercourse feature that lies within their Regulation Area. The alignment of the watermain which occurs within 25m of a Butternut tree (SAR) and would require a crossing of Alcona Creek and associated fish habitat, represents the most significant impact to the natural environment. However, it is important to note that this alignment is similar in both the new conceptual design and the ESR alignment, and does not represent any newly identified impact. Mitigation of negative effects associated with the impacts of project works as summarized above and in **Table 2** is further described in the next section.




## LEGEND

- Watercourse
- Intermittent Watercourse
- Butternut + 25m Buffer
- Preferred Alternative from ESR (March, 2011) *
- New Recommended Solution from EA Addendum (Oct, 2014) *

*Note that all alignment options shown should be considered approximate.

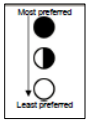
# Innisfil Water Treatment Plant

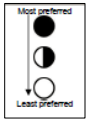
*Preferred Alignment Options*

LGL LIMITED
environmental research associates

| | |
|---|---|
| **Project** TA8459 | **Figure** 4 |
| **Date** October 2014 | **Prepared By:** VLG |
| **Scale** 1:2,700 | **Verified By:** LKR |

**Table 2 Evaluation of Preferred Design Alternative (ESR, AECOM 2011) and New Design Alternative (CH2MHill 2014) as shown in Figure 4.**

| Project Component | Design Alternative as shown on Figure 4 | Potential Effects on Groundwater<br>Temporary change in groundwater quality and quantity during construction. | Potential Effects on Surface Water Quality and the Aquatic Environment<br>Direct or indirect loss of aquatic habitat and functions, aquatic species.<br>Impact on species risk, including rare, threatened, endangered and species of local concern. | Potential Effects on the Terrestrial Environment<br>Direct or indirect loss of terrestrial habitat and functions, terrestrial species.<br>Impact on species risk, including rare, threatened, endangered and species of local concern. | Natural Environment Evaluation Summary<br>  |
|---|---|---|---|---|---|
| **Low Lift Pumping Station (LLPS)** | **Conceptual Design Alternative from ESR (AECOM 2011)** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program. | • LLPS expansion within Lake Simcoe Region Conservation Authority Regulated Area – LSRCA approvals required.<br>• Potential Impact to fish habitat related to construction (e.g. sedimentation and erosion, dewatering).<br>• No species at risk found. | • Removal of 3-9 mature trees.<br>• No species at risk found. | ◑ |
| | **New Conceptual Design Alternative from EA Addendum (CH2M HILL 2014)** | • No new construction required<br>• Footprint of pumping station remains that which currently exists<br>• It is assumed that construction staging will occur in areas already disturbed and available in close proximity to the LLPS (e.g. parking lot)<br>• No impacts to natural feature identified as a result of the LLPS retrofit. | | | ● |
| **Watermain Connection** | **Conceptual Design Alternative from ESR (AECOM 2011)** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program. | • 1 Directional drill watercourse crossing (Innisfil Beach Park).<br>• Watermain crosses Lake Simcoe Region Conservation Authority Regulated Area – LSRCA approvals required.<br>• No species at risk found. | • Requires some tree/vegetation removal.<br>• No species at risk found.*<br>**Note: Butternut (SAR) found within 25m of ESR alternative by LGL in 2014 survey* | ◑ |

| **Project Component** | **Design Alternative as shown on Figure 4** | **Potential Effects on Groundwater** Temporary change in groundwater quality and quantity during construction. | **Potential Effects on Surface Water Quality and the Aquatic Environment** Direct or indirect loss of aquatic habitat and functions, aquatic species. Impact on species risk, including rare, threatened, endangered and species of local concern. | **Potential Effects on the Terrestrial Environment** Direct or indirect loss of terrestrial habitat and functions, terrestrial species. Impact on species risk, including rare, threatened, endangered and species of local concern. | **Natural Environment Evaluation Summary**   |
|---|---|---|---|---|---|
| | **New Conceptual Design Alternative from EA Addendum (CH2M HILL 2014)** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program. | • 1 Directional drill watercourse crossing (Alcona Creek) required.<br>• Watermain crosses Lake Simcoe Region Conservation Authority Regulated Area – LSRCA approvals required.<br>• No aquatic SAR identified | • Watermain alignment is located within 25m buffer of butternut (SAR)<br>• Alignment utilizes manicured areas/sports fields to reduce/avoid impact to boulevard trees |  |
| **Water Treatment Plant Expansion** | **Conceptual Design Alternative from ESR (AECOM 2011)** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program as per PTTW. | • Requires relocation of unnamed water feature that discharges to Park Road drainage system.<br>• Avoids expansion into regulated floodplain.<br>• Complies with Lake Simcoe Protection Plan.<br>• No species at risk found. | • Encroachment into treed area north of existing WTP.<br>• Tree removal required – Scotch Pine plantation.<br>• No species at risk found.*<br>**Note: wooded area identified for expansion footprint found to include Butternut (SAR) in LGL 2014 survey* |  |
| | **New Conceptual Design Alternative from EA Addendum (CH2M HILL 2014)** | • Complete hydrogeological investigations.<br>• Implement dewatering and monitoring program as per PTTW. | • Avoids need to relocate unnamed tributary north of existing WTP.<br>• Greatly reduces footprint for expansion.<br>• Avoids intrusion into natural features adjacent to unnamed tributary north of existing WTP.<br>• Includes crossing of WTP outlet channel (regulated by LSRCA as watercourse) with new ring road construction. | • Greatly reduces footprint for expansion.<br>• Avoids intrusion into natural or plantation features (treed area north of existing WTP).<br>• Avoids SAR (Butternut) within the CUP3-3/FOD3 community. |  |

## 5.0 SUMMARY OF IMPACTS AND MITIGATION

A summary of mitigation and monitoring associated with the impacts identified for construction of the WTP expansion is included in the ESR for the preferred design alternative determined at that time (AECOM 2011). Given that the new recommended solution from the EA Addendum results in a much reduced footprint of construction to avoid impacts to the wooded area (and associated SAR trees), and watercourse north of the existing WTP, impacts are greatly reduced compared to what previously appeared in the ESR (AECOM 2011). For that reason, the table from the ESR (Table 13-1, page 95) has been updated to summarize impacts and proposed mitigation as shown in **Table 3**. The information as it appears in Table 3 has been scoped to address impacts to natural heritage features only.

**Table 3 Summary of Impacts and Mitigation associated with the New Recommended Solution from the EA Addendum (CH2M HILL 2014) as they relate to the Natural Environment.**

| Impacts | Mitigation |
|---|---|
| Short Term Construction | |
| Impacts to water resources (Surface water) and fisheries as a result of construction associated with the:<br>• Interconnecting Watermain;<br>• WTP Expansion; and,<br>• Ring Road. | • Use of trenchless technology for installation of watermain across watercourses.<br>• Appropriate setbacks should be applied to watercourses and wooded areas in order to maintain the character and quality of the natural areas providing habitat.<br>• Setbacks from natural features should be clearly demarcated with the installation of silt fencing along the disturbance limit. No construction activities are to occur outside of these fences (including overhead), nor the piling of construction materials.<br>• Minimize footprint within the construction zone within proximity to the Alcona Creek riparian zone and regulated habitat.<br>• Consult with LSRCA and adhere to Permit conditions (Development, Interference with Wetlands and Alteration to Shorelines and Watercourses) for road crossing of outlet channel and watermain crossing of Alcona Creek.<br>• Develop and implement an Erosion and Sediment Control Plan to include monitoring in order to mitigate impacts of construction to watercourses.<br>• Prior to the commencement of construction, all appropriate erosion and sediment control measures (such as silt fencing) should be installed and maintained (with regular inspection) during construction and until the site has been stabilized.<br>• Complete hydrogeological investigations to determine dewatering and groundwater control.<br>• For interconnecting watermain, establish appropriate clearance between bottom of Creek and top of pipe. |

| Impacts | Mitigation |
|---|---|
| | • Adhere to construction timing windows to avoid impacts to fish where works are proposed within, or in proximity to, fish habitat. MNRF identifies a timing window of March 15 to July 15 (no construction). Consultation with Department of Fisheries and Oceans (DFO) is required to confirm mitigation in the form of timing windows to protect fish and fish habitat.<br>• A DFO screening is recommended for proposed construction within the regulated flood lines as the Conservation Authorities no longer have an agreement to screen projects on behalf of the DFO<br>• If required, provide straw-bale check dams at points of overland flow that cross or drain the watermain alignment area.<br>• Ensure proper onsite monitoring of erosion and sediment control measures, especially during in-water works.<br>• Development of a frac out plan if trenchless technology is employed for crossing of watercourse, to include monitoring of construction activities.<br>• Any areas disturbed by construction will be restored to natural or better conditions and stabilized as soon as practically possible.<br>• Refuelling of equipment and fuel storage will be conducted at a safe distance from the watercourses at a designated location, along with the implementation of a spill protection plan. |
| Impacts to vegetation, including tree removal associated with construction of:<br>• Interconnecting Watermain;<br>• WTP Expansion;<br>• Ring Road; and,<br>• Construction laydown and staging area. | • Any vegetation removal (including dead standing trees) may be influenced by conditions set by the Migratory Birds Convention Act (MBCA) including, but not limited to, timing restrictions during breeding season for tree pruning or removal during construction activities. The breeding bird season typically extends from March 25 to August 31. Construction activities planned during the breeding season should be completed after a qualified avian biologist has completed a bird nesting survey to ensure no impacts to breeding birds to ensure compliance with the MBCA.<br>• Construct new ring road for easy access during construction and operation which will reduce impacts to natural vegetation where feasible.<br>• Qualified professional to complete tree protection or vegetation management plan as required. |

| Impacts | Mitigation |
|---|---|
| | • SAR tree species found will require a Butternut Health Assessment (BHA) if construction activities cannot avoid 25m protection zone around the tree. Further consultation with MNRF is required once the BHA is complete.<br>• The new alternative minimizes the extent of vegetation removal possible through using existing open and manicured lawn areas and avoiding expansion into the woodlot to the north of the WTP. |
| Contamination of Soils Through Spills and Leaks | • Refuelling and maintenance of equipment and fuel storage will be conducted at a safe distance from the watercourses at a designated location, along with the implementation of spill protection.<br>• Spill contingency plan will be prepared and implemented prior to the beginning of construction. |
| Long Term Operations<br>Operational footprint of expansion will be limited to a small area at the back of the existing plant and the adjacent ring road. This represents a reduced footprint compared to the previous design in an already disturbed area that receives overflow from the plant. Expansion in this area also avoids impacts to species at risk (butternut). | |
| Impacts associated with increase in impervious surfaces as a result of:<br>• WTP Expansion; and,<br>• Operation of new Ring Road. | • Consider means for improving infiltration through the use of permeable materials, where feasible.<br>• Replant and restore any areas disturbed by construction to natural or better conditions and stabilized as soon as practically possible. |
| Impacts associated with loss of vegetation as a result of:<br>• WTP Expansion; and,<br>• Operation of new Ring Road. | • Implement tree protection plan, as required;<br>• Restore or replant trees, as required.<br>• Ensure any vegetation restoration plans recommend appropriate native and non-invasive species. |

## 5.1 ENVIRONMENTAL MONITORING

As the project works identify the need to cross a watercourse known to support fish and fish habitat with a feedermain, as well as a new ring road crossing of the outlet channel, it is recommended that an independent Environmental Monitor be retained to provide support during the construction phase. The Environmental Monitor would:

- Ensure compliance with monitoring requirements in the approvals and permits;
- Complete inspections prior to the start, during and post-construction to document site conditions, ensure that erosion and sediment control plan is initiated and maintained and that natural heritage features/functions are stabilized and rehabilitated;
- Provide timely and effective advice in regards to the environment management of the site; and,
- Provide support and advice in the event of any unforeseen events.

## 6.0 SUMMARY AND CONCLUSIONS

Impacts as they relate to the natural environment are reduced as a result of the new recommended solution from the EA Addendum as compared to the preferred alternative from the 2011 ESR. Impacts are identified to relate the following four areas:

- tree removal;
- impact to Butternut (SAR);
- watermain installation across watercourse documented to provide fish habitat for a coldwater fish assemblage; and,
- ring road crossing of the plant outlet channel documented to provide intermittent flow into Alcona Creek

Mitigation has been prescribed as part of this report to include a plan for tree preservation and compensation. Although Butternut had not been previously identified on site as a result of the 2011 Class EA, 2014 data collected by LGL indicates that the new design alternative presented in the EA Addendum avoids impacts to 3 Butternut observed to occur within the expansion area of ESR preferred alternative. However, one Butternut tree observed within 25m of the alignment of the new recommended alternative has the potential to be impacted. Although the general condition of the tree was observed to be healthy at the time of survey in July 2014, it is unknown at this time whether the individual tree would be considered a retainable Butternut and therefore subject to the provisions of the ESA. A Butternut Health Assessment is required if final construction limits are identified within 25 m of the trunk of any identified Butternut tree. Recommendations to mitigate impacts of the project to Alcona Creek and the WTP outlet channel include the use of trenchless technology for watermain installation and monitoring of construction activities within the high water mark. Also of note is that a Department of Fisheries and Oceans (DFO) screening will be required for the watermain and ring road crossing as the LSRCA no longer has a Level III agreement to screen projects on behalf of the DFO.

## 7.0 REFERENCES

AECOM Canada Ltd. (AECOM). 2011. Lakeshore Water Treatment Plant Expansion Municipal Class Environmental Assessment Environmental Study Report – Final. March 2011.

Department of Fisheries and Oceans Canada (DFO). 2014. Distribution Maps for Aquatic Species at Risk. Available at: http://www.conservationontario.ca/projects/DFO/2014/Toronto%20and%20Region%20Conservation %20Authority_ENG_2014.zip

Environment Canada. 2014. "General Nesting Period for Migratory Birds", as viewed at: www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=C51C415F-1

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, South-central Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

Ministry of Natural Resources and Forestry (MNRF). 2014a. Species at Risk Website as viewed at: https://www.ontario.ca/environment-and-energy/species-risk

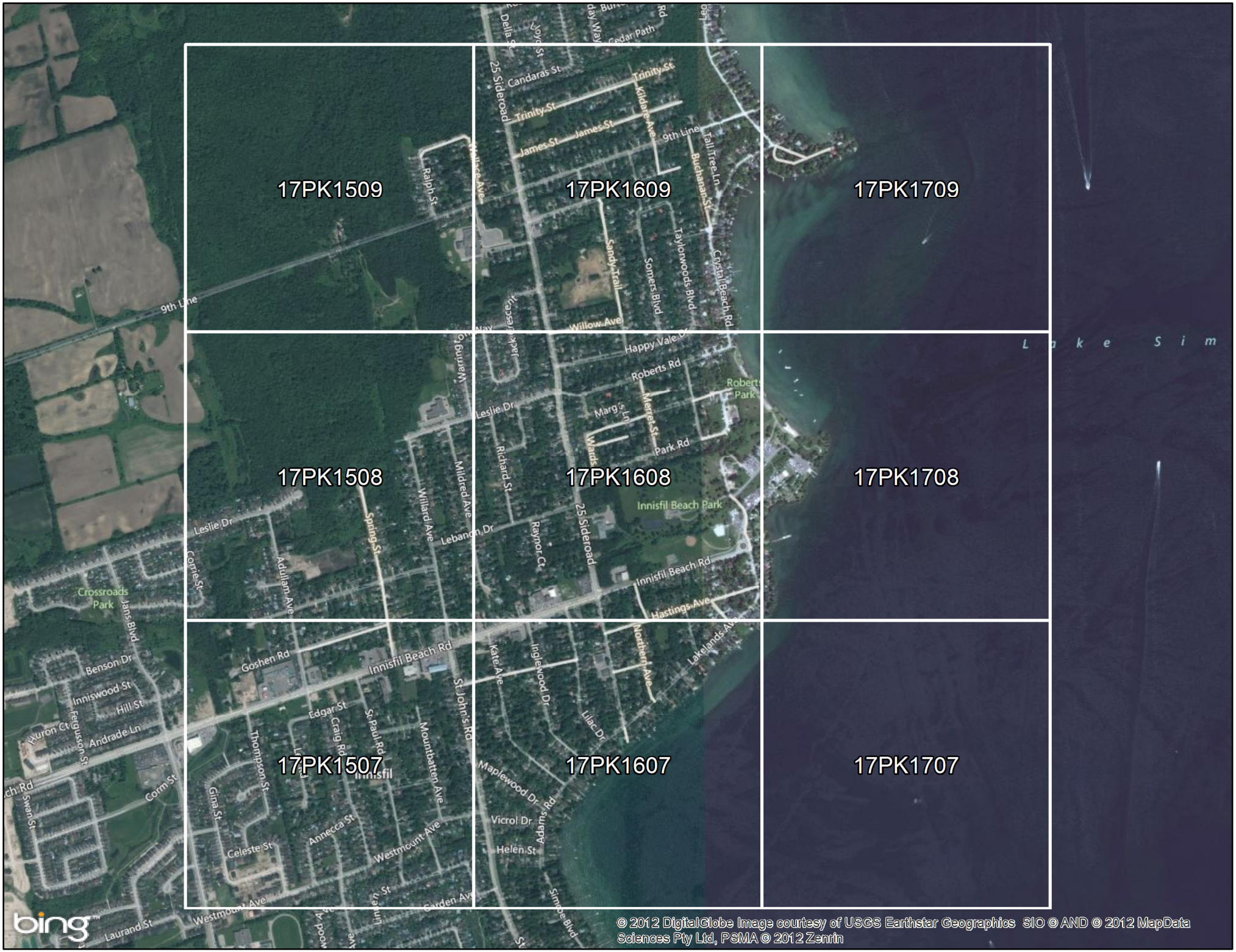
Ministry of Natural Resources and Forestry (MNRF). 2014b. Personal Communication with Graham Findlay, Management Biologist Midhurst District Office, October 7, 2014 (as provided in Appendix F).

Newmaster, S.G. and S. Ragupathy, 2008. Flora Ontario – Integrated Botanical Information System (FOIBIS), Phase I. University of Guelph, Canada. Available at: http://www.uoguelph.ca/foibis/

Natural Heritage Information Centre. 1997. *Southern Ontario Vegetation Communities List.* Ontario Ministry of Natural Resources.

Riley, J.L., et al. 1999. *Distribution and Status of the Vascular Plants of the Central Region*. Ontario Ministry of Natural Resources.

# APPENDIX A
# BACKGROUND REVIEW


17PK1509
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17PK1507
17PK1607
17PK1707
9th Line
Ralph St
Wallace Ave
25 Sideroad
Candaras St
Trinity St
James St
Kildare Ave
Buchanan St
Tall Tree Ln
Sandy Trail
Somers Blvd
Taylorwoods Blvd
Crystal Beach Rd
Willow Ave
Happy Vale Dr
Roberts Rd
Merret St
Park Rd
Leslie Dr
Richard St
Raynor Ct
Innisfil Beach Park
Innisfil Beach Rd
Hastings Ave
Lebanon Dr
Willard Ave
Mildred Ave
Spring St
Abdullah Ave
Corrie St
Crossroads Park
Jans Blvd
Benson Dr
Inniswood St
Hill St
Andrade Ln
Ferguson St
Goshen Rd
Edgar St
Craig Rd
St Paul Rd
St John's Rd
Thompson St
Mountbatten Ave
Gina St
Annecca St
Celeste St
Westmount Ave
Garden Ave
Corm St
Swan St
Kate Ave
Inglewood Dr
Lilac Dr
Northern Ave
Lakelands Ave
Maplewood Dr
Adams Rd
Vicrol Dr
Helen St
Simcoe Blvd
Laurand St
Lake Sim
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# APPENDIX B
# PHOTO APPENDIX

**PROJECT #TA8459**
**Innisfil WTP**
**July 2014**

# PHOTO APPENDIX

LGL LIMITED
environmental research associates

**Photo 1:** Culvert conveying roadside drainage across 25 Side Road to the CUP3-3/FOD3 community to the east .

**Photo 2:** Evidence of intermittent channel in CUP3-3/FOD3 community where soils are saturated. Channel dry on July 24, 2014.

**Photo 3:** Flow from CUP3-3/FOD3 community is received by channel that cuts through residential properties to Park Road ditch. Dry in upper portion and standing water in channel nearest road (July 24, 2014).

**Photo 4:** Roadside ditch along Park Road conveys seasonal flow toward Innisfil beach. Standing water in portions of ditch at the time of survey (July 24, 2014).

