Town of Wasaga Beach, Constance Boulevard Drainage Improvements Schedule ‘C’ Municipal Class Environmental Assessment

Addendum Report

Prepared For:

Town of Wasaga Beach

May 2024

CREATING QUALITY SOLUTIONS TOGETHER

TOWN OF WASAGA BEACH, CONSTANCE BOULEVARD DRAINAGE IMPROVEMENTS

SCHEDULE ‘C’ MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

ADDENDUM REPORT

PROJECT NO. 221057

Prepared For:

Town of Wasaga Beach – Mr. Mike Pincivero, Manager of Engineering Services

By:

Himanshu Sharma, EIT.
Water Resources Engineering Intern

Checked By:

Richard Sloan, P.Eng.
Water Resources Group Lead

Ainley & Associates Ltd.
550 Welham Road
Barrie, ON L4N 8Z7
Tel: (705) 726-3371
E-mail: barrie@ainleygroup.com

WWW.AINLEYGROUP.COM

Table of Contents

1 Introduction and Background 1
1.1 Introduction 1
1.2 Municipal Class Environmental Assessment Process 2
1.3 Objective of this Report 4
1.4 Project Team 4
2 Planning Policy and this Class EA 4
2.1 Provincial Policy Statement (2020) 4
2.2 Places to Grow Act (2005) 5
2.3 Town of Wasaga Beach Official Plan (Adopted 2004, Consolidated Sep. 2021) 5
2.4 Nottawasaga Valley Conservation Authority Guidance Documents 5
2.5 Source Water Protection 6
2.6 Climate Change 6
2.7 County of Simcoe Official Plan (Adopted 2008, Amended December 2016) .. 6
3 Summary of Previous Phases 6
4 Additional Studies Completed for Areas Adjacent to Project Study 8
5 Evaluation of Proposed and New Solutions Within the EA Project Study Area 10
5.1 Evaluation Criteria 10
6 Rationale for the Proposed Changes 14
6.1 Physical Environment 14
6.2 Natural Environment 15
6.3 Cultural Environment 16
6.4 Social Environment 17
6.5 Economic Environment 17
6.6 Climate Change 17
6.7 Selection of the Preferred Design Concept 18
7 Consultation 19
7.1 Notice of Addendum and Public Information Centre 19
8 Permits and Approvals 19

8.1 Nottawasaga Valley Conservation Authority. 19
8.2 Ministry of Environment, Conservation and Parks.... 20
8.3 Department of Fisheries and Oceans and Ministry of Natural Resources and Forestry.... 20
8.4 Ministry of Transportation.... 20
9 Mitigation Measures 20
9.1 Natural Environment 20
9.1.1 Species at Risk.... 20
9.1.2 Migratory Breeding Birds and Bats.... 20
9.1.3 Sediment and Erosion Controls.... 21
9.1.4 General Operations 21
9.1.5 Fish and Fish Habitat.... 21
9.2 Archaeological and Cultural Heritage Resources.... 22
9.3 Utilities and Servicing.... 23
10 Monitoring 23

Table of Figures

Figure 1: Project Study Location 1
Figure 2: MCEA Planning and Design Process.... 3
Figure 3: Option 2 with Alternative Proposed Solutions.…....8
Figure 4: Alternative 1– Overview and Profile Design Concept…....9

Table of Tables

Table 1: Evaluation Matrix.... 12
Table 2: A Summary of the Technical Considerations for each Drainage Option.... 15
Table 3: Cost Estimate.... 18

Appendices

Appendix A .... Floodplain Assesment Study
Appendix B .... Environmental Studies 8859 Beachwood Road

Appendix C .... NVCA Comments and Responses 8859 Beachwood Road
Appendix D ... Scoped Environmental Impact Study Beachwood Road Class EA Update
Appendix E .... Addendum to Cultural Heritage Assessment Report
Appendix F........................... Stage 1 Archaeological Assessment Constance Boulevard
Appendix G .... Consultation

1 Introduction and Background

1.1 Introduction

The Town of Wasaga Beach (Town) has retained the services of Ainley Group (Ainley) to undertake a Municipal Class Environmental Assessment (Class EA) to identify a suitable solution for reducing the probability of flooding events in the area of Constance Boulevard and Thomas Street to Bayswater Drive, particularly in consideration of snow melt occurrences as well as increased rainfall intensities expected due to climate change. The current capacity of the side road ditch along Constance Boulevard in this area is insufficient to contain larger stormwater events and results in flooding.

The study area (Figure 1) is focused around the corridors of Thomas Street, Bayswater Drive, and the segment of Constance Boulevard that runs parallel to the shoreline of Georgian Bay.

In 2022, Ainley Group, on behalf of the Town of Wasaga Beach, filed a Notice of Completion for the Constance Boulevard Drainage Improvements Schedule 'C' Municipal Class Environmental Assessment.

Figure 1: Project Study Location

1.2 Municipal Class Environmental Assessment Process

The Municipal Class Environmental Assessment (MCEA) document (amended 2024) as published by the Municipal Engineers Association outlines a planning process for municipalities to follow so as to complete infrastructure projects in an environmentally responsible manner and in accordance with the *Ontario Environmental Assessment Act* (OEAA). Based on the scope of the proposed improvements, a Schedule 'C' level of planning was determined to be required. A Schedule 'C' project requires completion of Phases 1 to 4 of the Class EA process as illustrated in Figure 2, which is generally comprised of the following tasks:

PHASES 1 & 2

- Inventory the existing environment (physical, natural, social and economic);
- Identify the problem/opportunity;
- Develop alternative solutions to address the problem/opportunity;
- Evaluate proposed alternative solutions;
- Consult with the public, review agencies, relevant stakeholders; and
- Select the Preferred Solution giving consideration to the evaluation and any feedback received through consultation.

PHASES 3 & 4

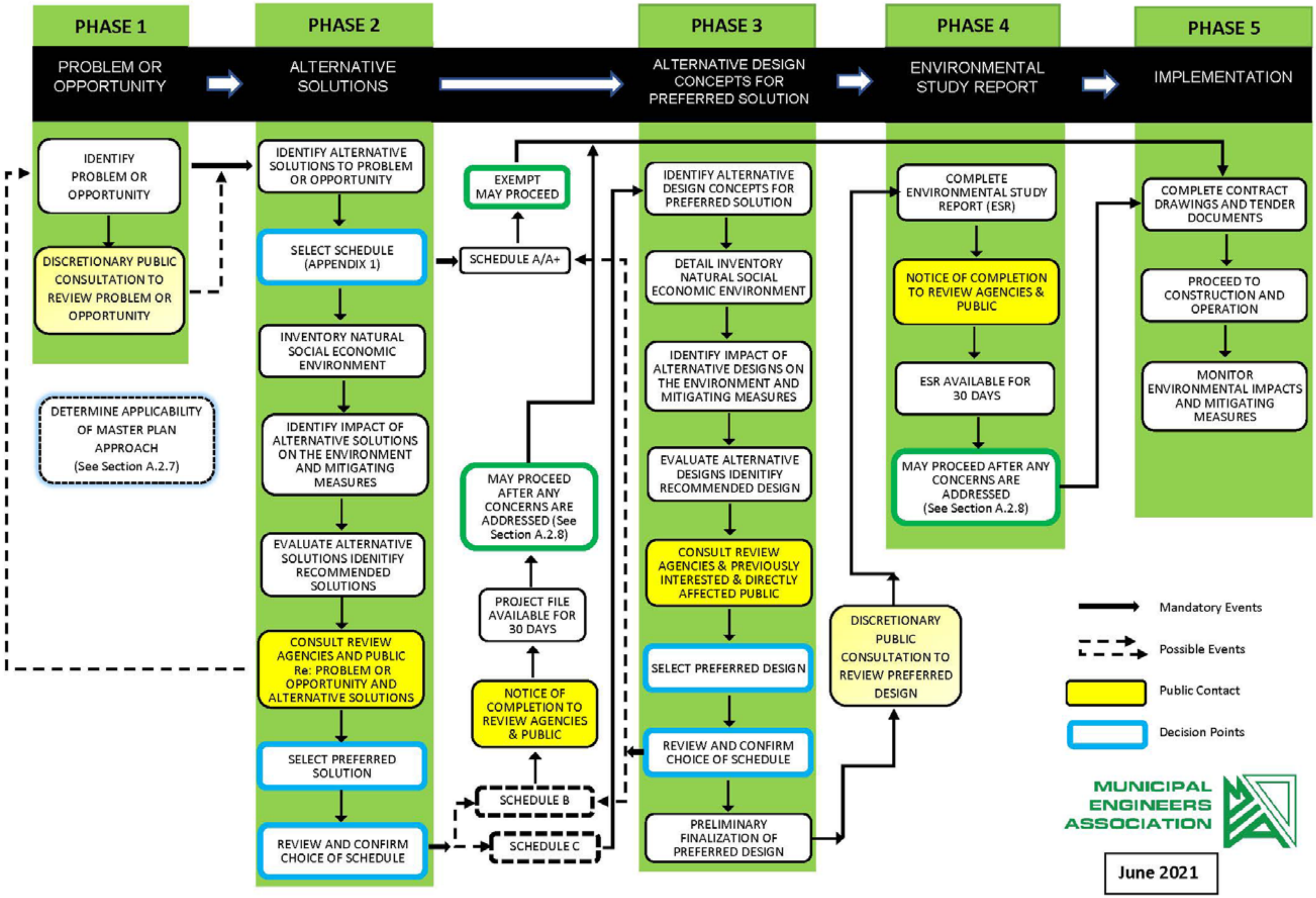
- Establish alternative design concepts to implement the Preferred Solution as selected at the close of Phase 2;
- Evaluate the impacts of the proposed alternative designs on the existing environment;
- Consult with the public, review agencies, relevant stakeholders;
- Select the Preferred Design in consideration of comments received;
- Develop a suitable mitigation strategy to minimize potential environmental effects;
- Prepare an Environmental Study Report (ESR) to document the Class EA process;
- Issue a Notice of Completion followed by a 30-day review period; and
- Address any final comments and conclude the Class EA process.

PHASE 5 – IMPLEMENTATION

- Complete the detailed design; prepare the contract drawings and tender documents; and proceed to construction.
- Monitor for environmental provisions and commitments.

Consultation is a key component of the Class EA process as it allows various stakeholders, including members of the public, Indigenous communities, and relevant review agencies, an opportunity to provide information and feedback for consideration.

Figure 2: MCEA Planning and Design Process



1.3 Objective of this Report

The objective of this report is to document the additional information which has been provided since the Notice of Completion was issued in 2022 for the project which necessitate consideration of an additional potential solution in comparison to the originally selected Preferred Solution selected during the Schedule 'C' Class EA planning process. The Notice of Completion, marking the completion of Phase 4 of the MCEA, was issued on December 21, 2022. This report summarizes a brief history of the Preferred Solution and Preferred Design Alternative selected during the MCEA process, the additional studies and analysis which has been completed for areas located immediately adjacent to the Project Study Location, the additional solution under consideration, and the evaluation of the environmental implications of this alternative in comparison to the original preferred solution to demonstrate the decision-making process leading to the selection of the preferred solution and subsequently the design solution. Consultation completed during this process is also included. In accordance with the MCEA, the Class EA Addendum will be made available for a 30-day public comment period; however, only the proposed changes to the project are open for review and not the entire project.

1.4 Project Team

The project team involved in the completion of this Schedule 'C' Class EA includes the following:

Proponent:	Town of Wasaga Beach
Prime Consultant:	Ainley Group
Sub-Consultants:	ARA Heritage Azimuth Environmental Consulting Inc.

2 Planning Policy and this Class EA

This section provides a brief discussion of various land use planning policies and principles to illustrate the consistency of this project in relation to provincial, regional and municipal planning goals.

2.1 Provincial Policy Statement (2020)

The *Provincial Policy Statement (2020)* provides policy direction relating to land use planning and development in Ontario. Section 3 of the *Planning Act* stipulates that all decisions affecting planning matters are to be consistent with the *Provincial Policy Statement (PPS)*. Policies applicable to this project include the following:

- Section 1.1.1i) "Healthy, liveable and safe communities are sustained by preparing for the regional and local impacts of a changing climate."
- Section 1.6.6.7c "Planning for stormwater management shall minimize erosion and changes in water balance, and prepare for the impacts of a changing climate

through the effective management of stormwater, including the use of green infrastructure."

- Section 1.6.6.7d "Planning for stormwater management shall mitigate risks to human health, safety, property and the environment."
- Section 2.1.1 "Natural features and areas shall be protected for the long term."
- Section 2.1.6 "Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements."
- Section 2.6.1 "Significant built heritage resource and significant cultural heritage landscapes shall be conserved."

As the current project is following a Municipal Class Environmental Assessment process consideration is being given to the potential to impact the physical, natural, social, cultural and economic environment prior to selection of the preferred solution. Various studies have been completed to obtain a better understanding of the existing conditions of the study area so that impacts can be properly assessed and appropriate mitigation developed.

2.2 Places to Grow Act (2005)

The *Places to Grow Act, 2005* enables the development of regional growth plans that guide government investments and land use planning policies. A Place to Grow – Growth Plan for the Greater Golden Horseshoe (2020) is the Ontario government's initiative to plan for growth and development in a way that supports economic prosperity, protects the environment, and helps communities achieve a high quality of life. This Plan applies to the area designated by Ontario Regulation 416/05 as the Greater Golden Horseshoe growth plan area, to which the Town of Wasaga Beach is located.

2.3 Town of Wasaga Beach Official Plan (Adopted 2004, Consolidated Sep. 2021)

Under the *Places to Grow Act*, regional and municipal Official Plans are required to reflect the policies of the relevant growth plan. At the municipal level, provincial policy is implemented through the Town of Wasaga Beach's Official Plan document. The Official Plan guides the decisions of Town Council on land use and construction of public works. Since the Official Plan has incorporated both the Growth Plan and the PPS, among others, the reasoning provided in the previous two sections that demonstrate consistency of this Class EA with those policies can also be applied to the Official Plan.

2.4 Nottawasaga Valley Conservation Authority Guidance Documents

Portions of the project study area are within an area regulated by the Nottawasaga Valley Conservation Authority (NVCA) and as such, a permit will be required from this agency prior to construction. The NVCA Planning and Regulation Guidelines (NVCA, August 2009) is a guidance document that outlines the role of a conservation authority under the *Conservation Authorities Act* and the *Planning Act*. These guidelines provide direction relating to standards and requirements associated with NVCA approvals.

2.5 Source Water Protection

The purpose of the *Clean Water Act* (2006) is to protect drinking water at the source and to safeguard human health and the environment. It aims to protect existing and future drinking water sources. It ensures that municipal drinking water supplies are protected through prevention by the development of a watershed-based source protection plan. The source protection plans identify vulnerable areas within each municipality and provide policies to address existing and future risks to municipal drinking water sources within these vulnerable areas. This project is subject to the South Georgian Bay Lake Simcoe's Region Source Protection Plan (SGBLS – SPP) and is within the Nottawasaga Valley Source Protection Area. Source Water Protection policy as it relates to this project are specifically discussed further in Section 6.3 of this document.

2.6 Climate Change

The MECP document entitled "Considering Climate Change in the Environmental Assessment Process" (2017) provides guidance relating to the Ministry's expectations for considering climate change during the environmental assessment process. The Guide is now a part of the Environmental Assessment Program's Guides and Codes of Practice. The environmental assessment of proposed undertakings is to consider how a project might impact climate change and how climate change may impact a project. Climate Change was considered during the course of this Class EA and is discussed further in Section 6.7 of this document to include any works for the collection, and transmission of drainage and storm water.

2.7 County of Simcoe Official Plan (Adopted 2008, Amended December 2016)

The purpose of the County of Simcoe Official Plan (2008) is to provide a policy context for land use planning taking into consideration the economic, social, and environmental impacts of land use and development decisions. Section 4.7 of the County's Official Plan provides the objectives and policies for the development of municipal sewage services, as defined in the Ontario Water Resources Act. The County's objective is to promote the development of sewage works that facilitate the conservation and protection of ground and surface water quality and quantity, natural heritage features, and ecological functions. The County requires that any servicing capability study or hydrological study must be prepared to the satisfaction of the County and local municipality in consultation with relevant agencies.

3 Summary of Previous Phases

The problem/opportunity statement was developed during Phase 1 of the MCEA process as follows:

"The purpose of this study is to identify a suitable solution for reducing the probability of flooding events in the area of Constance Boulevard and Thomas Street to Bayswater Drive, particularly in consideration of snow melt occurrences as well as increased rainfall intensities expected due to climate change. The current capacity of the side road

ditch along Constance Boulevard in this area is insufficient to contain larger stormwater events and results in flooding."

In Phase 2 of the process, the Preferred Solution selected was Option 2 – *Create New Outlet to the Bay through Property at 18 Constance Boulevard*. This option included a new drainage outlet constructed through private residence at 18 and 24 Constance Boulevard. A new outlet to Georgian Bay would be constructed and the current outlet would continue to convey the flows from west of Thomas Street along Constance Boulevard.

Figure 3: Option 2 with Alternative Proposed Solutions

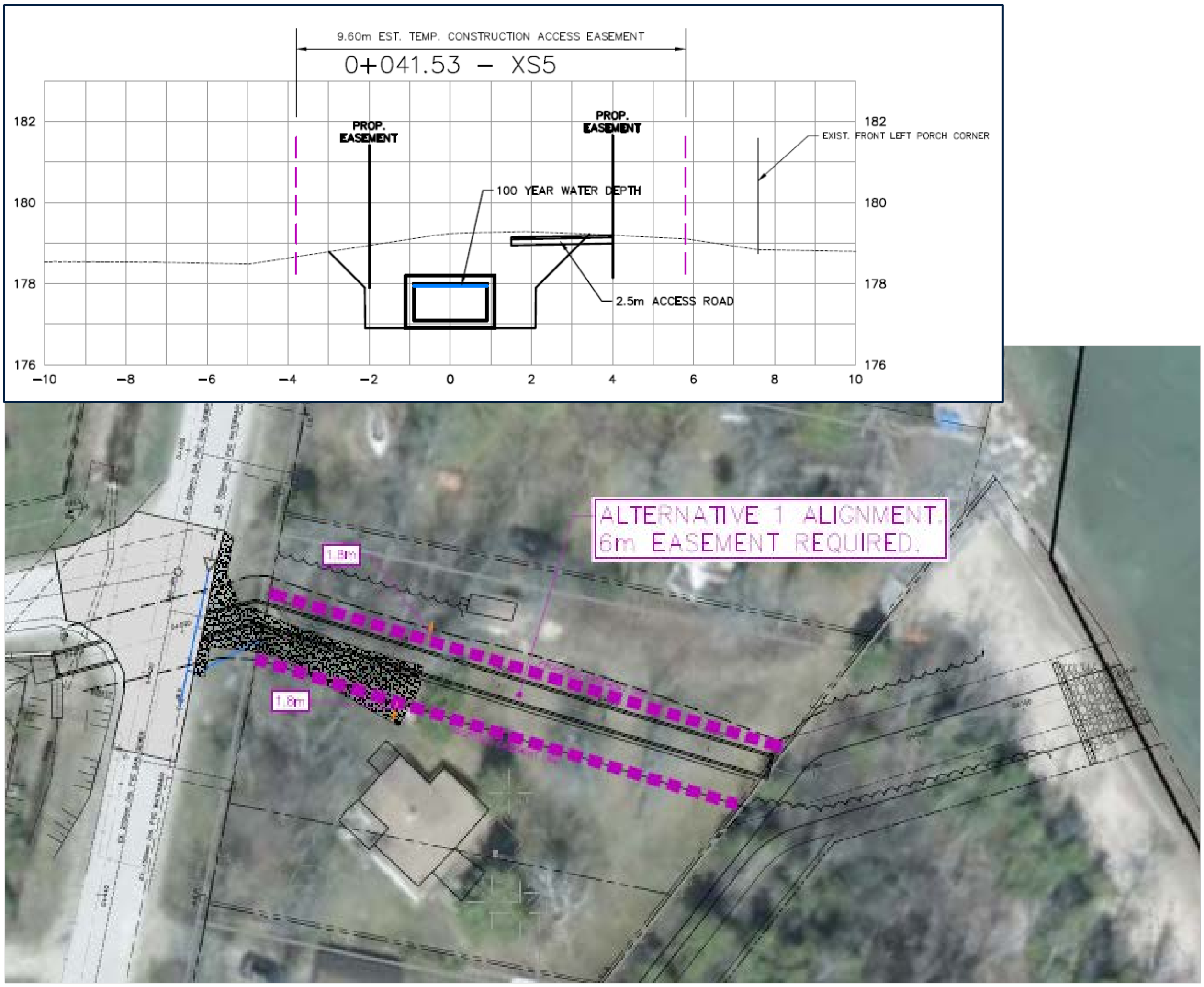
During Phases 3 and 4 of the process, the Preferred Design Alternative selected was *Alternative 1 – Skewed Alignment with a Culvert Extension*

The Preferred Design is summarized as follows:

- A concrete culvert installed under Constance Boulevard. The current culvert under Thomas Street that outlets to the Constance Boulevard ditch will remain in place.
- New concrete box culvert extension 1800 x 900mm (width and height).
- Access road for maintenance would be adjacent to the culvert extension.

- Total easement width required would be approximately 9.6m for construction, with the possibility that the easement width could be reduced to 6m post-construction.

Figure 4: Alternative 1 – Overview and Profile Design Concept



4 Additional Studies Completed for Areas Adjacent to Project Study

A floodplain assessment completed for the property located at 8859 Beachwood Road, immediately adjacent to the Project Study Area using 2D hydraulic models to demonstrate how the Regulatory Flood enters and traverses through their subject property, and how it would ultimately be conveyed to Georgian Bay under existing conditions was prepared in September 2022. Based on the results of the model it was determined that the floodplain extents would be expected to expand over a vast area encompassing both Bayswater Creek and Shore Creek with flood depths varying from 0 to 1.3 m, depending on location. The significant extent of this flooding was attributed to historical development in the area, minimal drainage infrastructure, and the absence of a defined outlet to Georgian Bay. Based on their review, it was determined that analysis of the potential positive impacts of diverting Bayswater Creek, which originates south of Highway 26, and diverting it through the proposed development area into an expanded version of the channel to be constructed as part of the West End Public Works Depot and Water Tower project initiated by the Town to create a defined outlet to Georgian Bay was merited. A conceptual design was completed to establish the channel footprint and configuration required to achieve this objective. It was concluded that implementation of this channel would vastly reduce floodplain extents within their extended project area, specifically reducing or eliminating seasonal flooding to residential homes, reduce or eliminate municipal roadway overtopping, and support current and future development projects through the creation of a low-risk conveyance mechanism to convey peak flows to Georgian Bay.

The design of the channel was advanced through discussions with the Town and the Nottawasaga Conservation Authority through March 2024. As a result of these discussions, the specifics of the solution to convey a Regional peak flow of 8.92 m^3/s consisted of the following:

1. A 1.1km long channel extending from just west of Bayswater Creek draining along the rear property line of 8859 Beachwood Road, merging with the proposed channel to be constructed as part of the Town's West End Public Works Depot and Water Tower project, approximately 80m south of Beachwood Road, and extending from Beachwood Road to Georgian Bay along the proposed alignment of the Town's proposed channel (as shown on the "SWM Conveyance Channel Area Markup – R1" drawing prepared by RJ Burnside & Associates Ltd. and included in *Appendix* A (Drawing R1)).
2. The dimensions of the channel are expected to consist of a bankfull width of approximately 18m including a 4m access road, and 5m flat-bottom configuration including a 1.5 m wide sinuous low-flow channel, approximately 0.3m deep, with additional wetland features and 3:1 sideslopes through the property at 8859 Beachwood Road to approximately 120m southwest of the confluence with the future channel to be constructed as part of the West End Public Works Depot and Water Tower project (as shown on Drawing R1 and the "Beachwood Flood Channel Enhancement Conceptual Plan prepared by Palmer Environmental Ltd., dated 2023-11-20, and included in *Appendix* A (Drawing CON).
3. The channel expands to a bankfull width of approximately 19m, with a 5.4 flat-bottom configuration and 200mm deep low-flow channel, with all other characteristics remaining consistent with the upstream segment from the end of Segment 1 to Beachwood Road as shown on Drawings R1 and CON in *Appendix A*.
4. Replacement of the existing crossing culvert under Beachwood Road with twin 3000mm span x 1500mm rise concrete box culverts (as shown on Drawing R1 in *Appendix* A).
5. These culverts discharge to channel of a bankfull width of approximately 18m with a 4.25m flat-bottom configuration, with all other characteristics remaining consistent with the upstream channel.

6. The channel profile varies from a profile grade of 0.69 to 1.52% along the entire length.
7. Flow depths in the channel are expected to range from 1.2 to 1.3 m deep along the length of the outlet, accounting for flow within the low flow portion.

In addition to the technical analysis for the channel configuration, and in response to comments by NVCA, a desktop screening of the unevaluated wetland on the 8839 Beachwood Road property, dated February 26, 2024 was completed by Cotyledon Environmental Consulting which precisely followed the Ontario Ministry of Natural Resources and Forestry (MNRF) Ontario Wetland Evaluation System (OWES), Southern Manual, 3rd Edition, Version 3.2, 2013 without the usual supporting documentation or submission to MNRF in support of the Preliminary Scoped Environmental Impact Study Beachwood Road and Robert Street South revised by Cotyledon April 11, 2023. The Preliminary Scoped Environmental Impact Study Beachwood Road and Robert Street South report is attached in the *Appendix* B. The intent of this screening was to determine if the unevaluated wetland was ecologically diverse and complex enough to be considered as a Provincially Significant wetland, necessitating a greater degree of protection.

Based on their analysis, they concluded that the approximate score, based on the OWES scoring system, would be expected to be in the order of 245 to 355 (to a maximum of 68 points in the biological component and 133 in the special features component), just 20% of the maximum possible score of 1,773 points. A wetland which scores higher than 600 points in total, or 200 points in either the biological or special features components meets the criteria for a wetland to be designated as Provincially Significant. They concluded that the analysis confirmed their assessment in the 2023 study that the wetland was not Provincially Significant and had a relatively low ecological service value, and as such, the elimination of the wetland would be justified in addressing the overall flooding issue identified in the expanded area identified in the floodplain assessment.

5 Evaluation of Proposed and New Solutions Within the EA Project Study Area

5.1 Evaluation Criteria

Under the Class EA process, evaluation involves the identification and consideration of the effects of each alternative on all aspects of the environment. The completion of the evaluation considered a number of factors, which were separated into evaluation criteria:

- **Physical Environment:** Increases Capacity to Reduce Flooding, Constructability, Erosion Potential, Sufficient Grade, Required Footprint, Expected Performance, Utility Impacts
- **Natural Environment:** Terrestrial Vegetation (Includes SAR), Wildlife (Includes SAR), Fish and Fish Habitat, Ground Water

- **Social and Cultural Environment:** Noise, Archaeological, Cultural and Built Heritage, Property Impacts, Climate Change
- **Economic Environment:** Construction Costs, and Operation and Maintenance Costs

A summary of the evaluation results is expressed in an Evaluation Matrix (Table 1). The Evaluation Matrix provides a means of comparing the effects that each alternative will generate on the area environment (physical, natural, cultural, social and economic). Visual markers are used to represent the potential for impact on each of the evaluation criteria. 4 options were considered during Phase 3 and 4 of the MCEA. As a result, the new option under consideration is Option 5 - *Create New Channel to Redirect Drainage from Bayswater Creek to West Depot Outlet Channel* which is evaluated in comparison the previously selected Preferred Option which was Design Alternative #1 of Option 2 (Option 2), as described in Section 3.

Legend:

Positive	Positive Neutral	Neutral	Negative Neutral	Negative
P	PN	O	NN	N

Green represents the most preferred option, as it will address the key concerns, but create the least amount of environmental impact. Red is indicative of a least preferred option as it has a higher potential to impact the environment. A blank space indicates that the impact is considered neutral. The evaluation of each criterion is described in more detail in the following subsections.

Table 1: Evaluation Matrix

EVALUATION CRITERIA	OPT 2	OPT 5	DESCRIPTION OF IMPACTS
PHYSICAL ENVIRONMENT			
Increases Capacity to Reduce Flooding	PN	P	Option 2 provides the creation of a new outlet to enhance capacity. Option 5 addresses the overall flooding issue in addition to Thomas Constance and can effectively convey the design storm, offering a comprehensive solution to the stormwater management challenges.
Constructability	PN	P	Option 2 is deemed feasible for construction but is located within the existing Municipal Road allowance and traverses an existing residential property. Conversely, Option 5 presents an advantage over Option 2 since the alignment is primarily through undeveloped properties and follows the proposed drainage outlet channel for the Public Works Depot and Water Tower site (which has already received approvals), thereby streamlining the implementation process.
Erosion Potential	P	P	Increased erosion is possible where the conveyance route turns. Both Option 2 and Option 5 offer a direct flow pathway without the presence of multiple 90-degree bends or sharper turns at road intersections.
Sufficient Grade	P	P	Higher grades within the conveyance route facilitate greater capacity. Option 2 follows the natural contours in the area over the shortest pathway, presenting an optimal choice for grading purposes. Additionally, Option 5 features a large channel ensuring efficient conveyance and alignment with natural topography.
Required Footprint	P	PN	Option 2 demonstrates commendable efficiency in addressing existing capacity issues, providing an optimal cross-section for improved performance. However, while Option 5 offers substantial capacity enhancements, its implementation requires a larger footprint due to the construction of a larger channel, presenting a potential drawback in terms of land usage.
Expected Performance	PN	P	Option 5 presents a notable advantage with its extensive coverage, offering ample space for efficient maintenance activities. Its superior capacity compared to Option 2 enhances its effectiveness in managing flow diversion. Conversely, while Option 2 demonstrates efficiency, its limited capacity may hinder its ability to adequately address the required flow diversion, potentially impacting overall effectiveness.
Impacts to Existing Utilities	NN	PN	Option 2 involves proposed work on private property, potentially impacting private utility services. Conversely, Option 5 does not pose any risk to private utility services, providing a distinct advantage in terms of project implementation.
NATURAL ENVIRONMENT			
Terrestrial Vegetation (Includes SAR)	NN	N	The execution of Option 2 may involve the removal of trees, subject to the dimensions of the channel. Conversely, Option 5, characterized by a larger channel size, is anticipated to necessitate a more extensive removal of trees compared to Option 2.
Wildlife (Includes SAR)	PN	PN	The woodlot to the east of the project area contains potential habitat for endangered bats. Adherence to the timing restriction window for tree removal under proposed Options 2 and 5 will mitigate impacts to individual SAR bats.
Fish Habitat (Includes SAR)	PN	N	While the alignment of Option 2 currently doesn't intersect with fish habitat constraints, both options entail fisheries considerations. Altering or eliminating the tributary within the current alignment could result in the harmful alteration, disruption, or destruction of fish habitat. Option 5 is expected to permanently eliminate 360 linear meters of indirect fish habitat and permanently alter 520 linear meters of direct Coldwater fish habitat.
Ground Water	O	O	The project area is within a highly vulnerable aquifer zone. Further geotechnical studies will be conducted during the detailed design stage. It is not anticipated that any of the work proposed under the options would impact ground water conditions. There are approximately 10 residential wells located within the study area. Residents are connected to municipal water.

EVALUATION CRITERIA	OPT 2	OPT 5	DESCRIPTION OF IMPACTS
CULTURAL & SOCIAL ENVIRONMENT			
Noise	NN	NN	Options 2 and 5 would have temporary noise disturbances due to construction activity. There are numerous residential dwellings in close proximity.
CULTURAL & SOCIAL ENVIRONMENT			
Archaeological	NN	NN	The work proposed under Option 2 has the potential to impact archaeological resources. Option 5 involves an area comprising a mixture of areas with archaeological potential and previously assessed lands of no further concern. However, further field investigation is required to confirm.
Cultural and Built Heritage	NN	NN	The beach/shoreline is identified as a Cultural Heritage Landscape (CHL), and the construction of a new channel outlet proposed under Options 2 and 5 may have a negative impact on the CHL.
Property Impacts	N	NN	Option 2 would have major property impacts to construct a new outlet. The channel can be placed to allow for future severance of this lot and maximizing the development potential while providing a positive outlet. Option 5 will entail impacts associated with the construction of a larger channel adjacent to future development lands, commercial businesses, and a new culvert crossing under Beachwood Road, which is owned by MTO.
Climate Change	N	P	Option 2 features a smaller channel compared to Option 5, resulting in less capacity to convey larger storms. Conversely, Option 5 entails a larger channel capable of accommodating larger storm events and possessing greater capacity to address climate change considerations
ECONOMIC ENVIRONMENT			
Construction Costs	NN	PN	The construction cost associated with Option 2 is lower than that of Option 5. However, Option 2 is funded solely under the Town's Capital Projects budgets, whereas Option 5 is funded by various sources including development charges, cost sharing with the developers, and the Town's Capital Projects budget.
Operating and Maintenance Costs	NN	PN	Option 2 includes a culvert that necessitates maintenance. The Town is responsible for maintaining the channel to prevent flooding issues, and the channel itself is smaller, making it difficult for maintenance purposes. Option 5 will feature a larger open channel, with direct access which is easier to clean and offers better operational efficiency.
TOTALS			
	PN	P	The Options have been ranked using the evaluation of all criteria to select a suitable approach that will address the problem/opportunity but also keep impacts to a minimum.

6 Rationale for the Proposed Changes

6.1 Physical Environment

Option 2 presents an approach focused on creating a new outlet, thereby increasing the capacity of the existing stormwater management system. By introducing this additional outlet, Option 2 aims to alleviate pressure on the existing infrastructure and improve the system's ability to handle stormwater runoff effectively. In contrast, Option 5 takes a more comprehensive approach to address the broader flooding issues within the area. This option not only targets the specific problem areas like Thomas Constance but also encompasses a wider scope, aiming to tackle the overall flooding challenges more comprehensively.

Option 2 effectively addresses existing site deficiencies through the creation of a new outlet, making it a feasible solution for construction. However, the improvements are located within the existing Municipal Road allowance and the new culvert must cross through an occupied residential property. In contrast, the alignment of Option 5 is primarily through currently undeveloped properties thereby streamlining the implementation process.

The potential for increased erosion is a concern where the conveyance route changes direction. However, both Option 2 and Option 5 mitigate this risk by providing a direct flow pathway, devoid of multiple sharp turns often found at road intersections. This streamlined approach minimizes the likelihood of erosion, ensuring the long-term stability and effectiveness of the stormwater management system.

Higher grades along the conveyance route are crucial for enhancing capacity, and both Option 2 and Option 5 capitalize on this aspect effectively. Option 2 strategically follows the natural contours of the area, offering the shortest pathway and optimal grading solutions. Similarly, Option 5 incorporates a larger channel design, ensuring efficient conveyance while aligning seamlessly with the natural topography.

Option 2 showcases efficiency in tackling current capacity limitations, boasting an optimal cross-section that enhances overall performance. However, despite Option 5's significant capacity improvements, its execution demands a larger footprint due to the construction of a more expansive channel. This aspect may pose a potential drawback concerning land usage.

Option 5 presents a notable advantage with its extensive coverage, offering ample space for efficient maintenance activities. Its superior capacity compared to Option 2 enhances its effectiveness in managing flow diversion. Conversely, while Option 2 demonstrates efficiency, its limited capacity may hinder its ability to adequately address the required flow diversion, potentially impacting overall effectiveness.

Option 2 entails proposed work on private property, which may result in potential disruptions to private utility services. In contrast, Option 5 eliminates this risk, as it does not involve any impact on private utility services. This key difference provides Option 5 with a notable advantage in terms of project implementation, as it mitigates potential conflicts and delays associated with utility service disruptions.

Table 2: A Summary of the Technical Considerations for each Drainage Option.

Option #	Description	Technical consideration
2	Create New Outlet to the Bay through Property at 18 Constance Boulevard	▪ The new outlet to Georgian Bay would be constructed and the current outlet would continue to convey the flows from west of Thomas Street along Constance Boulevard
5	Create New channel that redirect Drainage from Highway 26 to West Depot Outlet Channel	▪ The proposed channel will flow east in proximity to Highway 26, and then north into the proposed West Depot Channel. The West Depot Channel will flow north and outlet into Georgian Bay at a new outlet location along the shoreline. ▪ The channel length would be approximately 1.1km long and consist of a bankfull width of 12.05-13.2m. The bankfull depth of the channel would be 1.3m, and the flow-bottom portion of the channel would be approximately 4.25-5.5m wide.

6.2 Natural Environment

The work proposed under Option 2 may include tree removals dependent on size of channel. In contrast, Option 5, distinguished by its larger channel size, is expected to entail a more significant removal of trees compared to Option 2. Additionally, option 5 will remove approximately 1,600m^2 of direct wetland, impacting the ecosystem's integrity and biodiversity.

In accordance with the Scoped Environmental Impact Study Beachwood Road Class EA Update conducted by Azimuth Environmental Consulting, Inc., it has been observed that the Option 5 study area contains Black Ash trees, which may need to be removed to facilitate proposed developments. Furthermore, the project will not pose any negative repercussions on Chimney Swifts or their aerial foraging habitat, ensuring the preservation of their ecological niche. With the evaluation of the Option 5 study area, it has been determined that there is a low risk of restricted species occurring within the vicinity of the proposed project, further affirming the minimal ecological disruption anticipated. Additionally, no other Species at Risk (SAR) are anticipated within the study area, highlighting the overall conservation-conscious approach taken in the planning and execution of the project.

The woodlot situated east of the project area harbors potential habitat for endangered bats, signifying the ecological significance of the surrounding environment. Adhering to the timing restriction window for tree removal for proposed Options 2 and 5 is essential to minimize potential impacts on individual SAR (Species at Risk) bats residing within this habitat. This proactive measure serves to mitigate disturbance to bat populations during critical periods, ensuring their continued protection and conservation within the project vicinity.

While the alignment of Option 2 currently doesn't intersect with fish habitat constraints, both options entail fisheries considerations. Altering or eliminating the tributary within the current alignment could result in the harmful alteration, disruption, or destruction of fish habitat. Option 5 is expected to permanently eliminate 360 linear meters of indirect fish habitat and permanently alter 520 linear meters of direct Coldwater fish habitat. A copy of the "*Scoped Environmental Impact Study Beachwood Road Class EA Update"* can be found in *Appendix D.*

As per the OWES Evaluation conducted by Cotyledon, as described in Section 4, wetlands scoring higher than 600 points in total or 200 points in either the biological or special features components are designated as Provincially Significant. The Beachwood Road unevaluated wetland received a total score of 355 points, with 68 points in the biological component and 133 points in the special features component. This score falls below the Provincially Significant threshold by all measures. Based on a potential maximum score of 1,773 points, this rating approximates the 20th percentile, indicating relatively low ecological service value. Moreover, an estimated 8.9 acres of wetland will dry up following the construction of Option 5 flood diversion channel, with approximately 6.25 acres to be landscaped for wetland habitat restoration. This restoration aims to enhance functionality by creating habitats suitable for various species, including fish, waterfowl, and amphibians, which are absent in the existing wetland. Option 5 is anticipated to yield two significant benefits: mitigating chronic seasonal flooding and enhancing ecological value through wetland restoration. Although slightly smaller in size, the restored wetland is expected to offer substantially greater ecological service value compared to the wetland it replaces. Additionally, observations of SAR species, such as the Little Brown Myotis and Eastern Wood Pewee, in adjacent existing woodlands suggest opportunistic foraging near the wetland, though they are not dependent on existing wetland for breeding, foraging, or staging purposes. A copy of the "*Desktop OWES Evaluation of the Unevaluated Wetland on the Sunray Living property on Beachwood Road, Wasaga Beach Memorandum by Cotyledon"* can be found in *Appendix B.*

The project area is within a highly vulnerable aquifer zone. Further geotechnical studies will be conducted during the detailed design stage. It is not anticipated that any of the work proposed under the options would impact ground water conditions. There are approximately 10 residential wells located within the study area. Residents are connected to municipal water.

6.3 Cultural Environment

The work proposed under Option 2 has the potential to impact archaeological resources. Option 5 involves an area comprising a mixture of areas with archaeological potential and previously assessed lands of no further concern. However, further field investigation is required to confirm.

The beach/shoreline is identified as a Cultural Heritage Landscape (CHL), and the construction of a new channel outlet proposed under Options 2 and 4 may have a negative impact on the CHL.

6.4 Social Environment

Options 2 and 5 both would have temporary noise disturbances due to construction activity. There are numerous residential dwellings in close proximity.

Option 2 would have major property impacts to construct a new outlet. The channel can be placed to allow for future severance of this lot and maximizing the development potential while provided a positive outlet. Option 5 will entail impacts associated with the construction of a larger channel along undeveloped areas which will eventually potentially include residential homes, commercial businesses, and town right-of-way.

In comparison to Option 5, Option 2 presents a narrower channel, leading to reduced capability in managing larger storm events. Conversely, Option 5 incorporates a larger channel, enhancing its capacity to accommodate significant storm events and better address concerns related to climate change impacts.

6.5 Economic Environment

While the construction cost for Option 2 is lower compared to Option 5, it is exclusively funded by the Town. In contrast, Option 5's funding is more diversified, with contributions coming from developers as well as the Town, among other sources.

Option 2's inclusion of a culvert requires regular maintenance by the town to prevent flooding issues. However, the smaller size of the channel complicates maintenance efforts. In contrast, Option 5's larger open channel not only facilitates easier cleaning but also offers improved operational efficiency, presenting a more favorable solution for long-term maintenance and stormwater management.

6.6 Climate Change

Climate change concerns generally relate to the increased concentration of greenhouse gases in the atmosphere, which can result in a rise in the global mean surface temperature. Increased temperatures worldwide are creating changes in climate that is resulting in extreme weather events.

The rise of greenhouse gas emissions is influencing climate patterns, hydrology, ecosystems and ocean chemistry. There are two approaches to address climate change. These include reducing a project's impact on climate change (climate change mitigation) and increasing the local ecosystem's resilience to climate change (climate change adaptation).

Climate change has the potential to result in increased storm events and intensities that can lead to flooding. Alternatives were evaluated with respect to how successfully they would decrease water ponding and flood duration in the area of Constance Boulevard and Thomas Street to Bayswater Drive. The preferred solution is designed to accommodate water volumes of up to the Regional (Timmins) storm event level and is expected to make the area less vulnerable to climate change.

6.7 Selection of the Preferred Design Concept

Considering the comments received during Phase 2, it was determined that the Preferred Solution is Option 5 – Create New Channel to Redirect Drainage from Bayswater Creek to the West End Public Works Depot and Water Tower Outlet Channel. The Design Alternative for this option is based on the configuration established in the RJ Burnside Floodplain Analysis Study consisting of:

- A 1.1km long channel extending from just west of Bayswater Creek draining along the rear property line of 8859 Beachwood Road, merging with the proposed channel to be constructed as part of the Town's West End Depot project, approximately 80m south of Beachwood, and extending from Beachwood Road to Georgian Bay along the proposed alignment of the Town's proposed channel (as shown on the "SWM Conveyance Channel Area Markup – R1" drawing prepared by RJ Burnside & Associates Ltd. and included in *Appendix* A (Drawing R1)).
- The dimensions of the channel are expected to consist of varying bankfull width of approximately 18 to 19m including a 4m access road, and flat-bottom configuration ranging from 4.25 to 5m wide, including a 1.5 m wide sinuous low-flow channel, ranging from approximately 0.2 to 0.3m deep, with additional wetland features and 3:1 sideslopes.
- Replacement of the existing crossing culvert under Beachwood Road with twin 3000mm span x 1500mm rise concrete box culverts (as shown on Drawing R1 in *Appendix* A).
- The channel profile varies from a profile grade of 0.69 to 1.52% along the entire length.
- Flow depths in the channel are expected to range from 1.2 to 1.3 m deep along the length of the outlet, accounting for flow within the low flow portion.

The alignment of the proposed channel for this option flows east in proximity to Highway 26, and then north into the proposed West Depot Channel. The West Depot Channel will flow north and outlet into Georgian Bay at a new outlet location along the shoreline.

The estimated cost for the design and construction of the Preferred Design is $1,143,790.00 +HST. Table 3 provides a breakdown of estimated costs for the Constance Boulevard Drainage Improvements.

Table 3: Cost Estimate

Item	Estimated Total ($)
General Work	$ 5,300.00
Sediment and Erosion Control Measures	$ 17,500.00
Removals	$ 95,060.00

Item	Estimated Total ($)
Roadworks	$ 89,300.00
Culvert Works	$ 695,000.000
Water Management	$ 50,000.00
Provisional items (Survey)	$ 3,000.00
Channel Work	$ 188,630.00
TOTAL	**$ 1,143,790.00**

7 Consultation

7.1 Notice of Addendum and Public Information Centre

A Notice of Addendum and Public Information Centre was posted on the Town of Wasaga Beach's website on May 30, 2024. A mail out to area residents adjacent to the project study area, relevant review agencies as well as Indigenous communities and agencies was issued on May 30, 2024 providing notification of the Addendum to the project and the scheduled Public Information Centre. A copy of the agency mailing list and copies of all comments received from Ministry are included in Appendix G.

8 Permits and Approvals

The requirement to obtain any permits and approvals during detailed design and construction remains unchanged and includes, but is not limited to the following:

8.1 Nottawasaga Valley Conservation Authority.

Since work will be completed in the existing floodplain a permit will be required from the Nottawasaga Valley Conservation Authority to proceed with future development or construction activities. A copy of the review comments provided by NVCA on December 1, 2023, along with responses provided by the developer's consultant have been included in *Appendix* C. Based on their review comments to date the NVCA and the consultant's responses the following additional information will be provided as part of detailed design.

- More description regarding the preparation of the PCSWMM model including catchment boundaries, hydrologic parameters, and IDF data as well as a digital copy of the model.
- Information regarding the verification of the digital terrain used in the 2D model by the vendor, calibration detail (topographic vs. LIDAR), as well as digital copies of the terrain data.
- An updated hydraulic model accounting for the culvert performance under existing conditions, and a sensitivity analysis, as well as digital copies of the model.
- Additional information regarding expected flooding depths under existing and proposed conditions.

8.2 Ministry of Environment, Conservation and Parks

Future consultation with MECP will be required due to presence of Black Ash within the proposed location of the channel to obtain permission from MECP to mitigate or offset potential impacts.

Potential need for Permit to Take Water (PTTW) or Environmental Activity and Sector Registry (EASR).

Approvals for storm servicing will be required and may be completed via the Town's Consolidated Linear Environmental Compliance Approval.

8.3 Department of Fisheries and Oceans and Ministry of Natural Resources and Forestry

A fisheries screening should be completed to establish the requirements for a submission to the DFO. The MNRF may also require a permit under the *Lakes and Rivers Improvement Act* based on works in the water.

8.4 Ministry of Transportation

To accommodate the expected flows in the proposed channel the replacement of the existing culvert crossing under Beachwood Road with twin 3000mm span x 1500mm rise concrete box culverts will be required. Beachwood Road is under the jurisdiction of the MTO and their approval of this proposed modification will be required.

9 Mitigation Measures

The following sub-sections outline the mitigation measures to be considered in the development of the detailed design for the implementation of the Preferred Design. The anticipated approvals and permitting requirements are also described.

9.1 Natural Environment

The mitigation measures related to the natural environment are detailed within the natural heritage report included in *Appendix* D and summarized below.

9.1.1 Species at Risk

It is the responsibility of the proponent to ensure that they are not in contravention of the ESA at the time that site works are undertaken. A review of the assessment provided in the natural heritage report should be sufficient to provide appropriate advice at the time of the onset of future site works.

9.1.2 Migratory Breeding Birds and Bats

A general survey screening should be completed for the presence of 'snag' trees with potential to provide refuge and maternity roosting habitat for bat species listed as Endangered under the Endangered Species Act (ESA).

Tree removal be avoided during the active period for bats and breeding birds that occurs during the early spring through later summer months. As such, tree removals should be avoided between **April 1** and **September 30** to avoid potential impacts to maternity and/or day roosting bats.

If vegetation clearing is required within the date range above, it is recommended that screening by an ecologist with knowledge of bird and bat habitat be undertaken to ‘screen’ trees, and confirm absence of nesting/roosting.

Tree cutting should occur within 48 hours of confirmation of nest/roost absence, and if nesting/roost occurrence is confirmed, vegetation removal should not occur until fledglings have vacated prior to clearing to avoid contraventions of the MBCA and ESA.

Workers should be instructed to stop work and contact the MECP immediately if any SAR are encountered within the work area. Individuals working on site should ensure that SAR are not harmed during construction or killed by heavy machinery, vehicles or other equipment.

The contractor should educate all site personnel to ensure that, if identified, the SAR are not wantonly injured or killed, and to ensure that damage to features which could constitute habitat is avoided. Information should be conveyed through a SAR expert.

9.1.3 Sediment and Erosion Controls

Diligent application of sediment and erosion controls is recommended for all future construction activities to minimize the extent of accidental or unavoidable impacts to adjacent vegetation communities and wildlife habitat. Prior to the commencement of site works (including tree removals) silt fencing should be applied along the length of directly adjacent natural or naturalized features, and routine inspection/maintenance of the silt fencing should occur throughout construction. It is recommended that erosion and sediment controls be maintained until vegetation is re-established post-construction.

9.1.4 General Operations

All maintenance activities (including refueling) required during future construction should be conducted at least 30m away from natural features to prevent accidentals spillage of deleterious substances that may harm natural environments. Snow fencing or equivalent should be installed at the limit of the work area to prevent the accidental intrusion of machinery operations into adjacent undisturbed natural areas. The contractor is recommended to have a Contaminant and Spill Management Plan in place prior to initiation of works. This should include keeping an emergency spill kit on site at all times. In the event of a spill, the contractor must report it immediately to the provincial Spills Action Centre (SAC).

9.1.5 Fish and Fish Habitat

A fisheries screening should be completed to establish the requirements for a submission to the DFO. The MNRF may also require a permit under the Lakes and Rivers Improvement Act based on works in the water for the diversion of Bayswater Creek.

The following minimum mitigation measures should be applied to avoid any potential impacts to the watercourse and aquatic habitat:

- The construction of the outlet channel should be constructed in the dry as much as possible with the diversion of Bayswater Creek occurring once the vegetation in the proposed outlet channel has been established.
- Should any fish be observed when the diversion of Bayswater Creek is expected to proceed, a fish salvage shall be completed by a qualified ecologist under an MNRF Licence to Collect Fish for Scientific Purposes.
- Appropriate sediment and erosion control measures should be implemented between any stockpiled materials and the water, and exposed soils should be stabilized with vegetation where possible.
- Diligent application of ESC measures is recommended for all future construction activities to minimize the extent of accidental or unavoidable impacts to adjacent or downstream fish habitat. Prior to the commencement of site works, sediment fence or filter socks should be installed. Routine inspection/maintenance of the ESC measures should occur throughout construction. It is recommended that ESC measures be maintained until vegetation is re-established post-construction.
- All site disturbance should be minimized to the extent possible and riparian vegetation should be enhanced where feasible.
- All stockpiled material on site should be stored a minimum of 30m from any fish habitat features and be protected with appropriate ESC measures, such as sediment fence and/or tarps. Disposal of excess or waste material should occur in a timely fashion to minimize risk of entry into fish habitat features
- Re-fueling and the maintenance of construction equipment should be completed away from water to minimize the possibility of water and sediment contamination.
- All on-site fuel oils and chemicals should also be stored at least 100m away from surface water.
- Should there be any dewatering requirements that require a permit to take water, the MECP will have to review and approve the permit before local approvals can be issued.

9.2 Archaeological and Cultural Heritage Resources

The mitigation measures related to the archaeological and cultural heritage resources are detailed within the reports included in *Appendix* E & F and are summarized below.

- All areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 S&Gs.
- In the event the following situations are encountered during construction, the contractor should be advised to stop work immediately and take the appropriate actions as noted below:

a) Should previously unknown or unassessed deeply buried archaeological resources be uncovered, 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 archaeologist to carry out archaeological fieldwork, in compliance with section 48 (1) of the Ontario Heritage Act. The Ministry of Tourism, Culture and Sport should be notified immediately at archaeology@ontario.ca

b) In the event that human remains are encountered, the proponent or person discovering human remains must immediately notify the police or coroner and the Registrar of the Bereavement Authority of Ontario at 647-483-2645 or 1-807-468-2450.

- Construction activities, staging areas, and temporary signage are to be suitably planned and undertaken to avoid impacts to identified cultural heritage resources.
- Should future work require an expansion of the study area, a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on identified cultural heritage resources and confirm if a Heritage Impact Assessment is required.

9.3 Utilities and Servicing

On-going consultation with utilities is recommended during detailed design and construction of the project to ensure that any concerns are addressed.

10 Monitoring

Information pertaining to required mitigation and monitoring will be incorporated into the Construction Documents once the detailed design has been finalized. Monitoring will be conducted by on-site construction staff to make certain that environmental protection measures are being implemented and are effective. The Contract Administrator will make certain that environmental protection measures and monitoring, as identified, are implemented during construction and that any repairs to protection measures will be made in a timely fashion.

Appendix A
Floodplain Assessment Study

8859 Beachwood Road
West End Existing Floodplain Analysis

Sunray Living Inc.
701-515 Consumers Road
North York ON M2J 4Z2

R.J. Burnside & Associates Limited
3 Ronell Crescent
Collingwood ON   L9Y 4J6 CANADA

September 2, 2022
300052877.1000

Distribution List

Hard Copies	PDF	Email	Organization Name
1	Yes	Yes	Sunray Living Inc.

Record of Revisions

Rev.	Date	Description
-	September 2, 2022	Final Report issued to Client for further distribution.

R.J. Burnside & Associates Limited

Prepared By:

Tim Koen, P.Eng
Water Resources Engineer
TK:RW:

Rachel Walton, MASc., P.Eng.
Project Engineer

Reviewed By:

James Orr, P.Eng.
Senior Project Advisor

Table of Contents

1.0 Project Overview 5
2.0 Project Area 6
3.0 Background Information 6
3.1 Reference Material and Studies 6
3.2 Preliminary Hydraulic Modelling and Discussions 7
3.3 Historical Flooding within the Study Area 8
3.4 Historical Drainage Patterns 9
3.4.1 Location A 10
3.4.2 Location B 10
3.4.3 Location C 11
3.4.4 Historical Aerial Imagery Review Summary 11
4.0 Hydrology 11
4.1 Hydrology Background and Modelling References 11
4.2 Burnside PCSWMM Hydrological Model 12
4.3 Peak Flow Summary Comparison Commentary 13
5.0 Topographic Information 15
5.1 Base Mapping 15
5.2 Field Reconnaissance and Topographic Survey 15
5.3 Ground Truthing 15
5.4 Composite Base Map 15
6.0 SMS 2D Hydraulic Model 16
6.1 Hydraulic Modelling Assumptions 16
6.1.1 DEM Data 16
6.1.2 2D Mesh 16
6.1.3 2D Mesh Polygons 17
6.2 Buildings within the Floodplain 18
6.3 Model Specific Coverages 19
6.3.1 Boundary Condition Coverages 19
6.3.2 Materials Coverage 23
7.0 Analysis of 2D Floodplain Modelling Results 23
7.1 Floodplain Elevations and Extents Commentary 24
7.2 Floodplain Depth Commentary 25
7.3 Floodplain Velocity Commentary 25
7.4 Floodplain Depth x Velocity Commentary 25
8.0 2D Modelling Validation 25
8.1 Highway 26 By-Pass and Beachwood Road Culverts 25
8.2 Peak Flow Selection 26
8.2.1 Regional Storm Event Validation 26
8.2.2 100-Year Storm Event Validation 27
9.0 Overall Hydraulic Modelling Summary 27

10.0 Future Considerations and Recommendations 28
10.1 Drainage Improvements and Defined Outlet to Georgian Bay 28
10.1.1 Proposed Drainage Consideration 28
10.2 Site Specific Drainage Improvements 30
10.3 Considerations for Drainage Improvements under the Drainage Act 31
11.0 References 32

Tables

Table 1: Burnside PCSWMM Peak Flow Summary 13
Table 2: Baywater Creek Summarized Peak Flows 13
Table 3: Highway 26 By-Pass and Beachwood Road Culvert Summary 22
Table 4: Materials Coverage – Manning’s “n” Summary 23

Figures

Figure 1: Site Map 5
Figure 2: Study Area 6
Figure 3: Thomas Street Historical Flooding 8
Figure 4: 1954 Aerial Image 9
Figure 5: 2018 Aerial Image 10
Figure 6: Patch Mesh Coverage 17
Figure 7: Paving Mesh Coverage 18
Figure 8: SMS Mesh with Buildings 19
Figure 9: Regulatory Floodplain Extents 24
Figure 10: Current Day Flood Conditions vs Proposed Channel Concept 29

Appendices

Appendix A Background Information
Appendix B Hydrologic Summary Output
Appendix C Hydraulic Summary Output
Appendix D Conceptual Design
Appendix E Digital Files

Disclaimer

1.0 Project Overview

R.J. Burnside & Associates Limited (Burnside) has been retained by Sunray Group to complete a 2D Floodplain Study to determine the extents of the existing Regulatory Floodplain within 8859 Beachwood Road (site), located between Collingwood and Wasaga Beach.

This Report has been prepared to outline the methodology used in the preparation of the Hydrological and 2D Floodplain Hydraulic Modelling associated with the 8859 Beachwood Road property (site). The 2D Floodplain Hydraulic Modelling contained in this report has also been extended outside the limits of the site to gain an understanding of how Regulatory Flood flows enter the site, drain through the site and how they are ultimately conveyed to Georgian Bay under existing conditions. The broader complete footprint of the floodplain analysis will be referred to as the study area for the remainder of this report.

The site is shown in Figure 1 below. The Sunray Group was in the process of obtaining the parcel of land adjacent to the east of 8859 Beachwood Road, and as such, it was included within the study scope. We note this is no longer the case, and the parcel is to remain owned by the Ministry of Transportation (MTO), referred to below as MTO Lands.

Figure 1: Site Map

2.0 Project Area

The study area is located within the Town of Wasaga Beach (Town). The project limits are bound to the north by Georgian Bay, to the south by the Highway 26 Bypass, to the west generally by Fairgrounds Road and 45th Street to the east. The study area is also located within the Nottawasaga Valley Conservation Authority (NVCA) watershed. The study area is outlined in Figure 2 below.

Figure 2: Study Area

3.0 Background Information

3.1 Reference Material and Studies

A number of specific references have been accumulated and applied to complete the hydraulic modelling of the site and study area. The following list highlights the key information used in developing our hydraulic model.

- The MTO Intensity-Duration-Frequency (IDF) rainfall tool was used to derive rainfall data for the study area. This rainfall data was further used to develop a hydrological model and verify peak flows values used in the floodplain analysis. Applicable hydrologic reference material has been provided in Appendix B.

- Topographic LIDAR mapping of the study area was acquired from the Town in the spring of 2021. A topographic survey of the site was completed by JoeTOPO in January 2020, August 2021 and January 2022. The topographic survey was completed to obtain detailed ground elevations, detailed roadway elevations and culvert information within the site. Specific culvert information obtained at each structure includes inverts, obverts, guardrail and roadway elevations, crossing materials and overall dimensions. The topographic survey includes both the site and the adjacent MTO Lands. The LIDAR information has been complemented with topographical information within the property limits of the site to create an overall surface of the study area for use in the 2D hydraulic floodplain model.

The following background reports have been referenced in the preparation of this report:

- Drainage, Hydrology and Stormwater Management Report, Preliminary Design, Highway 26 new Alignment between Collingwood and Wasaga, Delcan, July 3, 2009.[1]
- Drainage Update of Existing Highway 26, Existing Highway 26 between Collingwood and Wasaga Beach (Huronia to Mosely Street), Delcan, September 2013. [2]

3.2 Preliminary Hydraulic Modelling and Discussions

In 2013, Burnside was originally retained by the previous owner of 8859 Beachwood Road to undertake a floodplain analysis within the site. Between 2013 and 2018 Burnside completed preliminary investigations to understand key hydraulic characteristics such as land use, drainage routes, roadways, culvert crossings and other relevant hydrologic / hydraulic characteristics associated with the site. During the preliminary analysis Burnside was in direct contact with the NVCA.

Through discussions with the NVCA, it was noted that two drainage features, known as Baywater Creek and Shore Creek, drain through the west and east portions of the site respectively. The NVCA agreed that while the drainage features have names for reference perspectives, both features lack defined geometry. Prior to this report being written, formal Regulatory floodplain mapping had not been completed by the NVCA and was therefore not available for reference during this study.

A preliminary floodplain hydraulic analysis was developed using limited survey and contour data with a 1D HEC-RAS hydraulic model. It was apparent early on in the project that, given the absence of a defined flow path through the site and flat topography, a 1D HEC-RAS hydraulic model would not accurately depict the flood plain extents. Burnside discussed the limitations of using a 1D HEC-RAS hydraulic model with the NVCA. For reference, a 1D hydraulic model calculates a flow depth in a single direction. A 2D hydraulic model calculates flow depth in two or more directions at a time.

---

[1] Drainage, Hydrology and Stormwater Management Report, Preliminary Design, Highway 26 new Alignment between Collingwood and Wasaga, Delcan, July 3, 2009.
[2] Drainage Update of Existing Highway 26, Existing Highway 26 between Collingwood and Wasaga Beach (Huronia to Mosely Street), Delcan, September 2013.

While 1D hydraulic modelling is generally applicable in many floodplain modelling projects, it was agreed by both Burnside and the NVCA that the floodplain within the site and study area would be best delineated using a 2D Hydraulic model. Accordingly, Burnside has proceeded with the 2D floodplain modelling presented in this report to delineate Regulatory floodplain extents for both Baywater Creek and Shore Creek.

3.3 Historical Flooding within the Study Area

In direct discussions with the Town since the inception of the project, the Town has indicated that a number of locations within the study area, between Beachwood Road and Georgian Bay are known to experience flooding during spring runoff events. At the time of writing of this report, the Town was in the process of completing an Environmental Assessment (EA) to *"find a solution to reduce the probability of flooding, particularly snowmelt, as well as the increase in the number and intensity of rainfall events due to climate change"*[3]. The EA study area includes both Thomas Street and Constance Boulevard which are both included in the study area for this project.

Figure 3 below illustrates historical flooding experienced within the Thomas Street right-of-way.

Figure 3: Thomas Street Historical Flooding[4]

[3] Quotation "Environmental Assessment", Town of Wasaga Beach. Environmental Assessment proposes new drainage channel for west-end Wasaga Beach neighbourhood, new channel would address persistent flooding issues on Constance Boulevard.
[4] https://www.thestar.com/local-wasaga/news/2022/03/21/environmental-assessment-proposes-new-drainage-channel-for-west-end-wasaga-beach-neighbourhood.html

Through past discussions with the Town and through work experience on past drainage projects within the vicinity of the Thomas Street and Constance Boulevard rights-of-way, Burnside has firsthand experience with the historical flooding. It is noted that the majority of flooding experienced to date in these areas occurs during spring freshet flows when snow and ice accumulation blocks a number of natural drainage pathways. However, we do note that existing drainage capacities within this area are limited and would be subject to flooding in major system events.

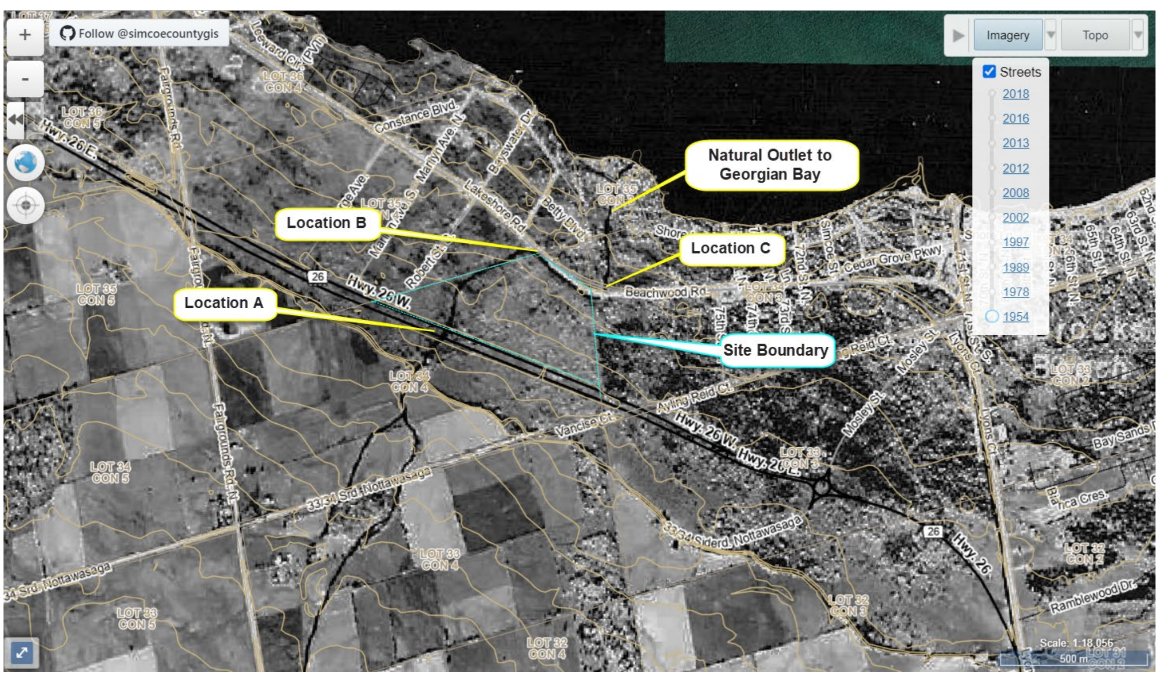
Knowing that these areas have experienced historical flooding, this information has been used where possible to aid in the validation of the 2D hydraulic model.

In regards to the site, multiple discussions with both current and previous landowners of the site and the Town have occurred. While it is known that flows from both Baywater Creek and Shore Creek drain through the site, there is no knowledge of historical peak flows exceeding the capacity of the Beachwood Roadway culverts abutting the north limits of the site. This information has been used where possible to aid in the validation of the 2D hydraulic model.

3.4 Historical Drainage Patterns

Noting the NVCA has identified two drainage features within the site, it is also understood that development within the project area has influenced the overall drainage patterns throughout the years. Figure 4 below of the project area from Simcoe County GIS mapping has been referenced. The historical aerial image was taken in 1954.

Figure 4: 1954 Aerial Image



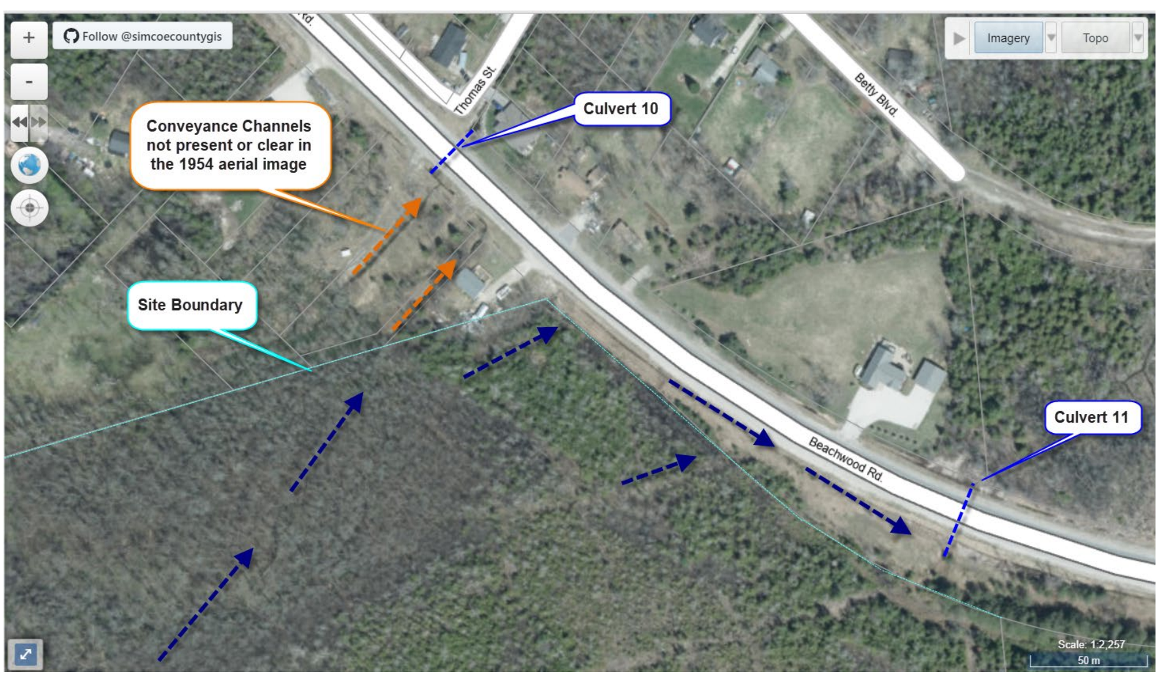
3.4.1 Location A

Location A refers to the location where peak flows enter the southern limits of the site. While recognizing that the Highway 26 By-Pass did not exist in 1954, peak flows in 1954 entered the southwest limits of the site in a similar fashion to current day. However, as the Highway 26 By-Pass did not exist, the 1954 watercourse location only delivered flows to the west limits of the site. In the current day condition, the Highway 26 By-Pass spreads the same flows over multiple culvert locations whereby permitting major system flows to spread across the site. In 1954, the drainage area contributing runoff to Location A was primarily comprised of agricultural lands. This is similar to current day conditions. With the exception of increased rainfall volumes due to climate change, it is assumed that runoff conditions from 1954 to current day at Location A are generally maintained.

3.4.2 Location B

Location B refers to the location where peak flows enter the Beachwood Road (former Highway 26) right-of-way limits at the northwest limits of the site. Similar to current day, peak flows were conveyed from the south limits of the site towards the west property line and further to the upstream limit of Beachwood Road (former Highway 26). In the 1954 aerial photo, it appears as those peak flows, once in the right-of-way, were conveyed east rather than crossing under the roadway. It is unknown whether Culvert 10 was present in 1954. Figure 5, again referenced from Simcoe County GIS mapping, shows the 2018 aerial image which is comparable to current day conditions in 2022.

Figure 5: 2018 Aerial Image



Current day conditions show that peak flows exit the western limits of the site and are conveyed through two channels (which appears to be man-made) to the upstream limits of Culvert 10. These two channels are either not present or clear in the 1954 aerial image. These two channels permit peak flows to be conveyed through Culvert 10. Based on detailed discussions with the Town, we understand that private residences on Thomas Street and Constance Boulevard experience regular flooding during spring freshet and major system peak flows. While the construction of these two channels may have been well intended at the time of construction, the construction of these two channels may have contributed to increased flooding downstream of Beachwood Road.

3.4.3 Location C

Location C refers to the location where peak flows are conveyed east within the Beachwood Road right-of-way and are conveyed through Culvert 11.

In 1954, once peak flows reached the south limits of Beachwood Road, flows were directed approximately 300 m east and conveyed under Beachwood Road. This is similar to the Culvert 11 culvert crossing as identified in the Delcan SWM report. Downstream, or north of Beachwood, peak flows in 1954 were conveyed north and ultimately discharged to Georgian Bay.

3.4.4 Historical Aerial Imagery Review Summary

Based on the direct comparison of the 2018 and 1954 aerial images, it is apparent that non-natural processes have influenced drainage patterns within the project area. While these drainage revisions may have been well intended at the time of construction, it is our view that these drainage revisions have diverted peak flows away from the natural outlet of Georgian Bay and may have directed these flows towards residential areas whereby increasing flood risk.

4.0 Hydrology

4.1 Hydrology Background and Modelling References

In 2013 during the preliminary hydraulic investigations for the site, the NVCA provided Burnside with a Regional Flow value of 8.49 m^3/s. This flow was referenced from the NVCA regionalization hydrological modelling. The NVCA indicated that this flow may be used as a starting point, however, should be verified through refined hydrological modelling specific to the site and study area. The NVCA did not have peak flow values for the 2 to 100-year peak flow events at that time. Accordingly, the development of a hydrological model to determine peak flow values was required.

In the preparation of a hydrological model for the site and study area, the 2009 and 2013 Stormwater Management and Drainage Reports completed by Delcan, as outlined in Section 3.0, were reviewed in detail. From the Delcan reports it was determined that the Hydrologic Reference Points (HRP), HRP-14 and HRP-16 are applicable to the site and study area and have therefore been referenced for further consideration. The catchment area drawing and the peak flow summary tables from the Delcan 2009 Report have been included in Appendix A.

The Ontario Flow Assessment Tool (OFAT) from the Ministry of Natural Resources and Forestry (MNRF) has been utilized to review peak flows via the Flood Flow: Index Flood Flow Method with EPA (Moin and Shaw 1985). The output from the OFAT has been included in Appendix A.

The NVCA Regional Flow, the Delcan Flows and the OFAT flows provide a useful comparison to the hydrologic model developed in this report.

4.2 Burnside PCSWMM Hydrological Model

A hydrological model using PCSWMM was developed by Burnside for further reference and examination, by comparison, to the flows in the Delcan Report and as calculated by OFAT.

PCSWMM, produced by Computational Hydraulics International, is a spatial decision support system for the EPA SWMM5 urban drainage and watershed modeling software. SWMM is described by the EPA as:

> *"The EPA Storm Water Management Model (SWMM) is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas. The runoff component of SWMM operates on a collection of subcatchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion of SWMM transports this runoff through a system of pipes, channels, storage / treatment devices, pumps, and regulators. SWMM tracks the quantity and quality of runoff generated within each subcatchment, and the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period comprised of multiple time steps (EPA, 2004)."*

To develop the PCSWMM model, the following information has been referenced:

- **Catchment Area:** Produced by the NVCA using NVCA DEM data.
- **Soils Conditions:** Derived from the Simcoe County Soils Map.
- **Land Use Patterns:** Based on orthophotography, GIS ArcHydro and field reconnaissance.
- **Rainfall Data –** The 24-hour SCS Type-II rainfall distribution was used for the 1:2, 1:5, 1:10, 1:25, 1:50 and 1:100-year Storm Event calculations. The Regional Storm Event was based on the Timmins Storm. The SCS storm distributions were based on the MTO Intensity-Duration-Frequency (IDF) curve tool.

Table 1 outlines the hydrologic results of the PCSWMM modelling developed to the upstream limits of the Highway 26 by-pass within the Baywater Creek watershed.

Table 1: Burnside PCSWMM Peak Flow Summary

Storm Event	2-year (m^3/s)	5-year (m^3/s)	10-year (m^3/s)	25-year (m^3/s)	50-year (m^3/s)	100-year (m^3/s)	Regional (m^3/s)
Burnside PCSWMM	0.52	0.77	1.09	1.70	2.27	2.94	8.92

4.3 Peak Flow Summary Comparison Commentary

Table 2 compares the peak flows from the various hydrological methods detailed above, to the upstream limits of the Highway 26 by-pass within the Baywater Creek watershed.

Table 2: Baywater Creek Summarized Peak Flows

Interval	OFAT Index Flood (m^3/s)	Delcan 4 (m^3/s)	Delcan HRP-16 (m^3/s)	NVCA Regional (m^3/s)	Burnside PCSWMM (m^3/s)
2	0.65	1.4	0.3		0.52
5	0.86	2.5	0.5		0.77
10	1.06	3.4	0.7		1.09
25	1.28	4.6	1		1.70
50	1.56	5.4	1.2		2.27
100	1.8	6.5	1.5		2.94
Regional				8.49	8.92
Area (ha)	**344.3**	**212.44**	29.89	**259.35**	**259.35**

As shown above, there is a difference in the overall catchment area based on the various hydrological methods listed above. The overall Baywater Creek catchment area is generally quite long in relation to its width. Accordingly, small changes in catchment width over long distances will impact the overall catchment footprint. To this end, it is noted that the drainage area associated with the Delcan HRP-14 and HRP 16 totals 242.33 ha (212.44 ha + 29.89 ha) is relatively close to the NVCA catchment area of 259.35 ha. In direct comparison, it is also noted that the catchment area delineated by OFAT is larger than both the Delcan and NVCA drainage areas. The differences in drainage areas can be attributed to the relative flat topography contained within the watershed upstream of Sideroad 33 & 34. This relatively flat topography, coupled with low resolution topographic contour data available, increases the chances of variability between hydrological methods.

The NVCA drainage area of 259.35 ha has been carried forward for further analysis and validation. Refer to Section 8.0 for further discussion on the drainage area.

Both the site and study area are located within the Nottawasaga Valley Conservation Authority (NVCA) regulated area. The NVCA resides within Zone 3 of the Flood Hazard Criteria Zones of Ontario and Conservation Authorities, as referenced from the MNRF Technical Guide – Rivers and Stream Systems: Flooding Hazard Limit. The Regulatory Storm is the greater of the 100-year peak flow or Timmins Storm. Therefore, it is imperative to determine what storm event, 100-year peak flow or Timmins Storm is the Regulatory Storm event.

Neither the Delcan report, nor OFAT contain the Timmins Regional peak flows for direct comparison. The PCSWMM Timmins Regional Peak flow of 8.92 m^3/s is relatively close to the NVCA Timmins Regional Peak flow of 8.49 m^3/s. Therefore, it is assumed that the Timmins Regional modelling run, and the associated hydrological parameters used in the PCSWMM hydrological model are reasonable. Therefore, the Timmins Regional Peak flow of 8.92m^3/s has been used for further analysis.

In comparing the 100-year peak flow values, stark differences between the OFAT, Delcan and Burnside PCSWMM modelling runs have been noted. The OFAT tool has produced a 100-year peak flow value of 1.8 m^3/s, Delcan has produced a 100-year peak flow of 8.0 m^3/s (100-year HRP-14 + 100-year HRP-16) and finally, the PSWMM model has produced a 100-year peak flow of 2.94 m^3/s. However, in all cases, it is noted that all three flow values are less than the Timmins Regional Peak Flow value of 8.92 m^3/s. Therefore, the Timmins Regional storm event has been determined to be the Regulatory Storm event for the study area.

With regards to the 100-year peak flows, based on historical experience, deterministic HYMO based modelling has a tendency to overestimate peak flow rates. Conversely the OFAT tool has been observed to underestimate peak flows. For this project, measured historical peak flow rates in the field are not available to verify the accuracy of the modelled flows being produced. That said, it is anticipated that the actual 100-year peak flow rate experienced in the field would likely reside between the OFAT and Delcan Peak flow rates. Accordingly, the PCSWMM 100-year peak flow rate of 2.94 m^3/s has been used for further analysis. In selecting this flow value, neither flow extreme has been used. Additional commentary on the validity of the flow assumptions has been provided in Section 8.0.

The overall sub-catchment watershed area plan and supporting hydrologic calculations are in Appendix B.

5.0 Topographic Information

5.1 Base Mapping

Topographic base mapping was acquired from the Town of Wasaga Beach. The base mapping includes two feature classes; a regular grid of mass points spaced 20 meters apart, and breaklines, manually captured features denoting an abrupt change in topography (such as ridges, roadside ditches, watercourses, etc.).

LIDAR mapping used in the preparation of this project. Figure 1 in Appendix A shows the limits of the LiDAR data as contours. The processed LiDAR data has been included digitally in Appendix E for reference.

5.2 Field Reconnaissance and Topographic Survey

Site investigations were conducted by Burnside to verify hydraulic structures, the shape, surface characteristics and degree of maintenance of drainage features, as well as the terrestrial cover of the drainage course and floodplain area within the study limits.

A topographic survey was conducted by Joe Topo in January 2020, August 2021, and January 2022. The topographic surveys were completed specifically to obtain detailed ground elevations within the site as well as detailed roadway, ditch, and culvert information. Specific culvert information obtained at each structure includes inverts, obverts, guardrail and roadway elevations, crossing materials and overall dimensions.

5.3 Ground Truthing

As LIDAR data may often reside within a vertical tolerance of 0.1 to 1 m higher or lower when compared to topographic survey elevations, a ground truthing analysis is required. Ground truthing is a vertical elevation comparison between survey and LIDAR topographic information.

As ground elevation comparisons can be subjective due to the exact location to where the elevations are compared, the centerline elevation profile of Beachwood Road within the study area in the vicinity of the site has been used as a reference between both the survey elevations and LIDAR information. A total of 10 random spot elevations have been compared. Negligible elevation differences between the LIDAR data and topographic survey data have been observed. Therefore, the LIDAR data has not been adjusted to match topographic survey elevations.

5.4 Composite Base Map

Using the acquired LIDAR data and topographic survey information, both data sets have been combined into a composite base map for further use in the 2D Floodplain Hydraulic Model. In areas where topographic survey data is available, the topographic survey data has taken precedence in the composite base map.

6.0 SMS 2D Hydraulic Model

The SMS 2D hydraulic model, produced by Aquaveo, has been used to determine the floodplain extents for the study area. The SMS 2D hydraulic model is described by Aquaveo as:

> *"SMS (Surface-water Modeling System) is a complete program for building and simulating surface water models. It is a graphical user interface and analysis tool that allows engineers and scientists to visualize, manipulate, analyze, and understand numerical data and associated measurements. Many of the tools in SMS are generic. They are designed to facilitate the establishment and operation of numerical models of rivers, coasts, inlets, bays, estuaries, and lakes. It features 1D and 2D modeling and a unique conceptual model approach."*

6.1 Hydraulic Modelling Assumptions

The construction of the SMS 2D hydraulic model consists of a compilation of a number of key parameters. The following commentary outlines the key parameters and assumptions used in building the hydraulic model.

6.1.1 DEM Data

The first step in developing the SMS 2D model is to import elevation data into the model. The elevation data provides the building blocks on which the entire 2D model is built upon. The elevation data for this model was derived from the composite base map, which includes both LiDAR data and topographical survey data. The topographical elevations of the composite base map were exported from AutoCAD Civil 3D as a Digital Elevation Model (DEM) file to import into SMS 2D. The DEM is used internally within SMS 2D to interpolate elevations to other data types including meshes and grids. The DEM imported into the SMS model is shown in Figure 3 in Appendix A.

6.1.2 2D Mesh

The next step in the SMS process is to develop the mesh. A SMS mesh consists of nodes that are grouped together to form elements. Nodes are the basic building blocks of elements in a mesh. A node consists of northing and easting coordinates with an associated elevation. The mesh created for the study area contains a sufficient number of mesh nodes within roadway allowances to ensure model stability and accuracy. The mesh was drawn to encompass the study area but was further broken down into various polygons throughout the study area to allow for greater node density in critical locations of the study area, while allowing for a broader definition in locations that did not need as high of accuracy. This was done to improve processing time of the model without sacrificing accuracy where needed. For example, a mesh polygon was defined around the site, Highway 26 ditches and the Beachwood Road ditches at a node spacing of

10 m. Conversely, the southern most portions of the study area have been defined with a 25 m node spacing as this space is fairly flat farmland.

6.1.3 2D Mesh Polygons

A polygon coverage is a mesh property within SMS 2D that describes how SMS should generate nodes and connect these nodes to elements. Once the mesh outline was drawn in SMS and the node spacing was defined, the mesh polygon coverage was assigned. The patch mesh coverage has been selected for the Beachwood Road right-of-way and the Highway 26 right-of-way (including both the roadway and the ditches), while the paving mesh coverage has been selected for use in the remaining open areas of the floodplain, including the site. Figures 6 and 7 below illustrate the patch and paving mesh polygon coverage types. The location of the polygon coverages used throughout the model is shown in Figure 4 in Appendix A.

Polygons can be assigned bathymetry data and material information that will be used in conjunction with the mesh to produce 2D floodplain results. In this case, the elevations from the DEM of the composite base map have been assigned to the mesh nodes.

Figure 6: Patch Mesh Coverage

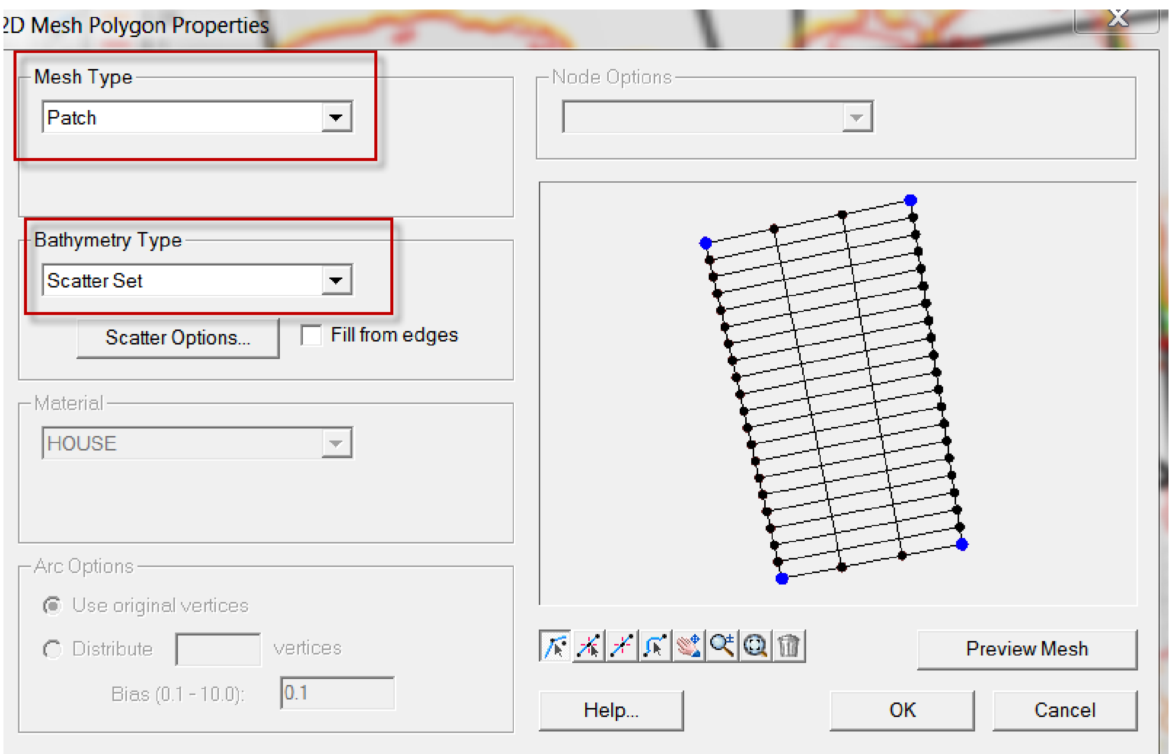
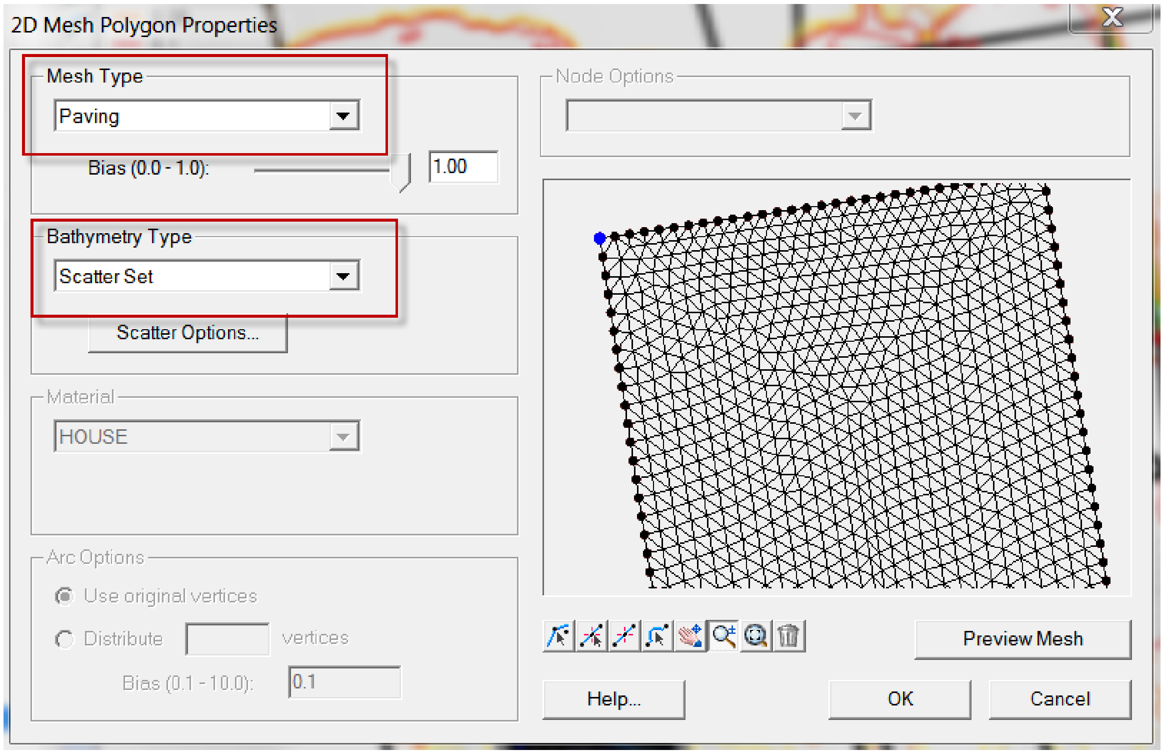


Figure 7: Paving Mesh Coverage

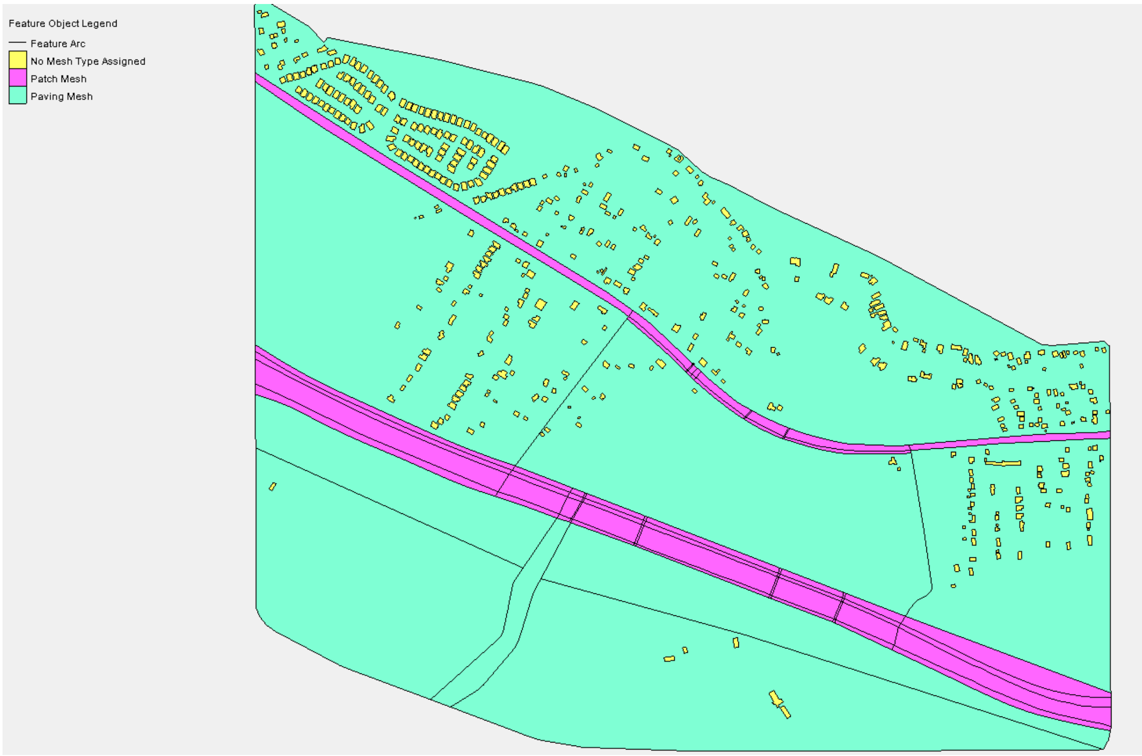


6.2 Buildings within the Floodplain

A total of approximately 500 buildings are present within the study area. Buildings within the anticipated Regulatory Floodplain occupy a parcel of topography which is impenetrable by peak flows. Accordingly, peak flows approaching the building footprint would be diverted to either side of the building. It has been assumed that flows would not enter or otherwise flow through the buildings within the study area.

To create an impenetrable barrier, the building footprints within the SMS 2D model have been removed from the 2D mesh. This is illustrated in Figure 8 below by the yellow polygons, which represent areas where *"no mesh type assigned"* which means the area has been removed from the mesh.

Figure 8: SMS Mesh with Buildings



The yellow rectangular polygons as illustrated in Figure 8 represent the building footprints within the study area. As shown above, the 2D mesh has been constructed around the perimeter of each building. As the buildings within the floodplain technically represent a hole in the 2D mesh, SMS effectively assumes that the mesh does not exist where the buildings reside. Accordingly, SMS produces vertical walls within the model in and around the building perimeters. Artificially constructing vertical walls within the model, deflects flows around the perimeters of the buildings and is what is expected to see in the field during Regulatory Storm flow conditions.

6.3 Model Specific Coverages

SMS 2D uses multiple coverages to create the 2D model simulation. These specific coverages are used to define key hydraulic parameters within the model, including:

- Boundary Conditions;
- Obstructions; and
- Materials.

6.3.1 Boundary Condition Coverages

Within the SMS 2D model, Burnside has created Arcs to represent a number of boundary conditions within the model as noted below. The location of the boundary conditions within the SMS 2D model are shown on Figure 6 in Appendix A.

6.3.1.1 Downstream Boundary Conditions

The Exit-H (subcritical outflow) boundary condition has been selected as the downstream boundary condition at Georgian Bay. This downstream boundary condition has been represented by an Arc at the northern limits of the model boundary. The water surface elevation (WSE) provided within the LIDAR mapping depicts the Georgian Bay WSE at 176.83 m. The Long-Term Maximum water surface elevation of Lake Huron from 1918 to 2015, as referenced from the US Army Corps of Engineers, has been observed at 177.50 m, which has been used as the Exit-H boundary condition in the model.

6.3.1.2 Inlet Boundary Conditions

The Inlet-Q (subcritical inflow) boundary condition has been selected as inlet boundary condition within the Floodplain model. The inlet boundary condition has been applied as an Arc, approximately 495 m upstream of the Highway 26 By-Pass. The PCSWMM Timmins Regional hydrograph has been applied at this location to observe peak flow impacts within the model.

Inlet boundary conditions, represented by Arcs, have also been applied at the inlet and outlets of Highway 26 By-Pass and Beachwood Road culvert crossings. These culverts have been defined in the SMS 2D model through the hydraulic modeling software HY8. Key hydraulic parameters, including inverts, culvert size and composition, roadway deck elevations, and widths for the Highway 26 By-Pass and Beachwood Road Culverts have been referenced from detailed topographic survey information and included within the HY8 hydraulic model.

The primary focus of this report is to identify the Regulatory floodplain extents within the site itself. In the 2D modelling environment for the study area there are two key manmade hydraulic controls that influence flood elevations within the site. These hydraulic controls are the Highway 26 By-Pass and Beachwood Road. The Highway 26 By-Pass and its associated culvert crossings permit Regulatory peak flows to enter the site at various locations. Beachwood Road acts as a hydraulic barrier whereby restricting flows from crossing Beachwood Road and ponding on the site itself. Downstream of Beachwood Road, topographic elevations fall sharply towards Georgian Bay. Accordingly, due to the elevation difference from the site to the downstream limits of Beachwood Road, roadway culvert crossings downstream of Beachwood Road will not impact Regulatory flood elevations on the site. Accordingly, the roadway crossings downstream of the site have not been coded in as boundary conditions in the model. Refining the floodplain results downstream of Beachwood Road is considered out of scope for this project and could be re-visited in the future should the Regional Floodplain require refinement for considerations outside of this report.

6.3.1.3 Culvert using the HY8 Approach in SMS

Culverts are represented in the SMS model as 1D structures. The HY-8 hydraulic modelling software is used perform the 1D hydraulic culvert calculations. The HY-8 model was setup independently of the SMS model with all the required culvert input data such as inverts, size, length, material, and roadway elevation. Within the SMS 2D modelling environment, the culvert inlets and outlets are defined as boundary arcs. The boundary arcs refer to the HY-8 file to call the culvert calculation results into the model. Key dimensions for each culvert were referenced from topographical survey data and field reconnaissance.

Table 3 below provides a detailed summary of the Highway 26 By-Pass and Beachwood Road Culverts used in the SMS 2D model. The HY8 model output is in Appendix C. A digital copy of the HY8 model is in Appendix E.

Table 3: Highway 26 By-Pass and Beachwood Road Culvert Summary

Crossing Characteristic	**15**	**16**	**17**	**20**	**10**	**11.1**	**11**
Roadway	Highway 26	Highway 26	Highway 26	Highway 26	Beachwood	Beachwood	Beachwood
Type	Conc. Box	CSP	CSP	CSP	Conc. Box	CSP	CSP
Diameter(m)		1050	1050	750		750	
Span (m)	1200				1500		1200
Rise (m)	2400				1200		900
U/S Invert (m)	189.10	189.31	189.123	188.68	183.58	183.81	182.76
D/S Invert (m)	189.07	188.94	188.90	188.420	181.81	183.45	182.50
Length (m)	57.18	60.4	53.010	57	20.8	20.89	23.34

6.3.2 Materials Coverage

The materials area coverage has been used to associate key land use parameters to the 2D mesh. The land use parameters have been represented by areas of varying Manning's roughness values within the model. Table 4 outlines the Manning's "n" values used within the SMS 2D Hydraulic Model.

Table 4: Materials Coverage – Manning's "n" Summary

Material Coverage Type	Manning's "n" Value Assigned
Bush	0.075
Road	0.013
Single Family Home	0.020
Townhome	0.013
Ditch	0.020
Open Field	0.030
Water	0.025

The location of each material coverage defined within the model is shown on Figure 5 in Appendix A. Aerial imagery of the study area was used to determine the varying material coverage throughout the model and is shown on Figure 7 in Appendix A.

Mannings "n" values have been referenced from Table 3.2 of the HEC-RAS Hydraulic Reference Manual. Applicable reference material has been provided in Appendix A.

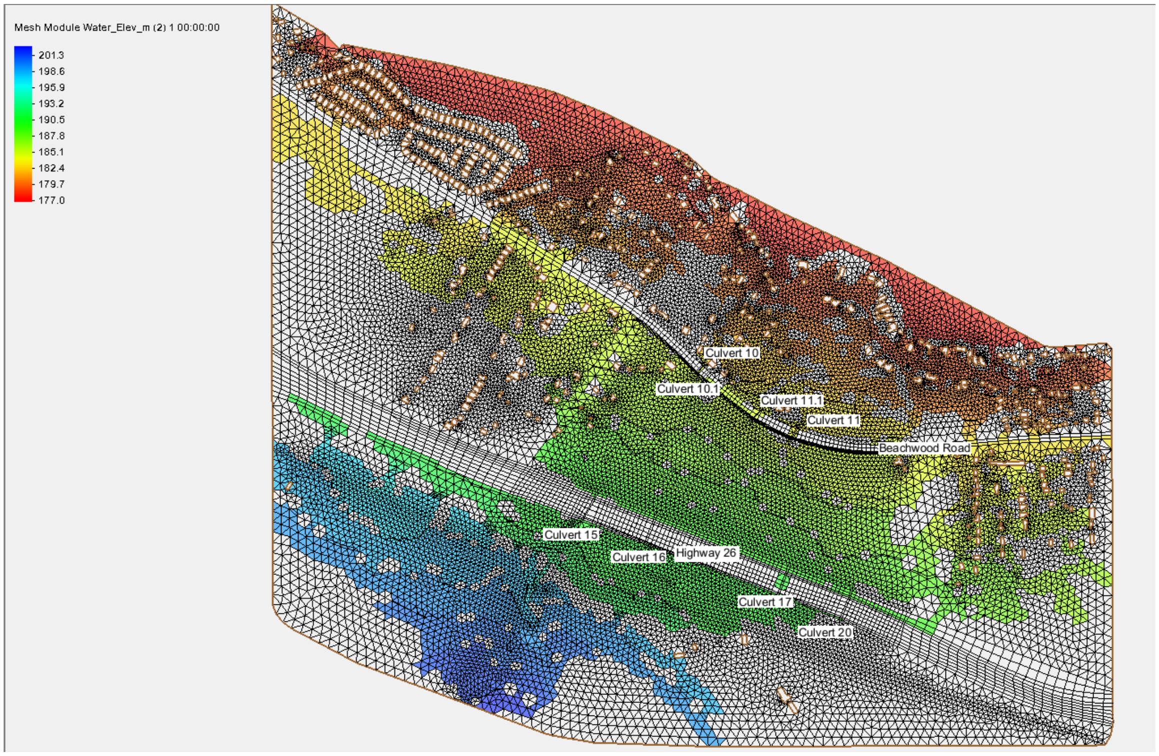
7.0 Analysis of 2D Floodplain Modelling Results

Visual representations of the 2D floodplain modelling result output have been provided in Appendix C. Visual representations of the following Mesh Layers can be found directly the SMS 2D Hydraulic Model.

- Floodplain Elevation;
- Floodplain Depth;
- Floodplain Velocity; and
- Product of Floodplain Depth and Velocity.

Figure 9 below illustrates the extents of the Regulatory Floodplain within the study area. Detailed figures of each of the above layers within the study area and on the site are provided in Figures 9 to 13 in Appendix C.

Figure 9: Regulatory Floodplain Extents



The following commentary outlines the observations of each output layer.

7.1 Floodplain Elevations and Extents Commentary

The Water_Elev_m Mesh Layer shows the extents of the Regulatory floodplain. The SMS model has been simulated over a 24-hour time period. As such, the floodplain extents over the 24-hour model simulation can be observed within SMS. The floodplain elevation extents shown in Figure 9 above are at the end of the 24-hour simulation period. At the beginning of the simulation, flow enters the site at the southern extents of the study area, gradually draining north towards Highway 26. The flow generally follows the drainage draw to the south of Culvert 15; however, the capacity of the drainage draw is exceeded as the simulation progresses. When runoff first reaches Highway 26, runoff passes through Culvert 15 and onto the site. As the simulation progresses runoff reaches Culverts 16, 17 and 20, allowing more flow onto the site. In general, the floodplain extents are widespread across both the study area and the site. The study area and the site lack well defined channels, as such, the widespread floodplain extents are intuitive to the sheet flow experienced once the runoff passes through the Highway 26 culverts.

Floodplain elevations have been calculated at 177.5 m located at the downstream limits of the project area, in the vicinity of Georgian Bay while the upstream water surface elevations have been calculated at 203 m.

7.2 Floodplain Depth Commentary

The Water_Depth_m Mesh Layer depicts the range of floodplain depths experienced under the Regulatory event. The floodplain depths have been shown illustratively by varying colours within the project area. Floodplain depths have been observed to range from 0 m outside the limits of the floodplain, to a maximum of 3.56 m. The majority of floodplain depths are less than 0.3 m on most Municipal roadways. Deeper areas of the floodplain have been observed within low lying residential areas, local depressions within forested / agricultural areas and in the vicinity of the culvert outlets. We note that the floodplain depth through the site itself is relatively shallow (<0.15 m) as the Regional peak flow sheets across the site.

7.3 Floodplain Velocity Commentary

The Vel_Mag_m_p_s Mesh Layer identifies the range of flow velocities within the Floodplain. Floodplain velocities have been observed to range from 0 to 2 m/s. The highest concentration of floodplain velocities have been observed near the culvert inlets and outlets. The velocity through the site is minimal with velocities less than 0.2 m/s.

7.4 Floodplain Depth x Velocity Commentary

A common method of determining safe access and egress within a floodplain area is to assess the product of the floodplain depth and floodplain velocity. The SMS model allows for the output layers to be manipulated, as such the depth layer was multiplied by the velocity layer directly in SMS. However, due to the very low velocities and very shallow depths across the study area, the resulting depth x velocity layer is essentially zero. As such, the figure for this layer has not been included, as it does not produce observable results. This shows that although the floodplain extents are widespread across the study area and the site, the resulting depths and velocities are not significant or are of value for further consideration.

8.0 2D Modelling Validation

8.1 Highway 26 By-Pass and Beachwood Road Culverts

While it is challenging to validate flow depths and velocities within a 2D model in areas where sheet flow is present, the hydraulic modelling results at roadway culvert crossings can be validated within SMS. To validate Regional Floodplain depths at roadway culvert crossings Observation Points in SMS were used to observe headwater elevation fluctuations at the inlets of the culvert crossings. Headwater elevations can further be used to determine peak flow magnitudes through the culvert itself, however this must be determined in HY-8 directly as the flow through a culvert is not an output in SMS. The peak depth at each culvert inlet observation point was correlated with the headwater depth in HY-8. The resulting flow at the corresponding headwater elevation was taken as the flow through the culvert within the validation process.

Figure 14 in Appendix C summarises headwater depth vs peak flow of the four Highway 26 By-Pass and three Beachwood Road culvert crossings. As the SMS 2D model has used the actual hydrograph of the Timmins Regional storm event, for simplicity, it is assumed that peak flows will arrive at all culvert inlets at the same time. Based on this assumption flows have been iterated at each culvert crossing to match head water elevations produced in the SMS model. As this process can be completed for each culvert crossing, all culvert crossings conveying flow under the roadway will produce a total outlet flow. This total outlet flow was then compared to the Regional Peak flow being conveyed to the roadway. In general, based on the assumptions listed above, Regional Flood elevations produced by the SMS 2D model are relatively close to the independent HY-8 culvert analysis. Key differences in flow values are directly attributed to peak flow timing and to a degree, storage associated with the limited depression storage within the watershed. Accordingly, the results of the SMS 2D model are accurately depicting the hydraulic flow characteristics of the Timmins Regional event through the site.

8.2 Peak Flow Selection

8.2.1 Regional Storm Event Validation

As noted in Section 4.0, various assumptions have been made with regards to overall watershed area and selection of peak flows to be used in the SMS 2D model. In the absence of recorded rainfall data or peak flow data throughout the watershed, the selection of the Timmins Regional peak flow was validated as peak flow flows derived by an external hydrological model are comparable to Regional peak flows provided by the NVCA. The SMS model was simulated over a 24-hour period and the flood extents can be simulated visually over this period to observe how the Regional peak flow is conveyed through the study area. Peak flows have been observed to be conveyed from the southern extents of the study area through existing watercourse and drainage draw to the individual culvert crossings at the Highway 26 By-Pass and Beachwood Road. Where roadways become barriers, increased / pressurised flows through culverts are observed. In some locations, Beachwood Road has been observed to overtop at shallow depths. It is our view that SMS Regional floodplain modelling results presented in this report provide the most accurate depiction of the Regulatory floodplain possible based on information available at the time of writing of this report.

8.2.2 100-Year Storm Event Validation

In Section 4.0, the 100-year peak flow values were also discussed. The 100-year PCSWMM hydrograph (peak flow of 2.94 m^3/s) was routed through the SMS 2D model to observe floodplain extents depths and velocities. Based on local knowledge of historical flooding, while noting that the 100-year peak flow is considerably less than the Delcan 100-year peak flow of 8.0 m^3/s, a point of interest and validation was to observe if flooding was present in the Thomas and Constance Street rights-of-way in the model.

Historical flooding has been observed and noted during spring freshet flows. It is not un-common, for culvert barrels to be blocked with snow and ice during the spring freshet. This temporary condition prevents flows from being conveyed in the roadside ditches and within the culverts. In this condition, roadway, and driveway culverts while physically present in the field, are not draining water due to the blockage. This condition is similar to the SMS model as culvert crossings downstream of Beachwood Road have not been coded. As these conditions are similar, it is noted that the 100-year floodplain depth at the intersection of Thomas and Constance Street is 0.05 m in the SMS 2D model under the 100-year event. While the actual elevation and depth of flooding is not known in Figure 3 in Section 3.3, the 100-year 2D modelling results produce a similar flood condition at this location.

9.0 Overall Hydraulic Modelling Summary

The information provided in this report has been presented to outline the existing condition Regulatory Floodplain characteristics of the site and study area only.

The Floodplain elevation, depth and velocity for the study area are summarized below:

- Floodplain Elevation Range = 177.5 m to 203 m;
- Floodplain Depth Range = 0 m to 3.56 m; and
- Floodplain Velocity Range = 0 m/s to 2 m/s.

Based on the final 2D hydraulic results, the flood elevations, depths and velocities appear to be reasonable given the relatively flat topography of the project area. A one-dimensional model would have challenges quantifying the hydraulic characteristics of the Regulatory Floodplain due to the absence of defined flow pathways within the study area.

The horizontal extents of the Regulatory floodplain have been observed to be quite wide within the project area, with floodplain depths of 0 to 1.30 m depending on location. The horizontal extents of the floodplain have been observed to expand over a vast area encompassing both Baywater Creek and Shore Creek.

Digital SMS 2D modelling files have been provided in Appendix E for reference.

10.0 Future Considerations and Recommendations

10.1 Drainage Improvements and Defined Outlet to Georgian Bay

In reviewing SMS Hydraulic results, it is noted that the site and many other properties are located within the Regulatory Floodplain within the project area. The overall width and spread of the floodplain is largely attributed to development within the project area, minimal drainage infrastructure and the absence of a defined outlet to Georgian Bay. The 2D hydraulic modelling detailed in this report further confirm historical flooding as detailed in Section 4.1.

Given the relatively shallow floodplain depths and velocities, the risk to human life is small. However, the risk of flood damage to a number of properties is elevated. Under current day conditions, the Regulatory Floodplain is producing a **Net-Negative** risk condition to properties and municipal infrastructure located within the project area.

Given the project area borders and resides in close proximity to Georgian Bay, it is our view that a rare opportunity is presenting itself for our client (Sunray), the Town, NVCA, private landowners to work together to improve drainage within the project area.

It is understood that the Town is currently in the process of completing a Drainage EA that includes both Thomas Street and Constance Boulevard. This will be a great first step to exploring drainage opportunities moving forward. However, as shown in this report, the Regulatory Floodplain is quite wide. Future drainage solutions will not only need to create a direct outlet to Georgian Bay but create and identify key drainage infrastructure to be able to direct and collect peak flows to this outlet.

Should a defined and capable outlet be created in the future, this will allow for further drainage improvements to be implemented whereby reducing or eliminating flood risks within the project area. This will create a **Net-Positive** within the project area that would be advantageous to all (affected) landowners. Any proposed drainage improvements within the project area will impact the Regulatory floodplain. Given the close proximity of the project area to Georgian Bay, it is our view that drainage improvements to reduce flood risk should be placed as a priority above retaining the configuration and hydraulic characteristics of the Existing Floodplain.

10.1.1 Proposed Drainage Consideration

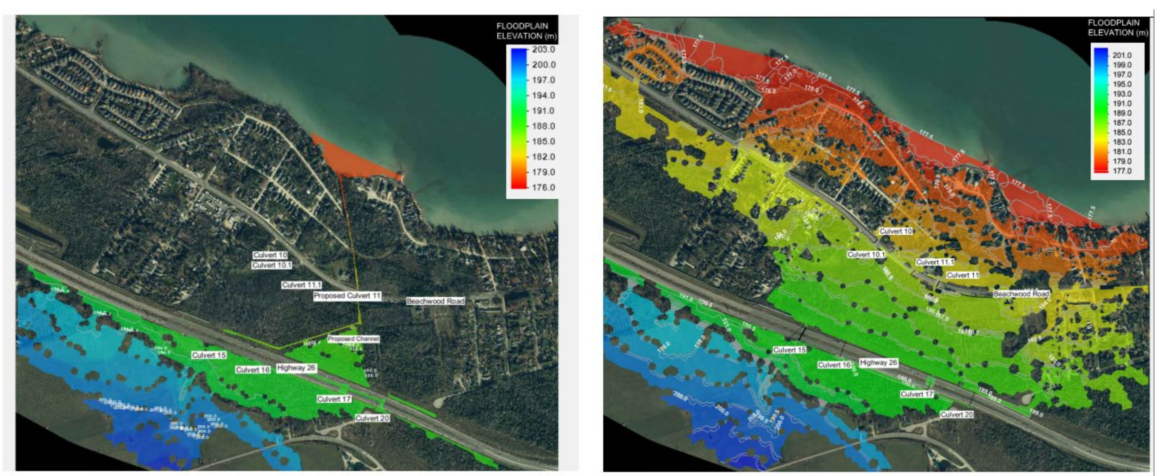
To illustrate the positive impacts of a defined outlet to Georgian Bay, a conceptual channel design to collect peak flow discharge from the Highway 26 By-Pass has been completed. Specifically, through this conceptual design, peak flows will be collected from the outlets of Culvert 15, Culvert 16 and Culvert 20 to drain directly to Georgian Bay. Drawing C1, C2 and Figure 14 in Appendix D illustrate the conceptual design.

The alignment of the proposed channel concept has been orientated along parcels of land that are un-developed at the time of writing of this report. The sizing of the channel has been completed produce a free-flowing conditions in the Regional peak flow event. The main channel will run along the south limits of the site to capture flow from Culvert 15 and 16 . To accommodate a Regional peak flow of 8.92 m^3/s, a channel with a profile grade of 0.69 to 1.52%, a bottom width of 6.3m, 3:1 side slopes and a 3 m wide maintenance access has been preliminarily designed. The depth of the channel generally is 1 m deep, however, this depth varies throughout the length of the channel due to variations in existing topography. The channel continues along the eastern limits of the site to Beach wood Road. A twin 3000 mm span x 1500 m rise concrete box culvert has been sized to convey peak flows beneath the Beachwood Road right of way under free-flowing conditions.

A secondary channel has been designed to capture runoff from Culvert 20 and intercept flows from Culvert 17 off of the MTO lands. This channel will connect into the main channel at the northern limits of the MTO lands. To accommodate the Regional peak flow event from Culvert 17 and off of the MTO lands from Culvert 20, a 0.5 m wide by 1 m deep channel with 3:1 side slopes has been modelled.

Figure 10 below illustrates the current day flood conditions (right) versus the positive impacts of the proposed channel (left).

Figure 10: Current Day Flood Conditions vs Proposed Channel Concept



a) FLOODPLAIN WITH PROPOSED DRAINAGE CHANNEL b) EXISTING CONDITION FLOODPLAIN

As shown, the reduction in Regional Floodplain extents that are associated with a defined outlet to Georgian Bay are vast. The lands west and east of the channel are removed from the Regional Floodplain. These lands include several residential homes, commercial businesses, Town rights-of-way and lands currently being considered for development.

The proposed channel concept has been proven through detailed SMS 2D hydraulic modelling to vastly reduce floodplain extents within the project area. This will create a **Net-Positive** within the project area that would be advantageous to all affected landowners. Specifically, a dedicated outlet would reduce or eliminate seasonal flooding to residential homes, reduce or eliminate municipal roadway overtopping, will support current and future development projects, and creates a low-risk conveyance mechanism to convey peak flows to an ultimate outlet. A larger, more visible version of Figure 10 has been included in Appendix D for reference.

10.2 Site Specific Drainage Improvements

In reviewing the SMS 2D hydraulic modelling results upstream of the Highway 26 By-Pass, it is apparent that the By-Pass has influenced the Regulatory Floodplain. Regulatory peak flows have been observed to spread West to East from Culvert 15 to Culvert 20. This spreading of flows with multiple culvert outlets has resulted in the Regional peak flows spreading across the majority of the site. It is our view that this flood condition is development related and would not have reflected the historical Regulatory Flood condition prior to the By-Pass being built. Accordingly, it is our view that drainage features should be explored within the site to create a natural and defined channel corridor that adequately conveys peak flows from the Highway 26 By-Pass to Beachwood Road, as described in Section 10.1.1 above. The intent of this defined corridor would mimic the pre-bypass conditions.

Currently, the Regulatory peak flows have the ability to spread across the site and reach multiple touch points on Beachwood Road. These touch points are specific culvert crossings and locations where peak flows overtop the roadway. A defined channel corridor through the site could be naturalized to provide both aquatic and wildlife habitat while limiting the ability of Regional peak flows from spilling over top of the roadway and conveying peak flows to a specific or limited number of culvert crossings. This defined channel corridor would benefit the site and would also benefit future downstream drainage improvements as peak flows could be collected in an efficient manner therefore reducing flood risks.

Again, it is our view that a rare opportunity is presenting itself for our client (Sunray), the Town, NVCA, private landowners to work together to improve drainage within the project area. These drainage improvements would benefit all parties involved whereby reducing the overall flood risk within the project area.

10.3 Considerations for Drainage Improvements under the Drainage Act

As noted previously, *"Should a defined and capable outlet be created in the future, this will allow for further drainage improvements to be implemented whereby reducing or eliminating flood risks within the project area. This will create a* ***Net-Positive*** *within the project area that would be advantageous to all (affected) landowners."*

As noted, under existing conditions, peak flows spread across the entire site due to the Highway 26 By-Pass culverts and further, are permitted to enter a number of residential areas both upstream and downstream of Beachwood Road. Existing peak flows no longer appear to have a direct outlet to Georgian Bay.

It is recognized that due to the number of current residential dwellings, as well as both Town and Developer interests within the project area, the implementation of the required drainage improvements may not be without challenges. In our view, the path of least resistance moving forward would be for (all) landowners and the Town to work together to produce an amicable drainage solution that works for all parties that includes the incorporation of a direct outlet connected to Georgian Bay. However, should an amicable drainage solution not be reached through these discussions, it is our view that the (Ontario) Drainage Act, RSO 1990, chapter D.17 (Act) may be a viable solution to ensure a sufficient outlet to Georgian Bay is created.

A "petition for drainage works by owners" could be completed by Sunray for an 'area requiring drainage' (ARD) within the site and filed with the local municipality under the auspices of Section 4 of the Act. There are prescribed (Petition) Forms available, depending on the circumstances and ownership of the drainage challenged property(ies) or land(s). The critical part of any Petition is a detailed and accurate description of the ARD; this determines the sufficiency and/or validity of the Petition which is determined by the engineer appointed in accordance with Section 8 of the Act.

One of the first duties of the appointed engineer, before making an examination and report, is to cause the clerk of the local municipality to send Notice of the On-Site Meeting as per Section 9 of the Act. It is at that meeting (or in some case thereafter) that the engineer determines the ARD and whether the Petition complies with Section 4 of the Act. If determined that the Petition is valid, the engineer shall proceed to prepare a report or preliminary report.

Another important Section of the Act is 15 entitled Sufficient Outlet which states *"Subject to section 32, every drainage works constructed under this Act shall be continued to a sufficient outlet. R.S.O. 1990, c. D.17, s. 15."* Furthermore, Section 1 of the Act states that *"'sufficient outlet' means a point at which water can be discharged safely so that it will do no damage to lands or roads;".* Accordingly, the engineer is bound under the Act to comply with Section 15.

Currently, runoff discharged downstream of the Highway 26 By-Pass and Beachwood Road are negatively impacting a number of properties. By initiating a petition for drainage works under Section 4 of the Act, Sunray (or another owner(s)) could be provided with a mechanism to permit peak flows to be discharged safely downstream of the Highway 26 By-Pass and Beachwood Road such that drainage runoff from existing and future development could be taken to said sufficient outlet (presumably Georgian Bay).

Again, it is our view that a rare opportunity is presenting itself for our client (Sunray), the Town, NVCA, and private landowners to work together to improve drainage within the project area. These drainage improvements would be of value to and for all parties involved whereby reducing the overall flood risk within the project area.

11.0 References

Drainage, Hydrology and Stormwater Management Report, Preliminary Design, Highway 26 new Alignment between Collingwood and Wasaga, Delcan, July 3, 2009.

Drainage Update of Existing Highway 26, Existing Highway 26 between Collingwood and Wasaga Beach (Huronia to Mosely Street), Delcan, September 2013.

Quotation “Environmental Assessment”, Town of Wasaga Beach. Environmental assessment proposes new drainage channel for west-end Wasaga Beach neighbourhood, New channel would address persistent flooding issues on Constance Boulevard.

https://www.thestar.com/local-wasaga/news/2022/03/21/environmental-assessment-proposes-new-drainage-channel-for-west-end-wasaga-beach-neighbourhood.html.

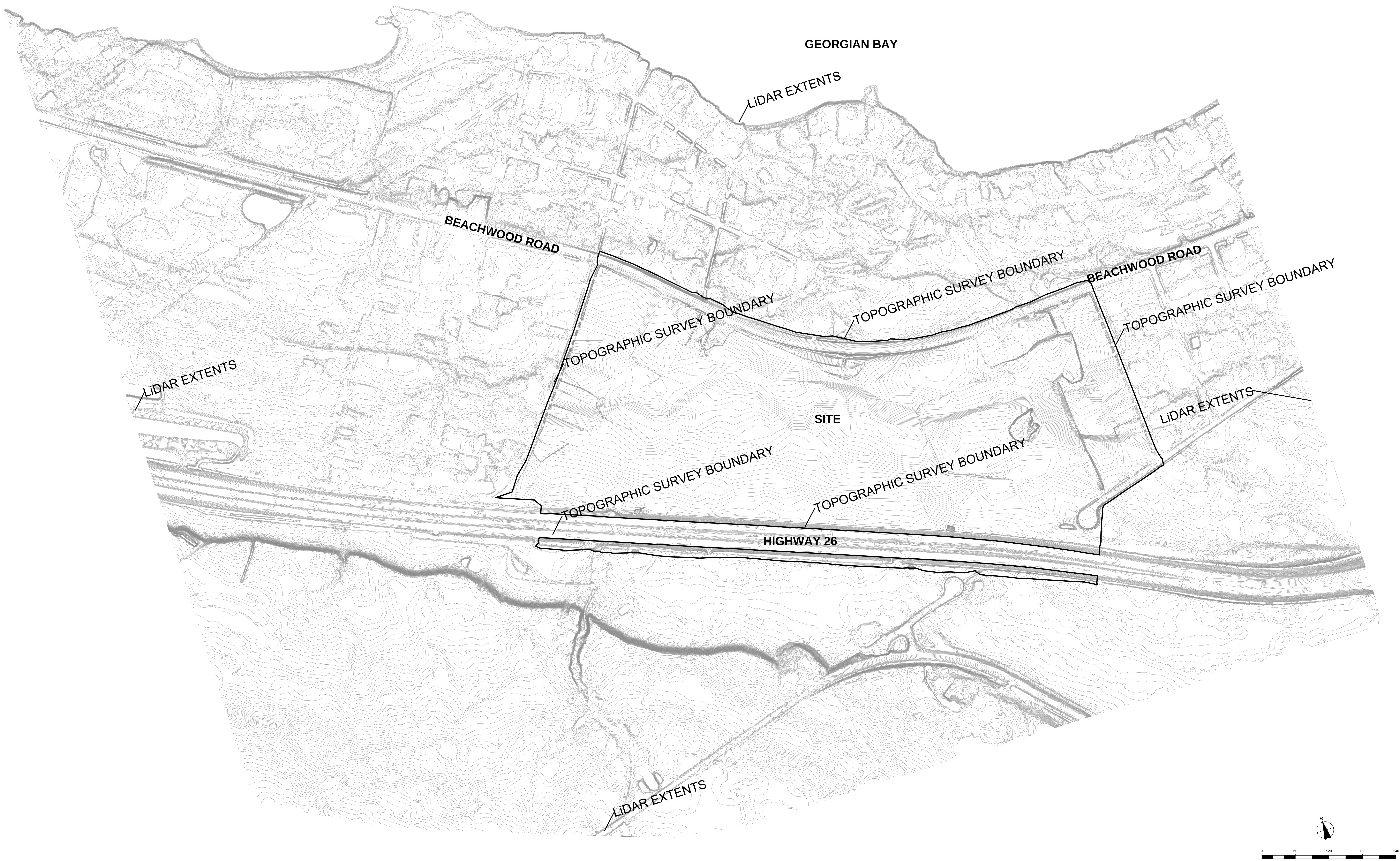
Appendix A

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

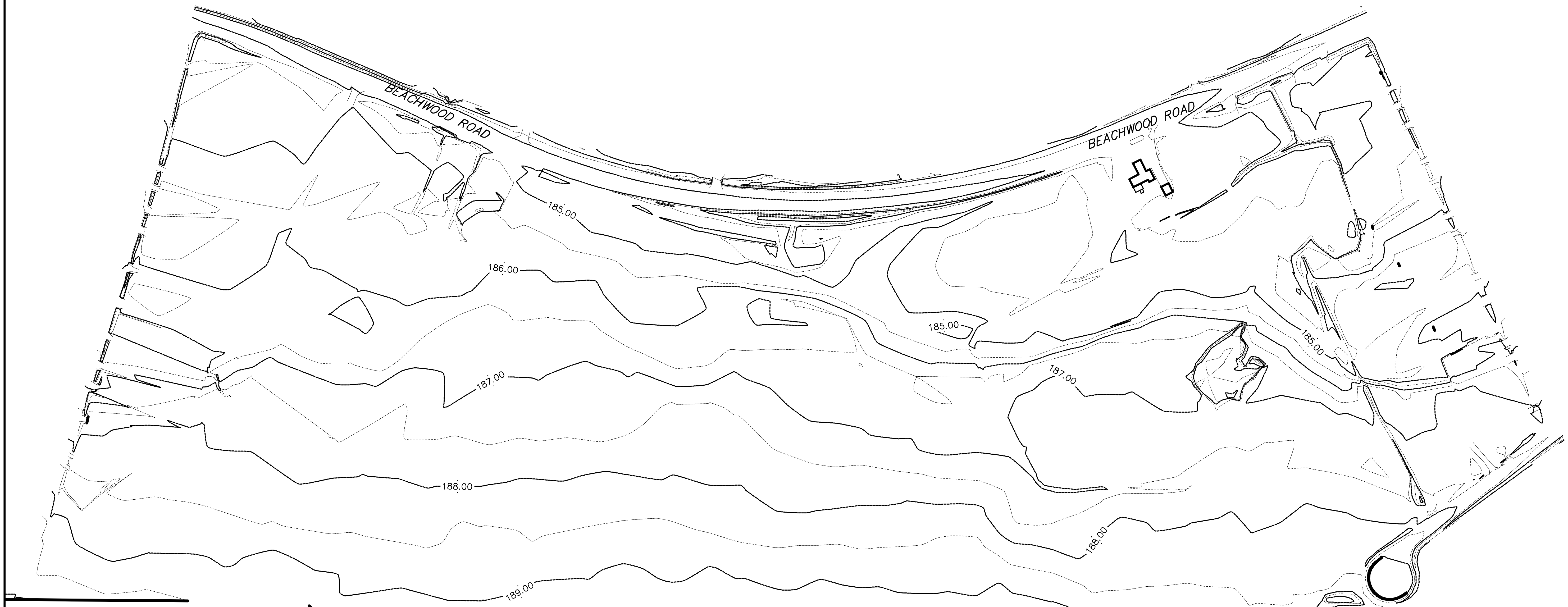
Background Information

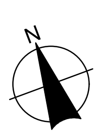


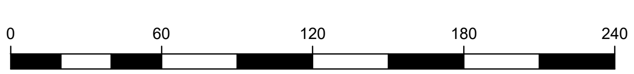
BURNSIDE

Figure Title			
SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY COMBINATION OF LiDAR AND TOPOGRAPHIC SURVEY EXTENTS			
Client: **SUNRAY LIVING INC.**	Drawn: ?? Checked: ??	Date: APRIL 8, 2022	Figure No. **1**
	Scale: 1:3,000	Project No. 300052877.1000	

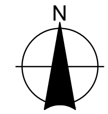
File: \\Collingwood\Shared Work Areas\052877 - Sunray Living Beachwood\01_Mod

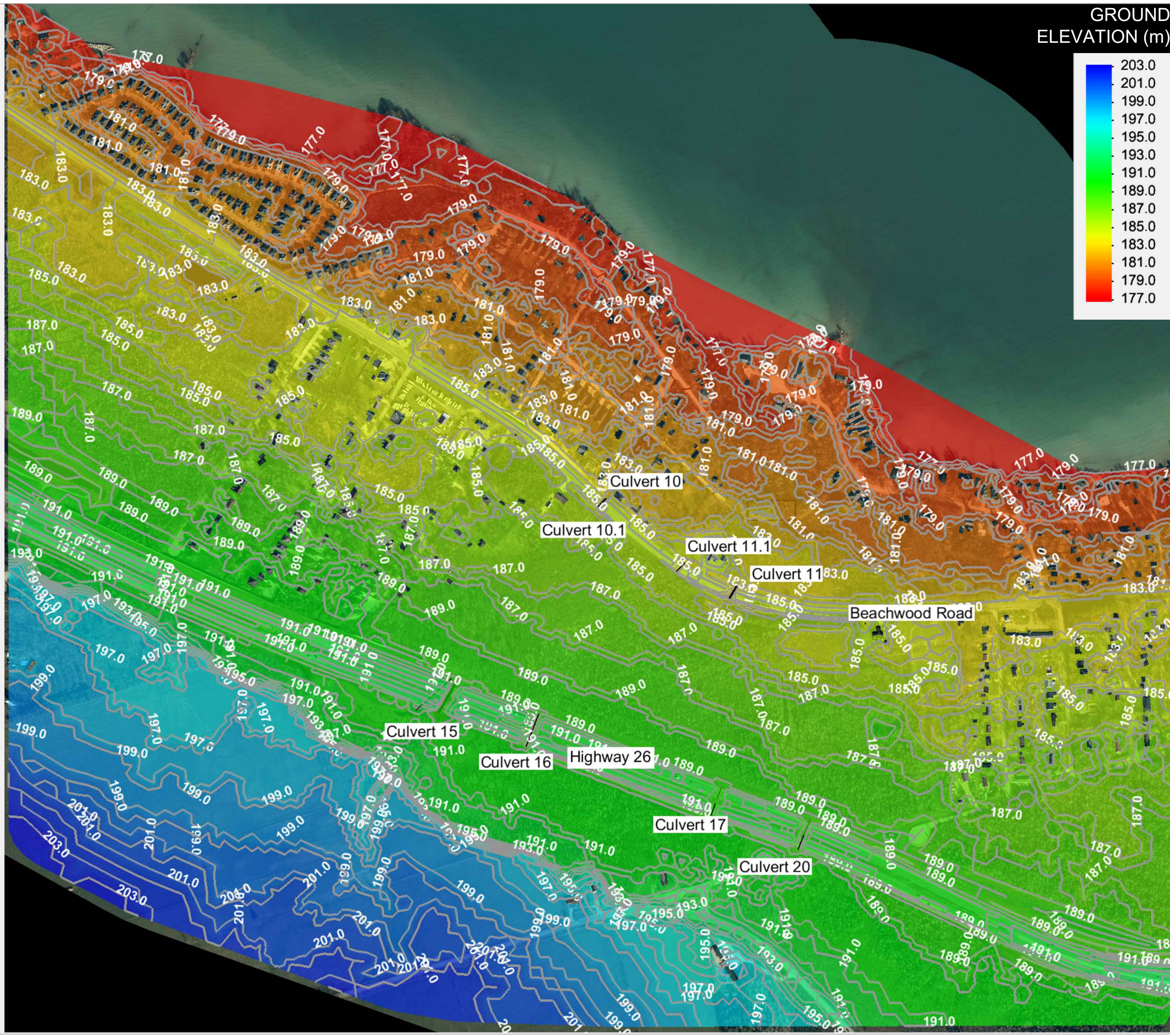






BURNSIDE	Figure Title **SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY** TOPOGRAPHIC SURVEY OF SITE COMPLETED BY JOETOPO			
Client **SUNRAY LIVING INC.**	Drawn RW	Checked TK	Date 22/05/03	Figure No. **2**
	Scale 1:3000		Project No. 300052877.0000	





BURNSIDE

Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

GROUND ELEVATION

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**3**
	Scale		Project No.	
	NTS		300052877.1000	

File: \\Collingwood\Shared Work Areas\052877.1000 - NVCA Floodplain Study\04_MiscDwg\220405 SMS REPORT FIGURES.dwg Date Plotted: April 5, 2022 - 10:05 PM

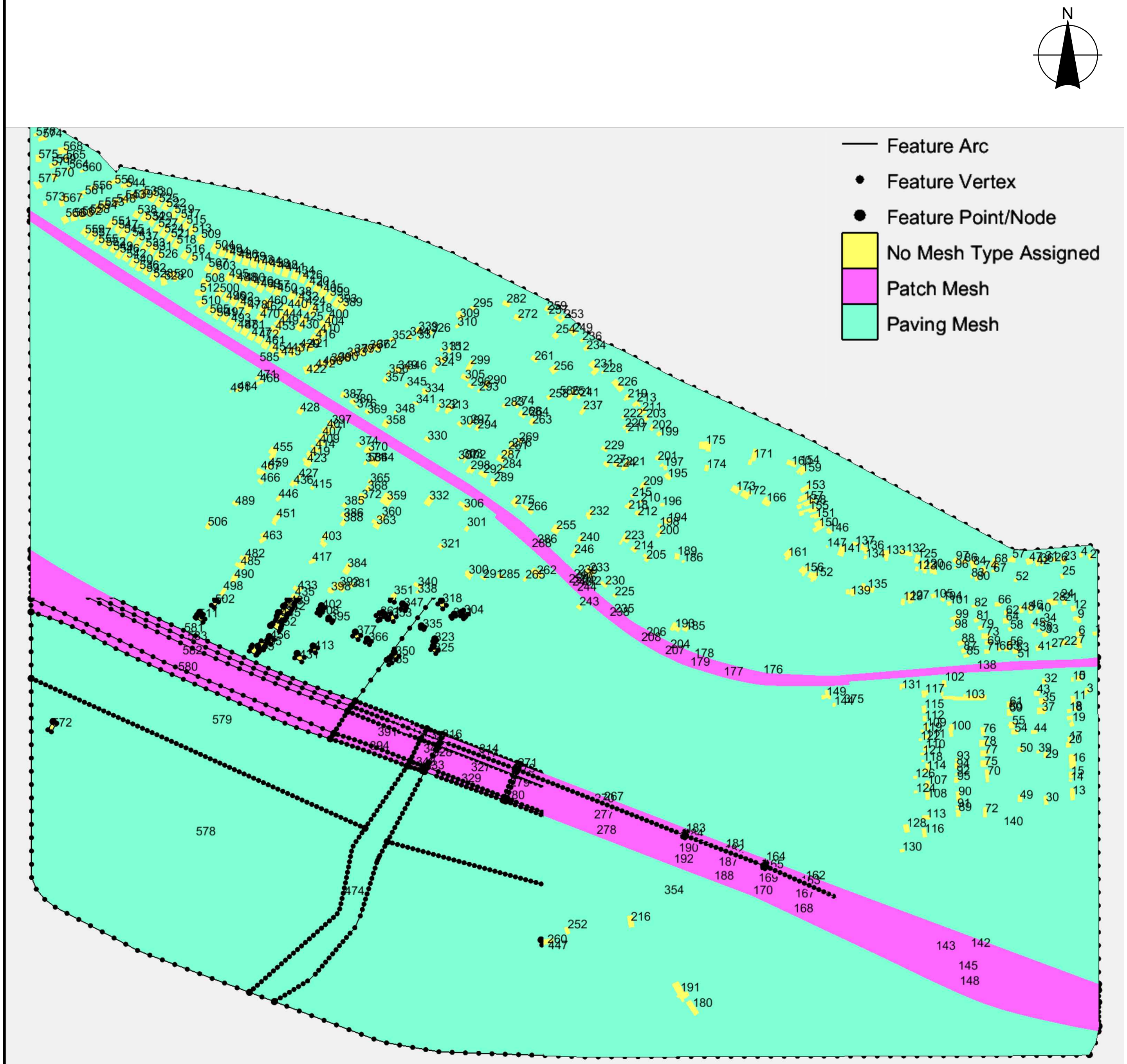


Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

MESH TYPE

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	4
	Scale		Project No.	
	NTS		300052877.1000	

File: \\Collingwood\Shared Work Areas\052877.1000 - NVCA Floodplain Study\04_MiscDwg\220405 SMS REPORT FIGURES.dwg Date Plotted: April 5, 2022 - 10:16 PM

BURNSIDE

Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

MATERIALS

Client

SUNRAY LIVING INC.

Drawn	Checked	Date	Figure No.
RW	TK	APRIL 8, 2022	**5**
Scale		Project No.	
NTS		300052877.1000	

BURNSIDE

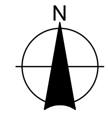
Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

BOUNDARY CONDITIONS

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**6**
	Scale		Project No.	
	NTS		300052877.1000	

File: \\Collingwood\Shared Work Areas\052877.1000 - NVCA Floodplain Study\04_MiscDwg\220405 SMS REPORT FIGURES.dwg Date Plotted: April 5, 2022 - 10:35 PM



BURNSIDE

Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

LAND USE

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**7**
	Scale		Project No.	
	NTS		300052877.1000	

File: \\Collingwood\Shared Work Areas\052877.1000 - NVCA Floodplain Study\04_MiscDwg\220405 SMS REPORT FIGURES.dwg Date Plotted: April 5, 2022 - 10:28 PM

Manning's "n" Values

from HEC RAS Hydraulic Reference Manual, dated February 2016, pages 3-14 to 3-16.

