

Project File Report (PFR)

Simcoe Wastewater Treatment Plant

Biosolids Management Upgrades Municipal Class Environmental Assessment

Prepared for: Norfolk County

HATCH

Norfolk County
Simcoe Wastewater Treatment Plant - Biosolids Management Upgrades - Municipal Class Environmental Assessment

Project File Report (PFR)

2025-12-15	0	Final	Carson Brennen	O. Koc/ M. Armstrong	O. Koc
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**
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Executive Summary

Background

The Simcoe Wastewater Treatment Plant (WWTP), along with the Waterford, Port Dover, Port Rowan and Delhi WWTPs, provide wastewater treatment services to the residents of Norfolk County (County). The County's 2016 Integrated Sustainable Master Plan (ISMP) and 2007 Biosolids Management Plan (BMP) highlighted the need for upgrades to the Simcoe WWTP, with the goal to create a centralized biosolids treatment facility for the County. In 2024, the County initiated the process to review and evaluate biosolids management upgrade options for the Simcoe WWTP using a 2051 planning horizon and comparing traditional treatment technologies with new emerging technologies such as Thermal Hydrolysis Process (THP).

The County completed the Schedule B Municipal Class Environmental Assessment (EA) Study to evaluate the potential upgrades to the Simcoe WWTP, ensuring proposed solutions align with the County's needs and that proper consultation with all stakeholders has been conducted. This Project File Report (PFR) documents Phases 1 and 2 of the Class EA. The PFR will be available for public review for a period of 30 days. Any comments received will be addressed prior to the project proceeding.

Problem/Opportunity Statement

The problem/opportunity statement prepared for Phase 1 of the Simcoe WWTP Biosolids Management Upgrades Municipal Class EA has been defined as follows:

"Norfolk County must develop a long-term biosolids management solution to effectively handle materials generated at all wastewater treatment plants. The solution should accommodate future growth, evaluate emerging technologies, maximize value, be fiscally responsible, and minimize environmental impacts."

Municipal Class Environmental Assessment

Under the provisions of the Ontario *Environmental Assessment Act*, 1990 (EAA) and Ontario Regulation 334, certain types of provincial and municipal undertakings can meet the requirements of the Act through the use of an approved environmental planning process referred to as a Class EA.

The Class EA process provides a standardized decision-making framework by which a Group or "Class" of undertakings can be planned and implemented in compliance with the Act without the need to complete an Individual Environmental Assessment. Upon completion of the process, the undertaking is considered approved and does not require formal submission to the Ministry of Environment, Conservation and Parks (MECP).

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The Municipal Class EA guidance document prepared by the Municipal Engineers Association (MEA) (originally issued in October 2000, and amended in 2024) outlines the approved five phase process for the planning and design of municipal infrastructure.

- Phase 1 includes the problem identification.
- Phase 2 includes the identification of the preferred solution.
- Phase 3 includes the identification of the preferred design concept.
- Phase 4 includes the documentation of the EA process; and
- Phase 5 includes the detailed design and construction of the project.

Consultation and engagement were integrated at key milestones throughout the project. Both virtual and in-person sessions were held with impacted stakeholders and Indigenous communities to ensure meaningful participation. This input was critical to identifying potential issues early in the process, allowing them to be addressed proactively before advancing to final recommendations.

Development and Evaluation of Alternative Solutions

The preliminary screening phase evaluated all the proposed Alternative Solutions to identify the solutions that align with the project's objectives and deserve further consideration. Identified solutions must meet all established screening criteria to advance in the Class EA study. The short-listed alternative solutions include Alternative Solution 3 – Centralized Anaerobic Digestion and Alternative Solution 4 – Centralized Thermal Hydrolysis Process.

Each Alternative Solution was evaluated to ensure it effectively addresses the issues identified in the Problem/Opportunity Statement. The evaluation criteria included environmental, social, economic, technical, and planning considerations to identify the most preferred solution. Solutions that did not improve the existing situation were excluded. The County's long-term growth was considered, emphasizing the need for the new biosolids management facility to accommodate future needs. The impact on natural heritage features was assessed for each solution, aiming to minimize environmental impacts. Input from the public and stakeholders was considered crucial for evaluating the feasibility and acceptability of each Alternative Solution. Solutions that did not meet these criteria were not advanced to the next phase of the Class EA Study.

Preferred Alternative Solution

The evaluation process identifies Alternative Solution 4 as the preferred Alternative Solution. Compared to Alternative Solution 3, Alternative Solution 4, a centralized thermal hydrolysis process, offers several key advantages. These include the production of Class A biosolids, greater operational flexibility, a smaller required footprint, and lower life cycle and upfront capital costs. The design will fit within the existing property boundaries and, when evaluated

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against the proposed Alternative Solutions, will provide the best overall balance of environmental protection, community benefit, cost efficiency, and long-term planning.

Public, Indigenous, and Agency Consultation

The public and agency consultation process of this Class EA involved several key steps to ensure transparency and gather input from stakeholders. A Notice of Commencement was issued to inform the public, relevant agencies, and Indigenous communities about the project and its scope. Additionally, one Public Information Centre (PIC) was held to receive feedback and incorporate comments into the Project's design. Rightsholders and stakeholders were also invited to review and comment on the project at various stages.

Throughout the process, information was shared through County project websites and public notices to keep stakeholders informed and engaged. Consultation activities identified concerns, gathered local knowledge, and incorporated public and agency feedback into project planning. This feedback has been documented and included in this report, which outlines how concerns were considered and mitigated in the final project design. Stakeholder input influenced the preferred design by highlighting the importance of minimizing impacts on the local community, particularly by reducing disruptions to the existing Lake Erie and Northern (L.E. & N.) Railway Trail and limiting increased truck traffic associated with construction activities.

The completion of the PFR is finalized with the issuance of a Notice of Completion inviting Indigenous communities, agencies and the public to review and provide input on the document within the 30 calendar-day review period. The Notice will identify the location(s) where the PFR can be reviewed.

Proposed Mitigation of Potential Impacts

The proposed project construction of the preferred Alternative Solution is within the existing Simcoe WWTP property boundary. Mitigation measures are outlined within the PFR to address potential impacts that may result from the project development.

Species at risk were found at the southwest of the existing facility during bird breeding surveys. Communication with the MECP will be required to ensure all requirements under the Endangered Species Act and Species at Risk Act are addressed prior to any construction activities.

Effectively managing increased truck traffic, both during construction and as a result of converting the Simcoe WWTP into a centralized biosolids treatment facility for the County, is essential to the success of the proposed alternative. A new access road to the facility is being proposed, to divert the truck traffic away from the nearby elementary school to improve safety for the general public and the plant operators. The access road feasibility is currently under review, pending the Class EA completion.

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During construction, erosion and sediment control plans will be implemented, along with excess soil management plans, to ensure no contamination of the surrounding water sources and on-site reused soils.

Throughout the project, the County commits to clear and consistent communication with stakeholders and the public, providing updates on construction schedules, potential disruptions, and ongoing mitigation efforts. This approach aims to enhance transparency, address community concerns, and facilitate a successful implementation.

Conclusions and Recommendations

The County's Class EA study for the Simcoe WWTP Biosolids Management Upgrades Project identified Alternative Solution 4 – Centralized Thermal Hydrolysis Process as the preferred recommended solution. Alternative Solution 4 was identified as the preferred alternative over others because environmental, social, economic, technical, and planning considerations. Alternative Solution 4 will achieve a reduction in current CO_2 emissions, supports an increase in incoming sludge truck operation, has a lower capital cost (compared to other alternatives), follows Canadian Food Inspection Agency (CFIA) regulation, and has the smallest footprint of the short-listed alternatives. The Thermal Hydrolysis Process solution addresses the County's current problems and aligns with the County Biosolids Management Plan and Integrated Sustainable Master Plan.

While each of the alternative solutions was assessed based on potential impacts, recommended mitigation measures were offered to address these concerns. Construction activities during the implementation stage of the Project could result in impacts resulting from increased traffic, noise, dust and disturbance to the natural environment. The mitigation measures, detailed within this PFR, provide a framework to reduce these potential impacts and minimize their effect on the local community and natural environment. It is recommended that the County pursue Alternative Solution 4 – Centralized Thermal Hydrolysis Process as the preferred biosolids management upgrades solution for the Project and proceed with the design suggested in this report. The PFR is completed when the Notice of Completion is issued, inviting Indigenous Communities, agencies, and the public to review and provide feedback on the document within a 30-day review period.

Construction of the biosolids management upgrades at the Simcoe WWTP is anticipated to begin in 2027. This timeline is contingent upon County Council's approval of the capital budget, as well as successfully securing all of the permits and approvals detailed in Section 9.

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List of Abbreviations

Definition	Abbreviation
AA	Archaeological Assessment
AE	Adult bird entering, occupying, or leaving a nest site (visible or not) or whose behavior suggests the presence of an occupied nest.
AODA	Accessibility for Ontarians with Disabilities Act
ASI	Archaeological Services Inc.
BMP	Biosolids Master Plan
CAS	Conventional Activated Sludge
CF	Adult carrying food for young
CFIA	Canadian Food Inspection Agency
CO_2	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
County	Norfolk County
dBA	A-weighted Decibels
EA	Environmental Assessment
EAA	Environmental Assessment Act
ECA	Environmental Compliance Approval
END	Endangered
ESA	Electrical Safety Authority / Endangered Species Act
ESR	Environmental Study Report
FY	Recently fledged young bird or downy young – who's young leave the nest soon after hatching) incapable of sustained flight
GHG	Greenhouse Gas
GIS	Geographic Information System
H	Species observed in suitable nesting habitat during its breeding season
HCCC	Haudenosaunee Confederacy Chiefs Council
HDI	Haudenosaunee Development Institute
HL	Hazard Land
Individual EA	Individual Environmental Assessment
ISMP	Integrated Sustainable Master Plan
MCEA	Municipal Class Environmental Assessment
MCFN	Mississaugas of the Credit First Nation
MEA	Municipal Engineers Association
MECP	Ministry of Environment, Conservation and Parks
MNO #9	Métis Nation of Ontario Region #9
NASM	Non-Agricultural Source Material / Non-agricultural source materials
NHIC	Natural Heritage Information Centre
NY	Nest with young
OB	Observed

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Definition	Abbreviation
OBBA	Ontario Breeding Bird Atlas
OHSA	Occupational Health and Safety Act
OMAFRA	Ontario Ministry of Agriculture and Rural Affairs
OP	Official Plan
OS	Open Space
PFR	Project File Report
PIC	Public Information Centre
PO	Possible breeding evidence
PSW	Provincially Significant Wetland
RDT	Rotary Drum Thickener
S	Singing male bird or adult bird producing other sounds associated with breeding (e.g., calls or drumming) in suitable nesting habitat during the species' breeding season.
SARA	Species at Risk Act
SNGRFN	Six Nations of the Grand River First Nation
T	Presumed Territory based on the presence of an adult bird, in the same suitable nesting habitat patch on at least two visits, one week or more apart, during the species' breeding season.
THP	Thermal Hydrolysis Process
TSSA	Technical Standards and Safety Authority
WAS	Waste Activated Sludge
WWTP	Wastewater Treatment Plant

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1. Background

In 2016, the County issued its Integrated Sustainable Master Plan (ISMP[1]) to address municipal infrastructure needs across the County for the 25-year planning horizon. The ISMP presented a Biosolids Management Solution for the Simcoe Wastewater Treatment Plant (WWTP), building on the recommendations of the 2007 Biosolids Management Options Report. While the assessment showed that Simcoe WWTP would not require major upgrades based on capacity, it was identified as the central facility for biosolids treatment and storage for the County.

The proposed solution included aerobic digestion and thickening of biosolids at Simcoe WWTP, with re-purposing of the existing anaerobic digesters for biosolids storage, which required upgrades to meet operational, compliance and regulatory requirements. This storage would accommodate biosolids from Simcoe and in the future, excess biosolids from Port Rowan and Port Dover WWTPs.

In 2019, the Biosolids Management Solution was re-evaluated for a design year (2041 and 2051) because of forecasted population increases. This review considered the Delhi WWTP as an additional source of biosolids and recommended a technology shift to anaerobic digestion at Simcoe WWTP.

During the evaluation of biosolids management options for Simcoe WWTP, significant concerns were identified regarding the existing anaerobic digesters, particularly their compliance with Technical Standards and Safety Authority (TSSA) regulations. These issues presented operational and safety risks that required immediate attention. As part of the ISMP, a key recommendation was to transition from anaerobic to aerobic digestion through the construction of new aerobic digesters. This approach offers several distinct advantages, including regulatory compliance, cost-effectiveness, and improved sustainability.

Starting in 2024, Norfolk County initiated a new re-evaluation of biosolids management solutions for three key reasons:

- A county-wide review of biosolids management was deemed necessary. A broader scope enables more integrated planning, consistent environmental and social outcomes, and cost-effective technical solutions.
- Updated growth projections extended the planning horizon to 2051, including the addition of Waterford WWTP sludge to the design basis. Future growth impacts technical scalability, long-term cost projections, and environmental footprint, requiring forward-looking planning.

[1] (Norfolk County, 2016)

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- Emerging technologies, such as Thermal Hydrolysis Process (THP), became more feasible and warranted consideration. Advanced processes improve environmental performance, reduce social impacts (e.g., odour), and offer potential economic and technical efficiencies.

1.1 Objectives of the Class EA Study

The main objectives of the Class Environmental Assessment (EA) study are to evaluate potential upgrades to the Simcoe WWTP to meet the biosolids management and storage requirements for the projected growth across the County. The preferred design concept should be technically viable, environmentally responsible, and economically feasible (considering both capital and operating costs). It should align with the County's priorities as outlined in the 2007 Biosolids Master Plan (BMP) and the 2016 ISMP.

Other Class EA objectives include facilitating comprehensive consultation with affected and interested parties to allow sharing of ideas, education, testing of creative solutions, developing alternatives, and documenting the planning and decision-making process in this Project File Report (PFR).

1.2 Objectives of the Project File Report

The PFR describes the planning and decision-making process followed during the Class EA Study for the potential upgrades to the Simcoe WWTP. The PFR describes the:

- Various alternative solutions and design concepts (with differing impacts to environmental, social, economic, technical, and planning aspects) considered for the biosolids management upgrades,
- The evaluation methodology and criteria used to assess these alternatives,
- Anticipated potential impacts and mitigation measures,
- The rationale for selecting the preferred solution and implementation plans.

The Class EA process also allows members of the public, Indigenous communities, interest groups, and approval agencies to review the PFR during a 30-day review period. This period provides individuals with the opportunity to raise any outstanding concerns regarding the project with the County.

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1.3 Problem/Opportunity Statement

Norfolk County is experiencing significant challenges in biosolids management, driven by aging infrastructure at the Simcoe and Port Dover WWTPs. These facilities are approaching end-of-life and no longer meet performance or regulatory standards. Issues such as Electrical Safety Authority (ESA) Code violations and poor digester performance further complicate operational reliability. Although the 2016 ISMP identified critical upgrades, they remain unaddressed. Compounding these concerns are space constraints at other WWTPs, updated growth projections to 2051, and evolving requirements under Ontario's Nutrient Management Act, necessitating a long-term, integrated strategy.

In response to these challenges, Norfolk County has a strategic opportunity to modernize its biosolids management approach. Phase 1 of the Class EA Study supports upgrading the Simcoe WWTP to meet future regulatory and operational needs. Advancements in wastewater treatment technologies now enable the production of Class A biosolids that comply with Canadian Food Inspections Agency (CFIA) fertilizer standards, offering environmental and economic benefits. A centralized approach could enhance operational efficiency, support fiscal sustainability, and align with long-term growth and planning objectives.

As part of the Class EA, Phase 1 resulted in the development of the following problem/opportunity statement:

"Norfolk County must develop a long-term biosolids management solution to effectively handle materials generated at all wastewater treatment plants. The solution should accommodate future growth, evaluate emerging technologies, maximize value, be fiscally responsible, and minimize environmental impacts."

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2. Municipal Class Environmental Assessment Process

The Environmental Assessment Act (EAA) is a legislative framework established to ensure that significant environmental effects of projects are considered before they proceed. Enacted in 1975 and regularly updated, the EAA mandates that major public and private sector projects undergo a thorough assessment process to identify, predict, and mitigate potential environmental impacts. The Act emphasizes public consultation and transparency, requiring project proponents to engage with stakeholders and consider their input throughout the assessment process. This ensures that environmental, social, and economic factors are integrated into the decision-making process, promoting sustainable development and safeguarding environmental quality.

The EAA outlines a comprehensive assessment procedure, which includes the preparation of an EA report, review and approval by the Ministry of Environment, Conservation and Parks (MECP), and opportunities for public input and appeals. The assessment can vary in complexity, from streamlined assessments for smaller projects to more detailed and rigorous evaluations for larger, more impactful ones. The Act also allows for the designation of individual projects for special consideration and establishes mechanisms for compliance and enforcement. The EAA serves as a critical tool for environmental governance in Ontario, ensuring that the potential impacts of projects are responsibly managed and mitigated.

The MECP's guide on climate change considerations in EAs helps project proponents evaluate both how their projects may contribute to climate change and how climate change could impact their projects over time. It emphasizes assessing greenhouse gas (GHG) emissions, incorporating climate projections, and planning for resilience and adaptation. The guide also outlines documentation requirements and provides sector-specific examples to facilitate meaningful integration of climate considerations into project planning.

2.1 Principles of Environmental Planning

The EAA prescribes a set of five key principles for successful environmental assessment planning, including:

Early and Ongoing Consultation: Engage affected parties early and continuously throughout the planning process to foster cooperation. This may include approval agencies, the public, Indigenous communities, property owners, interest groups, and municipalities. The proponent should involve those potentially impacted and interested as soon as possible to enhance the understanding of environmental issues before selecting the preferred solution. The County conducted early engagement and ongoing consultation throughout the Study, information related to the consultation process is included in Section 7.

Consideration of Alternatives: Evaluate a reasonable range of alternatives, including functionally different "alternatives to" and "alternative methods" for implementing the solution. The "Do nothing" alternative must also be considered as a benchmark for comparison. Information on the evaluation of alternatives can be found in Sections 4, 5, and 6.

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Assessment of Environmental Effects: Identify and consider the impact of each alternative on all aspects of the environment, including natural, social, cultural, technical, and economic factors. An evaluation of environmental effects and mitigation measures is detailed in Section 8.

Systematic Evaluation and Decision-Making: Evaluate the advantages and disadvantages of alternatives to determine their net environmental effects. The planning process should include distinct evaluation points, focusing on a preferred alternative. The decision-making process should be phased, recognizing the dynamic nature of environmental decision-making and adapting to changing conditions and new information. Section 4 provides the evaluation methodology.

Clear Documentation: Provide clear and complete documentation of the planning process to ensure "traceability" in decision-making. Documentation should detail the approach and adherence to the principles of environmental assessment planning throughout the process. Once the EA process is complete, a Project File Report will be prepared. This report will include all studies, activities, and evaluations completed during the EA. It will be shared publicly for a 30-day comment period, after which feedback will be reviewed and incorporated into the final recommendations before submission to the MECP.

2.2 Overview of the MCEA Process

A streamlined EA under the EAA is the Municipal Class EA (MCEA) process, which recognizes that there are varying levels of impact requiring a greater or lesser amount of assessment, depending on the nature of the work, the estimated cost and the potential impacts on the environment (which includes natural, social, economic, cultural and technical components). There are four “schedules” of undertakings defined in the MCEA to account for this variation. These schedules include:

Exempt Projects:	These projects, previously classified as Schedule A and A+, involve minor municipal works with minimal environmental impact. They are exempt from the requirements of the EAA.
Eligible for Screening Exempt:	Some projects may qualify for exemption from the EAA following a detailed screening process. Proponents must accurately complete this process to confirm eligibility or proceed under the applicable Schedule B or C requirements.
Schedule B	Schedule B projects may cause some environmental effects and require public and agency consultation during the first two phases of the assessment process. A PFR must be prepared and made available for review, and if no concerns remain, the project may proceed; these typically involve improvements or minor expansions to existing facilities.

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Schedule C	Schedule C projects typically involve constructing new facilities or major expansions and require a full planning and documentation process under the MCEA, including an Environmental Study Report (ESR) for public and agency review. If no concerns are raised during the review, the proponent may proceed with implementation once regulatory requirements are met.