**PROJECT #TA8459**
**Innisfil WTP**
**July 2014**

# PHOTO APPENDIX

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environmental research associates

**Photo 5:** Wooded area receives flow from Park Road roadside ditch and conveys it toward Innisfil Beach Park through a small wooded area to the cattail lined channel.

**Photo 6:** Unnamed watercourse as it approaches Lake Simcoe. Narrow strip of riparian vegetation on either side.

**Photo 7:** Outlet of Park Road flow at Innisfil Beach/ Lake Simcoe. Two culverts, one with sediments obstructing flow.

**Photo 8:** no flow observed from outlet of unnamed watercourse to Lake Simcoe.

**Photo 9 :** Outlets from WTP to overflow channel.

**Photo 10:** Standing water in overflow channel.

**PROJECT #TA8459**
**Innisfil WTP**
**July 2014**

# PHOTO APPENDIX

LGL LIMITED
environmental research associates

**Photo 11:** Alcona Creek as it flows out of culvert crossing of 25th Sideroad.

**Photo 12:** Upper Alcona Creek as it flows in vicinity of the proposed watermain crossing.

**Photo 13:** Lower Alcona Creek as it flows toward Lake Simcoe.

**Photo 14:** MAM2/MAS2-1 community behind WTP.

**Photo 15:** Poison Ivy dominant within groundcover in plantation areas.

**Photo 16:** Small CUM1-1 community bordering manicured pedestrian path and CUP.

**PROJECT #TA8459**
**Innisfil WTP**
**July 2014**

# PHOTO APPENDIX

LGL LIMITED
environmental research associates

**Photo 17:** MAM2/MAS2-1 community along overflow channel.

**Photo 18:** View of CUP3-3/FOD3 from soccer field within Innisfil Beach Park.

**Photo 19:** Silver Spotted Skipper

**Photo 20:** Butternut 1 within cultural plantation.

**Photo 21:** Butternut 2 within cultural plantation.

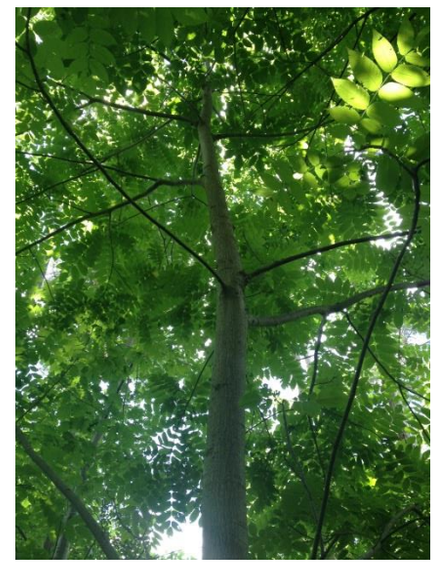


**Photo 22:** Butternut 3 within cultural plantation.

# PHOTO APPENDIX

**Photo 23:** Butternut 4 within Innisfil Beach Park.

**Photo 24:** View of dead standing trees within CUP3-3/FOD3.

**Photo 25:** Path across **:** MAM2/MAS2-1 community at the end of the overflow channel. This path runs adjacent to Alcona Creek.

# APPENDIX C
# VASCULAR PLANT LIST

Appendix C: Vascular Plant List for Lakeshore WTP SIte, July 24, 2014

| Scientific Name | Common Name | GRank | SRank | MNR | COSEWIC | Simcoe - Riley | CUM1-1 | CUP3 | MAS2/ MAM2 |
|---|---|---|---|---|---|---|---|---|---|
| ***EQUISETACEAE*** | **HORSETAIL FAMILY** | | | | | | | | |
| *Equisetum arvense* | field horsetail | G5 | S5 | | | | X | X | X |
| ***DENNSTAEDTIACEAE*** | **BRACKEN FERN FAMILY** | | | | | | | | |
| *Pteridium aquilinum var. latiusculum* | eastern bracken-fern | G5T | S5 | | | | | X | |
| ***DRYOPTERIDACEAE*** | **WOOD FERN FAMILY** | | | | | | | | |
| *Matteuccia struthiopteris var. pensylvanica* | ostrich fern | G5 | S5 | | | | | X | |
| *Onoclea sensibilis* | sensitive fern | G5 | S5 | | | | | X | X |
| ***PINACEAE*** | **PINE FAMILY** | | | | | | | | |
| *Picea glauca* | white spruce | G5 | S5 | | | | | X | |
| * *Pinus nigra* | Austrian pine | G? | SE2 | | | | | X | |
| * *Pinus sylvestris* | scotch pine | G? | SE5 | | | | | X | X |
| ***CUPRESSACEAE*** | **CEDAR FAMILY** | | | | | | | | |
| *Thuja occidentalis* | eastern white cedar | G5 | S5 | | | | | X | |
| ***RANUNCULACEAE*** | **BUTTERCUP FAMILY** | | | | | | | | |
| *Actaea rubra* | red baneberry | G5 | S5 | | | | | X | |
| *Anemone canadensis* | Canada anemone | G5 | S5 | | | | | | X |
| *Anemone virginiana var. virginiana* | thimbleweed | G5T | S5 | | | | X | | |
| *Clematis virginiana* | virgin's-bower | G5 | S5 | | | | X | | |
| ***URTICACEAE*** | **NETTLE FAMILY** | | | | | | | | |
| *Urtica dioica ssp. gracilis* | American stinging nettle | G5T? | S5 | | | | | | X |
| ***JUGLANDACEAE*** | **WALNUT FAMILY** | | | | | | | | |
| *Juglans cinerea* | butternut | G3G4 | S3? | END | END | | | X | |
| *Juglans nigra* | black walnut | G5 | S4 | | | R-1 Nat | | X | X |
| ***FAGACEAE*** | **BEECH FAMILY** | | | | | | | | |
| *Fagus grandifolia* | American beech | G5 | S5 | | | | | X | |
| *Quercus rubra* | red oak | G5 | S5 | | | | | X | |
| ***BETULACEAE*** | **BIRCH FAMILY** | | | | | | | | |
| *Betula papyrifera* | white birch | G5 | S5 | | | | | X | X |
| ***CARYOPHYLLACEAE*** | **PINK FAMILY** | | | | | | | | |
| * *Cerastium arvense ssp. arvense* | field chickweed | G5T? | SE4 | | | | X | | |
| ***POLYGONACEAE*** | **SMARTWEED FAMILY** | | | | | | | | |
| * *Rumex crispus* | curly-leaf dock | G? | SE5 | | | | X | | |

| Scientific Name | Common Name | GRank | SRank | MNR | COSEWIC | Simcoe - Riley | CUM1-1 | CUP3 | MAS2/ MAM2 |
|---|---|---|---|---|---|---|---|---|---|
| ***GUTTIFERAE*** | **ST. JOHN'S-WORT FAMILY** | | | | | | | | |
| * *Hypericum perforatum* | common St. John's-wort | G? | SE5 | | | | X | | |
| ***TILIACEAE*** | **LINDEN FAMILY** | | | | | | | | |
| *Tilia americana* | basswood | G5 | S5 | | | | | X | |
| ***SALICACEAE*** | **WILLOW FAMILY** | | | | | | | | |
| *Populus balsamifera ssp. balsamifera* | balsam poplar | G5T? | S5 | | | | | X | X |
| *Populus deltoides* | cottonwood | | | | | | | X | |
| *Populus tremuloides* | trembling aspen | G5 | S5 | | | | | X | X |
| *Salix bebbiana* | long-beaked willow | G5 | S5 | | | | | | X |
| *Salix discolor* | pussy willow | G5 | S5 | | | | | | X |
| *Salix eriocephala* | Missouri willow | G5 | S5 | | | | | | X |
| * *Salix X sepulcralis* | hybrid willow | HYB | SE2 | | | | | | X |
| ***BRASSICACEAE*** | **MUSTARD FAMILY** | | | | | | | | |
| * *Alliaria petiolata* | garlic mustard | G5 | SE5 | | | | X | | |
| * *Rorippa nasturtium-aquaticum* | water-cress | G? | SE? | | | | | | X |
| ***GROSSULARIACEAE*** | **GOOSEBERRY FAMILY** | | | | | | | | |
| *Ribes sp.* | currant | | | | | | | X | |
| ***ROSACEAE*** | **ROSE FAMILY** | | | | | | | | |
| *Malus sp.* | apple | | | | | | X | | |
| *Prunus virginiana var. virginiana* | choke cherry | G5T? | S5 | | | | | X | |
| *Rubus idaeus ssp. strigosus* | wild red raspberry | G5T | S5 | | | | X | | |
| *Sorbus sp.* | mountain-ash | | | | | | | X | |
| ***FABACEAE*** | **PEA FAMILY** | | | | | | | | |
| * *Lotus corniculatus* | bird's-foot trefoil | G? | SE5 | | | | X | | |
| * *Medicago lupulina* | black medick | G? | SE5 | | | | | X | X |
| * *Medicago sativa ssp. sativa* | alfalfa | G?T? | SE5 | | | | X | | |
| * *Melilotus alba* | white sweet-clover | G? | SE5 | | | | X | | |
| * *Trifolium hybridum ssp. elegans* | alsike clover | | SE5 | | | | X | | |
| * *Trifolium pratense* | red clover | G? | SE5 | | | | X | | |
| * *Vicia cracca* | tufted vetch | G? | SE5 | | | | X | | |
| ***ONAGRACEAE*** | **EVENING-PRIMROSE FAMILY** | | | | | | | | |
| *Circaea lutetiana ssp. canadensis* | yellowish enchanter's nightshade | G5T5 | S5 | | | | | X | X |

| Scientific Name | Common Name | GRank | SRank | MNR | COSEWIC | Simcoe - Riley | CUM1-1 | CUP3 | MAS2/ MAM2 |
|---|---|---|---|---|---|---|---|---|---|
| * *Epilobium hirsutum* | great hairy willow-herb | G? | SE5 | | | | X | | X |
| ***CORNACEAE*** | **DOGWOOD FAMILY** | | | | | | | | |
| *Cornus alternifolia* | alternate-leaved dogwood | G5 | S5 | | | | | X | |
| *Cornus racemosa* | red panicled dogwood | G5? | S5 | | | R-2 | | | X |
| *Cornus sericea ssp. sericea* | red-osier dogwood | G5 | S5 | | | | | X | X |
| ***RHAMNACEAE*** | **BUCKTHORN FAMILY** | | | | | | | | |
| * *Frangula alnus* | glossy buckthorn | G? | SE5 | | | | | X | |
| * *Rhamnus cathartica* | common buckthorn | G? | SE5 | | | | | X | |
| ***VITACEAE*** | **GRAPE FAMILY** | | | | | | | | |
| *Parthenocissus vitacea* | inserted Virginia-creeper | G5 | S5 | | | | X | X | |
| *Vitis riparia* | riverbank grape | G5 | S5 | | | | | X | X |
| ***ACERACEAE*** | **MAPLE FAMILY** | | | | | | | | |
| *Acer negundo* | manitoba maple | G5 | S5 | | | | | X | X |
| * *Acer platanoides* | norway maple | G? | SE5 | | | | | X | X |
| *Acer rubrum* | red maple | G5 | S5 | | | | | X | |
| ***ANACARDIACEAE*** | **SUMAC FAMILY** | | | | | | | | |
| *Rhus hirta* | staghorn sumac | G5 | S5 | | | | X | X | |
| *Toxicodendron radicans ssp. negundo* | poison-ivy | G5T | S5 | | | | | X | |
| ***BALSAMINACEAE*** | **TOUCH-ME-NOT FAMILY** | | | | | | | | |
| *Impatiens capensis* | spotted touch-me-not | G5 | S5 | | | | | | X |
| ***APIACEAE*** | **PARSLEY FAMILY** | | | | | | | | |
| * *Daucus carota* | wild carrot | G? | SE5 | | | | X | | X |
| *Sium suave* | hemlock water-parsnip | G5 | S5 | | | | | | X |
| ***ASCLEPIADACEAE*** | **MILKWEED FAMILY** | | | | | | | | |
| *Asclepias syriaca* | common milkweed | G5 | S5 | | | | X | | X |
| * *Cynanchum rossicum* | swallow-wort | G? | SE5 | | | | | | X |
| ***SOLANACEAE*** | **POTATO FAMILY** | | | | | | | | |
| * *Solanum dulcamara* | bitter nightshade | G? | SE5 | | | | X | | |
| ***CONVOLVULACEAE*** | **MORNING-GLORY FAMILY** | | | | | | | | |
| * *Convolvulus arvensis* | field bindweed | G? | SE5 | | | | | X | X |
| ***BORAGINACEAE*** | **BORAGE FAMILY** | | | | | | | | |
| * *Myosotis scorpioides* | mouse-ear scorpion-grass | G5 | SE5 | | | | | | X |

| Scientific Name | Common Name | GRank | SRank | MNR | COSEWIC | Simcoe - Riley | CUM1-1 | CUP3 | MAS2/ MAM2 |
|---|---|---|---|---|---|---|---|---|---|
| ***LAMIACEAE*** | **MINT FAMILY** | | | | | | | | |
| *Clinopodium vulgare* | wild basil | G? | S5 | | | | X | | X |
| ***PLANTAGINACEAE*** | **PLANTAIN FAMILY** | | | | | | | | |
| * *Plantago lanceolata* | ribgrass | G5 | SE5 | | | | X | | |
| * *Plantago major* | common plantain | G5 | SE5 | | | | | | X |
| ***OLEACEAE*** | **OLIVE FAMILY** | | | | | | | | |
| *Fraxinus americana* | white ash | G5 | S5 | | | | X | | |
| *Fraxinus pennsylvanica* | red ash | G5 | S5 | | | | | X | X |
| ***SCROPHULARIACEAE*** | **FIGWORT FAMILY** | | | | | | | | |
| * *Linaria vulgaris* | butter-and-eggs | G? | SE5 | | | | X | | |
| * *Verbascum thapsus* | common mullein | G? | SE5 | | | | | | X |
| ***BIGNONIACEAE*** | **TRUMPET-CREEPER FAMILY** | | | | | | | | |
| * *Catalpa speciosa* | northern catalpa | GU | SE1 | | | | | X | |
| ***RUBIACEAE*** | **MADDER FAMILY** | | | | | | | | |
| *Galium palustre* | marsh bedstraw | G5 | S5 | | | | | | X |
| ***CAPRIFOLIACEAE*** | **HONEYSUCKLE FAMILY** | | | | | | | | |
| *Sambucus racemosa var. racemosa* | red-berried elderberry | G5T4T5 | S5 | | | | | X | |
| *Viburnum opulus var. americanum* | high bush cranberry | G5T5 | S5 | | | | | X | X |
| ***ASTERACEAE*** | **ASTER FAMILY** | | | | | | | | |
| *Ambrosia artemisiifolia* | common ragweed | G5 | S5 | | | | X | | |
| * *Arctium minus* | common burdock | G?T? | SE5 | | | | X | | |
| *Aster lanceolatus ssp. lanceolatus* | tall white aster | G5T? | S5 | | | | X | | X |
| *Bidens frondosa* | devil's beggar-ticks | G5 | S5 | | | | | | X |
| * *Cichorium intybus* | chicory | G? | SE5 | | | | X | | |
| * *Cirsium arvense* | Canada thistle | G? | SE5 | | | | X | | X |
| *Erigeron annuus* | daisy fleabane | G5 | S5 | | | | X | | X |
| *Eupatorium maculatum var. maculatum* | spotted joe-pye-weed | G5T5 | S5 | | | | | | X |
| *Eupatorium perfoliatum* | perfoliate thoroughwort | G5 | S5 | | | | | | X |
| * *Leucanthemum vulgare* | ox-eye daisy | G? | SE5 | | | | X | | |
| *Rudbeckia hirta* | black-eyed Susan | G5 | S5 | | | | X | | |
| *Solidago canadensis* | canada goldenrod | G5 | S5 | | | | X | X | X |
| * *Sonchus arvensis ssp. arvensis* | field sow-thistle | G?T? | SE5 | | | | X | | X |

| Scientific Name | Common Name | GRank | SRank | MNR | COSEWIC | Simcoe - Riley | CUM1-1 | CUP3 | MAS2/ MAM2 |
|---|---|---|---|---|---|---|---|---|---|
| *Symphyotrichum novae-angliae* | New England aster | G5 | S5 | | | | X | | X |
| * *Taraxacum officinale* | common dandelion | G5 | SE5 | | | | X | X | |
| * *Tragopogon pratensis ssp. pratensis* | meadow goat's-beard | G?T? | SE5 | | | | | | X |
| ***ALISMATACEAE*** | **WATER-PLANTAIN FAMILY** | | | | | | | | |
| *Alisma plantago-aquatica* | common water-plantain | G5 | S5 | | | | | | X |
| ***JUNCACEAE*** | **RUSH FAMILY** | | | | | | | | |
| *Juncus sp.* | rush | | | | | | | | X |
| ***CYPERACEAE*** | **SEDGE FAMILY** | | | | | | | | |
| *Carex plantaginea* | plantain-leaved sedge | G5 | S5 | | | | | X | |
| *Carex sp.* | sedge | | | | | | | | X |
| *Scirpus microcarpus* | small-fruited bulrush | G5 | S5 | | | | | | X |
| ***POACEAE*** | **GRASS FAMILY** | | | | | | | | |
| * *Bromus inermis ssp. inermis* | awnless brome | G4G5T? | SE5 | | | | X | | X |
| * *Dactylis glomerata* | orchard grass | G? | SE5 | | | | X | | X |
| *Elymus hystrix* | bottle-brush grass | G5 | S5 | | | | | X | |
| *Phalaris arundinacea* | reed canary grass | G5 | S5 | | | | | | X |
| * *Phleum pratense* | timothy | G? | SE5 | | | | X | | X |
| *Phragmites australis* | common reed | G5 | S5 | | | | X | | X |
| *Poa pratensis ssp. pratensis* | Kentucky bluegrass | G5T | S5 | | | | X | | |
| ***TYPHACEAE*** | **CATTAIL FAMILY** | | | | | | | | |
| *Typha angustifolia* | narrow-leaved cattail | G5 | S5 | | | | | | X |
| *Typha latifolia* | broad-leaved cattail | G5 | S5 | | | | | | X |
| ***LILIACEAE*** | **LILY FAMILY** | | | | | | | | |
| *Clintonia borealis* | bluebead-lily | G5 | S5 | | | | | X | |
| * *Convallaria majalis* | lily-of-the-valley | G5 | SE5 | | | | | X | |
| *Maianthemum canadense* | wild lily-of-the-valley | G5 | S5 | | | | | X | |
| ***ORCHIDACEAE*** | **ORCHID FAMILY** | | | | | | | | |
| * *Epipactis helleborine* | common helleborine | G? | SE5 | | | | | X | |

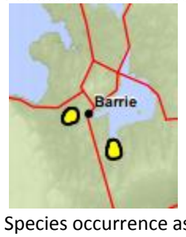
# APPENDIX D
# WILDLIFE LIST

Appendix D: Wildlife List for Lakeshore WTP Site, July 24, 2014

| Type | Scientific Name | Common Name | 24-Jul-14 | G Rank | S Rank | COSEWIC | SARO | FWCA | MBCA | SWH-TG Area Sensitive Species | Priority Species Simcoe |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Amphibian | *Rana clamitans* | Green Frog | X | G5 | S5 | | | | | | |
| Amphibian | *Rana pipiens* | Northern Leopard Frog | X | G5 | S5 | | | | | | |
| Bird | *Corvus brachyhrynchos* | American Crow | X | G5 | S5B | | | | | | |
| Bird | *Carduelis tristis* | American Goldfinch | X | G5 | S5B | | | | X | | level 3 |
| Bird | *Turdus migratorius* | American Robin | X | G5 | S5B | | | | X | | |
| Bird | *Poecile atricapillus* | Black-capped Chickadee | X | G5 | S5 | | | | X | | level 4 |
| Bird | *Cyanocitta cristata* | Blue Jay | X | G5 | S5 | | | P | | | |
| Bird | *Thryothorus ludovicianus* | Carolina Wren | X | G5 | S4 | | | | X | | |
| Bird | *Quiscalus quiscula* | Common Grackle | X | G5 | S5B | | | | | | |
| Bird | *Picoides pubescens* | Downy Woodpecker | X | G5 | S5 | | | | X | | |
| Bird | *Tyrannus tyrannus* | Eastern Kingbird | X | G5 | S4B | | | | X | | level 3 |
| Bird | *Sturnus vulgaris* | European Starling | X | G5 | SNA | | | | | | |
| Bird | *Passer domesticus* | House Sparrow | X | G5 | SNA | | | | | | |
| Bird | *Cardinalis cardinalis* | Northern Cardinal | X | G5 | S5 | | | | X | | |
| Bird | *Pheucticus ludovicianus* | Rose-breasted Grosbeak | X | G5 | S4B | | | | X | | |
| Bird | *Melospiza melodia* | Song Sparrow | X | G5 | S5B | | | | X | | |
| Bird | *Sitta carolinensis* | White-breasted Nuthatch | X | G5 | S5 | | | | X | X | |
| Invertebrates | *Enodia anthedon* | Northern Pearly-Eye | X | G5 | S5 | | | | | | |
| Invertebrates | *Epargyreus clarus* | Silver-spotted Skipper | X | G5 | S4 | | | | | | |