Table 3-1 Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
A. *Natural Streams*			
1. **Main Channels**			
a. Clean, straight, full, no rifts or deep pools	0.025	0.030	0.033
b. Same as above, but more stones and weeds	0.030	0.035	0.040
c. Clean, winding, some pools and shoals	0.033	0.040	0.045
d. Same as above, but some weeds and stones	0.035	0.045	0.050
e. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. Same as "d" but more stones	0.045	0.050	0.060
g. Sluggish reaches, weedy. deep pools	0.050	0.070	0.080
h. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush	0.070	0.100	0.150
2. **Flood Plains**			
a. Pasture no brush			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
2. Same as above, but heavy sprouts	0.050	0.060	0.080
3. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.080	0.100	0.120
4. Same as above, but with flow into branches	0.100	0.120	0.160
5. Dense willows, summer, straight	0.110	0.150	0.200
3. **Mountain Streams, no vegetation in channel, banks usually steep, with trees and brush on banks submerged**			
a. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
b. Bottom: cobbles with large boulders	0.040	0.050	0.070

Table 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
B. *Lined or Built-Up Channels*			
1. **Concrete**			
a. Trowel finish	0.011	0.013	0.015
b. Float Finish	0.013	0.015	0.016
c. Finished, with gravel bottom	0.015	0.017	0.020
d. Unfinished	0.014	0.017	0.020
e. Gunite, good section	0.016	0.019	0.023
f. Gunite, wavy section	0.018	0.022	0.025
g. On good excavated rock	0.017	0.020	
h. On irregular excavated rock	0.022	0.027	
2. **Concrete bottom float finished with sides of:**			
a. Dressed stone in mortar	0.015	0.017	0.020
b. Random stone in mortar	0.017	0.020	0.024
c. Cement rubble masonry, plastered	0.016	0.020	0.024
d. Cement rubble masonry	0.020	0.025	0.030
e. Dry rubble on riprap	0.020	0.030	0.035
3. **Gravel bottom with sides of:**			
a. Formed concrete	0.017	0.020	0.025
b. Random stone in mortar	0.020	0.023	0.026
c. Dry rubble or riprap	0.023	0.033	0.036
4. **Brick**			
a. Glazed	0.011	0.013	0.015
b. In cement mortar	0.012	0.015	0.018
5. **Metal**			
a. Smooth steel surfaces	0.011	0.012	0.014
b. Corrugated metal	0.021	0.025	0.030
6. **Asphalt**			
a. Smooth	0.013	0.013	
b. Rough	0.016	0.016	
7. **Vegetal lining**	0.030		0.500

Table 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
C. *Excavated or Dredged Channels*			
1. **Earth, straight and uniform**			
a. Clean, recently completed	0.016	0.018	0.020
b. Clean, after weathering	0.018	0.022	0.025
c. Gravel, uniform section, clean	0.022	0.025	0.030
d. With short grass, few weeds	0.022	0.027	0.033
2. **Earth, winding and sluggish**			
a. No vegetation	0.023	0.025	0.030
b. Grass, some weeds	0.025	0.030	0.033
c. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
d. Earth bottom and rubble side	0.028	0.030	0.035
e. Stony bottom and weedy banks	0.025	0.035	0.040
f. Cobble bottom and clean sides	0.030	0.040	0.050
3. **Dragline-excavated or dredged**			
a. No vegetation	0.025	0.028	0.033
b. Light brush on banks	0.035	0.050	0.060
4. **Rock cuts**			
a. Smooth and uniform	0.025	0.035	0.040
b. Jagged and irregular	0.035	0.040	0.050
5. **Channels not maintained, weeds and brush**			
a. Clean bottom, brush on sides	0.040	0.050	0.080
b. Same as above, highest stage of flow	0.045	0.070	0.110
c. Dense weeds, high as flow depth	0.050	0.080	0.120
d. Dense brush, high stage	0.080	0.100	0.140

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Hydrologic Summary Output

HRP ID	HRP-Description
HRP-1	Huronia Pathway
HRP-2	Between Huronia Pathway and Lakeview Avenue
HRP-3	Batteaux Creek
HRP-4	Glenlake Blvd
HRP-5	Broadview Street
HRP-6	Braeside Street
HRP-7	Nottawa Sideroad Channel
HRP-8	Fairgrounds Roadside Ditch
HRP-9	Intersection of Nottawa, Fairgrounds Rd and Hwy 26-existing
HRP-10	Interceptor Ditch
HRP-11	George Avenue
HRP-12	Marilyn Avenue
HRP-13	Robert Street
HRP-14	Thomas Street
HRP-15	Constance Blvd
HRP-16	West of Joan Avenue
HRP-17	75th Street
HRP-18	Existing Airport Road
HRP-19	Realigned Airport Road
HRP-20	The Canal (Nottawa East Canal)
HRP-21	Intersection of Mosley St, Airport Rd and Hwy 26-existing

0 600 1800m

1:30000

LEGEND

BOUNDARY OF CATCHMENT AREA

HYDROLOGIC REFERENCE POINT (HRP)

PROPOSED HWY 26 (NEW)

A, B EXTERNAL DRAINAGE AREA ID UPSTREAM OF HWY 26-NEW

Chrp DRAINAGE AREA ID DOWNSTREAM OF HWY 26-NEW

Ontario

SCALE: 1 : 30000

DATE: June 30, 2009

Delcan

HIGHWAY 26 NEW ALIGNMENT BETWEEN COLLINGWOOD AND WASAGA BEACH (GWP 630-91-00)

Figure 1: DRAINAGE AREAS AND HYDROLOGIC REFERENCE POINTS (HRPs) WITHIN THE STUDY LIMITS

J:\Division\Water\Projects\MARKHAM\TT4006 Hwy 26 - Drainage\CAD files\External Drainage patterns\Hwy26-External Drainage Patterns_p0702.dwg Fig 1 Jul 02, 2009 3:52pm d.liu

Tabel 7. Post-Development Condition without and with SWM - Peak Flows to HRPs: SCS Type II 12-hr

	HRP-1				
	Pre-Dev	Post no SWM		Post with SWM	
ID	401	401		401	
Areas	(A1, A2)tot	(A1, A2)tot			
A (ha)	147.72	147.72			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.4	0.4	-2%	0.4	-2%
5-yr	0.9	0.8	-3%	0.8	-3%
10-yr	1.2	1.2	-3%	1.2	-3%
25-yr	1.7	1.7	-3%	1.7	-3%
50-yr	2.1	2.1	-2%	2.1	-2%
100-yr	2.6	2.5	-2%	2.5	-2%

	HRP-2				
	Pre-Dev	Post no SWM		Post with SWM	
ID	402	402		402 SWMF1	
Areas	Btot Bhrp	Btot, Bhrp			
A (ha)	21.5	21.5			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.4	9%	0.3	-9%
5-yr	0.6	0.7	7%	0.5	-16%
10-yr	0.8	0.9	6%	0.8	-7%
25-yr	1.1	1.2	6%	1.0	-10%
50-yr	1.3	1.4	6%	1.2	-8%
100-yr	1.6	1.7	9%	1.5	0%

	HRP-3				
	Pre-Dev	Post no SWM		Post with SWM	
ID	403	403		4.03	
Areas	(C2 toE)tot (C2 toE)hrp	(C2, C,D,E2,E)tot,Fext, (C2 toE)hrp			
A (ha)	6556.08	6626.56			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	8.83	8.84	0%	8.84	0%
5-yr	16.96	16.98	0%	16.98	0%
10-yr	23.59	23.63	0%	23.63	0%
25-yr	32.57	32.62	0%	32.62	0%
50-yr	39.6	39.7	0%	39.7	0%
100-yr	47.0	47.1	0%	47.1	0%

	HRP-4				
	Pre-Dev	Post no SWM		Post with SWM	
ID	404	207		207	
Areas	F1tot F1hrp	F1hrp			
A (ha)	88.88	15.97			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.5	0.2	-64%	0.2	-64%
5-yr	1.0	0.4	-65%	0.4	-65%
10-yr	1.4	0.5	-65%	0.5	-65%
25-yr	1.9	0.7	-65%	0.7	-65%
50-yr	2.4	0.8	-65%	0.8	-65%
100-yr	2.8	1.0	-65%	1.0	-65%

	HRP-5				
	Pre-Dev	Post no SWM		Post with SWM	
ID	405	208		205	
Areas	F2tot F2hrp	F2hrp			
A (ha)	10.94	4.55			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.05	-61%	0.05	-61%
5-yr	0.2	0.09	-61%	0.09	-61%
10-yr	0.3	0.13	-60%	0.13	-60%
25-yr	0.5	0.18	-61%	0.18	-61%
50-yr	0.6	0.22	-61%	0.22	-61%
100-yr	0.7	0.26	-61%	0.26	-61%

	HRP-6				
	Pre-Dev	Post no SWM		Post with SWM	
ID	406	209		209	
Areas	G1tot G1hrp	G1 hrp			
A (ha)	26.12	12.52			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.1	-49%	0.1	-49%
5-yr	0.6	0.3	-49%	0.3	-49%
10-yr	0.8	0.4	-49%	0.4	-49%
25-yr	1.1	0.5	-49%	0.5	-49%
50-yr	1.3	0.7	-49%	0.7	-49%
100-yr	1.5	0.8	-49%	0.8	-49%

	HRP-7				
	Pre-Dev	Post no SWM		Post with SWM	
ID	407	407		407 SWMF3	
Areas	(G2,H,I)tot (G2, (H-I)1hrp	(F2,G1,G2,H,I)tot, Frd, (G2,(H-I1)hrp			
A (ha)	673.62	696.04			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	3.1	3.2	3%	3.1	0%
5-yr	6.1	6.2	3%	6.1	0%
10-yr	8.4	8.6	3%	8.4	0%
25-yr	11.6	11.9	2%	11.6	0%
50-yr	14.1	14.4	2%	14.1	0%
100-yr	16.7	17.1	2%	16.7	0%

	HRP-8				
	Pre-Dev	Post no SWM		Post with SWM	
ID	408	408		408	
Areas	Jtot	Jtot			
A (ha)	38.7	38.70			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.2	0%	0.2	1%
5-yr	0.5	0.5	-1%	0.5	-1%
10-yr	0.7	0.7	-2%	0.7	-2%
25-yr	0.9	0.9	-3%	0.9	-3%
50-yr	1.2	1.1	-3%	1.1	-3%
100-yr	1.4	1.3	-3%	1.3	-3%

	HRP-9				
	Pre-Dev	Post no SWM		Post with SWM	
ID	409	409		409 SWMF3	
Areas	(G2,H,I,J)tot (G2,H-I, J)hrp	(F2,G1,G2,H,I,J)tot, (G2,H-I,J)hrp			
A (ha)	730.72	753.14			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	3.4	3.5	3%	3.4	0%
5-yr	6.5	6.7	3%	6.6	0%
10-yr	9.1	9.3	3%	9.1	0%
25-yr	12.6	12.9	2%	12.6	0%
50-yr	15.3	15.7	2%	15.3	0%
100-yr	18.1	18.6	2%	18.1	0%

	HRP-10				
	Pre-Dev	Post no SWM		Post with SWM	
ID	410	410		410 SWMF4	
Areas	Ktot Khrp	(K,L,M)tot, Khrp			
A (ha)	15.39	31.22			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.4	100%	0.2	-14%
5-yr	0.4	0.7	95%	0.3	-18%
10-yr	0.5	1.0	92%	0.4	-22%
25-yr	0.7	1.3	89%	0.5	-24%
50-yr	0.9	1.6	87%	0.7	-25%
100-yr	1.0	1.9	87%	0.8	-26%

	HRP-11				
	Pre-Dev	Post no SWM		Post with SWM	
ID	411	215		215	
Areas	Ltot Lhrp	Lhrp			
A (ha)	10.91	1.21			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.03	-77%	0.03	-77%
5-yr	0.2	0.05	-78%	0.05	-78%
10-yr	0.3	0.07	-78%	0.07	-78%
25-yr	0.4	0.09	-78%	0.09	-78%
50-yr	0.5	0.11	-78%	0.11	-78%
100-yr	0.6	0.13	-79%	0.13	-79%

	HRP-12				
	Pre-Dev	Post no SWM		Post with SWM	
ID	412	216		216	
Areas	Mtot Mhrp	Mhrp			
A (ha)	8.07	1.94			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.04	-64%	0.04	-64%
5-yr	0.2	0.07	-65%	0.07	-65%
10-yr	0.3	0.10	-65%	0.10	-65%
25-yr	0.4	0.14	-66%	0.14	-66%
50-yr	0.5	0.17	-66%	0.17	-66%
100-yr	0.6	0.20	-66%	0.20	-66%

	HRP-13				
	Pre-Dev	Post no SWM		Post with SWM	
ID	413	218		218	
Areas	Ntot Nhrp	Nhrp			
A (ha)	15.54	4.54			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.1	-64%	0.1	-64%
5-yr	0.4	0.1	-64%	0.1	-64%
10-yr	0.5	0.2	-64%	0.2	-64%
25-yr	0.7	0.3	-65%	0.3	-65%
50-yr	0.9	0.3	-65%	0.3	-65%
100-yr	1.0	0.4	-65%	0.4	-65%

	HRP-14				
	Pre-Dev	Post no SWM		Post with SWM	
ID	414	414		414 SWMF5	
Areas	Otot Ohrp	(N,O)tot, (N,O)hrp			
A (ha)	212.44	223.44			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.1	1.1	4%	1.1	0%
5-yr	2.1	2.2	4%	2.1	0%
10-yr	3.0	3.1	3%	3.0	0%
25-yr	4.1	4.3	3%	4.1	0%
50-yr	5.0	5.2	3%	5.0	0%
100-yr	6.0	6.2	3%	6.0	0%

	HRP-15				
	Pre-Dev	Post no SWM		Post with SWM	
ID	415	415		415 SWMF5	
Areas	(L,MN,O) tot and hrp	(N,O)tot, (L-M-N-O)hrp			
A (ha)	282.65	266.82			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.5	1.4	-6%	1.3	-9%
5-yr	2.9	2.7	-6%	2.6	-10%
10-yr	4.0	3.8	-7%	3.6	-10%
25-yr	5.6	5.2	-7%	5.0	-10%
50-yr	6.8	6.4	-7%	6.1	-10%
100-yr	8.1	7.6	-7%	7.0	-14%

	HRP-16				
	Pre-Dev	Post no SWM		Post with SWM	
ID	416	416		416 SWMF6	
Areas	Ptot Phrp	Ptot, Phrp			
A (ha)	29.89	29.89			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.3	6%	0.3	-1%
5-yr	0.5	0.5	4%	0.5	-5%
10-yr	0.7	0.7	2%	0.7	-4%
25-yr	1.0	1.0	1%	1.0	-1%
50-yr	1.2	1.2	0%	1.2	-2%
100-yr	1.5	1.5	0%	1.4	-3%

	HRP-17				
	Pre-Dev	Post no SWM		Post with SWM	
ID	417	417		417	
Areas	Qtot Qhrp	Qtot, Qhrp			
A (ha)	17.02	17.02			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.1	0%	0.1	3%
5-yr	0.2	0.2	0%	0.2	0%
10-yr	0.4	0.3	-1%	0.3	-1%
25-yr	0.5	0.5	-2%	0.5	-2%
50-yr	0.6	0.6	-2%	0.6	-2%
100-yr	0.7	0.7	-3%	0.7	-3%

	HRP-18				
	Pre-Dev	Post no SWM		Post with SWM	
ID	418	223		223	
Areas	Rtot R1hrp	R1hrp			
A (ha)	121.93	9.5			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.3	0.1	-94%	0.1	-94%
5-yr	2.6	0.2	-94%	0.2	-94%
10-yr	3.7	0.2	-94%	0.2	-94%
25-yr	5.1	0.3	-94%	0.3	-94%
50-yr	6.3	0.4	-94%	0.4	-94%
100-yr	7.5	0.5	-94%	0.5	-94%

	HRP-19				
	Pre-Dev	Post no SWM		Post with SWM	
ID	419	419		419 SWMF7	
Areas	-- --	Rtot,Parking Lot,S1ext,S1rd, S2rd-uncontr.			
A (ha)		138.4			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	N/A	1.9	N/A	1.5	N/A
5-yr	N/A	3.4	N/A	3.0	N/A
10-yr	N/A	4.7	N/A	4.1	N/A
25-yr	N/A	6.5	N/A	5.7	N/A
50-yr	N/A	7.9	N/A	6.9	N/A
100-yr	N/A	9.4	N/A	8.2	N/A

	HRP-20				
	Pre-Dev	Post no SWM		Post with SWM	
ID	420	420		420	
Areas	S2ext, T&U	S2ext, T&U			
A (ha)	1682.71	1682.7			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	5.9	5.9	0%	5.9	0%
5-yr	11.4	11.4	0%	11.4	0%
10-yr	15.8	15.8	0%	15.8	0%
25-yr	21.7	21.7	0%	21.7	0%
50-yr	26.4	26.4	0%	26.4	0%
100-yr	31.2	31.2	0%	31.2	0%

	HRP-21				
	Pre-Dev	Post no SWM		Post with SWM	
ID	421	421		421 SWMF7	
Areas	(R,S,T&U)tot (R,S,T&U)hrp	(R,S,T&U)tot, (R,S,T&U)hrp			
A (ha)	1871.33	1871.33			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	6.2	6.2	0%	6.2	1%
5-yr	11.9	11.9	0%	12.0	0%
10-yr	16.6	16.6	0%	16.6	0%
25-yr	22.8	22.8	0%	22.8	0%
50-yr	27.7	27.6	0%	27.7	0%
100-yr	32.8	32.7	0%	32.8	0%

(green)	SWM required
(yellow)	no SWM required

Notes: peak flows are reported with one decimal place but % calculated based on peak flows extracted from Visual Otthymo Model - 3 decimal places
total areas=areas upstream of Hwy 26-new (roadway+external areas); hrp areas=areas downstream of Hwy 26-new

Tabel 8. Post-Development Condition without and with SWM - Peak Flows to HRPs: SCS Type II 24-hr

HRP-1	Pre-Dev	Post no SWM		Post with SWM	
ID	401	401		401	
Areas	(A1, A2)tot	(A1, A2)tot			
A (ha)	147.72	147.72			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.6	0.6	-1%	0.6	-1%
5-yr	1.0	1.0	-1%	1.0	-1%
10-yr	1.4	1.4	-1%	1.4	-1%
25-yr	2.0	1.9	-2%	1.9	-2%
50-yr	2.4	2.3	-2%	2.3	-2%
100-yr	2.9	2.8	-2%	2.8	-2%

HRP-2	Pre-Dev	Post no SWM		Post with SWM	
ID	402	402		402 SWMF1	
Areas	Btot Bhrp	Btot, Bhrp			
A (ha)	21.5	21.5			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.4	5%	0.3	-5%
5-yr	0.6	0.6	4%	0.5	-8%
10-yr	0.7	0.8	3%	0.7	1%
25-yr	1.0	1.0	3%	0.9	-3%
50-yr	1.1	1.1	2%	1.1	-1%
100-yr	1.3	1.3	2%	1.3	2%

HRP-3	Pre-Dev	Post no SWM		Post with SWM	
ID	403	403		4.03	
Areas	(C2 toE)tot (C2 toE)hrp	(C2, C,D,E2,E)tot,Fext, (C2 toE)hrp			
A (ha)	6556.08	6626.56			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	10.1	10.1	0%	10.1	0%
5-yr	18.1	18.1	0%	18.1	0%
10-yr	24.8	24.8	0%	24.8	0%
25-yr	33.7	33.7	0%	33.7	0%
50-yr	39.7	39.7	0%	39.7	0%
100-yr	48.0	48.0	0%	48.0	0%

HRP-4	Pre-Dev	Post no SWM		Post with SWM	
ID	404	207		207	
Areas	F1tot F1hrp	F1hrp			
A (ha)	88.88	15.97			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.7	0.2	-72%	0.2	-72%
5-yr	1.2	0.3	-72%	0.3	-72%
10-yr	1.6	0.4	-73%	0.4	-73%
25-yr	2.1	0.6	-73%	0.6	-73%
50-yr	2.5	0.7	-73%	0.7	-73%
100-yr	3.0	0.8	-74%	0.8	-74%

HRP-5	Pre-Dev	Post no SWM		Post with SWM	
ID	405	208		205	
Areas	F2tot F2hrp	F2hrp			
A (ha)	10.94	4.55			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.1	-60%	0.1	-60%
5-yr	0.2	0.1	-60%	0.1	-60%
10-yr	0.3	0.1	-60%	0.1	-60%
25-yr	0.4	0.2	-59%	0.2	-59%
50-yr	0.5	0.2	-60%	0.2	-60%
100-yr	0.5	0.2	-59%	0.2	-59%

HRP-6	Pre-Dev	Post no SWM		Post with SWM	
ID	406	209		209	
Areas	G1tot G1hrp	G1 hrp			
A (ha)	26.12	12.52			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.1	-51%	0.1	-51%
5-yr	0.5	0.3	-51%	0.3	-51%
10-yr	0.7	0.3	-51%	0.3	-51%
25-yr	0.9	0.4	-51%	0.4	-51%
50-yr	1.1	0.5	-51%	0.5	-51%
100-yr	1.3	0.6	-51%	0.6	-51%

HRP-7	Pre-Dev	Post no SWM		Post with SWM	
ID	407	407		407 SWMF3	
Areas	(G2,H,I)tot (G2, (H-I)1hrp	(F2,G1,G2,H,I)tot, Frd, (G2,(H-I1)hrp			
A (ha)	673.62	696.04			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	4.2	4.3	3%	4.2	0%
5-yr	7.3	7.5	3%	7.4	0%
10-yr	9.9	10.2	3%	9.9	0%
25-yr	13.2	13.6	3%	13.3	0%
50-yr	15.5	15.9	3%	15.5	0%
100-yr	18.6	19.0	3%	18.6	0%

HRP-8	Pre-Dev	Post no SWM		Post with SWM	
ID	408	408		408	
Areas	Jtot	Jtot			
A (ha)	38.7	38.70			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.3	0%	0.3	1%
5-yr	0.5	0.5	0%	0.5	0%
10-yr	0.7	0.7	0%	0.7	0%
25-yr	1.0	1.0	-1%	1.0	-1%
50-yr	1.2	1.1	-1%	1.1	-1%
100-yr	1.4	1.4	-1%	1.4	-1%

HRP-9	Pre-Dev	Post no SWM		Post with SWM	
ID	409	409		409 SWMF3	
Areas	(G2,H,I,J)tot (G2,H-I, J)hrp	F2,G1,G2,H,I,J)tot, (G2,H-I,J)hrp			
A (ha)	730.72	753.14			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	4.5	4.6	3%	4.5	1%
5-yr	7.9	8.2	3%	8.0	0%
10-yr	10.7	11.0	3%	10.7	0%
25-yr	14.4	14.8	3%	14.4	0%
50-yr	16.8	17.3	3%	16.8	0%
100-yr	20.1	20.7	3%	20.2	0%

HRP-10	Pre-Dev	Post no SWM		Post with SWM	
ID	410	410		410 SWMF4	
Areas	Ktot Khrp	(K,L,M)tot, Khrp			
A (ha)	15.39	31.22			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.4	107%	0.2	6%
5-yr	0.3	0.6	105%	0.3	0%
10-yr	0.4	0.8	103%	0.4	-2%
25-yr	0.5	1.1	103%	0.5	-4%
50-yr	0.6	1.3	102%	0.6	-5%
100-yr	0.8	1.5	102%	0.7	-5%

HRP-11	Pre-Dev	Post no SWM		Post with SWM	
ID	411	215		215	
Areas	Ltot Lhrp	Lhrp			
A (ha)	10.91	1.21			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.02	-86%	0.02	-86%
5-yr	0.2	0.03	-86%	0.03	-86%
10-yr	0.3	0.04	-86%	0.04	-86%
25-yr	0.4	0.05	-87%	0.05	-87%
50-yr	0.4	0.06	-87%	0.06	-87%
100-yr	0.5	0.07	-87%	0.07	-87%

HRP-12	Pre-Dev	Post no SWM		Post with SWM	
ID	412	216		216	
Areas	Mtot Mhrp	Mhrp			
A (ha)	8.07	1.94			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.03	-72%	0.03	-72%
5-yr	0.2	0.05	-72%	0.05	-72%
10-yr	0.2	0.06	-73%	0.06	-73%
25-yr	0.3	0.08	-73%	0.08	-73%
50-yr	0.3	0.09	-73%	0.09	-73%
100-yr	0.4	0.11	-73%	0.11	-73%

HRP-13	Pre-Dev	Post no SWM		Post with SWM	
ID	413	218		218	
Areas	Ntot Nhrp	Nhrp			
A (ha)	15.54	4.54			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.1	-67%	0.1	-67%
5-yr	0.3	0.1	-68%	0.1	-68%
10-yr	0.4	0.1	-68%	0.1	-68%
25-yr	0.5	0.2	-68%	0.2	-68%
50-yr	0.6	0.2	-68%	0.2	-68%
100-yr	0.8	0.2	-69%	0.2	-69%

HRP-14	Pre-Dev	Post no SWM		Post with SWM	
ID	414	414		414 SWMF5	
Areas	Otot Ohrp	(N,O)tot, (N,O)hrp			
A (ha)	212.44	223.44			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.4	1.5	5%	1.4	0%
5-yr	2.5	2.6	4%	2.5	0%
10-yr	3.4	3.6	4%	3.4	0%
25-yr	4.6	4.8	4%	4.6	0%
50-yr	5.4	5.6	4%	5.4	0%
100-yr	6.5	6.7	4%	6.5	0%

HRP-15	Pre-Dev	Post no SWM		Post with SWM	
ID	415	415		415 SWMF5	
Areas	(L,MN,O) tot and hrp	(N,O)tot, (L-M-N-O)hrp			
A (ha)	282.65	266.82			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.9	1.8	-6%	1.7	-10%
5-yr	3.4	3.2	-6%	3.1	-10%
10-yr	4.7	4.4	-6%	4.2	-10%
25-yr	6.3	5.8	-7%	5.6	-11%
50-yr	7.3	6.9	-7%	6.6	-11%
100-yr	8.3	8.2	-1%	7.9	-5%

HRP-16	Pre-Dev	Post no SWM		Post with SWM	
ID	416	416		416 SWMF6	
Areas	Ptot Phrp	Ptot, Phrp			
A (ha)	29.89	29.89			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.3	6%	0.3	0%
5-yr	0.5	0.5	4%	0.5	-2%
10-yr	0.6	0.7	4%	0.6	-1%
25-yr	0.9	0.9	3%	0.9	1%
50-yr	1.0	1.0	2%	1.0	1%
100-yr	1.2	1.3	2%	1.2	0%

HRP-17	Pre-Dev	Post no SWM		Post with SWM	
ID	417	417		417	
Areas	Qtot Qhrp	Qtot, Qhrp			
A (ha)	17.02	17.02			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.1	1%	0.1	1%
5-yr	0.3	0.3	0%	0.3	0%
10-yr	0.3	0.3	0%	0.3	0%
25-yr	0.5	0.5	0%	0.5	0%
50-yr	0.5	0.5	0%	0.5	0%
100-yr	0.7	0.7	0%	0.7	0%

HRP-18	Pre-Dev	Post no SWM		Post with SWM	
ID	418	223		223	
Areas	Rtot R1hrp	R1hrp			
A (ha)	121.93	9.5			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.3	0.1	-93%	0.1	-93%
5-yr	2.2	0.1	-93%	0.1	-93%
10-yr	3.0	0.2	-93%	0.2	-93%
25-yr	4.0	0.3	-93%	0.3	-93%
50-yr	4.6	0.3	-93%	0.3	-93%
100-yr	5.6	0.4	-93%	0.4	-93%

HRP-19	Pre-Dev	Post no SWM		Post with SWM	
ID	419	419		419 SWMF7	
Areas	-- --	Rtot,Parking Lot,S1ext,S1rd, S2rd- uncontr.			
A (ha)		138.4			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	N/A	1.6	N/A	1.4	N/A
5-yr	N/A	2.8	N/A	2.4	N/A
10-yr	N/A	3.7	N/A	3.2	N/A
25-yr	N/A	4.9	N/A	4.3	N/A
50-yr	N/A	5.7	N/A	5.0	N/A
100-yr	N/A	6.7	N/A	6.0	N/A

HRP-20	Pre-Dev	Post no SWM		Post with SWM	
ID	420	420		420	
Areas	S2ext, T&U	S2ext, T&U			
A (ha)	1682.71	1682.7			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	7.9	7.9	0%	7.9	0%
5-yr	14.0	14.0	0%	14.0	0%
10-yr	18.9	18.9	0%	18.9	0%
25-yr	25.3	25.3	0%	25.3	0%
50-yr	29.7	29.7	0%	29.7	0%
100-yr	35.5	35.5	0%	35.5	0%

HRP-21	Pre-Dev	Post no SWM		Post with SWM	
ID	421	421		421 SWMF7	
Areas	(R,S,T&U)tot (R,S,T&U)hrp	(R,S,T&U)tot, (R,S,T&U)hrp			
A (ha)	1871.33	1871.33			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	8.2	8.2	0%	8.2	0%
5-yr	14.6	14.5	0%	14.6	0%
10-yr	19.8	19.7	-1%	19.7	0%
25-yr	26.6	26.4	-1%	26.5	0%
50-yr	31.2	31.0	-1%	31.1	0%
100-yr	37.4	37.1	-1%	37.3	0%

SWM required
no SWM required

Notes: peak flows are reported with one decimal place but % calculated based on peak flows extracted from Visual Otthymo Model - 3 decimal places
total areas=areas upstream of Hwy 26-new (roadway+external areas); hrp areas=areas downstream of Hwy 26-new

Tabel 9. Post-Development Condition without and with SWM - Peak Flows to HRPs: Chicago 4-hr

	HRP-1				
	Pre-Dev	Post no SWM		Post with SWM	
ID	401	401		401	
Areas	(A1, A2)tot	(A1, A2)tot			
A (ha)	147.72	147.72			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.4	0.4	-1%	0.4	-1%
5-yr	0.8	0.7	-2%	0.7	-2%
10-yr	1.1	1.1	-2%	1.1	-2%
25-yr	1.5	1.4	-2%	1.4	-2%
50-yr	1.8	1.8	-2%	1.8	-2%
100-yr	2.2	2.1	-2%	2.1	-2%

	HRP-2				
	Pre-Dev	Post no SWM		Post with SWM	
ID	402	402		402 SWMF1	
Areas	Btot Bhrp	Btot, Bhrp			
A (ha)	21.5	21.5			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.3	11%	0.3	-5%
5-yr	0.5	0.6	6%	0.5	-14%
10-yr	0.7	0.8	3%	0.7	-8%
25-yr	1.0	1.0	3%	0.9	-9%
50-yr	1.2	1.2	3%	1.1	-10%
100-yr	1.4	1.4	0%	1.2	-10%

	HRP-3				
	Pre-Dev	Post no SWM		Post with SWM	
ID	403	403		4.03	
Areas	(C2 toE)tot (C2 toE)hrp	(C2, C,D,E2,E)tot,Fext, (C2 toE)hrp			
A (ha)	6556.08	6626.56			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	7.3	7.3	0%	7.3	0%
5-yr	13.4	13.4	0%	13.4	0%
10-yr	18.5	18.5	0%	18.5	0%
25-yr	25.0	25.0	0%	25.0	0%
50-yr	30.3	30.3	0%	30.3	0%
100-yr	36.1	36.1	0%	36.1	0%

	HRP-4				
	Pre-Dev	Post no SWM		Post with SWM	
ID	404	207		207	
Areas	F1tot F1hrp	F1hrp			
A (ha)	88.88	15.97			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.5	0.2	-65%	0.2	-65%
5-yr	0.9	0.3	-65%	0.3	-65%
10-yr	1.2	0.4	-65%	0.4	-65%
25-yr	1.6	0.6	-65%	0.6	-65%
50-yr	2.0	0.7	-65%	0.7	-65%
100-yr	2.4	0.8	-65%	0.8	-65%

	HRP-5				
	Pre-Dev	Post no SWM		Post with SWM	
ID	405	208		205	
Areas	F2tot F2hrp	F2hrp			
A (ha)	10.94	4.55			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.04	-60%	0.04	-60%
5-yr	0.2	0.08	-60%	0.08	-60%
10-yr	0.3	0.11	-60%	0.11	-60%
25-yr	0.4	0.15	-61%	0.15	-61%
50-yr	0.5	0.19	-61%	0.19	-61%
100-yr	0.6	0.22	-61%	0.22	-61%

	HRP-6				
	Pre-Dev	Post no SWM		Post with SWM	
ID	406	209		209	
Areas	G1tot G1hrp	G1 hrp			
A (ha)	26.12	12.52			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.3	0.1	-49%	0.1	-49%
5-yr	0.5	0.2	-49%	0.2	-49%
10-yr	0.7	0.3	-49%	0.3	-49%
25-yr	0.9	0.5	-49%	0.5	-49%
50-yr	1.1	0.6	-49%	0.6	-49%
100-yr	1.3	0.7	-49%	0.7	-49%

	HRP-7				
	Pre-Dev	Post no SWM		Post with SWM	
ID	407	407		407 SWMF3	
Areas	(G2,H,I)tot (G2, (H-I)1hrp	(F2,G1,G2,H,I)tot, Frd, (G2,(H-I1)hrp			
A (ha)	673.62	696.04			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	3.0	3.1	3%	3.1	0%
5-yr	5.5	5.6	3%	5.5	0%
10-yr	7.6	7.8	3%	7.6	0%
25-yr	10.2	10.4	3%	10.2	0%
50-yr	12.3	12.6	2%	12.3	0%
100-yr	14.6	15.0	2%	14.6	0%

	HRP-8				
	Pre-Dev	Post no SWM		Post with SWM	
ID	408	408		408	
Areas	Jtot	Jtot			
A (ha)	38.7	38.70			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.2	1%	0.2	1%
5-yr	0.4	0.4	0%	0.4	0%
10-yr	0.6	0.6	-1%	0.6	-1%
25-yr	0.8	0.8	-1%	0.8	-1%
50-yr	1.0	1.0	-2%	1.0	-2%
100-yr	1.2	1.1	-2%	1.1	-2%

	HRP-9				
	Pre-Dev	Post no SWM		Post with SWM	
ID	409	409		409 SWMF3	
Areas	(G2,H,I,J)tot (G2,H-I, J)hrp	(F2,G1,G2,H,I,J)tot, (G2,H-I,J)hrp			
A (ha)	730.72	753.14			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	3.3	3.4	3%	3.3	0%
5-yr	5.9	6.1	3%	6.0	0%
10-yr	8.2	8.4	3%	8.2	0%
25-yr	11.0	11.3	3%	11.0	0%
50-yr	13.4	13.7	2%	13.4	0%
100-yr	15.8	16.2	2%	15.9	0%

	HRP-10				
	Pre-Dev	Post no SWM		Post with SWM	
ID	410	410		410 SWMF4	
Areas	Ktot Khrp	(K,L,M)tot, Khrp			
A (ha)	15.39	31.22			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.4	105%	0.1	-13%
5-yr	0.3	0.6	96%	0.3	-17%
10-yr	0.4	0.9	93%	0.4	-21%
25-yr	0.6	1.2	91%	0.5	-24%
50-yr	0.7	1.4	89%	0.6	-26%
100-yr	0.9	1.7	88%	0.7	-26%

	HRP-11				
	Pre-Dev	Post no SWM		Post with SWM	
ID	411	215		215	
Areas	Ltot Lhrp	Lhrp			
A (ha)	10.91	1.21			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.02	-78%	0.02	-78%
5-yr	0.2	0.04	-78%	0.04	-78%
10-yr	0.3	0.06	-78%	0.06	-78%
25-yr	0.4	0.08	-78%	0.08	-78%
50-yr	0.4	0.09	-78%	0.09	-78%
100-yr	0.5	0.11	-78%	0.11	-78%

	HRP-12				
	Pre-Dev	Post no SWM		Post with SWM	
ID	412	216		216	
Areas	Mtot Mhrp	Mhrp			
A (ha)	8.07	1.94			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.03	-65%	0.03	-65%
5-yr	0.2	0.06	-65%	0.06	-65%
10-yr	0.3	0.09	-65%	0.09	-65%
25-yr	0.3	0.12	-65%	0.12	-65%
50-yr	0.4	0.15	-65%	0.15	-65%
100-yr	0.5	0.17	-66%	0.17	-66%

	HRP-13				
	Pre-Dev	Post no SWM		Post with SWM	
ID	413	218		218	
Areas	Ntot Nhrp	Nhrp			
A (ha)	15.54	4.54			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.1	-64%	0.1	-64%
5-yr	0.3	0.1	-64%	0.1	-64%
10-yr	0.4	0.2	-64%	0.2	-64%
25-yr	0.6	0.2	-64%	0.2	-64%
50-yr	0.7	0.3	-65%	0.3	-65%
100-yr	0.9	0.3	-65%	0.3	-65%

	HRP-14				
	Pre-Dev	Post no SWM		Post with SWM	
ID	414	414		414 SWMF5	
Areas	Otot Ohrp	(N,O)tot, (N,O)hrp			
A (ha)	212.44	223.44			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.1	1.1	4%	1.1	0%
5-yr	1.9	2.0	4%	1.9	0%
10-yr	2.7	2.8	4%	2.7	0%
25-yr	3.6	3.7	4%	3.6	0%
50-yr	4.4	4.5	4%	4.4	0%
100-yr	5.2	5.4	4%	5.2	0%

	HRP-15				
	Pre-Dev	Post no SWM		Post with SWM	
ID	415	415		415 SWMF5	
Areas	(L,MN,O) tot and hrp	(N,O)tot, (L-M-N-O)hrp			
A (ha)	282.65	266.82			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.4	1.3	-5%	1.3	-9%
5-yr	2.5	2.4	-5%	2.3	-9%
10-yr	3.5	3.3	-6%	3.2	-9%
25-yr	4.8	4.5	-6%	4.3	-9%
50-yr	5.8	5.5	-6%	5.3	-9%
100-yr	6.9	6.5	-6%	6.3	-9%

	HRP-16				
	Pre-Dev	Post no SWM		Post with SWM	
ID	416	416		416 SWMF6	
Areas	Ptot Phrp	Ptot, Phrp			
A (ha)	29.89	29.89			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.2	0.2	0%	0.2	2%
5-yr	0.4	0.5	3%	0.4	-3%
10-yr	0.6	0.6	0%	0.6	-2%
25-yr	0.8	0.9	2%	0.8	0%
50-yr	1.0	1.0	0%	1.0	0%
100-yr	1.2	1.2	0%	1.2	-2%

	HRP-17				
	Pre-Dev	Post no SWM		Post with SWM	
ID	417	417		417	
Areas	Qtot Qhrp	Qtot, Qhrp			
A (ha)	17.02	17.02			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	0.1	0.1	0%	0.1	4%
5-yr	0.2	0.2	0%	0.2	1%
10-yr	0.3	0.3	0%	0.3	0%
25-yr	0.4	0.4	0%	0.4	-1%
50-yr	0.5	0.5	0%	0.5	-2%
100-yr	0.6	0.6	0%	0.6	-2%

	HRP-18				
	Pre-Dev	Post no SWM		Post with SWM	
ID	418	223		223	
Areas	Rtot R1hrp	R1hrp			
A (ha)	121.93	9.5			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	1.2	0.1	-94%	0.1	-94%
5-yr	2.2	0.1	-94%	0.1	-94%
10-yr	3.1	0.2	-94%	0.2	-94%
25-yr	4.3	0.3	-94%	0.3	-94%
50-yr	5.3	0.3	-94%	0.3	-94%
100-yr	6.3	0.4	-94%	0.4	-94%

	HRP-19				
	Pre-Dev	Post no SWM		Post with SWM	
ID	419	419		419 SWMF7	
Areas	-- --	Rtot,Parking Lot,S1ext,S1rd, S2rd-uncontr.			
A (ha)		138.4			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	N/A	1.9	N/A	1.4	N/A
5-yr	N/A	3.0	N/A	2.6	N/A
10-yr	N/A	4.1	N/A	3.6	N/A
25-yr	N/A	5.5	N/A	4.8	N/A
50-yr	N/A	6.7	N/A	5.9	N/A
100-yr	N/A	8.0	N/A	7.0	N/A

	HRP-20				
	Pre-Dev	Post no SWM		Post with SWM	
ID	420	420		420	
Areas	S2ext, T&U	S2ext, T&U			
A (ha)	1682.71	1682.7			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	5.8	5.8	0%	5.8	0%
5-yr	10.4	10.4	0%	10.4	0%
10-yr	14.3	14.3	0%	14.3	0%
25-yr	19.2	19.2	0%	19.2	0%
50-yr	23.2	23.2	0%	23.2	0%
100-yr	27.5	27.5	0%	27.5	0%

	HRP-21				
	Pre-Dev	Post no SWM		Post with SWM	
ID	421	421		421 SWMF7	
Areas	(R,S,T&U)tot (R,S,T&U)hrp	(R,S,T&U)tot, (R,S,T&U)hrp			
A (ha)	1871.33	1871.33			
	(m^3/s)	(m^3/s)	%	(m^3/s)	%
2-yr	6.1	6.1	0%	6.1	0%
5-yr	11.0	10.9	-1%	10.9	0%
10-yr	15.1	15.0	-1%	15.0	0%
25-yr	20.3	20.1	-1%	20.2	0%
50-yr	24.5	24.3	-1%	24.4	0%
100-yr	29.0	28.8	-1%	28.9	0%

SWM required
no SWM required

Notes: peak flows are reported with one decimal place but % calculated based on peak flows extracted from Visual Otthymo Model - 3 decimal places
total areas=areas upstream of Hwy 26-new (roadway+external areas); hrp areas=areas downstream of Hwy 26-new

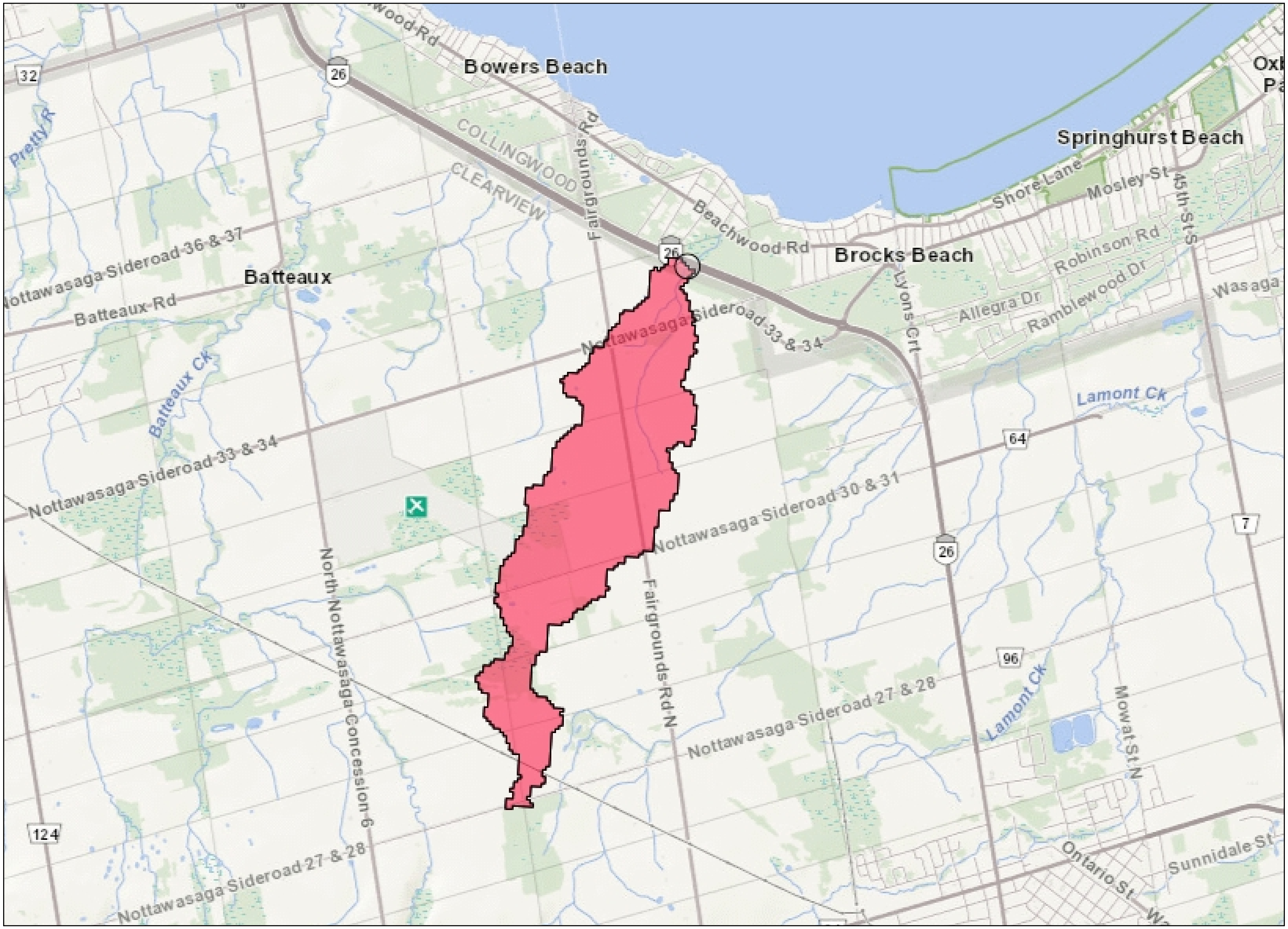
Ontario

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ontario Flow Assessment Tools

Drainage Area - OFAT

Notes:



Legend

- Assessment Parcel
- Secondary Watershed
- Tertiary Watershed
- Quaternary Watershed
- Great Lakes - St. Lawrence Basin
- Hudson - James Bay Basin
- Nelson River Basin
- Diversions
- Waterbody Outlet
- Conservation Authority Dam
- Provincial Dam
- Federal Dam
- OPG Dam
- Other Dam
- HYDAT Gauge
- HYDAT Gauge (RHBN)
- Virtual Flow Segment

Land Cover Compilation

- Other
- Cloud/Shadow
- Clear Open Water
- Turbid Water
- Shoreline
- Mudflats
- Marsh
- Swamp
- Fen
- Bog
- Heath
- Sparse Treed
- Treed Upland
- Deciduous Treed
- Mixed Treed
- Coniferous Treed
- Plantations - Treed Cultivated
- Hedge Rows
- Disturbance
- Open Cliff and Talus
- Alvar
- Sand Barren and Dune
- Open Tallgrass Prairie
- Tallgrass Savannah
- Tallgrass Woodland
- Sand/Gravel/Mine Tailings/Extraction
- Bedrock
- Community/Infrastructure
- Agriculture and Undifferentiated Rural Land Use

2.6 | 0 km | 1.31 | 2.6

Scale: 1 : 51,557

Projection: Web Mercator

The Ontario Ministry of Natural Resources and Forestry shall not be liable in any way for the use of, or reliance upon, this map or any information on this map. This map should not be used for: navigation, a plan of survey, routes, nor locations.

Ontario Flow Assessment Tool
Ministry of Natural Resources and Forestry

Looking for a town/city/park? Enter the name here... | français

About | Navigation | Map Layers | OFAT | Find Information | Markup & Printing | Tool Labels

Create Watershed | Watershed Characterization | Land Cover | Hydrology Models | Flow Statistics | Find Watershed | Export | Help

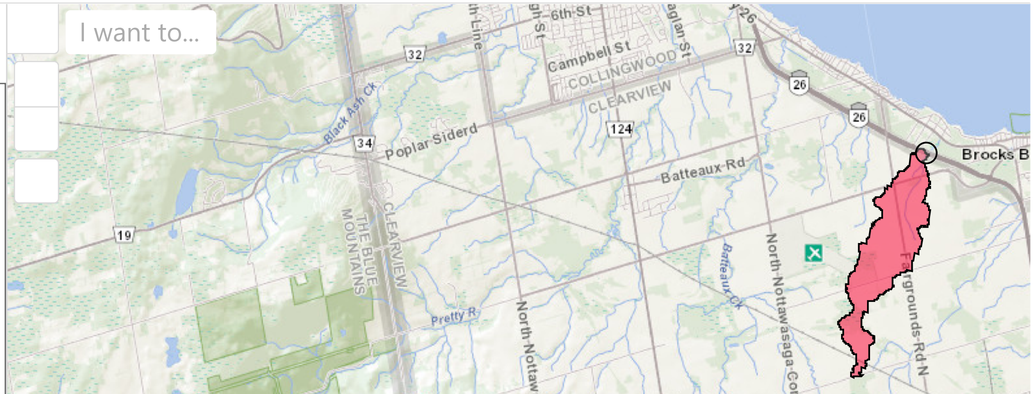
OFAT Tools

Watershed Characterization

Drainage Area (km²)	3.443
Shape Factor ()	11.232
Length of Main Channel (km)	6.219
Maximum Channel Elevation (m)	239.570
Minimum Channel Elevation (m)	188.350
Slope of Main Channel (m/km)	8.240
Slope of Main Channel (%)	0.824
Area Lakes/Wetlands (km²)	0.169
Area - Lakes (km²)	0.003
Area - Wetlands (km²)	0.167
Mean Elevation (m)	217.290
Maximum Elevation (m)	239.573
Mean Slope (%)	1.275
Annual Mean Temperature (°C)	7.200
Annual Precipitation (mm)	896.000

Calculate All

Watershed Name	On/Off	Delete
Watershed 1	☑	✗



WKID: 4326 Lat/Long ▲ | Lat: 44.49365° N Lon: 79.96085° W | 3km

Hydrology Models

MoinShaw1985IndexExpectedProbabilityAdjustment

Flow	Results (m³/s)
AreaLimit	Drainage Area Parameter not in range for model.
$Q_{1.25}$	0.640000
Q_2	0.650000
Q_5	0.860000
Q_{10}	1.060000
Q_{20}	1.280000
Q_{50}	1.560000
Q_{100}	1.800000
Q_{200}	2.040000
Q_{500}	2.330000

PCSWMM Report

Beachwood PCSWMM Output

Model 10 Year Event.inp

April 6, 2022

Table of Contents

Summaries

Summary 1A: Options 3
Summary 1B: Options 4
Summary 1C: Options 5
Summary 2: Model inventory 6
Summary 3: Model complexity 7
Summary 4: Inflows 7
Summary 5: Subcatchment statistics 8
Summary 6: Node statistics 8
Summary 7: Conduit statistics 9
Summary 8: Conduit Inventory 9
Summary 9: Pipe inventory 9
Summary 10: Unused objects 10
Summary 11: Runoff quantity continuity 10
Summary 12: Flow routing continuity 11
Summary 13: Results statistics 11

Maps

Figure 1: Extent 1 13

Graphs

Figure 2: Regional vs 100 Year Peak 14
Figure 3: Regional Peak 15
Figure 4: 100 Year Peak 16
Figure 5: Peak Flow 17
Figure 6: 2 Year Peak 18
Figure 7: 5 Year Peak 19
Figure 8: 10 Year Peak 20
Figure 9: 25 Year Peak 21
Figure 10: 50 Year Peak 22

Time Series

Time Series 1: Peak Flow 23

Summary 1A: Options

Name	Timmins	100 Year	2 Year Event
Flow Units	CMS	CMS	CMS
Infiltration method	Curve Number	Curve Number	Curve Number
Flow routing method	Dynamic Wave	Dynamic Wave	Dynamic Wave
Link offsets defined by	Depth	Depth	Depth
Allow ponding	No	No	No
Skip steady flow periods	No	No	No
Inertial dampening	Partial	Partial	Partial
Define supercritical flow by	Both	Both	Both
Force Main Equation	H-W	H-W	H-W
Variable time step	On	On	On
Adjustment factor (%)	75	75	75
Conduit lengthening (s)	0	0	0
Minimum surface area (m^2)	0	0	0
Starting date	Oct-7-2013 12:00:00 AM	Oct-7-2013 12:00:00 AM	Oct-7-2013 12:00:00 AM
Ending date	Oct-8-2013 12:00:00 AM	Oct-8-2013 12:00:00 AM	Oct-8-2013 12:00:00 AM
Duration of simulation (hours)	24	24	24
Antecedent dry days (days)	0	0	0
Rain interval (h:mm)	1:00	0:06	0:06
Report time step (h:mm:ss)	00:05:00	00:05:00	00:05:00
Wet time step (h:mm:ss)	00:05:00	00:05:00	00:05:00
Dry time step (h:mm:ss)	00:05:00	00:05:00	00:05:00
Routing time step (s)	5	5	5
Minimum time step used (s)	3.66	4.31	5
Average time step used (s)	4.45	4.83	5
Minimum conduit slope	0	0	0
Ignore rainfall/runoff	No	No	No
Ignore snow melt	No	No	No
Ignore groundwater	No	No	No
Ignore flow routing	No	No	No
Ignore water quality	No	No	No
Report average results	No	No	No

Summary 1B: Options

Name	5 Year Event	10 Year Event	25 Year Event
Flow Units	CMS	CMS	CMS
Infiltration method	Curve Number	Curve Number	Curve Number
Flow routing method	Dynamic Wave	Dynamic Wave	Dynamic Wave
Link offsets defined by	Depth	Depth	Depth
Allow ponding	No	No	No
Skip steady flow periods	No	No	No
Inertial dampening	Partial	Partial	Partial
Define supercritical flow by	Both	Both	Both
Force Main Equation	H-W	H-W	H-W
Variable time step	On	On	On
Adjustment factor (%)	75	75	75
Conduit lengthening (s)	0	0	0
Minimum surface area (m^2)	0	0	0
Starting date	Oct-7-2013 12:00:00 AM	Oct-7-2013 12:00:00 AM	Oct-7-2013 12:00:00 AM
Ending date	Oct-8-2013 12:00:00 AM	Oct-8-2013 12:00:00 AM	Oct-8-2013 12:00:00 AM
Duration of simulation (hours)	24	24	24
Antecedent dry days (days)	0	0	0
Rain interval (h:mm)	0:06	0:06	0:06
Report time step (h:mm:ss)	00:05:00	00:05:00	00:05:00
Wet time step (h:mm:ss)	00:05:00	00:05:00	00:05:00
Dry time step (h:mm:ss)	00:05:00	00:05:00	00:05:00
Routing time step (s)	5	5	5
Minimum time step used (s)	5	5	4.93
Average time step used (s)	5	5	5
Minimum conduit slope	0	0	0
Ignore rainfall/runoff	No	No	No
Ignore snow melt	No	No	No
Ignore groundwater	No	No	No
Ignore flow routing	No	No	No
Ignore water quality	No	No	No
Report average results	No	No	No

Summary 1C: Options

Name	50 Year Event
Flow Units	CMS
Infiltration method	Curve Number
Flow routing method	Dynamic Wave
Link offsets defined by	Depth
Allow ponding	No
Skip steady flow periods	No
Inertial dampening	Partial
Define supercritical flow by	Both
Force Main Equation	H-W
Variable time step	On
Adjustment factor (%)	75
Conduit lengthening (s)	0
Minimum surface area (m^2)	0
Starting date	Oct-7-2013 12:00:00 AM
Ending date	Oct-8-2013 12:00:00 AM
Duration of simulation (hours)	24
Antecedent dry days (days)	0
Rain interval (h:mm)	0:06
Report time step (h:mm:ss)	00:05:00
Wet time step (h:mm:ss)	00:05:00
Dry time step (h:mm:ss)	00:05:00
Routing time step (s)	5
Minimum time step used (s)	4.59
Average time step used (s)	4.92
Minimum conduit slope	0
Ignore rainfall/runoff	No
Ignore snow melt	No
Ignore groundwater	No
Ignore flow routing	No
Ignore water quality	No
Report average results	No

Summary 2: Model inventory

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Raingages	9	9	14	14	14	14	14
Subcatchments	1	1	1	1	1	1	1
Aquifers	0	0	0	0	0	0	0
Snowpacks	0	0	0	0	0	0	0
RDII hydrographs	0	0	0	0	0	0	0
Junction nodes	1	1	1	1	1	1	1
Outfall nodes	1	1	1	1	1	1	1
Flow divider nodes	0	0	0	0	0	0	0
Storage unit nodes	0	0	0	0	0	0	0
Conduit links	1	1	1	1	1	1	1
Pump links	0	0	0	0	0	0	0
Orifice links	0	0	0	0	0	0	0
Weir links	0	0	0	0	0	0	0
Outlet links	0	0	0	0	0	0	0
Treatment units	0	0	0	0	0	0	0
Transects	0	0	0	0	0	0	0
Control rules	0	0	0	0	0	0	0
Pollutants	0	0	0	0	0	0	0
Land Uses	0	0	0	0	0	0	0
Control Curves	0	0	0	0	0	0	0
Diversion Curves	0	0	0	0	0	0	0
Pump Curves	0	0	0	0	0	0	0
Rating Curves	0	0	0	0	0	0	0
Shape Curves	0	0	0	0	0	0	0
Storage Curves	0	0	0	0	0	0	0
Tidal Curves	0	0	0	0	0	0	0
Weir Curves	0	0	0	0	0	0	0
Time Series	9	9	14	14	14	14	14
Time Patterns	0	0	0	0	0	0	0

Summary 3: Model complexity

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Subcatchments	13	13	13	13	13	13	13
Groundwater	0	0	0	0	0	0	0
Aquifers	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Snowpacks	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RDII hydrographs	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Junction nodes	2	2	2	2	2	2	2
Outfall nodes	1	1	1	1	1	1	1
Flow divider nodes	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Storage unit nodes	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Conduit links	7	7	7	7	7	7	7
Pump links	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Orifice links	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Weir links	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Outlet links	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Transect	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pollutants	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Land Uses	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Model complexity (total uncertain input parameters)	23	23	23	23	23	23	23

Summary 4: Inflows

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Time series inflows	0	0	0	0	0	0	0
Dry weather	0	0	0	0	0	0	0
Groundwater	0	0	0	0	0	0	0
RDII inflows	0	0	0	0	0	0	0

Summary 5: Subcatchment statistics

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Max. width (m)	750	750	750	750	750	750	750
Min. width (m)	750	750	750	750	750	750	750
Max. area (ha)	259.35	259.35	259.35	259.35	259.35	259.35	259.35
Min. area (ha)	259.35	259.35	259.35	259.35	259.35	259.35	259.35
Total area (ha)	259.35	259.35	259.35	259.35	259.35	259.35	259.35
Max. length of overland flow (m)	3458	3458	3458	3458	3458	3458	3458
Min. length of overland flow (m)	3458	3458	3458	3458	3458	3458	3458
Max. slope (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Min. slope (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Max. imperviousness (%)	1	1	1	1	1	1	1
Min. imperviousness (%)	1	1	1	1	1	1	1
Max. imp. roughness	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Min. imp. roughness	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Max. perv. roughness	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Min. perv. roughness	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Max. imp. depression storage (mm)	2	2	2	2	2	2	2
Min. imp. depression storage (mm)	2	2	2	2	2	2	2
Max. perv. depression storage (mm)	7	7	7	7	7	7	7
Min. perv. depression storage (mm)	7	7	7	7	7	7	7

Summary 6: Node statistics

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Max. ground elev. (m)	185	185	185	185	185	185	185
Min. ground elev. (m)	185	185	185	185	185	185	185
Max. invert elev. (m)	183	183	183	183	183	183	183
Min. invert elev. (m)	181	181	181	181	181	181	181
Max. depth (m)	2	2	2	2	2	2	2
Min. depth (m)	2	2	2	2	2	2	2

Summary 7: Conduit statistics

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Max. roughness	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Min. roughness	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Max. entry loss coef.	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Min. entry loss coef.	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Max. exit loss coef.	1	1	1	1	1	1	1
Min. exit loss coef.	1	1	1	1	1	1	1
Max. avg. loss coef.	0	0	0	0	0	0	0
Min. avg. loss coef.	0	0	0	0	0	0	0
Max. length (m)	39.63	39.63	39.63	39.63	39.63	39.63	39.63
Min. length (m)	39.63	39.63	39.63	39.63	39.63	39.63	39.63
Total length (m)	39.63	39.63	39.63	39.63	39.63	39.63	39.63
Max. slope (m/m)	0.0505	0.0505	0.0505	0.0505	0.0505	0.0505	0.0505
Min. slope (m/m)	0.0505	0.0505	0.0505	0.0505	0.0505	0.0505	0.0505

Summary 8: Conduit Inventory

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Closed Rectangular (m)	39.63	39.63	39.63	39.63	39.63	39.63	39.63

Summary 9: Pipe inventory

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Max. pipe diameter (m)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Min. pipe diameter (m)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total pipe length (m)	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Summary 10: Unused objects

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Rain Gages	8	8	13	13	13	13	13
Aquifers	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Snow Packs	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Unit Hydrographs	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Transects	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Control Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Diversion Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pump Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rating Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shape Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Storage Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tidal Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Weir Curves	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Time Series	0	0	0	0	0	0	0
Time Patterns	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Summary 11: Runoff quantity continuity

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Initial LID storage (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Initial snow cover (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total precipitation (mm)	193.000	121.000	54.900	72.600	84.300	99.200	110.100
Outfall runon (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Evaporation loss (mm)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Infiltration loss (mm)	90.027	61.193	37.902	45.658	50.068	55.022	58.250
Surface runoff (mm)	91.490	36.088	3.783	10.128	15.439	23.190	29.436
LID drainage (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Snow removed (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Final snow cover (mm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Final storage (mm)	11.497	23.784	13.228	16.842	18.830	21.037	22.471
Continuity error (%)	-0.007	-0.054	-0.025	-0.038	-0.044	-0.049	-0.052

Summary 12: Flow routing continuity

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Dry weather inflow (ML)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wet weather inflow (ML)	237.221	93.091	9.711	26.056	39.754	59.766	75.901
Groundwater inflow (ML)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RDII inflow (ML)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
External inflow (ML)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
External outflow (ML)	178.293	93.084	9.709	26.053	39.750	59.761	75.895
Flooding loss (ML)	58.929	0.000	0.000	0.000	0.000	0.000	0.000
Evaporation loss (ML)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Exfiltration loss (ML)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Initial stored volume (ML)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Final stored volume (ML)	0.003	0.012	0.004	0.006	0.008	0.010	0.011
Continuity error (%)	-0.001	-0.005	-0.018	-0.011	-0.009	-0.007	-0.006

Summary 13: Results statistics

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Max. subcatchment total runoff (ML)	237.28	93.6	9.81	26.27	40.04	60.14	76.34
Max. subcatchment peak runoff (m^3/s)	8.92	2.94	0.52	0.77	1.09	1.7	2.27
Max. subcatchment runoff coefficient	0.474	0.298	0.069	0.14	0.183	0.234	0.267
Max. subcatchment total precip (mm)	193	121	54.9	72.6	84.3	99.2	110.1
Min. subcatchment total precip (mm)	193	121	54.9	72.6	84.3	99.2	110.1
Max. node depth (m)	2	0.67	0.15	0.2	0.27	0.41	0.53
Num. nodes surcharged	1	0	0	0	0	0	0
Max. node surcharge duration (hours)	7.2	0	0	0	0	0	0
Max. node height above crown (m)	1.1	0	0	0	0	0	0
Min. node depth below rim (m)	0	0	0	0	0	0	0
Num. nodes flooded	1	0	0	0	0	0	0
Max. node flooding duration (hours)	6.36	0	0	0	0	0	0
Max. node flood volume (ML)	58.928	0	0	0	0	0	0
Max. node ponded volume or depth (ha-mm/1000 m^3/m)	2	0	0	0	0	0	0
Max. storage volume (1000 m^3)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Max. storage percent full (%)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Max. outfall flow frequency (%)	99.99	99.84	99.67	99.73	99.78	99.8	99.82
Max. outfall peak flow (m^3/s)	4.767	2.937	0.519	0.767	1.09	1.702	2.267
Max. outfall total volume (ML)	178.293	93.084	9.709	26.052	39.75	59.76	75.894
Total outfall volume (ML)	178.293	93.084	9.709	26.052	39.750	59.760	75.894

Summary 13: Results statistics (continued...)

Name	Timmins	100 Year	2 Year Event	5 Year Event	10 Year Event	25 Year Event	50 Year Event
Max. link peak flow (m^3/s)	4.767	2.937	0.519	0.767	1.09	1.702	2.267
Max. link peak velocity (m/s)	5.48	4.64	3.25	3.59	3.89	4.24	4.45
Min. link peak velocity (m/s)	5.48	4.64	3.25	3.59	3.89	4.24	4.45
Num. conduits surcharged	0	0	0	0	0	0	0
Max. conduit surcharge duration (hours)	0	0	0	0	0	0	0
Max. conduit capacity limited duration (hours)	0	0	0	0	0	0	0

Figure 1: Extent 1

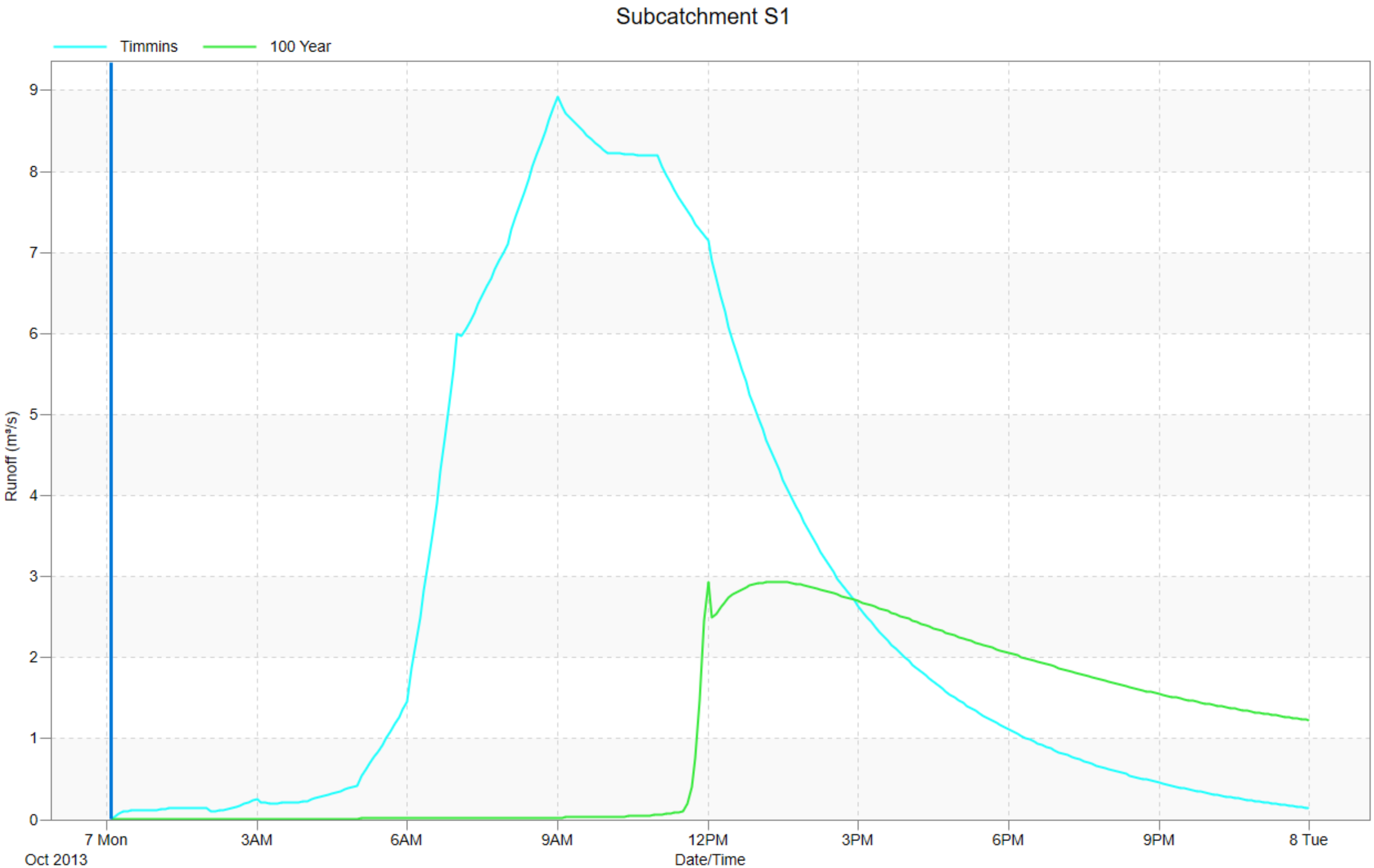


Figure 2: Regional vs 100 Year Peak

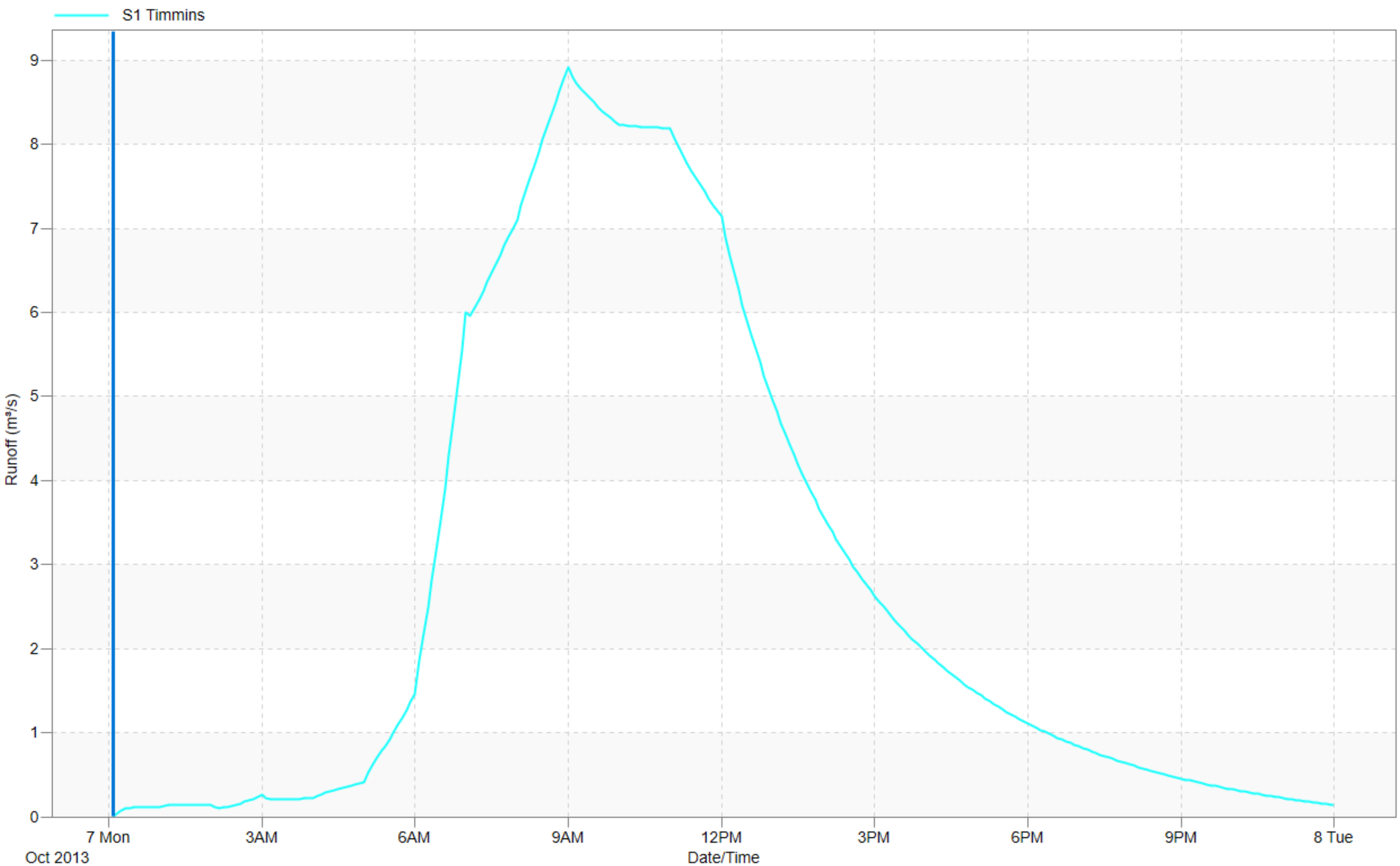


Figure 3: Regional Peak

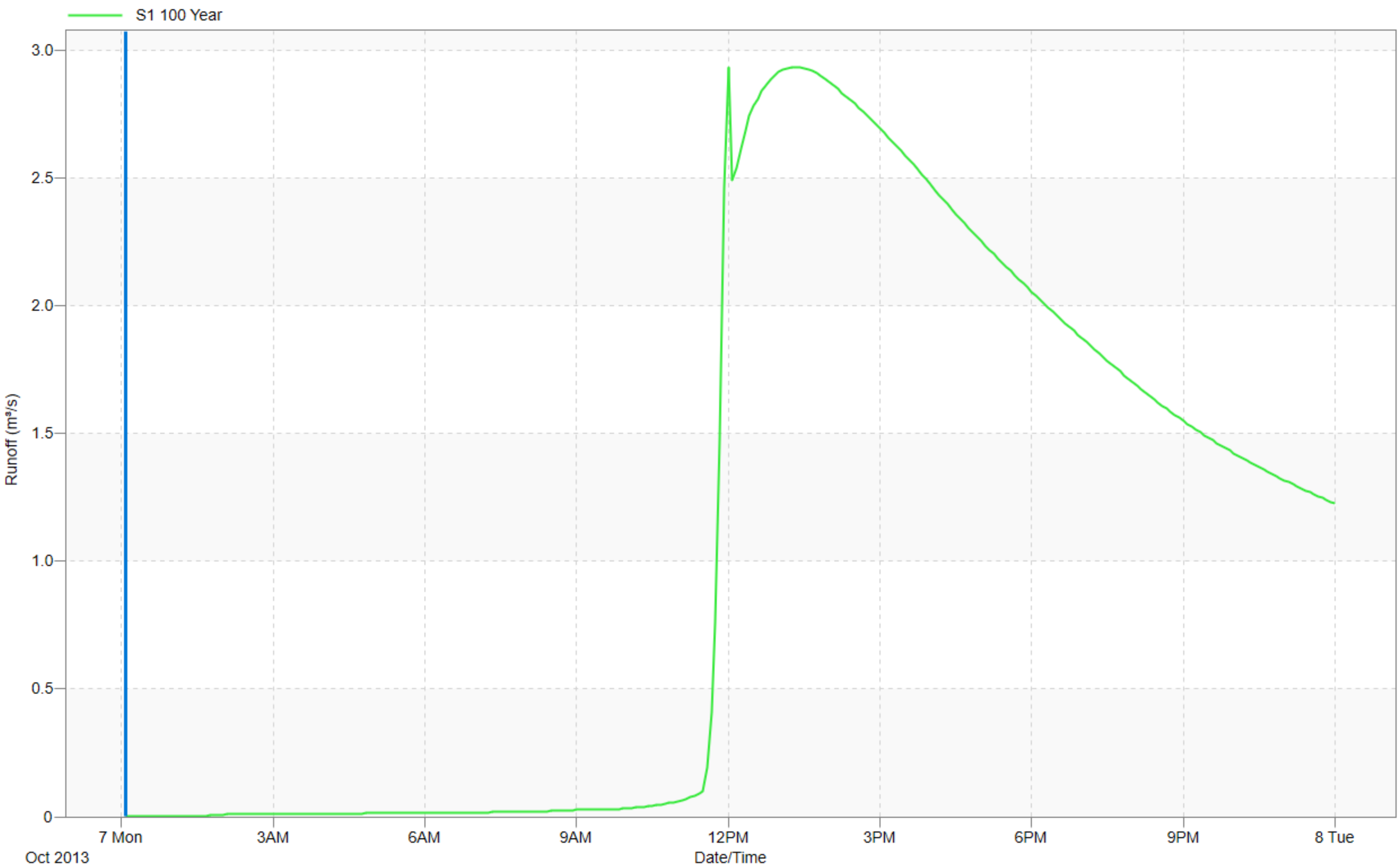


Figure 4: 100 Year Peak

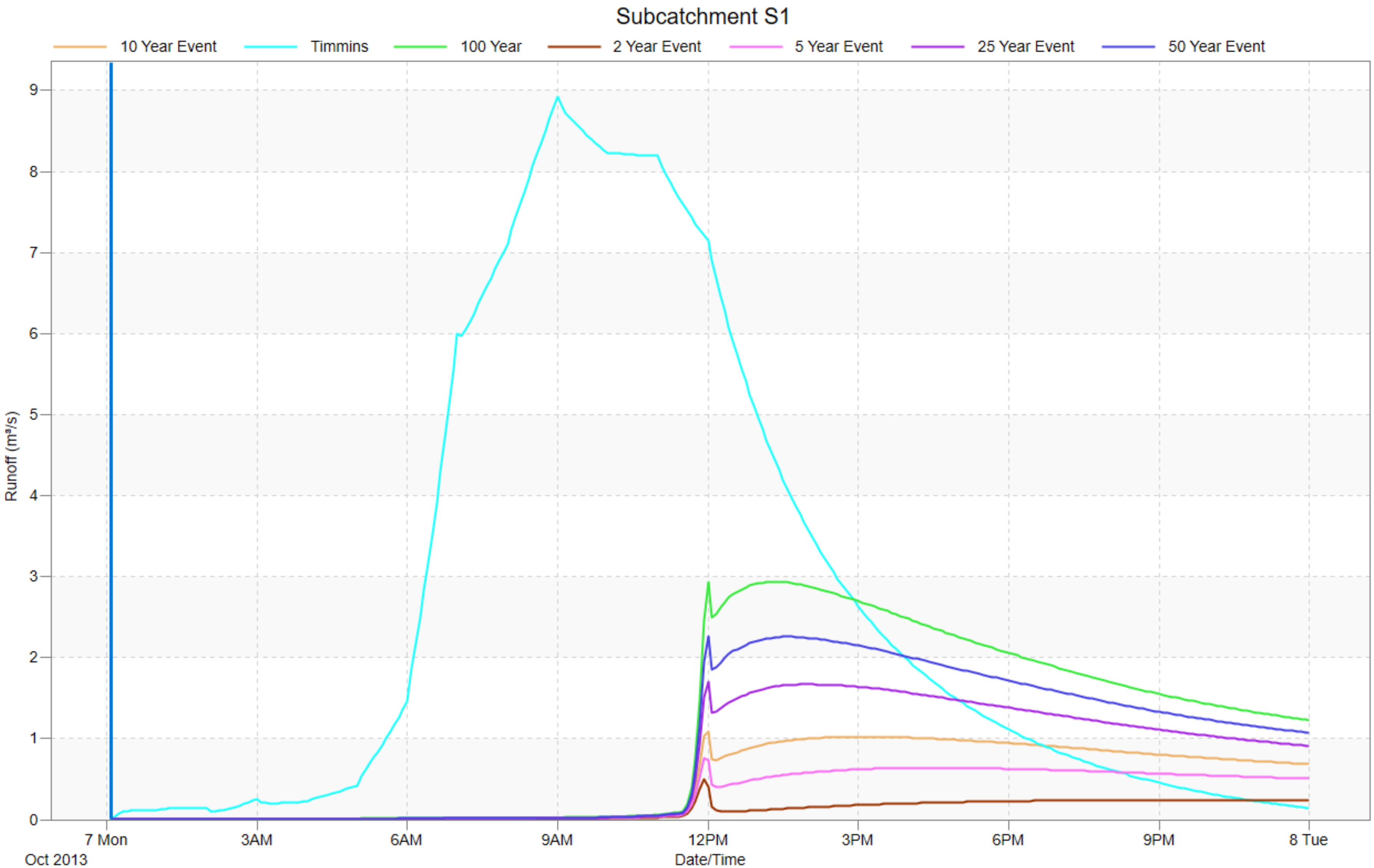


Figure 5: Peak Flow

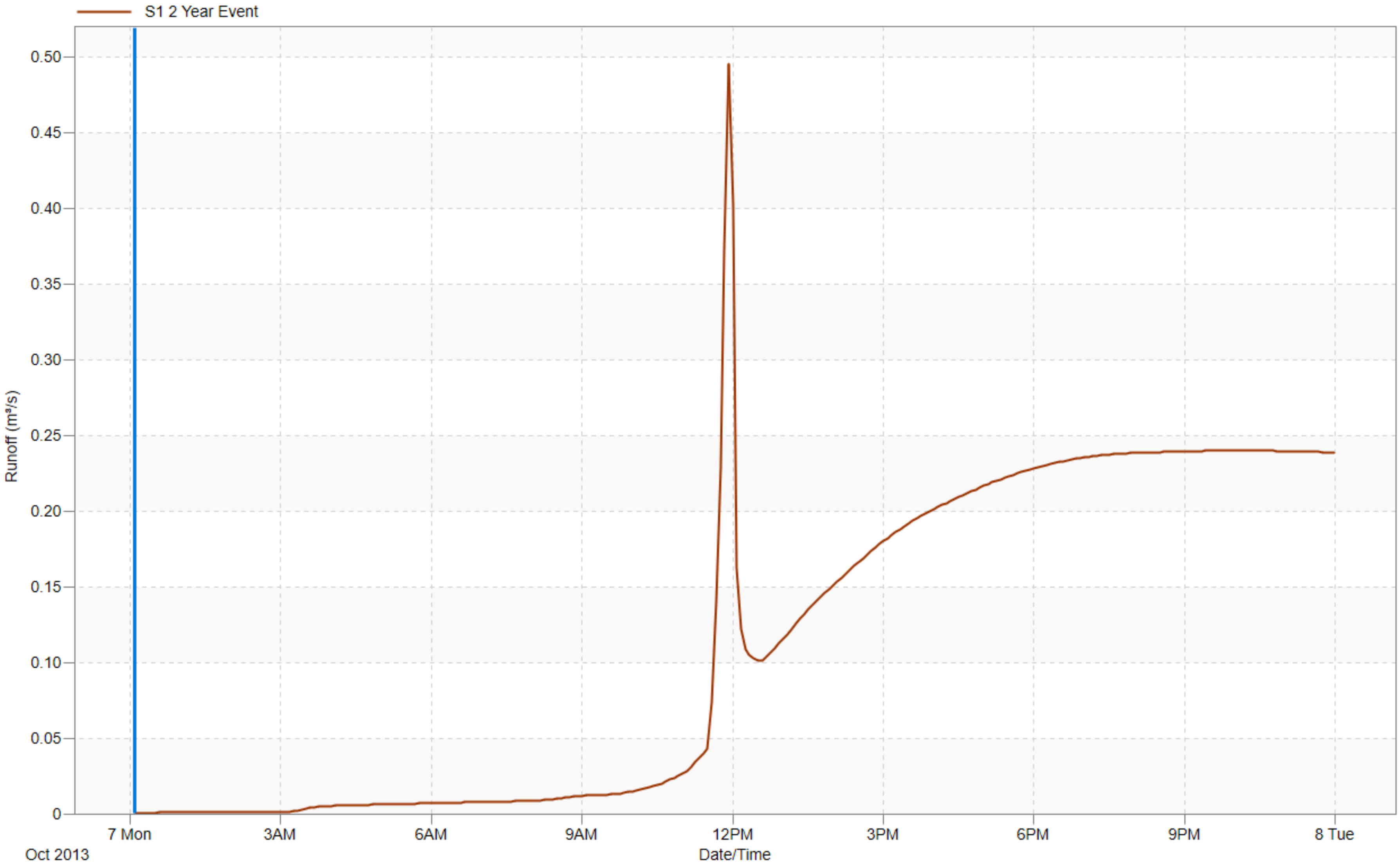


Figure 6: 2 Year Peak

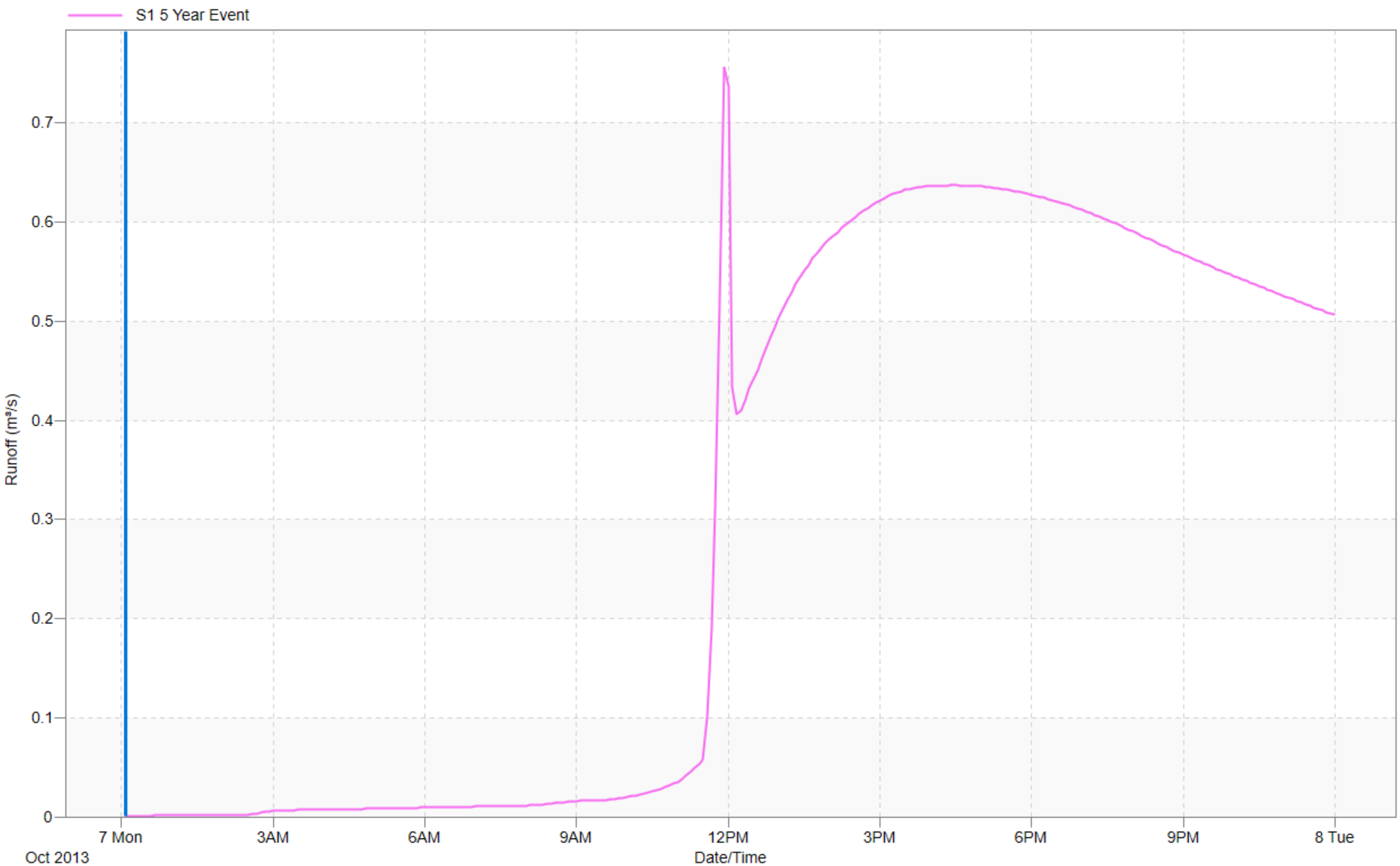


Figure 7: 5 Year Peak

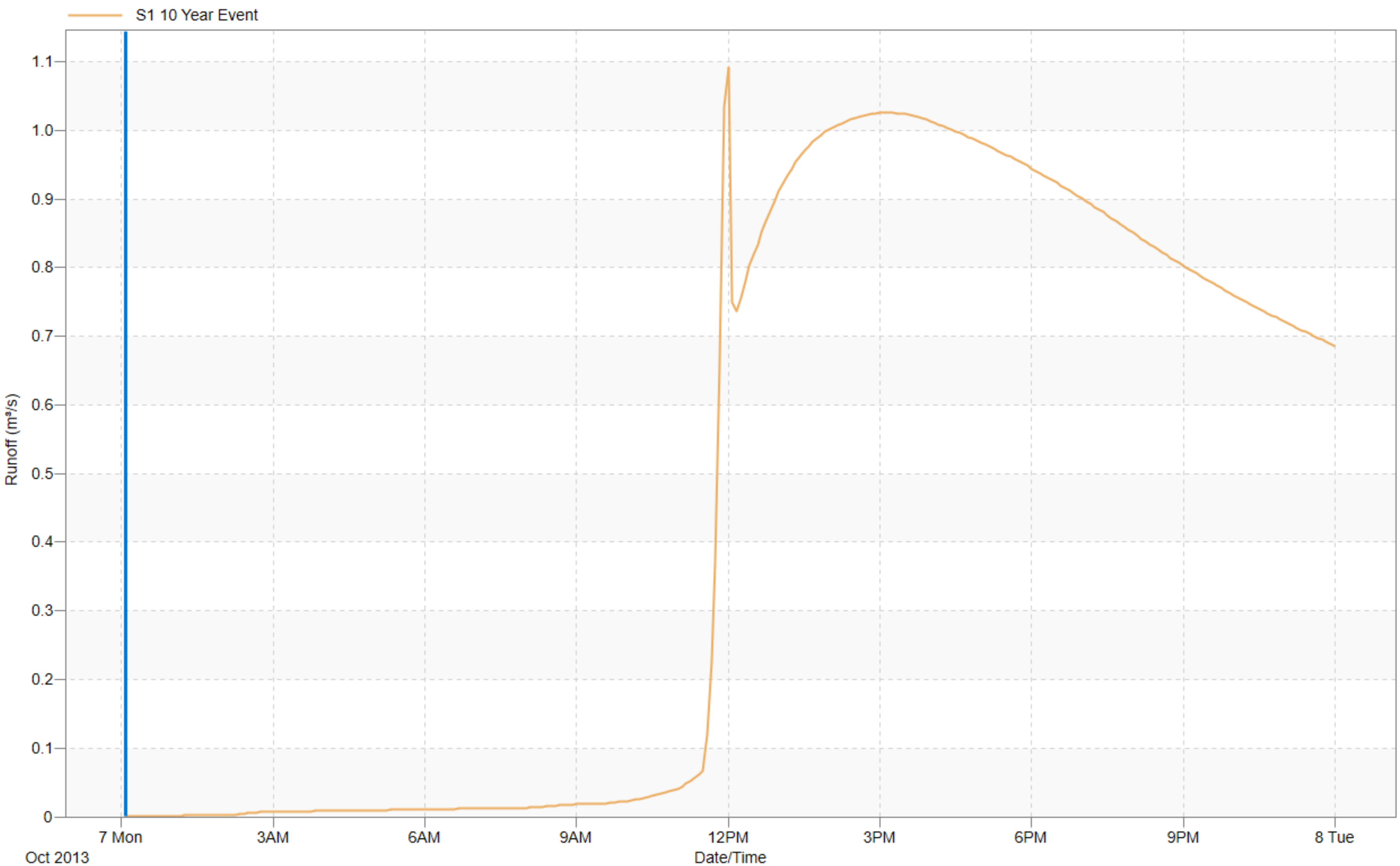


Figure 8: 10 Year Peak

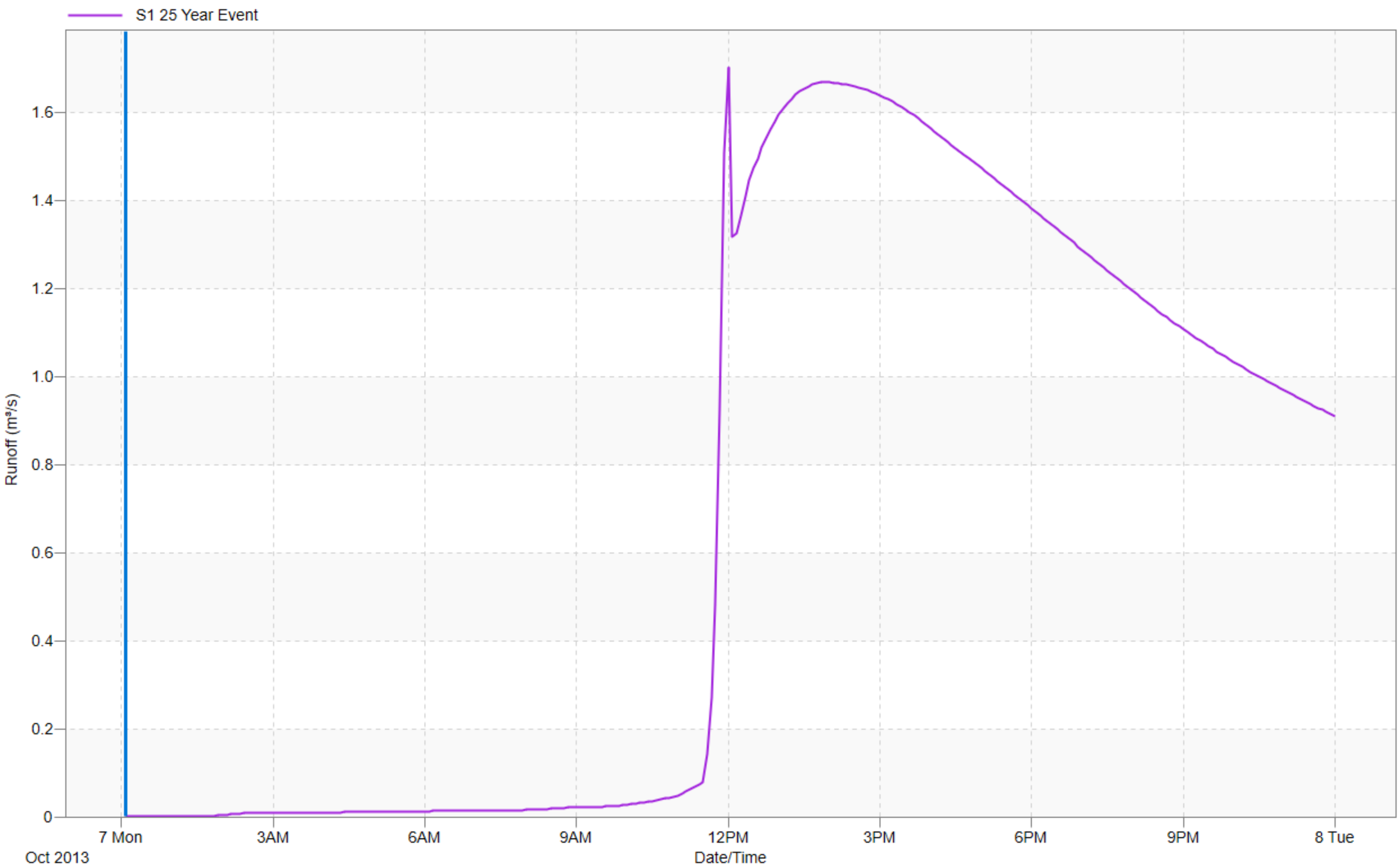


Figure 9: 25 Year Peak

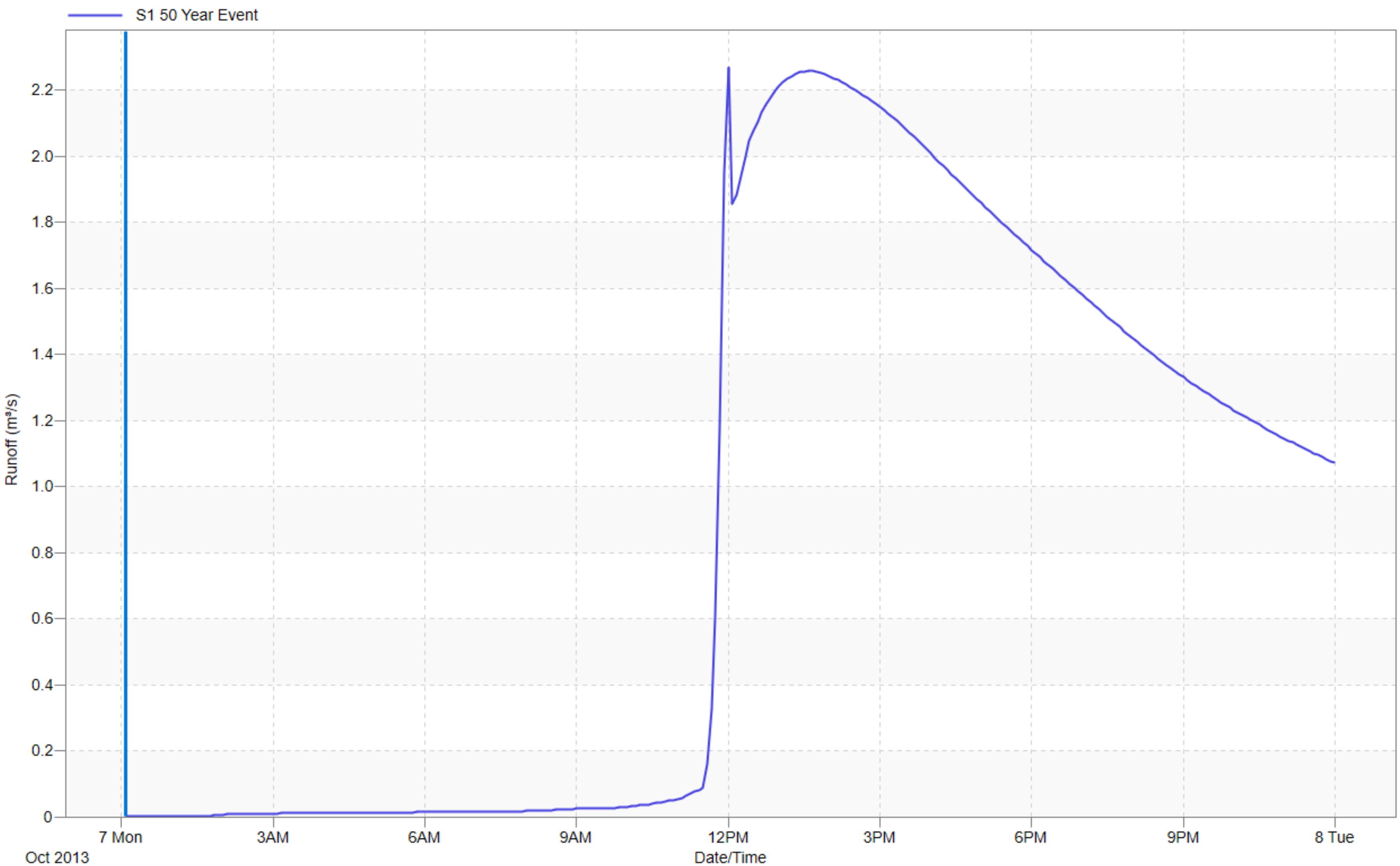


Figure 10: 50 Year Peak

Time Series 1: Peak Flow

Date/Time (M/D/Y)	Runoff (m^3/s) S1 10 Year Event	Runoff (m^3/s) S1 100 Year	Runoff (m^3/s) S1 2 Year Event	Runoff (m^3/s) S1 25 Year Event	Runoff (m^3/s) S1 5 Year Event	Runoff (m^3/s) S1 50 Year Event	Runoff (m^3/s) S1 Timmins
10/7/2013 12:05:00	0	0	0	0	0	0	0.011
10/7/2013 12:10:00	0	0.001	0	0	0	0.001	0.033
10/7/2013 12:15:00	0.001	0.001	0	0.001	0	0.001	0.076
10/7/2013 12:20:00	0.001	0.001	0	0.001	0.001	0.001	0.099
10/7/2013 12:25:00	0.001	0.002	0.001	0.001	0.001	0.001	0.107
10/7/2013 12:30:00	0.001	0.002	0.001	0.001	0.001	0.002	0.11
10/7/2013 12:35:00	0.001	0.002	0.001	0.002	0.001	0.002	0.111
10/7/2013 12:40:00	0.001	0.002	0.001	0.002	0.001	0.002	0.111
10/7/2013 12:45:00	0.001	0.002	0.001	0.002	0.001	0.002	0.111
10/7/2013 12:50:00	0.002	0.002	0.001	0.002	0.001	0.002	0.111
10/7/2013 12:55:00	0.002	0.002	0.001	0.002	0.001	0.002	0.111
10/7/2013 01:00:00	0.002	0.002	0.001	0.002	0.001	0.002	0.111
10/7/2013 01:05:00	0.002	0.002	0.001	0.002	0.001	0.002	0.131
10/7/2013 01:10:00	0.002	0.002	0.001	0.002	0.001	0.002	0.137
10/7/2013 01:15:00	0.002	0.002	0.001	0.002	0.001	0.002	0.138
10/7/2013 01:20:00	0.002	0.002	0.001	0.002	0.001	0.002	0.139
10/7/2013 01:25:00	0.002	0.002	0.001	0.002	0.001	0.002	0.139
10/7/2013 01:30:00	0.002	0.002	0.001	0.002	0.001	0.002	0.139
10/7/2013 01:35:00	0.002	0.003	0.001	0.002	0.001	0.002	0.139
10/7/2013 01:40:00	0.002	0.004	0.001	0.002	0.001	0.002	0.139
10/7/2013 01:45:00	0.002	0.006	0.001	0.002	0.002	0.003	0.139
10/7/2013 01:50:00	0.002	0.007	0.001	0.002	0.002	0.004	0.139
10/7/2013 01:55:00	0.002	0.008	0.001	0.003	0.002	0.005	0.139
10/7/2013 02:00:00	0.002	0.009	0.001	0.004	0.002	0.007	0.142
10/7/2013 02:05:00	0.002	0.009	0.001	0.005	0.002	0.008	0.109
10/7/2013 02:10:00	0.002	0.01	0.001	0.006	0.002	0.008	0.105
10/7/2013 02:15:00	0.003	0.01	0.001	0.007	0.002	0.009	0.11
10/7/2013 02:20:00	0.003	0.01	0.001	0.007	0.002	0.009	0.119
10/7/2013 02:25:00	0.004	0.01	0.001	0.008	0.002	0.009	0.13
10/7/2013 02:30:00	0.005	0.011	0.001	0.008	0.002	0.01	0.144
10/7/2013 02:35:00	0.006	0.011	0.001	0.008	0.002	0.01	0.159
10/7/2013 02:40:00	0.006	0.011	0.001	0.009	0.003	0.01	0.175
10/7/2013 02:45:00	0.007	0.011	0.001	0.009	0.004	0.01	0.194
10/7/2013 02:50:00	0.007	0.011	0.001	0.009	0.005	0.01	0.213
10/7/2013 02:55:00	0.007	0.011	0.001	0.009	0.005	0.01	0.234
10/7/2013 03:00:00	0.008	0.011	0.001	0.009	0.006	0.01	0.257

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m³/s) S1 10 Year Event	Runoff (m³/s) S1 100 Year	Runoff (m³/s) S1 2 Year Event	Runoff (m³/s) S1 25 Year Event	Runoff (m³/s) S1 5 Year Event	Runoff (m³/s) S1 50 Year Event	Runoff (m³/s) S1 Timmins
10/7/2013 03:05:00	0.008	0.011	0.001	0.009	0.006	0.01	0.218
10/7/2013 03:10:00	0.008	0.011	0.001	0.009	0.006	0.01	0.207
10/7/2013 03:15:00	0.008	0.011	0.002	0.009	0.006	0.01	0.203
10/7/2013 03:20:00	0.008	0.011	0.002	0.009	0.007	0.01	0.203
10/7/2013 03:25:00	0.008	0.012	0.003	0.009	0.007	0.01	0.204
10/7/2013 03:30:00	0.008	0.012	0.003	0.01	0.007	0.011	0.206
10/7/2013 03:35:00	0.008	0.012	0.004	0.01	0.007	0.011	0.209
10/7/2013 03:40:00	0.008	0.012	0.004	0.01	0.007	0.011	0.212
10/7/2013 03:45:00	0.008	0.012	0.005	0.01	0.007	0.011	0.214
10/7/2013 03:50:00	0.008	0.012	0.005	0.01	0.007	0.011	0.217
10/7/2013 03:55:00	0.008	0.012	0.005	0.01	0.007	0.011	0.22
10/7/2013 04:00:00	0.008	0.012	0.005	0.01	0.007	0.011	0.223
10/7/2013 04:05:00	0.008	0.012	0.005	0.01	0.007	0.011	0.248
10/7/2013 04:10:00	0.009	0.012	0.005	0.01	0.007	0.011	0.268
10/7/2013 04:15:00	0.009	0.012	0.005	0.01	0.007	0.011	0.285
10/7/2013 04:20:00	0.009	0.013	0.006	0.01	0.007	0.011	0.3
10/7/2013 04:25:00	0.009	0.013	0.006	0.01	0.008	0.011	0.314
10/7/2013 04:30:00	0.009	0.013	0.006	0.01	0.008	0.012	0.327
10/7/2013 04:35:00	0.009	0.013	0.006	0.011	0.008	0.012	0.341
10/7/2013 04:40:00	0.009	0.013	0.006	0.011	0.008	0.012	0.355
10/7/2013 04:45:00	0.009	0.013	0.006	0.011	0.008	0.012	0.369
10/7/2013 04:50:00	0.009	0.013	0.006	0.011	0.008	0.012	0.384
10/7/2013 04:55:00	0.009	0.014	0.006	0.011	0.008	0.012	0.398
10/7/2013 05:00:00	0.009	0.014	0.006	0.011	0.008	0.012	0.413
10/7/2013 05:05:00	0.01	0.014	0.006	0.011	0.008	0.013	0.534
10/7/2013 05:10:00	0.01	0.014	0.006	0.011	0.008	0.013	0.622
10/7/2013 05:15:00	0.01	0.014	0.006	0.012	0.008	0.013	0.696
10/7/2013 05:20:00	0.01	0.014	0.006	0.012	0.009	0.013	0.769
10/7/2013 05:25:00	0.01	0.014	0.006	0.012	0.009	0.013	0.844
10/7/2013 05:30:00	0.01	0.015	0.007	0.012	0.009	0.013	0.922
10/7/2013 05:35:00	0.01	0.015	0.007	0.012	0.009	0.013	1.004
10/7/2013 05:40:00	0.01	0.015	0.007	0.012	0.009	0.013	1.089
10/7/2013 05:45:00	0.01	0.015	0.007	0.012	0.009	0.014	1.177
10/7/2013 05:50:00	0.011	0.015	0.007	0.012	0.009	0.014	1.269
10/7/2013 05:55:00	0.011	0.015	0.007	0.012	0.009	0.014	1.363
10/7/2013 06:00:00	0.011	0.015	0.007	0.013	0.009	0.014	1.461

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m³/s) S1 10 Year Event	Runoff (m³/s) S1 100 Year	Runoff (m³/s) S1 2 Year Event	Runoff (m³/s) S1 25 Year Event	Runoff (m³/s) S1 5 Year Event	Runoff (m³/s) S1 50 Year Event	Runoff (m³/s) S1 Timmins
10/7/2013 06:05:00	0.011	0.016	0.007	0.013	0.009	0.014	1.866
10/7/2013 06:10:00	0.011	0.016	0.007	0.013	0.009	0.014	2.182
10/7/2013 06:15:00	0.011	0.016	0.007	0.013	0.009	0.014	2.493
10/7/2013 06:20:00	0.011	0.016	0.007	0.013	0.01	0.015	2.819
10/7/2013 06:25:00	0.011	0.016	0.007	0.013	0.01	0.015	3.162
10/7/2013 06:30:00	0.011	0.016	0.007	0.013	0.01	0.015	3.524
10/7/2013 06:35:00	0.011	0.016	0.007	0.013	0.01	0.015	3.901
10/7/2013 06:40:00	0.012	0.017	0.007	0.014	0.01	0.015	4.294
10/7/2013 06:45:00	0.012	0.017	0.008	0.014	0.01	0.015	4.702
10/7/2013 06:50:00	0.012	0.017	0.008	0.014	0.01	0.015	5.122
10/7/2013 06:55:00	0.012	0.017	0.008	0.014	0.01	0.015	5.553
10/7/2013 07:00:00	0.012	0.017	0.008	0.014	0.01	0.016	5.996
10/7/2013 07:05:00	0.012	0.017	0.008	0.014	0.01	0.016	5.965
10/7/2013 07:10:00	0.012	0.017	0.008	0.014	0.01	0.016	6.048
10/7/2013 07:15:00	0.012	0.018	0.008	0.014	0.011	0.016	6.151
10/7/2013 07:20:00	0.012	0.018	0.008	0.015	0.011	0.016	6.259
10/7/2013 07:25:00	0.012	0.018	0.008	0.015	0.011	0.016	6.367
10/7/2013 07:30:00	0.013	0.018	0.008	0.015	0.011	0.016	6.475
10/7/2013 07:35:00	0.013	0.018	0.008	0.015	0.011	0.017	6.582
10/7/2013 07:40:00	0.013	0.018	0.008	0.015	0.011	0.017	6.687
10/7/2013 07:45:00	0.013	0.018	0.008	0.015	0.011	0.017	6.792
10/7/2013 07:50:00	0.013	0.019	0.008	0.015	0.011	0.017	6.896
10/7/2013 07:55:00	0.013	0.019	0.008	0.015	0.011	0.017	6.998
10/7/2013 08:00:00	0.013	0.019	0.009	0.015	0.011	0.017	7.1
10/7/2013 08:05:00	0.013	0.019	0.009	0.016	0.011	0.017	7.279
10/7/2013 08:10:00	0.014	0.02	0.009	0.016	0.012	0.018	7.442
10/7/2013 08:15:00	0.014	0.02	0.009	0.017	0.012	0.018	7.599
10/7/2013 08:20:00	0.014	0.021	0.009	0.017	0.012	0.019	7.754
10/7/2013 08:25:00	0.015	0.022	0.01	0.018	0.013	0.02	7.906
10/7/2013 08:30:00	0.015	0.022	0.01	0.018	0.013	0.02	8.057
10/7/2013 08:35:00	0.016	0.023	0.01	0.019	0.014	0.021	8.206
10/7/2013 08:40:00	0.016	0.024	0.011	0.019	0.014	0.022	8.353
10/7/2013 08:45:00	0.017	0.025	0.011	0.02	0.015	0.022	8.498
10/7/2013 08:50:00	0.017	0.025	0.011	0.021	0.015	0.023	8.642
10/7/2013 08:55:00	0.018	0.026	0.012	0.021	0.015	0.024	8.783
10/7/2013 09:00:00	0.019	0.027	0.012	0.022	0.016	0.024	8.922

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m³/s) S1 10 Year Event	Runoff (m³/s) S1 100 Year	Runoff (m³/s) S1 2 Year Event	Runoff (m³/s) S1 25 Year Event	Runoff (m³/s) S1 5 Year Event	Runoff (m³/s) S1 50 Year Event	Runoff (m³/s) S1 Timmins
10/7/2013 09:05:00	0.019	0.027	0.012	0.022	0.016	0.025	8.8
10/7/2013 09:10:00	0.019	0.028	0.012	0.023	0.016	0.025	8.724
10/7/2013 09:15:00	0.019	0.028	0.012	0.023	0.017	0.025	8.661
10/7/2013 09:20:00	0.019	0.028	0.013	0.023	0.017	0.025	8.603
10/7/2013 09:25:00	0.019	0.028	0.013	0.023	0.017	0.025	8.549
10/7/2013 09:30:00	0.019	0.028	0.013	0.023	0.017	0.025	8.497
10/7/2013 09:35:00	0.02	0.028	0.013	0.023	0.017	0.026	8.447
10/7/2013 09:40:00	0.02	0.029	0.013	0.024	0.017	0.026	8.399
10/7/2013 09:45:00	0.021	0.03	0.013	0.024	0.018	0.027	8.353
10/7/2013 09:50:00	0.021	0.031	0.014	0.025	0.018	0.028	8.309
10/7/2013 09:55:00	0.022	0.032	0.014	0.026	0.019	0.029	8.266
10/7/2013 10:00:00	0.023	0.033	0.015	0.027	0.02	0.03	8.225
10/7/2013 10:05:00	0.024	0.035	0.015	0.028	0.021	0.031	8.228
10/7/2013 10:10:00	0.025	0.036	0.016	0.03	0.021	0.033	8.225
10/7/2013 10:15:00	0.026	0.038	0.017	0.031	0.022	0.034	8.221
10/7/2013 10:20:00	0.027	0.039	0.018	0.032	0.023	0.036	8.216
10/7/2013 10:25:00	0.028	0.041	0.018	0.034	0.024	0.037	8.212
10/7/2013 10:30:00	0.03	0.043	0.019	0.035	0.025	0.039	8.208
10/7/2013 10:35:00	0.031	0.045	0.02	0.037	0.027	0.041	8.204
10/7/2013 10:40:00	0.033	0.048	0.021	0.039	0.028	0.043	8.201
10/7/2013 10:45:00	0.035	0.051	0.022	0.041	0.03	0.046	8.198
10/7/2013 10:50:00	0.037	0.053	0.024	0.044	0.032	0.048	8.196
10/7/2013 10:55:00	0.039	0.056	0.025	0.046	0.033	0.051	8.194
10/7/2013 11:00:00	0.041	0.059	0.026	0.048	0.035	0.054	8.193
10/7/2013 11:05:00	0.044	0.064	0.028	0.052	0.038	0.058	8.065
10/7/2013 11:10:00	0.048	0.07	0.031	0.057	0.041	0.063	7.959
10/7/2013 11:15:00	0.053	0.076	0.034	0.062	0.045	0.069	7.861
10/7/2013 11:20:00	0.057	0.083	0.037	0.068	0.049	0.076	7.769
10/7/2013 11:25:00	0.062	0.09	0.04	0.074	0.053	0.082	7.68
10/7/2013 11:30:00	0.067	0.099	0.043	0.079	0.058	0.088	7.595
10/7/2013 11:35:00	0.119	0.193	0.074	0.143	0.101	0.16	7.513
10/7/2013 11:40:00	0.226	0.407	0.14	0.272	0.191	0.327	7.434
10/7/2013 11:45:00	0.369	0.758	0.229	0.482	0.311	0.604	7.357
10/7/2013 11:50:00	0.661	1.477	0.372	0.925	0.519	1.176	7.283
10/7/2013 11:55:00	1.034	2.461	0.496	1.51	0.757	1.947	7.212
10/7/2013 12:00:00	1.092	2.937	0.402	1.705	0.737	2.27	7.142

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m³/s) S1 10 Year Event	Runoff (m³/s) S1 100 Year	Runoff (m³/s) S1 2 Year Event	Runoff (m³/s) S1 25 Year Event	Runoff (m³/s) S1 5 Year Event	Runoff (m³/s) S1 50 Year Event	Runoff (m³/s) S1 Timmins
10/7/2013 12:05:00	0.75	2.492	0.162	1.318	0.433	1.854	6.895
10/7/2013 12:10:00	0.737	2.541	0.122	1.328	0.407	1.882	6.675
10/7/2013 12:15:00	0.755	2.618	0.109	1.368	0.41	1.94	6.469
10/7/2013 12:20:00	0.78	2.69	0.105	1.412	0.421	1.998	6.273
10/7/2013 12:25:00	0.802	2.747	0.103	1.448	0.433	2.046	6.085
10/7/2013 12:30:00	0.819	2.785	0.102	1.475	0.442	2.079	5.905
10/7/2013 12:35:00	0.834	2.812	0.101	1.497	0.45	2.104	5.732
10/7/2013 12:40:00	0.851	2.841	0.103	1.521	0.462	2.131	5.566
10/7/2013 12:45:00	0.868	2.866	0.106	1.543	0.473	2.156	5.406
10/7/2013 12:50:00	0.884	2.888	0.11	1.564	0.484	2.178	5.251
10/7/2013 12:55:00	0.898	2.904	0.113	1.582	0.494	2.197	5.102
10/7/2013 01:00:00	0.911	2.917	0.116	1.597	0.504	2.212	4.959
10/7/2013 01:05:00	0.922	2.925	0.119	1.61	0.512	2.223	4.821
10/7/2013 01:10:00	0.934	2.931	0.122	1.622	0.521	2.234	4.687
10/7/2013 01:15:00	0.944	2.935	0.125	1.633	0.529	2.242	4.558
10/7/2013 01:20:00	0.954	2.937	0.129	1.642	0.537	2.249	4.433
10/7/2013 01:25:00	0.962	2.936	0.132	1.65	0.544	2.254	4.313
10/7/2013 01:30:00	0.97	2.933	0.135	1.656	0.551	2.257	4.196
10/7/2013 01:35:00	0.977	2.927	0.138	1.661	0.557	2.258	4.084
10/7/2013 01:40:00	0.983	2.921	0.141	1.665	0.563	2.257	3.975
10/7/2013 01:45:00	0.989	2.912	0.143	1.668	0.568	2.256	3.869
10/7/2013 01:50:00	0.994	2.902	0.146	1.669	0.574	2.253	3.767
10/7/2013 01:55:00	0.998	2.891	0.149	1.67	0.578	2.248	3.668
10/7/2013 02:00:00	1.001	2.878	0.151	1.67	0.582	2.243	3.573
10/7/2013 02:05:00	1.004	2.864	0.154	1.669	0.586	2.236	3.48
10/7/2013 02:10:00	1.007	2.85	0.156	1.667	0.59	2.23	3.39
10/7/2013 02:15:00	1.01	2.836	0.159	1.666	0.594	2.223	3.303
10/7/2013 02:20:00	1.013	2.821	0.161	1.665	0.598	2.216	3.219
10/7/2013 02:25:00	1.015	2.807	0.164	1.663	0.602	2.209	3.137
10/7/2013 02:30:00	1.018	2.792	0.166	1.661	0.605	2.201	3.058
10/7/2013 02:35:00	1.019	2.776	0.169	1.658	0.608	2.193	2.981
10/7/2013 02:40:00	1.021	2.761	0.171	1.655	0.611	2.185	2.906
10/7/2013 02:45:00	1.022	2.745	0.173	1.652	0.614	2.176	2.834
10/7/2013 02:50:00	1.024	2.729	0.176	1.648	0.617	2.167	2.763
10/7/2013 02:55:00	1.024	2.713	0.178	1.644	0.62	2.158	2.695
10/7/2013 03:00:00	1.025	2.696	0.18	1.64	0.622	2.148	2.628

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m³/s) S1 10 Year Event	Runoff (m³/s) S1 100 Year	Runoff (m³/s) S1 2 Year Event	Runoff (m³/s) S1 25 Year Event	Runoff (m³/s) S1 5 Year Event	Runoff (m³/s) S1 50 Year Event	Runoff (m³/s) S1 Timmins
10/7/2013 03:05:00	1.025	2.679	0.182	1.636	0.624	2.138	2.564
10/7/2013 03:10:00	1.026	2.662	0.184	1.631	0.626	2.128	2.501
10/7/2013 03:15:00	1.025	2.644	0.186	1.626	0.628	2.117	2.44
10/7/2013 03:20:00	1.025	2.627	0.188	1.62	0.63	2.107	2.381
10/7/2013 03:25:00	1.024	2.609	0.19	1.614	0.631	2.095	2.323
10/7/2013 03:30:00	1.024	2.591	0.192	1.608	0.633	2.084	2.267
10/7/2013 03:35:00	1.022	2.572	0.194	1.602	0.634	2.072	2.212
10/7/2013 03:40:00	1.021	2.553	0.195	1.595	0.635	2.06	2.159
10/7/2013 03:45:00	1.019	2.534	0.197	1.588	0.635	2.048	2.107
10/7/2013 03:50:00	1.017	2.515	0.198	1.581	0.636	2.035	2.057
10/7/2013 03:55:00	1.015	2.496	0.2	1.574	0.636	2.022	2.008
10/7/2013 04:00:00	1.013	2.476	0.201	1.566	0.637	2.009	1.96
10/7/2013 04:05:00	1.011	2.456	0.203	1.558	0.637	1.996	1.914
10/7/2013 04:10:00	1.008	2.437	0.204	1.551	0.637	1.983	1.868
10/7/2013 04:15:00	1.006	2.418	0.205	1.543	0.637	1.97	1.824
10/7/2013 04:20:00	1.003	2.399	0.207	1.535	0.637	1.958	1.781
10/7/2013 04:25:00	1.001	2.381	0.208	1.528	0.637	1.945	1.739
10/7/2013 04:30:00	0.998	2.362	0.209	1.52	0.637	1.932	1.698
10/7/2013 04:35:00	0.996	2.344	0.211	1.512	0.637	1.92	1.659
10/7/2013 04:40:00	0.993	2.326	0.212	1.505	0.637	1.907	1.62
10/7/2013 04:45:00	0.99	2.308	0.213	1.497	0.637	1.895	1.582
10/7/2013 04:50:00	0.988	2.29	0.214	1.49	0.637	1.883	1.545
10/7/2013 04:55:00	0.985	2.273	0.216	1.482	0.636	1.871	1.509
10/7/2013 05:00:00	0.982	2.255	0.217	1.474	0.636	1.858	1.473
10/7/2013 05:05:00	0.979	2.238	0.218	1.467	0.636	1.846	1.439
10/7/2013 05:10:00	0.976	2.221	0.219	1.459	0.635	1.834	1.406
10/7/2013 05:15:00	0.973	2.204	0.22	1.451	0.635	1.822	1.373
10/7/2013 05:20:00	0.97	2.187	0.221	1.444	0.634	1.81	1.341
10/7/2013 05:25:00	0.967	2.17	0.222	1.436	0.633	1.798	1.31
10/7/2013 05:30:00	0.964	2.154	0.223	1.428	0.633	1.786	1.279
10/7/2013 05:35:00	0.961	2.137	0.224	1.421	0.632	1.775	1.249
10/7/2013 05:40:00	0.958	2.121	0.225	1.413	0.631	1.763	1.22
10/7/2013 05:45:00	0.954	2.105	0.226	1.405	0.631	1.751	1.192
10/7/2013 05:50:00	0.951	2.088	0.227	1.397	0.63	1.74	1.164
10/7/2013 05:55:00	0.948	2.072	0.228	1.39	0.629	1.728	1.137
10/7/2013 06:00:00	0.944	2.056	0.228	1.382	0.628	1.716	1.11

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m³/s) S1 10 Year Event	Runoff (m³/s) S1 100 Year	Runoff (m³/s) S1 2 Year Event	Runoff (m³/s) S1 25 Year Event	Runoff (m³/s) S1 5 Year Event	Runoff (m³/s) S1 50 Year Event	Runoff (m³/s) S1 Timmins
10/7/2013 06:05:00	0.941	2.041	0.229	1.374	0.627	1.705	1.084
10/7/2013 06:10:00	0.937	2.025	0.23	1.367	0.626	1.693	1.059
10/7/2013 06:15:00	0.934	2.009	0.231	1.359	0.625	1.682	1.034
10/7/2013 06:20:00	0.93	1.994	0.231	1.351	0.623	1.67	1.01
10/7/2013 06:25:00	0.927	1.978	0.232	1.343	0.622	1.659	0.986
10/7/2013 06:30:00	0.923	1.963	0.233	1.336	0.621	1.648	0.963
10/7/2013 06:35:00	0.919	1.948	0.233	1.328	0.62	1.636	0.94
10/7/2013 06:40:00	0.916	1.933	0.234	1.32	0.618	1.625	0.918
10/7/2013 06:45:00	0.912	1.918	0.234	1.312	0.617	1.614	0.897
10/7/2013 06:50:00	0.908	1.903	0.235	1.305	0.615	1.603	0.875
10/7/2013 06:55:00	0.904	1.888	0.235	1.297	0.614	1.591	0.855
10/7/2013 07:00:00	0.9	1.873	0.236	1.289	0.612	1.58	0.834
10/7/2013 07:05:00	0.896	1.858	0.236	1.281	0.611	1.569	0.814
10/7/2013 07:10:00	0.892	1.844	0.236	1.273	0.609	1.558	0.795
10/7/2013 07:15:00	0.888	1.829	0.237	1.265	0.607	1.547	0.776
10/7/2013 07:20:00	0.884	1.815	0.237	1.258	0.606	1.536	0.757
10/7/2013 07:25:00	0.88	1.8	0.237	1.25	0.604	1.525	0.739
10/7/2013 07:30:00	0.876	1.786	0.238	1.242	0.602	1.514	0.721
10/7/2013 07:35:00	0.872	1.771	0.238	1.234	0.6	1.503	0.703
10/7/2013 07:40:00	0.868	1.757	0.238	1.226	0.598	1.492	0.686
10/7/2013 07:45:00	0.864	1.743	0.238	1.218	0.596	1.481	0.669
10/7/2013 07:50:00	0.859	1.729	0.238	1.211	0.594	1.47	0.653
10/7/2013 07:55:00	0.855	1.715	0.239	1.203	0.592	1.46	0.637
10/7/2013 08:00:00	0.851	1.701	0.239	1.195	0.59	1.449	0.621
10/7/2013 08:05:00	0.847	1.687	0.239	1.187	0.588	1.438	0.606
10/7/2013 08:10:00	0.842	1.674	0.239	1.179	0.586	1.428	0.59
10/7/2013 08:15:00	0.838	1.661	0.239	1.172	0.584	1.417	0.575
10/7/2013 08:20:00	0.834	1.648	0.239	1.164	0.582	1.407	0.561
10/7/2013 08:25:00	0.83	1.635	0.239	1.157	0.58	1.397	0.547
10/7/2013 08:30:00	0.826	1.622	0.239	1.15	0.579	1.387	0.533
10/7/2013 08:35:00	0.822	1.61	0.239	1.143	0.577	1.377	0.519
10/7/2013 08:40:00	0.818	1.597	0.239	1.136	0.575	1.368	0.506
10/7/2013 08:45:00	0.814	1.585	0.239	1.129	0.573	1.358	0.492
10/7/2013 08:50:00	0.81	1.573	0.239	1.122	0.571	1.349	0.48
10/7/2013 08:55:00	0.807	1.562	0.24	1.115	0.569	1.34	0.467
10/7/2013 09:00:00	0.803	1.55	0.24	1.108	0.567	1.331	0.455

Time Series 1: Peak Flow (continued...)

Date/Time (M/D/Y)	Runoff (m^3/s) S1 10 Year Event	Runoff (m^3/s) S1 100 Year	Runoff (m^3/s) S1 2 Year Event	Runoff (m^3/s) S1 25 Year Event	Runoff (m^3/s) S1 5 Year Event	Runoff (m^3/s) S1 50 Year Event	Runoff (m^3/s) S1 Timmins
10/7/2013 09:05:00	0.799	1.539	0.24	1.102	0.565	1.322	0.442
10/7/2013 09:10:00	0.795	1.528	0.24	1.095	0.564	1.313	0.431
10/7/2013 09:15:00	0.792	1.517	0.24	1.089	0.562	1.304	0.419
10/7/2013 09:20:00	0.788	1.506	0.24	1.082	0.56	1.296	0.407
10/7/2013 09:25:00	0.784	1.495	0.24	1.076	0.558	1.287	0.396
10/7/2013 09:30:00	0.781	1.485	0.24	1.07	0.556	1.279	0.385
10/7/2013 09:35:00	0.777	1.474	0.24	1.064	0.554	1.271	0.375
10/7/2013 09:40:00	0.774	1.464	0.24	1.057	0.553	1.263	0.364
10/7/2013 09:45:00	0.77	1.454	0.24	1.051	0.551	1.255	0.354
10/7/2013 09:50:00	0.767	1.444	0.24	1.045	0.549	1.247	0.344
10/7/2013 09:55:00	0.763	1.434	0.24	1.04	0.547	1.239	0.334
10/7/2013 10:00:00	0.76	1.424	0.24	1.034	0.546	1.231	0.324
10/7/2013 10:05:00	0.757	1.415	0.24	1.028	0.544	1.224	0.314
10/7/2013 10:10:00	0.753	1.405	0.24	1.022	0.542	1.216	0.305
10/7/2013 10:15:00	0.75	1.396	0.24	1.017	0.54	1.209	0.296
10/7/2013 10:20:00	0.747	1.387	0.24	1.011	0.539	1.201	0.287
10/7/2013 10:25:00	0.743	1.378	0.24	1.006	0.537	1.194	0.278
10/7/2013 10:30:00	0.74	1.369	0.24	1	0.535	1.187	0.269
10/7/2013 10:35:00	0.737	1.36	0.24	0.995	0.534	1.18	0.261
10/7/2013 10:40:00	0.734	1.351	0.24	0.989	0.532	1.173	0.253
10/7/2013 10:45:00	0.731	1.343	0.24	0.984	0.53	1.166	0.245
10/7/2013 10:50:00	0.727	1.334	0.24	0.979	0.529	1.159	0.237
10/7/2013 10:55:00	0.724	1.326	0.24	0.974	0.527	1.152	0.229
10/7/2013 11:00:00	0.721	1.318	0.24	0.969	0.525	1.145	0.221
10/7/2013 11:05:00	0.718	1.31	0.24	0.963	0.524	1.139	0.214
10/7/2013 11:10:00	0.715	1.302	0.24	0.958	0.522	1.132	0.206
10/7/2013 11:15:00	0.712	1.294	0.24	0.953	0.52	1.126	0.199
10/7/2013 11:20:00	0.709	1.286	0.24	0.949	0.519	1.119	0.192
10/7/2013 11:25:00	0.706	1.278	0.239	0.944	0.517	1.113	0.185
10/7/2013 11:30:00	0.703	1.27	0.239	0.939	0.516	1.107	0.179
10/7/2013 11:35:00	0.7	1.263	0.239	0.934	0.514	1.101	0.172
10/7/2013 11:40:00	0.697	1.255	0.239	0.929	0.512	1.094	0.165
10/7/2013 11:45:00	0.694	1.248	0.239	0.925	0.511	1.088	0.159
10/7/2013 11:50:00	0.692	1.24	0.239	0.92	0.509	1.082	0.153
10/7/2013 11:55:00	0.689	1.233	0.239	0.915	0.508	1.076	0.147
10/8/2013 12:00:00	0.686	1.226	0.239	0.911	0.506	1.071	0.141

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	6-Apr-2022

BURNSIDE

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **S1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	80	60	119.35			
BC						
C						
CD						
D						

Total area (ha):	259.4	Composite CN(I):	46	Ia (mm) NVCA	8.2
Pervious area (ha):	259.4	Composite CN(II):	67	Ia (mm) NRSCS	26.2
Impervious area (ha):	0.0	Composite CN(III):	82		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			119.35				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			60.00				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			80.00				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	259.35
Runoff Coefficient	0.25
Length (m)	3458
h_1 (m)	234.58
h_2 (m)	200
Dh (m)	34.58
Slope (%)	1.00

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		162.63	60.03	89.60		112.45
Tp (hr)		1.82	0.67	1.00		1.26

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	162.35	535.54				125.29
Tp (hr)	1.81	5.98				1.40

Ontario IDF CURVE LOOKUP

Active coordinate

44° 28' 15" N, 80° 7' 14" W (44.470833,-80.120833)

Retrieved: Wed, 06 Apr 2022 17:53:48 GMT

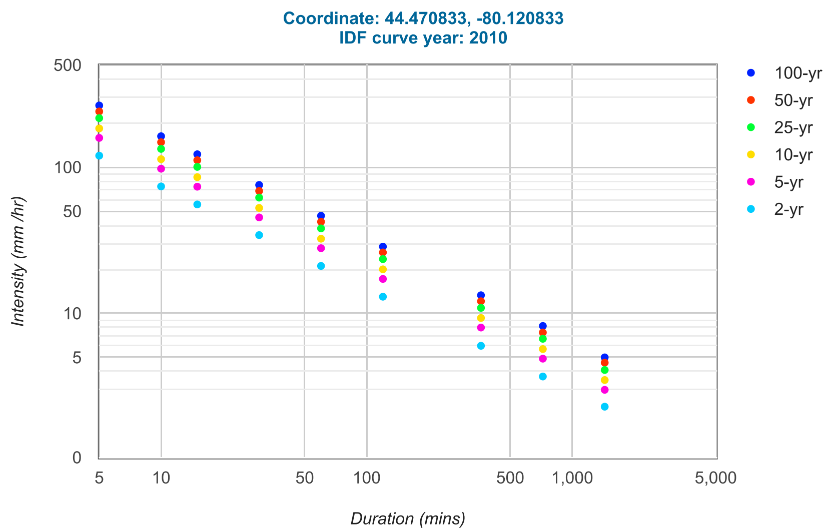
Location summary

These are the locations in the selection.

IDF Curve: 44° 28' 15" N, 80° 7' 14" W (44.470833,-80.120833)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 28' 15" N, 80° 7' 14" W (44.470833,-80.120833)

Retrieved: Wed, 06 Apr 2022 17:53:48 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	21.1	27.9	32.4	38.1	42.3	46.5
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	119.8	73.8	55.6	34.3	21.1	13.0	6.0	3.7	2.3
5-yr	158.5	97.6	73.5	45.3	27.9	17.2	8.0	4.9	3.0
10-yr	184.0	113.4	85.4	52.6	32.4	20.0	9.3	5.7	3.5
25-yr	216.4	133.3	100.4	61.9	38.1	23.5	10.9	6.7	4.1
50-yr	240.3	148.0	111.5	68.7	42.3	26.1	12.1	7.4	4.6
100-yr	264.1	162.7	122.5	75.5	46.5	28.6	13.3	8.2	5.0

Rainfall depth (mm)

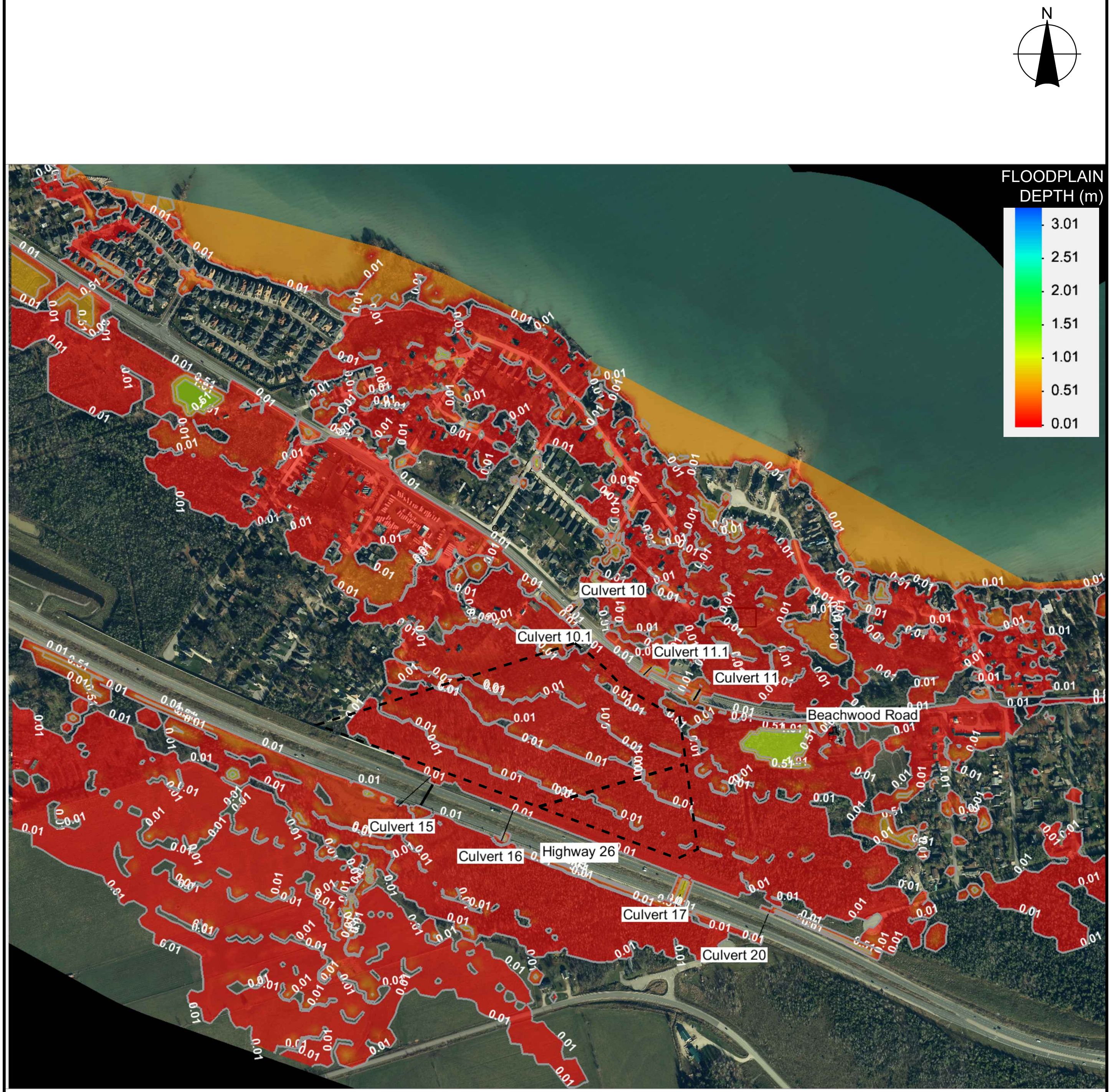
Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.0	12.3	13.9	17.1	21.1	26.0	36.2	44.6	54.9
5-yr	13.2	16.3	18.4	22.6	27.9	34.4	47.8	58.9	72.6
10-yr	15.3	18.9	21.3	26.3	32.4	39.9	55.6	68.5	84.3
25-yr	18.0	22.2	25.1	30.9	38.1	46.9	65.3	80.5	99.2
50-yr	20.0	24.7	27.9	34.3	42.3	52.1	72.5	89.4	110.1
100-yr	22.0	27.1	30.6	37.7	46.5	57.3	79.7	98.2	121.0

Terms of Use

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Hydraulic Summary Output



BURNSIDE

Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

FLOODPLAIN DEPTH

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	8
	Scale: NTS		Project No.: 300052877.1000	

File: Drawing2.dwg Date Plotted: April 5, 2022 - 4:36 PM

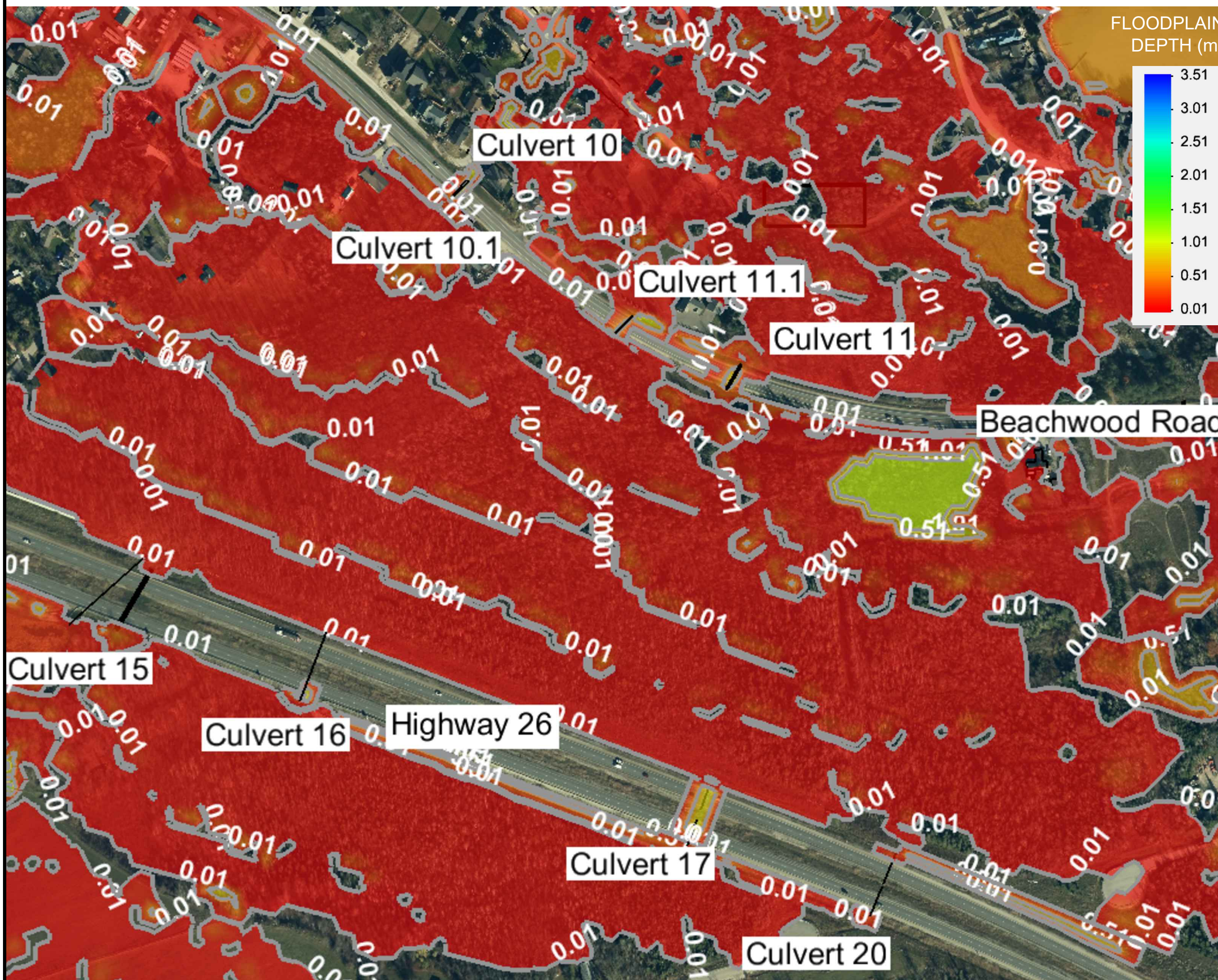


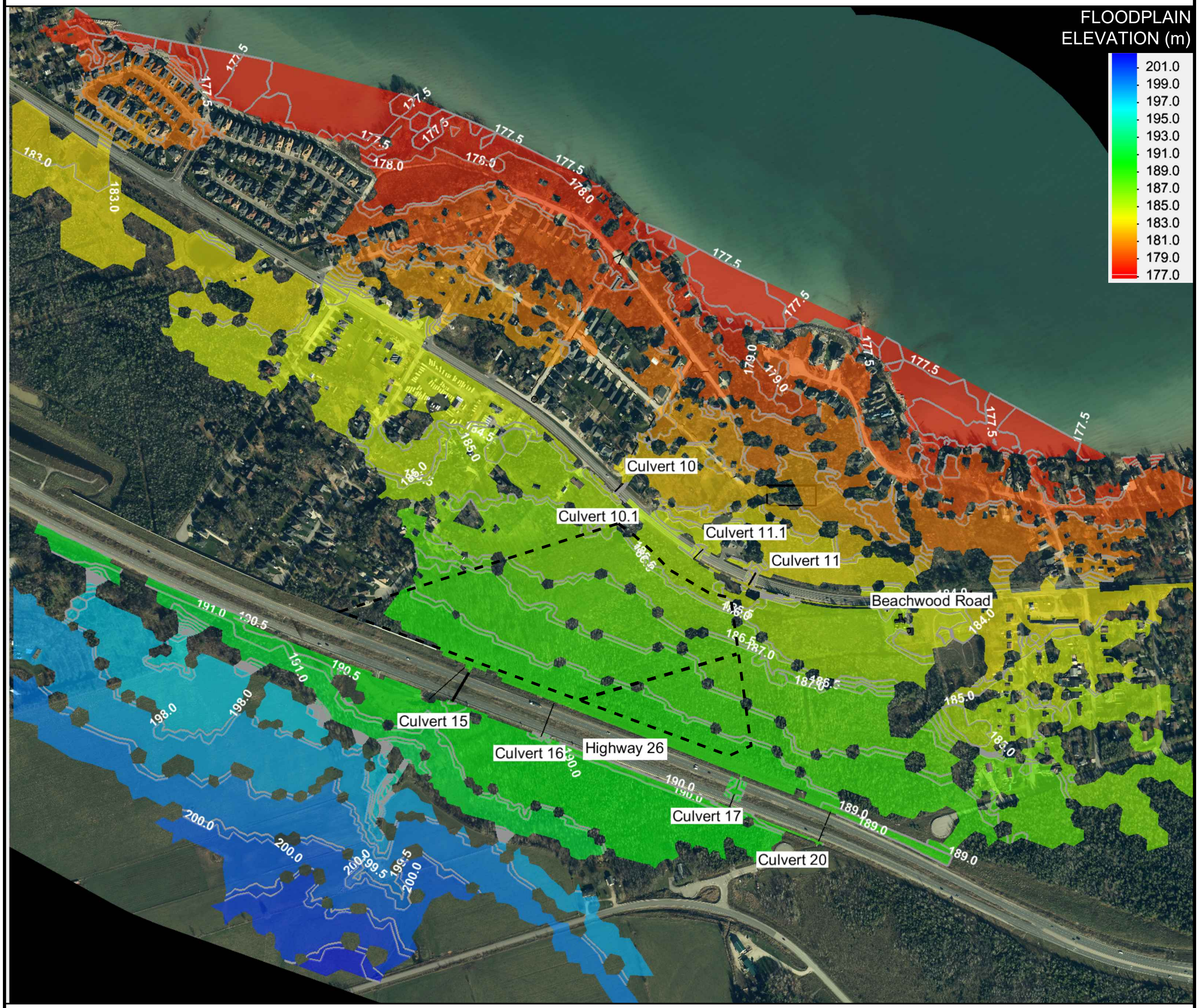
Figure Title
SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY
FLOODPLAIN DEPTH - SITE

BURNSIDE

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**9**
	Scale		Project No.	
	NTS		300052877.1000	

File: Drawing2.dwg Date Plotted: April 5, 2022 - 4:35 PM

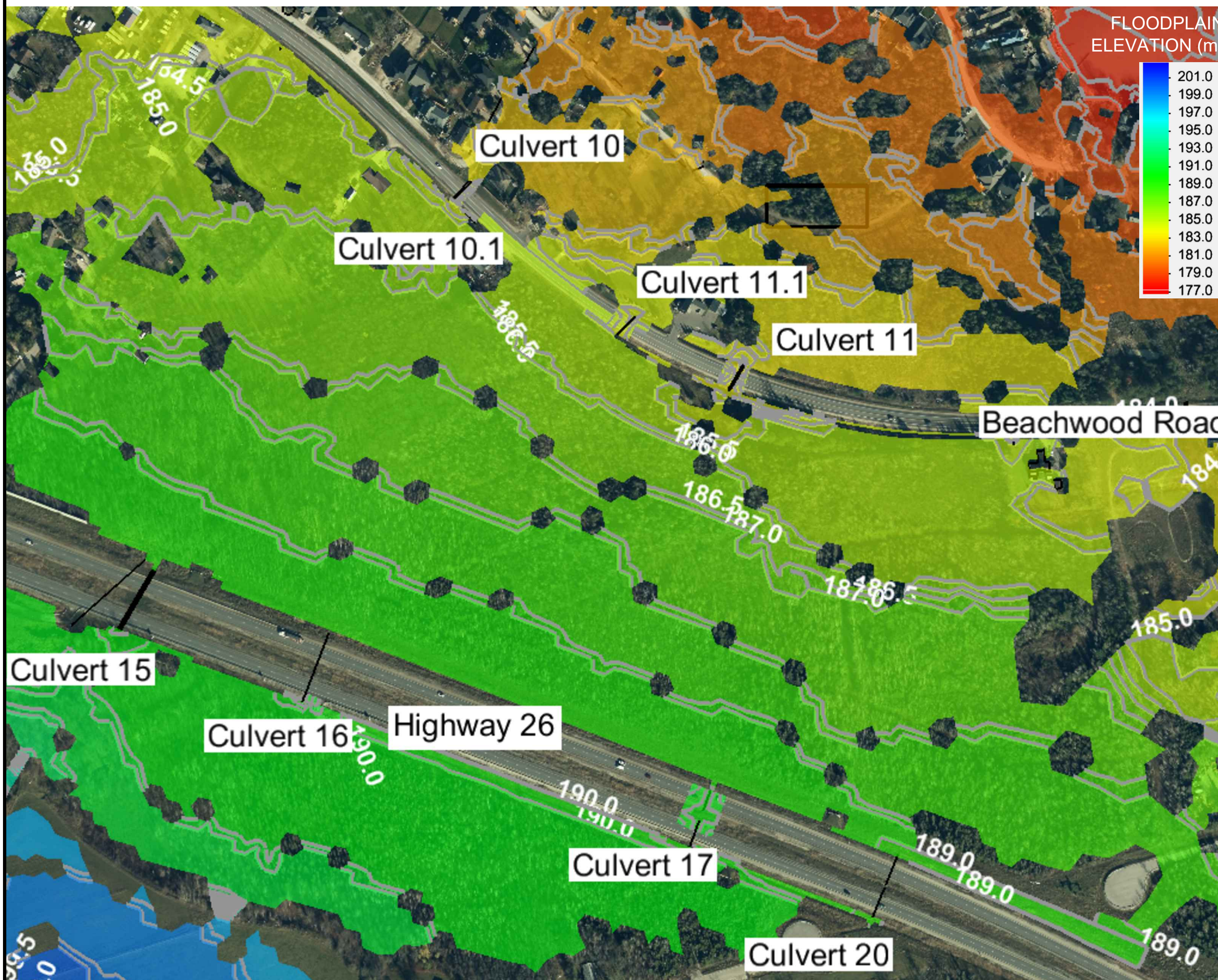
N



BURNSIDE	Figure Title **SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY** FLOODPLAIN ELEVATION EXTENTS

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**10**
	Scale		Project No.	
	NTS		300052877.1000	

File: Drawing2.dwg Date Plotted: April 5, 2022 - 1:31 PM



BURNSIDE

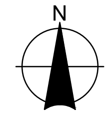
Figure Title

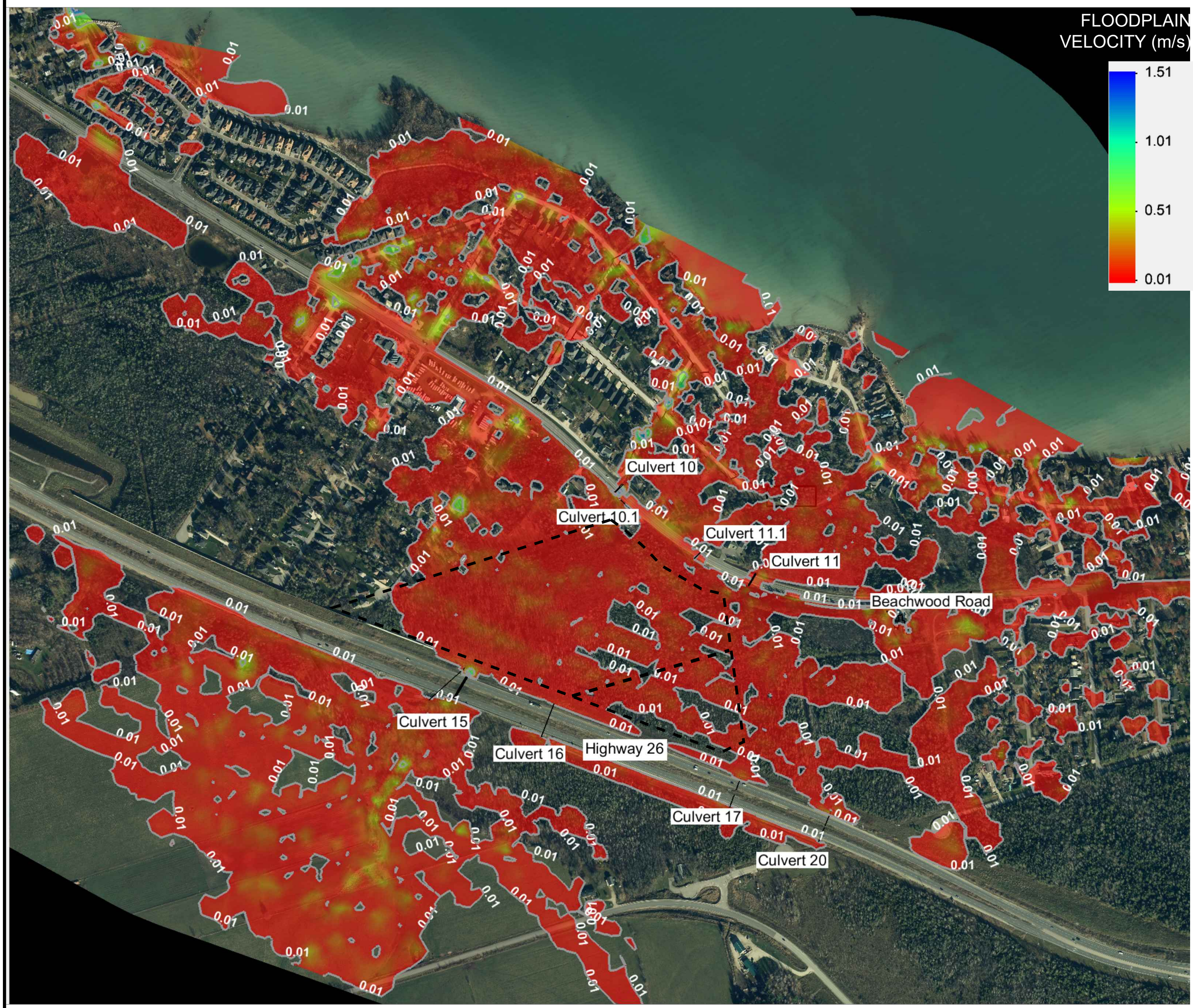
SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

FLOODPLAIN ELEVATION EXTENTS- SITE

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**11**
	Scale: NTS		Project No.: 300052877.1000	

File: Drawing2.dwg Date Plotted: April 5, 2022 - 1:37 PM





BURNSIDE

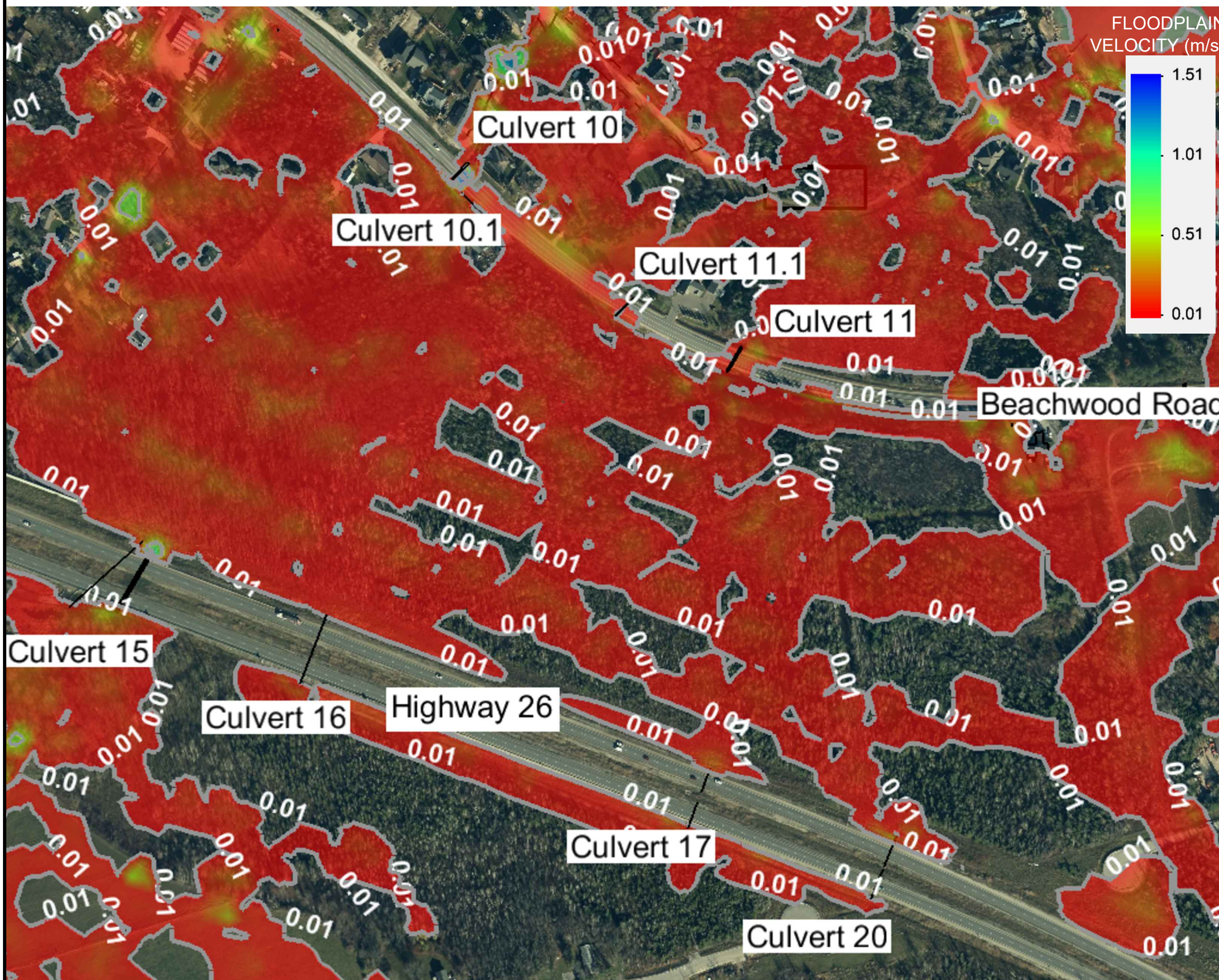
Figure Title

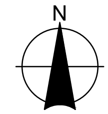
SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

FLOODPLAIN VELOCITY

Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**12**
	Scale		Project No.	
	NTS		300052877.1000	

File: Drawing2.dwg Date Plotted: April 5, 2022 - 4:37 PM





BURNSIDE

Figure Title

SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY

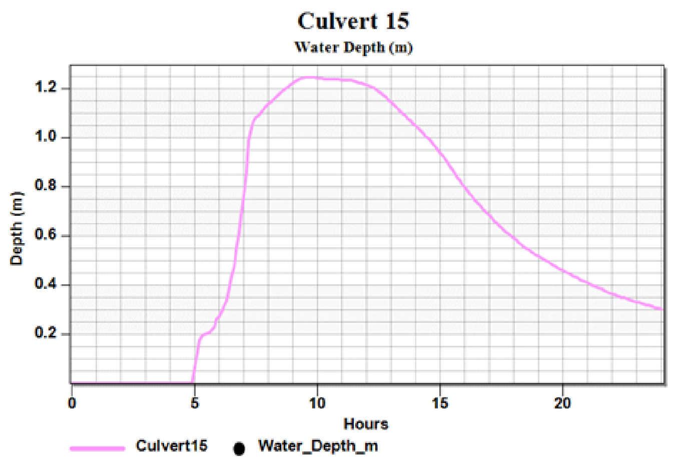
FLOODPLAIN VELOCITY - SITE

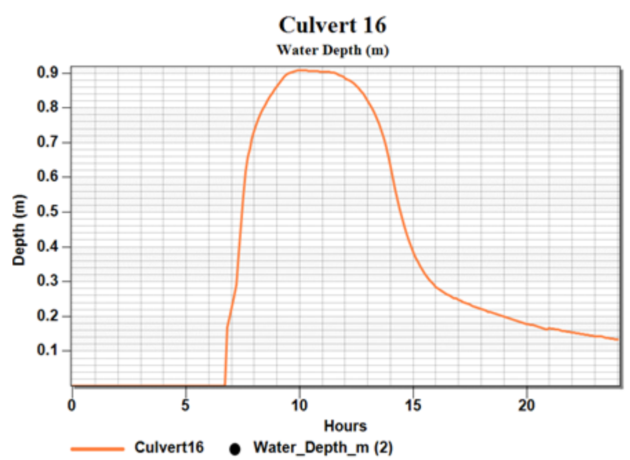
Client	Drawn	Checked	Date	Figure No.
SUNRAY LIVING INC.	RW	TK	APRIL 8, 2022	**13**
	Scale		Project No.	
	NTS		300052877.1000	

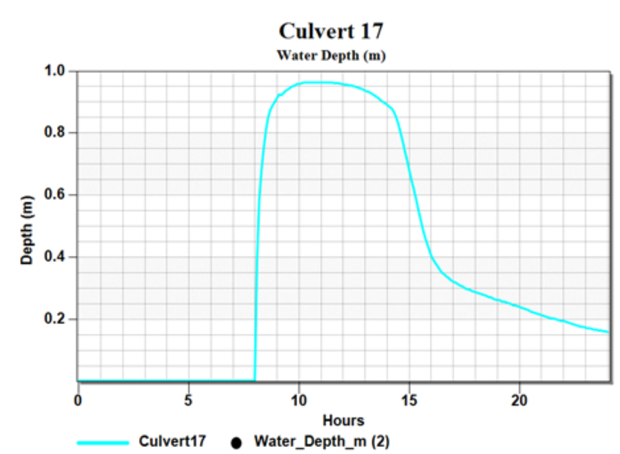
File: Drawing2.dwg Date Plotted: April 5, 2022 - 4:46 PM

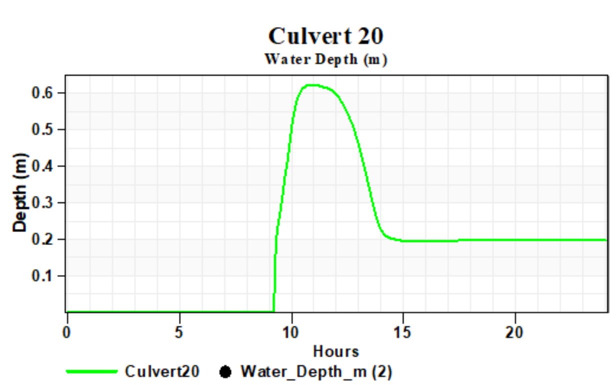
Culvert Headwater Depth vs Time under the Regional Storm Event Flow from SMS 2D Observation Points

Culvert Crossings under Highway 26

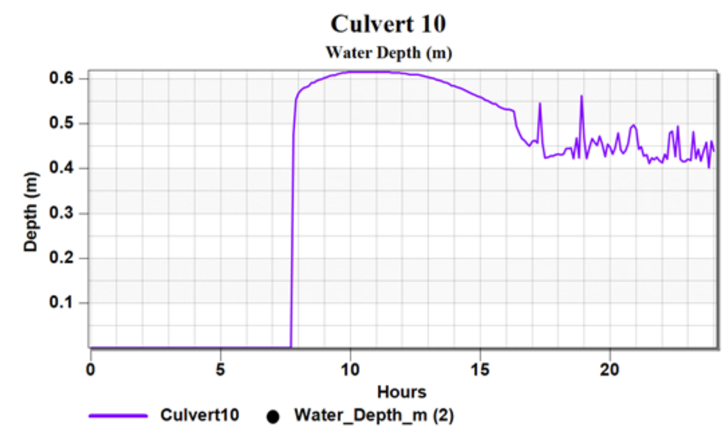


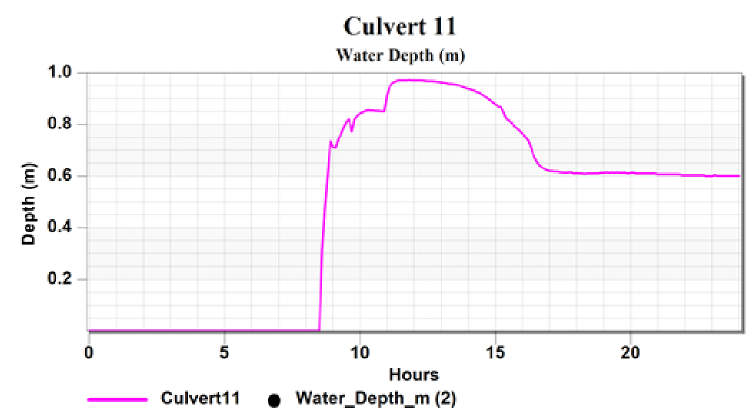


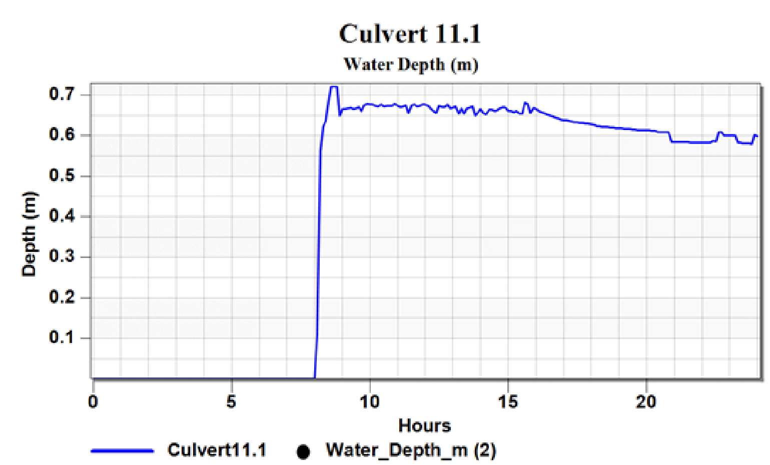




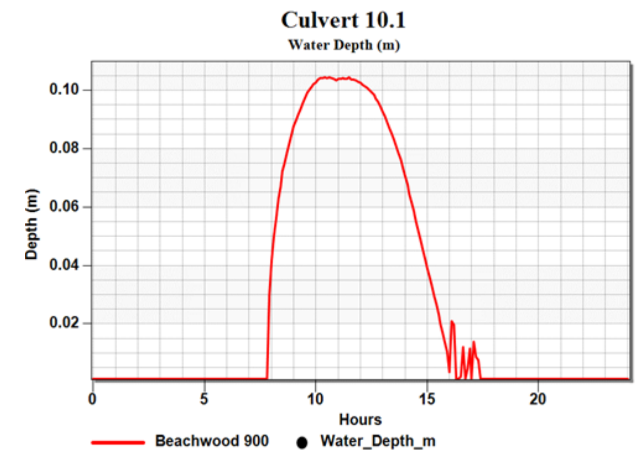
Culvert Crossings under Beachwood Road

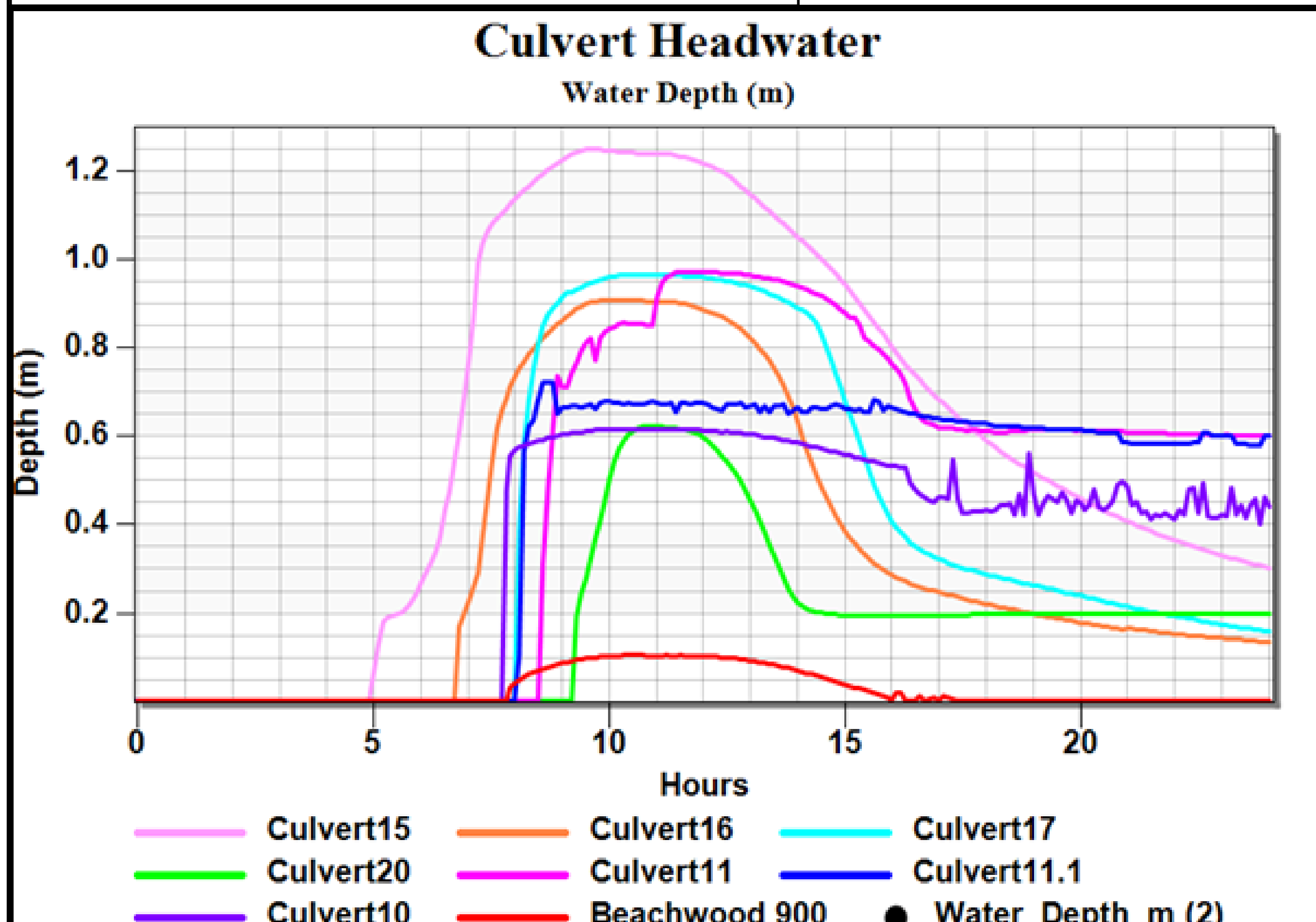






Beachwood Road Driveway Culvert east of Culvert 10





Project Name:	Beachwood Floodplain
Project No.:	300052722
Completed By:	R.Walton
Checked By:	T.Koen
Date:	22/04/07

BURNSIDE

HY8 and SMS2D Culvert Comparison

Culvert	**Size**	Location	**Surveyed Invert (m)**	**SMS Peak Depth (m)**	**Headwater Elevation (Invert + SMS Depth) (m)**	**HY8 Flow @ SMS Headwater Elevation (m^3/s)**	**HY8 Headwater Depth at Peak Flow (m)**
15	1200x2400 Box	HWY26	189.1	1.2475	190.35	4.55	1.21
16	1050	HWY26	189.31	0.9082	190.22	1.22	0.91
17	1050	HWY26	189.123	0.9639	190.09	1.28	0.97
20	750	HWY26	188.68	0.6223	189.30	0.48	0.62
11	900x1200 Box	Beachwood	182.76	0.9709	183.73	1.6	0.97
11.1	750	Beachwood	183.81	0.7212	184.53	0.51	0.72
10	1200x1500 Box	Beachwood	183.58	0.6155	184.20	0.93	0.62
10.1	900	Beachwood Driveway	184.04	0.1045	184.1445	0.015	0.11
Total Peak Flow Crossing HWY 26 from HY8						**7.53**	
Total Peak Flow Crossing Beachwood from HY8						**3.04**	

HY-8 Culvert Analysis Report

Site Data - HWY26Box Culvert 15

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 189.10 m

Outlet Station: 57.18 m

Outlet Elevation: 189.07 m

Number of Barrels: 1

Culvert Data Summary - HWY26Box Culvert 15

Barrel Shape: Concrete Box

Barrel Span: 2400.00 mm

Barrel Rise: 1200.00 mm

Barrel Material: Concrete

Embedment: 0.00 mm

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 1 - Culvert Summary Table: HWY26Box Culvert 15

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.50	0.50	189.40	0.282	0.302	2-M2c	0.288	0.164	0.164	0.138	1.269	0.727
1.35	1.35	189.67	0.546	0.567	2-M2c	0.559	0.318	0.318	0.254	1.767	1.063
2.20	2.20	189.88	0.751	0.777	2-M2c	0.787	0.441	0.441	0.345	2.080	1.276
3.05	3.05	190.06	0.928	0.961	2-M2c	0.996	0.548	0.548	0.424	2.319	1.438
3.90	3.90	190.23	1.092	1.129	2-M2c	1.200	0.646	0.646	0.496	2.517	1.571
4.55	4.55	190.35	1.215	1.249	7-M2c	1.200	0.715	0.715	0.548	2.650	1.660
5.60	5.60	190.53	1.417	1.431	7-M2c	1.200	0.822	0.822	0.627	2.840	1.785
6.45	6.45	190.69	1.592	1.571	7-M2c	1.200	0.903	0.903	0.688	2.977	1.875
7.30	7.30	190.88	1.783	1.756	7-M2c	1.200	0.981	0.981	0.747	3.102	1.956
8.15	8.15	191.09	1.993	1.964	7-M2c	1.200	1.055	1.055	0.803	3.218	2.030
9.00	9.00	191.33	2.225	2.177	7-M2c	1.200	1.127	1.127	0.858	3.326	2.098

****

Straight Culvert

Inlet Elevation (invert): 189.10 m, Outlet Elevation (invert): 189.07 m

Culvert Length: 57.18 m, Culvert Slope: 0.0005

****

Water Surface Profile Plot for Culvert: HWY26Box Culvert 15

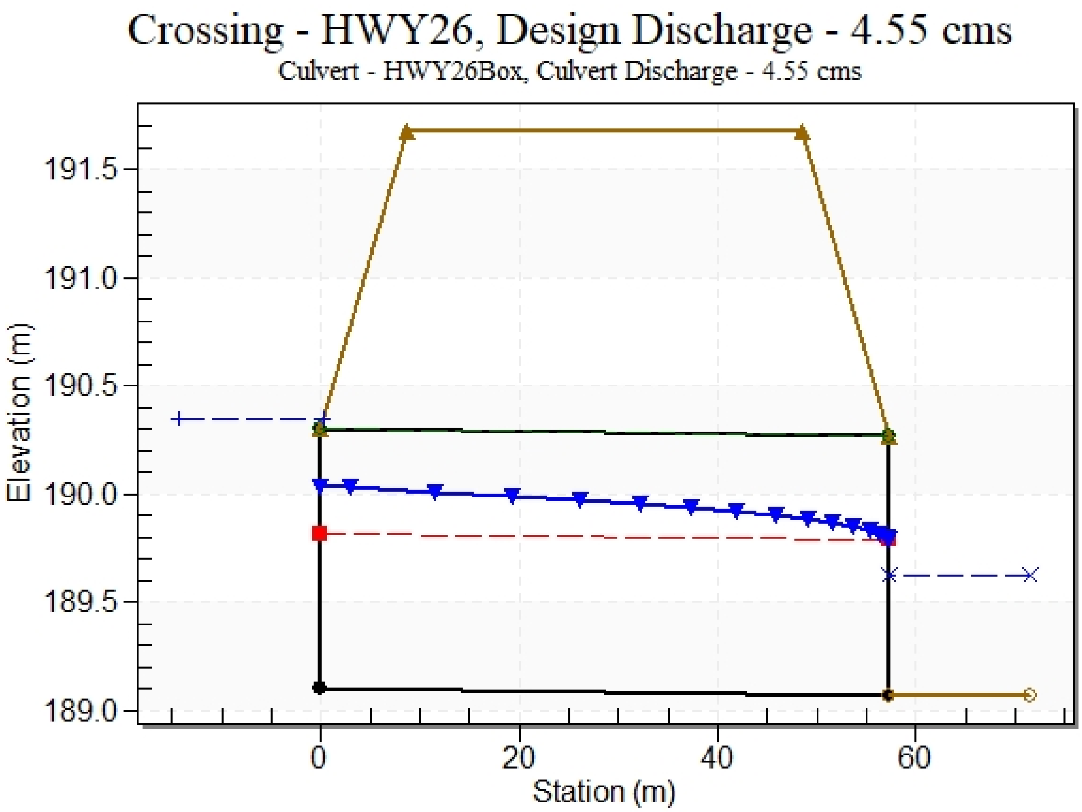


Table 2 - Downstream Channel Rating Curve (Crossing: HWY26 Culvert 15)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.50	189.21	0.14	0.73	26.96	0.63
1.35	189.32	0.25	1.06	49.77	0.67
2.20	189.41	0.34	1.28	67.60	0.69
3.05	189.49	0.42	1.44	83.14	0.71
3.90	189.57	0.50	1.57	97.31	0.71
4.55	189.62	0.55	1.66	107.47	0.72
5.60	189.70	0.63	1.79	122.98	0.72
6.45	189.76	0.69	1.87	134.90	0.72
7.30	189.82	0.75	1.96	146.36	0.72
8.15	189.87	0.80	2.03	157.44	0.72
9.00	189.93	0.86	2.10	168.20	0.72