This Project falls within the scope of a Schedule B project since it involves establishing a biosolids management facility at a sewage treatment plant where the biosolids were not generated, as per Municipal Class Environmental Assessment, February 2024, Appendix 1: Project Tables Table B: Municipal Water and Wastewater Projects, Item 33c.

2.3 Schedule B Classification and Planning Phases

Projects classified under Schedule B must complete the initial two stages of the assessment process. This includes mandatory engagement with both the directly impacted public and relevant regulatory agencies to ensure awareness of the project and to gather and address any concerns. A Project File Report must be compiled and made accessible for public review. If no unresolved issues remain following this process, the project may move forward to implementation, pending completion of regulatory requirements. Typically, Schedule B projects involve upgrades or modest expansions to existing infrastructure, or the development of smaller-scale new initiatives. The Schedule B Class EA process is described below, and a flow chart is provided in Figure 2-1.

Phase 1: Problem or Opportunity Identification

In the initial phase, the need for a long-term biosolids management solution for Norfolk County's wastewater treatment plants is identified and formally documented. This phase includes a thorough assessment of current capacity limitations and projected future demands on the treatment infrastructure. To ensure a well-rounded understanding of the challenges and opportunities, input from the public and key stakeholders is actively gathered and integrated into the development of the problem and opportunity statement.

Phase 2: Alternative Solutions Identification and Evaluation

During Phase 2, a range of alternative solutions to address the identified problem and opportunity is developed. Each alternative is evaluated based on environmental, technical, social, and economic criteria. A Do-Nothing Option was also considered at this phase as a baseline comparison for other alternatives. This phase includes extensive consultation with stakeholders and rightsholders, including public agencies, Indigenous communities, and the general public. The goal of this phase is to identify a shortlist of feasible alternatives for further detailed analysis.

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Project File Report

The formal planning process for Schedule B projects concludes at the end of Phase 2. At this stage, proponents are required to compile a Project File Report that documents all activities and decisions made during Phases 1 and 2. The Project File Report should include:

- A summary of the project background and any previous studies.
- An explanation of the issue or opportunity that prompted the project.
- An environmental inventory or description of the project area.
- A review of alternative solutions considered and the rationale for selecting the preferred option.
- Any technical studies or reports related to environmental factors.
- A record of public and Indigenous engagement, including how feedback was addressed.
- Copies of public notices, letters, and bulletins.

Notice of Completion

Once the PFR is finalized and made publicly available, the proponent must issue a Notice of Completion. This notice marks the end of the formal planning process and initiates a minimum 30-day public comment period, during which stakeholders and rightsholders can review the documentation and provide feedback.

The Notice of Completion serves as an invitation for final input before the project proceeds to implementation, assuming all regulatory requirements have been satisfied, and no outstanding concerns remain.

Section 16 Order

Under the EAA, the Minister of the MECP has the authority to initiate a Section 16 Order. This Order may require the proponent of a project undergoing the Class EA process to:

1. Submit an application for approval of the project before they proceed. This is generally referred to as an Individual Environmental Assessment (individual EA).
2. Meet further conditions in addition to the conditions in the Class EA. This could include conditions for:
    - Further study
    - Monitoring
    - Consultation

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Reasons for requesting a Section 16 Order include unresolved concerns that a project proceeding under a Class EA may adversely impact constitutionally protected Aboriginal and Treaty rights. Such an Order may help prevent, mitigate, or remedy those potential impacts.

If a Section 16 Order request is made, the project proponent must wait for the Minister's decision and, if an Order is issued, may only proceed by complying with its conditions. To initiate a Section 16 Order request for a project, the request must be made before the 30-day public comment period ends. This period begins following the Notice of Completion and the public review of the PFR. A request may be made on the grounds that an Order could prevent, mitigate, or remedy potential adverse impacts on constitutionally protected Aboriginal and Treaty rights.

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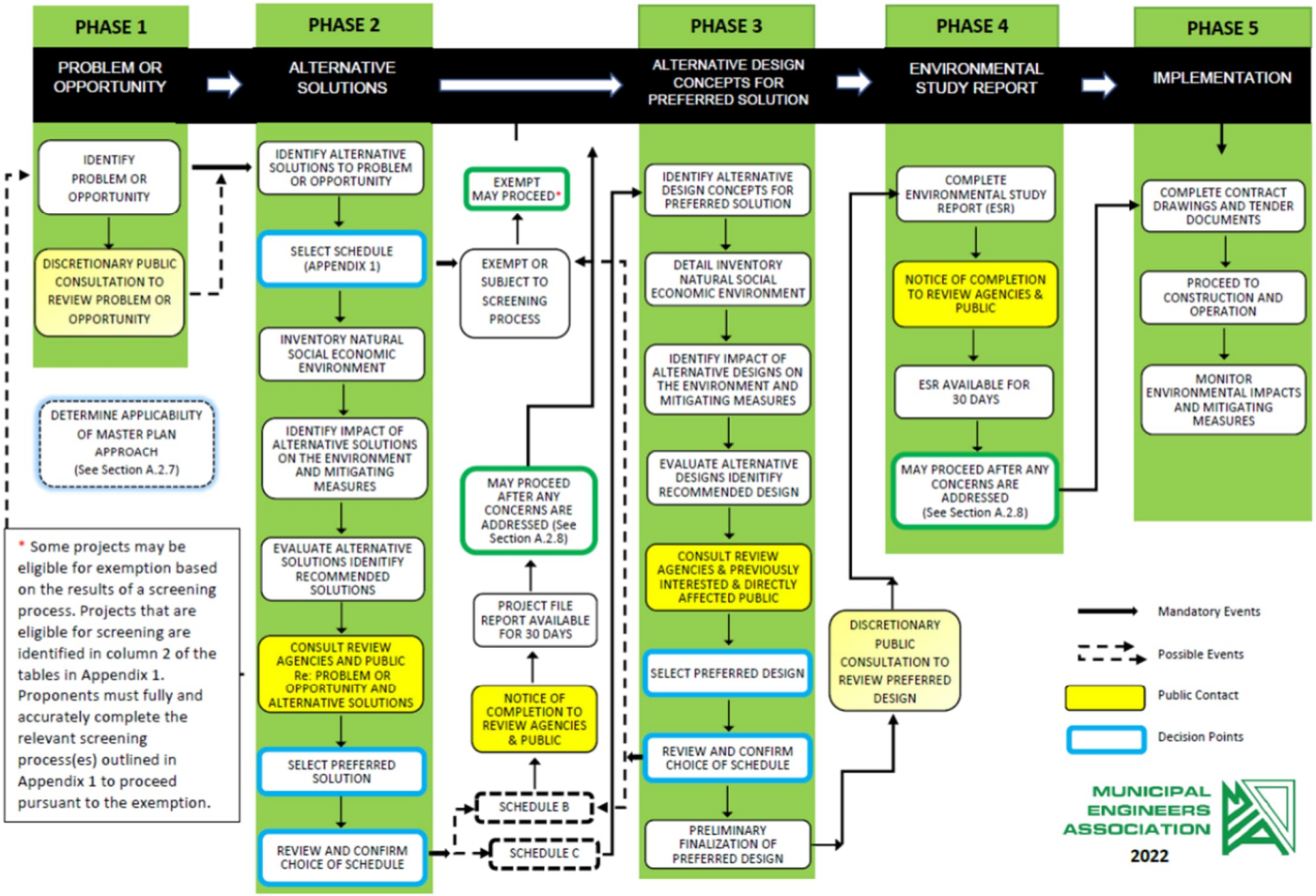


Figure 2-1: Municipal Class EA Planning and Design Process Flow Chart

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3. Study Area Overview

3.1 Study Area Location and Context

The Simcoe WWTP is located at 16 Oakwood Avenue in Simcoe, Ontario, and is primarily surrounded by residential development. Key nearby features include St. Joseph's School, future residential areas, and Oakwood Cemetery to the east; a light commercial area to the west; and the Brook Conservation Area and the Lake Erie and Northern (L.E. & N.) Railway Trail to the south. The study area extends to the municipal property boundary of the WWTP, as shown in Figure 3-1, and is designated as Major Public Infrastructure in the County's Official Plan[2] (OP).

The site is zoned Open Space (OS), where wastewater treatment facilities are permitted. A proposed access road is expected to cross both OS and Hazard Land (HL) zones, where streets are permitted. The area also includes an abandoned rail corridor, which the OP protects for Other Future Linear Uses (OFR). Currently, this corridor accommodates several underground and overhead utility lines and forms part of a recreational trail network. The OP also identified the potential need for a collector-level roadway connecting future residential development east of the Simcoe WWTP to Victoria Street. The proposed additional use of the corridor for a roadway is supported by both the OP and Zoning; however, the roadway design must remain minimal in nature and complementary to the existing trail and surrounding natural features to reduce disruption and maintain the area's recreational and ecological character.

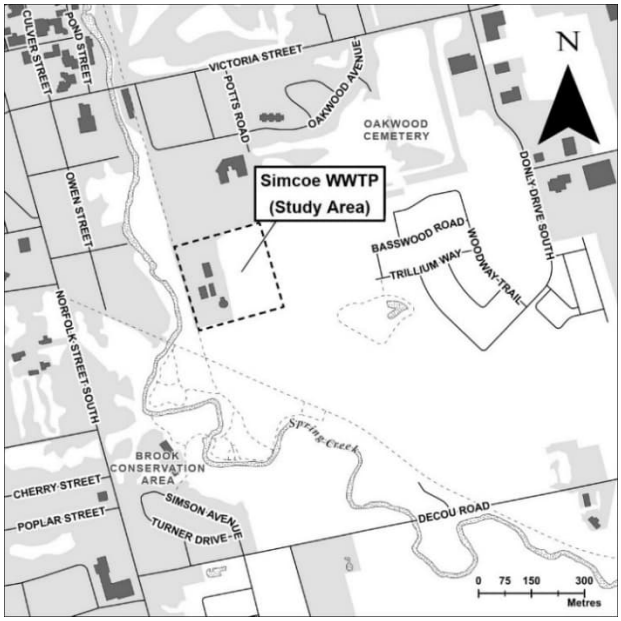


Figure 3-1: Study Area

[2] Norfolk County Official Plan

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3.2 Existing Infrastructure and Facilities

The Simcoe WWTP is a conventional activated sludge (CAS) system with tertiary treatment for phosphorus removal, and has an Environmental Compliance Approval (ECA) rated capacity of 15,400 m^3/d. After preliminary treatment (screening and grit removal), the wastewater is further treated between two secondary treatment plants, each equipped with primary clarifiers, bioreactors and secondary clarifiers, with capacities as follows: Plant 1 was constructed in 1953 with a rated capacity of 2,671 m^3/d; and Plant 2 was constructed in 1979 with a rated capacity of 12,729 m^3/d. Both treatment plants discharge effluent to a common tertiary filtration facility and chlorination facilities prior to discharge to the Lynn River.

The Simcoe WWTP has three cylindrical concrete anaerobic digesters: one primary digester and two secondary digesters. These digesters were built as part of the original plant construction. Combined raw sludge and waste activated sludge (WAS) are co-thickened in the primary clarifiers. This combined sludge is directed to a primary anaerobic digester, with an effective volume of 2,507 m^3, and digested biosolids are stored in two secondary digesters with total storage volume of 2,437 m^3. Figure 3-2 shows an aerial map of the Simcoe WWTP. The facility is currently experiencing ESA Code and regulatory compliance issues with respect to digester performance and biosolids quality, which is a major challenge to operations. Figure 3-3 features the existing infrastructure in the area around Simcoe WWTP.

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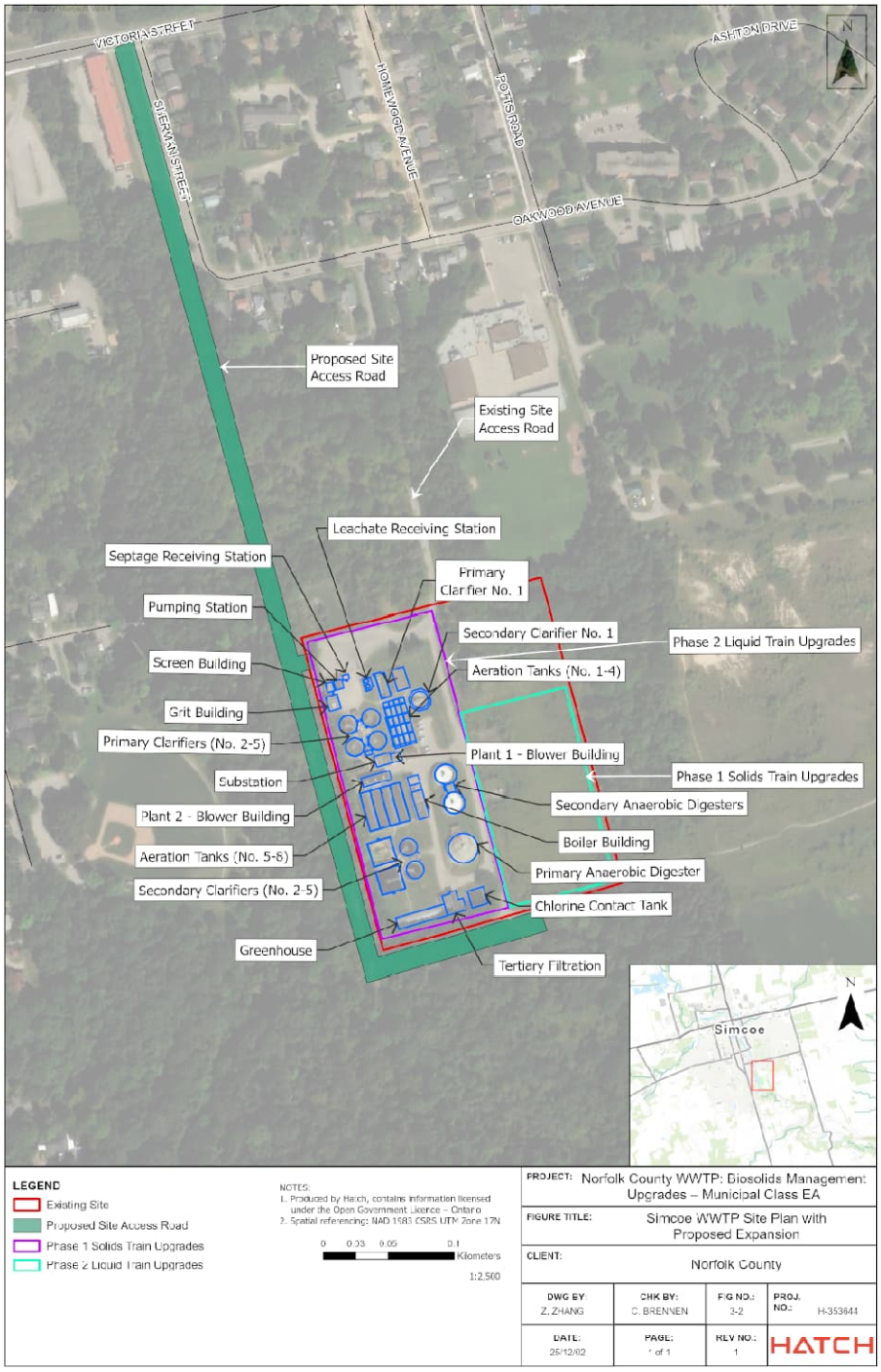


Figure 3-2: Simcoe WWTP Site Plan with Proposed Expansion

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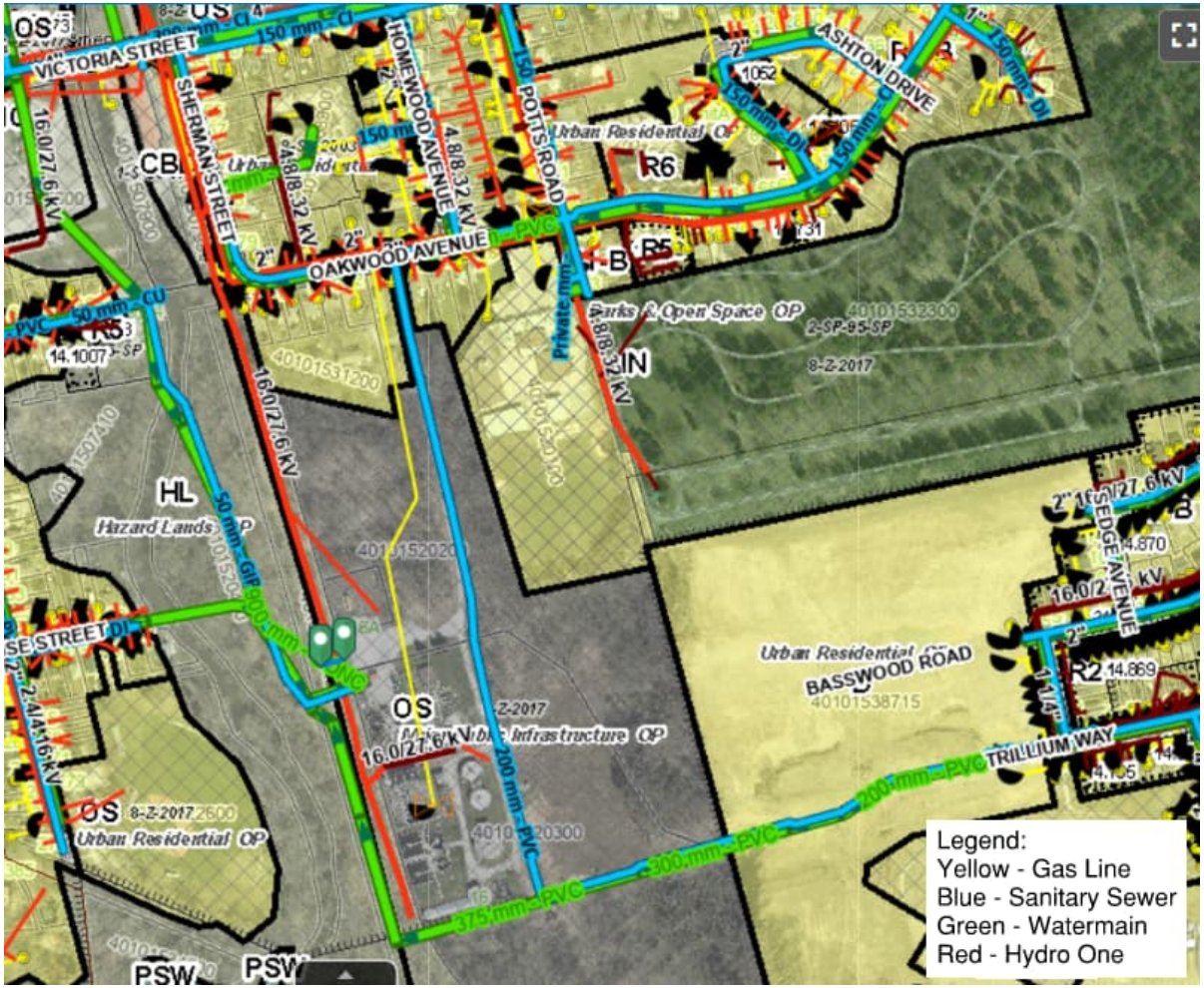


Figure 3-3: Existing Infrastructure

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3.3 Land Use and Recreational Features

According to the Norfolk County Zoning By-law3 and the County Geographic Information System (GIS) Mapping System4, the Simcoe WWTP is located within an area designated as “Open Space.” Facilities such as wastewater treatment plants are permitted in all zoning categories.

To the east of the facility, there is an additional Open Space Zone in addition to a Development Zone, where there is a proposed future residential development. There are Hazard Land Zones located to the west and the south of the facility, in addition to Provincially Significant Wetland (PSW) Zones. The north includes a Neighbourhood Institutional Zone, as well as various Residential Zones (R1-B, R2, R5, and R6). The Simcoe WWTP and surrounding areas zoning designations can be seen below in Figure 3-4 and the current occupation of service in study area is provided in Figure 3-5.

Community features located near the Simcoe WWTP include a cemetery, St Joseph’s Elementary School, Simcoe Memorial Park, Brook Conservation Area, and a future residential development. Additionally, there are various water sources near the facility, including the Lynn River and significant watersheds. Figure 3-5 highlights the community features near Simcoe WWTP.