# APPENDIX E
# SPECIES AT RISK SCREENING

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Plants | American Hart's-tongue Fern (*Asplenium scolopendrium*) | Special Concern | N/A | Hart's-tongue Fern (*Asplenium scolopendrium*) usually grows in rocky areas, particularly on limestone rock outcrops in maple-beech forest. Hart's-tongue Fern grows on calcareous rocks in deep shade on slopes in deciduous forest. Most Ontario occurrences are in maple-beech forest. Established plants can grow in exposed, rocky crevices and on outcrops, but moist, mossy areas seem to be essential for spore germination and early plant development. | Ontario has the bulk of populations north of Mexico. In this province the fern has been reported at more than 100 sites, mostly on the Niagara Escarpment, with about 75 of these believed to still exist.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |
| Plants | Broad Beech Fern (*Phengopteris hexagonoptera*) | Special Concern | N/A | The Broad Beech Fern prefers to grow in rich soils in deciduous forests, often in areas dominated by maple and beech trees. It requires moist soil and usually grows in full shade. | The Broad Beech Fern grows in eastern North America from the southern Great Lakes region west to southeast Kansas and northeast Oklahoma, south to northeast Texas and the Gulf Coast and east to the Atlantic coast. In Ontario, the species is found in forest remnants in southern Muskoka, along Lake Erie, and in the eastern Lake Ontario-St. Lawrence River region.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |
| Plants | Eastern prairie fringed orchid (*Platanthera leucophaea*) | Endangered | Species and General Habitat Protection | The Eastern Prairie Fringed-orchid grows in wetlands, fens, swamps and tallgrass prairie. It has been found in ditches and railroad rights of way (MNRF 2014). | In Ontario, there are about 20 small populations in prairie habitat or fens in Simcoe, Essex and Lambton counties, and the municipality of Chatham-Kent. It's also found in tamarack swamps in the Bruce Peninsula and Ottawa area.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) include records for the lower Lake Simcoe area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Plants | Forked Three-awned Grass (*Aristida basiramea*) | Endangered | Species and General Habitat Protection | Forked Three-awned Grass grows on open, bare ground or in sparsely-covered grassy areas, often in bare spots between patches of other species of grasses.<br>The maintenance of this type of habitat requires periodic disturbances, such as fire or drought, to prevent other plants from dominating the area. However, some forms of disturbance facilitate the establishment of invasive plant species that can outcompete Forked Three-awned Grass. | In Canada, Forked Three-awned Grass is found only in southwestern Quebec and southern Ontario, with one likely introduced population found in the Rainy River area of northwestern Ontario.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |
| Plants | Hill's Thistle (*Cirsium hillii*) | Threatened | Species and General Habitat Protection | In Ontario, Hill's Thistle is found in open alvar grasslands, surrounded by forests of Jack Pine, White Spruce, and Eastern White Cedar.<br>Alvars are flat areas of limestone bedrock with very shallow soil and vegetation consisting of scattered trees, shrubs and grasses.<br>This sun-loving thistle is also found in prairie and sand dunes. These are all rare habitats in Ontario, characterized by open and sunny conditions. | Hill's Thistle is only found near the Great Lakes of North America. In Canada, following an assessment in 2004, Hill's Thistle is believed to persist at 64 sites in southern Ontario. It is mainly found on Manitoulin Island, and on the west side of the Bruce Peninsula.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |
| Plants | Spotted Wintergreen (*Chimaphila maculate*) | Endangered | Species and General Habitat Protection | In Ontario, Spotted Wintergreen occurs in dry oak-pine woodland habitats with sandy soils<br>Typically, dominant tree species include White Pine, Red Oak, Black Oak, and American Beech. The species does best in semi-open habitats. | In Canada, it is only found in a few locations in southern Ontario in Norfolk County and the Niagara Region. It is believed to have been extirpated from Simcoe Kent, Middlesex and York Counties, Hamilton-Wentworth Region and the District of Muskoka.<br>There is a record for Spotted Wintergreen in Quebec but it is believed to have been introduced and now no longer persists.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |

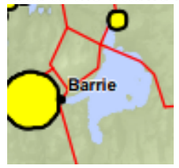
**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Insects | Hine's Emerald (*Somatochlora hineana*) | Endangered | Species and General Habitat Protection | Hine's Emerald lives in groundwater-fed wetlands with grassy vegetation.<br>Larvae use crayfish burrows during periods of low water and during the winter. | In Ontario, Hine's Emerald has been documented in and around Minesing wetland in Simcoe County (west of Barrie). It is also found in Wisconsin, Michigan, Illinois and Missouri.<br>  <br><br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Appropriate habitat does not exist on site. | No further effort recommended at this time. |
| Insects | Rusty-patched Bumble Bee (*Bombus affinis*) | Endangered | Species and General Habitat Protection (General Habitat Description) | This species, like other bumble bees, can be found in open habitat such as mixed farmland, urban settings, savannah, open woods and sand dunes. The most recent sightings have been in oak savannah, which contains both woodland and grassland flora and fauna. | The species has suffered rapid, severe decline throughout its entire range since the 1970s with only a handful of specimens collected in recent years in Ontario. The only locality within Ontario where the Rusty-patched Bumble Bee has been seen since 2002 is Pinery Provincial Park (Lambton County) despite widespread surveys in Ontario.<br>Historically the Rusty-patched Bumble Bee was common from southern Ontario, east to Quebec, south to Georgia and west to the Dakotas.<br>  <br><br>Species occurrence as of May 24, 2013 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Habitat generalist, with limited habitat occurring within the study area. Last known observations of species are far removed from current study area.<br>Species was not observed during July 2014 field survey. | No further effort recommended at this time. |
| Birds | Bald eagle (*Haliaeetus leucocephalus*) | Special Concern | N/A | Prefers deciduous and mixed-deciduous forest; and habitat close to water bodies such as lakes and rivers; Roost in super canopy trees such as Pine. | In Ontario, they nest throughout the north, with the highest density in the northwest near Lake of the Woods. Historically they were also relatively common in southern Ontario, especially along the shore of Lake Erie, but this population was all but wiped out 50 years ago. After an intensive re-introduction program and environmental clean-up efforts, the species has rebounded and can once again be seen in much of its former southern Ontario range.<br>  <br><br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Forested areas on site are small in size and fragmented, and primarily coniferous in nature.<br><br>Both the species and their nests are very conspicuous where they occur. Species was not observed during July 2014 field survey. | No further effort recommended at this time. |

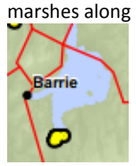
**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Birds | Barn swallow (*Hirundo rustica*) | Threatened | Species and General Habitat Protection (General Habitat Description) | Often use manmade structures to build cup-shaped mud nests. They nest inside or outside of buildings, under bridges, in road culverts, and on rock faces near foraging habitat in the form of farmland; lake/river shorelines; wooded clearings; and wetlands. General habitat protection is provided for the area up to 200m from a nest. | In Ontario the species is found throughout the southern part of the province and as far north as Hudson Bay.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | No active or inactive nests were documented on any structures associated with the WTP.<br>Species was not observed during July 2014 field survey. | No buildings are currently proposed for removal, however, avoidance of disturbance to this species could be achieved through use of timing windows to avoid construction on buildings during breeding season from March 25-August 31 |
| Birds | Black Tern (*Chlidonias niger*) | Special Concern | N/A | Black Terns build floating nests in loose colonies in shallow marshes, especially in cattails. In winter they migrate to the coast of northern South America. | In Ontario, Black Terns are found scattered throughout the province, but breed mainly in the marshes along the edges of the Great Lakes.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) include records in vicinity of the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Wetland communities that exist on site are very narrow in size, and function primarily as a natural buffer to Alcona Creek rather than open wetland. Beach access at Lake Simcoe does not include coastal wetland.<br><br>Species was not documented during July 2014 field survey | No further effort recommended at this time. |
| Birds | Bobolink (*Dolichonyx oryziborus*) | Threatened | Species and General Habitat Protection (General Habitat Description) | Bobolink is an obligate-grassland species (i.e., it requires grasslands). With the loss of most of their preferred native grassland habitats, Bobolink and Eastern Meadowlark now nest most commonly in a variety of anthropogenic (i.e., human-created) grassland habitats that effectively mimic the structural attributes (vegetation height and vegetation density) of native prairie and act as "surrogate" grasslands (MNRF Recovery Strategy, McCracken et al. 2013). They often build their small nests on the ground in open grasslands or hay fields. Prior to fall migration, they group into small flocks, often relocating to the interface between marshy wetlands and agricultural areas. General habitat protection is provided for the area up to 300m from a nest. | In Ontario this species is widely distributed to include the study area.<br>  <br>Species included in SAR list for Simcoe region (MNRF 2014a). | Cultural meadow communities on site are much too small (<0.5ha) to provide habitat for this species. Grassland areas in the nearby Innisfil Beach Park are all manicured grass.<br><br>Species was not documented during July 2014 field survey. | No further effort recommended at this time. |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Birds | Cerulean warbler (*Dendroica cerulean*) | Threatened | Species and General Habitat Protection | Generally found in mature deciduous forests with an open understorey; also nests in older, second-growth deciduous forests. | In southern Ontario, populations appear to be separated into two distinct bands: one from southern Lake Huron to western Lake Ontario, and further north, the other from the Bruce Peninsula and Georgian Bay area to the Ottawa River.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records in vicinity of the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Habitat is not present within the study area.<br><br>Species was not documented during July 2014 survey. | No further effort recommended at this time. |
| Birds | Eastern meadowlark (*Sturnella magna*) | Threatened | Species and General Habitat Protection (General Habitat Description) | Eastern Meadowlarks breed primarily in moderately tall grasslands, such as pastures and hayfields, but are also found in alfalfa fields, weedy borders of croplands, roadsides, orchards, airports, shrubby overgrown fields, or other open areas. Small trees, shrubs or fence posts are used as elevated song perches. General habitat protection is provided for the area up to 300m from a nest. | In Ontario this species is widely distributed to include the study area.<br>  <br>Species included in SAR list for Simcoe region (MNRF 2014a). | Cultural meadow communities on site are much too small (<0.5ha) to provide habitat for this species. Grassland areas in the nearby Innisfil Beach Park are all manicured grass.<br><br>Species was not documented during July 2014 field survey. | No further effort recommended at this time. |
| Birds | Henslow's Sparrow (*Ammodramus henslowii*) | Endangered | Species and General Habitat Protection | Generally found in old fields, pastures and wet meadows. They prefer areas with dense, tall grasses, and thatch, or decaying plant material (MNRF, 2014). | In Ontario, the Henslow's Sparrow lives in open fields with tall grasses, flowering plants, and a few scattered shrubs. It was once fairly common in scattered areas of suitable habitat south of the Canadian Shield. However, steep declines since the 1960s have all but wiped this bird out as a breeding species in Ontario.<br>A few are still seen each spring at migration hotspots such as Point Pelee National Park, and a few may breed at selected locations.<br>  <br>Species occurrence as of May 24, 2013 as published on MNRF SAR website (above) include records for the lower Lake Simcoe area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Cultural meadow communities on site are much too small (<0.5ha) to provide habitat for this species. Grassland areas in the nearby Innisfil Beach Park are all manicured grass.<br><br>Species was not documented during July 2014 field survey. | No further effort recommended at this time. |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Bird | King Rail (*Rallus elegans*) | Endangered | Species and General Habitat Protection | King Rails are found in densely vegetated freshwater marshes with open shallow water that merges with shrubby areas. They are sometimes found in smaller isolated marshes but most seem to prefer larger, coastal wetlands. Its nest is a dinner-plate sized platform made of plant material, placed just above the water in shrubs or clumps of other marsh plants. | King Rails reach their northern limit in southern Ontario, where they are quite rare. Recent province-wide surveys suggest there are only about 30 pairs left, the majority of which are in the large wetlands bordering Lake St. Clair. Most of the remainder are found in several key coastal marshes along Lakes Erie and Ontario.<br>  <br>Species occurrence as of May 24, 2013 as published on MNRF SAR website (above) include records for the lower Lake Simcoe area. Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Wetland communities that exist on site are very narrow in size, and function primarily as a natural buffer to Alcona Creek rather than open wetland. Beach access at Lake Simcoe does not include coastal wetland.<br><br>Species was not documented during July 2014 field survey | No further effort recommended at this time. |
| Birds | Least Bittern (*Ixobrychus exilis*) | Threatened | Species and General Habitat Protection | In Ontario, the Least Bittern is found in a variety of wetland habitats, but strongly prefers cattail marshes with a mix of open pools and channels. This bird builds its nest above the marsh water in stands of dense vegetation, hidden among the cattails. The nests are almost always built near open water, which is needed for foraging. This species eats mostly frogs, small fish, and aquatic insects. | In Ontario, the Least Bittern is mostly found south of the Canadian Shield, especially in the central and eastern part of the province. Small numbers also breed occasionally in northwest Ontario.<br>  <br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Wetland communities that exist on site are very narrow in size, and function primarily as a natural buffer to Alcona Creek rather than open wetland.<br><br>Species was not documented during July 2014 field survey | No further effort recommended at this time. |
| Birds | Loggerhead Shrike (*Lanius ludovicianus*) | Threatened | Species and General Habitat Protection (General Habitat Description) | In Ontario, the Loggerhead Shrike prefers pasture or other grasslands with scattered low trees and shrubs. It lives in fields or alvars (areas of exposed bedrock) with short grass, which makes it easier to spot prey. It builds its nest in small trees or shrubs and hunts by waiting patiently in tree branches until it swoops down and attacks its unsuspecting prey – usually large insects, such as grasshoppers. General habitat protection is provided for the area up to 400m from a nest. | The Loggerhead shrike currently breeds in central and western North America. Until the 1970s, the Loggerhead shrike could be found at many locations throughout southern Ontario and other parts of northeastern North America, but it has declined dramatically. Although the occasional bird is still found within the broader former range, most remaining Loggerhead shrikes are now found in two core grassland habitats - the Carden Plain north of Lindsay, and the Napanee Limestone Plain. Every fall these birds migrate to the southern United States for the winter.<br>  <br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Cultural meadow communities on site are much too small (<0.5ha) to provide habitat for this species. Grassland areas in the nearby Innisfil Beach Park are all manicured grass. No pasture exists within the study area.<br><br>Species was not documented during July 2014 field survey. | No further effort recommended at this time. |

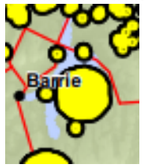
**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Birds | Louisiana Waterthrush (*Seiurus motacilla*) | Special Concern | N/A | Generally inhabits mature forests along steeply sloped ravines adjacent to running water. It prefers clear, cold streams and densely wooded swamps (MNRF, 2014). | In Canada, the Louisiana waterthrush breeds only in southern Ontario, along the Niagara Escarpment, in woodlands along Lake Erie and scattered locations elsewhere. It probably nests sporadically in southwestern Quebec, but breeding there has never been confirmed.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records in vicinity of the study area. | Habitat does not exist within the study area | No further effort recommended at this time |
| Birds | Peregrine Falcon (*Falco peregrinus*) | Special Concern | N/A | Peregrine Falcons usually nest on tall, steep cliff ledges close to large bodies of water. Although most people associate Peregrine Falcons with rugged wilderness, some of these birds have adapted well to city life. Urban peregrines raise their young on ledges of tall buildings, even in busy downtown areas. | Although Peregrine Falcons now nest in and around Toronto and several other southern Ontario cities, the majority of Ontario's breeding population is found around Lake Superior in northwestern Ontario.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records in vicinity of the project | Habitat does not currently exist within the study area | No further effort recommended at this time |
| Birds | Piping Plover (*Charadrius melodus*) | Endangered | Species and General Habitat Protection (General Habitat Description) | Piping Plovers nest exclusively on dry sandy or gravelly beaches just above the reach of high water and waves. When not migrating, this bird spends virtually all of its time between the water's edge and the back of the beach.<br>General habitat protection is provided for ELC community series between 50m and 500m (lengthwise) of the nest scrape. | In Ontario, although never common, they breed along the shores of the Great Lakes, and at Lake of the Woods in northwestern Ontario.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records in vicinity of the project | Sandy beach access exists, but is limited at the Lake Simcoe shoreline. Human influence and prevalence is likely to deter species.<br><br>Species was not observed during July 2014 field survey. | No further effort recommended at this time |
| Birds | Red-Headed Wood Pecker (*Melanerpes erythrocephalus*) | Special Concern | N/A | Generally prefer open oak and beech forests, grasslands, forest edges, orchards, pastures, riparian forests, roadsides, urban parks, golf courses, cemeteries, as well as along beaver ponds and brooks (MNRF, 2014). | The Red-headed Woodpecker is found across southern Ontario, where it is widespread but rare.<br>  <br>Species occurrence as of Feb 29, 2012 as published on MNRF SAR website (above) include records for the lower and middle Lake Simcoe area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Limited habitat available on site, including parkland, and woodland edges. Incidental presence is possible.<br><br>Species was not observed during July 2014 field survey | Avoidance of disturbance to this species could be achieved through use of timing windows to avoid vegetation removal during breeding season from March 25-August 31 |