Tailwater Channel Data - HWY26 Culvert 15

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 189.07 m

Roadway Data for Crossing: HWY26 Culvert 15

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 191.68 m

Roadway Surface: Paved

Roadway Top Width: 40.00 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 17.6573 cfs

Design Flow: 160.682 cfs

Maximum Flow: 317.832 cfs

Table 3 - Summary of Culvert Flows at Crossing: HWY26 Culvert 15

Headwater Elevation (m)	Total Discharge (cms)	HWY26Box Discharge (cms)	Roadway Discharge (cms)	Iterations
189.40	0.50	0.50	0.00	1
189.67	1.35	1.35	0.00	1
189.88	2.20	2.20	0.00	1
190.06	3.05	3.05	0.00	1
190.23	3.90	3.90	0.00	1
190.35	4.55	4.55	0.00	1
190.53	5.60	5.60	0.00	1
190.69	6.45	6.45	0.00	1
190.88	7.30	7.30	0.00	1
191.09	8.15	8.15	0.00	1
191.33	9.00	9.00	0.00	1
191.68	10.16	10.16	0.00	Overtopping

Site Data - Culvert 11.1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 183.81 m

Outlet Station: 20.89 m

Outlet Elevation: 183.45 m

Number of Barrels: 1

Culvert Data Summary - Culvert 11.1

Barrel Shape: Circular

Barrel Diameter: 750.00 mm

Barrel Material: Corrugated Steel

Embedment: 0.00 mm

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 4 - Culvert Summary Table: Culvert 11.1

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.51	0.51	184.53	0.716	0.358	1-S2n	0.437	0.440	0.437	0.139	1.907	0.733
1.17	1.06	185.34	1.483	1.525	7-M2c	0.750	0.632	0.632	0.232	2.669	1.007
2.04	1.10	185.45	1.570	1.636	7-M2c	0.750	0.642	0.642	0.329	2.742	1.241
2.91	1.13	185.52	1.630	1.714	7-M2c	0.750	0.649	0.649	0.412	2.791	1.414
3.78	1.16	185.59	1.684	1.781	7-M2c	0.750	0.655	0.655	0.486	2.834	1.554
4.65	1.18	185.65	1.733	1.840	7-M2c	0.750	0.659	0.659	0.556	2.873	1.673
5.52	1.20	185.71	1.778	1.895	7-M2c	0.750	0.663	0.663	0.621	2.909	1.776
6.39	1.22	185.76	1.820	1.947	7-M2t	0.750	0.667	0.684	0.684	2.889	1.869
7.26	1.23	185.81	1.837	1.996	7-M2t	0.750	0.668	0.744	0.744	2.785	1.952
8.13	1.23	185.85	1.829	2.044	4-FFf	0.750	0.668	0.750	0.802	2.774	2.028
9.00	1.22	185.90	1.820	2.090	4-FFf	0.750	0.667	0.750	0.858	2.765	2.098

****

Straight Culvert

Inlet Elevation (invert): 183.81 m, Outlet Elevation (invert): 183.45 m

Culvert Length: 20.89 m, Culvert Slope: 0.0172

****

Water Surface Profile Plot for Culvert: Culvert 11.1

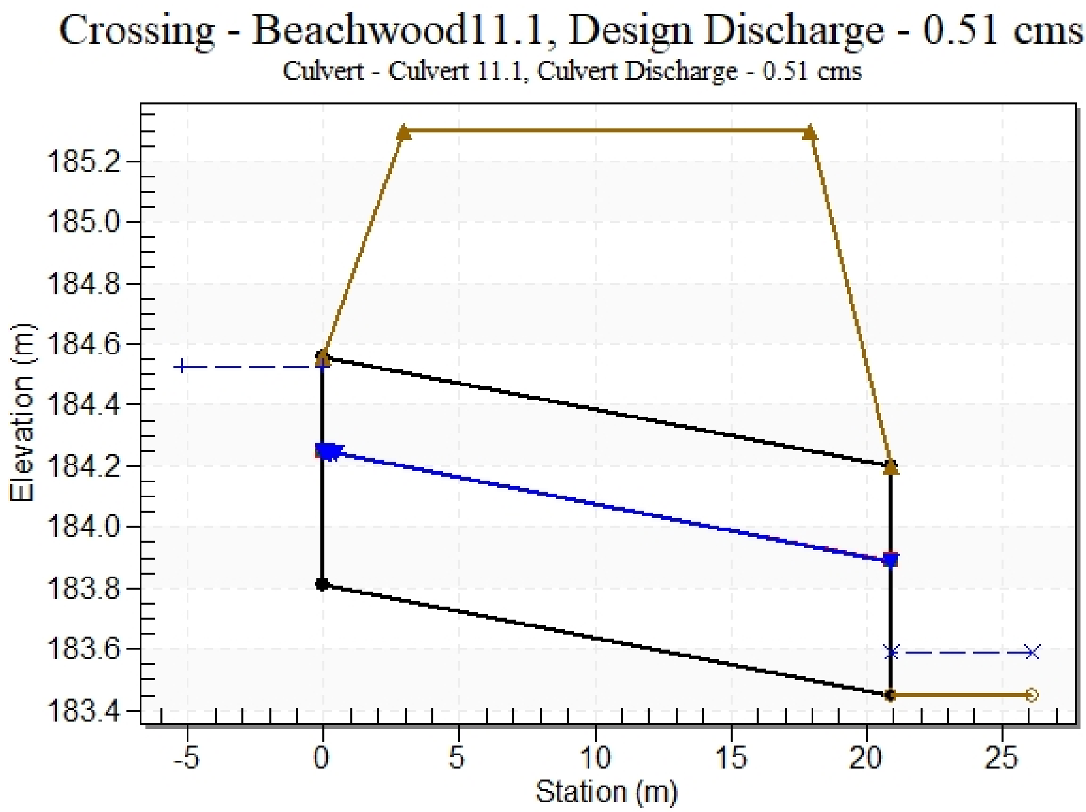


Table 5 - Downstream Channel Rating Curve (Crossing: Beachwood11.1)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.51	183.59	0.14	0.73	27.29	0.63
1.17	183.68	0.23	1.01	45.54	0.67
2.04	183.78	0.33	1.24	64.46	0.69
2.91	183.86	0.41	1.41	80.70	0.70
3.78	183.94	0.49	1.55	95.37	0.71
4.65	184.01	0.56	1.67	108.99	0.72
5.52	184.07	0.62	1.78	121.83	0.72
6.39	184.13	0.68	1.87	134.07	0.72
7.26	184.19	0.74	1.95	145.83	0.72
8.13	184.25	0.80	2.03	157.18	0.72
9.00	184.31	0.86	2.10	168.20	0.72

Tailwater Channel Data - Beachwood11.1

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 183.45 m

Roadway Data for Crossing: Beachwood11.1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 185.30 m

Roadway Surface: Paved

Roadway Top Width: 15.00 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10.5944 cfs

Design Flow: 18.0105 cfs

Maximum Flow: 317.832 cfs

Table 6 - Summary of Culvert Flows at Crossing: Beachwood11.1

Headwater Elevation (m)	Total Discharge (cms)	Culvert 11.1 Discharge (cms)	Roadway Discharge (cms)	Iterations
184.53	0.51	0.51	0.00	1
185.34	1.17	1.06	0.11	12
185.45	2.04	1.10	0.93	5
185.52	2.91	1.13	1.77	5
185.59	3.78	1.16	2.62	4
185.65	4.65	1.18	3.47	4
185.71	5.52	1.20	4.32	4
185.76	6.39	1.22	5.17	4
185.81	7.26	1.23	6.03	3
185.85	8.13	1.23	6.90	3
185.90	9.00	1.22	7.78	3
185.30	1.05	1.05	0.00	Overtopping

Site Data - Culvert 11

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 182.76 m

Outlet Station: 23.34 m

Outlet Elevation: 182.50 m

Number of Barrels: 1

Culvert Data Summary - Culvert 11

Barrel Shape: Concrete Box

Barrel Span: 1200.00 mm

Barrel Rise: 900.00 mm

Barrel Material: Concrete

Embedment: 0.00 mm

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 7 - Culvert Summary Table: Culvert 11

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.17	0.17	182.98	0.216	0.219	2-M2c	0.138	0.127	0.127	0.071	1.116	0.477
1.05	1.05	183.50	0.720	0.736	2-M2c	0.480	0.428	0.428	0.218	2.050	0.968
1.60	1.60	183.73	0.960	0.972	7-M2c	0.656	0.566	0.566	0.282	2.357	1.133
2.82	2.82	184.46	1.597	1.696	7-M2c	0.900	0.825	0.825	0.403	2.846	1.398
3.70	3.49	185.05	2.082	2.295	6-FFc	0.900	0.900	0.900	0.480	3.234	1.542
4.58	3.59	185.15	2.164	2.392	6-FFc	0.900	0.900	0.900	0.551	3.328	1.664
5.47	3.67	185.23	2.228	2.466	6-FFc	0.900	0.900	0.900	0.618	3.398	1.771
6.35	3.73	185.29	2.282	2.530	6-FFc	0.900	0.900	0.900	0.681	3.457	1.865
7.23	3.79	185.35	2.332	2.588	6-FFc	0.900	0.900	0.900	0.742	3.510	1.950
8.12	3.84	185.40	2.378	2.642	6-FFc	0.900	0.900	0.900	0.801	3.558	2.027
9.00	3.89	185.45	2.422	2.693	6-FFc	0.900	0.900	0.900	0.858	3.603	2.098

****

Straight Culvert

Inlet Elevation (invert): 182.76 m,   Outlet Elevation (invert): 182.50 m

Culvert Length: 23.34 m,   Culvert Slope: 0.0111

****

Water Surface Profile Plot for Culvert: Culvert 11

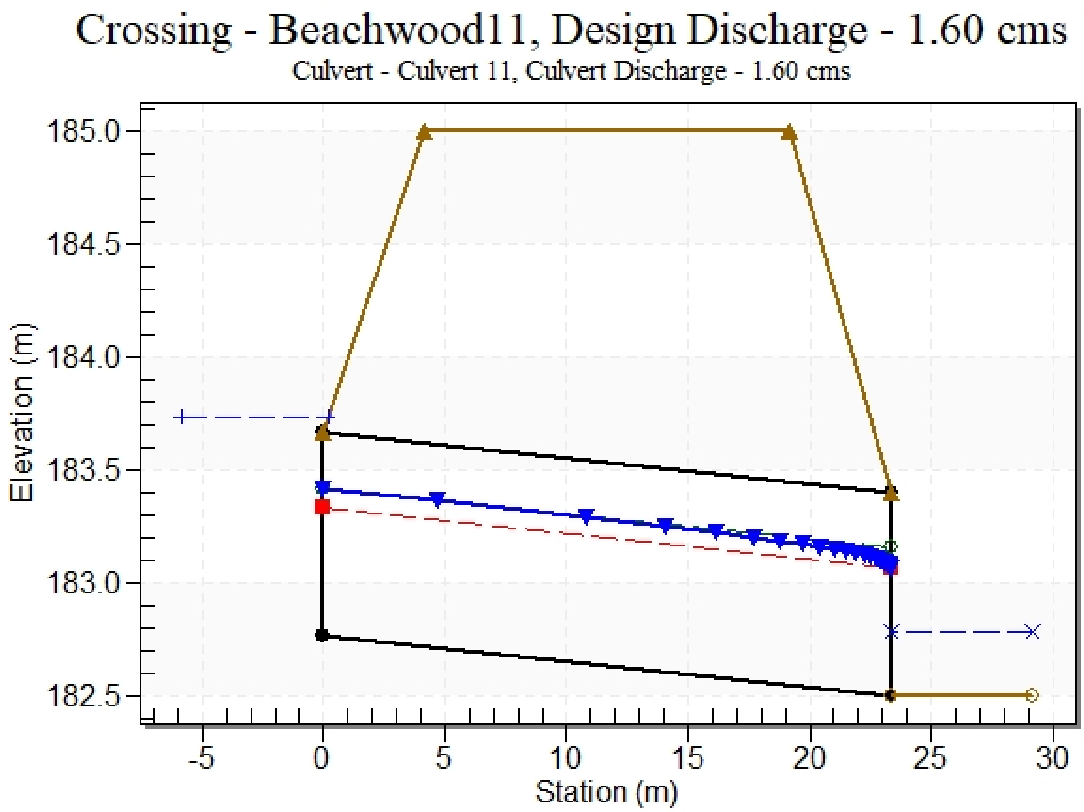


Table 8 - Downstream Channel Rating Curve (Crossing: Beachwood11)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.17	182.57	0.07	0.48	13.97	0.57
1.05	182.72	0.22	0.97	42.66	0.66
1.60	182.78	0.28	1.13	55.35	0.68
2.82	182.90	0.40	1.40	79.08	0.70
3.70	182.98	0.48	1.54	94.10	0.71
4.58	183.05	0.55	1.66	108.00	0.72
5.47	183.12	0.62	1.77	121.08	0.72
6.35	183.18	0.68	1.86	133.54	0.72
7.23	183.24	0.74	1.95	145.48	0.72
8.12	183.30	0.80	2.03	157.02	0.72
9.00	183.36	0.86	2.10	168.20	0.72

Tailwater Channel Data - Beachwood11

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 182.50 m

Roadway Data for Crossing: Beachwood11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 185.00 m

Roadway Surface: Paved

Roadway Top Width: 15.00 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 6.00349 cfs

Design Flow: 56.5035 cfs

Maximum Flow: 317.832 cfs

Table 9 - Summary of Culvert Flows at Crossing: Beachwood11

Headwater Elevation (m)	Total Discharge (cms)	Culvert 11 Discharge (cms)	Roadway Discharge (cms)	Iterations
182.98	0.17	0.17	0.00	1
183.50	1.05	1.05	0.00	1
183.73	1.60	1.60	0.00	1
184.46	2.82	2.82	0.00	1
185.05	3.70	3.49	0.21	5
185.15	4.58	3.59	0.99	5
185.23	5.47	3.67	1.80	5
185.29	6.35	3.73	2.61	4
185.35	7.23	3.79	3.44	4
185.40	8.12	3.84	4.27	4
185.45	9.00	3.89	5.11	4
185.00	3.43	3.43	0.00	Overtopping

Site Data - Culvert 10

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 183.58 m

Outlet Station: 20.80 m

Outlet Elevation: 181.81 m

Number of Barrels: 1

Culvert Data Summary - Culvert 10

Barrel Shape: Concrete Box

Barrel Span: 1200.00 mm

Barrel Rise: 1500.00 mm

Barrel Material: Concrete

Embedment: 0.00 mm

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 10 - Culvert Summary Table: Culvert 10

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.50	0.50	183.99	0.411	0.0*	1-S2n	0.143	0.261	0.145	0.138	2.882	0.727
0.93	0.93	184.20	0.622	0.0*	1-S2n	0.216	0.394	0.222	0.201	3.486	0.923
2.20	2.20	184.70	1.121	0.0*	1-S2n	0.393	0.700	0.402	0.345	4.565	1.276
3.05	3.05	184.99	1.411	0.0*	1-S2n	0.497	0.870	0.513	0.424	4.956	1.438
3.90	3.76	185.23	1.653	0.0*	5-S2n	0.580	0.999	0.601	0.496	5.208	1.571
4.75	3.99	185.32	1.737	0.0*	5-S2n	0.607	1.041	0.630	0.564	5.287	1.685
5.60	4.18	185.38	1.803	0.0*	5-S2n	0.628	1.073	0.653	0.627	5.329	1.785
6.45	4.33	185.44	1.862	0.072	5-S2n	0.646	1.099	0.672	0.688	5.377	1.875
7.30	4.48	185.50	1.915	0.146	5-S2n	0.662	1.123	0.690	0.747	5.409	1.956
8.15	4.61	185.55	1.965	0.391	5-S2n	0.676	1.145	0.704	0.803	5.448	2.030
9.00	4.73	185.59	2.012	0.446	5-S2n	0.690	1.165	0.720	0.858	5.473	2.098

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 183.58 m, Outlet Elevation (invert): 181.81 m

Culvert Length: 20.88 m, Culvert Slope: 0.0851

****

Water Surface Profile Plot for Culvert: Culvert 10

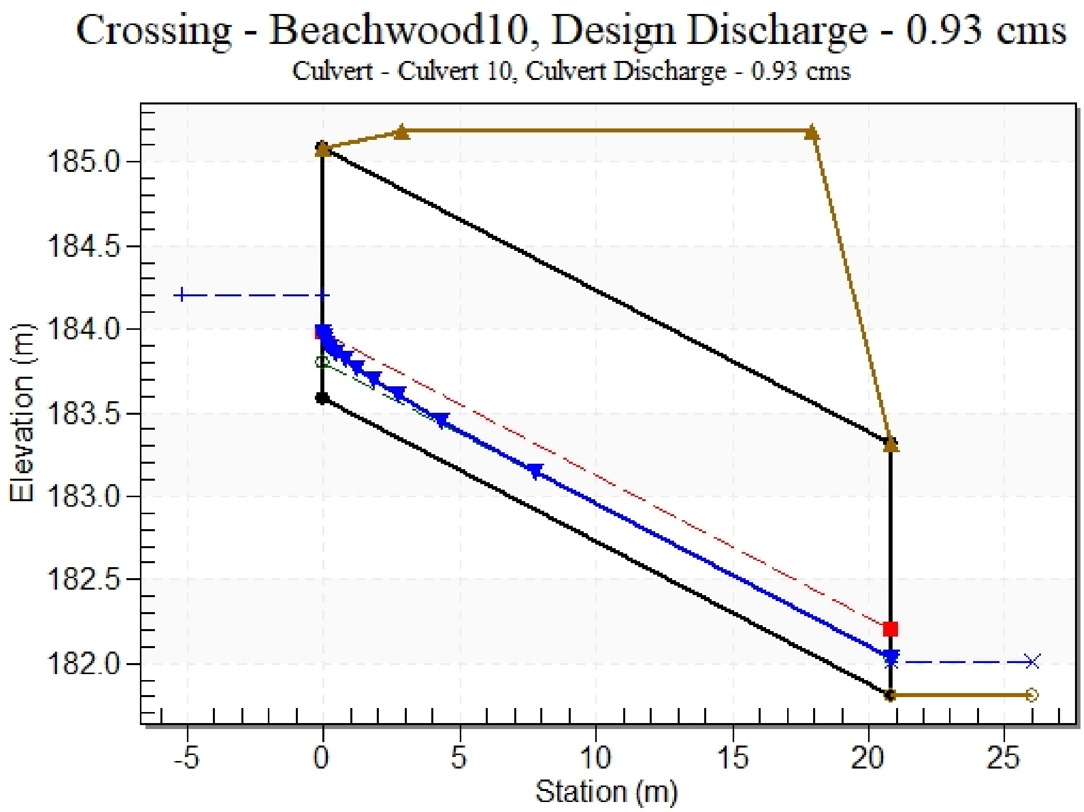


Table 11 - Downstream Channel Rating Curve (Crossing: Beachwood10)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.50	181.95	0.14	0.73	26.96	0.63
0.93	182.01	0.20	0.92	39.50	0.66
2.20	182.15	0.34	1.28	67.60	0.69
3.05	182.23	0.42	1.44	83.14	0.71
3.90	182.31	0.50	1.57	97.31	0.71
4.75	182.37	0.56	1.69	110.50	0.72
5.60	182.44	0.63	1.79	122.98	0.72
6.45	182.50	0.69	1.87	134.90	0.72
7.30	182.56	0.75	1.96	146.36	0.72
8.15	182.61	0.80	2.03	157.44	0.72
9.00	182.67	0.86	2.10	168.20	0.72

Tailwater Channel Data - Beachwood10

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 181.81 m

Roadway Data for Crossing: Beachwood10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 185.19 m

Roadway Surface: Paved

Roadway Top Width: 15.00 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 17.6573 cfs

Design Flow: 32.8426 cfs

Maximum Flow: 317.832 cfs

Table 12 - Summary of Culvert Flows at Crossing: Beachwood10

Headwater Elevation (m)	Total Discharge (cms)	Culvert 10 Discharge (cms)	Roadway Discharge (cms)	Iterations
183.99	0.50	0.50	0.00	1
184.20	0.93	0.93	0.00	1
184.70	2.20	2.20	0.00	1
184.99	3.05	3.05	0.00	1
185.23	3.90	3.76	0.14	6
185.32	4.75	3.99	0.75	5
185.38	5.60	4.18	1.42	4
185.44	6.45	4.33	2.11	4
185.50	7.30	4.48	2.82	4
185.55	8.15	4.61	3.54	4
185.59	9.00	4.73	4.27	4
185.19	3.63	3.63	0.00	Overtopping

Site Data - Culvert 16

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 189.31 m

Outlet Station: 60.40 m

Outlet Elevation: 188.94 m

Number of Barrels: 1

Culvert Data Summary - Culvert 16

Barrel Shape: Circular

Barrel Diameter: 1050.00 mm

Barrel Material: Concrete

Embedment: 0.00 mm

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 13 - Culvert Summary Table: Culvert 16

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.10	0.10	189.54	0.231	0.0*	1-S2n	0.148	0.172	0.148	0.052	1.341	0.387
1.22	1.22	190.22	0.908	0.480	1-S2n	0.541	0.626	0.541	0.238	2.713	1.024
1.88	1.88	190.52	1.214	0.942	5-S2n	0.717	0.781	0.717	0.312	2.984	1.204
2.77	2.77	191.09	1.782	1.761	7-M2c	1.050	0.926	0.926	0.399	3.425	1.389
3.66	3.25	191.55	2.189	2.235	7-M2c	1.050	0.973	0.973	0.477	3.881	1.536
4.55	3.34	191.63	2.269	2.324	7-M2c	1.050	0.980	0.980	0.548	3.968	1.660
5.44	3.41	191.71	2.336	2.395	7-M2c	1.050	0.985	0.985	0.616	4.039	1.767
6.33	3.47	191.77	2.392	2.457	7-M2c	1.050	0.988	0.988	0.680	4.099	1.863
7.22	3.52	191.83	2.445	2.516	7-M2c	1.050	0.992	0.992	0.741	4.155	1.948
8.11	3.57	191.88	2.494	2.569	7-M2c	1.050	0.994	0.994	0.800	4.206	2.026
9.00	3.61	191.93	2.540	2.619	7-M2c	1.050	0.997	0.997	0.858	4.254	2.098

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 189.31 m, Outlet Elevation (invert): 188.94 m

Culvert Length: 60.40 m, Culvert Slope: 0.0061

****

Water Surface Profile Plot for Culvert: Culvert 16

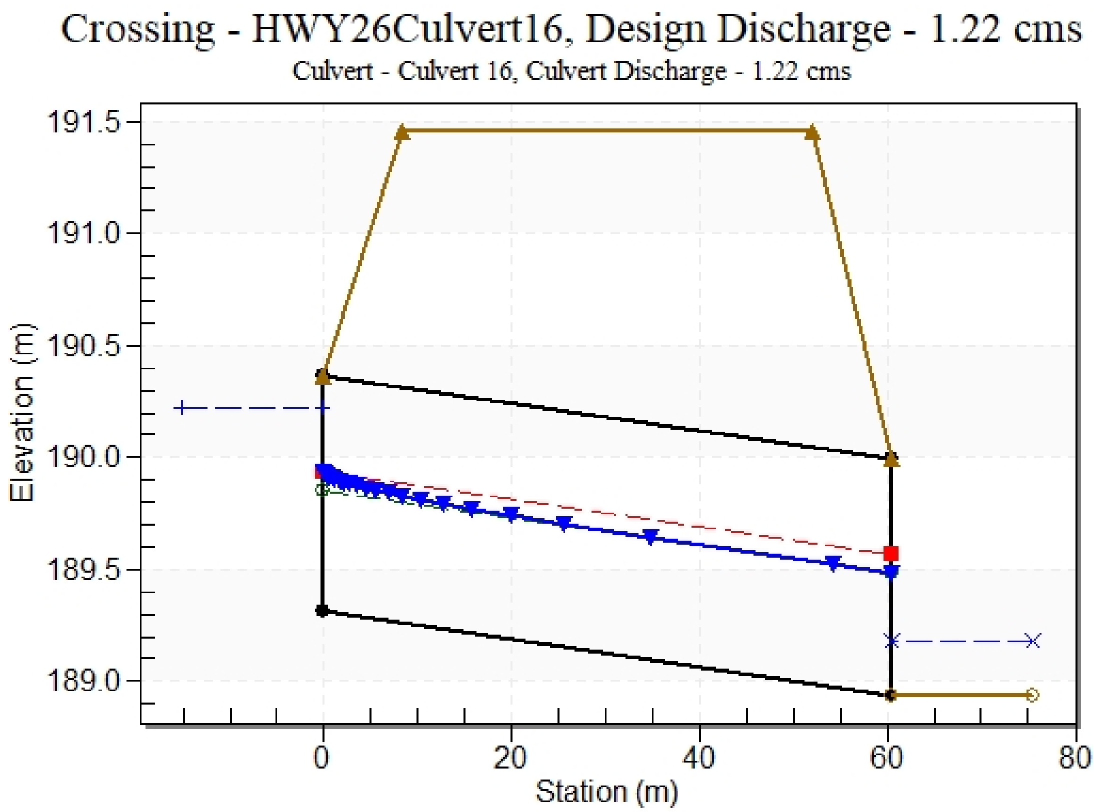


Table 14 - Downstream Channel Rating Curve (Crossing: HWY26Culvert16)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.10	188.99	0.05	0.39	10.13	0.54
1.22	189.18	0.24	1.02	46.74	0.67
1.88	189.25	0.31	1.20	61.23	0.69
2.77	189.34	0.40	1.39	78.20	0.70
3.66	189.42	0.48	1.54	93.42	0.71
4.55	189.49	0.55	1.66	107.47	0.72
5.44	189.56	0.62	1.77	120.68	0.72
6.33	189.62	0.68	1.86	133.24	0.72
7.22	189.68	0.74	1.95	145.29	0.72
8.11	189.74	0.80	2.03	156.92	0.72
9.00	189.80	0.86	2.10	168.20	0.72

Tailwater Channel Data - HWY26Culvert16

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 188.94 m

Roadway Data for Crossing: HWY26Culvert16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 191.46 m

Roadway Surface: Paved

Roadway Top Width: 43.80 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 3.53147 cfs

Design Flow: 43.0839 cfs

Maximum Flow: 317.832 cfs

Table 15 - Summary of Culvert Flows at Crossing: HWY26Culvert16

Headwater Elevation (m)	Total Discharge (cms)	Culvert 16 Discharge (cms)	Roadway Discharge (cms)	Iterations
189.54	0.10	0.10	0.00	1
190.22	1.22	1.22	0.00	1
190.52	1.88	1.88	0.00	1
191.09	2.77	2.77	0.00	1
191.55	3.66	3.25	0.41	8
191.63	4.55	3.34	1.21	5
191.71	5.44	3.41	2.03	5
191.77	6.33	3.47	2.86	4
191.83	7.22	3.52	3.70	4
191.88	8.11	3.57	4.54	4
191.93	9.00	3.61	5.39	4
191.46	3.17	3.17	0.00	Overtopping

Site Data - Culvert 17S

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 189.12 m

Outlet Station: 53.01 m

Outlet Elevation: 188.98 m

Number of Barrels: 1

Culvert Data Summary - Culvert 17S

Barrel Shape: Circular

Barrel Diameter: 1050.00 mm

Barrel Material: Concrete

Embedment: 0.00 mm

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 16 - Culvert Summary Table: Culvert 17S

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.06	0.06	189.31	0.179	0.187	2-M2c	0.141	0.133	0.133	0.038	0.945	0.316
1.28	1.28	190.09	0.936	0.971	2-M2c	0.731	0.642	0.642	0.246	2.307	1.042
1.85	1.85	190.38	1.199	1.253	7-M2c	1.050	0.775	0.775	0.309	2.698	1.196
2.74	2.59	190.91	1.651	1.791	7-M2c	1.050	0.904	0.904	0.396	3.270	1.384
3.64	2.71	191.01	1.741	1.892	7-M2c	1.050	0.920	0.920	0.475	3.375	1.533
4.53	2.80	191.09	1.808	1.967	7-M2c	1.050	0.930	0.930	0.547	3.454	1.657
5.42	2.88	191.16	1.868	2.032	7-M2c	1.050	0.939	0.939	0.614	3.522	1.766
6.32	2.94	191.21	1.920	2.091	7-M2c	1.050	0.946	0.946	0.679	3.581	1.861
7.21	3.00	191.27	1.973	2.145	7-M2c	1.050	0.952	0.952	0.741	3.641	1.948
8.11	3.06	191.32	2.020	2.197	7-M2c	1.050	0.957	0.957	0.800	3.693	2.026
9.00	3.11	191.37	2.065	2.245	7-M2c	1.050	0.962	0.962	0.858	3.744	2.098

****

Straight Culvert

Inlet Elevation (invert): 189.12 m, Outlet Elevation (invert): 188.98 m

Culvert Length: 53.01 m, Culvert Slope: 0.0027

****

Water Surface Profile Plot for Culvert: Culvert 17S

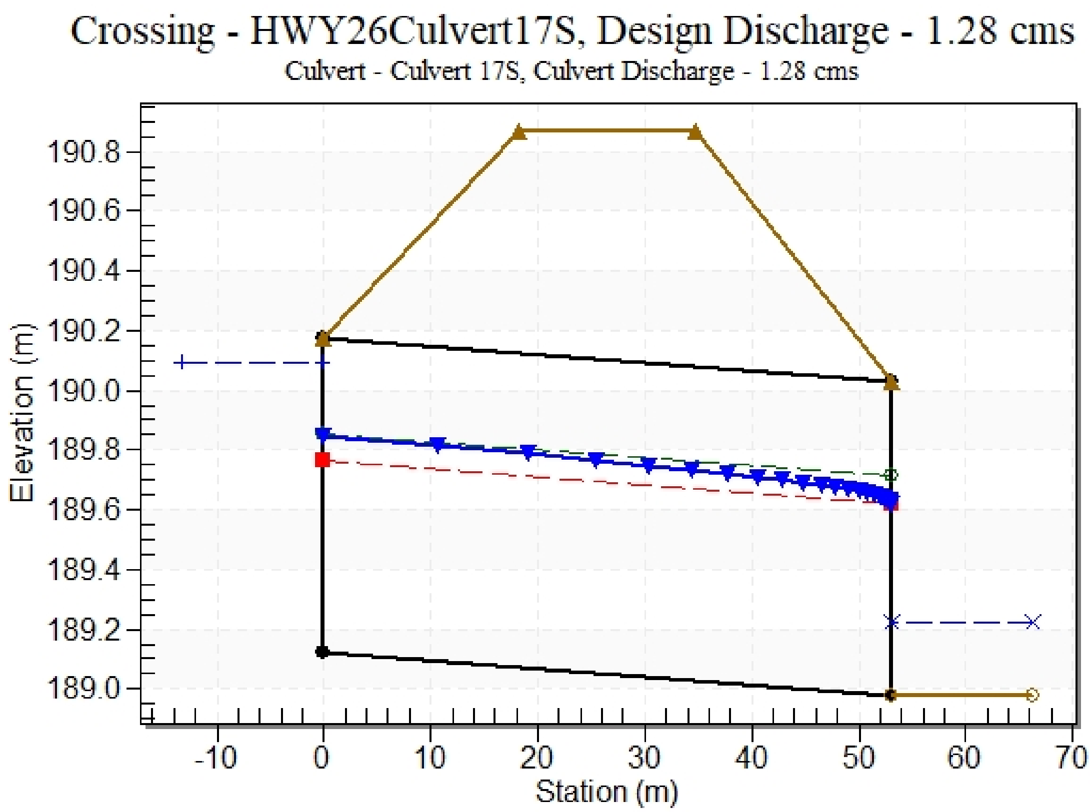


Table 17 - Downstream Channel Rating Curve (Crossing: HWY26Culvert17S)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.06	189.02	0.04	0.32	7.44	0.52
1.28	189.23	0.25	1.04	48.15	0.67
1.85	189.29	0.31	1.20	60.58	0.69
2.74	189.38	0.40	1.38	77.70	0.70
3.64	189.45	0.47	1.53	93.03	0.71
4.53	189.53	0.55	1.66	107.16	0.72
5.42	189.59	0.61	1.77	120.45	0.72
6.32	189.66	0.68	1.86	133.08	0.72
7.21	189.72	0.74	1.95	145.19	0.72
8.11	189.78	0.80	2.03	156.87	0.72
9.00	189.84	0.86	2.10	168.20	0.72

Tailwater Channel Data - HWY26Culvert17S

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 188.98 m

Roadway Data for Crossing: HWY26Culvert17S

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 190.87 m

Roadway Surface: Paved

Roadway Top Width: 16.45 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2.11888 cfs

Design Flow: 45.2028 cfs

Maximum Flow: 317.832 cfs

Table 18 - Summary of Culvert Flows at Crossing: HWY26Culvert17S

Headwater Elevation (m)	Total Discharge (cms)	Culvert 17S Discharge (cms)	Roadway Discharge (cms)	Iterations
189.31	0.06	0.06	0.00	1
190.09	1.28	1.28	0.00	1
190.38	1.85	1.85	0.00	1
190.91	2.74	2.59	0.15	8
191.01	3.64	2.71	0.92	5
191.09	4.53	2.80	1.73	5
191.16	5.42	2.88	2.55	4
191.21	6.32	2.94	3.37	4
191.27	7.21	3.00	4.21	4
191.32	8.11	3.06	5.04	4
191.37	9.00	3.11	5.88	3
190.87	2.54	2.54	0.00	Overtopping

Site Data - Culvert 20 S

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 188.68 m

Outlet Station: 57.00 m

Outlet Elevation: 188.42 m

Number of Barrels: 1

Culvert Data Summary - Culvert 20 S

Barrel Shape: Circular

Barrel Diameter: 750.00 mm

Barrel Material: Concrete

Embedment: 0.00 mm

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 19 - Culvert Summary Table: Culvert 20 S

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.01	0.01	188.76	0.079	0.0*	1-S2n	0.058	0.059	0.058	0.013	0.632	0.155
0.48	0.48	189.30	0.615	0.328	1-S2n	0.414	0.426	0.414	0.134	1.922	0.716
1.81	1.41	190.55	1.582	1.873	7-M2c	0.750	0.697	0.697	0.305	3.303	1.186
2.71	1.46	190.65	1.653	1.967	7-M2c	0.750	0.702	0.702	0.393	3.393	1.377
3.61	1.49	190.72	1.708	2.042	7-M2c	0.750	0.706	0.706	0.472	3.463	1.528
4.50	1.52	190.79	1.757	2.106	7-M2c	0.750	0.709	0.709	0.545	3.524	1.654
5.40	1.55	190.85	1.803	2.165	7-M2c	0.750	0.711	0.711	0.613	3.580	1.763
6.30	1.58	190.90	1.844	2.220	7-M2c	0.750	0.713	0.713	0.678	3.631	1.860
7.20	1.60	190.95	1.879	2.272	7-M2t	0.750	0.715	0.740	0.740	3.621	1.947
8.10	1.59	191.00	1.874	2.322	4-FFf	0.750	0.715	0.750	0.800	3.605	2.026
9.00	1.59	191.05	1.866	2.371	4-FFf	0.750	0.715	0.750	0.858	3.595	2.098

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 188.68 m, Outlet Elevation (invert): 188.42 m

Culvert Length: 57.00 m, Culvert Slope: 0.0046

****

Water Surface Profile Plot for Culvert: Culvert 20 S

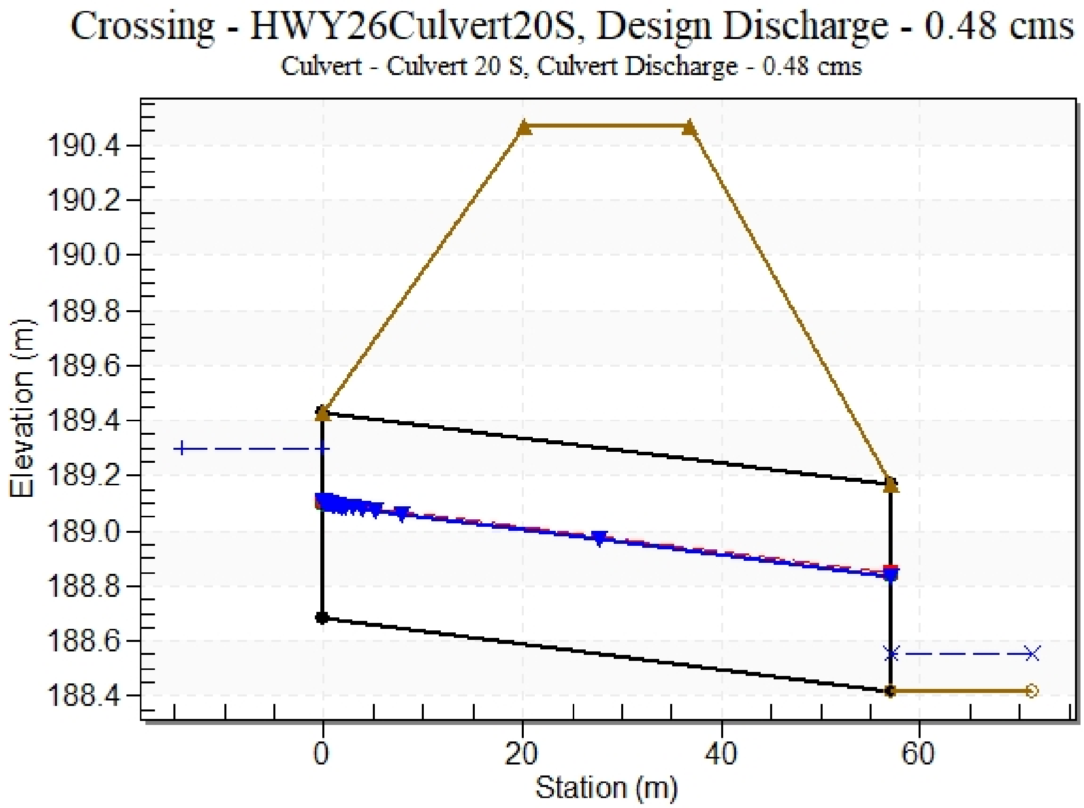


Table 20 - Downstream Channel Rating Curve (Crossing: HWY26Culvert20S)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.01	188.43	0.01	0.15	2.53	0.43
0.48	188.55	0.13	0.72	26.29	0.62
1.81	188.72	0.30	1.19	59.75	0.69
2.71	188.81	0.39	1.38	77.07	0.70
3.61	188.89	0.47	1.53	92.53	0.71
4.50	188.96	0.54	1.65	106.78	0.72
5.40	189.03	0.61	1.76	120.15	0.72
6.30	189.10	0.68	1.86	132.87	0.72
7.20	189.16	0.74	1.95	145.06	0.72
8.10	189.22	0.80	2.03	156.81	0.72
9.00	189.28	0.86	2.10	168.20	0.72

Tailwater Channel Data - HWY26Culvert20S

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 188.42 m

Roadway Data for Crossing: HWY26Culvert20S

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 190.47 m

Roadway Surface: Paved

Roadway Top Width: 16.75 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.353147 cfs

Design Flow: 16.951 cfs

Maximum Flow: 317.832 cfs

Table 21 - Summary of Culvert Flows at Crossing: HWY26Culvert20S

Headwater Elevation (m)	Total Discharge (cms)	Culvert 20 S Discharge (cms)	Roadway Discharge (cms)	Iterations
188.76	0.01	0.01	0.00	1
189.30	0.48	0.48	0.00	1
190.55	1.81	1.41	0.39	10
190.65	2.71	1.46	1.25	5
190.72	3.61	1.49	2.11	4
190.79	4.50	1.52	2.98	4
190.85	5.40	1.55	3.85	4
190.90	6.30	1.58	4.73	4
190.95	7.20	1.60	5.61	4
191.00	8.10	1.59	6.50	3
191.05	9.00	1.59	7.41	3
190.47	1.37	1.37	0.00	Overtopping

Site Data - 900DWY

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 184.04 m

Outlet Station: 12.38 m

Outlet Elevation: 183.87 m

Number of Barrels: 1

Culvert Data Summary - 900DWY

Barrel Shape: Circular

Barrel Diameter: 900.00 mm

Barrel Material: Corrugated Steel

Embedment: 0.00 mm

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 22 - Culvert Summary Table: 900DWY

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.01	0.01	184.15	0.099	0.111	2-M2c	0.072	0.069	0.069	0.016	0.676	0.182
0.91	0.89	185.02	0.931	0.982	7-M2c	0.595	0.557	0.557	0.199	2.156	0.917
2.00	1.09	185.15	1.106	1.113	7-M2c	0.701	0.619	0.619	0.325	2.344	1.232
2.71	1.17	185.21	1.174	1.161	7-M2c	0.749	0.640	0.640	0.393	2.411	1.378
3.61	1.23	185.28	1.242	1.209	7-M2c	0.900	0.658	0.658	0.472	2.475	1.528
4.51	1.29	185.34	1.303	1.252	7-M2c	0.900	0.673	0.673	0.545	2.531	1.655
5.41	1.34	185.40	1.359	1.292	7-M2c	0.900	0.686	0.686	0.613	2.581	1.764
6.30	1.39	185.45	1.412	1.332	7-M2c	0.900	0.697	0.697	0.678	2.626	1.860
7.20	1.43	185.50	1.461	1.372	3-M2t	0.900	0.707	0.740	0.740	2.556	1.947
8.10	1.47	185.55	1.509	1.436	7-M2t	0.900	0.716	0.800	0.800	2.459	2.026
9.00	1.51	185.59	1.555	1.522	7-M2t	0.900	0.724	0.858	0.858	2.408	2.098

****

Straight Culvert

Inlet Elevation (invert): 184.04 m,   Outlet Elevation (invert): 183.87 m

Culvert Length: 12.38 m,   Culvert Slope: 0.0137

****

Water Surface Profile Plot for Culvert: 900DWY

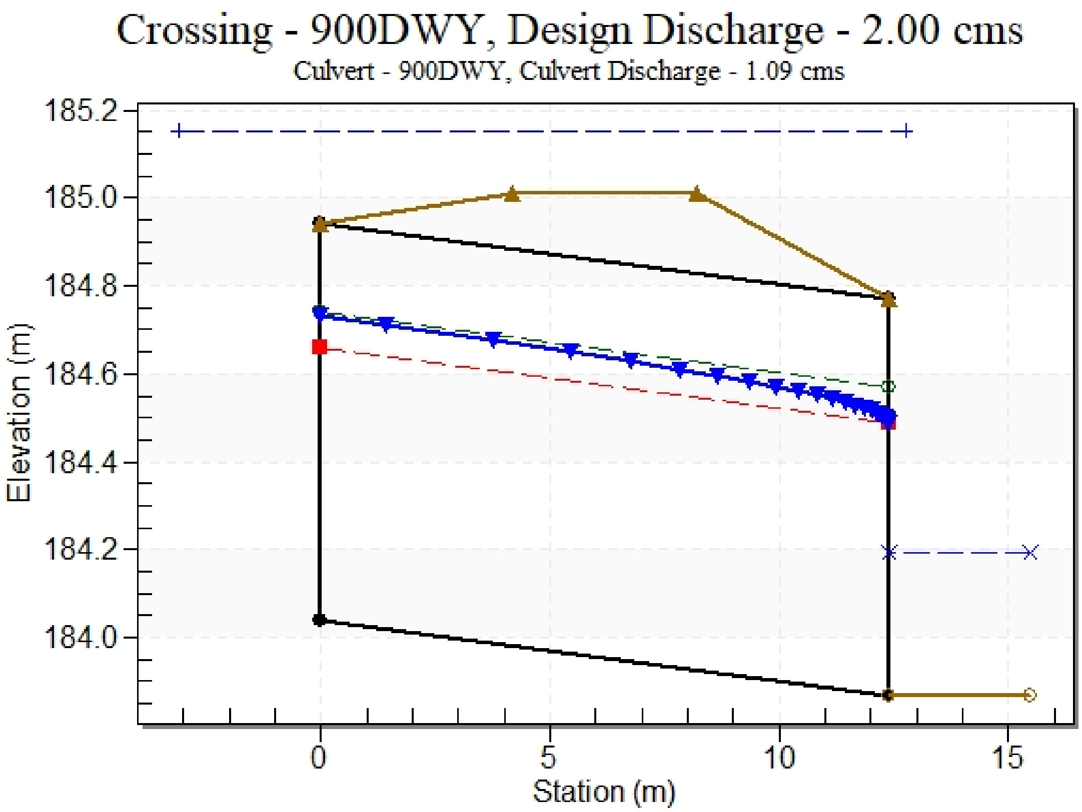


Table 23 - Downstream Channel Rating Curve (Crossing: 900DWY)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.01	183.89	0.02	0.18	3.23	0.45
0.91	184.07	0.20	0.92	39.07	0.66
2.00	184.19	0.32	1.23	63.66	0.69
2.71	184.26	0.39	1.38	77.14	0.70
3.61	184.34	0.47	1.53	92.58	0.71
4.51	184.41	0.54	1.65	106.81	0.72
5.41	184.48	0.61	1.76	120.19	0.72
6.30	184.55	0.68	1.86	132.90	0.72
7.20	184.61	0.74	1.95	145.07	0.72
8.10	184.67	0.80	2.03	156.82	0.72
9.00	184.73	0.86	2.10	168.20	0.72

Tailwater Channel Data - 900DWY

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 m

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 183.87 m

Roadway Data for Crossing: 900DWY

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 185.01 m

Roadway Surface: Paved

Roadway Top Width: 4.00 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.52972 cfs

Design Flow: 70.6293 cfs

Maximum Flow: 317.832 cfs

Table 24 - Summary of Culvert Flows at Crossing: 900DWY

Headwater Elevation (m)	Total Discharge (cms)	900DWY Discharge (cms)	Roadway Discharge (cms)	Iterations
184.15	0.01	0.01	0.00	1
185.02	0.91	0.89	0.02	10
185.15	2.00	1.09	0.90	5
185.21	2.71	1.17	1.54	5
185.28	3.61	1.23	2.37	4
185.34	4.51	1.29	3.21	4
185.40	5.41	1.34	4.06	4
185.45	6.30	1.39	4.91	4
185.50	7.20	1.43	5.77	4
185.55	8.10	1.47	6.63	3
185.59	9.00	1.51	7.49	3
185.01	0.87	0.87	0.00	Overtopping

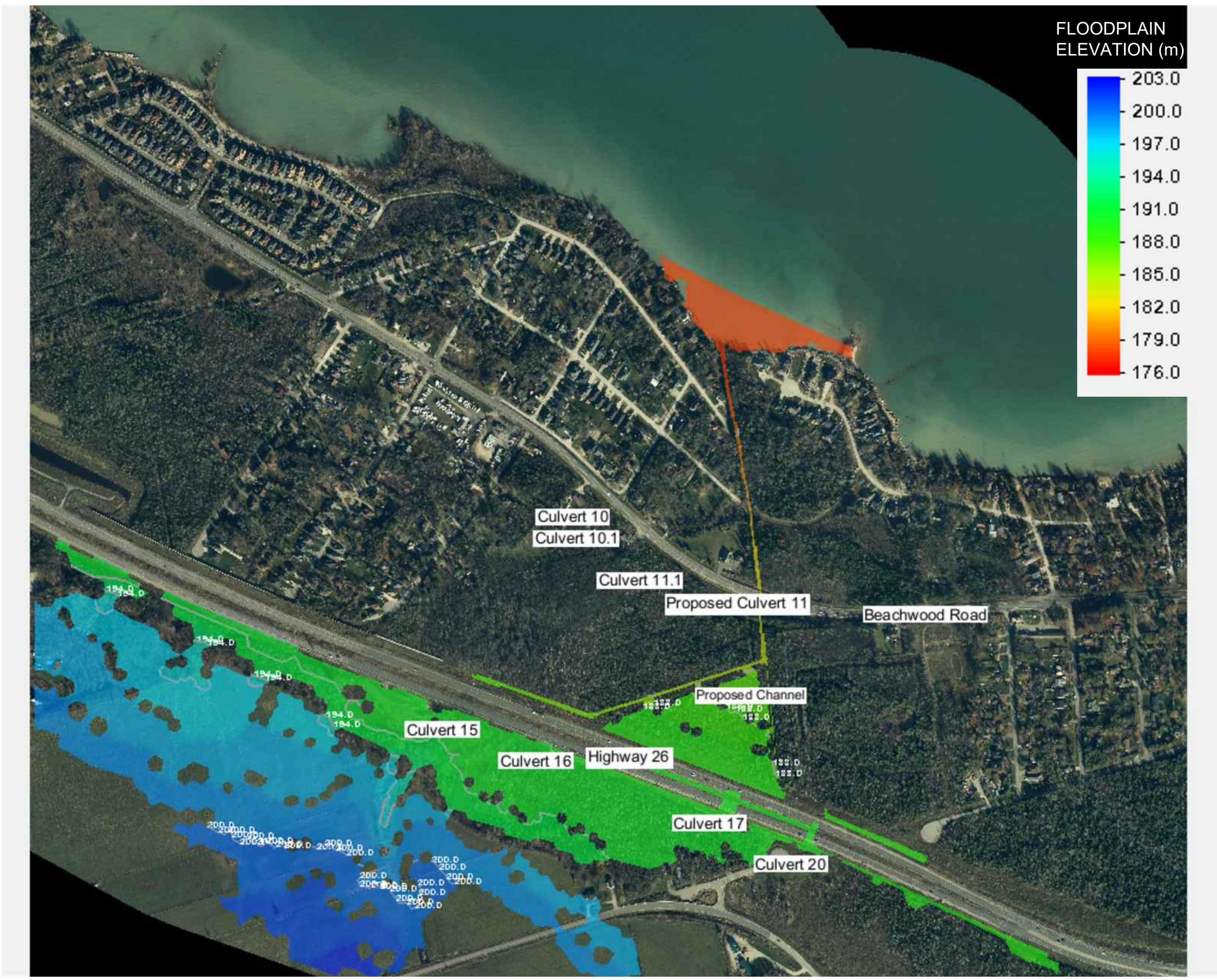
BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

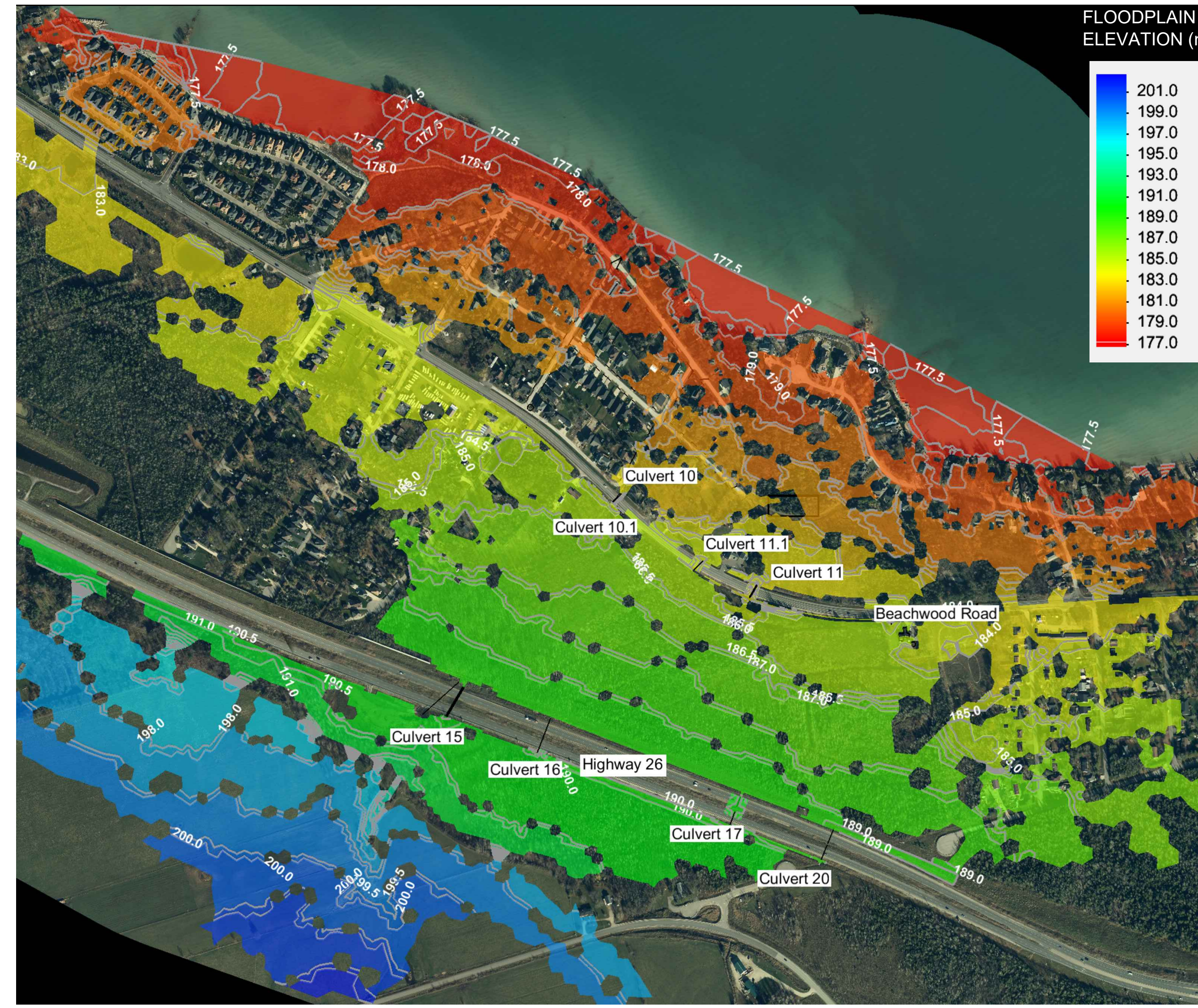
Appendix D

Conceptual Design

Appendix D



a) FLOODPLAIN WITH PROPOSED DRAINAGE CHANNEL



b) EXISTING CONDITION FLOODPLAIN

BURNSIDE	Figure Title: **SUNRAY LIVING BEACHWOOD FLOODPLAIN STUDY** PROPOSED DRAINAGE CHANNEL FLOODPLAIN VS. EXISTING CONDITION FLOODPLAIN			
Client: **SUNRAY GROUP**	Drawn: RW	Checked: TK	Date: AUGUST 18, 2022	Figure No. **14**
	Scale: NTS		Project No. 300052877.1000	

File: \\collingwood\Shared Work Areas\052877.1000 - NVCA Floodplain Study\04_MiscDwg\220405 SMS REPORT FIGURES.dwg Date Plotted: August 18, 2022 - 12:00 PM

Project Name:	Beachwood Floodplain
Project No.:	300052722
Completed By:	R.Walton
Checked By:	T.Koen
Date:	22/08/18

BURNSIDE

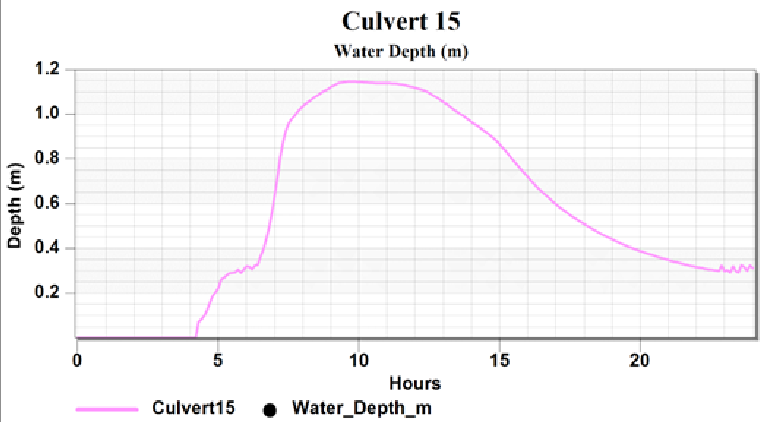
HY8 and SMS2D Culvert Comparison - with Cutoff Channel

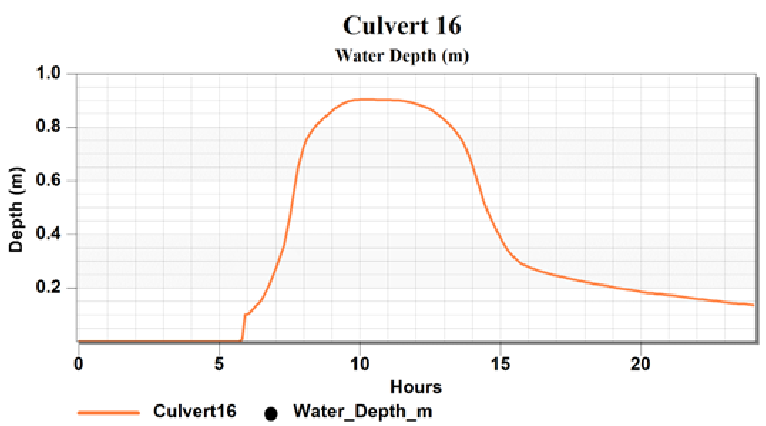
Culvert	**Size**	Location	**Surveyed Invert (m)**	**SMS Peak Depth (m)**	**Headwater Elevation (Invert + SMS Depth) (m)**	**HY8 Flow @ SMS Headwater Elevation (m^3/s)**	**HY8 Headwater Depth at Peak Flow (m)**
15	1200x2400 Box	HWY26	189.1	1.1462	190.25	4	1.15
16	1050	HWY26	189.31	0.9043	190.21	1.2	0.9
17	1050	HWY26	189.123	0.7597	189.88	0.85	0.76
20	750	HWY26	188.68	0.7541	189.43	0.63	0.75
Proposed Culvert 11	TWIN 3000 x 1500 Box	Beachwood*	182.76	0.9414	183.70	7.5	0.94
11.1	750	Beachwood	183.81	0	183.81	0	0
10	1200x1500 Box	Beachwood	183.58	0	183.58	0	0
10.1	900	Beachwood Driveway	184.04	0	184.04	0	0
Total Peak Flow Crossing HWY 26 from HY8						**6.68**	
Total Peak Flow Crossing Beachwood from HY8						**7.5**	

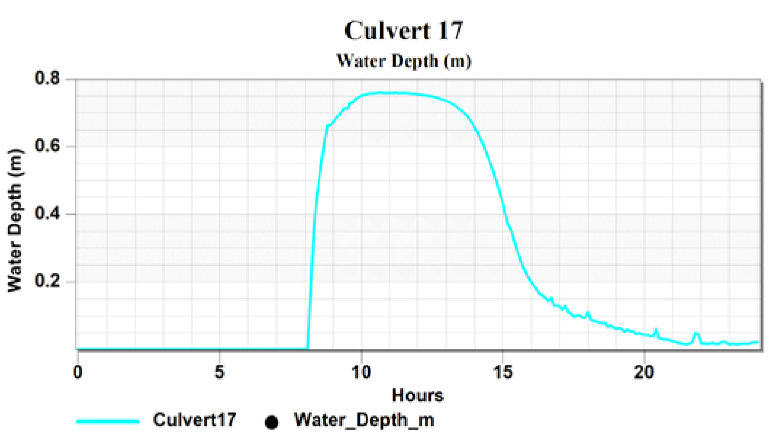
***proposed invert**

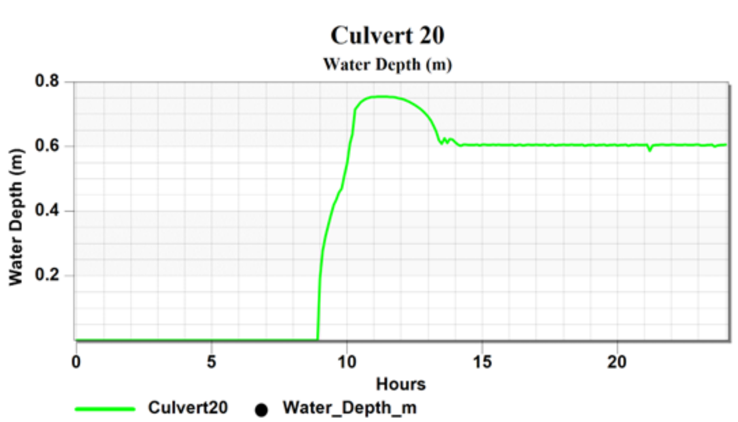
Culvert Headwater Depth vs Time under the Regional Storm Event Flow from SMS 2D Observation Points - Proposed Channel Results

Culvert Crossings under Highway 26

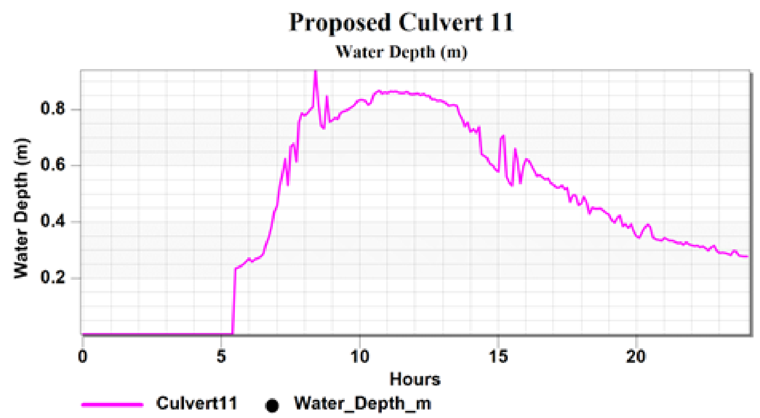


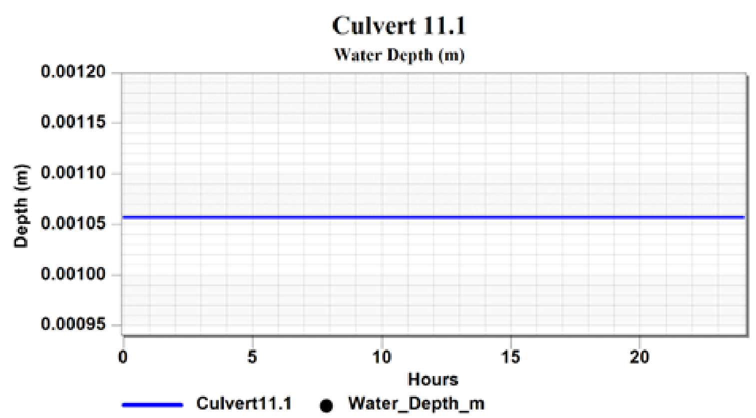


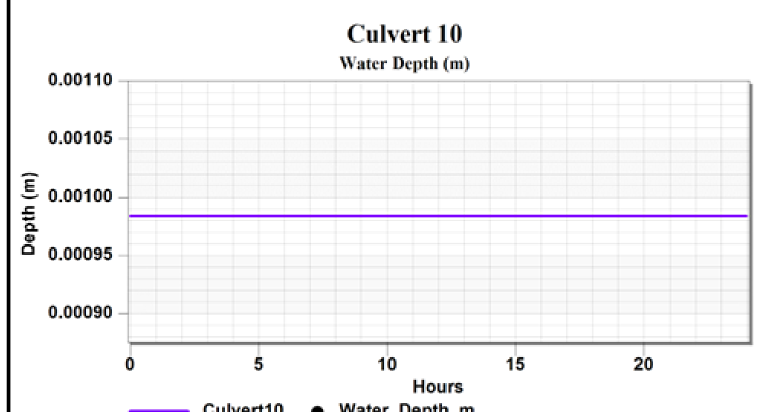




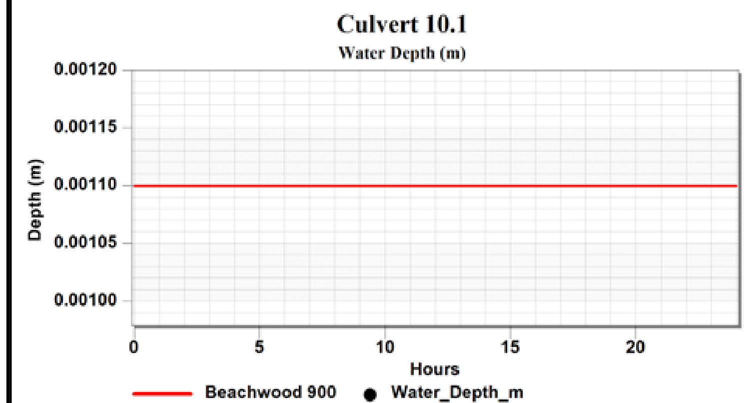
Culvert Crossings under Beachwood Road

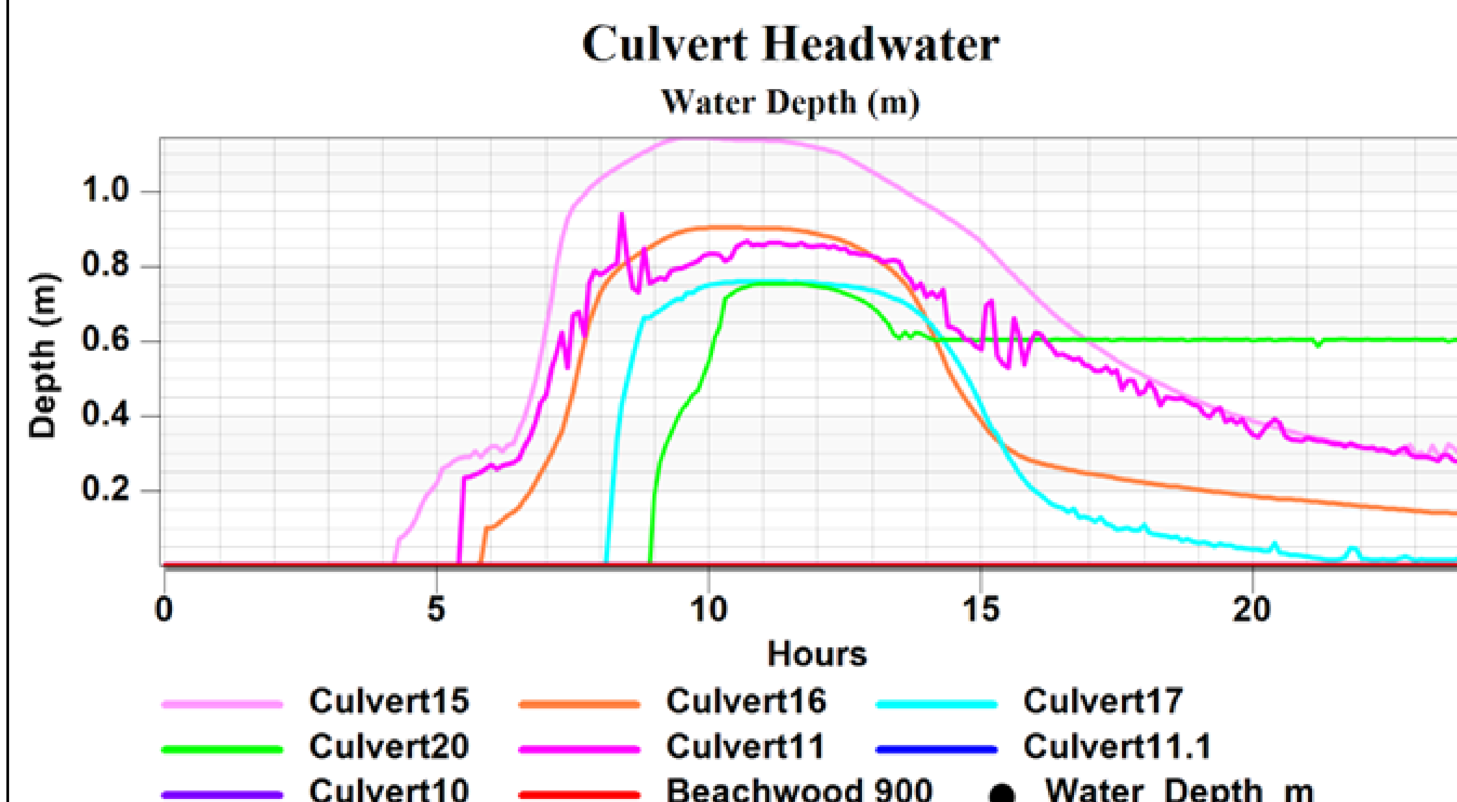






Beachwood Road Driveway Culvert east of Culvert 10





HY-8 Culvert Analysis Report

Site Data - Culvert 11PROP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 182.61 m

Outlet Station: 26.70 m

Outlet Elevation: 182.35 m

Number of Barrels: 2

Culvert Data Summary - Culvert 11PROP

Barrel Shape: Concrete Box

Barrel Span: 3000.00 mm

Barrel Rise: 1500.00 mm

Barrel Material: Concrete

Embedment: 150.00 mm

Barrel Manning's n: 0.0240 (top and sides)

Manning's n: 0.0240 (bottom)

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 1 - Culvert Summary Table: Culvert 11PROP

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.17	0.17	182.83	0.067	0.075	3-M1t	0.049	0.043	0.061	0.061	0.464	0.430
1.05	1.05	183.01	0.249	0.253	3-M1t	0.156	0.146	0.180	0.180	0.973	0.854
1.94	1.94	183.14	0.374	0.381	3-M1t	0.229	0.220	0.258	0.258	1.252	1.062
2.82	2.82	183.25	0.480	0.490	3-M1t	0.292	0.282	0.321	0.321	1.464	1.210
3.70	3.70	183.35	0.576	0.588	3-M1t	0.348	0.339	0.376	0.376	1.643	1.327
4.58	4.58	183.44	0.664	0.679	3-M1t	0.400	0.390	0.425	0.425	1.800	1.426
5.47	5.47	183.52	0.745	0.764	3-M1t	0.449	0.439	0.469	0.469	1.941	1.511
6.35	6.35	183.60	0.821	0.844	3-M1t	0.496	0.485	0.511	0.511	2.071	1.586
7.23	7.23	183.68	0.893	0.921	3-M1t	0.541	0.529	0.550	0.550	2.192	1.654
8.90	8.90	183.82	1.023	1.057	3-M2t	0.622	0.608	0.618	0.618	2.401	1.766
9.00	9.00	183.82	1.030	1.065	3-M2t	0.627	0.612	0.622	0.622	2.412	1.773

****

Straight Culvert

Inlet Elevation (invert): 182.76 m, Outlet Elevation (invert): 182.50 m

Culvert Length: 26.70 m, Culvert Slope: 0.0097

****

Water Surface Profile Plot for Culvert: Culvert 11PROP

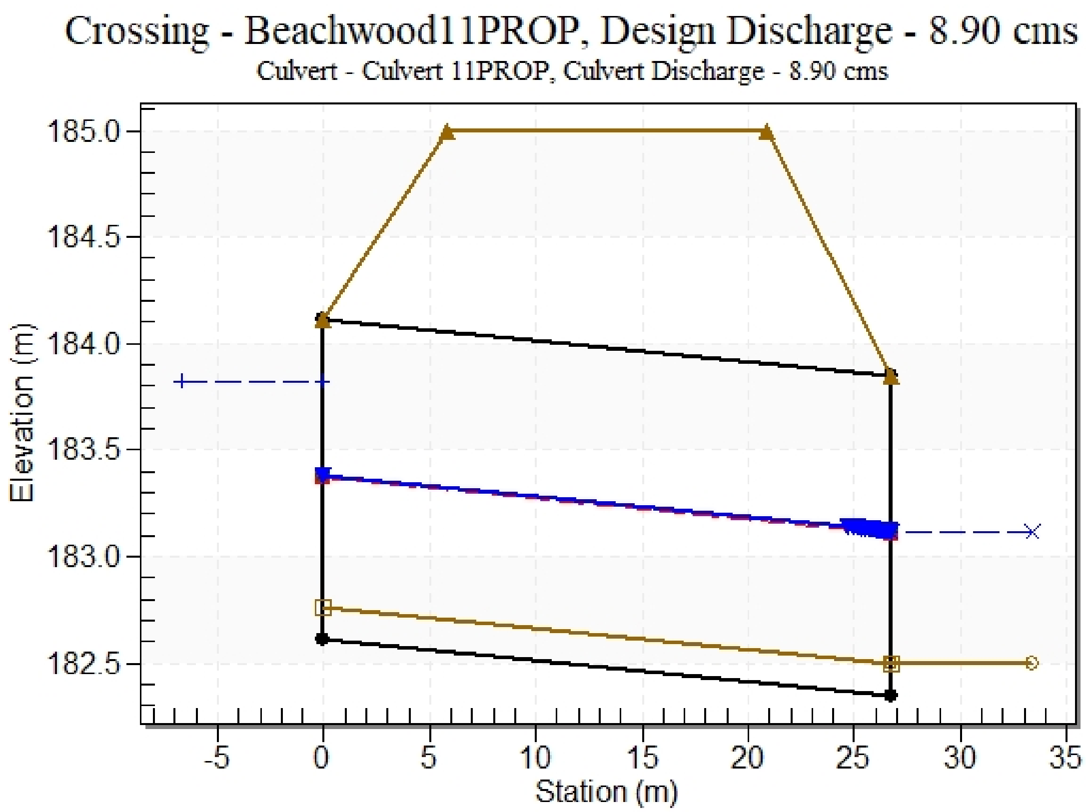


Table 2 - Downstream Channel Rating Curve (Crossing: Beachwood11PROP)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.17	182.56	0.06	0.43	11.96	0.56
1.05	182.68	0.18	0.85	35.35	0.67
1.94	182.76	0.26	1.06	50.54	0.70
2.82	182.82	0.32	1.21	62.90	0.73
3.70	182.88	0.38	1.33	73.62	0.74
4.58	182.92	0.42	1.43	83.23	0.75
5.47	182.97	0.47	1.51	92.04	0.77
6.35	183.01	0.51	1.59	100.19	0.77
7.23	183.05	0.55	1.65	107.84	0.78
8.90	183.12	0.62	1.77	121.14	0.79
9.00	183.12	0.62	1.77	121.90	0.80

Tailwater Channel Data - Beachwood11PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 6.30 m

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0500

Channel Invert Elevation: 182.50 m

Roadway Data for Crossing: Beachwood11PROP

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 m

Crest Elevation: 185.00 m

Roadway Surface: Paved

Roadway Top Width: 15.00 m

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 6.00349 cfs

Design Flow: 314.301 cfs

Maximum Flow: 317.832 cfs

Table 3 - Summary of Culvert Flows at Crossing: Beachwood11PROP

Headwater Elevation (m)	Total Discharge (cms)	Culvert 11PROP Discharge (cms)	Roadway Discharge (cms)	Iterations
182.83	0.17	0.17	0.00	1
183.01	1.05	1.05	0.00	1
183.14	1.94	1.94	0.00	1
183.25	2.82	2.82	0.00	1
183.35	3.70	3.70	0.00	1
183.44	4.58	4.58	0.00	1
183.52	5.47	5.47	0.00	1
183.60	6.35	6.35	0.00	1
183.68	7.23	7.23	0.00	1
183.82	8.90	8.90	0.00	1
183.82	9.00	9.00	0.00	1
185.00	24.35	24.35	0.00	Overtopping

STA 0+000 TO STA 0+560

CHAINAGE	EXIST CENTERLINE ELEVATION	PROP CENTERLINE ELEVATION
0+000	189.59	188.000
0+020	189.24	187.695
0+040	189.31	187.390
0+060	189.31	187.085
0+080	189.38	186.948
0+100	189.42	186.811
0+120	189.08	186.674
0+140	189.07	186.536
0+160	189.12	186.399
0+180	189.08	186.262
0+200	189.03	186.125
0+220	189.02	185.988
0+240	189.09	185.851
0+260	189.12	185.713
0+280	189.10	185.576
0+300	189.00	185.439
0+320	188.89	185.302
0+340	188.76	185.165
0+360	188.58	185.028
0+380	188.41	184.890
0+400	188.16	184.753
0+420	187.95	184.616
0+440	187.82	184.479
0+460	187.63	184.342
0+480	187.34	184.205
0+500	187.05	184.067
0+520	186.82	183.930
0+540	186.67	183.793
0+560	186.53	183.656

Notes
1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
0	ISSUED FOR COORDINATION	22/07/22	MZ

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

Client
SUNRAY GROUP
701-515 CONSUMERS ROAD
NORTH YORK, ON
M2J 4Z2

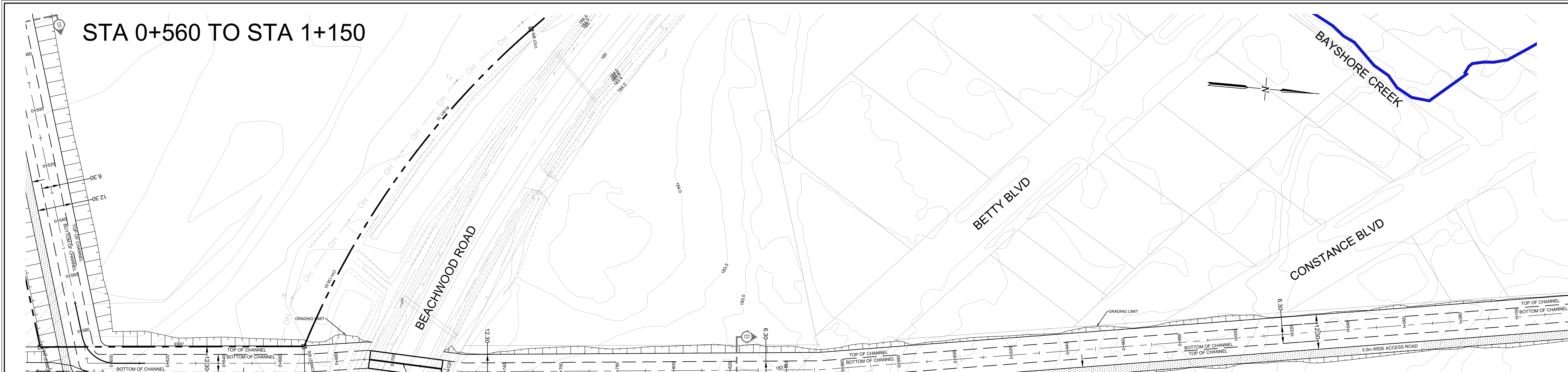
Drawing Title
BEACHWOOD DRAINAGE & FLOODING IMPROVEMENTS

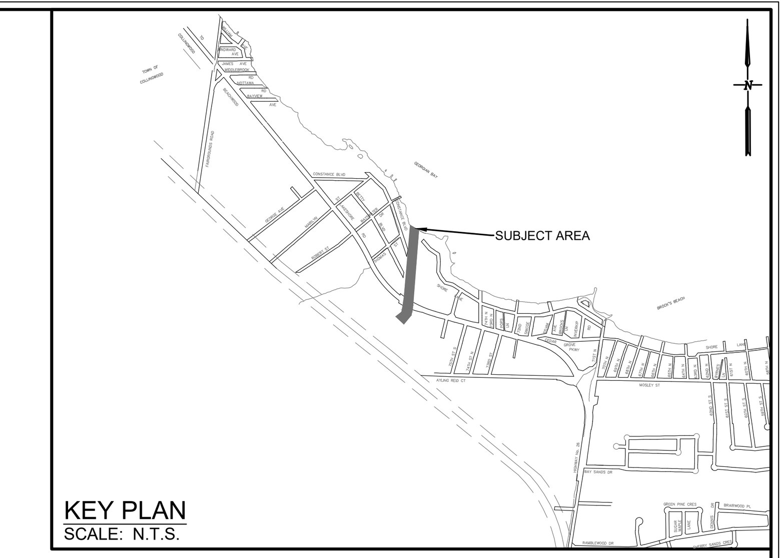
PRELIMINARY FLOOD CHANNEL CONFIGURATION

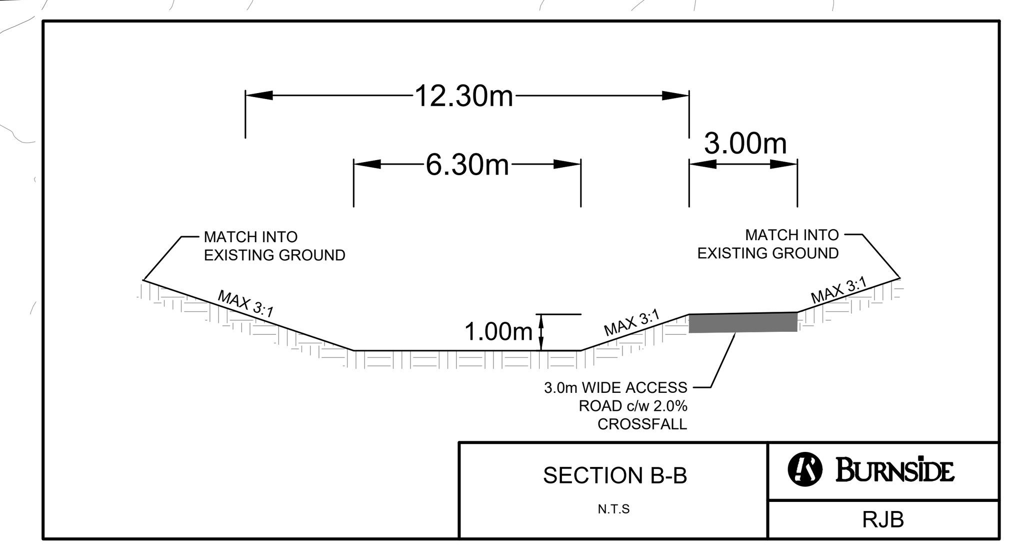
Drawn	Checked	Designed	Checked	Date	Drawing No.
MH	MZ	MZ	TK/RW	22/07/20	C1

Project No. 300052877.1000
Contract No. -
Revision No. 0
Scale 1:750

STA 0+560 TO STA 1+150







CHAINAGE	EXIST\PROP CENTERLINE ELEVATION	
0+560	186.53	183.656
0+580	186.17	183.519
0+600	185.59	183.381
0+620	185.20	183.244
0+640	185.21	183.107
0+660	184.87	182.970
0+680	184.66	182.833
0+700	185.15	182.670
0+720	183.57	182.467
0+740	183.75	182.201
0+760	183.14	181.935
0+780	183.09	181.670
0+800	183.24	181.404
0+820	182.99	181.138
0+840	183.00	180.873
0+860	182.45	180.607
0+880	181.61	180.342
0+900	180.53	180.076
0+920	180.46	179.810
0+940	180.79	179.545
0+960	180.42	179.279
0+980	180.20	179.014
1+000	180.38	178.748
1+020	179.35	178.482
1+040	178.97	178.217
1+060	178.91	177.951
1+080	179.00	177.685
1+100	178.20	177.420
1+120	178.00	177.154
1+140	178.47	176.889
1+153.10	176.75	

Notes
1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
0	ISSUED FOR COORDINATION	22/07/22	MZ

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

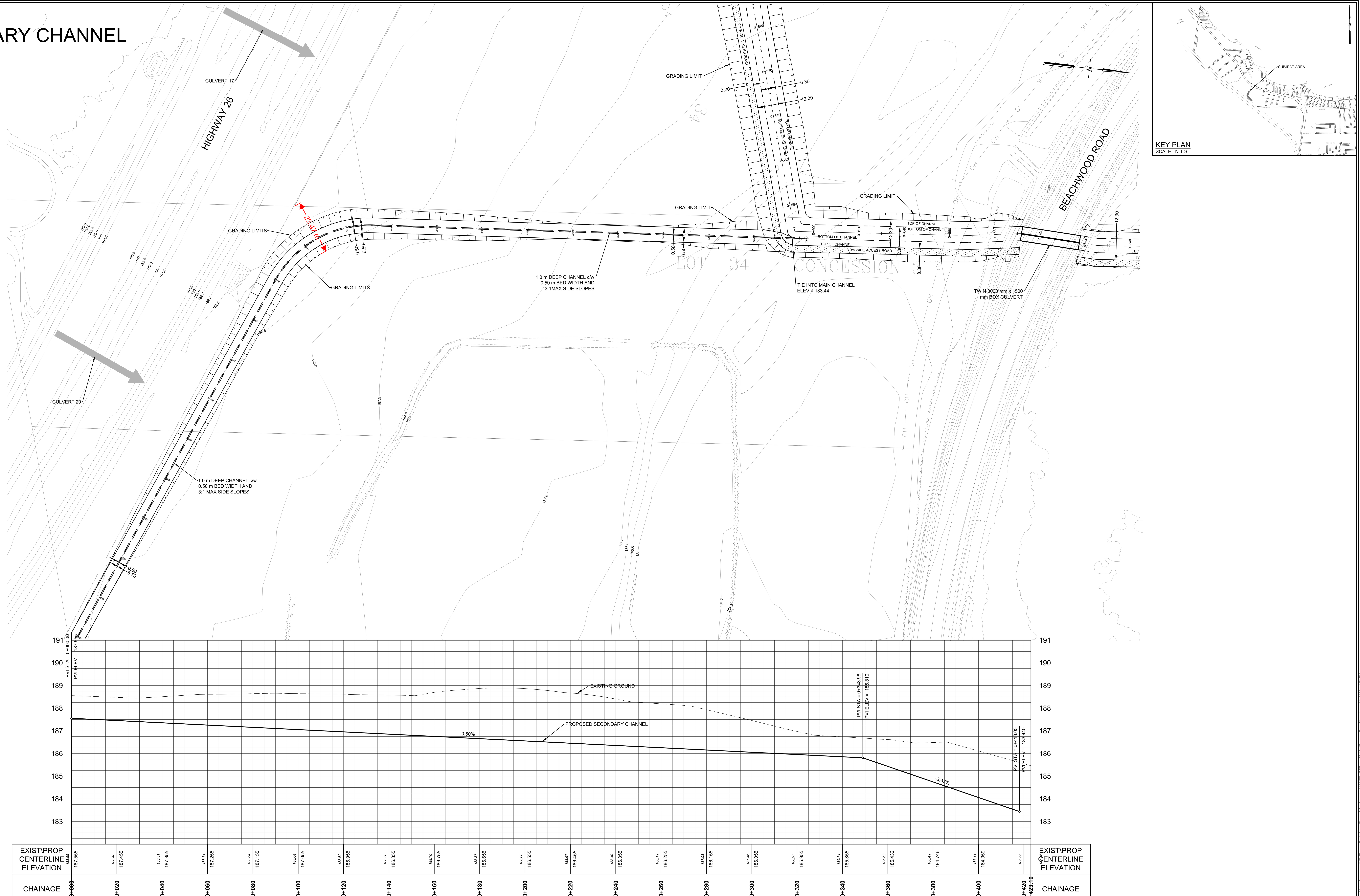
Client
SUNRAY GROUP
701-515 CONSUMERS ROAD
NORTH YORK, ON
M2J 4Z2

Drawing Title
BEACHWOOD DRAINAGE & FLOODING IMPROVEMENTS

PRELIMINARY FLOOD CHANNEL CONFIGURATION

Drawn	Checked	Designed	Checked	Date	Drawing No.
MH	MZ	MZ	TK/RW	22/07/20	C2
Project No. 300052877.1000		Contract No. -		Revision No. 0	
Scale 1:750		0 10 20 40m			

SECONDARY CHANNEL



No.	Issue / Revision	Date	Auth.
0	ISSUED FOR COORDINATION	22/07/22	MZ

Notes

1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

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

Client
SUNRAY GROUP
701-515 CONSUMERS ROAD
NORTH YORK, ON
M2J 4Z2

Drawing Title
BEACHWOOD DRAINAGE & FLOODING IMPROVEMENTS

PRELIMINARY FLOOD CHANNEL CONFIGURATION

Drawn	Checked	Designed	Checked	Date	Drawing No.
MH	MZ	MZ	TK/RW	22/07/20	C3
Project No. 300052877.1000		Contract No. -		Revision No. 0	
Scale 1:750		0 10 20 40m			

File: \\COLLINGWOOD\Shared Work Areas\052877 - Sunray Living Beachwood\07_Figures\

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Digital Files

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (519) 941-8120 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Technical Memorandum

Date: August 2, 2023 **Project No.:** 300052877.1000

Project Name: 8859 Beachwood Road

Client Name: Sunray Living Inc.

Submitted To: Nottawasaga Valley Conservation Authority (NVCA)

Submitted By: Rachel Walton, P.Eng., MASc.

Reviewed By: James Orr, P.Eng.

1.0 Introduction

Sunray Living Inc. (Sunray) has retained R.J. Burnside & Associates Limited (Burnside) to provide engineering services to support the development of 8859 Beachwood Road, in the Town of Wasaga Beach (ToWB).

Burnside had previously prepared a 2D Floodplain study (8859 Beachwood Road; West End Existing Floodplain Analysis, dated December 15, 2022) to determine the extents of the existing Regulatory Floodplain within 8859 Beachwood Road. While this study was completed as a requisite document in support of development application(s), the study showed that the Floodplain impacted not only the subject Sunray property, but the majority of the study area (as determined by consultation with the NVCA), which included many existing residential areas and future developments. The subject property and the study area is shown in Figure 1 below. The broader study area has been the focus of various drainage studies completed by the Town due to the historical flooding issues, including, most notably, the ongoing EA for Constance and Thomas Street.

Through the Burnside Flood Report, it was further contemplated and demonstrated that a diversion channel could be constructed through the Sunray lands and downstream properties to contain the Regulatory Floodplain and divert Regional runoff to Georgian Bay, providing protection to the existing and proposed future developments within the existing floodplain. Through extensive consultation with ToWB and the Nottawasaga Valley Conservation Authority (NVCA), the Regulatory diversion channel has been approved in concept for further consideration through the Thomas / Constance EA. This was confirmed by NVCA in in a letter dated April 21, 2023.

Therefore, this technical memorandum has been prepared subsequent to the original West End Existing Floodplain Analysis to clarify and summarize the hydrology calculations performed since the original report, to indicate how the Regional peak flow contributing to the proposed diversion channel was determined. The design catchments and resulting peak flows were very close between a number of related studies as listed below, however, per ToWB and NVCA comments, there was a need to address the minor discrepancies to ensure that all parties were confident with the assumptions used in the design of the channel, prior to this information been inserted into the EA process, where land requirements for the channel need to be confirmed.

The followings studies have been reviewed and considered within the calculations performed:

- Drainage, Hydrology and Stormwater Management Report, Preliminary Design, Highway 26 new Alignment between Collingwood and Wasaga, prepared by Delcan, dated July 3, 2009.
- Drainage Update of Existing Highway 26, Existing Highway 26 between Collingwood and Wasaga Beach (Huronia to Mosley Street), prepared by Delcan, dated September 2013.
- West End Water Tower and Public Works Depot Drainage Study, prepared by Ainley Group, dated May 1, 2021.
- Drainage Master Plan West End Drainage Assessment, Town of Wasaga Beach, prepared by Tatham Engineering, dated August 3, 2022.
- Drainage Master Plan Existing Conditions Report, Town of Wasaga Beach, prepared by Tatham Engineering, dated November 18, 2022.
- West End Drainage Assessment Overall Drainage Plan and TOWB – Regional Storm VO Output, prepared by Tatham Engineering, provided in email from Daniel Twigger on July 14, 2023.

Study Area

2.0 Hydrologic Model

2.1 Input Values

PCSWMM was chosen as the hydrologic model for the study area. The 2D Floodplain Study prepared by Burnside provides a discussion on the previous hydrologic modelling completed for the study area and the decision to move forward with the PCSWMM model.

Following the completion and submission of the 2D Floodplain Study, various meetings with the NVCA, Wasaga Beach, Tatham Engineering (Tatham) and Ainley Group (Ainley) have occurred to ensure the needs of the various external developments contributing to the proposed drainage corridor are adequately addressed. Each of the studies listed in Section 1.0 above have assessed the overall study area for the purpose of their development. Through various discussions it was determined that one overall flow needed to be agreed upon for the design of the drainage channel.

The calculations performed within this technical memorandum have considered the specific design of the channel, looking at the external areas contributing to the channel only (not the entire study areas that are subject of some of the other studies), since this is the specific scope at hand.

Table 1 below summarizes each of the catchments and their hydrologic values. Figure 1 enclosed illustrates the locations of the catchment areas. Catchment areas have been determined based on a review of the previous studies performed as well as verification using LiDAR data (provided by Wasaga) where available. Calculations to support the hydrologic input values have been enclosed.

Table 1 – Catchment Input Values

Catchment	Area (ha)	CN	Impervious (%)	Slope (%)	Length (m)
HWY26	267	70	1	1	3458
MTO	5.75	60	25	0.77	260
Sunray	15.5	48	7	1.6	400
PW	11.6	50	5	1.1	396
Rom	4.62	44	1	1.72	160
Beach	1.30	48	8	1.5	100
TC	4.03	44	1	1.15	330

A proxy drainage channel was input into the PCSWMM model to provide a more accurate representation of how each catchment contributes runoff to the channel.

The Timmins Regional Storm was simulated in the PCSWMM model.

2.2 Model Results

Table 2 below outlines the Regional Storm peak flow from each catchment. Figure 2 enclosed shows the resultant flow from each catchment in the PCSWMM model.

Table 2 – Regional Peak Flow Values

Catchment	Regional Storm (m^3/s)
HWY26	11.33
MTO	0.45
Sunray	0.87
PW	0.52
Rom	0.22
Beach	0.08
TC	0.14

The following Table 3 provides a summary of the peak flow experienced at each of the channel nodes.

Table 3 – Regional Peak Flows Contributing to the Drainage Channel

Node	Contributing Catchment	Regional Storm (m^3/s)
J2	HWY26	11.33
J3		11.31
J4	MTO, PW	11.99
J5	Sunray	12.56
J6		12.56
J7	Rom, Beach	12.76
J8	TC	12.88
Outfall		12.88

The flows summarized above have been used to determine the required channel block size.

3.0 Conclusion

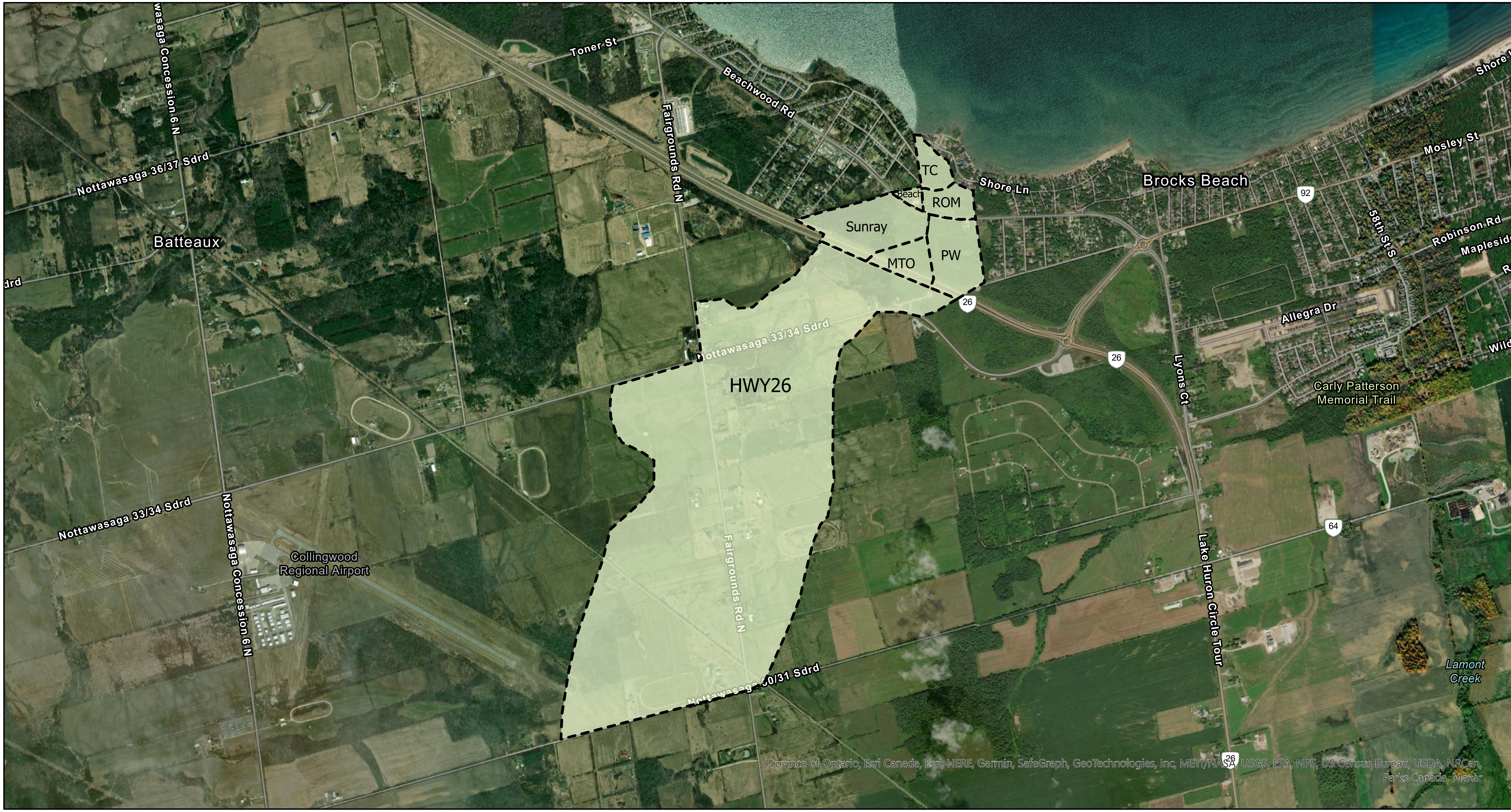
Burnside has reviewed the relevant drainage studies, assessed the key differences, and updated the hydrologic modelling to determine the Regional Storm peak flow contributing to the proposed drainage channel. The flows summarized above in Table 3 have been used to design the proposed channel and determine the required drainage channel block sizes in each of the land parcels, including Sunray, Beachwood Terrace, MTO, Romanin, and TC Energy.

R.J. Burnside & Associates Limited

Rachel Walton, P.Eng., MASc.
Project Engineer
RW:"[Type Admin Initials]"

Enclosure(s) Fig 1 – Catchment Area
Fig 2 – PCWMM Output Summary
PCSWMM Input Calculations
PCSWMM Model Output

cc: "[Type Name]"



Datum:	
Coord. System:	
Projection:	
Central Meridian:	
False Easting: m	False Northing: m
Page Orientation: °	Scale Factor:

N

Grid North

0 0.17 0.35 0.7 1.05 1.4 Kilometers

BURNSIDE

Figure Title

8859 BEACHWOOD ROAD

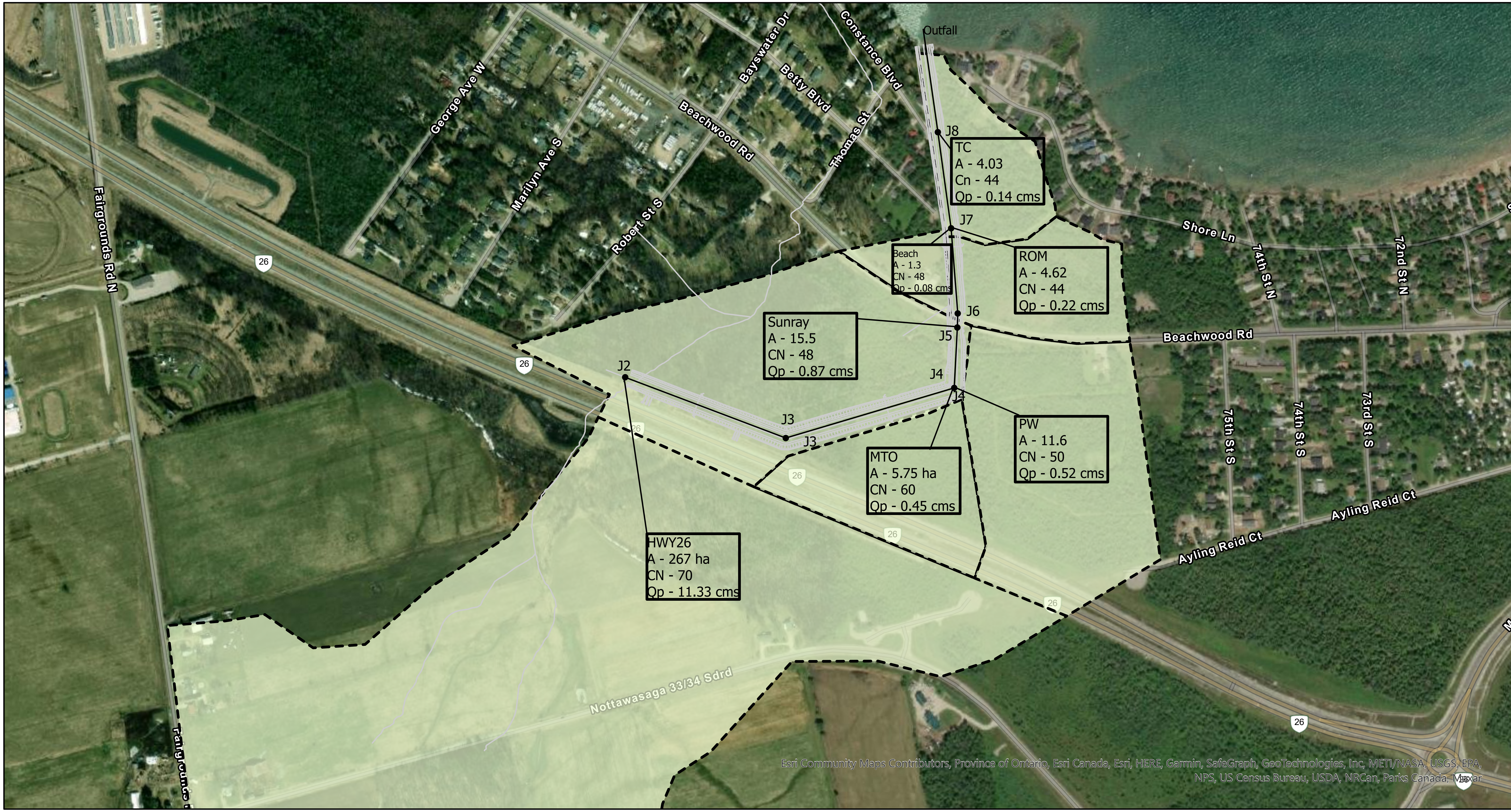
CHANNEL CATCHMENT AREAS

Client

SUNRAY LIVING INC.

Drawn	Checked	Date	Figure No.
RW	JO	2023/08/02	1
Scale		Project No.	
H 1:24,000		300052877.1000	

File Path: C:\Users\RWalton\Documents\052877- Beachwood Floodplain\GIS\Beachwood GIS\Beachwood GIS.aprx Print Date: 2023/08/02 Time: 10:46 AM



Datum:
Coord. System:
Projection:
Central Meridian:
False Easting: m | False Northing: m
Page Orientation: ° | Scale Factor:

N
Grid North

0 0.05 0.1 0.2 0.3 0.4 Kilometers

BURNSIDE

Client
SUNRAY LIVING INC.

Figure Title
8859 BEACHWOOD ROAD
PCSWMM MODEL SUMMARY

Drawn	Checked	Date	Figure No.
RW	JO	2023/08/02	2
Scale		Project No.	
H 1:24,000		300052877.1000	

File Path: C:\Users\RWalton\Documents\052877- Beachwood Floodplain\GIS\Beachwood GIS\Beachwood GIS.aprx Print Date: 2023/08/02 Time: 01:32 PM

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **HWY26**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B	30	81	153		3	
BC						
C						
CD						
D						

Total area (ha):	267.0	Composite CN(I):	49	Ia (mm) NVCA	7.6
Pervious area (ha):	264.0	Composite CN(II):	70	Ia (mm) NRSCS	22.8
Impervious area (ha):	3.0	Composite CN(III):	84		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			153.00				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			81.00				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			30.00				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area			3.00				
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	267.00
Runoff Coefficient	0.27
Length (m)	3458
h_1 (m)	234.58
h_2 (m)	200
Dh (m)	34.58
Slope (%)	1.00

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		158.18	60.73	90.65		112.45
Tp (hr)		1.77	0.68	1.01		1.26

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	157.91	498.45				125.29
Tp (hr)	1.76	5.57				1.40

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **MTO**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB	4				1.75	
B						
BC						
C						
CD						
D						

Total area (ha):	5.8	Composite CN(I):	39	Ia (mm) NVCA	7.6
Pervious area (ha):	4.0	Composite CN(II):	60	Ia (mm) NRSCS	33.9
Impervious area (ha):	1.8	Composite CN(III):	78		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope							
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope		4.00					
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area		1.75					
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	5.75
Runoff Coefficient	0.38
Length (m)	260
h_1 (m)	189
h_2 (m)	187
Dh (m)	2
Slope (%)	0.77

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		41.06	13.79	20.58		16.15
Tp (hr)		0.46	0.15	0.23		0.18

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	40.96	91.19				10.74
Tp (hr)	0.46	1.02				0.12

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

BURNSIDE

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **Sunray**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB	14.35				1.15	
B						
BC						
C						
CD						
D						

Total area (ha):	15.5	Composite CN(I):	28	Ia (mm) NVCA	9.4
Pervious area (ha):	14.4	Composite CN(II):	48	Ia (mm) NRSCS	55.0
Impervious area (ha):	1.2	Composite CN(III):	68		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope							
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			14.35				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area			1.15				
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	15.50
Runoff Coefficient	0.25
Length (m)	410
h_1 (m)	191.2
h_2 (m)	184.7
Dh (m)	6.5
Slope (%)	1.59

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		48.15	17.74	26.48		17.39
Tp (hr)		0.54	0.20	0.30		0.19

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	48.14	125.27				11.80
Tp (hr)	0.54	1.40				0.13

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

BURNSIDE

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **PW**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB	10.44				1.15	
B						
BC						
C						
CD						
D						

Total area (ha):	11.6	Composite CN(I):	29	Ia (mm) NVCA	9.2
Pervious area (ha):	10.4	Composite CN(II):	49	Ia (mm) NRSCS	52.9
Impervious area (ha):	1.2	Composite CN(III):	69		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope							
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope		10.44					
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area		1.15					
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	11.59
Runoff Coefficient	0.22
Length (m)	396
h_1 (m)	189
h_2 (m)	184.6
Dh (m)	4.4
Slope (%)	1.11

0.10

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		55.28	16.96	25.31		19.47
Tp (hr)		0.62	0.19	0.28		0.22

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	55.21	140.58				13.61
Tp (hr)	0.62	1.57				0.15

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **PW**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB	4.62					
B						
BC						
C						
CD						
D						

Total area (ha):	4.6	Composite CN(I):	25	Ia (mm) NVCA	10.0
Pervious area (ha):	4.6	Composite CN(II):	44	Ia (mm) NRSCS	64.7
Impervious area (ha):	0.0	Composite CN(III):	64		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope							
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope		4.62					
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	4.62
Runoff Coefficient	0.14
Length (m)	160
h_1 (m)	183.5
h_2 (m)	180.75
Dh (m)	2.75
Slope (%)	1.72

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		33.16	10.76	16.05		8.01
Tp (hr)		0.37	0.12	0.18		0.09

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	33.17	62.89				4.42
Tp (hr)	0.37	0.70				0.05

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

BURNSIDE

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: TC

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB	4.04					
B						
BC						
C						
CD						
D						

Total area (ha):	4.0	Composite CN(I):	25	Ia (mm) NVCA	10.0
Pervious area (ha):	4.0	Composite CN(II):	44	Ia (mm) NRSCS	64.7
Impervious area (ha):	0.0	Composite CN(III):	64		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope							
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope							
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	4.04						
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	4.04
Runoff Coefficient	0.08
Length (m)	330
h_1 (m)	180.6
h_2 (m)	176.8
Dh (m)	3.8
Slope (%)	1.15

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		57.63	11.04	16.48		16.62
Tp (hr)		0.64	0.12	0.18		0.19

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	57.56	137.11				11.14
Tp (hr)	0.64	1.53				0.12

Project Name:	Beachwood Floodplain
Project No.:	300052877.1
Location:	Town of Wasaga Beach
Created By:	R.Walton
Checked By:	T.Koen
Date Created:	6-Apr-2022
Date Modified:	2-Aug-2023

SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **Beach**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB	1.18				0.1	
B						
BC						
C						
CD						
D						

Total area (ha):	1.3	Composite CN(I):	28	Ia (mm) NVCA	9.4
Pervious area (ha):	1.2	Composite CN(II):	48	Ia (mm) NRSCS	55.0
Impervious area (ha):	0.1	Composite CN(III):	68		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			119.35				
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			60.00				
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			80.00				
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area							
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	259.35
Runoff Coefficient	0.25
Length (m)	100
h_1 (m)	184.5
h_2 (m)	183
Dh (m)	1.5
Slope (%)	1.50

Uplands Method	
Flow Path Cover	Short Grass Pasture
x	4.6

Kerby Method	
Rk =	0.4

Kinematic Wave/Izzard Method	
cr =	0.05
n =	0.05
i (mm/hr) =	210

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		24.16	55.36	82.62		5.83
Tp (hr)		0.27	0.62	0.92		0.07

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	24.15	41.43		15.48		2.96
Tp (hr)	0.27	0.46		0.17		0.03

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

PCSWMM analysis for comparison to Visual Otthymo Results

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ OCT-07-2013 00:00:00
Ending Date .............. OCT-08-2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec


WARNING 02: maximum depth increased for Node J2

WARNING 02: maximum depth increased for Node J3

WARNING 02: maximum depth increased for Node J4

WARNING 02: maximum depth increased for Node J7

WARNING 02: maximum depth increased for Node J8

*************
Element Count
*************
Number of rain gages ...... 8
Number of subcatchments ... 7
Number of nodes ........... 8
Number of links ........... 7
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
100Yr_SCS_Type_II_121mm	100yr_SCS_Type_II_121mm	INTENSITY	6 min.
10Yr_SCS_Type_II_84.3mm	10Yr_SCS_Type_II_84.3mm	INTENSITY	6 min.
25Yr_SCS_Type_II_99.2mm	25Yr_SCS_Type_II_99.2mm	INTENSITY	6 min.
2Yr_SCS_Type_II_54.9mm	2Yr_SCS_Type_II_54.9mm	INTENSITY	6 min.
50Yr_SCS_Type_II_110.1mm	50Yr_SCS_Type_II_110.1mm	INTENSITY	6 min.
5Yr_SCS_Type_II_72.6mm	5Yr_SCS_Type_II_72.6mm	INTENSITY	6 min.
Hurricane_Hazel_(Southern_Ontario)	Hurricane_Hazel_(Southern_Ontario)	INTENSITY	60 min.
Timmins_Storm_(0-25)	Timmins_Storm_(0-25)	INTENSITY	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
Beach	1.29	128.73	8.00	1.5000	Timmins_Storm_(0-25)	J7
HWY26	266.82	771.61	1.00	1.0000	Timmins_Storm_(0-25)	J2
MTO	5.75	221.00	25.00	0.7700	Timmins_Storm_(0-25)	J4
PW	11.57	292.15	5.00	1.1000	Timmins_Storm_(0-25)	J4
Rom	4.62	288.58	1.00	1.7000	Timmins_Storm_(0-25)	J7
Sunray	15.50	387.50	7.00	1.6000	Timmins_Storm_(0-25)	J5
TC	4.04	122.31	1.00	1.1000	Timmins_Storm_(0-25)	J8

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J2	JUNCTION	187.60	1.10	0.0	
J3	JUNCTION	185.50	1.10	0.0	
J4	JUNCTION	183.40	1.50	0.0	
J5	JUNCTION	182.75	1.50	0.0	
J6	JUNCTION	182.49	1.50	0.0	
J7	JUNCTION	180.80	1.10	0.0	
J8	JUNCTION	178.80	1.25	0.0	
OF2	OUTFALL	177.90	1.25	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness

```
  ---------------------------------------------------------------------------------
---------
  C2              J2              J3              CONDUIT          277.1    0.7578
0.0350
  C3              J3              J4              CONDUIT          283.7    0.7404
0.0350
  C4              J4              J5              CONDUIT           97.6    0.6636
0.0350
  C5              J5              J6              CONDUIT           22.7    1.1774
0.0100
  C6              J6              J7              CONDUIT          137.8    1.2224
0.0350
  C7              J7              J8              CONDUIT          156.6    1.2773
0.0350
  C8              J8              OF2             CONDUIT          167.7    0.5366
0.0350


  *********************
  Cross Section Summary
  *********************
                                          Full     Full     Hyd.     Max.   No. of
Full
  Conduit          Shape                 Depth     Area     Rad.    Width  Barrels
Flow
  ---------------------------------------------------------------------------------
------
  C2               TRAPEZOIDAL            1.10    10.56     0.80    12.90     1
22.57
  C3               TRAPEZOIDAL            1.10    10.56     0.80    12.90     1
22.31
  C4               TRAPEZOIDAL            1.50    16.20     1.03    15.30     1
38.37
  C5               RECT_CLOSED            1.50     4.50     0.50     3.00     2
30.77
  C6               TRAPEZOIDAL            1.10    10.56     0.80    12.90     1
28.67
  C7               TRAPEZOIDAL            1.10    10.56     0.80    12.90     1
29.31
  C8               TRAPEZOIDAL            1.25    12.56     0.88    13.80     1
24.23


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......        59.749       193.000
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........        26.435        85.389
  Surface Runoff ...........        30.822        99.562
  Final Surface Storage ....         2.496         8.062
  Continuity Error (%) .....        -0.007


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
```

Wet Weather Inflow	30.820	308.199
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	30.788	307.886
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.033	0.329
Continuity Error (%)	-0.005	

****
Time-Step Critical Elements
****
Link C5 (39.72%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	3.25 sec
Average Time Step	:	4.48 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
Beach	193.00	0.00	0.00	112.35	79.62	1.02	0.08	0.413
HWY26	193.00	0.00	0.00	80.94	102.91	274.58	11.33	0.533
MTO	193.00	0.00	0.00	75.67	116.15	6.67	0.45	0.602
PW	193.00	0.00	0.00	116.64	75.20	8.70	0.52	0.390
Rom	193.00	0.00	0.00	129.14	62.73	2.90	0.22	0.325

Sunray	193.00	0.00	0.00	114.81	77.04	11.94	0.87	0.399
TC	193.00	0.00	0.00	132.14	59.66	2.41	0.14	0.309

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J2	JUNCTION	0.34	0.76	188.36	0 09:00
J3	JUNCTION	0.34	0.76	186.26	0 09:01
J4	JUNCTION	0.36	0.81	184.21	0 09:01
J5	JUNCTION	0.53	1.28	184.03	0 09:01
J6	JUNCTION	0.31	0.70	183.19	0 09:02
J7	JUNCTION	0.31	0.70	181.50	0 09:02
J8	JUNCTION	0.45	0.94	179.74	0 09:03
OF2	OUTFALL	0.28	0.67	178.57	0 09:03

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J2	JUNCTION	11.325	11.325	0 08:59	274.552	274.552
J3	JUNCTION	0.000	11.307	0 09:00	0.000	274.522
J4	JUNCTION	0.970	11.994	0 09:00	15.374	289.817
J5	JUNCTION	0.875	12.562	0 09:01	11.942	301.703
J6	JUNCTION	0.000	12.557	0 09:01	0.000	301.691
J7	JUNCTION	0.303	12.757	0 09:02	3.921	305.590
J8	JUNCTION	0.142	12.883	0 09:02	2.408	307.963
OF2	OUTFALL	0.000	12.878	0 09:03	0.000	307.884

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CMS	Max. Flow CMS	Total Volume 10^6 ltr
OF2	99.19	4.295	12.878	307.884
System	99.19	4.295	12.878	307.884

****
Link Flow Summary
****

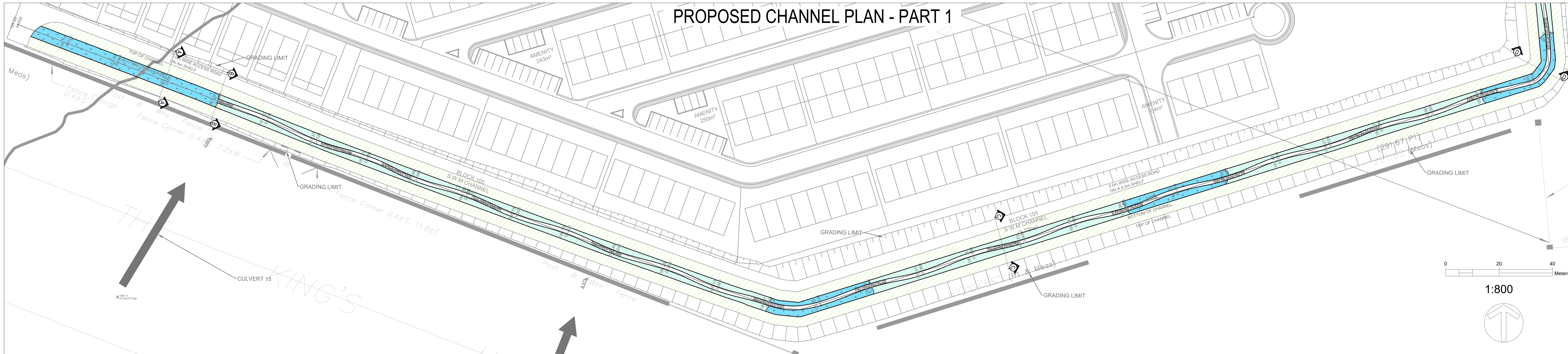
Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C2	CONDUIT	11.307	0 09:00	1.74	0.50	0.69
C3	CONDUIT	11.280	0 09:01	1.66	0.51	0.71
C4	CONDUIT	11.983	0 09:02	1.21	0.31	0.70
C5	CONDUIT	12.557	0 09:01	2.11	0.20	0.66
C6	CONDUIT	12.558	0 09:02	2.13	0.44	0.64
C7	CONDUIT	12.753	0 09:02	1.78	0.44	0.75
C8	CONDUIT	12.878	0 09:03	1.83	0.53	0.64

****
Flow Classification Summary
****

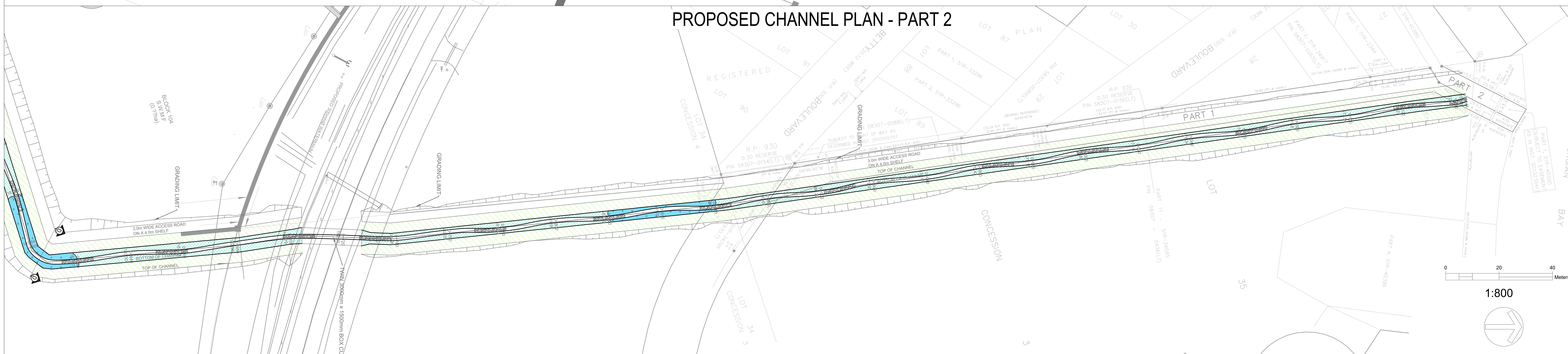
                    Adjusted   --- Fraction of Time in Flow Class ----   Avg.
Avg.
                     /Actual   Up   Down Sub   Sup   Up   Down   Froude
Flow

```
  Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit   Number
Change
  ---------------------------------------------------------------------------------
--------
  C2                      1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00     0.60
0.0001
  C3                      1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00     0.56
0.0001
  C4                      1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00     0.45
0.0000
  C5                      1.00   0.00  0.00  0.00  0.99  0.01  0.00  0.00     0.62
0.0001
  C6                      1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00     0.77
0.0000
  C7                      1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00     0.54
0.0000
  C8                      1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00     0.58
0.0001


  *************************
  Conduit Surcharge Summary
  *************************

  No conduits were surcharged.


  Analysis begun on:  Wed Aug 02 13:29:46 2023
  Analysis ended on:  Wed Aug 02 13:29:46 2023
  Total elapsed time: < 1 sec
```

PROPOSED CHANNEL PLAN - PART 1

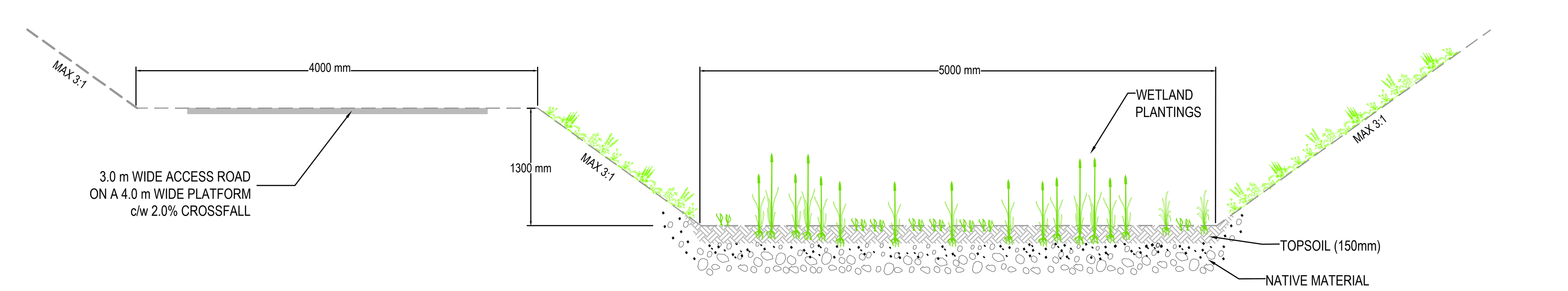


PROPOSED CHANNEL PLAN - PART 2



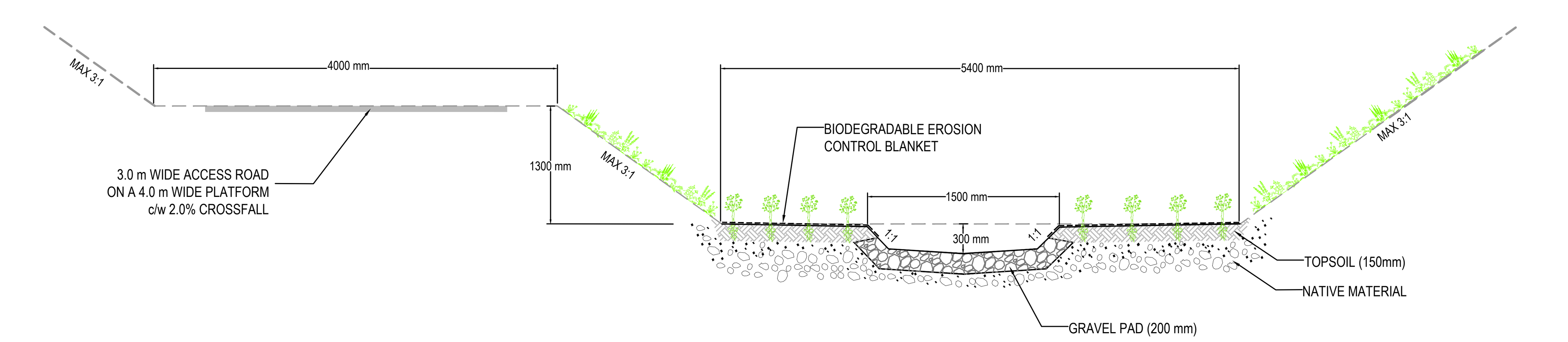
SECTION A - UPSTREAM WETLAND FEATURE

N.T.S.



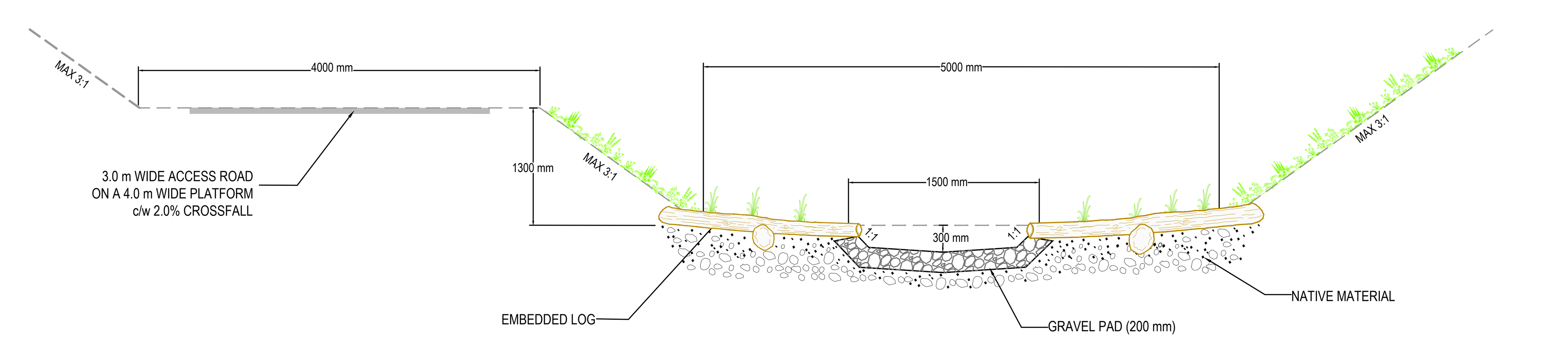
SECTION C - GRAVEL PAD

N.T.S.



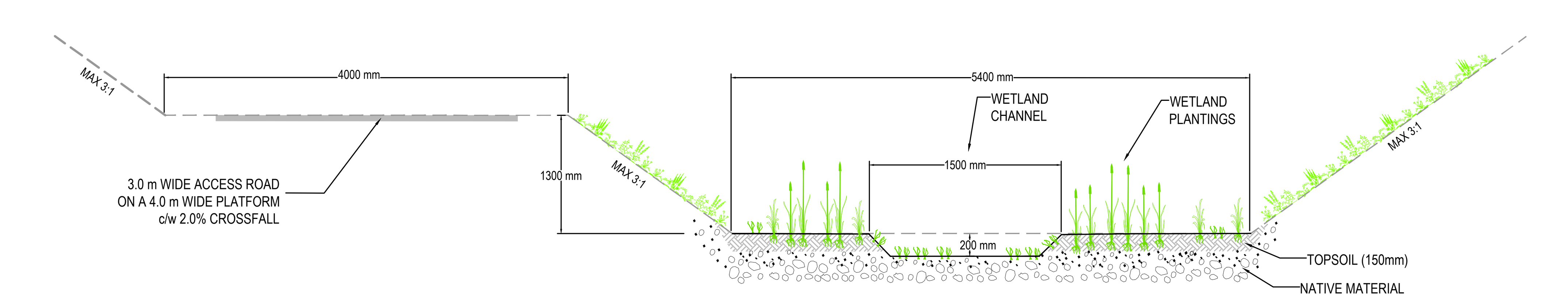
SECTION B - INLET

N.T.S.

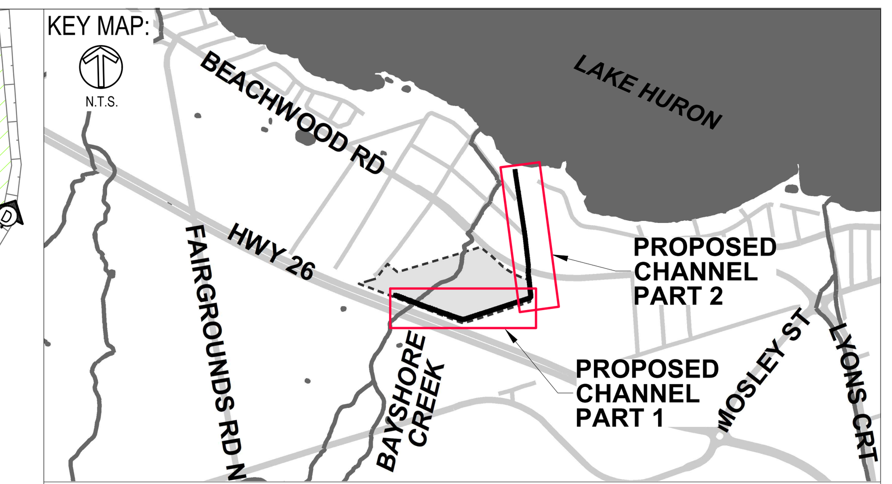


SECTION D - INLINE WETLAND FEATURE

N.T.S.



KEY MAP:



LEGEND

- PROPOSED GRAVEL PAD
- PROPOSED WETLAND
- PROPOSED FLOODPLAIN PLANTINGS
- PROPOSED BANK PLANTINGS

CLIENT:

SUNRAY LIVING INC.

PREPARED BY:

Palmer | PART OF SLR

DATE	REVISION	BY
2023-11-20	CONCEPT DESIGN	MB

DRAFT

PROJECT:

BEACHWOOD FLOOD CHANNEL ENHANCEMENT

TITLE:

CONCEPTUAL PLAN

PROJECT NO: 2101402	DATE: 2023-11-20		
DESIGN BY: MB	DRAWN BY: CV	APPROVED BY: SM	
DRAWING NO: CON	SHEET NO: 1 of 1		

R.J. BURNSIDE
SWM CONVEYANCE CHANNEL
AREA MARKUP - R1
M.RAY / J.ORR - 2024/02/20

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT	PLAN 51R-
DATE	RECEIVED AND DEPOSITED
PAUL R. THOMSEN	DATE
	REPRESENTATIVE FOR LAND REGISTRAR FOR THE LAND TITLES DIVISION OF SIMCOE (No. 51)

SCHEDULE

PART	LOT	CONC	PIN
1	Pt. 35	3	Pt. 58307-0436(LT)
2			

NOTE: PARTS 1 AND 2 ON THIS PLAN COMPRISE PART OF PIN 58307-0436(LT)
PART 2 ON THIS PLAN IS SUBJECT TO EASEMENT AS IN INST. SC1323041

PLAN OF SURVEY OF PART OF LOT 35 CONCESSON 3

(FORMERLY TOWNSHIP OF NOTTAWASAGA)

TOWN OF WASAGA BEACH COUNTY OF SIMCOE

SCALE 1:500

0 2 4 6 8 10 20 METRES

NOTES:

DISTANCES AND COORDINATES ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD 83 (CSRS) (1997).

FOR BEARING COMPARISONS, A ROTATION OF 0°37'20" COUNTER-CLOCKWISE WAS APPLIED TO THE BEARINGS ON PLANS 51R-34917, 51R-34095, 51R-2344 AND REGISTERED PLAN 930 TO CONVERT TO UTM BEARINGS.

DISTANCES ON THIS PLAN ARE HORIZONTAL GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999632

⌖	DENOTES SET
■	DENOTES FOUND
⌖ S.I.B.	DENOTES STANDARD IRON BAR
⌖ I.B.	DENOTES IRON BAR
⌖ S.S.I.B.	DENOTES SHORT STANDARD IRON BAR
⌖ C.C.	DENOTES CUT CROSS
⌖ C.P.	DENOTES CONCRETE PIN
wit	DENOTES WITNESS
meas.	DENOTES MEASURE
R.P.	DENOTES REGISTERED PLAN
N. S. E. W.	DENOTES NORTH, SOUTH, EAST, WEST
P.W.F.	DENOTES POST AND WIRE FENCE
C.L.F.	DENOTES CHAIN LINK FENCE
P.C.	DENOTES POINT OF CURVATURE
P1	REFERS TO PLAN 51R-34095
P2	REFERS TO PLAN 51R-40390

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.

2. THE SURVEY WAS COMPLETED ON THE 6TH DAY OF APRIL 2023.

APRIL , 2023 ____________ O.L.S.

PAUL R. THOMSEN
ONTARIO LAND SURVEYOR
COLLINGWOOD

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER ________

OBSERVED REFERENCE POINTS: UTM ZONE 17, NAD83 (CSRS) (1997)
COORDINATES TO RURAL ACCURACY PER SEC. 14(2) OF O. REG. 216/10.

POINT ID	NORTHING	EASTING
A	4924667.35	569691.45
B	4924550.64	569711.54

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN

ZUBEK, EMO PATTEN & THOMSEN LIMITED

ONTARIO LAND SURVEYORS
200 MOUNTAIN ROAD
UNIT 4
COLLINGWOOD, ONTARIO L9Y 4V5
PHONE: (705) 445-4910

JOB No. 66-138-8 SURVEY FOR: TOWN OF WASAGA BEACH

DGN FILE: C:\DGN\ 2023-DC\ 66-138-8.DGN

Cost Estimate for Site Plan Agreement

BURNSIDE

Project Name:	Sunray Living Beachwood
Project Number:	300052877
Client:	Sunray Living Inc.
Date:	February 21, 2024

Project Name: Sunray Living Beachwood
Address: 8859 Beachwood Road
Site Plan: 052877 - DESIGNBASE_CHANNEL

Cost Summary

Sunray Living Channel Costs

#	Item	Quantity	Unit	Unit Rate	Total
Sunray Living Lands					
1	OLS Legal Survey + Placement of Iron Bars for Channel Alignment	1	LS	$ 3,000	$ 3,000
2	Tree Clearing	13,140	m^2	$ 7	$ 91,980
3	Stump Removal / Clear and Grub Site	13,140	m^2	$ 7	$ 91,980
4	Strip & Stockpile Topsoil	3,100	m^3	$ 5	$ 15,500
5	Cut to Pre-Grade and Stockpile Native Fill on Sunray Site	20,450	m^3	$ 5	$ 102,250
6	Place Stockpiled Topsoil back on Pre-graded Channel to Finished Elevation	2,060	m^3	$ 5	$ 10,300
7	Low Flow Channel Excavation / Fine Grading	1	LS	$ 240,650	$ 240,650
8	Apply Seed Mix	11,430	m^2	$ 2	$ 22,860
9	Supply, Construct and Maintain Construction Fence	1	LS	$ 5,000	$ 5,000
10	Dewatering / Water Management During Construction	1	LS	$ 75,000	$ 75,000
11	Erosion and Siltation Control				
	a) Supply, Construct and Maintain Mud Mat per Town STD. DWG 17	1	ea.	$ 7,500	$ 7,500
	b) Install Rock Check Dams as per OPSD 219.211	6	ea.	$ 1,000	$ 6,000
	c) Install Sediment Traps as per OPSD 219.220	6	ea.	$ 2,500	$ 15,000
12	Maintenance Road (3m) per Town Specs	1,960	m^2	$ 20	$ 39,200
	Total Estimate for Sunray Living Channel Construction				**$ 726,220**
External Works					
12	OLS Legal Survey + Placement of Iron Bars for Channel Alignment	1	LS	$ 3,000	$ 3,000
13	Tree Clearing	6,790	m^2	$ 7	$ 47,530
14	Stump Removal / Clear and Grub Site	6,790	m^2	$ 7	$ 47,530
15	Strip & Stockpile Topsoil	2,020	m^3	$ 5	$ 10,100
16	Cut to Pre-Grade and Stockpile Native Fill on Sunray Site	5,570	m^3	$ 5	$ 27,850
17	Place Stockpiled Topsoil back on Pre-graded Channel to Finished Elevation	1,350	m^3	$ 5	$ 6,750
18	Low Flow Channel Excavation / Fine Grading	1	LS	$ 124,350	$ 124,350
19	Apply Seed Mix	6,790	m^2	$ 2	$ 13,580
20	Install 300mm Rip Rap for Highway 26 Culverts	600	m^2	$ 10	$ 6,000
21	Beachwood Temporary Lane Construction, Traffic Management & Culverts				
	a) Remove and Dispose of Existing Concrete Box Culverts	2	ea.	$ 5,000	$ 10,000
	b) Supply and Place New 3 x 1.5m Concrete Box Culverts	2	ea.	$ 280,000	$ 560,000
	c) Traffic Management (Barrels and Signs)	1	LS	$ 3,000	$ 3,000
	d) Temporary Traffic Lane Consisting of 200 mm Granular 'A' Material	1,700	m^2	$ 12	$ 20,400
	e) Temporary Traffic Lane Consisting of 300 mm Granular 'B' Material	1,700	m^2	$ 22	$ 37,400
	f) Temporary CSP Culvert Installation and Removal	2	ea.	$ 25,000	$ 50,000
22	Betty Boulevard Culverts (Future)				
	a) Supply and Place 1.8 x 0.9m Concrete Box Culvert	1	ea.	$ 75,000	$ 75,000
	b) Supply and Place Temporary Gravel Cover / Surface Treatment on Culv	50	m^3	$ 50	$ 2,500
23	Maintenance Road (3m) per Town Specs	1,300	m^2	$ 20	$ 26,000
24	Supply, Construct and Maintain Construction Fence	1	LS	$ -	$ -
25	Dewatering / Water Management During Construction	1	LS	$ 50,000	$ 50,000
26	Erosion and Siltation Control				
	a) Supply, Construct and Maintain Silt Fence as per NVCA BSD-23	1,300	m^2	$ 1	$ 1,920
	b) Supply, Construct and Maintain Mud Mat per Town STD. DWG 17	1	ea.	$ 7,500	$ 7,500
	c) Install Rock Check Dams as per OPSD 219.211	4	ea.	$ 1,000	$ 4,000
	d) Install Sediment Traps as per OPSD 219.220	4	ea.	$ 2,500	$ 10,000
	Total Estimate for External Works Channel Construction				**$ 1,144,410**
	Total Estimate for Channel Construction				**$ 1,870,630**

Appendix B
Environmental Studies 8859 Beachwood Road

Cotyledon
Environmental Consulting

Preliminary Scoped Environmental Impact Study
Beachwood Road and Robert Street South
Wasaga Beach

Original Report: September 10, 2021
1st Revision: March 13, 2022
2nd Revision: December 15, 2022
3rd Revision: April 11, 2023

Prepared for:
Sunray Living Inc.

By:
Cotyledon Environmental Consulting
Brampton, Ontario
www.cotyledonenvironmental.com

The Yellow Lady's Slipper, or Moccasin Flower, is one of the most widespread native orchids. An Ojibway legend tells of a young girl lost during a bitterly cold winter, and searchers found a Lady's Slipper blooming in the snow where she was last seen. The Lady's Slipper has become the model of the Ojibway moccasin based on this legend.

We don't inherit this world from our parents we borrow it from our children.

1.0 Executive Summary

Cotyledon Environmental Consulting (CEC) was engaged by Watters Environmental Group Inc. (WEG) to carry out a preliminary scoped Environmental Impact Study (sEIS) of lands owned by Sunray Living Inc. (Sunray), known municipally as 8859 Beachwood Road and 65 Robert Street South, in the Town of Wasaga Beach, Ontario.

Sunray is planning to develop the property as a residential subdivision and engaged several technical consultants to carry out the required assessments and investigations (such as CEC for this sEIS).

Flood modelling recently conducted by R.J. Burnside demonstrated widespread flooding of the property and surrounding area during a regional storm event. As a result, the Town of Wasaga Beach is working with the Nottawasaga Valley Conservation Authority (NVCA) on a flood mitigation strategy that involves the construction of an engineered flood control by-pass channel that will traverse the south and east sides of the property and join with a proposed drainage ditch system that will divert the flood waters north to Georgian Bay. This will effectively divert all surface water from entering the Sunray property.

The property is not in the Oak Ridges Moraine, the Greenbelt, the Lake Simcoe Protection Plan Area, the Niagara Escarpment Planning Area, or the Frontenac Arc Biosphere Reserve. It is in the Greater Golden Horseshoe Growth Plan Area and an area that the Town of Wasaga Beach has planned for residential development.

This report includes observations and data from four environmental consultants (Burnside, Beacon, Azimuth, and CEC) over the period 2010 to 2021. The property characterization is thorough, and the biological inventories are current and robust.

The property is neither environmentally unique nor ecologically diverse; it is typical of young, successional, mixed-wood forests in and around Wasaga Beach.

The wetland areas of the property are ephemeral and dry out every summer. The wetlands have low ecological functionality as there is no nesting, foraging or staging habitat for waterfowl, and no open water or riparian habitat for ducks, geese, or raptors. Also, there is no amphibian breeding habitat, no fish habitat, and no locally or regionally rare plant species on the property.

The woodlands on the property also have low ecosystem functionality, although they are designated as significant wildlife habitat due to the presence of maternity roosting colonies for several species of bats, including the Little Brown Myotis, which is an endangered species. Disturbance of an endangered species or its habitat requires a permit issued by the Ontario Ministry of the Environment, Conservation and Parks (MECP). Regardless of the proposed mitigation initiatives, the sustainability of the local at-risk bat population is not jeopardized because the removal of bat habitat on the property is only about 1% of the comparable forested habitat in the planning area.

As a result of the regional flooding concerns, CEC understands that discussions are ongoing between the Town of Wasaga Beach and the NVCA regarding mitigation measures and the resultant impacts on lands such as the Sunray property. This report will be revised once the directives of the Town of Wasaga Beach and/or the NVCA are known.

2.0 Disclaimer

This study was conducted by Cotyledon Environmental Consulting (CEC), subcontracted to Watters Environmental Group Inc. (WEG), for Sunray Living Inc. (Sunray). This report, and the data obtained to produce the report, are the property of Sunray. An electronic copy of this report, and all related data and field notes, are retained by CEC and/or WEG for usual project management and accounting purposes. However, neither the report nor the accompanying files will be given to anyone without the written approval of Sunray.

I am pleased to provide this report – *Preliminary Scoped Environmental Impact Study Beachwood Road and Robert Street South, Wasaga Beach* dated April 11, 2023. It represents information obtained from historic and current reports, on-line sources, and site visits made by CEC on December 14, 2020, April 19 and 27, May 17 and 31, and June 10, 13, 16 and 29, 2021 with the caveats identified in the Limitations Section.

DMcLaughlin

Dave McLaughlin. BScF, MScF
Cotyledon Environmental Consulting

We don't inherit this world from our parents, we borrow it from our children.

3.0 Table of Contents

1.0 Executive Summary 2
2.0 Disclaimer 4
3.0 Table of Contents 5
4.0 List of Tables 9
5.0 List of Figures 11
6.0 List of Photographs 13
7.0 Limitations 17
8.0 Scope of Work/Terms of Reference for the sEIS 19
9.0 The Property 24
9.1 Size and Location 24
9.2 Additional Information About the Property 25
9.3 Topography 30
9.4 Soils and Geomorphology 30
9.5 Drainage 32
10.0 The Proposed Development 42
11.0 Regulatory Framework 45
11.1 Eco-Regions 45
11.2 Provincial Planning Zones 45
11.3 Growth Plan for the Greater Golden Horseshoe 45
11.4 Provincial Policy Statement 46
11.5 Simcoe County Official Plan 48
11.6 Town of Wasaga Beach Official Plan 49
11.7 Nottawasaga Valley Conservation Authority 57
11.7.1 A Strategy to Mitigate the Potential Flood Hazard on and in the Vicinity of the Property and the Implication on Ecological Compliance. 61
11.8 NVCA Ecological Offset Policy 67
12.0 Natural Heritage Assessment 68
12.1 Local Natural Heritage Features – Physical 68
12.2 Local Natural Heritage Features – Biological 70
13.0 Flora and Fauna Inventories 74

13.1 Flora 75
13.1.1 Trees and Shrubs........ 75
13.1.2 Ground Flora........ 75
13.2 Birds 80
13.3 Amphibians 86
13.4 Mammals 90
13.5 Reptiles and Turtles 92
13.6 Fish........ 92
13.7 Acoustic Bat Survey 94
13.7.1 Species at Risk Bats in Ontario 94
13.7.2 Survey Protocol........ 95
13.7.3 Monitoring Site Selection........ 95
13.7.4 Timing and Weather Conditions 96
13.7.5 Monitoring Equipment and Software 99
13.7.6 Survey Conditions 99
13.8 Butterflies and Moths 106
13.9 Monarch Butterfly Biology and Threats 106
13.10 Habitat for Species of Special Concern 107
14.0 Landscape Features and Ecological Landscape Classification of Vegetation Communities........ 111
14.1 General 111
14.2 Watercourses........ 114
14.2.1 Bayshore Creek 114
14.2.2 Shore Creek........ 116
14.2.3 Watercourse Significance........ 117
14.3 Field Thicket 118
14.3.1 Field Thicket Significance........ 118
14.4 Rural Residential........ 118
14.4.1 Rural Residential Significance........ 121
14.5 Wooded Wetland 121
14.5.1 Wooded Wetland Significance 129
14.6 Woodlands........ 132
14.6.1 Woodlands Significance 139

14.7 Significant Wildlife Habitat 142
15.0 Screening for Species at Risk 151
15.1 Bald Eagle 153
15.2 Common Nighthawk 153
15.3 Eastern Meadowlark 154
15.4 Eastern Small-footed Myotis 155
15.5 Eastern Wood Pewee 156
15.6 Lake Sturgeon 157
15.7 Little Brown Myotis 157
15.8 Monarch Butterfly 158
15.9 Midland Painted Turtle 160
15.10 Sea Rocket Sand Beach Type 160
15.11 Tri-coloured Bat 161
15.12 Wood Thrush 163
16.0 Endangered Species Act and Authorization Permits 164
16.1 Species at Risk Designation 164
16.2 Endangered Species Act Authorizations 164
17.0 Impacts of the Proposed Development on the Natural Features and Species at Risk 167
17.1 Natural Features 167
17.2 Species at Risk 168
18.0 Mitigation 169
18.1 Construction Mitigation 169
18.1.1 Fuel 169
18.1.2 Soil and Dust Management 170
18.1.3 Erosion and Sediment Control 170
18.1.4 Other 171
18.2 Natural Environment Mitigation 172
18.2.1 Natural Landscape Features 172
18.2.1.1 Shore Creek and Bayshore Creek 172
18.2.1.2 Wooded Wetland 172
18.2.1.4 Woodlands 172
18.3 Birds and Other Wildlife 174

18.4 Species at Risk 174
18.4.1 Little Brown Myotis 174
18.4.2 Eastern Wood Pewee 176
18.4.3 Monarch Butterfly 178
19.0 Conclusions 179
20.0 References 181
21.0 Appendices 189
21.1 November 5, 2013 Meeting Minutes - NVCA and Burnside 189
21.2 January 25, 2012 Meeting Minutes – NVCA, Equi-Knox, Pre-consultation Meeting. 189
21.3 February 22, 2021 - NVCA Response to Property Inquiry 194
21.4 Vascular Plants Considered Rare in Simcoe County. 197
21.5 Correspondence from Equi-Knox Environmental Inc Regarding the Wetland Classification. 199
21.6 Town of Wasaga Beach Tree Cutting Permit Application. 200
21.7 Correspondence with MECP Regarding the ESA 201
21.8 The Cotyledon Environmental Consulting Team that worked on the Beachwood Road sEIS 203

4.0 List of Tables

Table 1: The Terms of Reference for this sEIS are based on the NVCA Policy Guidelines and the Crow Valley Conservation Authority Policy Manual (Appendix A: EIS Scoping Checklist), reproduced in this table. The items to be included in the sEIS are indicated by a red check mark……………………………………………………………23

Table 2: Property site visits to obtain data used in this sEIS………………..…………27

Table 3: Landscape components of the conceptual Site Plan………..……………………45

Table 4**:** Erosion and Flood Hazard Features, Wetlands, and the NVCA Regulated Area on the property…………………………………………...……...……………………………61

Table 5: Natural Heritage Features nearest the property……………………………..…..70

Table 6: Results of NHIC Screening for Biological Natural Heritage Features……...…73

Table 7: Vascular plants observed on the property…………………………..……..……77

Table 8: Locations of Breeding Bird Survey observation and listening sites…………....83

Table 9: Birds Seen or Heard on the Property………………...……………..……………86

Table 10: Mammals observed or likely present on the property……………..…………..…92

Table 11: Locations of the Four Acoustic Bat Survey Sites…………………….…..………99

Table 12: Summary of Time and Weather Conditions During the Acoustic Bat Survey……………………………………………………………………………………102

Table 13: Summary of Bat Species Identification………………………………………103

Table 14: Ecological Landscape Classification of Vegetation Communities on the property……………………………………………………………………………….…113

Table 15: Forest Resource Inventory Data Summarized by Plot and ELC Ecotype….126

Table 16: Location of Forest Resource Inventory Plots………………….………………127

Table 17: Determining if the Woodlands on the Property are Significant Woodlands, as defined by the Provincial Policy Statement…………………………………………….…142

Table 18: Screening for Significant Wildlife Habitat (SWH)…...………….……………144

Table 19: The Potential for Species at Risk on the Property……..……………………153

5.0 List of Figures

Figure 1: The regional location of the property…………………………………………....28

Figure 2: The local orientation of the property and the three separately purchased blocks……………………..………………………………………………………………………29

Figure 3: A recent spring ortho image of the property illustrating the area of conifer (green) vs deciduous (grey) forest cover. ……………………..……………………………..30

Figure 4: Topographic features of the property………………..……………………………32

Figure 5: The NVCA maps two intermittent streams that traverse the property; Bayshore Creek and Shore Creek. The minor discrepancy of the path of Bayshore Creek does not depict a braided channel, it is an anomaly of the NVCA on-line mapping software. Shore Creek does not exist as a functioning water course……………………………………...34

Figure 6: The Palmer fluvial geomorphic study (2021) mapped the course of Bayshore Creek on March 29, 2021. This study confirmed observations by Beacon and Cotyledon that Bayshore Creek was ephemeral and had no defined stream channel. The stream flow is being constantly re-directed by fallen trees and debris associated with exposed roots (see Photos 1 and 2)……………..…………………………………..……………...36

Figure 7: Bayshore Creek and Shore Creek inflow and outflow points across the property. The creek path through the property is approximate. The most accurate depiction is Figure 6…………………………………………………………………………..…39

Figure 8: Conceptual Site Plan (reproduced from Innovative Planning Solutions)….….44

Figure 9: Schedule A-1 of the Town of Wasaga Beach Official Plan designates most of the property as '*Residential*'. A strip of land that approximates the Bayshore Creek riparian zone is designated '*Natural Heritage System Category 1*', in which development is usually prohibited……………………………………...………………………………..51

Figure 10: Schedule C of the Town of Wasaga Beach Official Plan indicates the property is not currently serviced but is planned for future services……………………..53

Figure 11: Schedule D of the Town of Wasaga Beach Official Plan indicates the west half of the property is Natural Heritage System Category 1 and 2 Lands, which may have restrictions on development. This appears to roughly correspond to the Bayshore Creek flood Plain………………………………………………………………………………..54

Figure 12: Schedule G of the Town of Wasaga Beach Official Plan identifies Wellhead Protection and Vulnerable Aquifer Areas. The property is in not in either area, although much of the developed area of Wasaga Beach is……………………..……...…………57

Figure 13: NVCA Meander Erosion Hazard. The west hazard is associated with Bayshore Creek, the east hazard is associated with Shore Creek. In fact, neither creek has a meander belt and Shore Creek doesn't exist as a defined watercourse. Therefore, there is no erosion hazard on the property…………………………………………….....60

Figure 14: The NVCA Regulated Area is about 24.7 ac (10.0 ha) and covers about 80% of the property………………………………….……………..…………….….…………63

Figure 15: NVCA Flood Hazard associated with Bayshore Creek is 9.7 ac (3.9 ha). The NVCA doesn't predict a flood hazard associated with Shore Creek, which recognizes the insignificance of that watercourse………..…………………………………….………64

Figure 16: The most recent modelling by Burnside (2022) illustrates the extent of flooding during a Regional Event……………………..…………………….……………..66

Figure 17: The Route of the Proposed Flood By-pass Channel………..……..…….…….…67

Figure 18: There were eight NHIC grids explored for screening Natural Heritage Features…………………………………………………………………………………....72

Figure 19: Location of Breeding Bird Survey Sites, May 31 and June 10, 2021……….84

Figure 20: Location of the Amphibian Call Survey. The Storm Water Retention Pond on the south side of Highway 26 is the closest amphibian breeding habitat………………..88

Figure 21: Location of the Four Acoustic Bat Survey Sites (see Table 11)……………98

Figure 22: Image of a spectrogram from the Kaleidoscope Pro software illustrating echolocating calls of up to four Little Brown Myotis (Myotis lucifugus) and/or other Myotis/Perimyotis species. Image is from a recording file created on June 23, 2021 at 11:32pm………………………………………………………………….……….....105

Figure 23: Ecological Landscape Classifications of the vegetation communities on the property…………………………………………………………………………..…….114

Figure 24: Approximate Location of Forest Resource Inventory measurement plots...128

Figure 25: Age Class Distribution of the three forest ecotypes (see Table 14)……..…136

Figure 26: Diameter Class Distribution of the three forest ecotypes (see Table 14)….136

6.0 List of Photographs

Unless otherwise noted, all photographs were taken by CEC with a Nikon Coolpix P90 digital SLR camera.

Cover Photo: The Yellow Lady's Slipper, or Moccasin Flower, is one of the most widespread native orchids. An Ojibway legend tells of a girl lost during a bitterly cold winter, and searchers found a Lady's Slipper blooming in the snow where she was last seen. The Lady's Slipper has become the model of the Ojibway Moccasin based on this legend.