[3] (Norfolk County, 2014)
[4] (Map Norfolk Community Web Map, 2025)

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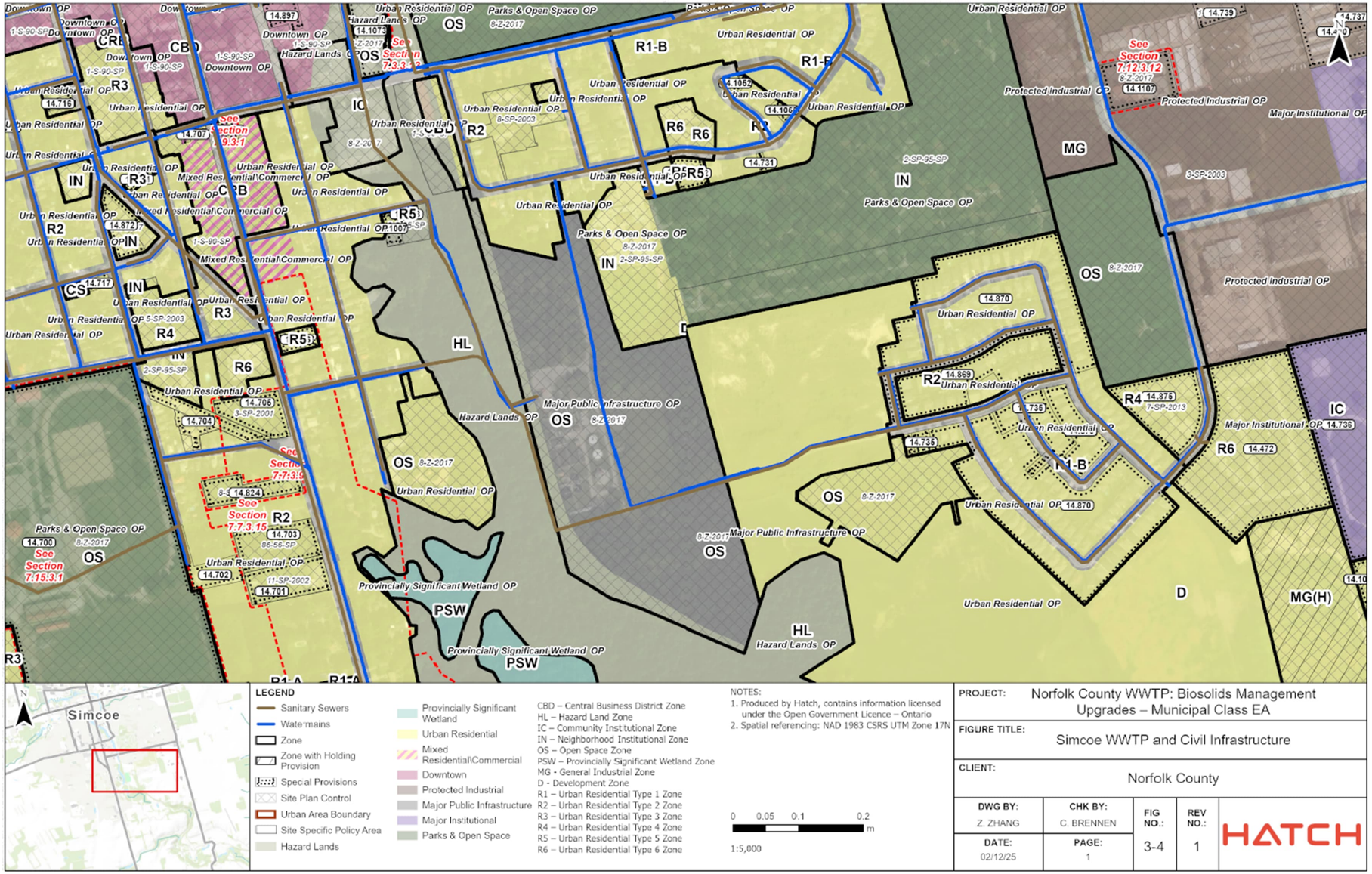


Figure 3-4: Zoning Designations and Current Occupation of Service in Study Area

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Figure 3-5: Community Features Near Simcoe WWTP

3.4 Natural Environment Overview

As noted in the Natural Heritage Report in Appendix A, there were 35 species of birds and 2 mammal species observed during the two surveys conducted on site. Species at Risk were seen near the south-west corner of the existing site, including red-headed woodpeckers, which are endangered, and chimney swifts, which are threatened. Preliminary vegetation assessments characterized the property as primarily cultural meadow habitat with deciduous-dominant mixed woodlands adjacent.

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3.5 Archaeological and Cultural Heritage Resources

A Stage 1 Archaeological Assessment (AA) was completed for the proposed biosolids management upgrades area within the Simcoe WWTP property boundaries during 2025, which recommended Stage 2 test pit surveys be conducted for parts of the study area. The Stage 1 AA project area was located adjacent to the east of the existing facilities at the Simcoe WWTP. It measured approximately 150 metres by 90 metres and covered an area of approximately 1.35 hectares. The Stage 1 AA Report is included in Appendix B.

Archaeological Services Inc. (ASI) was contracted by Hatch, on behalf of the County, to conduct a Stage 2 AA following the recommendations of their Stage 1 report. The Stage 2 work has not yet been scheduled but will be completed prior to the finalization of the design and any construction activities taking place to ensure that no archaeological potential is disturbed.

3.6 Groundwater and Surface Water Protection

As per the MECP Source Protection Information Atlas[5], there are no drinking water well source protections in place for the Simcoe WWTP. However, there are various water sources near the Simcoe WWTP and provincially significant wetland zones. Simcoe WWTP's proximity to the Lynn River poses additional concerns, especially related to phosphorus loadings. Stormwater management plans will be created throughout the design to ensure no negative impacts on the surrounding areas. Additionally, provisions will be implemented during and before construction to ensure no contamination of the water sources. Pre-construction baseline water quality monitoring is critical since surface waters could be temporarily affected by construction or sludge handling.

3.7 Geotechnical/Hydrogeological Considerations

Geotechnical and hydrogeological assessments were completed in 2017 and 2018, respectively, and are included in Appendix C. These reports will need to be updated prior to any construction activities taking place to determine soil and dewatering requirements for the site. In addition, updates to these reports will inform the excess soil management and erosion and sediment control requirements for the project.

3.8 Air Quality/GHG Emissions

Air quality and GHG emissions have been considered throughout the review of the various alternative solutions. A GHG emission analysis was conducted on the short-listed alternatives to compare and help minimize potential impacts of the proposed facilities, as shown in Table 3.1. Further reviews will be conducted once the selected design is finalized to ensure that all potential mitigation measures are in place to reduce the overall air quality impacts of the Simcoe WWTP.

[5] (Ministry of the Environment, Conservation and Parks, 2025)

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Table 3.1: 2051 Projected Annual GHG Emissions for Short Listed Alternatives

2051 GHG Emissions (tonneCO_2e)		
	Alternative 3	**Alternative 4**
THP MODULE		
Electrical consumption	N/A	3
45% KOH solution manufacturing	N/A	174
CONVENTIONAL/LYSTEMIZE DIGESTION		
Fugitive emissions from biogas combustion and flaring	16	16
Digester mixing electrical consumption	12	N/A
THICKENING/DEWATERING		
Polymer manufacturing	9	34
Electrical consumption	0.3	3
TRANSPORTATION		
Biosolids to land application	25	19
Polymer to Simcoe WWTP	0.1	0.3
KOH to Simcoe WWTP	N/A	2
LAND APPLICATION		
Tractor diesel consumption	33	25
Fertilizer offset credit for nitrogen	-144	-218
Fertilizer offset credit for phosphorus	-37	-55
Fertilizer offset credit for potassium	N/A	-61
Fertilizer offset credit for carbon sequestration	-292	-339
TOTAL	**-348**	**-396**

3.9 Existing Roadway

The County, as recognized in the OP, identified the potential need for a collector-level roadway connecting future residential development east of the Simcoe WWTP to Victoria Street. If deemed beneficial, this connection could also serve as a new access route to the WWTP, improving safety and reducing traffic impacts near sensitive areas such as St. Joseph's School and Oakwood Cemetery. Given the projected increase in truck traffic by 2051, this new access road is a key criterion in the screening process. Should both residential and public infrastructure developments require the roadway, a cost-sharing approach (based on usage and vehicle type) may be considered to support its design and construction.

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4. Evaluation Methodology

The project team has established an evaluation framework to guide the development and assessment of biosolids management upgrades alternatives for the Simcoe WWTP. This framework plays a pivotal role in selecting the preferred alternative design concept. The evaluation process is structured following five steps:

Step 1: Identify and Define a Vision for the plant and its context in the Local Community taking into consideration opportunities and constraints (Phase 1)

Step 2: Develop Alternative Solutions Long-List (Phase 2)

Step 3: Complete Screening and Develop Short-listed Solutions (Phase 2)

Step 4: Identify Recommended Preferred Alternative (Phase 2)

Step 5: Confirm Preferred Solution Based on Comments from Public and Review Agencies (Phase 2)

This structured approach ensures a balanced and systematic selection of the most appropriate biosolids management upgrades option for the Simcoe WWTP considering both practical constraints and the long-term impacts of the facility within the community. The evaluation criteria were developed in conjunction with the County, with preliminary criteria used to screen the long-list of alternatives, and more detailed criteria used to compare the short-listed alternatives, as presented in Sections 5.2.1 and 5.3.3, respectively.

4.1 Identification of Constraints and Opportunities

- As outlined in Section 3, several key constraints must be considered in the Preferred Alternative Solution:
- Land Use and Recreational Features: The facility is surrounded by residential areas, with St. Joseph's School, future housing developments, and Oakwood Cemetery to the east. To the west, there is a small commercial area.
- Natural Environment: The Brook Conservation Area and the L.E. & N. Trail are located to the south, providing important recreational and ecological value that must be protected.
- Groundwater and Surface Water Protection: The Simcoe WWTP is near various water sources, including the Lynn River and provincially significant wetlands, which require careful protection of groundwater and surface water quality.

In addition to the facility and regulatory requirements noted above and in Section 1.3, the County identified the following opportunities to improve the existing facilities:

- Newer technologies have become more prominent in the wastewater treatment industry and should be evaluated against conventional technologies.

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- Quality of Biosolids - opportunity to convert biosolids to higher value final product such as Class A product that complies with the Ontario Nutrient Management Act and CFIA fertilizer quality designation. Biosolids are nutrient-rich organic materials produced during the treatment of domestic sewage sludge. Once treated to meet regulatory standards, biosolids can be beneficially reused most commonly through land application. There are two classifications of biosolids considered in this project: Class A and Class B:
  - Class B Biosolids have undergone treatment to reduce pathogens but do not eliminate them entirely. They are subject to additional restrictions for public health and environmental safety. Non-Agricultural Source Material (NASM) Plans (Ontario Ministry of Agriculture and Rural Affairs (OMAFRA) protocols) are required prior to land application. All five wastewater facilities currently produce Class B biosolids.
  - Class A Biosolids must have pathogens reduced to virtually all non-detectable levels and comply with very strict standards for odours, metals, and vector attraction reduction. Class A biosolids are safe for residential home use for lawns and gardens and in agricultural applications. Class A Biosolids are considered fertilizers and therefore NASM Plans are not required.

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5. Alternative Solutions

5.1 Long List of Alternatives

A comprehensive review of the available upgrade options was completed to identify Alternative Solutions that align with the project objectives. The project team identified four Alternative Solutions as presented in Table 5.1.

Table 5.1: Long List of Alternative Solutions

Alternative Solutions	Description
Alternative 1 - Do Nothing	Maintain the existing Simcoe WWTP with no improvements other than regular maintenance. This alternative is used as a baseline comparison for other alternatives. This solution would not meet regulatory compliance.
Alternative 2 – 2016 Master Plan (ISMP)	Upgrading the Simcoe WWTP as per the 2016 ISMP solution and noted in Section 1. Aerobic digestion and thickening of Simcoe Biosolids, and repurposing of the Simcoe WWTP anaerobic digesters for storage of biosolids from Simcoe, and excess biosolids from Port Rowan and Port Dover WWTPs in future.
Alternative 3 – Centralized Anaerobic Digestion	Upgrading the Simcoe WWTP to be a County-wide centralized biosolids treatment facility using anaerobic digestion and biosolids storage with thickening at the Simcoe WWTP.
Alternative 4 – Centralized Thermal Hydrolysis Process	Upgrading the Simcoe WWTP to be a County-wide centralized biosolids treatment facility using thermal hydrolysis process stabilization and biosolids storage at the Simcoe WWTP.

5.2 Preliminary Screening of Alternatives

5.2.1 Screening Criteria and Rationale

The preliminary screening phase is a crucial step aimed at thoroughly examining all proposed Alternative Solutions. The objective is to identify solutions that align with the project's objectives and merit further consideration during the development of alternative concepts. Therefore, it is expected that the Alternative Solutions need to meet the screening criteria as these criteria are considered mandatory criteria. If an Alternative Solution does not meet all criteria, it cannot be advanced to the next phase of the Class EA Study.

Three key criteria were employed during this screening process:

1. Growth Requirements: All alternatives must align with a 2051 planning horizon.
2. Centralized Solution for all County Wastewater Treatment Facilities: According to both the 2007 BMP and the 2016 ISMP, all proposed alternatives must include a centralized, County-wide biosolids management facility.

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3. By 2051, truck traffic to and from the plant is expected to double, making the current Oakwood Avenue access route unsuitable due to safety concerns and restricted access near St. Joseph's school and Oakwood Cemetery. A proposed access road should be included in all alternatives to improve safety, reduce community disruption, and support long-term operational needs, including future plant expansion.

Alternative Solution 1 (Do Nothing) and Alternative Solution 2 (2016 Master Plan) both failed to comply with the preliminary screening criteria. Alternative Solution 1 did not propose any upgrades to the existing facility, which is currently having compliance issues, and therefore must be upgraded and expanded to meet future demands. Additionally, Alternative Solution 1 fails meet MECP requirements due to compliance issues. Alternative Solution 2 (2016 Master Plan) was designed for a 2041 planning horizon, not 2051, and did not include Delhi and Waterford WWTPs in the design basis, making it insufficient for the County's needs. Therefore, both Alternative Solutions 1 and 2 were screened out as future solutions.

Alternative Solutions 3 and 4 both met the preliminary screening criteria and were carried through as short-listed alternatives for further evaluation.

5.2.2 Short-Listed Alternatives

The two short-listed alternatives were developed in more detail and are described in the following sub-sections. In addition to the details below, both alternatives would require a new access road to the plant, to accommodate increased truck traffic and to improve safety for the operators and public. Only Alternative Solution 4 will include enhanced biogas production to be used for energy recovery.

Preliminary site layouts for the two alternatives are summarized in Sections 5.2.2.1 and 5.2.2.2. During the detailed design phase of the project, the chosen alternative site layout will be reviewed and optimized and therefore may be modified from what has been presented. However, the final site layout will remain within the property boundaries and will not impose on the general public.

5.2.2.1 Alternative Solution 3: Centralized Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP

Alternative Solution 3 involves the construction of new anaerobic digesters to digest sludge generated in the liquid treatment train of the Simcoe WWTP, co-thickened sludge from Port Rowan, Port Dover and Delhi WWTPs, and WAS from Waterford WWTP. The anaerobically digested sludge would then be thickened and transferred to new biosolids storage tanks prior to disposal. Like Alternative Solution 4, an important constraint of this solution are the existing digesters, which are aged and would require upgrades. A process flow schematic and preliminary site layout have been provided in Figure 5-1and Figure 5-2 respectively.

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The conceptual level design for the 2051 planning horizon consists of the following:

- Co-thickened sludge from Port Rowan, Delhi, and Port Dover WWTPs as well as WAS from Waterford WWTP would be hauled to a new receiving station that would be constructed at the Simcoe WWTP.
- Co-thickened sludge from Simcoe WWTP and the hauled co-thickened sludge and WAS in the receiving station would be directed to the new anaerobic digesters.
- Digested sludge (Class B biosolids) from the anaerobic digesters would then be conveyed to the thickening facility. The biosolids thickening process would include a rotary drum thickener (RDT) feed tank, polymer dosing system, flocculation tank, two RDT units (one duty/one standby), a filtrate equalization tank, and polymer make-down system. Filtrate would be returned to the head of the Simcoe WWTP liquid treatment train.
- The thickened biosolids would then be conveyed to the new biosolids storage tanks. From storage, the Class B biosolids would be disposed to Townsend lagoon or via land application.
- The biosolids storage tanks would be designed to allow for periodic decanting of the storage tank contents, with supernatant directed to the head of the liquid treatment train. Due to the potential for odour generation during decanting, odour control facilities would be provided.

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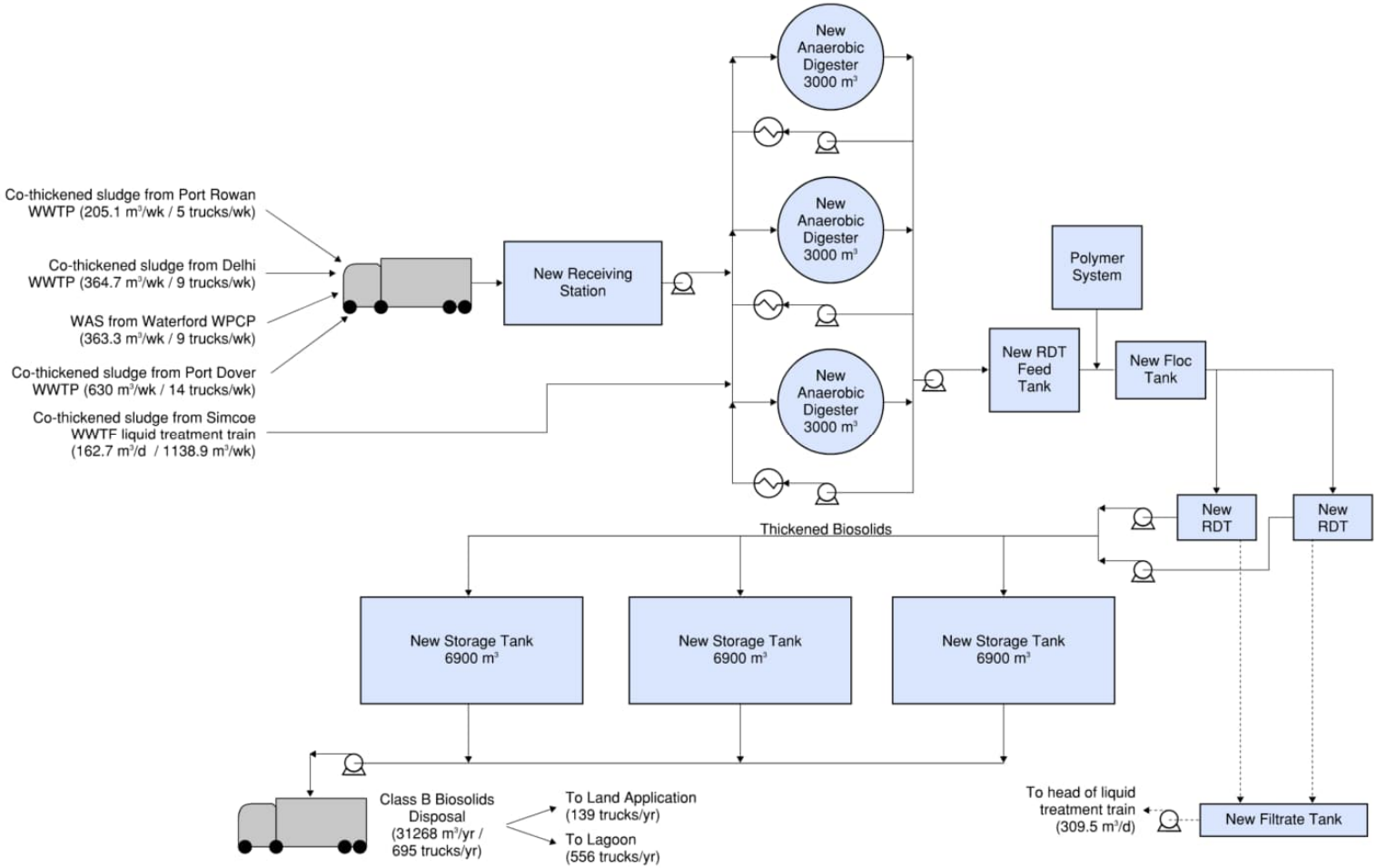