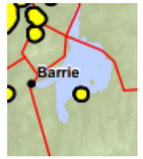
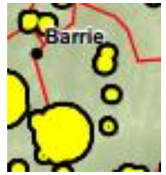
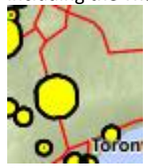
**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Birds | Whip-poor-will (*Caprimulgus vociferous*) | Threatened | Species and General Habitat Protection (General Habitat Description) | The Whip-poor-will is usually found in areas with a mix of open and forested areas, such as savannahs, open woodlands or openings in more mature, deciduous, coniferous and mixed forests. It forages in these open areas and uses forested areas for roosting (resting and sleeping) and nesting. It lays its eggs directly on the forest floor, where its colouring means it will easily remain undetected by visual predators. | Although Eastern Whip-poor-wills were once widespread throughout the central Great Lakes region of Ontario, their distribution in this area is now fragmented.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records in vicinity of the project.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Focused nocturnal surveys have not been completed at this time, however, suitable habitat does not exist within the study area | No further effort recommended at this time |
| Birds | Yellow Rail (*Coturnicops noveboracensis*) | Special Concern | N/A | Yellow Rails are secretive birds and live deep in the reeds, sedges, and marshes of shallow wetlands, where they nest on the ground. The marshy areas used by Yellow Rails have an overlying dry mat of dead vegetation that is used to make roofs for nests. | In Ontario, it is mainly found in the Hudson Bay Lowlands region, and is only found in localized marshes in southern Ontario. The breeding status of Yellow Rail in boreal regions south of the Hudson Bay Lowlands is uncertain. It winters along the southeastern coast of the United States and the Gulf of Mexico.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) include records in vicinity of the study area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Wetland communities that exist on site are very narrow in size, and function primarily as a natural buffer to Alcona Creek rather than open wetland.<br><br>Species was not documented during July 2014 field survey | No further effort recommended at this time. |
| Mammals | Little Brown Myotis (Myotis lucifugus) | Endangered | Species and general habitat protection | Overwintering habitat: Caves and mines that remain above 0C, Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh). | Not included in SAR list for Simcoe region accessed online (MNRF 2014a) but where wooded habitat is present, there is potential for SAR bats to occur. | Habitat does not currently exist within the study area. | No further effort recommended at this time |
| Mammals | Northern Myotis (Myotis septentrionalis) | Endangered | Species and general habitat protection | Overwintering habitat: Caves and mines that remain above 0C, Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.) | | | |
| Mammals | Eastern Small-footed Bat (Myotis leibii) | Endangered (uplisted June 27, 2014) | Species and general habitat protection. | During spring and summer this species will roost in or under rocks, buildings, bridges, caves, mines and hollow trees. This species may change its roost sites frequently or daily. | | | |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Reptiles | Blanding's Turtle (*Emydoidea blandingii*) | Threatened | Species and General Habitat Protection (General Habitat Description) | Generally occur in freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. The species prefers shallow water that is rich in nutrients, organic soils and dense vegetation. Adults dig their nest in a variety of loose substrates, including sand, organic soil, gravel and cobblestone. Overwintering occurs in permanent pools that average one metre in depth, or in slow-flowing streams. This species is known to travel long distances overland (7 km) in search of food or a mate. | Blanding's Turtles can be found throughout southern, central and eastern Ontario.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) include records for the vicinity of the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Alcona creek and associated wetlands are fairly narrow in size, with minimal large pool areas. Limited potential for incidental encounters.<br><br>Species was not observed during July 2014 field survey. | Potential impacts will be avoided through general mitigation for wildlife. |
| Reptiles | Common Five-lined Skink (*Plestiodon fasciatus*) | Special Concern (Great Lakes/St. Lawrence population) | N/A | Common Five-lined Skinks like to bask on sunny rocks and logs to maintain a preferred body temperature (28-36°C). During the winter, they hibernate in crevices among rocks or buried in the soil. There are two populations of Common Five-lined Skink in Ontario and they each occupy different types of habitat. The Southern Shield population can be found underneath rocks on open bedrock in forests. The Carolinian population can be found under woody debris in clearings with sand dunes, open forested areas, and wetlands. | In Canada, the species is limited to two distinct areas, along the southern margin of the Canadian Shield, and in the Carolinian Zone where it is found near the shores of Lakes Erie, St. Clair and Huron.<br>  <br>Records for this species are primarily north of study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Habitat does not exist within the study area | No further effort recommended at this time |
| Reptiles | Eastern Musk Turtle(Stinkpot) (*Sternotherus odoratus*) | Threatened | Species and General Habitat Protection (General Habitat Description) | Eastern Musk Turtles are found in ponds, lakes, marshes and rivers that are generally slow-moving have abundant emergent vegetation and muddy bottoms that they burrow into for winter hibernation. Nesting habitat is variable, but it must be close to the water and exposed to direct sunlight. Nesting females dig shallow excavations in soil, decaying vegetation and rotting wood or lay eggs in muskrat lodges, on the open ground or in rock crevices. | In Ontario, this species occurs at various locations throughout southwestern and eastern Ontario. The limited data available indicate that the stinkpot has disappeared from much of its original range in southwestern Ontario.<br>  <br>Species occurrence as documented in the Ontario Reptile and Amphibian Atlas (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Alcona creek and associated wetlands are fairly narrow in size, with minimal large pool areas. Limited potential for incidental encounters.<br><br>Species was not observed during July 2014 field survey. | Potential impacts will be avoided through general mitigation for wildlife. |
| Reptiles | Eastern Ribbonsnake (*Thamnophis sauritus*) | Special concern | N/A | The Eastern Ribbonsnake is usually found close to water, especially in marshes, where it hunts for frogs and small fish. A good swimmer, it will dive in shallow water, especially if it is fleeing from a potential predator. At the onset of cold weather, these snakes congregate in underground burrows or rock crevices to hibernate together. | In Ontario, this snake occurs throughout southern and eastern Ontario and is locally common in parts of the Bruce Peninsula, Georgian Bay and eastern Ontario.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | Alcona creek and associated wetlands are fairly narrow in size, with minimal large pool areas. Limited potential for incidental encounters.<br><br>Species was not observed during July 2014 field survey. No hibernacula were observed. | Potential impacts will be avoided through general mitigation for wildlife. |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Reptiles | Massasauga Rattlesnake (*Sistrurus catenatus)* | Threatened | Species and General Habitat Protection (General Habitat Description) | Massasaugas live in different types of habitats throughout Ontario, including tall grass prairie, bogs, marshes, shorelines, forests and alvars. Within all of these habitats, Massasaugas require open areas to warm themselves in the sun. Pregnant females are most often found in open, dry habitats such as rock barrens or forest clearings where they can more easily maintain the body temperature required for the development of their offspring. Non-pregnant females and males forage and mate in lowland habitats such as grasslands, wetlands, bogs and the shorelines of lakes and rivers. Massasaugas hibernate underground in crevices in bedrock, sphagnum swamps, tree root cavities and animal burrows where they can get below the frost line but stay above the water table. | In Canada, the Massasauga is found only in Ontario, primarily along the eastern side of Georgian Bay and on the Bruce Peninsula. Two small populations are also found in the Wainfleet Bog on the northeast shore of Lake Erie and near Windsor.<br>  <br>Species occurrence as of Feb 29, 2012 as published on MNRF SAR website (above) include records for the lower Lake Simcoe area.<br>Species included in SAR list for Simcoe region accessed online (MNRF 2014a). | Wetland communities that exist on site are very narrow in size, and function primarily as a natural buffer to Alcona Creek rather than open wetland. Very minimal habitat opportunity exists on site.<br><br>Species was not documented during July 2014 field survey | No further effort recommended at this time. |
| Reptiles | Milksnake (*Lampropeltis triangulum*) | Special concern | N/A | The Milksnake can be found in a range of habitats including rocky outcrops, fields and forest edges. In southern Ontario, it is often found in old farm fields and farm buildings where there is an abundance of mice. The Milksnake hibernates underground, in rotting logs or in the foundations of old buildings. | In Ontario, it is widespread and locally common in southern Ontario, and can be found as far north as Lake Nipissing and Sault Ste. Marie.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) includes records for the vicinity of the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | To date no specialized habitat for the species is identified on site (e.g. hibernacula). Habitat generalist, therefore potential for incidental encounter within Study area | Potential impacts will be avoided through general mitigation for wildlife. |
| Reptiles | Northern Map Turtle (*Graptemys geographica*) | Special concern | N/A | The Northern Map Turtle inhabits rivers and lakeshores where it basks on emergent rocks and fallen trees throughout the spring and summer. In winter, the turtles hibernate on the bottom of deep, slow-moving sections of river. They require high-quality water that supports the female's mollusc prey. Their habitat must contain suitable basking sites, such as rocks and deadheads, with an unobstructed view from which a turtle can drop immediately into the water if startled. | In southern Ontario, it lives primarily on the shores of Georgian Bay, Lake St. Clair, Lake Erie and Lake Ontario, and along larger rivers including the Thames, Grand and Ottawa.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | No rivers present within study area. Alcona Creek is more narrow and shallow to allow for appropriate habitat.<br><br>Species was not observed during July 2014 field survey. | No further effort recommended at this time. |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Reptiles | Snapping Turtle (*Chelydra serpentina*) | Special concern | N/A | This turtle is often found in many types of freshwater bodies, including ponds with soft mud bottom, slow-moving streams, persistent wetland areas, as well as man-made features like golf course ponds or irrigation channels. (SARA Public Registry). Snapping turtles prefer shallow waters so they can hide under soft mud and leaf litter with only their noses exposed. During the nesting season females travel in search of suitable nesting sites, usually gravelly or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits. Overwintering habitat is in the form of ponds of sufficient depth not to freeze in the winter season. | In Ontario this species is primarily limited to the southern part of the province.<br>  <br>Widespread species occurrence as published on MNRF SAR website (above) include records for the study area.<br>Species included in SAR list for Simcoe region (MNRF 2014a). | To date no specialized habitat for the species is identified on site (e.g. ponds, hibernacula). Habitat generalist, therefore potential for incidental encounter within Study area<br><br>Species was not observed during July 2014 field survey. | Potential impacts will be avoided through general mitigation for wildlife. |
| Fish | American Eel (*Anguilla rostrata*) | Endangered | Species and General Habitat Protection | Found near cover over muddy bottoms in lakes, ponds, rivers and creeks at depths <15 m; preferred water temperature range 16-19°C. | Great Lakes and tributaries, St. Lawrence River and tributaries, Ottawa River and tributaries (extirpated); native to Lake Ontario, Ottawa River and St. Lawrence River watersheds. | American Eel habitat is included in DFO mapping of Lake Simcoe (Section 2.1). Follow up consultation with MNRF indicates this species is not considered to have a productive population within Lake Simcoe and that tributaries in the study area do not provide suitable habitats critical to the species' life history (Appendix F). | Impacts to aquatic habitat will be avoided through general mitigation and best management practices. |
| Fish | Lake Sturgeon (*Acipenser fulvenscens*) (Great Lakes/Upper St. Lawrence population) | Threatened | Species and General Habitat Protection | The Lake Sturgeon lives almost exclusively in freshwater lakes and rivers with soft bottoms of mud, sand or gravel. They are usually found at depths of five to 20 metres. They spawn in relatively shallow, fast-flowing water (usually below waterfalls, rapids, or dams) with gravel and boulders at the bottom. However, they will spawn in deeper water where habitat is available. They also are known to spawn on open shoals in large rivers with strong currents. Preferred water temperature ranges from 15-17°C. | In Ontario, the Lake Sturgeon is found in the rivers of the Hudson Bay basin, the Great Lakes basin and their major connecting waterways, including the St. Lawrence River. Species included in SAR list for Simcoe region (MNRF 2014a). | Lake Sturgeon habitat is included in DFO mapping of Lake Simcoe (Section 2.1). Consultation with MNRF Midhurst District indicates that this species is considered extirpated from Lake Simcoe (Appendix F). | Impacts to aquatic habitat will be avoided through general mitigation and best management practices. |

**Appendix E, Table 1:** Screening for Species-at-Risk in Study Area (to include species listed for Simcoe Region on MNRF website, and SAR identified through background review, MNRF consultation and field investigation).

| Group | Species | Designation (COSSARO) | ESA Protection (MNRF, 2014a) | Habitat Description (MNRF, 2014a) | Background Information & Agency Consultation | Habitat Potential | Further Effort Recommended |
|---|---|---|---|---|---|---|---|
| Fish | Northern Brook Lamprey | Special Concern | N/A | The Northern brook lamprey inhabits clear, coolwater streams. The larval stage requires soft substrates such as silt and sand for burrowing which are often found in the slow-moving portions of a stream. Adults are found in areas associated with spawning, including fast flowing riffles comprised of rock or gravel.<br>Spawning occurs in May and June. The males construct small, often inconspicuous, nests by picking up pebbles with their mouths and moving them to form the rims of shallow depressions. The sticky eggs are deposited in the nest and adhere to the substrate. | In Ontario, it lives in rivers draining into Lakes Superior, Huron and Erie, and the Ottawa River.<br>  <br>Species occurrence as of Feb. 29, 2012 as published on MNRF SAR website (above) does not include records for study area. | No records of this species were included in fish sampling records documented in the 2011 ESR. Consultation with MNRF Midhurst District indicates that this species does not occur in Lake Simcoe (Appendix F). | Impacts to aquatic habitat will be avoided through general mitigation and best management practices. |

MNRF 2014. Species at Risk Website as accessed at: https://www.ontario.ca/environment-and-energy/species-risk-region?name=Simcoe

# APPENDIX F
# AGENCY CONSULTATION

## Lynette Renzetti

**From:** Findlay, Graham (MNR) <graham.findlay@ontario.ca>
**Sent:** October-07-14 12:08 PM
**To:** Lynette Renzetti
**Subject:** RE: American Eel

Hello Lynette to follow-up on our discussion here are a few comments for your consideration …

- Regarding the potential for lake sturgeon in Lake Simcoe and its tributaries, the Lake Simcoe Fisheries Assessment Unit in their species list for Lake Simcoe note lake sturgeon as considered extirpated from Lake Simcoe.
- Northern brook lamprey are not listed as a species collected from Lake Simcoe.
- As discussed an American eel had been caught in 2011 in fish salvage work related to reconstruction of the Holland Marsh canals; and in October 2012 an eel was captured in Lake Simcoe during the lake trout egg collection trap netting. At this point we are not considering American eel to have a productive population within Lake Simcoe; and we do not feel the subject tributary would provide suitable habitats critical to their life history.

As for additional fish community sampling, given the project proposes to directionally drill under the subject creek to install the watermain we accept additional sampling will not further inform the project planning. We are not recommending more sampling be done in this instance.

Regarding the proposed methods for installing the watermain we recommend appropriate sedimentation controls be applied and maintained in working order around construction areas in order to prevent sediment from entering any water course or waterbody. All disturbed areas should be stabilized and protected from erosion immediately on completion of work; sediment controls should remain in place until those areas are stable against erosion. Please call with any further questions.

Regards,

Graham Findlay
Management Biologist
Huronia Area, Midhurst, MNRF
(705) 725-7530
(705) 725-7584 fax
graham.findlay@ontario.ca

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**From:** Lynette Renzetti [mailto:LRenzetti@lglcambridge.com]
**Sent:** October 3, 2014 3:45 PM
**To:** Findlay, Graham (MNR)
**Subject:** American Eel

HI Graham
I have left you a voicemail this afternoon. I was hoping to get some feedback on the potential for American Eel in Alcona Creek in Innisfil as it drains into Lake Simcoe. We are working on an EA addendum for the Lakeshore Water Treatment Plant Expansion in Innisfil.

DFO mapping seems to indicate habitat and information received from Dave Balint at DFO (below) indicates that the habitat as indicated in DFO mapping for Lake Simcoe in orange is for American Eel and Lake Sturgeon. There is a coloured trib that appears within the study area of Innisfil Beach Park, so I am guessing this is Alcona Creek. AECOM did some electrofishing of Alcona Creek in 2010 when the original EA was conducted for expansion of the Lakeshore Water Treatment Plant, no American Eel caught but not sure of the effort expended. Habitat in the area is sandy, small trib (0.5- 1m wide), with a coldwater fish assemblage documented by AECOM (pictured below). Project activity is to install

a watermain across the creek using trenchless technology. ESR documentation from the original ESR indicates that MNR was consulted but not sure to what extent. I was wondering if there are records for fish SAR for Alcona Creek that you might be aware of and what your feeling is regarding the need for presence/absence surveys in addition to the 2010 electrofishing survey conducted. I would appreciate if you could give me a call to discuss further.

The DFO mapping for the area indicates that all of Lake Simcoe is potential habitat for American Eel and Lake Sturgeon (Figure 2). American Eel (*Anguilla rostrata*) is listed provincially as Endangered and federally as Threatened; while the Lake Sturgeon (*Acipenser fulvenscens*) is listed both provincially and federally as Threatened. DFO indicates that records for Lake Sturgeon for the lake are somewhat dated such that the species may be considered extirpated from the lake. Further consultation with MNRF would be needed to confirm if this is the case (D. Balint, DFO, pers. comm.).

Figure 2: Department of Fisheries and Oceans (DFO) mapping for fish species at risk in the vicinity of the study area.

Kind regards,

Lynette Renzetti
Planning Ecologist

LGL LIMITED
environmental research associates
445 Thompson Drive, Unit 2
Cambridge Ontario N1T 2K7
Tel 519-622-3300 Fax 519-622-3310
email cambridge@lgl.com

# Appendix B

## Stage 1 AA Report (Archeoworks Inc.)

ARCHEOWORKS INC.

# Stage 1 Archaeological Assessment: Lakeshore Water Treatment Plant Expansion Municipal Class Environmental Assessment Within Lot 26, Concession 8 Geographic Township of Innisfil Now the Town of Innisfil Simcoe County Ontario

**Project #: 043-IN1305-14**
**Licensee (#): Alvina Tam (P1016)**
**PIF#: P1016-0018-2014**

**Original Report**

**November 18th, 2014**

**Presented to:**
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**Prepared by:**
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# EXECUTIVE SUMMARY

*Archeoworks Inc.* was retained by *CH2M HILL Canada Limited* to conduct a Stage 1 Archaeological Assessment (AA) for the proposed expansion of the Lakeshore Water Treatment Plant within Lot 26, Concession 8, in the Town of Innisfil, Simcoe County, as part of a Municipal Class Environmental Assessment (EA).

The Stage 1 AA identified potential for the recovery of Aboriginal and Euro-Canadian archaeological remains within undisturbed portions of the study area due to the presence or proximity to the following features: water sources (an unnamed stream, Alcona Creek, Lake Simcoe); the known presence of a former homestead within the property; and two historic transportation routes, presently known as 25th Sideroad and Innisfil Beach Road.

Based on the established elevated archaeological potential, it is recommended that following the finalization of project design and the delineation of construction impact/activity areas, that:

1. Portions identified as undisturbed be subjected to a Stage 2 AA employing test pit survey at five-metre intervals in accordance with *Section 2.1.2* of the 2011 *Standards and Guidelines for Consultant Archaeologists*.

2. Portions identified as potentially disturbed must be subjected to a judgmental Stage 2 test pit survey in accordance with *Section 2.1.8* of the 2011 *Standards and Guidelines for Consultant Archaeologists.* Should any of these areas be identified in the field as undisturbed, test pit survey at standard five-metre intervals must be undertaken.

3. Portions classified as having low or no archaeological potential due to disturbances or physical features (e.g., permanently wet areas, steep slopes, etc.) must be subjected to an on-site visual survey to confirm and document their nature and extent. Only then can these areas be exempt from Stage 2 test pit survey.

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**LIST OF TABLES**

# PROJECT PERSONNEL

Project Director ..... Alvina Tam - MTCS licence P1016

Report Preparation ..... Jay Villapando

Report Review ..... Nimal Nithiyanantham – MTCS licence P390
Kim Slocki – MTCS licence P029

Historical Research ..... Lee Templeton – MTCS licence R454

Graphics ..... Lee Templeton – MTCS licence R454
Jay Villapando

# 1.0 PROJECT CONTEXT

## 1.1 Objective

The objectives of a Stage 1 Archaeological Assessment (AA), as outlined by the 2011 *Standards and Guidelines for Consultant Archaeologists* (*'2011 S&G'*) (2011), are as follows:

- To provide information about the property's geography, history, previous archaeological fieldwork and current land condition;
- To evaluate in detail the property's archaeological potential, which will support recommendations for Stage 2 survey for all or parts of the property; and,
- To recommend appropriate strategies for Stage 2 survey.

## 1.2 Development Context

*Archeoworks Inc*. was retained by *CH2M HILL Canada Limited* to conduct a Stage 1 AA as part of the proposed expansion of the existing Lakeshore Water Treatment Plan (WTP) located within Lot 26, Concession 8, in the Town of Innisfil, Simcoe County. The potential impact area of the project (henceforth referred to as the 'study area') is roughly bounded by Park Road to the north, 25th Sideroad to the west, Innisfil Beach Road to the south, and Lake Simcoe to the east (***see Appendix A – Map 1***).

This study was triggered by the *Ontario Municipal Class Environmental Assessment Act* in support of the Lakeshore WTP Expansion Municipal Class EA completed in 2011. The preferred design concept identified in the 2011 Environmental Study Report involved the following proposal: expand the WTP facility northward; expand the Low Lift Pumping Station (LLPS) northward; and twin the existing Lake Simcoe intake and watermain between the WTP and the LLPS. This Stage 1 AA will provide an evaluation of the study area's archaeological potential and provide recommendations for appropriate Stage 2 survey strategies prior to the commencement of construction activities; the preferred design concept falling within the limits of the Stage 1 study area. The Stage 1 AA was conducted under the project direction of Ms. Alvina Tam, under the archaeological consultant licence number P1016, in accordance with the *Ontario Heritage Act* (2009). Permission to investigate the study area was granted by *CH2M HILL Canada Limited* on July 29th, 2014.

## 1.3 Historical Context

The *2011 S&G*, published by the *Ministry of Tourism, Culture and Sport* (MTCS) considers areas of early Euro-Canadian settlement, including places of early military pioneer or pioneer settlement (e.g., pioneer homesteads, isolated cabins, and farmstead complexes), early wharf or dock complexes, and pioneer churches and early cemeteries, as having archaeological potential. There may be commemorative markers of their history, such as local, provincial, or

federal monuments or heritage parks. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed in a municipal register or designated under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site, and properties that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations are also considered to have archaeological potential.