Photo 1: The path of Bayshore Creek is diverted left by a recently fallen tree (Palmer, March 29, 2021)……..………………..…………………………………………………….35

Photo 2: Fallen trees are very common and constantly alter the spring sheet flow and stream flow across the wetland area of the property (April 19, 2021)………………..….35

Photo 3: The outflow of Bayshore Creek flows into Georgian Bay (April 27, 2021). It is dry for much of the year………………………………………………………………………..40

Photo 4: At peak flow in the spring Bayshore Creek overflows west between 39 and 45 Robert St. S. and then into the ditch on the east side of Robert St. S. (April 19, 2021)………..…………………………………………………………..…………………40

Photo 5: The main exit for Bayshore Creek is a ditch on the west side of a new residential property (April 19, 2021)……………………………………………...…….41

Photo 6: The ditch runs along the west side of 8859 Beachwood Rd. (April 19, 2021)..41

Photo 7: The Bayshore Creek exit ditch then flows into the ditch on the south side of Beachwood Rd. (April 19, 2021)……………………………………………………………41

Photo 8: The Bayshore Creek main exit from the property is on the south of Beachwood Road, opposite Thomas St. After a heavy rain the area around the culvert held water but the creek channel was dry (July 29, 2021).………………………………………...42

Photo 9: Bayshore Creek has a secondary exit at the southeast corner of Beachwood Rd. and Robert St. S. (July 29, 2021).……………………………………..…………42

Photo 10: Bayshore Creek enters the property through a box culvert on the north side of Highway 26. The area around the culvert holds water into the summer, but there is no standing water on the property (July 29, 2021)………………………………………...42

Photo 11: The forest, particularly on the east side of the property, was so thick in areas that it was difficult to walk through, and very challenging to see or hear birds…………85

Photo 12: An ATV trail looped through the property immediately adjacent to the east of the study property, which made for better observing and listening opportunities. The forest community type was consistent across the two adjacent properties, so several of the breeding bird survey sites were shifted eastward…...……………………..………….85

Photo 13: A small, shallow pond formed in the west-central area of the wooded wetland, as photographed by Palmer during their fluvial geomorphic study March 29, 2021…...90

Photo 14: The same area April 27, 2021, is completely drained, the ground was moist but there was no standing water. The pond is too shallow and dries too quickly to be a vernal pond, so it is not amphibian breeding habitat…………………………………..….90

Photo 15: A Song Meter SM4s full spectrum Acoustic Bat Detector mounted on a Poplar tree at Bat Survey Monitoring Site 3…………………………………….…….….………..101

Photo 16: SMM-U2 ultrasonic microphone was connected to the SM4 Detector. The remote microphone provided a substantially greater recording envelope than the microphones built into the detector……………..……………………………………..…..101

Photo 17: The Canadian Tiger Swallowtail butterfly was one of seven species of moths and butterflies observed on the property. It is a common inhabitant of forests and fields in southern Ontario……...………………………………………………………………..….111

Photo 18: Bayshore Creek was flowing April 19, 2021…………………………………..…116

Photo 19: No water was flowing in Bayshore Creek April 27, 2021, but the stream channel was moist and muddy…………………………………………...……………….116

Photo 20: The Bayshore Creek channel was dry May 31, 2021……………..…………116

Photo 21: The Field Thicket on the north edge of the property adjacent to Beachwood Rd. is a small but distinct ecosite (ELC CUT1a)………………………………...…….…120

Photo 22: The Rural Residential area is adjacent to the undeveloped woodland. The abrupt transition of the vegetation community is evident. There is no ELC classification for residential land-use. (Photo source: NVCA)…………………………………………..….121

Photo 23: Ash trees killed by the Emerald Ash Borer litter the ground damming and diverting the seasonal flow of water in the wetland causing the ephemeral pooling and ponding to constantly shift location……..……………………..…………………………….124

Photo 24: The high-water table causes very shallow root systems to develop, making mature trees susceptible to blow down. The fallen timber and the root mass also damn and/or divert surface water flow……………………………………………………………124

Photo 25: The extent of Ash dieback is so significant it is changing the character of the wetland. The canopy openings permit greater light penetration, which dries the surface soil more quickly in the spring and encourages the seeding of Poplar, Birch, Cedar and Buckthorn……………………………………………………………………………………129

Photo 26: The extent of Ash dieback is so significant it is changing the character of the wetland. The canopy openings permit greater light penetration, which dries the surface soil more quickly in the spring and encourages the seeding of Poplar, Birch, Cedar and Buckthorn……………………………………………………………………………………129

Photo 27: The West and East Woodlands are ELC FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest. In openings and edges Buckthorn has seeding in so thick it is literally impossible to walk through……………………………………………………………135

Photo 28: The West and East Woodlands are about 53% White Cedar, 25% Trembling Aspen, 13% Green Ash, 4% Buckthorn, 2% White Elm, 2% White Spruce, 1% White Pine and less than 1% Yellow Birch, White Birch and Black Spruce (see Table 14)..135

Photo 29: The West-Central and East-Central Woodlands are ELC FOD8-1 Fresh-Moist Poplar Deciduous Forest. It is a young successional forest with 86% of the trees less than 6 inch (20 cm) in diameter, about 430 stems/ac (1,063 stems/ha) and a basal area of about 99 ft2/ac (22 m2/ha)……………………………………………………………138

Photo 30: The West-Central and East-Central Woodlands are about 53% Green Ash, 35% Trembling Aspen, 6% White Cedar, 4% Buckthorn, 2% White Elm and <1% Black Spruce (see Table 14)…………………………………………………………………………138

Photo 31: The remains of a White-tailed Deer on the north side of Highway 26 immediately adjacent to the south side of the property. This animal was killed in a deer-vehicle collision. The likelihood of increased frequency of deer-vehicle collisions subsequent to the expansion of the Highway 26 by-pass resulted in Azimuth (2010) recommending to the Town of Wasaga Beach that properties between the highway and Beachwood Road in the west end of Wasaga Beach should not be designated Significant Wildlife Habitat. Removing 162 ac (65 ha) of forest from the west end of the Town, which would include the entire property for this sEIS, would not jeopardize the sustainability of the White-tailed Deer population because there is 3,116 ac (1,261 ha) of Stratum 1 Deer Yard in the Town of Wasaga Beach, the vast majority of which is protected by the Provincial Park……………………………………………………………150

Photo 32: There is a robust population of Little Brown Myotis on the property, almost 36% of all the acoustic recordings. This bat is a species at risk. (photo source: Shutterstock)…………..………………………………………………………….………….……..…….163

Photo 33: Eastern Small-footed Myotis were detected in the immediate vicinity of the property, but the population was very small, less that 1% of the acoustic recordings. This bat is a species at risk (photo source: Shutterstock)……….……………………..….163

Photo 34: Tri-coloured Bat was also confirmed on the property, but the population was very small, less than 1% of the acoustic recordings. This bat is a species at risk (photo source: Shutterstock)….……………………….....…………………..…………………..……163

Photo 35: Bat boxes provide day-time roosting habitat for bats and can deter bats from invading buildings (Photo by Shutterstock)………..…………………………………….….……179

Photo 36: Bat boxes provide day-time roosting habitat for bats and can deter bats from invading buildings (Photo by Shutterstock)………………………..…………………..……179

7.0 Limitations

This report is a preliminary scoped Environmental Impact Study (sEIS). The Terms of Reference for this sEIS were determined through consultation with Sunray, reviewing environmental and engineering reports prepared for a previous property owner, reviewing numerous reports prepared for the current site plan and current owner, and compiling and reviewing correspondence with the Town of Wasaga Beach and the Nottawasaga Valley Conservation Authority (NVCA). In addition to observations made during multiple visits to the property, the data used to describe flora, fauna and natural heritage features on and in the immediate vicinity of the property were obtained from several recent environmental studies and online sources, such as, the Natural Heritage Information Centre (NHIC), eBird, the Ontario Breeding Bird Atlas, iNaturalist, MECP well records, Ontario GeoHub, the NVCA, and the Simcoe County and the Town of Wasaga Beach Official Plans. These resources are routinely used by the environmental consulting community and planning authority and regulatory agencies. CEC assumes the information obtained from these multiple sources is factual, accurate and current. Sunray is expected to inform CEC if they become aware that information has changed, or if additional information becomes available that may reasonably be expected to have relevance to the contracted work.

CEC conducted the work outlined in Section 8.0 *Scope of Work/Terms of Reference* for this sEIS using accepted industry standards and practices to the best of our professional ability. Other than the deliverables committed to in Section 8.0, CEC makes no other warranties regarding the provided services, work, or reports.

Throughout the onsite investigations and report preparation, CEC endeavoured to comply with all relevant legislation, regulations, policies, and guidelines that we are aware of. However, the report is not intended to constitute a legal opinion. All legal matters should be discussed with a qualified legal practitioner.

Information and physical conditions may vary with time. CEC conducted site investigations and prepared this report based on the circumstances at the time of the field work and the most recent studies and correspondence. If circumstances change after the collection of information, CEC may have to revisit the *Scope of Work/Terms of Reference* with the understanding that the contracted deliverables and related costs may be adjusted. CEC will not proceed with additional work unless it is approved by Sunray.

This report is preliminary in that sections related to compliance cannot be completed at this time without direction from the Town of Wasaga Beach and/or the NVCA, who are addressing the regional flooding issue.

These limitations do not in any way impede the ability to address the work stated in Section 8.0, rather they set reasonable expectations regarding the detail to which the natural environment on the property was characterized.

8.0 Scope of Work/Terms of Reference for the sEIS

The Terms of Reference for a sEIS is usually determined through pre-consultation with municipal and/or regulatory planning authorities, most often it is the local conservation authority, which for this property would be the NVCA. Even though considerable information was available about the property from previous environmental and engineering studies, the NVCA suggested that some of the property-specific information, particularly the biological inventories, should be redone because the data are 10 years old.

Simcoe County, the Town of Wasaga Beach, and the NVCA do no have a template for an EIS, although they all provide generic guidelines about what an EIS should include. The following is paraphrased from Appendix 6 of the NVCA Planning and Regulations Guidelines (2009).

> *The scope of an Environmental Impact Study (EIS) should be adjusted according to the nature/sensitivity of the subject area and the type of work being proposed. The EIS may include:*
>
> *1) Overview of the natural features that may be impacted by the proposal. This could include, but not be limited to:*
>
> - *Valley Lands,*
> - *Environmentally Significant Areas (ESAs),*
> - *Areas of Natural and Scientific Interest (ANSIs),*
> - *Significant Habitat of endangered, threatened, and species of concern,*
> - *Woodlands,*
> - *Fisheries Habitat,*
> - *Significant Wildlife Habitat,*
> - *Cumulative impacts,*
> - *Hydrologic setting,*
>   - *Groundwater recharge, discharge, quality and quantity, including flow paths and contributions,*
>   - *Surface water quality and quantity, including flow paths and seasonal contributions.*
>
> *2) Detailed description of the natural environment and the development proposal, including:*
>
> - *Biophysical, hydrologic and hydrogeologic inventory and analysis.*
>
> *3) Detailed description of the development proposal.*
>
> *4) Assessment of the potential impacts of the proposed development on the*

natural features and their functions.

5) Cumulative impacts assessment.

6) Analysis of the available techniques to avoid impacts, mitigation measures and their effectiveness to eliminate or reduce the potential impacts of the development on natural features and functions.

The Crowe Valley Conservation Authority (CVCA) has a very detailed checklist for the components of an EIS. This checklist is reproduced as Table 1 and was used to help define the Terms of Reference for this sEIS. Elements in Table 1 that were considered relevant for this study are indicated with a red checkmark. Based on the NVCA guidelines and the CVCA checklist, the Terms of Reference for this sEIS were identified as follows:

1. Review the provincial, municipal and conservation authority environmental policies regarding land development.

2. Use existing documents, on-line sources and site observations to characterize the physical conditions of the property, such as location, size, access, soils, topography, geomorphology and drainage.
    a. Hydrogeological, geofluvial, groundwater characteristics and water balance will be covered in detail by separate reports prepared by other consultants, i.e., they are only addressed superficially in this sEIS.

3. Use existing documents, on-line sources and site observations to characterize the natural features of the property, such as forests, fields, wetlands, and water courses.
    a. Characterize the natural features by their Ecological Land Classification.

4. Using accepted methods and protocols, conduct flora and fauna surveys, specifically.
    a. Breeding Bird Survey,
    b. Acoustic Bat Survey,
    c. Amphibian Call Survey,
    d. Mammals and other animals,
    e. Fisheries,
    f. Vegetation surveys.

5. Identify ESAs, ANSIs, species at risk, significant wildlife habitat and regionally rare species on and immediately adjacent to the property.

6. Describe the proposed development.

7. Identify potential impacts the proposed development may have on the natural features, the wildlife and their habitat.

8. Identify possible mitigation or avoidance strategies to minimize or prevent the potential impacts on the natural environment and during the construction.

9. Prepare a sEIS report for review by the planning and regulatory authorities.

As noted, this report is preliminary in that the sections related to compliance cannot be completed at this time without receiving direction from the Town of Wasaga Beach and/or the NVCA, who are addressing a regional flooding issue.

Table 1: The Terms of Reference for this sEIS are based on the NVCA Policy Guidelines and the CVCA Policy Manual (Appendix A: EIS Scoping Checklist), reproduced in this table. The items to be included in the sEIS are indicated with a red checkmark.

	Natural Heritage Designation and Zoning:
√	Provincially Significant Wetland
√	Non-Provincially Significant Wetland
√	Unevaluated Wetland
√	Threatened or Endangered Species Habitat
√	Significant Woodland
□	Significant Valleyland
√	Significant Wildlife Habitat
√	Area of Natural and Scientific Interest
√	Fish Habitat
√	Other Designations (e.g., SNA, ESA, ORM, Greenlands, etc.)

	Geology, Hydrogeology, Hydrology:
√	Sub-watershed or Wetland Catchment boundary
√	Surface Drainage Patterns (incl. all permanent and intermittent watercourses)
√	Geomorphologic and Topographic features
√	Soils (surface and subsurface)
□	Groundwater Recharge/Discharge Areas
□	Hydrogeologic Conditions

Specify timing of any field studies to be done:

√ winter √ spring √ summer √ Fall

	Natural Hazard Lands:
√	Survey Flood Plain
□	Valleylands
√	Erosion Hazards
√	Poorly Drained Soils

	Biological Inventory:
□	Wetland Evaluation
√	Wetland Boundary Delineation
√	Ecological Land Classification

	Wildlife Inventory																					
√	Amphibians	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	Reptiles	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	Birds	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	Mammals	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	Fish	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	Insects	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	Plants	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
√	SAR	□	Jan	□	Feb	□	Mar	√	Apr	√	May	√	Jun	√	Jul	√	Aug	□	Oct	√	Nov	√ Dec
□	Other:																					

See next page for Significant Wildlife Habitat identification.

Table 1 Continued.

Significant Wildlife Habitat	
Seasonal Concentration Areas of Animals	
√	Waterfowl Stopover and Staging Areas -Terrestrial and Aquatic
√	Shorebird Migratory Stopover Area
√	Raptor Wintering Area
√	Bat Hibernacula
√	Bat Maternity Colonies
√	Bat Migratory Stopover Area
√	Turtle Wintering Area
√	Snake Hibernacula
√	Colonially Nesting Bird Breeding Habitat (Bank and Cliff/Tree/Shrub, Ground)
√	Migratory Butterfly Stopover Area
√	Land bird Migratory Stopover Areas
√	Deer Yarding Areas
√	Deer Winter Congregation Area
Rare Vegetation Communities or Specialized Habitat for Wildlife	
□	Cliff and talus slopes
□	Sand Barren
□	Alvar
□	Old Growth Forest
□	Savannah
□	Tallgrass Prairie
□	Other
Specialized Habitat for Wildlife	
√	Waterfowl Nesting Area
√	Bald Eagle and Osprey Nesting, Foraging, Perching Habitat
√	Woodland Raptor Nesting habitat
√	Turtle Nesting Areas
□	Seeps and Springs
√	Amphibian Breeding Habitat - Woodland and Wetland
Habitat for Species of Conservation Concern (not including End or Thr Species)	
√	Marsh/Woodland Area-Sensitive/Open Country/Shrub/Early Successional Bird Breeding Habitat
□	Terrestrial Crayfish
□	Special Concern and Rare Wildlife Species
Animal Movement Corridors	
√	Amphibian Movement Corridors
√	Deer Movement Corridors
Other	
□	Mast producing Areas
□	Lek

9.0 The Property
9.1 Size and Location

The property is composed of two blocks, which were purchased separately and added to the proposed development plan. This sEIS covers both blocks, and collectively the blocks are referred to in this report simple as ‘*the property*’. The property is in the west end of the Town of Wasaga Beach, Simcoe County.

The largest, and original block (Block A) is 8859 Beachwood Road. It is Part Lot 34, Concession 4. The Assessment Roll Number is 436402000015225100000. This block is about 30.5 ac (12.3 ha) in size.

The second and smaller of the two blocks (Block B) is the most recent to be purchased. The municipal address is 65 Robert Street South. It is Part Lot 35, Concession 4. The Assessment Roll Number is 436402000015440000000. This block is about 0.5 ac (0.2 ha) in size.

The property, composed of both blocks, is about 30.56 ac (12.37 ha) in size.

The property is irregular in shape and adjacent to Beachwood Road to the north, Highway 26 to the south, residential properties along Robert Street South to the west, and undeveloped woodland to the east.

Block A is typical of undeveloped wooded areas in and around Wasaga Beach. There are no residences, structures, roads, trails, paths, or infrastructure on this part of the property.

Block B, 65 Robert Street South, is a single residential lot. Other than a single storey house with a deck and two short driveways, there is no other obvious infrastructure on the property.

Other than the driveways for 65 Robert Street South, the property has to be accessed by foot. Safe parking and access spots are located at:

- The north side of the property. A wide shoulder on the south side of Beachwood Road, opposite 8868 Beachwood Road.
    - 44º 28’ 05.90” N and 80º 07’ 26.05” W (Degrees, Minutes and Seconds).

- The southwest side of the property. The cul-de-sac at the south end of Robert Street South.
    - 44º 28’ 04.32” N and 80º 07’ 51.53” W.

- The west side of the property from the driveway to 65 Robert Street South.
    - o 44º 28’ 06.07” N and 80º 07’ 49.50” W.

- The southeast side of the property. The cul-de-sac at the west end of Ayling Reid Court, and then walking westward across the intervening property.
    - o 44º 27’ 51.87” N and 80º 07’ 09.85” W.

- The east side of the property. The west end of the ATV loop trail at the west side of the MTO yard south of Beachwood Road, and then walking westward across the intervening property.
    - o 44º 27’ 58.77” N and 80º 07’ 19.56” W.

9.2 Additional Information About the Property

Considerable information is available for the property. Azimuth Environmental conducted a Natural Heritage Review in 2010 for the Town of Wasaga Beach, as part of the Town’s mapping of natural heritage features in the west end of the municipality, which included the property. In 2011 and 2012, Beacon Environmental conducted a preliminary sEIS of the Block A portion of the property in support of a development proposal for a previous owner. Equi-Knox Environmental engaged the Town of Wasaga Beach and the NVCA in 2012 on behalf of the property’s previous owner. R.J. Burnside and Associates continues to work on modelling flood hazards for the property. WEG has recently engaged Palmer Environmental to conduct hydrogeological, geomorphological, and fluvial-geomorphic studies on the property.

Over the last 11 years the property has been visited at least 27 times by six environmental consulting companies (see Table 2). Although the property information from the Azimuth (2010) and Beacon (2012) studies is 11 to 12 years old much of the environmental data are still relevant, and where appropriate, have been used to supplement or confirm observations and opinions of the current CEC sEIS.

For more than a decade urban intensification has continued around and adjacent to the property. This includes a new 4-lane divided provincial Highway 26 bypass adjacent to the south, a widening of Beachwood Road adjacent to the north, and new residential development adjacent to the west and the north. Therefore, the property, like the entire west end of Wasaga Beach, has experienced enhanced pressure on its ecological diversity and functionality.

Figure 1 illustrates the regional location of the property. Figure 2 illustrates the local orientation of the property. Figure 3 is a recent early spring ortho-image of the property.

Table 2: Property site visits to obtain data used in this sEIS[1].		
Date	Visited By	Observations Conducted
February 5 & 9, 2010	Azimuth	ELC classification
February 5 & 11, 2010	Azimuth	Watercourse evaluation
April 10 & 16, 2010	Azimuth	Watercourse evaluation
April 10 & 16, 2010	Azimuth	ELC classification
April 14, May 24, 2011	Beacon	Amphibian Call Survey
May 4, 31, June 16, 2011	Beacon	Breeding Bird Survey
May 24, June 28, 2011	Beacon	ELC classification
June 28, 2011	Beacon, NVCA	Wetland staking
July 28, 2011	Beacon, NVCA	Wetland staking
November 9, 2011	Beacon, NVCA	Wetland staking, watercourse evaluation
December 14, 2020	Cotyledon	Flora, fauna, natural features
March 29, 2021	Palmer	Drainage study
April 19, 2021	Cotyledon	Flora, fauna, forest inventory, natural features
April 27, 2021	Cotyledon, Palmer	Flora, fauna, forest inventory,1st Amphibian Call Survey, natural features
May 17, 2021	Cotyledon, Palmer	2nd Amphibian Call Survey, forest inventory, flora, fauna
May 31, 2021	Cotyledon	1st Breeding Bird Survey, flora, fauna, natural features
June 10, 2021	Cotyledon	2nd Breeding Bird Survey, flora, fauna, natural features
June 13, 2021	Cotyledon	Acoustic Bat Survey Setup, flora, fauna, natural features
June 16, 2021	Cotyledon	Flora, fauna, natural features
June 29, 2021	Cotyledon	Acoustic Bat Survey take-down, flora, fauna, natural features
1 - Azimuth (2010), observations were made for the Town of Wasaga Beach and covered the west end of Wasaga Beach, which included all of the property. The Beacon (2012) observations were completed in support of a previous development proposal and covered most, but not all of the property (Block B excluded). The CEC observations covered all of the property. Property site visits by Equi-Knox, Palmer Environmental and Burnside for erosion and flood hazard assessment and bore hole and well water drilling are not listed.		

Figure 1: The regional location of the property.

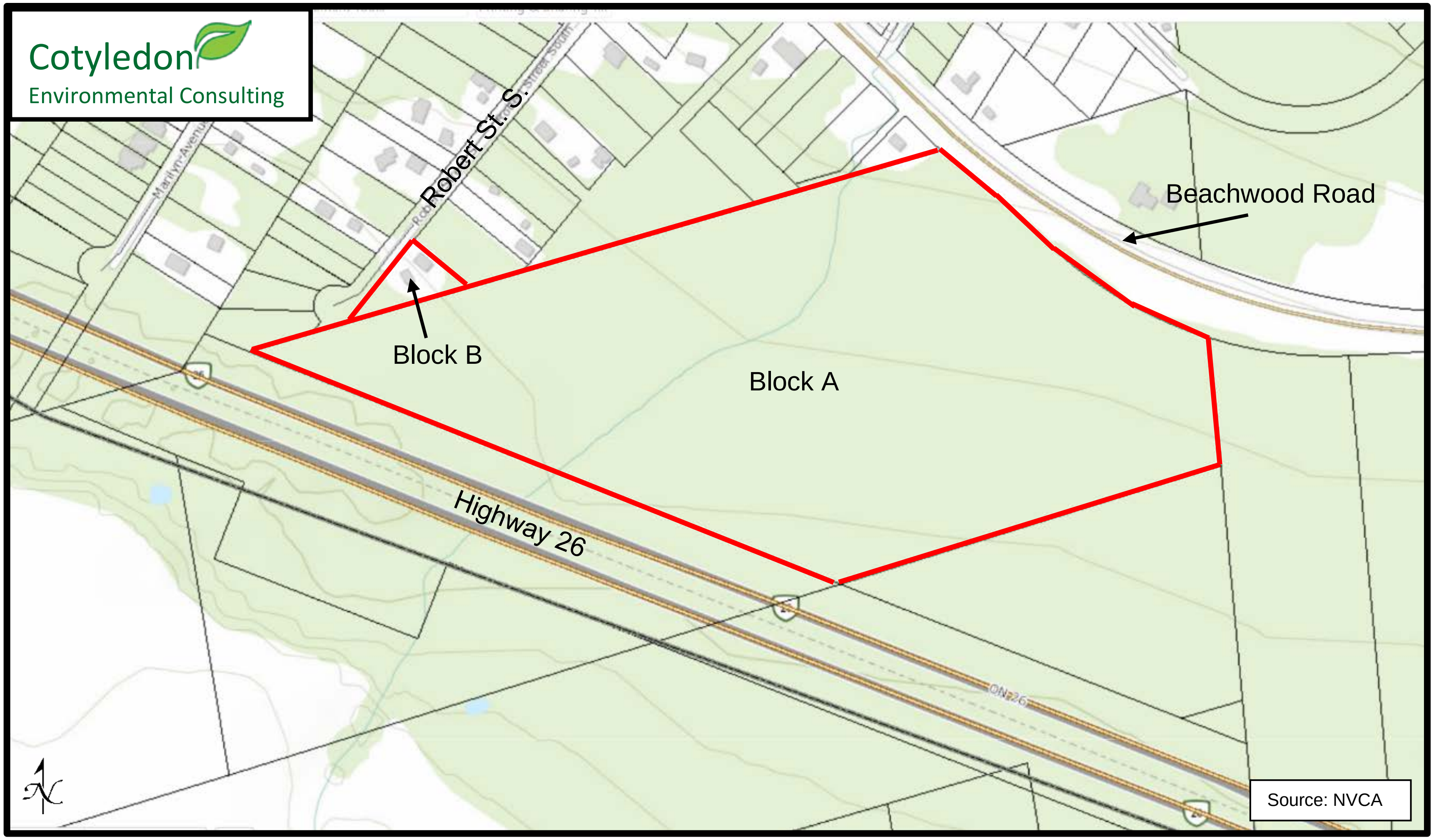


Figure 2: The local orientation of the property and the two separately purchased blocks.

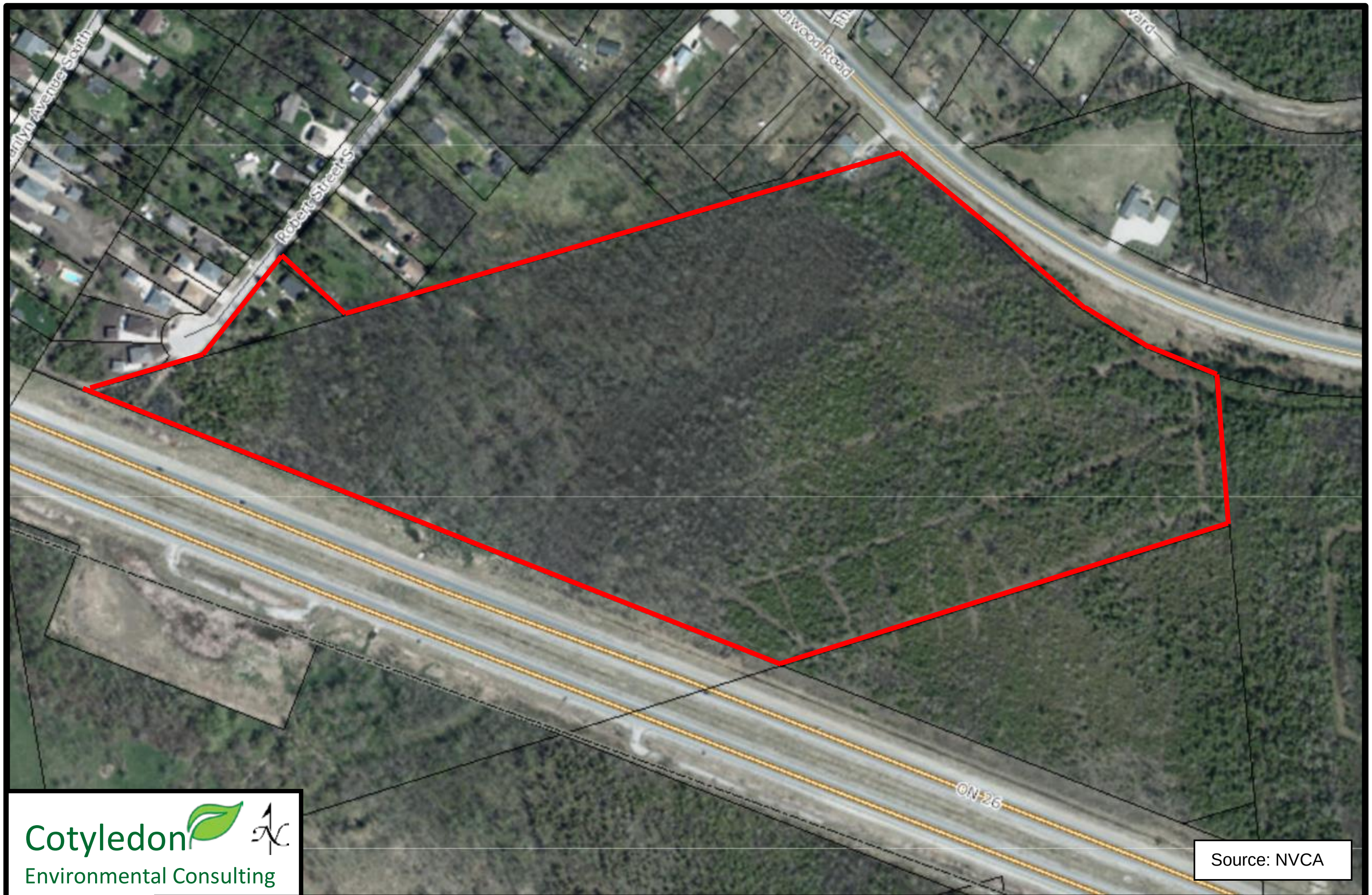


Figure 3: A recent spring ortho-image of the property illustrating the area of predominantly conifer (green) vs predominantly deciduous (grey) forest cover.

9.3 Topography

The property is located on a flat, very slightly sloping plain between Highway 26 to the south and Beachwood Road to the north. Figure 4 is a topographic map produced from the MNRF/NHIC website and the Burnside 2021 flood mapping exercise.

The height of land on the property is about 190 m, located at the southwest corner adjacent to Highway 26. The lowest point is about 185 m, which is at the northeast corner next to the ditch by Beachwood Road. The property slopes gently in a northerly direction towards Georgian Bay. A southwest-to-northeast transect from the highest to the lowest point of land drops about 5 m over approximately 694 m, for an average slope of about 0.7%.

There are no substantial hummocks or depressions, except those caused by uprooted trees, of which there are many. There are no hills, gullies, valleys, ridges or beaches. The property is essentially flat table land.

9.4 Soils and Geomorphology

The bedrock geology is calcitic limestone of the Trenton Formation, which can be up to 180 m thick in places across Simcoe County. Near the property the surficial geology is a sandy outwash plain of shallow lacustrine deposits, originating from the bed of glacial Lake Algonquin, which covered the area towards the end of the last glaciation. The glaciolacustrine deposits overlay a dense till. A layer of clay mineral deposits, likely associated with the till, is present about 0.5 m below the surface and extends for many metres. This low permeability clay layer creates a perched water table. There are no bedrock outcrops on the property.

There are no property-specific soil maps. Based on Simcoe County soil maps the property is overlayed by Grey-Brown Podzolic soil types. Most of the property is the imperfectly drained Wiarton Silt Loam Till. A small section of the southwestern tip of the property is well drained Sargent Sandy Loam. Near-surface soil samples extracted at several locations across the property during the spring and summer site visits revealed a thin forest duff layer overtop of a very moist sandy loam and, as previously mentioned, the clay-like mineral soil layer at about 0.5 m deep. This was consistent with the recent Palmer fluvial-geomorphic report and the Ontario Ministry of the Environment, Conservation and Parks (MECP) records for local wells.

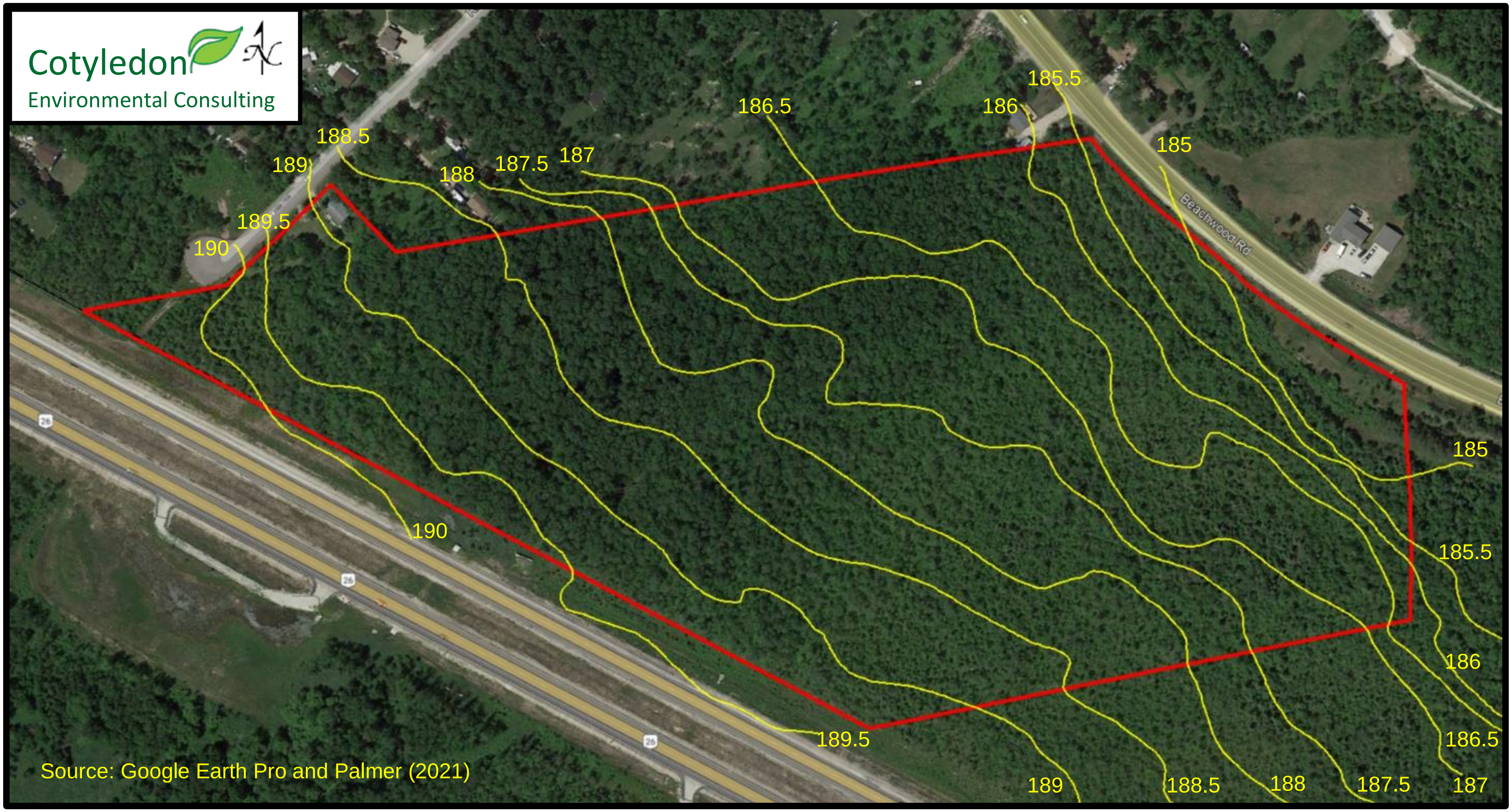


Figure 4: Topographic features of the property.

9.5 Drainage

The property is entirely within the Blue Mountains sub-watershed, and entirely within the NVCA jurisdiction. Because of the perched water table and very gentle slope the surface drainage is essentially overland sheet flow from south to north, from Highway 26 to Beachwood Road. In a meeting with Burnside on November 5, 2013, regarding flood modeling on the property, the NVCA stated "*… that there is little or no channelization of this flow through the property – there is widespread dissipation of the flow – it sheet flows throughout the entire site*." (Appendix 20.1).

There are no lakes, ponds, or permanent standing water on the property. Some map sources indicate there are two streams that flow across the property from south to north. The NVCA mapping tool identifies Bayshore Creek on the west side of the property and Shore Creek on the east side of the property. Figure 5 illustrates the two streams. For the west stream (Bayshore Creek), there appears to be a double channel in Figure 5. This is an anomaly of the NVCA mapping tool, as it does not precisely overlay the water courses when the map 'stream' layer is turned on. Both streams are ephemeral, flowing intermittently, mostly in the spring after the snowmelt, and dry up completely at other times during the year.

Bayshore Creek, on the west side of the property, is the larger of the two streams. Its source is a ditch on the east side of Fairgrounds Road North, just north of 30+31 Nottawasaga Side Road, about 2.2 km south of Highway 26. It flows northerly through agricultural land and enters the property via a box culvert under Highway 26. It meanders across the property, crossing under Beachwood Road via a culvert, then continues for about 670 m in municipal ditches along Thomas Street and Constance Boulevard, and discharges into Georgian Bay by a cobbled ditch at the end of Bayshore Drive.

A recent Palmer fluvial-geomorphic report (2021) provides a detailed description of the Bayshore Creek flow patterns and confirms observations by both Beacon (2012) and CEC (2020/21) that Bayshore Creek is ephemeral, the stream channel is very poorly defined and often absent, and the flow is being constantly re-directed by falling trees resulting in a meandering or braided nature (see Photos 1 and 2).

Palmer produced a map of the Bayshore Creek flow that is quite different than the NVCA creek map illustrated in Figure 5. The Palmer map is reproduced as Figure 6. This represents conditions observed by Palmer on March 29, 2021 and is consistent with observations made by CEC on April 19 and 27, and May 17 and 31, 2021. The lack of a defined stream channel is because the flow is being constantly redirected by fallen trees and because the flow is neither strong enough nor consistent enough to erode the surface soil. The meandering nature of Bayshore Creek, the lack of an eroded channel, the flat landscape, and the perched water table causes the water to spread out over the

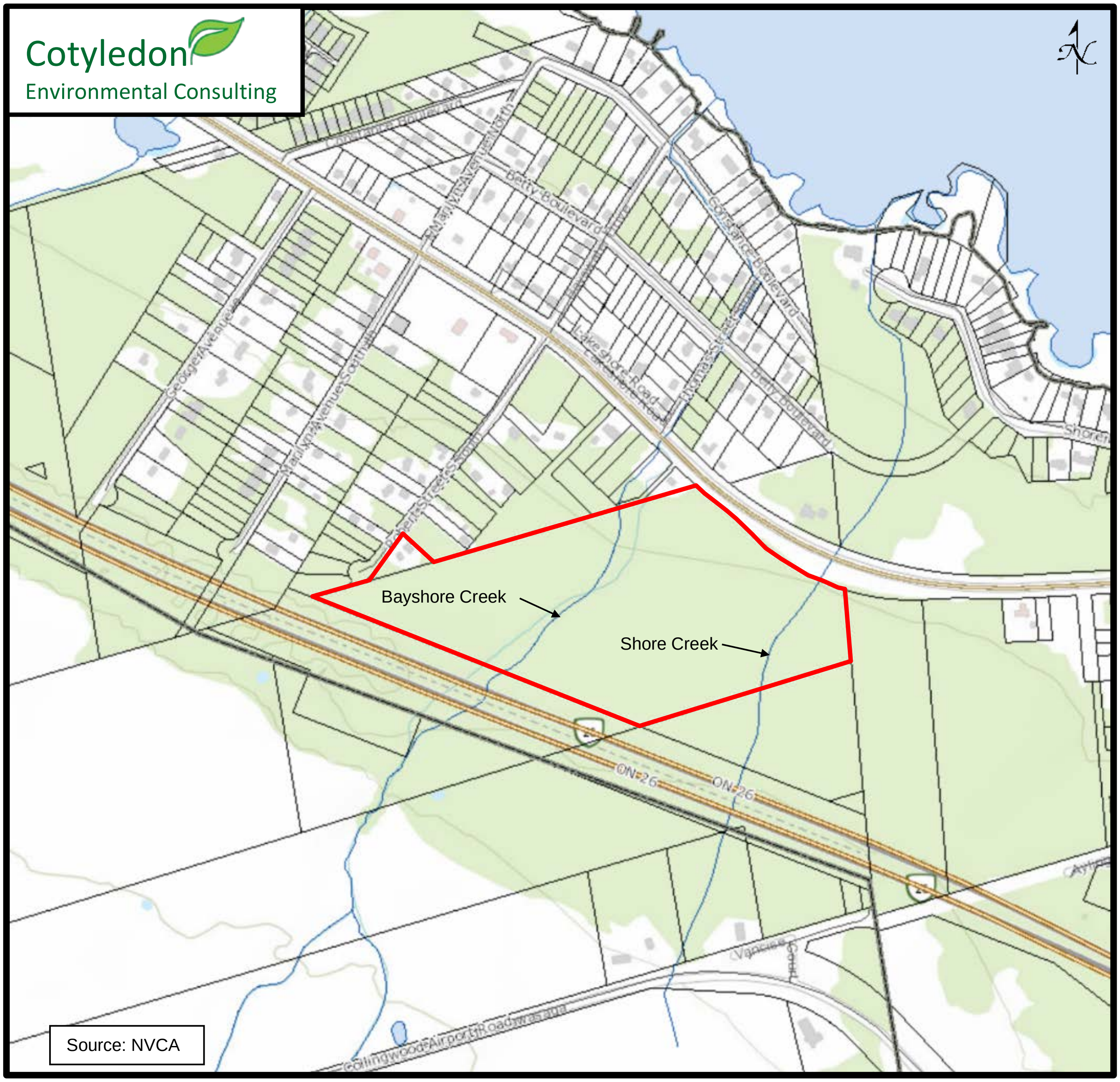


Figure 5: The NVCA depicts two intermittent streams that traverse the property; Bayshore Creek and Shore Creek. The minor discrepancy of the path of Bayshore Creek does not depict the braided channel, it is an anomaly of the NVCA on-line mapping software. Shore Creek does not exist as a functioning water course.

Photo 1 (above): The path of Bayshore Creek is diverted left by a recently fallen tree (Palmer, March 29, 2021). Photo 2 (below): Fallen trees are very common and constantly alter the spring sheet flow and stream flow across the (April 19, 2021).

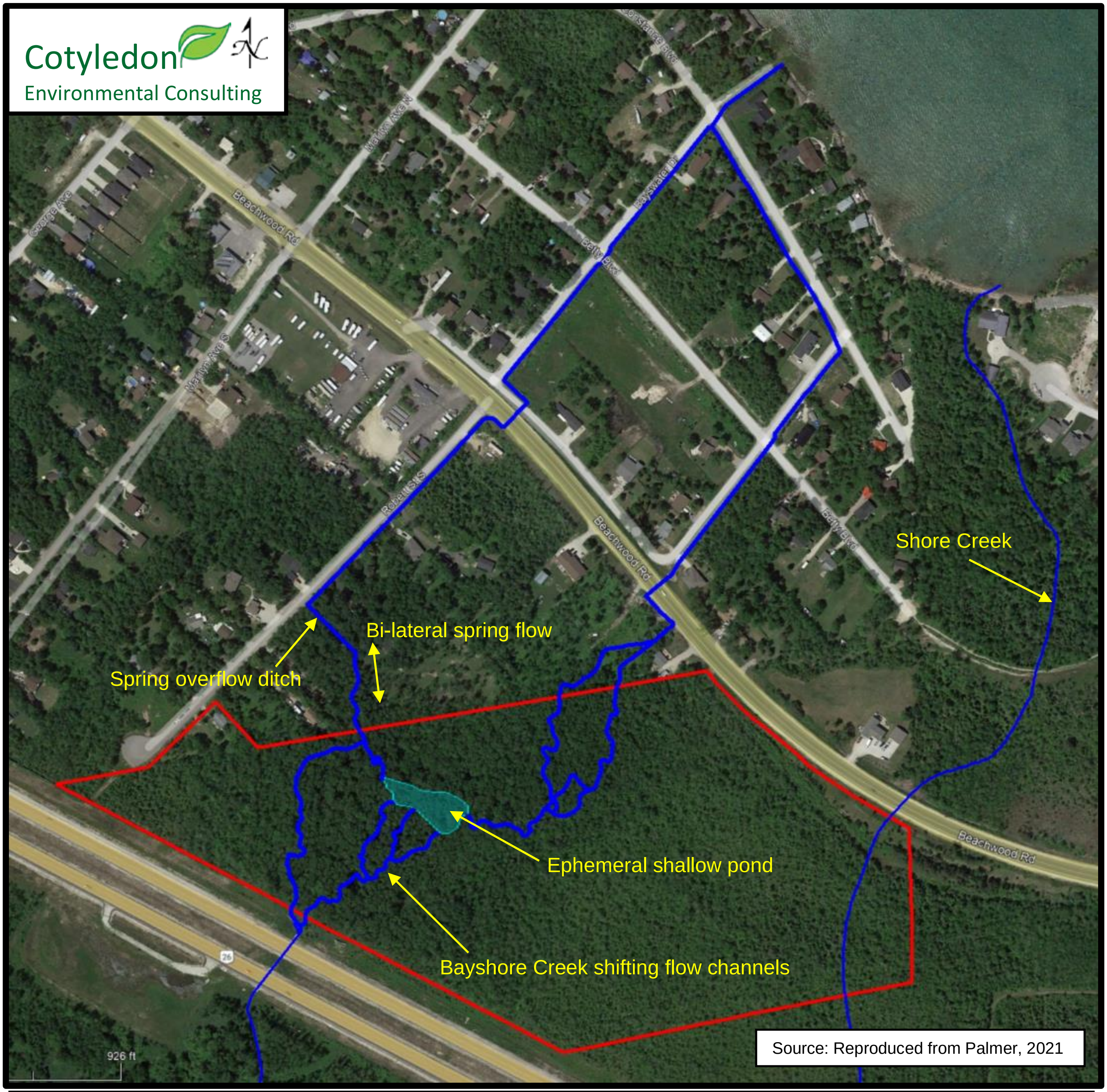


Figure 6: The Palmer fluvial-geomorphic study (2021) mapped the course of Bayshore Creek on March 29, 2021. This study confirmed observations by Beacon and CEC that Bayshore Creek is ephemeral and had no defined stream channel. The stream flow is being constantly re-directed by fallen trees and debris associated with exposed roots (see Photos 1 and 2).

landscape as sheet flow, producing the spring wetland in the center portion of the property. The potential erosion and flood hazards are discussed further in Section 11.7.

Figure 7 identifies the inflows and outflows of Bayshore Creek and Shore Creek across and to the north of the property. Photo 3 illustrates the mouth of Bayshore Creek at the confluence with Georgian Bay. Bayshore Creek was flowing when the photo was taken April 29, 2021, but the outflow is dry for much of the year. Photo 4 illustrates the ditch between 35 and 43 Robert Street South that carries the overflow from Bayshore Creek during maximum spring flow, which was the case April 19, 2021, when the picture was taken. This is the ‘spring overflow ditch’ that flows both ways, as described by Palmer (2021) and indicated in Figure 6. This spring overflow from the creek exits the property and then flows north along the municipal ditch on the east side of Robert Street South and crosses under Beachwood Road via a corrugated culvert at the southeast corner of Robert Street South and Beachwood Road, adjacent to 8933 Beachwood Road (Photo 9). From there the spring overflow flows north in the municipal ditch on the east side of Bayswater Drive all the way to the cobbled outfall ditch into Georgian Bay. The cobbled outfall ditch is between 58 and 62 Constance Boulevard. When it is flowing, the main channel of Bayshore Creek exists the property via a ditch on the west side of 8895 Beachwood Road, then flows westerly in the municipal ditch on the south side of Beachwood Road (Photos 5, 6 and 7). It crosses under Beachwood Road via a cement box culvert opposite Thomas Street (Photo 8). From there it flows north in the municipal ditch on the east side of Thomas Street, then through a corrugated culvert under Thomas Street and westward in the municipal ditch on the south side of Constance Boulevard, then it turns north into the cobbled outflow ditch and into Georgian Bay. The Bayshore Creek main inflow is through a pair of box culverts on the north side of Highway 26 about 16 m south of the property (Photo 10). The area around the culverts by Highway 26 holds water most of the season, but there is no permanent standing water on the property.

The 2021 Palmer drainage study indicated the presence of a small pond about 0.3 ac (0.1 ha) in size, as illustrated in Figure 6. The pond was present on March 29, 2021, when Palmer was on-site; however, it had drained by April 19 when CEC first visited the property. It did not re-appear on subsequent site visits, so it was obviously a temporary pond caused by fallen and uprooted trees.

According to the NVCA map, Shore Creek, on the east side of the property, rises from a field just south of Collingwood Airport Road, about 300 metres south of Highway 26. It enters the property via a box culvert under Highway 26, flows northerly across the property and crosses under Beachwood Road via a culvert just east of 8868 Beachwood Road. From there it flows about 520 m though an undeveloped wooded area into a ditch that wraps westerly around 2320 Shore Lane, where it subsequently empties into Georgian Bay.

Both Bayshore Creek and Shore Creek are their own watersheds, in that there are no other creeks or tributaries that flow into them, they do not flow into another creek, and they both have independent confluences with Georgian Bay. Therefore, they are physically, hydrologically, and ecologically isolated from one another, and they can't be complexed with other local or regional watercourses or natural features.

The natural heritage mapping schedules for the Town of Wasaga Beach, Simcoe County and Nottawasaga Township, and the MNRF and NHIC maps, don't identify Shore Creek as a watercourse, in that the creek doesn't appear on any of these maps. Only the NVCA maps identify Shore Creek in their streams map layer. In a meeting with the Town of Wasaga Beach and Equi-Knox Environmental on January 25, 2012, the NVCA conceded "…*that no floodplain or hazard assessment studies were required for the east watercourse* [Shore Creek] *because it has no defined channel*". Furthermore, the NVCA stated "…*that drainage from Highway 26 via the east watercourse* [Shore Creek] *can be either treated* [i.e., with a retention pond] *or re-directed to the same outlet north of Beachwood Road"* (Appendix 21.2). The Azimuth report refers to Shore Creek simply as a "*surface drain*".

Repeated visits to the property during all seasons by Beacon in 2010/11 and CEC in 2020/21, and the 2021 Palmer fluvial-geomorphic report, could not identify on the ground or confidently map the Shore Creek watercourse, even during the period of peak meltwater flow in early spring. There was no identifiable stream channel and no evidence of flowing or pooled water along the route indicated for Shore Creek by the NVCA map. Delcan's 2013 report, Palmer's 2021 report, and a GPS exercise by CEC in June 2021, all concur that water exiting the box culvert on the north side of Highway 26 in the vicinity of Shore Creek mostly flows eastward along the highway ditch to the south of the property. In periods of maximum flow some water spills over into the property and meanders northward towards Beachwood Road. However, a defined watercourse does not exist on the east side of the property.

Figure 7: Bayshore Creek and Shore Creek inflow and outflow points across the property. The Bayshore Creek path is approximate. The most accurate depiction is Figure 6.

Photo 3 (above): The outflow of Bayshore Creek flows into Georgian Bay (April 27, 2021). It is dry for much of the year. Photo 4 (below): At peak flow in the spring Bayshore Creek overflows west between 35 and 43 Robert Street South and then into the ditch on the east side of Robert St. S. (April 19, 2021).

Photo 5: (left) The main exit for Bayshore Creek is a ditch on the west side of 8895 Beachwood Road. (April 19, 2021).

Photo 6: (right) The ditch runs along the west side of 8895 Beachwood Road. (April 19, 2021).

Photo 7: (left) The Bayshore Creek exit then flows westward along the ditch on the south side of Beachwood Road. (April 19, 2021).

Photo 8 (left): The Bayshore Creek main exit from the property is on the south of Beachwood Road, opposite Thomas Street. After a heavy rain the area around the culvert held water but the creek channel was dry (July 29, 2021).

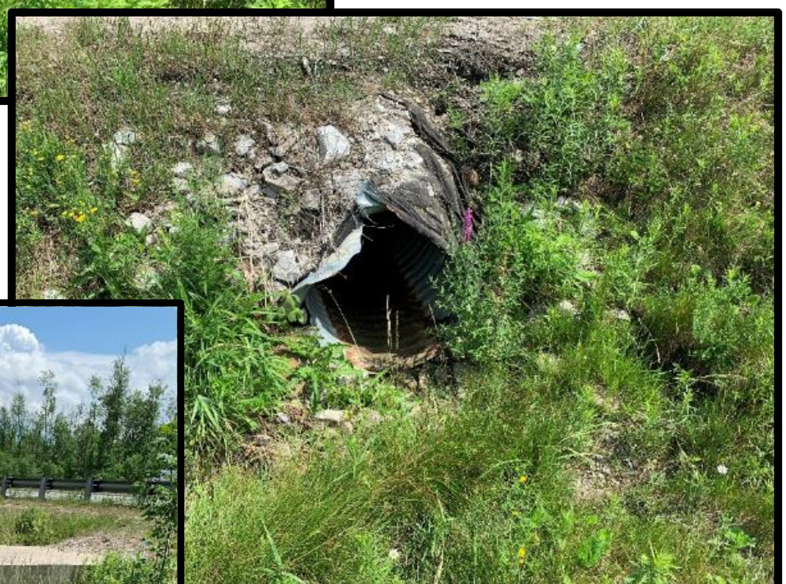


Photo 9 (above): Bayshore Creek has a secondary exit (spring overflow) at the southeast corner of Beachwood Road and Robert Street South. (July 29, 2021).

Photo 10 (left): Bayshore Creek enters the property through box culverts on the north side of Highway 26. The area around the culverts holds water into the summer, but there is no standing water on the property (July 29, 2021).

10.0 The Proposed Development

Sunray proposes to build a residential subdivision on the property. The conceptual site plan is illustrated in Figure 8.

Table 3 lists possible landscape components of the conceptual site plan. The components are preliminary and may change as a result of regulatory review and/or the final design. They are included in this report for discussion only, as they relate to parts of the ecological mitigation strategy.

The proposed development will be serviced by the planned expansion of the existing municipal drinking water and wastewater infrastructure.

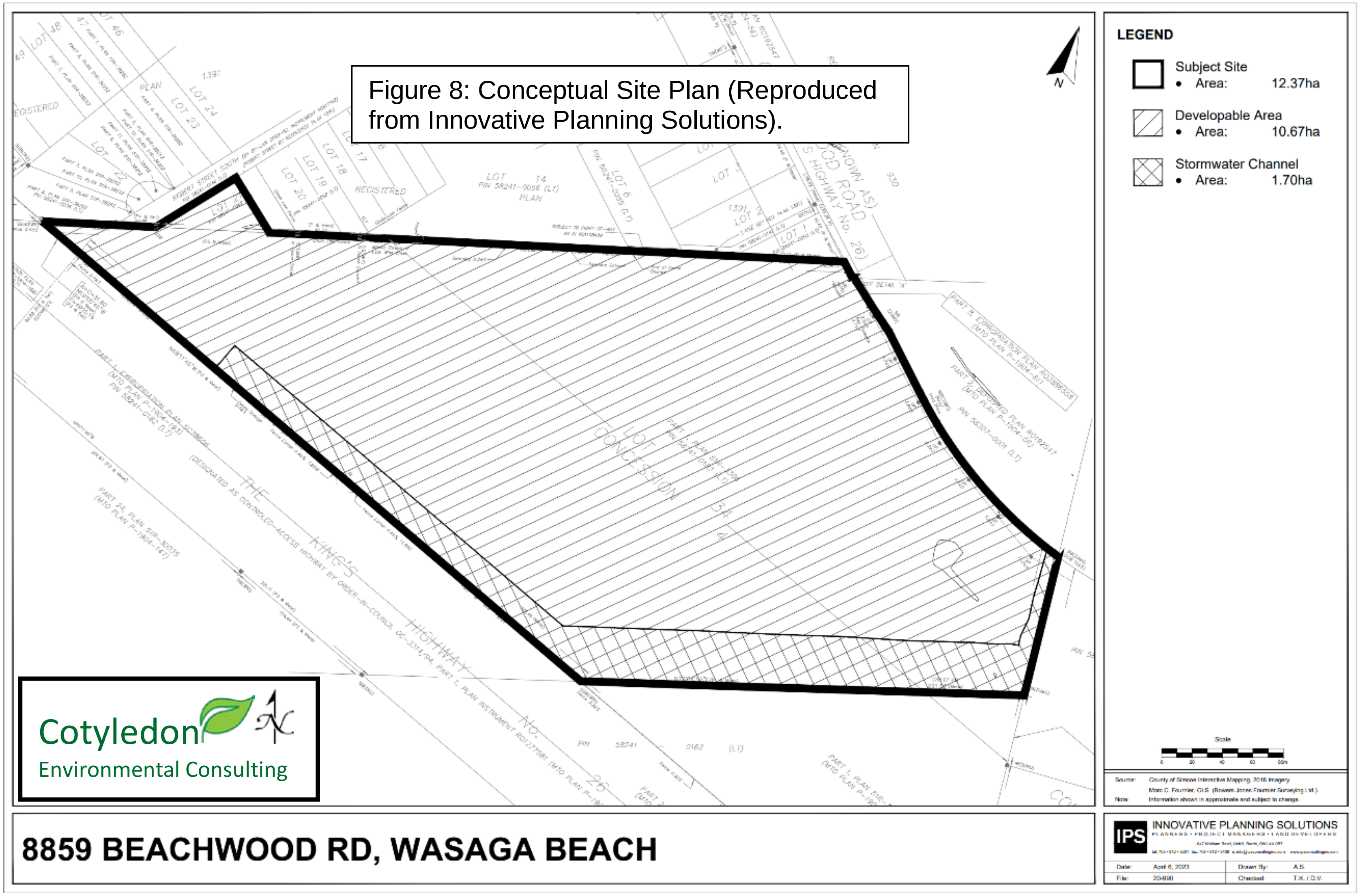


Figure 8: Conceptual Site Plan (Reproduced from Innovative Planning Solutions).
LEGEND
Subject Site
• Area: 12.37ha
Developable Area
• Area: 10.67ha
Stormwater Channel
• Area: 1.70ha
Cotyledon
Environmental Consulting
8859 BEACHWOOD RD, WASAGA BEACH
INNOVATIVE PLANNING SOLUTIONS

Table 3: Landscape components of the conceptual Site Plan.[1]			
Component	Acres	Hectares	% of Property
Residential Units	23.40	9.47	75.2%
Two Parks	1.68	0.68	5.4%
Storm Water Pond	1.85	0.75	6.0%
By-pass Channel	4.20	1.70	13.5%
1 – The areas are preliminary and may change after regulatory review and final design. They are included in this preliminary sEIS because they relate to parts of the ecological mitigation strategy.			

11.0 Regulatory Framework

11.1 Eco-Regions

The property is in the Mixed-wood Plains Ecozone, the Lake Simcoe-Rideau Ecoregion 6E, and Barrie Ecodistrict 6E-6.

The property is in the Huron-Ontario Forest District of the Great Lakes-St. Lawrence Forest Region. Because of the long history of settlement and agriculture, extensive natural forest tracts no longer exist in the area. The woodland on the property is an early successional mixed-wood forest that has established on an abandoned field or a shoreline plain. The forest cover is described further in Section 14.6. It is typical of undeveloped wooded tracts in the Wasaga Beach area.

11.2 Provincial Planning Zones

The property is not in the Greenbelt, the Lake Simcoe Protection Plan area, the Oak Ridges Moraine, the Niagara Escarpment Planning Area, or the Frontenac Arc Biosphere Reserve, and it is not in a Greenbelt Specialty Crop Area. It is in the Greater Golden Horseshoe Growth Plan Area.

11.3 Growth Plan for the Greater Golden Horseshoe

A Place to Grow, Growth Plan for the Greater Golden Horseshoe (2020) was prepared and approved under the *Places to Grow Act*, 2005.

The Plan states:

> *Section 2.2.2.1b)*
> *The City of Kawartha Lakes and the Counties of Brant, Dufferin, Haldimand, Northumberland, Peterborough, **Simcoe** and Wellington will, through the next municipal comprehensive review, each establish the minimum percentage of all residential development occurring annually that will be within the delineated built-up area, based on maintaining or improving upon the minimum intensification target contained in the applicable upper-or single-tier official plan.*

In other words, Simcoe County, in which the property is located, is identified as a place to grow in the Provincial Growth Plan.

The Growth Plan is a guidance document that recognizes the current growth pressures in the Greater Golden Horseshoe area and encourages municipalities to responsibly intensify development in communities designated as places to grow while balancing regional transportation and employment opportunities. The Growth Plan does not supersede municipal plans, particularly in relation to the protection of the natural environment. Rather, the Growth Plan states:

> *…where there may be a conflict between the Growth Plan and a municipal plan in relation to the protection of the natural environment, whichever plan provides the greatest degree of protection shall prevail.*

11.4 Provincial Policy Statement

The *Provincial Policy Statement* (2020) provides general policies to municipalities to guide development across the province specifically for the protection and management of natural heritage features and resources. It is issued under Section 3 of the *Planning Act* and was promulgated May 1, 2020. It replaces the Provincial Policy Statement of 2014.

The preamble of the Provincial Policy Statement states in part:

> *The Provincial Policy Statement provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. The Provincial Policy Statement supports improved land use planning and management, which contributes to a more effective and efficient land-use planning system.*

Section 2.1 of the Provincial Policy Statement refers to the protection of natural heritage features. It states that natural features shall be protected for the long term and that;

> *Development and site alteration shall not be permitted in:*
>
> Section 2.1.4
> *a) significant wetlands in Ecoregions 5E, 6E and 7E*
> *b) significant coastal wetlands*
>
> Section 2.1.5
> *a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E*
> *b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River)*
> *c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River)*
> *d) significant wildlife habitat*

e) significant areas of natural and scientific interest, and
f) coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b).

Section 2.1.6
Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.

Section 2.1.7
Development and site alteration shall not be permitted in habitat of endangered species and threatened species, *except in accordance with provincial and federal requirements*.

Section 2.1.8
Development and *site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function* of the *adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions*.

Carte blanche protection is not provided to all wetlands, woodlands, valleylands and wildlife habitat. These natural features must meet minimum ecological criteria set out in the Natural Heritage Reference Manual (2010) and be evaluated as '*significant*' to be protected by the Provincial Policy Statement. The policies of the Provincial Policy Statement represent minimum standards. Municipal planning authorities and conservation authorities can go beyond the minimum standards and establish additional or more protective policies, providing their policies do not conflict with the Provincial Policy Statement.

Significant wetlands are designated by the MNRF using the Ontario Wetland Evaluation System (OWES). Significant habitat of endangered or threatened species is recognized by the MECP if a species is identified on a property through site specific investigations or on the basis of existing records. Fish habitat is governed by Fisheries and Oceans Canada (DFO), although conservation authorities usually act on their behalf.

Of the 11 natural heritage features identified in Section 2.1 of the Provincial Policy Statement, five may be relevant to the property, they are: *significant* woodlands*, significant* wetlands*, significant* wildlife habitat, fish habitat and Species at Risk habitat. However, the woodlands, wetlands, and wildlife habitat on the property may not be *significant,* as defined by the Provincial Policy Statement. This is explored in Section 14.0.

11.5 Simcoe County Official Plan

The Simcoe County Official Plan provides a policy context for land use planning for local municipalities. It attempts to achieve a balance between the demands for economic development, community building, and environmental conservation, and provides a framework for coordinated planning with adjacent municipalities, agencies, and other levels of government. Many of the prohibitions or restrictions on development parrot the Provincial Policy Statement.

Section 3.3.15 of the Simcoe County Official Plan refers to Natural Heritage Features, and states in part:

> … *unless it can be shown with an Environmental Impact Study that there will be no adverse impacts on natural heritage features or their ecological functions, that development and site alteration shall not be permitted in*:
>
> 1. *significant wetlands*
> 2. *significant coastal wetlands*
> 3. *significant woodlands*
> 4. *significant valleylands*
> 5. *significant wildlife habitat*
> 6. *regional and provincial areas of natural and scientific interest (ANSIs)*
> 7. *fish habitat*
> 8. *habitat of endangered species and threatened species*
> 9. *on adjacent lands to 1-8 above.*

This list is consistent with the Provincial Policy Statement, and the same caveats regarding *significant* features applies. Similarly, of the nine natural heritage features identified in Section 3.3.15 of the Simcoe County Official Plan, five may be relevant to the property, they are: *significant* wetlands, *significant* woodlands, *significant* wildlife habitat, fish habitat and Species at Risk habitat.

Schedule 5.1 of the Simcoe County Official Plan designates the land on and adjacent to the property as *Settlements,* i.e., zoned for residential development or growth, or already developed.

Schedule 5.2.2 confirms that there are no provincially or locally significant wetlands on or adjacent to the property. Similarly, Schedules 5.2.3 and 5.2.4 identify that there are no provincially or regionally significant ANSIs, and there are no wetland or surface water protection zones on or adjacent to the property. Section 12.0 further explores the proximity to wetlands and ANSIs.

Schedule 5.2.5 suggests there is one small, pixelated area on the property that is a Highly Vulnerable Aquifer. This pixelated area is not well defined but appears to be approximately in the center of the unevaluated wetland that runs through the middle of the property. Section 4.5.6 states in part:

> …*aquifers, headwater areas, and recharge and discharge areas shall be identified and protected in the policies and maps of local municipal official plans and/or through the development and subdivision approval process*.

Protection of the wetland, and therefore the possible aquifer, is explored further in Section 14.5.

Schedule 5.2.6 identifies that the property is not in a Significant Groundwater Recharge Area. Section 4.5.9b refers to flood hazards and sates:

> *Development shall generally be directed to areas outside of: …b) hazardous lands adjacent to river, stream and small inland lake systems which are impacted by flooding hazards and/or erosion hazards.*

Potential flood hazards on the property are further discussed in Section 11.7.

Section 4.5.33 of the Official Plan states:

> *Development and site alteration are not permitted in fish habitat except in accordance with provincial and federal requirements*.

The potential for fish habitat on the property is discussed in Section 13.6.

11.6 Town of Wasaga Beach Official Plan

The Official Plan of the Town of Wasaga Beach was approved in June 2004. A consolidated plan, which includes Amendments 1 through 54, was completed and posted in January 2020. The amendments included the recommendations from the 2010 Azimuth West End Natural Heritage Review, which includes the property and surrounding area.

Schedule A-1 of the Town of Wasaga Beach Official Plan designates most of the property and adjacent areas as '*Residential*' (Figure 9). A strip of land that runs through the centre of the property and approximates the Bayshore Creek riparian zone is designated '*Natural Heritage System Category 1 Land'*. Development is usually prohibited or restricted in this land designation.

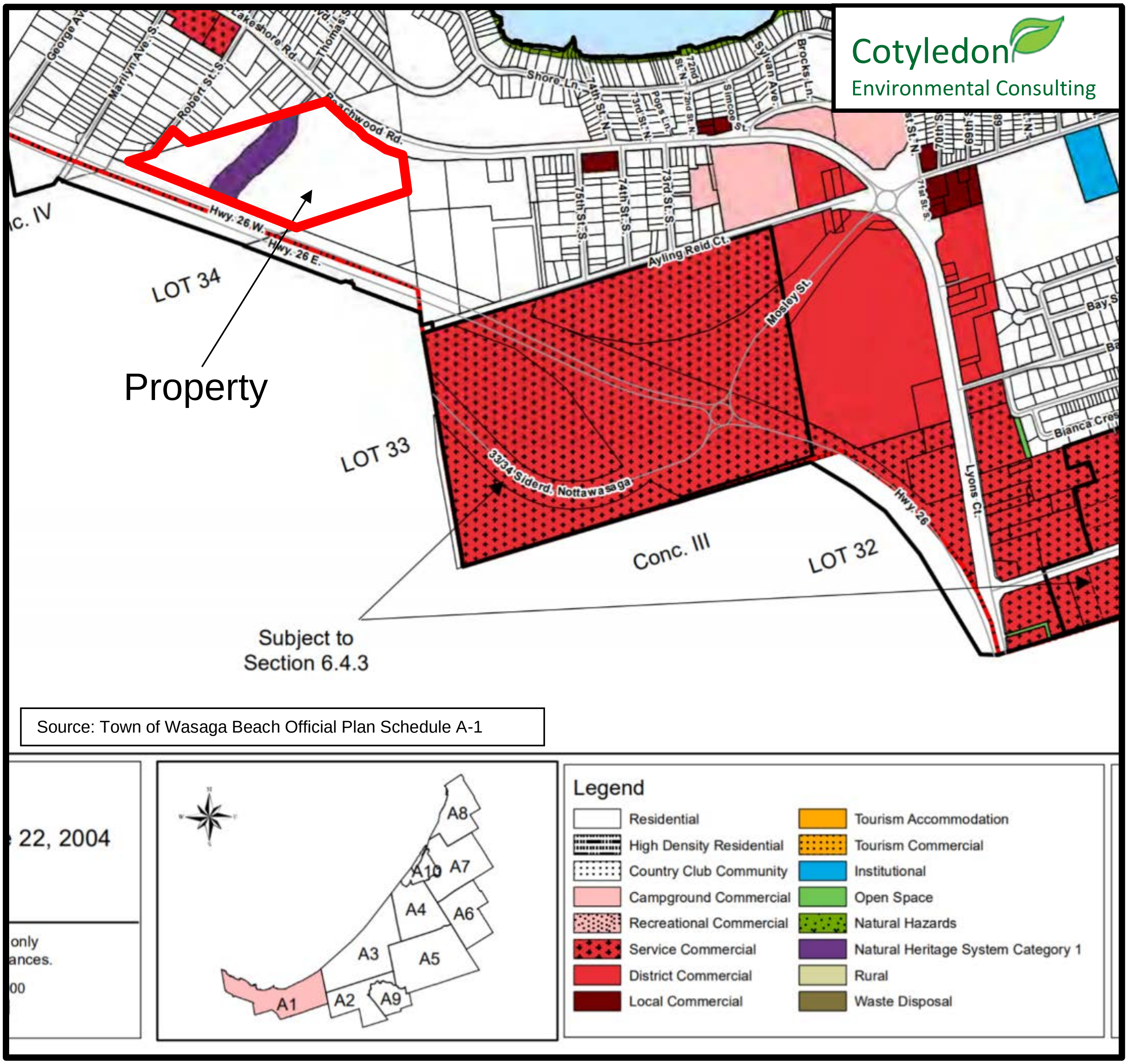


Figure 9: Schedule A-1 of the Town of Wasaga Beach Official Plan designates most of the property as '*Residential*'. A strip of land that approximates the Bayshore Creek riparian zone is designated '*Natural Heritage System Category 1*', in which development is usually prohibited.

Schedule C Section 25 of the Town of Wasaga Beach Comprehensive Zoning By-Law 2003-60 has the property zoned ‘*Development*’. Residential is an acceptable land use for this zoning. The land adjacent to the property is predominantly zoned residential ‘*R1*’, which is consistent with the proposed development plan.

Schedule C of the Official Plan indicates the property is not currently serviced by water or sewer (Figure 10), but it is in a staging area that is scheduled for future infrastructure expansion.

Schedule D of the Official Plan indicates the west half of the property is ‘*Natural Heritage System Category 1 and 2 Lands’* (Figure 11). Category 1 and Category 2 Lands may have restrictions on development. Category 2 Lands are less restrictive. This area appears to roughly correspond to the Bayshore Creek flood plain and wetland. The watercourses, flooding hazard and wetland are discussed in Sections 11.7, 14.2 and 14.5.

Natural Heritage Category 1 Land contains natural features such as (Official Plan Section 13.2.2):

- *provincially significant wetlands;*
- *significant habitat of endangered and threatened species* [species at risk]*, and;*
- *significant parabolic dunes outside of the Provincial Park.*

The designation ‘*significant*’ identifies natural features that have been evaluated using procedures produced by or accepted by the MNRF, or other provincial environmental regulatory agencies, and determined to have inherent ecological uniqueness or sensitivity, make a substantial contribution to the quality, diversity or functioning of local natural systems, or are locally, regionally or provincially rare. Category 1 Lands usually have the highest degree of environmental protection.

Section 13.3.1 of the Official Plan states in part:

> *Natural Heritage System - Category 1 Lands*
>
> *a) The natural state of these areas is intended to be preserved and protected. Permitted uses … include existing agricultural uses, forestry, passive outdoor recreation, public works/uses, scientific research and education and wildlife management activities compatible with the conservation and preservation of the natural flora and fauna.*
>
> *b) No development or site alteration shall be allowed in Natural Heritage System Category 1 lands other than public works/uses and those structures necessary for flood or erosion control.*

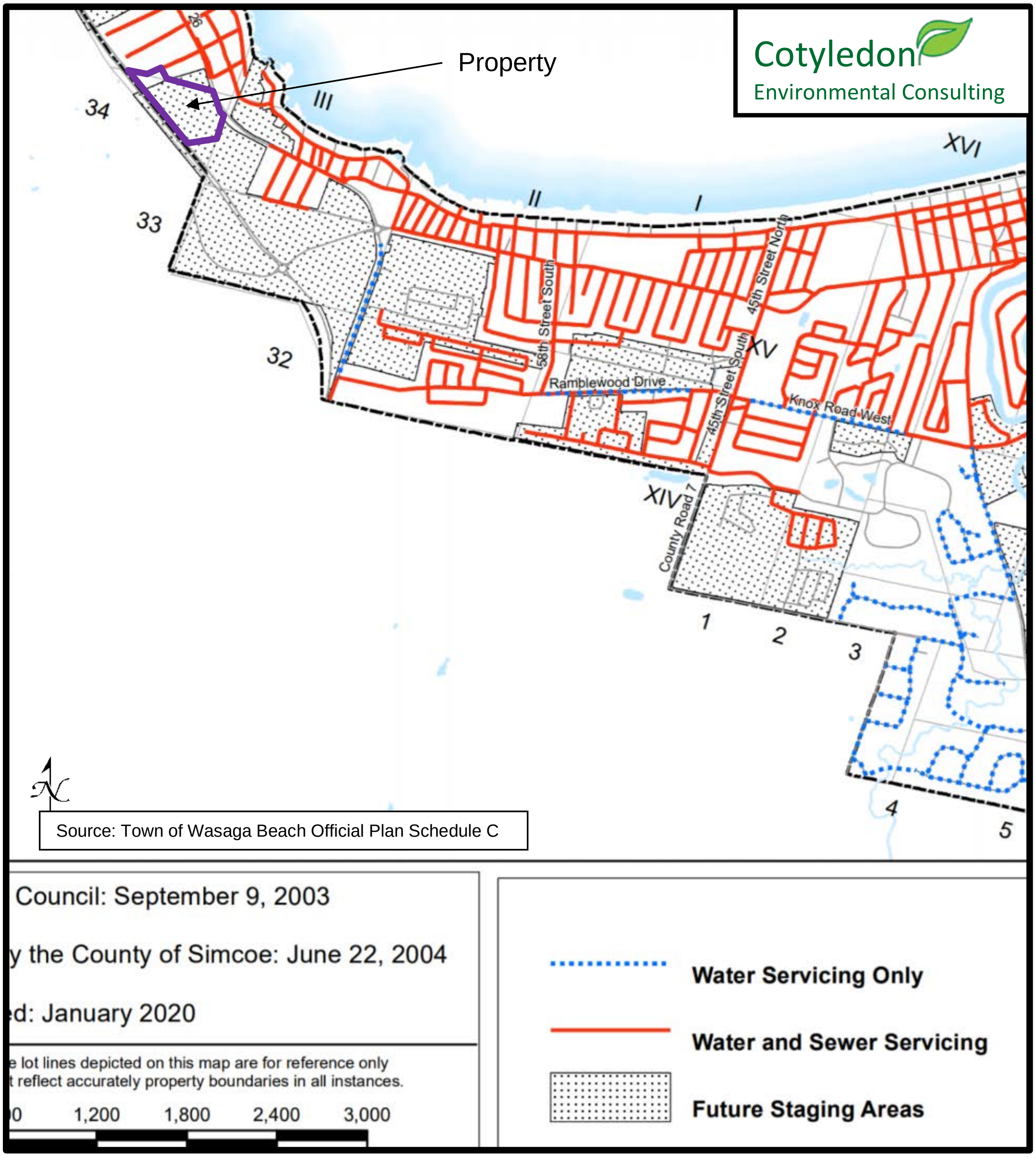


Figure 10: Schedule C of the Town of Wasaga Beach Official Plan indicates the property is not currently serviced but is planned for future services.

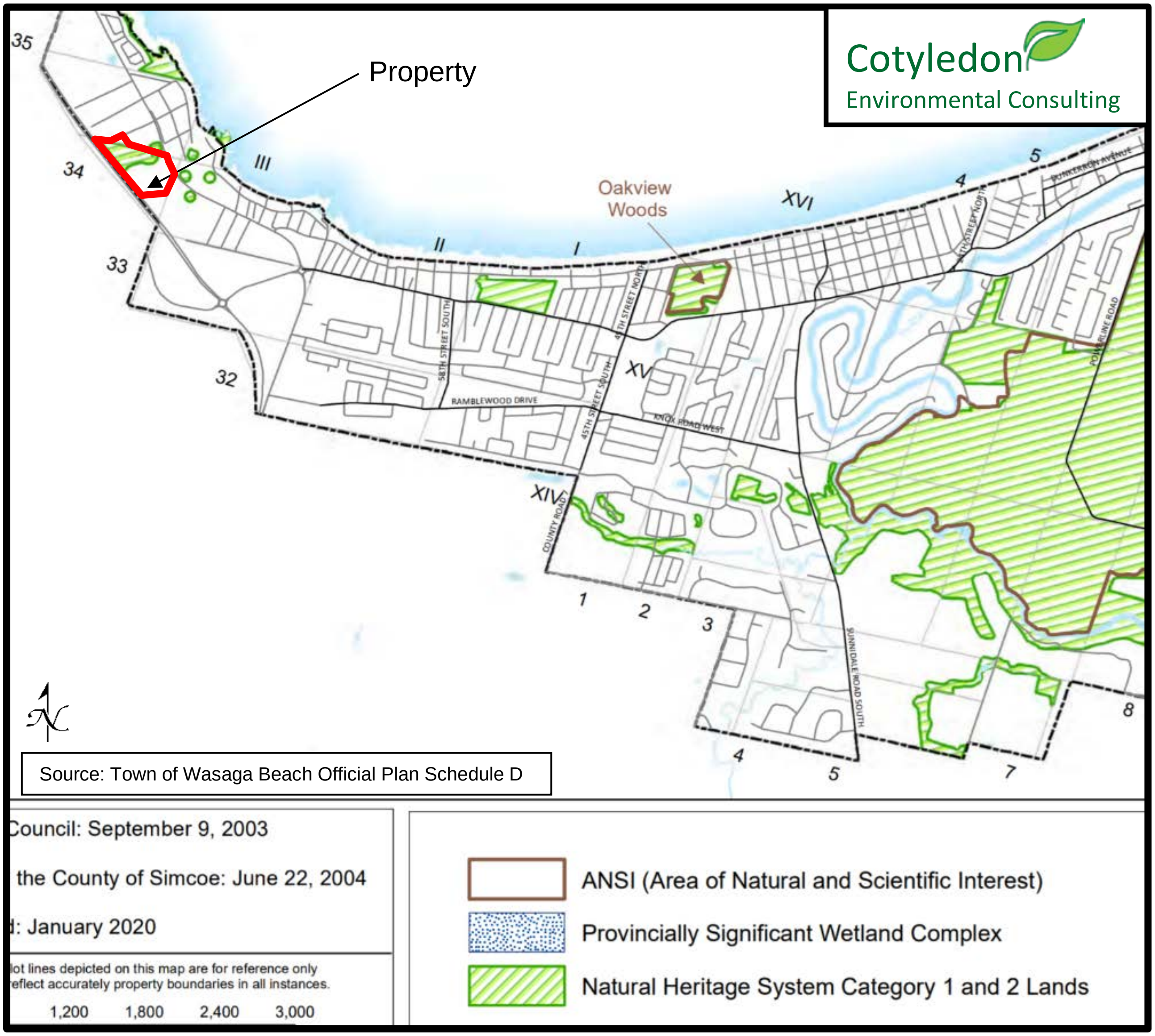


Figure 11: Schedule D of the Town of Wasaga Beach Official Plan indicates the west half of the property is Natural Heritage System Category 1 and 2 Lands, which may have restrictions on development. This appears to roughly correspond to the Bayshore Creek flood Plain.

Natural Heritage Category 2 Lands are environmentally sensitive lands and waters that contain features such as (Official Plan Section 13.2.3):

- *adjacent lands to provincially significant wetlands and other natural heritage system - Category 1 Lands;*
- *provincially significant Areas of Natural and Scientific Interest (ANSI) or other combinations of habitat or landform which could be essential for scientific research or conservation education;*
- *significant wildlife habitat;*
- *natural connections through valley corridors or other linkages between core areas of the natural heritage system;*
- *shoreline areas and beach and dune conservation areas;*
- *fish habitat;*
- *significant woodlands;*
- *significant valleylands, and*
- *natural watercourses and ravines.*

Section 13.3.2 of the Official Plan states in part:

> *Natural Heritage System - Category 2 Lands*
>
> *c) … development and site alteration in lands delineated Natural Heritage System - Category 2 Lands … may be permitted if it can be demonstrated, to the satisfaction of the Municipality in consultation with the applicable commenting agencies and approving authorities, that negative impacts on the ecological features or functions of the components of the natural heritage system of the Town of Wasaga Beach will not occur.*

The Natural Heritage system and whether natural features on the property are determined to be '*significant*' is discussed further in Section 14.0.

Schedule E of the Official Plan confirms the property is not connected to a current or planned recreational trail system.

Schedule F of the Town of Wasaga Beach Official Plan illustrates the significant growth planned for the west portion of the Town, in which the property is located. It has a planned population potential of 7,190. The 2001 assessment identifies a population of about 2,020. Therefore, this portion of the Town of Wasaga Beach has a planned population increase of about 5,170. The planned residential developments on the property are consistent with the Town of Wasaga Beach's population growth strategy.

Schedule G confirms the property is not in a Wellhead Protection Area or in a Vulnerable Aquifer Area (Figure 12). This is in contrast to the Simcoe County Official Plan which identifies a small portion in about the center of the property as a Vulnerable Aquifer Area. This discrepancy is discussed further in Section 11.7.

Section 19.25 of the Official Plan states in part:

> *Tree Preservation and/or Compensation.*
>
> *Where possible, development should retain existing vegetation and/or mature trees. Prior to removal of vegetation and/or trees for the purpose of development, a tree identification/preservation plan shall be submitted to the satisfaction of the Town, which should locate and identify the trees in terms of size, species, and health.*
>
> *19.25.3 Tree preservation and/or compensation shall be implemented through the approval of plans of subdivision …*

The proposed development plan would require the removal of a substantial portion of the vegetation and trees on property. Therefore, a tree compensation plan may be required. This requirement is one of several environmental issues that are currently being discussed with the Town of Wasaga Beach and the NVCA.

Even though the Official Plan for the Town of Wasaga Beach has the property zoned for development, it is in an area scheduled for future infrastructure services, and it is in an area planned for substantial population growth, there are environmental features that may restrict development on some parts of the property. Because some of the impacts on the natural features will occur as a result of the proposed flood control by-pass channel and not the residential development, discussions are on-going with the Town to determine how compliance with the municipal environmental policies will be achieved.

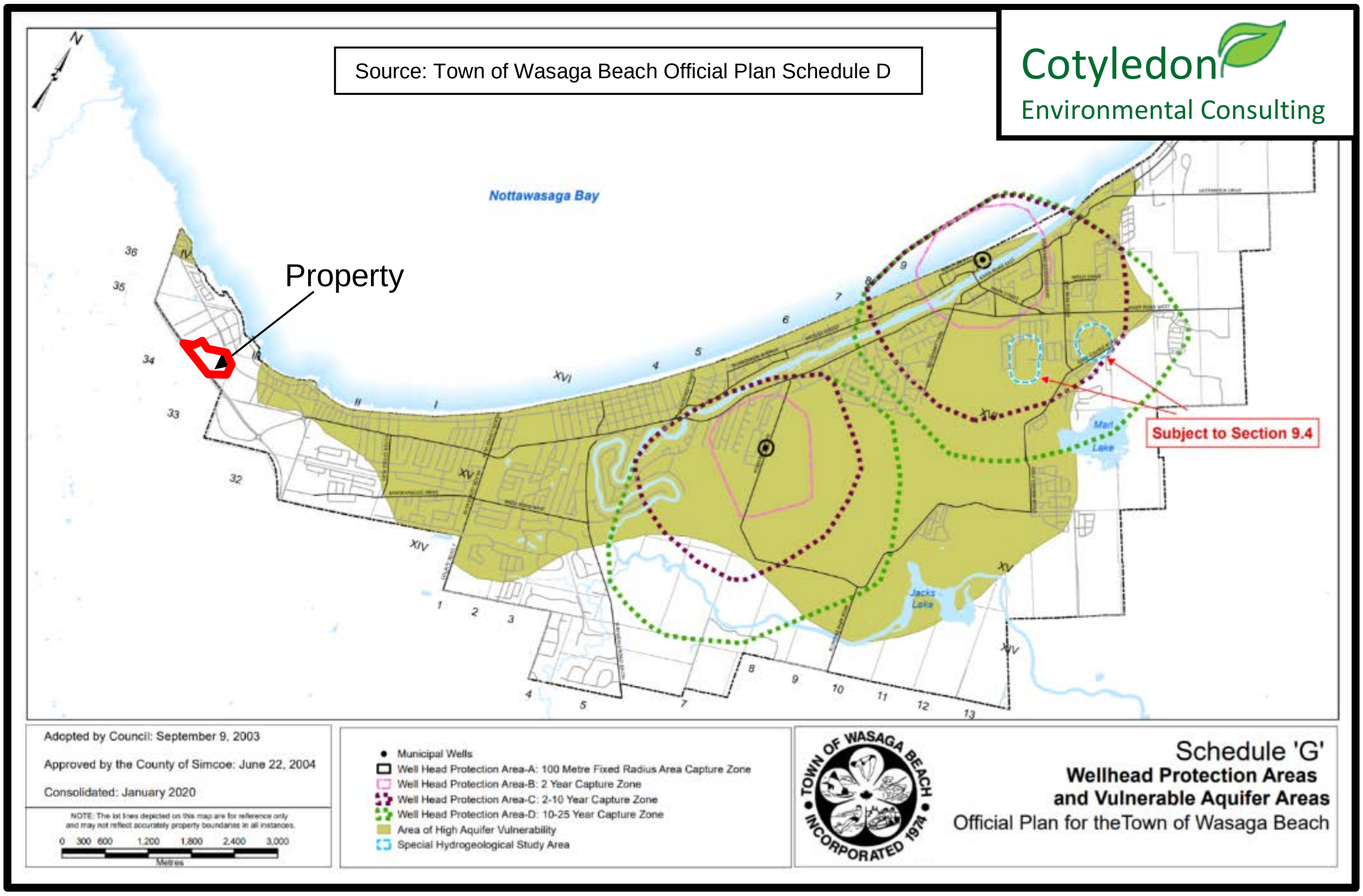


Figure 12: Schedule G of the Town of Wasaga Beach Official Plan identifies Wellhead Protection and Vulnerable Aquifer Areas. The property is in not in either area, although much of the developed area of Wasaga Beach is.

11.7 Nottawasaga Valley Conservation Authority

The Nottawasaga Valley Conservation Authority (NVCA) guards against the risks posed by flooding, erosion and other natural hazards by regulating development in the watershed through administering *Ontario Regulation 172/06* made under Section 28 of the *Conservation Authorities Act,* known as the *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation*.

O. Reg. 172/06 outlines what and where the NVCA can regulate. Generally, this regulation restricts or prohibits the alterations of natural features such as woodlands, watercourses, wetlands, valleys and slopes, flood plains and lake shorelines, unless an Environmental Impact Study illustrates the proposed development will not have an adverse impact on these natural features or their ecological functionality.

In addition, the *Nottawasaga Valley Conservation Authority Planning and Regulation Guidelines* (2009)*,* provides guidance to developers on land regulated by the NVCA.

Consulting the NVCA's on-line property mapping tool, it was determined that the property is neither in nor adjacent to a Well Head Protection Zone or a Significant Groundwater Recharge Area. Similar to the Town of Wasaga Beach Official Plan, but in contrast to the Simcoe County Official Plan, the NVCA indicates the property is not in a Highly Vulnerable Aquifer. Although this mapping anomaly is curious, being in a vulnerable aquifer does not prohibit development. However, municipal planning authorities will expect robust surface water and sewage management strategies and may require infrastructure adjustments to enhance or manage surface water percolation. The proposed development will connect to the scheduled expansion of the municipal drinking water, wastewater, and storm water management infrastructure, so impacts to an aquifer, if one exists on the property, should not occur.

In order to avoid flooding of adjacent lands or erosion of the stream bank, Section 4.3.4.3 of *O. Reg 172/06* generally prohibits development and storm water management facilities within a *Regulated Area*. However, Section 4.3.4.4 states that development may be permitted if it can be demonstrated to the satisfaction of the NVCA that the control of flooding, erosion, pollution or the conservation of land will not be affected.

A property enquiry was made to the NVCA. The CA's email response is reproduced in Appendix 21.3.

The NVCA confirmed that a substantial portion of the property is designated Regulated Area under the *Conservation Authorities Act* due to:

> … *meander erosion hazards, flood hazards, locally significant wetlands, and wetland buffer. The NVCA regulates development within 120 metres of wetland features*.

NVCA permits are required for any development on the property within the Regulated Area.

The NVCA provided a property-specific map illustrating meander erosion hazards, flood zones, wetlands and Regulated Areas. These features were compiled on a single map, which made the map quite busy. Therefore, the features were extracted using image overlays onto geo-referenced Google Earth Pro ortho-images and reproduced separately.

Figure 13 illustrates the two NVCA meander erosion hazard areas on the property. The west feature, which is 6.9 acres (2.8 ha), corresponds to Bayshore Creek. The smaller, east feature, which is 2.8 acres (1.1 ha), corresponds to Shore Creek. Although the NVCA refers to these features as meander erosion hazards, there is, in fact, no erosion hazard. In a pre-consultation meeting about the property on January 25, 2012, with Equi-Knox Environmental and the Town of Wasaga Beach, the NVCA conceded that an erosion hazard assessment wasn't required because the creeks don't have a defined channel (see Appendix 21.2).

As briefly described in Section 9.5 and in more detail in Section 14.2, both streams on the property are ephemeral, or intermittent, don't have defined channels, and the shallow sheet flow is constantly being redirected by fallen vegetation. Stream flow is neither sufficient enough nor sufficiently prolonged to carve a stream channel, so there cannot be an erosion hazard associated with either of the two watercourses.

This is collaborated by the recent fluvial-geomorphic study completed by Palmer (2021). A meander belt could not be determined for Bayshore Creek, NVCA's west erosion hazard, because there is no evidence of fluvial erosion and deposition, i.e., there is no defined, eroded, creek channel. Regarding the NVCA's east erosion hazard, despite a thorough ground inspection by both Palmer and CEC over two years and several seasons, a channel for Shore Creek couldn't be distinguished at all. Most of the Shore Creek flow upstream of the property flows eastward along the ditch on the north side of Highway 26, immediately adjacent to the south side of the property. In peak flow periods some water spills over onto the property and makes its way by sheet flow to a box culvert on the south side of Beachwood Road in the northeast corner of the property. The NVCA conceded that Shore Creek doesn't exist as a watercourse and the flow could be treated or re-directed (Appendix 21.2).

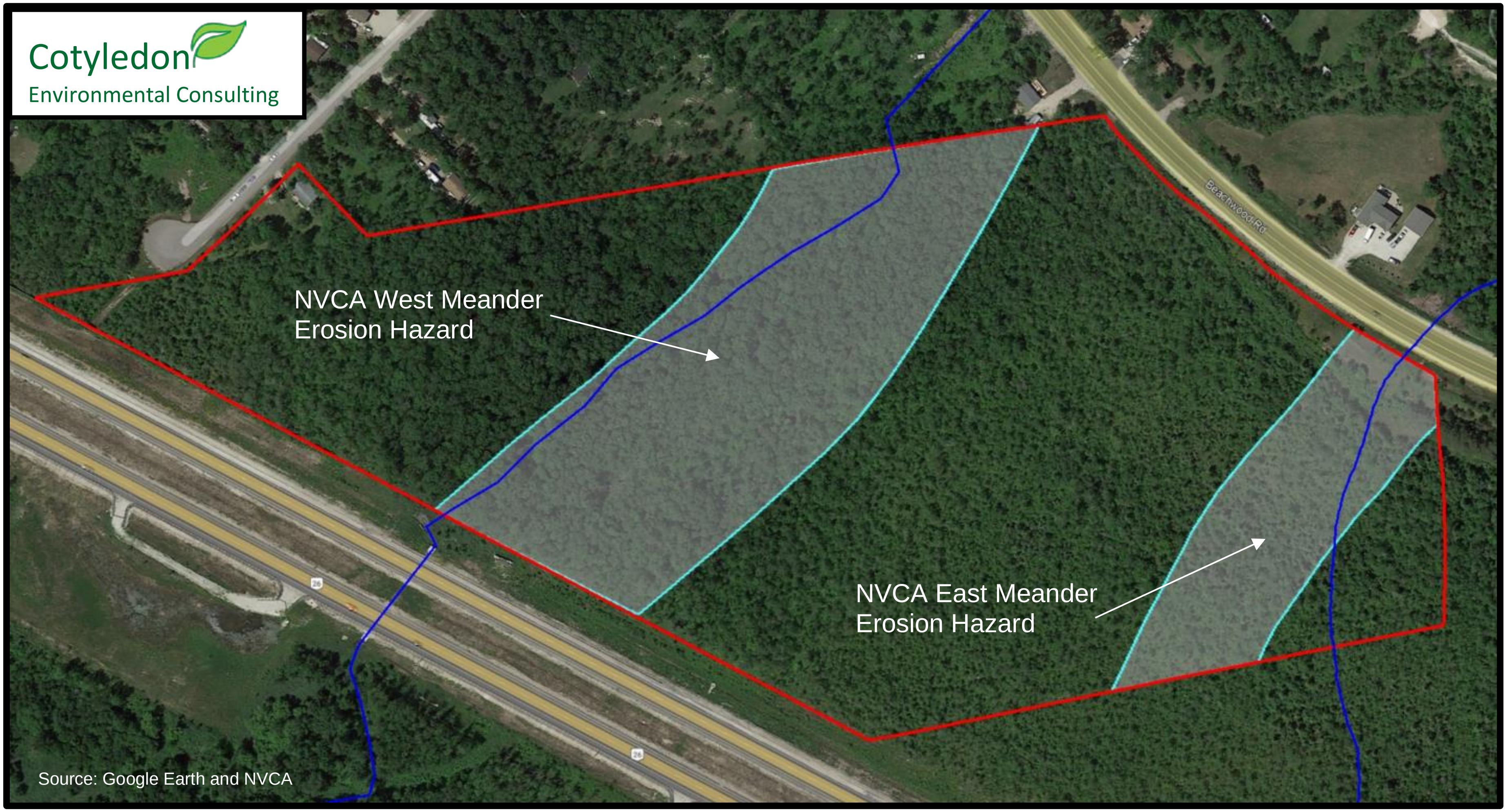


Figure 13: NVCA Meander Erosion Hazard. The west hazard is associated with Bayshore Creek, the east hazard is associated with Shore Creek. In fact, neither creek has a meander belt and Shore Creek doesn't exist as a defined watercourse. Therefore, there is no erosion hazard on the property.

Table 4: Erosion and Flood Hazard Features[1], Wetlands, and the NVCA Regulated Area on the property.			
Hazard	Area		% of Property[4]
	Acres	Hectares	
NVCA Meander Erosion Hazard West (Bayshore Creek)[2]	6.9	2.8	22.3%
NVCA Meander Erosion Hazard East (Shore Creek)[2]	2.8	1.1	9.0%
Total NVCA Meander Erosion Hazard[2]	9.7	3.9	31.3%
NVCA Flood Hazard	9.7	3.9	31.3%
NVCA Wetland[3]	9.7	3.9	31.3%
NVCA Regulated Area	24.7	10.0	79.7%

1 – Hazard features as reported by the NVCA, Burnside (2021), Beacon (2012) and CEC 2020/21.
2 – There is no erosion hazard because both streams are ephemeral and neither have a defined channel, and Shore Creek doesn't exist as a water course.
3 - Based on Beacon Environmental/NVCA staking exercise July 28, 2011.
4 – Property size is 31.0 ac (12.6 ha).

Since neither creek has a meander belt, and Shore Creek doesn't really exist as a watercourse at all, there is no erosion hazard on the property. The NVCA erosion hazards illustrated in Figure 13 don't, in fact, exist.

The discrepancy between the NVCA Erosion Hazard mapping and the actual on-site conditions is understandable. Watersheds are large and complex and conservation authorities don't have the human resources to visit and ground truth every natural feature in their jurisdiction. Therefore, out of an abundance of caution and respecting their regulatory mandate, they assume every watercourse has the potential to erode its banks and periodically flood adjacent and downstream land. As a result, they automatically apply a minimum 30 m buffer on each side of all the watercourses mapped in the watershed and include the designated buffer in their Regulated Area mapping. The NVCA mapping is the regulatory standard with regard to protection of hazard lands, it is up to the proponent to illustrate that the hazard either doesn't exist or it can be mitigated. In this case, it has been illustrated conclusively that an erosion hazard doesn't exist on the property.

Figure 14 illustrates the NVCA Regulated Area as it relates to the property. It is about 24.7 acres (10.0 ha) and covers approximately 80% of the property. The area is Regulated because of the potential for flooding and to protect the wetland.

The NVCA discourages development in Regulated Areas, unless an EIS illustrates that hazard land can be avoided or the hazard mitigated, and natural heritage features or their ecological functions will not be impacted. In this case, there is no erosion hazard on the property, but the proposed development is in a Regulated Area and some of the natural features will be impacted. Normally, a permit is required from the NVCA to allow development to proceed in Regulated Areas. However, in this case it is the proposed flood mitigation and not the residential development that will have the most significant impact on the natural features on the property, so impacts will occur even if the development doesn't proceed. Therefore, the relevance of and the requirement for a permit is currently being discussed with the NVCA.

11.7.1 A Strategy to Mitigate the Potential Flood Hazard on and in the Vicinity of the Property and the Implication on Ecological Compliance.

In the absence of a meander belt, the erosion hazard limit is based on the extent of the flood hazard limit, which is consistent with the NVCA's Planning and Regulations Guidelines. Figure 15 illustrates the NVCA's flood hazard area, which is associated with Bayshore Creek. The NVCA does not map a flood hazard associated with Shore Creek. The NVCA flood hazard area is 9.7 acres (3.9 ha) in size. However, the NVCA flood hazard area significantly underestimates the potential for flooding. Both the Town of Wasaga Beach and the NVCA are aware of shallow flooding across an area substantially larger than illustrated in Figure 15. Chronic seasonal flooding occurs across the property. Shallow flooding has been regularly documented on adjacent properties in the west end of Wasaga Beach south of Beachwood Road.

Periodic flooding is known to be a problem. Sunray engaged R.J. Burnside to model the potential flood hazard on and in the vicinity of the property. Burnside concluded that the absence of a defined flow path through the property and the flat topography in the area limited the use of a 1-D hydraulic model (HEC-RAZ). The NVCA concurred with Burnside that the floodplain within the property and the surrounding area would be best delineated using a 2-D hydraulic model (SMS-2D).

One of the accepted outcomes of climate change is that storm events are likely to be more extreme. Burnside reviewed the storm data for Timmins Ontario and concluded that a Regional Event could be 3.5 times the magnitude of a 50-year storm, and 2.5 times the 100-year event. Burnside then modelled the Regional Event for the west end of Wasaga Beach using the 2-D hydraulic model. The result is illustrated in Figure 16. Under a Regional Storm Event the entire property is flooded, as are most of the nearby residential properties north and south of Beachwood Road, and the undeveloped area south of HWY 26. The flooded area is approximately 450 ac (180 ha), potentially impacting 250 to 300 residential properties north and south of Beachwood Rd.

Burnside's model was reviewed by two independent engineering firms (Tatham Engineering and the Ainley Group). Both firms agreed in principle to the concept of addressing flood mitigation using a drainage ditch system.

Burnside calculated that the flooding could be completely mitigated with an engineered by-pass channel that engulfs the surface flow from the box culvert at the southwest corner of the property on the north side of HWY 26, routes along the south side of the property, turns north along the east side of the property, and joins a planned municipal channel north of Beachwood Rd., which runs directly to Georgian Bay. The route of the conceptual flood by-pass channel is illustrated in Figure 17. The by-pass channel is conceptually illustrated in Figures 8 and 17. The exact dimensions are yet to be determined.

Burnside presented the model results and the mitigation strategy to the Town of Wasaga Beach and the NVCA in the fall of 2022 and engaged in a series of subsequent discussions. These discussions are on-going.

Figure 14: The NVCA Regulated Area is about 24.7 ac (10.0 ha) and covers about 80% of the property.

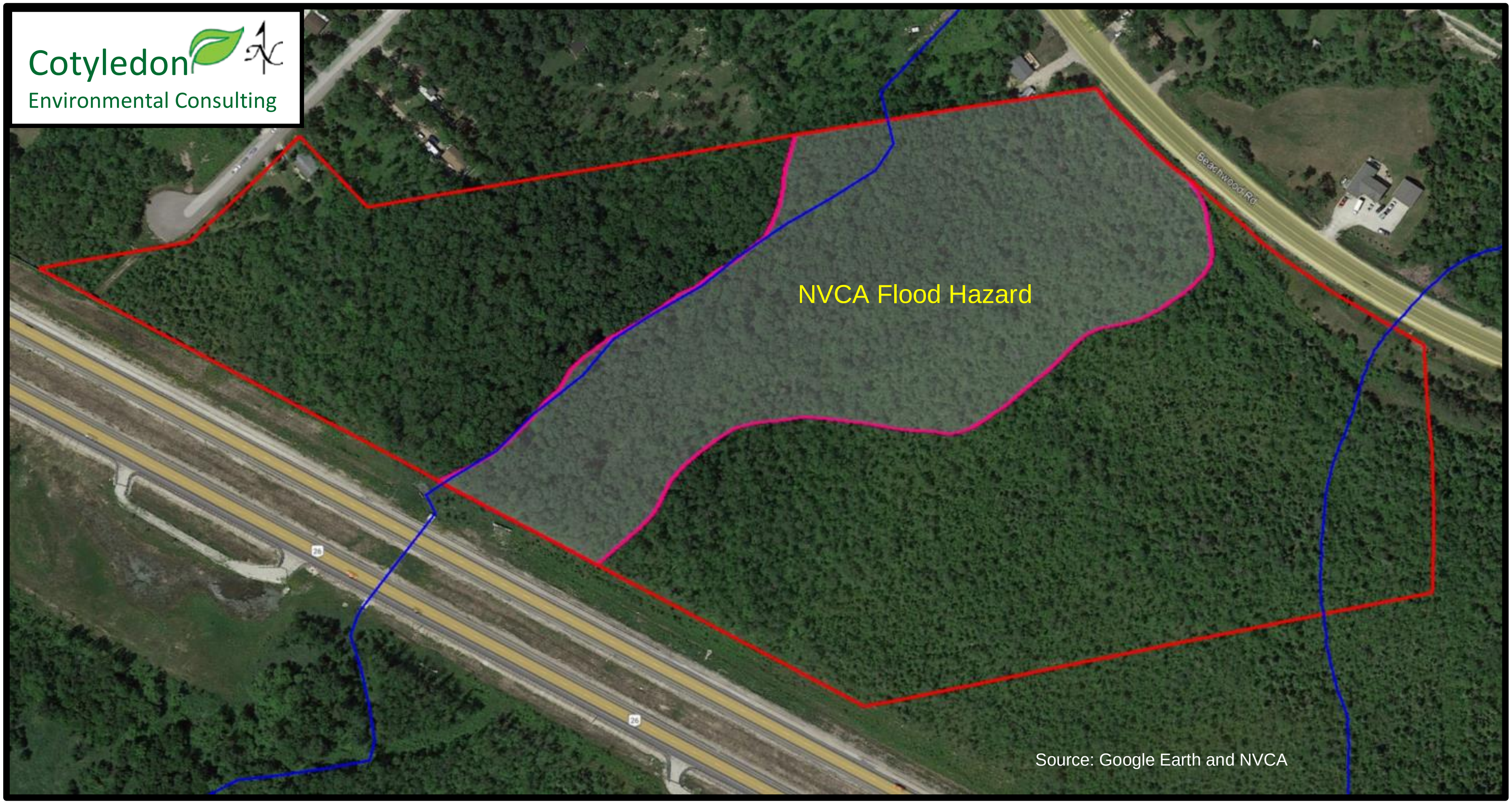


Figure 15: NVCA Flood Hazard associated with Bayshore Creek is 9.7 ac (3.9 ha). The NVCA doesn't predict a flood hazard associated with Shore Creek, which recognizes the insignificance of that watercourse.

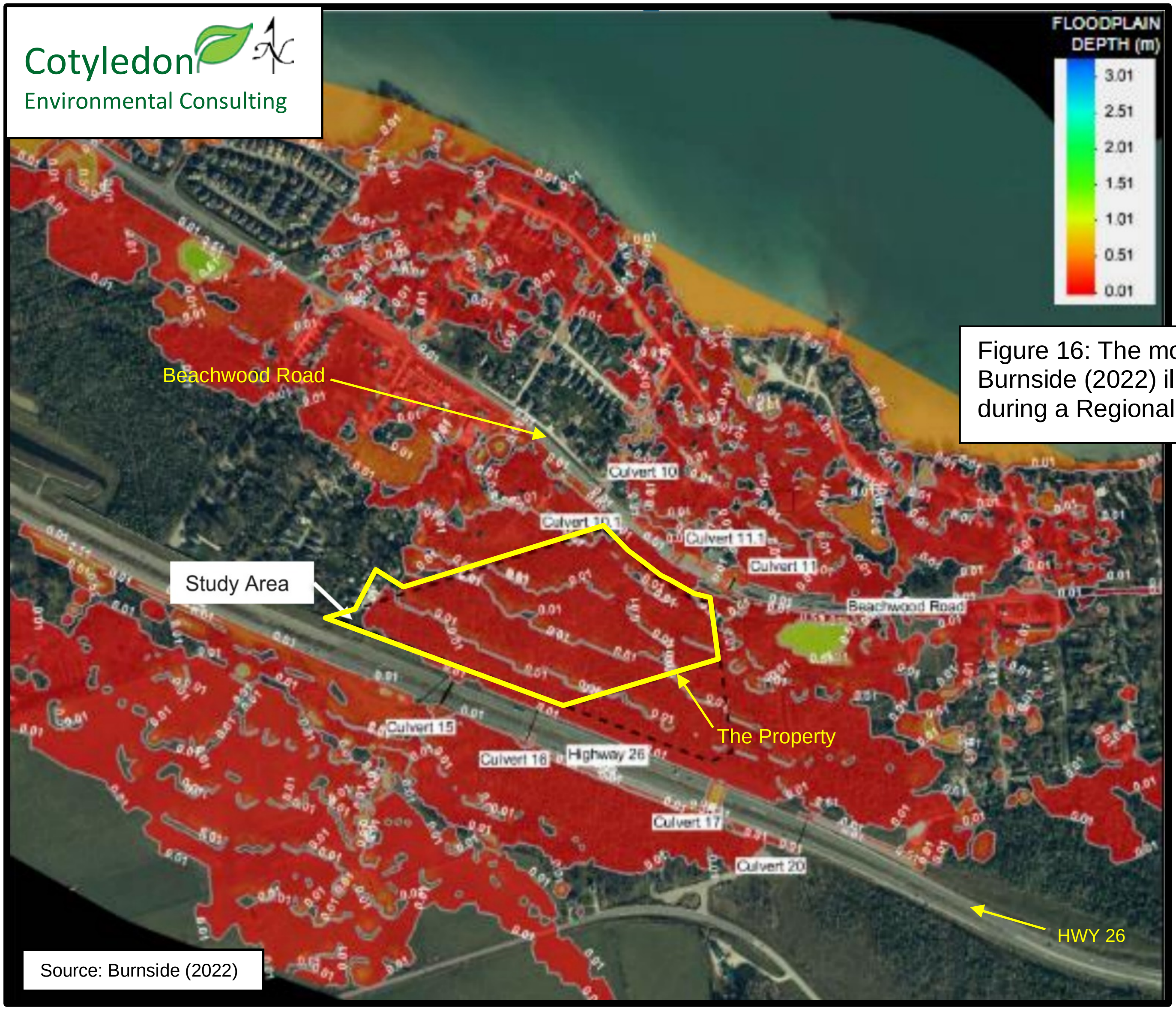


Figure 16: The most recent modelling by Burnside (2022) illustrates the extent of flooding during a Regional Event.

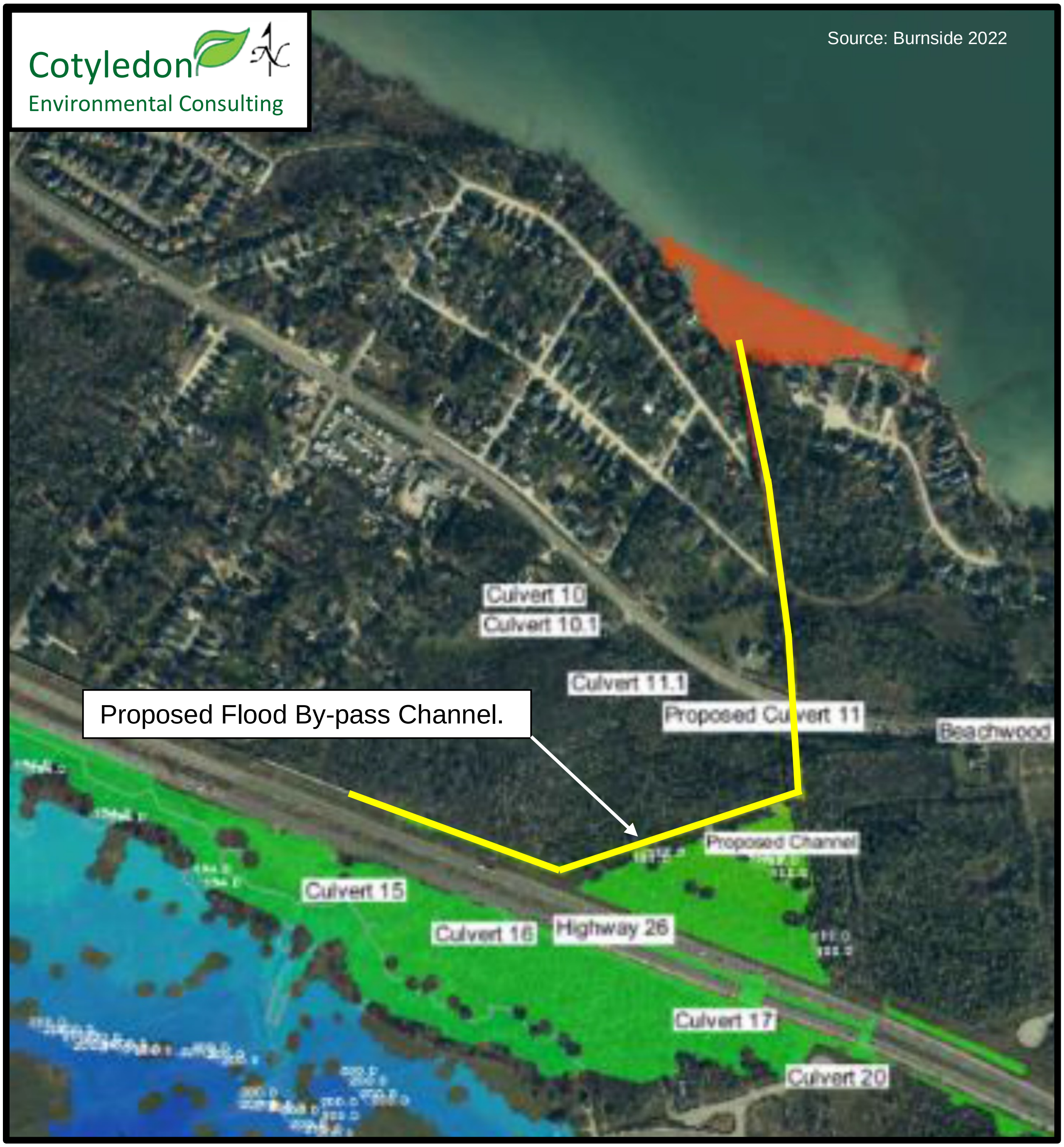


Figure 17: The Route of the Proposed Flood By-pass Channel.

11.8 NVCA Ecological Offset Policy

In September of 2021 the NVCA adopted an ecological offset policy entitled *Achieving Net Gains through Ecological Offsetting Guidelines for Site-specific Ecological Offsetting Proposals and Plans.* This policy promotes an alternative approach to ensuring that there is no net loss in wetland features across the watershed while striving to achieve overall net gains in natural features and their functionality on the landscape.

The ecological offset policy requires the proponent to compensate for wetland features that are lost through development. The compensation can be reproducing the wetland somewhere else on the developed property or on another property purchased by the proponent for that reason. Compensation can also be made by a cash payment, called pay-in-lieu, to the NVCA or a third party, such as Ducks Unlimited, which they use to create new wetland habitat elsewhere in the watershed. Compensation applies, on an area basis, to the displaced wetland and to the 30 m wetland buffer.

The proposed development completely displaces the wetland and the associated woodland on the property. The extent of the wetland, and other natural features, is discussed in Section 12.0.

Normally, the loss of the wetland and the associated woodland buffer would be addressed through the NVCA's ecological offset policy, and the proponent would be responsible for compensation. However, in this case, the loss of the wetland is related to the flood mitigation and not the development, because the wetland will dry up when the surface water is re-directed via the by-pass channel. Therefore, the wetland would be lost even if the proposed residential development does not proceed, and so the relevance of and the responsibility for any ecological off-set charges needs to be determined.

12.0 Natural Heritage Assessment
12.1 Local Natural Heritage Features – Physical

Natural heritage features can be physical features, such as wetlands, woodlands, parks, ANSIs and water bodies, or they can be biological features, such as flora, fauna, and species at risk.

Table 5 lists the physical natural heritage features nearest the property. There are two provincial parks, two areas of natural and scientific interest (ANSI), four conservation areas, two provincially significant wetlands, one regionally significant wetland, at least four unevaluated wetlands (one on-property), one wildlife concentration area (one on-property) and one specialty plant community within 17 km of the property. There are no known archeological or specialty crop areas on, adjacent to, or in the local vicinity of the property.

The proposed development will have no impact on most of these local natural heritage features because there are no anticipated off-site impacts, they are too far away (greater than the 120 m regulatory buffer), and they are not physically or ecologically complexed with the natural features on the property.

The unevaluated wetland on the property is coincident with the Town of Wasaga Beach Natural Heritage System Category 1 Land (see Figure 9). This wetland, and therefore the Category 1 Land, will be impacted, as it will dry out because of the flood mitigation by-pass channel.

The entire property is in a Stratum 2 Deer Wintering Area. A Stratum 2 Deer Wintering Area is the area occupied by deer in early winter or occasionally all season during mild winters. By comparison, a Stratum 1 Deer Yard is considered as the core of a deer yard. Deer use Stratum 1 habitat when mobility is most restricted under severe winter and deep snow conditions. Deer concentrations can be substantial in Stratum 1 habitat. Stratum 2 areas support Stratum 1 Yards by providing access and additional feeding areas for the wintering deer herd. The proposed development could displace as much as 31 ac (12.6 ha) of woodland, which is Stratum 2 Deer Wintering Area.

In their 2010 Natural Heritage Assessment report to the Town of Wasaga Beach, Azimuth concluded the following regarding the preponderance of deer habitat in the west end (which includes the entire property).

> *Highway 26 poses a significant hazard to deer and humans as deer migrate to and from the yard each winter. Retaining deer yards within urban conditions can result in significant numbers of deer/vehicle collisions. This deer migration hazard and the highly urbanized nature of Wasaga's west end greatly decrease the*

Table 5: Natural Heritage Features nearest the property.	
Feature	Distance & Direction
Wasaga Beach Provincial Park[1]	1.3 km ENE
Nottawasaga Lookout Provincial Park[1]	11.2 km SW
Wasaga Backland Park Reserve (Earth Science) ANSI[1]	4.0 km ENE
Oakview Woods (Life Science) ANSI[1]	4.0 Km ENE
Petun Conservation Area[1]	14.3 km WSW
Nottawasaga Bluffs Conservation Area[1]	13.2 km SW
New Lowell Conservation Area[1]	16.3 km SE
Edenvale Conservation Area[1]	17.7 km E
Provincially Significant Wetland (Jacks Lake Complex)[1]	9.8 km ENE
Provincially Significant Wetland (Stayner Wetland Complex)[1]	7.0 km SSE
Regionally Significant Wetland (Edenvale Wetland)[1]	12.6 km SE
Unevaluated Wetland[1]	1.2 km SW
Unevaluated wetland[1]	895 m NW
Unevaluated Wetland[1]	545 m ESE
Unevaluated Wetland (Town of Wasaga Beach Natural Heritage System Category 1 land)[2]	On-property
Wildlife Concentration Area (Colonial Waterbird Nesting Area)[1]	750 m NNW
Wildlife Concentration Area (Stratum 2 Deer Wintering Area)[3]	On-property
Plant Community (Sea Rocket Sand Beach Type)[1]	230 m ENE
Archeological Site	None known
Specialty Crop Areas	None known

1 - The proposed development will have no impact on these local natural heritage features because they are greater than 120 m distance and they are not physically or ecologically complexed with the natural features on the property.
2 – The proposed development will have an impact on this wetland because it will be completely displaced by the proposed development. Ecological Offsets are being negotiated.
3 – Some of the deer yard will be impacted by the development because woodlands will be removed, however, there is ample deer habitat in and around Wasaga Beach, therefore the sustainability of the local deer population will not be jeopardized.

suitability of the remnant forest as deer yard. We recommend that the Stratum 1 deer yard in the area not be designated significant wildlife habitat [in fact it wasn't, the Town of Wasaga Beach designated it as Stratum 2 Deer Wintering Area rather than a Stratum1 Deer Yard]*. Excluding this area from consideration as deer yard does not greatly diminish the supply of winter deer yard in Wasaga Beach. The MNR's most recent deer yard survey indicates Wasaga Beach contains 1,261 ha* [3,116 ac] *of Stratum 1 winter deer yard (Allan et. al., 2005). Even if deer are occupying all of the forest habitat in the west end and none of the forest habitat is retained, over 95% of the core habitat of the Wasaga Deer Yard would remain. Considering that most of the core winter deer range of the Wasaga Beach deer yard is protected within the Wasaga Beach Provincial Park and other Natural Heritage System lands of the municipality, there is no threat to deer populations as the result of not designating the deer yard habitat of Wasaga's west end* [which includes the entire property] *as significant. Therefore, we recommend that the woodland in the west end* [including the property] *not be designated as Significant Wildlife Habitat.*

Clearly, removing the woodland on the property would not jeopardize the sustainability of the local deer population.

12.2 Local Natural Heritage Features – Biological

The Natural Heritage Information Centre (NHIC) database was reviewed to determine if there were any documented species at risk or significant biological records on or adjacent to the property.

The NHIC information is summarized in 1 km^2 grids. The property is almost entirely included in NHIC grid number 17NK6924. Because birds and animals may utilize adjacent land while foraging, nesting or traversing their territory, the seven adjacent NHIC grids to the property were also explored. The eight NHIC grids screened for this discussion are illustrated in Figure 18. The results of the NHIC biological screening are summarized in Table 6.

There is a Wildlife Concentration Area associated with the shore of Georgian Bay, which is as close as 360 m north of the property. It is a colonial waterbird nesting area. Colonial waterbirds are birds that frequent coastal areas for nesting and foraging and typically gather in colonies. This includes gulls, terns, herons, egrets and some species of geese and ducks. They generally prefer open habitats to vegetated areas. The property is almost completely forested, even the wetland areas, and there is no standing or running water for most of the season. There is no suitable habitat on the property to attract and hold colonial waterbirds, and the referenced colony is about 360 m distance. Therefore, there is no anticipated impact on this local natural feature if the proposed development proceeds.

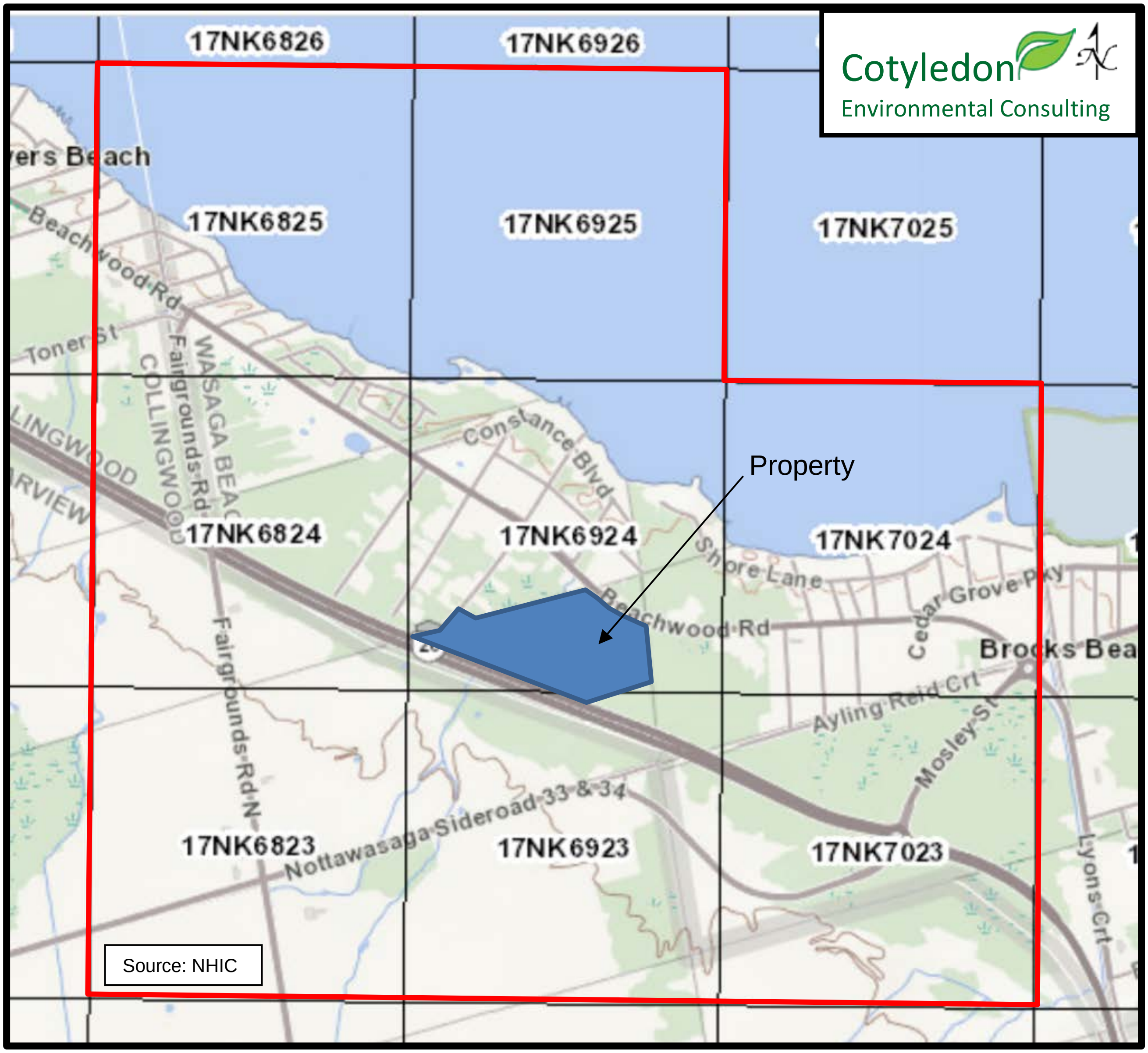


Figure 18: There were eight NHIC grids explored for screening Natural Heritage Features.

Table 6: Results of NHIC Screening for Biological Natural Heritage Features.			
NHIC Grid	Distance & Direction from Property	NHIC Record	Likely to be Impacted by the Proposed Development
17NK6825	790 m NNW	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Lake Sturgeon (*Acipenser fulvescens*)	This fish is a species at risk (*Threatened*) It exists in nearby Georgian Bay. There is no fish habitat on the property (see Section 13.6). **No anticipated impact**.
		Wood Thrush (H*ylocichia mustelina*)	This bird is a species at risk (*Special Concern*). Although it exists locally it was not confirmed to be present on the property (see Section 13.2), also there is no suitable habitat on the property. **No anticipated impact**.
17NK6824	120 m W	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Wood Thrush (H*ylocichia mustelina*)	This bird is a species at risk (*Special Concern*). Although it may exist locally it was not confirmed to be present on the property (see Section 13.2), also there is no suitable habitat on the property. **No anticipated impact**.
17NK6823	220 m SW	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Eastern Meadowlark (*Sturnella magna*)	This bird is a species at risk (*Threatened*). Although it may exist locally it was not confirmed to be present on the property (see Section 13.2), also there is no suitable habitat on the property. **No anticipated impact**.
17NK6924	Property mostly in this grid	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Lake Sturgeon (*Acipenser fulvescens*)	This fish is a species at risk (*Threatened*) It exists in nearby Georgian Bay. There is no fish habitat on the property (see Section 13.6). **No anticipated impact**.
17NK6923	Property partially in this grid	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
17NK7024	230 m E	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Plant Community	Sea Rock Sand Beach Type. This rare plant community is confined to the sandy shores of Georgian Bay. This habitat doesn't exist on the property. These species were not confirmed to be present on the property (see Section 13.1.2). **No anticipated impact.**
		Lake Sturgeon (*Acipenser fulvescens*)	This fish is a species at risk (*Threatened*) It exists in nearby Georgian Bay. There is no fish habitat on the property (see Section 13.6). **No anticipated impact**.
		Midland Painted Turtle (*Chrysemys pictamaginate*)	This turtle is not a species at risk in Ontario, but it is listed in COSEWIC (*Special Concern*). Turtle habitat does not exist on the property, no turtles were observed on the property. **No anticipated impact**.
		Eastern Meadowlark (*Sturnella magna*)	This bird is a species at risk (*Threatened*). Although it may exist locally it was not confirmed to be present on the property (see Section 13.2), also there is no suitable habitat on the property. **No anticipated impact**.
17NK7023	220 m SE	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Eastern Meadowlark (*Sturnella magna*)	This bird is a species at risk (*Threatened*). Although it may exist locally it was not confirmed to be present on the property (see Section 13.2), also there is no suitable habitat on the property. **No anticipated impact**.
17NK6925	660 m N	Wildlife Concentration Area	Colonial Waterbird Nesting Area. This feature is confined to the edge of Georgian Bay. No suitable habitat exists on the property (see Section 14.0). **No anticipated Impact**.
		Lake Sturgeon (*Acipenser fulvescens*)	This fish is a species at risk (*Threatened*) It exists in nearby Georgian Bay. There is no fish habitat on the property (see Section 13.6). **No anticipated impact**.

NHIC – Natural Heritage Information Centre, NHIC grids are illustrated in Figure 22.

Similarly, there is a regionally rare plant community which can be as close as about 230 m ENE of the property. This Sea Rocket Sand Beach Type exists along Wasaga Beach's extensive sand dune ecology. This ecosystem is unique to the Georgian Bay shoreline and the habitat is not present on the property. Therefore, there is no anticipated impact on this local natural feature if the proposed development proceeds.

The NHIC lists occurrence records for species at risk, resolved to the NHIC 1 km^2 grids. Table 6 lists four species at risk on or in the vicinity of the property.

The Lake Sturgeon (*Endangered*), obviously relates to Georgian Bay. Not only are there no water bodies suitable for this fish on the property, there is no fish habitat at all. Section 13.6 is a discussion about fish habitat on the property. There is no anticipated impact to Lake Sturgeon that may exists locally.

The Midland Painted Turtle is not on the Ontario species at risk list, but it is on the COSEWIC list as *Special Concern*. This turtle lives in shallow ponds and streams and inshore bays of lakes. This habitat does not exist on the property, and no turtles of any species were observed on the property during the many biological inventories conducted by multiple consultants over more than a decade. For this sEIS, turtles and reptiles are discussed in Section 13.5. There is no anticipated impact to Midland Painted Turtles that may exists locally.

The Wood Thrush (*Special Concern*) lives in mature deciduous and mixed (conifer-deciduous) forests with tall trees and well-developed undergrowth. These birds prefer large forests but will also use smaller stands. They build their nests in Sugar Maple and American Beech saplings. Although the property is extensively forested, the woodland is dominated by early successional Ash, Poplar and Cedar, there is no Maple or Beech. Wood Thrush that live locally would not likely nest or forage extensively on the property because it is not their preferred habitat. The Wood Thrush was not observed or heard on the property during two breeding bird surveys, one conducted by Beacon in 2012 and most recently by CEC in 2021 (see Section 13.2). Therefore, there is no anticipated impact on Wood Thrush that may exist locally.

The Eastern Meadowlark (*Threatened*) is a grassland bird, nesting in moderately tall grasslands, pastures and hayfields, weedy borders of croplands, roadsides, orchards, airports, shrubby overgrown fields, or other open areas. There is a very small strip of field thicket on the north edge of the property. However, it is only 0.5 acres (0.2 ha) in size and the Eastern Meadowlark requires about 6 acres to establish a territory. Eastern Meadowlark that live locally would not likely nest or forage extensively on the property because their preferred habitat is insufficient in size. Also, the Eastern Meadowlark was not heard or observed during the two breeding bird surveys (see Section 13.2). Therefore, there is no anticipated impact on Eastern Meadowlark that may exist locally.

13.0 Flora and Fauna Inventories

The flora and fauna of the property has been extensively inventoried over more than a decade. Azimuth (2010) conducted biological surveys across the west end of Wasaga Beach, including the property, February 5 and 9, and April 10 and 16, 2010. Beacon (2012) conducted a full suite of biologic inventories for their preliminary scoped EIS:

- Vegetation Survey - June 28, July 28, November 9, 2011and May 24, 2012.
    - Wetland Staking Exercise with NVCA – July 28, 2011.
- Breeding Bird Survey - May 31 and June 16, 2012.
- Amphibian Breeding survey - April 14 and May 24, 2012.
- Animals – opportunistic observations made during the above survey dates.

Although extensive biological inventories were available for the property, municipal planning authorities, specifically conservation authorities, prefer the data to be more recent than 10 years. The west Wasaga Beach area is a planned growth area. As mentioned in Section 11.6, the Town of Wasaga Beach anticipates more than tripling the population in that area, and recent development has been substantial. This recent urbanization of the landscape is more likely to have reduced rather than enhanced biodiversity, therefore, the existing biological inventories should adequately characterize the property. However, in anticipation of the requirement to update the inventories, CEC conducted a comprehensive assessment of flora and fauna in 2020 and 2021, as follows:

- December 14, 2020;
    - General flora, fauna, watercourse and forest observations.

- April 19, 2021;
    - General flora, fauna, watercourse observations.
    - Forest resource inventory assessment.

- April 27, 2021;
    - General flora, fauna, watercourse observations.
    - Forest resource inventory assessment.
    - 1st amphibian call survey.

- May 17, 2021;
    - General flora, fauna, watercourse observations.
    - 2nd amphibian call survey.

- May 31, 2021;
    - General flora, fauna, watercourse observations.
    - 1st breeding bird survey.

- June 10, 2021;
    - o General flora, fauna, watercourse observations.
    - o 2nd breeding bird survey.

- June 13, 2021;
    - o General flora, fauna, watercourse observations.
    - o Set-up acoustic bat survey equipment.

- June 16, 2021;
    - o General flora, fauna, watercourse observations.
    - o GPS watercourse survey.

- June 29, 2021;
    - o General flora, fauna, watercourse observations.
    - o Take down acoustic bat survey equipment.

13.1 Flora
13.1.1 Trees and Shrubs

Botanical surveys were completed by thoroughly traversing the property and visiting each vegetation community type multiple times. In addition to the site visits made by Beacon, CEC observed the flora on the property December 14, 2020, April 9 and 27, May 17 and 31 and June 10, 13, 16 and 29, 2021. Species at risk were referenced according to the SARO website and for regional rarity by Oldham et. al., 2009 (reproduced in Appendix 21.4).

There were 23 species of trees and shrubs observed on the property (Table 7). There were no tree or shrub species at risk or regionally rare plant species observed on the property. As a general observation, the species diversity was relatively low, which is typical of the early successional woodlands on undeveloped land in the Wasaga Beach area. The trees and shrubs observed on the property are discussed in more detail in Section 14.0, which describes the ELC vegetation communities.

13.1.2 Ground Flora

Ground flora observations and species at risk and rarity were assessed as previously discussed (Section 13.1.1). There were 97 species of ground flora observed on the property (Table 7). There were no species at risk or regionally rare plant species found on the property. In the Beacon (2012) report Drooping Sedge (*Carex prasina*) was found in the southwest corner of the property. This was identified by Beacon to be a

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Trees and Shrubs				
Abies balsamea	Balsam Fir	S5	Tree	Forest, Forest Wetland
Acer negundo	Manitoba Maple	S5	Tree	Field, Forest Edge
Amelanchier spp.	Serviceberry species	NA	Shrub	Forest
Apocynum cannabinum	Indian (Dogbane) Hemp	S4	Shrub	Forest
Betula papyrifera	White (Paper) Birch	S5	Tree	Forest
Cornus amomum	Silky Dogwood	S5	Shrub	Forest, Forest Wetland
Cornus sericea	Red-osier Dogwood	S5	Shrub	Forest Edge, Forest Wetland
Fraxinus pennsylvanica	Green Ash	S5	Tree	Forest Edge, Forest Wetland
Fraxinus nigra	Black Ash	S5	Tree	Forest Wetland
Juniperus communis	Ground Juniper	S5	Shrub	Forest
Pinus strobus	White Pine	S5	Tree	Forest
Picea glauca	White Spruce	S5	Tree	Forest
Picea mariana	Black Spruce	S5	Tree	Forest, Forest Wetland
Populus tremuloides	Trembling (Quaking) Aspen	S5	Tree	Field, Forest, Forest Wetland
Prunus virginiana	Choke Cherry	S5	Tree	Forest
Rhamnus alnifolia	Alderleaf Buckthorn	S5	Shrub	Field, Forest, Forest Wetland
Rhamnus cathartica	Common Buckthorn	SE5	Shrub	Field, Forest, Forest Edge
Rhus typhina	Staghorn Sumac	S5	Shrub	Field, Field Edge
Salix discolor	Pussy Willow	S5	Shrub	Field, Forest Wetland
Thuja occidentalis	Eastern White Cedar	S5	Tree	Forest, Forest Wetland
Ulmus americana	American (White) Elm	S5	Tree	Forest, Forest Wetland
Viburnum lentago	Nannyberry	S5	Shrub	Field, Forest, Forest Wetland
Viburnum opulus	Highbush Cranberry	SE4	Shrub	Forest
Ground Flora				
Achillea millefolium	Common Yarrow	S5	Herbaceous	Field, Forest Edge
Aegopodium podagraria	Goutweed	S5	Herbaceous	Field
Allium tricoccum	Wild Leek	S5	Herbaceous	Forest
Alliaria petiolate	Garlic Mustard	SE5	Herbaceous	Forest, Forest Wetland
Ambrosia psilostachyam	Ragweed	NA	Herbaceous	Field
Aneone canadensis	Canada Anemone	S5	Herbaceous	Field, Forest
Aquilegia canadensis	Wild Columbine	S5	Herbaceous	Field, Forest Edge
Athyrium filix-femina	Lady Fern	S5	Herbaceous	Forest
Arctium minus	Common Burdock	NA	Herbaceous	Field, Forest Edge
Arisaema triphyllum	Jack-in-the-pulpit	S5	Herbaceous	Forest, Forest Wetland
Asclepias syriaca	Common Milkweed	S5	Herbaceous	Field, Forest Edge
Aster spp.	Aster species	NA	Herbaceous	Field, Forest Edge

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Calamagrostis canadensis	Blue-joint Reedgrass	S5	Graminoid	Ditch, Forest Wetland
Calystegia sepium	Hedge Bindweed	NA	Herbaceous	Field
Carex castanea	Chestnut-colored Sedge	S5	Graminoid	Field, Forest
Carex echinate	Little Prickly Sedge	S5	Graminoid	Forest Wetland
Carex gracillima	Graceful Sedge	S5	Graminoid	Forest, Forest Wetland
Carex granularis	Meadow Sedge	S5	Graminoid	Field
Carex prasine	Drooping Sedge	S4	Graminoid	Forest Wetland
Carex grayi	Gray's Sedge	S5	Graminoid	Forest, Forest Wetland
Chenopodium album	Lamb's Quarters	S5	Herbaceous	Field
Cichorium intybus	Chicory	S5	Herbaceous	Field
Convallaria majalis	Lily-of-the-valley	S5	Herbaceous	Forest
Cypripedium parviflorum	Yellow Lady's Slipper	S5	Herbaceous	Forest, Forest Wetland
Daucus carota	Wild carrot	SE5	Herbaceous	Field, Forest Edge
Dipsacus fullonum	Common Teasel	NA	Herbaceous	Field
Echium vulgare	Viper's Bugloss	S5	Herbaceous	Field
Eleocharis spp.	Spikerush species	NA	Herbaceous	Forest, Forest Wetland
Equisetum arvense	Field Horsetail	S5	Graminoid	Forest Wetland
Erigeron philadelphicus	Philadelphia Fleabane	S5	Herbaceous	Field
Erythronium	Trout-lily	S5	Herbaceous	Forest
Fragaria virginiana	Woodland Strawberry	S5	Herbaceous	Forest
Galium triflorum	Sweet-scent Bedstraw	S5	Herbaceous	Field, Forest Edge
Geranium robertianum	Herb-Robert	SE5	Herbaceous	Forest, Forest Wetland
Geum aleppicum	Yellow Avens	S5	Herbaceous	Forest
Geum canadense	White Avens	SE5	Herbaceous	Field, Forest Edge
Helianthus divaricatus	Woodland Sunflower	S5	Herbaceous	Field, Forest Edge
Hesperis matronalis	Dame's Rocket	S5	Herbaceous	Field
Hypericum punctatum	Common St. Joh's Wort	SE5	Herbaceous	Field
Impatiens capensis	Spotted Jewelweed	S5	Herbaceous	Forest Wetland
Juncus canadensis	Canada Rush	S5	Graminoid	Forest, Forest Wetland
Lathyrus latifolius	Perennial Pea	S5	Herbaceous	Forest Edge
Leucanthemum vulgare	Ox-eyed Daisy	SE5	Herbaceous	Field
Lotus corniculatus	Bird's-foot Trefoil	S5	Herbaceous	Field
Lycopodiopsida spp.	Clubmoss	S5	Herbaceous	Forest Wetland
Lysimachia ciliate	Fringed Loosestrife	S5	Herbaceous	Forest
Lythrum salicaria	Purple Loosestrife	SE5	Herbaceous	Ditch
Maianthemum stellatum	Star-flowered Solomon's Seal	S5	Herbaceous	Forest
Maianthemum racemosum	False Solomon's Seal	S5	Herbaceous	Forest
Medicago lupulina	Black Medic	SE5	Herbaceous	Forest, Forest Edge

Table 7: Vascular plants observed on the property.

Latin Binomial	Common Name	SRank	Form	Property Habitat
Myosotis laxa	Small Forget-me-not	S5	Herbaceous	Forest, Forest Wetland
Oenothera biennis	Evening-primrose	S5	Herbaceous	Field
Osmorhiza claytonia	Woolly Sweet cicely	S5	Herbaceous	Forest
Packera aurea	Golden Ragwort	S5	Herbaceous	Forest Wetland
Paniculata spp.	Phlox spp.	SE5	Herbaceous	Field
Parthenocissus quinquefolia	Virginia Creeper	NA	Herbaceous	Field, Forest Edge
Parthenocissus vitacea	Thicket Creeper	S5	Herbaceous	Field, Forest Edge
Phalaris arundinacea	Reed Canary Grass	S5	Graminoid	Field Edge, Forest Wetland
Phleum pratense	Timothy Grass	S5	Herbaceous	Field
Phragmites australis	Phragmites Common Reed	NA	Graminoid	Ditch
Phlox divaricate	Wild Blue Phlox	S5	Herbaceous	Field
Phryma leptostachya	Spiked Lopseed	S5	Herbaceous	Field Edge
Physocarpus opulifolius	Common Ninebark	S5	Herbaceous	Forest Edge
Pilosella caespitosa	Yellow Hawkweed	NA	Herbaceous	Forest Edge
Plantago lanceolata	English Plantain	SE5	Herbaceous	Field
Plantago major	Common (Nipple-seed) Plantain	SE5	Herbaceous	Field
Poa palustris	Fowl (Swamp) Bluegrass	S5	Graminoid	Forest Wetland
Potentilla simplex	Common Cinquefoil	S5	Herbaceous	Forest
Prunella vulgaris	Self-heal (Heal-all)	SE5	Herbaceous	Field, Forest
Ranunculus acris	Tall Buttercup	S5	Herbaceous	Forest
Ribes triste	Swamp Red Current	S5	Herbaceous	Forest Wetland
Rubus pubescens	Dwarf Raspberry	S5	Herbaceous	Forest, Forest Wetland
Rudbeckia hirta	Black-eyed Susan	S5	Herbaceous	Field, Forest Edge
Shepherdia canadensis	Canada Buffalo-berry	S5	Herbaceous	Forest
Senecio pauperculus	Balsam Ragwort	S5	Herbaceous	Field
Silene vulgaris	Bladder Campion	SE5	Herbaceous	Field, Forest Edge
Sisyrinchium montanum	Strict Blue-eyed-grass	S5	Graminoid	Field
Solidago canadensis	Canada Goldenrod	S5	Herbaceous	Field
Sonchus arvensis	Field (Smooth) Sow-thistle	S5	Herbaceous	Field
Symphyotrichum novae-angliae	New England Aster	S5	Herbaceous	Field, Forest Edge
Symphytum officinale	Common Comfrey	S5	Herbaceous	Field Edge
Taraxacum officinale	Common Dandelion	SE5	Herbaceous	Field
Thalictrum pubescens	Tall Meadowrue	S5	Herbaceous	Forest
Toxicodedron radicans	Poison Ivy	S5	Herbaceous	Field, Forest Edge
Trifolium pratense	Meadow Clover	S5	Herbaceous	Field
Tussilago farfara	Coltsfoot	S5	Herbaceous	Field, Forest Edge
Typha angustifolia	Narrowleaf Cattail	NA	Herbaceous	Ditch, Forest Wetland
Typha latifolia	Common Cattail	S5	Herbaceous	Ditch, Forest Wetland

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Urtica dioica ssp. Gracilis	Slender Stinging Nettle	S5	Herbaceous	Forest
Verbascum Thapsus	Common Mullein	S5	Herbaceous	Field
Vicia cracca	Cow Vetch	NA	Herbaceous	Field
Viola adunca	Sand Violet	S4S5	Herbaceous	Field, Forest Edge
Viola canadensis	Canada Violet	S5	Herbaceous	Forest
Viola sororia	Wooly Blue Violet	S5	Herbaceous	Forest
Viola spp.	Violet species	NA	Herbaceous	Forest
Vinca minor	Common Periwinkle	S5	Herbaceous	Forest
Vitis riparia1	Riverbank Grape	S5	Vine	Forest Edge

Observed June 28, July 28, November 10, 2011 and May 4, 2012 (Beacon Environmental, NVCA), December 14, 2020, April 19, 27, May 17, 31, June 10, 13, 16, 29, 2021 (Cotyledon Environmental).
SRank: S5 - Secure – Common, widespread, and abundant (includes invasives). **S4 -** Apparently Secure – Uncommon but not rare. **SE** – Exotic, i.e., invasive. **NA -** A conservation status rank is not applicable, an agricultural species, a species of no conservation value, species not confirmed.
Species at Risk in Ontario, O. Reg. 230/08. No Species at Risk were observed on the property.
Regionally Rare Species. No species rare to Simcoe County were observed on the property (Oldham, M.J., and S.R. Brinker. 2009).
Considered wetland indicator species in Appendix 10 of OWES 2013.

species of conservation significance and rare in Simcoe County, as referenced by Riley (1989). However, in a more recent MNRF publication (Oldham et. Al., 2009) this species is not listed as rare in Simcoe County (see Appendix 21.4).

As a general observation, the species diversity was relatively low, which is typical of the woodlands and fields on undeveloped land in the Wasaga Beach area. The relatively large number of species identified (97) is less reflective of the property's biodiversity and more a function of the number of observational site visits conducted by several consultants over a long time. The ground flora observed on the property are discussed in more detail in Section 14.0, which describes the ELC vegetation communities.

Invasive species, such as Garlic Mustard, Coltsfoot, and particularly Buckthorn, were quite common, suggesting a high degree of site disturbance and proximity to nearby urban areas. In some of the woodland areas the Buckthorn was so thick it was literally impossible to walk through.

13.2 Birds

Beacon (2012) conducted the first breeding bird surveys on the property on May 4 and 31 and June 16, 2012, under ideal weather conditions. The breeding bird community was surveyed using a roving survey which covered the entire property. Birds heard or observed on the property and showing some dispensation towards breeding were considered to be breeding. CEC conducted a breeding bird survey May 31 and June 10, 2021. Additional bird observations were made during site visits December 14, 2020, April 19 and 27, May 17, June 10, 13 and 29, 2021.

Protocols for breeding bird surveys vary between habitat types and agencies, but all follow a basic pattern. The protocol used by Conservation Halton (2017) was used by CEC for the 2021 breeding bird survey of this property. The protocol states the property being surveyed must be visited between May 24 and July 10. The property is to be visited twice, with at least 6 days between visits. Observations are made between one hour before sunrise and 10 a.m. Birds are recorded at marked points for periods of 5 minutes at a forest edge or a non-forest area, or 10 minutes for forest interior. All bird species heard or seen by one observer, within a 100 m radius, are noted. Weather conditions must be clear to slightly damp but not raining, and winds must be below 15 km/hr. Normally the minimum distance between points is 300 m, but for a small area with considerable road noise, this can be reduced. All habitat types within the survey region were sampled.

Habitats visited on the property included forest, forested wetland, forest opening, forest edge, shrub field and roadside. Survey times were typically 5 minutes but given the occasional traffic noise and extent of forest cover, some counts were made for 10 minutes or even longer.

Visit 1 was May 31, 2021. The time on-site was 4:45 am to 8:15 am. The temperature was 18º C at the start, rising to 20º C at completion. The wind was calm (3 km/hr), and the sky was clear.

Visit 2 was June 10, 2021. The time on-site was 4:45 am to 8:30 am. The temperature was 17º C at the start and didn't change for the duration of the survey. The wind was light (not exceeding 15 km/hr) and the sky was clear.

There were 11 sites that were officially surveyed, although roadside stops were also made along Robert Street South and Beachwood Road. The breeding bird survey sites are summarized in Table 8 and illustrated in Figure 19. The forest area on the east side of the property is particularly dense, with areas of Buckthorn and young Cedar that exceed 700 stems/ac (1,700 stems /ha – Photo 11). Not only was it difficult to walk through, because it was so thick, it was challenging to observe and hear birds. There is an ATV trail that loops through the forest immediately adjacent to the east of the study property (Photo 12). This made for much better access and observation and listening opportunities, and since the forest community type was contiguous across the two properties, several of the breeding bird observation sites were shifted eastward (breeding bird sites 4 to 8). Similarly, the narrow strip of shrub field across the top of the property is adjacent to Beachwood Road, which had enough traffic noise, even early in the morning, to make listening challenging. Therefore, comparable forest opening (breeding bird site 3) and field sites (breeding bird site 9) were selected on the property adjacent to the east.

The birds observed or heard on and adjacent to the property during the Beacon (2012) and the CEC (2021) breeding bird surveys are listed in Table 9. Over the 10-year period, the two surveys tallied a total of 44 species of birds on or immediately adjacent to the property.

All of the 44 species of birds are common in southern Ontario. Only three species, the Eastern Wood Pewee, the Bald Eagle and the Common Nighthawk, are currently listed as species at risk in *O. Reg. 230/08* of the ESA. All three species are designated *Special Concern*. Species at risk are discussed further in Sections 15.0, 16.0 and 17.2.

The property is a mix of woodland, wooded wetland, field thicket and a small portion of urban residential, therefore, the bird community on the property is mostly forest and open forest/thicket species. The Song Sparrow was the most numerous species, which is not surprising considering its prevalence in southern Ontario and wide range of habitats. Also quite common were birds that preferred open woodland and thicket habitats, such as the House Wren, Gray Catbird, Indigo Bunting, Northern Cardinal and American Goldfinch. The forest bird community included the commonly observed Blue Jay, Black-capped Chickadee, Red-eyed Vireo, and Eastern Wood-Pewee, to the less commonly observed Ruffed Grouse, American Woodcock, Chestnut-sided Warbler, and

Table 8: Locations of Breeding Bird Survey observation and listening sites.			
BBS Site Number	GPS Coordinates		Landscape Type
	Northerly	Westerly	
1	44º 28’ 1.28”	80º 7’ 43.11”	Forest Wetland
2	44º 28’ 3.30”	80º 7’ 47.88”	Forest
3	44º 27’ 58.18”	80º 7’ 10.39”	Forest Clearing
4	44º 27’ 54.87”	80º 7’ 8.33”	Forest Edge
5	44º 27’ 54.55”	80º 7’ 13.77”	Forest
6	44º 27’ 56.83”	80º 7’ 20.15”	Forest
7	44º 28’ 1.11”	80º 7’ 20.23”	Forest Edge
8	44º 28’ 2.44”	80º 7’ 16.55”	Forest Wetland
9	44º 28’ 0.30”	80º 7’ 6.83”	Field
10	44º 28’ 5.77”	80º 7’ 32.31”	Forest Wetland
11	44º 28’ 4.44”	80º 7’ 28.89”	Forest
Breeding Bird Survey conducted May 31 and June 10, 2021. See Figure 23 for map locations.			

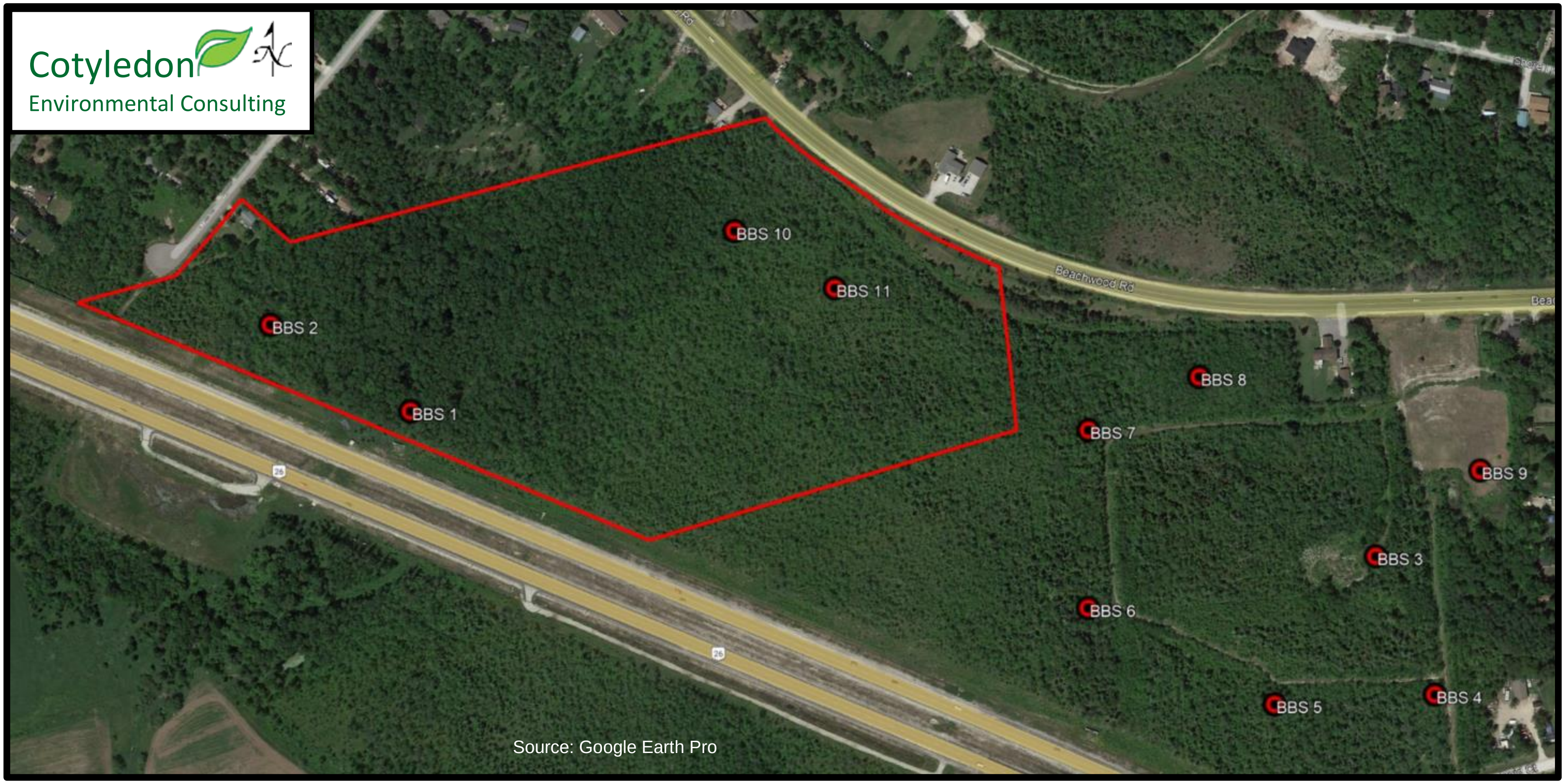


Figure 19: Location of Breeding Bird Survey Sites, May 31 and June 10, 2021.

Photo 11: (above) The forest, particularly on the east side of the property, was so thick in areas that it was difficult to walk through, and very challenging to see or hear birds.
Photo 12: (below) An ATV trail looped through the forest immediately adjacent to the east of the study property, which made for better observing and listening opportunities. The forest community type was consistent across the two adjacent properties, so several of the breeding bird survey sites were shifted eastward.

Table 9: Birds Seen or Heard on the Property.			
Latin Binomial	Common Name	SRank	Observation Status
Agelaius phoeniceus	Red-winged Blackbird	S5	Heard, Seen, Probably Breeding
Anas platyrhynchos	Mallard Duck	S5	Fly Over
Bonasa umbellus	Ruffed Grouse	S4	Heard, Probably Breeding
Branta canadensis	Canada Goose	S5	Fly Over
Buteo jamaicensis	Red-tailed Hawk	S5	Fly Over
Cardinalis	Northern Cardinal	S5	Heard, Seen, Probably Breeding
Cathartes aura	Turkey Vulture	S5	Fly Over
Cartharus fuscenscens	Verry	S4	Heard, Probably Breeding
Certhia americana	Brown Creeper	S5	Heard, Seen, Probably Breeding
Chordeiles minor	Common Nighthawk	SC	Fly Over
Colaptes auratus	Northern Flicker	S4	Heard, Seen, Probably Breeding
Contopus virens	Eastern Wood-pewee	SC	Heard, Possibly Breeding
Corvus brachyrhynchos	American Crow	S5	Heard, Seen, Possibly Breeding
Cyanocitta cristata	Blue Jay	S5	Heard, Seen, Probably Breeding
Dendroica pensylvanica	Chestnut-sided Warbler	S5	Heard, Possibly Breeding
Dumetella carolinensis	Gray Catbird	S4	Heard, Probably Breeding
Empidonax traillii	Willow Flycatcher	S5	Heard, Possibly Breeding
Falco columbarius	Merlin	S5	Seen, Possibly Breeding
Geothilphis trichas	Common Yellowthroat	S5	Heard, Probably Breeding
Haliaeetus leucocephalus	Bald Eagle	SC	Fly Over
Larus delawarensis	Ring-billed Gull	S5	Fly Over
Leiothlypis ruficapilla	Nashville Warbler	S5	Heard, Seen, Probably Breeding
Melospiza melodia	Song Sparrow	S5	Heard, Seen, Probably Breeding
Molothrus ater	Brown-headed Cowbird	S5	Heard, Probably Breeding
Mniotilta varia	Black-and-white Warbler	S5	Heard, Probably Breeding
Myiarchus crinitus	Great Crested Flycatcher	S4	Heard, Seen, Probably Breeding
Passer domesticus	House Sparrow	S5	Seen
Paswserina cyanea	Indigo Bunting	S4	Heard, Probably Breeding
Picoides pubescens	Downy Woodpecker	S5	Heard, Seen, Possibly Breeding
Picoides villosus	Hairy Woodpecker	S5	Seen, Probably Breeding
Pipilio erythrophthaimus	Eastern Towhee	S4	Heard, Possibly Breeding
Poecile atricapillus	Black-capped Chickadee	S5	Heard, Seen, Probably Breeding
Quiscalus quiscula	Common Grackle	S5	Heard, Seen, Probably Breeding
Troglodytes aedon	House Wren	S5	Heard, Seen, Probably Breeding
Sayornis phoebe	Eastern Phoebe	S5	Heard, Probably Breeding
Scolopax minor	American Woodcock	S4	Heard. Probably Breeding
Setophaga ruticilla	American Redstart	S5	Heard, Seen, Probably Breeding
Spinus tristis	American Goldfinch	S5	Heard, Seen, Probably Breeding
Spizella pusilla	Field Sparrow	S5	Seen
Stunus vulgaris	European Starling	SE	Heard, Seen, Possibly Breeding
Turdus migratorius	American Robin	S5	Heard, Seen, Probably Breeding
Vireo olivaceus	Red-eyed Vireo	S5	Heard, Seen, Probably Breeding
Zenaida macroura	Mourning Dove	S5	Heard, Seen, Probably Breeding
Zonotrichia albicollis	White-throated Sparrow	S5	Heard, Seen, Probably Breeding

Beacon Environmental Breeding Bird Survey – May 31, June 16, 2012. Other dates – June 28, November 9, 2011.
Cotyledon Environmental Breeding Bird Survey – May 31 and June 10, 2021. Other dates December 14, 2020, April 19 and 27, May 17, June 13, 16 and 29, 2021
S5 – Secure/Common – widespread and abundant.
S4 – Apparently Secure – uncommon but not rare.
SE – Exotic, invasive.
Species at Risk O. Reg 230/06, SC – Special Concern

White-throated Sparrow. Birds considered to be urban tolerant were also observed on the property, such as, American Robin, European Starling, Brown-headed Cowbird, and Song Sparrow. The species diversity reflects the varied habitat on and adjacent to the property, which included fields, forest openings, wetlands, wooded wetlands, forest, and urban areas.

Even though there is a wetland on the property, specifically absent were colonial or shoreline waterbirds, such as geese, ducks, grebes, herons, egrets or terns. This reflects the ephemeral nature of the wetland and the lack of any standing water for all but a short time in the spring or subsequent to prolonged or substantial rainfall. The Redwing Black Bird was heard and seen. It is considered a wetland species because its preferred habitat is wetland, particularly if cattails are present. However, it also nests in dry meadows and fields.