Figure 5-1: Alternative 3 Process Flow Schematic

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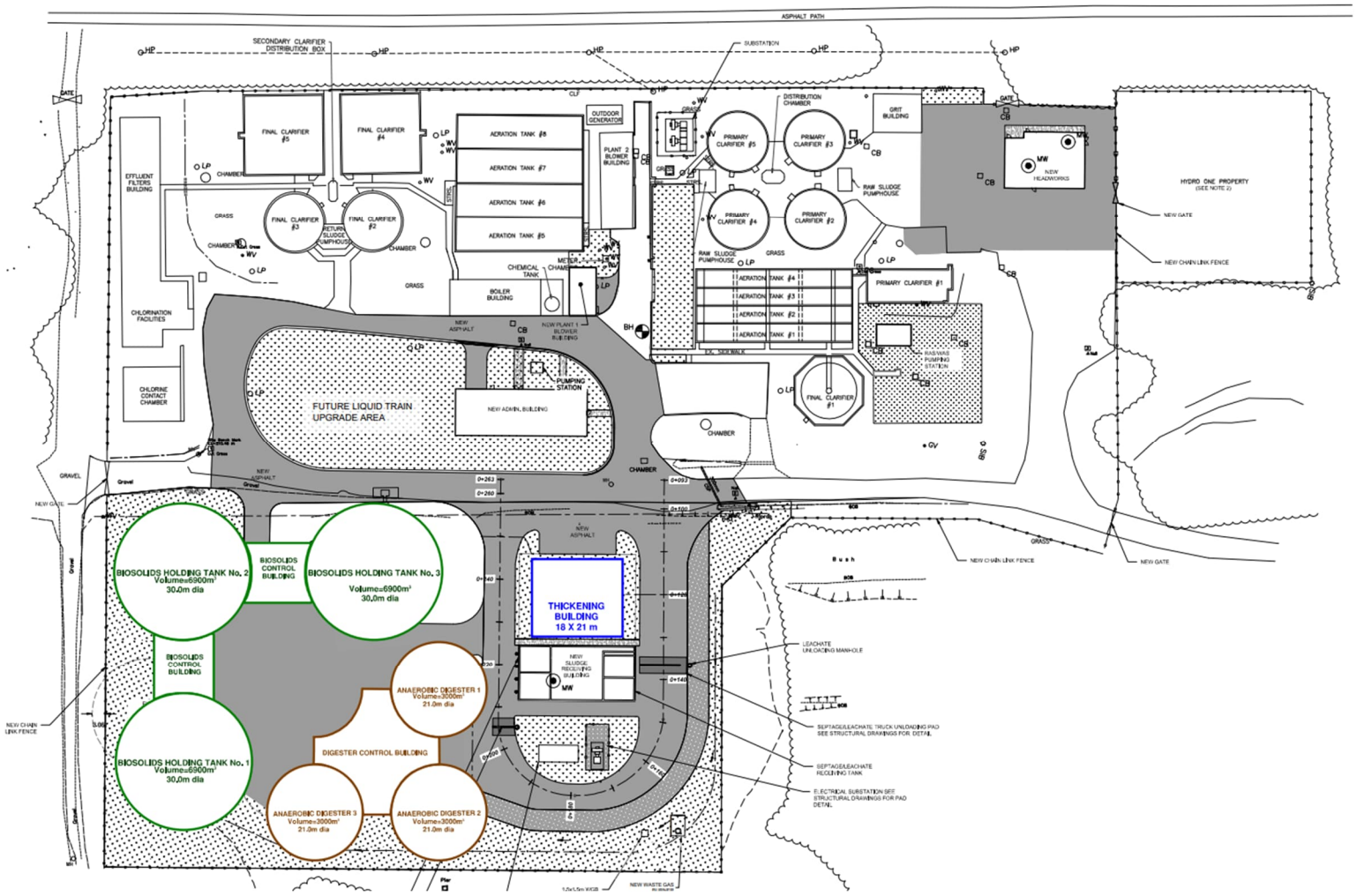


Figure 5-2: Alternative 3 Preliminary Site Layout

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5.2.2.2 *Alternative Solution 4: Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP*

Alternative Solution 4 involves implementing the THP system, including a polymer system, dewatering system, alkali system, THP reactor, an anaerobic digestion tank, a fertilizer storage tank, and an odour control system. This solution would still require upgrading the existing digesters post implementing the THP process. A process flow schematic and preliminary site layout have been provided in Figure 5-3 and Figure 5-4 respectively.

The conceptual level design for the 2051 planning horizon consists of the following:

- Co-thickened sludge from Port Rowan, Port Dover and Delhi WWTPs, and WAS from Waterford WWTP would be hauled to a blend tank in the new receiving station at the Simcoe WWTP, where it would be combined with co-thickened sludge from Simcoe WWTP.
- The contents of the blend tank would then be conveyed to centrifuges, from where each centrifuge would send the dewatered sludge to the dewatered cake tank. Filtrate would be returned to the head of the Simcoe WWTP liquid treatment train.
- The cake from each dewatered cake tank would then be sent to a dedicated THP module, for a total of two THP modules, where it would be combined with alkali (Potassium Hydroxide) and low-pressure steam and sheared prior to being conveyed to the anaerobic digestion tank.
- From the anaerobic digestion tank, the Class A biosolids would be conveyed to the fertilizer storage tanks prior to disposal via land application.

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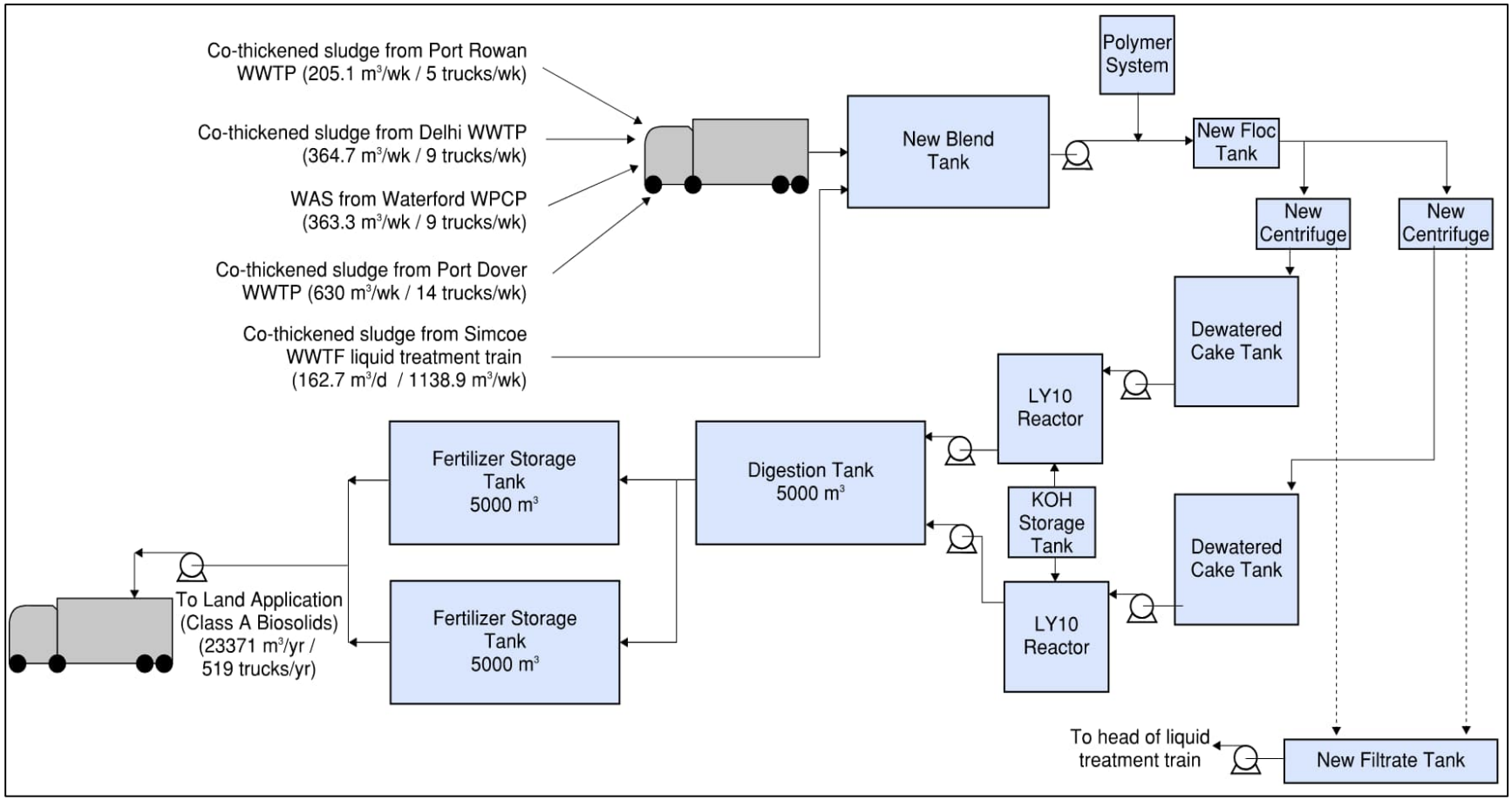


Figure 5-3: Alternative 4 Process Flow Schematic

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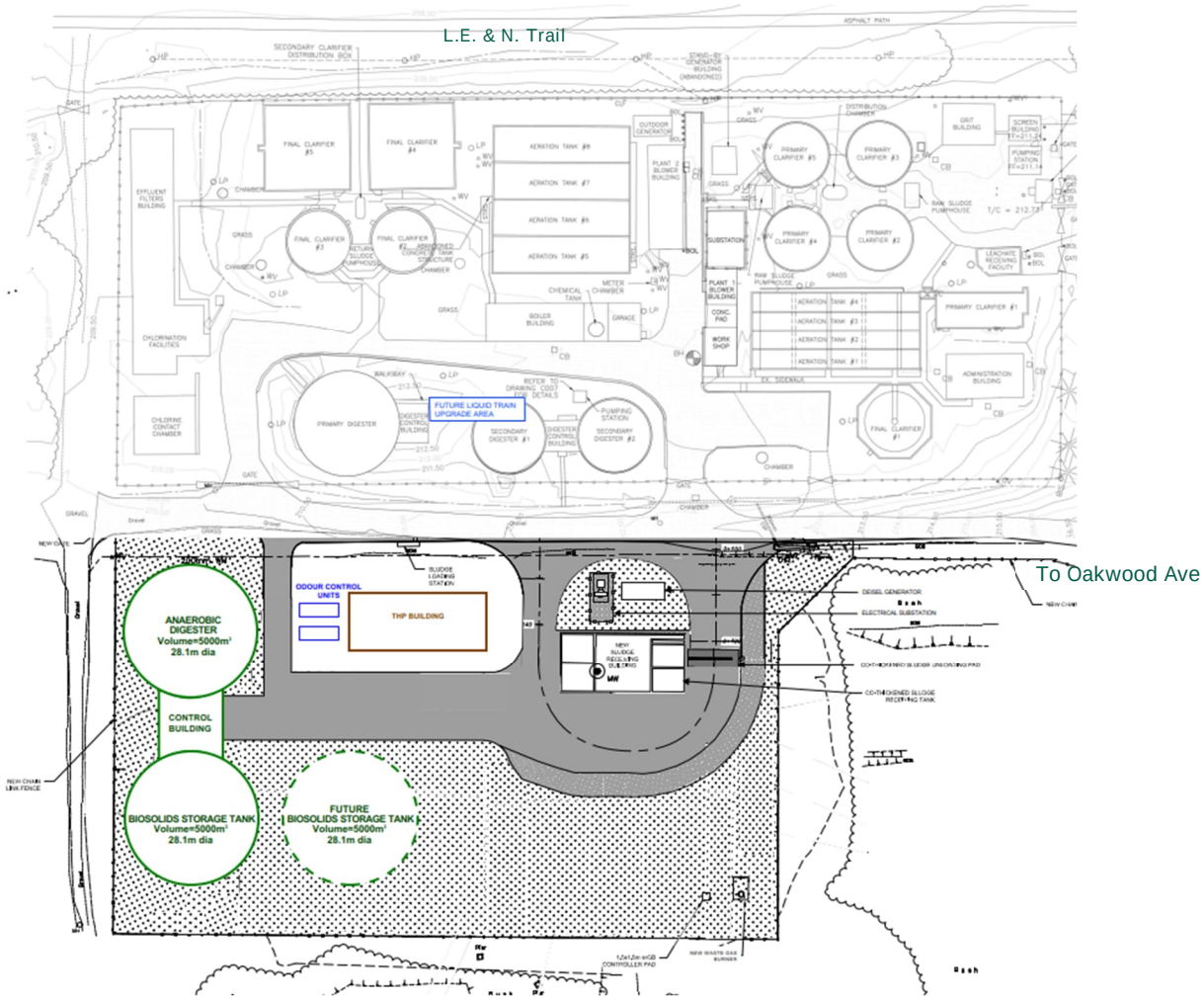


Figure 5-4: Alternative 4 Preliminary Site Layout

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5.3 Evaluation of Short-Listed Alternatives

5.3.1 Comparison of Alternatives

A technical feasibility comparison for Alternative Solutions 3 and 4 was completed, focusing on four major topics: quality of biosolids produced, potential for odours, operational flexibility, and storage requirements on site, as presented in Table 5.2.

Table 5.2: Technical Feasibility Comparison

Alternative 3 – Centralized Anaerobic Digestion	Alternative 4 – Centralized Thermal Hydrolysis Process
Produces Class B biosolids, with higher pathogen levels – less ideal for reuse near communities	Advanced treatment delivers Class A biosolids, safest for community and environment
Odours can be more noticeable, potentially affecting nearby residents	Significantly reduces pathogens and odours, minimizing nuisance to neighbors
Limited operating flexibility as all system components need to be sized to ultimate 2051 flows and loadings, which will impact short term performance if growth is delayed	Higher operating flexibility allows system run time to be adjusted to increase treatment capacity, having no impact on short term performance
Treatment process produces larger volume of biosolids, requiring more trucks (4/week) for hauling compared to THP process and requires larger storage capacity (e.g., 240 days) – increasing land and footprint needs	Onsite storage is not regulated – treatment process produces lower volume of biosolids, requiring fewer trucks for hauling and reducing overall storage requirements – smaller footprint, less land use
Alternative 3 results in slightly higher total GHG emissions than Alternative 4	Achieves greater overall GHG reductions, with a total of -396 tonneCO_2e compared to -348 tonneCO_2e in Alternative 3

5.3.2 Life Cycle Cost Estimates

The cost estimate at this stage of the project is classified as a Class D capital cost estimate and is considered reliable to an accuracy range of -35% to +50% at the conceptual design level. Any escalation of the 2024 cost estimate for the future years should be done based on the construction cost estimates.

The capital costs for each alternative consider all major equipment and tankages, site works, yard piping mobilization, demobilization, bonding, and insurance, and include a 35% contingency as requested by the County. The capital costs exclude upgrades to the existing headworks building.

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The operational costs include energy, chemical, labour, and annual maintenance costs, as well as sludge disposal costs for the base process requirements for each alternative. No allowances were included for the operation of the liquid treatment train.

The County requested that a 25-year life cycle cost analysis to be provided. As the options were considering the design year of 2051, a 27-year-life cycle cost analysis was calculated to consider all costs incurred until 2051. To cover the increases in operational costs due to equipment degradation over time, a 5% increase in annual operational costs was included in the life cycle cost calculation. The life cycle cost has been presented in terms of net present value.

Conceptual cost estimates for the Biosolids Management Upgrades Alternatives 3 and 4 were prepared based on the conceptual layouts developed and with considerations to building footprint, major process requirement, site preparation and construction, and are presented below in Table 5.3.[6]

Table 5.3: Cost Comparison of Alternative Solutions

Indicator/Alternative	Alternative 3	Alternative 4
Capital Cost	$100,330,000*	$56,264,000*
Annual Operation and Maintenance Cost	$530,000**	$915,000
27-year Life Cycle Cost (to 2051)	$121,305,000	$92,455,000
* Proposed Access Road worth $7M-$9M is not included in the capital cost ** Annual Operation and Maintenance Costs including core process elements for each alternative for comparison purposes		

5.3.3 Evaluation Matrix

A comprehensive assessment of the biosolids management alternatives described above is summarized in Table 5.4. Alternatives were examined with consideration of key factors and assessed based on their perceived impacts.

[6] Cost estimates presented in Table 5.3 are from 2024.

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Table 5.4: Evaluation of Alternatives

Evaluation Criteria	Alternative 3 – Centralized Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP	Rating	Alternative 4 – Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP	Rating
Environmental	• Reduction in current CO_2 emissions • Produces lower quality Class B biosolids – E. coli levels must be < 2,000,000 CFU/g • A Non-Agricultural Source Material (NASM) Plan is required for an agricultural operation/ application • Storage at Townsend lagoons required when land application is not feasible	◑	• Reduction in current CO_2 emissions • Achieves Class A biosolids standard – E. coli < 1,000 CFU/g; produces higher quality biosolids • Pathogen and Odour Reduction • Storage at Townsend lagoons no longer required • Enhanced Biogas Production which will be used for energy recovery	◔
Social	• Higher biosolids volume to be hauled from Simcoe WWTP (14 trucks per week) • Increased incoming sludge truck traffic (35 trucks/week) than current operation	◑	• Lower biosolids volume to be hauled from Simcoe WWTP (10 trucks per week) • Increased incoming sludge truck traffic (35 trucks/week) than current operation	◔
Economic	• Higher capital cost • Lower operating cost • Higher life cycle cost	●	• Lower capital cost • Higher operating cost • Lower life cycle cost	◑

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Evaluation Criteria	Alternative 3 – Centralized Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP	Rating	Alternative 4 – Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP	Rating
Technical	• Follows Non-agricultural source materials (NASM) regulatory requirements • Product quality will restrict its use • 240 days of storage and a larger storage footprint • Lower operational risk: o Operating temperatures (<40C) o Process includes gas emissions and explosion risk	◑	• Follows CFIA regulations • Pathogen destruction • Product quality will not restrict its use • Operational flexibility for increased capacity • Higher operational risk: o Operating temperatures (<100C) o Process includes high speed rotating equipment, chemical use, gas emissions, explosion risk	◑
Planning	• Larger footprint with no room for future expansion	◑	• Smaller footprint with room for future expansion	◔

Legend:

Most Preferred Least Preferred

○ ◔ ◑ ◕ ●

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5.3.4 Selection of the Preferred Solution

Alternative 4 – Centralized Thermal Hydrolysis Process has been identified as the preliminary preferred alternative design, offering the best overall balance of environmental protection, community benefit, cost efficiency, and long-term planning. Key advantages include:

- Produces high quality biosolids (Class A), with minimal land application restrictions in Ontario.
- Regulatory compliance assurance, since it is CFIA approved and does not require a NASM.
- Small footprint allows for room for future expansion within current property boundaries.
- High operational flexibility ensures that short-term performance will not be impacted while operating under current conditions.
- Lower 27-year life cycle cost, with modular nature of system allowing County to reduce upfront capital costs.

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6. Details of the Preferred Solution

6.1 Description of Preferred Solution

The basis of design for Alternative 4 – Centralized Thermal Hydrolysis Process includes the following:

- Construction of a new sludge receiving facility.
- Construction of a new THP building (29.5m x 12.5m) to house THP equipment including:
  - Two dewatering centrifuge systems (polymer system, centrifuges, and dewatered cake tanks).
  - Two THP Modules (dewatered biosolids tanks, dewatered biosolids pumps, THP reactors, KOH storage tank, KOH dosing skids, and dual-fuel boilers).
- Electrical/instrumentation and controls panels.
- Construction of two odour control systems.
- Construction of one digestion tank.
- Construction of one storage tank and truck loading systems.
- Enhanced biogas production to be used for potential energy recovery.

In establishing the Simcoe WWTP as a centralized biosolids and storage facility for the County, there will be an increase in truck traffic to and from the treatment plant. To help mitigate truck traffic congestion on Oakwood Avenue and to divert heavy trucks away from sensitive areas including the school and cemetery, a new access road to the plant has been proposed along the west of the plant from either Victoria Street or Sherman Avenue. The road alignment feasibility is currently under review, pending the Class EA completion.

In addition to the items mentioned above, a Phase 2 upgrade would be required at the Simcoe WWTP to support the biosolids facility, which will include:

- New headworks facility with screening and grit separators.
- New septage, raw sewage and leachate receiving stations.
- Electrical substation and stand-by power unit.
- Sludge recirculation pumping stations.
- The site layout of Alternative Solution 4 and the proposed access road is provided in Figure 6.