To establish the archaeological and historical significance of the study area, *Archeoworks Inc*. conducted a comprehensive review of listed and designated heritage properties, and registered archaeological sites within close proximity to its limits. Furthermore, a review of the physiography of the overall area and its correlation to locating archaeological remains, as well as consultation of available historical documentation was performed.

The results of this background research are documented below and summarized in **Appendix B – Summary of Background Research.**

### 1.3.1 Pre-Contact Period

#### *1.3.1.1 The Paleo-Indian Period*

The region in which the study area is situated was first inhabited after the final retreat of the North American Laurentide ice sheet 15,000 years ago (or 13,000 B.C.) (Stewart, 2013, p.24). Massive amounts of glacial meltwater expanded against the retreating ice boundary in the north, flooding the Huron and Georgian Bay and occupying much of the Simcoe lowlands (Stewart, 2013, p.25). Eventually, the water within these basins coalesced, forming glacial Lake Algonquin which "covered parts or all of Lake Huron, Lake Superior, and Erie basins, which included Lake Simcoe and Lake Couchiching" (Frim, 2002, p.xi; Karrow and Warner, 1990, p.15). The lessening ice load created isostatic rebound, causing abandoned shorelines to tilt northward towards the ice centre which caused water to accumulate along the southern shorelines, creating the main glacial strandline of Lake Algonquin which extended around the southern shore of Lake Simcoe (Karrow and Warner, 1990, p.15). This strandline is marked by a number of erosional and depositional features including high bluffs, off-shore bars and limestone scarps where wave erosion cut into the bedrock (Storck, 1982, p.9). Along this shoreline and beaches of Lake Algonquin, there is definite evidence of human occupations (Karrow and Warner, 1990, p.15).

Initial vegetation of southern Ontario was tundra-like. As the average climatic temperature warmed and spruce trees were replaced by birch, red pine and jack pine, small groups of Paleoindians entered Southern Ontario (Karrow and Warner, 1990, p.22; Stewart, 2013, p.28). Paleoindians are thought to have been small groups of nomadic hunter-gatherers who depended on naturally available foodstuff such as game or wild plants (Ellis and Deller, 1990, p.38). For much of the year, Paleoindians "hunted in small family groups; these would periodically gather into a larger grouping or bands during a favourable period in their hunting cycle, such as the annual annual caribou migration" (Wright, 1994, p.25). Plentiful aquatic resources and open vegetation allowed for easy hunting of both caribou and mastodons in low and wet habitats found within exposed lake beds (Jackson et al., 2000, p.435).

Paleoindian sites are extraordinarily rare and consist of "stone tools clustered in an area of less than 200-300 metres" (Ellis, 2013, p.35). These sites appear to have been campsites used during travel episodes and can be found on well-drained soils in elevated situations, which would have provided a more comfortable location in which to camp and view the surrounding territory (Ellis and Deller, 1990, p.50). Traditionally, Paleoindian sites have been located primarily along abandoned glacial lake strandlines or beaches. However, this view is biased as these are the only areas in which archaeologists have searched for sites, due to current understanding the region's geological history (Ellis and Deller, 1990, p.50; Ellis, 2013, p.37). In areas where attention has been paid to non-strandline areas and to older strandlines, sites are much less concentrated and are more ephemeral (Ellis and Deller, 1990, p.51). The artifact assemblage from this period is characterized by fluted and lanceolate stone points, scrapers, and small projectile points produced from specific chert types (Ellis and Deller, 1990). Distinctive dart heads were used to kill game, and knives for butchering and other tasks (Wright, 1994, p.24). These items were created and transported over great distances while following migratory animals within an extensive territory.

The continuing retreat of the glaciers between 10,500 and 10,000 B.P. (ca. 8500-8000 B.C.) and glacial uplift uncovered a series of lower outlets near the North Bay, Ontario and water flooded the Ottawa River. The level of Lake Algonquin rapidly fell to form a series of short-lived post-Algonquin lakes located in the Georgian Bay and Lake Huron Basins which "exposed about half the present lake floor areas as dry land" (Karrow and Warner, 1990, p.17; Larson and Schaetzl, 2001, p.532; Jackson et al., 2000, p.419). These low-water lakes exposed as much as 12,000 to 14,000 sq. km. of lake plain along the Ontario side of modern Lake Huron (Jackson, 2004, p.38). Streams and stream valleys extended throughout the flat newly-exposed lake plain, opening large tracts of land available for flora and fauna to colonize (Karrow, 2004, p. 8; Karrow and Warner, 1990, p. 17).

#### *1.3.1.2 The Archaic Period*

As isostatic uplift continued, drainage through the North Bay outlet was closed off, elevating water levels in the Huron Basin to levels higher than modern levels (Jackson et al., 2000, p.419). This high water phase is known as the "Nipissing Phase, which inundated large areas probably previously occupied by humans" (Karrow and Warner, 1990, p. 21). It is generally believed that during the Nipissing Phase, water levels reached the same elevation as those during the Lake Algonquin Phase along the same strandlines, and occupied Lake Superior, Lake Michigan and Lake Huron basins forming one contiguous lake (Jackson et al., 2000, p.419). However, isostatic uplift in the north "meant that most of the Lake Simcoe area of south central Ontario flooded by Algonquin was not reoccupied by Nipissing waters" (Jackson et al., 2000, p.420).

The climate steadily warmed, deciduous trees slowly began to permeate throughout southern Ontario, creating mixed deciduous and coniferous forests (Karrow and Warner, 1990, p.30). The "Archaic peoples are the direct descendants of Paleoindian ancestors" that have adapted to meet new environmental and social conditions (Ellis, 2013, p.41; Wright, 1994, p.25). The Archaic Period is divided chronologically and cultural groups are divided geographically and sequentially. Archaic Aboriginals lived in "hunter-gatherer bands whose social and economic

organization was probably characterized by openness and flexibility" (Ellis et al., 1990, p.123). This fluidity creates 'traditions' and 'phases' which encompass large groups of Archaic Aboriginals (Ellis et al., 1990, p.123).

Few Archaic sites have faunal and floral preservation and lithic scatters are often the most common Archaic Aboriginal site type (Ellis et al., 1990, p. 123). House structures have "left no trace" due to the high acidic content of Ontario soils (Wright, 1994, p.27). Burial, grave goods and ritual items, although very rare, appear. By the Late Archaic, multiple individuals were buried together, suggesting semi-permanent communities were in existence (Ellis, 2013, p.46). Ceremonial and decorative items also appear on Archaic Aboriginal sites through widespread trade networks, such as conch shells from the Atlantic coast and galena from New York (Ellis, 2013, p.41). Through trade with the northern Archaic Aboriginals situated around Lake Superior, native copper was initially utilized to make hooks and knives but gradually became used for decorative and ritual items (Ellis, 2013, p.42).

During the Archaic period, stone points were reformed from the fluted and lanceolate points to stone points with notched bases to be attached to a wooden shaft (Ellis, 2013, p.41). The artifact assemblages from this period are characterized by a reliance on a wide range of lithic raw materials in order to make stone artifacts, the presence of stone tools shaped by grinding and polishing, and an increase in the use of polished stone axes and adze as wood working tools (Ellis et al., 1990, p. 65; Wright, 1994, p.26). Ground-stone tools were also produced from hard stones and reformed into tools and throwing weapons (Ellis, 2013, p.41). The bow and arrow was first used during the Archaic period (Ellis, 2013, p.42).

Between approximately 6,000 and 5,000 years ago (or 4,000 B.C. and 3,000 B.C.), water levels in Lake Algonquin dropped as catastrophic flooding broke through a barrier of sediment at Sarnia-Port Huron (Stewart, 2013, p.29). Uplift in the north continued, and southward tilting at the end of Cook's Bay in Lake Simcoe backed up the Holland River, creating a long embayment that extended southward into the Oak Ridges Moraine forming a "finger" of the former Lake Algonquin (Stewart, 2013, p.25). This embayment formed a marsh, the Holland Marsh, where dead vegetation accumulated at about 30 centimetres per 500 years, forming a layer of organic material overlying a clay pan in the basin (Karrow and Warner, 1990, p.21; Blair, 2012). After this time, the environment began to stabilize.

#### *1.3.1.3. The Woodland Period*

The Woodland period is divided chronologically into subsequent stages of cultural development. Early Woodland cultures evolved out of the Late Archaic period (Ferris and Spence, 1995, p. 89; Spence et al., 1990, p.168). The distinguishing characteristic of the Early Woodland period is the introduction of pottery (ceramics), although the earliest forms are coil-formed, "thick, friable and often under fired, and must have been only limited to utility usage" (Ferris and Spence, 1995, p.89; Williamson, 2013, p.48). The Early Woodland Period is divided into two complexes: the Meadowood complex and the Middlesex complex. The Middlesex complex appears to be restricted to Eastern Ontario, particularly along the St. Lawrence River,

while Meadowood materials depict a broad extent of occupation in southwestern Ontario (Spence et al., 1990, p.134, 141).

Cache Blades or 'quaternary blanks', a formal chipped stone technology during the Early Woodland period, were employed to make tool types from secondary chipping using primarily Onondaga chert (Ferris and Spence, 1995, p.93; Spence et al., 1990, p.128). Meadowood sites have produced a number of distinctive material culture that function in both domestic and ritual spheres (Ferris and Spence, 1995, p.90; Spence et al., 1990, p. 128). This allows correlations to be made between habitations and mortuary sites that create a well-rounded view of Meadowood culture (Ferris and Spence, 1995, p.90; Spence et al., 1990, p. 128). However, the settlement-subsistence system is poorly understood as only a "few settlement types have been adequately investigated, and not all of these are from the same physiographic regions" (Ferris and Spence, 1995, p.93; Spence et al., 1990, p. 136). Generally, Meadowood sites are in association with the Point Peninsula and Saugeen complexes and "then eventually changed or were absorbed into the Point Peninsula complex" (Wright, 1994, pp. 29-30).

During the Middle Woodland Period, the Point Peninsula complex was "distributed throughout south-central and eastern Southern Ontario, the southern margins of the Canadian Shield, the St. Lawrence River down river to Quebec City, most of southeastern Quebec, and along the Richelieu River into Lake Champlain" (Spence et al., 1990, p.157; Wright, 1999, p.633). Subsequently, the Saugeen complex occupied "southwestern Southern Ontario from the Bruce Peninsula on Georgian Bay to the north shore of Lake Erie" (Wright, 1999, p.629). The Saugeen and Point Peninsula culture shared Southern Ontario but the Saugeen culture appears to have "occupied the region between Lake Huron and Lake Erie to the west of Toronto" (Wright, 1994, p.30). The borders between cultures are not well defined, and many academics believe that the Niagara Escarpment formed a frontier between the Saugeen complex and the Point Peninsula complex (Spence et al., 1990, p.143; Wright, 1999, p.629; Ferris and Spence, 1995, p.98). Consequently, the dynamics of hunter-gatherer societies shifted territorial boundaries resulting in regional clusters throughout southwestern Southern Ontario that have been variously assigned to Saugeen, Point Peninsula, or independent complexes (Spence et al., 1990, p.148; Wright, 1999, p.649).

Middle Woodland pottery appears as globular pots where decoration was stamped producing scallop-edge or tooth-like impressions (Williamson, 2013, p.49; Ferris and Spence, 1995, p. 97). Major changes in settlement-subsistence systems occurred in the Middle Woodland, particularly the introduction of large 'house' structures and substantial middens associated with these structures (Spence et al., 1990, p.167; Ferris and Spence, 1995, p. 99). The larger sites likely indicate a prolonged period of macroband settlement and a more consistent return to the same site, rather than an increase in band size (Spence et al., 1990, p. 168). Environmental constraints in different parts of southern Ontario all produce a common implication of increased sedentism caused by the intensified exploitation of local resources (Ferris and Spence, 1995, p. 100). Burial offerings became more ornate and encompassed many material mediums, including antler, whetstones, copper and pan pipes (Ferris and Spence, 1995, p.

99). Burial sites during this time were set away from occupation sites and remains were buried at time of death; secondary burials were not common (Ferris and Spence, 1995, p. 101). Small numbers of burial mounds are present, particularly around Rice Lake, and both exotic and utilitarian items were left as grave goods (Williamson, 2013, p.51; Ferris and Spence, 1995, p.102).

After A.D. 900, during the Late Woodland Period, the Ontario Iroquoian culture flourished throughout much of southern Ontario (Bursey et al., 2013). Multiple sub-stages and complexes have been assigned to this period, are divided spatially and chronologically, and eventually progressed into the historic Contact Period groups of the Late Ontario Iroquois Stage (Williamson, 1990; Dodd et al., 1990). Although several migration theories have been suggested explaining the Iroquoian origins, "available data from southern Ontario strongly suggests continuity (*in situ*) from the transitional Princess Point complex and Late Woodland cultural groups" (Ferris and Spence, 1995, p. 105; Smith, 1990, p.283). Villages developed as horticulture gradually began to take on a more central importance in subsistence patterns, particularly the farming of maize, squash, and beans, supplemented by fishing, hunting, and gathering. "Communities established a base camp around which land was cleared for crops, while hunting, fishing and gathering parties were sent out to satellite camps" (Williamson, 2013, p.55). With the introduction of farming, descent was traced matrilineal and matrilocal residence was practiced (Williamson, 1990, p.317; Williamson, 2013, p.55). House structures were initially oval and gradually became longhouses, and later, villages were fortified (Williamson, 1990; Dodd et al., 1990).

Consequently, as horticulture became the primary subsistence, native groups gradually relocated from the northern shores of Lake Ontario further inland likely as a result of depleting resources and growing aggression between native communities. During the Late Ontario Iroquoian stage, the historic Contact Period Iroquoian-speaking linguistic groups developed. Neighbouring Iroquois-speaking nations united to form several confederacies known as the Huron (Wendat), Neutral (called Attiewandaron by the Wendat), or Petun (Tionnontaté or Khionontateronon) in Ontario, and the Five Nations of the Iroquois (Haudenosaunee) of upper New York State (Birch, 2010, p.31; Warrick, 2013, p.71). These groups are located primarily in south and central Ontario. Each group was distinct but shared a similar pattern of life already established by the sixteenth century (Trigger, 1994, p.42).

### 1.3.2 Contact Period

From Samuel de Champlain's visit of the Huron-Wendat territory to the great epidemics of 1630, the Huron-Wendat population was reported to be approximately 30,000 individuals (Heidenreich, 1978, p.369). Their homeland is considered north of Lake Simcoe but their territorial homeland and hunting grounds, known as Wendake, stretched roughly between the Canadian Shield along the Frontenac Axis, Lake Ontario and the Niagara Escarpment (Warrick, 2008, p.12). The western boundary is often contested, with a number of sites between the Niagara Escarpment and the Humber River occupied by a mixed Neutral-Wendat population (Warrick, 2008, p.15). It is speculated that four nations, the Attignawantan, Tahontaenrat, Attigneenongnahac, and Arendahronon, amalgamated to form a single Huron-Wendat

Confederacy in defense against the continual aggression of the Haudenosaunee (Warrick, 2008, p.11; Trigger, 1994, p.41).

Settlement patterns were complex. Village sites were chosen for their proximity to sources of "water, arable soils, available firewood, [and] a young secondary forest, [as well as] a defendable position" (Heidenreich, 1978, p.375). Longhouse sizes depended on the size of the extended family that inhabited it; however, archaeological evidence suggests that the average longhouse was 25 feet by 100 feet, with heights about the same as widths (Heidenreich, 1978, p.366). Villages consisted of up to 100 longhouses clustered closely together, and only the largest villages on the frontier were fortified (Heidenreich, 1978, p.377). Subsistence patterns reflect a horticultural diet that was supplemented with fish rather than meat (Heidenreich, 1978, p.377). 'Slash-and-burn' farming was used to quickly and efficiently clear trees and brushwood for flour and flint corn fields (Heidenreich, 1978, p.380). These were consistently cultivated until no longer productive, at which point the village was abandoned, an event that took place about every eight to twelve years (Heidenreich, 1978, p.381).

By 1609, Samuel de Champlain had encountered the Huron-Wendat, in particular the Arendahronon. Desiring greater quantities of furs, the French concluded a trading relationship with the Huron-Wendat (Trigger, 1994, p.68; Heidenreich, 1978, p.386). Consequently, the Huron-Wendat became the middlemen for trade goods between the French and their Algonquin, Nipissing, Tionnontaté, and Attiewandaron neighbours. By mid-1620, the Huron-Wendat had exhausted all available pelts in their own hunting territories and opted to trade European goods for tobacco and furs from their neighbours (Trigger, 1994, pp.49-50).

During the 1630s, Jesuit missionaries attempted to convert the entire Huron-Wendat Confederacy to Christianity as the initial phase of a missionary endeavour to convert all native people in Southern Ontario (Trigger, 1994, p.51). However, the Jesuits' presence in the region had become precarious after a series of major epidemics of European diseases that killed nearly two-thirds of the Huron-Wendat population, lowering the total population to approximately 10,000 individuals (Warrick 2008, p.245; Heidenreich, 1978, p.369). These epidemics hit children and elderly the worst. The death of their elders deprived the Huron-Wendat of their experienced political, military, and spiritual leaders, leaving them more susceptible to Christian missions and conversion (Trigger, 1994, p.52; Heidenreich, 1978, p.371).

By 1645, having grown dependent on European goods and with their territory no longer yielding enough animal pelts, the Haudenosaunee became increasingly aggressive towards the Huron-Wendat Confederacy (Trigger, 1994, p.53). Armed with Dutch guns and ammunition, the Haudenosaunee engaged in warfare with the Huron-Wendat Confederacy and brutally attacked and destroyed several Huron-Wendat villages throughout Southern Ontario (Trigger, 1994, p.53). After the massacres of 1649-50, the Huron-Wendat Confederacy dispersed widely through the Great Lakes region (Schmalz, 1991, p.17).

### 1.3.3 Post Contact Period

In the 1660s, the Haudenosaunee, despite their homeland being located south of the Great Lakes, controlled most of Southern Ontario, occupying at "least half a dozen villages along the north shore of Lake Ontario and into the interior" (Schmalz, 1991, p.17; Williamson, 2013, p.60). The Haudenosaunee established settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. Their settlements were on canoe-and-portage routes that linked Lake Ontario to Georgian Bay and the upper Great Lakes (Williamson, 2013, p.60). Such trade routes included the ancient Toronto Carrying Place Trail or "Humber Passage". This passage was a crucial trade and travel route that connected Lake Ontario to Lake Simcoe by means of the Humber River; it passed over the Oak Ridges Moraine and went up to the Holland River to Cooks Bay and into Lake Simcoe. It was an ancient highway, about 46 kilometres in length, and was used for hundreds of years by many groups. The origins of the trail are not known; however, its place in the history of the region is undisputed (Robinson, 1965).

As early as 1653, the Ojibwa of the Anishinaabeg, an Algonquin-speaking linguistic group, wanted control of the land between Lake Huron and Lake Ontario in order to further their role in the fur trade (Johnston, 2004, p.9). Before contact with the Europeans, the Ojibwa territorial homeland was situated inland from the north shore of Lake Huron (MNCFN, ND, p.3; Hunter, 1909a, p.9). In 1640, the Jesuit fathers had recorded the name "*oumisagai*, or Mississaugas, as the name of the group who resided near the Mississagi River on the northwestern shore of Lake Huron. The French, and later English, applied this same designation to all Algonquian-speaking groups settling on the north shore of Lake Ontario (Smith, 2002, p. 107).

After a major smallpox epidemic in 1662, the capture of New Netherland by the English in 1664 curtailing access to guns and powder, and a series of successful attacks against the Haudenosaunee by the Ojibwa from 1653 to 1662, the Haudenosaunee dominance in the region began to fail (Warrick, 2008, p.242; Schmalz, 1991, p.20). By 1680, the Ojibwa had begun to settle just north of the evacuated Huron-Wendat territory, and as the English entered the fur-trading market, the Ojibwa began to expand into southern Ontario (Gibson, 2006, p. 36; Schmalz, 1991, p.18). The Mississauga moved southward against the Haudenosaunee, and utilized the Carrying Place Trail to defeat the Haudenosaunee at the mouth of the Humber River (Gibson, 2006, p. 37; Schmalz, 1991, p.27). By the 1690s, Haudenosaunee settlements along Lake Ontario were abandoned (Williamson, 2013, p.60). In 1701, Ojibwa parties met the Haudenosaunee at Burlington Bay and on the Bruce Peninsula in a final push to expel the Haudenosaunee from Ontario (Gibson, 2006, p.37).