13.3 Amphibians

Beacon conducted amphibian breeding surveys April 14 and May 24, 2012 following Environment Canada's Marsh Monitoring Program protocol (Gartshore *et al*. 2004). Beacon reported that no species were heard calling on either visit, and they concluded there was no sustainable amphibian breeding habitat on the property. This is not surprising considering the ephemeral nature of the wetland and the lack of any standing water, vernal ponds or permanent flowing water.

CEC contracted ecologists at Palmer to conduct an amphibian call survey to re-evaluate the potential for amphibian breeding habitat on the property. The survey protocol followed Environment Canada's Marsh Monitoring Program Amphibian Monitoring Protocol (BSC, 2009)

Of the 13 species of frogs in Ontario, 9 could possibly be present on the property. These are the American Toad, Gray Treefrog, Spring Peeper, Chorus Frog, Wood Frog, Northern Leopard Frog, Pickerel Frog, Green Frog, and the Bull Frog.

Amphibian breeding surveys were conducted on April 27 and May 17, 2021. The weather conditions during the first survey were 13º C with 22 km/h winds, and 100% cloud cover. Conditions during the second survey were 16º C with 3 km/h winds and 10% cloud cover. There was no precipitation at the time of the surveys. The two surveys were conducted at the same location, in the southwestern portion of the property. This area is the wettest part of the wooded wetland that stretches across the west half of the property. The surveys were conducted standing at the south edge of the property and facing north towards the wetland habitat. This area is north of the spot where Bayshore Creek enters the property via a concrete box culvert under Highway 26. The survey area is illustrated in Figure 20. The area immediately around the box culvert is a small

Figure 20: Location of the Amphibian Call Survey. The Storm Water Retention Pond on the south side of Highway 26 is the closest amphibian breeding habitat.

pool of water that stays wet long enough to support aquatic vegetation (see Photo 10). This small pool area is about 10 m south of the property.

During the April 27 survey no amphibians were heard calling within the survey area on the property. However, a full chorus of Spring Peepers and a couple of American Toads were heard calling south of the property in the vicinity of the storm water retention pond on the south side of Highway 26. Similarly, during the May 17 survey no amphibians were heard calling within the property survey area. Once again, a full chorus of Spring Peepers and American Toads were heard calling from the pond south of Highway 26. On May 17 a Northern Leopard frog was observed in a flooded ditch approximately 100 m west of the survey location at the southwest corner of the property just off of the Robert Street South cul-de-sac. Another Northern Leopard frog was observed June 13 in the culvert mouth in the ditch on the south side of Beachwood Road where Shore Creek exits the property (see Figure 7).

Because there were no amphibians heard during the first two surveys and because there is no bull frog habitat on the property (no standing water) the third survey was not warranted.

During the field work for their fluvial-geomorphic study March 29, 2021, Palmer observed a small, shallow pond in the west-central area of the wooded wetland where Bayshore Creek branched in two directions (Photo 13). By April 27, 2021 the pond area was completely drained, the ground was moist but there was no standing water (Photo 14). Typically, the presence of Fingernail Clams in moist depressions indicates the presence of a vernal pond. Neither the Azimuth nor Beacon reports mentioned the presence of vernal ponds or Fingernail Clams anywhere in the wooded wetland, and no Fingernail Clams were observed in the area of the ephemeral shallow pond during the many CEC site visits in 2021. The pond is too shallow and dries too quickly to be a vernal pond, so it is not amphibian breeding habitat. Furthermore, the pond, if it forms again the next spring, could be in a different area because the stream flow is being constantly diverted by fallen trees.

Although surveillance was not conducted, and no NHIC records exist of rare species, common species of salamanders and skinks likely exist on the property, as they are ubiquitous in woodlands in southern Ontario. However, there is no breeding habitat on the property.

The stream and the wetland on the property are ephemeral, both dry out early and completely in the spring. Although the wooded wetland may have amphibian foraging or staging habitat, there is no amphibian breeding habitat anywhere on the property. This conclusion is consistent with the observations in the Azimuth (2010) and Beacon (2012) reports.

The observation of a Northern Leopard frog at two locations on two dates indicates that amphibians may use the property as a corridor for moving from their breeding habitat to

Photo 13: (above) A small, shallow pond formed in the west-central area of the wooded wetland, as photographed by Palmer during their fluvial geomorphic study March 29, 2021. Photo 14: (below) The same area April 27, 2021 is completely drained, the ground was moist but there was no standing water. The pond is too shallow and dries too quickly to be a vernal pond, so it is not amphibian breeding habitat.

their terrestrial habitat. It is just as likely, however, that the main movement corridors are the deep ditches that run along three sides of the property: the east side of Robert Street South, the south side of Beachwood Road, and the north side of Highway 26. These ditches are deep and hold water and/or remain moist for a longer time in the spring than the stream course or the wooded wetland, and they fill readily after a significant rain event.

13.4 Mammals

Mammals habituating on a specific property are difficult to confirm, since many species have an extensive range, are nocturnal, or den in structures that may not be obvious on the landscape. Large mammals, such as moose, deer, coyotes, wolves or bears, may range across the entire Township, forage on or transit through many properties, and den in a variety of habitats. Very small mammals, like mice and voles, may be present in large numbers but are almost invisible on the landscape because they den and forage underground or in cervices, rockpiles or building foundations.

Visual observations of mammals, their tracks or their scat are acceptable for a sEIS. In addition, a list of mammals that may exist on or in the immediate vicinity of the property was generated from iNaturalist for Simcoe County and listed in Table 10. There are 32 species of mammals listed, which could potentially be present on the property. After a review of habitat requirements, it was determined that the property has the habitat to potentially support 25 species. However, only 12 species of mammals were confirmed to be present on the property because they were seen, or their tracks or scat were observed, or there was other surveillance confirmation.

There are three species at risk listed in Table 10. They are all bats. They were identified by a comprehensive acoustic survey, which is discussed in Section 13.7. The other mammals confirmed to be present on the property, such as coyote, deer, squirrels, chipmunks and rabbits are all common and known to be widely present in the Wasaga Beach area.

Table 10: Mammals observed or likely present on the property.			
Latin Binomial	Common Name	SRank	Property Observation Status
Alces alces	Moose	S5	Habitat exists – not observed, not likely present
Apodemus sylvaticus	Field Mouse	S5	Habitat exists – not observed, **likely present**
Blarina brevicauda	Northern Short-tailed Shrew	S5	Habitat exists – not observed, **may be present**
Canis latrons	Coyote	S5	Habitat exists – scat observed, **definitely present**
Castor canadensis	Beaver	S5	Habitat does not exist – definitely not present
Eptesicus fuscus	Big Brown Bat	S5	Habitat exists – multiple acoustic recordings, **definitely present**
Erethizon dorsatum	North American Porcupine	S5	Habitat exists – not observed, **may be present**
Lasiurus borealis	Eastern Red Bat	S5	Habitat exists – multiple acoustic recordings, **definitely present**
Lasiurus cinereus	Hoary Bat	S5	Habitat exists – multiple acoustic recordings, **definitely present**
Lontra canadensis	North American River Otter	S5	Habitat does not exist – definitely not present
Marmota monax	Groundhog	S5	Habitat exists – not observed, **may be present**
Mephits mephitis	Striped Skunk	S5	Habitat exists – not observed, **likely present**
Microtus	Meadow Vole	S5	Habitat exists – not observed, **likely present**
Myotis mystacinus	Mouse-eared Bat	S5	Habitat exists – possible acoustic recording, **may be present**
Myotis leibii	Eastern Small-footed Myotis (Bat)	SAR En	Habitat exists – a few acoustic recordings, **may be present**
Myotis septentrionalis	Northern Myotis (Bat)	SAR En	Habitat exists – not detected by acoustic recordings, not present
Myotis lucifugus	Little Brown Myotis (Bat)	SAR En	Habitat exists – multiple acoustic recordings, **definitely present**
Napaeozapus insignus	Woodland Jumping Mouse	S5	Habitat exists – not observed, **may be present**
Neogale vison	American Mink	S5	Habitat does not exist – definitely not present
Odocoileus virginianus	White-tailed Deer	S5	Habitat exists – multiple observations, **definitely present**
Parascalops breweri	Hairy-tailed Mole	S5	Habitat exists – not observed, **may be present**
Ondatra zibethicus	Muskrat	S5	Habitat does not exist – definitely not present
Perimyotis subflavus	Tricoloured Bat	SAR En	Habitat exists – a few acoustic recordings, **may be present**
Peromyscus	North American Deer Mouse	S5	Habitat exists – not observed, **may be present**
Procyon lotor	Common Raccoon	S5	Habitat exists – footprints observed, **definitely present**
Sciurus carolinensis	Eastern Grey squirrel	S5	Habitat exists – observed, **definitely present**
Tamiasciurus hudsonicus	American Red Squirrel	S5	Habitat exists – observed, **definitely present**
Sylvilagus floridanus	Eastern Cottontail	S5	Habitat exists – observed, **definitely present**
Tamis striatus	Eastern Chipmunk	S5	Habitat exists – observed, **definitely present**
Ursus americanus	American Black Bear	S5	Habitat exists – not observed, not likely present
Vulpes	Red Fox	S5	Habitat exists – not observed, **may be present**
Zapus hudsonius	Meadow Jumping Mouse	S5	Habitat exists – not observed, **may be present**
Observed June 28, July 28, November 9, 2011 and May 4, 2012 (Beacon 2012), December 14, 2020, April 19 and 27, May 17 and 31, June 10, 13, 16, 29 2021(CECI). SRank: S5 - Secure – Common, widespread, and abundant (includes invasives). Species at Risk in Ontario, O. Reg. 230/08. SAR En - Endangered.			

13.5 Reptiles and Turtles

There were no turtles or reptiles observed on the property by any of the consultants on any of the many site visits over the last 10 years. As listed in Table 6, the NHIC records suggest the Midland Painted Turtle exists in the area. However, because there are no ponds our permanent watercourses, and the wetland dries up completely every summer, there is no sustainable turtle habitat, and no turtles of any species are likely to exist on the property.

Common snakes like, Gartersnakes and Ribbonsnakes, are ubiquitous in southern Ontario and likely exist on or forage across the property. No structures such as rockpiles, crevices, bluffs or old building foundations, which could be potential snake hibernaculum, are present on the property. Therefore, although foraging habitat exists on the property and there are likely snakes present, there is no snake breeding or hibernating habitat, and no snakes were observed.

13.6 Fish

As previously described, the watercourses and wetlands on the property are ephemeral. There are no vernal ponds, shallow standing water pools or ponds, or permanently flowing streams. The Beacon report concluded there was no fish habitat on the property, and no fish were observed.

The NVCA reported that fish minnows were observed in Bayshore Creek at the culvert on the north side of Beachwood Road on November 3, 2011. This was subsequent to a prolonged rainfall and there was water flowing through the municipal ditches that comprise Bayshore Creek north of Beachwood Road. The minnows weren't captured and identified. Minnows were also observed in the same municipal ditches north of Beachwood Road on April 19 and 27 and May 31, 2021 during the site visits for this sEIS. However, minnows were not observed on these dates in or around the culvert on the south side of Beachwood Road adjacent to the north edge of the property. Similarly, at no time during the many 2021 site visits were minnows observed anywhere on the property where/when there was water. When there is water on the property in the spring it is shallow (a few cm) and clear, so if minnows were present, they would have been easily seen. Therefore, minnow trapping would not be necessary to determine if fish were present.

Fish habitat is defined in Section 2 (1) of the *Fisheries Act* as:

> *…fish habitat means water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas*.

Section 34.4 (1) of the *Fisheries Act* prohibits any activity that harms fish, and Section 35 (1) prohibits activities that impacts fish habitat.

The MNRF has three classifications of fish habitat. If there was fish habitat present on the property it would be consistent with MNRF Habitat Type 3, which is:

> *Habitats have low productive capacity or are highly degraded, and do not currently contribute directly to fish productivity. They often have the potential to be improved significantly (e.g., a portion of a waterbody, a channelized stream that has been highly altered physically).*

Because both the wetland and the streams dry up quickly and completely in the spring and remain dry for most of the year, clearly there is no fish spawning habitat on the property. Therefore, the only possible use of either the wetland or the streams by fish would be in the spring when some fish populations migrate upstream to stage and/or forage. However, even when minnows were observed in and around the culvert on the north side of Beachwood Road they were not observed around the same culvert on the south side of the road. Therefore, either the water quality or quantity in the culvert is inadequate for fish passage or there is a physical barrier that blocks upstream fish migration. On June 29, 2021, when the water level was very low, the interior of the box culvert that is the main outflow of Bayshore Creek was examined. There appeared to be a vertical wall deeper in the culvert. At the meeting with the NVCA on November 5, 2013, Burnside stated (Appendix 21.1):

> …*indicated that the existing culvert at Thomas St.* [this is the main outflow of Bayshore Creek under Beachwood Rd. discussed above] *has an internal vertical drop and would have to be modelled …*

This internal vertical drop in the culvert is essentially a dam that blocks upstream movement by fish from the ditches downstream of Beachwood Road into the ephemeral stream on the property upstream of Beachwood Road.

Because of the ephemeral nature of Bayshore Creek, the lack of a defined stream channel, the absence of holding pools, vernal pools or any standing water, the rapid dry-down in the spring, and a physical migration barrier in the outflow culvert, neither Bayshore Creek nor the wetland can sustain a fish community. Fish can't spawn in, forage, or transit the property. Therefore, this meets the Matters of Proof definition in Section 40(5)(b) of the *Fisheries Act*, which states:

… no water is water frequented by fish, *as defined in subsection 34(1)* [water in Canadian territory or jurisdiction]*, where proof is made that at all times material to the proceedings the water is not, has not been and is not likely to be frequented in fact by fish.*

The proposed development would not be in violation of the *Fisheries Act* because there is no fish habitat on the property.

13.7 Acoustic Bat Survey

13.7.1 Species at Risk Bats in Ontario

Since 2013, four bat species have been listed as *Endangered* under the ESA due to rapidly declining populations caused by White-nose Syndrome - these are: Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), Tri-coloured Bat (*Perimyotis subflavus*) and Eastern Small-footed Myotis (*Myotis leibii)*. Under the ESA, these species at risk bats and their habitat are protected. This protection includes maternity roosting habitat used by at-risk bat species to raise their young during the spring and summer seasons.

Among the four listed bat species, three are known to form maternity roosting colonies in forested habitats - these are Little Brown Myotis, Northern Myotis, and Tri-coloured Bat. Little Brown Myotis and Northern Myotis are known to form maternity roosting colonies in the cracks and crevices of tree snags, which are free standing dead or dying trees that have begun to exhibit signs of decay, such as dead branches, cracks, crevices, or fungal corks. Large diameter snags are preferred because they retain heat for longer periods overnight. Additional studies on the foraging habits of Ontario bats found that proximity to water and winter hibernacula were also factors in attracting and maintaining local populations of Myotis species.

Tri-coloured Bats have been found roosting in various natural substrates such as lichen, moss, leaves and pine needles within or below the canopy. Although understudied in Ontario, research conducted in the eastern United States found that Tri-coloured Bats prefer to roost in live or dead foliage of Oak trees, and to a lesser extent Maple and Hickory trees. Other studies have found maternity roosting colonies in clumps of dead pine needles suspended in the branches of live Pine trees. Additional site characteristics such as large crown depth, tree maturity and increasing distance from roads positively influences roost site selection of Tri-coloured Bats.

The summer activities of Eastern Small-footed Myotis are poorly understood, but it is thought to primarily roost in open, sunny rocky habitats, including cracks and crevices in cliffs and boulders, in talus slopes, beneath stones on rock barrens and in rocky outcrops containing crevices. The property does not contain any type of exposed rocky habitat or cliffs/slopes and there are no known hibernacula sites in the vicinity. Therefore, the property is not preferable habitat for the Eastern Small-footed Myotis.

Because of the relatively recent ESA designation of these bat species and the sudden and significant reduction in populations, conservation authorities are routinely requesting proponents conduct bat surveys, particularly when the proposed development is planned for properties with apparent bat habitat.

13.7.2 Survey Protocol

The survey methodology for this sEIS was based on Phase III of the Guelph District MNRF *Survey Protocol for Species at Risk Bats within Treed Habitats* (2017). Although it is understood that the MECP oversees application for species at risk permits and authorizations under the ESA, this survey protocol is the latest to be developed and is used in the absence of a protocol created by the MECP.

According to the protocol, coniferous, deciduous and mixed wooded ecosites, including treed swamps, which include trees that are at least 10 cm in diameter should be considered suitable maternity roosting habitat. Recent discussions with the MECP noted that all tree species can be utilized by at-risk bats during their summer activities and should be considered maternity roosting habitat until monitoring studies have been completed and absence is determined.

13.7.3 Monitoring Site Selection

According to the protocol, monitoring sites are to be chosen based on optimal maternity roosting features for Tri-coloured Bat, Little Brown Myotis and Northern Myotis. To comply with the protocol, the following features were considered when choosing a location to install the monitoring equipment.

For Tri-coloured Bats:

- If Oaks are present;
    - live Oak with dead/dying leaf clusters,
    - dead Oak with retained dead leaf clusters,
    - live Oak (no dead leaf clusters) with the largest dbh (>25cm),
    - Oak within a forest gap.

- If Oaks are absent;
    - live Maple with dead/dying leaf clusters,
    - dead Maple with retained dead leaf clusters,
    - live Maple (no dead leaf clusters) with the largest dbh (>25cm),
    - Maple within a forest gap.

There are no Maple or Oak trees on the property, however, Tri-colored Bats have also been found roosting in Pine trees. Therefore, this tree species was also considered when choosing monitoring sites.

For Little Brown Myotis and Northern Myotis:

- Snags that exhibit the following features;

- tallest among all snags,
- contains cavities and crevices originating from cracks, scars knot holes or woodpecker cavities,
- location is within the highest density of snags (e.g., cluster of snags),
- contains large amounts of loose, peeling bark (naturally occurring or due to decay),
- contains cavities or crevices that are high on the tree (>10 m) or is “chimney like” with a low entrance,
- species known to be rot resistant (e.g., Black Cherry, Black Locust),
- species that provides good cavity habitat (e.g., White Pine, Maple, Aspen, Ash, Oak),
- location is within an area where the canopy is more open,
- snag that exhibits early stages of decay.

Bats generally don’t forage in the forest interior, preferring forest openings, corridors, and forest edges where there is less branch structure to confuse the echolocation they use for navigation and hunting. They also forage over open bodies of water, and open water is utilized by bats for drinking. To maximize the detection of at-risk bat species, these features were also considered when choosing monitoring sites.

As per the protocol, placement of the detectors was divided proportionally throughout the forested ecosite to target suitable roosting and foraging sites for all at-risk bat species. Also, the same constraints considered for site selection for the breeding bird survey were relevant for the acoustic bat survey (see Section 13.2). Therefore, two of the four bat monitoring sites were just off property to the east. Although they were off property, they were within the same ELC vegetation communities that are contiguous across the adjacent properties. The four acoustic bat monitoring sites are illustrated in Figure 21 and described in Table 11.

13.7.4 Timing and Weather Conditions

According to the protocol, acoustic monitoring should take place on evenings between June 1 and June 30, beginning at dusk and continuing for 5 hours at minimum. Surveys should occur during periods of low wind, no rain, and warm temperatures (i.e., evening temperatures above 10° C).

A minimum of 10 survey nights during suitable weather conditions are required to confirm presence/absence of at-risk bat species.

Passive acoustic detectors were deployed for 16 days, from June 13 to June 29, 2021, considerably longer than the minimum 10-day period. The extended survey time was employed to make up for any rainy, cold, or windy conditions when bats are less likely to be foraging. The detectors were programed to record bat calls beginning at sunset and ending at sunrise.

Figure 21: Location of the Four Acoustic Bat Survey Sites (see Table 11).

Table 11: Locations of the Four Acoustic Bat Survey Sites.			
Bat Survey Site Number	GPS Coordinates		Landscape Type
	Northerly	Westerly	
1	44º 28’ 1.37”	80º 7’ 13.47”	Attached to a large, dominant White Pine tree at the edge of a trail, a mixed-wood forest to the west and south, and a wooded wetland to the north.
2	44º 28’ 57.63”	80º 7’ 12.26”	Attached to the largest Poplar tree on the south side of a clearing in a mixed-wood forest.
3	44º 28’ 2.75”	80º 7’ 48.74”	Attached to the largest Polar tree along a survey cut line at the edge of a predominantly conifer forest adjacent to a mostly hardwood wetland.
4	44º 28’ 3.99”	80º 7’ 26.05”	Attached to the largest White Cedar tree with multiple cavities at the edge of a survey cut line in a mixed-wood forest near the wooded wetland.
Acoustic Bat Survey conducted June 13 to June 29, 2021. See Figure 21 for map locations.			

13.7.5 Monitoring Equipment and Software

The monitoring protocol requires a full spectrum broadband detector be used to record bat calls, and the same acoustic recording system should be used throughout the survey. Analysis software should be used to interpret calls to the species levels in order to confirm presence/absence of SAR bats.

Four Song Meter SM4 FS Bioacoustics Recorder bat detectors (SM4s) outfitted with SMM-U2 ultrasonic microphones were used to record bat calls. The microphones were positioned away from obstructions and slightly away from prevailing winds to maximize bat call recording opportunities. Obstacles such as branches and leaves near the microphones were removed to allow for maximum range of detection. The SM4 detector is illustrated in Photo 15. The SMM-U2 ultrasonic microphone is illustrated in Photo 16.

Kaleidoscope Pro software was used to analyze the data obtained from the SM4s. Automatic identification was applied to each recording using the batch processing feature. Recordings were then manually vetted by visual assessment of the recordings in a spectrogram.

Typical recording files contain search phase calls, approach phase calls, social calls and feeding buzzes. When possible, search phase calls were used for manual vetting as this call type is most distinct between species. Approach phase calls have greater overlap and are more easily misidentified. Social calls and feeding buzzes present no discernible features that aid in species identification.

13.7.6 Survey Conditions

The weather conditions during the 16-night survey period are summarized in Table 12. Four nights experienced precipitation, although only one event on June 25/26 was the rainfall substantial (35.8 mm). Temperatures dipped slightly below 10°C on one night, June 22/23. Bats are less active during cool temperatures and rainfall, but despite the one cool night and four rain events, calls were recorded every night during the survey duration.

13.7.7 Survey Results

In total, 16,569 recording files were detected by the four SM4 acoustic recorders. Eighty-eight recordings did not contain any discernable bat echolocating calls and were labeled as “noise”. The noise files were discarded. The remaining 16,481 files contained echolocating calls from seven of the eight bat species found in Ontario. Table 13

Photo 15: A Song Meter SM4s full spectrum Acoustic Bat Detector mounted on a Poplar tree at Bat Survey Monitoring Site 3.

Photo 16: SMM-U2 ultrasonic microphone was connected to the SM4 Detector. The remote microphone provided a substantially greater recording envelope than the microphones built into the detector.

Table 12: Summary of Time and Weather Conditions During the Acoustic Bay Survey.				
Night	Date	Sunset	Sunrise	Weather
1	June 13 to June 14	21:06	05:34	15.7 °C - 20.4 °C 2 -12 km/hr 0.0 mm precipitation
2	June 14 to June 15	21:06	05:34	14.4 °C - 17.4 °C 8 - 23 km/hr 1.5 mm precipitation (between 23:00 and 01:00)
3	June 15 to June 16	21:06	05:34	13.3 °C - 16.1 °C 8 - 19 km/hr 0.0 mm precipitation
4	June 16 to June 17	21:07	05:34	10.2 °C - 12.3 °C 3 - 6 km/hr 0.0 mm precipitation
5	June 17 to June 18	21:07	05:35	18.5 °C - 21.6 °C 4 - 19 km/hr 0.0 mm precipitation
6	June 18 to June 19	21:07	05:35	14.5 °C - 20.8 °C 3 - 7 km/hr 0.0 mm precipitation
7	June 19to June 20	21:08	05:35	11.6 °C - 15.2 °C 0 - 7 km/hr 0.0 mm precipitation
8	June 20 to June 21	21:08	05:35	17.0 °C - 21.3 °C 0 - 8 km/hr 0.0 mm precipitation
9	June 21 to June 22	21:08	05:35	11.3 °C - 12.2 °C 11 - 28 km/hr 0.0 mm precipitation
10	June 22 to June 23	21:08	05:36	9.3 °C - 12.6 °C 2 - 6 km/hr 0.5 mm precipitation (04:00)
11	June 23 to June 24	21:08	05:36	18.7 °C - 20.5 °C 9 - 17 km/hr 0.0 mm precipitation
12	June 24 to June 25	21:09	05:36	21.5 °C - 23.7 °C 4 - 14 km/hr 0.0 mm precipitation
13	June 25 to June 26	21:09	05:37	19.8 °C - 20.4 °C 6 - 10 km/hr 35.8 mm precipitation (between 21:00 and 02:00)
14	June 26 to June 27	21:09	05:37	24.5 °C - 25.9 °C 9 - 18 km/hr 0.0 mm precipitation
15	June 27 to June 28	21:09	05:37	20.9 °C - 22.2 °C 3 - 6 km/hr 1.0 mm precipitation (between 21:00 and 23:00)
16	June 28 to June 29	21:08	05:38	20.4 °C - 18.5 °C 1 - 8 km/hr 0.0 mm precipitation
Weather data obtained from Environment Canada Collingwood Ontario weather station (Climate ID: 6111792).				

Table 13: Summary of Bat Species Identification.						
Common Name	Latin Name	Song Meter SM4Bat FS Monitor[1]				Total Calls (% of Total)
		1	2	3	4	
Non-Myotis/Perimyotis Species						
Big Brown Bat	*Eptesicus fuscus*	483	323	242	256	1,304 (7.9%)
Eastern Red Bat	*Lasiurus borealis*	237	179	94	171	681 (4.1%)
Hoary Bat	*Lasiurus cinereus*	592	650	755	483	2,480 (15.0%)
Silver-haired Bat	*Lasinycteris noctivagans*	559	571	728	755	2,613 (15.9%)
Total Non-Myotis/Perimyotis Bat Species						7,078 (42.9%)
Myotis/Perimyotis Species[4]						
Little Brown Myotis	*Myotis lucifugus*	3,136	1,334	420	957	5,847 (35.5%)
Northern Myotis	*Myotis septentrionalis*	0	0	0	0	0 (0.0%)
Tri-colored Bat	*Perimyotis subflavus*	6	3	2	1	12 (0.07%)
Eastern Small-footed Myotis	*Myotis leibii*	0	0	2	0	2 (0.01%)
Call Assigned to Myotis[2]	*Myotis genus*	38	34	125	157	354 (2.1%)
Total Myotis/Perimyotis Bat Species						6,215 (37.7%)
Unknown[3]		1,051	903	630	604	3,188 (19.3%)
Total		6,102	3,997	2,998	3,384	16,481

1 – See Figure 21 for location of Bat Monitors.
2 – Definitely a *Myotis/Perimyotis* but species could not be confidently identified.
3 – Bat species could not be confidently identified, but definitely not a *Myotis/Perimyotis* species.
4 – *Myotis and Perimyotis* bats are species at-risk – SARO *Endangered.*

summarizes the recordings for each bat species and for each acoustic detector.

Bats navigate and forage by echolocation. Generally, the frequency of the echolocation is characteristic of the bat species, although there can be overlap depending on whether the bats are navigating, socializing or feeding. The Kaleidoscope software automatically filters the recordings by frequency, and therefore by species. Confirmation of species identity is done by manually vetting the filtered recordings. Figure 22 is an example of an echo spectrogram produced by the Kaleidoscope software.

Calls of *Myotis*/*Perimyotis* bat species, which are species at-risk, are normally quite distinct from non-*Myotis/Perimyotis* species. One of the most unique features of at-risk bat calls is their high frequency range. Typically, the lower range of *Myotis*/*Perimyotis* calls is around 40 khz, while the higher range of non-*Myotis*/*Perimyotis* calls are well below 40 khz. For example, the lower range of Big Brown Bat and Silver-haired Bat calls is typically between 20 and 30 khz. Although distinguishing *Myotis*/*Perimyotis* calls from *non-Myotis*/*Perimyotis* calls can be done confidently, identifying the specific *Myotis/Perimyotis* species is more complicated because call features often overlap between the at-risk bat species. Simply stated, distinguishing between at-risk bats and non-at-risk bats is easy, but identifying specific at-risk bat species is more difficult. When there was uncertainty about the specific *Myotis* species of a recorded call during the manual vetting process, the identification default was to assign it simply as *Myotis* genus. In other words, it was definitely an at-risk bat, but the specific species of at-risk bat could not be confidently determined.

The Kaleidoscope software automatically filtered the 16,481 recordings of the four SM4 detectors and identified echolocating calls by Big Brown Bat (1,304 recordings) Eastern Red Bat (681), Hoary Bat (2,480), and Silver-haired Bat (2,613). These non-at-risk bats are common and widespread in southern Ontario and manually vetting these calls would not have added value to the objective of determining the presence/absence of at-risk bats. Therefore, most of these calls were not manually assessed and the default identification of the software was accepted. In total, non-at-risk bats made up 42.9% of the bat recordings.

The highest number of calls were identified as the at-risk Little Brown Myotis (5,847). Several recordings contained calls from more than one individual. For example, one file from Detector 1 on June 23, 2021, contained calls from approximately four Little Brown Myotis and/or other *Myotis/Perimyotis* species. Furthermore, 51.4% of the recordings from Detector 1 were identified as Little Brown Myotis. Additionally, Little Brown Myotis calls were confirmed in 33.4%, 14.0% and 28.3% of recordings from Detectors 2, 3 and 4 respectively. This suggests that a robust population of Little Brown Myotis are present on or in the vicinity of the property.

Five recordings were identified as Eastern Small-footed Myotis by Kaleidoscope Pro's auto-identification feature. Echolocating calls by Eastern Small-footed Myotis are very similar to Little Brown Myotis, so they can be difficult to differentiate. When these five recordings were vetted manually only two were concluded to be consistent with Eastern

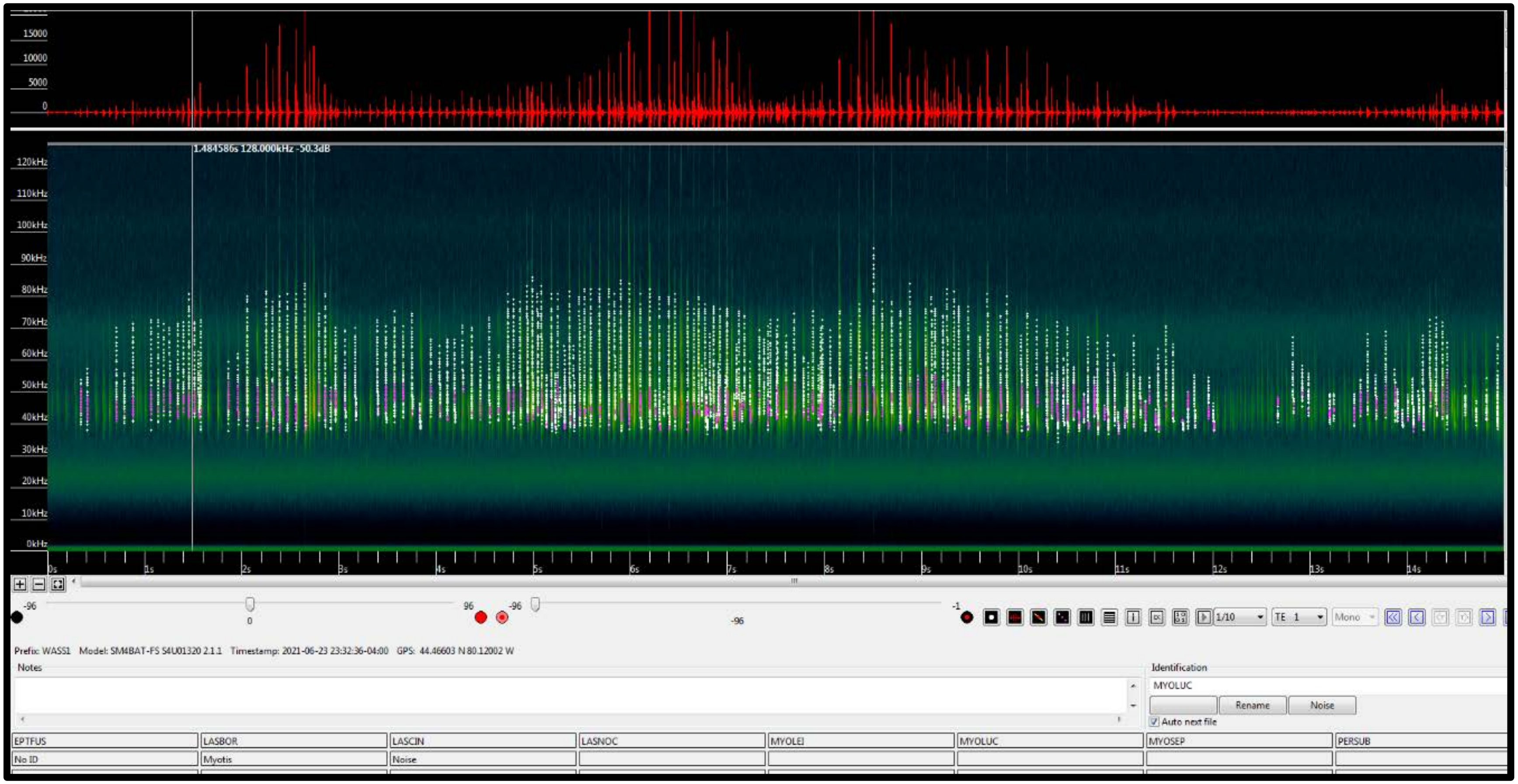


Figure 22: Image of a spectrogram from the Kaleidoscope Pro software illustrating echolocating calls of up to four Little Brown Myotis (Myotis lucifugus) and/or other Myotis/Perimyotis species. Image is from a recording file created on June 23, 2021 at 11:32pm.

Small-footed Myotis, and so they were assigned to this species. Because the number of recordings was very small, about 0.01% of the total, it cannot be concluded with confidence that the Eastern Small-footed Myotis is present on or in the vicinity of the property. As mentioned in Section 13.7.1, the property is not preferred habitat for this bat species. It was only identified at one of the four monitoring sites, which was Site 3, the woodland interior adjacent to the wetland.

Sixty-two recordings were identified as Tri-colored Bat by Kaleidoscope Pro's auto-identification feature. Calls of this species are typically easier to distinguish from the other Myotis species. However, many of these recordings were low quality, which made manual vetting difficult. Twelve recordings were high enough quality that they could be confirmed as Tri-colored Bat. Regardless, only 0.07% of the recordings were confirmed to be the Tri-coloured Bat, so if they are present on or in the vicinity of the property their population is not robust.

No recordings were confirmed to be Northern Myotis, so this at-risk bat is not present on or in the vicinity of the property.

Three hundred and fifty-four recordings contained echolocating calls from *Myotis/Perimyotis* bats, but they could not be confidently allocated to a specific species.

If the number of bats present is reflected by the number of recordings detected, then the at-risk Little Brown Myotis, at 35.5% of the recordings, is the most common bat on or in the vicinity of the property. The Silver-haired Bat, at 15.9%, is the second most common bat, followed by Hoary Bat (15.0%), Big Brown Bat (7.9%), Eastern Red Bat (4.1%), and the two at-risk Eastern Small-footed Myotis and Tri-coloured Bat (<1%) are the least common bats. The at-risk Northern Myotis was not confirmed to be present on or in the vicinity of the property.

Bats were detected at all four survey sites. Site 1 had the greatest number of bat recordings (37.0%), followed in decreasing order by Site 2 (24.3%), Site 4 (20.5%), and Site 3 (18.2%) had the least number of recordings. Sites 3 and 4 were in or adjacent to woodlands or wooded wetlands, whereas Sites 1 and 2 were in clearings near woodlands. This is consistent with bat foraging behavior; in that they prefer to forager in clearings or along wooded edges. Site 1 was near a large White Pine tree along a wide portion of an ATV trail. Site 2 was in a clearing surrounded by woodland. Site 4 was in dense mixed-wood forest, although the monitor was attached to a cedar tree on the edge of a wide survey cut line. Site 3 was in a Cedar thicket adjacent to the wooded wetland, which was the densest of the four survey sites, but it too was next to an overgrown survey cut line. Site 3, in the densest forest, had the least number of bat recordings. Although bats roost during the day in trees or in woodlands, they tend to forage along forest edges, clearings, fields and open wetlands. This is because the find their food, mostly flying insects, by echolocation, which is easier and more efficient in the open air rather than the echo-dense forest interior.

Given the large number of calls by at-risk bats (37.7% of the total recordings), particularly the Little Brown Bat, it is possible they are utilizing some suitable trees on the property as summer roosting habitat. However, when the timing of the recordings is considered, it is just as possible, in fact more likely, that they are roosting nearby and traveling to and foraging across the property. Recordings attributed to the Little Brown Bat tended to arrive later in the evening and leave earlier in the morning. If they were roosting on the property they would probably be one of the first recordings to arrive and among the last to leave, as they would emerge from and return to nearby roosting trees and have less distance to travel. Regardless of whether they are roosting on the property, their recording numbers clearly indicate they are foraging across the property.

The entire property has been assessed on many dates over more than a decade by three environmental consulting companies and it can be concluded with certainty that there is no bat hibernacula or suitable hibernacula habitat on the property. Therefore, even though at-risk bats forage and may roost on the property they do not overwinter on the property. Little Brown Myotis was confirmed to forage on the property, whereas the Eastern Small-footed Myotis and Tri-coloured Bat, also at-risk bat species, may be present on the property, although their number of confidently identified recorded calls was so small (0.01% to 0.07% of all recordings) their presence could not be confirmed.

Section 9 of the ESA prohibits the harming of species at risk, whereas Section 10 prohibits the destruction of species at risk habitat. An Overall Benefit Permit is required from the MECP in order for the proposed development to proceed.

13.8 Butterflies and Moths

Insect capture surveys were not conducted, but opportunistic observations of butterflies and moths were recorded during the many site visits. Only eight species of butterflies and moths were identified with certainty, these were: Canadian Tiger Swallowtail (Photo 17), Gypsy Moth, Cabbage White, Virginia Ctenucha, Morning Cloak, Clouded Sulphur, White-marked Tussock, and Monarch. The Monarch butterfly is a species at risk (*Special Concern*), whereas the other six species are all common and widespread in southern Ontario.

13.9 Monarch Butterfly Biology and Threats

Monarch butterfly populations have crashed in recent decades; what was once a common sight in Ontario fields and meadows is now much rarer, although anecdotal evidence suggests that Monarch butterflies in Ontario have recovered somewhat from their recent historical low population levels. Monarchs are unique in the butterfly community because they have the longest migration of any butterfly (4,000 km), they utilize only one plant species to lay their eggs and feed the emerging larvae (milkweed), and all of the adult butterflies overwinter in a single area (high mountain pine-oak forests of Angangueo and Michoacán in Mexico). This highly specialized adaptation makes the Monarch butterfly susceptible to catastrophic population collapse. Not-with-standing the efforts of the Mexican government to preserve and protect the overwintering sites, two developments have significantly impacted Monarch butterflies and contributed to their dramatic decline. The first is the development of herbicide-resistant crops. Before herbicide-resistant crops farmers along the Monarch's long spring migration route had to exercise caution when spraying their crops to prevent crop damage while controlling weeds. As a result, there were sufficient amounts of residual milkweed between crop rows and around the edges of farm fields on which the butterflies could lay their eggs and feed the emerging larvae. With herbicide-resistant crops farmers are much more likely to broadcast spray their crops and substantially reduce the milkweed in and near the fields, and in the process reduce the only nesting and feeding plant the migrating Monarch butterflies utilize.

The second development is the arrival from Eurasia of the invasive Black Swallowwort and Pale Swallowwort, also called Dog-strangling Vine. In addition to forming annoyingly dense mats in forests and fields and being toxic to some livestock and deer, Dog-strangling Vine is similar enough to the native milkweed that the Monarch butterflies will utilize it for egg laying. However, the emerging larvae cannot eat it, and they subsequently die. Common Milkweed was found on the property, whereas Dog-strangling Vine was not.

Mitigation measures for Monarch butterfly are discussed in Section 18.4.3.

13.10 Habitat for Species of Special Concern

Adult Monarch butterflies were occasionally observed on the property, and Common Milkweed was present, but not plentiful. Despite the number of property visits, Monarch eggs or feeding larvae were not observed on Milkweed plants. Therefore, it can't be determined if the Monarch were simply traversing and opportunistically foraging on the flowering plants on the property, or if they were using habitat on the property to reproduce.

In 2021 adult Monarch were observed and Milkweed was present, and so it follows that habitat exists on the property to support this species at risk. However, from a practical perspective, the habitat is marginal in extent and confined mostly to the thin strip of shrub field adjacent to the south side of Beachwood Road. This strip of field habitat will mostly remain undisturbed by the proposed development.

The property does not meet the criteria of a Migratory Butterfly Stopover Area in accordance with the eco-region 6E Criterion Schedules (MNRF, 2015), and therefore is not Habitat for Species of Special Concern. Following is a review of the criteria.

From Table 1.1 of the MNRF Criterion Schedules:

1) Seasonal Concentration of Animals - Migratory Butterfly Stopover Areas Rationale.

- *Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter. In the fall, during the southward migration, some species of butterflies (Monarchs) stop to feed, rest, or wait for inclement weather conditions to pass before they attempt to cross Lake Ontario, Lake Erie, and Lake Huron. Preferred stopover areas provide an abundance of preferred nectar plants, as well places for shelter and sunning.*

    - The property does have a reasonable variety and abundance of forage plants for adult butterflies, some Milkweed for egg laying and larvae foraging, and there is abundant shelter and sunning habitat.

2) Combination of ELC Community Series.

- *Need to have present one Community Series from each land class: Field; CUM, CUT, CUS, Forest; FOC, FOD, FOM, CUP. Anecdotally, a candidate site for Butterfly Stopover will have a history of butterflies being observed.*

    - Both field and forest ELC communities are present; CUT1a Mineral Cultural Thicket, FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest, and FOD8-1 Fresh-Moist Poplar Deciduous Forest.
    - Monarch butterflies were observed on the property in 2021, although the numbers of butterflies and the frequency of them using the property is unknown.

3) Habitat Criteria.

- *A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present and will be located within 5 km of Lake Ontario. The habitat is typically a combination of field and forest and provides the butterflies with a location to rest prior to their long migration south. The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat. Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes.*

    - The property meets the minimum size criterion of 10 ha, as it is about 12.6 ha. However, the preferred habitat is the narrow strip of field adjacent to the south side of Beachwood Rd., which is only about 0.5 ac (0.2 ha) in size, which is considerably less than the minimum 10 ha criterion.
    - The property is not within 5 km of a Lake Ontario.
    - The property has field and forest edge, so shelter habitat is present.
    - The field has suitable forage plants.
    - The property is a moderately disturbed site, and the surrounding area is

experiencing urban intensification.

It is clear from this review that the property does not meet the criteria of a Migratory Butterfly Stopover Area, specifically it is not near enough to Lake Ontario, and therefore is not Habitat for Species of Special Concern. The property would not be designated as Significant Wildlife Habitat under the criteria of the Provincial Policy Statement for the purpose of protecting Monarch butterflies.

The Monarch butterfly is listed as a species at risk in Ontario Regulation 230/08 of the Endangered Species Act. It is designated as '*Special Concern*'. Special Concern is defined as '…*the species lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats*.'

Section 9 of the ESA prohibits the harming of species at risk, whereas Section 10 prohibits the destruction of species at risk habitat. However, these prohibitions only apply to species that are designated '*Endangered*' or '*Threatened*', not to those designated '*Special Concern*'. Potential impacts on the Monarch butterfly are discussed further in Sections 14.6.1, 15.8 and 17.2.4, and mitigation measures are discussed in Section 18.4.3.

Photo 17: The Canadian Tiger Swallowtail butterfly was one of eight species of moths and butterflies observed on the property. It is a common inhabitant of forests and fields in southern Ontario.

14.0 Landscape Features and Ecological Landscape Classification of Vegetation Communities

14.1 General

The property is neither ecologically diverse nor regionally unique. It is typical of undeveloped land in the Town of Wasaga Beach. The property is about 31.0 acres (12.6 ha) in size. There are nine ecological landscape features on the property, referred to in this report as:

1. West Woodland,
2. West-Central Woodland,
3. Wooded Wetland,
4. East-Central Woodland,
5. East Woodland,
6. Field Thicket,
7. Rural Residential,
8. Bayshore Creek and,
9. Shore Creek.

The extent of these nine landscape features is summarized in Table 14. Woodland comprises about 21.1 acres (8.5 ha), or about 68% of the property. Wetlands cover about 8.8 acres (3.6 ha), or almost 29.0% of the property. A small field thicket covers 0.5 acres (0.2 ha) or about 1% of the property. A parcel of rural residential landscape makes up the remaining 0.5 ac (0.2 ha). Table 14 also identifies the vegetation communities by their Ecological Land Classification (ELC). There was a slight discrepancy in the woodland ELC classification between the Beacon (2012) and Azimuth (2010) reports. They both identified the woodlands as early successional mixed-wood forest, but the ecotype classification was slightly different. Azimuth (2010) stated that the ELC classification was determined mostly by roadside assessment combined with ortho-imagery review, whereas Beacon (2012) conducted property-specific observations. Therefore, the Beacon (2012) classification was considered more likely to be correct because Beacon (2012) conducted on-property observations and provided a more detailed inventory of the ground vegetation, which is critical for ecotype identification. CEC conducted detailed assessments of the vegetation communities over several seasons and, in review, concurred with the Beacon (2012) ELC designations. The ELC classification of the vegetation communities on the property are illustrated in Figure 23.

Table 14: Ecological Landscape Classification of Vegetation Communities on the property.			
ELC[1]	Description	Size Acres (Ha)	% Property
FOM7-2	West Woodland FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest	1.3 ac (0.5 ha)	4.3%
FOM7-2	East Woodland FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest	12.4 ac (5.0 ha)	40.0%
	Total FOM7-2 =	13.7 ac (5.5 ha)	44.2%
FOD8-1	West-Central Woodland FOD8-1 Fresh-Moist Poplar Deciduous Forest	1.2 ac (0.5 ha)	3.9%
FOD8-1	East-Central Woodland FOD8-1 Fresh-Moist Poplar Deciduous Forest	6.1 ac (2.5 ha)	19.7%
	Total FOD8-1 =	7.4 ac (3.0 ha)	23.9%
	Total Woodland =	21.1 ac (8.5 ha)	68.1%
SWD2-2	Wooded Wetland SWD2-2 Green Ash Mineral Deciduous Swamp	8.9 ac (3.6 ha)	28.7%
	Total (SWD2-2) Wetland =	8.9 ac (3.6 ha)	28.7%
CUT1a	Field Thicket CUT1a Mineral Cultural Thicket	0.5 ac (0.2 ha)	1.6%
Rural Residential	Block C – 65 Robert Street South	0.5 ac (0.2 ha)	1.5%
	Total Other =	1.0 ac (0.4 ha)	3.1%
	Property Total =	31.0 ac (12.6 ha)	100%
1 – Ecological Landscape Classification, Lee et.al., 1998			

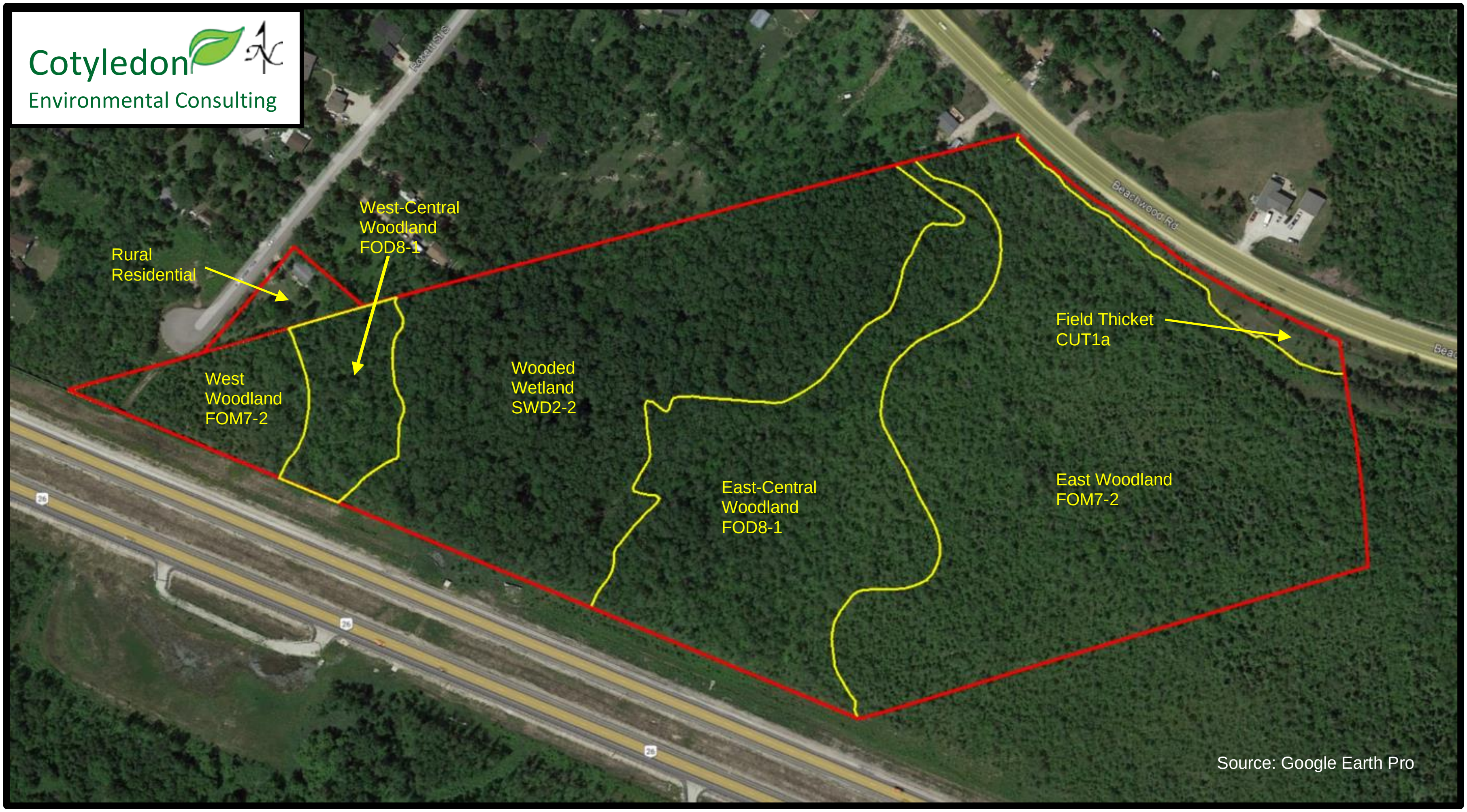


Figure 23: Ecological Landscape Classifications of the vegetation communities on the property.

14.2 Watercourses
14.2.1 Bayshore Creek

There are two water courses on the property. Bayshore Creek is the longer of the two and is located on the west side of the property. The shorter, Shore Creek, is located on the east side of the property. The general features of these creeks are discussed in Section 9.5 and illustrated in Figures 5, 6 and 7.

Bayshore Creek north of Beachwood Road downstream and off of the property, is not a natural watercourse. It has been engineered to comply with the residential land-use. It flows along municipal ditches adjacent to Thomas Street, Bayshore Drive, and Constance Boulevard, through many driveway and roadway culverts.

Bayshore Creek flows into Georgian Bay via a cobbled beach at the end of Bayshore Drive (Photo 3). Sections of Bayshore Creek upstream of Beachwood Road, where it crosses the property, have some natural characteristics, which prompted Azimuth to direct the Town of Wasaga Beach to classify this area as Natural Heritage Category 1 Land. This is also the basis of the NVCA's designation of the West Meander Erosion Hazard area illustrated in Figure 13 and the Flood Hazard area depicted in Figure 15.

As explained in Section 19.3, because of the flat topography, the presence of a perched water table, and the periodic and diffuse flow, Bayshore Creek has no permanent defined drainage channel. In some areas there is a shallow, braided channel that is littered with woody debris (Photos 1 and 2). The woody debris is a combination of trees and shrubs that have drowned from the high-water table and recent ash tree mortality from the Emerald Ash Borer. The creek path remains littered because there is neither sufficient nor prolonged and robust enough flow to wash the debris from the channel. The diffuse flow from Bayshore Creek and the perched water table are responsible for the Wooded Wetland that extents through the middle of the property, which is discussed in Section 14.5.

Bayshore Creek is ephemeral, flowing in the spring subsequent to snowmelt and after periods of prolonged or intense rainfall. There was flow during the November 9, 2011 visit by NVCA, the December 14, 2020 property visit by CEC, during the Palmer (2021) fluvial study March 29, 2021 and the CEC field work April 19, 2021. However, the stream channel was dry during June and July 2012 property visits by Beacon and the April 27, May 17 and 31 and June 10, 13 and 21, 2021 site visits by CEC (Photos 18, 19 and 20). The Palmer (2021) fluvial-geomorphic study concluded Bayshore Creek exhibits an irregular and poorly defined, multi-thread pattern that reflects obstructions by fallen trees and accumulations of organic matter, as opposed to fluvial erosion and deposition, so a meander belt can't be defined. Therefore, the creek isn't an erosion hazard.

Photo 18: (left) Bayshore Creek was flowing April 19, 2021.

Photo 19: (right) No water was flowing in Bayshore Creek April 27, 2021, but the stream channel was moist and muddy.

Photo 20: (left) The Bayshore Creek channel was dry May 31, 2021.

14.2.2 Shore Creek

Shore Creek, situated in the east portion of the property, is the shorter of the two creeks. Like Bayshore Creek, Shore Creek is ephemeral, it does not have a defined stream channel, there are no pools, ponds, or standing water, and it is dry most of the year. Shore Creek flows off the property under Beachwood Road via a box culvert, through an undeveloped wooded area, and is channelized in a municipal ditch around the cul-de-sac at the end of Shore Lane before it's cobble stone confluence with Georgian Bay.

The natural heritage mapping schedules for the Town of Wasaga Beach, Simcoe County, Nottawasaga Township, the MNRF and NHIC maps, and the Beacon and Azimuth reports don't recognize Shore Creek. The Azimuth report identifies Shore Creek simply as a 'surface drain'. Only the NVCA maps identify Shore Creek in their streams map layer, and the NVCA's East Meander Erosion Hazard area illustrated in Figure 13 appears to be associated with Shore Creek. However, unlike Bayshore Creek, the NVCA does not identify a Flood Hazard area in the vicinity of Shore Creek (Figure 15).

It is puzzling why the NVCA would identify a meander erosion hazard for Shore Creek (Figure 13) in their on-line inter-active map when at a meeting with the Town of Wasaga Beach and Equi-Knox Environmental on January 25, 2012, the NVCA conceded:

> "…*that no floodplain or hazard assessment studies were required for the east watercourse* [Shore Creek] *because it has no defined channel*".

Furthermore, the NVCA stated:

> "…*that drainage from Highway 26 via the east watercourse* [Shore Creek] *can be either treated* [i.e., with a retention pond] *or re-directed to the same outlet north of Beachwood Road*" (Appendix 21.2).

The Palmer (2021) fluvial-geomorphic study concluded Shore Creek doesn't exist as a water course, there is no meander belt, and no risk of erosion whatsoever. Repeated site visits by CEC in April, May and June of 2021 did not find a creek channel in the vicinity indicated in the NVCA map (Figures 5, 6 and 7). In April and May there were some patches in the woodland that were wetter, particularly towards the inlet on the north side of Highway 26 and the outlet on the south side of Beachwood Rd., although nowhere across the property was there a defined creek channel.

Unlike Bayshore Creek, which is associated with the Wooded Wetland in the centre of the property, there is no wetland on the east side of the property in the vicinity of where Shore Creek is supposed to be. The entire east side of the property is clearly a terrestrial and not a wetland vegetation community. Shore Creek does not exist as a watercourse.

14.2.3 Watercourse Significance

Bayshore Creek is dry for most of the growing season. Shore Creek doesn't exist as a defined water course.

There was no evidence of upstream movement of fish during the short seasonal flood, and the lack of a stream channel, the shallow water, the lack of holding pools and the rapid dry-down means there is no fish holding habitat and no practical fish breeding habitat. Therefore, as concluded in Section 13.6, there is no fish habitat associated with the creeks, or anywhere else on the property.

Similarly, as concluded by Beacon (2012) and confirmed by the survey conducted for this sEIS (Section 13.3), there is no amphibian breeding habitat associated with the creeks. Although amphibians will utilize moist forest areas outside of the breeding period, there is no amphibian breeding habitat on the property.

The Bayshore Creek watercourse has development restrictions because it is Natural Heritage Category 1 Land, it is in an un-evaluated wetland, and it is in NVCA Regulated Area (Figure 14). Although there is clearly no erosion hazard, the area floods seasonally. Also, the NVCA policies prohibit interference with watercourses. Therefore, the Bayshore Creek watercourse would warrant protection from development regardless of its lack of fish and amphibian breeding habitat, no erosion hazard, and its ephemeral character.

The Shore Creek watercourse is in Natural Heritage Category 2 Land, which is potentially developable. It is also in an NVCA Regulated Area (Figure 14). However, the Palmer (2021) fluvial report and the studies conducted for this sEIS clearly illustrate that the Regulated Area associated with Shore Creek is not in a wetland, is neither a flood nor an erosion hazard, has no fish or amphibian breeding habitat, and in fact Shore Creek doesn't exist as a watercourse. Therefore, this area should not be designated as Regulated Area. Also, since the watercourse doesn't exist there is no relevant NVCA stream policy, so there should be no restriction to development. In addition, the NVCA has conceded in a pre-consultation meeting that the flow can be re-directed, or its flow treated (Appendix 21.2). Therefore, the Shore Creek watercourse does not warrant protection from development under the current regulatory policies and discussions with the NVCA.

The proposed mitigation plan to address the regional flooding results in complete diversion of surface water away from the property, which will dry up both watercourses.

The implications of this action in relation to NVCA and municipal policies is discussed in Section 17.1.8 and 17.1.9.

14.3 Field Thicket

There is a narrow strip of field thicket across the north edge of the property, immediately adjacent to the south side of Beachwood Road. It is about 0.5 acres (0.2 ha) in size, or a little more than 1% pf the property (Table 14, Figure 23, Photo 21). It is ELC classified as *CUT1a Mineral Cultural Thicket*. Neither the Azimuth nor Beacon reports recognized this natural feature on the property, likely because of its small size. One half hectare is usually considered the minimum size for ELC vegetation community mapping. Although small, this feature was clearly evident and distinctly different than the adjacent woodland, and so it was identified and classified for this sEIS.

Although the percentage of field vs tree and shrub cover varied considerably across this ecotype, on average it was less than 25% trees and greater than 25% shrub. It was on moderately to well-drained mineral soil with some of the more open, flat, coarse-textured soil field areas possibly cast-off material from the re-construction or maintenance of Beachwood Road. The trees were mostly young or sapling Green Ash, Trembling Aspen, Manitoba Maple and Eastern White Cedar. The shrubs were Ground Juniper, Common Buckthorn and scattered Red-osier Dogwood. The ground cover was typical field and waste area plants, such as grass and sedge species, Garlic Mustard, Goutweed, Common Burdock, Wild Carrot, Common St. John's Wort, Bird's-foot Trefoil, Timothy, Canada Goldenrod, Common Plantain, Common Dandelion, Sand Violet and Poison Ivy.

14.3.1 Field Thicket Significance

A Field Thicket of this size would not warrant protection from development. In fact, the proposed site plan has development right to the edge of the roadway's setback, so the entire Field Thicket will be removed (see Section 17.1.6).

14.4 Rural Residential

The Rural Residential feature is a single residential lot, 65 Robert Street South, that was purchased in 2021 and added to the area proposed for development. It is 0.5 ac (0.2 ha) in size, which is slightly more than 1% of the entire property (Table 14, Figure 23, Photo 22). The abrupt transition of the vegetation community is apparent in Photo 22, which is a recent ortho-image from the NVCA's inter-active map site. The east side of the rural residential parcel is adjacent to woodland.

Photo 21: The Field Thicket on the north edge of the property adjacent to Beachwood Rd. is a small but distinct ecosite (ELC CUT1a).

Photo 22: The Rural Residential area is adjacent to the undeveloped woodland. The abrupt transition of the vegetation community is evident. There is no ELC classification for residential land-use. (Photo source: NVCA).

The property is a typical residential landscape. The ground has been filled and leveled and a roadside ditch manages surface water drainage. The trees on the lot are a mixture of Green Ash, Trembling Aspen and White Cedar, likely remnants from the adjacent woodland when the lot was cleared and developed, and planted ornamentals, such as White and Blue Spruce. The ground cover is predominantly maintained lawn grass.

There is no ELC classification for residential property.

14.4.1 Rural Residential Significance

The Rural Residential feature is entirely within the NVCA Regulated Area. Normally this would prohibit or restrict development. However, in this case the property is already zoned and functioning as a single-family residence, which is consistent with the proposed development. Municipal approval would be required to severe lots and a NVCA permit would be required to allow the proposed development to proceed on this small parcel. The policy implications are further discussed in Section 17.1.7.

14.5 Wooded Wetland

There is an un-evaluated Wooded Wetland associated with Bayshore Creek on the west side of the property (Figure 23). It has not been evaluated using the Ontario Wetland Evaluation System (OWES). About 8.8 acres (3.6 ha) in size, it encompasses almost 29% of the property. The Beacon (2012) sEIS classified the wetland as ELC *SWD2-2 Green Ash Mineral Deciduous Swamp*. The observations made by CEC for this sEIS during site visits in 2020 and 2021 concur with this classification. The Wooded Wetland exists because the Bayshore Creek stream flow is neither sufficient enough nor frequent enough to carve a stream channel and contain the flow, because the topography is essentially flat so the sheet flow is slow, diffuse, and spreads out, and also because the impervious clay-like mineral soil layer about ½ metre below the surface doesn’t allow the surface water to percolate downward into the ground water, which creates a perched water table.

The Wooded Wetland is ephemeral. There are very shallow pools of standing or slowly moving water associated with the Bayshore Creek seasonal flow in the late winter into early April. Depending on the volume of the melting snowpack and the amount of spring rainfall, the water is mostly gone by late April or early May, although the ground remains moist. In most years by late May and early June the wetland is mostly dry, and it remains dry for much of the growing season. The timing of this seasonal transition was observed by Beacon (2012) during their field work in 2011/12 and by CEC in 2020/21.

The Wooded Wetland was staked by Beacon and the NVCA on July 28, 2011. At that time, NVCA identified a second, smaller, area of wetland slightly to the southeast of the main wetland. This smaller wetland does not appear on any of the municipal or regulatory planning agencies' natural heritage maps. Neither Azimuth (2010) nor Beacon (2012) included this smaller wetland in their reports. CEC traversed this area several times in April, May and June 2021 and, based on the landscape conditions and the vegetation communities, concluded the smaller wetland is no longer present. Therefore, the current extent of the Wooded Wetland on the property is reflected in Figure 23.

Palmer (2021) discussed in their fluvial-geomorphic report how the threads of Bayshore Creek move and meander across the flood plain. Most of the meandering is caused by fallen trees that dam and/or divert the seasonal surface water flow. The Ash trees in the Wooded Wetland have been decimated by the Emerald Ash Borer. Ash mortality is substantial and on-going. Fallen Ash trees literally litter the ground in large numbers (Photo 23). Furthermore, the high-water table causes very shallow root systems to develop, making mature trees susceptible to blow down. The fallen timber and the root mass also damn and/or divert surface water flow (Photo 24). As a result, the ephemeral pooling and ponding is constantly shifting locations throughout the Wooded Wetland and from year to year.

There is discussion in the files on this property about the origin of the Wooded Wetland. Some correspondence suggests that it may have originated, or at least its physical size exacerbated, by changes in the surface water flow caused by the recent construction of the Highway 26 bypass adjacent to the south of the property. The origin of a wetland, either anthropogenic or natural, is irrelevant from a regulatory perspective. Colloquially speaking, a wetland is a wetland regardless of the origin. Wetlands are natural heritage features that serve a unique and valuable function on the landscape and regulatory and municipal planning authorities provide them some degree protection, depending on their size, their ecological uniqueness and complexity, and their OWES classification.

The vegetation communities reflect the integration of local environmental conditions. Wetland ecotypes occur where wetland conditions have existed for a substantial period of time. The Wooded Wetland on the property is a forested swamp, ELC classified *SWD2-2 Green Ash Mineral Deciduous Swamp*, which is a classic wetland ecotype. Forests take a considerable amount of time to become established on a site. Although young by forest standards, based on the forest resource inventory plots and measurements taken across the Wooded Wetland, the trees in the Wooded Wetland averaged about 30 years old. There are very few living, large Ash trees, as mortality by Emerald Ash Borer exceeded 50% of the Ash stems. Increment cores were collected from two of the largest Ash trees in the Wooded Wetland and counted with the aid of a digital microspore slaved to a desktop PC. One Ash, with a diameter of 35.1 cm, had 82 rings. The second ash tree, which had a diameter of 36.2 cm, had 73 rings. With an average age of about 30 years and the oldest trees being between 70 and 80 years old

Photo 23: (above) Ash trees killed by the Emerald Ash Borer litter the ground damming and diverting the seasonal flow of water in the wetland causing the ephemeral pooling and ponding to constantly shift location. Photo 24: (below) The high-water table causes very shallow root systems to develop, making mature trees susceptible to blow down. The fallen timber and the root mass also damn and/or divert surface water flow.

it is apparent that the tree species characteristic of a wetland ecotype substantially predates the Highway 26 bypass construction. Therefore, the Wooded Wetland, in its current extent, is almost certainly natural in origin.

Although the Wooded Wetland appears to be a forest in ortho-images, this feature meets the ELC wetland classification because it is seasonally flooded and there are vegetation species that are recognized as 'wetland indicators' in the OWES manual. Another characteristic of wetlands is the soil is typically dense fibric organic substrate, or peaty-soil that contains a lot of organic matter that is not well decomposed because it is chronically water-saturated and often anaerobic. That is not the case in the Wooded Wetland on the property. Based on the county soil maps and the recent Palmer (2021) report, the soils on the property are mineral soils. The dense mineral soil layer at about ½ meter deep is responsible for the perched water table and the major contributing feature to the existence of the Wooded Wetland.

The *SWD2-2 Green Ash Mineral Deciduous Swamp* typically occurs where flooding is periodic or seasonal. Observations by four environmental consultants over more than 10 years has conclusively shown that the Wooded Wetland is ephemeral and is dry for much of the growing season. The forest floor may remain moist in areas, but there is no standing water or ponds. This ecotype has more than 75% tree cover and is fern and sedge rich. Tree and shrub cover was predominantly Green Ash, White Elm, Pussy Willow, Silky Dogwood, Red-osier Dogwood and Common Buckthorn. Ground herbaceous cover included Spotted Touch-me-not, Stinging Nettle, Marsh Marigold, Swamp Red Current, Fowl Bluegrass, Drooping Sedge and Little Prickly Sedge. The two forest resource inventory plots in the Wooded Wetland (Plots 3 and 4, Tables 15 and 16, Figure 24) confirmed the casual observations that the forest is, on average, quite young (30 – 36 years), the trees are small (average diameter is 19.3 cm) and the stand is quite thick in areas (average 425 stems/ac and a basal area of 158 ft^2/ac). For trees over the minimum measurement criterion of 9 cm, the Wooded Wetland was 82% Green Ash, 17% White Elm and less than 1% Yellow Birch. The landscape is very forest-like, although there are numerous openings in the canopy from the on-going Ash mortality where abundant sunlight reaches the ground resulting in a thick, although not particularly ecologically diverse, herbaceous community.

The extent of Ash and Elm dieback is so significant (Photos 25 and 26) it is changing the character of the Wooded Wetland. In some areas mortality of the mature trees exceeds 50% of the basal area. The canopy openings permit greater light penetration and air movement, which increases the light regime on the ground and reduces relative humidity. This in turn dries the surface soil more quickly in the spring and favours light-tolerant as opposed to shade-tolerant herbaceous growth. It also encourages the seeding of pioneering species, such as Trembling Aspen, White Birch, White Cedar and Buckthorn. Buckthorn particularly is a very aggressive invader. In some areas around the edge of the Wooded Wetland and in the clearings where the mature overstory has died and fallen the young buckthorn growth is so thick it is literally impossible to walk through.

Table 15: Forest Resource Inventory Data Summarized by Plot[1] and ELC Ecotype.								
FRI Plot & Tree Species	Basal Area		% Basal Area	Mean DBH		Mean Age	Number of Stems	
	Ft^2/Ac	M^2/Ha		Inches	Cm		Per Ac	Per Ha
Plot 1 – ELC FOM7-2								
Plot 1 – Common Buckthorn	7.2	1.7	5.1	4.4	11.0	19	70	173
Plot 1 – Green Ash	12.1	2.8	8.6	8.5	21.6	34	30	74
Plot 1 – Trembling Aspen	27.7	6.4	19.6	5.7	14.6	11	140	346
Plot 1 – White Cedar	90.0	20.7	63.8	6.1	15.4	22	420	1038
Plot 1 – White Elm	4.1	0.9	2.9	6.1	15.4	24	20	49
Plot 1 – Total	141	32	100	15.1	5.9	20	680	1680
Plot 2 – ELC FOD8-1								
Plot 2 – Common Buckthorn	7.8	1.8	7.2	4.2	10.6	18	80	198
Plot 2 – Green Ash	48.3	11.1	44.3	6.0	15.1	24	210	519
Plot 2 – Trembling Aspen	41.6	9.6	38.2	9.6	24.3	19	80	198
Plot 2 – White Cedar	10.8	2.5	9.9	6.9	17.5	24	40	99
Plot 2 – White Elm	0.8	0.2	0.7	3.8	9.6	15	10	25
Plot 2 Total	109	25	100	6.3	16.1	22	420	1038
Plot 3 – ELC SWD2-2								
Plot 3 – Green Ash	127	29	86.4	8.2	20.9	33	280	692
Plot 3 – White Elm	19.7	4.5	13.4	5.6	14.2	22	110	272
Plot 3 - Total	147	34	100	7.5	19.0	30	390	964
Plot 4 – ELC SWD2-2								
Plot 4 – Green Ash	133	30.5	77.8	8.5	21.5	34	300	741
Plot 4 – White Elm	33.2	7.6	19.4	6.1	15.4	24	150	371
Plot 4 – Yellow Birch	4.7	1.1	2.7	9.3	23.5	28	10	25
Plot 4 - Total	171	39	100	7.1	19.6	31	460	1137
Plot 5 – ELC FOD8-1								
Plot 5 – Common Buckthorn	2.5	0.6	2.7	3.9	10.0	17	30	74
Plot 5 – Green Ash	53.3	12.2	57.3	6.4	16.2	25	230	568
Plot 5 – Trembling Aspen	24.2	5.6	26.0	5.1	12.9	10	150	371
Plot 5 – White Cedar	7.8	1.8	8.4	4.7	11.9	17	60	148
Plot 5 – White Elm	5.5	1.3	5.9	5.8	14.7	23	30	74
Plot 5 - Total	93	21	100	5.6	14.2	19	500	1236
Plot 6 – ELC FOD8-1								
Plot 6 – Common Buckthorn	1.8	0.6	1.9	4.1	10.4	18	20	49
Plot 6 – Green Ash	54.3	12.5	57.2	7.2	18.2	29	170	420
Plot 6 – Trembling Aspen	39.0	8.9	41.1	6.1	15.5	12	180	445
Plot 6 - Total	95	22	100	6.5	16.5	20	370	914
Plot 7 – ELC FOM7-2								
Plot 7 – Common Buckthorn	7.5	1.7	6.0	4.1	10.5	18	80	198
Plot 7 – Green Ash	19.6	4.5	15.7	5.6	14.9	23	100	247
Plot 7 – Trembling Aspen	32.3	7.4	25.9	5.3	13.6	11	180	445
Plot 7 – White Cedar	59.5	13.6	47.6	5.2	13.3	19	380	939
Plot 7 – White Spruce	3.8	0.9	3.0	8.4	21.3	20	10	25
Plot 7 – Yellow Birch	2.2	0.5	1.8	6.4	16.2	19		
Plot 7 Total	125	29	100	5.3	13.4	17	760	1878
Plot 8 – ELC FOM7-2								
Plot 8 – Black Spruce	1.2	0.3	0.9	4.7	12.0	11	10	25
Plot 8 – Common Buckthorn	0.7	0.2	0.5	3.6	9.1	15	10	25
Plot 8 – Green Ash	9.1	2.1	6.8	6.0	15.5	24	40	99
Plot 8 – Trembling Aspen	24.7	5.7	18.4	6.0	15.2	12	130	321
Plot 8 – White Cedar	90.4	20.8	67.5	5.7	14.5	20	460	1137
Plot 8 – White Elm	8.0	1.8	6.0	4.8	12.2	19	60	148
Plot 8 - Total	134	31	100	5.7	14.4	19	700	1730
Plot 9 – ELC FOM7-2								
Plot 9 – Common Buckthorn	2.0	0.5	1.8	4.0	10.2	17	30	74
Plot 9 – Green Ash	24.1	5.5	21.5	6.0	15.3	24	120	297
Plot 9 – Trembling Aspen	43.2	9.9	38.6	5.2	13.2	10	270	667
Plot 9 – White Cedar	29.8	6.8	26.6	4.9	12.3	17	220	544
Plot 9 – White Pine	7.3	1.7	6.5	11.5	29.3	47	10	25
Plot 9 – White Spruce	5.6	1.3	5.0	6.5	16.6	16	20	49
Plot 9 - Total	112	26	100	5.3	13.4	16	670	1656
Mean ELC FOM7-2	128	29		5.54	14.07	18	703	1736
Mean ELC FOD8-1	99	22		6.09	15.48	20	430	1063
Mean SWD2-2	158	36		7.6	19.3	30	425	1051
1 – FRI Plots are 1/10 ac. Plot locations are illustrated in Figure 28 and described in Table 15.								

Table 16: Location of Forest Resource Inventory Plots.			
FRI Plot[1]	Co-ordinates		Site and Vegetation Community Description
	North	West	
1	44º 28' 3.96"	80º 7' 50.56"	West Woodland – ELC FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest Cw_{64}, At_{20}, Ag_{9}, Bc_{5}, Ew_{3}
2	44º 28' 3.27"	80º 7' 47.43"	West-Central Woodland – ELC FOD8-1 Fresh-Moist Poplar Deciduous Forest. Ag_{44}, At_{38}, Cw_{10}, Bc_{7}, Ew_{1}
3	44º 28' 3.25"	80º 7' 43.13"	Wooded Wetland – ELC SWD2-2 Green Ash Mineral Deciduous Swamp Ag_{86}, Ew_{13}
4	44º 28' 5.69"	80º 7' 37.34"	Wooded Wetland – ELC SWD2-2 Green Ash Mineral Deciduous Swamp Ag_{78}, Ew_{19}, By_{3}
5	44º 28' 2.57"	80º 7' 36.13"	East-Central Woodland – ELC FOD8-1 Fresh-Moist Poplar Deciduous Forest. Ag_{57}, At_{26}, Cw_{8}, Ew_{6}, Bc_{3}
6	44º 28' 0.29"	80º 7' 37.57"	East-Central Woodland – ELC FOD8-1 Fresh-Moist Poplar Deciduous Forest. Ag_{57}, At_{41}, Bc_{2}
7	44º 28' 4.39"	80º 7' 28.89"	East Woodland – ELC FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest Cw_{48}, Ag_{16}, Bc_{6}, Sw_{3}, By_{2}
8	44º 28' 1.16"	80º 7' 28.48"	East Woodland – ELC FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest Cw_{68}, At_{18}, Ag_{7}, Ew_{6}, Sb_{1}, Bc_{1}
9	44º 27' 58.47"	80º 7' 26.40"	East Woodland – ELC FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest At_{39}, Cw_{27}, Pw_{7}, Sw_{5}, Bc_{2}

1 = FRI Plots illustrated in Figure 24, Plots are fixed area 1/10th ac.
Species Code:
Cw – Eastern White Cedar, At – Trembling Aspen, Ag – Green Ash, Bc – Common Buckthorn
Ew – White Elm, By – Yellow Birch, Sw – White Spruce, Sb – Black Spruce, Pw – White Pine.

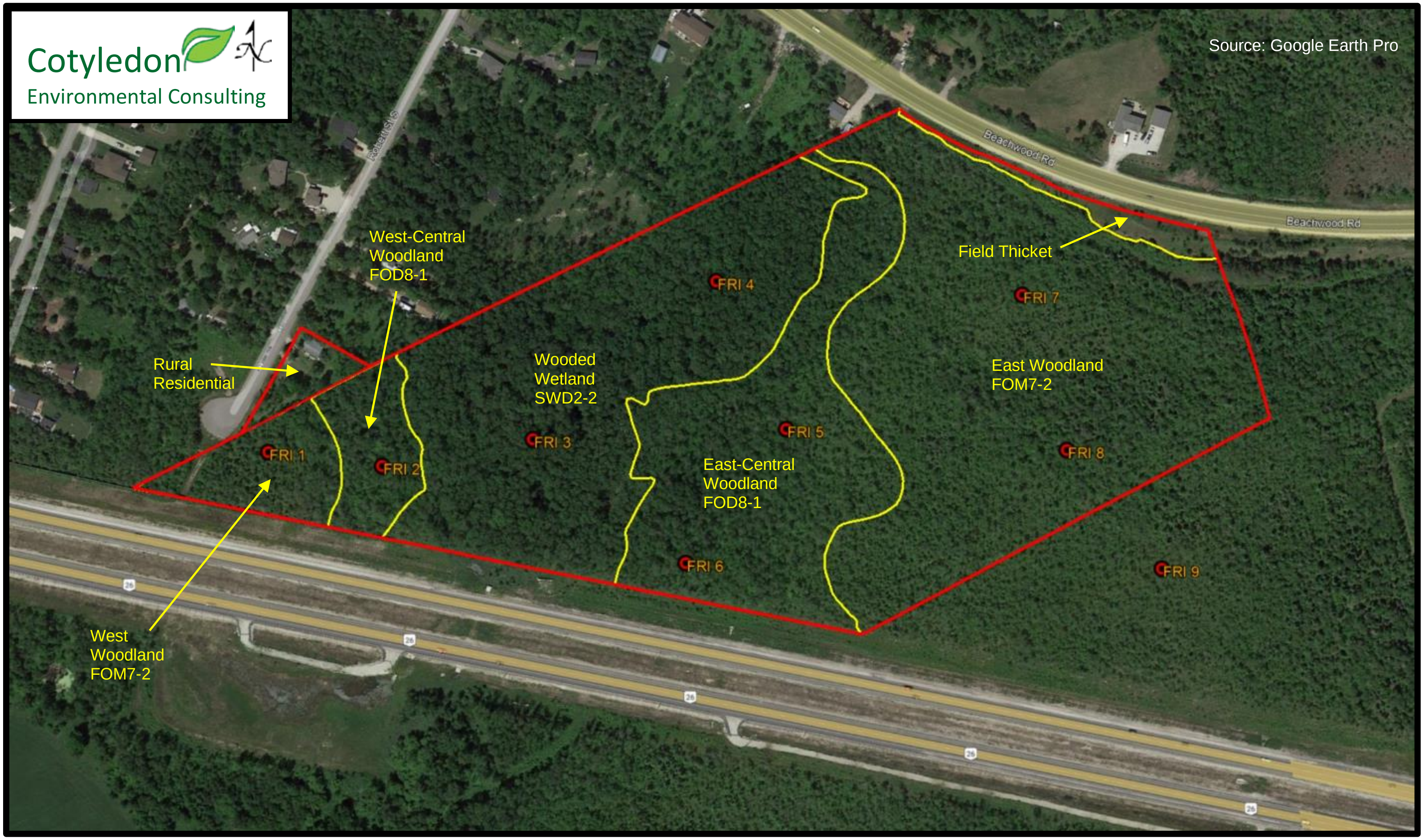
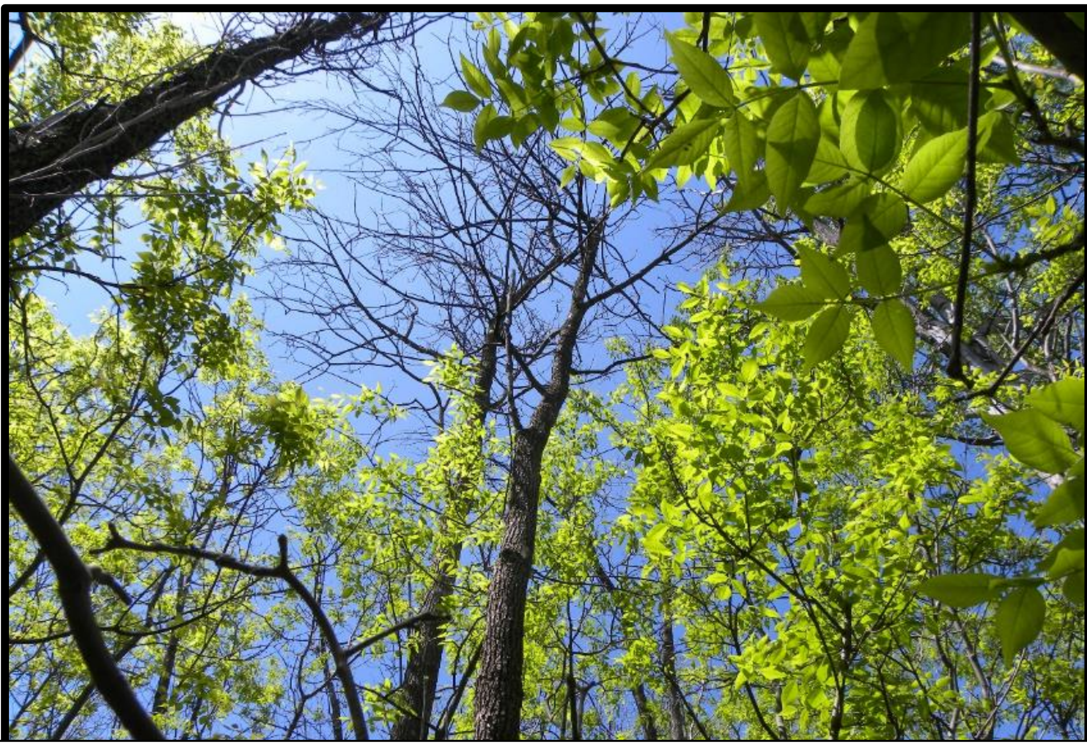


Figure 24: Approximate Location of Forest Resource Inventory measurement plots.



Photos 25 (above) and 26 (below): The extent of Ash dieback is so significant it is changing the character of the wetland. The canopy openings permit greater light penetration, which dries the surface soil more quickly in the spring and encourages the seeding of Poplar, Birch, Cedar and Buckthorn.

14.5.1 Wooded Wetland Significance

The wetland on the property is unevaluated, i.e., it has not been investigated and rated by a certified wetland ecologist using the OWES. OWES looks at a large number of physical, biological, hydrological, social and cultural features and derives a numerical score to determine the wetland's classification. The minimum score for a wetland to be classified as *provincially significant* is 600, or 200 or more in either the biological or special features components. Based on the OWES evaluation criteria and observations by Beacon (2012), Azimuth (2010), Palmer (2021) and the field work by CEC for this sEIS, without question the wetland would not score high enough to be designated as provincially significant for the following reasons:

- Normally wetlands less than 4.9 acres (2 ha) would not be evaluated;
    - The Wooded Wetland meets this criterion because it is about 8.8 acres (3.6 ha);
    - Minimum size for individual OWES vegetation community mapping is 1.2 acres (0.5 ha);
    - Community mapping was done. It is ELC SWD2-2;

- There is no NHIC wetland evaluation file for this wetland, and it can't be locally or regionally complexed;
    - Regulatory authorities have never considered the Wooded Wetland substantial enough to warrant evaluation nor consider it for complexing with local or regional natural heritage features;
    - It is the only wetland on the Bayshore Creek watercourse;
    - Bayshore Creek is not a tributary to another water course and the creek has no tributaries of its own, it is a singular watercourse from source to confluence with Georgian Bay, it is its own watershed;
    - Because it is the only wetland in the watershed it cannot be physically, hydrologically, hydrogeologically, or ecologically complexed with another local or regional wetland, i.e., there is no functioning ecological corridor or linkage;
    - The closest unevaluated wetland is about 545 m, regionally significant wetland is 12.6 km, and provincially significant wetland is 7 km. The Wooded Wetland cannot be linked or complexed with any of these nearby wetlands.

- The biodiversity is relatively low.
  - Of the 120 species of plants identified on the property only 22, or 18%, are identified in the OWES Appendix 10 as wetland indicators, and not all of these are exclusively located in the Wooded Wetland;
  - The vegetation community is not homogenous across the wetland, in many areas the 50:50 wetland rule is not met, i.e., 50% of the species on the site are not wetland indicator species.

- It is ephemeral. There is no permanent open water, it flows in the spring with the snowmelt or subsequent to prolonged or severe precipitation and dries up completely for most of the growing season. Therefore:
  - There is no waterfowl nesting habitat;
  - There is no waterfowl staging of stopover habitat;
  - There is no aquatic mammal habitat;
  - There is no fish habitat;
  - There is no amphibian breeding habitat;
  - Raptor winter foraging and roosting habitat is marginal.

- There is no meaningful ground water retention or recharge functions:
  - Surface water sheet flows across the landscape;
  - Surface water cannot percolate through the impermeable mineral soil layer into the groundwater;
  - The downstream landscape is urbanized, and residential water users are connected to the municipal water, waste water and sewage systems, as is the plan for the proposed development.

- There is no meaningful erosion or flood control functions.
  - There is no meander belt and the wetland floods seasonally;
  - The downstream watercourses north of the property are channelized municipal ditches.

- There are no bird or plant species at-risk dependent on the wetland for foraging or breeding habitat.
  - One mammal species at-risk (Little Brown Myotis) is likely present in the Wooded Wetland, although of all the ecotypes on the property where at-risk bats were detected, the Wooded Wetland had the lowest population density.
  - Eastern Wood Peewee are present on the property and were recorded during the breeding bird survey in and around the Wooded Wetland. However, their preferred habitat is mature forest not wetlands, and they were more frequently recorded in the adjacent woodlands.

- There are no special features or local social, cultural or archeological components in or around the Wooded Wetland.

- The property is privately owned so there are no recreational or educational opportunities for the public.

- The Wooded Wetland does not produce any economically valuable products.

The OWES states:

> "*Where there are wetland features on a site that have not been evaluated or that have not been recently evaluated, municipalities, county governments, conservation authorities, landowners, or others should not assume that the wetland is not significant.*"

Regardless of this statement, for the above reasons, it is a certainty that the Wooded Wetland on the property would not be considered a *provincially significant* wetland by the Provincial Policy Statement, nor score high enough to be classified as provincially significant by the OWES. The Beacon (2012) report described the wetlands and identified an ELC classification, but it did not make a conclusion regarding the wetlands' regulatory significance. The Azimuth (2010) report concluded that there are no locally or provincially significant wetlands in the entire west end of Wasaga Beach, which includes the property. In a November 18, 2011, email from Equi-Knox to the previous property owner regarding meetings with the Town of Wasaga Beach and the NVCA Equi-Knox relates (Appendix 21.5):

> *…the result of all this is that we have proven that the wetland on your site is not a provincially significant wetland …*

It is CEC's opinion that, based on the weight of evidence collected by several environmental consultants over more than a decade, the Wooded Wetland on the property is not regionally or provincially *significant*, it can't be complexed with other nearby wetlands, and it isn't a functional natural heritage linkage feature. For these reasons the time and expense of having the Wooded Wetland OWES evaluated is not warranted.

The wetland meets the technical definition of a Coastal Wetland in the Provincial Policy Statement (2020). The rather awkward definition is:

> *a) any wetland that is located on one of the Great Lakes or their connecting channels (Lake St. Clair, St. Mary's, St. Clair, Detroit, Niagara and St. Lawrence Rivers); or*
>
> *b) any other wetland that is on a tributary to any of the above-specified water bodies and lies, either wholly or in part, downstream of a line located 2 kilometres*

upstream of the 1:100-year flood line (plus wave run-up) of the large water body to which the tributary is connected.

Section 2.1.5f) of the Provincial Policy Statement states in part:

… development and site alteration shall not be permitted in Coastal Wetlands in regions 5E, 6E and 7E that are not subject to Policy 2.1.4b)…

The proposed flood mitigation by-pass channel will divert the flow of both creeks away from the property, resulting in the wetland drying up. The implications of the flood mitigation strategy and the proposed development on environmental policy are discussed in Section 17.1.3.

14.6 Woodlands

The generic definition of a woodland is a landscape where tree crowns cover greater than 60% of the ground. There is no minimum age that defines a woodland, but stocking should range from more than 400 trees per acre for a young, successional forest to about 100 trees per acre for a moderately-aged merchantable forest (*Forestry Act, R.S.O.1990*).

The property is almost completely forested. Even the wetland is a forested ecotype. The woodlands on the property are not remnants or residuals of the historic mixed-wood forests that once covered the landscape, as is the case with most ‘back 40’ farm woodlots in southern Ontario. Rather these woodlands are early successional stands that have re-seeded abandoned agricultural land or invaded sandy shoreline and savannahs.

There are two woodland vegetation communities on the property, as illustrated in Figure 23 and described in Table 14. Bracketing either side of the Wooded Wetland that extends through the central portion of the property are the West-Central and the East-Central Woodlands. These are ELC classified as *FOD8-1 Fresh-Moist Poplar Deciduous Forest*. Together these cover about 7.4 ac (3.0 ha) or almost 24% of the property. In turn, bracketing these woodlands are the West Woodland and the East Woodland. These are ELC classified as *FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest*. Together these cover about 13.7 ac (5.5 ha) or a little more than 44% of the property. Neither forest community is unique to the area nor are they particularly biologically diverse.

The West and East Woodlands (*FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest*) are the drier of the two woodland communities, as they are farther from the wetland feature. Together they cover the western and eastern portions of the property. The canopy consists of a closed immature, early successional forest comprised mostly of Eastern White Cedar with scattered Green Ash, Trembling Aspen and White Elm. The shrub layer is dominated by the invasive Common Buckthorn with Red-osier Dogwood, Nannyberry, Pussy Willow and Canada Buffalo-berry common secondary shrubs. The herbaceous ground cover is fairly dense with the most common species being Canada Anemone, Wild Leak, Lilly-of-the-valley, Trout Lilly, False Solomon's Seal and Common Cinquefoil. The West and East Woodlands are illustrated in Photos 27 and 28.

The characteristics of the woodlands on the property were determined by a series of forest resource inventory measurements. Nine fixed area plots were established: Plots 1,7, 8 and 9 were in the FOM7-2 West and East Woodlands, Plots 2,5 and 6 were in the FOD8-1 West-Central and East-Central Woodlands, and Plots 3 and 4 were in the Wooded Wetland. The plot locations are illustrated in Figure 24 and their GPS co-ordinates are provided in Table 16. An oversized screwdriver was inserted into the ground as a center-point anchor and a pre-measured rope (37.2 ft, or 11.3 m) was stretched out on a north compass bearing. At the end of the rope the ground and the nearest tree were marked with orange tree marking paint. This process was repeated on the northeast, east, southeast, etc., bearings until a complete circle was marked, which created a fixed area plot 1/10 ac (0.04 ha) in size. All trees 3.5 inches (9 cm) and larger were tallied, which included, species, condition, and diameter at breast height (4.5 ft, or 1.4 m). The age of each tree was predicted from on-line growth and yield tables based on tree diameter. To reduce age bias, three on-line tree age calculators were used and the average of the three age calculations was selected. These diameter-based age predictions were compared to actual tree ring counts of increment cores harvested from selected trees.

Table 15 summarizes the woodland characteristics by plot and averaged for the ELC ecotypes. Species distribution was not uniform. Some areas were almost solid White Cedar, in other areas Trembling Aspen proliferated. On average, based on percentage of basal area, the FOM7-2 West and East Woodlands are composed of 53% White Cedar, 25% Trembling Aspen, 13% Green Ash, 4% Buckthorn, 2% White Elm, 2% White Spruce, 1% White Pine and less than 1% Yellow Birch, White Birch and Black Spruce. Figures 25 and 26 illustrate the diameter and age class distributions. The age class and diameter class distributions were consistent with a young, successional mixed-wood forest that has not been managed. For the FOM7-2 woodlands, the average tree diameter was about 6 inches (14 cm), and only about 9% of the trees were greater than 8 inches (20 cm) in diameter. The relatively young age is reflected not only by the small tree diameters but also by the large number of trees – 703 stems/ac (1,736 stems/ha). Tree age was estimated using measured diameter with on-line yield tables and checked against tree rings counted on increment cores from selected trees. The average tree age was determined to be about 18 years. However, based on comparison with the actual age measured from the increment cores, the calculated age is likely underestimated by about 20%, so the average tree age of the FOM7-2 ecotype is probably closer to 22 years. The basal area averaged 128 ft^2/ac (29 m^2/ha).

Photo 27: (above) The West and East Woodlands are ELC FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest. In openings and edges Buckthorn has seeding in so thick it is literally impossible to walk through. Photo 28: (below) The West and East Woodlands are about 53% White Cedar, 25% Trembling Aspen, 13% Green Ash, 4% Buckthorn, 2% White Elm, 2% White Spruce, 1% White Pine and less than 1% Yellow Birch, White Birch and Black Spruce (see Table 14).

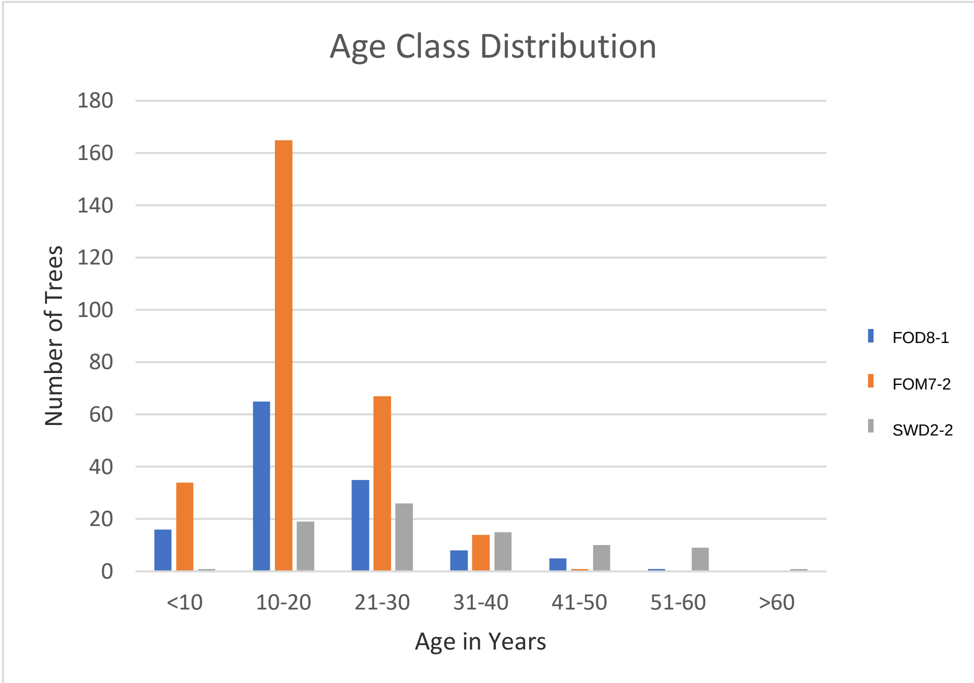
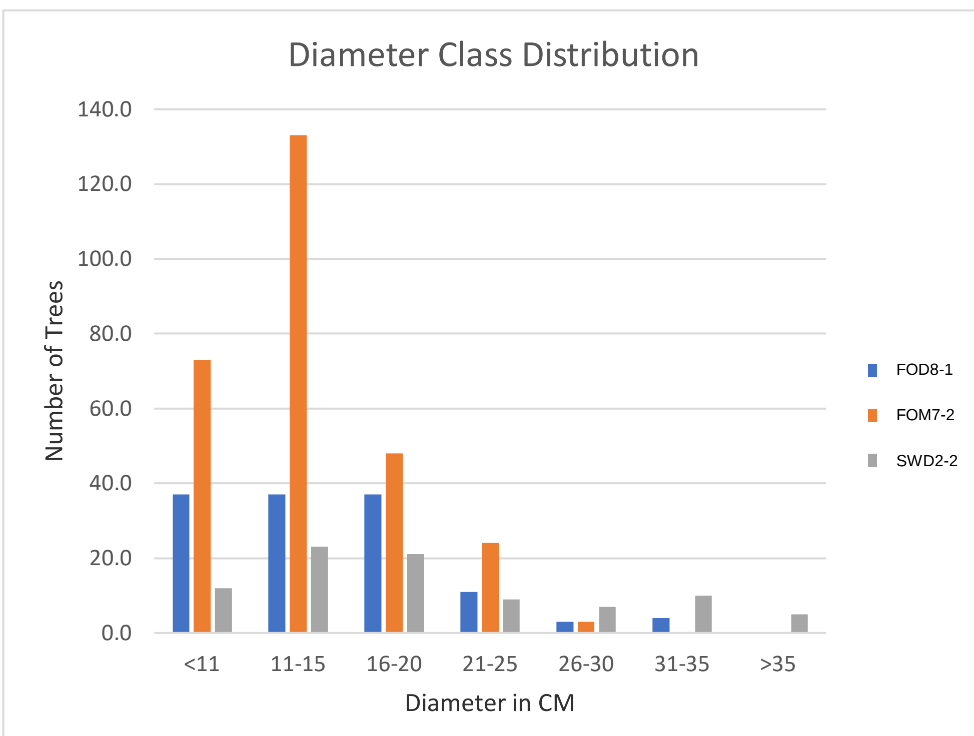


Figure 25: (above) Age Class Distribution of the three forest ecotypes (see Table 14).
Figure 26: (below) Diameter Class Distribution of the three forest ecotypes (see Table 14).



The West-Central and East-Central Woodlands are ELC classified FOD8-1 Fresh-Moist Poplar Deciduous Forest. These woodlands are a moister forest type as they are adjacent to the Wooded Wetland that dominates the central portion of the property. The stands are dominated by Green Ash and Trembling Aspen. The shrub understory is mostly Common Buckthorn, Red-osier Dogwood, Nannyberry and Choke Cherry. The herbaceous ground cover includes Small-flowered Forget-me-not, Fringed Loosestrife, Lady Fern, Jack-in-the-pulpit, sedge species and Tall Buttercup. These woodlands are a young successional forest with 86% of the trees less than 6 inch (20 cm) in diameter, about 430 stems/ac (1,063 stems/ha) and a basal area of about 99 ft^2/ac (22 m^2/ha). The calculated average age is 20 years, but with a 20% underestimate it is likely closer to 24 years. The species distribution of the West-Central and East-Central Woodlands is not uniform, there are areas dominated by Ash and other areas are a predominance of Aspen. On average, the FOD8-1 ecotype is about 53% Green Ash, 35% Trembling Aspen, 6.3% White Cedar, 4% Buckthorn, about 2% White Elm and <1% Black Spruce (see Table 15, Photos 29 and 30).

The woodlands across the property have not been managed. There is no sign of tree harvesting. Tree mortality from periodic flooding, particularly in the Wooded Wetland and wetter West-Central and East-Central Woodlands, in combination with predation by the Emerald Ash Borer, has been substantial. Mortality of larger Ash trees in some areas exceeds 50% of the Ash basal area.

Ash trees are a common species on the property, particularly in the Wooded Wetland and the West-Central and East-central Woodlands. Regardless of the Ash species, site or age, the Ash trees on the property have been severely impacted by the Emerald Ash Borer (*Agrilus planipennis Farmaire*). This invasive insect originated in Asia and likely came to North America on wooden shipping crates. It was first identified in Ontario in 2002. Since then, it has spread across southern and central Ontario. Once infected, tree mortality is almost 100%. Currently there are no natural control mechanisms for the Emerald Ash Borer, so Ash mortality in the woodlands will continue. The only affective control measure is to remove the infected trees and burn them. To prevent the spread of the Emerald Ash Borer, Ash wood, either trees that are cut down or dead trees on the ground, should not be transported off-property.

Analysis of the woodland on the property to determine if it is classified as a significant woodland is addressed in Section 14.6.1.

Photo 29: (above) The West-Central and East-Central Woodlands are ELC FOD8-1 Fresh-Moist Poplar Deciduous Forest. It is a young successional forest with 86% of the trees less than 6 inch (20 cm) in diameter, about 430 stems/ac (1,063 stems/ha) and a basal area of about 99 ft2/ac (22 m2/ha). Photo 30: (below) The West-Central and East-Central Woodlands are about 53% Green Ash, 35% Trembling Aspen, 6% White Cedar, 4% Buckthorn, 2% White Elm and <1% Black Spruce (see Table 14).

The Town of Wasaga Beach has a Tree By-Law that restricts the conditions under which trees can be removed. Section 2 of the By-Law reads in part:

> *Except in accordance with the terms and conditions authorized by permit issued by the Town, no person shall, within the boundaries of the Town, injure, destroy or permit to be injured or destroyed any tree that is:*
>
> *b) Located on lands shown as Natural Heritage System on Schedule D of the Official Plan of the Town;*
>
> *c) On all lands within the Town where the parcel measures 1 hectare in area or greater ...*

Exemptions are provided for land development. Section 3 reads in part:

> *Section 2 of this By-Law does not apply to:*
>
> *g) The injuring or destruction of trees by a person licensed under the Surveyors Act, R.S.O. 1990, c.S.29 to engage in the practice of cadastral surveying or his or her agent, while making a survey;*
>
> *k) The unavoidable injury or destruction of trees permitted as a condition to the approval of a site plan, a plan of subdivision or, a consent under the Planning Act, or, as a requirement of a site plan agreement or subdivision agreement;*
>
> *q) Ash trees that have become infected with the Emerald Ash Borer*.

Section 6 identifies Permit requirements, and reads in part:

> *e) Duration of Permit*
>
> *ii. All permits for the injury or destruction of trees within woodlots will be deemed not to be in effect during the period of April 1 through to August 15, due to bird nesting. This period may be extended to August 31 on a case-by-case basis subject to the nesting period being confirmed by a qualified environmental consultant at the time of application. The Town may grant exemptions to this requirement in writing having regard to the potential for rutting of soil and subsequent damage to the ecology of the woodlot or designated area during the spring break up period.*

Therefore, tree cutting to provide access for drilling or surveying of the property would be permitted, as would tree removal to accommodate an approved plan of subdivision. For the purpose of this sEIS, providing the plan of subdivision is approved, Section 2(k) and 2(q) would apply. Restrictions on when tree cutting may be restricted is further discussed in Section 18.2.1.4. Permits are required prior to the removal of trees. Appendix 21.6 is the Town of Wasaga Beach Tree Cutting By-Law permit application.

The proposed development will completely displace the woodlands on the property. The implications of the development on environmental policy are discussed in Section 17.

14.6.1 Woodlands Significance

Significant woodlands, as defined by the Provincial Policy Statement and other regulatory and land-use planning agencies, are ecologically important because of their size, species composition, age, stand history, protection of water resources, wildlife habitat, economic value, and their contribution to the environmental functionality of the broader landscape. Smaller, less diverse, younger, isolated, or fragmented woodlands have lower ecological functionality and therefore a lower ecosystem service value. Larger, connected or contiguous, and more biologically diverse woodlands, have a greater degree of ecological functionality and therefore a higher ecosystem service value. Generally, regulatory and municipal planning authorities prohibit the disturbance of significant woodlands, or impose development restrictions, or apply ecological offset provisions, and may require substantial setbacks.

Woodlands are classified as significant woodlands by the Provincial Policy Statement using eight criteria in the Natural Heritage Reference Manual, including total size, presence and size of interior habitat, proximity to other natural heritage surface and groundwater features, ecological linkages, unique characteristics, and economic and social values. Table 17 summarizes the classification process of the woodlands on the property to determine if they are significant woodlands.

Some of the woodland classification criteria are based on how much of the watershed or the local/regional area is forested. In watersheds or areas with a low percentage forest cover the minimum size of a woodland to be designated a significant woodland is smaller. Conversely, in watersheds and areas with a higher percentage of forest cover the minimum size for significance is larger.

The property is in the Blue Mountains sub-watershed, which is in the Nottawasaga River Valley watershed. The forest cover of the Blue Mountains sub-watershed is about 35%. The forest cover of the entire Nottawasaga River Valley watershed is about 33%. The Town of Wasaga Beach has a substantial amount of protected area because of the environmentally unique freshwater beach ecosystem and the Provincial Park, and so the percent forest cover of the Town is about 43%.

There is some subjectivity associated with the Natural Heritage Reference Manual for rating woodlands, in that the outcome can depend on which watershed or area baseline is used. For example, if the area, or watershed, has 15-30% forest cover then the minimum size of a woodland to be considered a significant woodland is 49.4 ac (20.0 ha). If the area is 30-60% forest cover then the minimum forest size for significance increases to 123.5 ac (50.0 ha). To avoid potential bias Table 17 works through the decision matrix for all three area/watershed situations. In this case, the baseline is not a critical factor because the percentage forest cover is similar for all three situations and falls within the same classification bracket (30-60% forest cover). So that size alone doesn't drive the designation, if just one of the eight criteria are met, and the forest meets minimum area thresholds that vary with the criterion, then the woodland is a significant woodland.

Another consideration is how the woodland on the property relates to nearby woodlands and local natural features. If woodlands on adjacent properties are contiguous with the woodlands on the property and canopy gaps are less than 20 m and not separated by a municipal road, then the woodlands should be complexed, or combined. Including the Wooded Wetland, there is about 29.9 ac (12.1 ha) of woodlands on the property. They can be complexed with the wetland because the wetland is also a forest ecotype. In addition, there are small areas of contiguous woodlands to the west and larger areas to the east of the property. Combining the on-property woodlands with the on-property wetland and the adjacent off-property woodlands yields a total woodlands, for the purpose of determining significance, of about 65.2 ac (26.4 ha).

The determination of the amount of interior forest, another important classification factor, is based on the total complexed woodlands. Interior forest is forest that is more than 100 m from an edge. In this case, considering the complexed forest area, there is about 13.7 ac (5.5 ha) of interior forest.

It is clear that, based on the Natural Heritage Reference Manual criteria worked through in Table 17, the woodlands on the property are not significant woodlands based on any of the baseline assumptions. Therefore, the woodlands would not warrant more restrictive protection by planning authorities that use the Provincial Policy Statement and the Natural Heritage Reference Manual as regulatory benchmarks.

In addition, both the Beacon (2012) and Azimuth (2010) reports concur that woodlands on the property are not significant woodlands.

Table 17: Determining if the Woodlands on the Property are Significant Woodlands, as defined by the Provincial Policy Statement.			
NHRM Criteria[1]	Town of Wasaga Beach 43% Forest Cover[2]	Blue Mountains Sub-watershed 35% Forest Cover[2]	Nottawasaga Valley Watershed 33% Forest Cover[2]
Woodlot Size on Property. (Complexed with adjacent property)	36.7 ac (65.2 ac)		
% Forest Cover of Property.	96%		
Minimum Total Size (acres).[3] • If 30-60% of the land cover is forest, woodlands 123.5 ac (50 ha) or larger considered *Significant*.	• 123.5 ac (50 ha) Needed. • 65.2 ac (26.4 ha) Present o ***Not Significant***		
Interior Forest.[4] • If 30-60% of the land is forest, considered *Significant* if there is 19.8 ac (8.0 ha) of interior forest.	• 19.8 ac (8.0 ha) Interior Forest Needed • 13.7 ac (5.5 ha) Interior Forest Present o ***Not Significant***		
Proximity to Natural Features • Considered *Significant* if the woodland is in proximity (30 m) to Significant Natural Features or fish habitat ***and*** the entire woodland meets the Minimum Area Threshold of 49.2 ac (20 ha).	• 49.2 ac (20 ha) Minimum Area Threshold Needed • 65.2 ac (26.4 ha) Present o Minimum Area Threshold met. • Not within 30 m of a Significant Natural Feature or fish habitat o ***Not Significant***		
Ecological Linkages • Considered *Significant* if the woodland is within a Defined Natural Heritage System and provides ecological linkage within a specified distance (120 m) to Significant Natural Heritage Feature ***and*** woodland meets the Minimum Area Threshold of 49.2 ac (20 ha).	• 49.2 ac (20 ha) Minimum Area Threshold Needed • 65.2 ac (24.5 ha) Present o Minimum Area Threshold Met • Woodland is within a Defined Natural Heritage System (Town of Wasaga Beach Natural Heritage Category 1 Lands). • No ecological linkage to Significant Natural Heritage Feature. o ***Not Significant***		
Water Protection[5] • Considered *Significant* if the woodland is within a sensitive or threatened watershed, sensitive groundwater discharge or recharge area, sensitive headwater area, or fish habitat ***and*** the woodland meets the Minimum Area Threshold of 24.7 ac (10 ha).	• 24.7 ac (10 ha) Minimum Area Threshold Needed • 65.2 ac (24.5 ha) Present o Minimum Area Threshold Met • Not within sensitive watershed, groundwater or headwater area and no fish habitat. o ***Not Significant***		
Woodland Diversity. • Considered *Significant* if the woodland has locally or regionally rare species or a high ecological biodiversity ***and*** the woodland meets the Minimum Area Threshold of species present or high native diversity *and* woodland is Minimum Total Size of 49.2 ac (20 ha).	• 49.2 ac (20 ha) Minimum Area Threshold Needed. • 65.2 ac (26.4 ha) Present o Minimum Area Threshold Met • No locally or regionally rare species, minimal ecological biodiversity. o ***Not Significant***		
Uncommon Characteristics. • Considered *Significant* if community level unique species are present, or there are trees greater than 100 years old or greater than 40 cm diameter ***and*** the woodland meets the Minimum Area Threshold of 24.7 ac (10 ha).	• 24.7 ac (10 ha) Minimum Area Threshold Needed • 65.2 ac (26.4 ha) Present o Minimum Area Threshold Met • No trees greater than 100 years old or 40 cm diameter in the woodland. o ***Not Significant***		
Economic & and Social Function. • Considered *Significant* if the woodland produces high quality economic value, provides local recreational or educational opportunities, or has cultural, historical, archeological or aboriginal importance ***and*** the woodland meets the Minimum Area Threshold of 24.7 ac (10 ha).	• 24.7 ac (10 ha) Minimum Area Threshold Needed • 65.2 ac (26.4 ha) Present o Minimum Area Threshold met. • No economic products produced, private ownership excludes community recreational or education opportunities, and no known cultural importance. o ***Not Significant***		

1 - Natural Heritage Reference Manual Provincial Policy Statement.
2 - % Forest cover of the local sub-watershed and the total regional watershed.
3 – Minimum woodland size needed to be considered *Significant* varies by % forest cover: 1) 15-30% forest cover = 49.4 ac, 2) 30-60% forest cover = 123.5 ac.
4 – Interior Forest is forest area that is more than 100 m from an edge. 1) 15-30% forest cover = 4.9 ac of interior forest needed to be *Significant*, 2) 30-60% forest cover = 19.8 ac needed.
5 – Property is not in a Well Head Protection Zone or an Area of High Aquifer Vulnerability.

14.7 Significant Wildlife Habitat

Beacon (2012) did not make a decision about significant wildlife habitat, it simply states:

> *Beacon Environmental has examined the area from a wildlife and botanical perspective and found nothing remarkable about this area that would warrant its retention*.

The evaluation of significant wildlife habitat for the property was re-visited for this sEIS using the more recent (2015) MNRF Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. This guideline includes 35 habitat types that could be considered significant wildlife habitat, if certain minimum criteria are met, such as: size of the feature, proximity to nearby significant features, presence of locally rare species or species at-risk, concentration of wildlife, evidence of seasonal staging or breeding, migration staging areas, unique or rare physical features, wildlife movement corridors, and presence of hibernacula. Table 18 summarizes a comparison of the property in relation to the MNRF Criteria Schedules to determine if the property, or areas on the property, could be designated as significant wildlife habitat. Areas designated as significant wildlife habitat may have development restrictions, or require larger buffers and approval permits from municipal planning and conservation authorities.

In relation to this property, of the 35 habitat types in the Criteria Schedule, two are possible significant wildlife habitat for this property, these are deer yards and bat maternity roosting colonies.

Azimuth (2010) conducted a very thorough assessment of wildlife habitat in the west end of Wasaga Beach, which includes the entire property. Most of the west end of Wasaga Beach was identified as a winter deer yard. However, Azimuth recommended that this area not be designated as significant wildlife habitat because of the increased risk of deer-vehicle collisions subsequent to the completion of the Highway 26 by-pass, which is adjacent to the south side of the property. Photo 31 illustrates the remains of a White-tailed Deer on the north side of Highway 26 immediately adjacent to the fence on the south side of the property. This animal was killed in a deer-vehicle collision. Azimuth correctly concluded that removing 162 ac (66 ha) of forest from the west end, which would include the entire property for this sEIS, would not jeopardize the sustainability of the White-tailed Deer population because there is 3,116 ac (1,261 ha) of Stratum 1 Deer Yard in the Town of Wasaga Beach, the vast majority of which is protected by the Provincial Park. The Town of Wasaga Beach obviously accepted this recommendation because the non-wetland forest in the west end is designated Natural Heritage Category 2 Land, not the more protected Category 1 Land.

Normally, according to the 2015 MNRF Schedule, woodlands should be larger than 247 ac (100 ha) to be considered suitable deer yard habitat, although smaller areas can be

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
1) Seasonal Concentration Areas of Animals				
Waterfowls Stopover and Staging Areas - Terrestrial	American Black Duck, Wood Duck, Green-winged Teal, Blue-winged Teal, Mallard, Northern Pintail, Northern Shoveler, American Wigeon, Gadwall.	CUM1, **CUT1**.	Fields with flooding during spring melt and run-off, Agricultural fields with waste grains. Ecotype present (CUT1), but fields don't flood, therefore habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Waterfowl Stopover and Staging Areas (Aquatic)	Canada Goose, Cackling Goose, Snow Goose, American Black Duck, Northern Pintail, Northern Shoveler, American Wigeon, Gadwall, Green-winged Teal, Blue-winged Teal, Hooded Merganser, Common Merganser, Lesser Scaup, Greater Scaup, Long-tailed Duck, Surf Scoter, White-winged Scoter, Black Scoter, Ring-necked duck, Common Goldeneye, Bufflehead, Redhead, Ruddy Duck, Red-breasted Merganser, Brant Canvasback, Ruddy Duck.	MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, SWD1, **SWD2**, SWD3, SWD4, SWD5, SWD6, SWD7.	Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Ecotype present (SWD2), but wetlands are ephemeral with no standing water, therefore habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Shorebird Migratory Stopover Area	Greater Yellowlegs, Lesser Yellowlegs, Marbled Godwit, Hudsonian Godwit, Black-bellied Plover, American Golden-Plover, Semipalmated Plover, Solitary Sandpiper, Spotted Sandpiper, Semipalmated Sandpiper, Pectoral Sandpiper, White-rumped Sandpiper, Baird's Sandpiper, Least Sandpiper, Purple Sandpiper, Stilt Sandpiper, Short-billed Dowitcher, Red-necked Phalarope, Whimbrel, Ruddy Turnstone, Sanderling Dunlin.	BBO1, BBO2, BBS1, BBS2, BBT1, BBT2, SDO1, SDS2, SDT1, MAM1, MAM2, MAM3, MAM4, MAM5.	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Ecotype not present, therefore habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Raptor Wintering Area	Rough-legged Hawk, **Red-tailed Hawk**, Northern Harrier, American Kestrel, Snowy Owl, Short-eared Owl, **Bald Eagle**.	**FOD**, **FOM**, FOC, CUM, **CUT**, CUS, CUW, **SWD**, SWM, SWC.	Combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Eagle sites have open water, large trees and snags available for roosting. Ecotype present (FOD, FOM. SWD, CUT), but no open water and trees too small for roosting.	Bald Eagle and Red-tailed Hawk both observed flying over the property. No evidence of habituating or breeding on-site. No nests were observed, habitat not suitable for wintering. **Not Significant Wildlife Habitat.**
Bat Hibernacula	**Big Brown Bat**, **Tri-coloured Bat**.	CCR1 CCR2 CCA1 CCA2	Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. Ecotypes not present, no natural or anthropogenic underground features, therefore habitat is not present.	Both bat species are present on the property as their summer range, but no hibernacula on or near the property. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
Bat Maternity Colonies	**Big Brown Bat**, **Silver-haired Bat**.	**FOD**, **FOM**, **SWD**, SWM.	Maternity colonies can be found in tree cavities, vegetation and often in buildings, mature deciduous or mixed forest stands with large, old and decaying trees. Forest should be >24.7 ac (10 ha) and have trees >25 cm DBH. Ecotypes present (FOD, FOM, SWD). Forest on the property is >24.7 ac, but relatively few large trees (<3% of trees >25 cm). Many decaying trees, therefore, habitat is marginal but it is present.	Both bat species are present on the property. Based on abundance of acoustic recordings, some maternal roosting colonies are likely. In addition, SAR bat species were confirmed on the property. **Significant Wildlife Habitat is present.**
Turtle Wintering Areas	Midland Painted Turtle, Northern Map Turtle, Snapping Turtle	FEO, BOO.	For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. Ecotypes are not present. There is no permanent deep water on the property. Habitat is not present.	No turtles were observed on the property. No suitable wintering habitat. **Not Significant Wildlife Habitat.**
Reptile Hibernaculum	Eastern Gartersnake, Northern Watersnake, Northern Red-bellied Snake, Northern Brownsnake, Smooth Green Snake, Northern Ring-necked Snake, Milksnake, Eastern Ribbonsnake, Five-lined Skink.	**FOD**, **FOM**, FOC1, FOC3.	Sites located below frost lines in burrows, rock crevices and other natural or naturalized locations, rock piles, slopes, old stone fences, abandoned crumbling foundations, broken and fissured rock, rock outcrop, cover rock overlaying granite bedrock with fissures. Ecotypes present (FOM, FOD), but no suitable rocky features. Habitat is not present.	None of the species were observed, and there is no suitable winter hibernacula habitat. **Not Significant Wildlife Habitat**.
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)	Cliff Swallow, Northern Rough-winged Swallow.	CUM1 **CUT1** CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	Sites or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. Ecotype is present (CUT1), but there are no banks or cliffs on the property. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)	Great Blue Heron, Black-crowned Night Heron, Great Egret, Green Heron.	SWM2, SWM3, SWM5, SWM6, SWD1, **SWD2,** SWD3, SWD4, SWD5, SWD6, SWD7, FET1.	Live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. Most nests in trees are 11 to 15 m from ground, near the top of the tree. Ecotype is present (SWD2), but there is permanent standing water on the property, and very trees are tall enough for nesting. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Colonially - Nesting Bird Breeding Habitat (Ground)	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	MAM1-6, MAS1-3, CUM, **CUT,** CUS.	Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. Brewers Blackbird colonies are found loosely on the	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
			ground in low bushes in close proximity to streams and irrigation ditches within farmlands. Ecotype is present (CUT), but there are no permanent open water or marshy areas on the property. Habitat is not present.	
Migratory Butterfly Stopover Areas	Painted Lady, Red Admiral.	CUM, **CUT**, CUS, FOC, **FOD**, **FOM**, CUP.	A butterfly stopover area will be a minimum of 24.7 ac (10 ha) in size with a combination of field and forest habitat and will be located within 5 km of Lake Ontario. Ecotypes are present (CUT, FOM, FOD) but the property is not in proximity to Lake Ontario. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Land bird Migratory Stopover Areas	All migratory songbirds.	FOC, **FOM**, **FOD**, SWC, SWM, **SWD**.	Woodlots need to be greater than 24.7 ac (10 ha) in size and within 5 km of Lake Ontario. Ecotypes are present (FOM, FOD, SWD), but property is not in proximity to Lake Ontario. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Deer Yarding Areas	**White-tailed Deer**.	**FOM**, FOC, SWM, SWC, CUP2, CUP3, FOD3, **CUT**.	Deer yarding areas or winter concentration areas (yards) are areas that deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum 1 and Stratum 2. Stratum 2 covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20 cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30 cm snow depth. In mild winters, deer may remain in the Stratum 2 area the entire winter. Ecotypes are present (FOM, CUT). The entire property is Stratum 2 deer yard; therefore, the habitat is present.	Species are present. Habitat is present. Significant Wildlife Habitat designation is not suggested because of the increased traffic flow along the recently expanded and adjacent Highway 26 and Beachwood Road, which would increase the frequency of deer-vehicle collisions. Ample Stratum 1 and 2 deer yard habitat exists in the planning area. Although much of the forest on the property would be removed for the proposed development, the forested wetland will remain, which is a substantial wildlife movement corridor. **Not Significant Wildlife Habitat**.
Deer Winter Congregation Areas	**White-tailed Deer**	FOC **FOM FOD** SWC SWM **SWD**	Woodlots will typically be greater than 247 ac (100 ha). Ecotypes are present (FOM, FOD, SWD), but forest is not large enough. Habitat is not present.	Species are present, but habitat is not present. **Not Significant Wildlife Habitat.**
2) Rare Vegetation Communities or Specialized Habitat for Wildlife that are Considered Significant Wildlife Habitat.				
Cliffs and Talus Slopes	S1, S2, S3 plant species.	TAO, TAS, TAT, CLO, CLS, CLT.	A Cliff is vertical to near vertical bedrock greater than 3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
Sand Barren	S1, S2, S3 plant species.	SBO1, SBS1, SBT1.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Alvar		ALO1, ALS1, ALT1, FOC1, FOC2, CUM2, CUS2, CUT2-1, CUW2.	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. An Alvar site is greater than 1.2 ac (0.5 ha) in size. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Old Growth Forest	S1, S2, S3 plant species.	**FOD** FOC **FOM** **SWD** SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris. Woodland areas 74 ac (30 ha) or greater in size or with at least 24.7 ac (10 ha) interior habitat. Ecotypes are present (FOM, FOD, SWD) but interior forest and total forest size is too small. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Savannah	S1, S2, S3 plant species.	TPS1, TPS2, TPW1, TPW2, CUS2,	A Savannah is a tallgrass prairie habitat that has tree cover between 25–60%. There is no minimum size. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
3) Specialized Habitats of Wildlife considered Significant Wildlife Habitat.				
Waterfowl Nesting Area	American Black Duck, Northern Pintail, Northern Shoveler, Gadwall, Blue-winged Teal, Green-winged Teal, Wood Duck, Hooded Merganser, Mallard.	SWH, MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, SWT1, SWT2, SWD1, **SWD2**, SWD3, SWD4.	A waterfowl nesting area extends 120 m from a wetland, or any small wetlands within 120m, or a cluster of 3 or more small wetlands within 120 m of each other where waterfowl nesting is known to occur. Ecotype is present (SWD2), but there is no waterfowl nesting habitat present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	Osprey, **Bald Eagle**.	**FOD**, **FOM,** FOC, **SWD**, SWM, SWC	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree’s canopy. Ecotypes present (FOD, FOM, SWD), but no open water ponds, rivers or wetlands and no old tall trees for nests. Habitat is not present.	Bald Eagle fly over was observed, but no nesting or roosting habitat is present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
Woodland Raptor Nesting Habitat	Northern Goshawk, Cooper's Hawk, Sharp-shinned Hawk, Red-shouldered Hawk, Barred Owl, Broad-winged Hawk.	All forested Ecosites and SWC, SWM, **SWD** and CUP3.	All natural or conifer plantation and forest stands >74 ac (30 ha) with >24.7 ac (10ha) of interior habitat. Interior habitat determined with a 200m buffer. Ecotypes present (FOM, FOD, SWD) but woodlands are not large enough and no 200 m interior habitat. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Turtle Nesting Areas	Midland Painted Turtle, Northern Map Turtle, Snapping Turtle	MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, BOO1, FEO1.	Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. For an area to function as a turtle nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Ecotypes not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Seeps and Springs	Wild Turkey, **Ruffed Grouse**, Spruce Grouse, **White-tailed Deer**, Salamander spp.	Any forested Ecosite within headwater areas.	Seeps and Springs are areas where ground water comes to the surface. Any forested area, meadow, field or within the headwaters of a stream or river system. Ecotypes are present (FOM, FOD, SWD) but there are no seeps or springs. Habitat is not present.	Species are present but habitat is not present. **Not Significant Wildlife Habitat**.
Amphibian Breeding Habitat (Woodland).	Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog, Wood Frog.	FOC, **FOM**, **FOD**, SWC, SWM, **SWD**.	Presence of a wetland, pond or woodland pool, including vernal pools, >500 m^2 in size within or adjacent to a woodland. Ecotypes present (FOM, FOD, SWD) but no permanent or vernal ponds on the property. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Amphibian Breeding Habitat (Wetlands)	American Toad, Spotted Salamander, Four-toed Salamander, Blue-spotted Salamander, Gray Treefrog, Western Chorus Frog, Northern Leopard Frog, Pickerel Frog, Green Frog, Mink Frog, Bullfrog.	Any wetland ecosites.	Wetlands >500 m^2, supporting high species diversity. Some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats. Ecotypes present (SWD), but there is no open water streams or ponds that are suitable amphibian breeding habit, confirmed by amphibian call surveys. Habitat not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Area-Sensitive Bird Breeding Habitat	Yellow-bellied Sapsucker, Red-breasted Nuthatch, **Veery**, Blue-headed Vireo, Northern Parula, Black-throated Green Warbler, Blackburnian Warbler, Black-throated Blue Warbler, Ovenbird, Scarlet Tanager, Winter Wren, Cerulean Warbler, Canada Warbler.	FOC, **FOM**, **FOD**, SWC, SWM, **SWD**.	Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >74 ac (30 ha) with interior forest habitat at least 200 m from forest edge. Ecotypes present (FOM, FOD, SWD) but forest total size and interior forest size do not meet minimum size thresholds. Habitat not present.	One species (Veery) confirmed, but habitat is not present. **Not Significant Wildlife Habitat**
4) Habitats of Species of Conservation Concern considered Significant Wildlife Habitat.				
Marsh Breeding Bird Habitat	American Bittern, Virginia Rail, Sora, Common Moorhen, American Coot, Pied-billed Grebe, Marsh Wren, Sedge	MAM1, MAM2, MAM3, MAM4, MAM5, MAM6,	All wetland habitat as long as there is shallow water with emergent aquatic vegetation, sluggish streams, ponds and marshes sheltered by shrubs and trees.	No habitat, no species present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
	Wren, Common Loon, Sandhill Crane, Green Heron, Trumpeter Swan.	SAS1, SAM1, SAF1, FEO1, BOO1, CUM1.	Ecotypes not present. No open water stream, ponds or marshes on the property. Habitat is not present.	
Open Country Bird Breeding Habitat	Upland Sandpiper, Grasshopper Sparrow, Vesper Sparrow, Northern Harrier, Savannah Sparrow, Short-eared Owl.	CUM1 CUM2	Large grassland areas, includes natural and cultural fields and meadows, >74 ac (30 ha), grasslands not Class 1 or 2 agricultural lands and not being actively used for farming. Ecotype not present. Grasslands do not meet minimum size threshold. Habitat not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Shrub/Early Successional Bird Breeding Habitat	Brown Thrasher, Clay-coloured Sparrow, **Field Sparrow**, Black-billed Cuckoo, **Eastern Towhee**, **Willow Flycatcher**, Yellow-breasted Chat, Golden-winged Warbler.	**CUT1**, CUT2, CUS1, CUS2, CUW1, CUW2.	Large field areas succeeding to shrub and thicket >24.7 ac (10 ha) in size. Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming. Ecotype present (CUT1) but it does not meet the minimum size threshold. Habitat not present.	Three species confirmed (Field Sparrow, Eastern Towhee, Willow Flycatcher) but habitat is not present. **Not Significant Wildlife Habitat**.
Terrestrial Crayfish	Chimney or Digger Crayfish, Devil Crayfish or Meadow Crayfish.	MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, MAS1, MAS2, MAS3, **SWD**. SWT SWM CUM1	Wet meadow and edges of shallow marshes (no minimum size). Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. Terrestrial Crayfish are only found in SW Ontario and their habitats are very rare. Ecotype is present (SWD) but marsh habitat is not present, and property is likely well out of the known range in Ontario.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Special Concern and Rare Wildlife Species	All S1, S2, S3 plant and animal species tracked by NHIC.	Any ELC	NHIC record for Sea Rocket Sand Beach Type rare plant community within 1 km of the property. The required sand beach habitat is not present on the property.	No habitat, no species present. **Not Significant Wildlife Habitat.**
5) Animal Movement Corridors				
Amphibian Movement Corridors	Eastern Newt, **American Toad**, Spotted Salamander, Four-toed Salamander, Blue-spotted Salamander, Gray Treefrog, Western Chorus Frog, **Northern Leopard Frog**, Pickerel Frog, Green Frog, Mink Frog, Bullfrog.	Corridors may be found in all ecosites associated with water.	Movement corridors between breeding habitat and summer habitat. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH. There is no amphibian breeding habitat confirmed as SWH on the property.	No habitat present. Two species observed on the property (American Toad, Northern Leopard Frog). **Not Significant Wildlife Habitat.**
Deer Movement Corridors	White-tailed Deer	Corridors may be found in all forested ecosites.	Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH. Ecotypes present (FOM, FOD, SWD). Stratum 2 Deer Yard is present on property.	Habitat is present and White-tailed Deer are present. However, SWH designation is discouraged because of increased likelihood of deer-vehicle collisions from the adjacent Highway 26 and Beachwood Road. **Not Significant Wildlife Habitat**
Extracted from: MMNRF. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. January 2015.				

Photo 31: The remains of a White-tailed Deer on the north side of Highway 26 immediately adjacent to the south side of the property. This animal was killed in a deer-vehicle collision. The likelihood of increased frequency of deer-vehicle collisions subsequent to the expansion of the Highway 26 by-pass resulted in Azimuth (2010) recommending to the Town of Wasaga Beach that properties between the highway and Beachwood Road in the west end of Wasaga Beach should not be designated Significant Wildlife Habitat. Removing 162 ac (65 ha) of forest from the west end of the Town, which would include the entire property for this sEIS, would not jeopardize the sustainability of the White-tailed Deer population because there is 3,116 ac (1,261 ha) of Stratum 1 Deer Yard in the Town of Wasaga Beach, the vast majority of which is protected by the Provincial Park.

designated if the MNRF has deer census data that deer congregate in the area in the winter. There is about 29.9 ac (12.1 ha) of woodland on the property, which is substantially less than the minimum size threshold in the MNRF Criteria Schedule. Considering the relatively small size of the woodland on the property (which doesn't meet the minimum size threshold) relative to the abundance of protected deer habitat in Wasaga Beach, and the designation of Category 2 Land in the Town of Wasaga Beach Official Plan, CEC concurs with the Azimuth recommendation that the woodland feature is not significant wildlife habitat as it relates to deer yards (see Section 1 - Deer Yarding Areas and Deer Wintering Congregation Areas in Table 18). Beacon (2012) did not do a significant wildlife assessment.

The other consideration in the MNRF Schedule is bat maternity roosting colonies. The woodland on the property meets the minimum size threshold of 24.7 ac (10 ha). However, bats prefer older trees greater than 25 cm in diameter that are in declining health. There is an abundance of declining Ash trees because of the severe impacts of the Emerald Ash Borer, however the forest on the property is young and the trees tend to be small. On average across the property only about 2.5% of the trees are greater than the 25 cm diameter preferred by bats for roosting. The criteria include the threshold number of bats as more than 10 Big Brown Bats and greater than 5 adult female Silver-haired Bats using known maternity colonies. The only way of determining the number and sex of bats is through a mist net capture survey, which is time consuming, intrusive, expensive and requires an MNRF capture permit. This was not done for this sEIS, instead a 16-day acoustic bat survey was conducted. The acoustic survey confirmed there is a robust population of bats on or in the vicinity of the property, and because of the volume of recordings (16,481) there is the likelihood of maternity roosting colonies on and adjacent to the property. Big Brown Bats were about 8% of recordings and Silver Haired Bats comprised about 16%. Surprisingly, three species at-risk bats – Little Brown Myotis, Eastern Small-footed Myotis and Tri-coloured Bat together were almost 38% of the recordings. Despite the forest not being optimal bat habitat, the bat survey indicated a robust bat population, including species at-risk bats, and suggested maternity roosting colonies likely exist on or adjacent to the property. Therefore, the woodland on the property would be designated as significant wildlife habitat.

The site plan requires virtually all of the woodlands on the property be removed to accommodate the proposed residential development. The woodland is designated significant wildlife habitat because of the presence of species at-risk bats. An authorization permit under Section 17(1) of the ESA will be required from the MECP to remove species at risk habitat. This process has been initiated. Removing the woodlands on the property will not jeopardize the sustainability of the local at-risk bat population because there is ample suitable forested habitat, literally hundreds of acres, in the planning area, and about 2,500 ac (1,000 ha) in Wasaga Beach. In addition, post-development mitigation strategies should enhance bat foraging and roosting opportunities.

15.0 Screening for Species at Risk

There are currently 243 species of plants, mammals, insects, birds, amphibians, fish, reptiles and mollusks listed in *Ontario Regulation 230/08,* the list of species at-risk made under the Ontario *Endangered Species Act*. The entire *O. Reg. 230/08* list wasn't screened for this sEIS because comprehensive flora and fauna surveys were conducted and the NHIC data base was consulted to support the on-property surveys. This significantly narrowed down the list of species at-risk that could reasonably be expected to be present on the property.

Table 19 lists the 12 species of flora and fauna for which there are NHIC records of local occurrences and therefore may exist on the property, and species that were observed on the property during the many site visits and surveys.

The conservation status of the flora and fauna listed in Table 19 is identified as follows:

- Special Concern
  - the species lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.

- Threatened
  - the species lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.

- Endangered
  - the species lives in the wild in Ontario but is facing imminent extinction or extirpation.

- S2 (Sub-national Conservation status)
  - Imperiled. Very rare, perhaps 5-20 occurrences in Ontario, susceptible to extirpation.

- S3 (Sub-national Conservation Status)
  - Vulnerable. Rare to uncommon. Perhaps 20 to 100 occurrences in Ontario, susceptible to disturbance.

- Special Concern (COSWIC, Committee on the Status of Endangered Wildlife in Canada)
  - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Table 19: The Potential for Species at Risk on the Property.					
Common Name	Scientific Name	Type	Conservation Status[1]	Local NHIC Record[2]	Confirmed on Property
Bald Eagle	*Haliaeetus leucocephalus*	Bird	SARO Special Concern	No	No Observed flying over December 2020. Habitat not suitable on property. No nesting observed.
Common Nighthawk	*Chordeiles minor*	Bird	SARO Special Concern	No	No Observed flying over during Amphibian Call Survey. Habitat not suitable on property. No nesting observed.
Eastern Meadowlark	*Sturnella magna*	Bird	SARO Threatened	Yes	No Not heard or observed during Breeding Bird Survey. Preferred tall grasslands habitat not present on property.
Eastern Small-footed Myotis	*Myotis leibii*	Bat	SARO Endangered	No	**Possibly** Less than 1% of acoustic recordings attributed to this species.
Eastern Wood Pewee	*Contopus virens*	Bird	SARO Special Concern	No	**Yes** Confirmed. Heard during Breeding Bird Survey, considered possibly breeding.
Lake Sturgeon	Acipenser fulvescens	Fish	SARO Endangered	Yes	No. No suitable habitat on property. Present in nearby Georgian Bay.
Little Brown Myotis	*Myotis lucifugus*	Bat	SARO Endangered	No	**Yes** Confirmed. 36% of acoustic recordings were attributed to this species. Maternity roosting colonies may be on property.
Monarch	*Danaus plexippus*	Insect	SARO Special Concern	No	**Yes** Confirmed. Observed foraging on several occasions in field and forest edge.
Midland Painted Turtle	*Chrysemys picta marginata*	Reptile	COSEWIC Special Concern	Yes	No No suitable habitat on property. Present in nearby Georgian Bay shoreline and creeks and rivers.
Sea Rocket Sand Beach Type	*Cakile edentula*	Plant	S2S3	Yes	No No suitable habitat on property. Present along nearby sand beach shoreline of Georgian Bay.
Tri-cloured Bat	*Perimyotis subflavus*	Bat	SARO Endangered	No	**Possibly** Less than 1% of acoustic recordings attributed to this species.
Wood Thrush	*Hylocichla mustelina*	Bird	SARO Special Concern	Yes	No Not heard or observed during Breeding Bird survey. Preferred mature forest habitat not present on property.

1 – SARO Species at Risk in Ontario. Ontario Regulation 230/08 made under the Endangered Species Act.
COSEWIC Committee on the Status of Endangered Wildlife in Canada, an independent advisory panel to the Minister of Environment and Climate Change Canada,
2 – NHIC Natural Heritage Information Centre, conservation data tracking centre administered by MNRF.

15.1 Bald Eagle

On December 14, 2020 a mature Bald Eagle (SARO *Special Concern*) was observed flying low over the property. This was the only time a Bald Eagle was observed, despite multiple site visits in April, May and June 2021.

Historically Bald Eagles were shot as pests or trophies, and their shoreline breeding habitat was lost through development. This significantly impacted their population, but the most serious threat was the introduction of pesticides such as DDT that resulted in thin eggshells that broke easily. As a result, by 1960 the Bald Eagle was extirpated from southern Ontario. As a result of the banning of DDT and recovery efforts, the Bald Eagle has made a remarkable recovery and has reclaimed much of its previous southern Ontario range.

Bald Eagles are predominantly fish eaters, but they will opportunistically scavenge animal carcasses, including White-tail Deer. In the winter they sometimes congregate near open water and near places with high deer populations. Both of these features are present in the Wasaga Beach area. Their preferred breeding habitat is mature or old growth forests where their very large nest is usually built on exposed branches of the tallest tree. The nest is almost always near a major lake or large river where they do most of their foraging.

Their nests can be 2 m across and 1 m thick and are made from large sticks and woody debris, therefore they are very easy to see. The forest on the property is mostly young, successional Poplar and Cedar and there are few tall trees, so the habitat is not attractive to nesting Bald Eagles. Despite extensive time spent on the property and thorough inventories of the wetlands, forests and fields, no Bald Eagle nests were observed, and no mature or immature eagles were seen or heard on the property, other than the one December 14, 2020 fly-over siting.

Although they are present locally and may congregate in significant numbers along the nearby Georgian Bay shoreline in the winter, Bald Eagles do not nest or forage on the property. Therefore, the proposed development will have no impact on the sustainability of the local Bald Eagle population.

15.2 Common Nighthawk

A Common Nighthawk (SARO *Special Concern*) was observed flying over the property during the amphibian call survey. It was neither seen nor heard during the breeding bird surveys.

Its population in southern Canada has declined by more than 6% since 1970, but the rate of decline has slowed appreciably over the past decade, and the species appears to be quite abundant in suitable boreal habitats. The large-scale use of insecticides may be partly responsible for the recent decline in Common Nighthawk, since insects are their main food source. They have a crepuscular feeding habit, which means they are most active at dusk and dawn. Habitat degradation resulting from fire suppression, land use changes in the boreal forest and an increase in intensive agriculture are other factors contributing to this species decline. The Common Nighthawk is a ground nester, so the proliferation of terrestrial predators around urban areas, such as domestic cats, striped skunks, racoons and American crows, has likely resulted in increased nest predation in urban landscapes.

Common Nighthawk habitat consists of open areas with little to no ground vegetation, such as logged or burned-over areas, forest clearings, rock barrens, peat bogs, lakeshores, and mine tailings. Although they have been known to nest in urban environments, such as cultivated fields, orchards, urban parks, and along gravel roads and railways, they prefer natural sites. It is a solitary nester, preferring a substantial distance, up to 75 m, between itself and other Nighthawk nests.

Although they are present locally, they likely congregate along the open landscape of the nearby Georgian Bay shoreline. Common Nighthawk nesting and foraging habitat does not exist on the property. Therefore, the proposed development will have no impact on the sustainability of the local Common Nighthawk population.

15.3 Eastern Meadowlark

There are NHIC records of Eastern Meadowlark (SARO *Threatened*) in the area. However, this bird was not seen or heard on the property during the Breeding Bird Surveys.

Eastern Meadowlark prefer grassland habitats, including native prairies and savannahs, as well as non-native pastures, hayfields, weedy meadows, herbaceous fencerows and airfields. The decline of this species is associated with the decline in the amount of native prairie and savannah, and the loss of suitable habitat that has resulted from development, changes in farming practices, over-grazing of pasturelands by livestock, grassland fragmentation, reforestation, and the use of pesticides. Eastern Meadowlark are also subject to predators, including foxes, domestic cats and dogs, coyotes, snakes, skunks, raccoons, and other small mammals. Canadian Breeding Bird Survey data suggests a population decline of about 70% subsequent to 1970.

Eastern Meadowlark nest on the ground in small depressions, 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. This bird typically requires about 6 ac (2.4 ha) to establish a breeding and foraging territory. There is a very small strip of field thicket on the north edge of the property. However, it is only 0.5 acres (0.2 ha) in size and Eastern Meadowlark that exist locally would not likely nest or forage extensively on the property because their preferred habitat is insufficient in size. Therefore, the proposed development will have no impact on the sustainability of the local Eastern Meadowlark population.

15.4 Eastern Small-footed Myotis

The Eastern Small-footed Myotis (SARO *Endangered*, Photo 33) is the smallest bat in eastern North America. It is also one of the most poorly known species of bats in Ontario. The Eastern Small-footed Myotis has been found from south of Georgian Bay to Lake Erie and east to the Pembroke area. There are also records from the Bruce Peninsula, the Espanola area, and Lake Superior Provincial Park. Most documented sightings are of bats in their winter hibernation sites.

Eastern Small-footed Myotis may be present on the property. With only 0.01% of the acoustic recordings during the bat survey attributed to this species it can't be confirmed with certainty that the Eastern Small-footed Bat is roosting on the property, as opposed to simply foraging in the vicinity. In fact, based on the timing of recordings it is more likely this bat species is roosting locally and travelling to the property to forage (see Section 13.7.7).

Females establish summer maternity colonies, often in buildings, large-diameter or hollow trees, in or under rocks, in rock outcrops, or in caves and abandoned mines. Most of these habitats are not present on the property, which combined with the very low acoustic detection rate, makes it unlikely that there are maternity roosting colonies present.

Foraging for insects occurs over water, along waterways, forest edges, and in gaps in the forest. Large open fields or clear cuts are generally avoided. In autumn, Eastern Small-footed Myotis return in large numbers to hibernacula in caves and mines to spend the winter in a state of hibernation. The winter hibernaculum may be hundreds of kms from their summer habitat.

Although Ontario population trends have not been documented, Eastern Small-footed Myotis is at high risk from White-nose Syndrome (WNS), a fungal disease that has invaded Ontario since about 2010. WNS is present in many Eastern Small-footed Myotis hibernacula in Ontario, and this disease has been demonstrated to cause declines of the species in the northeastern US, so Ontario populations are likely to be similarly affected. Eastern Small-footed Myotis is classified as *Endangered* due to the high risk of severe population declines caused by WNS. Mortality from wind turbines has been documented, but the magnitude of this threat to bat populations is unknown.

Eastern Small-footed Myotis were detected foraging on and in the vicinity of the property, but because of the marginal habitat and the low number and timing of acoustic recordings there aren't likely any maternity roosting colonies, and unquestionably there are no hibernacula on the property. The woodlands will be removed to accommodate the proposed development; however, tree removal can be done in the winter when the bats are not present. Removing forest habitat will not jeopardize the sustainability of the local Eastern Small-footed Myotis population because there is ample woodland habitat, literally hundreds of acres, in the planning area, and about 2,500 ac (1,000 ha) in Wasaga Beach. However, Eastern Small-footed Myotis is a species at risk that may be present on the property, therefore an authorization permit under Section 17(1) of the ESA will be required from the MECP to remove species at risk habitat. This process has been initiated. This is further explained in Section 16.2.

15.5 Eastern Wood Pewee

Eastern Wood-pewee (SARO *Special Concern*) were heard during the breeding bird surveys and are possibly breeding on the property.

This is one of the most common and widespread songbirds in North America's eastern forests. It lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed-wood forests. It is a 'flycatcher', feeding on flying insects in the forest canopy. This bird is territorial during the breeding season, typically their range is 5 to 20 acres (2 to 8 ha). There is 21.1 acres (8.5 ha) of woodland on the property and an additional 8.8 acres (3.6 ha) of forested wetland. Eastern Wood-pewee nesting and foraging habitat is present on the property.

Possible threats to the Eastern Wood-pewee aren't well known but may include loss of forest habitat due to urban development, reductions in the availability of the flying insects they eat, egg and fledgling predation from Blue Jays and Red Squirrels (both of which are present on the property), and changes to the make-up of forests due to White-tailed Deer over-browsing (deer are common on the property). Even though the species is resilient to habitat changes, it seems to be experiencing persistent declines over the past 40 years in Ontario and throughout its range, although this trend has moderated in the last 10 years. However, Breeding Bird Atlas, migration monitoring, and forest bird monitoring data suggest that populations are not declining significantly, instead they may have simply shifted to more northern areas where there is less breeding bird survey coverage.

In other words, although the Eastern Wood Pewee has declined in southern Ontario, and hence the Special Concern species at risk designation, it is possible that the species has shifted its range further north where there is much less survey coverage, and the population in general may not be in decline.

If the development proceeds as proposed the forest on the property will be removed. However, adjacent to the property and within 1 km, there is about 113 acres (46 ha) of woodland and open woodland-thicket. The NVCA reports that about 43% of Wasaga Beach is woodland with an average size of 66 acres (27 ha) and a maximum size of more than 1,970 acres (800 ha). Therefore, the removal of the woodland on the property to accommodate the proposed development would not jeopardize the sustainability of the local Eastern Wood-pewee population.

15.6 Lake Sturgeon

The NHIC lists local occurrence records for Lake Sturgeon (SARO *Endangered*). Lake Sturgeon are the largest freshwater fish in Ontario. They are also slow growing, very long-lived and late to mature sexually. The oldest known specimen of Lake Sturgeon is 155 years old from Lake Huron. The largest Lake Sturgeon recorded was from the Roseau River of Manitoba, which weighed 185 kg and measuring 4.6 m in length. Historically, exploitive harvesting, dams and other river barriers, habitat loss and deteriorating water quality were responsible for the decline of Lake Sturgeon throughout North America.

The NHIC records obviously relate to Georgian Bay. Not only are there no water bodies suitable for this fish on the property, there is no fish habitat at all. Section 13.6 is a discussion about fish habitat on the property. Therefore, the proposed development would not jeopardize the sustainability of the local Lake Sturgeon population.

15.7 Little Brown Myotis

Little Brown Myotis (SARO Endangered, Photo 32) was confirmed on the property by the acoustic bat survey. Although this bat is a species at risk, designated *Endangered*, there appears to be a robust local population on and in the vicinity of the property. Recordings of Little Brown Myotis made up 94% of all the myotis calls and 36% of all bat recordings during the 16-day acoustic bat survey.

The range in Ontario of the Little Brown Myotis stretches from southwestern Ontario to Moose Factory on the shores of James Bay.

Like all bats, Little Brown Myotis are voracious insect eaters and forage nightly along forest edges, forest gaps, across small fields and over water. Large open fields are generally avoided. They form maternity roosting colonies in tall, large-diameter trees (greater than 25 cm), although they will utilize smaller trees, providing they are the largest in the area and the tree's state of decline is sufficient to have loose bark or hollow cavities. Little Brown Myotis are one of only three bat species in Ontario that are known to use buildings as summer maternity roosting colony habitat (the others being Big Brown Bat and Tri-colored Bat).

Little Brown Myotis travel considerable distances, up to 200 kms, to hibernate in caves, abandoned mines and deep rock crevices where the air remains humid and doesn't fall below freezing in the winter.

Little Brown Myotis have been severely affected by White Nose Syndrome. The syndrome affects bats by disrupting their hibernation cycle, so that they use up body fat supplies before the spring when they can once again find food sources. Smaller bats, like the Myotis species, are particularly affected because their tiny bodies don't have surplus fat stores. The fungus may also affect the wing membrane, which helps to maintain water balance in bats. Because of this, thirst may wake bats up from hibernation, which may be why infected bats can sometimes be seen flying outside their hibernacula during the winter. This disease was first detected in Canada in 2010, and to date has caused an estimated 94% decline in known numbers of hibernating Myotis bats in Nova Scotia, New Brunswick, Ontario, and Quebec.

The forested habitat will be removed by the proposed development; however, tree removal can be done in the winter when the bats are not present. Removing the forest on the property will not jeopardize the sustainability of the local Little Brown Myotis population because there is ample woodland habitat, literally hundreds of acres, in the planning area, and about 2,500 ac (1,000 ha) in Wasaga Beach, much of it protected by the Provincial Park system. However, Little Brown Myotis is a species at risk that has been confirmed to be present on the property, therefore an authorization permit under Section 17(1) of the ESA will be required from the MECP to remove species at risk habitat. This process has been initiated. This is further explained in Section 16.2. A mitigation strategy to replace potential roosting sites and forage plants will also be implemented.

15.8 Monarch Butterfly

Monarch Butterflies (SARO *Special Concern*) were observed on several occasions foraging on flowering plants along the woodland edges, the small field, and the open trails on the property, although eggs and larvae were not observed on Milkweed plants on the property. Monarch Butterflies are known to travel and feed along the extensive beaches in Wasaga Beach. Records from the Provincial Park from August 29, 2016 describe hundreds of Monarchs feeding on the nectar of a variety of shoreline community plants, in preparation for their southern migration.

Adult butterflies forage over diverse habitats consuming nectar from a variety of shrub flowers and wildflowers, although they will only lay their eggs on milkweed plants. Monarchs are unique in the butterfly community because they have the longest migration of any butterfly (4,000 km), they utilize only one plant species to lay their eggs and feed the emerging larvae (milkweed), and all of the adult butterflies overwinter in a single area (high mountain pine-oak forests of Angangueo and Michoacán in Mexico). This highly specialized adaptation makes the Monarch butterfly susceptible to catastrophic population collapse.

Monarch Butterfly populations have crashed in recent decades; what was once a common sight in Ontario fields and meadows is now much rarer. Not-with-standing the efforts of the Mexican government to preserve and protect the overwintering sites, two developments have occurred that have significantly impacted Monarch butterflies and contributed to their dramatic decline. The first is the development of herbicide-resistant crops. Before herbicide-resistant crops farmers along the Monarch's long spring migration route had to exercise caution when spraying their crops to prevent crop damage while controlling weeds. As a result, there were sufficient amounts of residual milkweed between crop rows and around the edges of farm fields on which the Monarch butterflies could lay their eggs and feed the emerging larvae. With herbicide-resistant crops farmers are much more likely to broadcast spray their crops and eliminate the milkweed in the fields, and in the process eliminate the only nesting and feeding plant the migrating Monarch butterflies utilize.

The second development is the arrival from Eurasia of the invasive Black Swallowwort and Pale Swallowwort, also called Dog-strangling Vine. In addition to forming annoyingly dense mats in forests and fields and being toxic to some livestock and deer, Dog-strangling Vine looks enough like the native milkweed that the Monarch butterflies will utilize it for egg laying. However, the emerging larvae cannot eat it, and they subsequently die. Dog-strangling vine was not observed on the property, so this Monarch risk factor is not present.

Anecdotal evidence suggests that Monarch butterflies in Ontario have recovered somewhat from their recent historical low population levels.

The proposed development will not jeopardize the sustainability of the local Monarch population because the woodland that will be removed is not preferred Monarch habitat. In fact, Monarch foraging habitat is anticipated to be enhanced post-development because of increased residential floral landscape planting and the establishment of flowering flora around the planned storm water retention pond. Further Monarch mitigation strategies are discussed in Section 18.4.3.

15.9 Midland Painted Turtle

There are NHIC records of Midland Painted Turtles in the vicinity of the property, although none were observed during the many site visits. The Midland Painted Turtle is not on the Ontario species at risk list, but it is on the COSEWIC list, designated *Special Concern*. Midland Painted Turtles typically occupy slow moving, relatively shallow, and well-vegetated wetlands and water bodies with abundant basking sites and organic substrate. This habitat is found primarily in swamps, marshes, ponds, fens, and bogs.

Midland Painted Turtles nest in areas with an open canopy, often with a southern exposure, such as the shorelines of lakes and wetlands, beaver dams, and sand dunes, although they will also utilize railway embankments, dirt logging roads, and unpaved road shoulders. Migration from their aquatic habitat to their nesting habitat ranges from less than 100 m to greater than 1,200 m.

Midland Painted Turtles are omnivorous and known to consume a wide variety of invertebrates, vertebrates, algae, and aquatic vascular plant species across their broad geographic range. The Midland Painted Turtle has a unique symbiotic relationship with the Snapping Turtle, from which they remove and consume leeches.

The decline in Midland Painted Turtle populations is believed to be primarily related to habitat loss, specifically the loss of wetlands in southern Ontario.

Habitat for the Midland Painted Turtle does not exist on the property, and no turtles of any species were observed on the property during the many biological inventories conducted by multiple consultants over more than a decade. The NHIC records likely relate to occurrences along the nearby Georgian Bay shoreline and the larger creeks and rivers in the Nottawasaga River watershed. Therefore, the proposed development will not jeopardize the sustainability of the local Midland Painted Turtle population that may exist in the vicinity of the property.

15.10 Sea Rocket Sand Beach Type

The NHIC has an occurrence record for a provincially rare vegetation community in the vicinity of the property. The Sea Rocket Sand Beach community is designated S2/S3 (sub-national conservation status). There may be less than 100 occurrences of this vegetation community in the Great Lakes system. This is typically the first vegetation community encountered inland of the water in a dune ecology, above the seasonal high-water line. Seeds from the annual Sea Rocket (*Cakile edentula*) are carried by waves and take root in the shelter of driftwood and other shoreline debris. Common associates of this vegetation community include American Beachgrass (*Ammophila breviligulata*) and Bayberry Willow (*Salix myricoides*). The Sea Rocket Sand Beach Vegetation Type exists along Wasaga Beach's extensive sand shoreline, which can be as close as 350 m north of the property.

This vegetation community is restricted to the beach ecosystem of the Georgian Bay shoreline along Wasaga Beach. This habitat does not exist on the property. Therefore, the proposed development will not jeopardize the sustainability of the rare Sea Rocket Sand Beach vegetation community.

15.11 Tri-coloured Bat

The Tri-coloured Bat (SARO *Endangered*, Photo 34) is one of the smallest bats in eastern North America. This species may be on the property, based on the acoustic bat survey, although the population was quite small, just 0.07% of all of the acoustic recordings. Like the other Myotis/Perimyotis bat species, it forages for insects along forest edges and gaps, over water, and across small fields, and day roosts in mature but declining trees. However, it appears to be less specific about the species of roost trees and will utilize Oak, Maple and Pine. Also, it will roost among foliage, whereas other Myotis/Perimyotis species prefer bark crevices and hollow stems.

Like all small bat species in Ontario, the Tri-coloured Bat has been severely impacted by White Nose Syndrome. Declines of more than 75% have occurred in the known hibernating populations. Most of the Canadian range of the species overlaps with the current White Nose Syndrome range, and further declines are expected as more hibernacula are infected.

In the late fall Tri-coloured Bats migrate up to several hundred kms to their winter hibernacula in caves and abandoned mines. However, unlike other bat species that can congregate in the hundreds or thousands, Tri-colored Bats tend to be solitary.

The forested habitat will be removed by the proposed development; however, tree removal can be done in the winter when the bats are not present. Removing the woodlands will not jeopardize the sustainability of the local Tri-coloured Bat population because there is ample woodland habitat, literally hundreds of acres, in the planning area, and about 2,500 ac (1,000 ha) in Wasaga Beach, much of it protected by the Provincial Park system. However, the Tri-coloured Bat is a species at risk that may be on the property, therefore an authorization permit under Section 17(1) of the ESA will be required from the MECP to remove species at risk habitat. This process has been initiated. This is further explained in Section 16.2.

Photo 32: (left) There is a robust population of Little Brown Myotis on the property, almost 36% of all the acoustic recordings. This bat is a species at risk. (photo source: Shutterstock).

Photo 33: (right) Eastern Small-footed Myotis may be present on the property, about 0.01% of the acoustic recordings. This bat is a species at risk (photo source: Shutterstock).