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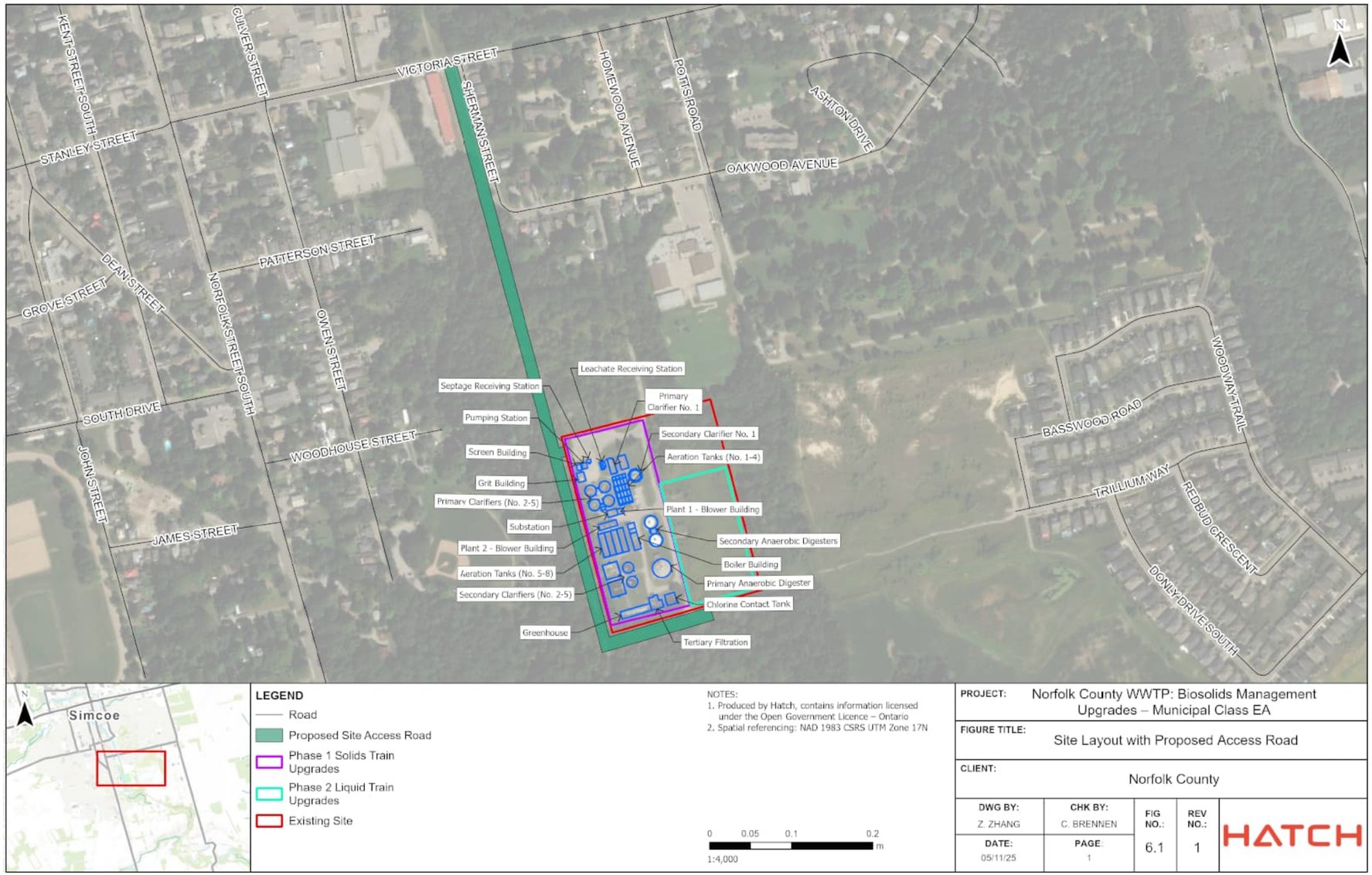


Figure 6-1: Alternative Solution 4 Site Layout and Proposed Access Road

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6.2 Implementation Schedule

The Simcoe WWTP Biosolids Management Upgrades project is planned with detailed design, tendering, and award to be completed by Q4 2026, with construction anticipated to begin in 2027. However, the construction timeline is contingent upon County Council's approval of the capital budget.

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7. Public, Indigenous, and Agency Consultation Process

7.1 Consultation and Engagement Strategy

In accordance with the Class EA, the County completed meaningful consultation efforts with Indigenous communities, relevant stakeholders, interested groups and local community members. The engagement and consultation activities fulfilled the regulatory requirements outlined in the Class EA study and compliance with the Accessibility for Ontarians with Disabilities Act (AODA). These efforts included formal notifications and individual meetings with Indigenous communities and affected stakeholders, as well as the hosting of a Public Information Centre (PIC) to facilitate broader public input.

A Project Contact List was developed during the initial phase of the project and has been regularly maintained to include individuals who requested ongoing updates about project milestones. Initial outreach was conducted via email, and on June 20, 2025, emails containing the Notice of Commencement were distributed to relevant agencies and ministries. Individuals on the contact list receive direct notifications regarding all upcoming meetings and consultation activities. Following the completion of the PIC, the list was updated to include participants who expressed interest in receiving future project updates. The most current version of the Project Contact List is provided in Appendix D.

Government Agencies and Ministries Informed of Notice of Commencement include:

- Ministry of Environment, Conservation and Parks
- Ministry of Natural Resources
- Ministry of Tourism, Culture and Sport
- Ministry of Indigenous Affairs and First Nations Economic Reconciliation
- Ministry of Municipal Affairs and Housing.

On October 9, 2025, the County held a meeting with the Long Point Region Conservation Authority (LPRCA) to discuss the proposed biosolids upgrade project. During the meeting, the County presented an overview of the Class EA, highlighted the preferred design alternatives, and outlined related infrastructure improvements, including access road planning. The discussion also covered the County's long-term objectives in alignment with Ontario's Nutrient Management Act, along with a review of technical and environmental feasibility. Key topics included addressing community and conservation concerns, and identifying next steps related to regulatory approvals, traffic safety, and conceptual design development. Meeting minutes are provided in Appendix E.

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7.2 Indigenous Engagement

Indigenous communities were provided a Notice of Commencement and invitation to participate in an engagement meeting to discuss the specifics of the Project with the Project Team. On June 20, 2025, emails containing the Notice of Commencement were provided to the following Indigenous communities:

- Mississaugas of the Credit First Nation (MCFN)
- Six Nations of the Grand River First Nation (SNGRFN)
- Haudenosaunee Confederacy Chiefs Council (HCCC)
- Haudenosaunee Development Institute (HDI)
- Metis Nation of Ontario Region #9 (MNO #9)

On July 28, 2025, the County hosted a meeting with the MCFN's Department of Consultation and Accommodation. The County provided an overview of the Project and the purpose of the Class EA under Schedule 'B'. The goal of the meeting was to share project background, outline current activities, review key milestones, and provide an opportunity for MCFN to provide their input. The focus of the meeting remained on biosolids management, infrastructure components, and environmental considerations. Minutes from the July 28, 2025 meeting with MCFN are provided in Appendix F.

7.3 Engagement Tracking Log

An Engagement Tracking Log was created and updated to record feedback and outreach during the Project. Information recorded included contact information and a summary of the correspondence. Refer to Appendix G for a copy of the tracking log. The Tracking Log was updated consistently throughout the Class EA process and reflects comments from the PIC 1.

7.4 Public Consultation

The Project followed the Class EA Schedule 'B' consultation process, including a Notice of Commencement, Public Information Centre, and Comment Period.

7.4.1 Notice of Commencement

On June 20, 2025 a Notice of Commencement was issued to each of the identified Ministries, Agencies, and Indigenous communities. For the public and local community, the Notice of Commencement was posted on the County's website on June 23, 2025. A copy of the Notice is provided in Appendix H.

7.4.2 Public Information Centre Notification

On July 25, 2025, a PIC Notice was issued to the identified Ministries, Agencies, and Indigenous communities. The Notice was also made available to the public and local community by posting it on the County's website on the same day. A copy of the Notice is provided in Appendix H.

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7.4.3 *Public Information Centre*

The Project Team hosted the PIC on August 12, 2025, at the Norfolk County Administration Building to solicit information and suggestions on the purpose of the Study, the Study Area, issues and concerns within the Study Area, the list of alternatives, and next steps in the study process. Participants of the PIC were encouraged to actively engage in discussion with the Project team and review the proposed options. Presentation boards, which provided an overview of the Project, were arranged throughout the venue and focused on impacts to the public. These presentation boards (Appendix I) were then uploaded to the County's website and were made accessible as required by the AODA.

7.4.4 *Summary of Public Comments*

Public feedback from the PIC was received through email correspondence and Feedback Forms. Feedback garnered from the PIC was generally positive, with concerns mainly focused on the proposed access road and maintaining the existing L.E. & N. Railway Trail. Mitigation measures related to the trail network are included in Section 8.1.11. The public shared positive feedback in response to the preferred Alternative Solution.

A summary of feedback from the PIC attendees is presented below in Table 7.1 and provided in Appendix J.

Table 7.1: Summary of PIC Public Feedback

Public Issue	Comments	Concerns
Proposed Access Road	Participants noted potential impacts on local trails and increased truck traffic.	Concerns were raised about safety, noise, and disruption to local traffic.
Trail Access & Maintenance	Community members emphasized the importance of preserving safe and reliable access to park trails during and after construction.	Feedback highlighted worries about trail closures, reduced maintenance, and long-term accessibility.

7.4.5 *Notice of Completion*

A Notice of Completion will be issued to the identified Ministries, Agencies, and Indigenous communities, along with the completed Project File Report with a 30-day review period. The Notice will also be made available to the public and local community by posting it on the County's website on the same day. Once the 30-day review period has ended, the project may proceed pending the address of any comments reviewed. A copy of the Notice is provided in Appendix H.

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8. Mitigation of Potential Impacts and Monitoring

8.1 Environmental Considerations and Mitigation Measures

This section outlines the anticipated impacts during construction of the preferred Simcoe WWTP Biosolids Management Upgrades, along with proposed mitigation measures to minimize or avoid them. Through the Schedule 'B' Class EA process, the Preferred Alternative was identified as having the least impact across environmental, social, economic, cultural, and technical considerations.

Like any construction project, temporary impacts such as noise, dust, vibration, and visual changes are expected during the work period. The County will take steps to minimize these impacts and keep the community informed throughout the process. A public engagement process and notification plan will be developed to receive feedback and mitigate any potential construction impacts. All construction work will be carried out in accordance with the Occupational Health and Safety Act (OHSA) and other local regulations. Specific mitigation measures, as described below, are recommended for implementation to reduce anticipated potential impacts.

8.1.1 Natural Environment

As per the Natural Heritage Report in Appendix A, species at risk were found at the southwest corner of the existing facility. Prior to any construction work, all requirements under the Endangered Species Act (ESA) and Species at Risk Act (SARA) must be met and any required coordination with the MECP be completed. Avoidance times for clearing activities will be adhered to. Vegetation clearing activities will be scheduled outside of wildlife avoidance periods: April 1 to September 30 for bats, and March 31 to October 1 for birds.

8.1.2 Cultural and Archaeological Resources

As noted in Section 3.5, a Stage 2 Archaeological Assessment of the proposed biosolids management upgrades location is to be completed prior to the start of any construction activities. Stage 1 AA and Stage 2 AA proposals have also been submitted for the access road location and will be scheduled prior to any construction activities. Indigenous communities have been invited to participate and monitor the archaeology. Findings from the assessment will be used to guide construction planning, with careful attention to avoiding significant areas and protecting sensitive features.

8.1.3 Noise, Odour, Dust, and Vibration

During construction, potential noise effects are expected from both construction traffic and equipment operations. Noise during operation of the Simcoe WWTP is not expected to differ from the existing conditions. The proposed mitigation measures include the following:

- Ensuring all vehicles and construction equipment are equipped with effective muffling devices and are operated in a fashion to minimize noise in the project area.

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- Throughout the construction period, the County will ensure the contractors undertake measures to reduce noise disturbances as much as possible and adhere to local noise by-laws.

Construction traffic could create additional dust and/or mud. The proposed mitigation measures include the following:

- Dust control measures such as the application of water to be implemented as required.
- The County will ensure the contractor maintain public roadways clean and free of mud on a consistent basis.

Once the geotechnical assessment has been completed, there will be a clearer indication of what is buried beneath the proposed biosolids upgrade areas. Prior to construction, a review will be conducted to assess potential vibration disruptions and mitigation measures will be implemented if required.

During construction, the County will maintain a complaint and grievance tracker to document concerns, ensure timely responses, and support transparent communication with the community.

During operations, noise enclosures will be provided for all required equipment to ensure that no workers are exposed to noises greater than 85 A-weighted decibels (dBA) over an 8-hour workday as required by the Ontario Building Code and Occupational Health and Safety regulations. Odour control measures have been integrated into the design to minimize disruptions to surrounding properties, and the construction of two odour control systems will help mitigate odour emissions during operations.

8.1.4 Traffic and Access

As noted in Section 6.1, a new access road is being proposed to mitigate the impact of the increased number of trucks on the surrounding residential streets. The new access road is proposed to replace the existing Oakwood Avenue entrance, which is no longer viable due to restricted truck access during school drop-off and pick-up times and associated safety concerns. The proposed 1 km access route (from either Victoria Street or Sherman Avenue) will divert heavy vehicles away from sensitive areas such as St. Joseph's Elementary School and the Oakwood Cemetery, reducing public safety risks and minimizing disruptions. The road will be constructed to municipal standards, support safe two-way truck traffic, and preserve existing trails and natural features. The road alignment feasibility is currently under review, pending the Class EA completion.

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8.1.5 *Visual and Landscape Impacts*

The proposed solution will be constructed entirely within existing property boundaries, minimizing disruption to surrounding land uses and maintaining low visibility from public roadways. During construction, the County will incorporate visual mitigation measures to limit aesthetic impacts. Post-construction landscaping will be implemented to blend with the natural environment and require minimal ongoing maintenance, supporting long-term operational efficiency. Minimal grading is anticipated for the site.

8.1.6 *Community Engagement*

To ensure transparency and minimize disruptions, notices will be distributed to nearby residents and stakeholders outlining anticipated construction schedules, potential traffic impacts, and mitigation measures. Opportunities for feedback will be provided where feasible, and updates will be shared through multiple channels to maintain clear and consistent communication.

8.1.7 *Erosion and Sediment Control*

In compliance with LPRCA requirements, an erosion and sediment control plan will be developed prior to the start of construction to highlight areas of concern and to outline all required measures are in place to avoid contamination of surrounding water sources.

8.1.8 *Disposal of Excess Material/Soil Management*

An excess soil management plan, including an Assessment of Past Uses, Sampling and Analysis Plan, and a Soil Characterization Report will be developed to outline the expected volume and quality of excess soil and to determine appropriate disposal measures and locations in accordance with Ontario Regulation 406/19: On-site and Excess Soil Management. The plan will also highlight testing requirements to determine any possible contamination. Where possible, excess soil will be reused within the site boundaries.

Best management practices for unknown contamination to be prepared for use by the contractor. These will include isolation of impacted soils in sealed bins, sampling and analytical testing of these soils and the excavation perimeter to assess disposal options.

8.1.9 *Traffic Management During Construction*

There will be increased truck traffic throughout the construction period on the surrounding access roads, including Victoria Street, Sherman Avenue and Oakwood Avenue, from the delivery of construction equipment, construction materials, and removal of excavated material from site. The proposed mitigation measures include the following:

- Appropriate hours of work will be specified in the contract, considering neighbourhood requirements such as school pick up/drop off times where possible.
- Truck access to and from the site will be limited to the new access road entrance.
- Any lane closures will be completed in accordance with best practices to protect the safety of the workers and the general public.

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- Residents in the area will be kept informed ahead of time of any road closures and anticipated timing, as well as the overall schedule of construction.
- All standard best practices for vehicle and pedestrian safety will be employed throughout the construction areas.

8.1.10 GHG Emissions Control/Efficient Design

A preliminary evaluation of GHG Emissions was conducted. Prior to construction, further evaluation will be completed to determine overall GHG emissions, and to ensure that all measures are in place to optimize the system while reducing overall emissions.

8.1.11 Lake Erie and Northern Railway Trail

It is recognized that the L.E. & N. Railway is an important trail connection between Simcoe and Port Dover supporting recreational and inter-community movements. The right of way for the proposed new access road, should be designed to accommodate a new trail within its western boulevard area and ideally buffered from the road with landscaping and minor berming (if possible). During construction, a trail detour should be considered – possibly along Sherman to Oakwood and south onto Potts Road to Oakwood Cemetery and into the development lands (by Agreement) to the east. Users could then re-connect with the trail by entering back into the WWTP lands at their south limit. The detour would minimize impact on trail users until the reconfigured trail could be re-opened along the new roadway.

8.2 Monitoring

Throughout the construction phase, the County will conduct regular checks to ensure that all required mitigation measures outlined above are being followed to ensure compliance with local by-laws.

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9. Approval and Permits

Permits and approvals required to implement the preferred design for the Simcoe WWTP Biosolids Management Upgrades are shown in Table 9.1.

Table 9.1: Simcoe WWTP Biosolids Management Upgrades – Permits and Approvals

Approval Agency	Permits/Approval Required
Electrical Safety Authority	• Notification of Electrical Work Permit
Ministry of Environment, Conservation and Parks	• Species at Risk Act Permit • ECA Amendment
Norfolk County	• Building Permit • Site Plan Approval
Long Point Region Conservation Authority	• Prohibited Activities, Exemptions and Permits

10. References

Map Norfolk Community Web Map. (2025). Retrieved from https://norfolk.maps.arcgis.com/apps/webappviewer/index.html?id=c6683057b83744dfb36afb773ba09135

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Appendix A

Natural Heritage Report

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Norfolk County
Simcoe Wastewater Treatment Plant - Biosolids Management Upgrades - Municipal Class Environmental Assessment

Natural Heritage Report

2025-12-15	0	Final	J. Néné	C. Sehl	O. Koc
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**
HATCH					

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1. Introduction

Hatch Ltd. (Hatch) has been retained by Norfolk County to complete an Environmental Assessment in support of the Simcoe Wastewater Treatment Facility (WWTF) upgrades. The existing WWTF is located at 16 Oakwood Avenue, Simcoe. The subject property for the screening is defined as the existing facility and the proposed development adjacent the existing facility. The study area consists of the subject property and a 250-m radius. The subject property is located within the Long Point Region Conservation Authority (LPRCA) regulated area. The study area, subject property and LPRCA boundaries are located on Figure 2.

2. Desktop Analysis

A background review (desktop analysis) was previously conducted to determine potential Species at Risk (SAR) or Species of Conservation Concern (SCC) presence within the study area. During this exercise, data was compiled from various secondary sources. Sources include the Ontario Breeding Bird Atlas (OBBA), Ontario Butterfly Atlas (OBA), Natural Heritage Information Centre (NHIC), Ontario Reptile and Amphibian Atlas (ORAA), iNaturalist, and eBird. The following species were identified and are outlined in Table 2-1 below. SAR are those listed as Threatened or Endangered under the *Species at Risk Act, 2002* (SARA). SCC are those considered:

- Special Concern under SARA and the *Endangered Species Act, 2007* (ESA),
- Special Concern under the ESA but not under SARA, and
- Unregulated species with an S-Rank of S3 or lower.