In 1701, representatives of several bands within the Ojibwa Nation and the Haudenosaunee assembled in Montreal to participate in Great Peace negotiations, sponsored by the French (Johnston, 2004, p.10; Trigger, 2004, p.58). The Mississaugas were granted sole possession of the territory to the north of Lake Ontario and Lake Erie, while the Haudenosaunee, or Six Nations as the British referred them with the inclusion of the Tuscarora group, retained their territory along the Grand River (Hathaway, 1930, p.433; Tooker, 1978, p.428).

From 1701 to the fall of New France in 1759, the Ojibwa experienced a "golden age" of trade, and withheld conclusive alliance from both the British and the French, while maintaining a middle-man position between native groups to the north and southwestern Ontario (Schmalz, 1991, p. 35). As the Seven Years' War between the French and British continued in North America, both the Ojibwa bands and the French were weakened by famine, lack of supplies, and disease (Schmalz, 1991, p.53). In 1763, the Royal Proclamation declared the Seven Years' War over, giving the British control of New France and creating a western boundary for British colonization. The British did not earn the respect of several Ojibwa bands, as the British did not respect fair trade nor the Ojibwa occupancy of the land as the French had, and the Pontiac Uprising, also known as the Beaver Wars, began in the same year (Schmalz, 1991, p.70). Pontiac, an Ottawa-Ojibwa, rallied several bands against British occupation of New France, but many groups also sought to avoid military action (Schmalz, 1991, p.71). By 1766, after numerous attacks had been carried out on the British, the Pontiac Uprising was over when a peace agreement with Sir William Johnson, the Superintendent of Indian Affairs, was concluded, which depended mostly on the integrity of the British (Schmalz, 1991, p.81).

### 1.3.4 Euro-Canadian Settlement Period

By 1793, Lieutenant-Governor John Graves Simcoe had arrived at the entrance of Penetanguishene Bay and sought to establish a fort in the easily defensible location should the Americans provoke an attack from the south (Pencen Museum, 2013). In 1798, Wm. Claus, Superintendent of Indian Affairs, bargained on behalf of the British Government for a tract of land adjacent to the harbour of Penetanguishene, and purchased the tip of the peninsula for cloth, blankets and kettles valued at £101 of Quebec currency (Surtees, 1994, p. 109; Pencen Museum, 2013; Hunter, 1909a, p.12). Settlement around Fort Penetanguishene continued in earnest to the War of 1812.

After the War of 1812, the second wave of settlers arrived in Upper Canada. Between 1815 and 1824, the non-Aboriginal population doubled as a result of heavy immigration from Britain (Surtees, 1994, p. 112). In 1818, William Claus assembled an Ojibwa council and asked for over a million hectares to the west and south of Lake Simcoe (Surtees, 1994, p. 115; Hunter, 1909a, p.14). At this council, William Claus advised that settlement would take several years and the Aboriginals that resided in the area would still be able to occupy the area while receiving clothing and the usual presents distributed by the King on an annual basis (Surtees, 1994, p. 116). The government agreed to pay an annuity of £1200 currency in goods (Surtees, 1994, p.116; Hunter, 1909a, p. 15). This tract included 1,592,000 acres of land and the majority of the County of Simcoe, and is known as the Lake Simcoe-Nottawasaga Treaty (Hunter, 1909a, p.15; Surtees, 1994, p.103).

The Township of Innisfil was surveyed in 1820 and contained 68,653 acres of rolling terrain and mostly clay loam soils (Belden, 1881, p. 14). Immediately after the survey, the Hewson family arrived in Innisfil on the point of land at the entrance to Kempenfeldt Bay, then called Hewson's Point (Belden, 1881, p.14). Before 1830, few dwellings had taken up farms, but the few that had, ventured out to Innisfil and, took up land around what is now called Hewson's Point (Belden, 1881, p.14; Hunter, 1907b, p.53). By 1850, 1,887 individuals resided within Innisfil and

the Township had one grist, five saw mills and cultivated acreage that exceeded fifty percent (Smith, 1851, pp.53-54; Belden, 1881, p.14). Agriculture is the main industry within the Township of Innisfil with a "considerable amount of lumbering done within its borders" (Belden, 1881, p.14).

### 1.3.5 Past Land Use

A review of the 1881 *Simcoe Supplement* (***see Map 2***) revealed that the study area, located within the south end of Lot 26, Concession 8, Geographic Township of Innisfil, was depicted within the lands of an unlisted occupant. Dominion atlases only identified the names and structures on the properties of landowners and occupants who had paid for a subscription fee (Benson, 1944, p.4); the lack of any markings on Lot 26, Concession 8 indicates the titleholder did not subscribe to the atlas. The Innisfil Beach Park property, within which the study area is situated, was purchased for $1,800 by the Township for the public's recreational use in 1922; it is known that the property hosted a settler's homestead despite being "half swamp, half bush" (Innisfil Township, 1951, p.8). Even if it had existed then, this house would not appear on the 1881 *Atlas* since the property owner did not subscribe to the service.

The next available historical mapping, a 1928 topographic map produced by the Department of National Defence (***see Map 3***), shows that much of the study area was cleared of vegetation and that a large structure existed towards the east end. Whether this structure is a remnant of the historic nineteenth century occupation, or was a facility built by the township after the property's conversion into a public space, is unknown. It is documented to have existed until at least 1950, when it last appeared on a topographic map (***see Map 4***). The structure was situated at the current location of a paved parking lot and baseball diamond (***see Map 8***). By 1954, the study area appeared to be devoid of structures; only open grass meadows and recently wooded areas (mostly in the west end) are discernible in the aerial photograph (***see Map 5***). The 2002 aerial photograph (***see Map 6***) shows extensive disturbances in select areas, related to the construction of modern buildings and other park features (paved areas, baseball diamonds) which was undertaken since the mid-twentieth century. By 2008, the Lakeshore WTP building footprint had been expanded southward and westward, and the parking lot at the east end of the study area had been paved (***see Map 7***). The 2013 aerial photograph subsequently shows that a traffic circle had also been constructed at the east end of the study area (***see Map 8***).

In addition to the study area potentially encompassing historical structures as documented in local histories and historical mapping, the study area abuts two historic settlement roads, present-day 25$^{th}$ Sideroad and Innisfil Beach Road, which were originally laid out during the survey of the Township of Innisfil. In Southern Ontario, the *2011 S&G* considers undisturbed lands within 300 metres of early Euro-Canadian settlements and 100 metres of early historic transportation routes (e.g., trails, passes, roads, railways, portage routes) to be of elevated archaeological potential. Therefore, based on the proximity to historic transportation routes, potential for the location of Euro-Canadian archaeological resources (pre-1900) within undisturbed portions of the study area can be established.

### 1.3.6 Present Land Use

Most of the lands within the study area form part of the Innisfil Beach Park grounds. A portion along the west end is occupied by the existing Water Treatment Plant facility; a fire hall is located along the southern edge; and a Low Lift Pumping Station sits at the east end.

## 1.4 Archaeological Context

### 1.4.1 Designated and Listed Cultural Heritage Resources

Consultation of the Ontario Heritage Properties Database, which records heritage resources that have been designated for their cultural value or interest under the *Ontario Heritage Act*, confirmed the absence of provincially designated heritage properties within the study area[1].

Consultation of the document titled 'Town of Innisfil Heritage Register' (Town of Innisfil, 2010), which records municipal properties that have been identified as listed and non-designated heritage properties, confirmed the presence of one heritage property within 300 metres of the study area (***see Table 1***). As this inventory is outdated, the Assistant Clerk at the Innisfil Heritage Committee was contacted. However, no response was granted by report completion.

Table 1 Listed Heritage Properties within 300 metres of the Study Area

| Name | Address | Description |
|---|---|---|
| Alcona Beach Club | 2044 25 Sideroad | Built 1965 |

Despite the evaluation of the above-listed property as being of cultural heritage significance or interest, its distance from the study area and its late construction date both do not contribute to elevated archaeological potential within the study area.

### 1.4.2 Heritage Conservation Districts

A Heritage Conservation District (HCD) includes areas that have been protected under Part V of the Ontario Heritage Act. A HCD can be found in both urban and rural environments, and include: residential, commercial and industrial areas; rural landscapes or entire villages; and, hamlets with features or land patterns that contribute to a cohesive sense of time or place, and to an understanding and appreciation of the cultural identity of a local community, region, province or nation. A HCD may comprise an area with a group or complex of buildings, or a large area with many buildings and properties. They often extend beyond their built heritage, structures, streets, landscapes, and other physical and spatial elements, to include important vistas and views between and towards buildings and spaces within the district (MTCS, 2006, p.5). HCDs are

[1] C**larification:** As of 2005, the Ontario Heritage Properties Database is no longer being updated. The Ministry of Tourism, Culture and Sport is currently updating a new system which will provide much greater detail to users and will become publicly accessible in the future. (http://www.hpd.mcl.gov.on.ca).

part of a valuable cultural heritage and must be taken into consideration during municipal planning to ensure that they are conserved.

According to *Section 1.3.1, Standard 1* of the *2011 S&G,* undisturbed lands within 300 metres of designated heritage resources under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site, are considered to have elevated archaeological potential. In order to determine whether the study area is located within a HCD, the Assistant Clerk at the Innisfil Heritage Committee was contacted. However, no response was granted by report completion.

### 1.4.3 Commemorative Plaques or Monuments

According to *Section 1.3.1, Standard 1* of the *2011 S&G,* undisturbed lands within 300 metres of commemorative markers, such as local, provincial, or federal monuments, cairns or plaques, or heritage parks, are considered to have elevated archaeological potential. In order to determine whether any historical plaques are present, the Ontario's Historical Plaques inventory was reviewed; the inventory contains a catalogue of all federal Historic Sites and Monuments Board of Canada plaques; provincial Ontario Heritage Trust plaques; plaques from various historical societies; and, other published plaques located in Ontario. This resource confirmed that no historical plaques are located within 300 metres of the study area (Ontario Plaques, 2014). Without the location of commemorative markers within a 300-metre radius of the study area, elevated archaeological potential within the study area cannot be established based on this feature.

### 1.4.4 Registered Archaeological Sites

In order to compile an inventory of archaeological resources for this study area, the *Ontario Archaeological Sites Database* (OASD) (maintained by the *MTCS*) was consulted (MTCS, 2014). Every archaeological site is registered according to the Borden System, which is a numbering used throughout Canada to track archaeological sites and their artifacts. The study area is located within Borden block BbGv.

According to the *MTCS*, no archaeological sites have been registered within a one kilometre radius of the study area (MTCS, 2014). It must be noted, however, that the paucity of archaeological sites in proximity to the study area is not necessarily reflective of the scale of previous inhabitation, but rather due to a lack of detailed archaeological surveys within the immediate area.

Despite the lack of previously identified archaeological resources in proximity to the study area, it is still useful to provide the cultural history of occupation in Southern Ontario (*see Table 2*). This data provides further understanding of the potential cultural activity that may have occurred within the study area (Ferris, 2013, p.13).

Table 2 History of Occupation in Southern Ontario

| Period | Archaeological Culture | Date Range | Attributes |
|---|---|---|---|
| **PALEO-INDIAN** | | | |
| Early | Gainey, Barnes, Crowfield | 9000-8500 BC | Big game hunters. Fluted projectile points |
| Late | Holcombe, Hi-Lo, Lanceolate | 8500-7500 BC | Small nomadic hunter-gatherer bands. Lanceolate projectile points |
| **ARCHAIC** | | | |
| Early | Side-notched, corner notched, bifurcate-base | 7800-6000 BC | Small nomadic hunter-gatherer bands; first notched and stemmed points, and ground stone celts. |
| Middle | Otter Creek, Brewerton | 6000-2000 BC | Transition to territorial settlements |
| Late | Narrow, Broad and Small Points Normanskill, Lamoka, Genesee, Adder Orchard etc. | 2500-500 BC | More numerous territorial hunter-gatherer bands; increasing use of exotic materials and artistic items for grave offerings; regional trade networks |
| **WOODLAND** | | | |
| Early | Meadowood, Middlesex | 800BC-0BC | Introduction of pottery, burial ceremonialism; panregional trade networks |
| Middle | Point Peninsula, Saugeen, Jack's Reef Corner Notched | 200 BC-AD 900 | Cultural and ideological influences from Ohio Valley complex societies; incipient horticulture |
| Late | Algonquian, Iroquoian | AD 900-1250 | Transition to village life and agriculture |
| | Algonquian, Iroquoian | AD 1250-1400 | Establishment of large palisaded villages |
| | Algonquian, Iroquoian | AD 1400-1600 | Tribal differentiation and warfare |
| **HISTORIC** | | | |
| Early | Huron, Neutral, Petun, Odawa, Ojibwa | AD 1600 – 1650 | Tribal displacements |
| Late | Six Nations Iroquois, Ojibwa, Mississauga | AD 1650 – 1800s | Migrations and resettlement |
| | Euro-Canadian | AD 1780 - present | European immigrant settlements |

### 1.4.5 Previous Archaeological Assessments

According to the OASD (MTCS, 2014), there are no documented reports of previous archaeological fieldwork carried out within the limits of, or immediately adjacent (i.e., within 50 metres) to, the study area.

### 1.4.6 Physical Features

An investigation of the study area's physical features was conducted to aid in the development of an argument for archaeological potential based on the environmental conditions of the study area. Environmental factors such as proximity to water, soil type, and nature of the terrain, for example, can be used as predictors to determine where human occupation may have occurred in the past.

The study area is located within the Simcoe Lowlands, a physiographic region of Southern Ontario which formed the lakebed of glacial Lake Algonquin and is bordered by beaches and boulder terraces (Chapman and Putnam, 1984). The native soil within the study area consists of the stony phase of Tioga loamy sand, described as a well-drained grey, calcareous outwash sand of medium acidity, and low to moderate stoniness (Department of Agriculture, 1959).

In terms of archaeological potential, potable water is a highly important resource necessary for any extended human occupation or settlement. As water sources have remained relatively stable in Southern Ontario since post-glacial times, proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location. In Southern Ontario, the *2011 S&G* considers undisturbed lands in proximity to a water source to be of elevated archaeological potential. Hydrological features such as lakes, rivers, creeks, swamps, and marshes would have helped supply plant and food resources to the surrounding area, and consequently support high potential for locating archaeological resources within 300 metres of their limits.

The study area encompasses two water courses – an unnamed stream draining into Lake Simcoe, and Alcona Creek; it is also bounded by Lake Simcoe to the east. All these freshwater sources would have helped supply plant and food resources to their surrounding areas. Elevated potential for locating archaeological resources within all undistributed portions of the study area can therefore be established, given that all parts of the study area fall within 300 metres of these water sources.

### 1.4.7 Current Land Conditions

The study area is situated in a suburban setting within the community of Alcona. The topography within the study area is gently undulated, with an elevation ranging from 225 metres above sea level (ASL) at the west end to 220 metres ASL adjacent to the lakeshore.

Currently, the study area encompasses built facilities tied to Innisfil Beach Park: two baseball diamonds, a basketball court, a portion of a tennis court, paved parking areas, and a gate house. Other built structures encompassed within the study area include the Lakeshore WTP in the west, a Fire Hall in the south, a Low Lift Pumping Station in the east, and part of the house at 773 Park Road in the north. Wooded areas occupy much of the western portion of the study area, especially that which surrounds the existing Lakeshore WTP and Fire Hall. Open areas are mostly manicured grass landscapes. The western and southern edges of the study area encompass the full widths of the rights-of-way of both 25$^{th}$ Sideroad and Innisfil Beach Road, which, for most of their lengths, are flanked by pedestrian sidewalks.

### 1.4.8 Date(s) of Review

A desktop review of the study area was undertaken on September 3$^{rd}$, 2014. The study was completed by way of aerial photographs and Google Earth street views.

## 1.5 Confirmation of Archaeological Potential

Based on the information gathered from background research documented in the preceding sections, potential for the recovery of archaeological resources within the study area limits has been established. Features contributing to archaeological potential are summarized in **Appendix B**.

# 2.0 ANALYSIS AND CONCLUSIONS

A desktop review of field conditions was carried out by way of historical aerial photographs, street view imagery obtained from the Google Earth application, and other online sources. In combination with data gathered from background research (***see Sections 1.3 and 1.4***), an assessment of archaeological potential was performed.

## 2.1 Low + Uncertain Archaeological Potential – Potential Disturbances

The study area was evaluated for extensive disturbances that would have removed archaeological potential. Disturbances include, but are not limited to: grading below topsoil, quarrying, building footprints or sewage and infrastructure development. *Section 1.3.2* of the *2011 S&G* counts infrastructure development among "features indicating that archaeological potential has been removed." These land and infrastructure developments, the construction of which often entails soil-grading operations and the installation of utilities essential to service the areas (i.e., hydro, cable, sewer, water, etc.), would have caused extensive and deep disturbance to any archaeological resources that could have been present in the ground, thus resulting in the removal of archaeological potential within their footprints.

Within the study area, disturbances include: paved areas within the 25$^{th}$ Sideroad and Innisfil Beach Road rights-of-way, including paved portions, graded margins, and pedestrian sidewalks; footprints of buildings and other built recreational facilities; and, other paved areas such as parking spaces, pedestrian walkways and minor park roads (***see Map 9; Images 1-10***).

Areas with uncertain archaeological potential include: manicured grass frontage of the Lakeshore WTP, which was shown in the 2008 aerial photograph to have been potentially disturbed by the facility expansion at the time (***see Map 7***); narrow margins along the north side of Innisfil Beach Park Road, which may have been disturbed by the construction of new serpentine park paths; and, landscaped areas near the Park entrance. In accordance with *Section 2.1.8* of the *2011 S&G*, it may be necessary to conduct a Stage 2 AA within these areas by way of judgmental test pit surveys, in order to confirm disturbed ground conditions and document the nature and extent of any disturbance.

## 2.2 Low Archaeological Potential – Physical Features

*Section 2.1, Standard 2.a.* of the 2011 *S&G* states that Stage 2 pedestrian or test pit surveys are not required in lands evaluated as having no or low archaeological potential based on the identification of certain physical features. Such features include (but are not limited to) permanently wet areas (such as rivers, creeks, streams, marshes, ponds, lakes, swamps, wetlands, etc.), exposed bedrock, and steep slopes (greater than 20 degrees) except in locations likely to contain pictographs or petroglyphs. Within the study area, physical features of low or no archaeological potential due to steep slopes or permanently wet conditions consist of: both watercourses (Alcona Creek and the unnamed stream north of the existing WTP facility); and, the permanently wet area on Lake Simcoe.

However, only a combination of background study and property inspection can exempt any area from further Stage 2 assessment (*Section 1.4.1* of the 2011 *S&G*). As such, it is recommended that the aforementioned areas of low or no archaeological potential due to physical features – marked in cyan on **Map 9** – only be considered as *potentially not requiring assessment*. A Stage 2 visual survey is still required to provide confirmation of the actual condition and exact extent of the physical features.

## 2.3 High Archaeological Potential

Though the study area – formerly described as "half swamp, half bush" (Innisfil Township, 1951, p.8) – has largely been drained (thereby resulting in a largely dryer landscape), there is no indication in the majority of the land that deep and extensive disturbance has taken place.

As there is elevated potential to recover archaeological resources within all undisturbed portions of the study area, a Stage 2 AA in the form of test pit surveys at five-metre intervals must be undertaken in all undisturbed portions, marked in green on **Map 9**.

# 3.0 RECOMMENDATIONS

Based on the established elevated archaeological potential of all portions of the study area, the following recommendations – applicable to all areas encompassed within the proposed construction activity area (construction areas, easements, pipe routes, laydown areas, etc.), pending the finalization of project design – are presented:

1. Portions encompassed within the proposed construction activity area that are identified as undisturbed (marked in green on **Map 9**) must be subjected to a Stage 2 AA, with the use of test pit survey at five-metre intervals in accordance with *Section 2.1.2* of the 2011 *Standards and Guidelines for Consultant Archaeologists*.

2. Portions encompassed within the proposed construction activity area that are identified as potentially disturbed (marked in yellow on **Map 9**) must be subjected to a judgmental Stage 2 test pit survey in accordance with *Section 2.1.8* of the 2011 *Standards and Guidelines for Consultant Archaeologists.* Should any of these areas be confirmed in the field as undisturbed, test pit survey at standard five-metre intervals must be undertaken.