Photo 34: (left) Tri-coloured Bat may also be present on the property, but the population was very small, just 0.07% of the acoustic recordings. This bat is a species at risk (photo source: Shutterstock).

15.12 Wood Thrush

The NHIC has occurrence records of Wood Thrush (SARO *Special Concern*) in the vicinity of the property. However, this bird was neither seen nor heard during the breeding bird surveys.

These birds prefer large, mature, mixed-wood forests, but will also use smaller stands. They build their nests in Sugar Maple and American Beech saplings. Although the property is extensively forested, the woodland is dominated by early successional Ash, Poplar and Cedar, not mature Maple and Beech. Wood Thrush that exist locally would not likely breed or forage on the property because it is not their preferred habitat.

The Wood Thrush is threatened by the fragmentation of its preferred large forest areas as urban, suburban and cottage development intensifies, over-browsing by White-tailed Deer which decreases the number and type of plants and trees in the forest, including the number of saplings where the wood thrush nests, and parasitic behavior from Brown-headed Cowbirds, which lay their eggs in the nests of the Wood Thrush and whose young are fed by the host Thrush at the expense of their own young.

The property is not preferred Wood Thrush habitat, so it’s not surprising that this species wasn’t confirmed on the property by the breeding bird surveys conducted by CEC in 2021 and Beacon in 2012. Therefore, the proposed development will not jeopardize the sustainability of the local Wood Thrush population.

16.0 Endangered Species Act and Authorization Permits
16.1 Species at Risk Designation

Ontario Regulation 230/08 is administered under the *Endangered Species Act*. O. Reg. 230/08 identifies, designates and manages species at risk in Ontario. There are four designations of species at risk under O. Reg 230/08, they are: *Special Concern*, *Threatened*, *Endangered* and *Extirpated*. Species designated *Threatened* and *Endangered* are provided specific protection under the *ESA*. In contrast, species at risk with the *Special Concern* designation are not provided the same degree of regulatory protection under the *ESA*, even though the species is listed in O. Reg. 230/08*.* This is confirmed by recent correspondence with the Manager of the Species at Risk Branch of the MECP (June 7, 2021, email in Appendix 21.7):

> *… special concern species are not afforded the protections of section 9 and 10 of the ESA … when it comes to habitat, it generally falls within the purview … of MNRF … when it comes to protecting those areas. They may be looked upon as more significant that other natural features and areas but aren't within the purview of section 10* [of the ESA]*.*

Section 9 of the *ESA* relates to protecting the designated species. Section 10 relates to protecting the species' habitat. Proponents are obligated to comply with the *ESA* when species at risk designated *Threatened or Endangered* are confirmed to be present on or immediately adjacent to the property. If a natural feature is considered to be significant, or when affording protection to species at risk, regulatory agencies generally consider '*immediately adjacent to the property*' to be 120 m, unless specified otherwise.

16.2 Endangered Species Act Authorizations

The *ESA* provides protection to both the species at risk (Section 9) and their habitat (Section 10).

Subsection 9(1) of the *ESA* states:

No person shall,

a. *kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;*

b. *possess, transport, collect, buy, sell, lease, trade or offer to buy, sell, lease or trade,*
   i. *a living or dead member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species,*

ii. *any part of a living or dead member of a species referred to in subclause (i),*

iii. *anything derived from a living or dead member of a species referred to in subclause (i); or*

c. *sell, lease, trade or offer to sell, lease or trade anything that the person represents to be a thing described in subclause (b) (i), (ii) or (iii).*

Section 10(1) of the ESA states:

> *No person shall damage or destroy the habitat of a species that is listed on the Species at Risk in Ontario list as an endangered or threatened species.*

The Minister of the MECP may issue a permit under subsection 17(1) of the *ESA* that authorizes an activity that would otherwise be prohibited by subsection 9(1) or 10(1) of the *ESA*.

There are four types of permits that may be issued for authorizing activities where the activity:

1. *is necessary for the protection of human health or safety - clause 17(2)(a);*

2. *has the main purpose to assist, and would assist, in the protection or recovery of the species - clause 17(2)(b);*

3. *has the main purpose not to assist in the protection or recovery of the species, but through specific and mandatory conditions outlined in the permit will result in an overall benefit to the species within a reasonable time - clause 17(2)(c); and,*

4. *will result in significant social or economic benefit to Ontario but will not jeopardize the survival or recovery of species at risk - clause 17(2)(d).*

In early 2022 correspondence was initiated with the MECP Species at Risk Branch regarding the confirmation of at-risk bats on and in the vicinity of the property and which ESA authorization may be the appropriate permit. At that time a very different site plan was proposed. This earlier site plan, prepared prior to the most recent Burnside flood modelling, completely avoided development of the central Wooded Wetland and much of the adjacent forest. It was agreed that a Section 17(2)(c) Overall Benefit Permit was the appropriate permit to apply for, and CEC proceeded with submitting an application. However, subsequent to the recent Burnside modelling that illustrated the extent of flooding, Burnside proposed an engineered flood by-pass channel that will completely mitigate the flooding, and the Town and the NVCA agreed in principle. With the seasonal flooding eliminated the Wooded Wetland will completely dry out and revert to a dryer woodland, similar to the woodland elsewhere on the property. This would potentially make all of the property suitable for residential development. Therefore, Sunray elected to revise their site plan, as described in Section 10. If the proposed residential development proceeds, then species at risk bat habitat will be impacted and an ESA authorization permit will be required. In this case, an Overall Benefit Permit is not the appropriate permit. Since the landscape changes are predicated on the need to mitigate community-wide flooding a more appropriate ESA authorization may be Section 17(2)(a) ‘protection of human health and safety’.

17.0 Impacts of the Proposed Development on the Natural Features and Species at Risk.

17.1 Natural Features

The proposed development, as illustrated in Figure 8 and described in Section 10, will substantially impact the natural features on the property.

As identified in Section 14.1 and illustrated in Figure 23, there are nine natural landscape features on the property:

1. West Woodland (1.3 ac/0.5 ha, ELC FOM7-2),
2. West-Central Woodland (1.2 ac/0.5 ha, ELC FOD8-1),
3. Wooded Wetland (8.9 ac/3.6 ha, ELC SWD2-2),
4. East-Central Woodland (6.1 ac/2.5 ha, ELC FOD8-1),
5. East Woodland (12.4 ac/5.0 ha, ELC FOM7-2),
6. Field Thicket (0.5 ac/0.2 ha, ELC CUT1a),
7. Rural Residential (0.5 ac/0.2 ha),
8. Bayshore Creek and,
9. Shore Creek.

The proposed development will remove about 21.1 ac (8.5 ha) of woodland, about 0.5 ac (0.2 ha) of field thicket and re-develop about 0.5 ac (0.2 ha) of residential property. The loss of about 8.9 ac (3.6 ha) of wetland and the two streams is a result of the flood mitigation strategy. The engineered flood by-pass channel could be about 4.2 ac (1.7 ha) in size and about 1.1 km long (the design plans have not been finalized.

There is nothing ecologically unique or significant about the woodlands or the wetland on the property. The woodlands are young successional forests that are common in the planning area and across Wasaga Beach. They are not ecologically diverse, and they contain numerous invasive plant species and other flora that is typical of disturbed areas. The exception is the designation as significant wildlife habitat because of the presence of species at risk. This is addressed in Section 17.2.

The unevaluated Wooded Wetland unquestionably would not rate as a significant wetland, as described by the OWES. Although all wetlands have ecological value, the ecological functionality of this wetland is marginal. As described in detail in Sections 14.5 and 14.5.1, the wetland is ephemeral and dries out completely during the summer. It has no fish habitat, no amphibian breeding habitat, no waterfowl breeding or staging habitat, no aquatic mammal habitat, no meaningful ground water retention or recharge functions, and no meaningful erosion or flood control functions. When the proposed flood by-pass channel is completed there will be no seasonal flow from Bayshore or Shore creeks, which is what created and maintains the wetland. The wetland will dry out. Since the soil is mostly the same across the property, the surrounding adjacent forest is composed of successional pioneering tree species, and the mature tree mortality in the wetland is in the range of 50% of the basal area, the wetland will eventually transform from a SWD2-2 Green Ash Mineral Swamp to a FOM7-2 Fresh-Moist White Cedar-Hardwood Mixed Forest. Similarly, with the seasonal flooding mitigated, the FOD8-1 Fresh-Moist Poplar Deciduous Forest will also shift towards the drier FOM7-2 forest type.

About 80% of the property is NVCA Regulated Area, and about 30% of the property is Natural Heritage System Category 1 Land. Compliance with environmental policies will be achieved through addressing the flood hazard. A proposal has been suggested to construct a by-pass channel that will mitigate both the chronic flooding on the property and the potential for community-scale flooding associated with a regional storm event. Negotiations with both the Town and the NVCA are on-going. A NVCA permit may be required. NVCA eco-offset payments may be levied. A MECP ESA authorization permit will be required to address the impacts to species at risk.

17.2 Species at Risk

Screening for species at risk (Section 15.0) indicated there may be up to 12 designated birds, animals and plant communities on or in the immediate vicinity of the property. However, when these species were screened for suitable habitat and compared to the extensive flora and fauna surveys it was determined that there are only three species at risk confirmed to be on or immediately adjacent to the property. These are:

1. Eastern Wood Pewee (bird) – *Special Concern*,
2. Little Brown Myotis (bat) – *Endangered*, and
3. Monarch (butterfly) – *Special Concern.*

Two of the three species, Eastern Wood Pewee and the Monarch, are designated *Special Concern* and do not have regulatory protection under the *ESA*. Impacts on the Little Myotis as a result of the proposed development are two-fold. Although not confirmed, the Little Brown Myotis may be utilizing some larger trees on the property for maternity and daytime roosting. Unquestionably, this at-risk bat is foraging across the property. ESA Section 9 impacts on the bat itself will be avoided by removing trees and other vegetation during the winter when bats are not present on the property. ESA Section 10 impacts on the bat's habitat cannot be avoided, as most trees and other vegetation will be removed to accommodate the proposed development. Therefore, an ESA authorization permit is required from the MECP. Communication with the MECP will determine which ESA permit is appropriate. It will likely be either Section 17(2)(a) protection of human health and safety, or Section 17(2)(d) significant social or economic benefit. Regardless of which permitting process is pursued, the sustainability of the local at-risk bat population is not jeopardized because the 31 ac of the wooded habitat to be removed is only about 1% of the 2,500 ac of similar habitat in the planning area.

18.0 Mitigation

Disturbance of the natural environment is inevitable during major construction projects, such as the proposed residential subdivision. Ideally, adverse environmental impacts should be avoided, where avoidance is impossible the impacts should be minimized, and where they can't be minimized there should be some sort of mitigating compensation, ecological offset, or post-development restoration. Steps can be taken to mitigate impacts during the construction phase of the proposed development and on the impacts to the natural environment.

18.1 Construction Mitigation

The following recommendations are intended to reduce the physical disturbance and contamination of the property and the adjacent area during the construction phase, thereby reducing the likelihood of environmental impacts. Some of the construction phase impacts are unavoidable and transient, such as noise and dust, whereas others, if not managed, could be more serious and long term, such as soil and ground water contamination. Construction mitigation strategies are mostly accepted industry best practices and common sense.

18.1.1 Fuel

Construction equipment requires substantial quantities of fuel.

- Low sulphur fuel should be used in all off road and construction equipment diesel engines.
    - This will reduce the sulphur dioxide emissions from all sources and minimize local airshed contamination.
- On-site fuel storage tanks should be checked daily for leaks.
- All fuel tanks should be surrounded with appropriate containment structures to ensure fuel spills do not migrate off-site or contaminate the soil or groundwater.
- Fuel spill cleanup kits should be readily available to contain accidental fuel spills.
- Consider minimizing the number of fuel storage tanks on the construction site.
    - A single centralized fueling station is the most efficient way to minimize potential fuel related impacts.
    - A concrete pad or a fuel-impermeable poly-barrier placed under the fuel tank will ensure spilled fuel will not contaminate the soil or groundwater.

18.1.2 Soil and Dust Management

The import, export and on-property movement of soil is a major component of most construction projects.

- Only clean, local, fill should be imported.
- Specifically, the fill should not contain organic matter that may introduce exotic or invasive plant species that may compete with native vegetation.
- All soil brought onto the property should comply with *O. Reg. 153/04* and its end use should comply with the appropriate Table in the Regulation.
    - Soil to be used for topsoil should meet Table 1 Criteria – Full Depth Background Site Condition Standards.
    - Soil to be used for grading below the topsoil should meet Table 2 Criteria – Full Depth Site Condition Standards in a Potable Ground Water Condition.
- All soil moved off-property should comply with *O. Reg. 406/19.*
- All soil stockpiled on site should be surrounded with a silt fence to avoid erosion and runoff during precipitation events.
- The site should have water trucks with water sprays to wet soil piles and access roads during dry periods.
    - This prevents nuisance dust blowing off the construction site and exacerbating local air quality.
    - Water trucks could also rinse dirty vehicles leaving the site to prevent off-site soil contamination and nuisance soil deposition on local municipal roads.
- All excavation, grading, and soil movement activities should be suspended when average wind speeds exceed 32 kph (20 mph)
    - To prevent off-site nuisance dust.

18.1.3 Erosion and Sediment Control

Soil runoff during construction can contribute significant sediment loads to receiving watercourses. Effective erosion and sediment control strategies at construction sites are crucial in mitigating off-site impacts. Although the property slope is very gentle, and the risk of surface water flow and erosion is minimal, proper erosion and sedimentation controls should be maintained whenever heavy construction equipment is on site and surface grading is underway.

- Heavy-duty silt fence should be installed along watercourses and ditches.
- Straw bales should be placed along the ditch on the south side of Beachwood Road and the east side of Robert Street South.
    - This should minimize the possibility of downstream water sedimentation

and contamination and avoid impacting spawning fish and spawning habitat along Bayshore Creek between the north side of Beachwood Road and Georgian Bay (there is no fish habitat on-property).

- Construction should be halted during heavy or severe precipitation events, and silt fencing should be regularly examined for integrity.
- All siltation control devises should be installed prior to the commencement of construction and maintained until soils are stabilized and the construction phase is complete.
- As soon as possible after the completion of the grading of the residential lots the bare soil should be seeded or otherwise planted, or sprayed with water when dry, to avoid erosion and blowing dust.
- Erosion and sediment control features may include silt fences, straw bales, hydroseeding of exposed soils, and mulching, as appropriate for the site being protected and the stage of construction.
- Vehicles exiting the construction site should have their undercarriage and tires rinsed to prevent off-property soil tracking along local municipal roads.

18.1.4 Other

Best management practices should be followed to avoid accidental spills of fuel, oils, lubricants, chemicals, concrete leachate, and sediments into adjacent soil, nearby aquatic habitats, sensitive natural features, and the ground water.

- Include the proper storage, use, and cleanup of all construction-related chemicals.
- No use of herbicides or other chemical agents for vegetation clearing, use mechanical vegetation management only.
- Ensure heavy loads are sized appropriately and that truck traffic observes seasonal load restrictions and local speed limits.
- Observe and respect local noise bylaws, specifically after-hours and holiday restrictions.
- Engage the local community.
  - Create a website so the community can be informed about construction activities and timelines – keep it current.
  - Host a public information session(s) to keep the local community informed (not everyone is on-line and tech-savvy).
  - Conduct direct mail-drops to the local community with relevant information.

18.2 Natural Environment Mitigation

Mitigating impacts to the natural environment includes the natural landscape features, birds and other wildlife, and species at risk.

18.2.1 Natural Landscape Features
18.2.1.1 Shore Creek and Bayshore Creek

Both watercourses will be removed, and the surface water drainage will be managed by a 4.2 ac (1.7 ha) flood control by-pass channel and a 1.9 ac (0.75 ha) storm water management pond. (1.7 ha). In this case it is the chronic flooding that is being mitigated rather than the preservation of the watercourses. The final dimensions of the by-pass channel are yet to be determined, however the stream channel within the by-pass channel and the adjacent vegetation on the slopes and back of the channel can be designed to create an extensive riparian habitat that currently doesn't exist on the property.

18.2.1.2 Wooded Wetland

The wetland as it currently exists on the property is ephemeral and its ecological functionality is marginal. The wetland will be lost, it will dry up, when the flood by-pass channel is constructed. Although about 8.9 ac (3.6 ha) of wetland will be lost, at least 4.2 ac (1.7 ha) of wetland habitat can be re-created in and adjacent to the flood by-pass channel. The mineral soil layer that is responsible for the perched water table on the property is several m thick. The watercourse within the 1.1 km-long by-pass channel can be sculpted into the clay-like mineral soil layer to create holding pools around which pocket wetlands can be established. This has the potential to create waterfowl breeding and/or staging habitat, amphibian breeding habitat, and generally enhance wetland wildlife foraging and shelter habitat, all of which is currently absent in the ephemeral wetland on the property. To protect nesting birds, tree and vegetation removal should not be conducted between May 1 and July 15.

18.2.1.4 Woodlands

The proposed development will remove about 21 ac (8.5 ha) of young, successional forest. Although the cleared forest tracts cannot be replaced on the post-development landscape, trees and shrubs will be planted in the parkland, along boulevards, on the residential properties, and around the storm water retention pond. The woodlands that will be removed are not locally or regionally unique, nor are they ecologically very biodiverse. There are literally hundreds of acres of similar young successional mixed-wood forests in the planning area and Wasaga Beach in general. The displaced trees will be mostly scrub Eastern White Cedar, Green Ash (heavily impacted by the Emerald Ash Borer), and Trembling Aspen. Tree planting can substantially expand the biodiversity of tree species on the property. Post-development site conditions are suitable for White and Yellow Birch, Silver, Red and Sugar Maple, Shagbark, Shellbark and Bitternut Hickory, Red, Black and White Oak, American Beach, American Elm, Basswood, White and Red Pine, White and Black Spruce, Eastern Hemlock, and Tamarack. All of these are native species typical of the region and will substantially enhance the tree biodiversity of the property.

All post-development planting strategies should use locally sourced native species.

The Emerald Ash Borer is decimating all species of Ash trees across southern Ontario and has resulted in extensive mortality of Green Ash trees on the property, as much as 50% of the Ash basal area in some of the forest resource inventory plots. Similarly, Dutch Elm Disease continues to kill young and mature Elm trees across the province, including Elm on the property. To limit the spread of these very destructive organisms, Ash and Elm trees removed from the woodland cleared to accommodate the development should not be transported off-property. Ash and Elm trees should be burned on-site. This would require a written exemption from the Wasaga Beach Fire Chief, as regulated by Wasaga Beach By-Law 2014-48, which is the by-law to regulate open fires.

No locally or regionally rare plants were observed on the property during the site visits by Beacon, Azimuth, the NVCA and CEC. However, should rare plants be found during the construction phase, they can be transplanted to suitable sites elsewhere in the planning area.

Surface water drainage strategies are still (at the time of this writing) under development. An open water storm water retention pond will be constructed on or adjacent to the property. The pond, and the surrounding vegetated buffer, will provide habitat for a variety of plants, animals and birds. The most obvious is nesting, foraging and staging habitat for colonial water birds, such as geese, ducks, herons, egrets, and shore birds like gulls and terns, as well as Wood Cocks, Plovers and Red-winged Blackbirds. Also, the pond could provide breeding and foraging habitat for turtles, frogs, toads, salamanders and some snakes. This open water wetland habitat currently doesn't exist on the property. Therefore, a conscientiously constructed and landscaped storm water retention pond can result in a substantial ecological net gain.

Like the wetland, the woodland should be fenced off from adjacent new residences that back onto this feature. Regrettably, uncontrolled access often leads to residents dumping waste. Also, pets and people walking through the woodland can contribute to the introduction and spread of unwanted invasive plant species, such as Garlic Mustard, Dog-strangling Vine and Common Buckthorn. Post-development plans for the woodland haven't been created, however, thought should be given to a trail system to control and direct pedestrian access. Large green spaces near residential communities invite casual exploration and passive recreation. If a trail system is not available people will inevitably make their own trails, which may interfere with sensitive woodland vegetation communities or specific plant species, such as the Yellow Lady Slipper orchid pictured on the front cover of this report. A trail system would direct pedestrian traffic away from sensitive areas and minimize wayward trampling and reduce the spread of invasive plant species.

18.3 Birds and Other Wildlife

Migratory birds, nests, and eggs are protected by the *Migratory Birds Convention Act*, and the *Fish and Wildlife Conservation Act*. Construction activities involving the removal of vegetation should be restricted during the bird breeding season in order not to interfere with the breeding activities of migratory birds. In southern Ontario this is generally considered to be May 1 to August 15. The removal of trees and shrubs should be avoided during this time period. If vegetation clearing is required between these dates, screening by an ecologist with knowledge of bird species present in the area should be undertaken to ensure that the landscape is confirmed to be free of nests. If singing males are recorded then it is assumed that a nesting female is nearby, and species-specific nest buffers should be established around the singing male.

A prohibition of woodland clearing between May 1 and August 15 would ensure that there are no impacts to breeding birds and compliance with the migratory birds and the fish and wildlife legislation. This would also eliminate the need to have an ecologist on-site to screen for breeding birds.

18.4 Species at Risk

Three species at risk were confirmed to be present on the property – these are the Little Brown Myotis, the Eastern Wood Pewee, and the Monarch butterfly.

18.4.1 Little Brown Myotis

The Little Brown Myotis definitely forages across the property and it's possible this bat may day roost or have maternity roosting colonies in some of the larger trees in the woodlands. Interfering with or harming endangered species contravenes Section 9 of the *ESA*. Destroying species at risk habitat contravenes Section 10 of the *ESA*.

A prohibition on tree removal during the time when bats are present in the woodlands would ensure there is no Section 9 violation. In southern Ontario, this is generally considered to be April 1 to October 30.

There is no way to avoid a Section 10 violation because the wetland and the surrounding woodlands will be removed. Therefore, an *ESA* Section 17(2) authorization permit is required from the MECP to remove species at risk habitat.

Bats generally don't forage in the forest interior, they prefer to forage along forest edges, in forest openings and along shorelines and over open water. In addition, open water is an important source of drinking water for bats. An open water habitat is not currently present on the property. The proposed development includes a storm water management pond and an extensive stream by-pass channel. The pond and the riparian by-pas channel will attract flying insects, which are the primary food source for bats, and the open water will provide a source of drinking water.

Bat boxes, similar to those illustrated in Photos 35 and 36, will compensate for the loss of roosting trees in the near term. In the forest bats roost in holes, cracks, and loose bark in taller, older, declining trees. As one roosting tree dies and falls down it is replaced by another tree that devolves into a declining state, thereby ensuring a constant supply of roosting habitat. Bat boxes provide immediate roosting habitat, but they are not permanent. However, if they are monitored and maintained they can last long enough to provide roosting habitat until trees planted in the new community are mature enough to be utilized for roosting. There will be a substantial number of trees planted in the post development landscape. The trees can be selected to include species that develop plated bark, which are attractive for bats seeking roosting sites. These include Sugar, Silver and Red Maple, Shagbark and Shellbark Hickory, Black Cherry, White and Burr Oak, and Sycamore. The number and location of the bat boxes will depend on the final dimensions of the flood by-pass channel and the planting plans to be developed for the by-pass channel, the park, and the perimeter of the storm water retention pond.

As previously mentioned, bats don't routinely forage in the forest interior. Although about 31 ac (12.1 ha) of woodland will be removed, about 7.7 ac (3.13 ha) of greenspace will be planted with trees, flowering shrubs and ground flora that will attract insects and create bat forage habitat. In addition, landscape planting on the 323 residential units will provide further foraging opportunities. Collectively this new foraging habitat is greater in extent than currently exists on the property.

Regardless of the immediate, although temporary, disturbance of bat roosting and foraging habitat, the proposed development will not jeopardize the sustainability of the local Little Brown Myotis population. The wetland and woodland habitat to be removed from the property is about 1% of the comparable forested tracts that currently exist in the planning area (31 ac on the property vs 2,500 ac in Wasaga Beach).

18.4.2 Eastern Wood Pewee

Although it is a species at risk, the Eastern Wood Pewee is designated *Special Concern* and therefore does not have the same *ESA* regulatory protection. An *ESA* authorization permit is not required. Like bats, the Eastern Wood Pewee's preferred foraging habitat is clearings and edges. The same post-development planting strategy that will enhance bat foraging habitat also improves foraging opportunities for the Eastern Wood Pewee. Also similar to the bats, the sustainability of the local Eastern Wood Pewee population will not be jeopardized by the proposed development because of the extensive forest tracts, literally several thousand ac, that exist in the planning area.

Photo 35 and 36: Bat boxes provide day-time roosting habitat for bats and can deter bats from invading buildings (Photo by Shutterstock).

18.4.3 Monarch Butterfly

Like the Eastern Wood Pewee, the Monarch butterfly is a species at risk designated *Special Concern*.

In order to enhance the habitat for Monarch butterflies in the post-development landscape the proposed extensive planting strategy should include Milkweed, as this plant is critical to the Monarch's reproduction. Milkweed has a beautiful and very fragrant flower and readily re-seeds each year. In addition to the planting in public greenspaces, inexpensive and simple initiatives can be undertaken by the new residents in the community that can substantially enhance Monarch habitat in the new residential community.

Monarch Watch is dedicated to restoring and preserving Monarch butterfly populations. This organization provides tips on establishing gardens and greenspaces that enhance butterfly habitat. Natural fields and managed greenspaces, such as residential gardens, that are suitable Monarch habitat can qualify, and be recognized through signage, as a Monarch Waystation, to show that the site is contributing to Monarch conservation. Waystations can be certified and included in a North America-wide registry.

Using the initiatives provided through Monarch Watch the existing Monarch habitat can be enhanced and new habitat created by direct planting in the post-development landscape. Seeding milkweed and other flowering plants into the planned green spaces, on the new residential properties, and around the storm water pond, creating Monarch Waystations and promoting Monarch conservation through signage, would be a substantial post-development net ecological gain for this species at risk. In addition, landscape plantings that encourage Monarch nesting and feeding also attract and support other butterfly species.

19.0 Conclusions

Cotyledon Environmental Consulting (CEC) was engaged by Watters Environmental Group Inc. (WEG) to carry out a preliminary scoped Environmental Impact Study (sEIS) of lands owned by Sunray Living Inc. (Sunray), known municipally as 8859 Beachwood Road and 65 Robert Street South, in the Town of Wasaga Beach, Ontario.

Sunray is planning to develop the property as a residential subdivision and engaged several technical consultants to carry out the required assessments and investigations (such as CEC for this sEIS).

Flood modelling recently conducted by R.J. Burnside demonstrated widespread flooding of the property and surrounding area during a regional storm event. As a result, the Town of Wasaga Beach is working with the Nottawasaga Valley Conservation Authority (NVCA) on a flood mitigation strategy that involves the construction of an engineered flood control by-pass channel that will traverse the south and east sides of the property and join with a proposed drainage ditch system that will divert the flood waters north to Georgian Bay. This will effectively divert all surface water from entering the Sunray property.

The property is not in the Oak Ridges Moraine, the Greenbelt, the Lake Simcoe Protection Plan Area, the Niagara Escarpment Planning Area, or the Frontenac Arc Biosphere Reserve. It is in the Greater Golden Horseshoe Growth Plan Area and an area that the Town of Wasaga Beach has planned for residential development.

This report includes observations and data from four environmental consultants (Burnside, Beacon, Azimuth, and CEC) over the period 2010 to 2021. The property characterization is thorough, and the biological inventories are current and robust.

The property is neither environmentally unique nor ecologically diverse; it is typical of young, successional, mixed-wood forests in and around Wasaga Beach.

The wetland areas of the property are ephemeral and dry out every summer. The wetlands have low ecological functionality as there is no nesting, foraging or staging habitat for waterfowl, and no open water or riparian habitat for ducks, geese, or raptors. Also, there is no amphibian breeding habitat, no fish habitat, and no locally or regionally rare plant species on the property.

The woodlands on the property also have low ecosystem functionality, although they are designated as significant wildlife habitat due to the presence of maternity roosting colonies for several species of bats, including the Little Brown Myotis, which is an endangered species. Disturbance of an endangered species or its habitat requires a permit issued by the Ontario Ministry of the Environment, Conservation and Parks (MECP). Regardless of the proposed mitigation initiatives, the sustainability of the local at-risk bat population is not jeopardized because the removal of bat habitat on the property is only about 1% of the comparable forested habitat in the planning area.

As a result of the regional flooding concerns, CEC understands that discussions are ongoing between the Town of Wasaga Beach and the NVCA regarding mitigation measures and the resultant impacts on lands such as the Sunray property. This report will be revised once the directives of the Town of Wasaga Beach and/or the NVCA are known.

Normally, the loss of the wetland and the associated woodland buffer would be addressed through the NVCA's ecological offset policy, and the proponent would be responsible for compensation. However, in this case, the loss of the wetland is related to the flood mitigation and not the development, because the wetland will dry up when the surface water is re-directed via the flood by-pass channel. Therefore, the wetland would be lost even if the proposed residential development does not proceed, and so the relevance of and the responsibility for any ecological off-set charges needs to be determined.

20.0 References

Allan, B., J. Broadfoot and G. Findlay. 2005. Midhurst District Deer Yard Survey: Huronia Area 2004. Ministry of Natural Resources, Midhurst District.

A Place to Grow, Growth Plan for the Greater Golden Horseshoe*.* 2020. Order in Council No 641/2019. Under the Places to Grow Act, 2005. Available on-line at: https://www.ontario.ca/document/place-grow-growth-plan-greater-golden-horseshoe

Azimuth Environmental Consulting Inc. 2010. Town of Wasaga Beach West End Natural Heritage Review. April 2010. AEC 09-315.

Beacon Environmental. 2012. Preliminary Assessment Scoped Environmental Impact Study, Lot 34, Concession 4, Part 1, Town of Wasaga Beach. September 2012.

Bezener, Andy. 2000. Birds of Ontario. Lone Pine Publishing. Edmonton, Alberta.

Boyce, John Shaw. 1961. Forest Pathology. 3rd Edition. McGraw-Hill Book Company.

Conservation Halton Ecological Monitoring Protocols. Version 1.0. February 2017.

COSEWIC Assessments and Status Reports. 2013. Little brown myotis, northern myotis and tri-coloured bat, COSEWIC assessment and status report. Available on-line at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/little-brown-myotis-tri-coloured-bat-2013.html

COSEWIC Assessment and Status Report on the Midland Painted Turtle *Chrysemys picta marginata* and the Eastern Painted Turtle *Chrysemys picta picta* in Canada. 2018. Committee on the Status of Species at Risk in Ontario (COSSARO). Available on-line at:
https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/srMidlandPaintedTurtleEasternPaintedTurtle2018e.pdf

COSEWIC Assessment and Status Report on the Wood Thrush *Hylocichla mustelina* in Canada. 2012. Committee on the Status of Species at Risk in Ontario (COSSARO). Available on-line at:
https://ontarionature.org/wp-content/uploads/2015/09/sr_Wood20Thrush_2013_e.pdf

COSSARO Candidate Species at Risk Evaluation for Eastern Small-footed Myotis (formerly Eastern Small-footed Bat) (Myotis leibii). 2013. Committee on the Status of Species at Risk in Ontario (COSSARO). Available on-line at: http://cossaroagency.ca/wp-content/uploads/2017/06/Final-COSSARO-Evaluation-Eastern-Small-footed-Bat_Jan2013_GFM_processed-....pdf

Crow Valley Conservation. Watershed Planning and Regulations (*O. Reg 159/06*) Policy Manual. Created February 2014. Updated: January 2016, March 2017 and February 2020. Appendix A: EIS Scoping Checklist. Appendix E: Environmental Impact Study Terms of Reference. Section 2.0 EIS Report Requirements. Available online at: https://www.crowevalley.com/wpcontent/uploads/2020_Policy_Manual_FINAL_Website.pdf

Delcan, September 2013. Drainage Update of Existing Highway-26: Huronia Pathway to Mosley Street. Produced for the Ontario Ministry of Transportation.

Endangered Species Act. S.O. 2007. Current to July 21, 2020. Available on-line at: https://www.ontario.ca/laws/statute/07e06

Environment and Climate Change Canada. 2019. Handbook Managing Conflict Issues with Colonial Waterbirds in Canada. Cat. No.: CW66-588/2019E-PDF ISBN: 978-0-660-30443-4. Available on-line at: https://www.canada.ca/content/dam/eccc/documents/pdf/oiseaux-migrateurs-migratory-bird/handbook-managing-conflict-issues-colonial-waterbirds-canada-2019.pdf

Fish and Wildlife Conservation Act, 1997, S.O. 1997, c. 41. Available on-line at: https://www.ontario.ca/laws/statute/97f41

Fisheries Act R.S.C., 1985, c. F-14, last amended August 28, 2019.

Fluvial Geomorphic Assessment for a Proposed Development at 8859 Beachwood Road, Town of Wasaga Beach. Memorandum from Palmer to Sunray Group. July 5, 2021.

Fowells, H.A. 1965. Silvics of Forest Trees of the United States. U.S. Forest Service. Timber Management Branch. Agricultural Handbook No. 271.

Furlong, C., Deward, H., & Fenton, M. 1986. Habitat Use by Foragive Insectivorous Bats. Department of Biology, Carelton University, Ottawa ON. Canadian Journal of Zoology: 65(2): 284-288. Available on-line at: http://doi.org/10.1139/z87-044

Gartshore, M.E., M.J. Oldham, R. van der Ham, F.W. Schueler, C.A. Bishop and G.C. Barrett. 2004. Amphibian Road Call Counts Participants Manual. Environment Canada, Ontario Region.

Gartshore *et al*. 2004. Environment Canada Marsh Monitoring Protocol.

Google Earth Pro. Google Inc. ©2020 Google LLC.

Google Maps. Available on-line at:
https://www.google.ca/maps/@43.664111,-79.7599573,15z

Graham, Samuel Alexander, and Fred Barrows Knight. 1965. Principles of Forest Entomology. McGraw-Hill Book Company.

Hoffman D.W., Wicklunf R.E. and N.R. Richards. 1962. Soil Survey of Simcoe County Ontario. Report No. 29, Canada Department of Agriculture and the Ontario Agricultural College. Available on-line at:
https://sis.agr.gc.ca/cansis/publications/surveys/on/on29/on29_report.pdf

Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (myotis leibii) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry.

James, Ross D. Associate Curator of Ornithology, Royal Ontario Museum. Habitat Management Guidelines for Birds of Ontario Wetlands, including marshes, swamps and fens or bogs of various types. Ontario Ministry of Natural Resources and Forestry. MNRF #51603, ISBN 0-7794-2349-6. Available on-line at:
https://docs.ontario.ca/documents/2810/guide-wetland-birds.pdf

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 Applications*. SCSS Field Guide FG-02. Available on-line at:
https://www.ontario.ca/page/introduction-ecological-land-classification-systems#section-0

Marsh Monitoring Program Participant's Handbook for Surveying Amphibians. 2009. Published by Bird Studies Canada in Cooperation with Environment Canada and the U.S. Environmental Protection Agency.

Migratory Birds Convention Act, 1994. S.C. 1994, c. 22. Available on-line at:
https://laws.justice.gc.ca/PDF/M-7.01.pdf

Nature Serve Explorer – Fingernail Clams. Available on-line at:
https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.113320/Musculium_partumeium

Nottawasaga Valley Conservation Authority. 2009. Planning and Regulation Guidelines. August 28, 2009.

Nottawasaga Valley Conservation Authority. Achieving Net Gains through Ecological Offsetting Guidelines for site-specific ecological offsetting proposals and plans. September 2021

Official Plan of the Town of Wasaga Beach. January 2020. Available on-line at: https://www.wasagabeach.com/en/town-and-government/resources/Documents%20-%20Planning/OP%20Consolidation%20-%202020.pdf

Official Plan of the Town of Wasaga Beach. January 2020. Schedules. Available on-line at: https://www.wasagabeach.com/en/town-and-government/resources/Documents%20-%20Planning/OP_consolidation_2020_-_schedules.pdf

Official Plan of the County of Simcoe. Adopted November 25, 2008. Available on-line at: https://www.simcoe.ca/Planning/Documents/SimcoeOfficialPlanText.pdf

Official Plan of the County of Simcoe. Adopted November 25, 2008. Schedules. Available on-line at: https://www.simcoe.ca/dpt/pln/county-official-plan

Oldham, M.J., and S.R. Brinker. 2009. Rare Vascular Plants of Ontario, Fourth Edition. Natural Heritage Information Centre, Ontario Ministry of Natural Resources. Available on-line at: https://www.researchgate.net/profile/Michael-Oldham-4/publication/274252597_Rare_Vascular_Plants_of_Ontario_Fourth_Edition/links/5a7cc6a4458515dea40f0c96/Rare-Vascular-Plants-of-Ontario-Fourth-Edition.pdf

Ontario Geological Survey 1991. Bedrock geology of Ontario, southern sheet; Ontario Geological Survey, Map 2544, scale 1: 1 000 000.

Ontario Government. 1990. Forestry Act. Revised Statutes of Ontario. Available on-line at: https://www.ontario.ca/laws/statute/90f26

Ontario Government. 2014. Provincial Policy Statement. Queen's Printer of Ontario. 2005. Available on-line at: https://www.ontario.ca/document/provincial-policy-statement-2014

Ontario Government. 2020. Ministry of Municipal Affairs and Housing. A Place to Grow. Growth Plan for the Greater Golden Horseshoe. Office Consolidation, August 2020. Available on-line at: https://www.ontario.ca/document/place-grow-growth-plan-greater-golden-horseshoe

Ontario Ministry of the Environment, Conservation and Parks. Well Records. Available on-line at:
https://www.ontario.ca/page/map-well-records

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Ontario Regulation 230/08. Available on-line at:
https://www.ontario.ca/page/species-risk-ontario

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Common Nighthawk. Available on-line at:
https://www.ontario.ca/page/common-nighthawk

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Eastern Wood Pewee. Available on-line at:
https://www.ontario.ca/page/eastern-wood-pewee

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Eastern Meadowlark. Available on-line at:
https://www.ontario.ca/page/eastern-meadowlark

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Bald Eagle. Available on-line at:
https://www.ontario.ca/page/bald-eagle

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Lake Sturgeon. Available on-line at:
https://www.ontario.ca/page/lake-sturgeon-species-risk

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Little Brown Myotis. Available on-line at:
https://www.ontario.ca/page/little-brown-myotis

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Tri-coloured Bat. Available on-line at:
https://www.ontario.ca/page/tri-colored-bat

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Eastern Small-footed Myotis. Available on-line at:
https://www.ontario.ca/page/eastern-small-footed-myotis

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Monarch Butterfly. Available on-line at:
https://www.ontario.ca/page/monarch

Ontario Ministry of Environment, Conservation and Parks. Species at Risk in Ontario. Wood Thrush. Available on-line at:
https://www.ontario.ca/page/wood-thrush

Ontario Ministry of Natural Resources and Forestry. Make a Topographic Map. Available on-line at:
https://www.ontario.ca/page/topographic-maps

Ontario Ministry of Natural Resources and Forestry. Natural Heritage Information Centre. Available on-line at:
http://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US

Ontario Ministry of Natural Resources and Forestry. 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Available on-line at:
http://www.ontla.on.ca/library/repository/mon/24004/297495.pdf

Ontario Ministry of Natural Resources and Forestry. Emerald Ash Borer in in Ontario. Available on-line at:
https://www.ontario.ca/page/emerald-ash-borer

Ontario Ministry of Natural Resources and Forestry. 2014. Wetland Evaluation System. Southern Manual, 3rd Edition, Version 3.3. Available on-line at:
http://files.ontario.ca/environment-and-energy/parks-and-protected-areas/ontario-wetland-evaluation-system-southen-manual-2014.pdf

Ontario Ministry of Natural Resources and Forestry. 2018. The Ecosystems of Ontario, Part 2: Ecodistricts. Science and Research Branch, Science and Research Technical Report TR-26.

Ontario Ministry of Natural Resources and Forestry. 2000. Significant Wildlife Habitat Technical Guide. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, Southcentral Sciences Section. MNR #51438. ISBN# 0-7794-0262-6-6. Available on-line at:
https://dr6j45jk9xcmk.cloudfront.net/documents/3620/significant-wildlife-habitat-technical-guide.pdf

Ontario Ministry of Natural Resources and Forestry. 2014. Significant Wildlife Habitat Mitigation Support Tool. Available on-line at:
https://dr6j45jk9xcmk.cloudfront.net/documents/4773/mnr-swhmist-accessible-2015-03-10.pdf

Ontario Ministry of Natural Resources and Forestry. 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. Ontario Regional Operations Division: Southern Region Resources Section.

Perry, R. W., Silvis, A., and Ford, W. F. 2016. Relationships of Three Species Impacted by White-Nose Syndrome to Forest Conditions and Management. United States Department of Agriculture.

Perry, R., & Thill, R. 2007. Tree Roosting by Male and Female Easter Pipistrelles in a Forested Landscape. Jounal of Mammalogy, 88:974-981.

R.W. Watt, & Caceres, M. 1999. Managing for Snags in the Boreal Foresrs of Northeastern Ontario. Ontario Ministry of Natural Resources. Northeast Science and Technology.

Riley, J.L. 1989. Distribution and Status of the Vascular Plants of Central Region. Ontario Ministry of Natural Resources, Richmond Hill.

Rowe, J.S. 1972. Forest Regions of Canada. Canadian Forestry Service, Department of the Environment. Catalog Number FO 47-1300.

Shaefer, K. 2017. Habitat Usage of Tri-colored Bats (Perimyotis subflavus) in Western Kentuky and Tennessee Post-White Nose Syndrome. Murray State Thesis and Dissertations. Available online at: https://digitalcommons.murraystate.edu/etd/33

The Cornell Lab. Eastern Wood-pewee. Available on-line at: https://www.allaboutbirds.org/guide/Eastern_Wood-Pewee/lifehistory

The Cornell Lab. Cerulean Warbler. Available on-line at: https://www.allaboutbirds.org/guide/Cerulean_Warbler/lifehistory

The Cornel Lab. Eastern Meadowlark. Available on-line at: https://www.allaboutbirds.org/guide/Eastern_Meadowlark/id

The Corporation of the Town of Wasaga Beach Comprehensive Zoning By-Law 2003-60. Office Consolidation January 2020. Available on-line at: https://www.wasagabeach.com/en/town-and-government/resources/By-laws-and-Policies/Zoning-By-law-2003-60---Consolidation-2020.pdf

The Corporation of the Town of Wasaga Beach By-Law No. 2014-48 A By-Law to Amend By-Law No. 2007-64, Being a By-Law to Regulate Open Fires. Available on-line at: https://www.wasagabeach.com/en/town-and-government/resources/By-laws-and-Policies/Fire%20-%20Open%20Fire%20By-Law%202014-48%20-%20Amend%202007-64.pdf

Thorne, T. J. 2017. Bats of Ontario. Newcastle Ontario: Hawk Owl Publication Inc.

Tree-guide.com Tree Age Calculator. Available on-line at:
http://www.tree-guide.com/tree-age-calculator

The Corporation of the Town of Wasaga Beach Comprehensive Zoning By-Law 2003-60. Office Consolidation January 2020. Schedules. Available on-line at:
https://www.wasagabeach.com/en/town-and-government/resources/By-laws-and-Policies/Zoning-By-law-2003-60-schedule-A--Office-Consolidation-2020.pdf

The Corporation of the Town of Wasaga Beach By-Law 2019-82. A by-law to prohibit or regulate the injuring or destruction of trees on private property in the Town of Wasaga Beach. Available on-line at:
https://www.wasagabeach.com/en/town-and-government/resources/By-laws-and-Policies/Tree%20Cutting%20By-Law.pdf

University of Kansas. Monarch Watch. Available on-line at:
https://monarchwatch.org/

University of Kansas. Monarch Habitat. Available on-line at:
https://monarchwatch.org/garden/
University of Kansas. Monarch Waystations. Available on-line at:
https://monarchwatch.org/waystations/

University of Kansas. Monarch Certification. Available on-line at:
https://monarchwatch.org/waystations/certify.htm

University of Wisconsin, College of Letters and Science, Field Station. Fingernail Clams.
https://uwm.edu/field-station/fingernail-clams/

21.0 Appendices

21.1 November 5, 2013 Meeting Minutes - NVCA and Burnside

Minutes of Meeting

Sabatini Lands – 8859 (former) Highway 26

Meeting Date:	Tuesday, November 5, 2013	**Date Prepared:**	November 7, 2013
Time:	3:00 p.m.		
Location:	Nottawasaga Valley Conservation Authority Offices		
File No.:	300030911.0000		

Those in attendance were:

Tom Reeve (TR)	Nottawasaga Valley Conservation Authority (NVCA)
Glenn Switzer (GS)	NVCA
Patti Young (PY)	NVCA
Kristine Loft (KL)	Loft Planning Inc.
Tim Lozon (TL)	R.J. Burnside & Associates Limited (Burnside)
James Orr (JO)	Burnside

Items Discussed **Action b**

1. **Introductions**

1.1 TL and JO introduced project, identified development lands, and produced NVCA regulation mapping, and other figures for review around the table.

1.2 PY indicated she had another meeting to attend, and requested to address any planning matters first.

2. **Project Background/Comment Status**

2.1 KL and JO indicated that the current work on the project was strictly at an investigation stage to determine the development limits and constraints w.r.t. the flood hazard.

2.2 JO acknowledged the pre-consultation meeting held in January 2012 at Town of Wasaga Beach (TOWB) and produced copies of minutes. PY had attended from NVCA w/ Dave Featherstone and Kate Northcott.

2.3 PY excused herself from meeting.

Minutes of Meeting
November 5, 2013 Page 2 of 3

3. **Floodplain Analysis to Date**

3.1 TL produced several copies of preliminary flood plain model mapping indicating projected flood line, culverts, and other drainage features.

3.2 TL explained that the Regulatory flows were consistent among West End Drainage Study, NVCA model, and Hwy 26 Delcan Report, however that there is little to no channelization of this flow through the property - there is widespread dissipation of the flow - it sheet flows throughout entire site. The cross sections within the hydraulic modelling do not contain the Regional flows and therefore produce vertical walls in the model, artificially increasing flood elevations.

3.3 TL outlined work to date by Burnside in developing the preliminary floodplain model, suggested results, challenges, and discrepancies between DEM, survey, and Generic Regulation Mapping.

3.4 JO indicated difficulty with obtaining topographic survey given the site conditions, dense vegetation, boggy ground, variable terrain.

3.5 TL indicated that existing culvert at Thomas Street has an internal vertical drop and would have to be modelled with PCSWM or other software independently pf HEC-RAS.

3.6 GS indicated that external drainage to the site would have to be accommodated with proposed design such that existing flow conditions and directions are maintained.

3.7 GS indicated that further investigation into ridge feature would be worthwhile to see if change in vegetation indicated on aerial mapping is related to an elevation change. This could help to map the sheet drainage into sub-catchments more clearly. Beacon may have some information in this regard as well.

3.8 GS suggested looking at downstream conveyance to the outfall (Georgian Bay) through Wasaga Beach, and to engage Town (M. Pincivero) to gather information and establish potential constraints and opportunities.

3.9 GS suggested walking the site from downstream outfall back up to Highway 26 to evaluate drainage corridor.

3.10 GS suggested that a new culvert crossing may provide an independent solution for the development if downstream conveyance is available.

4. **Actions for Burnside - Further Background Work**

4.1 Determine sag / spill point along Beachwood Road profile further to the east (not indicated on current extent of maps).

4.2 Field reconnaissance to determine if the visible vegetation divide from aerial photography represents a topographic feature as well which will define the division of sheet flow.

Minutes of Meeting
November 5, 2013 Page 3 of 3

4.3 Review West End Drainage Study again specifically looking at downstream conditions and conveyance capacity.

4.4 Determine Beachwood Road culvert capacities and downstream conveyance capacity - identify constraints and opportunities for improvements to pass flow.

4.5 Liaise with M. Pincivero at TOWB on this.

4.6 Burnside to issue Minutes and keep NVCA / TOWB apprised of updates and progress.

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise within seven days. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

R.J. Burnside & Associates Limited

James Orr, P.Eng.
Project Engineer
JO:lm

Distribution: Tom Reeve, NVCA (Via: Email - treeve@nvca.on.ca)
Glenn Switzer, NVCA (Via: Email - gswitzer@nvca.on.ca)
Patti Young, NVA (Via: Email - pyoung@nvca.on.ca)
Kristine Loft, LPI (Via: Email – kristine@loftplanning.com)
Tim Lozon, Burnside

030911 Minutes of Meeting with NVCA.docx
11/7/2013 12:32 PM

21.2 January 25, 2012 Meeting Minutes – NVCA, Equi-Knox, Pre-consultation Meeting.

THE CORPORATION OF THE TOWN OF WASAGA BEACH PLANNING DEPARTMENT

OFFICE USE ONLY

MEETING DATE: January 25, 2012 FILE NO.PRE-C01/12

APPLICANT: Nick Sabatini, John Purdy, Anita Purdy & Elizabeth Bradley

ADDRESS OF SUBJECT PROPERTY: 8859 Highway 26

PROJECT DETAILS: Residential Plan of Subdivision located southeast of Robert Street proposing 55 single detached units and 20 semidetached units

TYPE OF APPLICATION: Proposed Subdivision & Rezoning Applications

A pre-consultation meeting was held at the Classroom at the Town of Wasaga Beach to review and identify planning and design requirements for the above-noted development and to obtain information from each interested agency and/or department required for the applicant to obtain planning approval. The following is a summary of comments noted during the meeting.

ATTENDEES

NAME	AGENCY/DEPARTMENT
1.Kristine Loft	Loft Planning Inc.
2.Knox Henry	Equi-Knox Environmental Inc.
3.Dave Featherstone	NVCA
4.Patti Young	NVCA
5.Kate Northcott	NVCA
6.Mike Kusiar	Ainley Group
7.Mike Pincivero	Public Works
8.Gerry Reinders	Parks and Facilties
9.Ray Kelso	Planning
10.Nathan Wukasch	Planning

CIRCULATION OF CORRESPONDENCE

Distribution of comments received by the Town

AGENCY/DEPARTMENT	DATE RECEIVED
MTO, Peter Dorton	January 23, 2012
Ainley Group, Mike Kusiar	January 20, 2012, revised January 27, 2012
NVCA, Patti Young and Dave Featherstone	January 26, 2012

SUMMARY OF PROPOSAL

Proposed plan of subdivision of 55 single detached lots and 20 semi detached lots. Proposed Rezoning from Development (D) to Residential Type One (R1) and Residential Type Two (R2). Three lots proposed by Consent on Robert Street.

AGENCY/DEPARTMENT COMMENTS

Mike Pincivero – Town Engineer; Public Works Department
Severances on Robert Street

- cul-de-sac recently built at the south limit of Robert Street, for lot frontage need to extend the cul-de-sac or contact neighbour to obtain more frontage on Robert Street.
- Servicing – need to bring sanitary and water services south along Robert as well. – MTO setback requirement of 14 metres

Subdivision

- Refine road layout and geometry to conform to Town Engineering standards. Odd bends in road are not acceptable as they are difficult for maintenance and snow removal.
- Second road access connection should be provided on the east limit of the property for emergency service purposes.
- Drainage issues in the west end, the whole property is regulated by the NVCA.
- Minimum Daylighting triangles at intersections to be included on the plan (15 metres for an arterial road, 4 metres for a local road).
- Servicing connections and road stubs are to be provided to lands to the south and east to facilitate connections to abutting properties.
- Noise attenuation from new Highway 26 and existing Highway 26 is to be addressed.

Mike Kusiar – Ainley Group
Went through comments dated January 20, 2011. The reference to Marilyn Street is not applicable so comments will be revised. Reports to be submitted include a traffic report, functional servicing report, stormwater management reports, geotechnical report.

Gerry Reinders – Director of Parks and Facilities
There is a trail crossing at Airport Road and Highway 26 (main highway roundabout) that provides access to adjacent municipalities (Clearview Township and Collingwood). Eventual trail linkage should be made with this point. Trail connections should be demonstrated through an Active Transportation report. There are no parks in the west end – should look at coordinating a larger park with adjacent property owners.

Kate Northcott, Engineer in Training, NVCA
There are two watercourses on the property - one through the wetland that outlets at Thomas Street - the other at the east end of property that is fed by a culvert under Highway 26 new. Floodplain study is needed to determine flood protection for the west watercourse.

No erosion hazard assessment is required because it has no defined channel. Review DELCAN highway 26 drainage study. ‘O’ and ‘P’ catchment areas in the Delcan report will show how much water is going to be accepted from MTO lands.

For water course 2 (east end of property) have to accept drainage from Highway 26 new – can accept it and treat it or redirect it to the same outlet. Mr. Henry stated that he has evidence that the Highway 26 existing and Robert Street culvert is the cause of the wetland on the property as the invert is too high (bottleneck). Mr. Pincivero noted that this culvert under Highway 26 was replaced in 2008. Mr. Henry also stated that the New Highway 26 has been incorrectly graded, resulting in more water at Robert Street, and there is litigation concerning this issue. Mr. Henry enquired about the steps required for the Town to take over the existing Highway 26. Mr. Pincivero stated that there is a process – improvements will be required to the satisfaction of the Town.

Ms. Northcott noted that quality and quantity control is required. Post and predevelopment flows should remain the same. A stormwater management pond will likely be needed, and a watercourse is an acceptable outlet, but a wetland is not. Any development land greater than 5ha requires a stormwater management pond, whereas if development lands are less than 5ha then a pond may not be required.

Patti Young, Planner, NVCA
Identify constraints on one plan for submission with application. Province requires defining the floodplain plus a six-metre setback. The Conservation Authority requires a 30-metre wetland setback. Overlay constraints on the development plan.

Dave Featherstone, NVCA
Wetland work done by Beacon environmental was good. Development limits are generally okay. An EIS should include a review of species at risk and determine if any protection is required. What is the intention for ownership of the wetland area?

K. Loft stated that they would have to speak with their clients about it. R. Kelso stated that the Town would take ownership, but it would not be included as parkland, although portions of it could be if it was used for recreational purposes. K. Loft would like to discuss the potential for these lands to be used for trail purposes.

N. Wukasch reviewed the MTO comments and provided copies to the group. MTO would like to see one new intersection on Highway 26 existing for all of the surrounding lands, including lands to the north of the Highway. N. Wukasch to provide contact info for Mr. Rad Whitehead, owner of lands to the east (Mr. Rad Whitehead, Synergics Inc., 532 Sixth Street, Collingwood, Ontario, L9Y 3Y9, 705-444-1424, rwhite@georgian.net). A 14-metre setback is required for all buildings and structures from Highway 26 existing and new. This could be incorporated into an increased setback in the Zoning. MTO building and land use permits will be required within the MTO permitting area (within 45 metres of the Highway). MTO lands to the south could be purchased for inclusion in the development – contact Peter Dorton. Access via a public road connection must be provided to this parcel.

MTO comments on the proposed consents were included as an attachment to Mr. Dorton's email and are identical to comments provided on proposed consents on the west side of Robert Street for another developer. MTO 14 metre setback will likely result in the southernmost proposed lot being undevelopable. Consider different alignments of the cul-de-sac to maximize frontage. Services would have to be extended to the proposed lots. If using the existing cul-de-sac, a penalty of $25,000 per service would be applicable because the road would have to be altered to put in the new services. Mr. Sabatini was approached when the road and services were constructed and declined to put services in. Consider a different alignment of the lots, with potential to speak to landowner to the north to obtain more frontage on Robert Street. N. Wukasch to provide contact information (Verna Winnifred Shears, 65 Robert Street South, Wasaga Beach, Ontario, L9Z 2Y2). If the cul-de-sac is extended, no penalty would be assessed, but the other developer would receive the lands used for the cul-de-sac back.

The lands are designated Residential and zoned in the Development Zone, so they need to be rezoned to support the subdivision plan and consents. Adjacent lands to the east are designated Residential but zoned Service Commercial Holding (CSH).

R. Kelso went through the list of studies required for a complete application –
Archaeological assessment, EIS, Functional Servicing Study, Geotechnical study, legal survey, planning justification report, stormwater management report, traffic impact study, tree preservation plan, etc. EIS can be a scoped addendum to the Beacon Environmental work. A concept plan will be required for the property with the adjacent lands (Whitehead and MTO properties), showing shared road connections and parkland. A noise study for existing Highway 26 will be required.

Architectural control would be required as a condition of subdivision approval to ensure consistent and aesthetically pleasing development.

There seems to be two different approaches to provide access to the plan, from the Town and the MTO. One intersection on Highway 26 existing would work if a secondary access for emergency purposes was provided to Local Airport Road. A concept plan is required to show the interrelationships between the property and adjacent lands.

This summarizes the notes taken at the meeting. Please report any errors and/or omissions to the undersigned by Friday February 3, 2012.

Respectfully submitted,

Nathan Wukasch, Planner
Planning and Development Department

21.3 February 22, 2021 - NVCA Response to Property Inquiry

To: mclaughlin.environmental@gmail.com
From: Permits@nvca.on.ca
Date: 2/22/2021 9:12 AM
Subject: 8859 Beechwood Road, Wasaga Beach - Inquiry Response

Hello Dave,

Thank you for your inquiry to the Nottawasaga Valley Conservation Authority (NVCA) regarding the property located at 8859 Beechwood Road, Wasaga Beach.

The noted property appears to be partially regulated under the *Conservation Authorities Act* due to meander erosion hazards, flood hazards, Locally Significant Wetlands, and wetland buffer (NVCA regulates development within 120 metres of wetland features).

Permits will be required for any proposed development on the lot within the regulated boundary. For any proposed development outside of regulated lands, as confirmed by the NVCA, please contact the municipality. In general, all efforts must be made to locate works outside of these regulations where it is feasible to do so.

Development within the Hazard Lands:
If looking to construct an addition and your property is located within the hazard lands (erosion hazard (s) or floodplain) as identified above, the minor addition policy may apply. For information about **Minor Addition Policy**, please visit:
https://www.nvca.on.ca/Shared%20Documents/Planning%20and%20Regulations%20Guidelines.pdf

In addition, when proposing to build a new home/addition in the flood hazard, a basement is generally not permitted. However, a crawl space may be permitted provided it is unfinished and under 5’11”.

Development within Natural Heritage Lands (Wetlands):
In general, development and site alteration shall not be permitted in wetlands, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

We seek to maintain a minimum setback of 30 m away from the natural heritage feature; therefore, you may build within the regulated boundary, but a 30 m setback should be maintained from the identified wetland. The 30m setback is a general guideline which we like to suggest, however we do understand that some properties do not allow this setback. If you are not able to maintain the 30 m setback, appropriate studies may be required to support the development.

As part of the review of an application, the NVCA may request an Environmental Impact Study (EIS) to address interference with a wetland. An EIS is a mechanism for assessing impacts to determine the suitability of a proposal. The submission of an EIS does not guarantee approval of the works. An EIS must be carried out by a qualified professional, with recognized expertise in the appropriate area of concern and shall be prepared using established procedures and recognized methodologies to the satisfaction of the Authority.

NVCA Permit Process and Guidelines:
Development or redevelopment on the lot may be limited due to the natural hazard and natural heritage (wetland) features present. Additional development should be located within an area of least (and acceptable) risk. The proposal would need to be completely reviewed by NVCA staff through the permit process, once an application has been submitted with full payment received. Additional information may

be required depending on the proposal, this would be determined through the review of a permit application submission. The cost of any additional information (reports/studies) that is requested and considered necessary for the NVCA to make a decision is the responsibility of the applicant.

When someone is deciding on the purchase of a property, staff often suggests they submit an application as the "applicant/agent" with the current owner's consent. The current owner must sign the application and authorization letter, and if approved the permit would be granted to the new owner after ownership is transferred. This will give the opportunity for staff to provide comments before the applicant decides on purchasing the property. The fee associated is still required but will become full payment for the permit if granted.

When looking to submit an application the following information would be required:

- **Application** (see attached).
- **Payment** (Depending on proposal and hazards). We will contact you to advise that the **signed/completed** application form has been received. We will outline any outstanding requirements, advise of the permit cost, and provide a reference number to use when calling to make payment. ***Payment will not be accepted before a signed application is received and a file created in our system.***
- **Location Map** (showing nearest intersection).
- **Site Plan Drawing**- show existing and proposed works; property boundaries; street name(s); north arrow; and features of the site such as buildings and structures, tree lines, streams, wetlands, wet areas, springs, ditches, culverts, and elevation contours (existing and proposed grades). Include measurements and dimensions with consistent units (meters or feet). Show how much vegetation or tree cover is to be removed and where fill is to be located.
- **Digital Photo(s)** of the proposed work location (taken with a phone or camera).
- **Zoning Certificate/Approval (by email)** from local municipality (provide proposed site plan to Municipal Planning staff to review and confirm the proposal meets all Planning requirements. Municipal Planning staff can email permits@nvca.on.ca directly with their comments, and the site plan attached).
- **Authorization Form (if applicant/agent is not the owner, see page 6).**

Note: The process can become delayed waiting for the applicants' submission of the required information to complete our review and/or during busy periods when NVCA is experiencing high volumes of application submissions. These timelines are to be used as a target that NVCA strives to achieve. NVCA Staff endeavors to keep applicants informed of our process and move applications efficiently through our review.

To view NVCA's general regulation boundaries, check out the online **Interactive Property Map** available on our website. Maps are a tool for preliminary review of properties and to provide a visual display of any hazards. Please note that in the case of discrepancies between the mapping and the actual features on your property, the text of Ontario Regulation 172/06 prevails and the jurisdiction of the NVCA may extend beyond the areas shown on the maps. NVCA Planning and Regulation Guidelines and Ontario Regulation 172/06 can be accessed on our website at https://www.nvca.on.ca/planning-permits/planning-guidelines

Additionally, if not already initiated we would encourage you to consult with municipal Planning and Building department staff. The principle of development must be established during the review of any necessary *Planning Act* applications, not through the NVCA permitting process. These preliminary comments have been provided to outline the requirements to obtain a NVCA permit for works within a regulated area under O. Reg. 172/06 only. Should an application under the *Planning Act* be required to facilitate the proposed development, the applicant will be responsible for demonstrating that the proposal is consistent with the *Provincial Policy Statement* and in conformity with all other provincial plans. These preliminary comments shall be considered valid until such time as a *Planning Act* application is deemed necessary by the local approval authority. Please contact planning@nvca.on.ca for additional information.

NVCA requires additional information in order to complete our review and additional comments may be provided in the future once we have received a complete *Application for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit*.

Kind Regards,

Morgen
Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479│**F** 705-424-2115
permits@nvca.on.ca | www.nvca.on.ca

21.4 Vascular Plants Considered Rare in Simcoe County.

Appendix 5: Vascular Plants Considered Rare in Simcoe County			
Latin	Common	SRank	SARO
Aesculus glabra	Ohio Buckeye	S1	
Amelanchier amabilis	Beautiful Serviceberry	S2S3	
Aplectrum hyemale	Puttyroot	S2	
Aristida basirame	Forked Three-awned Grass	S2	END
Arnoglossum plantagineum	Tuberous Indianplantain	S3	SC
Asplenium scolopendrium var. americanum	American Hart's-tongue Fern	S3	SC
Bartonia virginica	Yellow Bartonia	S2	
Botrychium lanceolatum	Triangle Moonwort	S3	
Botrychium oneidense	Blunt-lobed Grapefern	S3	
Bouteloua curtipendula	Side-oats Grama	S2	
Carex argyrantha	Silvery-flowered Sedge	S2	
Carex folliculata	Northern Long Sedge	S3	
Carex schweinitzii	Schweinitz's Sedge	S3	
Carex trichocarpa	Hairy-fruited Sedge	S3	
Carex typhina	Cattail Sedge	S2	
Chenopodium foggii	Fogg's Goosefoot	S2	
Chimaphila maculata	Spotted Wintergreen	S1	END
Cirsium discolor	Field Thistle	S3	
Cirsium hillii	Hill's Thistle	S3	THR
Crataegus brainerdii	Brainerd's Hawthorn	S2	
Cyperus houghtonii	Houghton's Flatsedge	S3	
Cyperus schweinitzii	Schweinitz's Flatsedge	S3	
Cypripedium arietinum	Ram's-head Lady's-slipper	S3	
Cystopteris laurentiana	Laurentian Bladder Fern	S3	
Dichanthelium acuminatum ssp. spretum	Sand Panic Grass	S2	
Dichanthelium sphaerocarpon	Round-fruited Panic Grass	S3	
Digitaria cognata	Fall Crab Grass	S1	
Eleocharis rostellata	Beaked Spikerush	S3	
Elymus lanceolatus ssp. psammophilus	Great Lakes Wild Rye	S3	
Epilobium brachycarpum	Panicled Willowherb	SH	
Helianthemum canadense	Long-branched Frostweed	S3	
Hieracium gronovii	Queen Devil	S3	
Houstonia caerulea	Bluets	SH	
Hypericum ascyron	Great St. John'swort	S3	
Isoetes engelmannii	Engelmann's Quillwort	S1	END
Juglans cinerea	Butternut	S3	END
Juncus acuminatus	Sharp-fruited Rush	S3	
Juncus secundus	One-sided Rush	S3	
Linum medium var. medium	Stiff Yellow Flax	S3	
Listera australis	Southern Twayblade	S2	
Lithospermum caroliniense	Golden Puccoon	S3	
Mimulus moschatus	Muskflower	S2	
Najas gracillima	Thread-like Naiad	S2	
Najas guadalupensis	Southern Naiad	S3	

Latin	Common	SRank	SARO
Nelumbo lutea	American Lotus	S2	
Oenothera pilosella	Pilose Evening Primrose	S2	
Panax quinquefolius	Ginseng	S3	END
Panicum rigidulum	Redtop Panic Grass	S3	
Pascopyrum smithii	Western Wheat Grass	S3	
Peltandra virginica	Green Arrowarum	S2	
Persicaria arifolia	Halberd-leaved Tearthumb	S3	
Phegopteris hexagonoptera	Broad Beech Fern	S3	SC
Platanthera hookeri	Hooker's Orchid	S3	
Platanthera leucophaea	Eastern Prairie Fringed-orchid	S2	END
Platanthera macrophylla	Large Roundleaved Orchid	S2	
Poa saltuensis ssp. languida	Weak Blue Grass	S3	
Potamogeton bicupulatus	Snailseed Pondweed	S3	
Prunus pumila var. pumila	Sand Cherry	S3	
Pterospora andromedea	Woodland Pinedrops	S2	
Ranunculus hispidus var. hispidus	Bristly Buttercup	S3	
Rorippa aquatica	Lakecress	S3	
Rumex altissimus	Pale Dock	S2	
Sagittaria cristata	Crested Arrowhead	S3	
Salix myricoides	Blue-leaved Willow	S3	
Saururus cernuus	Lizard's-tail	S3	
Schizachyrium littorale	Shore Bluestem	S2	
Schoenoplectus heterochaetus	Slender Bulrush	S3	
Schoenoplectus smithii	Smith's Bulrush	S3	
Scleria verticillata	Low Nutrush	S3	
Silphium perfoliatum	Cup Plant	S2	
Symphyotrichum dumosum	Bushy Aster	S2	
Trichophorum clintonii	Clinton's Clubrush	S2S3	
Utricularia geminiscapa	Twin-stemmed Bladderwort	S3	
Valeriana uliginosa	Mountain Valerian	S2	

Source: Oldham, M.J., and S.R. Brinker. 2009.
SRank: S1 - Critically Imperiled in the province or state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.
S2 - Imperiled in the province or state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation.
S3 - Vulnerable in the province or state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
SH - Possibly Extirpated (Historical), species or community occurred historically in the province or state, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20–40 years.
SARO – Species at Risk in Ontario. **END** – Endangered, species lives in the wild in Ontario but is facing imminent extinction or extirpation.
THR – Threatened, species lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
SC – Special Concern, species lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.

21.5 Correspondence from Equi-Knox Environmental Inc Regarding the Wetland Classification.

Note: The relevant sections of the correspondence are highlighted. Only the first page of the email has been reproduced.

From: "Knox M Henry" <kmhenry@rogers.com>
To: "Nick Sabatini" nsabatini@rogers.com ;John & Anita Puddy" <jw.puddy@rogers.com>
Sent: Friday, November 18, 2011 3:18 PM
Attach: Development Charges.pdf; PLANNING FEESasofFebruary12011.pdf; Sabatini PCP1-PRELIM.pdf; Sabatini PCP1-PRELIM-window1 .pdf; Sabatini PCP1-PRELIM-window2.pdf; 211128_Figure01_ExistingConditions_20111013.pdf
Subject: Beacon Environmental and an update Hi Nick et al;

Unfortunately, I have been fighting influenza for the last couple of days and am only now beginning to feel well enough to sit up and do some work. I am thankful for Tylenol!

As I recall, Beacon Environmental estimated their original quotation on the basis that they would not have to make a visit to the site. Unfortunately, the opposition to your proposal and in particular from the NVCA, as well as one of your neighbours to the South and another to the East meant that:

- more time had to be spent by Beacon assisting us in preparing ammunition to fight the Azimuth report - four trips were made to the site (including, at my request, staking of the wetland perimeter to persuade the NVCA to accept a smaller wetland footprint) - at my request, 2 Beacon personnel also attended the meeting with the Planning Department at the Town of Wasaga Beach where we were successful in getting the department and the NVCA to accept a decreased area of wetland.

The result of all this is that we have proven that the wetland on your site is not a provincially significant wetland and this allows us to have less setback for any residential lots from the wetland perimeter. **Email truncated at this point.**

Best regards,

Knox

Knox M. Henry
Equi-Knox Environmental Inc.

www.equi-knoxenvironmental.com
45 Smithy Street, Suite 202
Markham ON L3P 6M6
Tel.: 905.294.6196 Cell: 416.587.5201 Fax: 905.294.6780
kmhenry@roaers.com

21.6 Town of Wasaga Beach Tree Cutting Permit Application.

Schedule 'A' to By-law 2019-82
Information Required for Application

1. Name, address and telephone number of all owners.

2. Signature or authorization of all owners.

3. Name, address, and telephone number and qualifications of Registered Professional Forester submitting report as part of application (if required).

4. Names, address and telephone number of person retained to perform work on trees under permit, and contact name if corporation or company.

5. Fax numbers and e-mail addresses for the owner(s), Registered Professional Forester and person performing work on trees where applicable.

6. Municipal address of property (if assigned).

7. Legal Description of property.

8. If deemed required by the Clerk, a statement/report from an Environmental Consultant confirming nesting period on a site-specific basis, subject to acceptance by the Town.

9. If deemed required by the Clerk - A Managed Forest Plan Report prepared by a Registered Professional Forester containing:

   a) A general description of the history of use of the property.
   b) Importance of the property to the surrounding landscape.
   c) A key map of the property showing the location of the property within the Town.
   d) A detailed map of the property showing the property boundary, vegetation type boundaries, fences, road, access roads or trails, hydro lines, utility lines, windbreaks, watercourses, grass fields, railways, buildings, towers, bridges, quarries, dams treed floods or swamps, mines, brush, marshes, debris piles, shallow rocky areas, orchards, hazard areas, development agricultural lands, plantations, and woodland areas.
   e) A description of the short term and long-term objectives of the landowner with respect to environmental protection, income/investment from the woodlot, wildlife habitat, recreation, forest products, or other objectives, the priorities assigned to these objectives and the plans for accomplishing these objectives.
   f) Details with respect to soil types, topography, physical features, water features, drainage, access, wildlife and inventory of trees and tree regeneration, and the method of calculating the inventory of trees with respect to each distinct area or compartment within the woodlot which may be subject to different considerations in accordance with good forestry practice.
   g) A silvicultural prescription for each forest compartment within the woodlot including a description of any trees to be injured, destroyed or removed, together with a statement that the silvicultural prescription is in accordance with good forestry practice.

21.7 Correspondence with MECP Regarding the ESA

To: Paul Heeney paul.heeney@ontario.ca
From: Dave McLaughlin mclaughlin.environmental@gmail.com
June 7, 2021
9:13 pm

Hello Paul, it's been a while since our last correspondence, I hope you, your family and your colleagues are well and safe. It looks like we only have a few more months to endure until things begin to return to the new normal. I'm scheduled to receive my 2nd vaccination on Wednesday, so I'm confident the worst is behind me.

I have a quick question about the ESA. I believe I know the answer, I just want to be absolutely certain. Species on the ESA 2007 O.Reg. 230/08 list are given a designation: extirpated, endangered, threatened, and special concern.

The provisions in the ESA don't mention the designation 'special concern', specifically.

Prohibition on killing, etc.
9 (1) No person shall,
(a) kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;

Prohibition on damage to habitat, etc.
10 (1) No person shall damage or destroy the habitat of,
(a) a species that is listed on the Species at Risk in Ontario List as an endangered or threatened species; or
Am I correct that species designated 'special concern', even though they are listed in O. Reg. 230/08, are not provided regulatory protection under the ESA? In other words, the ESA only applies to species that are designated 'endangered' or 'threatened'. If that is the case, then why list 'special concern' species in the regulation? Are there other provisions in the ESA that relate specifically to 'special concern' species?

Case in point. I just completed a breeding bird survey on a 7-ac woodlot in the Guelph area and the only SARO bird species was the Eastern Wood Pewee, designated 'special concern'. Only one bird was heard calling and there were no signs of breeding activity. If the plan of subdivision is approved most of the woodlot will be removed to facilitate estate residential houses. Because of the 'special concern' designation am I correct that there is no regulatory requirement under the ESA to protect habitat for this bird species?

Thanks for your clarification.
Dave.
--
Dave McLaughlin
Cotyledon Environmental Consulting
BB: 289.233.3762
www.cotyledonenvironmental.com

To: Dave McLaughlin mclaughlin.environmental@gmail.com
From: Paul Heeney paul.heeney@ontario.ca
June 7, 2021
9:21 pm

Hi Dave,
Good to hear from you. And yes, so far, we have all been doing well at work to stay safe (and sane!) and family is good too. I am really enjoying seeing the "light at the end of the tunnel" for sure. Glad to hear you will fully vaccinated. I have my first and am waiting anxiously for shot number two. Hope you are well, and work has been going well.
You are correct – special concern species are not afforded the protections of section 9 and 10 of the ESA. There is a provision (section 12) about preparing management plans for these species. These really are meant to provide some general direction for anyone to use.

When it comes to habitat, it generally falls within the purview of municipalities or MNRF, as the case may be, when it comes to protecting those areas. They may be looked upon as more significant that other natural features and areas but aren't within the purview of section 10.

Same for species, there may be other protections afforded, through for example the Fish and Wildlife Conservation Act or perhaps some federal legislation.

Hope that helps, Dave. Happy to answer any other questions this might raise.

Paul

Paul Heeney
Manager, Permissions and Compliance
Species at Risk Branch
Ministry of the Environment, Conservation and Parks
40 St. Clair. Ave. W., Toronto ON M4V 1M2
paul.heeney@ontario.ca
C: (613) 202-1889

21.8 The Cotyledon Environmental Consulting Team that worked on the Beachwood Road sEIS

Dave McLaughlin
Dave McLaughlin is the owner and scientist of *Cotyledon Environmental Consulting*. He was a senior scientist and program director with the Ontario Ministry of the Environment for almost four decades, where he investigated the impacts of pollution on the terrestrial environment in all eco-zones across Ontario.

Dave McLaughlin obtained a BSc and an MSc from the University of Toronto, where he was an adjunct professor for 15 years.

As a government forensic scientist in the 1980s, Mr. McLaughlin led a multi-year study of the impacts of acidic deposition on Ontario's forests. More recently, he coordinated studies assessing the environmental impacts of historic mining activities on communities across the province. He is an expert phytotoxicologist with almost 40 years of professional experience and expert knowledge of environmental sampling, the recognition of air pollution injury symptoms on plants, pollution impacts on soil and vegetation, and the environmental regulatory framework.

During his government career he planned, conducted, and reported on phytotoxicology studies around dozens of pollution sources, including aluminum, base metal and uranium smelters and refineries, foundries, fertilizer and glass manufactures, brickyards, iron and steel mills, petrochemical refineries, municipal refuse and sewage incinerators, salt storage facilities and many other pollution sources that may impact the terrestrial environment. This experience and knowledge made Mr. McLaughlin a leading scientific advisor in the Ministry's program of evaluating and risk managing the ecological and human health impacts on communities with landscape-scale environmental contamination from historic industrial emissions. In this role he coordinated, or was a key scientific contributor, to soil contaminant assessment projects for communities in the Ontario municipalities of Toronto, Mississauga, Deloro, Galetta, Wawa, Port Hope, Cornwall, Cobalt, Sudbury, and Port Colborne.

From 2006 to 2007 he was the science liaison for a team of government policy advisors that negotiated agreements on transboundary air pollution between Ontario and its American air-shed neighhbours of Michigan, New York and NESCAUM (*North East States for Co-ordinated Air Use Management*), and the provinces of Quebec and New Brunswick.

Dave McLaughlin completed his career with the Ontario Ministry of the Environment as the Assistant Director of the Ministry's Environmental Monitoring and Reporting Branch, the Ontario government's premier environmental science Branch responsible for more than 40 ambient air, land and water monitoring programs across the province. In 2004 the Environmental Monitoring and Reporting Branch received the prestigious ECO

Award from the Environmental Commissioner of Ontario in recognition of the importance of, and the commitment to, long term ambient environmental monitoring.

Dave McLaughlin is the author or editor of more than 300 government reports and 11 articles in peer reviewed scientific journals. In his almost 40-year government career he received considerable recognition for his integrity in working with community stakeholders and his comprehensive scientific knowledge. This recognition culminated in his receipt of three Emerald Awards, the Ministry of the Environment's highest recognition for professional achievement, for his role in the Deloro, Sudbury and Port Colborne community-based soil risk assessments. In addition, he is also the recipient of an Amethyst Award, the Ontario Public Service's highest recognition for professional achievement, for his role in stakeholder and community engagement for the cleanup and remediation of the province's largest PCB storage facility at Pottersburg Creek in London, Ontario.

After retirement from government service, in 2012 Dave McLaughlin started *Cotyledon Environmental Consulting*, a sole-proprietor consulting service based in Brampton, Ontario. Recently marking 11 years in business, Cotyledon has been the primary contractor, or a sub-contracted partner, on 67 projects for private, corporate, non-profit and government clients across Ontario.

Fiona Reid
Fiona Reid earned a BA in biology from Cambridge University and an MSc in Animal Behavior from SUNY at Stony Brook, New York. She has written and/or illustrated more than a dozen books on mammals, including: *A Field Guide to the Mammals of Central America and Southeast Mexico* (Oxford University Press) and a *Peterson Field Guide to Mammals of North America (Houghton-Mifflin).* For these two books, which she both authored and illustrated, she captured and drew from life almost all the bats and small rodents. She also illustrated *The Golden Guide to Bats of the World, Bats of Papua New Guinea*, and *Mammals of the Neotropics* (volumes 1–3), and she coauthored and partially illustrated *Wildlife of Costa Rica.* Fiona also co-authored and illustrated *Bats of Trinidad and Tobago*, published in 2016. Fiona has worked as an eco-tourist guide for 33 years, leading trips to numerous destinations worldwide. Her tours focus on mammals and birds. She has done environmental survey work for the Credit Valley Conservation Authority in Ontario, and for the Royal Ontario Museum in Ecuador, Guyana and Costa Rica. She has been studying birds in Halton Region for 26 years and took part in the *Ontario Breeding Bird Atlas 2001-2005*. During that survey she recorded over 120 breeding birds in her atlas square.

Sarah Robins
Sarah Robins earned a Bachelor of Environmental Studies from York University, Toronto, in 2007 and an Environmental Technology Diploma from Georgian College in Barrie in 2015. She has several environmental certifications, including Can-CISEC, CISEC Inc. (2018), Reptile and Amphibian Survey Course, MNRF (2017), Ontario Wetland Evaluation System (OWES) (2017), Aboriginal Cultural Awareness (2016),

Ecological Land Classification (2016), MNRF Level 1 Fish Identification (2016), and Level 1 Benthic Identification (OBBN, 2016). Sarah is a member of the Canadian Herpetological Society (2018) and the Field Botanists of Ontario (2017).

Sarah has more than nine years of professional experience as a terrestrial ecologist, during which she provided support on land development projects in southern and central Ontario and authored environmental impact studies (EIS), annual monitoring reports, and technical reports, and contributed to Class Environmental Assessments (EA) and Environmental Monitoring Plans (EMPs). Additional professional expertise includes vegetation inventories, ecological land classification (ELC), wetland delineation, targeted reptile studies, anural call surveys, sediment transport assessment, environmental compliance monitoring, construction monitoring and water quality monitoring programs.

As a terrestrial ecologist, she has taken a particular interest in species at risk bats (Eastern Small-food Myotis, Little Brown Myotis, Northern Myotis and Tri-coloured bat) and has become a leader in the research and execution of various bat habitat assessments and presence/absence studies.

Cotyledon
Environmental Consulting
www.cotyledonenvironmental.com

Memorandum

To: Mike Pincivero, Town of Wasaga Beach

Cc: Rob Watters, Watters Environmental
James Orr, R.J. Burnside & Associates

From: Dave McLaughlin, Cotyledon Environmental Consulting

Subject: Desktop OWES Evaluation of the Unevaluated Wetland on the Sunray Living property on Beachwood Road, Wasaga Beach

Date: February 26, 2024

Cotyledon was asked to complete a desktop screening of the unevaluated wetland on the Sunray Living property on Beachwood Road in Wasaga Beach. This wetland is the same wetland that is described in the recent 2023 Cotyledon EIS for 8859 Beachwood Road. This screening followed the *Ontario Ministry of Natural Resources and Forestry Ontario Wetland Evaluation System (OWES), Southern Manual, 3rd Edition, Version 3.2, 2013.*

An OWES evaluation is a very thorough characterization of the biological, social, cultural, hydrological, and flora and fauna rarity encountered in the wetland. The observations and data must be supported with robust field work and comprehensive supporting documents. The completed OWES worksheet and supporting documents are submitted to the MNRF for review and approval. If the evaluation is approved by the MNRF, the physical characteristics of the wetland and it's OWES designation are posted on the Land Information Ontario portal and the Natural Heritage Information Centre.

The evaluation summarized in this memo is a desktop screening. The exercise precisely followed the OWES scoring worksheet. However, the usual supporting documentation was not compiled and the OWES package will not be forwarded to the MNRF. This exercise was conducted to assist the Town of Wasaga Beach and the Nottawasaga Valley Conservation Authority in their review of the 2023 Cotyledon EIS. Specifically, the reviewing agencies requested additional information to support the EIS's conclusion that this unevaluated wetland is not ecologically diverse and complex enough to be a *Provincially Significant* wetland. Wetlands that are designated Provincially Significant warrant a greater degree of protection than unevaluated wetlands. Generally, the disturbance of a Provincially Significant wetland is not permitted when the wetland is proposed to be removed for the purpose of obtaining additional land for development. However, approval agencies can allow a Provincially Significant wetland to be disturbed or removed if the proposal is a municipally-driven initiative to mitigate a hazard such as flooding or erosion.

The OWES evaluation is a scoring exercise. A wetland that scores higher than 600 points in total, or 200 points in either the biological component or the special features component, is designated a Provincially Significant wetland. The attached table summarizes the OWES worksheet and scoring of the various wetland attributes. The Beachwood Road unevaluated wetland scored a total of 355 points, which included 68 points in the biological component and 133 points in the special features component. The wetland does not meet the Provincially Significant threshold by any of the three measures. The score of 355 is based on a possible 1,773 points, which approximates the 20th percentile, or just 20% of the possible maximum score. This low rating reflects the observations in the 2023 Cotyledon EIS and the conclusion that not only is the wetland not Provincially Significant, but it has a relatively low ecological service value.

The wetland score of 355 points may be slightly biased on the high side for two reasons. In Section 3.5.1 of the worksheet no allowance is made for a wetland on a perched water table. If the wetland is isolated or a palustrine wetland, this Section scores 50 points, which is the maximum score for this Section. A palustrine wetland may not have a permanent inflow or outflow, so the water sits for some time in the wetland basin. In theory, this is a favourable wetland attribute because the standing surface water has an opportunity to percolate downwards and contribute to groundwater recharge, hence the high score. However, there is no sub-category for a wetland like the Beachwood Road wetland, which is a palustrine wetland that sits on a perched water table because of a near-surface impermeable soil hard pan, which prevents the downward percolation of standing surface water and the subsequent groundwater recharge. This is a substantially less favourable wetland attribute and should score lower. If it scored similar to a riverine wetland that has a continuous inflow and outflow, and therefore less opportunity for downward percolation, the score would be 20 instead or 50. The lower total wetland score would then be 325 instead of 355, which drops the wetland rating to the 18th percentile.

The second potentially bias score is Section 4.1.2.3. This Section scores provincial, regional, and local significant animal species that use, but are not dependent on, the wetland. This was a difficult Section to score, because two SAR species, the Little Brown Myotis and the Eastern Wood Pe-wee, were observed to be foraging in the woodland adjacent to the wetland. It must be assumed they were also foraging in the wetland, so they were scored accordingly. This added 80 points to the score. Neither species are dependent on the wetland; in other words, they would still nest, forage, and rest in the adjacent woodlands if the wetland were not present, so the survival of the local SAR population would not be compromised by the absence of the wetland. If these two species were removed from this Section the score would be 0 instead of 80. The lower total wetland score would be 275 instead of 355, which drops the wetland rating to the 15th percentile.

If the scoring in Sections 3.5.1 and 4.1.2.3 were both adjusted the total wetland score would be 245, which drops the wetland rating to the 13th percentile.

Conclusion

This desktop OWES evaluation was not a trivial exercise. The OWES protocol is very comprehensive. Scoring is not just a matter of ticking boxes. Each Section must be thoroughly evaluated in order to accurately reflect the known conditions of the wetland. In many instances a professional opinion must be made to determine which of the presented options is the most appropriate.

Based on this desktop evaluation, the Beachwood Road wetland would score between 245 and 355 points of a potential 1,773 points. This reflects a range of between the 13th and the 20th percentile.

This does not meet the threshold of a Provincially Significant wetland, which is 600 points in total or 200 points in either the biological component or the special features component. This exercise substantiates the conclusion of the 2023 Cotyledon EIS that not only is the Beachwood Road wetland not Provincially Significant, but that the wetland has a relatively low ecological service value.

DMcLaughlin

Dave McLaughlin, BScF, MScF
Owner and Principal Scientist
Cotyledon Environmental Consulting

OWES Worksheet Summary[1] Unevaluated Wetland on the Sunray Group Beachwood Road Property in Wasaga Beach		
OWES Component Description	Score	Possible Score
1.0 Biological Component		
1.1 Productivity		
1.1.1 Growing Degree-Days/Soils	15	30
1.1.2 Wetland Type	8	15
1.1.3 Site Type	2	5
1.2 Biodiversity		
1.2.1 Number of Wetland Types	9	30
1.2.2 Vegetation Communities	9	45
1.2.3 Diversity of Surrounding Habitat	6	7
1.2.4 Proximity to Other Wetlands	5	8
1.2.5 Interspersion	9	30
1.2.6 Open Water Types	0	30
1.3 Size (Biological Component)	5	50
Total Score for Biological Component (A)	**68**	**250**
2.0 Social Component		
2.1 Economically Valuable Products		
2.1.1 Wood Products	0	18
2.1.2 Wild Rice	0	6
2.1.3 Commercial Bait Fish	0	12

OWES Worksheet Summary[1] Unevaluated Wetland on the Sunray Group Beachwood Road Property in Wasaga Beach		
OWES Component Description	Score	Possible Score
2.1.4 Furbearers	0	12
2.2 Recreational Activities	0	80
2.3 Landscape Aesthetics		
2.3.1 Distinctiveness	0	3
2.3.2 Absence of Human Disturbance	4	7
2.4 Educational and Public Awareness		
2.4.1 Educational Uses	0	20
2.4.2 Facilities and Programs	0	8
2.4.3 Research and Studies	0	12
2.5 Proximity to Areas of Human Settlement	40	40
2.6 Ownership	4	10
2.7 Size (Social Component)	2	20
2.8 Aboriginal Values and Cultural Heritage		
2.8.1 Aboriginal Values	0	30
2.8.2 Cultural Heritage	0	30
Total Score for Social Component (B)	**50**	**308**
3.0 Hydrological Component		
3.1 Flood Attenuation	1	100
3.2 Water Quality Improvement		

OWES Worksheet Summary[1] **Unevaluated Wetland on the Sunray Group Beachwood Road Property in Wasaga Beach**		
OWES Component Description	Score	Possible Score
3.2.1 Short Term Water Quality Improvement	42	60
3.2.2 Long Term Water Quality Improvement	0	10
3.2.3 Ground Discharge	7	30
3.3 Carbon Sink	0	5
3.4 Shoreline Erosion	0	15
3.5 Groundwater Recharge		
3.5.1 Site Type	50	50
3.5.2 Soil Recharge Potential	4	10
Total Score for Hydrological Component (C)	**104**	**280**
4.0 Special Features Component		
4.1 Rarity		
4.1.1 Wetland Types		
4.1.1.1 Rarity Within the Landscape	40	80
4.1.1.2 Rarity of Wetland Type	0	80
4.1.2 Species		
4.1.2.1 Reproductive Habitat for Endangered or Threatened Species	0	No Max (+250)[2]
4.1.2.2 Traditional Migration of Feeding Habitat for an Endangered or Threatened Species	0	No Max (+150)
4.1.2.3 Provincially Significant Animal Species	80	No Max (+50)
4.1.2.4 Provincially Significant Plant Species	0	No Max (+50)

OWES Worksheet Summary[1] Unevaluated Wetland on the Sunray Group Beachwood Road Property in Wasaga Beach		
OWES Component Description	Score	Possible Score
4.1.2.5 Regionally Significant Species	0	No Max (+20)
4.1.2.6 Locally Significant Species	0	No Max (+10)
4.2 Significant Features and Habitats		
4.2.1 Colonial Waterbirds	0	50
4.2.2 Winter Cover for Wildlife	0	150
4.2.3 Waterfowl Staging and/or Moulting Areas	0	150
4.2.4 Waterfowl Breeding	0	100
4.2.5 Migratory Passerine, Shorebird or Raptor Stopover Area	0	100
4.2.6 Fish Habitat		
4.2.6.1 Spawning and Nursery Habitat	0	100
4.2.6.2 Migratory and Staging Habitat	0	25
4.3 Ecosystem Age	3	25
4.4 Great Lakes Coastal Wetlands	10	75
Total Score for Special Features Component (D)	**133**	**935 (+530)**
Total OWES Score (Sum of 4 Components = A+B+C+D)	**355**	**1,773 (+530)**

1 – Ontario Wetland Evaluation System. Southern Manual. 3rd Edition. Version 3.2. 2013. See Appendix for the complete worksheet.
2 – No Maximum Score. Score the number in brackets for each SAR, Provincial, Regional, or local rare species.

Appendix: The OWES Work Sheet

Reproduced from the OWES Wetland Data and Scoring Record.

i) Wetland Name: *Beachwood Road, Wasaga Beach. Property owned by the Sunray Group. Wetland to be impacted by the Town of Wasaga Beach West End Flood Mitigation Proposal*.

ii) MNR Administrative Region: *Southern Region*
MNR District: *Aurora Midhurst Owen Sound District*
MNR Area Office: *Barrie Area Office*

iii) Conservation Authority: *Nottawasaga Valley Conservation Authority.*

iv) County of Regional Municipality: *Simcoe County.*

v) Township/Geographic Twp and/or Local Municipality: *Town of Wasaga Beach.*

vi) Lot and Concession: *Part Lot 34, Concession 4.*

vii) Ecodistrict/Ecoregion: *Ecoregion 6E, Mixed-wood Plains Ecozone, the Lake Simcoe-Rideau Ecoregion. Ecodistrict - 6E-6, Barrie.*

viii) Map and Air Photo References
- a) Latitude and Longitude: *44º 28' 05.90" N and 80º 07' 26.05" W.*
- b) UTM Grid Reference: *Not Relevant for this exercise.*
  - Zone: *Not Relevant for this exercise.*
  - Block: *Not Relevant for this exercise.*
  - E: *Not Relevant for this exercise.*
  - N: *Not Relevant for this exercise.*
- c) National Topographic Series
  - Map names: *Not Relevant for this exercise.*
  - Map number: *Not Relevant for this exercise.*
  - Edition: *Not Relevant for this exercise.*
  - Scale: *Not Relevant for this exercise.*
- d) Aerial Photographs
  - Date(s) photo taken: *Not Relevant for this exercise.*
  - Scale: *Not Relevant for this exercise.*
  - Flight and Plate Numbers: *Not Relevant for this exercise.*
- e) Ontario Base Map Numbers and Scale: *Not Relevant for this exercise.*

ix: Wetland Size a) or b)
- a) Single Contiguous Wetland Area: *3.6 ha*
- b) Wetland Complexed Comprised of *1 Individual Wetland*:

1.0 BIOLOGICAL COMPONENT

1.1 PRODUCTIVITY

1.1.1 Growing Degree-Days/Soils *(max: 30 pts)*

Refer to page 43 of manual for further explanation.

1. Determine the correct GDD value for your wetland (use Figure 5).
2. Circle the appropriate GDD value from the evaluation table below.
3. Determine the Fractional Area (FA) of the wetland for each soil type.
4. Multiply the fractional area of each soil type by the applicable score-factor in the evaluation table.
5. Sum the scores for each soil type to obtain the final score (maximum score is 30 points).

NOTE: *In wetland complexes the evaluator should aim at determining the fractional area occupied by the categories for the complex as a whole.*

Growing Degree-Days		Clay-Loam	Silt-Marl	Lime-stone	Sand	Humic-Mesic	Fibric	Granite
	<2800	15	13	11	9	8	7	5
	2800-3200 ✓	18	15	13	11	9	8	7
	3200-3600	22	18	15	13	11	9	7
	3600-4000	26	21	18	15	13	10	8
	>4000	30	25	20	18	15	12	8

Soil Type	FA of wetland in soil type		Enter appropriate score-factor from above table		
Clay/Loam	25	x		=	
Silt/Marl:	1	x	15	=	15
Limestone:		x		=	
Sand:		x		=	
Humic/Mesic:		x		=	
Fibric:		x		=	
Granite:		x		=	
Total	1		15		15

GDD/Soils score *(maximum 30 points)* 15

1.1.2 Wetland Type

(Fractional Areas = area of wetland type/total wetland area)

	Fractional Area		Score
Bog		x 3 =	
Fen		x 6 =	
Swamp	1	x 8 =	8
Marsh		x 15 =	
Total	1	=	8

Wetland type score *(maximum 15 points)* 8

1.1.3 Site Type

(Fractional Area = area of site type/total wetland area)

	Fractional Area		Score
Isolated		x 1 =	
Palustrine (permanent or intermittent flow)	1	x 2 =	2
Riverine		x 4 =	
Riverine (at rivermouth)		x 5 =	
Lacustrine (at rivermouth)		x 5 =	
Lacustrine (with barrier beach)		x 3 =	
Lacustrine (exposed to lake)		x 2 =	
Total		=	

Site Type Score *(maximum 5 points)* 2

1.2.1 Number of Wetland Types

(Check only one)

✓	One	=	9 points
	Two	=	13
	Three	=	20
	Four	=	30

Number of Wetland Types Score
(maximum 30 points) 9

1.2.2. Vegetation Communities

Use the data sheet provided in Appendix 4 to record and score vegetation communities (the completed form must be attached to this data record)

Scoring *(circle only one option for each of the columns below):*

Total # of communities with **1-3 forms**			Total # of communities with **4-5 forms**			Total # of communities with **6 or more forms**		
1	=	1.5 pts	1	=	2 pts	1	=	3 pts
2	=	2.5	2	=	3.5	2	=	5
3	=	3.5	3	=	5	3	=	7
4	=	4.5	4	=	6.5	4	=	9 ✓
5	=	5	5	=	7.5	5	=	10.5
6	=	5.5	6	=	8.5	6	=	12
7	=	6	7	=	9.5	7	=	13.5
8	=	6.5	8	=	10.5	8	=	15
9	=	7	9	=	11.5	9	=	16.5
10	=	7.5	10	=	12.5	10	=	18
11	=	8	11	=	13	11	=	19
+ 0.5 *for each additional community*	=		+ 0.5 *for each additional community*	=		+ 1.0 *for each additional community*	=	

Vegetation Communities Score
(maximum 45 points) 9

1.2.3 Diversity of Surrounding Habitat

Check all appropriate items. Only habitat within 1.5 km of the wetland boundary and at least 0.5 ha in size are to be scored.

✓	row crop
✓	pasture
✓	abandoned agricultural land
	deciduous forest
	coniferous forest
✓	mixed forest*
	abandoned pits and quarries
✓	open lake or deep river
	fence rows with deep cover, or shelterbelts
	terrain appreciably undulating, hilly or with ravines
✓	creek flood plain

* *"Mixed forest" is defined as either 25% coniferous trees distributed singly or in clumps in deciduous forest, or 25% deciduous trees distributed singly or in clumps in coniferous forest. Note that Forest Resource Inventory (FRI) maps can be misleading since 25% conifer within a unit could be entirely concentrated around a lake.*

Score 1 point for each feature checked, up to a maximum of 7 points.

Diversity of Surrounding Habitat Score
(maximum 7 points) 6

1.2.4 Proximity to Other Wetlands

Check highest appropriate category. (Note: if the wetland is lacustrine, score option #1 at 8 points).

✓		Points
	Hydrologically connected by surface water to other wetlands different dominant wetland type), or to open lake or deep river within 1.5 km	8
	Hydrologically connected by surface water to other wetlands (same dominant wetland type) within 0.5 km	8
	Hydrologically connected by surface water to other wetlands (different dominant wetland type), or to open lake or deep river from 1.5 to 4 km away	5
	Hydrologically connected by surface water to other wetlands (same dominant wetland type) from 0.5 to 1.5 km away	5
✓	Within 0.75 km of other wetlands (different dominant wetland type) or open water body, but not hydrologically connected by surface water	5
	Within 1 km of other wetlands, but not hydrologically connected by surface water	2
	No wetland within 1 km	0

Name and distance (from wetland) of wetlands/waterbodies scored above:

Georgian Bay

Proximity to other Wetlands Score
(maximum 8 points) 5

1.2.5 Interspersion

Number of Intersections = 58

✓	Number of Intersections *(Check one only)*		Points
	26 or less	=	3
	27 to 40	=	6
✓	41 to 60	=	9
	61 to 80	=	12
	81 to 100	=	15
	101 to 125	=	18
	126 to 150	=	21
	151 to 175	=	24
	176 to 200	=	27
	>200	=	30

Interspersion Score *(maximum 30 points)* 9

1.2.6 Open Water Types

NOTE: *this attribute is only to be scored for permanently flooded open water within the wetland (adjacent lakes do not count). Check one option only.*

✓	Open Water Type	Characteristic		Points
	Type 1	Open water occupies < 5 % of wetland area	=	8
	Type 2	Open water occupies 5-25% of wetland (occurring in central area)	=	8
	Type 3	Open water occupies 5-25% (occurring in various-sized ponds, dense patches of vegetation or vegetation in diffuse stands)	=	14
	Type 4	Open water occupies 26-75% of wetland (occurring in a central area)	=	20
	Type 5	Open water occupies 26-75% of wetlands (small ponds and embayments are common)	=	30
	Type 6	Open water occupies 76%-95% of wetland (occurring in large central area; vegetation is peripheral)	=	8
	Type 7	Open water occupies 76-95% of wetland (vegetation in patches or diffuse open stands)	=	14
	Type 8	Open water occupies more than 95% of wetland area	=	3
✓	No open water		=	0

Open Water Type Score *(maximum 30 points)* 0

1.3 SIZE (BIOLOGICAL COMPONENT)

Total Size of Wetland = 3.6 ha

Sum of scores from Biodiversity Subcomponent

1.2.1
+ 1.2.2
+ 1.2.3
+ 1.2.4
+ 1.2.5
+ 1.2.6

38

Circle the appropriate score from the table below.

	Total Score for Biodiversity Subcomponent									
Wetland size (ha)	<37	37-47	48-60	61-72	73-84	85-96	97-108	109-120	121-132	>132
<20 ha	1	5	7	8	9	17	25	34	43	50
20-40	5	7	8	9	10	19	28	37	46	50
41-60	6	8	9	10	11	21	31	40	49	50
61-80	7	9	10	11	13	23	34	43	50	50
81-100	8	10	11	13	15	25	37	46	50	50
101-120	9	11	13	15	18	28	40	49	50	50
121-140	10	13	15	17	21	31	43	50	50	50
141-160	11	15	17	19	23	34	46	50	50	50
161-180	13	17	19	21	25	37	49	50	50	50
181-200	15	19	21	23	28	40	50	50	50	50
201-400	17	21	23	25	31	43	50	50	50	50
401-600	19	23	25	28	34	46	50	50	50	50
601-800	21	25	28	31	37	49	50	50	50	50
801-1000	23	28	31	34	40	50	50	50	50	50
1001-1200	25	31	34	37	43	50	50	50	50	50
1201-1400	28	34	37	40	46	50	50	50	50	50
1401-1600	31	37	40	43	49	50	50	50	50	50
1601-1800	34	40	43	46	50	50	50	50	50	50
1801-2000	37	43	47	49	50	50	50	50	50	50
>2000	40	46	50	50	50	50	50	50	50	50

Size Score (Biological Component)
(maximum 50 points) 5

2.0 SOCIAL COMPONENT

2.1 ECONOMICALLY VALUABLE PRODUCTS

2.1.1 Wood Products

Check the option that best reflects the total area (ha) of forested wetland (i.e., areas where the dominant vegetation form is h or c). Note that this is the area of all the forested vegetation communities, not total wetland size. Do not include areas where harvest is not permitted. Check only one option.

Area of wetland used for scoring 2.1.1: 3.6 ha

✓	< 5 ha	=	0 pts
	5 - 25 ha	=	3
	26 – 50 ha	=	6
	51 – 100 ha	=	9
	101 – 200 ha	=	12
	> 200 ha	=	18

Source of information:

Cotyledon 2023 EIS

Wood Products Score *(maximum 18 points)* 0

2.1.2 Wild Rice

Check only one.

	Present (min. size 0.5 ha)	=	6 pts
✓	Absent	=	0
	Harvest not permitted	=	0

Source of information:

Cotyledon 2023 EIS

Wild Rice Score *(maximum 6 points)* 0

2.1.3 Commercial Bait Fish

Check only one.

	Present	=	12 pts
✓	Absent	=	0
	Fishing not permitted	=	0

Source of information:

Cotyledon 2023 EIS

Commercial Fish Score *(maximum 12 points)* 0

2.1.4 Furbearers

Only species recognized as furbearers under the Fish & Wildlife Conservation Act may be scored here. Score 3 *points for each furbearer species listed, up to a maximum of 12 points.*

	Name of furbearer	Source of information
1.		
2.	Private property, trespassing and trapping are prohibited.	
3.		
4.		
5.		
6.		

Furbearer Score *(maximum 12 points)* 0

2.2 RECREATIONAL ACTIVITIES

Sources of information and reasons for scoring a wetland under high or moderate use below, must be included below.

Circle one score for each of the activities listed. Score is cumulative – add score for hunting, nature enjoyment and fishing together for final score.

Intensity of Use	Type of Wetland-Associated Use: Hunting	Nature Enjoyment/ Ecosystem Study	Fishing
High	40 points	40 points	40 points
Moderate	20	20	20
Low	8	8	8
Not Possible/ No evidence	0 ✓	0 ✓	0 ✓

Sources of information (include evidence/criteria forming basis for score and any relevant reference used to obtain that information):
- *e.g., Hunting scored at 20 points: 5 hunting blinds observed; hunters using area frequently monitored for compliance (source: D. Black, MNR Conservation Officer)*

Hunting: Private property - trespassing prohibited, no evidence of owner hunting.

Nature: Private property - trespassing prohibited, no evidence of owner use.

Fishing: No fish habitat present.

Recreational Activities Score
(maximum 80 points) 0

2.3 LANDSCAPE AESTHETICS

2.3.1 Distinctness

Check only one.

	Clearly Distinct	=	3 pts
✓	Indistinct	=	0

Landscape Distinctness Score
(maximum 3 points) 0

2.3.2 Absence of Human Disturbance

Check only one.

	Human disturbances absent or nearly so	=	7 pts
✓	One or several localized disturbances	=	4
	Moderate disturbance; localized water pollution	=	2
	Wetland intact but impairment of ecosystem quality intense in some areas	=	1
	Extreme ecological degradation, or water pollution severe and widespread	=	0

Details regarding type, extent and location of disturbance scored:
Land suveyor lines, ATV trails.

Source of information: Cotyledon 2023 EIS

Absence of Human Disturbance Score
(maximum 7 points) 4

2.4 EDUCATION AND PUBLIC AWARENESS

2.4.1 Educational Uses

Check highest appropriate category.

	Frequent	=	20 pts
	Infrequent	=	12
✓	No visits	=	0

Details regarding the type and frequency of education uses scored above:
Private property, trespassing prohibited.

Source of information: Cotyledon 2023 EIS

Educational Uses Score *(maximum 20 points)* 0

2.4.2 Facilities and Programs

Check all appropriate options, score highest category checked.

	Staffed interpretation centre	=	8 pts
	No interpretation centre or staff, but a system of self-guiding trails or brochures available	=	4
	Facilities such as maintained paths (e.g., woodchips), boardwalks, boat launches or observation towers, but no brochures or other interpretation	=	2
✓	No facilities or programs	=	0

Additional Notes/Comments:
Private property, trespassing prohibited.

Source of information: Cotyledon EIS

Facilities and Programs Score *(maximum 8 points)* 0

2.4.3 Research and Studies

Check all that apply; score highest category checked.

	Long term research has been done	=	12 pts
	Research papers published in refereed scientific journal or as a thesis	=	10
	One or more (non-research) reports have been written on some aspect of the wetland's flora, fauna, hydrology, etc.	=	5
✓	No research or reports	=	0

List of reports, publications, research studies etc. scored above:

Cotyledon 2023 EIS

Beacon 2012 EIS

Azimuth 2010 EIS

Private property, trespassing prohibited.

Research and Studies Score
(maximum 12 points) 0

2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT

Name of Settlement: Wasaga Beach

Distance of wetland from settlement: Within

Population of settlement: 21,182 (2019) (Source: Town of Wasaga Beach)

Circle only the highest score applicable

Distance of wetland to settlement	population >10,000	population 2,500-10,000	population <2,500 or cottage community
within or adjoining settlement	✓ 40 points	26 points	16 points
0.5 to 10 km from settlement	26	16	10
10 to 60 km from settlement	12	8	4
>60 km from nearest settlement	5	2	0

Proximity to Human Settlement Score
(maximum 40 points) 40

2.6 OWNERSHIP

FA of wetland held by or held under a legal contract by a conservation body (as defined by the *Conservation Land Act*) for wetland protection	______ x 10 = ______
FA of wetland occurring in provincially or nationally protected areas (e.g., parks and conservation reserves)	______ x 10 = ______
FA of wetland area in Crown/public ownership, not as above	______ x 8 = ______
FA of wetland area in private ownership, not as above	1 x 4 = 4

Source of information:
Cotyledon EIS

Ownership Score *(maximum 10 points)* 4

2.7 SIZE (SOCIAL COMPONENT)

Total Size of Wetland = 3.6 ha   Sum of scores from Subcomponents 2.1, 2.2, and 2.5 = 40

Circle the appropriate score from the table below.

	Total for Size Dependent Social Features									
	<31	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	>150
<2 ha	1	2	4	8	10	12	14	14	14	15
2-4	1	2	4	8	12	13	14	14	15	16
5-8	2	2	5	9	13	14	15	15	16	16
9-12	3	3	6	10	14	15	15	16	17	17
13-17	3	4	7	10	14	15	16	16	17	17
18-28	4	5	8	11	15	16	16	17	17	18
29-37	5	7	10	13	16	17	18	18	19	19
38-49	5	7	10	13	16	17	18	18	19	20
50-62	5	8	11	14	17	17	18	19	20	20
63-81	5	8	11	15	17	18	19	20	20	20
82-105	6	9	11	15	18	18	19	20	20	20
106-137	6	9	12	16	18	19	20	20	20	20
138-178	6	9	13	16	18	19	20	20	20	20
179-233	6	9	13	16	18	20	20	20	20	20
234-302	7	9	13	16	18	20	20	20	20	20
303-393	7	9	14	17	18	20	20	20	20	20
394-511	7	10	14	17	18	20	20	20	20	20
512-665	7	10	14	17	18	20	20	20	20	20
666-863	7	10	14	17	19	20	20	20	20	20
864-1123	8	12	15	17	19	20	20	20	20	20
1124-1460	8	12	15	17	19	20	20	20	20	20
1461-1898	8	13	15	18	19	20	20	20	20	20
1899-2467	8	14	16	18	20	20	20	20	20	20
>2467	8	14	16	18	20	20	20	20	20	20

Total Size Score (Social Component) 2

2.8 ABORIGINAL VALUES AND CULTURAL HERITAGE

Either or both Aboriginal or Cultural Values may be scored. However, the maximum score permitted for 2.8 is 30 points.

Full documentation of sources must be attached to the data record.

2.8.1 Aboriginal Values

	Significant	=	30 pts
	Not Significant	=	0
✓	Unknown	=	0

Additional Comments/Notes:

There is no known or documented aboriginal significance for the property.

2.8.2 Cultural Heritage

	Significant	=	30 pts
	Not Significant	=	0
✓	Unknown	=	0

Additional Comments/Notes:

No physical structures, artefacts or remains present on the property. There is no known historical significance associated with the property.

Aboriginal Values/Cultural Heritage Score
(maximum 30 points) 0

3.0 HYDROLOGICAL COMPONENT

3.1 FLOOD ATTENUATION

Check one of the following four options.

- [ ] If wetland is a single contiguous coastal wetland, ➡ score 0 points for this section.
- [ ] If all wetland units of a wetland complex are coastal wetland units, ➡ score 0 points for this section.
- [ ] If wetland or wetland complex is entirely isolated in site type, ➡ score 100 points automatically.
- [x] Wetland not as above – proceed through 'steps' A through L below.

(A) Total wetland area = 3.6 ha

(B) Size of wetland's catchment = 287 ha

(C) Size of other detention areas in catchment = 0 ha

(D) Size of 'isolated' portions of wetland = 0 ha (FA = 0)

(E) Size of coastal units of wetland complex = 0 ha (FA = 0)

Points for Isolated Portion of Wetland (If not applicable, enter '0'):
(F) (FA of D) x 100 pts = 0 pts

Points for Coastal Portion(s) of Wetland (if not applicable, enter '0')
(G) (FA of E) x 100 pts = 0 pts

(H) Size of wetland minus the isolated and coastal portions = {A – D – E} = 3.6 ha

(I) Number of points available to score 'rest' of wetland = {100 – F – G} = 100 pts

(J) Total area of upstream detention areas = {A + C } = 3.6 ha

(K) Upstream Detention Factor = {(H/J) x 2} = 2 (maximum 1.0)

(L) Attenuation Factor = {(H/B) x 10} = 0.13 (maximum 1.0)

Flood Attenuation Final Score = {[((K + L) /2) x I] + F} = 1.1

Flood Attenuation Score *(maximum 100 points)* 1.1

3.2 WATER QUALITY IMPROVEMENT

3.2.1 Short Term Water Quality Improvement

Step 1: Determination of maximum initial score

	Wetland on one of the 5 defined large lakes or 5 major rivers (Go to Step 5A)
✓	All other wetlands (Go through Steps 2, 3, 4, and 5B)

Step 2: Determination of Watershed Improvement Factor (WIF)

Calculation of WIF is based on the fractional area (FA) of each site type that makes up the total area of the wetland.

(FA = area of site type/total area of wetland)

FA of isolated wetland	=		x 0.5 =	
FA of riverine wetland	=		x 1.0 =	
FA of palustrine wetland with no inflow	=		x 0.7 =	
FA of palustrine wetland with inflows ✓	=	1	x 1.0 =	1
FA of lacustrine on lake shoreline	=		x 0.2 =	
FA of lacustrine at lake inflow or outflow	=		x 1.0 =	

Sum (*WIF cannot exceed 1.0*) 1.0

Step 3: Determination of catchment Land Use Factor (LUF)

(Choose the first category that fits upstream land use in the catchment.)

✓	Over 50% agricultural and/or urban	=	1.0
	Between 30 and 50% agricultural and/or urban	=	0.8
	Over 50% forested or other natural vegetation	=	0.6

LUF *(maximum 1.0)* 1.0

Step 4: Determination of Pollutant Uptake Factor (PUF)

Calculation of PUF is based on the fractional area (FA) of each vegetation type that makes up the total area of the wetland. Base assessment on the dominant vegetation form for each community except where dead trees or shrubs dominate. In that case base assessment on the dominant live vegetation type.

(FA = area of vegetation type/total area of wetland)

FA of wetland with live trees, shrubs, herbs or mosses (c, h, ts, ls, gc, m) ✓	0.8	= x	0.75	=	0.6
FA of wetland with emergent, submergent or floating vegetation (re, be, ne, su, f, ff)		= x	1.0	=	
FA of wetland with little or no vegetation (u) ✓	0.2	= x	0.5	=	0.1

Sum (*PUF cannot exceed 1.0*) 0.7

Step 5: Calculation of final score

	Wetland on defined 5 major lakes or 5 major rivers	0
✓	All other wetlands – calculate as follows	
	Initial score	60
	Watershed Improvement Factor (WIF)	1.0
	Land Use Factor (LUF)	1.0
	Pollutant Uptake Factor (PUF)	0.7
	Final score: 60 x WIF x LUF x PUF =	42

Short Term Water Quality Improvement Score
(maximum 60 points) 42

3.2.2 Long Term Nutrient Trap

Step 1:

	Wetland on defined 5 major lakes or 5 major rivers = 0 points
✓	All other wetlands (Proceed to Step 2)

Step 2: Choose only one of the following settings that best describes the wetland being evaluated

	Wetland located in a river mouth	=	10 pts
	Wetland is a bog, fen, or swamp with more than 50% of the wetland being covered with organic soil	=	10
	Wetland is a bog, fen, or swamp with less than 50% of the wetland being covered with organic soil	=	3
	Wetland is a marsh with more than 50% of the wetland covered with organic soil	=	3
✓	None of the above	=	0

Long Term Nutrient Trap Score
(maximum 10 points) 0

3.2.3 Groundwater Discharge

Circle the characteristics that best describe the wetland being evaluated and then sum the scores. If the sum exceeds 30 points, assign the maximum score of 30). Note: for wetland type, wetland type scored does not have to the dominant type in the wetland.

Wetland Characteristics	Potential for Discharge: None to Little	Some	High
Wetland type	Bog = 0	Swamp/Marsh = 2	Fen = 5
Topography	Flat/rolling = 0	Hilly = 2	Steep = 5
Wetland area: Upslope catchment area	Large (>50%) = 0	Moderate (5-50%) = 2	Small (<5%) = 5
Lagg development	None found = 0	Minor = 2	Extensive = 5
Seeps	None = 0	≤ 3 seeps = 2	> 3 seeps = 5
Surface marl deposits	None = 0	≤ 3 sites = 2	> 3 sites = 5
Iron precipitates	None = 0	≤ 3 sites = 2	> 3 sites = 5
Located within 1 km of a major aquifer	N/A = 0	N/A = 0	Yes = 10 No = 0

Additional Comments/Notes:

Hydrogeological report concluded clay hard pan creates a perched water table.

Groundwater Discharge Score
(maximum 30 points) 7

3.3 CARBON SINK

Check only one of the following:

	Bog, fen or swamp with more than 50% coverage by organic soil	=	5 pts
	Bog, fen or swamp with between 10 to 50% coverage by organic soil	=	2
	Marsh with more than 50% coverage by organic soil	=	3
✓	Wetlands not in one of the above categories	=	0

Source of information:

____

____

Carbon Sink Score
(maximum 5 points) 0

3.4 SHORELINE EROSION CONTROL

From the wetland vegetation map determine the dominant vegetatino type within the erosion zone for lacustrine and riverine site type areas only. Score according to the factors listed below.

Step 1:

✓	Wetland entirely isolated or palustrine	=	0 pts
	Any part of the wetland is riverine or lacustrine	=	Go to step 2

Step 2: *Choose the one characteristic that best describes the shoreline vegetation (see page 109 for description of "shoreline".)*

	Trees and shrubs	=	15 pts
	Emergent vegetation	=	8
	Submergent vegetation	=	6
	Other shoreline vegetation	=	3
	No vegetation	=	0

Shoreline Erosion Control Score
(maximum 15 points) 0

3.5 GROUNDWATER RECHARGE

3.5.1 Site Type

Wetland > 50% lacustrine (by area) or located on one of the five major rivers	= 0 pts	
Wetland not as above. Calculate final score as follows:		
■ FA of isolated or palustrine wetland ✓ = 1	x 50 =	50
■ FA of riverine wetland =	x 20 =	
■ FA of lacustrine wetland (not dominant site type) =	x 0 =	

Groundwater Recharge/Wetland Site Type Score *(maximum 50 points)* 50

3.5.2 Soil Recharge Potential

Circle only one choice that ***best*** *describes the soils in* ***the area surrounding the wetland*** *being evaluated (the soils within the wetland are not scored here).*

Dominant Wetland Type		Group A, B, C (sands, gravels, loams)	Group D (clays, substrates in high water tables, shallow substrates over impervious materials such as bedrock)
	Lacustrine or major river	0	0
	Isolated	10	5
	Palustrine	7	✓ 4
	Riverine (not on a major river)	5	2

Groundwater Recharge/Wetland Soil Recharge Potential Score *(maximum 10 points)* 4

Southern OWES 3.2

4.0 SPECIAL FEATURES COMPONENT

4.1 RARITY

4.1.1 Wetland Types

Ecodistrict	Rarity within the Landscape (4.1.1.1)	Rarity of Wetland Type (4.1.1.2)			
		Marsh	Swamp	Fen	Bog
6E-1	60	40	0	80	80
6E -2	60	40	0	80	80
6E-4	60	40	0	80	80
6E-5	20	40	0	80	80
6E-6	40 ✓	20	0 ✓	80	80
6E-7	60	10	0	80	80
6E-8	20	20	0	80	80
6E-9	0	20	0	80	80
6E-10	20	0	20	80	80
6E-11	0	30	0	80	80
6E-12	0	30	0	60	80
6E-13	60	10	0	80	80
6E-14	40	20	0	40	80
6E-15	40	0	0	80	80
6E-16	60	20	0	80	60
6E-17	40	10	0	30	80
7E-1	60	0	60	80	80
7E-2	60	0	0	80	80
7E-3	60	00	0	80	80
7E-4	80	0	0	80	80
7E-5	60	20	0	80	80
7E-6	80	30	0	80	80

4.1.1.1 Rarity within the Landscape

Choose appropriate score from 2nd column above.

Score *(maximum 80 points)* 40

4.1.1.2 Rarity of Wetland Type

Score is cumulative, based on presence/absence. Circle all appropriate scores from above table and sum.

Score *(maximum 80 points)* 0

4.1.2 Species

4.1.2.1 Reproductive Habitat for an Endangered or Threatened Species

Under the "Activity" column, when scoring animal species, record what the animal was doing when observed (e.g., nesting, courtship, singing, etc).

Common Name	Scientific Name	Activity	Date Observed	Info Source
None				

For each species score 250 points. (Score is cumulative, no maximum score)

Additional Notes/Comments:

Little Brown Bat (Myotis lucifugus) was confirmed by acoustic survey to be present in woodlands adjacent to the wetland. The largest number of recordings occurred at the monitoring site furthest from the wetland, the least number of recordings occurred at the monitoring site closest to the wetland. This bat may be opportunistically foraging across the wetland, but there is no confirmation that it is dependent on the wetland for reproductive habitat.

Reproductive Habitat for Endangered or Threatened Species *(no maximum)* 0

4.1.2.2 Traditional Migration or Feeding Habitat for an Endangered or Threatened Species

Under the "Activity" column, when scoring animal species, record what the animal was doing when observed (e.g., nesting, courtship, singing, feeding, resting etc). Dates that species has been recorded using the wetland must be included in the table below.

Common Name	Scientific Name	Activity	Dates Observed	Info Source
None				

For one species score 150 points; for each additional species score 75 points. (Score is cumulative)

Additional Notes/Comments:

No records of migration, feeding or hibernation of Endangered or Threatened species using the wetland for at least 2 years within the last 10 years.

Traditional Habitat for Endangered or Threatened Species *(no maximum)* 0

4.1.2.3 Provincially Significant Animal Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source
Little Brown Myotis	Myotis leibii	foraging	June 2021	2023 EIS
Eastern Wood Pewee	Contopus virens	foraging	June 2021	2023 EIS

Additional Notes/Comments:
2 SAR species were observed/heard in woodlands adjacent to the wetland and may be using the wetland for additional opportunistic foraging but they are not dependent on the wetland for breeding, foraging, or staging.

One species	=	50 pts	9 species	=	140 pts	17 species	=	160 pts
2 species	=	80 ✓	10 species	=	143	18 species	=	162
3 species	=	95	11 species	=	146	19 species	=	164
4 species	=	105	12 species	=	149	20 species	=	166
5 species	=	115	13 species	=	152	21 species	=	168
6 species	=	125	14 species	=	154	22 species	=	170
7 species	=	130	15 species	=	156	23 species	=	172
8 species	=	135	16 species	=	158	24 species	=	174
						25 species	=	176

Add one point for every species past 25 (for example, 26 species = 177 points, 27 species = 178 points etc.)

Provincially Significant Animal Species
(no maximum) 80

4.1.2.4 Provincially Significant Plant Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source
None				

Additional Notes/Comments:

Only 1 record of Provincially Tracked plant species/plant community (Sea Rocket Sand Beach Type) but this community is not present in the wetland.

One species	=	50 pts	9 species	=	140 pts	17 species	=	160 pts
2 species	=	80	10 species	=	143	18 species	=	162
3 species	=	95	11 species	=	146	19 species	=	164
4 species	=	105	12 species	=	149	20 species	=	166
5 species	=	115	13 species	=	152	21 species	=	168
6 species	=	125	14 species	=	154	22 species	=	170
7 species	=	130	15 species	=	156	23 species	=	172
8 species	=	135	16 species	=	158	24 species	=	174
						25 species	=	176

Add one point for every species past 25 (for example, 26 species = 177 points, 27 species = 178 points etc.)

Provincially Significant Plant Species
(no maximum) 0

4.1.2.5 Regionally Significant Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source
None				

One species=	20 pts		4 species =	45 pts		7 species =	58 pts	
2 species =	30		5 species =	50		8 species =	61	
3 species =	40		6 species =	55		9 species =	64	
						10 species =	67	

For each significant species over 10 in wetland, add 1 point.

Regionally Significant Species Score
(no maximum score) 0

4.1.2.6 Locally Significant Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source
None				

One species=	10 pts		4 species =	31 pts		7 species =	43 pts	
2 species =	17		5 species =	38		8 species =	45	
3 species =	24		6 species =	41		9 species =	47	
						10 species =	49	

For each significant species over 10 in wetland, add 1 point.

Locally Significant Species Score
(no maximum score) 0

4.2.1 Colonial Waterbirds

Record all available information. Score the highest applicable category. Include additional information as possible (e.g., nest locations, etc).

Activity	Species	Info Source	Points
Currently nesting			= 50
Known to have nested within the past 5 years			= 25
Active feeding area (great blue heron excluded)			= 15
None known			= 0 ✓

Additional Notes/Comments:

There is no Colonial Waterbird nesting, foraging or staging habitat in the wetland.

Colonial Waterbird Nesting Score
(maximum 50 points) 0

4.2.2 Winter Cover for Wildlife

Score highest appropriate category. Include rationale/sources of information.

	Provincially significant	=	100 pts
	Significant in Ecoregion	=	50
	Significant in Ecodistrict	=	25
	Locally significant	=	10
	Little or poor winter cover	=	0

Species/habitat/vegetation community scored *(e.g., winter deer cover in hemlock swamp, S3 and S4b)*:

No Significant Wildlife Habitat for Winter Cover for Wildlife is present in the wetland.

Source of information:

Winter Cover for Wildlife Score
(maximum 100 points) 0

4.2.3 Waterfowl Staging and/or Moulting Areas

Check highest level of significance for both staging and moulting; add scores for staging and for moulting together for final score. However, maximum score for evaluation under this section is 150 points.

	Staging	Moulting
Nationally/internationally significant	= 150 pts	= 150 pts
Provincially significant	= 100	= 100
Significant in the Ecoregion	= 50	= 50
Significant in Ecodistrict	= 25	= 25
Known to occur	= 10	= 10
Not possible/Unknown	= 0 ✓	= 0 ✓

Species/habitat/vegetation community scored *(e.g., approx 20 mallards in W3)*:

There is no Waterfowl nesting, foraging, or staging habitat in the wetland.

Source of information:

Cotyledon 2023 EIS

Waterfowl Staging/Moulting Score
(maximum 150 points) 0

4.2.4 Waterfowl Breeding

Check highest level of significance.

	Nationally/internationally significant	= 150 pts
	Provincially significant	= 100
	Significant in the Ecoregion	= 50
	Significant in Ecodistrict	= 25
	Habitat Suitable	= 5
	Habitat not suitable	= 0 ✓

Species/habitat/vegetation community scored *(e.g., mallard in W3)*:

There is no waterfowl breeding habitat in the wetland.

Source of information:

Waterfowl Breeding Score
(maximum 100 points) 0

4.2.5 Migratory Passerine, Shorebird or Raptor Stopover Area

Check highest level of significance.

	Nationally / internationally significant	= 150 pts
	Provincially significant	= 100
	Significant in Ecoregion	= 50
	Significant in Ecodistrict	= 25
	Known to occur	= 10
	Not possible / Unknown	= 0 ✓

Species/habitat/vegetation community scored:

Habitat not present in the wetland. No records of use for migratory stopover.

Source of information:

Cotyledon 2023 EIS

Passerine, Shorebird or Raptor Stopover Score
(maximum 100 points) 0

4.2.6 Fish Habitat

4.2.6.1 Spawning and Nursery Habitat

Area Factors for Low Marsh, High Marsh and Swamp Communities.

No. of ha of Fish Habitat	Area Factor
< 0.5 ha	0.1
0.5 – 4.9	0.2
5.0 – 9.9	0.4
10.0 – 14.9	0.6
15.0 – 19.9	0.8
20.0 +	1.0

Step 1:

✓	Fish habitat is not present within the wetland	Go to Step 7, Score 0 points
	Fish habitat is present within the wetland	Go to Step 2

Step 2: *Choose only one option*

	Significance of the spawning and nursery habitat within the wetland is known	Go to Step 3
	Significance of the spawning and nursery habitat within the wetland is not known	Go through Steps 4, 5 and 6

Step 3: *Select the highest appropriate category below, attach documentation:*

	Significant in Ecoregion	Go to Step 7, Score 100 points
	Significant in Ecodistrict	Go to Step 7, Score 50 points
	Locally Significant Habitat (5.0+ ha)	Go to Step 7, Score 25 points
	Locally Significant Habitat (<5.0 ha)	Go to Step 7, Score 15 points

Source of information:

Step 4: Low Marsh = the 'permanent' marsh area, from the existing water line out to the outer boundary of the wetland.

	Low marsh not present	Go to Step 5
	Low marsh present	Continue through Step 4, scoring as noted below

Scoring of Low Marsh:

1. Check the appropriate **Vegetation Group** (see Appendix 7) for each Low Marsh community. (Based on the one most clearly dominant plant species of the dominant form in each Low Marsh vegetation community.)
2. Sum the areas (ha) of the vegetation communities assigned to each **Vegetation Group**.
3. Use these areas to assign an **Area Factor** for each checked **Vegetation Group**.
4. Multiply the **Area Factor** by the **Multiplication Factor** for each row to calculate **Score**.
5. Sum all numbers in Score column to get **Total Score for Low Marsh**.

Scoring for Presence of Key Vegetation Groups – Low Marsh						
Vegetation Group Number	Vegetation Group Name	Present as a Dominant Form (check)	Total Area (ha)	Area Factor (from Table 8)	Multiplication Factor	Score
1	Tallgrass				6	
2	Shortgrass-Sedge				11	
3	Cattail-Bulrush-Burreed				5	
4	Arrowhead-Pickerelweed				5	
5	Duckweed				2	
6	Smartweed-Waterwillow				6	
7	Waterlily-Lotus				11	
8	Waterweed-Watercress				9	
9	Ribbongrass				10	
10	Coontail-Naiad-Watermilfoil				13	
11	Narrowleaf Pondweed				5	
12	Broadleaf Pondweed				8	
	Total Score for Low Marsh (*maximum 75 points*)					

Continue to Step 5

Step 5: High Marsh = the 'seasonal' marsh area, from the water line to the inland boundary of marsh wetland type. This is essentially what is commonly referred to as a wet meadow, in that there is insufficient standing water to provide fisheries habitat except during flood or high water conditions.

☐	High marsh not present	Go to Step 6
☐	High marsh present	Continue through Step 5, scoring as noted below

Scoring of High Marsh:

1. Check the appropriate **Vegetation Group** (see Appendix 7) for each High Marsh community. (Based on the one most clearly dominant plant species of the dominant form in each High Marsh vegetation community.)
2. Sum the areas (ha) of the vegetation communities assigned to each **Vegetation Group**.
3. Use these areas to assign an **Area Factor** (from Table 8) for each checked **Vegetation Group**.
4. Multiply the **Area Factor** by the **Multiplication Factor** for each row to calculate **Score**.
5. Sum all numbers in Score column to get **Total Score for High Marsh**.

Scoring for Presence of Key Vegetation Groups – High Marsh

Vegetation Group Number	Vegetation Group Name	Present as a Dominant Form (check)	Total Area (ha)	Area Factor (from Table 8)	Multiplication Factor	Score
1	Tallgrass				6	
2	Shortgrass-Sedge				11	
3	Cattail-Bulrush-Burreed				5	
4	Arrowhead-Pickerelweed				5	
	Total Score for High Marsh (*maximum 25 points*)					

Continue to Step 6

Step 6:

	Swamp containing fish habitat not present	Go to Step 7
	Swamp containing fish habitat present	Continue through Step 6, scoring as follows

Scoring of Swamp:

1. Determine the total area (ha) of seasonally flooded swamp communities within the wetland containing fish habitat and record below.
2. Determine the total area (ha) of permanently flooded swamp communities within the wetland containing fish habitat and record below.
3. Use these areas to assign an **Area Factor** (from Table 8).
4. Multiply the Area Factor by the **Multiplication Factor** for each row to calculate **Score**.
5. Sum all numbers in Score column to get **Total Score for Swamp**.

Scoring Swamps for Fish Habitat (Seasonally flooded; Permanently flooded)					
Swamp Containing Fish Habitat	Present (check)	Total Area (ha)	Area Factor (from Table 8)	Multiplication Factor	Score
Seasonally Flooded Swamp				10	
Permanently Flooded Swamp				10	
		Total Score for Swamp (*maximum 20 points*)			

Continue to Step 7

Step 7: CALCULATION OF FINAL SCORE

NOTE: Scores for Steps 4, 5 and 6 are only recorded if Steps 1 and 3 have not been scored.

A. Score from Step 1 (fish habitat not present) = ______
B. Score from Step 3 (significance known) = ______
C. Score from Step 4 (Low Marsh) = ______
D. Score from Step 5 (High Marsh) = ______
E. Score from Step 6 (Swamp) = ______

Calculation of Final Score for Spawning and Nursery Habitat = A or B or Sum of C, D, and E

Score for Spawning and Nursery Habitat
(maximum 100 points) ___0___

4.2.6.2 Migration and Staging Habitat

Step 1:

✓	Staging or Migration Habitat is not present in the wetland	Go to Step 4, Score 0 points
	Staging or Migration Habitat is present in the wetland, significance of the habitat is known	Go to Step 2
	Staging or Migration Habitat is present in the wetland, significance of the habitat is not known	Go to Step 3

Step 2: Select the highest appropriate category below. Ensure that documentation is attached to the data record.

	Significant in Ecoregion	Score 25 points in Step 4
	Significant in Ecodistrict	Score 15 points in Step 4
	Locally Significant	Score 10 points in Step 4
	Fish staging and/or migration habitat present, but not as above	Score 5 points in Step 4

Source of information:

____

____

Step 3: Select the highest appropriate category below based on presence of the designated site type (i.e. does not have to be the dominant site type). Refer to Site Types recorded earlier (section 1.1.3). Attach documentation.

	Wetland is riverine at rivermouth or lacustrine at rivermouth	Score 25 points in Step 4
	Wetland is riverine, within 0.75 km of rivermouth	Score 15 points in Step 4
	Wetland is lacustrine, within 0.75 km of rivermouth	Score 10 points in Step 4
	Fish staging and/or migration habitat present, but not as above	Score 5 points in Step 4

Step 4: Enter a score from only one of the three above Steps.

Score for Staging and Migration Habitat
(maximum 25 points) ___0___

4.3 ECOSYSTEM AGE

		Fractional Area		Score
Bog	=		x 25 =	
Fen, on deeper soils; floating mats or marl	=		x 20 =	
Fen, on limestone rock	=		x 5 =	
Swamp ✓	=	1	x 3 =	3
Marsh	=		x 0 =	
	Total		=	3

Ecosystem Age Score *(maximum 25 points)* 3

4.4 GREAT LAKES COASTAL WETLANDS

Choose one only. Only coastal wetland units may be scored.

✓	Wetland < 10 ha	=	10 pts
	Wetland 10-50 ha	=	25
	Wetland 51-100 ha	=	50
	Wetland > 100 ha	=	75

If the wetland is a complex, identify which wetlands units or wetland communities are being scored as coastal:

Great Lakes Coastal Wetland Score *(maximum 75 points)* 10

5.0 DOCUMENTATION OF WETLAND FEATURES NOT INCLUDED IN THE EVALUATION

5.1 INVASIVE SPECIES

Attach documentation of invasive species found in wetland (include location information and a coarse estimate of abundance [F = few, C = fairly common, A = abundant]):

Buckthorn (R. cathartiica) = A

Phragmities = C

Garlic Mustard = C

Purple Loosestrife = C

5.2 VERNAL POOLS

Documentation of information on vernal pools encountered during the wetland evaluation but not included as part of the evaluated wetland.

There are no vernal pools in the wetland.

5.3 SPECIES OF SPECIAL INTEREST

5.3.1 Osprey

Check all that apply:

- [ ] Present and nesting
- [ ] Known to have nested in last 5 years
- [ ] Feeding area for Osprey
- [x] Not as above

5.3.2 Common Loon

Check all that apply:

- [ ] Nesting in wetland
- [ ] Feeding at edge of wetland
- [ ] Observed or heard on lake or river adjoining the wetland
- [x] Not as above

5.4 IMPORTANT DRINKING WATER AREA

Wetland located within:
(check all that apply)

- [ ] Wellhead Protection Area
- [ ] Intake Protection Zone
- [ ] Significant Recharge Area
- [ ] Vulnerable Aquifer Area

Source of information:

Simcoe County, Wasaga Beach Official Plan, NVCA

Additional Comments:

Wetland is not in any of the 4 features.

5.5 AREA OF WETLAND RESTORATION POTENTIAL

Check all that apply. Attach additional pages if necessary.

6.25 ac	Area of wetland restoration potential adjacent to evaluated wetland unit(s)
0 ac	Area of wetland restoration potential within 750m of evaluated wetland unit(s), but not adjacent
0 ac	Area of wetland restoration potential encountered elsewhere
8.9 ac	Area currently functioning as wetland (e.g., showing signs of degradation but still mapped as wetland).
	Adjacent Wetland Unit (if applicable):
	GPS Coordinates of Site:

Description of site (e.g., current land use, wetland characteristics of site, etc) and why it is identified as an area of restoration potential:

About 8.9 ac of wetland will dry up after the flood diversion channel is constructed. About 4.27 ac of the flood diversion channel and about 1.98 ac of the SWM pond, which totals 6.25 ac, will be landscaped to create wetland habitat that has a greater functionality than the wetland that will be lost. For example, it is anticipated that fish habitat, waterfowl nesting, foraging and staging habitat, and amphibian breeding habitat will be created in the new wetland restoration. The existing wetland, that will dry up, has none of these attributes. The proposed flood diversion channel will have two substantial net benifits. A net social, economic and safety benifit is that the chronic seasonal flooding and the potential for large-scale community flodding will be mitigated. A net ecological benifit is the proposed wetland restoration, although slightly less in absolute size than the wetland to be displaced, will be of a substantially better quality wetland with a significantly higher ecological service value.

Additional Notes/Comments (e.g., adjacent lands, etc)

General Information

Wetland Evaluator(s)

Name: Dave McLaughlin Affiliation: Cotyledon Environmental Consulting

Name: Affiliation:

Name: Affiliation:

Name: Affiliation:

Name: Affiliation:

Date(s) wetland visited (in field): Dec 14, 2020, Apr 19 & 27, May 17 & 31, Jun 10, 13, 16, 29, 2021

Date evaluation completed: Feb 9 & 10, 2024

Estimated time devoted to completing the field survey in person hours: >45 hrs

Weather Conditions

i) at time of field work: not relevant for this exercise

ii) summer conditions in general: not relevant for this exercise

WETLAND EVALUATION SCORING RECORD

WETLAND NAME: Beachwood Rd., Wasaga Beach, Sunray Group property.

1.0 BIOLOGICAL COMPONENT

	1.1	PRODUCTIVITY
15	1.1.1	Growing Degree-Days/Soils
8	1.1.2	Wetland Type
2	1.1.3	Site Type
	1.2	BIODIVERSITY
9	1.2.1	Number of Wetland Types
9	1.2.2	Vegetation Communities
6	1.2.3	Diversity of Surrounding Habitat
5	1.2.4	Proximity to Other Wetlands
9	1.2.5	Interspersion
0	1.2.6	Open Water Type
5	1.3	SIZE (Biological Component)
68		TOTAL (Biological Component)

2.0 SOCIAL COMPONENT

	2.1 ECONOMICALLY VALUABLE PRODUCTS
0	2.1.1 Wood Products
0	2.1.2 Wild Rice
0	2.1.3 Commerical Fish (Bait Fish and/or Coarse Fish)
0	2.1.4 Furbearers
0	2.2 RECREATIONAL ACTIVITIES
	2.3 LANDSCAPE AESTHETICS
0	2.3.1 Distinctness
4	2.3.2 Absence of Human Disturbance
	2.4 EDUCATION AND PUBLIC AWARENESS
0	2.4.1 Educational Uses
0	2.4.2 Facilities and Programs
0	2.4.3 Research and Studies
40	2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT
4	2.6 OWNERSHIP
2	2.7 SIZE (Social Component)
	2.8 ABORIGINAL VALUES AND CULTURAL HERITAGE
0	2.8.1 Aboriginal Values
0	2.8.2 Cultural Heritage
50	TOTAL (Social Component)

3.0 HYDROLOGICAL COMPONENT

1 3.1 FLOOD ATTENUATION

3.2 WATER QUALITY IMPROVEMENT

42 3.2.1 Short Term Water Quality Improvement

0 3.2.2 Long Term Nutrient Trap

7 3.2.3 Groundwater Discharge

0 3.3 CARBON SINK

0 3.4 SHORELINE EROSION CONTROL

3.5 GROUNDWATER RECHARGE

50 3.5.1 Site Type

4 3.5.2 Soil Recharge Potential

104 TOTAL (Hydrological Component)

4.0 SPECIAL FEATURES COMPONENT

	4.1 RARITY
	4.1.1 Wetland Types
40	4.1.1.1 Rarity within the Landscape
0	4.1.1.2 Rarity of Wetland Type
	4.1.2 Species
0	4.1.2.1 Reproductive Habitat for an Endangered or Threatened Species
0	4.1.2.2 Traditional Migration or Feeding Habitat for an Endangered or Threatened Species
80	4.1.2.3 Provincially Significant Animal Species
0	4.1.2.4 Provincially Significant Plant Species
0	4.1.2.5 Regionally Significant Species
0	4.1.2.6 Locally Significant Species
	4.2 SIGNIFICANT FEATURES AND HABITATS
0	4.2.1 Colonial Waterbirds
0	4.2.2 Winter Cover for Wildlife
0	4.2.3 Waterfowl Staging and/or Moulting Areas
0	4.2.4 Waterfowl Breeding
0	4.2.5 Migratory Passerine, Shorebird or Raptor Stopover Area
	4.2.6 Fish Habitat
0	4.2.6.1 Spawning and Nursery Habitat
0	4.2.6.2 Migration and Staging Habitat
3	4.3 ECOSYSTEM AGE
10	4.4 GREAT LAKES COASTAL WETLANDS
133	TOTAL (Special Features Component)

SUMMARY OF EVALUATION RESULT

Wetland Beachwood Rd., Wasaga Beach Sunray Group property.

68 1.0 TOTAL FOR BIOLOGICAL COMPONENT

50 2.0 TOTAL FOR SOCIAL COMPONENT

104 3.0 TOTAL FOR HYDROLOGICAL COMPONENT

133 4.0 TOTAL FOR SPECIAL FEATURES COMPONENT

355 TOTAL WETLAND SCORE

FOR MNR USE ONLY

MNR Reviewer (Name & Position) Not relevant for this exercise.

Reviewer Comments

MNR Approver (Name & Position)

Approval Date

Appendix C
NVCA Comments and Responses
8859 Beachwood Road

April 21, 2023

Mr. Mike Pincivero, P.Eng.
Manager of Engineering Services, RMO/RMI,
Town of Wasaga Beach
30 Lewis Street, Wasaga Beach, ON L9Z 1A1

Dear Mr. Pincivero:

RE: 8859 Beachwood Road
Flood Hazard Study Submission
Part Lot 34, Concession 4
Town of Wasaga Beach
NVCA ID #42454

Nottawasaga Valley Conservation Authority (NVCA) staff is in receipt of the Flood Hazard study submission from R.J. Burnside & Associates Limited for the above noted property.

GENERAL COMMENTS:

NVCA staff understand there is a proposal to develop a parcel of land between Hwy 26 and Beachwood Road in the west end of the Town of Wasaga Beach. In order to do so, the extent of the floodplain needs to be carefully defined. Preliminary technical comments were prepared using a 2D hydraulic model to define the extent of the flood inundation. Panning and Ecology comments have also been provided herein and are based on the information noted below.

In preparing these comments the following documents were received and reviewed:

1. REPORT: "8859 Beachwood Road West End Existing Floodplain Analysis – Sunray Living Inc."; Prepared by R. J. Burnside & Associates Limited; Dated December 15 2022.
2. COMMENT MATRIX: "Comment and Responses Regarding Peer Review of Sunray Beachwood Flood Report by R.J. Burnside"; Comments and responses provided by Town of Wasaga Beach, Tatham and Ainley.
3. MEETING: "SMS2D Floodplain Modelling Review (NVCA & R.J. Burnside staff)"; Prepared by R.J. Burnside & Associated Limited; dated March 23 2023.
4. Conceptual Site Plan – 323 Units – 8859 Beachwood Rd, Wasaga Beach; Prepared by IPS Consulting Inc.; dated December 21, 2022.

Ontario Regulation 176/06

The subject property is partially regulated pursuant to Ontario Regulation 172/06, the Authority's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. Permits are required from NVCA prior to development within the regulated area on the subject property.

Planning Comments

NVCA staff note that NVCA and Provincial policy prohibits development within natural hazard areas and modifications to convey flood flows to support development. Considerations for minor regularization of floodplains may be considered on a site-specific basis and if proposed, must meet NVCA's Natural Hazards Technical Guidelines. Please note that wetlands are considered a natural hazard component.

The proposed development appears to be present removal of the wetland and channelization of the floodplain as a public benefit to alleviate flooding concerns in the surrounding area associated with the regulatory floodplain, with the added benefit of converting a significant portion of the parcel for residential development. While mitigation of flooding is part of the NVCA core mandate, the *Planning Act* is not the appropriate mechanism through which comprehensive floodplain mitigation should be considered across a large area. NVCA staff recommend any comprehensive flood plain mitigation be assessed through the appropriate planning mechanism such as the Municipal Class Environmental Assessment process if the objective is to provide a public benefit.

There must be additional clarity regarding the type of project this is to be classified: If the proposed as municipal infrastructure and subject to procedural assessment under the *Environmental Assessment Act*? Is it a municipal drain subject to assessment under the *Drainage Act*?

It is also noted that the design concept relies upon up-sizing culverts under Beachwood Road, which must be coordinated with Simcoe County.

Engineering Comments

1. Provide documentation describing the build of the hydrology model (PCSWMM) including reasons for selection of catchment boundary and catchment parameters including the selection of the runoff method (SWMM5 nonlinear reservoir vs Alternative Runoff Method – NashIUH).
2. Please provide a digital copy of the hydrology model (PCSWMM).
3. Provide documentation from the LiDAR vendor describing the data acquisition, data processing and data validation procedures.
4. Provide digital copies of the digital terrain data (LiDAR, topographic survey, etc.) used to build the SMS model.
5. The points used for ground truthing should be representative of the land use surfaces in the study area including, but not limited to, roads. The number of spot elevations for comparison should be increased significantly from the number reported (10). Provide a table comparing the two-elevation data sets to support the

conclusion that "the LiDAR data was not adjusted to match topographic survey elevations".

6. Similar to the LiDAR data acquisition, provide documentation to support the accuracy of the topographic data. Provide an explanation as to why the topographic data was deemed of higher quality such that the topographic data was preferred over the LiDAR data for the site (Section 5.4).
7. Confirm if the culvert geometry was included in the topographic data survey. Please provide a hydraulic report for the existing conditions of each culvert.
8. Please provide a digital copy of the HY8 model (only the digital files for the SMS model were received).
9. It is understood that the downstream boundary condition (Section 6.3.1.1) was set at 177.50m which is slightly higher than the value used in the NVCA Natural Hazard Technical Guide (Section 3.2.4) – 176.44m. Include a model scenario using 176.44m as a boundary condition and compare the results. Once the analysis is complete for the regional and 100-year events, the 100yr lake level for Georgian Bay (178.00m) is to be superimposed on the resultant water surface profile to establish the regulatory level.
10. Please provide digital copies (GIS format) of the hydraulic model data sets independent of the SMS platform including the existing and proposed flood hazard water surfaces.

Conceptual Channel Design:
An alternative alignment for the outlet of Bayswater Creek to Georgian Bay has been proposed (Fig A2 and A3, this memo) to mitigate the flood hazard between Hwy 26 and the Georgian Bay shoreline. The preliminary design includes the following characteristics:

a) Profile grade of 0.69 to 1.52%
b) Bottom width 6.3m and 3:1 side slopes.
c) A 3m maintenance access road
d) Regional flow 10.3 m3/s.

While it is necessary to respond to the above noted comments before NVCA engineering is in a position to accept the SMS flood hazard model, sufficient information has been provided to demonstrate the "conceptual channel design" and associated horizontal alignment may be technically feasible option. Details of the "conceptual channel" corridor, including total width, main channel alignment within the flood cross-section and corridor/channel boundary materials, may vary depending on the results of the final flood hazard model.

Wetland Comments

NVCA staff have reviewed past submission materials related to wetland and natural hazard constraint identification for the subject property, as well as previous pre-consultation minutes involving NVCA staff. NVCA staff will require a comprehensive and updated environmental impact assessment and hydrologic study in order to provide comprehensive pre-consultation comments with regards to the proposed development. The applicant should be aware that previous reviews and comments on this file have not supported encroachment into the identified wetland and associated minimum 30m setback.

Below is a list of preliminary terms for an updated EIS:

- Background information review, including review of past site-specific assessment for the subject lands.
- Updated biological/ecological field data collection following standardized protocols, including:
  - Delineation (Ecological Land Classification for Southern Ontario) of vegetation community with current vascular plant species inventory for each identified vegetation community.
  - Confirmation of wetland unit identification and delineation (Ontario Wetland Evaluation System); NVCA may request formal evaluation of any identified wetland features using standard provincial criteria (Ontario Wetland Evaluation System).
- Feature-based water balance for the wetland feature (refer to TRCA feature-based water balance guidance). The wetland hydroperiod should be identified, as well as the catchment area and any groundwater interaction, including seeps.
- Geotechnical report which includes soil stability analysis, with multiple samples of soils within the delineated wetland and 30m wetland setback and evaluation by a qualified professional of the suitability of these soils for construction.
- Detailed constraint mapping which depicts the concept development plan in relation to all relevant wetland and NH features, including:
  - ELC Vegetation communities;
  - Wetland area calculation and 30m minimum setback (as per NVCA Planning and Regulations Guidelines)
- Environmental impact assessment to review updates to the concept plan and provide an interpretation of all potential direct, indirect, and induced impacts of the proposal to identified natural hazard features and functions (including the wetland). The impact assessment should include a review of the feature-based water balance to interpret potential impacts to vegetation communities (wetlands) resulting from any potential changes in site drainage.
- Avoidance, mitigation, and restoration planning, including:
  - The provision of recommendations for development plan revisions, as appropriate.
  - Mitigation planning for potential construction activities and post-construction environmental risks.
  - Preliminary restoration planning related to impacts from construction activities, edge management planning considerations, ecologically-responsible landscaping, etc.
  - If offsetting for wetland and wetland setback is proposed, the wetland feature must be demonstrated to be eligible in accordance with the NVCA Net Gains for Ecological Offsetting Guideline.

NVCA screening maps for the property indicate the presence of two wetland features within the subject site measuring 4.2ha and 0.4ha respectively. The site also contains and a braided watercourse feature which traverse the property and conveys flows to Georgian Bay. Presence of these features is based on available data from NVCA, MNRF and Land Information Ontario sources. The precise locations of these features will need to be determined through an Environmental Impact Study review as detailed above. Natural Hazards associated with flooding and meander erosion are also present on the site.

Conclusion

The information presented herein is based on a preliminary concept plan and should not be considered NVCA final comments on development of the site at this time. The NVCA may at any point change our comments should new information become available which raises concerns pertaining to the NVCA core mandate. These comments should be considered valid at the time of issuance and preliminary in nature. All information related to ownership title, parcel registration and property boundaries is based on information provided by the applicant. We note that these comments are related to this submission and the information provided within this submission. NVCA requires additional information in order to complete our review and additional comments may be provided in the future.

Should you require any further information, please feel free to contact the undersigned at bkrul@nvca.on.ca or at extension 231.

Sincerely,

Ben Krul, Manager, Development Planning and Permits

Copies: Trevor Houghton, Manager of Planning – Town of Wasaga Beach
Jody McNabb, Project Support Specialist - R.J. Burnside
Ken Michaud - Sunray Group

From:	Ben Krul
To:	Mike Pincivero; Kevin Lalonde
Cc:	Trevor Houghton; James Orr; Jody McNabb; Tammy Kalimootoo; Richard Sloan; Tyler Kawall; Chris Hibberd; Dalia Al-Ali; Emma Perry; Planning Dept
Subject:	NVCA ID 42454 - 8859 Beachwood Road - Flood Hazard Study, Conceptual Design and Preliminary Scoped EIS - NVCA Comments
Date:	December 1, 2023 4:19:03 PM
Attachments:	image005.jpg image006.jpg

Good afternoon Mike and Kevin,

Nottawasaga Valley Conservation Authority (NVCA) staff have completed their review and are pleased to provide our comments below.

Background/Planning

It is proposed to develop a parcel of land between Hwy 26 and Beachwood Road in the west end of the Town of Wasaga Beach. In order to determine the existing flooding conditions of the site, floodplain modelling was completed using a 2D model. Based on these model results, the applicant is suggesting that a constructed drainage channel would mitigate local flooding (both on and off site). A preliminary technical memo was prepared using a 2D hydraulic model to define the extent of the flood inundation under existing conditions and to present the preliminary concept for the proposed drainage channel.

The watercourses in question are locally known as:

- Bayswater Creek (conveyed under Beachwood Road by Culvert #10) and
- Shore Creek (conveyed under Beachwood Road by Culvert #11).

A majority of the property is within the Bayswater Creek catchment with a portion of the eastern end being contained in the Shore Creek catchment.

NVCA staff note that NVCA and Provincial policy prohibits development within natural hazard areas and modifications to convey flood flows to support development. Considerations for minor regularization of floodplains may be considered on a site-specific basis and if proposed, must meet NVCA's Natural Hazards Technical Guidelines. Please note that wetlands are considered a natural hazard component.

The proposed development appears to be present removal of the wetland and channelization of the floodplain as a public benefit to alleviate flooding concerns in the surrounding area associated with the regulatory floodplain, with the added benefit of converting a significant portion of the parcel for residential development. While mitigation of flooding is part of the NVCA core mandate, the *Planning Act* is not the appropriate mechanism through which comprehensive floodplain mitigation should be considered across a large area. NVCA staff continue to recommend that any comprehensive flood plain mitigation be assessed through the appropriate planning mechanism such as the Municipal Class Environmental Assessment process if the objective is to provide a public benefit.

Material Reviewed

- Hydrogeological Investigation - 8859 Beachwood Road & 65 Robert Street, Town of Wasaga Beach. June 14, 2023. Palmer.
- Preliminary Scoped Environmental Impact Study - Beachwood Road and Robert Street South - Wasaga Beach. 3rd Revision April 11, 2023. Cotyledon Environmental Consulting.

Letter: August 16, 2023 "8859 Beachwood Road, Wasaga Beach, Flood Hazard Study Submission, Response to NVCA Review Engineering Comments", R.J. Burnside.

- Report: "8859 Beachwood Road West End Existing Floodplain Analysis – Sunray Living Inc.", R. J. Burnside & Associates Limited, December 15, 2022.
- Technical Memorandum: "8859 Beachwood Road, Sunray Living Inc.", R. J. Burnside & Associates Limited, August 16, 2023.
- Comment Matrix: "Comment/Responses re Peer Review (of Sunray Beachwood Flood Report (by Burnside)", author unclear, date unclear (comments/responses provided by Town of Wasaga Beach, Tatham and Ainley).
- Meeting: "SMS2D Floodplain Modelling Review (NVCA & RJB staff)", R.J. Burnside & Associated Limited, March 23 2023.

Ontario Regulation 176/06

The subject property is partially regulated pursuant to Ontario Regulation 172/06, the Authority's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. Permits are required from NVCA prior to development within the regulated area on the subject property.

-

<u>Ecology Review Comments</u>

Wetland Hydrology

Mini piezometers (MP1 and MP2) were installed on the edges of the parcel. It is not clear whether these devices were installed within the delineated wetland boundary, and at the margins of the feature may not be representative of the hydrologic conditions throughout the wetland. It is noted that the stated intent of the installation sites for the mini piezometers was to "to determine if the wetland features are groundwater or surface water supported" and that the MPs were installed within watercourses."

1. The report does not draw a conclusion about whether it was determined if the wetland features are groundwater-supported. Please provide a conclusion with respect to the groundwater interactions with the wetland feature as a whole based on the data collected.
2. The wetland hydroperiod was not determined as requested in previous comments. Please provide an assessment of the wetland hydroperiod.
3. The report concludes that there is no groundwater discharge based on dry surface conditions, with the exception of water levels in December. The data indicates MP2 had standing water from December 2021 to June 17, 2022, while MP1 had standing water from December 2021 to June 2022. Intermittently dry surface conditions for two out of five measurement events appears to be insufficient data to conclude that the standing water is related solely to surface flows, especially where the majority of measurements indicate standing water.
4. It is noted that one year of monitoring data (2021) is missing from the MP1 device, with inconsistent measurements missing key months when the sensors were presumably actively logging water levels. One measurement is presented in spring conditions across both sensors. Please provide the measurements from missing months to show at least one year of data for the site to inform the wetland hydroperiod.

5. The applicant’s hydrogeologist should provide a response as to why data for MP1 was not reported during April and May, which represent the spring freshet and likely the highest water level measurements for the year.
6. Please account for the loss of the sensor between the installation date on March 25th, 2021 and its retrieval December 22, 2021.
7. Are the gaps in the sensor data acceptable and in accordance with best practices to characterize the hydrogeologic conditions of the wetland?