Table 2-1: Desktop Review Results for SAR/SCC Within the Study Area

Species Common Name	Species Scientific Name	*Species at Risk Act* Status	*Endangered Species Act* Status	Background Source(s)
Birds				
Bank Swallow	*Riparia riparia*	Threatened	Threatened	OBBA (May 2025)
Barn Swallow	*Hirundo rustica*	Special Concern	Special Concern	OBBA (May 2025)
Bobolink	*Dolichonyx oryzivorus*	Threatened	Threatened	OBBA (May 2025)
Canada Warbler	*Cardellina canadensis*	Special Concern	Special Concern	OBBA (May 2025)

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Species Common Name	Species Scientific Name	*Species at Risk Act* Status	*Endangered Species Act* Status	Background Source(s)
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	OBBA (May 2025)
Eastern Meadowlark	*Sturnella magna*	Threatened	Threatened	NHIC, OBBA (May 2025)
Eastern Wood-pewee	*Contopus virens*	Special Concern	Special Concern	NHIC, OBBA (May 2025)
Grasshopper Sparrow	*Ammodramus savannarum*	Special Concern	Special Concern	OBBA (May 2025)
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Endangered	Endangered	NHIC, OBBA (May 2025)
Wood Thrush	*Hylocichla mustelina*	Threatened	Special Concern	NHIC, OBBA (May 2025)
Herpetofauna				
Blanding's Turtle (Great Lakes/St. Lawrence population)	*Emydoidea blandingii*	Endangered	Threatened	ORAA (May 2025)
Eastern Foxsnake (Carolinian and Great Lakes/St. Lawrence population)	*Pantherophis vulpinus*	Endangered	Threatened	ORAA (May 2025)
Eastern Hog-nosed Snake	*Heterodon platyrhinos*	Threatened	Threatened	ORAA (May 2025)
Massasauga (Carolinian Population)	*Sistrurus catenatus pop. 2*	Endangered	Endangered	ORAA (May 2025)
Northern Map Turtle	*Graptemys geographica*	Special Concern	Special Concern	ORAA (May 2025)
Northern Ribbonsnake (Great Lakes Population	*Thamnophis sauritus septentrionalis*	Special Concern	Special Concern	ORAA (May 2025)
Snapping Turtle	*Chelydra serpentina*	Special Concern	Special Concern	NHIC, ORAA (May 2025)
Insects				
Macropis Cuckoo Bee	*Epeoloides pilosulus*	Endangered	Extirpated	NHIC (May 2025)
Monarch	*Danaus plexippus*	Endangered	Not Regulated	OBA (May 2025)
One-banded Mason Wasp	*Ancistrocerus unifasciatus*	Not Regulated	Not Regulated	NHIC (May 2025)
Rusty-patched Bumblebee	*Bombus affinis*	Endangered	Endangered	NHIC (May 2025)

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Species Common Name	Species Scientific Name	*Species at Risk Act* Status	*Endangered Species Act* Status	Background Source(s)
Mammals				
Eastern Small-footed Myotis	*Myotis leibii*	Not Regulated	Endangered	MWH (2023)
Little Brown Myotis	*Myotis lucifugus*	Endangered	Endangered	MWH (2023)
Northern Myotis	*Myotis septentrionalis*	Endangered	Endangered	MWH (2023)
Tri-coloured Bat	*Pipistrellus subflavus*	Endangered	Endangered	MWH (2023)
Eastern Red Bat	*Lasiurus borealis*	Endangered	Endangered	Added by Hatch
Hoary Bat	*Lasiurus cinereus*	Endangered	Endangered	Added by Hatch
Silver-haired Bat	*Lasionycteris noctivagans*	Endangered	Endangered	Added by Hatch
Plants				
Autumn Coralroot	*Corallorhiza odontorhiza*	Not Regulated	Not Regulated	NHIC (May 2025)
Bird's-foot Violet	*Viola pedate*	Endangered	Endangered	NHIC (May 2025)
Broad Beech Fern	*Phegopteris hexagonoptera*	Special Concern	Special Concern	NHIC (May 2025)
Carolina Vetch	*Vicia caroliniana*	Not Regulated	Not Regulated	NHIC (May 2025)
Hairy Hawkweed	*Hieracium longipilum*	Not Regulated	Not Regulated	NHIC (May 2025)
Moss Phlox	*Phlox subulate*	Not Regulated	Not Regulated	NHIC (May 2025)
Walter's Barnyard Grass	*Echinochloa walteri*	Not Regulated	Not Regulated	NHIC (May 2025)

3. Survey Methods

3.1 Breeding Birds

Targeted breeding bird surveys were completed across two site visits on May 28 and July 4, 2025, in accordance with the Ontario Breeding Bird Atlas survey protocols (2021). A combination of five-minute point counts and an area search was completed by a Hatch biologist to document the highest level of breeding evidence associated with all bird species observed within the subject property.

3.2 Vegetation Communities

A high-level vegetation assessment was completed for the subject property and adjacent woodlands in accordance with Ecological Lands Classification for Southern Ontario (Lee et al. 1998). Vegetation communities were identified to ecosite level where feasible, with the dominant plant species recorded.

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4. Survey Results

The following sections outline the results of the surveys described in Section 3. Table 4-1 below outlines the weather conditions present on site during the time of the investigation.

Table 4-1: Weather Conditions Summary

Date (2025)	Time (24hrs)	Cloud Cover (%)	Wind Speed (Beaufort Scale)	Precipitation	Air Temperature (˚C)
May 28	0620	100	2	Light drizzle prior to survey	11
July 4	0732	0	1	None	17

4.1 Breeding Birds

A total of 35 bird species were observed during 2025 targeted breeding bird surveys. Of those observed, five species exhibited confirmed breeding evidence including Red-headed Woodpecker (*Melanerpes erythrocephalus*), Song Sparrow (*Melospiza melodia*), Yellow Warbler (*Setophaga petechia*), Gray Catbird (*Dumetella carolinensis*) and Red-winged Blackbird (*Agelaius phoeniceus*). Probable breeding evidence was observed for 13 species including, American Robin (*Turdus migratorius*), Indigo Bunting (*Passerina cyanea*), Cedar Waxwing (*Bombycilla cedrorum*) and Great Crested Flycatcher (*Myiarchus crinitus*).

SAR birds were observed exhibiting breeding evidence directly adjacent to the property including:

- Redheaded Woodpecker (*Chaetura pelagica*) – Endangered; and
- Chimney Swift (*Chaetura pelagica*) – Threatened.

One SCC, Barn Swallow (*Hirundo rustica*) was observed exhibiting possible breeding evidence within the subject property. One SCC species, Eastern Wood-pewee (*Contopus virens*), was observed exhibiting possible breeding evidence within the study area but was not observed within the subject property. A full list of bird species from within the study area can be found in Appendix B. Point count and area-search transect locations are shown on Figure 1.

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4.2 Vegetation Communities

Vegetation communities within the subject property are characterized as primarily Mineral Cultural Meadow Ecosite (CUM1) and Black Walnut Deciduous Plantation Type (CUP1-3) ecosites. The CUM1 community is dominated by Canada/Tall Goldenrod (*Solidago sp.*) with occasional patches of Kentucky Bluegrass (*Poa pratensis*), Dame's Rocket (*Hesperis matronalis*) and Tufted Vetch (*Vicia cracca*). The CUP1-3 ecosite is dominated by Black Walnut (*Juglans nigra*) and Manitoba Maple (*Acer negundo*) with lesser proportions of *Prunus sp*., White Spruce (*Picea glauca*), Scots Pine (*Pinus sylvestris*), American Elm (*Ulmus americana*) and Eastern Cottonwood (*Populus deltoides*). A full list of plant species from within the study area can be found in Appendix C. Vegetation communities are shown on Figure 1.

4.3 Incidental Wildlife

Two mammal species, Eastern Cottontail (*Sylvilagus floridanus*) and White-tailed Deer (*Odocoileus virginianus*), were observed incidentally within the subject property during 2025 field visits.

5. Potential Constraints

5.1 Species at Risk

During the initial background review, 18 SAR and 16 SCC were observed to have potential to occur within the study area. Two SAR and two SCC were observed within the study area by Hatch Biologists during the 2025 field season. Of those, two SAR and one SCC, Red-headed Woodpecker, Chimney Swift (*Chaetura pelagica*) and Barn Swallow, respectively, were observed within or directly adjacent to the subject property. An additional nine SAR and four SCC were determined to have potential to occur within the subject property but were not observed. Full results of the SAR/SCC screening can be found in Appendix A.

Red-headed Woodpecker

A Red-headed Woodpecker individual was observed entering a nesting cavity in a large Eastern Cottonwood snag, immediately adjacent to the subject property (Figure 2) during the July 4 site visit. This species is listed as *Endangered* under the ESA and SARA. The federal recovery strategy (Pickett et al., 2019) identifies critical habitat for this species as a radius of 200m centered on a nesting cavity location. Within the 200m radius, critical habitat is defined as the extent of biophysical attributes within the area. Biophysical attributes generally include treed areas, decadent deciduous trees with minimum 18cm diameter at breast height (DBH) or dead/dying limbs with 13cm diameter or more, and other vegetated areas within 50m of a dripline or decadent tree.

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Eastern Massasauga

The Eastern Massasauga (*Sistrurus catenatus*) was identified during the desktop investigation (ORAA 2025). It is noted that the species is largely considered extirpated from the general study area.

SAR Bats

Seven SAR bats found within the study area were determined to have potentially suitable habitat within the subject property. Buildings are present and may provide suitable roosting. Additionally, potentially suitable roosting trees have been observed within the study area and may be present within the CUP1-3 community. While no bats were observed during the 2025 site visits, targeted bat surveys were not completed.

5.1.1 Species of Conservation Concern

Northern Ribbonsnake

The Northern Ribbonsnake (*Thamnophis sauritus septentrionalis*) was determined to have potential to occur within the study area (ORAA 2025). Additionally, suitable habitat for this species persists within the subject property. While this species was not observed during the 2025 site visits, targeted surveys for this species were not completed.

Vascular Plants

Three SCC plant species found within the study area were determined to have potentially suitable habitat within the subject property including, Autumn Coralroot (*Corallorhiza odontorhiza*), Moss Phlox (*Phlox subulate*) and Hairy Hawkweed (*Hieracium longipilum*). While these species were not observed during the 2025 site visits, targeted vascular plant surveys were not completed.

5.2 Significant Wildlife Habitat

During the July 4 site visit three Barn Swallow individuals were observed within suitable breeding habitat within the subject property, indicating possible breeding evidence. Barn Swallow is designated as *Special Concern* under the ESA and *Threatened* under Schedule 1 of SARA.

Although presence of *Special Concern* species qualifies as Significant Wildlife Habitat under the Significant Wildlife Habitat Criteria Schedule for Ecoregion 7E, this species was only observed exhibiting possible breeding evidence. Additionally, this species was observed primarily in the vicinity of the man-made structures within the subject property. Barn Swallows nest on a variety of man-made structures (sheds, stables, barns, buildings, bridges, etc.). Given that these structures are more likely being utilized than natural features and that suitable foraging habitats persist directly adjacent to the subject property, significant wildlife habitat for this species is deemed not present within the subject property.

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5.3 Regulated Areas

The Long Point Region Conservation Authority regulated area is mapped along the western boundary and encroaches on the southwest portion of the subject property (Figure 2). Under section 28 of the *Conservation Authorities Act* (1990) (CAA) development activities are not permitted within the jurisdiction of an authority. An application for permit must be completed in accordance with *O. Reg 41/24* for any proposed development activities within regulated areas.

6. Conclusion and Recommendations

6.1 Species at Risk

With the recent introduction of Bill 5, the ESA is set to be repealed and replaced by *The Species Conservation Act 2025* (SCA). Additionally, the definition of 'habitat' under the ESA has changed, as it pertains to SAR. Processes involving SAR continues to operate under the ESA framework until the SCA comes into force.

6.1.1 Red-headed Woodpecker

Critical habitat for Red-headed Woodpecker persists within the subject property (Figure 2). Given that critical habitat overlaps with the desired footprint of the facility upgrades, an authorization under the ESA may be required where construction is planned within forested habitat within 200 m of the nest occurrence. It is recommended an Information Gathering Form be submitted to the Ministry of the Environment, Conservation and Parks prior to any site clearing or construction activities within the CUM1 community during the active nesting season, to avoid contravention of the ESA. It should be noted that it is expected that the current ESA is expected to be repealed in early 2026, to be replaced by the *Species Conservation Act* (SCA). The SCA is not expected to be applicable to migratory birds regulated under the *Migratory Bird Convention Act or Species at Risk Act* and therefore this species is only expected to be regulated federally.

6.1.2 Chimney Swift

During the July 4 visit, two Chimney Swift individuals were observed flying above suitable nesting habitat directly adjacent to the subject property, indicating possible breeding evidence. The two individuals were observed circling above two large Eastern Cottonwood snags containing various cavities. Chimney Swifts primarily nest in chimneys and other man-made structures but will also nest in tree cavities. Chimney Swifts are listed as *Threatened* under the ESA and SARA. Although this species was observed during the July 4 visit it was not observed during the May 28 site visit, indicating possible breeding evidence. As such, it is unlikely this species is nesting in close proximity to the subject property and is likely utilizing man-made structures within the town of Simcoe.

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6.1.3 Eastern Massasauga

Historical records from the ORAA indicate Eastern Massasauga within the study area. Populations of this species are tracked by the province and occurrences are well-known. The remaining Carolinian populations of this species are generally reserved to isolated areas in Niagara and Essex. Given that remaining populations are well-known and that historical records from the study area are well-dated (1961), this species is deemed not present within the study area.

6.1.4 SAR Bats

Potentially suitable bat roosting buildings were identified within the subject property. Additionally, potential bat roosting trees were identified within the study area and may persist within the CUP1-3 community. The proposed facility upgrades are not anticipated to affect any of the existing potential roost buildings on site. Some boundary trees associated with the CUP1-3 community may be cleared to facilitate facility upgrades. It is recommended all tree clearing activities be completed outside of the April 1 to September 30 bat active window. All pruning and tree removals should occur between October 1 and March 31 to avoid possible contravention of the ESA.

6.2 Migratory Birds

The *Migratory Birds Convention Act* (1994) (MBCA) prohibits the destruction of a nest or eggs of migratory birds. It is recommended all vegetation clearing be completed outside of the April 1 to August 31 migratory bird active nesting period. All vegetation removals should occur between September 1 and March 31 to avoid contravention of the MBCA.

6.3 Regulated Areas

In order to facilitate development within the LPRCA regulated area, a permit application must be submitted to remain in compliance with CAA. The proposed facility upgrades are not anticipated to occur within the LPRCA regulated area therefore, a permit application is not required (Figure 3).

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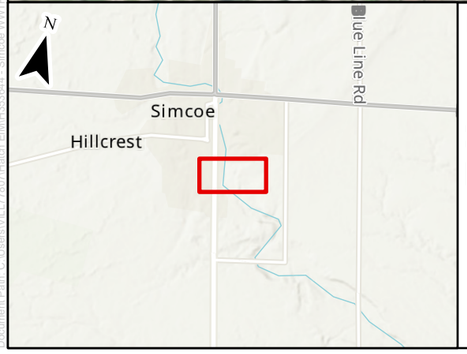
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Figure 1: ELC and Survey Locations

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LEGEND

- Breeding Bird Survey Location
- Breeding Bird Survey Transect
- Subject Property
- Study Area

Ecological Land Classification (ELC)

- CUM1 – Mineral Cultural Meadow Ecosite
- CUP1-3 Black Walnut Deciduous Plantation

NOTES:
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2. Spatial referencing: NAD 1983 UTM Zone 17N

0 0.05 0.1 0.2 m

1:4,000

PROJECT:	Simcoe Wastewater Treatment Plant Upgrades Class Environmental Assessment (EA) Study
FIGURE TITLE:	Ecological Land Classification (ELC) and Survey Locations
CLIENT:	Norfolk County

DWG BY:	CHK BY:	FIG NO.:	REV NO.:
S. PERRY	J. NENE	1	1
DATE: 28/07/25	**PAGE:** 1		

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Plotted By: C. Davis/VAL1/HATCH on: 28/07/2025 10:38:00 AM | Drawing File: G:\GIS\NAMWP\Norfolk County\Simcoe WWTP Upgrades\GIS\MXD\Simcoe_BreedingBird_Survey.mxd

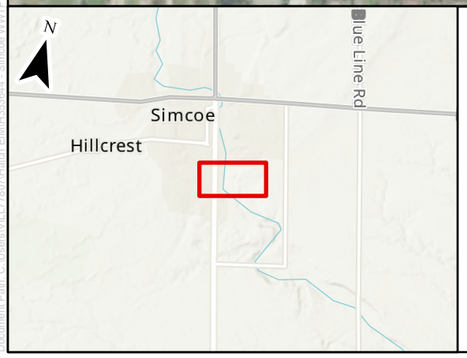
Figure 2: Potential Constraints

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N

RHWO Nest



LEGEND

- Red-headed Woodpecker Nesting Snag
- Subject Property
- Study Area
- Red-headed Woodpecker Critical Habitat
- Long Point Region Conservation Authority Regulated Area

NOTES:
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2. Spatial referencing: NAD 1983 UTM Zone 17N
3. Long Point Region Conservation Authority (LPRCA) Regulated Area digitized from LPRCA online mapping application, July 2025

0 0.05 0.1 0.2 m

1:4,000

PROJECT:	Simcoe Wastewater Treatment Plant Upgrades Class Environmental Assessment (EA) Study
FIGURE TITLE:	Potential Constraints
CLIENT:	Norfolk County

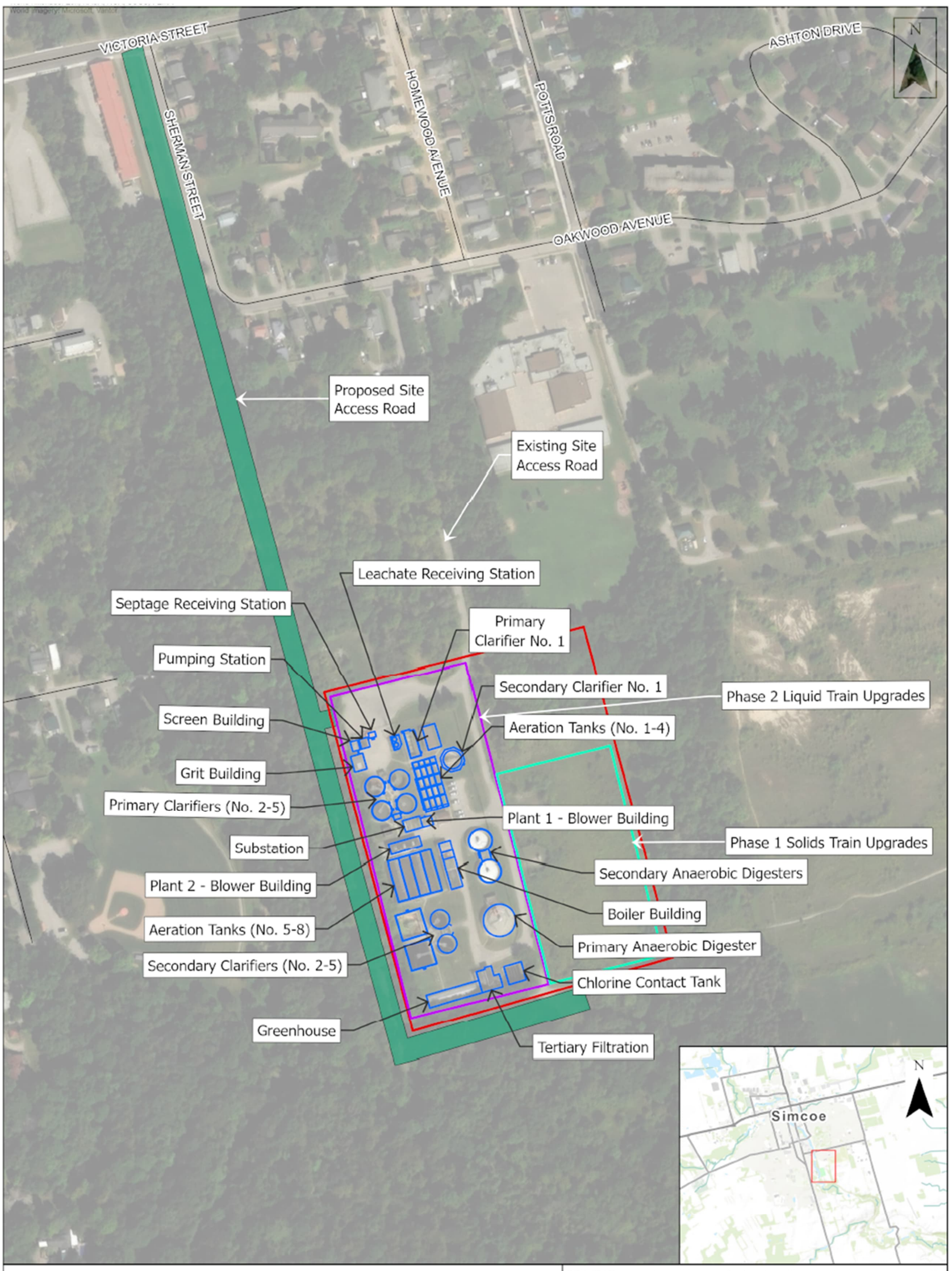
DWG BY:	CHK BY:	FIG NO.:	REV NO.:
S. PERRY	J. NENE	2	1
DATE: 28/07/25	**PAGE:** 1		