3. Portions encompassed within the proposed construction activity area that are classified as having low or no archaeological potential due to disturbances (marked in pink on **Map 9**) or physical features (e.g., permanently wet areas, steep slopes, etc.) (marked in cyan on **Map 9**) must be subjected to an on-site visual survey to confirm and document their nature and extent. Only then can these areas be exempt from a Stage 2 test pit survey.

# 4.0 ADVICE ON COMPLIANCE WITH LEGISLATION

1. This report is submitted to the *MTCS* as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the *MTCS*, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

2. It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

3. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

4. The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the *Ministry of Consumer Services*.

# 5.0 BIBLIOGRAPHY AND SOURCES

Belden, H. & Co. (1881). *Simcoe Supplement.* In *Illustrated Atlas of the Dominion of Canada*. Toronto.

Benson, L.R. (1944). *Historical Atlases of Ontario: A Preliminary Check-List.* London, Ontario: The Library, University of Western Ontario.

Birch, J. (2010). *Coalescence and Conflict in Iroquoian Ontario*. [Online]. Available at: http://uga.academia.edu/JenniferBirch/Papers/183903/Coalescence_and_Conflict_in_Iroquoian_Ontario [Accessed 25 August 2014].

Blair, A.M. (2012). *Holland Marsh*. [Online]. Available at: http://www.thecanadianencyclopedia.com/ articles/holland-marsh [Accessed 25 August 2014].

Bursey, J., Daechsel, H., Hinshelwood, A., and Murphy, C. (2013). *The Archaeology of Ontario – The Early Woodland Period*. [Online]. Available at: http://www.ontarioarchaeology.on.ca/summary/earlyw.htm [Accessed 25 August 2014].

Chapman, L. J. and Putnam, D. F. (1984). *Physiography of Southern Ontario. 3rd ed*. *Ontario Geological Survey, Special Volume 2.* Toronto: Ministry of Natural Resources.

Department of Agriculture (1959). *Soil Map of Simcoe County, Ontario. South Sheet. Soil Survey Report No. 29.* Ottawa.

Department of National Defence (1928). *Topographic Map, Ontario, Barrie. Sheet No. 105*. Ottawa.

Department of National Defence (1950). *National Topographic Series, Ontario, Barrie. Sheet 31 D/5. 2nd Edition*. Ottawa.

Dodd, C.F., Poulton, D. R., Lennox, P.A., Smith, D.G., and Warrick, G.A. (1990). The Middle Ontario Iroquoian Stage. In Ellis, C.J. and N. Ferris (Eds.) *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 321-359.

Ellis, C.J. and Deller, D.B. (1990). Paleo-Indians. In C.J. Ellis, and N. Ferris, (Eds.). *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 37-64.

Ellis, C.J., Kenyon, I.T., and Spence, M.W. (1990). The Archaic. In C.J. Ellis, and N. Ferris, (Eds.). *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 65-124.

Ellis, C. J. (2013). Before Pottery: Paleoindian and Archaic Hunter-Gathers. In Munson, M.K. and Jamieson, S.M (Eds.) *Before Archaeology: The Archaeology of a Province*. Montreal & Kingston, Ontario: McGill Queen's University Press.

Energy, Mines and Resources. (1986). *National Topographic Survey of Canada, Series A 751, Map 31 D/05. 6th ed.* Ottawa.

Ferris, N. (2013). Seeing Ontario's Past Archaeologically. In Munson, M.K. and Jamieson, S.M (Eds.) *Before Ontario: The Archaeology of a Province*. Montreal & Kingston, Ontario: McGill Queen's University Press, p.3-20.

Ferris, N. and Spence, M.W. (1995). The Woodland Traditions in Southern Ontario. *Revista de Arquologia Americana* (9), 83-138.

Fox, W. A. (1990). The Middle Woodland to Late Woodland Transition. In C.J. Ellis, and N. Ferris, (Eds.). *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 171-188.

Frim, M. (2002). *Secrets of the Lakes*. Toronto, Ontario: Lynx Images Inc.

Gibson, M. M. (2006). *In the Footsteps of the Mississaugas*. Mississauga, Ontario: Mississauga Heritage Foundation.

Google (2014). *Street View Imagery*. [Online]. Available through Google Earth application [Accessed 3 September 2014].

Hathaway, E. (1930). The River Credit and the Mississaugas. In *Ontario Historical Society Papers and Records Vol. xxvi*. Toronto: Ontario Historical Society.

Hunter, J. A. (1909a). *A History of Simcoe County: Volume I, Its Public Affairs*. [Online]. Available at: http://www.ourroots.ca/e/page.aspx?id=589890 [Accessed 25 August 2014].

Hunter, J. A. (1909b). *A History of Simcoe County: Volume II, Its Pioneers*. [Online]. Available at: http://www.ourroots.ca/e/toc.aspx?id=2856 [Accessed 25 August 2014].

Heidenreich, C.E. (1978). Huron. In B.G. Trigger (Ed.). *Volume 15: Northeast*. Washington: Smithsonian Institution, pp.368-388.

Hunting Survey Corporation Limited (1954). *Digital Aerial Photographs, Southern Ontario, 1954*. [Online]. Available at http://maps.library.utoronto.ca/data/on/AP_1954/index.html [Accessed 24 March 2014].

Innisfil Township. (1951). *A Record of 100 Years of Progress : Innisfil Township Centennial, 1850-1950*. [Online]. Available at: http://ourroots.ca/toc.aspx?id=3632 [Accessed 3 September 2014].

Jackson, L. J., Ellis, C., Morgan, A.V., McAndrews, J.H. (2000). Glacial Lake Levels in Eastern Great Lakes Palaeo-Indians. *Geoarchaeology: An International Journal*, 15(5). [Online]. Available at: http://labs.eeb.utoronto.ca/mcandrews/PDFs/049%5B1%5D.pdf [Accessed 25 August 2014].

Jackson, L.J. (2004).Changing Our Views of Late Palaeo-Indian in Southern Ontario. In L.J. Lawrence and A. Hinshelwood, (Ed.). *The Late Palaeo-Indian Great Lakes: Geological and Archaeological Investigations of Late Pleistocene and Early Holocene Environments*. Gatineau, Quebec: The Canadian Museum of Civilization, pp. 25-56.

Johnston, D. (2004). *Connecting People to Place: Great Lakes Aboriginal History in Cultural Context*. [Online]. Available at: http://www.attorneygeneral.jus.gov.on.ca/inquiries/ipperwash/transcripts/pdf/P1_Tab_1.pdf [Accessed 28 March 2014].

Karrow, P.F. (2004).Ontario Geological Events and Environmental Change in the Time of the Lake Palaeo-Indian and Early Archaic Cultures (10,500 to 8,500 B.P.). In L.J. Lawrence and A. Hinshelwood, (Ed.). *The Late Palaeo-Indian Great Lakes: Geological and Archaeological Investigations of Late Pleistocene and Early Holocene Environments*. Gatineau, Quebec: The Canadian Museum of Civilization, pp. 25-56.

Karrow, P.F. and Warner, B.G. (1990). The Geological and Biological Environment for Human Occupation in Southern Ontario. In C.J. Ellis, and N. Ferris (Eds.). *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 5-35.

Larson, G. and Schaetzl, R. (2001). Origin and Evolution of the Great Lakes. *J. Great Lakes Res.* 27(4), 518-546.

Mississaugas of the New Credit First Nation (MNCFN). (N.D.a.). *The History of the Mississauga of the New Credit First Nation*. Ottawa, Ontario: Praxis Research Associates.

Ontario Ministry of Tourism, Culture and Sport. (2006). *Heritage Conservation Districts: A Guide to District Designation under the Ontario Heritage Act*. [Online]. Available at: http://www.mtc.gov.on.ca/en/publications/Heritage_Tool_Kit_HCD_English.pdf [Accessed 21 March 2014].

Ontario Ministry of Tourism, Culture and Sport. (2011). *Standards and Guidelines for Consultant Archaeologists*. Toronto: Ministry of Tourism, Culture and Sport.

Ontario Ministry of Tourism, Culture and Sport. (2014). *Sites within a One Kilometre Radius of the Project Area*, provided from the Ontario Archaeological Sites Database, 25 August 2014.

Ontario Historical Plaques. (2014). *The Plaque Map*. [Online]. Available at: http://www.ontarioplaques.com/Menu_Map.html [Accessed 25 August 2014].
Pencen Museum. (2013). *A Short History of Penetangishene*. [Online]. Available at: http://www.pencenmuseum.com/general-information/history/ [Accessed 25 August 2014].

Robinson, P.J. (1965). *Toronto during the French Regime: 1615-1793.* Toronto: University of Toronto Press.

Simcoe County Interactive Maps (2014). *2002, 2008 and 2013 Aerial Photography.* [Online]. Available at: http://maps.simcoe.ca/Public [Accessed 2 September 2014].

Schmalz, P.S. (1991). *The Ojibwa of Southern Ontario*. Toronto, Canada: University of Toronto Press.

Smith, D.A. (1990). Iroquois Research. In C.J. Ellis, and N. Ferris, (Eds.). *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 279-290.

Smith, D.G. (2002). Their Century and a Half on the Credit: The Mississaugas in Mississauga. In *Mississauga: The First 10,000 Years*. Toronto, Ontario: The Mississauga Heritage Foundation Inc., 123-138.

Smith, W.H. (1851). *Canada: Past, Present and Future, being a Historical, Geographical, Geological and Statistical Account of Canada West*. [Online]. Available at: http://archive.org/stream/canadapast00smituoft#page/n7/mode/2up [Accessed 25 August 2014].

Spence, M.W., Pihl, R.H., and Murphy, C.R. (1990). Cultural Complexes of the Early and Middle Woodland Periods. In Ellis, C.J. and N. Ferris (Eds.) *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 125-169.

Stewart, A.M. (2013). Water and Land. In Munson, M.K. and Jamieson, S.M (Eds.) *Before Archaeology: The Archaeology of a Province*. Montreal & Kingston, Ontario: McGill Queen's University Press

Storck, P.L. (1982). *Palaeo-Indian Settlement Patterns Associated with the Strandlines of Glacial Lake Algonquin in South-Central Ontario.* Canadian Journal of Archaeology, Vol. 6:1-32.

Surtees, R.J. (1994). Land Cessions, 1763-1830. In Rogers, E.S. (Ed.) *Aboriginal Ontario: Historical Perspectives on the First Nations*. Toronto, Ontario: Dundurn Press Limited, pp. 92- 121

Tooker, E. (1978). The League of the Iroquois: Its History, Politics, and Ritual. In B.G. Trigger (Ed.). *Volume 15: Northeast*. Washington: Smithsonian Institution, pp.418-441.

Town of Innisfil. (2010). *Town of Innisfil Heritage Register*. [Online]. Available at: http://www.innisfil.ca/sites/all/files/uploads/Clerks/HC_InnisfilHeritageRegisterJune2010%282%29.pdf [Accessed 25 August 2014].

Trigger, B. G. (1994).The Original Iroquoians: Huron, Petun and Neutral. In Edward S. Rogers (Eds.). *Aboriginal Ontario: Historical Perspectives on the First Nations*. Toronto, Ontario: Dundurn Press Limited, pp 41-63.

Warrick, G. (2008). *A Population History of the Huron-Petun, A.D. 500-1650*. New York: Cambridge University Press.

Warrick, G. (2013). The Aboriginal Population of Ontario in Late Prehistory. In Munson, M.K. and Jamieson, S.M (Eds.) *Before Archaeology: The Archaeology of a Province*. Montreal & Kingston, Ontario: McGill Queen's University Press.

Williamson, R. F. (1990). The Early Iroquoian Period of Southern Ontario . In Ellis, C.J. and N. Ferris (Eds.) *The Archaeology of Southern Ontario to A.D. 1650*. London, Ontario: Occasional Publication of the London Chapter, OAS, pp. 291-320.

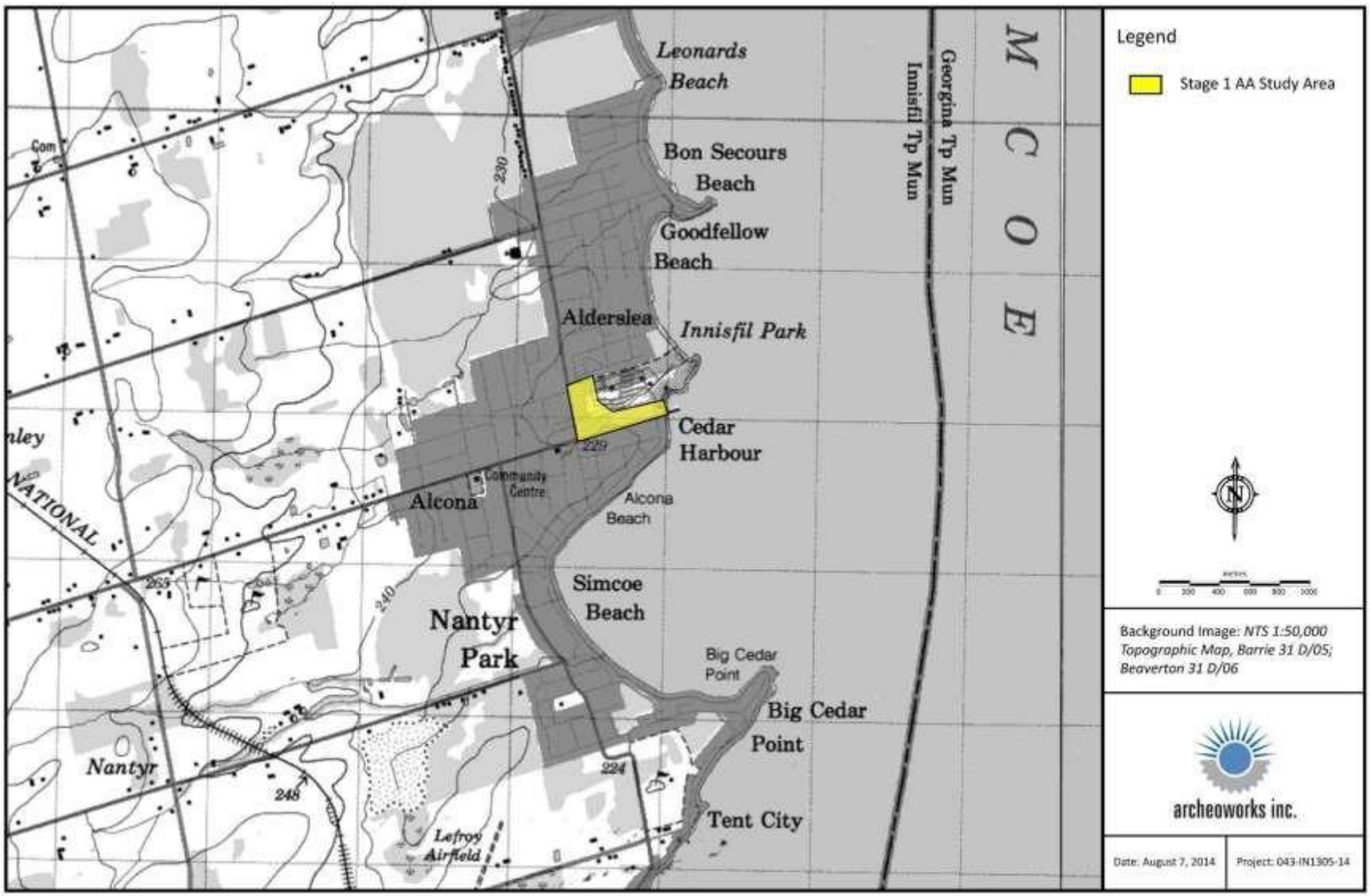
Williamson, R.F. (2013). The Woodland Period, 900 BCE to 1700 CE. In Munson, M.K. and Jamieson, S.M (Eds.) *Before Archaeology: The Archaeology of a Province*. Montreal & Kingston, Ontario: McGill Queen's University Press

Wright, J.V. (1994).Before European Contact. In Edward S. Rogers (Eds.). *Aboriginal Ontario: Historical Perspectives on the First Nations*. Toronto, Ontario: Dundurn Press Limited, pp 21-40

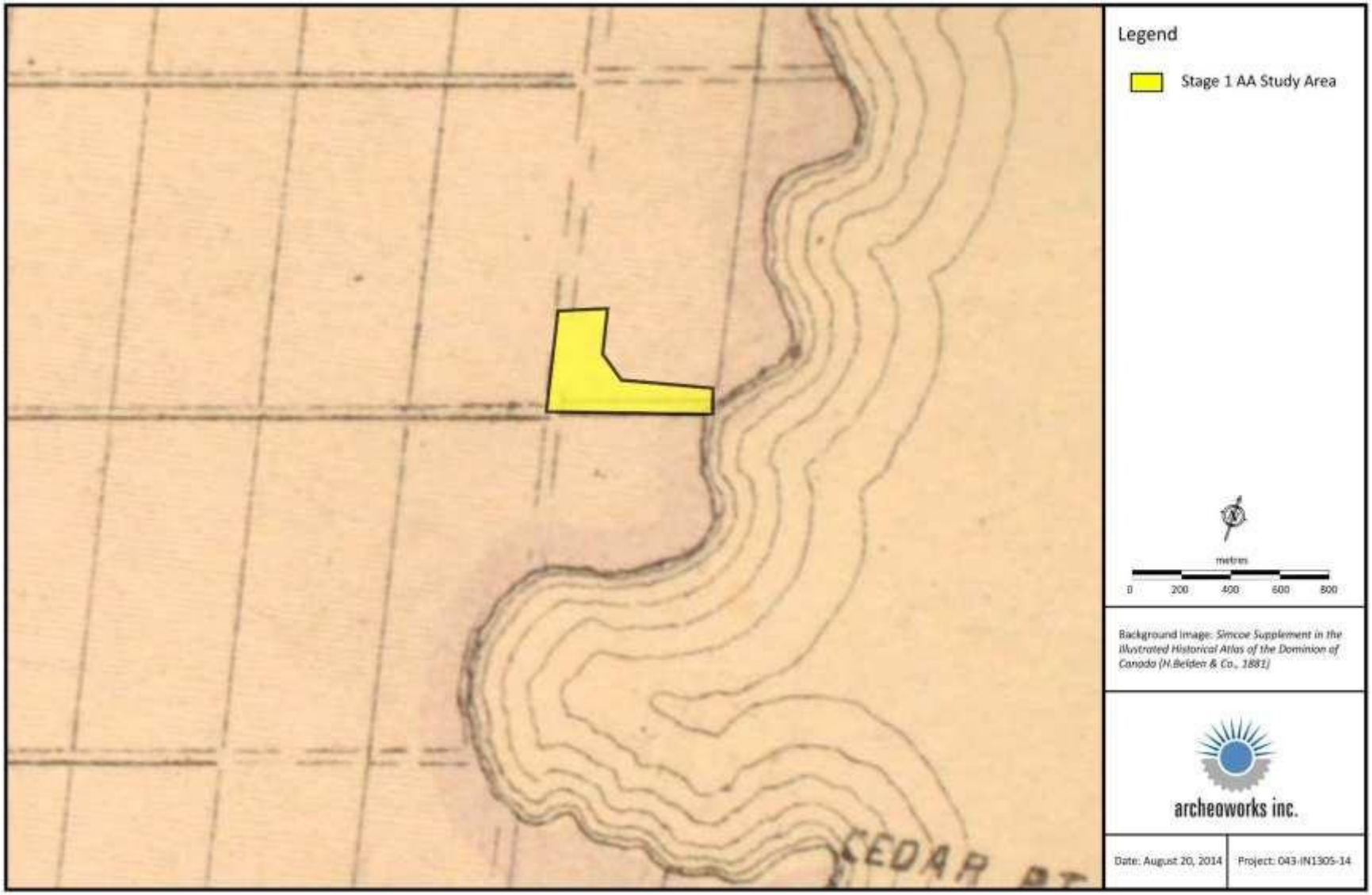
Wright, J.V. (1999). *A History of the Native People of Canada: Volume II (1,000B.C. – A.D. 500)*. Hull, Quebec: Museum of Civilization.