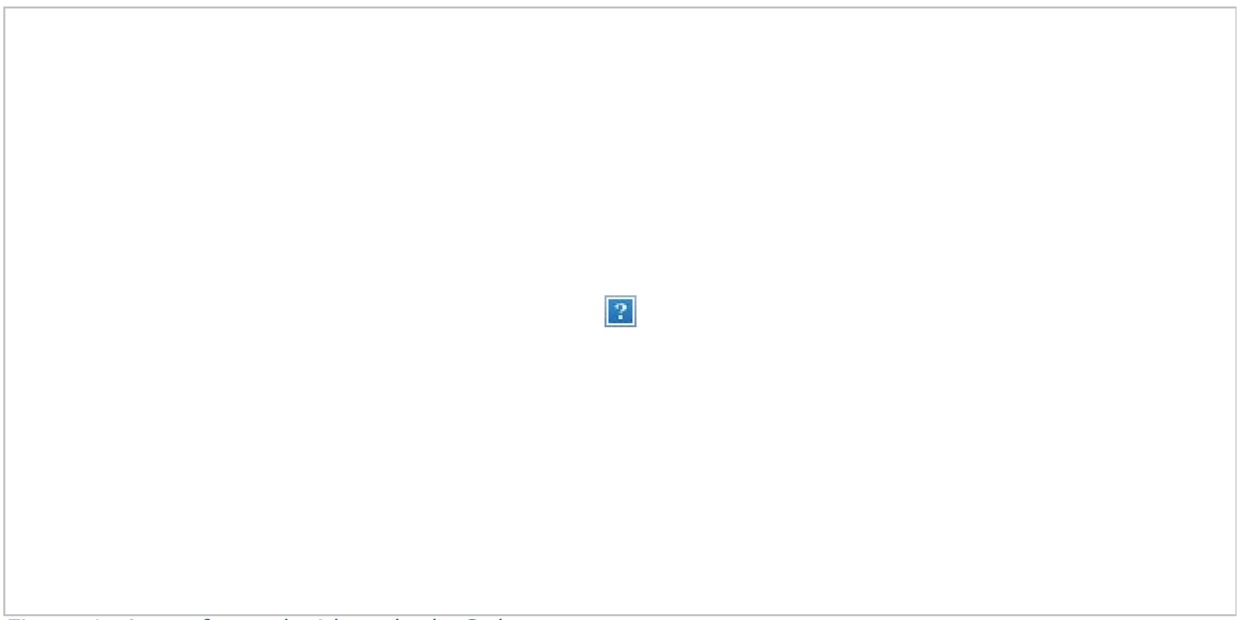


Figure 1: Area of parcel with no hydroG data

8. There appears to be a significant amount of area within the wetland feature (Figure 1) that was not monitored as part of the hydrogeologic program. The hydrogeologist should provide comment on how the chosen locations for the MPs support the characterization of the wetland hydrogeologic conditions across the entire feature and a statement that the locations of the MPs are appropriate to draw conclusions regarding the hydrogeological conditions of the wetland feature.
9. A post-development assessment of the water balance should be provided; only pre-development is provided in the current submission.

Environmental Impact Assessment

10. Previous NVCA comments requested that the impact assessment include a review of a feature-based water balance to interpret potential impacts to vegetation communities (wetlands)

resulting from any potential changes in site drainage. This request has not been addressed.

1. There appears to be no discussion of alternative alignments for the drainage channel which minimize impacts to the wetland. These options should be duly considered in order to preserve the feature and its reported functions as detailed in the EIS. Previous NVCA comments requested avoidance, mitigation, and restoration planning, including:
    a. The provision of recommendations for development plan revisions, as appropriate.
    b. Mitigation planning for potential construction activities and post-construction environmental risks.
    c. Preliminary restoration planning related to impacts from construction activities, edge management planning considerations, ecologically-responsible landscaping, etc.
    d. If offsetting for wetland and wetland setback is proposed, the wetland feature must be demonstrated to be eligible in accordance with the NVCA Net Gains for Ecological Offsetting Guideline.

   This request has not been addressed.

Wetland Classification and Evaluation

11. Previous NVCA comments requested delineation (Ecological Land Classification for Southern Ontario) of vegetation community with current vascular plant species inventory for each identified vegetation community. This request has been partially addressed. Please provide the ELC classifications and vegetation data from the Beacon (2012) EIS.
12. Previous NVCA comments requested confirmation of wetland unit identification and delineation (Ontario Wetland Evaluation System) and noted that NVCA may request formal evaluation of any identified wetland features using standard provincial criteria (Ontario Wetland Evaluation System). This request has not been addressed. Due to the proposed impacts to the wetland community, an OWES evaluation of the wetland feature is required to determine the level of significance of the feature. The EIS concludes that the feature is not significant, but this statement is not supported by a standardized evaluation methodology for assessing wetland significance in Ontario.

-

Documentation

13. The EIS cites reports from multiple consultants (Beacon and Azimuth) previously engaged in the ecological characterization of the site. For complete documentation of the surveys that were completed by others outside the authors of the EIS, the applicant must append all data and records collected by the previous consultants that are reference in the EIS report. The applicant’s consultant should confirm that they have taken reasonable steps to verify all information collected by previous consultants where referenced in the EIS report. Without this documentation, the EIS is considered incomplete.
14. The EIS is a preliminary, scoped document. The EIS was not scoped in accordance with the NVCA’s previously issued comments. The EIS should be updated to address all comments above, finalized and signed by the author.

The information presented herein is based on a preliminary EIS and should not be considered NVCA final comments on development of the site at this time. The NVCA may at any point change our comments should new information become available which raises concerns pertaining to the NVCA core mandate. These comments should be considered valid at the time of issuance and preliminary in nature. The NVCA does not conduct title searches in the Land Registry or obtain legal land title consultation when providing comments. All information related to ownership title, parcel registration and property boundaries is based on information provided by the applicant.

-

Engineering Review Comments

General Comments

1. **(NEW)** This engineering review was specific to the Existing Conditions Flood Study completed by R.J. Burnside for the Sunray property and surrounding drainage areas, and a high-level review of the proposed drainage channel concept. The comments generated as part of this review do not address the direct implications of the proposed drainage channel to the subject property and other impacted properties. Additional investigations and reviews are required to determine the impacts and feasibility of the proposed drainage improvements and future site development.

2. **(NEW)** The comments provided below relating to the proposed drainage improvements should be considered through the next steps of the planning and design process, but should not be construed as a conditional approval for the proposed design, and NVCA notes that future reviews will be required as the channel design is refined through the Municipal planning process and site plan development.

3. **(NEW)** The NVCA is requesting any additional information available related to the long-term operation and maintenance of the drainage channel. Please clarify any if any consideration has been given to the operation and maintenance of this feature.

Hydrologic Model

4. Provide documentation describing the build of the hydrology model (PCSWMM) including reasons for selection of catchment boundary and catchment parameters including the selection of the runoff method (SWMM5 nonlinear reservoir vs Alternative Runoff Method – NashIUH).

   RJB Response (August 2023): This rationale and background have been previously discussed with NVCA staff, but will also be provided in the final version of the floodplain report.

   NVCA Response (November 2023): NVCA looks forward to reviewing the next submission of the floodplain report.

5. Please provide a digital copy of the hydrology model (PCSWMM).

   RJB Response (August 2023): A digital copy was provided. A revised version can be submitted to support the current design process that is underway.

   NVCA Response (November 2023): Input parameters, including area weighted calculations based on land use and soil type seem generally appropriate for the contributing drainage areas. Please confirm that values used for area weighted composite CN and Runoff Coefficient calculations match values presented in NVCA SWM Guideline document (Tables 10.1 and 10.5).

6. **(NEW)** As this model is proposed to inform the design of a major municipal drainage project with long-term operations and maintenance implications, NVCA recommends that the hydrologic model is updated to incorporate climate change model projections, such as parameters provided by the IDF_CC tool *(Computerized IDF CC Tool for the Development of Intensity-Duration-Frequency Curves under a Changing Climate: (idf-cc-uwo.ca))*. Including climate adaptation options in the next submission will indicate that a more fulsome assessment of design criteria and alternatives have been considered in the conceptual drainage design.

7. **(NEW)** NVCA understands that significant review and discussion has been conducted to inform the development of the hydrologic model for this project. As discussed in Section 4.3 of the West End Existing Floodplain Analysis Report, NVCA understands that the catchment upstream of

Highway 26 that was originally delineated in the Delcan study does not include an area upstream of Sideroad 30 & 31. However, other recent hydrologic models, including NVCA's Regulatory Floodplain model, have included an upstream area as part of this catchment. Can further discussion be provided as to how it was determined that these upstream areas do not contribute runoff to the downstream catchment during the Regional storm event?

8. **(NEW)** In addition to Comment #7 above, and considering that this model is proposed to inform the design of a municipal drainage project, NVCA requests that the upstream catchment hydrology be revisited in future model updates to ensure that modelled conditions are reflective not only of current conditions, but also consider the future land use implications for the catchment upstream of Highway 26.

2D Model

9. Provide documentation from the LiDAR vendor describing the data acquisition, data processing and data validation procedures.

   RJB Response (August 2023): Burnside, Tatham, and Ainley have all independently undertaken some ground truthing of the LiDAR-sourced topo and have found very good correlation. Specific areas of this review can be provided as examples, should NVCA require them. See the response to Comment 5 below. We will obtain a statement from the vendor, but assume this may have been provided to the Town and / or Ainley already as part of the MDP data acquisition?

   NVCA Response (November 2023): Please provide a statement from the vendor.

10. Provide digital copies of the digital terrain data (LiDAR, topographic survey, etc.) used to build the SMS model.

    RJB Response (August 2023): A digital copy of the above information was provided in the initial submission. This information can be resubmitted.

    NVCA Response (November 2023): NVCA has received and reviewed this information. In subsequent submissions, NVCA requests that the final combined digital terrain model layer (SMS mesh) be exported as a terrain layer for review outside of the 2D model space (such as a DWG file), if possible.

11. The points used for ground truthing should be representative of the land use surfaces in the study area including, but not limited to, roads. The number of spot elevations for comparison should be increased significantly from the number reported (10). Provide a table comparing the two elevation data sets to support the conclusion that "the LiDAR data was not adjusted to match topographic survey elevations".

    RJB Response (August 2023): A total of 82 spot elevations were compared between the topographic data and the LiDAR data set. Overall, the difference between the two data sets was < 1 cm. The majority of the site is vegetated with trees, therefore most of the points that were compared fall within the forested land use category. However, comparisons were made between points that were on the roadway and ditches.

    NVCA Response (November 2023): Can a table please be provided which presents the differences in topographic data, including coordinates for these selected points (or shows them on a figure)?

12. Similar to the LiDAR data acquisition, provide documentation to support the accuracy of the topographic data. Provide an explanation as to why the topographic data was deemed of higher quality such that the topographic data was preferred over the LiDAR data for the site (Section 5.4).

RJB Response (August 2023): The topographic survey was completed by JoeTOPO. The elevations are geodetic based on NAD83 (Canada) and are derived from GPS real-time network observations using the 'CAN-NET' VRS Network, in UTM 17N. The Benchmark is CM 71U183, a control monument (CM) on top of a concrete culvert under Beachwood Road. The elevation of the CM is 183.98 m.

NVCA Response (November 2023): Thank you for providing information on the benchmark. However, this does not explain why the topographic data was selected instead of the LiDAR data for the site extents. Please further explain this decision.

13. Confirm if the culvert geometry was included in the topographic data survey. Please provide a hydraulic report for the existing conditions of each culvert.

RJB Response (August 2023): Culvert geometry was included in the topographic survey data. Hydraulic reports for the existing conditions of each culvert were provided in Appendix C of the report.

NVCA Response (November 2023): Provided. Comment addressed.

14. Please provide a digital copy of the HY8 model (only the digital files for the SMS model were received).

RJB Response (August 2023): A digital copy of the HY8 independent of the SMS model was provided in the submission. Another copy can be provided.

NVCA Response (November 2023): Please provide another copy of the HY-8 models for each culvert in existing conditions.

15. It is understood that the downstream boundary condition (Section 6.3.1.1) was set at 177.50m which is slightly higher than the value used in the NVCA Natural Hazard Technical Guide (Section 3.2.4) – 176.44m. Include a model scenario using 176.44m as a boundary condition and compare the results. Once the analysis is complete for the regional and 100-year events, the 100yr lake level for Georgian Bay (178.00m) is to be superimposed on the resultant water surface profile to. establish the regulatory level.

RJB Response (August 2023): We have run a scenario with the downstream boundary condition set to 176.44 m. Negligible differences were noted. This scenario will be included in the next submission.

NVCA Response (November 2023): NVCA looks forward to reviewing the next submission of the floodplain report.

16. Please provide digital copies (GIS format) of the hydraulic model data sets independent of the SMS platform including the existing and proposed flood hazard water surfaces.

RJB Response (August 2023): To be provided with detailed design submission.

NVCA Response (November 2023): NVCA looks forward to reviewing the next submission.

17. **(NEW)** For future submissions, can a cross-section of the site be provided illustrate flooding

depths under existing and proposed conditions for different storm events (i.e. 2- to 100-year storms)? This would assist in demonstrating the severity of flooding and potential for flooding abatement under a larger range of flooding events.

18. **(NEW)** For future submissions, please generate new figures from the 2D model to demonstrate the following results under existing and proposed conditions:

    a. Maximum flooding depths across the floodplain

    b. Maximum flow velocities across the floodplain

    c. Depth-velocity products across the floodplain.

Conceptual Channel Design

19. An alternative alignment for the outlet of Bayswater Creek to Georgian Bay has been proposed (Fig A2 and A3, this memo) to mitigate the flood hazard between Hwy 26 and the Georgian Bay shoreline. The preliminary design includes the following characteristics:

    - Profile grade of 0.69 to 1.52%
    - Bottom width 6.3m and 3:1 side slopes
    - A 3m maintenance access road
    - Regional flow 10.3 m3/s

    While it is necessary to respond to the above noted comments before NVCA engineering is in a position to accept the SMS flood hazard model, sufficient information has been provided in the above noted report for NVCA engineering to support, in principle, the proposed "conceptual channel design" and associated horizontal alignment. Details of the "conceptual channel" corridor, including total width, main channel alignment within the flood cross-section and corridor/channel boundary materials, may vary depending on the results of the final flood hazard model.

    RJB Response (August 2023): Acknowledged. Significant modelling and analysis have been performed since the original submission of the model to further confirm the catchment areas and delineations to the channel, and how they interact over time through the channel reach. This has provided a sufficient level of confidence in determining the peak flows at various nodes in the channel, and from that, detailed channel geometry has been derived to accommodate these flows. In addition, the peak flow discrepancy between the Burnside 2D SMS Model and Tatham MDP has also been studied and the peak flow "delta" can now be rationalized with confidence, based on difference in the true catchment area to the channel. A technical memo has been prepared under separate cover, summarizing how the peak flows were arrived at, and how the channel geometry was determined from those flows (allowing for grading transitions on each side, plus a 5 m flat platform on which a 3 m maintenance access road will be constructed.

    NVCA Response (November 2023): NVCA understands that hydrology updates since the last model submission may slightly modify the extents or depths of flooding in the 2D model. Please provide updated model results to reflect these changes, once available.

20. **(NEW)** Installation of the proposed drainage channel configuration may have effect of draining the wetland feature located on the subject lands at 8859 Beachwood Road, which will impact the extents of the future development of the parcel. It should be demonstrated that alternative channel configurations have been duly considered in accordance with the intent of the

Environmental Assessment Act Sections 6.1(2)(ii)-(iii), 6.1(2)(c)(iii) and 6.1(2)(d) to minimize the environmental impact and provide partial drainage of the site without entirely removing baseflow / minor inputs to the existing wetland features on the subject site and maintain a baseline of ecological functions. Please demonstrate that alternative drainage configurations have been duly considered to provide different levels of flood mitigation for the site and surrounding properties and the respective impacts on adjacent natural features. Ultimately, the NVCA is looking for a holistic assessment of potential alternatives and impacts to the subwatershed through several technical studies (including the provided the Flood Study) when reviewing the proposed drainage improvement design.

21. **(NEW)** NVCA understands that the proposed channel design supports the Town's broader flooding abatement objectives (as outlined in the West End Drainage Master Plan), as it seeks to mitigate flooding on site and beyond the property's extents. NVCA would like to formally distinguish between the proposed channel's feasibility to achieve flood mitigation goals and the approval of this overall drainage strategy to increase the developable envelope within the parcel. As previously communicated, the *Planning Act* is not an appropriate regulatory tool for this type of large-scale flooding remediation project.

22. As part of a comprehensive review, the NVCA may also request the following studies and evaluations (or others not listed) to support this type of channel alteration:

    a. Further calibration and validation of the hydrologic model
        - Baseflow estimates and field verification
    b. Additional hydraulic analyses, including:
        - Sensitivity analysis of 2D model under different flow and blockage conditions for a variety of storm events
        - Riparian storage (existing vs. proposed)
        - Velocity calculations
    c. Geomorphic basis for design
    d. Proposed channel morphology (plan form, cross-section, bed profile)
    e. Proposed substrate (provide calculations to support size)
    f. Bank stabilization
    g. Erosion protection (if applicable)
    h. Connection to existing channel / final discharge point

References & Closure

Review of the above noted response was based on requirements and guidelines presented in the following documents:

1. "Planning and Regulation Guidelines", Nottawasaga Valley Conservation Authority, August 2009;
2. "Natural Hazards Technical Guide", Nottawasaga Valley Conservation Authority, December 2013
3. "Technical Guide River & Stream Systems: Flood Hazard Limit", Ministry of Natural Resources

2002.

4. “Technical Guide River & Stream Systems: Erosion Hazard Limit”, Ministry of Natural Resources 2002.
5. “Stormwater Management Planning and Design Manual”, Ministry of the Environment 2003;
6. “Stormwater Technical Guide”, Nottawasaga Valley Conservation Authority, December 2013;
7. “Erosion and Sediment Control Guideline for Urban Construction”, Great Golden Horseshoe Area Conservation Authorities, December 2006

We note that these comments are related to this submission and the information provided within this submission. NVCA requires additional information in order to complete our review and additional comments may be provided in the future.

Please provide a comment response matrix with the next submission which clearly outlines how each comment has been addressed and where the information can be found in the submission (i.e. drawing name). Please ensure that any reports and/or drawings subject to revision include the revision date.

Should you have any questions or require clarification on any of the above, please let me know.

Thank you,

Ben Krul BES., CAN-CISEC (he/him/his)
Manager, Development Planning and Permits

Provincial Offences Officer
Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext.231¦**F** 705-424-2115
bkrul@nvca.on.ca¦nvca.on.ca

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (519) 941-8120 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

April 26, 2024

Via: Email (bkrul@nvca.on.ca)

Ben Krul, Manager
Development Planning and Permits
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia ON L0M 1T0

Mike Pincivero, P.Eng.
Manager of Engineering Services, RMO/RMI
Town of Wasaga Beach
30 Lewis Street
Wasaga Beach ON L9Z 1A1

Dear Ben:

Re: 8859 Beachwood Road, Wasaga Beach
Flood Hazard Study Submission
Response to NVCA Review Engineering Comments
NVCA ID No.: 42454
Project No.: 300052877.1000

This letter provides a summary of preliminary review comments (by NVCA) and responses (by R.J. Burnside) with respect to the proposed west end flood diversion channel in Wasaga Beach. These comments were also discussed extensively during a meeting between Burnside, NVCA, and the Town of Wasaga Beach on January 12, 2024.

Engineering Review Comments:

Please see below R.J. Burnside & Associates Limited's (Burnside's) response in bold to the Nottawasaga Valley Conservation Authority's (NVCA's) review comments, received December 1, 2023. Most comments will be addressed as indicated and revisions carried through Burnside's 2D floodplain model and hydraulic report, both of which will be updated and re-submitted at detailed design. The revisions requested to address these comments are not expected to result in any significant changes to the channel design as presently proposed.

General Comments

1. **(NEW)** This engineering review was specific to the Existing Conditions Flood Study completed by R.J. Burnside for the Sunray property and surrounding drainage areas, and a high-level review of the proposed drainage channel concept. The comments generated as part of this review do not address the direct implications of the proposed drainage channel to the subject property and other impacted properties. Additional investigations and reviews are required to determine the impacts and feasibility of the proposed drainage improvements and future site development.

   Noted, any additional studies required can be confirmed and discussed during detailed design.

2. **(NEW)** The comments provided below relating to the proposed drainage improvements should be considered through the next steps of the planning and design process, but should not be construed as a conditional approval for the proposed design, and NVCA notes that future reviews will be required as the channel design is refined through the Municipal planning process and site plan development.

   Noted.

3. **(NEW)** The NVCA is requesting any additional information available related to the long-term operation and maintenance of the drainage channel. Please clarify any if any consideration has been given to the operation and maintenance of this feature.

   Noted. Yes, the Town of Wasaga Beach will be responsible for the long term operation and maintenance of the channel. An access road has been proposed along the length of the channel for maintenance. Access rights over this area will be provided via an easement in favour of the Town of Wasaga Beach for any sections that are not otherwise dedicated (to be owned outright by the Town).

Hydrologic Model

4. Provide documentation describing the build of the hydrology model (PCSWMM) including reasons for selection of catchment boundary and catchment parameters including the selection of the runoff method (SWMM5 nonlinear reservoir vs Alternative Runoff Method – NashIUH).

   RJB Response (August 2023): This rationale and background have been previously discussed with NVCA staff, but will also be provided in the final version of the floodplain report.

   NVCA Response (November 2023): NVCA looks forward to reviewing the next submission of the floodplain report.

   Noted.

5. Please provide a digital copy of the hydrology model (PCSWMM).

   RJB Response (August 2023): A digital copy was provided. A revised version can be submitted to support the current design process that is underway.

   NVCA Response (November 2023): Input parameters, including area weighted calculations based on land use and soil type seem generally appropriate for the contributing drainage areas. Please confirm that values used for area weighted composite CN and Runoff Coefficient calculations match values presented in NVCA SWM Guideline document (Tables 10.1 and 10.5).

   Noted, will be confirmed when the report is re-submitted during detailed design.

6. **(NEW)** As this model is proposed to inform the design of a major municipal drainage project with long-term operations and maintenance implications, NVCA recommends that the hydrologic model is updated to incorporate climate change model projections,

such as parameters provided by the IDF_CC tool *(Computerized IDF CC Tool for the Development of Intensity-Duration-Frequency Curves under a Changing Climate: (idf-cc-uwo.ca))*. Including climate adaptation options in the next submission will indicate that a more fulsome assessment of design criteria and alternatives have been considered in the conceptual drainage design.

Noted. This comment was discussed at the January 12 meeting and it was agreed that climate change adaptations (based on ongoing research) to the peak flows could be considered through a sensitivity analysis of the flood plain modelling to determine potential impacts. Although it was agreed that that Climate Change adaptations could be an important consideration, the Town of Wasaga Beach and the NVCA do not presently have established Climate Change standards or requirements in their design guidelines / SWM standards.

7. **(NEW)** NVCA understands that significant review and discussion has been conducted to inform the development of the hydrologic model for this project. As discussed in Section 4.3 of the West End Existing Floodplain Analysis Report, NVCA understands that the catchment upstream of Highway 26 that was originally delineated in the Delcan study does not include an area upstream of Sideroad 30 & 31. However, other recent hydrologic models, including NVCA's Regulatory Floodplain model, have included an upstream area as part of this catchment. Can further discussion be provided as to how it was determined that these upstream areas do not contribute runoff to the downstream catchment during the Regional storm event?

   This question has been discussed and coordinated with both Ainley and Tatham during their reviews of the report. A subsequent supporting hydrology memo was prepared and submitted by Burnside to provide context to the establishment of the peak flows used in the floodplain report. This memo will be incorporated into the revised hydraulic report to be prepared and submitted during detailed design following the completion of the EA.

8. **(NEW)** In addition to Comment #7 above, and considering that this model is proposed to inform the design of a municipal drainage project, NVCA requests that the upstream catchment hydrology be revisited in future model updates to ensure that modelled conditions are reflective not only of current conditions, but also consider the future land use implications for the catchment upstream of Highway 26.

   This was discussed at the January 12 meeting and it was agreed that future development conditions would be very difficult to ascertain at this point in time. The upstream lands contributing to the proposed channel are predominantly agricultural and undeveloped lands outside of the Town of Wasaga Beach development boundary. Future development and / or changes of land use within these areas is assumed to be very minimal. However, further discussions with the Town will be held to refine / confirm these assumptions.

2D Model

9. Provide documentation from the LiDAR vendor describing the data acquisition, data processing and data validation procedures.

   RJB Response (August 2023): Burnside, Tatham, and Ainley have all independently undertaken some ground truthing of the LiDAR-sourced topo and have found very good correlation. Specific areas of this review can be provided as examples, should NVCA require them. See the response to Comment 5 below. We will obtain a statement from the vendor, but assume this may have been provided to the Town and / or Ainley already as part of the MDP data acquisition?

   NVCA Response (November 2023): Please provide a statement from the vendor.

   The source of LIDAR was from the Town of Wasaga Beach – Burnside and the Town will seek to obtain a statement from the vendor, but this information has been calibrated and ground-trothed and found to be accurate and consistent by several consultants and the Twon of Wasaga Beach.

10. Provide digital copies of the digital terrain data (LiDAR, topographic survey, etc.) used to build the SMS model.

    RJB Response (August 2023): A digital copy of the above information was provided in the initial submission. This information can be resubmitted.

    NVCA Response (November 2023): NVCA has received and reviewed this information. In subsequent submissions, NVCA requests that the final combined digital terrain model layer (SMS mesh) be exported as a terrain layer for review outside of the 2D model space (such as a DWG file), if possible.

    Noted, to be provided during detailed design.

11. The points used for ground truthing should be representative of the land use surfaces in the study area including, but not limited to, roads. The number of spot elevations for comparison should be increased significantly from the number reported (10). Provide a table comparing the two elevation data sets to support the conclusion that “the LiDAR data was not adjusted to match topographic survey elevations”.

    RJB Response (August 2023): A total of 82 spot elevations were compared between the topographic data and the LiDAR data set. Overall, the difference between the two data sets was < 1 cm. The majority of the site is vegetated with trees, therefore most of the points that were compared fall within the forested land use category. However, comparisons were made between points that were on the roadway and ditches.

    NVCA Response (November 2023): Can a table please be provided which presents the differences in topographic data, including coordinates for these selected points (or shows them on a figure)?

    Noted, to be provided during detailed design.

12. Similar to the LiDAR data acquisition, provide documentation to support the accuracy of the topographic data. Provide an explanation as to why the topographic data was deemed of higher quality such that the topographic data was preferred over the LiDAR data for the site (Section 5.4).

    RJB Response (August 2023): The topographic survey was completed by JoeTOPO. The elevations are geodetic based on NAD83 (Canada) and are derived from GPS real-time network observations using the 'CAN-NET' VRS Network, in UTM 17N. The Benchmark is CM 71U183, a control monument (CM) on top of a concrete culvert under Beachwood Road. The elevation of the CM is 183.98 m.

    NVCA Response (November 2023): Thank you for providing information on the benchmark. However, this does not explain why the topographic data was selected instead of the LiDAR data for the site extents. Please further explain this decision.

    Geodetically derived topographic survey is general found to be more accurate than the tolerance range for LIDAR.

13. Confirm if the culvert geometry was included in the topographic data survey. Please provide a hydraulic report for the existing conditions of each culvert.

    RJB Response (August 2023): Culvert geometry was included in the topographic survey data. Hydraulic reports for the existing conditions of each culvert were provided in Appendix C of the report.

    NVCA Response (November 2023): Provided. Comment addressed.

14. Please provide a digital copy of the HY8 model (only the digital files for the SMS model were received).

    RJB Response (August 2023): A digital copy of the HY8 independent of the SMS model was provided in the submission. Another copy can be provided.

    NVCA Response (November 2023): Please provide another copy of the HY-8 models for each culvert in existing conditions.

    Burnside will re-submit the files previously sent and include in the detailed design submission.

15. It is understood that the downstream boundary condition (Section 6.3.1.1) was set at 177.50m which is slightly higher than the value used in the NVCA Natural Hazard Technical Guide (Section 3.2.4) – 176.44m. Include a model scenario using 176.44m as a boundary condition and compare the results. Once the analysis is complete for the regional and 100-year events, the 100yr lake level for Georgian Bay (178.00m) is to be superimposed on the resultant water surface profile to. establish the regulatory level.

    RJB Response (August 2023): We have run a scenario with the downstream boundary condition set to 176.44 m. Negligible differences were noted. This scenario will be included in the next submission.

NVCA Response (November 2023): NVCA looks forward to reviewing the next submission of the floodplain report.

Noted.

16. Please provide digital copies (GIS format) of the hydraulic model data sets independent of the SMS platform including the existing and proposed flood hazard water surfaces.

    RJB Response (August 2023): To be provided with detailed design submission.

    NVCA Response (November 2023): NVCA looks forward to reviewing the next submission.

    Noted.

17. **(NEW)** For future submissions, can a cross-section of the site be provided illustrate flooding depths under existing and proposed conditions for different storm events (i.e. 2- to 100-year storms)? This would assist in demonstrating the severity of flooding and potential for flooding abatement under a larger range of flooding events.

    The modelling completed has focused on the Reigonal Storm, as such the 2 - 100-year storms have not been modelled and are not relevant for a regulatory flood study.

18. **(NEW)** For future submissions, please generate new figures from the 2D model to demonstrate the following results under existing and proposed conditions:

    a. Maximum flooding depths across the floodplain

    b. Maximum flow velocities across the floodplain

    c. Depth-velocity products across the floodplain.

    Noted, these figures were included in the Floodplain report submitted and will be included in the future design reports.

Conceptual Channel Design

19. An alternative alignment for the outlet of Bayswater Creek to Georgian Bay has been proposed (Fig A2 and A3, this memo) to mitigate the flood hazard between Hwy 26 and the Georgian Bay shoreline. The preliminary design includes the following characteristics:

    - Profile grade of 0.69 to 1.52%
    - Bottom width 6.3m and 3:1 side slopes
    - A 3m maintenance access road
    - Regional flow 10.3 m3/s

20. While it is necessary to respond to the above noted comments before NVCA engineering is in a position to accept the SMS flood hazard model, sufficient information has been provided in the above noted report for NVCA engineering to support, in principle, the proposed “conceptual channel design” and associated horizontal alignment. Details of

the “conceptual channel” corridor, including total width, main channel alignment within the flood cross-section and corridor/channel boundary materials, may vary depending on the results of the final flood hazard model.

RJB Response (August 2023): Acknowledged. Significant modelling and analysis have been performed since the original submission of the model to further confirm the catchment areas and delineations to the channel, and how they interact over time through the channel reach. This has provided a sufficient level of confidence in determining the peak flows at various nodes in the channel, and from that, detailed channel geometry has been derived to accommodate these flows. In addition, the peak flow discrepancy between the Burnside 2D SMS Model and Tatham MDP has also been studied and the peak flow “delta” can now be rationalized with confidence, based on difference in the true catchment area to the channel. A technical memo has been prepared under separate cover, summarizing how the peak flows were arrived at, and how the channel geometry was determined from those flows (allowing for grading transitions on each side, plus a 5 m flat platform on which a 3 m maintenance access road will be constructed.

NVCA Response (November 2023): NVCA understands that hydrology updates since the last model submission may slightly modify the extents or depths of flooding in the 2D model. Please provide updated model results to reflect these changes, once available.

Noted.

21. **(NEW)** Installation of the proposed drainage channel configuration may have effect of draining the wetland feature located on the subject lands at 8859 Beachwood Road, which will impact the extents of the future development of the parcel. It should be demonstrated that alternative channel configurations have been duly considered in accordance with the intent of the Environmental Assessment Act Sections 6.1(2)(ii)-(iii), 6.1(2)(c)(iii) and 6.1(2)(d) to minimize the environmental impact and provide partial drainage of the site without entirely removing baseflow / minor inputs to the existing wetland features on the subject site and maintain a baseline of ecological functions. Please demonstrate that alternative drainage configurations have been duly considered to provide different levels of flood mitigation for the site and surrounding properties and the respective impacts on adjacent natural features. Ultimately, the NVCA is looking for a holistic assessment of potential alternatives and impacts to the subwatershed through several technical studies (including the provided the Flood Study) when reviewing the proposed drainage improvement design.

Please refer to the following documents in response to Ecology and Environmental comments, under separate cover:

- **Summary of Ecological Considerations, Cotyledon, December 21, 2023;**
- **Technical Memorandum, Cotyledon, January 19, 2024;**
- **Desktop OWES Evaluation, Cotyledon, February 26, 2024.**

22. **(NEW)** NVCA understands that the proposed channel design supports the Town's broader flooding abatement objectives (as outlined in the West End Drainage Master Plan), as it seeks to mitigate flooding on site and beyond the property's extents. NVCA would like to formally distinguish between the proposed channel's feasibility to achieve flood mitigation goals and the approval of this overall drainage strategy to increase the developable envelope within the parcel. As previously communicated, the Planning Act is not an appropriate regulatory tool for this type of large-scale flooding remediation project.

The Planning Act is not the mechanism being proposed – as such it is the intention for the proposed channel to be studied as part of an Addendum to the open EA for Thomas and Constance Street, the goal of which is to resolve flooding in the stated area and wider surrounds with a viable solution. The proposed channel will undoubtedly resolve flooding for a large number of properties, including existing residences, municipal roads and properties (West End Public Works Yard), and lands zoned and dedicated for development. Mitigation of flooding certainly makes these lands potentially viable for development where they once were not, because they were inundated with a regulatory flood plain. This fact is not in dispute. There are many positive outcomes of the proposed flood mitigation – rendering land developable is one of those outcomes.

23. As part of a comprehensive review, the NVCA may also request the following studies and evaluations (or others not listed) to support this type of channel alteration:

    a. Further calibration and validation of the hydrologic model
        - Baseflow estimates and field verification
    b. Additional hydraulic analyses, including:
        - Sensitivity analysis of 2D model under different flow and blockage conditions for a variety of storm events
        - Riparian storage (existing vs. proposed)
        - Velocity calculations
    c. Geomorphic basis for design
    d. Proposed channel morphology (plan form, cross-section, bed profile)
    e. Proposed substrate (provide calculations to support size)
    f. Bank stabilization
    g. Erosion protection (if applicable)
    h. Connection to existing channel / final discharge point

    Noted.

We trust the NVCA's comments on the conceptual flood channel engineering design, flood plain model, and hydraulic report have been satisfactorily addressed at this stage of the process leading into the EA Addendum PIC.

Yours truly,

R.J. Burnside & Associates Limited

James Orr, P.Eng.
Senior Vice President, Land Development
RW:sm

cc: Trevor Houghton, Manager of Planning, Town of Wasaga Beach
Ken Michaud, Sunray Group

240424_NVCA ID42454 - Response to Comments (052877)
26/04/2024 5:50 PM

Appendix D
Scoped Environmental Impact Study Beachwood Road Class EA Update

Scoped Environmental Impact Study

Beachwood Road Class EA Update

Town of Wasaga Beach

Prepared for:
Ainley Group

Prepared by:
Azimuth Environmental
Consulting, Inc.

October 2023

AEC 23-224

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

October 12, 2023 AEC 23-224

Ainley Group
550 Welham Road
Barrie, Ontario
L4N 8Z7

Attention: Richard Sloan, Water Resources Group Lead

Re: **Scoped Environmental Impact Study, Class EA Update for the West End Water Storage and Maintenance Depot, Town of Wasaga Beach**

Dear Mr. Sloan:

Azimuth Environmental Consulting, Inc. was retained to provide a Scoped Environmental Impact Study (EIS) to assist with the evaluation of drainage improvements along Beachwood Road for an updated Schedule 'C' Class Environmental Assessment (Class EA) in the Town of Wasaga Beach (the 'Town'). The purpose of this Class EA update is to review new design alternatives (Options 5 and 6) for managing drainage that considers possible development south of Beachwood Drive and the Constance Boulevard EA study area. Azimuth evaluated potential environmental impacts for the two new proposed design alternatives to assist the Town with selection of the preferred alternative to finalize the Environmental Study Report (ESR).

Should you have any questions or require additional information please do not hesitate to contact the undersigned.

Regards,

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

DRAFT

Roger Holmes, M.Sc.
Senior Aquatic Ecologist

DRAFT

Jordan Wrobel, B.Sc.
Terrestrial Ecologist

Table of Contents

page

Letter of transmittal ..... **i**

1.0 INTRODUCTION **1**

1.1 Municipal Class EA Process **1**

1.2 Statement of the Problem and Opportunities **1**

2.0 PLANNING AND AGENCY JURISDICTION CONTEXT **3**

2.1 Provincial Planning Policy (2020) **3**

2.2 Endangered Species Act (2007) **4**

2.3 County of Simcoe (2023) **4**

2.4 Town of Wasaga Beach (2023) **4**

2.5 Nottawasaga Valley Conservation Authority **5**

2.6 Federal Fisheries Act **5**

3.0 STUDY APPROACH **5**

3.1 Background Information **6**

3.2 Vegetation Community Mapping and Surveys **7**

3.3 Wildlife Surveys **7**

3.4 Fish and Fish Habitat **8**

4.0 EXISTING CONDITIONS **8**

4.1 Study Area and Land Use **8**

4.2 Terrestrial Resources **8**

4.2.1 Vegetation 8

4.2.2 Rare and Uncommon Plants 9

4.2.3 Wildlife 10

4.3 Species at Risk **10**

4.4 Wetlands **11**

4.5 Candidate Significant Woodland **11**

4.6 Candidate Significant Valleyland **11**

4.7 Candidate Significant Wildlife Habitat **12**

4.8 Areas of Natural and Scientific Interest **12**

4.9 Fish and Fish Habitat **12**

4.9.1 Review of Background Reporting 15

5.0 NATURAL HERITAGE FEATURES AND FUNCTIONS 16

6.0 SUMMARY OF PROPOSED ALTERNATIVE SOLUTIONS..... 16

6.1 Option 5 - Redirect Drainage from Highway 26 to West Depot Outlet Channel.. 17

6.1.1 Terrestrial Considerations... 17

Habitat for Endangered and Threatened Species.. 17

Other Wetlands.. 19

Candidate Significant Wildlife Habitat 20

Eastern Wood-pewee, Wood Thrush 22

Monarch 23

Snapping Turtle.. 23

6.1.2 Fisheries Considerations.. 23

6.2 Option 6 – Maintain Base Flow along Existing Drainage Alignment, Redirect Storm Flows from Highway 26 to West Depot Outlet Channel 24

6.2.1 Terrestrial Considerations... 25

6.2.2 Fisheries Considerations.. 25

7.0 EVALUATION OF PROPOSED ALTERNATIVE SOLUTIONS26

8.0 PRELIMANRY PREFERRED SOLUTION 26

9.0 RECOMMENDATIONS 27

9.1 Species at Risk 27

9.2 Migratory Breeding Birds and Bats.. 27

9.3 Sediment and Erosion Controls.. 28

9.4 General Operations.. 28

9.5 Fish and Fish Habitat 28

9.6 Permitting and Consultation... 29

9.6.1 DFO Permitting 29

9.6.2 NVCA Permitting.. 30

9.6.3 MECP Permitting 30

Black Ash (Endangered).. 30

10.0 CONCLUSIONS 30

11.0 REFERENCES 31

List of Figures

Figure 1: Study Area Location
Figure 2: Environmental Features
Figure 3: Proposed Development Option 5 & 6

List of In-text Tables

Table A: Evaluation of Alternative Solutions – Natural Heritage Impacts

List of Attached Tables

Table 1: Species at Risk Summary and Assessment

List of Appendices

Appendix A: Provincial and Municipal Mapping
Appendix B: Background Information
Appendix C: Photographic Record
Appendix D: Option 5 & 6 Proposed Site Plan

1.0 INTRODUCTION

The Town of Wasaga Beach has retained the services of the Ainley Group (Ainley) to undertake a Municipal Class Environmental Assessment (Class EA) to identify a suitable solution for reducing flooding events in the area of Constance Boulevard and Thomas Street to Bayswater Drive, as the current infrastructure is insufficient for stormwater events (Ainley, 2022). For this project, a Class EA was already underway regarding the flooding concerns. A new design alternative is being evaluated as part of this report that was not previously assessed as part of the original Class EA, which warranted reopening the assessment to ensure all possible solutions are evaluated.

1.1 Municipal Class EA Process

A Municipal Class Environmental Assessment follows an approved planning process designed to protect the environment and to ensure compliance with the *Environmental Assessment Act* (EA Act). The purpose of the EA Act is to provide for "…the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment". The term 'environment' is broadly defined and includes the built, natural, socio-economic and cultural environments. The process requires the evaluation of potential solutions and design concepts so as to select a suitable approach that will address the problem/opportunity, but also keep impacts to a minimum.

This project is classified as a Schedule 'C' in accordance with the Municipal Class Environmental Act (Oct. 2000, as amended 2007, 2011 & 2015) and requires completion of Phases 1 to 4 of the process. At this stage of the project, Azimuth is currently fulfilling the natural heritage components within Phase 2 of the Municipal Class EA Process.

1.2 Statement of the Problem and Opportunities

Azimuth was retained by Ainley Group (Ainley) to provide a preliminary environmental assessment of the study area with regards to updated alternatives to address the following problem/opportunity statement:

"The purpose of this study is to identify a suitable solution for reducing the probability of flooding events in the area of Constance Boulevard and Thomas Street to Bayswater Drive, particularly in consideration of snow melt occurrences as well as increased rainfall intensities expected due to climate change. The current capacity of the roadside ditch along Constance Boulevard in this area is insufficient to contain larger stormwater events and results in flooding."

Previously completed Class EA reporting, as prepared by others, has already reviewed the initial design alternatives from a natural heritage perspective (Options 1-4 as listed below). The two updated alternatives (Options 5 and 6 as listed below in bold) are reviewed by Azimuth in this Class EA Update report from a natural heritage features and functions (NHFFs) perspective for consideration in the selection process for the preferred design alternative. All design alternatives for this Class EA project are listed below:

- Option 1 - "Do Nothing"/Status Quo
- Option 2 - Create New Outlet to the Bay through Property at 18 Constance Boulevard
- Option 3 - Increase Capacity of Constance Boulevard Ditch to Outlet North of Bayswater Drive
- Option 4A - Redirect Drainage to Other Private Lands – Constance Boulevard-West Depot Connection
- Option 4B - Redirect Drainage to Other Private Lands – Betty Boulevard-West Depot Connection
- **Option 5 - Redirect Drainage from Highway 26 to West Depot Outlet Channel**
- **Option 6 – Maintain Base Flow along Existing Drainage Alignment, Redirect Storm Flows from Highway 26 to West Depot Outlet Channel**

The purpose of this EA is to:

1. Describe the two updated alternative solutions based on a scoped field program;
2. Evaluate each solution based on specific criteria to recommend a preferred solution; and,
3. Assess the potential for environmental impacts associated with construction of the diesel fuel depot at the preferred solution.

A review of online background information, in combination with the detailed field program and natural heritage reports prepared by others, are used to describe existing NHFFs within the study area. Recommendations for avoidance and mitigation are provided where potential or confirmed NHFFs have been identified.

2.0 PLANNING AND AGENCY JURISDICTION CONTEXT

2.1 Provincial Planning Policy (2020)

The Provincial Policy Statement (PPS) (MMAH, 2020) outlines policies related to natural heritage features (Section 2.1) and water resources (Section 2.2). Ontario's *Planning Act*, (1990) requires that planning decisions shall be consistent with the PPS. The study area for this assessment is located entirely in **Ecoregion 6E**. According to the PPS development and site alteration shall not be permitted in:

- *Significant wetlands* in Ecoregions 5E, 6E and 7E; and,
- *Significant coastal wetlands*.

Similarly, Section 2.1.5 of the PPS states that, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions, development and site alteration shall not be permitted within:

a) *significant wetlands* in the Canadian Shield north of Ecoregions 5E, 6E; and 7E;
b) *significant woodlands* in Ecoregions 6E; and 7E;
c) *significant valleylands* in Ecoregions 6E; and 7E;
d) *significant wildlife habitat*;
e) *significant areas of natural and scientific interest*; and,
f) *coastal wetlands* in Ecoregions 5E, 6E; and 7E that are not subject to policy 2.1.4(b).

It is ultimately the responsibility of the Province and/or the Municipality to designate areas identified within Section 2.1.4 and 2.1.5 of the PPS as “significant”.

Section 2.1.6 of the PPS states that development and site alteration is not permitted in fish habitat except in accordance with federal and provincial requirements.

Section 2.1.7 of the PPS states that development and site alteration shall not be permitted in the habitat of Threatened and Endangered species, except in accordance with provincial and federal requirements.

Furthermore, under Section 2.1.8 of the PPS, no development or site alteration will be permitted on lands adjacent to natural heritage features and areas identified in policies 2.1.4, 2.1.5 and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated there will be no negative impacts on the natural features and their ecological functions.

2.2 Endangered Species Act (2007)

Ontario's ESA provides regulatory protection to Endangered and Threatened species prohibiting harassment, harm and/or killing of individuals and destruction of their habitats. Habitat is broadly characterized in the ESA as the area prescribed by a regulation as the habitat of the species or an area on which the species depends, directly or indirectly, to carry out its life processes including reproduction, rearing of young, hibernation, migration or feeding.

The various schedules of the ESA included under O. Reg. 230/08 identify SAR in Ontario. These include species listed as Extirpated, Endangered, Threatened and Special Concern. As noted above, only species listed as Endangered and Threatened receive protection from harm and destruction to habitat on which they depend.

2.3 County of Simcoe (2023)

The study area is shown by the County's Official Plan (OP; County of Simcoe, 2023) as occurring entirely in the "Settlements" designation (Schedule 5.1; Appendix A). The study area and adjacent lands do not occur in the vicinity of a Provincially Significant Wetland (PSW), Locally Significant Wetland or Area of Natural and Scientific Interest (ANSI) – Provincial or Regional – in accordance with Schedules 5.2.2 and 5.2.3 of the County OP (Appendix A). A mapped watercourse occurs within the study area (Schedule 5.2.2; Appendix A).

Simcoe County Mapping (2023) illustrates a majority of the study area as "woodlands" (light green overlay) and identifies an "unevaluated wetland" (dark green overlay) between Beachwood Road and Highway 26. One watercourse feature is illustrated within the study area (Appendix A).

2.4 Town of Wasaga Beach (2023)

The majority of the study area is designated by the Town's OP (Town of Wasaga Beach, 2023) as "Residential", with the mapped watercourse and riparian lands designated as "Natural Heritage System Category 1" on the Land Use Plan (Schedule A-1; Appendix A). According to the Town's OP, "Natural Heritage System Category 1" lands may primarily be characterized as natural areas of high environmental quality and significance and/or sensitivity. These may include lands that are provincially significant wetlands, natural watercourses and ravines, and/or significant habitat of endangered species and threatened species. According to Schedule D (Appendix A), there are small pockets of

"Natural Heritage System Category 1 and 2 Lands" along the Right-of-Way (ROW) of Beachwood Road and Betty Boulevard within the study area

2.5 Nottawasaga Valley Conservation Authority

The study area is in the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA) and includes lands within the NVCA Regulation Limit. As such, the proposed development would be subject to O. Reg. 172/06 – "Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses" by the NVCA. Under Regulation 172/06, the NVCA may require that approvals be obtained for any proposed development or site alteration in areas regulated under the Conservation Authority's jurisdiction.

2.6 Federal Fisheries Act

The *Fisheries Act*, 1985 includes protections for fish and fish habitat in the form of standards, codes of practice, and guidelines for projects near water. The *Fisheries Act* provides protection against the "death of fish, other than by fishing", (Section 34.4(1)) and the "harmful alteration, disruption or destruction of fish habitat", (Section 35(1)), otherwise known as HADD.

In cases where impacts to fish and fish habitat cannot be avoided, the project does not fall within waterbodies where Fisheries and Oceans Canada (DFO) review is not required, or the scope of the project is not entirely covered under standards and code of practice, proponents are asked to submit a request for review to their Fish and Fish Habitat Protection Program regional office. If death of fish, or HADD of fish habitat have the potential to occur, the project may require an authorization from the Minister of Fisheries, Oceans and the Canadian Coast Guard as per Paragraph 34.4(2)(b) or 35(2)(b) of the *Fisheries Act Regulations*. All projects are encouraged to avoid causing the death of fish and HADD of fish habitat, using measures to protect fish and fish habitat that include standards and codes of practice for common works, undertakings and activities.

3.0 STUDY APPROACH

Background information and roadside field observations were used to fulfill the objectives of this Class EA. Given the Class EA timeline is currently in Phase 2 (alternatives assessment), high-level field investigations were determined to be adequate given the limited access to private lands in the study area and the refinement of the alternatives is still to be completed. Fieldwork focused on natural heritage features and functions within the study area. Azimuth undertook the following activities for this study:

- Searched Town, NVCA, Ministry of Natural Resources and Forestry (MNRF), Ministry of the Environment and Conservation and Parks (MECP), and Fisheries and Oceans Canada (DFO) records to determine data gaps and update natural heritage background information where applicable, including SAR in the area;
- Reviewed background documents pertinent to the project to assist in the evaluation of proposed design alternatives;
- Completed one site reconnaissance field visit on July 18, 2023 to evaluate current conditions and document general vegetation communities, wildlife habitat, potential SAR habitat, and watercourse locations from the road ROW within the study area;
- Updated the previously completed SAR screening;
- Updated the Significant Wildlife Habitat assessment in the study area; and,
- Reviewed the Class EA design alternatives (Options 5 and 6) from Ainley to assess potential direct and indirect impacts of the proposed alternatives on key natural heritage and hydrologic features and functions.

3.1 Background Information

A review of the following background documents provided information on property characteristics, habitat, wildlife, rare species and communities and general cultural/historic aspects of the study area:

- Wasaga Beach West End Maintenance Depot Drainage Channel Environmental Impact Study (Azimuth, 2021a);
- Natural Heritage Preliminary Constraints Summary Constance Boulevard Drainage Improvements, Town of Wasaga Beach, County of Simcoe (Azimuth, 2021b);
- Preliminary Scoped Environmental Impact Study: Beachwood Road and Robert Street South Wasaga Beach (Cotyledon, 2023);
- Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC; MNRF, 2023a);
- Ontario Ministry of Natural Resources (OMNR) Natural Heritage Reference Manual (OMNR, 2010);
- Atlas of the Breeding Birds of Ontario (OBBA; Cadman *et al.*, 2007);
- MECP's Species at Risk Ontario list (MECP, 2023);
- iNaturalist (NHIC) Rare Species of Ontario (iNaturalist, 2023);

- Air photos available for the study area (Google, VuMap);
- Government of Canada's Species at Risk Public Registry;
- Atlas of the Mammals of Ontario (Dobbyn, 1994);
- Simcoe County interactive mapping (2023b);
- Ontario Geohub: Aquatic resource area line segment (MNRF, 2023b);
- Aquatic Species at Risk Mapping (DFO, 2023);
- County OP (2023a); and,
- Town OP (2023).

3.2 Vegetation Community Mapping and Surveys

Prior to undertaking the field studies, an initial classification of vegetation communities was undertaken using recent air photo imagery for an area encompassing the study area. Reports previously completed by Azimuth and Cotyledon Environmental Consulting (Cotyledon) associated with the study area were reviewed prior to the site visit. Vegetation community boundaries were then checked in the field on July 18, 2023 during the growing season to the extent possible from the ROW edge (Figure 2), as permission to access private lands was not granted. Vegetation community types were classified using the Ecological Land Classification for Southern Ontario: First Approximation (ELC; Lee *et al*., 1998, updated 2008).

The visit was undertaken by a qualified ecologist with existing knowledge related to rare, Threatened and Endangered plant species with potential to occur in the area. The property assessment was focused during ELC work to ensure that appropriate effort was made to detect any federally or provincially designated species, notably SAR as identified under the ESA.

3.3 Wildlife Surveys

Wildlife species utilizing the study area were identified from direct observation, auditory signs, and through interpretation of other signs (tracks, scats, vocalizations, *etc.*) as a matter of course while conducting field surveys.

The SAR screening undertaken for the scope of this assignment includes an assessment of SAR with potential to occur in the overall planning area, compared with potential habitat features identified within the study area. Previously collected field data related to SAR from Azimuth and Cotyledon were reviewed and compared to data collected July 18, 2023. Habitat requirements and appropriate designations (Endangered, Threatened, or Special Concern) are outlined in Table 1.

3.4 Fish and Fish Habitat

Watercourses and drainage features in the study area were evaluated most recently on July 18, 2023, and were also evaluated during previous projects in the study area on October 28, 2021 and February 8, 2023. Assessments were aimed at understanding the extent of fish habitat features within and in proximity to the project area where access permitted. These assessments included documentation of channel dimensions and general morphometrics, water depths, flow observations, aquatic vegetation, substrate material, fish passage barriers, and observations of fish to determine characteristics of fish habitat and fish habitat sensitivity.

4.0 EXISTING CONDITIONS

4.1 Study Area and Land Use

The study area encompasses lands north of Highway 26 to the shoreline of Georgian Bay as shown on Figure 1. The study area includes both forested and residential lands that may be impacted from the various design alternatives. North of Beachwood Road towards Georgian Bay, the study area is comprised of residential lots with a wooded area located in the easterly area. The majority of the project area is regulated by the NVCA due to the watercourse and low-lying floodplain along the Georgian Bay shoreline. South of Beachwood Road, the study area is predominantly forested.

4.2 Terrestrial Resources

4.2.1 Vegetation

The study area is comprised of residential lots with wooded areas located in the northwest of the study area. Vegetation in the road ROW included manicured lawns or vegetated where the ROW ditches are not maintained or includes a drainage feature (watercourse or backwatered ditch). Watercress (*Nasturtium spp.*) (an aquatic plant) was observed in ditches north of Thomas Street. Watercress is commonly found in areas with coldwater conditions with ground water upwellings. The presence of watercress indicated the drainage features would be considered coldwater; this is further discussed in the fisheries review below.

The majority of the study area consisted of woodland and wetland features consisting of a variety of vegetation communities. Evidence from previous anthropogenic influences and disturbance (*i.e.* trail network, tree removal, site clearing) are present within the woodland and wetland features.

Vegetation communities within the study area were determined in accordance with the ELC system, and illustrated on Figure 2. Vegetation communities identified during the ROW site investigation in combination with previous reports (Azimuth, 2021a; Azimuth, 2021b; Cotyledon, 2023; Appendix B) are listed as follows:

- CVR_1 (Low Density Residential)
- FOCM4-1 (Fresh-Moist White Cedar Coniferous Forest)
- FODM7-2 (Fresh-Moist Green Ash- Hardwood Lowland)
- FODM8-1 (Fresh-Moist Poplar Deciduous Forest)
- FOMM4-2 (Dry-Fresh White Cedar Poplar Mixed Forest)
- FOMM7-2 (Fresh-Moist White Cedar-Hardwood Mixed Forest)
- FOMM8-2 (Fresh-Moist White Birch Mixed Forest)
- THD (Deciduous Thicket)
- SWDM2-2 (Green Ash Mineral Deciduous Swamp)
- SWDM4-5 (Poplar Mineral Deciduous Swamp)
- SWMM1-1 (White Cedar-Hardwood Mineral Mixed Swamp)
- MAMM4-1 (Graminoid Coastal Meadow Marsh)

A comprehensive list of vascular plants observed in the study area south of Highway 26 and completed by Cotyledon is provided in Appendix B.

4.2.2 Rare and Uncommon Plants

There are no elements of occurrence (EO_ID) within the study area for provincially Endangered or Threatened, or provincially rare vegetation species according to the NHIC database (MNRF, 2023).

Black Ash (*Fraxinus nigra*) an Endangered tree was observed in the wetland communities north of Beachwood Road during field investigation; and confirmed in Azimuth's previous EIS (Azimuth, 2021a). Cotyledon also observed Black Ash within the SWDM2-2 community south of Beachwood Road (Cotyledon, 2023).

No Butternut (*Juglans cinerea*) or provincially rare species (S1-S3) were identified during the site investigation or during previous assessments by Azimuth or Cotyledon.

4.2.3 Wildlife

Direct and indirect observations of wildlife (*e.g.* tracks, scat, fur) were collected as a matter of course during the July 18, 2023 site investigation. The following species and signs thereof were observed within the study area limits during the site investigation:

- <u>Birds:</u> American Crow, American Redstart, American Robin, Common Yellowthroat, Red-winged Blackbird
- <u>Mammals:</u> Eastern Grey Squirrel

A review of the MNRF NHIC database (1 x 1km squares 17NK7025, 17NK7024, 17NK7023, 17NK6823, 17NK6824, 17NK6825) identified records for SAR in proximity to the property, as follows:

- Restricted Species (Threatened)
- Lake Sturgeon (Endangered)
- Bobolink (Threatened)
- Eastern Meadowlark (Threatened)
- Wood Thrush (Special Concern)
- Snapping Turtle (Special Concern)
- Upland Sandpiper (S2)
- Blue-winged Teal (S3)
- Midland Painted Turtle (S4)

No Threatened, Endangered, or provincially rare wildlife species were observed during the July 18, 2023 site investigations. SAR observed during previous field investigations south of Highway 26 by Cotyledon are provided in Appendix B.

4.3 Species at Risk

The updated SAR assessment (Table 1) fully considers SAR with potential to occur in the planning area. Azimuth (2021a and 2021b) and Cotyledon (2023) SAR assessments and correspondences with MECP contributed to the analysis and findings in Table 1 (see Appendix B). Based on this assessment in combination with vegetation communities and other environmental features observed during the site investigation, the following species are considered below in this report:

- **Threatened or Endangered**: Little Brown Myotis, Northern Myotis, Tri-colored Bat, Black Ash, Chimney Swift, Restricted Species

- **Special Concern**: Barn Swallow, Eastern Wood Pewee, Monarch, Snapping Turtle, Wood Thrush

Only species designated Threatened or Endangered receive individual and habitat protection under Section 9 and Section 10 of the ESA. Special Concern species are further discussed in the context of Significant Wildlife Habitat (Habitat for Special Concern and Rare Wildlife Species) below.

4.4 Wetlands

Two unevaluated wetlands are mapped within and adjacent to the study area south of Beachwood Road (Appendix A; MNRFa, 2023). These wetlands were confirmed during field investigations, and multiple wetland communities were identified north of Beachwood Road, as illustrated in Figure 2.

No provincially or locally significant wetlands were identified within the study area (Appendix A). Wetlands within the study area are treated as Other Wetlands for the purpose of this assessment.

4.5 Candidate Significant Woodland

Woodlands within the study area are not identified as Significant Woodland according to municipal or provincial mapping resources.

According to the Natural Heritage Reference Manual (NHRM; OMNR, 2010), woodlands are considered as a single continuous feature if intersected by narrow gaps 20m or less in width between crown edges. As such the woodlands separated by Beachwood Road are considered two woodland features (north woodland and south woodland).

The two woodland features within the study area are approximately 10ha (north woodland) and 24.5ha (south woodland) in size. Woodland within the Town of Wasaga Beach requires a minimum size of 50ha to be considered significant according to the NHRM. Furthermore, Cotyledon (2023) report concurs the south woodland within the study area is not considered significant (Appendix B). As such, woodlands within the study area are not considered significant for the purposed of this assessment.

4.6 Candidate Significant Valleyland

No portion of the study area is identified as Significant Valleyland, nor assigned a similar designation according to municipal or provincial mapping resources.

There are no valleyland features located within the study area according standards presented in the NHRM. No portion of the study area fulfills the well-defined valley morphology and landform prominence required to be considered Candidate Significant Valleyland.

4.7 Candidate Significant Wildlife Habitat

An assessment of the potential for Significant Wildlife Habitat (SWH) within study area was conducted using the criteria outlined within the Significant Wildlife Habitat Technical Guide (OMNR, 2000) and the accompanying the Ecoregion 6E Criteria Schedules (MNRF, 2015). The following Candidate SWH types were determined to be present, or have potential to be present within the study area based on the results of the field program and previous reporting prepared by Azimuth and Cotyledon (Appendix B):

- Bat Maternity Colonies
- Amphibian Breeding Habitat (Woodland)
- Other Rare Vegetation Communities (MAMM4-1)
- Terrestrial Crayfish
- Habitat for Special Concern and Rare Wildlife Species
    - Barn Swallow, Eastern Wood-pewee, Monarch, Snapping Turtle, Wood Thrush

4.8 Areas of Natural and Scientific Interest

There are no Areas of Natural and Scientific Interest located within the study area according to municipal or provincial mapping resources.

4.9 Fish and Fish Habitat

The study area is located within the Blue Mountain Subwatershed and is located immediately south of Georgian Bay. Within the study area, one unnamed watercourse was identified during background review and field investigations linked to the flooding concerns. Based on aerial mapping, the watercourse originates in farmland approximately 1.5 kilometres (km) south of Highway 26. NVCA regulation mapping does indicate a second drainage feature within the forested lands to the east of Thomas Street, but no feature was noted as part of background reports, on aerial mapping, or in the field. This mapped feature may be a GIS generated feature from low-lying topography and/or based on historic drainage conditions.

Descriptions of the drainage feature as observed by Azimuth during the July 18, 2023 site visit is as follows.

Upstream of the study area at Highway 26, the unnamed watercourse crosses the highway via a concrete box culvert. The channel was dry at the upstream limits of the highway ROW, and standing water was present in the culvert and within the downstream ROW. Where water was present within the culvert and ROW, the average depth was 30 centimetres (cm) with a wetted width of 1.5-2 metres (m). The channel narrows to 0.5m downstream of the ROW where it drains onto private lands to the north. No flow in the channel was noted during the field investigation. Riparian vegetation was dominated by dense grasses, and no aquatic vegetation was observed (Appendix C).

Immediately west of the watercourse culvert crossing, a stormwater management pond (SWMP) is located on the south side of the highway. The SWMP outlet culvert drains northeast across the highway and outlets on the north side of Highway 26 approximately 10m west of the unnamed watercourse culvert outlet. Minnows were observed in the pond and within the outlet pool on the north side of the highway. A narrow channel connects the SWMP outlet pool to the unnamed watercourse drainage path. Therefore, fish may seasonally access the watercourse from the SWMP. However, it is assumed that fish could not survive downstream of the pond or outlet channel as the watercourse appears to be ephemeral downstream (north) of Highway 26. Dense terrestrial grasses were noted along the flow path of the unnamed watercourse, and no defined channel banks or substrate sorting was observed from the ROW. Access to the private lands between Highway 26 and Beachwood Road was not possible during the field surveys. Therefore, the assessment of existing conditions in this area is dependent on ROW observations, aerial photographs, and background reporting completed by others. Based on ROW observations and aerial photographs, the segment of the unnamed watercourse on the private lands is assumed to function as indirect fish habitat.

At the Beachwood Road crossing, the unnamed watercourse continues to drain north across the road via a concrete box culvert. On the south (upstream) side of Beachwood Road, the watercourse appears to be poorly defined with no substrate sorting or defined banks observed on the private lands to the south. The watercourse had minimal flow within a 0.5-1m wide grass swale, and terrestrial vegetation was present throughout the feature. The watercourse drains into the roadside ditch, flows west approximately 10m, and then enters the concrete box culvert underneath Beachwood Road. Flow was observed during the site visit from the east ditch, and the west ditch was dry.

On the north (downstream) side of Beachwood Road, a 0.5m deep outlet pool is present, and fish were observed in the watercourse at this location. Approximately 4-5m inside the culvert, a 1m+ drop structure is present that would not be passable for fish. Therefore, the culvert crossing at Beachwood Road is a permanent fish barrier and would be the upstream limit of direct fish habitat within the watercourse. Based on site observation upstream (ephemeral/intermittent channel characteristics, no refuge pools, minimal flow) fish are not anticipated to inhabit the watercourse upstream (south) of Beachwood Road and this reach of the unnamed watercourse is characterised as indirect fish habitat.

Downstream of Beachwood Road, the watercourse flows along Thomas Street and Constance Boulevard where it outlets into Georgian Bay. The channel remains fairly consistent in its shape and function throughout this section as it functions as a roadside ditch, and has an approximately 1m wetted width and steep roadside banks. Minnows were observed throughout this segment and no fish barriers were observed from Beachwood Road to Georgian Bay. Multiple culvert crossings are present along roadway and driveway crossings which may function as refuge for fish during low flow periods. Cattails and dense watercress (a coldwater indicator species) were present in sections of the ditch, and cobble riffle sections were noted as well. MNRF online background information indicates this segment of the unnamed watercourse has a coldwater thermal regime and has the potential to host the following species: Banded Killifish, Blacknose Dace, Blacknose Shiner, Bluntnose Minnow, Brassy Minnow, Brook Stickleback, Brook Trout, Central Mudminnow, Common Shiner, Creek Chub, Emerald Shiner, Fathead Minnow, Johnny Darter, Longnose Dace, Mimic Shiner, Northern Redbelly Dace, Pumpkinseed, Rainbow Trout, Sand Shiner, Spotfin Shiner, and White Sucker (MNRF, 2023b). Fish sampling has not been completed for the project to confirm the extent of fish use in the Tributary however given direct connectivity to Georgian Bay, species use is expected to be varied. With the known thermal regime and potential presence of Brook Trout (a coldwater species) according to MNRF background information, and the field observations of Watercress (a coldwater indicator plant that was abundant), the unnamed watercourse downstream of Beachwood Road is characterized as permanent direct coldwater fish habitat. It is also recognized that the watercourse may be considered moderately tolerant and impacted due to the historical flooding, alterations from its function as a roadside ditch, and fronting private residences, all of which expose the watercourse to multiple stressors (*e.g.,* road salt, lawn debris/grass clippings, etc).

4.9.1 Review of Background Reporting

As mentioned previously, access was not possible to the private lands between Highway 26 and Beachwood Road. As part of this Class EA update, Azimuth reviewed the "Preliminary Scoped Environmental Impact Study: Beachwood Road and Robert Street South, Wasaga Beach", prepared by Cotyledon Environmental Consulting (2023). The report was prepared for Sunray Living Inc. to assist with the planning and development of the lands at 8859 Beachwood Road and 65 Robert Street South.

Cotyledon completed site visits of the private lands and surrounding area, and also noted that the east drainage feature (titled "Shore Creek" in their report) could not be identified/observed in the field. Therefore, Azimuth is in agreement with Cotyledon that the east drainage feature/flow path is not present as shown on NVCA mapping.

Cotyledon also stated that the unnamed watercourse on the private lands (titled 'Bayshore Creek' in their report) does not function as direct fish habitat, and that the fish barrier at the Beachwood Road culvert, along with an absence of vernal ponds, shallow standing pools or ponds, and permanently flowing streams, would preclude the watercourse on the lands from hosting fish year round. Based on ROW observations in the area and aerial photographs, Azimuth agrees with this assessment. Cotyledon also stated that the proposed development would not be in violation of the *Fisheries Act* because there is no 'fish habitat' on the property as defined in the *Fisheries Act*. However, based on site observations by Azimuth and the presence of direct fish habitat immediately downstream of the proposed development, it is the opinion of Azimuth that the unnamed watercourse upstream (south) of Beachwood Road would be defined as 'fish habitat' due to its indirect fish habitat functions. The watercourse would function as a source of water/flow and food supply to downstream receiving watercourses, which is considered 'fish habitat' under the *Fisheries Act*. Therefore, the indirect fish habitat segment of the unnamed watercourse would be protected under the Federal *Fisheries Act*. Flow was noted at the Beachwood Road culvert during the mid-summer field visit (July 18, 2023). Therefore, it is assumed that downstream receiving watercourse would depend on the upstream indirect fish habitat segment for seasonal flows and food sources. Alterations to this feature would need to be completed in a manner that complies with the Federal *Fisheries Act.*

5.0 NATURAL HERITAGE FEATURES AND FUNCTIONS

The results of Azimuth's field studies combined with a review of background information indicate the potential for the following NHFFs to be associated with the alternative solutions:

- Threatened or Endangered Species;
    - Little Brown Myotis, Northern Myotis, Tri-colored Bat
    - Black Ash
    - Chimney Swift (aerial foraging only)
    - Restricted Species
- Other Wetlands
- Candidate Significant Wildlife Habitat
    - Bat Maternity Colonies
    - Amphibian Breeding Habitat (Woodland; North of Beachwood Road)
    - Other Rare Vegetation Communities (MAMM4-1)
    - Terrestrial Crayfish (North of Beachwood Road)
    - Habitat for Special Concern and Rare Wildlife Species
        - Barn Swallow
        - Eastern Wood-pewee, Wood Thrush
        - Monarch
        - Snapping Turtle
- Fish habitat within the unnamed watercourse.
    - Direct coldwater fish habitat downstream of Beachwood Drive
    - Indirect coldwater fish habitat upstream of Beachwood Drive

Section 6.0 below describes each alternative solution under consideration and develops the ranking criteria used to assign a score to each alternative solution.

6.0 SUMMARY OF PROPOSED ALTERNATIVE SOLUTIONS

As per the Class EA, the proposed development resulting from the Class EA study intends to reduce the probability of flooding events in the area of Constance Boulevard and Thomas Street to Bayswater Drive (Ainley, 2022). The two updated alternatives (Options 5 and 6) as prepared by Ainley are described below, with conceptual drawings presented in Appendix D. The alternative solution descriptions summarize relative locations, development logistics, and natural heritage conditions associated with each option.

6.1 Option 5 - Redirect Drainage from Highway 26 to West Depot Outlet Channel

Option 5 consists of redirecting all drainage that enters the private lands on the north side of Highway 26 to a newly constructed flat-bottom channel. The proposed channel will flow east in proximity to Highway 26, and then north into the proposed West Depot Channel. The West Depot Channel will flow north and outlet into Georgian Bay at a new outlet location along the shoreline (Figure 3). Concept drawings of the proposed channel are provided in Appendix D. The channel length would be approximately 1.1km long and consist of a bankfull width of 12.05-13.2m. The bankfull depth of the channel would be 1.3m, and the flow-bottom portion of the channel would be approximately 4.25-5.5m wide. A 3m wide access road will be constructed along the west side of the channel, and tree clear would be required along the entire length of the channel to allow for construction of the feature.

6.1.1 Terrestrial Considerations

Option 5 resulting in the redirection of all drainage north of Highway 26 through a newly constructed flat-bottom channel is anticipated to impact the following NHFFs within the study area:

Habitat for Endangered and Threatened Species

Impacts with regards to the ESA and Habitat of Threatened or Endangered Species are covered under Section 9 and 10 of the ESA. Section 9 deals directly with killing, harming, or harassing living members of a species while Section 10 covers destruction or damage to habitat of Threatened or Endangered species. Threatened and Endangered species described below have the potential to or do occur within the limits of the property and on adjacent lands.

- Little Brown Myotis, Northern Myotis, Tri-colored Bat

Little Brown Myotis, Northern Myotis, and Tri-colored Bat may utilize trees within the study area as maternity roost sites, preferring trees >25cm diameter at breast height (dbh) with evidence of cracks, holes, splits, lifted bark, etc. (called 'snags') to provide refuge for the rearing of young during the late spring and early summer months (approximately June). SAR bats have been confirmed within the study area according to Cotyledon (2023). Tree removal to accommodate Option 5 is required in approximately 17,600m^2 of woodland within the study area, and it is anticipated the removal of snag features will occur.

For projects of a similar scope, Azimuth engaged the MECP regarding potential impacts to woodland bat habitat. Guidance was provided via the Bat Survey Standards Note (MECP, 2022) which clarifies the following:

"If a proposed activity will avoid impairing or eliminating the function of habitat for supporting bat life processes (e.g. remove, stub, etc. a small number of potential maternity or day roost trees in treed habitats) but the timing of tree removal will avoid the bat active season (April 1-September 30 in Southern Ontario)"…"then there is no need to conduct species at risk bat surveys of treed habitats."

The above is consistent with Azimuth's understanding that when suitable habitat availability is not limiting, a mitigation approach that restricts vegetation removals during the active period for bats is a suitable approach to avoid a contravention to SAR bat individuals or habitats under Section 9 and Section 10 of the ESA.

Given that potential bat roosting habitat is extensive within the Town of Wasaga Beach (43% of land cover is forested), there is no expectation that the proposed works will result in a negative impact to Little Brown Myotis, Northern Myotis, Tri-colored Bat, or the habitat upon which they depend, providing that conformance is demonstrated for environmental considerations and mitigation described in Section 9 below.

- Black Ash

Black Ash was recorded within the study area during Azimuth (2021a) and Cotyledon (2023) field investigations, and confirmed during the July 18, 2023 site visit. Refer to Section 9.5 below regarding additional regulatory guidance with respect to Black Ash, for which provincial protections take effect on January 26, 2024.

- Chimney Swift

Chimney Swifts are mainly associated with urban and rural areas where chimneys or other manmade structures are present for nesting (COSEWIC, 2007a). Alternatively, Chimney Swifts can nest in tree cavities, although this is rare. Chimney Swifts are aerial foragers and often concentrate in the vicinity of water with high insect activity (COSEWIC, 2007a).

Anthropogenic structures capable of supporting nesting requirements for Chimney Swifts would not be impacted as a result of Option 5, therefore, consideration is only required for Chimney Swifts aerial foraging habitat.

Aerial foraging opportunities are anticipated to be minimal within the CVR_1 community, as these properties comprise of maintained lawns supporting limited insect populations. The woodland and wetland features within the study area contain an abundance of vegetation and would provide a higher quality of insect population, and as such provide aerial foraging habitat. Given that potential aerial foraging habitat is extensive within the study area and the surrounding landscape, it is not anticipated that Option 5 would negatively impact aerial foraging opportunities for Chimney Swift, providing that conformance is demonstrated for environmental considerations and mitigation described in Section 9 below.

- Restricted Species

The Restricted Species are found in habitats with loose and well-drained soils, open vegetative covers such as open woodlands and meadows, areas with a high toad population, and habitats in proximity to water (COSEWIC, 2007b). The Restricted Species also utilizes open habitats such as forest clearings, rock barrens, or shorelines to regulate their body temperatures (COSEWIC, 2007b). Based on our review and the environmental features within the study area there is a low to moderate risk of the Restricted Species occurring within the study area. Consultation with MECP in regards to the Restricted Species may be required at the detailed design stage.

It is Azimuth's opinion that impacts to the Restricted Species can likely be avoided by completing tree removal, grading, and other related works outside of the active window for the species (approximately April 1-September 30), and implementation of mitigation measures described in Section 9 below. With regard for these considerations, impacts to habitat opportunities for the species are not anticipated to occur, thereby remaining in compliance with the requirements of the ESA.

<u>Other Wetlands</u>

The proposed channel traverses three treed swamp wetland units; with a composition and structure of Green Ash Mineral Deciduous Swamp (SWDM2-2). According to Azimuth (2021a) and Cotyledon (2023) these wetland units are governed by surface water inputs. Approximately 100m of the proposed channel alignment crosses wetland and therefore approximately 1,600m^2 of wetland would be directly impacted. Given the location of the wetland units and the requirement for a linear channel, this direct impact would be unavoidable.

Option 5 results in water conveyance from the unnamed watercourse within the southwest SWDM2-2 community between Highway 26 and Beachwood Road redirected to the proposed drainage channel. This will alter the hydrological input within the wetland community and potentially alter the moisture regime, and distribution of nutrients; ultimately altering the community composition of the wetland. With the information available at this time, Option 5 is anticipated to result in an unavoidable impact to the southwest SWDM2-2 community.

Consultation with the Town and/or NVCA should occur at the detail design stage to confirm whether ecological offsetting is appropriate or necessary as a compensation measure for the wetland communities impacted by the proposed drainage channel.

Candidate Significant Wildlife Habitat

According to the PPS development and site alteration are not permitted within SWH located in Ecoregion 6E, unless it can be demonstrated there will be no negative impacts upon the feature and its ecological functions. As property access was not granted at the time of the assessment the following Significant Wildlife Habitat has the potential to occur within the study area:

- Bat Maternity Colonies

Bat maternity colonies can be found in tree cavities, vegetation and often in buildings (note: buildings are not considered SWH). According to MNRF (2015), maternity colonies are located in deciduous or mixed forested communities with large diameter (>25cm dbh) trees. Cotyledon (2023) confirmed this SWH is present within the study area, south of Beachwood Road. For the purpose of this assessment the presence of SAR bats and suitable SAR bat habitat north of Beachwood is treated as present in lieu of a detailed bat snag inventory and acoustic monitoring.

The proposed Option 5 would encroach within woodland communities and it is anticipated snag trees will require clearance to accommodate the proposed channel. Given that potential bat roosting habitat is extensive within the surrounding landscape (as discussed above), there is no expectation that the proposed works will result in a negative impact on Bat Maternity Colonies, providing that conformance is demonstrated for environmental considerations and mitigation described in Section 9 below.

- Amphibian Breeding Habitat (Woodland), Other Rare Vegetation Communities (MAMM4-1), Terrestrial Crayfish

Candidate SWH types associated with wetland communities with potential to occur north of Beachwood Road limits includes Amphibian Breeding Habitat, Other Rare Vegetation Communities (MAMM4-1), and Terrestrial Crayfish. As the proposed channel will traverse multiple wetlands within the study area it is recommended additional ecological surveys, including evening calling amphibian surveys, detailed vegetation inventory, wetland delineation, and a search for terrestrial crayfish burrows occur at the detailed design stage to gain a comprehensive understanding of the potential impacts to SWH north of Beachwood Road. No Candidate SWH associated with wetland communities occurs south of Beachwood Road (Cotyledon, 2023).

Amphibian Breeding Habitat (Woodland)
Option 5 would require the removal of wetland and woodland features that may contain amphibian breeding habitat. The loss of vegetation to accommodate the proposed drainage channel North of Beachwood Road (Figure 3) would be considered minor and would not be anticipated to have an appreciable impact on the remaining extensive woodland and wetland features, or their ecological functions. The extent of loss would not be anticipated to result in a negative impact on the above SWH, providing that conformance with environmental considerations and mitigations described in Section 9 below.

Other Rare Vegetation Communities (MAMM4-1)
An S2 ranked rare vegetation community (MAMM4-1) occurs within the study area according to Azimuth (2021a). Providing a vegetation inventory and wetland delineation confirms the presence/location of this SWH as shown on Figure 2, the proposed footprint for Option 5 would occur approximately 30m from the MAMM4-1 community. With the information available at this time, Option 5 does not pose a direct impact to the MAMM4-1 community. Indirect impacts to the SWH are likely to be avoided providing that conformance with environmental considerations and mitigations described in Section 9 below.

Terrestrial Crayfish
Typically chimney building terrestrial crayfish inhabit open areas containing shallow water. These areas are typically meadow marsh habitats, low areas of farm fields where surface water tends to pond, roadside ditches, and drainage swales. The lands traversed

by Option 5 are wooded throughout (SWDM2-2) and contain no drainage swales according to Azimuth (2021a). As such, if terrestrial crayfish are confirmed in the study area they would likely be associated with the MAMM4-1 community, and outside the proposed footprint for the drainage channel. With the information available at this time, Option 5 does not pose a direct impact to potential habitat of chimney crayfish. Indirect impacts to terrestrial crayfish are likely to be avoided providing that conformance with environmental considerations and mitigations described in Section 9 below.

- Habitat for Special Concern and Rare Wildlife Species

Barn Swallow

Barn Swallows are commonly associated with anthropogenic structures such as barns, buildings, and bridges where their nests often occupy (COSEWIC, 2021). Nesting sites are often associated with rural areas as there are open areas with abundant supply of insects to feed on, such as watercourses, farmland, meadows and wetlands (COSEWIC, 2021).

Anthropogenic structures capable of supporting nesting requirements for Barn Swallow would not be impacted as a result of Option 5. As illustrated in figure 3, a large proportion of the study area will remain unaltered and potential foraging habitat is extensive within the surrounding landscape. As such, no negative impacts to Barn Swallows of their habitat are anticipated as a result of Option 5, providing that conformance is demonstrated for environmental considerations and mitigation described in Section 9 below.

Eastern Wood-pewee, Wood Thrush

Eastern Wood-pewee inhabits mature deciduous and mixed stands with an open understory. This species is usually associated with woodland clearings and edges within the vicinity of its nest (COSEWIC, 2012a). High quality Wood Thrush habitat consists of deciduous or mixed forest, and complex forest floor with preferably moist conditions. The species can often reside in forests regenerating after anthropogenic or natural disturbances (COSEWIC, 2012b).

Habitat for these species is highly represented in the general area however, and as such, no negative impact to the species or its habitat is anticipated as a result of the proposed drainage channel, providing conformance is demonstrated for environmental considerations and mitigation described in Section 9 below.

Monarch
Monarch Butterfly are open and edge habitat generalists that occupy open wetlands, along roadsides, to cultural meadow habitats (COSEWIC, 2010). Monarch eggs and larvae also require Common Milkweed (*Asclepias syriaca*) as a critical component of their life cycle. Monarch have been documented within the study area according to Cotyledon (2023); open areas (MAMM4-1, roadsides) can provide marginal habitat opportunities for Monarch due to limited size and availability of Common Milkweed. Habitat for this species is highly represented in the general area however, and as such, no negative impact to the species or its habitat is anticipated as a result of the proposed development.

Snapping Turtle
Snapping Turtles can be found in most freshwater habitats, and prefer habitats with soft mud bottoms, dense vegetation, and slow-moving water (COSEWIC, 2008). The unnamed watercourse and associated southwest SWDM2-2 wetland does not contain sufficient habitat to support the species according to Cotyledon (2023) field assessment.

However, established populations can often be found in areas combining several types of wetland habitats (COSEWIC, 2008), as seen in the study area. Snapping Turtles could potentially be associated (foraging, basking) with the Georgian Bay shoreline and within the wetland communities in proximity (North of Beachwood Road). Habitat for this species is highly represented in the general area however, and as such, no negative impact to the species or its habitat is anticipated as a result of the proposed development, providing conformance is demonstrated with considerations and mitigations described in Section 9 below.

6.1.2 Fisheries Considerations

Redirection of all drainage north of Highway 26 into the proposed channel would result in the elimination of all indirect fish habitat functions from the watercourse on both the private development lands and within the direct fish habitat downstream (north) of Beachwood Road. On the private lands between Highway 26 and Beachwood Road, the permanent destruction of approximately 360 linear meters of indirect fish habitat would result from the proposed redirection of flows. It is assumed that lands would be infilled/altered to accommodate the proposed development, and that all surface flow on site would be redirected to a stormwater management system. Therefore, little to no surface flow would be conveyed to downstream direct fish habitat on the north side of Beachwood Road. As a result, the indirect fish habitat functions of water/flow conveyance and food supply would be permanently eliminated. The removal of these indirect fish habitat functions would then result in the permanent alteration to the 520 linear metres of direct coldwater fish habitat downstream from Beachwood Drive to Georgian Bay. At this time, the overall contribution of water/flow from the upstream indirect segment is unknown and would need to be assessed during detail design. However, it is expected that a majority of the flow originates from the upstream indirect segment of the watercourse. Therefore, the alteration is expected to significantly decrease the quality and viability of the current watercourse to sustain direct fish habitat. The ground water inputs (if present) are unknown at this time and would need to be assessed during detail design to determine if the remaining ground water contributions and surface water inputs from roadside ditches could sustain direct fish habitat downstream of Beachwood Road.

In addition to the elimination/alteration to fish habitat described above, the proposed redirection of flow would also result in the creation of approximately 1.1km of indirect fish habitat along the proposed flat-bottom channel. Based on our understanding of the proposed channel construction, the feature will not function as direct fish habitat, and will consist of a linear channel with no fish habitat features (such as refuge pools or riffles).

With the information available at this time, Option 5 is anticipated to result in the permanent elimination of 360 linear meters of indirect fish habitat, and the permanent alteration of 520 linear metres of direct coldwater fish habitat. The *Fisheries Act* provides protections from the "harmful alteration, disruption or destruction of fish habitat", (Section 35(1)), otherwise known as HADD. Both of these impacts would be considered a HADD to fish habitat in accordance with the *Fisheries Act*. Therefore, Option 5 would require submission to DFO through a request for review to their Fish and Fish Habitat Protection Program regional office to determine approval requirements. An authorization from DFO would be expected to be required with accompanying Offsetting Plan and Letter of Credit (LOC) due to the elimination of indirect and direct fish habitat that would constitute a HADD under the *Fisheries Act*. If approvable (provided that the HADD cannot be avoided), timelines to secure a DFO authorization can take up to a year (depending on several factors).

6.2 Option 6 – Maintain Base Flow along Existing Drainage Alignment, Redirect Storm Flows from Highway 26 to West Depot Outlet Channel

Ainley has developed Option 6 for evaluation as part of the EA, which consists of a similar redirection of flow as listed in Option 5, but would only divert storm flows that exceed the 2-yr flood flow (comparable to the annual spring flow volume), to a newly created drainage channel. The proposed drainage channel would have the same size/dimensions as the channel described in Option 5, and would be construction along the same alignment. However, base flows up to the 2yr flood flow would continue to flow along the existing drainage path and into the unnamed watercourse feature north of Beachwood Road. It is assumed that the newly proposed channel would receive flows during snow melt and 2-year+ storm events. It is also assumed that existing base flows are to be maintained to the existing unnamed watercourse through a stormwater drain and/or ditch drainage system through the private development lands.

6.2.1 Terrestrial Considerations

Option 6 consists of a similar redirection of flow as proposed in Option 5, and as such, terrestrial considerations are similar as listed in Section 6.2.1 above. Potential impacts to Threatened and Endangered Species, and SWH remain constant between Option 5 and 6; with the exception of potential impacts to Other Wetlands.

Option 6 will reduce potential impacts to the southwest SWDM2-2 community (Figure 2) as the existing base flow of the unnamed watercourse within the wetland will be maintained; potential impacts from diverting all water flow from the unnamed watercourse will be avoided. Although, the moisture regime in the southwest SWDM2-2 will be impacted with the loss of hydrological input during storm events, spring freshet, and similar high-discharge events, the anticipated impact would be lesser in extent compared to Option 5.

6.2.2 Fisheries Considerations

Redirection of storm flows from the drainage north of Highway 26 would allow a majority of the indirect fish habitat function of the watercourse to be retained, and direct fish habitat downstream of Beachwood Road to be largely unaltered. It is expected that during detail design, baseflow quality and quantity can be maintained and/or changes would be negligible in terms of impacts to downstream fish habitat. Areas of direct fish habitat could persist, with slight changes in hydraulic conditions with removal of annual flood flows causing some degree of change in fluvial geomorphic functions in the watercourse. Such changes are not anticipated to cause negative effects. As a result, no significant residual impacts or alterations to permanent direct coldwater fish habitat are anticipated from Option 6.

The channel alterations and/or piping of the indirect watercourse segment through the proposed private development would result in the permanent alteration of approximately 360 linear metres of indirect fish habitat. As mentioned previously, groundwater inputs to the indirect channel feature are unknown at this time. Therefore, a loss of groundwater contributions may occur if the feature is piped and/or constrained. Option 6 would also result in the creation of approximately 1.1km of indirect fish habitat along the proposed flat-bottom channel, which would only convey storm flows in this alternative.

With the information available at this time, Option 6 is anticipated to result in the permanent alteration of 360 linear meters of indirect fish habitat, but no significant impacts are anticipated to direct fish habitat if baseflow contributions, in both quantity and quality, are maintained post-development. The permanent alterations to indirect fish habitat would still be considered a HADD of fish habitat in accordance with the *Fisheries Act*. Therefore, Option 6 is likely to require submission to DFO through a request for review to their Fish and Fish Habitat Protection Program regional office to determine approval requirements. DFO would be required to confirm if the project could be approved under a Letter of Advice (LOA) or an authorization.

7.0 EVALUATION OF PROPOSED ALTERNATIVE SOLUTIONS

Each of the alternatives were evaluated based on their potential impact to the natural heritage features identified in the study area (Other Wetlands, SAR, SWH, fish habitat). To provide a simplified, visual comparison, the evaluation is presented in a table with colour-coded indicators.

Green cell colouration represents the preferred option, as it will address the key concerns, but result in the least impact to NHFFs. Red cell colouration is indicative of the least preferred option as it has a higher potential to impact NHFFs. An un-coloured cell indicates that the impact is considered neutral. Options with lesser or moderate impacts and/or benefits to NHFFs are coloured light red/green.

Table A. Evaluation of Alternative Solutions – Natural Heritage Impacts

Alternative Option	Threatened & Endangered Species	Other Wetlands	Candidate Significant Wildlife Habitat	Fish Habitat	Potential Permitting/Consultation Required
Option 5	• Black Ash is present and may require removal. • Permanent alteration to SAR bat habitat will occur, however no negative impact to species is anticipated. • No negative impact to Chimney Swift or their aerial foraging habitat. • Low Risk of Restricted Species occurring within study area. • No other SAR anticipated within study area.	• Approximately 1,600m^2 of direct wetland removal. • Removal of hydrological input to southwest SWDM2-2 community.	• Bat Maternity Colonies present, however no negative impact to SWH. • Amphibian Breeding Habitat, Other Rare Vegetation Communities, and Terrestrial Crayfish SWH may occur on the property; requires further field investigations. • Habitat for Special Concern Species (Barn Swallow, Eastern Wood-pewee, Wood Thrush, Monarch, and Snapping Turtle) is present; no negative impact to SWH.	• Permanent destruction of approximately 360 linear meters of indirect fish habitat. • Permanent alteration of approximately 520 linear meters of direct coldwater fish habitat.	• DFO Request for Review and likely DFO Request for Authorization (requiring an offsetting plan due to unmitigable residual effects resulting from the permanent loss and alteration of indirect/direct coldwater fish habitat). • MECP consultation regarding SAR, particularly with regard for the Restricted Species and potentially Black Ash. • Study area contains NVCA regulated lands; a permit may be required to proceed. • Ecological offsetting for wetland alterations may be required by the Town and/or NVCA.
Option 6	• Black Ash is present and may require removal. • Permanent alteration to SAR bat habitat will occur, however no negative impact to species is anticipated. • Low Risk of Restricted Species occurring within study area. • No negative impact to Chimney Swift or their aerial foraging habitat. • No other SAR anticipated within study area.	• Approximately 1,600m^2 of direct wetland removal • Decrease in hydrological input to southwest SWDM2-2 community during stormwater events.	• Bat Maternity Colonies present, however no negative impact to SWH. • Amphibian Breeding Habitat, Other Rare Vegetation Communities, and Terrestrial Crayfish SWH may occur on the property; requires further field investigations. • Habitat for Special Concern Species (Barn Swallow, Eastern Wood-pewee, Wood Thrush, Monarch, and Snapping Turtle) is present; no negative impact to SWH.	• Permanent alteration of approximately 360 linear meters of indirect fish habitat.	• DFO Request for Review. May be approvable under a DFO Letter of Advice (LOA), or may require a Request for Authorization with Offsetting Plan given unmitigable residual effects. • MECP consultation regarding SAR, particularly with regard for the Restricted Species and potentially Black Ash. • Study area contains NVCA regulated lands; a permit may be required to proceed. • Ecological offsetting for wetland alterations may be required by the Town and/or NVCA.

Legend:

Positive	Positive Neutral	Neutral	Negative Neutral	Negative

8.0 PRELIMANRY PREFERRED SOLUTION

From a terrestrial perspective, both options are similar in respect to their potential impact on the existing NHFFs within the study area, including Threatened and Endangered Species, Other Wetlands, and SWH. However, Option 5 is not preferred as hydrological inputs within the southwest SWDM2-2 feature will be completely diverted. This is anticipated to alter the moisture regime of the wetland and potentially alter the community composition. Option 6 will maintain base flow of the unnamed watercourse within the southwest SWDM2-2 feature, resulting in minimal impact to the wetland feature. As such, Option 6 is the preferred solution from a terrestrial perspective.

From a fisheries perspective, Option 5 is not preferred as indirect fish habitat would be permanently removed and direct coldwater fish habitat downstream would likely be permanently altered as a result of flow inputs being significantly reduced. This would result in permanent residual effects on direct fish habitat. Conversely, Option 6 does not result in the permanent destruction of permanent or indirect fish habitat, and should maintain the function of the indirect watercourse feature (*i.e.,* flow conveyance to direct coldwater fish habitat downstream). For both Options 5 and 6, there may be an opportunity to offset the loss of any indirect fish habitat functions if ground water contributions can be maintained post-development, and/or if the proposed flat-bottom channel can be designed to function as direct fish habitat near the downstream limits of the channel. Should Option 5 be chosen, offsetting works may be required to mitigate the permanent alteration anticipated to direct fish habitat downstream of Beachwood Drive. However, DFO consultation has not occurred at this time, and would need to be completed in detail design.

It is recognized that the health and safety of the residents and landowners in the area should be the priority with respect to controlling and/or diverting flows to prevent future flooding. Based on our understanding of the current flooding issue, it is our opinion that either Option 5 or 6 would be viable from a fisheries and/or terrestrial perspective. Additional fisheries permitting from DFO is anticipated if Option 5 is selected due to the impacts on direct fish habitat downstream, and additional offsetting works through a DFO authorization may be required. DFO permitting would also be required for Option 6; however, permitting under a LOA is possible to avert the authorization process. Ultimately, Option 5 or 6 would require submission to DFO to confirm the level of permitting. Should either Option 5 or 6 be chosen, consultation with MECP, NVCA, and ecological offsetting related to the unavoidable lose of wetland features may also be required at the detailed design stage.

9.0 RECOMMENDATIONS

9.1 Species at Risk

It should be noted that the absence of a protected species within the study area does not indicate that they will never occur within the area. Given the dynamic character of the natural environment, there is a constant variation in habitat use. Care should be taken in the interpretation of presence of species of concern including those listed under the ESA. Changes to policy, or the natural environment, could result in shifts, removal, or addition of new areas to the list of areas currently considered SAR habitat. This report is intended as a point in time assessment of the potential to impact SAR; not to provide long term "clearance" for SAR. While there is no expectation that the assessment should change significantly, it is the responsibility of the proponent to ensure that they are not in contravention of the ESA at the time that site works are undertaken. A review of the assessment provided in this report by a qualified person should be sufficient to provide appropriate advice at the time of the onset of future site works.

9.2 Migratory Breeding Birds and Bats

Activities involving the removal of vegetation should be restricted from occurring during the breeding season. Migratory birds, nests, and eggs are protected by the *Migratory Birds Convention Act*, 1994 (MBCA) and the *Fish and Wildlife Conservation Act,* 1997 (FWCA). Environment Canada outlines dates when activities in any region have potential to impact nests at the Environment Canada Website (https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html). In Zones C1 and C2 vegetation clearing should be avoided between **April 1 through August 31** of any given year. If work requires that vegetation clearing is required between these dates screening by an ecologist with knowledge of bird species present in the area could be undertaken to ensure that the vegetation has been confirmed to be free of nests prior to clearing.

Activities involving tree removal should be avoided between **April 1 through September 30** of any given year, during the active period for bat species that may utilities trees for maternity and day roosting purposes. It is anticipated that adherence to this timing restriction will avoid impacts to individual SAR bats, therefore remaining in compliance with Section 9 of the ESA affording individual protection to Endangered species.

9.3 Sediment and Erosion Controls

Diligent application of sediment and erosion controls (ESCs) is recommended for all future construction activities to minimize the extent of accidental or unavoidable impacts to adjacent vegetation communities and wildlife habitat (*e.g.* forests, wetlands, fish and fish habitat). Prior to the commencement of site works (including tree removals), silt fencing should be applied along the length of directly adjacent natural or naturalized features, and routine inspection/maintenance of the silt fencing should occur throughout construction. It is recommended that erosion and sediment controls be maintained until vegetation is re-established post-construction.

9.4 General Operations

All maintenance activities (including refueling) required during future construction should be conducted at least 30m away from natural features to prevent accidental spillage of deleterious substances that may harm natural environments.

Snow fencing or equivalent should be installed at the limit of the work area to prevent the accidental intrusion of machinery operations into adjacent undisturbed natural areas.

The contractor is recommended to have a Contaminant and Spill Management Plan in place prior to initiation of works. This should include keeping an emergency spill kit on site at all times. In the event of a spill, the contractor must report it immediately to the provincial Spills Action Centre (SAC).

9.5 Fish and Fish Habitat

Future development plans and construction activities occurring should have regard for fish habitat features within the study area, and that may be impacted downstream of any proposed works. Fish and fish habitat protection measures and Best Management Practices (BMPs) are as follows, and should be reviewed/updated during subsequent Class EA stages:

- Ground water contributions along the unnamed watercourse feature should be assessed to determine if baseflow contributions will be impacted from the proposed development;
- Fish sampling should be completed to determine if Brook Trout and/or other coldwater species are present in the unnamed watercourse;

- In-water work would only be permitted during the appropriate in-water timing window for coldwater systems (*i.e.,* no in-water work permitted from October 1 – July 15 of any given year);
- Should in-water work be proposed in direct fish habitat, a fish salvage shall be completed by a qualified ecologist under an MNRF Licence to Collect Fish for Scientific Purposes;
- Retained natural features, including the unnamed watercourse and/or downstream features, are to be protected at all times through the use of properly placed, installed, and maintained sediment controls (sediment barriers) to prevent any excavated and erodible soils/materials from entering these features;
- Diligent application of ESC measures is recommended for all future construction activities to minimize the extent of accidental or unavoidable impacts to adjacent or downstream fish habitat. Prior to the commencement of site works, sediment fence or filter socks should be installed. Routine inspection/maintenance of the ESC measures should occur throughout construction. It is recommended that ESC measures be maintained until vegetation is re-established post-construction.
- All site disturbance should be minimized to the extent possible and riparian vegetation should be enhanced where feasible;
- All stockpiled material on site should be stored a minimum of 30m from any fish habitat features and be protected with appropriate ESC measures, such as sediment fence and/or tarps. Disposal of excess or waste material should occur in a timely fashion to minimize risk of entry into fish habitat features; and,
- All machinery maintenance/refueling is to be completed a minimum distance of 30m from any watercourse to prevent accidental spillage of deleterious substances.

9.6 Permitting and Consultation

9.6.1 DFO Permitting

Both Options 5 and 6 are anticipated to require permitting from DFO through a request for review submission. The need for DFO permitting would need to be determined at the detailed design stage when impacts to direct/indirect fish habitat are known and mitigation strategies for avoidance or to minimize impacts are developed. The project will require reevaluation in detail design to update the impact assessment (by a qualified fisheries ecologist) to confirm opportunities for avoidance and mitigation, areas of residual effect and HADD, and confirm DFO permitting (*i.e.,* Letter of Advice or authorization).

9.6.2 NVCA Permitting

The study area including the proposed development and impacted flood area are mapped within the jurisdiction of the NVCA. Therefore, a permit issued under Ontario Regulation (O. Reg.) 172/06 may be required to proceed with future development or construction activities to resolve the flooding concerns. Consultation with NVCA and/or the Town should occur at the detail design stage to confirm whether ecological offsetting is appropriate or necessary as a compensation measure for wetland communities impacted by the proposed drainage channel.

9.6.3 MECP Permitting

Options 5 and 6 are anticipated to require consultation with MECP in regards to SAR; in respect to the Restricted Species record in proximity to the study area according to MNRF NHIC database.

<u>Black Ash (Endangered)</u>
It is noteworthy that although Black Ash is listed as Endangered under the ESA, protections for the species do not take effect until January 26, 2024. The proponent should be advised that the proposed provincial Recovery Strategy for Black Ash ("Recovery Strategy"; Catling *et al.*, 2022) recommends that the communities within which Black Ash is identified and a surrounding buffer measuring 28m from the community edge be subject to provincial regulation under the ESA, however further direction and/or adoption of the regulation has not been confirmed at this time. The Recovery Strategy also recommends a 28m critical habitat setback for individual Black Ash trees located outside of wetlands.

Black Ash occurs within SWDM2-2 communities associated with the location of the proposed channel. As such, future consultation and/or permission from MECP to mitigate or offset potential impacts to the species may be required

10.0 CONCLUSIONS

Based upon our analysis of the preferred solution regarding Option 5 and 6 with regard for NHFFs, it is concluded that the environmental conditions are less limiting to the proposed development outlined under Option 6. However, it is recognized that the health and safety of the residents and landowners is the key priority with respect to controlling and/or diverting flows to prevent future flooding, and that either Option 5 or 6 would be viable from a fisheries and/or terrestrial perspective. Environmental protection measures described in Section 9 of this report should be considered during subsequent design phases.

11.0 REFERENCES

Ainley Group (Ainley). 2022. Town of Wasaga Beach Constance Boulevard drainage improvements Schedule 'C' Municipal Class Environmental Assessment, Public Information Centre No. 2.

Azimuth. 2021a. Wasaga Beach West End Maintenance Depot Drainage Channel Environmental Impact Study.

Azimuth. 2021b. Natural Heritage Preliminary Constraints Summary Constance Boulevard Drainage Improvements, Town of Wasaga Beach, County of Simcoe.

Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier (eds.). 2007. Atlas of the Breeding Birds of Ontario (OBBA). 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologies, Ontario Ministry of Natural Resources and Ontario Nature, Toronto, xxii + 706pp.

Catling, P.K., W.D. Van Hemessen, D.A. Bettencourt, T.D. North and L.M. Wallis. 2022. Recovery Strategy for the Black Ash (Fraxinus nigra) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ministry of the Environment, Conservation and Parks, Peterborough, Ontario. vi + 80 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2007a. COSEWIC assessment and status report on the Chimney Swift *Chaetura pelagica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 49 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2007b. COSEWIC assessment and update status report on the [Restricted Species] in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. viii + 36 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2008. COSEWIC assessment and update status report on the Snapping Turtle *Chelydra serpentine* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 47 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2010. COSEWIC assessment and status report on the Monarch *Danaus plexippus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 43 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2012a. COSEWIC assessment and status report on the Wood Thrush *Hylocichla mustelina* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 46 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2012b. COSEWIC assessment and status report on the Eastern Wood-pewee *Contopus virens* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 39 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2021. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 60 pp.

Cotyledon Environmental Consulting (Cotyledon). 2023. Preliminary Scoped Environmental Impact Study Beachwood Road and Robert Street South Wasaga Beach.

Simcoe County. 2023. Simcoe County Official Plan.

Dobbyn, J. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists.

Endangered Species Act, Ontario. 2007 (ESA). An Act to protect species at risk and to make related changes to other Acts. Bill 184 Chapter 6, Statutes of Ontario 2007.

Fisheries and Oceans Canada (DFO). 2023. Aquatic species at risk mapping. Available at: (https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html). Accessed September 2023.

Fish and Wildlife Conservation Act, Ontario. 1997. S.O. 1997, c.41

Government of Canada. 1985. *Federal Fisheries Act.*

Government of Canada. 2014. *Migratory Birds Convention Act*.

iNaturalist. 2023. (NHIC) Rare Species of Ontario. (https://www.inaturalist.org/projects/nhic-rare-species-of-ontario). Accessed September 2023.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998, 2008. Ecological Land Classification for Southern Ontario. First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Sciences Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

Ministry of the Environment, Conservation and Parks (MECP). 2022. Bat Survey Standards Note 2021. 2 pp.

Ministry of Municipal Affairs and Housing (MMAH), 2020. Provincial Policy Statement.

Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. 38 pp.

Ministry of Natural Resources and Forestry (MNRF). 2023a. Natural Heritage Information Centre (NHIC) internet web page. Government of Ontario, Ministry of Natural Resources (https://www.ontario.ca/page/natural-heritage-information-centre). Accessed September 2023.

Ministry of Natural Resources and Forestry (MNRF). 2023b. Aquatic resource area line segment. Available at: (https://geohub.lio.gov.on.ca/datasets/aquatic-resourcearealinesegment/explore). Accessed September 2023.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, Southcentral Science Section. Queen's Printer for Ontario. 151 pp.

Ontario Ministry of Natural Resources (OMNR). 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

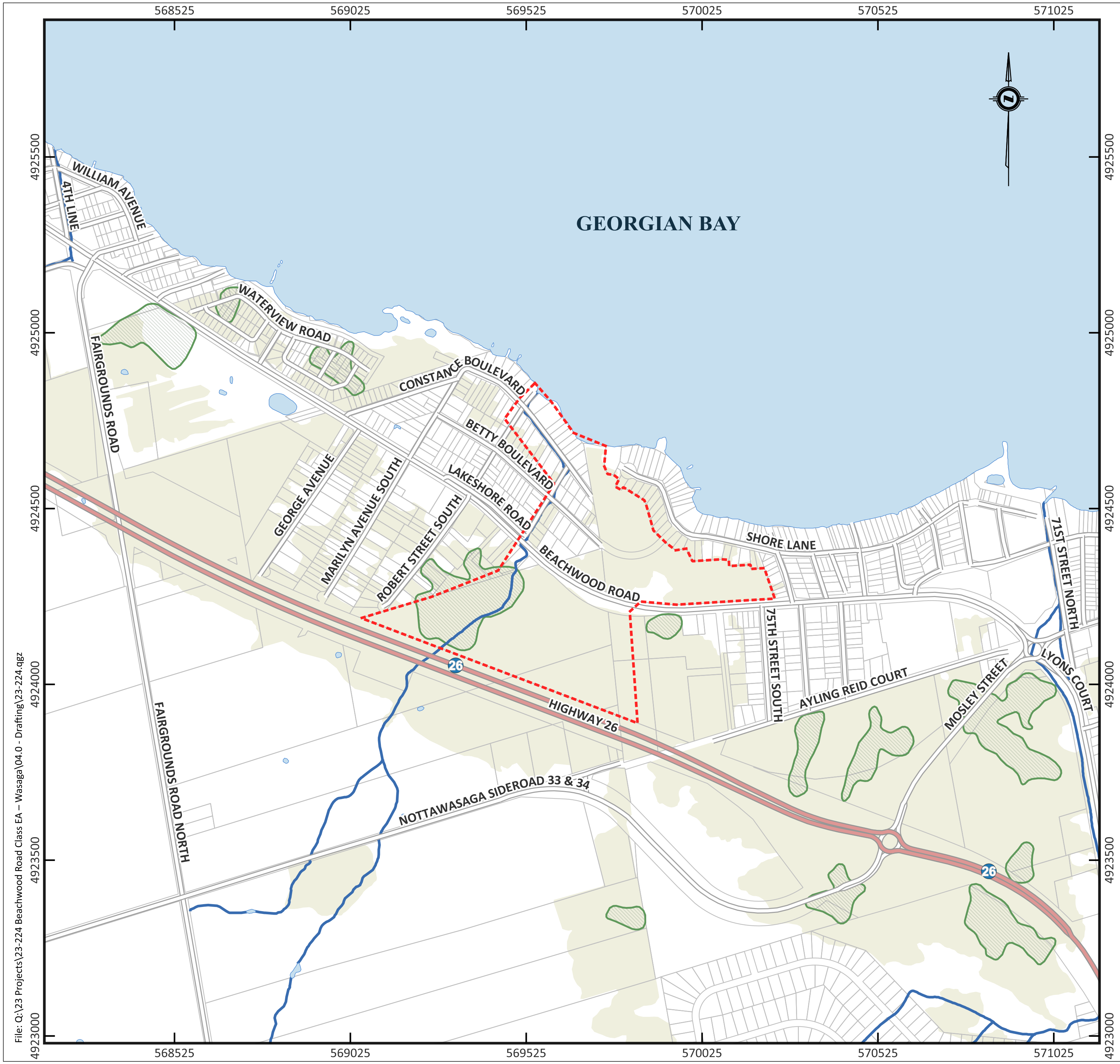
Ontario Nature. 2020. Ontario Reptile and Amphibian Atlas Program (https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/). Accessed August 2023.

Ontario Planning Act. 1990. (https://www.ontario.ca/laws/statute/90p13). Accessed September 2023.

Simcoe County. 2023a. Simcoe County Official Plan.

Simcoe County. 2023b. Simcoe County interactive mapping. (https://opengis.simcoe.ca/public/). Accessed September 2023.

Town of Wasaga Beach. 2023. Official Plan of the Town of Wasaga Beach.



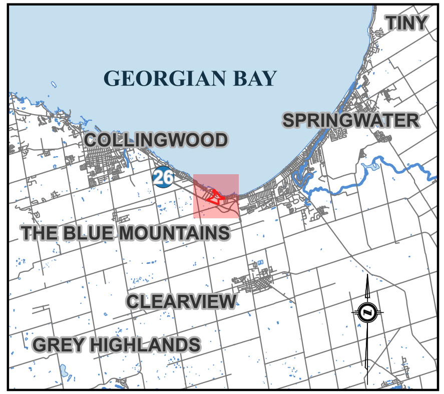
File: Q:\23 Projects\23-224 Beachwood Road Class EA – Wasaga\04.0 - Drafting\23-224.qgz

LEGEND

- Approx. Study Area
- Waterbody
- Watercourse
- Unevaluated Wetland (MNRF, 2023)
- Wooded Area
- Road
- Highway

REGIONAL MAP

SCALE 1:500000



0 0.25 0.5 0.75

KILOMETERS

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

SITE LOCATION

BEACHWOOD ROAD
CLASS EA UPDATE
TOWN OF WASAGA BEACH, ON

DATE ISSUED:	OCTOBER 2023	Figure No.
CREATED BY:	A.L.	1
PROJECT NO.:	23-224	
BASE MAP:	MNRF	

LEGEND:

- STUDY AREA
- PERMANENT WATERCOURSE/ DIRECT FISH HABITAT
- INTERMITTENT DRAINAGE FEATURE/ INDIRECT FISH HABITAT
- COLDWATER THERMAL REGIME
- FISH BARRIER
- CULVERT

ELC UPLAND COMMUNITIES:

CVR_1	LOW DENSITY RESIDENTIAL
FOCM4-1	FRESH-MOIST WHITE CEDAR CONIFEROUS FOREST
FODM7-2	FREH-MOIST WHITE CEDAR-HARDWOOD MIXED FOREST
FODM8-1	FRESH-MOIST POPLAR DECIDOUS FOREST
FOMM4-2	DRY-FRESH WHITE CEDAR POPLAR MIXED FOREST
FOMM7-2	FRESH-MOIST GREEN ASH-HARDWOOD LOWLAND DECIDUOUS FOREST
FOMM8-2	FRESH-MOIST WHITE BIRCH MIXED FOREST
THD	DECIDUOUS THICKET

ELC WETLAND COMMUNITIES:

SWDM2-2	GREEN ASH MINERAL DECIDUOUS SWAMP
SWDM4-5	POPLAR MINERAL DECIDUOUS SWAM
SWMM1-1	WHITE CEDAR-HARDWOOD MINERAL MIXED SWAMP
MAMM4-1	GRAMINOID COASTAL MEADOW MARSH

LOCATION PLAN

0 100.00 200.0

HORIZONTAL SCALE 1:4000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

ENVIRONMENTAL FEATURES

BEACHWOOD ROAD CLASS EA UPDATE
TOWN OF WASAGA BEACH, ON

DATE ISSUED:	OCTOBER 2023	Figure No.
CREATED BY:	A.L.	2
PROJECT NO.:	23-224	
REFERENCE:	SIMCOE COUNTY	

LEGEND:

- STUDY AREA
- PERMANENT WATERCOURSE/ DIRECT FISH HABITAT
- INTERMITTENT DRAINAGE FEATURE/ INDIRECT FISH HABITAT
- COLDWATER THERMAL REGIME
- FISH BARRIER
- CULVERT

ELC UPLAND COMMUNITIES:

CVR_1	LOW DENSITY RESIDENTIAL
FOCM4–1	FRESH–MOIST WHITE CEDAR CONIFEROUS FOREST
FODM7–2	FREH–MOIST WHITE CEDAR–HARDWOOD MIXED FOREST
FODM8–1	FRESH–MOIST POPLAR DECIDOUS FOREST
FOMM4–2	DRY–FRESH WHITE CEDAR POPLAR MIXED FOREST
FOMM7–2	FRESH–MOIST GREEN ASH–HARDWOOD LOWLAND DECIDUOUS FOREST
FOMM8–2	FRESH–MOIST WHITE BIRCH MIXED FOREST
THD	DECIDUOUS THICKET

ELC WETLAND COMMUNITIES:

SWDM2–2	GREEN ASH MINERAL DECIDUOUS SWAMP
SWDM4–5	POPLAR MINERAL DECIDUOUS SWAM
SWMM1–1	WHITE CEDAR–HARDWOOD MINERAL MIXED SWAMP
MAMM4–1	GRAMINOID COASTAL MEADOW MARSH

LOCATION PLAN

0 100.00 200.0

HORIZONTAL SCALE 1: 4000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

PROPOSED DRAINAGE FEATURE OPTION 5 AND 6

BEACHWOOD ROAD CLASS EA UPDATE
TOWN OF WASAGA BEACH, ON

DATE ISSUED:	OCTOBER 2023	Figure No.
CREATED BY:	A.L.	3
PROJECT NO.:	23-224	
REFERENCE:	SIMCOE COUNTY	

Plotted by: AUU on October 11, 2023 at 2:54pm
File: Q:\23 Projects\23-224 Beachwood Road Class EA - Wasaga\04.0 - Drafting\23-224 Site Layout.dwg Layout: PD Plotscale: 1

Common Name	Species Name	ESA	SARA	Key Habitats Used By Species[1]	Initial Assessment
Bald Eagle	*Haliaeetus leucocephalus*	SC	No status	Nests are typically found near the shoreline of lakes or large rivers, often on forested islands (Cadman *et al.* , 2007). ESA Protection: N/A	Species was observed flying over the study area December 2020 (Cotyledon, 2023). However, key habitat requirements for the species (*e.g.*, mature or old growth forests with tall trees for nesting) are not found in the study area. Species is not expected to occur.
Bank Swallow	*Riparia riparia*	THR	THR	Nests in burrows excavated in natural and human-made settings with vertical sand and silt faces. Commonly found in sand or gravel pits, road cuts, lakeshore bluffs, and along riverbanks (COSEWIC, 2013a). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.*, vertical sand riverbanks) are not found in the stduy area. Species is not expected to occur.
Barn Swallow	***Hirundo rustica***	**SC**	**THR**	**Ledges and walls of man-made structures such as buildings, barns, boathouses, garages, culverts and bridges. Also nest in caves, holes, crevices and cliff ledges (COSEWIC, 2011a). ESA Protection: Species and general habitat protection**	**Key habitat for the species (*e.g.*, man-made structures) are found in the stduy area. Species considered further in main text**
Black Ash	***Fraxinus nigra***	**END**	**No Status**	**Facultative wetland tree species frequently found in floodplain forests, swamps, seepage areas, shoreline margins and fens. Occupied sites are generally seasonally-flooded (COSEWIC, 2018a). ESA Protection: Species and general habitat protection (ESA protections take effect January 27, 2024)**	**The species was observed within the study area. Considered further in main text.**
Blanding's Turtle	*Emydoidea blandingii*	THR	END	Blanding's Turtles are a primarily aquatic species that prefer wetland habitats, lakes, ponds, slow-moving streams, etc., however they may utilize upland areas to search for suitable basking and nesting sites. In general, preferred wetland sites are eutrophic and characterized by clear, shallow water, with organic substrates and high density of aquatic vegetation (COSEWIC, 2016a). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.*, organic wetlands with clear water) are not found in the study area. Species is not expected to occur.
Bobolink	*Dolichonyx oryzivorus*	THR	THR	Nests primarily in forage crops (*e.g.* hayfields and pastures) dominated by a variety of species such as clover, Timothy, Kentucky Bluegrass, tall grass, and broadleaved plants. Also occurs in wet prairie, graminoid peatlands, and abandoned fields dominated by tall grasses. Does not generally occupy fields of row crops (*e.g* . corn, soybeans, wheat) or short-grass prairie. Sensitive to habitat size and has lower reproductive success in small habitat fragments (COSEWIC, 2010a). ESA Protection: Species and general habitat protection	Although species record occurs within 1km of the property according to NHIC 1x1km square 17NK7023, Key habitat for the species (*e.g.*, large grasslands) are not found in the stduy area. Species is not expected to occur.
Butternut	*Juglans cinerea*	END	END	Commonly found in riparian habitats, but is also found in rich, moist, well-drained loams, and well-drained gravels. Butternut is intolerant of shade (COSEWIC, 2017a). ESA Protection: Species and general habitat protection	Species was not observed during various field investigations. Species is not expected to occur.
Chimney Swift	***Chaetura pelagica***	**THR**	**THR**	**Nests primarily in chimneys though some populations (*i.e* . in rural northern areas) may nest in cavity trees (COSEWIC, 2018b). Recent changes in chimney design may be a significant factor in recent declines in numbers (Cadman *et al* ., 2007). ESA Protection: Species and general habitat protection**	**Key habitat for the species (*e.g.*, man-made structures with chimney's) are found in the stduy area. Species considered further in main text**
Common Nighthawk	*Chordeiles minor*	SC	THR	Open habitats including sand dunes, beaches recently logged/burned over areas, forest clearings, short grass prairies, pastures, open forests, bogs, marshes, lakeshores, gravel roads, mine tailings, quarries, and other open relatively clear areas (COSEWIC, 2018c). ESA Protection: N/A	A flyover for Common Nighthawk was observed during Cotyledon (2023) field investigations. However, key habitat for the species (*e.g.*, open areas or recently disturbed environments) are not found in the study area. Species is not expected to occur.
Restricted Species	**-**	**THR**	**THR**	**Habitat features include: well-drained soil; loose or sandy soil; open vegetative cover; brushland or forest edge; proximity to water; and climatic conditions typical of the eastern deciduous forest biome. In the Georgian Bay region, open grass, sand, human-impacted and forest habitats over rock, wetland, and aquatic habitats are preferable (COSEWIC, 2021). ESA Protection: Species and general habitat protection**	**Species record from 2006 occurs within 1km of the property according to NHIC 1x1km square 17NK7024. Considered further in main text.**
Eastern Meadowlark	*Sturnella magna*	THR	THR	Most common in grassland, pastures, savannahs, as well as anthropogenic grassland habitats, including hayfields, weedy meadows, young orchards, golf courses, restored surface mines, *etc* . Occasionally nest in row crop fields such as corn and soybean, but there are considered low-quality habitat. Large tracts of grassland are preferred over smaller fragments and the minimum area required is estimated at 5ha (COSEWIC, 2011b). ESA Protection: Species and general habitat protection	Although species record occurs within 1km of the property according to NHIC 1x1km square 17NK7024, Key habitat for the species (*e.g.*, large grasslands) are not found in the stduy area. Species is not expected to occur.
Eastern Whip-poor-will	*Antrostomus vociferus*	THR	THR	Semi-open forests or patchy forests with clearings, such as barrens or forests that are regenerating following major disturbances, are preferred nesting habitats (COSEWIC, 2009a). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.*, regenerating or semi-open forests) are not found in the study area. Species is not expected to occur.
Eastern Wood-pewee	***Contopus virens***	**SC**	**SC**	**Mostly in mature and intermediate-age deciduous and mixed forests having an open understory. It is often associated with forests dominated by Sugar Maple and oak. Usually associated with forest clearings and edges within the vicinity of its nest (COSEWIC, 2012a). ESA Protection: N/A**	**Species observed during Cotyledon (2023) field investigations within the study area. Considered further in main text.**
Hill's Thistle	*Cirsium hillii*	THR	THR	Found in a variety of open, dry, sandy, fire-prone habitats, including such communities as gravel hill or bluff prairies, sand prairies, pine barrens, oak barrens, sand dunes, oak savannah, and open woods (COSEWIC, 2004). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.*, sand priaries, barrens) are not found in the study area. Species is not expected to occur.
Lake Sturgeon (Great Lakes - Upper St. Lawrence populations)	*Acipenser fulvescens*	END	No status	Generally found in the shallow areas of lakes or larger rivers, moving into smaller rivers to spawn. Usually found at depths of 5 -10 m and are in areas where water velocity does not exceed 70 cm/sec (COSEWIC, 2017b). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.*, shallow bay) are not found in the study area. Species is not expected to occur.
Little Brown Myotis	***Myotis lucifugus***	**END**	**END**	**Forests and regularly aging human structures as maternity roost sites. Regularly associated with attics of older buildings and barns for summer maternity roost colonies. Overwintering sites are characteristically mines or caves (MNRF, 2014) (COSEWIC, 2013a). ESA Protection: Species and general habitat protection**	**Species recorded during Cotyledon (2023) acoustic monitoring within the study area. Considered further in main text.**
Massasauga (Great Lakes - St. Lawrence population)	*Sistrurus catenatus*	THR	THR	In Georgian Bay, Massasaugas use bedrock barrens, conifer swamps, beaver meadows, fens, bogs, and shoreline habitats. On the upper Bruce Peninsula, forested habitats are used during hibernation and open, wetland, and edge habitat with canopy closure <50% in mid-late summer (COSEWIC, 2012b). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.*, rock barrens in proximity to wetlands) are not found in the study area. Species is not expected to occur.
Monarch	***Danaus plexippus***	**SC**	**SC**	**Breeding habitat is confined to sites where milkweeds, the sole food of caterpillars, grow. Milkweeds grow in a variety of environments, including meadows in farmlands, along roadsides and in ditches, open wetlands, dry sandy areas, short and tall grass prairie, river banks, irrigation ditches, arid valleys, and south-facing hills (COSEWIC, 2016). ESA Protection: N/A**	**Species observed during Cotyledon (2023) field investigations within the study area. Considered further in main text.**

Common Name	Species Name	ESA	SARA	Key Habitats Used By Species[1]	Initial Assessment
Northern Myotis	***Myotis septentrionalis***	**END**	**END**	**Maternity roost sites are generally located within deciduous and mixed forests and focused in snags including loose bark and cavities of trees. Overwintering sites are characteristically mines or caves (COSEWIC, 2013a).** **ESA Protection: Species and general habitat protection**	**Key habitat for the species (e.g., woodland habitat with snag trees for roosting) are found in the stduy area. Considred further in main text.**
Piping Plover	*Charadrius melodus*	END	END	Nest on sand and pebble beaches of freshwater dune formations on barrier islands, peninsulas or shorelines of large lakes (COSEWIC, 2013b). ESA Protection: Species and general habitat protection	Key habitat for the species (*e.g.,* undisturbed shoreline with sand and pebble beaches) are not found in the study area. Species is not expected to occur.
Red-headed Woodpecker	*Melanerpes erythrocephalus*	END	END	Occurs in open deciduous forests, particularly those dominated by oak and beech, groves of dead trees, floodplain forests, orchards, cemeteries, savannas and savanna-like grasslands. Although the species occupies a range of habitat types, key habitat is characteristically composed of woodlands where tall trees are of large crcumference (*i.e.* mature cover) and are at a low density. A high density of snag trees is also an indicator of key habitat types (COSEWIC, 2018d). ESA Protection: Species and general habitat protection.	Key habitat for the species (*e.g.,* forests dominated by oak and beech, open deciduous forests associated with cemeteries, golf courses, or orchards) are not found in the study area. Species was not observed during Cotyledon (2023) dawn breeding bird surveys. Species is not expected to occur.
Tri-colored Bat	***Perimyotis subflavus***	**END**	**END**	**Maternity roost sites include forests and modified landscapes (barns or human-made structures). Overwintering sites include mines and caves (COSEWIC, 2013a).** **ESA Protection: Species and general habitat protection**	**Species recorded during Cotyledon (2023) acoustic monitoring within the study area. Considered further in main text.**
Wood Thrush	***Hylocichla mustelina***	**SC**	**THR**	**Found in moist, deciduous hardwood or mixed stands, often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches (COSEWIC, 2012c).** **ESA Protection: N/A**	**Species record occurs within 1km of the property according to NHIC 1x1km squares 17NK7023, 17NK6824, and 17NK6825. Considered further in main text.**

[1] Habitat as outlined within the MNRF's Species at Risk in Ontario website files (https://www.ontario.ca/environment-and-energy/species-risk-ontario-list), or Species Specific COSEWIC Reports referenced in this document.

APPENDICES

Appendix A: Provincial and Municipal Mapping
Appendix B: Background Information
Appendix C: Photographic Record
Appendix D: Option 5 & 6 Proposed Site Plan

APPENDIX A

Provincial and Municipal Mapping

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

AEC23-224

Map created:9/6/2023

Legend

- Assessment Parcel
- ANSI
  - Earth Science Provincially Significant/sciences de la terre d'importance provinciale
  - Earth Science Regionally Significant/sciences de la terre d'importance régionale
  - Life Science Provincially Significant/sciences de la vie d'importance provinciale
  - Life Science Regionally Significant/sciences de la vie d'importance régionale
- Evaluated Wetland
  - Provincially Significant/considérée d'importance provinciale
  - Non-Provincially Significant/non considérée d'importance provinciale
- Unevaluated Wetland
- Woodland
- Conservation Reserve
- Provincial Park
- Natural Heritage System

Notes:

Red polygon represents approximate study area.

0.6 0 0.31 0.6 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

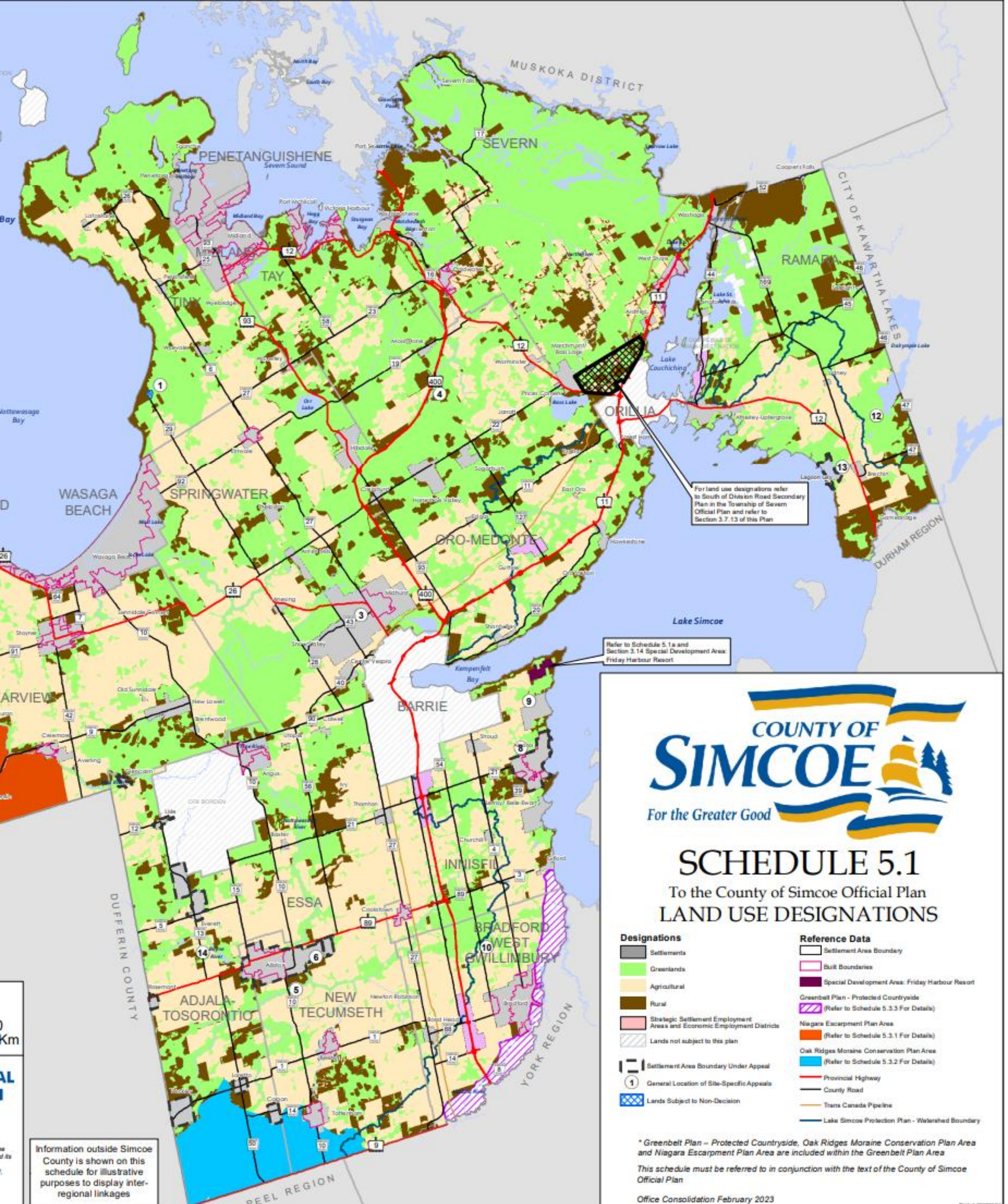
This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

County of Simcoe - Web Map

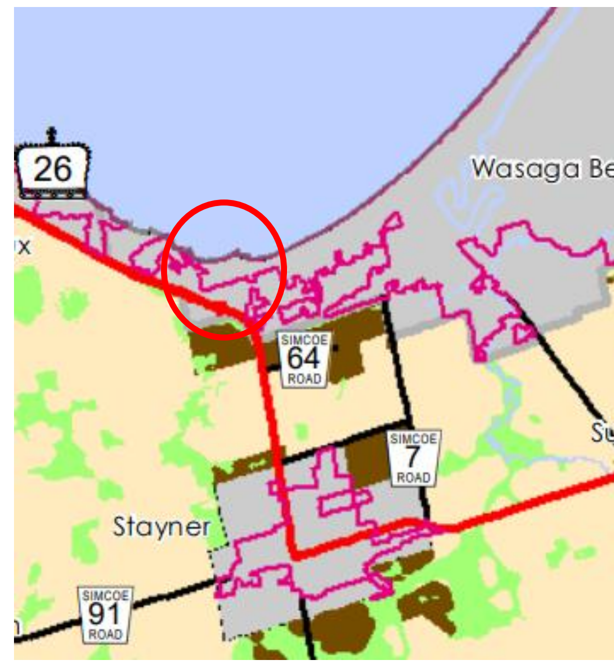
0 100 200 300m

1 : 10,624

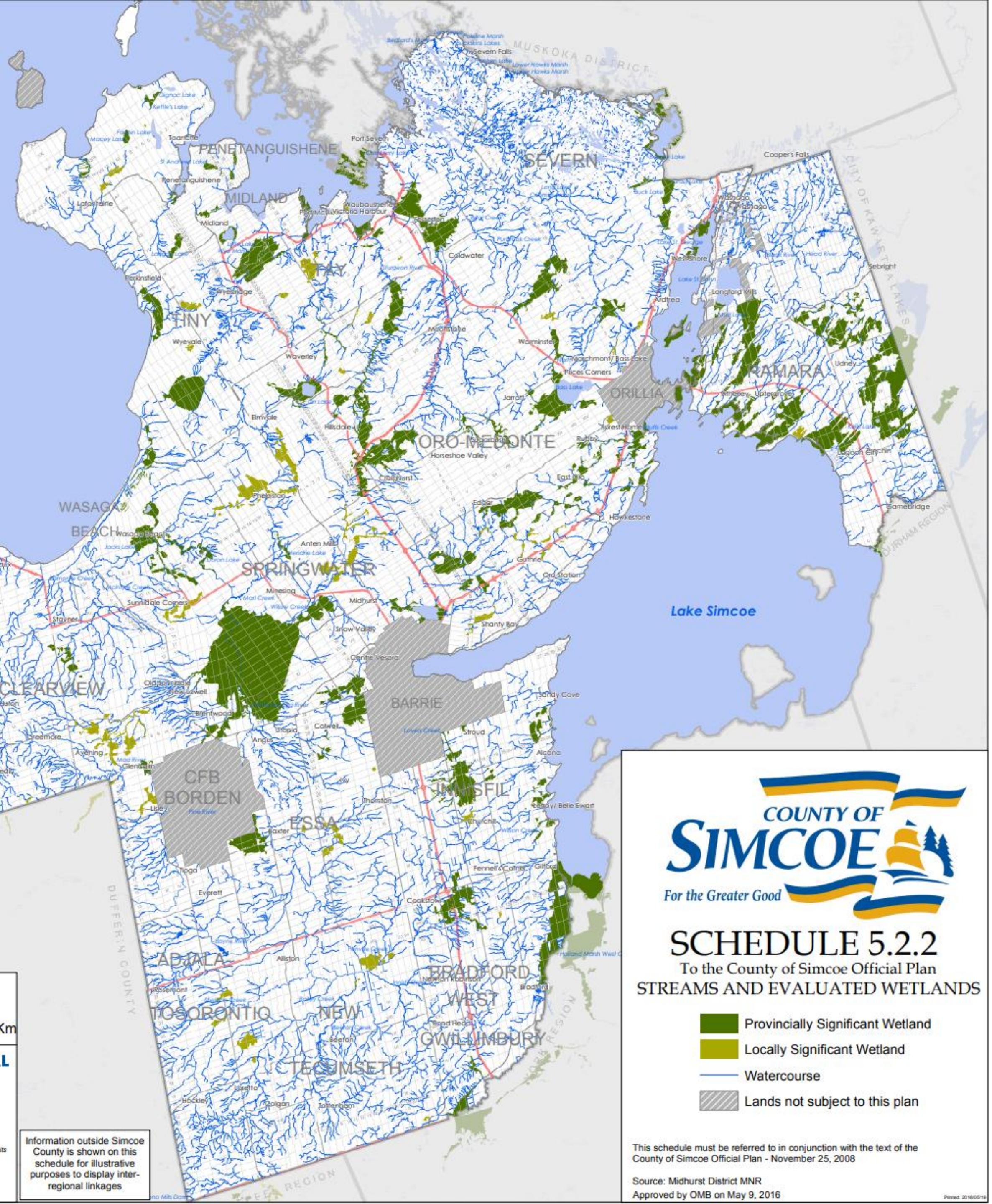
Oct. 5, 2023



MUSKOKA DISTRICT
SEVERN
PENETANGUISHENE
MIDLAND
TAY
TINY
RAMARA
CITY OF KAWARTHA LAKES
ORILLIA
Lake Couchiching
WASAGA BEACH
SPRINGWATER
ORO-MEDONTE
Lake Simcoe
BARRIE
Kempenfelt Bay
ESSA
INNISFIL
BRADFORD WEST GWILLIMBURY
ADJALA-TOSORONTIO
NEW TECUMSETH
DUFFERIN COUNTY
YORK REGION
PEEL REGION
DURHAM REGION
For land use designations refer to South of Division Road Secondary Plan in the Township of Severn Official Plan and refer to Section 3.7.13 of this Plan
Refer to Schedule 5.1a and Section 3.14 Special Development Area: Friday Harbour Resort
Information outside Simcoe County is shown on this schedule for illustrative purposes to display inter-regional linkages
COUNTY OF SIMCOE
For the Greater Good
SCHEDULE 5.1
To the County of Simcoe Official Plan
LAND USE DESIGNATIONS
Designations
Settlements
Greenlands
Agricultural
Rural
Strategic Settlement Employment Areas and Economic Employment Districts
Lands not subject to this plan
Settlement Area Boundary Under Appeal
General Location of Site-Specific Appeals
Lands Subject to Non-Decision
Reference Data
Settlement Area Boundary
Built Boundaries
Special Development Area: Friday Harbour Resort
Greenbelt Plan - Protected Countryside (Refer to Schedule 5.3.3 For Details)
Niagara Escarpment Plan Area (Refer to Schedule 5.3.1 For Details)
Oak Ridges Moraine Conservation Plan Area (Refer to Schedule 5.3.2 For Details)
Provincial Highway
County Road
Trans Canada Pipeline
Lake Simcoe Protection Plan - Watershed Boundary
* Greenbelt Plan – Protected Countryside, Oak Ridges Moraine Conservation Plan Area and Niagara Escarpment Plan Area are included within the Greenbelt Plan Area
This schedule must be referred to in conjunction with the text of the County of Simcoe Official Plan
Office Consolidation February 2023

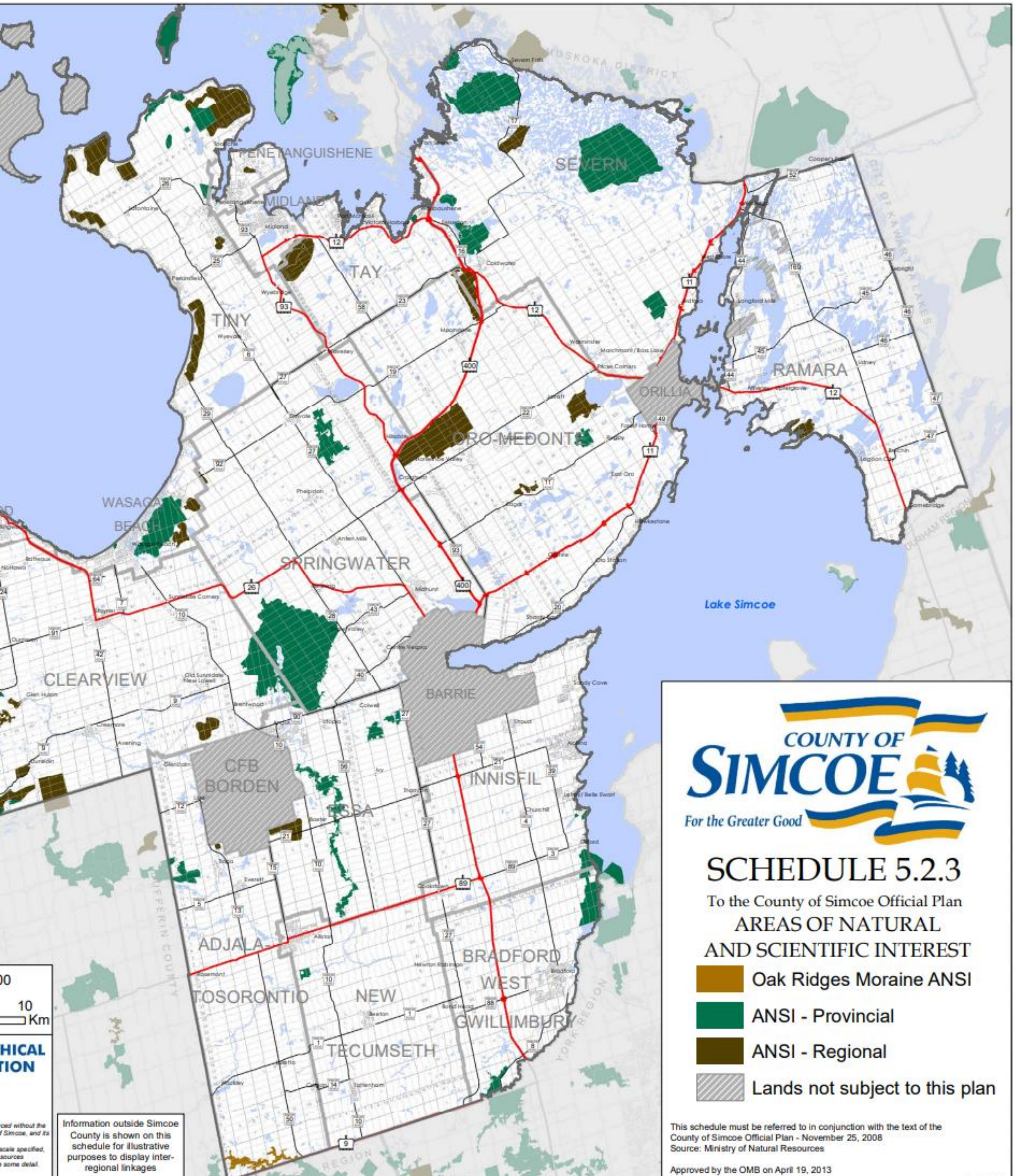


26
Wasaga Bea
SIMCOE 64 ROAD
SIMCOE 7 ROAD
SIMCOE 91 ROAD
Stayner



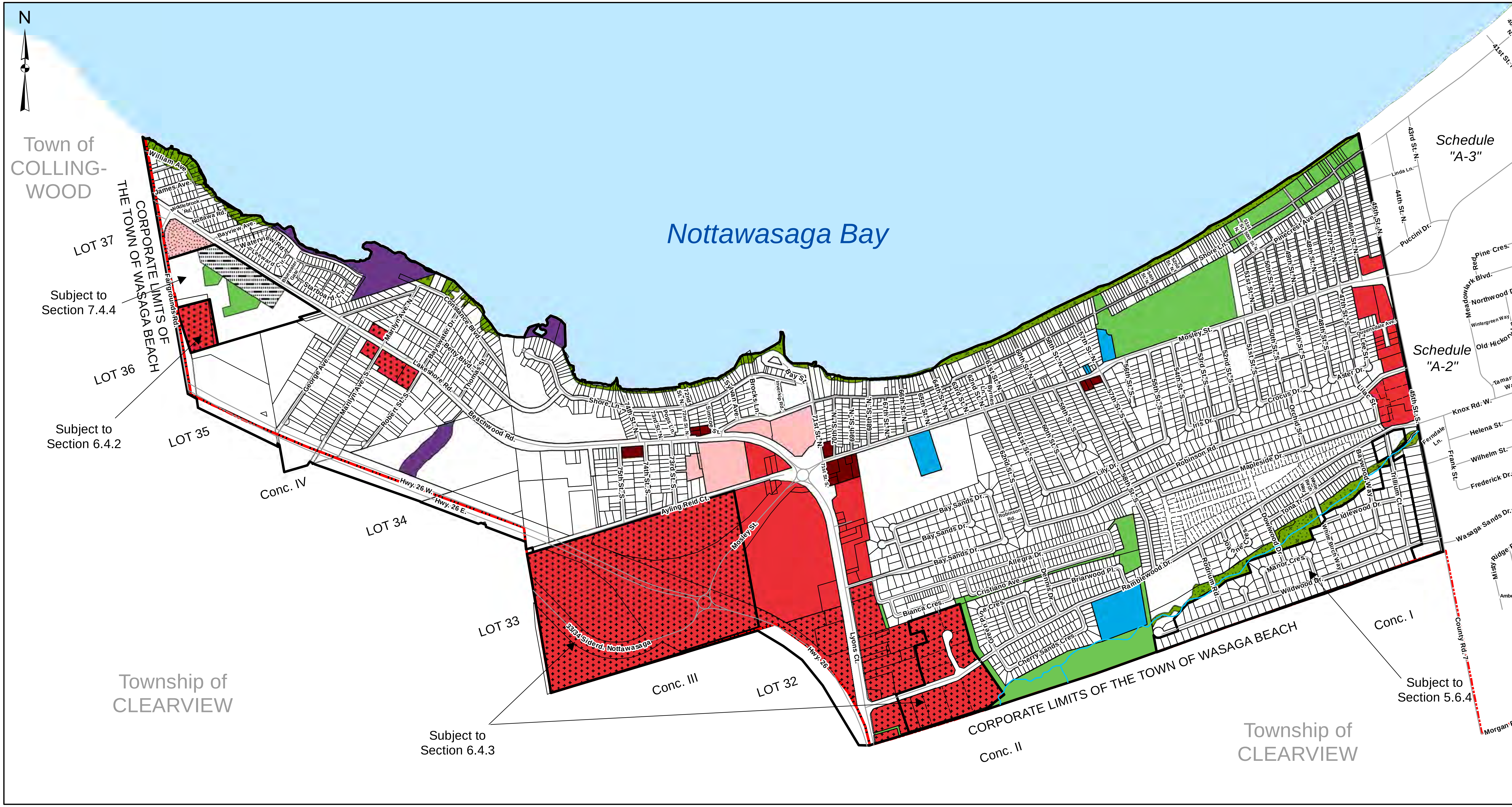
COUNTY OF SIMCOE
For the Greater Good
SCHEDULE 5.2.2
To the County of Simcoe Official Plan
STREAMS AND EVALUATED WETLANDS
Provincially Significant Wetland
Locally Significant Wetland
Watercourse
Lands not subject to this plan
This schedule must be referred to in conjunction with the text of the County of Simcoe Official Plan - November 25, 2008
Source: Midhurst District MNR
Approved by OMB on May 9, 2016
Information outside Simcoe County is shown on this schedule for illustrative purposes to display inter-regional linkages
PENETANGUISHENE
MIDLAND
SEVERN
TAY
TINY
RAMARA
ORILLIA
ORO-MEDONTE
WASAGA BEACH
SPRINGWATER
Lake Simcoe
CLEARVIEW
BARRIE
CFB BORDEN
ESSA
INNISFIL
ADJALA
TOSORONTIO
NEW TECUMSETH
BRADFORD WEST GWILLIMBURY
DUFFERIN COUNTY
MUSKOKA DISTRICT

WASAGA BEACH
Collingwood
Batteaux
Nottawa
Lamonte Creek
Stayner



PENETANGUISHENE
MIDLAND
SEVERN
TAY
TINY
RAMARA
ORILLIA
ORO-MEDONTE
WASAGA BEACH
SPRINGWATER
Lake Simcoe
CLEARVIEW
BARRIE
CFB BORDEN
ESSA
INNISFIL
ADJALA-TOSORONTIO
NEW TECUMSETH
BRADFORD WEST GWILLIMBURY
COUNTY OF SIMCOE
For the Greater Good
SCHEDULE 5.2.3
To the County of Simcoe Official Plan
AREAS OF NATURAL AND SCIENTIFIC INTEREST
Oak Ridges Moraine ANSI
ANSI - Provincial
ANSI - Regional
Lands not subject to this plan
This schedule must be referred to in conjunction with the text of the County of Simcoe Official Plan - November 25, 2008
Source: Ministry of Natural Resources
Approved by the OMB on April 19, 2013
Information outside Simcoe County is shown on this schedule for illustrative purposes to display inter-regional linkages

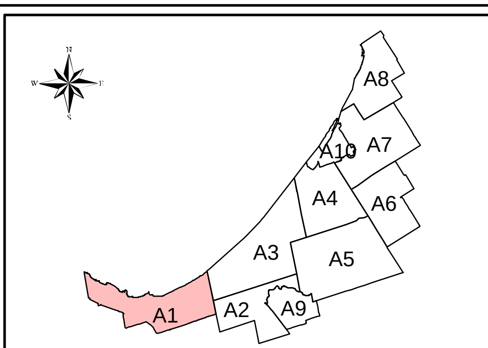
BEACH
Wasaga
Batteaux
64
7
Stayner



Adopted by Council: September 9, 2003	
Approved by the County of Simcoe: June 22, 2004	
Consolidated: January 2020	

NOTE: The lot lines depicted on this map are for reference only and may not reflect accurately property boundaries in all instances.

0 100 200 400 600 800 1,000
Metres



Legend

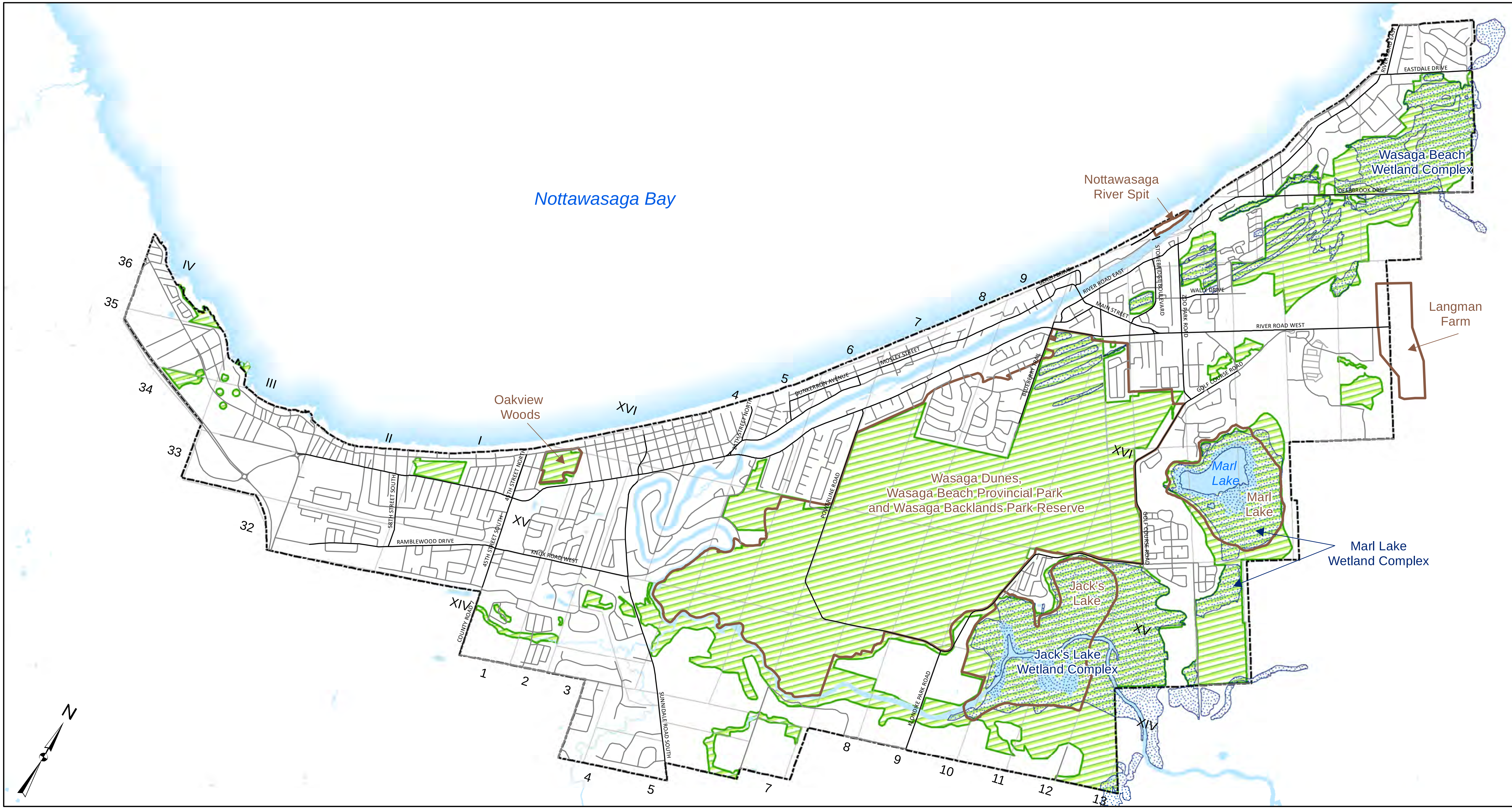
- Residential
- High Density Residential
- Country Club Community
- Campground Commercial
- Recreational Commercial
- Service Commercial
- District Commercial
- Local Commercial
- Tourism Accommodation
- Tourism Commercial
- Institutional
- Open Space
- Natural Hazards
- Natural Heritage System Category 1
- Rural
- Waste Disposal

TOWN OF WASAGA BEACH INCORPORATED 1974

Schedule 'A-1'

Land Use Plan

Official Plan of the Town of Wasaga Beach



Adopted by Council: September 9, 2003

Approved by the County of Simcoe: June 22, 2004

Consolidated: January 2020

NOTE: The lot lines depicted on this map are for reference only and may not reflect accurately property boundaries in all instances.

0 300 600 1,200 1,800 2,400 3,000
Metres

ANSI (Area of Natural and Scientific Interest)

Provincially Significant Wetland Complex

Natural Heritage System Category 1 and 2 Lands

TOWN OF WASAGA BEACH • INCORPORATED 1974 •

Schedule 'D'

Natural Heritage System

Official Plan of theTown of Wasaga Beach

APPENDIX B

Background Information

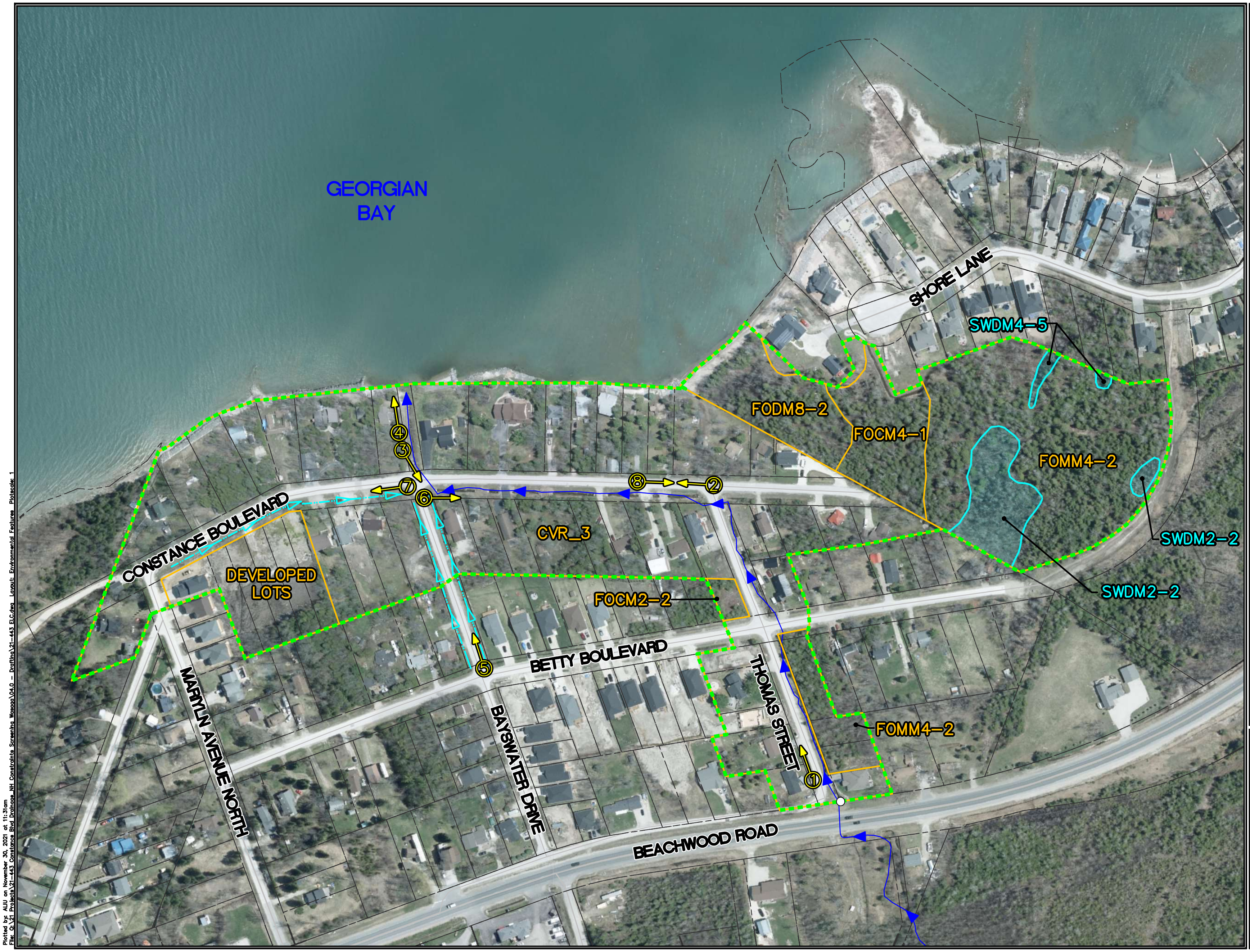
Figure 4: Existing Conditions, Beachwood Road

APP. AREA OF DRAINAGE WORKS

C

CULVERT

J.B. FOOT
MAY 12/21



LEGEND:

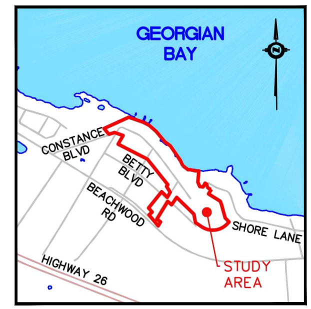
- STUDY AREA
- WATERCOURSE (ONTARIO MNR, 2020)
- WETTED DITCHES CONNECTED TO WATERCOURSE
- BARRIER TO FISH MOVEMENT
- PHOTO POINT COUNT STATION (AZIMUTH, OCT. 2021)

ELC VEGETATION COMMUNITIES:

FODM8-2	FRESH-MOIST POPLAR DECIDUOUS FOREST
FOCM4-1	FRESH-MOIST WHITE CEDAR CONIFEROUS FOREST
FOMM4-2	DRY-FRESH WHITE CEDAR POPLAR MIXED FOREST

ELC WETLAND COMMUNITIES:

SWDM2-2	GREEN ASH MINERAL DECIDUOUS SWAMP
SWDM4-5	POPLAR MINERAL DECIDUOUS SWAMP



LOCATION PLAN

0 62.50 125.0

HORIZONTAL SCALE 1:2500

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

PRELIMINARY ENVIRONMENTAL FEATURES

CONSTANCE BOULEVARD DRAINAGE IMPROVEMENTS
WASAGA BEACH, ON

DATE ISSUED:	NOVEMBER 2021	Figure No.
CREATED BY:	A.L.	2
PROJECT NO.:	21-443	
REFERENCE:	SIMCOE COUNTY	

Ontario

Aurora MNR
Information Request Form

Name:	Alyssa Deurwaarder
Company Name:	Azimuth Environmental Cinsulting Inc.
Proponent Name:	Ainley Group
Phone Number:	705-305-8582
Email Address:	alyssad@azimuthenvironmental.com
Project Name:	21-443 Constance Boulevard Drainage Improvements
Property Location (address):	
Township (Geographic):	Town of Wasaga Beach
Lot & Concession:	Part of Lots 35 Concession 4 and 5
UTM Coordinates:	569584.3 E 4924701.7 N
Brief Description of Undertaking	Natural Heritage Constraints for proposed drainage alternatives

Have you previously contacted someone at MNR for information on this site? ☐ Yes ☒ No

If yes, when and who?	