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Figure 3: Proposed Site Plans

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Appendix A

SAR/SCC Screening Table

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Birds						
Bank Swallow	*Riparia riparia*	Threatened	Threatened	OBBA (May 2025)	This species is a colonial nester, utilizing vertical cliffs or banks, which are most often found along natural bluffs or eroding streamside banks. They can also inhabit man-made sites such as sand, gravel or road cuts.	No – This species was not detected by Hatch biologists during targeted breeding bird surveys.
Barn Swallow	*Hirundo rustica*	Special Concern	Special Concern	OBBA (May 2025)	Commonly associated with human structures such as buildings, open barns, bridges and culverts where their mud nest-cups can be built.	Yes – This species was observed by a Hatch Biologist in suitable breeding habitat within the subject property, during the July 4, 2025 site visit.
Bobolink	*Dolichonyx oryzivorus*	Threatened	Threatened	OBBA (May 2025)	Commonly found in areas with medium to tall grass – meadows or tall grass prairies.	No – While no individuals were observed within the subject property during targeted breeding bird surveys, potential suitable habitats persist to the east of the subject property.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Canada Warbler	*Cardellina canadensis*	Special Concern	Special Concern	OBBA (May 2025)	Found in various forests with well-developed shrubbery, including: wet mixed forests, riparian shrub forests, and old-growth forests with open canopies.	No – While no individuals were observed within the subject property during targeted breeding bird surveys, potential suitable habitats persist to the south of the subject property.
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	OBBA (May 2025)	Originally nested in natural sites such as caves and hollow trees in old-growth forests. Modern nesting occurs in chimneys and other various artificial sites (silos, barns, sheds, air vents). Common in areas with large concentrations of chimneys for nest sites and roosts.	Possible – This species was observed by a Hatch Biologist in suitable breeding habitat immediately adjacent to the subject property, during the July 4, 2025 site visit.
Eastern Meadowlark	*Sturnella magna*	Threatened	Threatened	NHIC, OBBA (May 2025)	Primarily in moderately tall grasslands, such as pastures and hayfields – can also be found in alfalfa fields, weedy borders of croplands, roadsides, orchards, overgrown fields, and other open areas.	No – While no individuals were observed within the subject property during targeted breeding bird surveys, potential suitable habitats persist to the east of the subject property.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Eastern Wood-pewee	*Contopus virens*	Special Concern	Special Concern	NHIC, OBBA (May 2025)	Mid-canopy layer of forest clearings and edges of deciduous and mixed forests. Intermediate-age mature forest stands w/ little understory vegetation.	No – This species was observed by a Hatch Biologist in suitable breeding habitat within the study area, during the July 4, 2025 site visit.
Grasshopper Sparrow	*Ammodramus savannarum*	Special Concern	Special Concern	OBBA (May 2025)	Open grassland areas w/ well-drained, sandy soil. Also nest in hayfields and pasture, alvars, prairies; occasionally grain crops such as barley. Prefers areas sparsely vegetated.	No – While no individuals were observed within the subject property during targeted breeding bird surveys, potential suitable habitats persist to the east of the subject property.
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Endangered	Endangered	NHIC, OBBA (May 2025)	Associated with open woodland and woodland edges; areas typically have many dead trees used for nesting and perching.	Yes – Confirmed breeding evidence was observed for this species by Hatch Biologists during the July 4, 2025 field visit, immediately adjacent to the subject property.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Wood Thrush	*Hylocichla mustelina*	Threatened	Special Concern	NHIC, OBBA (May 2025)	Nests mainly in second growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Prefers large forest mosaics but may also nest in small forest fragments.	No – This species was not observed within the subject property during targeted breeding bird surveys. Potential suitable habitats persist to the south of the subject property.
Herpetofauna						
Blanding's Turtle (Great Lakes/St. Lawrence population)	*Emydoidea blandingii*	Endangered	Threatened	ORAA (May 2025)	Inhabit shallow lakes, ponds and wetlands with clean water and mucky bottoms, make the largest overland movement of any Ontario turtles, travelling up to several kilometres between summer habitat and nesting sites or overwintering habitat. This species hibernates in the soft bottoms of water bodies. Particularly in the spring, the Blanding's turtle basks on rocks, logs or substrates in sunny locations.	No – No suitable habitats persist within the subject property or study area.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Eastern Foxsnake (Carolinian and Great Lakes/St. Lawrence population)	*Pantherophis vulpinus*	Endangered	Threatened	ORAA (May 2025)	Generally use unforested habitats such as shorelines, prairies, savannahs, rock barrens and wetlands, and are most commonly found in shoreline edge habitats. This species does use forests and forest edge habitat, however, especially along the eastern shore of Georgian Bay. Females require rotten logs, stumps, decaying leaf piles and other features with appropriate conditions for incubating eggs. In southwestern Ontario, will use building foundations, drainage ditches, hedgerows, old wells and so on. In this region, nesting sites often consist of old piles of rotten leaves, wood chips and compost.	No - Subject property is predominantly cultural meadow habitats which is unsuitable for this species.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Eastern Hog-nosed Snake	*Heterodon platyrhinos*	Threatened	Threatened	ORAA (May 2025)	Inhabits fields, forests, shrubland, beaches and old dune habitats. Along the eastern shore of Georgian Bay, it can also be found in forest clearings and rock outcrops, as long as other suitable habitat is available nearby. This species is generally found in habitats with sandy, well-drained soils, into which this snake burrows. It is commonly encountered on beaches due to its affinity for open, sandy areas.	No – Sandy soils that are preferred by this species are not present within the subject property.
Massasauga (Carolinian Population)	*Sistrurus catenatus pop. 2*	Endangered	Endangered	ORAA (May 2025)	Generally associated with water, are rarely found more than 50 kilometres from the Great Lakes, and often inhabit wetlands near rivers. The Massasauga is a habitat generalist and can be found in forests, meadows, shoreline habitats, wetlands, rock barrens, grasslands and old fields. The species requires very specific microhabitat features within these habitats for mating, hunting and especially thermoregulation.	Possible – Meadows and forested habitats persist within the subject property and may provide suitable habitat for this species.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Northern Map Turtle	*Graptemys geographica*	Special Concern	Special Concern	ORAA (May 2025)	Inhabit large rivers and lakes with slow-moving water and a soft bottom. They require high-quality water that supports the female's mollusc prey. These turtles may congregate in areas with abundant basking sites.	No – Subject property does not contain any waterbodies.
Northern Ribbonsnake (Great Lakes Population	*Thamnophis sauritus septentrionalis*	Special Concern	Special Concern	ORAA (May 2025)	Semi-aquatic and is almost always found close to water, such as wetlands and the shorelines of lakes and rivers. The wetland and shoreline habitats that ribbonsnakes inhabit are generally near forests, and this species tends to be absent from regions with little to no forest cover. The species may rely on forested areas to provide upland habitats that it uses for overwintering and birthing sites.	Possible – Subject property is in close proximity to an unnamed watercourse (<100m). This species may be present within forested habitats adjacent to the watercourse.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Snapping Turtle	*Chelydra serpentina*	Special Concern	Special Concern	NHIC, ORAA (May 2025)	Occurs in almost any freshwater habitat, though it is most often found in slow-moving water with a soft mud or sand bottom and abundant vegetation. This species may inhabit surprisingly small wetlands, ponds and ditches. It hibernates in the mud or silt on the bottom of lakes and rivers, usually not too far from the shore.	No – Subject property does not contain any waterbodies.
Insects						
Macropis Cuckoo Bee	*Epeoloides pilosulus*	Endangered	Extirpated	NHIC (May 2025)		
Monarch	*Danaus plexippus*	Endangered	Not Regulated	OBA (May 2025)		
One-banded Mason Wasp	*Ancistrocerus unifasciatus*	Not Regulated	Not Regulated	NHIC (May 2025)		
Rusty-patched Bumblebee	*Bombus affinis*	Endangered	Endangered	NHIC (May 2025)		

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Mammals						
Eastern Small-footed Myotis	*Myotis leibii*	Not Regulated	Endangered	MWH (2023)	Roosting occurs in rocks, rock outcrops, buildings, under bridges, caves, mines, and hollow trees. Hibernation occurs within caves and abandoned mines.	Possible – Buildings persist within the subject property and may provide suitable roosting for this species. Potential roosting trees were observed within the study area during the July 4, 2025 site visit.
Little Brown Myotis	*Myotis lucifugus*	Endangered	Endangered	MWH (2023)	This species roosts in treed environments and select attics, abandoned buildings, and barns in colony format to raise their young. They hibernate from October/ November to March/April, most often in caves or abandoned mines that are humid and remain above freezing.	Possible – Buildings persist within the subject property and may provide suitable roosting for this species. Potential roosting trees were observed within the study area during the July 4, 2025 site visit.
Northern Myotis	*Myotis septentrionalis*	Endangered	Endangered	MWH (2023)	These bats are associated with forest environments, choosing to roost under loose bark and in the cavities of trees. They hibernate from October/ November to March/April like many other bat species; can be in caves or abandoned mines.	Possible – Potential roosting trees were observed within the study area during the July 4, 2025 site visit.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Tri-coloured Bat	*Pipistrellus subflavus*	Endangered	Endangered	MWH (2023)	This species is found in a variety of forested habitats. It forms day roosts in maternity colonies in old-growth forest and occasionally man-made structures. This species overwinter/hibernates in caves or underground locations like many other species of bats.	Possible – Buildings persist within the subject property and may provide suitable roosting for this species. Potential roosting trees were observed within the study area during the July 4, 2025 site visit.
Eastern Red Bat	*Lasiurus borealis*	Endangered	Endangered	Added by Hatch	This species typically roosts among foliage in trees and occasionally shrubs. Roosting can occur in both deciduous and coniferous forests of any age class. However, trees selected for roosting tend to be large in diameter and tall.	Possible – Potential roosting trees were observed within the study area during the July 4, 2025 site visit.
Hoary Bat	*Lasiurus cinereus*	Endangered	Endangered	Added by Hatch	Mostly treed habitats for roosting or foraging, with a particularly strong dependence on trees as roosting sites. Foraging habitats are less well known, but likely include the area above aquatic habitats (Barclay 1989), low-elevation meadows, grasslands, and fields, as well as open-canopied forest, the area above forest canopies, and forest edges.	Possible – Potential roosting trees were observed within the study area during the July 4, 2025 site visit.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Silver-haired Bat	*Lasionycteris noctivagans*	Endangered	Endangered	Added by Hatch	Roosting for this species tends to occur under the bark of trees and within suitable cavities. As such, they are reliant on large decaying trees. They can roost in a variety of large diameter coniferous and deciduous tree species. Size, height, roost aspect, and cavity temperature tend to be the deciding factors for where this species chooses to roost.	Possible – Potential roosting trees were observed within the study area during the July 4, 2025 site visit.
Plants						
Autumn Coralroot	*Corallorhiza odontorhiza*	Not Regulated	Not Regulated	NHIC (May 2025)	Part shade, shade; woods.	Possible – Suitable habitats persist within the subject property.
Bird's-foot Violet	*Viola pedate*	Endangered	Endangered	NHIC (May 2025)	In Ontario, Bird's-foot Violet is found only in black oak savanna, a very rare vegetation type having widely spaced open-grown trees with an understorey of tallgrass prairie herbs.	No – Black Oak savanna habitats are not present within the study area.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Broad Beech Fern	*Phegopteris hexagonoptera*	Special Concern	Special Concern	NHIC (May 2025)	Prefers to grow in rich soils in deciduous forests, often in areas dominated by maple and beech trees. It requires moist soil and usually grows in full shade.	No - Although woodlands persist within the subject property, these habitats are more upland (drier) and are dominated by Black Walnut (*Juglans nigra*) and conifers.
Carolina Vetch	*Vicia caroliniana*	Not Regulated	Not Regulated	NHIC (May 2025)		
Hairy Hawkweed	*Hieracium longipilum*	Not Regulated	Not Regulated	NHIC (May 2025)	sun; dry sandy soil; prairies open woods, roadsides	Possible – Field edges and conifer woodlands are present within the subject property and may provide suitable habitat for this species.
Moss Phlox	*Phlox subulata*	Not Regulated	Not Regulated	NHIC (May 2025)	Part shade, sun; dry sandy or rocky soil; barrens, woods, rock ledges, gardens.	Possible – Partly shaded habitats and woodlands are present within the subject property and may provide suitable habitat for this species.

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Species Common Name	Species Scientific Name	SARA Status	ESA Status	Background Source(s)	Habitat Description	Evaluation of Potential to be found within the Subject property
Walter's Barnyard Grass	*Echinochloa walteri*	Not Regulated	Not Regulated	NHIC (May 2025)	Typically found along stream and river banks, on sandy shores, and in floodplains, marshes and wet meadows.	No – Although an unnamed watercourse and wetlands persists within the study area, no aquatic features are present within the subject property.

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Appendix B

Bird Species from Within the Study Area

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Common Name	Scientific Name	Schedule 1	COSEWIC	SARO	OBBA	NHIC	BBS-01 & Transect		Highest Level of Breeding Evidence
					2025	2025	28-May-25	4-Jul-25	Hatch Results from 2025
American Crow	*Corvus brachyrhynchos*				FY		X	PO	PO
American Goldfinch	*Spinus tristis*				P			PO	PO
American Kestrel	*Falco sparverius*				CF				
American Redstart	*Setophaga ruticilla*				T				
American Robin	*Turdus migratorius*				CF		PO	PO	PR
American Woodcock	*Scolopax minor*				H				
Baltimore Oriole	*Icterus galbula*				CF		PO	PO	PR
Bank Swallow	*Riparia riparia*	THR	THR	THR	AE				
Barn Swallow	*Hirundo rustica*	THR	SC	SC	NY			PO	PO
Belted Kingfisher	*Megaceryle alcyon*				AE				
Black-billed Cuckoo	*Coccyzus erythropthalmus*				T				
Black-capped Chickadee	*Poecile atricapilla*				CF		PO	PO	PR
Blue Jay	*Cyanocitta cristata*				T		PO		PO
Blue-winged Warbler	*Vermivora cyanoptera*				S				
Bobolink	*Dolichonyx oryzivorus*	THR	SC	THR	S				
Broad-winged Hawk	*Buteo platypterus*				H				
Brown Thrasher	*Toxostoma rufum*				T				
Brown-headed Cowbird	*Molothrus ater*				D		PO	PR	PR
Canada Goose	*Branta canadensis*				FY				
Canada Warbler	*Cardellina canadensis*	THR	SC	SC	S				
Carolina Wren	*Thryothorus ludovicianus*				D			PO	PO
Cedar Waxwing	*Bombycilla cedrorum*				P			PR	PR
Chestnut-sided Warbler	*Setophaga pensylvanica*				T				
Chimney Swift	*Chaetura pelagica*	THR	THR	THR	AE			PO	PO
Chipping Sparrow	*Spizella passerina*				FY		PO		PO
Common Grackle	*Quiscalus quiscula*				CF		PO	PO	PR
Common Raven	*Corvus corax*				FY				
Common Yellowthroat	*Geothlypis trichas*				T		PO		PO
Cooper's Hawk	*Accipiter cooperii*				H				

Common Name	Scientific Name	Schedule 1	COSEWIC	SARO	OBBA	NHIC	BBS-01 & Transect		Highest Level of Breeding Evidence
					2025	2025	28-May-25	4-Jul-25	Hatch Results from 2025
Downy Woodpecker	*Dryobates pubescens*				FY			PO	PO
Eastern Bluebird	*Sialia sialis*				CF				
Eastern Kingbird	*Tyrannus tyrannus*				T		PO	PO	PR
Eastern Meadowlark	*Sturnella magna*	THR	THR	THR		X			
Eastern Phoebe	*Sayornis phoebe*				T				
Eastern Towhee	*Pipilo erythrophthalmus*				A				
Eastern Wood-Pewee	*Contopus virens*	SC	SC	SC	T	X		PO	PO
European Starling	*Sturnus vulgaris*				CF		PR	PO	PR
Field Sparrow	*Spizella pusilla*				CF				
Grasshopper Sparrow	*Ammodramus savannarum*	SC	SC	SC	A				
Gray Catbird	*Dumetella carolinensis*				CF			CO	CO
Great Blue Heron	*Ardea herodias*				T				
Great Crested Flycatcher	*Myiarchus crinitus*				T		PR	PO	PR
Hairy Woodpecker	*Dryobates villosus*				S				
Hooded Merganser	*Lophodytes cucullatus*				H				
Hooded Warbler	*Setophaga citrina*				T				
Horned Lark	*Eremophila alpestris*				S				
House Finch	*Haemorhous mexicanus*				T				
House Sparrow	*Passer domesticus*				AE				
Indigo Bunting	*Passerina cyanea*				T		PO	PO	PR
Killdeer	*Charadrius vociferus*				DD				
Mallard	*Anas fulvigula*				FY		X	PO	PO
Merlin	*Falco columbarius*				FY				
Mourning Dove	*Zenaida macroura*				FY			PO	PO
Mourning Warbler	*Geothlypis philadelphia*				S				
Northern Cardinal	*Cardinalis cardinalis*				CF		PO	PO	PR
Northern Flicker	*Colaptes auratus*				AE		PO	PO	PR
Northern House Wren	*Troglodytes aedon*				AE				
Northern Rough-winged Swallow	*Stelgidopteryx serripennis (L)*				AE			PO	PO

Common Name	Scientific Name	Schedule 1	COSEWIC	SARO	OBBA	NHIC	BBS-01 & Transect		Highest Level of Breeding Evidence
					2025	2025	28-May-25	4-Jul-25	Hatch Results from 2025
Northern Waterthrush	*Parkesia noveboracensis*				S				
Orchard Oriole	*Icterus spurius (L) (C)*				T				
Ovenbird	*Seiurus aurocapilla (L)*				T				
Pileated Woodpecker	*Dryocopus pileatus*				S				
Pine Warbler	*Setophaga pinus (L)*				T			PO	PO
Purple Martin	*Progne subis (L)*				AE				
Red-bellied Woodpecker	*Melanerpes carolinus (L)*				FY				
Red-breasted Nuthatch	*Sitta canadensis*				S				
Red-eyed Vireo	*Vireo olivaceus*				T		PO	PO	PR
Red-headed Woodpecker	*Melanerpes erythrocephalus (L)*	END	END	END	AE	X		CO	CO
Red-tailed Hawk	*Buteo jamaicensis*				T				
Red-winged Blackbird	*Agelaius phoeniceus*				NY		CO	PO	CO
Rock Pigeon (Feral Pigeon)	*Columba livia*				NY				
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				T				
Ruby-throated Hummingbird	*Archilochus colubris*				H				
Ruffed Grouse	*Bonasa umbellus*				H				
Savannah Sparrow	*Passerculus sandwichensis*				A				
Scarlet Tanager	*Piranga olivacea (L)*				T			PO	PO
Song Sparrow	*Melospiza melodia*				CF		CO	PO	CO
Tree Swallow	*Tachycineta bicolor*				AE				
Turkey Vulture	*Cathartes aura (L)*				H				
Veery	*Catharus fuscescens (L)*				T				
Vesper Sparrow	*Pooecetes gramineus (L)*				T				
Warbling Vireo	*Vireo gilvus*				T				
White-breasted Nuthatch	*Sitta carolinensis (L)*				T			PO	PO
Wild Turkey	*Meleagris gallopavo*				T				
Willow Flycatcher	*Empidonax traillii (L) (C)*				T				
Winter Wren	*Troglodytes hiemalis*				T				
Wood Duck	*Aix sponsa*				H				

Common Name	Scientific Name	Schedule 1	COSEWIC	SARO	OBBA	NHIC	BBS-01 & Transect		Highest Level of Breeding Evidence
					2025	2025	28-May-25	4-Jul-25	Hatch Results from 2025
Wood Thrush	*Hylocichla mustelina (L)*	THR	THR	SC	T	X			
Yellow Warbler	*Setophaga petechia*				T		CO	PO	CO
Yellow-bellied Sapsucker	*Sphyrapicus varius*				D		PO		PO
Yellow-billed Cuckoo	*Coccyzus americanus*				T				
Yellow-throated Vireo	*Vireo flavifrons (L)*				T				
				Total	**91**	**4**	**21**	**31**	**35**