# APPENDICES

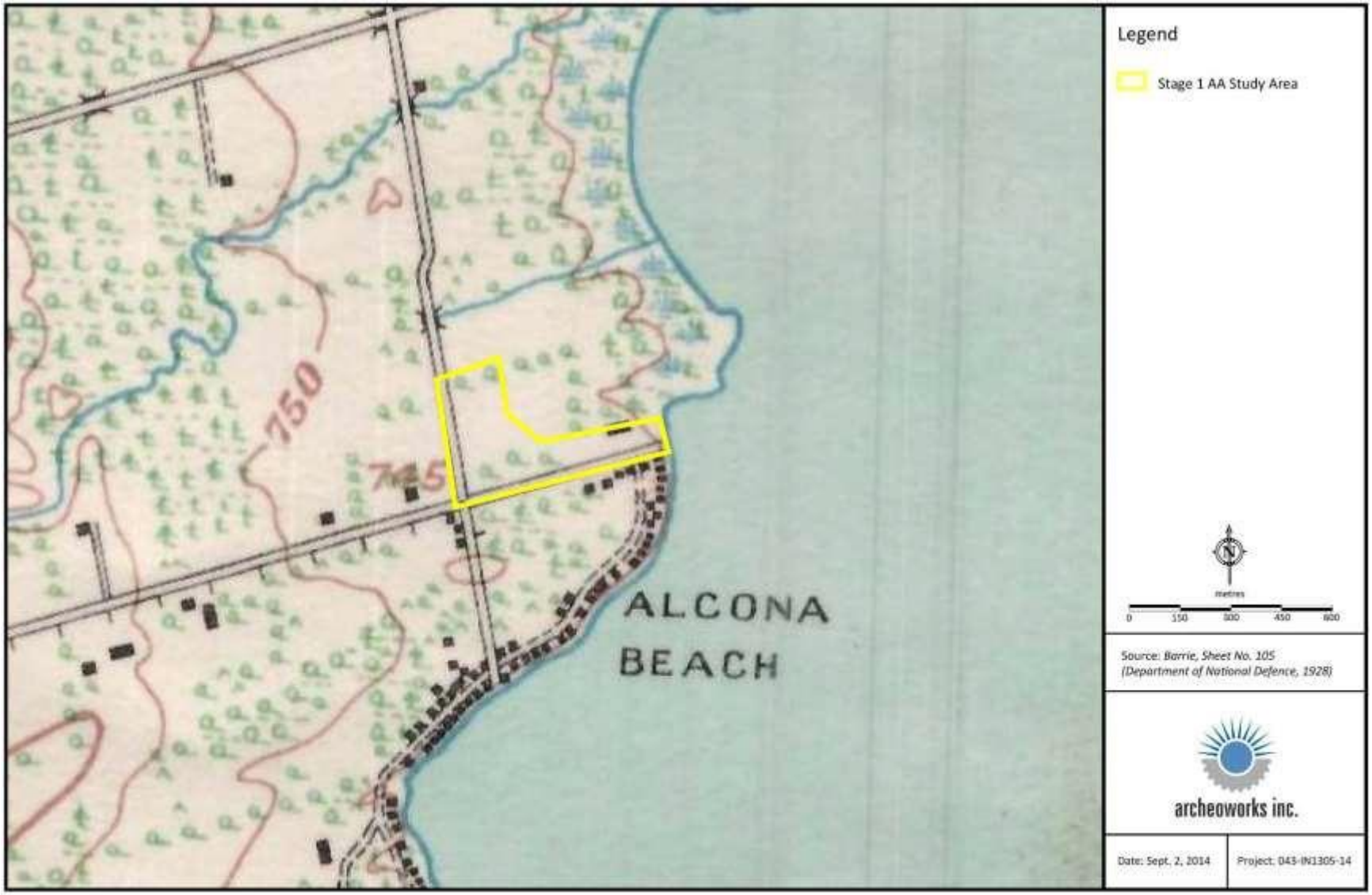
# APPENDIX A: MAPS



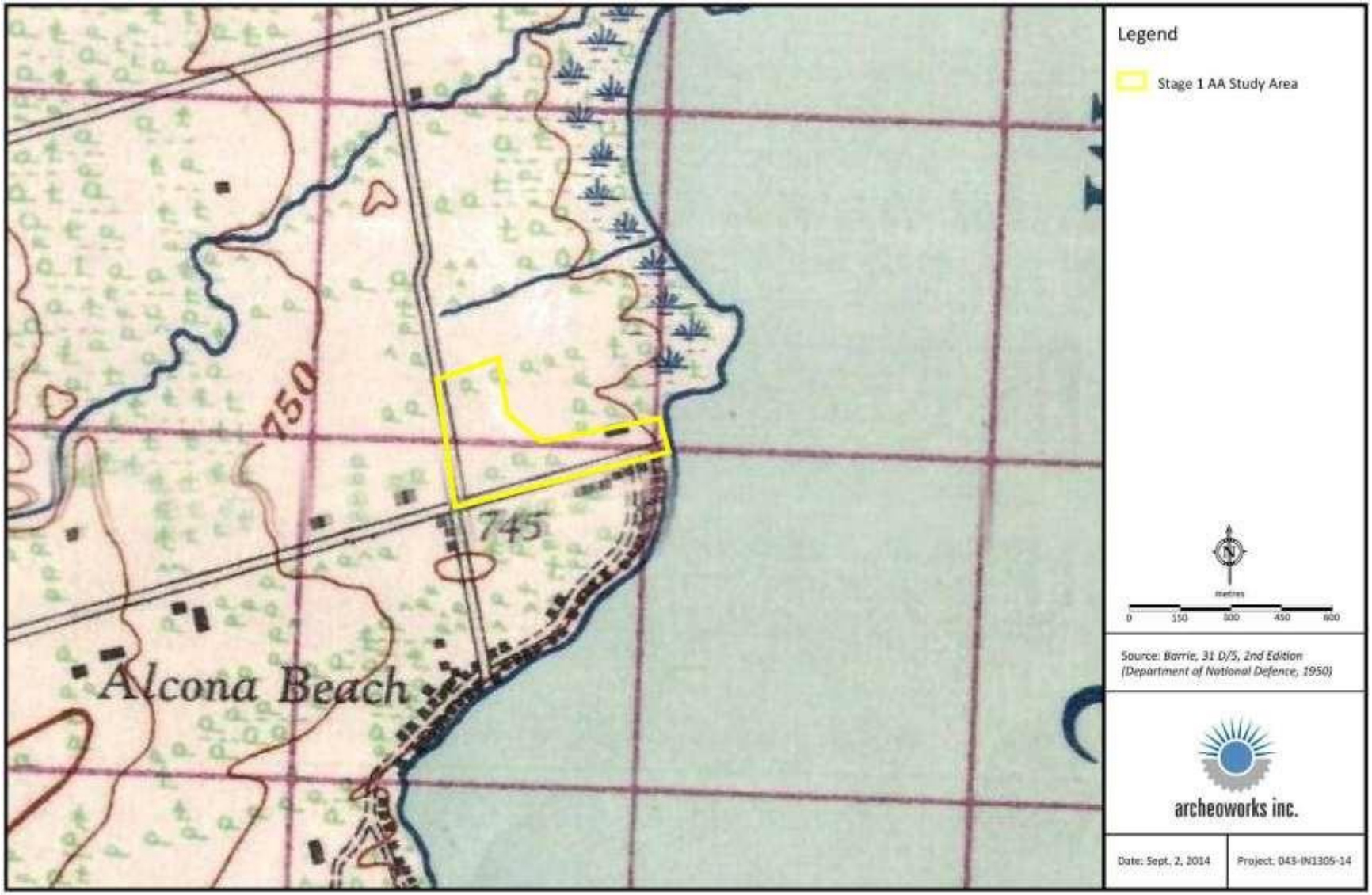

MAP 1: National Topographical System Map (Energy, Mines and Resources Canada, 1986) identifying the Stage 1 AA study area location.




MAP 2: Study area within the Simcoe Supplement of the Illustrated Atlas of the Dominion of Canada (Belden, 1881).



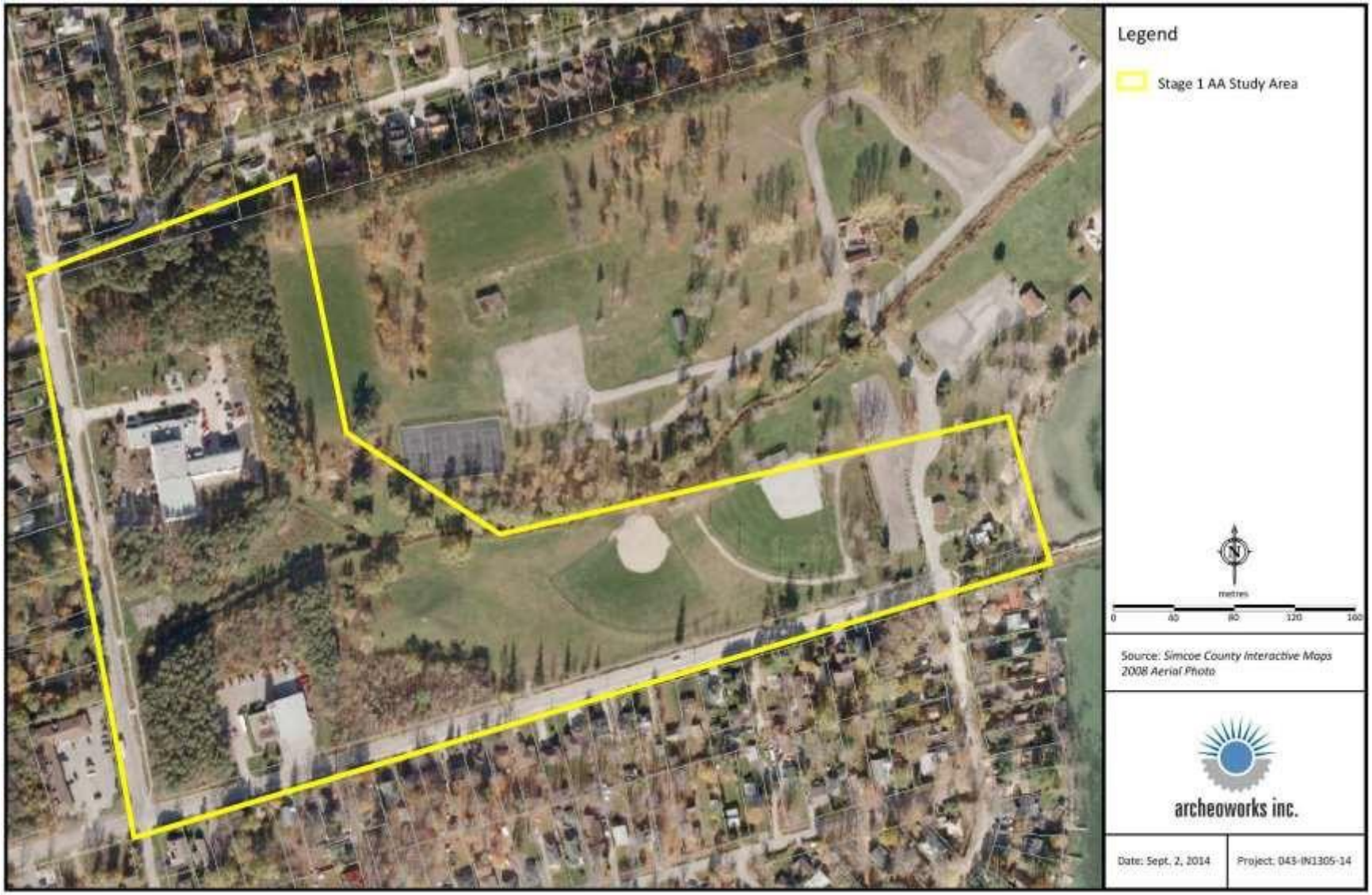

MAP 3: Study area within a 1928 topographic map (Department of National Defence, 1928).




MAP 4: Study area within a 1950 topographic map (Department of National Defence, 1950).


MAP 5: 1954 aerial photograph of the Stage 1 AA study area (Hunting Survey Corporation Limited, 1954).


MAP 6: 2002 aerial photograph of the study area (Simcoe County Interactive Maps, 2014).




MAP 7: 2008 aerial photograph of the study area (Simcoe County Interactive Maps, 2014).


MAP 8: 2013 aerial photograph of the study area (Simcoe County Interactive Maps, 2014).


MAP 9: Stage 1 AA of the study area, with street view image locations indicated. Note: The extent of the disturbed areas are to be considered provisional; only on-site inspection can confirm the disturbed nature of these areas and can exempt them from further assessment, per *Section 1.4.1* of the 2011 *S&G*.

# APPENDIX B: SUMMARY OF BACKGROUND RESEARCH

| Feature of Archaeological Potential | Yes | No | Unknown | Comment |
|---|---|---|---|---|
| Known archaeological sites within 300 m? | | X | | If Yes, potential confirmed |
| **Physical Features** | **Yes** | **No** | **Unknown** | **Comment** |
| Is there water on or near the property? | X | | | If Yes, potential confirmed |
| Presence of primary water source within 300 metres of the study area (lakes, rivers, streams, creeks) | X | | | If Yes, potential confirmed |
| Presence of secondary water source within 300 metres of the study area (intermittent creeks and streams, springs, marshes, swamps) | X | | | If Yes, potential confirmed |
| Features indicating past presence of water source within 300 metres (former shorelines, relic water channels, beach ridges) | | X | | If Yes, potential confirmed |
| Accessible or inaccessible shoreline (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh) | | X | | If Yes, potential confirmed |
| Elevated topography (knolls, drumlins, eskers, plateaus, etc) | | X | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| Pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground | | X | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| Distinctive land formations (mounds, caverns, waterfalls, peninsulas, etc) | | X | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| **Cultural Features** | **Yes** | **No** | **Unknown** | **Comment** |
| Is there a known burial site or cemetery that is registered with the Cemeteries Regulation Unit on or directly adjacent to the property? | | X | | If Yes, potential confirmed |
| Associated with food or scarce resource harvest areas (traditional fishing locations, food extraction areas, raw material outcrops, etc) | | X | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| Indications of early Euro-Canadian settlement (monuments, cemeteries, structures, etc) within 300 metres | X | | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| Associated with historic transportation route (historic road, trail, portage, rail corridor, etc) within 100 metres of the property | X | | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| **Property-specific Information** | **Yes** | **No** | **Unknown** | **Comment** |
| Contains property designated under the Ontario Heritage Act | | X | | If Yes to two or more of 3-5 or 7-10, potential confirmed |
| Local knowledge (aboriginal communities, heritage organizations, municipal heritage committees, etc) | | X | | If Yes, potential confirmed |
| Recent ground disturbance, not including agricultural cultivation (post-1960, extensive and deep land alterations) | Present in certain areas, but exact nature and extent cannot be confirmed at this stage | | | If Yes, low archaeological potential is determined |

# APPENDIX C: IMAGES

**Image 1:** Looking east along 25th Sideroad at pedestrian sidewalk and edge of the undisturbed Scot's Pine Forest, north of the existing Lakeshore WTP facility (Imagery date: Aug. 2012).

**Image 2**: Looking southeast along 25th Sideroad at existing Lakeshore WTP building, manicured grass lawns and paved areas (Imagery date: Aug. 2012).

**Image 3:** Looking east along 25th Sideroad at paved areas (basketball court, sidewalk, road edge), manicured grass lawn, and wooded areas (Imagery date: Aug. 2012).

**Image 4:** Looking northeast at the corner of 25th Sideroad and Innisfil Beach Road at disturbances caused by road margin-related construction (Imagery date: Sept. 2009).


**Image 5**: Looking east along 25th Sideroad at paved and manicured grass areas post-construction, at the edge of undisturbed woodland (Imagery date: Aug. 2012).

**Image 6**: Looking northeast along Innisfil Beach Road at existing Fire Hall building, manicured grass lawns, and surrounding undisturbed wooded area. (Imagery date: Sept. 2009).

**Image 7:** Looking northwest along Innisfil Beach Road at undisturbed woodland and manicured grass landscape (Imagery date: Sept. 2009). Note that the newer serpentine park paths running along the north side of the road were not yet built by the time of street view capture.

**Image 8**: Looking northeast along Innisfil Beach Road at the western baseball diamond and manicured grass landscape (Imagery date: Sept. 2009). Note that the newer serpentine park paths running along the north side of the road were not yet built by the time of street view capture.

**Image 9:** Looking northeast along Innisfil Beach Road at the eastern baseball diamond, adjacent paved parking area, and manicured grass landscape (Imagery date: Sept. 2009). Note that the newer serpentine park paths running along the north side of the road were not yet built by the time of street view capture.

**Image 10:** Looking northeast along Innisfil Beach Road at existing structures (Gate House, left; Low Lift Pumping Station, centre-right) paved areas, and manicured grass landscapes (Imagery date: Sept. 2009). Note that the newer traffic circle seen in the 2013 aerial photograph was not yet built at this time.

# APPENDIX D: INVENTORY OF DOCUMENTARY AND MATERIAL RECORD

| **Project Information:** | | | |
|---|---|---|---|
| **Project Number:** | | 059-VA502-11 | |
| **Licensee:** | | Alvina Tam (P1016) | |
| **MTCS PIF:** | | P1016-0006-2014 | |
| **Document/ Material** | | **Location** | **Comments** |
| 1. | Research/ Analysis/ Reporting Material | Archeoworks Inc., 16715-12 Yonge Street, Suite 1029, Newmarket, ON, Canada, L3X 1X4 | 32 digital files stored in Archeoworks servers: /2014/ 043-IN1305-14 - Lakeshore Water Treatment Plant, Town of Innisfil |

Under Section 6 of Regulation 881 of the *Ontario Heritage Act*, *Archeoworks Inc*. will, "keep in safekeeping all objects of archaeological significance that are found under the authority of the licence and all field records that are made in the course of the work authorized by the licence, except where the objects and records are donated to Her Majesty the Queen in right of Ontario or are directed to be deposited in a public institution under subsection 66 (1) of the Act."

# Appendix C

## Notice of Public Information Centre

**LAKESHORE WATER TREATMENT PLANT PHASE 3 EXPANSION**
**ENVIRONMENTAL STUDY REPORT ADDENDUM**
**NOTICE OF PUBLIC INFORMATION CENTRE**

In 2010, the Town of Innisfil (The Town) completed the Lakeshore Water Treatment Plant Phase 3 Expansion Environmental Study Report (ESR). The study was completed under the Municipal Engineers Association's (MEA) *Municipal Class Environmental Assessment* document to identify a preferred solution for expanding the Lakeshore Water Treatment Plant and improving water works in Innisfil for the future. The plant is located at 2155 25th Sideroad, in Innisfil, Ontario. The recommended solution identified in the ESR included the construction of a new treatment facility on the existing site, a new intake, a new low lift pumping station (LLPS) added to the existing station on the waterfront, and a dissolved air flotation/filtration with ultra violet disinfection / advanced oxidation process treatment solution. As the Town proceeded through the conceptual design stage of the project, a new solution was identified as having fewer net effects on the social and natural environment. The new recommended solution involves a small expansion to the existing WTP, a retrofit to the existing treatment facility with high recovery membrane filters and ultra violet disinfection, and a retrofit to the existing LLPS. The new solution allows for a single treatment process which creates less waste, provides enhanced flexibility and ease of implementation for future capacity expansions, and a smaller construction footprint including less construction on the waterfront at the LLPS. The Town is hosting a Public Information Centre (PIC) to present the new recommended solution and to receive input from interested stakeholders and the public. The PIC will be held at the following date and location:

**Date:** **Wednesday, October 8th, 2014**
**Time:** **6 p.m. to 8 p.m.**
**Location:** **Town Hall, Main Floor Community Rooms**
**2101 Innisfil Beach Road**

The submission of comments is encouraged at any time during the Addendum process. To submit a comment, please contact the project team at:

Mr. Tom Panak, P.Eng.
Capital Engineering Project Manager
Town of Innisfil
Infrastructure and Engineering Services
2010 Innisfil Beach Road
Innisfil, ON L9S 1A1
Tel: (705) 436 - 3740 ext. 3212
Fax: (705) 436 - 7120
Email: tpanak@innisfil.ca

Mr. Michael Papadacos
Project Manager
CH2M HILL Canada Ltd.
245 Consumers Road, Suite 400
Toronto, ON M2J 1R3
Tel: (416) 499 - 9000 ext. 73438
Email: cnrtorlakeshore@ch2m.com

All correspondence will be maintained for reference throughout the project and will become part of the project record. Under the *Municipal Freedom of Information and Protection of Privacy Act* and the *Environmental Assessment Act*, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this project and will be released, if requested, to any person.

This notice was issued on September 16, 2014.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