Provide a map of accurate scale to illustrate footprint/study area of the proposed activity in relation to the surrounding landscape (e.g. property boundaries, roads, waterbodies, natural features, towns, transmission corridors, and other human landmarks). Use of aerial photography is strongly encouraged. Include scale, north arrow and legend.

ATTACHMENTS - I have attached a:

☐ Picture ☒ Map ☐ Other

REQUEST - I would like to request the following information for the property identified above:

☒ Fish Dot Information (fish and other aquatic species found in a particular area of a watercourse)

☒ ANSI Mapping (hard copy) and/or check- sheet - please provide name of ANSI if known)

☒ Wetland Mapping (hard copy) and/or evaluation and data record - please provide name of wetland if known)

☒ Nesting Sites

☒ Species at Risk

Please forward the completed form to: esa.aurora@ontario.ca

Or send by mail:
Attn: Assistant Species at Risk Biologist
Aurora District, Ministry of Natural Resources
50 Bloomington Rd Aurora, ON L4G 0L8

MECP Information Request Form
Attachment

Initial Screening - SAR

Date: November 2, 2021 **Project Ref:** AEC 21-443

Azimuth Contact: Alyssa Deurwaarder, Ecologist
Email alyssad@azimuthenvironmental.com
Phone (705) 795-8451

Attachments: Natural Heritage Information Map
County of Simcoe Mapping

Project Name: Natural Heritage Constraints for Constance Boulevard Drainage Improvements

Activity Description: Drainage Improvement Alternatives

Study Area: Part of Lot 35 Concessions 4 and 5, (Wasaga Beach, ON)— *see attached County of Simcoe Map*

Comprehensive SAR List/Initial Screening Based on On-line and Other Sources[1]:

- Mammals: Little Brown Myotis (END), Northern Myotis (END), Tri-colored Bat (END)
- Reptiles and Amphibians: Massasauga (Great Lakes/ St. Lawrence population) (THR), Snapping Turtle (SC)
- Birds: Eastern Whip-poor-will (THR), Chimney Swift (THR) Bobolink (THR), Eastern Meadowlark (THR), Red-headed Woodpecker (SC), Eastern Wood-Pewee (SC), Barn Swallow (THR), Wood Thrush (SC).
- Insects: Monarch Butterfly (SC)
- Fish: Lake Sturgeon (Great Lakes-Upper St. Lawrence River population) (THR)

Rare and Provincially Tracked Species:

- No records

[1] *On-line and other sources: Species at Risk Ontario (*https://www.ontario.ca/environment-and-energy/species-risk-ontario-list*); Land Information Ontario (*https://www.ontario.ca/page/land-information-

ontario); *Make a Natural Heritage Map - Natural Heritage Information Centre (Squares 17NK6924) (*http://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US*); Ontario Breeding Bird Atlas (Square 17NK62) (*http://www.birdsontario.org/atlas/maps.jsp?lang=en*); Ontario Reptile and Amphibian Atlas (Square 17NK62) (*https://www.ontarioinsects.org/herp/) *eBird (*https://ebird.org/explore*); Fisheries and Oceans Canada (*http://www.dfo-mpo.gc.ca/species-especes/index-eng.htm*); Fish Online (*https://www.gisapplication.lrc.gov.on.ca/FishONLine/Index.html?site=FishONLine&viewer=FishONLine&locale=en-US*); Ontario Butterfly Atlas (Square 17NK62) (*http://www.ontarioinsects.org/atlas_online.htm*);* and *Atlas of the Mammals of Ontario (*Dobbyn, J. 1994. Federation of Ontario Naturalists*).*

List of Features/Habitats on and Adjacent to Proposed Activity:

- Study area comprises a residential neighborhood with areas of woodland along the Georgian Bay coast (*see attached NHIC Map for reference)*
- MNRF Mapped Watercourse- tributary of Georgian Bay
- MNRF Unevaluated Woodlands - comprising wooded portions of the study area;

Consolidated SAR List Expected in Area Based on Habitat[2]:

- Mammals: Little Brown Myotis (END), Northern Myotis (END), Tri-colored Bat (END)
- Reptiles and Amphibians: Snapping Turtle (SC)
- Birds: Wood Thrush (SC), Red-headed Woodpecker (SC), Eastern Wood-Pewee (SC)
- Fish: Lake Sturgeon (Great Lakes-Upper St. Lawrence River population) (THR)

[2]List of SAR to be assessed relative to the activity/proposed development.

Information Requested:

- Confirmation of key natural features in the vicinity of the proposed development;
- Confirmation that the Consolidated List of SAR expected in the Area Based on Habitat includes all SAR of concern to the MECP with respect to this activity (see attachment); or
- Additional information related to key natural features, fish habitat data and/or SAR of concern to the MECP with respect to the property[3].

[3]If SAR of concern are deemed "Restricted", Azimuth will protect the species identity within reporting that would become part of the public record.

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Constance Blvd NH

Map created:10/25/2021

Notes:

Enter map notes

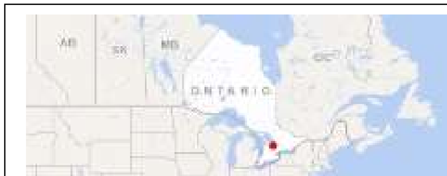
Legend

- Assessment Parcel
- NHIC 1 Km Grid
- Ecoregion
- ANSI
- Earth Science Provincially Significant/sciences de la terre d'importance provinciale
- Earth Science Regionally Significant/sciences de la terre d'importance régionale
- Life Science Provincially Significant/sciences de la vie d'importance provinciale
- Life Science Regionally Significant/sciences de la vie d'importance régionale
- Evaluated Wetland
- Provincially Significant/considérée d'importance provinciale
- Non-Provincially Significant/non considérée d'importance provinciale
- Unevaluated Wetland
- Woodland
- Conservation Reserve
- Provincial Park
- Natural Heritage System

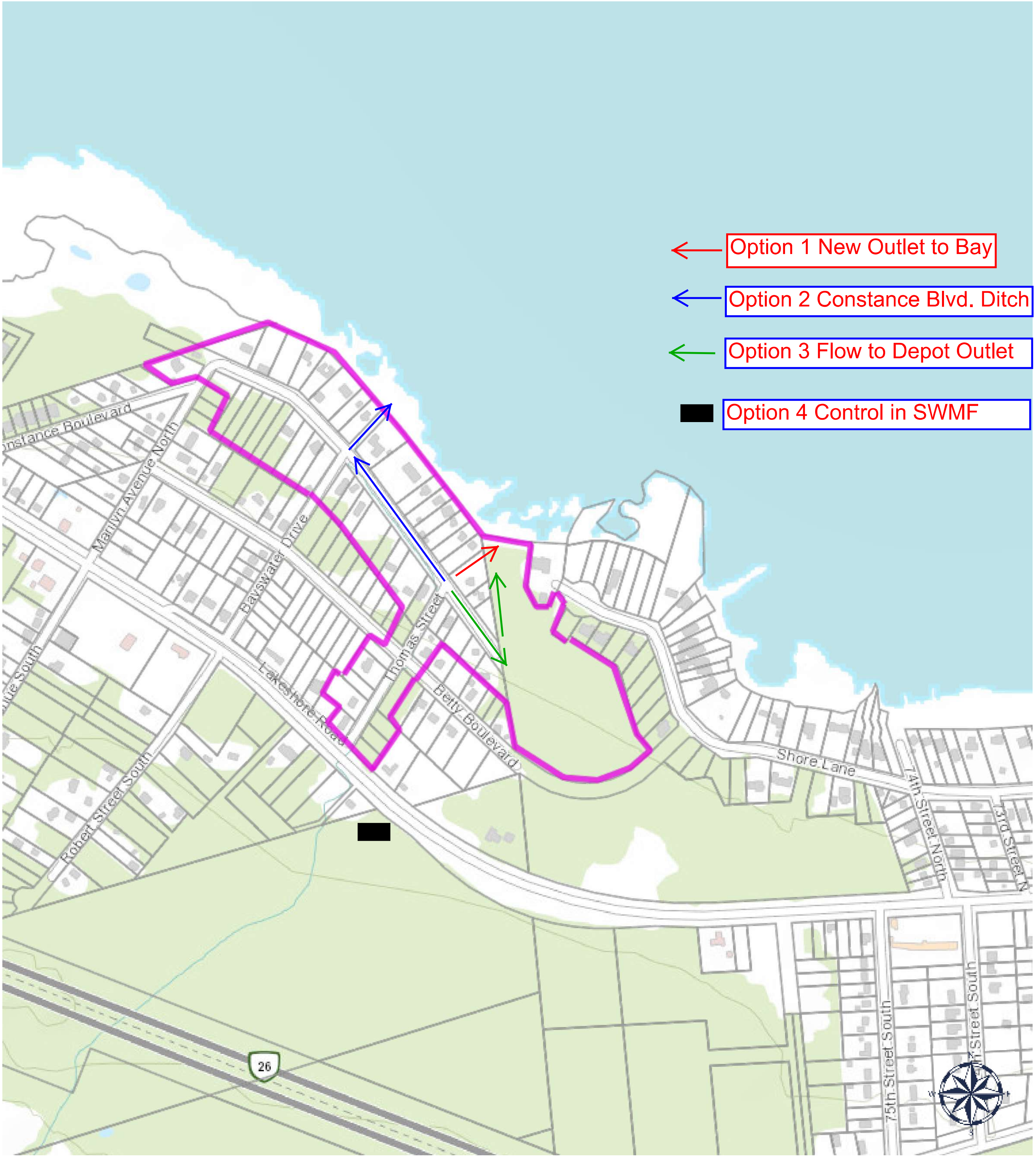
0.3 0 0.16 0.3 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.



County of Simcoe - Web Map



0 100 200 300m

1 : 9,028

COUNTY OF SIMCOE

Jul 29, 2021

Alyssa Deurwaarder

From:	Species at Risk (MECP) [SAROntario@ontario.ca]
Sent:	Thursday, November 4, 2021 3:22 PM
To:	Alyssa Deurwaarder
Cc:	Sara Murphy
Subject:	MECP SARB Response: Information Request Constance Boulevard, Wasaga Beach
Attachments:	Bat Survey Standards Note 2021.pdf; Treed Habitats - Maternity Roost Surveys.docx; SAR Bat Building Exit and Roost Survey Protocols.docx; Survey_Protocol_Snakes.pdf

Hi Alyssa,

The Ministry of Environment, Conservation and Parks (MECP), Species at Risk Branch (SARB) has reviewed the study area for Constance Boulevard Drainage Improvements and recommends that following Species at Risk (SAR) be considered as part of your consolidated SAR list:

- Eastern Hog-nosed Snake (*Heterodon platirhinos*);
- Hill's Thistle (*Cirsium hillii*);
- Piping Plover (*Charadrius melodus*).

While this review represents MECP's best currently available information, it is important to note that a lack of information for a location does not mean that SAR or their habitat are not present. There are many areas where the Government of Ontario does not currently have information, especially in areas not previously surveyed. On-site assessments will need to be conducted to better verify site conditions, identify and confirm presence of SAR and/or their habitats.

Please be aware that there is an Environmental Registry posting which impacts Red-headed woodpecker. The Endangered Species Act (ESA) requires that Ontario Regulation. 230/08 – Species at Risk Ontario (SARO) List be amended by January 27, 2022 to reflect the species classifications in the Committee on the Status of Species at Risk in Ontario (COSSARO) report submitted to the Minister in January 2021. This will result in the status update to Red-headed woodpecker changing it from special concern to endangered. As such you may wish to pre-emptively consider Red-headed woodpecker as endangered for your assessment to account for its anticipated status change. More information on this positing can be found here https://ero.ontario.ca/notice/019-4280

Numerous survey protocols have been attached for your reference and use as SARB expects that surveys will need to be performed within the study area given that a few SAR identified (Eastern Hog-nosed Snake & Piping Plover) are well known to occur in the Wasaga Beach area. If there are any concern or questions about which surveys need to be performed please contact MECP for additional information.

It is the responsibility of the proponent to ensure that SAR are not killed, harmed, or harassed, and that their habitat is not damaged or destroyed through the proposed activities to be carried out on the site. If the proposed activities can not avoid impacting protected species and their habitats then the proponent will need to apply for a authorization under the Endangered Species Act (ESA).

Regards,

Shamus Snell
A/ Management Biologist
Species at Risk Branch
Ministry of Environment, Conservation and Parks
Email: shamus.snell@ontario.ca

From: Alyssa Deurwaarder <AlyssaD@azimuthenvironmental.com>
Sent: November 2, 2021 12:48 PM
To: Species at Risk (MECP) <SAROntario@ontario.ca>
Cc: Sara Murphy <Sara@Azimuthenvironmental.Com>
Subject: SAR Information Request Constance Boulevard, Wasaga Beach

Good afternoon,

Please accept the attached SAR information request for Constance Boulevard, Wasaga Beach and the surrounding area.

Regards,

Alyssa Deurwaarder
Ecologist

Due to COVID-19, our staff are working remotely. Our offices are also closed to the public but I can be reached on my cell or email. I look forward to talking with you.

Azimuth Environmental Consulting, Inc
642 Welham Road
Barrie, Ontario, L4N 9A1
Cell: (705) 305-8582
alyssad@azimuthenvironmental.com
www.azimuthenvironmental.com

Providing services in hydrogeology, terrestrial and aquatic ecology & environmental engineering

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Trees and Shrubs				
Abies balsamea	Balsam Fir	S5	Tree	Forest, Forest Wetland
Acer negundo	Manitoba Maple	S5	Tree	Field, Forest Edge
Amelanchier spp.	Serviceberry species	NA	Shrub	Forest
Apocynum cannabinum	Indian (Dogbane) Hemp	S4	Shrub	Forest
Betula papyrifera	White (Paper) Birch	S5	Tree	Forest
Cornus amomum	Silky Dogwood	S5	Shrub	Forest, Forest Wetland
Cornus sericea	Red-osier Dogwood	S5	Shrub	Forest Edge, Forest Wetland
Fraxinus pennsylvanica	Green Ash	S5	Tree	Forest Edge, Forest Wetland
Fraxinus nigra	Black Ash	S5	Tree	Forest Wetland
Juniperus communis	Ground Juniper	S5	Shrub	Forest
Pinus strobus	White Pine	S5	Tree	Forest
Picea glauca	White Spruce	S5	Tree	Forest
Picea mariana	Black Spruce	S5	Tree	Forest, Forest Wetland
Populus tremuloides	Trembling (Quaking) Aspen	S5	Tree	Field, Forest, Forest Wetland
Prunus virginiana	Choke Cherry	S5	Tree	Forest
Rhamnus alnifolia	Alderleaf Buckthorn	S5	Shrub	Field, Forest, Forest Wetland
Rhamnus cathartica	Common Buckthorn	SE5	Shrub	Field, Forest, Forest Edge
Rhus typhina	Staghorn Sumac	S5	Shrub	Field, Field Edge
Salix discolor	Pussy Willow	S5	Shrub	Field, Forest Wetland
Thuja occidentalis	Eastern White Cedar	S5	Tree	Forest, Forest Wetland
Ulmus americana	American (White) Elm	S5	Tree	Forest, Forest Wetland
Viburnum lentago	Nannyberry	S5	Shrub	Field, Forest, Forest Wetland
Viburnum opulus	Highbush Cranberry	SE4	Shrub	Forest
Ground Flora				
Achillea millefolium	Common Yarrow	S5	Herbaceous	Field, Forest Edge
Aegopodium podagraria	Goutweed	S5	Herbaceous	Field
Allium tricoccum	Wild Leek	S5	Herbaceous	Forest
Alliaria petiolate	Garlic Mustard	SE5	Herbaceous	Forest, Forest Wetland
Ambrosia psilostachyam	Ragweed	NA	Herbaceous	Field
Aneone canadensis	Canada Anemone	S5	Herbaceous	Field, Forest
Aquilegia canadensis	Wild Columbine	S5	Herbaceous	Field, Forest Edge
Athyrium filix-femina	Lady Fern	S5	Herbaceous	Forest
Arctium minus	Common Burdock	NA	Herbaceous	Field, Forest Edge
Arisaema triphyllum	Jack-in-the-pulpit	S5	Herbaceous	Forest, Forest Wetland
Asclepias syriaca	Common Milkweed	S5	Herbaceous	Field, Forest Edge
Aster spp.	Aster species	NA	Herbaceous	Field, Forest Edge

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Calamagrostis canadensis	Blue-joint Reedgrass	S5	Graminoid	Ditch, Forest Wetland
Calystegia sepium	Hedge Bindweed	NA	Herbaceous	Field
Carex castanea	Chestnut-colored Sedge	S5	Graminoid	Field, Forest
Carex echinate	Little Prickly Sedge	S5	Graminoid	Forest Wetland
Carex gracillima	Graceful Sedge	S5	Graminoid	Forest, Forest Wetland
Carex granularis	Meadow Sedge	S5	Graminoid	Field
Carex prasine	Drooping Sedge	S4	Graminoid	Forest Wetland
Carex grayi	Gray’s Sedge	S5	Graminoid	Forest, Forest Wetland
Chenopodium album	Lamb’s Quarters	S5	Herbaceous	Field
Cichorium intybus	Chicory	S5	Herbaceous	Field
Convallaria majalis	Lily-of-the-valley	S5	Herbaceous	Forest
Cypripedium parviflorum	Yellow Lady’s Slipper	S5	Herbaceous	Forest, Forest Wetland
Daucus carota	Wild carrot	SE5	Herbaceous	Field, Forest Edge
Dipsacus fullonum	Common Teasel	NA	Herbaceous	Field
Echium vulgare	Viper’s Bugloss	S5	Herbaceous	Field
Eleocharis spp.	Spikerush species	NA	Herbaceous	Forest, Forest Wetland
Equisetum arvense	Field Horsetail	S5	Graminoid	Forest Wetland
Erigeron philadelphicus	Philadelphia Fleabane	S5	Herbaceous	Field
Erythronium	Trout-lily	S5	Herbaceous	Forest
Fragaria virginiana	Woodland Strawberry	S5	Herbaceous	Forest
Galium triflorum	Sweet-scent Bedstraw	S5	Herbaceous	Field, Forest Edge
Geranium robertianum	Herb-Robert	SE5	Herbaceous	Forest, Forest Wetland
Geum aleppicum	Yellow Avens	S5	Herbaceous	Forest
Geum canadense	White Avens	SE5	Herbaceous	Field, Forest Edge
Helianthus divaricatus	Woodland Sunflower	S5	Herbaceous	Field, Forest Edge
Hesperis matronalis	Dame’s Rocket	S5	Herbaceous	Field
Hypericum punctatum	Common St. Joh’s Wort	SE5	Herbaceous	Field
Impatiens capensis	Spotted Jewelweed	S5	Herbaceous	Forest Wetland
Juncus canadensis	Canada Rush	S5	Graminoid	Forest, Forest Wetland
Lathyrus latifolius	Perennial Pea	S5	Herbaceous	Forest Edge
Leucanthemum vulgare	Ox-eyed Daisy	SE5	Herbaceous	Field
Lotus corniculatus	Bird's-foot Trefoil	S5	Herbaceous	Field
Lycopodiopsida spp.	Clubmoss	S5	Herbaceous	Forest Wetland
Lysimachia ciliate	Fringed Loosestrife	S5	Herbaceous	Forest
Lythrum salicaria	Purple Loosestrife	SE5	Herbaceous	Ditch
Maianthemum stellatum	Star-flowered Solomon’s Seal	S5	Herbaceous	Forest
Maianthemum racemosum	False Solomon's Seal	S5	Herbaceous	Forest
Medicago lupulina	Black Medic	SE5	Herbaceous	Forest, Forest Edge

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Myosotis laxa	Small Forget-me-not	S5	Herbaceous	Forest, Forest Wetland
Oenothera biennis	Evening-primrose	S5	Herbaceous	Field
Osmorhiza claytonia	Woolly Sweet cicely	S5	Herbaceous	Forest
Packera aurea	Golden Ragwort	S5	Herbaceous	Forest Wetland
Paniculata spp.	Phlox spp.	SE5	Herbaceous	Field
Parthenocissus quinquefolia	Virginia Creeper	NA	Herbaceous	Field, Forest Edge
Parthenocissus vitacea	Thicket Creeper	S5	Herbaceous	Field, Forest Edge
Phalaris arundinacea	Reed Canary Grass	S5	Graminoid	Field Edge, Forest Wetland
Phleum pratense	Timothy Grass	S5	Herbaceous	Field
Phragmites australis	Phragmites Common Reed	NA	Graminoid	Ditch
Phlox divaricate	Wild Blue Phlox	S5	Herbaceous	Field
Phryma leptostachya	Spiked Lopseed	S5	Herbaceous	Field Edge
Physocarpus opulifolius	Common Ninebark	S5	Herbaceous	Forest Edge
Pilosella caespitosa	Yellow Hawkweed	NA	Herbaceous	Forest Edge
Plantago lanceolata	English Plantain	SE5	Herbaceous	Field
Plantago major	Common (Nipple-seed) Plantain	SE5	Herbaceous	Field
Poa palustris	Fowl (Swamp) Bluegrass	S5	Graminoid	Forest Wetland
Potentilla simplex	Common Cinquefoil	S5	Herbaceous	Forest
Prunella vulgaris	Self-heal (Heal-all)	SE5	Herbaceous	Field, Forest
Ranunculus acris	Tall Buttercup	S5	Herbaceous	Forest
Ribes triste	Swamp Red Current	S5	Herbaceous	Forest Wetland
Rubus pubescens	Dwarf Raspberry	S5	Herbaceous	Forest, Forest Wetland
Rudbeckia hirta	Black-eyed Susan	S5	Herbaceous	Field, Forest Edge
Shepherdia canadensis	Canada Buffalo-berry	S5	Herbaceous	Forest
Senecio pauperculus	Balsam Ragwort	S5	Herbaceous	Field
Silene vulgaris	Bladder Campion	SE5	Herbaceous	Field, Forest Edge
Sisyrinchium montanum	Strict Blue-eyed-grass	S5	Graminoid	Field
Solidago canadensis	Canada Goldenrod	S5	Herbaceous	Field
Sonchus arvensis	Field (Smooth) Sow-thistle	S5	Herbaceous	Field
Symphyotrichum novae-angliae	New England Aster	S5	Herbaceous	Field, Forest Edge
Symphytum officinale	Common Comfrey	S5	Herbaceous	Field Edge
Taraxacum officinale	Common Dandelion	SE5	Herbaceous	Field
Thalictrum pubescens	Tall Meadowrue	S5	Herbaceous	Forest
Toxicodedron radicans	Poison Ivy	S5	Herbaceous	Field, Forest Edge
Trifolium pratense	Meadow Clover	S5	Herbaceous	Field
Tussilago farfara	Coltsfoot	S5	Herbaceous	Field, Forest Edge
Typha angustifolia	Narrowleaf Cattail	NA	Herbaceous	Ditch, Forest Wetland
Typha latifolia	Common Cattail	S5	Herbaceous	Ditch, Forest Wetland

Table 7: Vascular plants observed on the property.				
Latin Binomial	Common Name	SRank	Form	Property Habitat
Urtica dioica ssp. Gracilis	Slender Stinging Nettle	S5	Herbaceous	Forest
Verbascum Thapsus	Common Mullein	S5	Herbaceous	Field
Vicia cracca	Cow Vetch	NA	Herbaceous	Field
Viola adunca	Sand Violet	S4S5	Herbaceous	Field, Forest Edge
Viola canadensis	Canada Violet	S5	Herbaceous	Forest
Viola sororia	Wooly Blue Violet	S5	Herbaceous	Forest
Viola spp.	Violet species	NA	Herbaceous	Forest
Vinca minor	Common Periwinkle	S5	Herbaceous	Forest
Vitis riparia1	Riverbank Grape	S5	Vine	Forest Edge

Observed June 28, July 28, November 10, 2011 and May 4, 2012 (Beacon Environmental, NVCA), December 14, 2020, April 19, 27, May 17, 31, June 10, 13, 16, 29, 2021 (Cotyledon Environmental).
SRank: S5 - Secure – Common, widespread, and abundant (includes invasives). **S4 -** Apparently Secure – Uncommon but not rare. **SE** – Exotic, i.e., invasive. **NA -** A conservation status rank is not applicable, an agricultural species, a species of no conservation value, species not confirmed.
Species at Risk in Ontario, O. Reg. 230/08. No Species at Risk were observed on the property.
Regionally Rare Species. No species rare to Simcoe County were observed on the property (Oldham, M.J., and S.R. Brinker. 2009).
Considered wetland indicator species in Appendix 10 of OWES 2013.

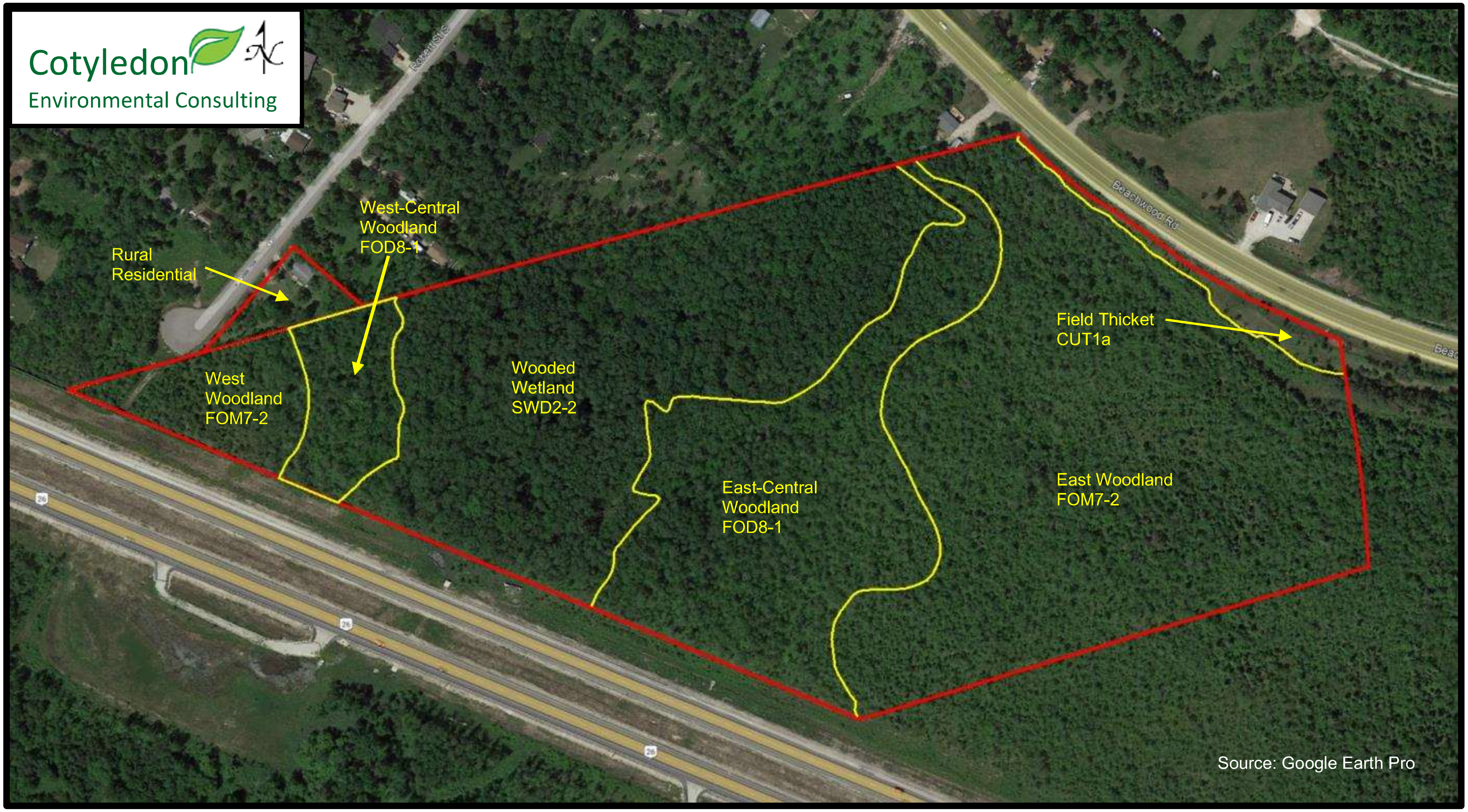


Figure 23: Ecological Landscape Classifications of the vegetation communities on the property.

Table 19: The Potential for Species at Risk on the Property.					
Common Name	Scientific Name	Type	Conservation Status[1]	Local NHIC Record[2]	Confirmed on Property
Bald Eagle	*Haliaeetus leucocephalus*	Bird	SARO Special Concern	No	No Observed flying over December 2020. Habitat not suitable on property. No nesting observed.
Common Nighthawk	*Chordeiles minor*	Bird	SARO Special Concern	No	No Observed flying over during Amphibian Call Survey. Habitat not suitable on property. No nesting observed.
Eastern Meadowlark	*Sturnella magna*	Bird	SARO Threatened	Yes	No Not heard or observed during Breeding Bird Survey. Preferred tall grasslands habitat not present on property.
Eastern Small-footed Myotis	*Myotis leibii*	Bat	SARO Endangered	No	**Possibly** Less than 1% of acoustic recordings attributed to this species.
Eastern Wood Pewee	*Contopus virens*	Bird	SARO Special Concern	No	**Yes** Confirmed. Heard during Breeding Bird Survey, considered possibly breeding.
Lake Sturgeon	Acipenser fulvescens	Fish	SARO Endangered	Yes	No. No suitable habitat on property. Present in nearby Georgian Bay.
Little Brown Myotis	*Myotis lucifugus*	Bat	SARO Endangered	No	**Yes** Confirmed. 36% of acoustic recordings were attributed to this species. Maternity roosting colonies may be on property.
Monarch	*Danaus plexippus*	Insect	SARO Special Concern	No	**Yes** Confirmed. Observed foraging on several occasions in field and forest edge.
Midland Painted Turtle	*Chrysemys picta marginata*	Reptile	COSEWIC Special Concern	Yes	No No suitable habitat on property. Present in nearby Georgian Bay shoreline and creeks and rivers.
Sea Rocket Sand Beach Type	*Cakile edentula*	Plant	S2S3	Yes	No No suitable habitat on property. Present along nearby sand beach shoreline of Georgian Bay.
Tri-cloured Bat	*Perimyotis subflavus*	Bat	SARO Endangered	No	**Possibly** Less than 1% of acoustic recordings attributed to this species.
Wood Thrush	*Hylocichla mustelina*	Bird	SARO Special Concern	Yes	No Not heard or observed during Breeding Bird survey. Preferred mature forest habitat not present on property.

1 – SARO Species at Risk in Ontario. Ontario Regulation 230/08 made under the Endangered Species Act.
COSEWIC Committee on the Status of Endangered Wildlife in Canada, an independent advisory panel to the Minister of Environment and Climate Change Canada,
2 – NHIC Natural Heritage Information Centre, conservation data tracking centre administered by MNRF.

Table 17: Determining if the Woodlands on the Property are Significant Woodlands, as defined by the Provincial Policy Statement.			
NHRM Criteria[1]	Town of Wasaga Beach 43% Forest Cover[2]	Blue Mountains Sub-watershed 35% Forest Cover[2]	Nottawasaga Valley Watershed 33% Forest Cover[2]
Woodlot Size on Property. (Complexed with adjacent property)	36.7 ac (65.2 ac)		
% Forest Cover of Property.	96%		
Minimum Total Size (acres).[3] • If 30-60% of the land cover is forest, woodlands 123.5 ac (50 ha) or larger considered *Significant*.	• 123.5 ac (50 ha) Needed. • 65.2 ac (26.4 ha) Present ○ ***Not Significant***		
Interior Forest.[4] • If 30-60% of the land is forest, considered *Significant* if there is 19.8 ac (8.0 ha) of interior forest.	• 19.8 ac (8.0 ha) Interior Forest Needed • 13.7 ac (5.5 ha) Interior Forest Present ○ ***Not Significant***		
Proximity to Natural Features • Considered *Significant* if the woodland is in proximity (30 m) to Significant Natural Features or fish habitat ***and*** the entire woodland meets the Minimum Area Threshold of 49.2 ac (20 ha).	• 49.2 ac (20 ha) Minimum Area Threshold Needed • 65.2 ac (26.4 ha) Present ○ Minimum Area Threshold met. • Not within 30 m of a Significant Natural Feature or fish habitat ○ ***Not Significant***		
Ecological Linkages • Considered *Significant* if the woodland is within a Defined Natural Heritage System and provides ecological linkage within a specified distance (120 m) to Significant Natural Heritage Feature ***and*** woodland meets the Minimum Area Threshold of 49.2 ac (20 ha).	• 49.2 ac (20 ha) Minimum Area Threshold Needed • 65.2 ac (24.5 ha) Present ○ Minimum Area Threshold Met • Woodland is within a Defined Natural Heritage System (Town of Wasaga Beach Natural Heritage Category 1 Lands). • No ecological linkage to Significant Natural Heritage Feature. ○ ***Not Significant***		
Water Protection[5] • Considered *Significant* if the woodland is within a sensitive or threatened watershed, sensitive groundwater discharge or recharge area, sensitive headwater area, or fish habitat ***and*** the woodland meets the Minimum Area Threshold of 24.7 ac (10 ha).	• 24.7 ac (10 ha) Minimum Area Threshold Needed • 65.2 ac (24.5 ha) Present ○ Minimum Area Threshold Met • Not within sensitive watershed, groundwater or headwater area and no fish habitat. ○ ***Not Significant***		
Woodland Diversity. • Considered *Significant* if the woodland has locally or regionally rare species or a high ecological biodiversity ***and*** the woodland meets the Minimum Area Threshold of species present or high native diversity *and* woodland is Minimum Total Size of 49.2 ac (20 ha).	• 49.2 ac (20 ha) Minimum Area Threshold Needed. • 65.2 ac (26.4 ha) Present ○ Minimum Area Threshold Met • No locally or regionally rare species, minimal ecological biodiversity. ○ ***Not Significant***		
Uncommon Characteristics. • Considered *Significant* if community level unique species are present, or there are trees greater than 100 years old or greater than 40 cm diameter ***and*** the woodland meets the Minimum Area Threshold of 24.7 ac (10 ha).	• 24.7 ac (10 ha) Minimum Area Threshold Needed • 65.2 ac (26.4 ha) Present ○ Minimum Area Threshold Met • No trees greater than 100 years old or 40 cm diameter in the woodland. ○ ***Not Significant***		
Economic & and Social Function. • Considered *Significant* if the woodland produces high quality economic value, provides local recreational or educational opportunities, or has cultural, historical, archeological or aboriginal importance ***and*** the woodland meets the Minimum Area Threshold of 24.7 ac (10 ha).	• 24.7 ac (10 ha) Minimum Area Threshold Needed • 65.2 ac (26.4 ha) Present ○ Minimum Area Threshold met. • No economic products produced, private ownership excludes community recreational or education opportunities, and no known cultural importance. ○ ***Not Significant***		

1 - Natural Heritage Reference Manual Provincial Policy Statement.
2 - % Forest cover of the local sub-watershed and the total regional watershed.
3 – Minimum woodland size needed to be considered *Significant* varies by % forest cover: 1) 15-30% forest cover = 49.4 ac, 2) 30-60% forest cover = 123.5 ac.
4 – Interior Forest is forest area that is more than 100 m from an edge. 1) 15-30% forest cover = 4.9 ac of interior forest needed to be *Significant*, 2) 30-60% forest cover = 19.8 ac needed.
5 – Property is not in a Well Head Protection Zone or an Area of High Aquifer Vulnerability.

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
1) Seasonal Concentration Areas of Animals				
Waterfowls Stopover and Staging Areas - Terrestrial	American Black Duck, Wood Duck, Green-winged Teal, Blue-winged Teal, Mallard, Northern Pintail, Northern Shoveler, American Wigeon, Gadwall.	CUM1, **CUT1**.	Fields with flooding during spring melt and run-off, Agricultural fields with waste grains. Ecotype present (CUT1), but fields don't flood, therefore habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Waterfowl Stopover and Staging Areas (Aquatic)	Canada Goose, Cackling Goose, Snow Goose, American Black Duck, Northern Pintail, Northern Shoveler, American Wigeon, Gadwall, Green-winged Teal, Blue-winged Teal, Hooded Merganser, Common Merganser, Lesser Scaup, Greater Scaup, Long-tailed Duck, Surf Scoter, White-winged Scoter, Black Scoter, Ring-necked duck, Common Goldeneye, Bufflehead, Redhead, Ruddy Duck, Red-breasted Merganser, Brant Canvasback, Ruddy Duck.	MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, SWD1, **SWD2**, SWD3, SWD4, SWD5, SWD6, SWD7.	Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Ecotype present (SWD2), but wetlands are ephemeral with no standing water, therefore habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Shorebird Migratory Stopover Area	Greater Yellowlegs, Lesser Yellowlegs, Marbled Godwit, Hudsonian Godwit, Black-bellied Plover, American Golden-Plover, Semipalmated Plover, Solitary Sandpiper, Spotted Sandpiper, Semipalmated Sandpiper, Pectoral Sandpiper, White-rumped Sandpiper, Baird's Sandpiper, Least Sandpiper, Purple Sandpiper, Stilt Sandpiper, Short-billed Dowitcher, Red-necked Phalarope, Whimbrel, Ruddy Turnstone, Sanderling Dunlin.	BBO1, BBO2, BBS1, BBS2, BBT1, BBT2, SDO1, SDS2, SDT1, MAM1, MAM2, MAM3, MAM4, MAM5.	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Ecotype not present, therefore habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Raptor Wintering Area	Rough-legged Hawk, **Red-tailed Hawk**, Northern Harrier, American Kestrel, Snowy Owl, Short-eared Owl, **Bald Eagle**.	**FOD**, **FOM**, FOC, CUM, **CUT**, CUS, CUW, **SWD**, SWM, SWC.	Combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Eagle sites have open water, large trees and snags available for roosting. Ecotype present (FOD, FOM. SWD, CUT), but no open water and trees too small for roosting.	Bald Eagle and Red-tailed Hawk both observed flying over the property. No evidence of habituating or breeding on-site. No nests were observed, habitat not suitable for wintering. **Not Significant Wildlife Habitat.**
Bat Hibernacula	**Big Brown Bat**, **Tri-coloured Bat**.	CCR1 CCR2 CCA1 CCA2	Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. Ecotypes not present, no natural or anthropogenic underground features, therefore habitat is not present.	Both bat species are present on the property as their summer range, but no hibernacula on or near the property. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
Bat Maternity Colonies	**Big Brown Bat**, **Silver-haired Bat**.	**FOD**, **FOM**, **SWD**, SWM.	Maternity colonies can be found in tree cavities, vegetation and often in buildings, mature deciduous or mixed forest stands with large, old and decaying trees. Forest should be >24.7 ac (10 ha) and have trees >25 cm DBH. Ecotypes present (FOD, FOM, SWD). Forest on the property is >24.7 ac, but relatively few large trees (<3% of trees >25 cm). Many decaying trees, therefore, habitat is marginal but it is present.	Both bat species are present on the property. Based on abundance of acoustic recordings, some maternal roosting colonies are likely. In addition, SAR bat species were confirmed on the property. **Significant Wildlife Habitat is present.**
Turtle Wintering Areas	Midland Painted Turtle, Northern Map Turtle, Snapping Turtle	FEO, BOO.	For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. Ecotypes are not present. There is no permanent deep water on the property. Habitat is not present.	No turtles were observed on the property. No suitable wintering habitat. **Not Significant Wildlife Habitat.**
Reptile Hibernaculum	Eastern Gartersnake, Northern Watersnake, Northern Red-bellied Snake, Northern Brownsnake, Smooth Green Snake, Northern Ring-necked Snake, Milksnake, Eastern Ribbonsnake, Five-lined Skink.	**FOD**, **FOM**, FOC1, FOC3.	Sites located below frost lines in burrows, rock crevices and other natural or naturalized locations, rock piles, slopes, old stone fences, abandoned crumbling foundations, broken and fissured rock, rock outcrop, cover rock overlaying granite bedrock with fissures. Ecotypes present (FOM, FOD), but no suitable rocky features. Habitat is not present.	None of the species were observed, and there is no suitable winter hibernacula habitat. **Not Significant Wildlife Habitat**.
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)	Cliff Swallow, Northern Rough-winged Swallow.	CUM1 **CUT1** CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	Sites or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. Ecotype is present (CUT1), but there are no banks or cliffs on the property. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)	Great Blue Heron, Black-crowned Night Heron, Great Egret, Green Heron.	SWM2, SWM3, SWM5, SWM6, SWD1, **SWD2**, SWD3, SWD4, SWD5, SWD6, SWD7, FET1.	Live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. Most nests in trees are 11 to 15 m from ground, near the top of the tree. Ecotype is present (SWD2), but there is permanent standing water on the property, and very trees are tall enough for nesting. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Colonially - Nesting Bird Breeding Habitat (Ground)	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	MAM1-6, MAS1-3, CUM, **CUT**, CUS.	Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. Brewers Blackbird colonies are found loosely on the	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
			ground in low bushes in close proximity to streams and irrigation ditches within farmlands. Ecotype is present (CUT), but there are no permanent open water or marshy areas on the property. Habitat is not present.	
Migratory Butterfly Stopover Areas	Painted Lady, Red Admiral.	CUM, **CUT**, CUS, FOC, **FOD**, **FOM**, CUP.	A butterfly stopover area will be a minimum of 24.7 ac (10 ha) in size with a combination of field and forest habitat and will be located within 5 km of Lake Ontario. Ecotypes are present (CUT, FOM, FOD) but the property is not in proximity to Lake Ontario. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Land bird Migratory Stopover Areas	All migratory songbirds.	FOC, **FOM**, **FOD**, SWC, SWM, **SWD**.	Woodlots need to be greater than 24.7 ac (10 ha) in size and within 5 km of Lake Ontario. Ecotypes are present (FOM, FOD, SWD), but property is not in proximity to Lake Ontario. Habitat is not present.	No habitat, wildlife species not present. **Not Significant Wildlife Habitat.**
Deer Yarding Areas	**White-tailed Deer**.	**FOM**, FOC, SWM, SWC, CUP2, CUP3, FOD3, **CUT**.	Deer yarding areas or winter concentration areas (yards) are areas that deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum 1 and Stratum 2. Stratum 2 covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20 cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30 cm snow depth. In mild winters, deer may remain in the Stratum 2 area the entire winter. Ecotypes are present (FOM, CUT). The entire property is Stratum 2 deer yard; therefore, the habitat is present.	Species are present. Habitat is present. Significant Wildlife Habitat designation is not suggested because of the increased traffic flow along the recently expanded and adjacent Highway 26 and Beachwood Road, which would increase the frequency of deer-vehicle collisions. Ample Stratum 1 and 2 deer yard habitat exists in the planning area. Although much of the forest on the property would be removed for the proposed development, the forested wetland will remain, which is a substantial wildlife movement corridor. **Not Significant Wildlife Habitat**.
Deer Winter Congregation Areas	**White-tailed Deer**	FOC **FOM FOD** SWC SWM **SWD**	Woodlots will typically be greater than 247 ac (100 ha). Ecotypes are present (FOM, FOD, SWD), but forest is not large enough. Habitat is not present.	Species are present, but habitat is not present. **Not Significant Wildlife Habitat.**
2) Rare Vegetation Communities or Specialized Habitat for Wildlife that are Considered Significant Wildlife Habitat.				
Cliffs and Talus Slopes	S1, S2, S3 plant species.	TAO, TAS, TAT, CLO, CLS, CLT.	A Cliff is vertical to near vertical bedrock greater than 3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
Sand Barren	S1, S2, S3 plant species.	SBO1, SBS1, SBT1.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Alvar		ALO1, ALS1, ALT1, FOC1, FOC2, CUM2, CUS2, CUT2-1, CUW2.	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. An Alvar site is greater than 1.2 ac (0.5 ha) in size. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Old Growth Forest	S1, S2, S3 plant species.	**FOD** FOC **FOM** **SWD** SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris. Woodland areas 74 ac (30 ha) or greater in size or with at least 24.7 ac (10 ha) interior habitat. Ecotypes are present (FOM, FOD, SWD) but interior forest and total forest size is too small. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Savannah	S1, S2, S3 plant species.	TPS1, TPS2, TPW1, TPW2, CUS2,	A Savannah is a tallgrass prairie habitat that has tree cover between 25–60%. There is no minimum size. Ecotypes are not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
3) Specialized Habitats of Wildlife considered Significant Wildlife Habitat.				
Waterfowl Nesting Area	American Black Duck, Northern Pintail, Northern Shoveler, Gadwall, Blue-winged Teal, Green-winged Teal, Wood Duck, Hooded Merganser, Mallard.	SWH, MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, SWT1, SWT2, SWD1, **SWD2**, SWD3, SWD4.	A waterfowl nesting area extends 120 m from a wetland, or any small wetlands within 120m, or a cluster of 3 or more small wetlands within 120 m of each other where waterfowl nesting is known to occur. Ecotype is present (SWD2), but there is no waterfowl nesting habitat present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	Osprey, **Bald Eagle**.	**FOD**, **FOM,** FOC, **SWD**, SWM, SWC	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. Ecotypes present (FOD, FOM, SWD), but no open water ponds, rivers or wetlands and no old tall trees for nests. Habitat is not present.	Bald Eagle fly over was observed, but no nesting or roosting habitat is present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
Woodland Raptor Nesting Habitat	Northern Goshawk, Cooper's Hawk, Sharp-shinned Hawk, Red-shouldered Hawk, Barred Owl, Broad-winged Hawk.	All forested Ecosites and SWC, SWM, **SWD** and CUP3.	All natural or conifer plantation and forest stands >74 ac (30 ha) with >24.7 ac (10ha) of interior habitat. Interior habitat determined with a 200m buffer. Ecotypes present (FOM, FOD, SWD) but woodlands are not large enough and no 200 m interior habitat. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Turtle Nesting Areas	Midland Painted Turtle, Northern Map Turtle, Snapping Turtle	MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, BOO1, FEO1.	Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. For an area to function as a turtle nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Ecotypes not present. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Seeps and Springs	Wild Turkey, **Ruffed Grouse**, Spruce Grouse, **White-tailed Deer**, Salamander spp.	Any forested Ecosite within headwater areas.	Seeps and Springs are areas where ground water comes to the surface. Any forested area, meadow, field or within the headwaters of a stream or river system. Ecotypes are present (FOM, FOD, SWD) but there are no seeps or springs. Habitat is not present.	Species are present but habitat is not present. **Not Significant Wildlife Habitat**.
Amphibian Breeding Habitat (Woodland).	Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog, Wood Frog.	FOC, **FOM**, **FOD**, SWC, SWM, **SWD**.	Presence of a wetland, pond or woodland pool, including vernal pools, >500 m^2 in size within or adjacent to a woodland. Ecotypes present (FOM, FOD, SWD) but no permanent or vernal ponds on the property. Habitat is not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Amphibian Breeding Habitat (Wetlands)	American Toad, Spotted Salamander, Four-toed Salamander, Blue-spotted Salamander, Gray Treefrog, Western Chorus Frog, Northern Leopard Frog, Pickerel Frog, Green Frog, Mink Frog, Bullfrog.	Any wetland ecosites.	Wetlands >500 m^2, supporting high species diversity. Some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats. Ecotypes present (SWD), but there is no open water streams or ponds that are suitable amphibian breeding habit, confirmed by amphibian call surveys. Habitat not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Area-Sensitive Bird Breeding Habitat	Yellow-bellied Sapsucker, Red-breasted Nuthatch, **Veery**, Blue-headed Vireo, Northern Parula, Black-throated Green Warbler, Blackburnian Warbler, Black-throated Blue Warbler, Ovenbird, Scarlet Tanager, Winter Wren, Cerulean Warbler, Canada Warbler.	FOC, **FOM**, **FOD**, SWC, SWM, **SWD**.	Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >74 ac (30 ha) with interior forest habitat at least 200 m from forest edge. Ecotypes present (FOM, FOD, SWD) but forest total size and interior forest size do not meet minimum size thresholds. Habitat not present.	One species (Veery) confirmed, but habitat is not present. **Not Significant Wildlife Habitat**
4) Habitats of Species of Conservation Concern considered Significant Wildlife Habitat.				
Marsh Breeding Bird Habitat	American Bittern, Virginia Rail, Sora, Common Moorhen, American Coot, Pied-billed Grebe, Marsh Wren, Sedge	MAM1, MAM2, MAM3, MAM4, MAM5, MAM6,	All wetland habitat as long as there is shallow water with emergent aquatic vegetation, sluggish streams, ponds and marshes sheltered by shrubs and trees.	No habitat, no species present. **Not Significant Wildlife Habitat.**

Table 18: Screening for Significant Wildlife Habitat (SWH)				
Wildlife Habitat	Wildlife Species	ELC Ecosite	Candidate SWH	Confirmed SWH
	Wren, Common Loon, Sandhill Crane, Green Heron, Trumpeter Swan.	SAS1, SAM1, SAF1, FEO1, BOO1, CUM1.	Ecotypes not present. No open water stream, ponds or marshes on the property. Habitat is not present.	
Open Country Bird Breeding Habitat	Upland Sandpiper, Grasshopper Sparrow, Vesper Sparrow, Northern Harrier, Savannah Sparrow, Short-eared Owl.	CUM1 CUM2	Large grassland areas, includes natural and cultural fields and meadows, >74 ac (30 ha), grasslands not Class 1 or 2 agricultural lands and not being actively used for farming. Ecotype not present. Grasslands do not meet minimum size threshold. Habitat not present.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Shrub/Early Successional Bird Breeding Habitat	Brown Thrasher, Clay-coloured Sparrow, **Field Sparrow**, Black-billed Cuckoo, **Eastern Towhee**, **Willow Flycatcher**, Yellow-breasted Chat, Golden-winged Warbler.	**CUT1**, CUT2, CUS1, CUS2, CUW1, CUW2.	Large field areas succeeding to shrub and thicket >24.7 ac (10 ha) in size. Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming. Ecotype present (CUT1) but it does not meet the minimum size threshold. Habitat not present.	Three species confirmed (Field Sparrow, Eastern Towhee, Willow Flycatcher) but habitat is not present. **Not Significant Wildlife Habitat**.
Terrestrial Crayfish	Chimney or Digger Crayfish, Devil Crayfish or Meadow Crayfish.	MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, MAS1, MAS2, MAS3, **SWD**. SWT SWM CUM1	Wet meadow and edges of shallow marshes (no minimum size). Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. Terrestrial Crayfish are only found in SW Ontario and their habitats are very rare. Ecotype is present (SWD) but marsh habitat is not present, and property is likely well out of the known range in Ontario.	No habitat, no species present. **Not Significant Wildlife Habitat.**
Special Concern and Rare Wildlife Species	All S1, S2, S3 plant and animal species tracked by NHIC.	Any ELC	NHIC record for Sea Rocket Sand Beach Type rare plant community within 1 km of the property. The required sand beach habitat is not present on the property.	No habitat, no species present. **Not Significant Wildlife Habitat.**
5) Animal Movement Corridors				
Amphibian Movement Corridors	Eastern Newt, **American Toad**, Spotted Salamander, Four-toed Salamander, Blue-spotted Salamander, Gray Treefrog, Western Chorus Frog, **Northern Leopard Frog**, Pickerel Frog, Green Frog, Mink Frog, Bullfrog.	Corridors may be found in all ecosites associated with water.	Movement corridors between breeding habitat and summer habitat. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH. There is no amphibian breeding habitat confirmed as SWH on the property.	No habitat present. Two species observed on the property (American Toad, Northern Leopard Frog). **Not Significant Wildlife Habitat.**
Deer Movement Corridors	White-tailed Deer	Corridors may be found in all forested ecosites.	Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH. Ecotypes present (FOM, FOD, SWD). Stratum 2 Deer Yard is present on property.	Habitat is present and White-tailed Deer are present. However, SWH designation is discouraged because of increased likelihood of deer-vehicle collisions from the adjacent Highway 26 and Beachwood Road. **Not Significant Wildlife Habitat**
Extracted from: MMNRF. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. January 2015.				

Table 9: Birds Seen or Heard on the Property.			
Latin Binomial	Common Name	SRank	Observation Status
Agelaius phoeniceus	Red-winged Blackbird	S5	Heard, Seen, Probably Breeding
Anas platyrhynchos	Mallard Duck	S5	Fly Over
Bonasa umbellus	Ruffed Grouse	S4	Heard, Probably Breeding
Branta canadensis	Canada Goose	S5	Fly Over
Buteo jamaicensis	Red-tailed Hawk	S5	Fly Over
Cardinalis	Northern Cardinal	S5	Heard, Seen, Probably Breeding
Cathartes aura	Turkey Vulture	S5	Fly Over
Cartharus fuscenscens	Verry	S4	Heard, Probably Breeding
Certhia americana	Brown Creeper	S5	Heard, Seen, Probably Breeding
Chordeiles minor	Common Nighthawk	SC	Fly Over
Colaptes auratus	Northern Flicker	S4	Heard, Seen, Probably Breeding
Contopus virens	Eastern Wood-pewee	SC	Heard, Possibly Breeding
Corvus brachyrhynchos	American Crow	S5	Heard, Seen, Possibly Breeding
Cyanocitta cristata	Blue Jay	S5	Heard, Seen, Probably Breeding
Dendroica pensylvanica	Chestnut-sided Warbler	S5	Heard, Possibly Breeding
Dumetella carolinensis	Gray Catbird	S4	Heard, Probably Breeding
Empidonax traillii	Willow Flycatcher	S5	Heard, Possibly Breeding
Falco columbarius	Merlin	S5	Seen, Possibly Breeding
Geothilphis trichas	Common Yellowthroat	S5	Heard, Probably Breeding
Haliaeetus leucocephalus	Bald Eagle	SC	Fly Over
Larus delawarensis	Ring-billed Gull	S5	Fly Over
Leiothlypis ruficapilla	Nashville Warbler	S5	Heard, Seen, Probably Breeding
Melospiza melodia	Song Sparrow	S5	Heard, Seen, Probably Breeding
Molothrus ater	Brown-headed Cowbird	S5	Heard, Probably Breeding
Mniotilta varia	Black-and-white Warbler	S5	Heard, Probably Breeding
Myiarchus crinitus	Great Crested Flycatcher	S4	Heard, Seen, Probably Breeding
Passer domesticus	House Sparrow	S5	Seen
Paswserina cyanea	Indigo Bunting	S4	Heard, Probably Breeding
Picoides pubescens	Downy Woodpecker	S5	Heard, Seen, Possibly Breeding
Picoides villosus	Hairy Woodpecker	S5	Seen, Probably Breeding
Pipilio erythrophthaimus	Eastern Towhee	S4	Heard, Possibly Breeding
Poecile atricapillus	Black-capped Chickadee	S5	Heard, Seen, Probably Breeding
Quiscalus quiscula	Common Grackle	S5	Heard, Seen, Probably Breeding
Troglodytes aedon	House Wren	S5	Heard, Seen, Probably Breeding
Sayornis phoebe	Eastern Phoebe	S5	Heard, Probably Breeding
Scolopax minor	American Woodcock	S4	Heard. Probably Breeding
Setophaga ruticilla	American Redstart	S5	Heard, Seen, Probably Breeding
Spinus tristis	American Goldfinch	S5	Heard, Seen, Probably Breeding
Spizella pusilla	Field Sparrow	S5	Seen
Stunus vulgaris	European Starling	SE	Heard, Seen, Possibly Breeding
Turdus migratorius	American Robin	S5	Heard, Seen, Probably Breeding
Vireo olivaceus	Red-eyed Vireo	S5	Heard, Seen, Probably Breeding
Zenaida macroura	Mourning Dove	S5	Heard, Seen, Probably Breeding
Zonotrichia albicollis	White-throated Sparrow	S5	Heard, Seen, Probably Breeding

Beacon Environmental Breeding Bird Survey – May 31, June 16, 2012. Other dates – June 28, November 9, 2011.
Cotyledon Environmental Breeding Bird Survey – May 31 and June 10, 2021. Other dates December 14, 2020, April 19 and 27, May 17, June 13, 16 and 29, 2021
S5 – Secure/Common – widespread and abundant.
S4 – Apparently Secure – uncommon but not rare.
SE – Exotic, invasive.
Species at Risk O. Reg 230/06, SC – Special Concern

Table 10: Mammals observed or likely present on the property.

Latin Binomial	Common Name	SRank	Property Observation Status
Alces alces	Moose	S5	Habitat exists – not observed, not likely present
Apodemus sylvaticus	Field Mouse	S5	Habitat exists – not observed, **likely present**
Blarina brevicauda	Northern Short-tailed Shrew	S5	Habitat exists – not observed, **may be present**
Canis latrons	Coyote	S5	Habitat exists – scat observed, **definitely present**
Castor canadensis	Beaver	S5	Habitat does not exist – definitely not present
Eptesicus fuscus	Big Brown Bat	S5	Habitat exists – multiple acoustic recordings, **definitely present**
Erethizon dorsatum	North American Porcupine	S5	Habitat exists – not observed, **may be present**
Lasiurus borealis	Eastern Red Bat	S5	Habitat exists – multiple acoustic recordings, **definitely present**
Lasiurus cinereus	Hoary Bat	S5	Habitat exists – multiple acoustic recordings, **definitely present**
Lontra canadensis	North American River Otter	S5	Habitat does not exist – definitely not present
Marmota monax	Groundhog	S5	Habitat exists – not observed, **may be present**
Mephits mephitis	Striped Skunk	S5	Habitat exists – not observed, **likely present**
Microtus	Meadow Vole	S5	Habitat exists – not observed, **likely present**
Myotis mystacinus	Mouse-eared Bat	S5	Habitat exists – possible acoustic recording, **may be present**
Myotis leibii	Eastern Small-footed Myotis (Bat)	SAR En	Habitat exists – a few acoustic recordings, **may be present**
Myotis septentrionalis	Northern Myotis (Bat)	SAR En	Habitat exists – not detected by acoustic recordings, not present
Myotis lucifugus	Little Brown Myotis (Bat)	SAR En	Habitat exists – multiple acoustic recordings, **definitely present**
Napaeozapus insignus	Woodland Jumping Mouse	S5	Habitat exists – not observed, **may be present**
Neogale vison	American Mink	S5	Habitat does not exist – definitely not present
Odocoileus virginianus	White-tailed Deer	S5	Habitat exists – multiple observations, **definitely present**
Parascalops breweri	Hairy-tailed Mole	S5	Habitat exists – not observed, **may be present**
Ondatra zibethicus	Muskrat	S5	Habitat does not exist – definitely not present
Perimyotis subflavus	Tricoloured Bat	SAR En	Habitat exists – a few acoustic recordings, **may be present**
Peromyscus	North American Deer Mouse	S5	Habitat exists – not observed, **may be present**
Procyon lotor	Common Raccoon	S5	Habitat exists – footprints observed, **definitely present**
Sciurus carolinensis	Eastern Grey squirrel	S5	Habitat exists – observed, **definitely present**
Tamiasciurus hudsonicus	American Red Squirrel	S5	Habitat exists – observed, **definitely present**
Sylvilagus floridanus	Eastern Cottontail	S5	Habitat exists – observed, **definitely present**
Tamis striatus	Eastern Chipmunk	S5	Habitat exists – observed, **definitely present**
Ursus americanus	American Black Bear	S5	Habitat exists – not observed, not likely present
Vulpes	Red Fox	S5	Habitat exists – not observed, **may be present**
Zapus hudsonius	Meadow Jumping Mouse	S5	Habitat exists – not observed, **may be present**

Observed June 28, July 28, November 9, 2011 and May 4, 2012 (Beacon 2012), December 14, 2020, April 19 and 27, May 17 and 31, June 10, 13, 16, 29 2021(CECI).
SRank: S5 - Secure – Common, widespread, and abundant (includes invasives).
Species at Risk in Ontario, O. Reg. 230/08. SAR En - Endangered.

APPENDIX C

Photographic Record

Photograph 1: Unnamed watercourse along Thomas Street – direct fish habitat

Photograph 2: Outlet pool on downstream (north) side of Beachwood Road culvert – direct fish habitat

Photograph 3: Unnamed watercourse outlet into Georgian Bay – direct fish habitat

Photograph 4: Grass swale feature upstream (south) of Beachwood Road culvert – indirect fish habitat

Photograph 5: SWMP outlet on north side of Highway 26

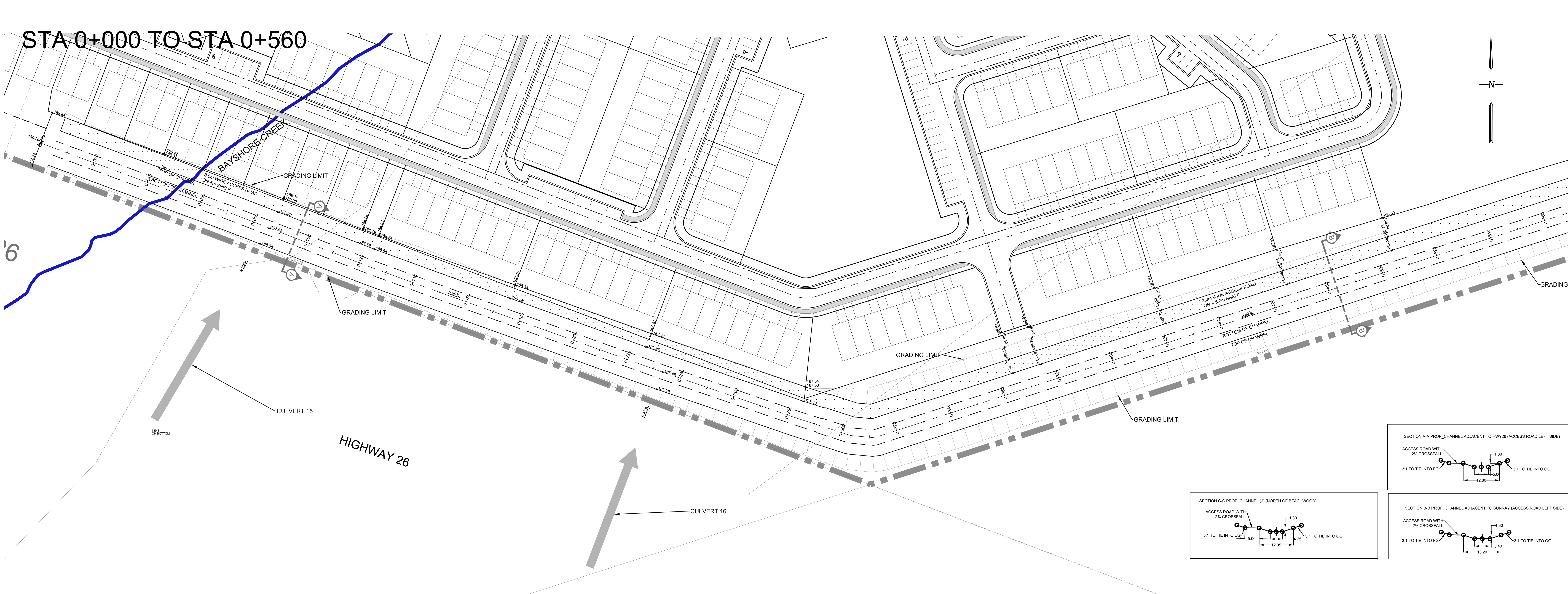
Photograph 6: Unnamed watercourse crossing at Highway 26 – looking upstream at culvert outlet

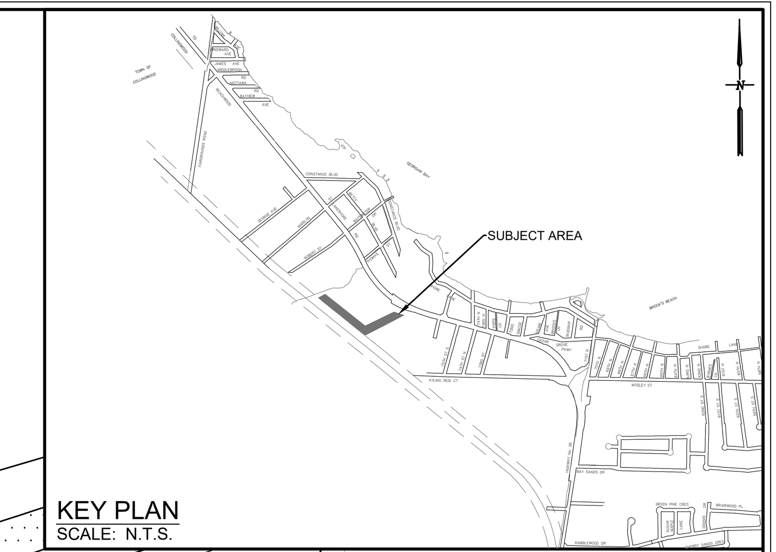
Photograph 7: SWMP on south side of Highway 26, west of unnamed watercourse

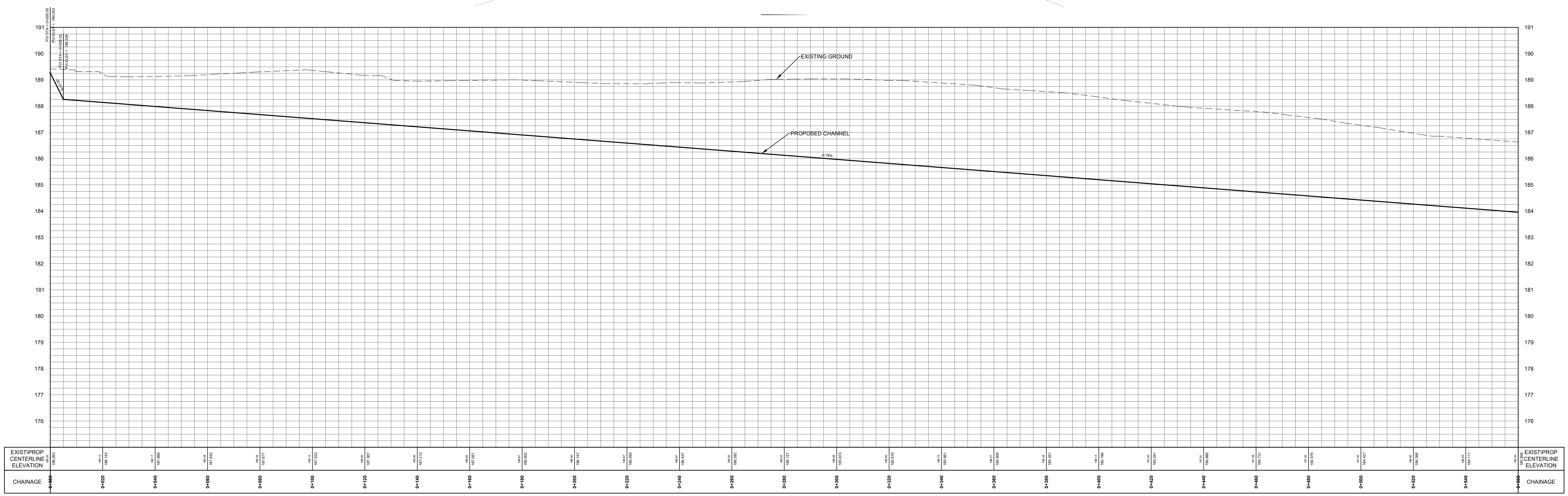
Photograph 8: Upstream limits of unnamed watercourse within Highway 26 ROW.

APPENDIX D

Option 5 & 6 Proposed Site Plan







Notes
1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
0	ISSUED FOR COORDINATION	22/07/22	MZ
1	FOR INTERNAL PURPOSES	23/04/14	JO
2	ISSUED FOR DRAFT REVIEW	23/08/14	JO

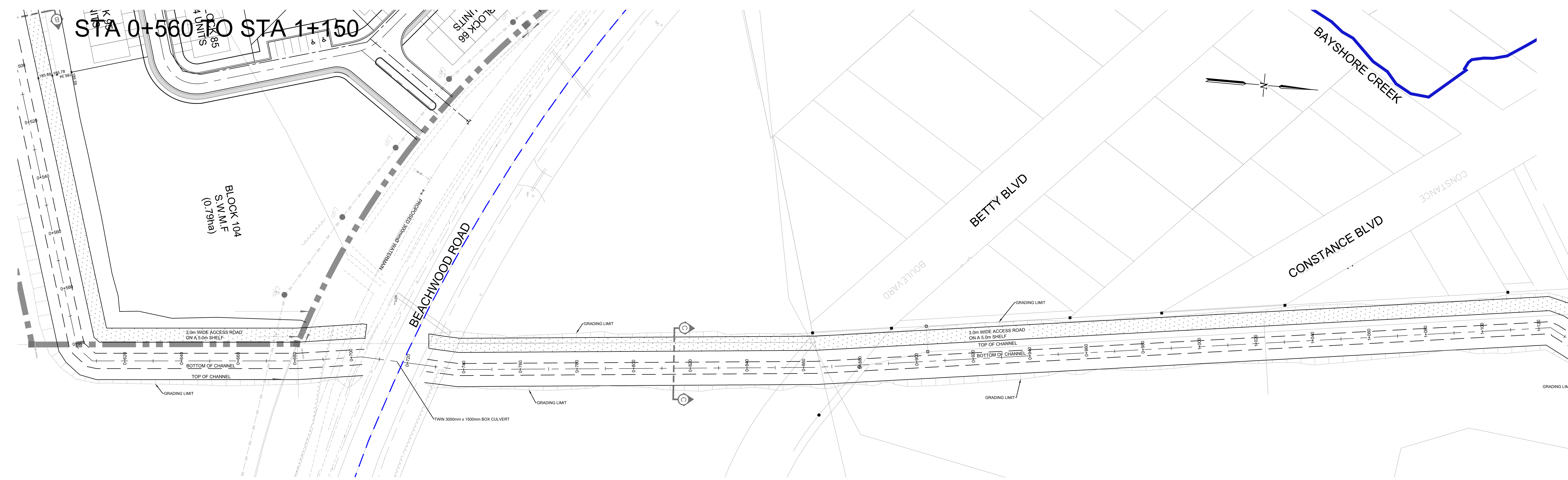
BURNSIDE

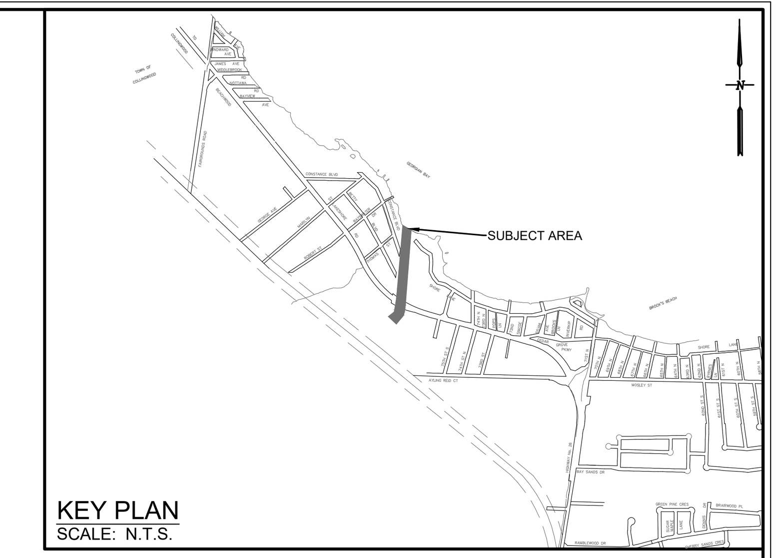
R.J. Burnside & Associates Limited
3 Ronell Crescent,
Collingwood, Ontario, L9Y 4J6
telephone (705) 446-0515
fax (705) 446-2399
web www.rjburnside.com

Client
SUNRAY GROUP
701-515 CONSUMERS ROAD
NORTH YORK, ON
M2J 4Z2

Drawing Title
BEACHWOOD DRAINAGE & FLOODING IMPROVEMENTS
PRELIMINARY FLOOD CHANNEL CONFIGURATION

Drawn	Checked	Designed	Checked	Date	Drawing No.
MH	MZ	MZ	TK/RW	22/07/20	C1
Project No. 300052877.1000		Contract No. -		Revision No. 0	
Scale 1:750					





Notes

1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
0	ISSUED FOR COORDINATION	22/07/22	MZ
1	FOR INTERNAL PURPOSES	23/04/14	JO
2	ISSUED FOR DRAFT REVIEW	23/08/14	JO

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

Client
SUNRAY GROUP
701-515 CONSUMERS ROAD
NORTH YORK, ON
M2J 4Z2

Drawing Title
BEACHWOOD DRAINAGE & FLOODING IMPROVEMENTS

PRELIMINARY FLOOD CHANNEL CONFIGURATION

Drawn	Checked	Designed	Checked	Date	Drawing No.
MH	MZ	MZ	TK/RW	22/07/20	C2
Project No. 300052877.1000		Contract No. -		Revision No. 0	
Scale 1:750					

Appendix E
Addendum to Cultural Heritage Assessment Report

November 27, 2023

Richard Sloan
Water Resources Group Lead
Ainley Group
Tel: (705) 726-3371 ext. 256
Email: richard.sloan@ainleygroup.com

RE: Addendum to Cultural Heritage Assessment Report - Constance Boulevard Drainage Improvements Additional Lands 2023-0179

1.0 BACKGROUND

Ainley Group retained Archaeological Research Associates Ltd. (ARA) to conduct a Cultural Heritage Assessment Report (CHAR) Addendum in support of the proposed drainage improvements along Constance Boulevard. A Schedule 'C' Municipal Class Environmental Assessment (EA) was previously completed for this project, but it was determined that the revised design of the drainage channel between Beechwood Road and Georgian Bay was not fully included in the initial scope. A CHAR was completed for this project in 2022; however, additional lands needing assessment were identified as a result of the revised design. ARA has assumed that the additional project lands will be approximately 1.32 ha (3.26 ac) in size. The project lands are located on part of Lots 34 and 35, Concession 3 and 4 in the Geographic Township of Nottawasaga, Simcoe County (see Map 1).

In 2022, ARA completed a CHAR for the Constance Boulevard Drainage Improvements project. As a result of consultation, existing recognition, research, and a field survey, the 2022 CHAR identified one potential Cultural Heritage Landscape (CHL), CHL1 – Georgian Bay Lakeshore, which was then evaluated against Ontario Regulation 9/06. ARA mapped and assessed these additional lands via desktop survey to determine whether these lands contain or are adjacent to any cultural heritage resources. This addendum should be read with the 2022 CHAR.

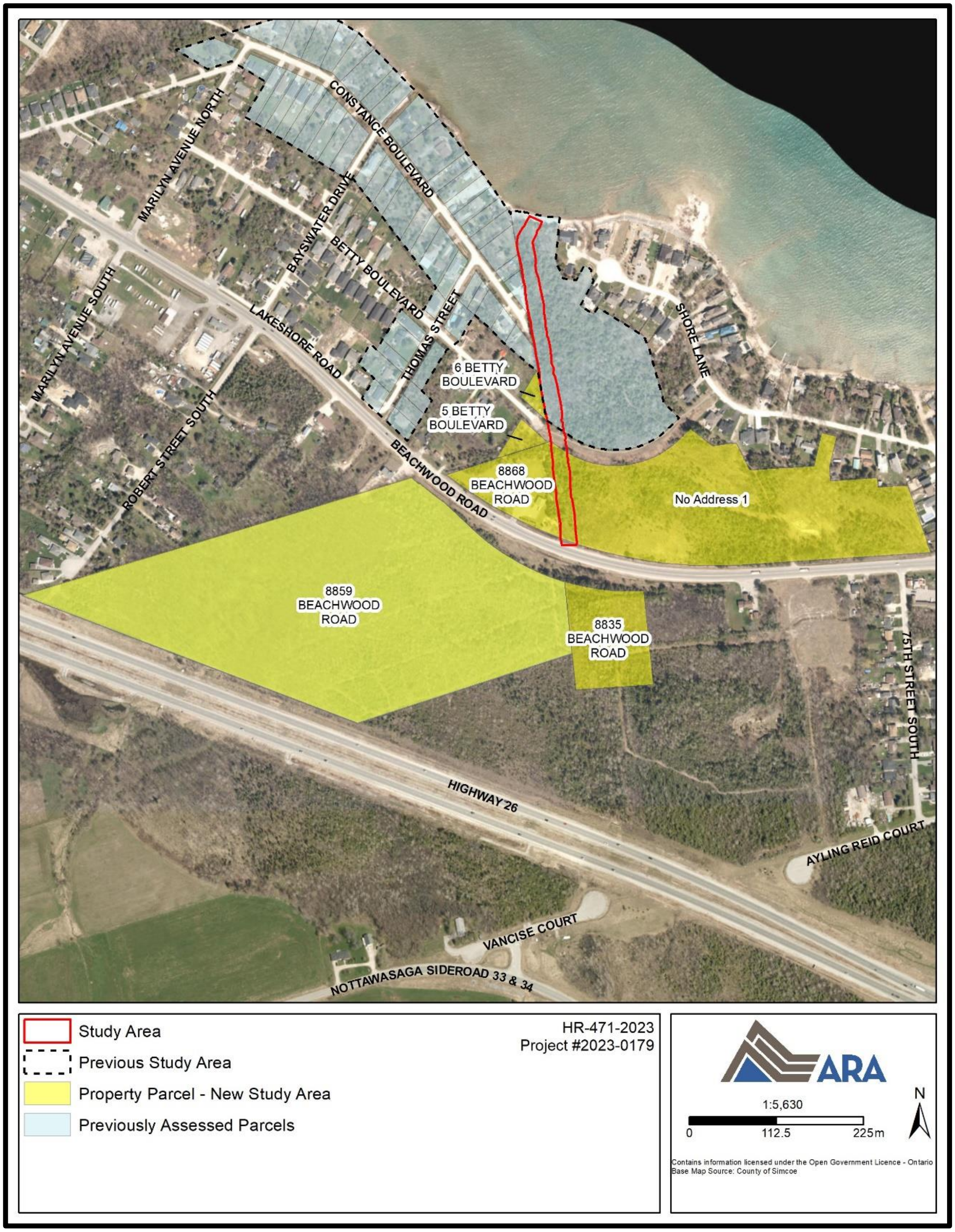
2.0 MAP ANALYSIS

A desktop survey was completed. Map 1 indicates the previously assessed area, the added study area as well as the added adjacent property parcels that were assessed for potential heritage resource(s).

After examination of the expanded study area, no further cultural heritage resources were found.

3.0 RECOMMENDATIONS AND CONCLUSIONS

No further heritage resources were identified as a result of the additional study area. All recommendations in the 2022 *Cultural Heritage Assessment Report*, *Constance Boulevard Drainage Improvements, Town of Wasaga Beach* are confirmed.



Map 1: Assessment Map – Previous and New Heritage Assessed Areas (ARA 2023)

4.0 SOURCES CONSULTED

ARA Ltd.
2022 *Constance Boulevard Drainage Improvements, Town of Wasaga Beach.*

Ministry of Citizenship and Multiculturalism (MCM)
2010 *Standards and Guidelines for the Conservation of Provincial Heritage Properties.*

Parks Canada
2010 *Standards and Guidelines for the Conservation of Historic Places in Canada, Second Edition.* Accessed online at: https://www.historicplaces.ca/media/18072/81468-parks-s+g-eng-web2.pdf.

Appendix F
Stage 1 Archaeological Assessment Constance Boulevard

ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

DRAFT
Stage 1 Archaeological Assessment
Constance Boulevard Drainage Improvements
Municipal Class Environmental Assessment Addendum
Town of Wasaga Beach
Part of Lots 34–35, Concessions 3–4
Geographic Township of Nottawasaga
Simcoe County, Ontario

Prepared for
Ainley Group
550 Welham Road
Barrie, ON L4N 8Z7
Tel: (705) 726-3371

Licensed under
P.J. Racher
MCM Licence #P007
PIF #P007-1537-2023
ARA File #2023-0170

07/12/2023

Original Report

EXECUTIVE SUMMARY

Under a contract awarded in July 2023, Archaeological Research Associates Ltd. carried out a Stage 1 assessment of lands with the potential to be impacted by the Constance Boulevard Drainage Improvements project in the Town of Wasaga Beach, Simcoe County, Ontario. A Schedule ‘C’ Municipal Class Environmental Assessment (EA) was previously completed, but it was determined that the revised design of the drainage channel between Beechwood Road and Georgian Bay was not fully included in the initial scope. The assessment was carried out in support of a Municipal Class EA Addendum in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The Stage 1 assessment was conducted in October 2023 under Project Information Form #P007-1537-2023. The investigation encompassed the entire study area. A property inspection did not occur; accordingly, no permissions were required for property access. At the time of assessment, the study area consisted of part of Georgian Bay’s shoreline, part of a trail and wooded lands.

The Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential and previously assessed lands of no further concern. It is recommended that all areas of archaeological potential that could be impacted by the project subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 *Standards and Guidelines for Consultant Archaeologists*. The previously assessed lands of no further concern do not require any additional assessment.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **I**
ABBREVIATIONS **III**
PERSONNEL **III**

1.0 PROJECT CONTEXT **1**
1.1 Development Context 1
1.2 Historical Context 1
1.2.1 Settlement History 2
1.2.1.1 Pre-Contact 2
1.2.1.2 Post-Contact 2
1.2.2 Past and Present Land Use 3
1.2.2.1 Overview 3
1.2.2.2 Mapping and Imagery Analysis 4
1.3 Archaeological Context 4
1.3.1 Condition of the Property 5
1.3.2 Registered or Known Archaeological Sites 5
1.3.3 Previous Archaeological Work 6
1.3.3.1 2320 Shore Lane (Stage 1–2) 6
1.3.3.2 Beachwood Development (Stage 1–2) 6
1.3.3.3 Constance Boulevard Drainage Improvements (Stage 1) 6
2.0 STAGE 1 BACKGROUND STUDY **7**
2.1 Background 7
2.2 Field Methods (Property Inspection) 7
2.3 Analysis and Conclusions 7
3.0 RECOMMENDATIONS **9**
4.0 ADVICE ON COMPLIANCE WITH LEGISLATION **10**
5.0 MAPS **11**
6.0 BIBLIOGRAPHY AND SOURCES **22**

MAPS

Map 1: Location of the Study Area 11
Map 2: *Hogg's Map of the County of Simcoe* (1871) 12
Map 3: *Simcoe Supplement in Illustrated Atlas of the Dominion of Canada* (1881) 13
Map 4: Topographic Map (1946) 14
Map 5: Aerial Image (1954) 15

Map 6: Aerial Images (1978–2002) 16
Map 7: Simcoe County's *Archaeological Potential* GIS Layer 17
Map 8: Previous Assessments 18
Map 9: Features of Potential 19
Map 10: Potential Modelling and Recommendations (Aerial Image) 20
Map 11: Potential Modelling and Recommendations (Development Plan) 21

TABLES

Table 1: Pre-Contact Settlement History 2
Table 2: Post-Contact Settlement History 3
Table 3: Soil Types 5

ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
EA – Environmental Assessment
MCM – Ministry of Citizenship and Multiculturalism
PIF – Project Information Form
S&Gs – Standards and Guidelines for Consultant Archaeologists

PERSONNEL

Project Director: P.J. Racher (#P007)
Operations Manager: C.E. Gohm (#R187)
Project Archaeologist: A. Dunlop (#P1146)
Field Director (Potential Modelling): A. Dunlop
Cartographers: A. Bailey (#R1069), K. Crotty
Report Writer: S. Goldberg
Editor: C.J. Gohm

1.0 PROJECT CONTEXT

1.1 Development Context

Under a contract awarded in July 2023, Archaeological Research Associates Ltd. (ARA) carried out a Stage 1 assessment of lands with the potential to be impacted by the Constance Boulevard Drainage Improvements project in the Town of Wasaga Beach, Simcoe County, Ontario. A Schedule 'C' Municipal Class Environmental Assessment (EA) was previously completed, but it was determined that the revised design of the drainage channel between Beechwood Road and Georgian Bay was not fully included in the initial scope. The assessment was carried out in support of a Municipal Class EA Addendum in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The study area consists of an irregularly shaped parcel of land with an area of 0.84 ha (Map 1). This parcel is generally bounded by Georgian Bay to the north, wooded lands to the east, Beachwood Road to the south and a mixture of residential properties and wooded lands to the west. In legal terms, the study area falls on part of Lots 34–35, Concessions 3–4 in the Geographic Township of Nottawasaga, Simcoe County. The Crown obtained these lands from the Chippewas as part of the Nottawasaga Purchase (Treaty 18) in 1818.

The Stage 1 assessment was conducted in October 2023 under Project Information Form (PIF) #P007-1537-2023. The investigation encompassed the entire study area. A property inspection did not occur; accordingly, no permissions were required for property access. As set out in Section 1.0 of the 2011 *Standards and Guidelines for Consultant Archaeologists* (*S&G*s), the investigation was carried out to achieve the following objectives:

- Provide information about geography, history and current land conditions;
- Determine whether any previous archaeological fieldwork has been completed;
- Evaluate in detail the study area's archaeological potential; and
- Recommend appropriate strategies for a Stage 2 assessment, if necessary.

The Ministry of Citizenship and Multiculturalism (MCM) is asked to review the results and recommendations presented herein and enter the report into the Ontario Public Register of Archaeological Reports. Although no Indigenous engagement occurred over the course of the project, ARA remains available to any interested peoples and communities should they have questions, comments or concerns about the archaeological investigation.

1.2 Historical Context

After a century of archaeological work in southern Ontario, scholarly understanding of the historical usage of the area has become very well-developed. With occupation beginning in the Palaeo period approximately 11,000 years ago, the greater vicinity of the study area comprises a complex chronology of Indigenous and Euro-Canadian histories. Section 1.2.1 summarizes the region's settlement history, whereas Section 1.2.2 documents past and present land uses. Three previous archaeological reports containing relevant background information were obtained during the research component of the study. These reports are summarized in Section 1.3.3, and the references (including title, author and PIF number) appear in Section 6.0.

1.2.1 Settlement History

1.2.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic and Woodland. Each of these periods comprise a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972; Ellis and Ferris 1990; Warrick 2000; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Gainey, Barnes and Crowfield traditions; Small bands; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Fluted points
Late Palaeo	8400–7500 BC	Holcombe, Hi-Lo and Lanceolate biface traditions; Continuing mobility; Campsite/Way-Station sites; Smaller territories are utilized; Non-fluted points
Early Archaic	7500–6000 BC	Side-notched, Corner-notched (Nettling, Thebes) and Bifurcate traditions; Growing diversity of stone tool types; Heavy woodworking tools appear (e.g., ground stone axes and chisels)
Middle Archaic	6000–2500 BC	Stemmed (Kirk, Stanly/Neville), Brewerton Side- and Corner-Notched traditions; Reliance on local resources; Populations increasing; More ritual activities; Fully ground and polished tools; Net-sinkers common; Earliest copper tools
Late Archaic	2500–900 BC	Narrow Point (Lamoka), Broad Point (Genesee) and Small Point (Crawford Knoll) traditions; Less mobility; Use of fish-weirs; True cemeteries appear; Stone pipes emerge; Long-distance trade (marine shells and galena)
Early Woodland	900–400 BC	Meadowood tradition; Crude cord-roughened ceramics emerge; Meadowood cache blades and side-notched points; Bands of up to 35 people
Middle Woodland	400 BC–AD 600	Point Peninsula tradition; Vinette 2 ceramics appear; Small camp sites and seasonal village sites; Influences from northern Ontario and Hopewell area to the south; Hopewellian influence can be seen in continued use of burial mounds
Middle/Late Woodland Transition	AD 600–900	Gradual transition between Point Peninsula and later traditions; Princess Point tradition emerges elsewhere (i.e., in the vicinity of the Grand and Credit Rivers)
Late Woodland	AD 900–1600	Area occupied by Algonquian-speaking Anishinaabeg and Iroquoian-speaking peoples such as the Huron-Petun; Early focus on the latter linguistic group identified Glen Meyer, Uren, Middleport and later traditions and tended to emphasize a linear 'Iroquoian' developmental sequence; There was likely a close interaction sphere between the two groups, which may have resulted in shared material culture and even some cohabitation; Algonquian sites or shared sites possibly linked with more diverse raw materials and a greater reliance on quartz; Huron-Petun associated with large villages, hunting and fishing camps, cabin sites and hamlets; Fur trade begins ca. 1580; European trade goods appear

1.2.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of

Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Smith 1846; Coyne 1895; Hunter 1909a, 1909b; Lajeunesse 1960; Cumming 1975; Ellis and Ferris 1990; Surtees 1994; AO 2023)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Brûlé explores southern Ontario in 1610/11; Champlain travels through in 1613 and 1615/1616, making contact with a number of Indigenous groups (including the Algonquin, Huron-Wendat and other First Nations); European trade goods become increasingly common and begin to put pressure on traditional industries
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; ‘The Great Peace of Montreal’ treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Early to mid-18th century	Growth and spread of the fur trade; Peace between the French and English with the Treaty of Utrecht in 1713; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years’ War in 1754; French surrender in 1760
British Control	Mid- to late 18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in 1764; The Niagara Purchase (Treaty 381) in 1781 included this area
Loyalist Influx	Late 18th century	United Empire Loyalist influx after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; J. Collins acquires the northern part of the Toronto Carrying Place in 1785 (subject to a confirmatory surrender as part of the Williams Treaties in 1923); *Constitutional Act* of 1791 creates Upper and Lower Canada
County Development	Late 18th to early 19th century	Nominally became part of Kent County in 1792 and Simcoe County in 1798; Additional land cessions included the Penetanguishene Purchase (Treaty 5) in 1798, Lake Simcoe Purchase (Treaty 16) in 1815 and Nottawasaga Purchase (Treaty 18) in 1818; All townships surveyed by the mid-1830s; Townships ceded to Waterloo County in 1837 and York County in 1838; Simcoe County independent after the abolition of the district system in 1849
Township Formation	Early 19th century	Surveyed by T. Kelly in 1832 and C. Rankin in 1833; First settlers arrived in 1834; Settlement initially facilitated by Crown Lands Agent H.C. Young, and four communities were founded (two Scottish, one Irish and one German); Scottish settlement at Bowmore (Duntroon) began with free grants, and 21 families settled there in 1834
Township Development	Mid-19th to early 20th century	Population reached 420 by 1842 (mostly Scottish); 7,628 ha taken up by 1846, with 623 ha under cultivation; 3 grist mills and 3 saw mills in operation at that time; Traversed by the Ontario, Simcoe & Huron Railway/Northern Railway (1855) and a branch of the Hamilton & North Western Railway (1879); Principal settlement was Collingwood; Other communities at Avening, Batteaux, Creemore, Dunedin, Duntroon, Glen Huron, Nottawa, Singhampton and Stayner

1.2.2 Past and Present Land Use

1.2.2.1 Overview

During Pre-Contact and Early Contact times, the vicinity of the study area would have comprised a mixture of coniferous trees, deciduous trees and open areas. Indigenous communities actively utilized the land and its resources well into Post-Contact times, and they would have managed the landscape to varying degrees (e.g., establishing clearings for campsites, plant cultivation, etc.). During the early 19th century, Euro-Canadian settlers arrived in the area and began to clear the forests for agricultural and settlement purposes. The study area was located southeast of the historical limits of Collingwood. The land was not being utilized at the time of assessment.

1.2.2.2 Mapping and Imagery Analysis

In order to gain a general understanding of the study area's past land uses, two historical settlement maps, one topographic map and five aerial images were examined during the research component of the study. Specifically, the following resources were consulted:

- *Hogg's Map of the County of Simcoe* (1871) (OHCMP 2019);
- *Simcoe Supplement in Illustrated Atlas of the Dominion of Canada* (1881) (MU 2001);
- A topographic map from 1946 (OCUL 2023); and
- Aerial images from 1954–2002 (Simcoe County 2023; U of T 2023).

The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 2–Map 6.

Hogg's Map of the County of Simcoe (1871) only identifies one resident in the vicinity of the study area, namely H. Gillson on Lot 34, Concession 4, and no farmhouses are illustrated (Map 2). Given that this map does not depict any residential structures, the absence of buildings should not be taken as evidence that the area was unimproved. The *Simcoe Supplement in Illustrated Atlas of the Dominion of Canada* (1881) similarly does not provide any insights regarding occupants or land uses (Map 3). Since this publication only included information for its subscribers, these omissions are not particularly significant. The nearby road allowances were only partially opened.

The topographic map from 1946 indicates that the study area consisted primarily of forested lands between Beachwood Road and the lakeshore (Map 4). Sand or gravel pits appear to the southwest and east of the study area. The aerial image from 1954 demonstrates that the local roadways were well-established, but the poor resolution precludes any other meaningful interpretations (Map 5). The study area comprised part of a woodlot from 1978–2002, save for the waterfront (Map 6).

1.3 Archaeological Context

The Stage 1 assessment (desktop evaluation) was conducted in October 2023 under PIF #P007-1537-2023. The limits of the study area were confirmed using aerial imagery showing physical features in relation to the subject lands.

The archaeological context of any given study area must be informed by 1) the condition of the property as found (Section 1.3.1), 2) a summary of registered or known archaeological sites located within a minimum 1 km radius (Section 1.3.2) and 3) descriptions of previous archaeological fieldwork carried out within the limits of, or immediately adjacent to the property (Section 1.3.3).

1.3.1 Condition of the Property

The study area lies within the Great Lakes–St. Lawrence forest region, which is a transitional zone between the southern deciduous forest and the northern boreal forest. This region extends along the St. Lawrence River across central Ontario to Lake Huron and west of Lake Superior along the border with Minnesota, and its southern portion extends into the more populated areas of Ontario. It is dominated by hardwood forests, although coniferous trees such as white pine, red pine, hemlock and white cedar commonly mix with deciduous broad-leaved species like yellow birch, sugar and red maples, basswood and red oak (MNRF 2023).

In terms of local physiography, the subject lands fall within the Simcoe Lowlands. This region consists of the Nottawasaga basin in the west, transverse valleys and the Lake Simcoe basin in the east. Both the lowlands and transverse valleys were flooded by Lake Algonquin and are bordered by shorecliffs, beaches and bouldery terraces. The study area is located within the Nottawasaga basin, which is limited to the broad flats bordering the Nottawasaga River. For the most part, this basin comprised the floor of Lake Algonquin and its surface beds therefore comprise deposits of deltaic and lacustrine origin rather than glacial outwash (Chapman and Putnam 1984:177–180). The bluffs of Lake Algonquin and the Nipissing Great Lakes occur roughly 3,600 m and 600 m to the southwest, respectively. The study area would have been submerged by these waterbodies.

According to the Ontario Soil Survey, the study area consists of Eastport sand in the north and Sargent gravelly sandy loam in the south. The characteristics of these soil types are summarized in Table 3 (Hoffman et al. 1962).

Table 3: Soil Types

Soil Type	Great Soil Group	Soil Materials	Drainage	Topography	Surface Stoniness
Eastport sand	Dry Sands	Grey calcareous outwash sand	Excessive	Irregular, moderately sloping	Stonefree
Sargent gravelly sandy loam	Brown Forest	Pale brown calcareous outwash gravel	Good	Smooth, gently sloping	Stonefree to moderately stony

The subject lands fall within the Blue Mountains drainage basin, which is under the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA 2023). Specifically, the study area is adjacent to Georgian Bay and is located 57 m east of a modified tributary of Georgian Bay and 127 m northwest of an unnamed wetland. At the time of assessment, the study area consisted of part of Georgian Bay’s shoreline, part of a trail and wooded lands. Soil conditions were not documented, as a property inspection did not occur.

1.3.2 Registered or Known Archaeological Sites

The Ontario Archaeological Sites Database and the Ontario Public Register of Archaeological Reports were consulted to determine whether any registered or known archaeological resources occur within a 1 km radius of the study area. The available search facility did not return any registered sites located within at least a 1 km radius (the facility returns sites in a rectangular area, rather than a radius, potentially resulting in results beyond the specified distance). No unregistered sites were identified within a 1 km radius of the study area.

1.3.3 Previous Archaeological Work

A review of available archaeological management plans and/or other archaeological potential mapping was undertaken to inform the assessment process. Specifically, Simcoe County's *Archaeological Potential* GIS layer was examined for information that could influence the choice of fieldwork techniques or recommendations. The associated mapping indicates that the southern part of study area has archaeological potential (Map 7).

Reports documenting assessments conducted within the subject lands and assessments that resulted in the discovery of sites within adjacent lands were sought during the research component of the study. In order to ensure that all relevant past work was identified, an investigation was launched to identify reports involving assessments within 50 m of the study area. The investigation determined that there are three available reports documenting previous archaeological fieldwork within the specified distance. The relevant results and recommendations are summarized below as required by Section 7.5.8 Standards 4–5 of the 2011 *S&Gs* (Map 8).

1.3.3.1 2320 Shore Lane (Stage 1–2)

In August 2016, Stage 1 and 2 assessments were carried out for a subdivision development at 2320 Shore Lane under PIF #P1024-0157-2016 (AMICK 2017). The assessed area overlaps the northern part of the study area. The investigation did not result in the discovery of any archaeological materials, and no further assessment was recommended (AMICK 2017:27–29). The overlapping area is therefore of no further archaeological concern.

1.3.3.2 Beachwood Development (Stage 1–2)

In April and May 2020, Stage 1 and 2 assessments were carried out for a condominium development under PIF #P058-1824-2020 (AMICK 2020). The assessed area traverses the southern part of the study area. The investigation did not result in the discovery of any archaeological materials, and the lands required no further assessment (AMICK 2020:31–32). The overlapping area is therefore of no further archaeological concern.

1.3.3.3 Constance Boulevard Drainage Improvements (Stage 1)

In December 2021, a Stage 1 assessment was carried out for the subject project under PIF #P007-1272-2021 (ARA 2022). The assessed area overlaps the northern part of the study area. The investigation identified a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. It was recommended that all areas of archaeological potential that could be impacted by the project be subject to a Stage 2 assessment (ARA 2022:11). The overlapping area comprised previously assessed lands, save for the shoreline area where test pit survey was recommended (ARA 2022:Map 9). The associated report was entered into the Ontario Public Register of Archaeological Reports on September 7, 2022. Only the previously assessed lands are of no further archaeological concern.

2.0 STAGE 1 BACKGROUND STUDY

2.1 Background

The Stage 1 assessment involved background research to document the geography, history, previous archaeological fieldwork and current land condition of the study area. This desktop examination included research from archival sources, archaeological publications and online databases. It also included the analysis of a variety of historical maps and aerial imagery. The results of the research conducted for the background study are summarized below.

With occupation beginning approximately 11,000 years ago, the greater vicinity of the study area comprises a complex chronology of Pre-Contact and Post-Contact histories (Section 1.2.1). Artifacts associated with Palaeo, Archaic, Woodland and Early Contact traditions are well-attested in Simcoe County, and Euro-Canadian archaeological sites dating to pre-1900 and post-1900 contexts are likewise common. The absence of documented sites in the surrounding area is likely related to lack of local archaeological exploration and should not be taken as an indicator that the area was unattractive or undesirable for occupation (Section 1.3.2). Background research identified three areas of previous assessment within the study area (Section 1.3.3).

The natural environment of the study area would have been attractive to both Indigenous and Euro-Canadian populations as a result of proximity to Georgian Bay. The study area was submerged by Main Lake Algonquin and the Nipissing Great Lakes, however, which would have resulted in the destruction of many Indigenous sites dating prior to the Late Archaic period. The areas of well-drained soils would have been ideal for agriculture, and the diverse local vegetation would also have encouraged settlement throughout Ontario’s lengthy history.

In summary, the background study included an up-to-date listing of sites from the Ontario Archaeological Sites Database (within at least a 1 km radius), the consideration of previous local archaeological fieldwork (within at least a 50 m radius), the analysis of historical maps (at the most detailed scale available) and the study of aerial imagery. A review of an archaeological management plan was also carried out. ARA therefore confirms that the standards for background research set out in Section 1.1 of the 2011 *S&Gs* were met.

2.2 Field Methods (Property Inspection)

The study area was not subject to a property inspection, as the corpus of available imagery, topographic mapping and digital environmental data provided abundant information concerning current land conditions. This information was of a scale and detail that allowed for the accurate evaluation of the presence and character of features of potential, and no greater level of detail was needed to make appropriate Stage 2 recommendations. The results of ARA’s archaeological potential modelling are discussed below.

2.3 Analysis and Conclusions

In addition to relevant historical sources and the results of past archaeological assessments, the archaeological potential of a property can be assessed using its soils, hydrology and landforms as considerations. Section 1.3.1 of the 2011 *S&Gs* recognizes the following features or characteristics as indicators of archaeological potential: previously identified sites, water sources (past and present), elevated topography, pockets of well-drained sandy soil, distinctive land formations, resource areas, areas of Euro-Canadian settlement, early transportation routes, listed or designated properties, historic landmarks or sites, and areas that local histories or informants have identified with possible sites, events, activities or occupations.

The Stage 1 assessment resulted in the identification of several features of archaeological potential in the vicinity of the study area (Map 9). The closest and most relevant indicators of archaeological potential (i.e., those that would affect survey interval requirements) include two primary water sources (Georgian Bay and one of its tributaries) and two secondary water sources (unnamed swamps). Background research did not identify any features indicating that the study area has potential for deeply buried archaeological resources.

Although proximity to a feature of archaeological potential is a significant factor in the potential modelling process, current land conditions must also be considered. Section 1.3.2 of the 2011 *S&Gs* emphasizes that 1) quarrying, 2) major landscaping involving grading below topsoil, 3) building footprints and 4) sewage/infrastructure development can result in the removal of archaeological potential, and Section 2.1 states that 1) permanently wet areas, 2) exposed bedrock and 3) steep slopes (> 20°) in areas unlikely to contain pictographs or petroglyphs can also be evaluated as having no or low archaeological potential. Areas previously assessed and not recommended for further work also require no further assessment.

Simcoe County's *Archaeological Potential* GIS layer indicates that the southern part of the study area has archaeological potential (Map 7). However, this modelling was not the result of a property-specific assessment and therefore does not fully account for land-use history and current conditions. Several previously assessed areas of no further concern were identified within the study area, none of which warrant additional assessment. ARA's desktop evaluation, coupled with the analysis of historical sources and digital environmental data, did not result in the identification of any areas of no archaeological potential within the remaining lands. The shoreline of Georgian Bay and the edge of the adjacent woodlot have potential for Indigenous and Euro-Canadian archaeological materials or require test pit survey to confirm disturbance.

In summary, the Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential and previously assessed lands of no further concern. The potential modelling results are presented in Map 10–Map 11. The study area is depicted as a layer in these maps.

3.0 RECOMMENDATIONS

The Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential and previously assessed lands of no further concern. It is recommended that all areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 *S&Gs*. The previously assessed lands of no further concern do not require any additional assessment.

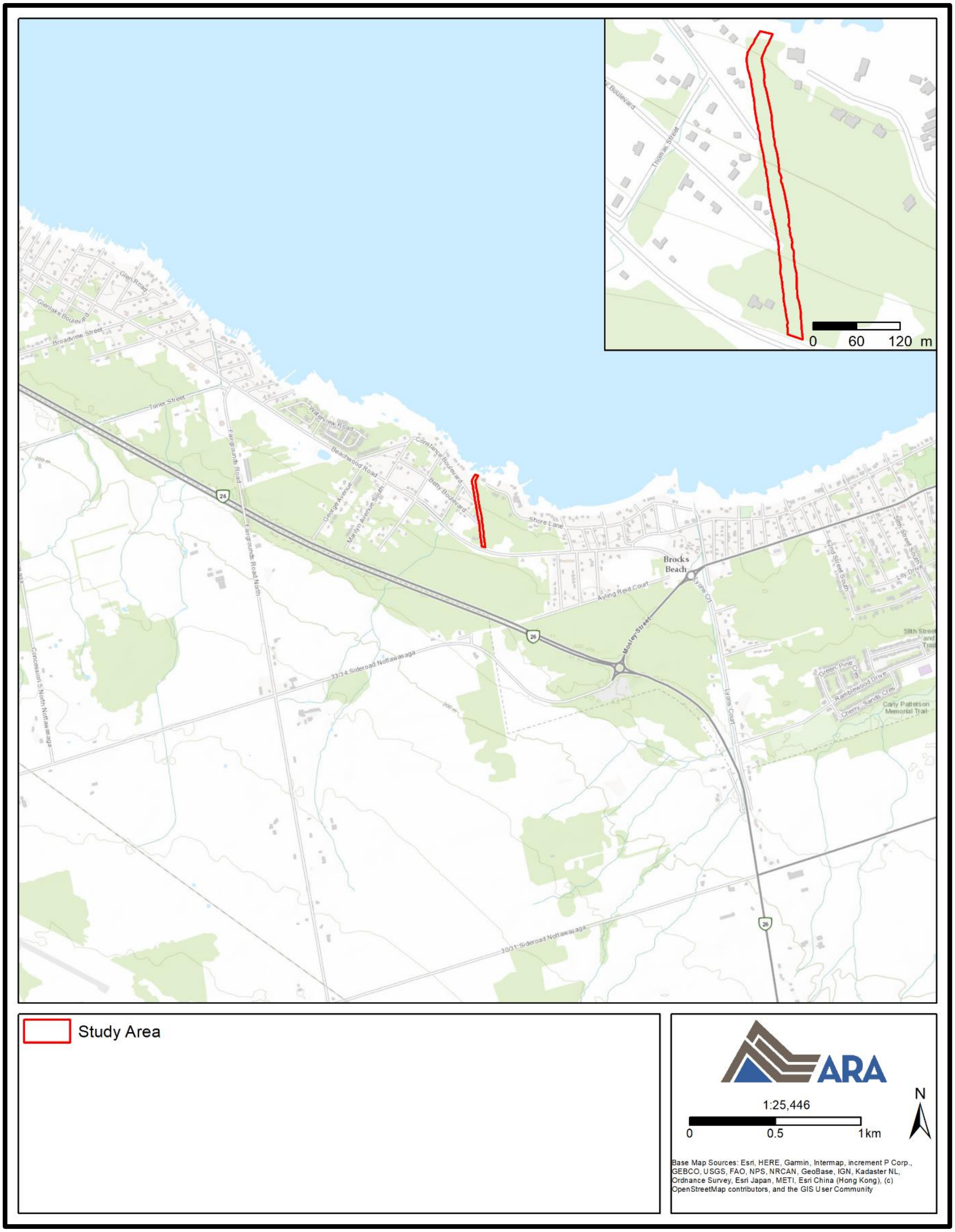
The shoreline of Georgian Bay and the edge of the adjacent woodlot must be assessed using the test pit survey method. A survey interval of 5 m will be required due to the proximity of the lands to the identified features of archaeological potential. Each test pit must be excavated into at least the first 5 cm of subsoil, and the resultant pits must be examined for stratigraphy, potential features and/or evidence of fill. The soil from each test pit must be screened through mesh with an aperture of no greater than 6 mm and examined for archaeological materials. If archaeological materials are encountered, all positive test pits must be documented, and intensification may be required.

4.0 ADVICE ON COMPLIANCE WITH LEGISLATION

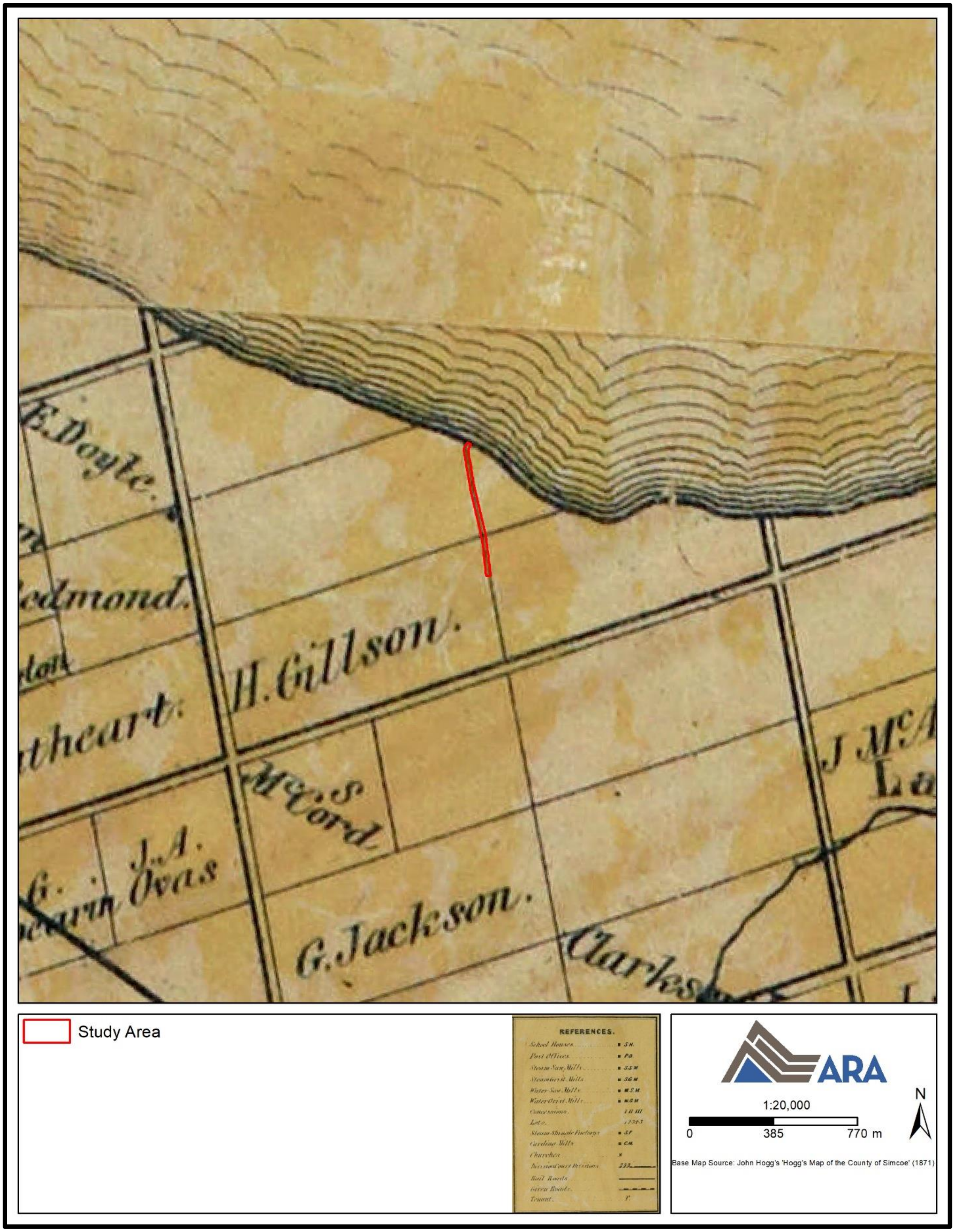
Section 7.5.9 of the 2011 *S&Gs* requires that the following information be provided for the benefit of the proponent and approval authority in the land use planning and development process:

- This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. 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 MCM, 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.
- 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*.
- 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*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar at the Ministry of Public and Business Service Delivery.

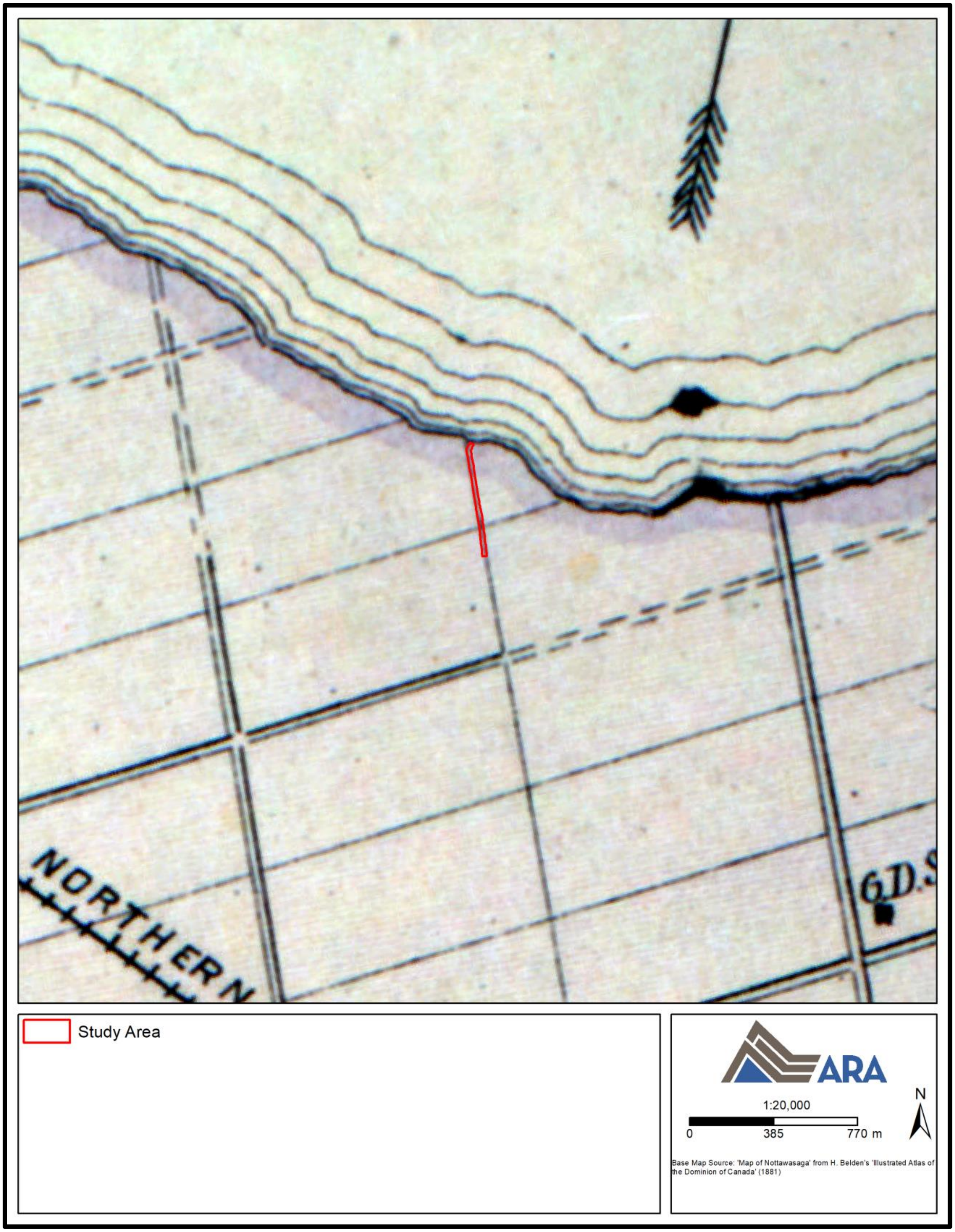
5.0 MAPS



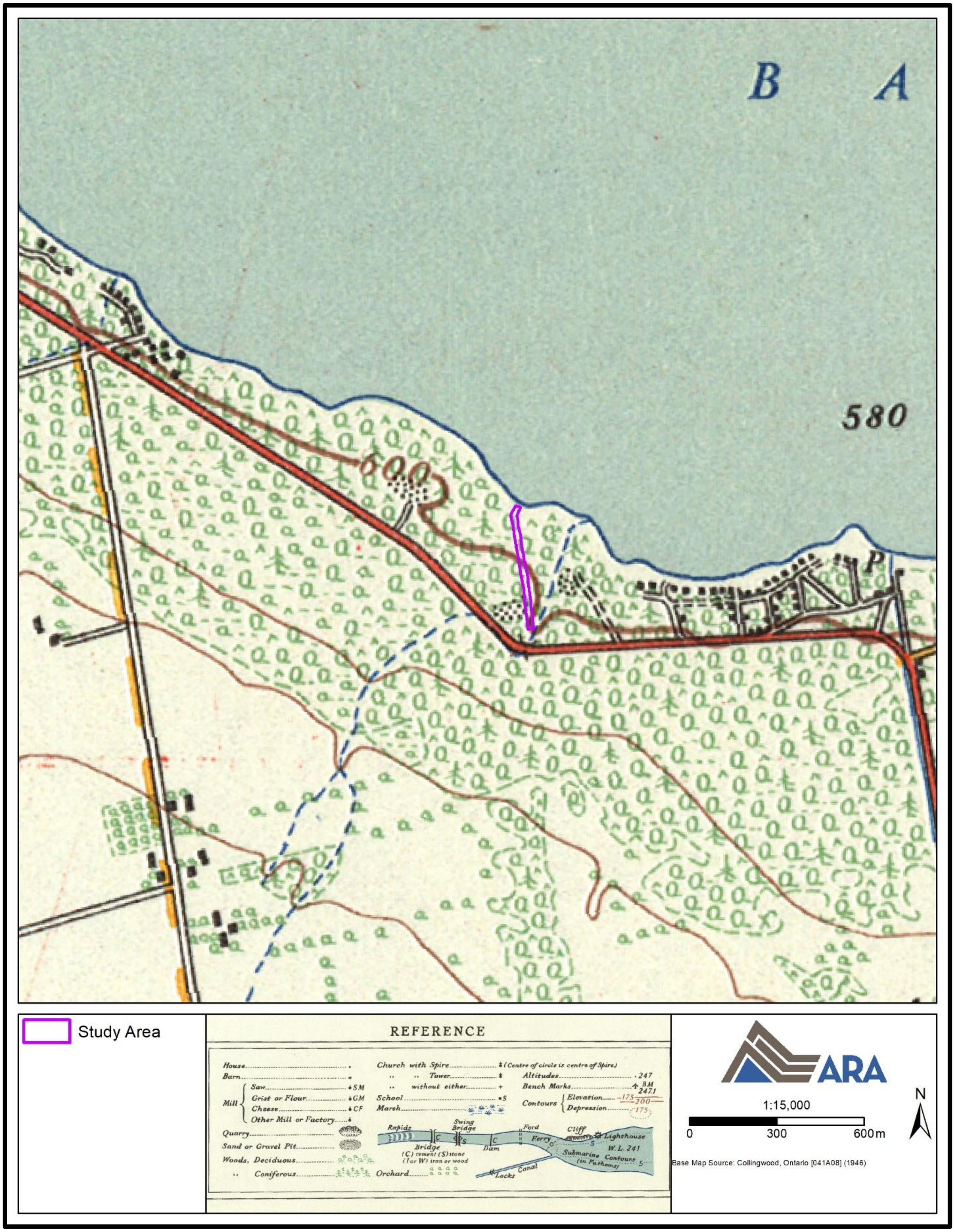
Map 1: Location of the Study Area
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 2: ***Hogg's Map of the County of Simcoe*** **(1871)**
(Produced under licence using ArcGIS® software by Esri, © Esri; OHCMP 2019)



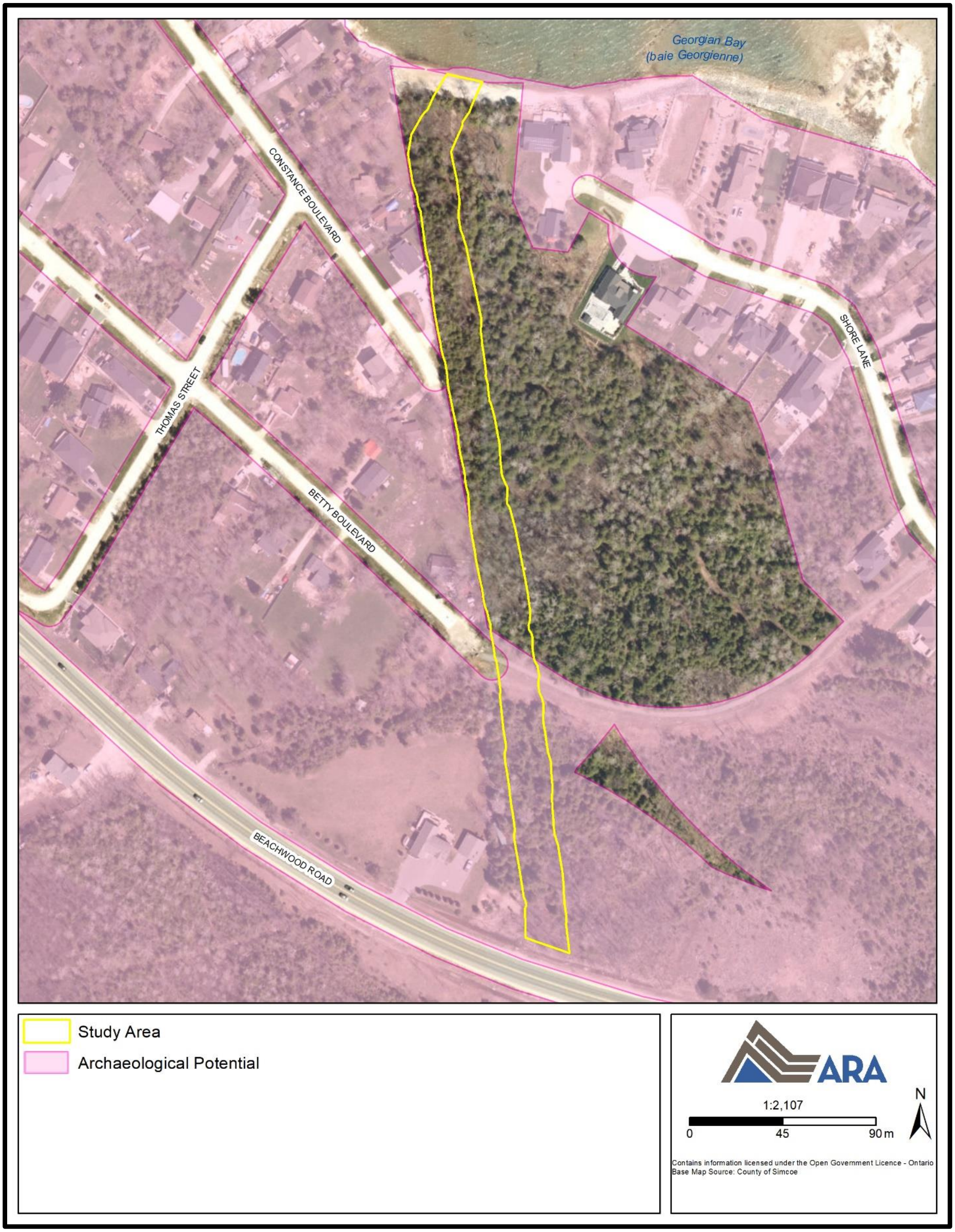
Map 3: *Simcoe Supplement in Illustrated Atlas of the Dominion of Canada* (1881)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2001)



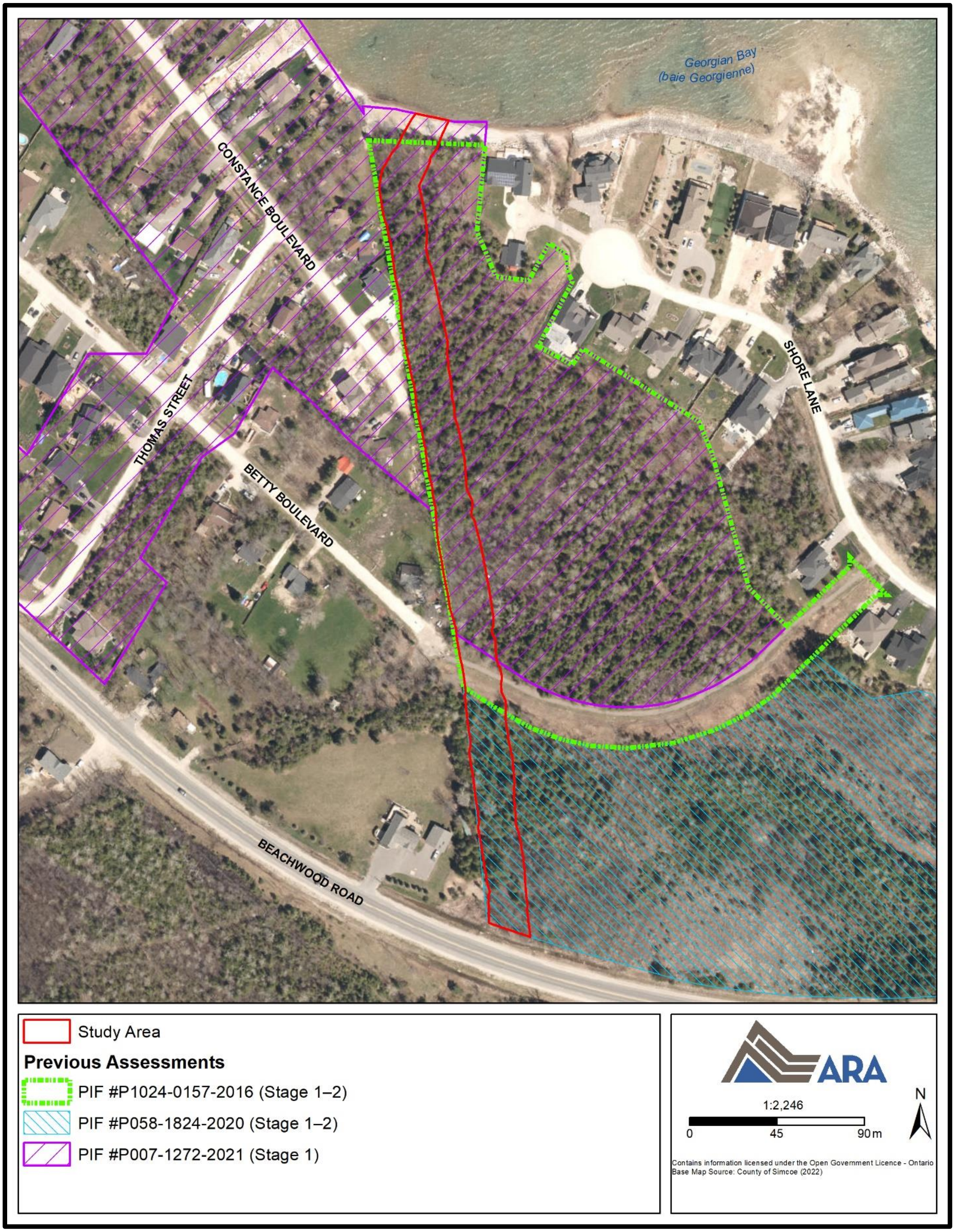
Map 4: Topographic Map (1946)
(Produced under licence using ArcGIS® software by Esri, © Esri; OCUL 2023)

Map 5: Aerial Image (1954)
(Produced under licence using ArcGIS® software by Esri, © Esri; U of T 2023)

Map 6: Aerial Images (1978–2002)
(Produced under licence using ArcGIS® software by Esri, © Esri; Simcoe County 2023)

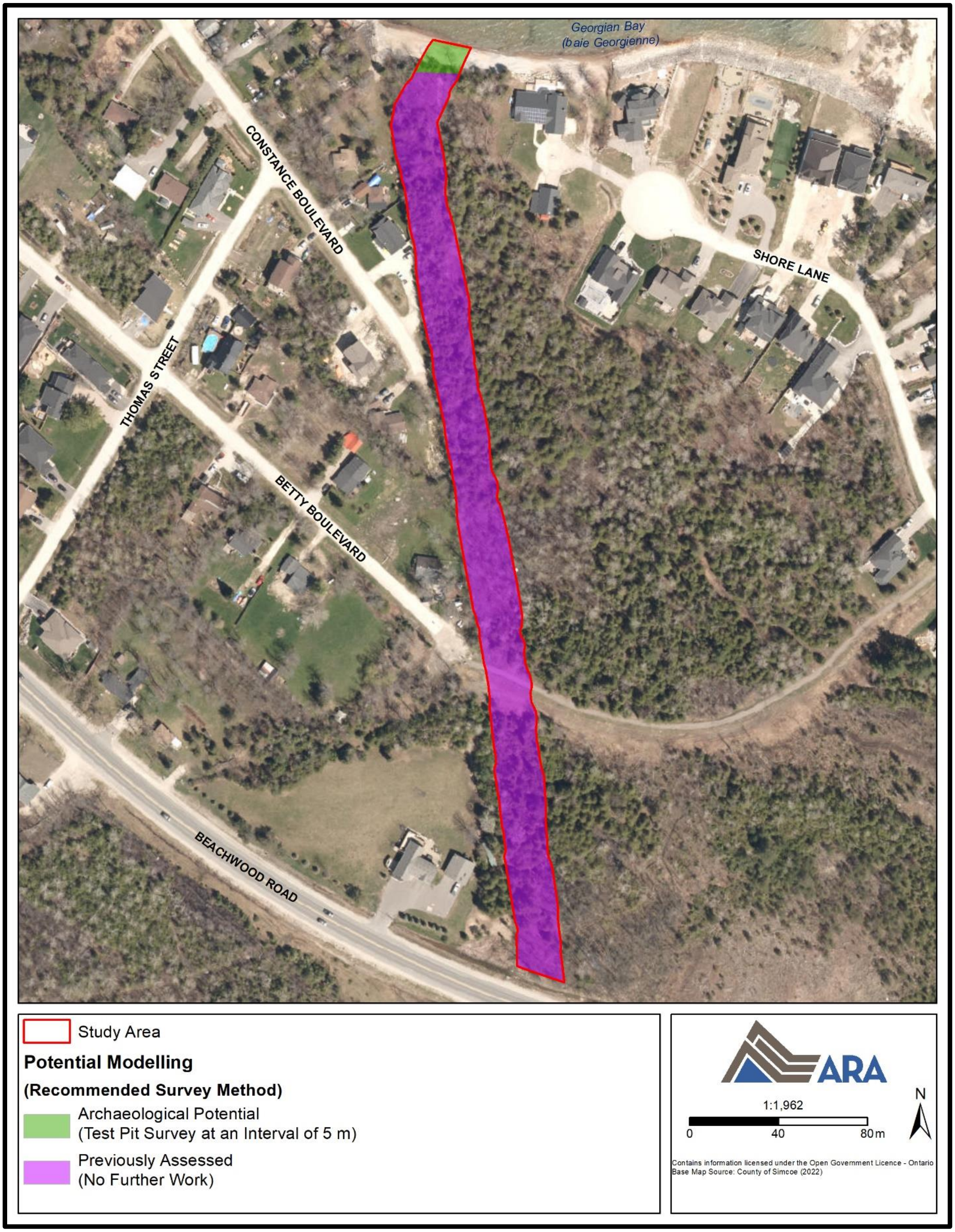


Map 7: Simcoe County's *Archaeological Potential* GIS Layer
(Produced under licence using ArcGIS® software by Esri, © Esri; Simcoe County 2023)

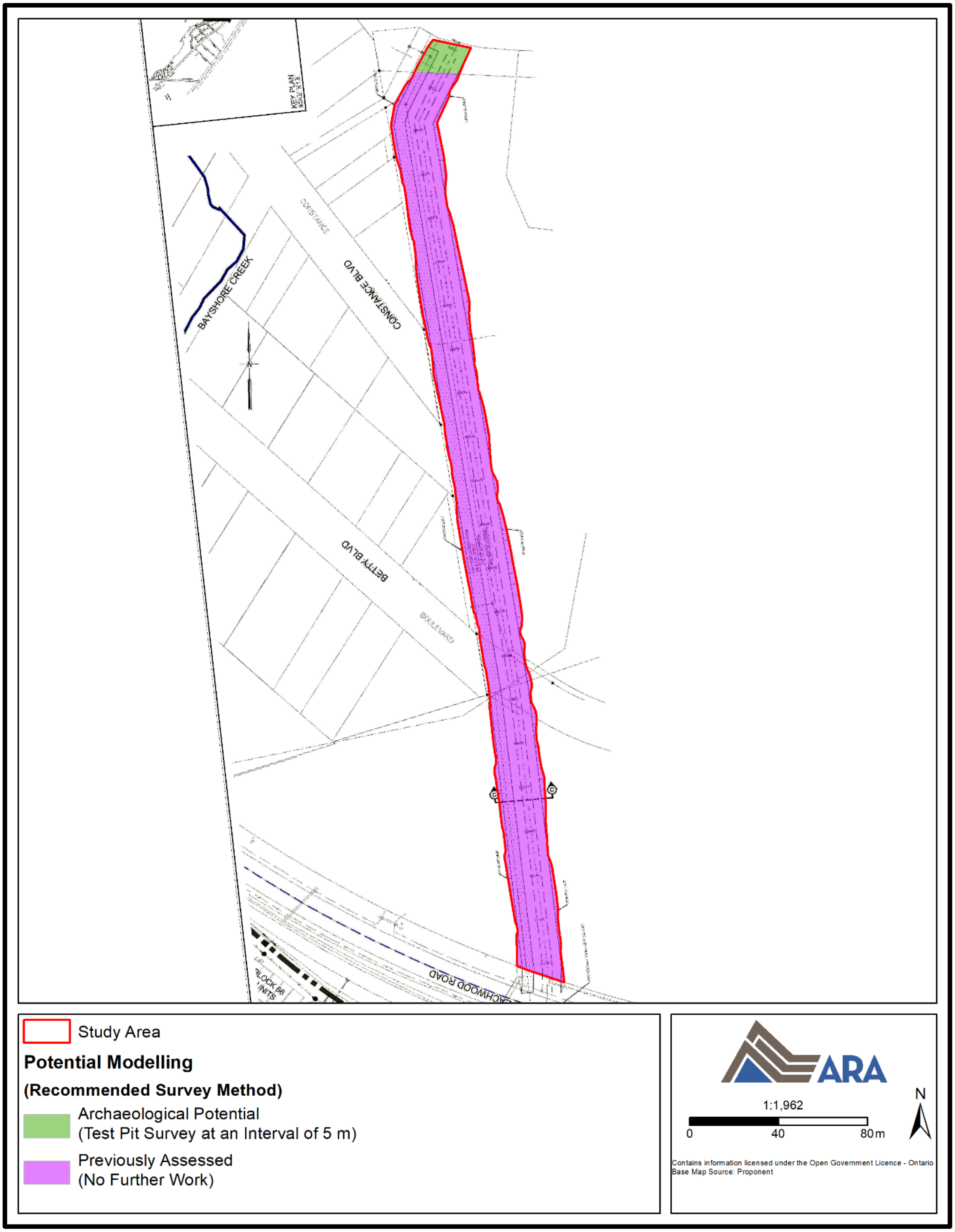


Map 8: Previous Assessments
(Produced under licence using ArcGIS® software by Esri, © Esri)

Map 9: Features of Potential
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 10: Potential Modelling and Recommendations (Aerial Image)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 11: Potential Modelling and Recommendations (Development Plan)
(Produced under licence using ArcGIS® software by Esri, © Esri)

6.0 BIBLIOGRAPHY AND SOURCES

AMICK Consultants Limited (AMICK)
2017 *Stage 1-2 Archaeological Assessment of 2320 Shore Lane, Part of Lot 35, Concession 3 (Geographic Township of Nottawasaga, County of Simcoe), Town of Wasaga Beach, County of Simcoe*. PIF #P1024-0157-2016. AMICK.
2020 *Stage 1-2 Archaeological Assessment of the Beachwood Development Inc. Property, Part of Lot 34, Con. 3 (Geo. Twp. of Nottawasaga, County of Simcoe), Town of Wasaga Beach, County of Simcoe*. PIF #P058-1824-2020. AMICK.

Archaeological Research Associates Ltd. (ARA)
2022 *Stage 1 Archaeological Assessment, Constance Boulevard Drainage Improvements, Town of Wasaga Beach, Part of Lots 34–35, Concession 3 and Part of Lot 35, Concession 4, Geographic Township of Nottawasaga, Simcoe County, Ontario.* PIF #P007-1272-2021. ARA.

Archives of Ontario (AO)
2023 *Access our Collections*. Accessed online at: http://www.archives.gov.on.ca/en/access/our_collection.aspx.

Chapman, L.J., and D.F. Putnam
1984 *The Physiography of Southern Ontario, 3rd Edition*. Toronto: Ontario Geological Survey, Special Volume 2.

Coyne, J. H.
1895 *The Country of the Neutrals (As Far as Comprised in the County of Elgin): From Champlain to Talbot*. St. Thomas: Times Print.

Cumming, R. (editor)
1975 *Illustrated Historical Atlas of the County of Simcoe, Ont*. Reprint of 1881 Edition (Toronto: H. Belden & Co.). Port Elgin: Cumming Atlas Reprints.

Ellis, C.J., and N. Ferris (editors)
1990 *The Archaeology of Southern Ontario to A.D. 1650*. Occasional Publication of the London Chapter, OAS Number 5. London: Ontario Archaeological Society Inc.

Hoffman, D.W., Wicklund, R.E., and N.R Richards
1962 *Soil Survey of Simcoe County, Ontario*. Report No. 29 of the Ontario Soil Survey. Ottawa: Research Branch, Canada Department of Agriculture.

Hunter, A.F.
1909a *A History of Simcoe County: Volume 1 – Its Public Affairs*. Barrie: The County Council.
1909b *A History of Simcoe County: Volume 2 – The Pioneers*. Barrie: The County Council.

Lajeunesse, E.J.
1960 *The Windsor Border Region: Canada's Southernmost Frontier*. Toronto: The Champlain Society.

McGill University (MU)
2001 *The Canadian County Atlas Digital Project*. Accessed online at: http://digital.library.mcgill.ca/countyatlas/default.htm.

Ministry of Natural Resources and Forestry (MNRF)
2023 *Forest Regions*. Accessed online at: https://www.ontario.ca/page/forest-regions.

Munson, M.K., and S.M. Jamieson (editors)
2013 *Before Ontario: The Archaeology of a Province*. Kingston: McGill-Queen's University Press.

Nottawasaga Valley Conservation Authority (NVCA)
2023 *Watershed Health Checks*. Accessed online at: https://www.nvca.on.ca/our-watershed/watershed-health-checks/.

Ontario Council of University Libraries (OCUL)
2023 *Historical Topographic Map Digitization Project*. Accessed online at: https://ocul.on.ca/topomaps/.

Ontario Historical County Maps Project (OHCMP)
2019 *The Ontario Historical County Maps Project*. Accessed online at: http://maps.library.utoronto.ca/hgis/countymaps/maps.html.

Simcoe County
2023 *County Interactive Mapping System*. Accessed online at: https://opengis.simcoe.ca/public/.

Smith, W.H.
1846 *Smith's Canadian Gazetteer: Comprising Statistical and General Information Respecting all Parts of the Upper Province, or Canada West*. Toronto: H. & W. Rowsell.

Surtees, R.J.
1994 Land Cessions, 1763–1830. In *Aboriginal Ontario: Historical Perspectives on the First Nations*, edited by E.S. Rogers and D.B. Smith, pp. 92–121. Toronto: Dundurn Press.

Warrick, G.
2000 The Precontact Iroquoian Occupation of Southern Ontario. *Journal of World Prehistory* 14(4):415–456.

Wright, J.V.
1972 *Ontario Prehistory: An Eleven-Thousand-Year Archaeological Outline*. Archaeological Survey of Canada, National Museum of Man. Ottawa: National Museums of Canada.

Appendix G
Consultation

TOWN OF WASAGA BEACH
Constance Boulevard Drainage Improvements
Schedule 'C' Municipal Class Environmental Assessment
Notice of Addendum and Public Information Centre

Date Notice Issued: Thursday May 30th, 2024

The Project

The Town of Wasaga Beach has retained the services of Ainley Group to complete an Addendum to the Municipal Class Environmental Assessment (Class EA) to identify an additional potential solution for reducing the probability of flooding events in the area of Constance Boulevard and Thomas Street to Bayswater Drive.

An addendum has now been completed to the Environmental Study Report. The Notice of Completion, marking the end of Phase 4 of the MCEA, was issued on December 21, 2022. This project has adhered to the Schedule 'C' planning and design process as outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011, 2015 & 2024). The Addendum contains details of the Preferred Solution and Preferred Design Alternative chosen during the MCEA process, the newly considered solution, and an evaluation of the environmental implications of this alternative compared to the original preferred solution. The Town is seeking comments on the proposed changes as outlined in the Addendum.

The Addendum is available for public, government agency and Indigenous Community review in accordance with the requirements of the Municipal Class Environmental Assessment. Subject to comments received following this Notice, the Town intends to proceed with the construction of this project in 2024. The preferred solution for the Addendum is to Create New Channel to Redirect Drainage from Bayswater Creek to the West End Public Works Depot and Water Tower Outlet Channel. The estimated cost for the new preferred solution is $1,143,790.

Public Information Centre

A Public Information Centre (PIC) Addendum session will take place at the Stars Arena in the Re/Max Room from 6:00 to 8:00 PM on June 13, 2024. It will follow an informal "Open House" format, featuring study materials on display and project team members available to address questions and discuss project-related matters. A brief presentation will be given to begin the session.

Addendum Report

In accordance with the Schedule 'C' Municipal Class EA process, an Addendum report has been prepared to document the Class EA process completed for this undertaking and by this Notice is being placed in the public record for a 30-day public review and comment period. A digital copy of the Addendum report is available on the Town of Wasaga Beach's website at www.wasagabeach.com. Interested persons may provide written comments to our project team by **June 26, 2024**. All comments and concerns should be sent directly to Mark Taylor of the Town of Wasaga Beach at mark.taylor@wasagabeach.com or (705) 429-2540 ext. 2337. In addition, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study, or that conditions be imposed, only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. The request should be sent in writing or by email to:

Minister
Ministry of Environment, Conservation and Parks
777 Bay St. 5th Floor
Toronto, ON M7A 2J3
minister.mecp@ontario.ca

Director, Environmental Assessment and Permissions Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W., 1st Floor
Toronto ON M4V 1P5
EABDirector@ontario.ca

Requests should also be sent to Mark Taylor of the Town of Wasaga Beach.

Comments and information regarding this project are being collected for the purpose of meeting Environmental Assessment Act requirements, which includes the creation of a record that is available to the general public as described in the Municipal Freedom of Information and Protection of Privacy Act. Please note that all personal information included in a submission – such as name, address, telephone number and property location – will be collected, maintained, and may be disclosed for the purpose of transparency and consultation unless a request is made that personal information remain confidential.

Town of Wasaga Beach
Thomas St. and Constance Blvd. Area Drainage - Schedule 'C' Class EA
AGENCY CONTACT LIST

First	Last	Title	Company/Community	Address 1	Address 2	Town	PC	Telephone	Email	Notes
Provincial & Federal Agencies										
Chunmei	Liu	Environmental Resource Planner & EA Coordinator - Air, Pesticides and Environmental Planner *(Barrie, Orillia & County of Simcoe)*	Central Region Ministry of Environment, Conservation and Parks	5775 Yonge Street	8th Floor	North York, ON	M2M 4J1	416-326-4886	chunmei.liu@ontario.ca	
Cindy	Hood	District Manager	Barrie District Office Ministry of Environment, Conservation and Parks	54 Cedar Point Drive	Unit 1201	Barrie, ON	L4N 5R7	705-739-6436	cindy.hood@ontario.ca	
Ken	Mott	District Manager, Midhurt	Ministry of Northern Development, Mines, Natural Resources and Forestry	2284 Nursery Road		Minesing, ON	L0L 1Y2	705-725-7546	Ken.mott@ontario.ca	
Becky	Cudmore	Senior Science Advisor - Bayfield Institute	Department of Fisheries and Oceans	867 Lakeshore Road	P.O. Box 5050	Burlington, ON	L7R 4A6		becky.cudmore@dfo-mpo.gc.ca	
Karla	Barboza	Team Lead, Heritage	Ministry of Heritage, Sport, Tourism and Culture Industries	401 Bay Street	Suite 1700	Toronto, ON	M7A 0A7	416-314-7120	karla.barboza@ontario.ca	
Annelies	Eckert	Rural Planner	Ontario Ministry of Agriculture, Food and Rural Affairs	6484 Wellington Road 7	Unit 10	Elora, ON	N0B 1S0	519-827-6040	anneleis.eckert@ontario.ca	
Alejandra	Perdomo	Municipal Planning Advisor - Team Lead Central Ontario	Ministry of Municipal Affairs and Housing	777 Bay Street	13th Floor	Toronto, ON	M5G 2E5		Alejandra.perdomo@ontario.ca	
Francois	Lachance	Senior Advisor, Indigenous Relations Branch	Ministry of Indigenous Affairs	160 Bloor St. East	9th Floor	Toronto, ON	M7A 2E6	416-326-4754		
Teepu	Khawja	Regional Director	Ministry of Transportation, Central Region	1201 Wilson Avenue		Toronto, ON	M3M 1J8	416-235-5400	teepu.khawja@ontario.ca	
Local Government, Adjacent Municipalities & Other Agencies										
Christian	Meile	Director, Transportation and Engineering	County of Simcoe	1110 Highway 26 West		Midhurst, ON	L0L 1X0	705-726-9300	christian.meile@simcoe.ca	
Nathan	Westendorp	Director, Planning and Chief Planner	County of Simcoe	1110 Highway 26 West		Midhurst, ON	L0L 1X0	705-726-9300	nathan.westendorp@simcoe.ca	
Chris	Hibberd	Director, Watershed Management Services	Nottawasaga Valley Conservation Authority	John Hix Conservation Administration Centre	8195 8th Line	Utopia, ON	L0M 1T0	705-424-1479	c.hibberd@nvca.on.ca	
Brad	Krul	Manager, Planning Services	Nottawasaga Valley Conservation Authority	John Hix Conservation Administration Centre	8195 8th Line	Utopia, ON	L0M 1T0		bkrul@nvca.on.ca	
Meagan	Kieferle	Senior Regulations Technician	Nottawasaga Valley Conservation Authority	John Hix Conservation Administration Centre	8195 8th Line	Utopia, ON	L0M 1T0		mkieferle@nvca.on.ca	
George	Vadeboncoeur	CAO	Town of Wasaga Beach	30 Lewis Street		Wasaga Beach, ON	L9Z 1A1			
~~Doug~~	~~Herron~~	~~Director of Planning and Economic Initiatives~~	~~Town of Wasaga Beach~~	~~30 Lewis Street~~		~~Wasaga Beach, ON~~	~~L9Z 1A1~~			
Kevin	Lalonde	Director of Public Works	Town of Wasaga Beach	150 Westbury Road		Wasaga Beach, ON	L9Z 0C8		publicworksdirector@wasagabeach.com	
Mike	McWilliam	Director of Emergency Services and Fire Chief	Town of Wasaga Beach	966 River Road West		Wasaga Beach, ON	L9Z 2K7			
Sonya	Skinner	CAO	Town of Collingwood	97 Hurontario Street	P.O Box 157	Collingwood, ON	L9Y 3Z5			
John	Ferguson	CAO	Clearview Township	217 Gideon Street		Stayner, ON	L0M 1S0		jferguson@clearview.ca	
		Simcoe County District Health Unit		280 Pretty River Parkway		Collingwood, ON	L9Y 4J5	705-445-6498		
Earl	Elliott	President	Simcoe County Historical Association		P.O. Box 144	Barrie, ON	L4M 4S9	705-796-7649	earl.elliott@rogers.com	
Emergency Services										
JC	Gilbert	Deputy Chief Operations	County of Simcoe Paramedic Services	1110 Highway 26		Midhurst, ON	L0L 1X0	705-726-9300	jc.gilbert@simcoe.ca	
Donna	Danyluk	Communications Representative	Royal Victoria Regional Health Centre	201 Georgian Drive		Barrie, ON	L4M 6M2	705-728-9090 ext. 41610	danylukd@rvh.on.ca	
Paula	Brown	Operational Policy & Strategic Planning	Ontario Provincial Police	777 Memorial Ave., 2nd Floor		Orillia, ON	L3V 7V3			
Attn: General			Nottawasaga OPP Detachment Office	4601 Industrial Pkwy		Alliston, ON	L9R 1V2	705 434 1939	Fax: 705 434 9109	(Prefer to receive Fax)
Indigenous Consultation - *As per MECP direction Feb. 4 2022*										
Donna	Big Canoe	Chief	Chippewas of Georgina Island*	R.R. #2	P.O. Box N-13	Sutton West	L0E 1R0	705-437-1337	donna.bigcanoe@georginaisland.com	
Ted	Williams	Chief	Chippewas of Rama First Nation *	5884 Rama Road	Suite 200	Rama	L3V 6H6	705 325-3611	tedw@ramafirstnation.ca	
Sharday	James	Community Consultation	Chippewas of Rama First Nation *	5884 Rama Road	Suite 200	Rama	L3V 6H6		shardayj@ramafirstnation.ca	
Susan	Copegog	Consultation	Beausoleil First Nation*	11 O'Gemaa Miikaans		Christian Island	L9M 0A9		consultations@chimnissing.ca	
Keith	Knott	Chief	Curve Lake First Nation*	22 Winookeedaa Road		Curve Lake	K0L 1R0			
Kelly	LaRocca	Chief	Mississaugas of Scugog Island First Nation*	Administration Building	22521 Island Road	Port Parry	L9L 1B6	905-985-3337	info@scugogfirstnation.com	
Dave	Mowat	Chief	Alderville First Nation*	11696 Second Line Rd		Alderville	K0K 2X0	905-352-3000	dmowat@alderville.ca	
Laurie	Carr	Chief	Hiawatha First Nation*	431 Hiawatha Line		Hiawatha	K9J 0E6	705-295-4421	chiefcarr@hiawathafn.ca	
*cc Karry Sandy-McKenzie on all corespondence sent to the above 7 FN (Williams TreatyCommunities)										
Karry	Sandy- McKenzie	Barrister & Solicitor	Williams Treaties Communities	8 Creswick Court		Barrie	L4M 2J7	705-792-5087	k.a.sandy-mckenzie@rogers.com	
Remy	Vincent	Grand Chief	Huron-Wendat Nation	255 Place Chef Michel Laveau		Wendake	G0A 4V0		administration@cnhw.qc.ca	
Dave	Dusome	Regional Councillor, Region 7	Métis Nation of Ontario	66 Slater Street	Suite 1100, 11th Floor	Ottawa	K1P 5H1		DavidD@metisnation.org	
Attn: Lands, Resources and Consultations Branch			Métis Nation of Ontario	66 Slater Street	Suite 1100, 11th Floor	Ottawa	K1P 5H1		consultations@metisnation.org; JustinH@meti	Requires notices sent electronically to the email
Emily	Martin	Infrastructure and Resources Manager	Saugeen Ojibway Nation Environment Office	25 Maadookii Subdivision		Neyaashiinigmiing	N0H 2T0		emily.martin@saugeenojibwaynation.ca juanita.meekins@saugeenojibwaynation.ca	cc' Juanita Meekins Executive Assistant juanita.meekins@saugeenojibwaynation.ca
Lester	Anoquot	Chief	Saugeen First Nation	6493 Highway 21	R.R. #1	Southampton	N0H 2L0	(519) 797-2781	sfn@saugeen.org	SON
Veronica	Smith	Chief	Chippewas of Nawash Unceded First Nation	135 Lakeshore Blvd.		Neyaashiinigmiing	N0H 2T0		chief.veronica@nawash.ca	SON
Utilities										
Attn: General			Planning Department	Hydro One	16 Graham Street	Woodstock, ON	N4S 6J6	519-537-7122		
			Wasaga Distribution Inc.	950 River Road West	P.O. Box 20	Wasaga Beach, ON	L9Z 1A1		hydro@wasagadist.ca	

Town of Wasaga Beach
Thomas St. and Constance Blvd. Area Drainage - Schedule 'C' Class EA
AGENCY CONTACT LIST

First	Last	Title	Company/Community	Address 1	Address 2	Town	PC	Telephone	Email	Notes
Carol	O'Brien		Bell Canada	136 Bayfield Street	2nd Floor	Barrie, ON	L4M 3B1	705-722-2405	carol.obrien@bell.ca	
Tony	Dominguez		Rogers	1 Sperling Drive		Barrie, ON	L4N 6B8	705-737-4660 xt 6907	tony.dominguez@rci.rogers.com	

Comments Received

From:	Liu, Chunmei (MECP)
To:	Richard Sloan; Ben Krul; Mike Pincivero; Mark Taylor; Tammy Kalimootoo; Himanshu Sharma
Cc:	EA Notices to CRegion (MECP); Mazzuca, Marco (MECP); Hyde, Chris (MECP); Colella, Nick (MECP)
Subject:	RE: Constance Boulevard Drainage Improvements Municipal Class EA MECP File #: EA 01-06-04
Date:	May 24, 2024 9:35:02 AM
Attachments:	image002.png image003.jpg

Dear Richard Sloan and the Project Team,

Thank you very much for updating us on the project. The ministry has no comments at this time.

We note the new option would result in permanent removal of direct and indirect fish habitat, a significant portion of which is identified as direct coldwater fish habitat. Removal of wetland areas & diversion of a water feature is also noted as the result of the new option. Have you received any input, or do you intend to seek approval from other agencies for these activities? Please share with us their input/ approval or direction you received regarding these activities.

Please be advised that the Municipal Class Environmental Assessment (MCEA) was amended in February 2024. The Environmental Registry notice and updated MCEA can be found at this link: https://ero.ontario.ca/notice/019- 8081. Please ensure that the most recent versions of ministry documents are used and referenced.

If you have any questions, please feel free to contact us for further discussion.

Many thanks,

Chunmei Liu (she/her) | Regional Environmental Planner
Environmental Assessments Branch, Ontario Ministry of the Environment, Conservation and Parks |7th Flr, 135 St Clair Ave W, Toronto, ON M4V 1P5 | Chunmei.Liu@ontario.ca | 437-249-3102.

From: Richard Sloan <richard.sloan@ainleygroup.com>
Sent: Tuesday, April 30, 2024 9:33 AM
To: Liu, Chunmei (MECP) <Chunmei.Liu@ontario.ca>
Cc: Dorton, Peter (MTO) <Peter.Dorton@ontario.ca>; Ben Krul <bkrul@nvca.on.ca>; Mike Pincivero <pwengineer@wasagabeach.com>; Mark Taylor <mark.taylor@wasagabeach.com>; Tammy Kalimootoo <tammy.kalimootoo@ainleygroup.com>; Himanshu Sharma <himanshu.sharma@ainleygroup.com>
Subject: Constance Boulevard Drainage Improvements Municipal Class EA MECP File #: EA 01-06-04

Hi Chunmei,

As you may recall, The Town of Wasaga Beach retained the services of Ainley Group to undertake a Municipal Class Environmental Assessment (Class EA) to identify a suitable solution for reducing the probability of flooding events in the area of

Constance Boulevard and Thomas Street to Bayswater Drive, particularly in consideration of snow melt occurrences as well as increased rainfall intensities expected due to climate change. The current capacity of the side road ditch along Constance Boulevard in this area is insufficient to contain larger stormwater events and results in flooding. This project has followed the Schedule 'C' planning and design process in accordance with the Municipal Class Environmental Assessment (Oct. 2000, as amended 2007, 2011, 2015 & 2023). The Notice of Completion for this project was published on December 22, 2022. During Phase 2 of the assessment *Option 2 – Create New Outlet to the Bay through Property at 18 Constance Boulevard* was selected as the Preferred Solution. During Phase 3 of the assessment, it was determined that the Preferred Design for this project was *Alternative 1- Skewed Alignment with a Culvert Extension*. However, prior to implementation of this concept, due to some recent design work completed by private owners immediately adjacent to the Study Area, an opportunity has been identified for consideration of a new design option and corresponding design alternative based on modifications to the design of the proposed channel to be constructed as part of the Town's West End Public Works Depot and Water Tower project.

As a result, the Town is planning to issue a Notice of Addendum, and provide a report for public review which outlines this additional information, provides a brief summary of the Preferred Solution and Preferred Design Alternative selected during the MCEA process, explains the additional solution under consideration, and includes an evaluation of the environmental implications of this alternative in comparison to the original preferred solution to demonstrate the decision-making process leading to the potential selection of a new preferred solution and associated design alternative. The Town also intends to host an additional PIC during the public review period following publishing of the Notice. Prior to issuing the Notice, the Town request that Ministry staff complete a technical review of the draft report and provide any comments, as necessary. The report is available at the following link:

Agency Technical Review

By copy of this e-mail we also request a review of the draft report by technical staff from NVCA and the MTO. Any comments received will be included in the consultation section and appendix of the final report available for public review, and ultimately within the final report to be provided for the Minister's Review in accordance with the standard MCEA process. We request that all agencies provide their comments within a 30-day review period, since the Town intends to publish the Notice of Addendum on May 30, 2024 to commence the Public Review period.

Please contact the undersigned to discuss any questions you may have to assist in completing your review.

Richard Sloan
Water Resources Group Lead

Tel: (705) 726-3371 Ext. 256
Cell: (705) 794-1754
Email: richard.sloan@ainleygroup.com

WWW.AINLEYGROUP.COM