Appendix C

Vascular Plant Species from Within the Study Area

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Common Name	Scientific Name	Schedule 1	COSEWIC	SARO	NHIC	Observed by Hatch
					2025	Results from 2025
American Elm	*Ulmus americana*					X
Bird's-foot Violet	*Viola pedata*	END	END	END	X	
Black Walnut	*Juglans nigra*					X
Broad Beech Fern	*Phegopteris hexagonoptera*	Not Listed	SC	SC	X	
Carolina Vetch	*Vicia caroliniana*				X	
Cherry sp.	*Prunus sp.*					X
Common Burdock	*Arctium minus*					X
Common Teasel	*Dipsacus fullonum*					
Dame's Rocket	*Hesperis matronalis*					X
Eastern Cottonwood	*Populus Deltoides*					X
Goldenrod Sp.	*Solidago sp.*					X
Hairy Hawkweed	*Hieracium longipilum*				X	
Kentucky Bluegrass	*Poa pratensis*					X
Manitoba Maple	*Acer negundo*					X
Moss Phlox	*Phlox subulata*				X	
Scots Pine	*Pinus sylvestris*					X
Trembling Aspen	*Populus tremuloides*					X
Tufted Vetch	*Vicia cracca*					X
Walter's Barnyard Grass	*Echinochloa walteri*				X	
White Spruce	*Picea glauca*					X
Wild Rose sp.	*Rosa spp.*					X
				Total	**6**	**14**

Appendix B

Stage 1 Archaeological Assessment

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Stage 1 Archaeological Assessment: Simcoe Wastewater Treatment Plant, 16 Oakwood Avenue (Lot 1, Concession 5, Geographical Township of Woodhouse, County of Norfolk) Town of Simcoe, Norfolk County

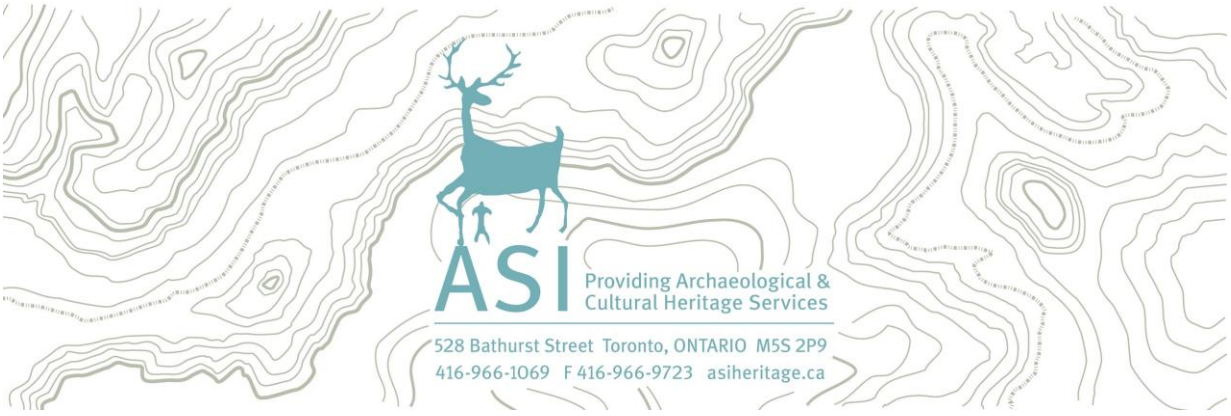
Original Report

Prepared for:

Hatch Ltd.
1235 North Service Road West
Oakville ON, L6M 2W2

Archaeological Licence: P094 (Merritt)
PIF# P094-0455-2025
Archaeological Services Inc. File: 25EA-019

25 June 2025



Executive Summary

Archaeological Services Inc. was contracted by Hatch Ltd., on behalf of Norfolk County, to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Simcoe Wastewater Treatment Plant project. This project is being conducted to support an addendum to the Norfolk County Integrated Sustainable Master Plan (MMM Group Ltd, 2016), and it involves potential upgrades to the Wastewater Treatment Plant located at 16 Oakwood Avenue in the town of Simcoe, Ontario. The Stage 1 Project Area is located adjacent to the east of the existing facilities at the Simcoe WWTP. It measures approximately 150 metres by 90 metres and covers an area of approximately 1.35 hectares.

The Stage 1 background research determined that 16 previously registered archaeological sites are located within one kilometre of the Project Area, but none within 50 metres. The property inspection determined that parts of the Project Area exhibit archaeological potential and will require Stage 2 archaeological assessment.

The following recommendations are made:

1) Parts of the Project Area exhibit archaeological potential. These lands require Stage 2 archaeological assessment by test pit survey at five-metre intervals (Figure 11). Stage 2 is required prior to any proposed construction activities on these lands;

2) The remainder of the Project Area does not retain archaeological potential on account of deep and extensive land disturbance. These lands do not require further archaeological assessment; and,

3) Should the proposed work extend beyond the current Project Area, further archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

Project Personnel

- **Principal**: Lisa Merritt, MSc. (P094) Partner, Director, Infrastructure
- **Senior Project Manager**: Sarah Jagelewski, BA Hons (R405), Lead Archaeologist, Manager, Infrastructure
- **Division Coordinator**: Katrina Thach, BA Hons. (R1225), Associate Archaeologist, Assistant Manager, Infrastructure
- **Project Administrator**: Justine Tenzer, BA Hons, Archaeologist, Project Administrator, Infrastructure
- **Project Director (Licensee)**: Lisa Merritt
- **Project Manager**: Jason Barrett, PhD, Lead Archaeologist, Project Manager, Infrastructure
- **Field Director**: Poorya Kashani, PhD (P1133), Associate Archaeologist, Assistant Manager, Field Services, Operations
- **Report Preparation**: Ciprian Ardelean, PhD, Senior Associate, Technical Writer and Researcher, Infrastructure
- **Graphics**: Peter Bikoulis, PhD, Archaeologist, GIS Technician, Operations Practice Area; Carolyn Nettleton, BA, Archaeologist, GIS Technician, Operations
- **Report Review**: Jason Barrett; Eliza Brandy, MA (R1109), Lead Archaeologist, Project Manager, Infrastructure; Sarah Jagelewski

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1.0 Project Context

Archaeological Services Inc. (ASI) was contracted by Hatch Ltd., on behalf of Norfolk County, to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Simcoe Wastewater Treatment Plant (WWTP) project. This project is being conducted to support an addendum to the Norfolk County Integrated Sustainable Master Plan (MMM Group Ltd, 2016), and it involves potential upgrades adjacent to the east of the existing facilities at the Simcoe WWTP at 16 Oakwood Avenue in the Town of Simcoe, Ontario.

The Stage 1 Project Area measures approximately 150 metres by 90 metres and covers an area of approximately 1.35 hectares (Figure 1).

All activities carried out during this assessment were completed in accordance with the *Ontario Heritage Act* (1990, as amended in 2024) and the 2011 *Standards and Guidelines for Consultant Archaeologists* (S & G), administered by the Ministry of Citizenship and Multiculturalism (MCM 2011).

1.1 Development Context

All work has been undertaken as required by the *Environmental Assessment Act* (Environmental Assessment Act, R.S.O. c. E.18, 1990 as amended 2024) and regulations made under the Act, and are therefore subject to all associated legislation. This project is being conducted in accordance with the *Municipal Class Environmental Assessment* process (Municipal Engineers Association, 2023).

Authorization to carry out the activities necessary for the completion of the Stage 1 archaeological assessment and property inspection was granted by Hatch Ltd. on March 31, 2025.

1.1.1 Treaties and Traditional Territories

1.1.1.1. Deed from the Five Nations to the King, of their Beaver Hunting Ground

In 1701 the Haudenosaunee and British Crown signed the "Deed from the Five Nations to the King, of their Beaver Hunting Ground", sometimes referred to as the 1701 Treaty of Fort Albany or Nanfan Treaty, where they agreed to place their beaver hunting grounds under the protection of the King of Britain and to reject the French from building forts on their lands, which included most of southcentral and southwestern Ontario.

In the following years, the Haudenosaunee called upon the King to honour this agreement and "tear down" the French forts at Detroit, Niagara and Fort Frontenac (Kingston) from their Beaver Hunting Grounds. The King did honour the terms of the 1701 deed. To confirm the Kings' commitment to the Five Nations and to allow their forts in the Five Nations lands as protection against the French an affirming agreement was entered into on September 14, 1726.

The protection of the Five Nations interests throughout their Beaver Hunting Grounds was again affirmed in Article 15 of the Treaty of Utrecht, signed in 1713 between the British and the French, wherein the Five Nations specifically would not be interfered with between (Lakes) Ontario, Erie and Huron (Six Nations of the Grand River, 2020).

1.1.1.2. Treaty 3, Between the Lakes Purchase

Following the American Revolutionary War (1775-1783), the British Crown needed to find lands on which to settle United Empire Loyalists, including approximately 2,000 members of the Six Nations confederacy who had fought alongside British troops. Led by Sir Frederick Haldimand who was the governor of Quebec at that time, the Crown was initially planning on providing lands for Loyalist settlers in Quebec and Southeastern Ontario, including providing land in the Bay of Quinte for Six Nations refugees. This was not suitable for many of the members of Six Nations and a contingent of approximately 1,800 community members, led by Chief Joseph Brant, requested land north of Lake Erie along the

Grand River. Brant felt that the location in the Bay of Quinte was too isolated and that his followers could be better served by being closer to the Six Nations communities that chose to remain in the United States in western New York (Surtees, 1984, p. 21).

Recognizing that, under the terms of the Royal Proclamation of 1763, the land needed to be purchased prior to settlement, Colonel John Butler was sent to negotiate with the Mississaugas of the Credit for lands east of Lake Ontario and north of Lake Erie. On May 22, 1784, the Mississaugas of the Credit agreed to cede approximately 3,000,000 acres (1,214,057 hectares) of land containing all or part of Brant, Elgin, Middlesex, Oxford, and Wellington Counties as well as the Regions of Haldimand-Norfolk, Halton, Hamilton-Wentworth, Niagara, and Waterloo. In exchange for these lands, the Mississaugas received £1180.74 worth of trade goods (Crown-Indigenous Relations and Northern Affairs, 2016; Surtees, 1984). Of the 3,000,000 acres (1,214,057 hectares), approximately 550,000 acres (222,577 hectares) was set aside for the settlement of Six Nations people.

However, due to uncertainties with the description of the lands in the original surrender, Treaty 3 was renegotiated on December 7, 1792, to clarify what was ceded. This largely revolved around the northern boundary of the Treaty area and in particular the area set aside for Six Nations settlement along the Grand River (see Haldimand Tract and Treaty 4). The signees on the side of the British included Lieutenant Governor John Graves Simcoe, John Butler, Robert Kerr, Peter Russell, John McGill, and Davie William Smith. The signees on the side of the Mississauga included Chiefs Wabakayne, Wabanip, Kautabus, Wabaniship and Mottotow (Crown-Indigenous Relations and Northern Affairs, 2016; Mississaugas of the Credit First Nation, 2017; Surtees, 1984).

The original text stipulated that the north-west boundary of the parcel was an imaginary line between Burlington Bay and the Thames River, which is inconsistent with the geography of the area. The boundaries of the parcel were corrected to create a polygon encompassing the Niagara peninsula up to Burlington Bay and then up north to the present-day town of Arthur then south to the present-day town of Woodstock to finally meet Lake Erie at Port Bruce.

Treaty 3 lands exclude a corridor along the Grand River set aside for Six Nations (Crown-Indigenous Relations and Northern Affairs, 2016; Native Land Digital, 2018).

1.2 Historical Context

1.2.1 Indigenous Land Use and Settlement

Current archaeological evidence indicates humans were present in southern Ontario approximately 13,000 years before present (BP) (Ferris, 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 BP, the environment had progressively warmed (Edwards & Fritz, 1988) and populations now occupied less extensive territories (Ellis & Deller, 1990).

Between approximately 10,000-5,500 BP, the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 BP; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest archaeological evidence for cemeteries dates to approximately 4,500-3,000 BP and is interpreted by archaeologists to be indicative of increased social organization and the investment of labour into social infrastructure (Brown, 1995, p. 13; Ellis et al., 1990, 2009).

Between 3,000-2,500 BP, populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 BP and exchange and interaction networks broaden at this time (Spence et al., 1990, pp. 136, 138) and by approximately 2,000 BP, evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1,500 BP there is macro botanical evidence for maize in southern Ontario, and it

is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2,300 BP – it is likely that once similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch & Williamson, 2013, pp. 13–15). As is evident in detailed Anishinaabek ethnographies, winter was a period during which some families would depart from the larger group as it was easier to sustain smaller populations (Rogers, 1962). It is generally understood that these populations were Algonquin-speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1,000 BP, lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (CE), larger settlement sites focused on horticulture begin to dominate the archaeological record. Seasonal dispersal of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson, 1990, p. 317). By 1300-1450 CE, archaeological research focusing on these horticultural societies note that this episodic community dispersal was no longer practised and these populations now occupied sites throughout the year (Dodd et al., 1990, p. 343). By the mid-sixteenth century these small villages had coalesced into larger communities (Birch et al., 2021). Through this process, the socio-political organization of these First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. Other First Nation communities continued to practice residential mobility and to harvest available resources across landscapes they returned to seasonally/annually.

By 1600 CE, the Confederation of Nations were encountered by the first European explorers and missionaries in Simcoe County. Samuel de Champlain in 1615 reported that a group of Iroquoian-speaking people situated between the Haudenosaunee and the Huron-Wendat were at peace and remained "la nation neutre". Like the Huron-Wendat, Petun, and Haudenosaunee, the Neutral or Attawandaron people were settled village agriculturalists.

By the 1640s, devastating epidemics and the traditional enmity between the Haudenosaunee and the Attawandaron and the Huron-Wendat (and their

Algonquian allies such as the Nippissing and Odawa) led to their dispersal from southern Ontario. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. Peace was achieved between the Haudenosaunee and the Anishinaabe Nations in August of 1701 when representatives of more than twenty Anishinaabe Nations assembled in Montreal to participate in peace negotiations. Peace was confirmed again at council held at Lake Superior when the Haudenosaunee delivered a wampum belt to the Anishinaabe Nations. This agreement between the Haudenosaunee and Anishinaabe nations is referred to as the Dish with One Spoon.

In 1763, following the fall of Quebec, New France was transferred to British control at the Treaty of Paris. The British government began to pursue major land purchases to the north of Lake Ontario in the early nineteenth century. The Crown acknowledged the Mississaugas of the Credit as the owners of the lands between Georgian Bay and Lake Simcoe and entered into negotiations for additional tracts of land as the need arose to facilitate European settlement.

1.2.2 Post-Contact Settlement

Historically, the Project Area is located in the Geographical Township of Woodhouse, County of Norfolk, in Lot 1, Concession 5.

The S & G stipulates that areas of early Euro-Canadian settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches, and early cemeteries are considered to have archaeological potential. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the Ontario Heritage Act or a federal, provincial, or municipal historic landmark or site are also considered to have archaeological potential.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e., those that are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be located in proximity to water. The development of the network of concession roads and railroads through the course of the nineteenth century

frequently influenced the siting of farmsteads and businesses. Accordingly, undisturbed lands within 100 metres of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes followed existing Indigenous trails, both along the lakeshore and adjacent to various creeks and rivers (ASI 2006). Early European settlements occupied similar locations as Indigenous settlements as they were generally accessible by trail or water routes and would have been in locations with good soil and suitable topography to ensure adequate drainage.

Throughout the period of initial European settlement, Indigenous groups continued to fish, gather, and hunt within their traditional and treaty territories, albeit often with legal and informal restrictions imposed by colonial authorities and settlers. In many cases, Indigenous peoples acted as guides and teachers, passing on their traditional knowledge to settlers, allowing them to sustain themselves in their new homes. Indigenous peoples entered into economic arrangements and partnerships, and often inter-married with settlers. However, pervasive and systemic oppression and marginalization of Indigenous peoples also characterized Euro-Canadian colonization, with thousands being displaced from their lands, denied access to traditional and treaty hunting, fishing, and collecting grounds, and forced to assimilate with Euro-Canadian culture through mandatory attendance at Day and Residential Schools (Ray, 2005; Rogers & Smith, 1994).

1.2.2.1. Town of Simcoe

The Town of Simcoe is located on the Lynn River 38 kilometres south of the City of Brantford. The town was visited by Sir John Graves Simcoe, first lieutenant-governor of Upper Canada, in 1795. Governor Simcoe made this stop during his

journey to establish Fort Norfolk on Fort Erie and granted land to potential settlers, including Aaron Culver with the provision that he was to build mills on the river (Ontario Heritage trust, 2025). By 1812, a settlement formed surrounding the saw and grist mills Culver had built. The mills were burnt during the War of 1812. Captain Bird, a prominent merchant in the settlement, was deeded some land by Culver and subsequently the town was initially called Birdtown (American Biographical Publishing Company, 1880). Aaron Culver further subdivided his land into village lots between 1819 and 1823, proposing the village be renamed in remembrance of the late lieutenant-governor Simcoe's visit.

The Simcoe Post Office opened in 1829 with Duncan Campbell as postmaster (American Biographical Publishing Company, 1880). In 1836 a courthouse and jail were constructed. Simcoe became the seat of the newly created Talbot District in 1837, and in 1851 was incorporated as a village and became the seat of Norfolk County. A branch of the Great Western Railway was completed from Glencoe through Simcoe to Fort Erie in 1872. A line from Woodstock to Port Dover was built in 1875. These lines cause an increase in Simcoe's population. Simcoe was incorporated as a town in 1878. Dr. John Wilson was the first mayor of Simcoe.

In addition to saw and grist mills, Simcoe's early industries included Cable's Carriage Works and the "alligator tug" tugboat (Churcher, 2022). The alligator tug was created by John West of West, Peachy and Sons and was able to operate on both water and land using cables and winches. The alligator tug was an asset to the lumbering industry. During the Depression, the flue-cured tobacco industry was a saving factor for Simcoe, as was fruit production. These industries drew people to the area. A large tin can manufacture plant was established around 1930.

Simcoe features several historic churches. Presbyterian minister Reverend Jabez Culver held services in his own log home until his death in 1818 (Wilson, 1983). A frame church was built to hold Methodist Episcopal services by 1820. In 1868, a new brick church was completed, then known as the Windham Memorial Chapel of the New Connection Methodist Church. Its name was later changed

to the Windham United Church (United Church of Canada, 1962). A church named the Old Windham Church, which stands present-day, was completed in 1962. The Methodist Church was built in 1840. The three churches eventually united to form the Methodist Church of Canada. The Old Mud Church was constructed in 1843 of clay and straw bricks by the Congregationalists of Simcoe and destroyed by a fire in 1876 (Owen, 1898). Saint Andrew's Church of Scotland, constructed in 1847, and the Canadian Presbyterian Church, built in 1868, were united in 1876. The united congregation built St. Paul's Presbyterian Church in 1886. Trinity Anglican Church was originally completed in 1850 and then renovated in 1882. Central School, constructed in 1858, was a Union School offering education to all students of Simcoe until a high school was erected in 1893-4. The South Ward Public School was erected in 1917, and the North Ward School in 1928.

In 1974, Simcoe became part of the Regional Municipality of Haldimand-Norfolk and the town was enlarged to include part of the Townships of Charlotteville, Townsend, Windham, and Woodhouse.

1.2.3 Map Review

The 1865 *Tremaine's Historical Map of Norfolk County* (Tremaine, 1856), 1877 *Illustrated Atlas of Norfolk County* (Page & Co., 1877), 1909 *Topographic Simcoe Sheet* (Department of Militia and Defence, 1909), 1939 *Topographic Simcoe Sheet* (Department of National Defence, 1939), and 1996 *National Topographic System (NTS) Simcoe Sheet* (Natural Resources Canada, 1996) were examined to determine the presence of historic features within the Project Area during the nineteenth and twentieth centuries (Figure 2-Figure 5).

It should be noted that not all features of interest were mapped systematically in the Ontario series of historical atlases. For instance, they were often financed by subscription limiting the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. The use of historical map sources to reconstruct or predict the location of former features within the modern landscape generally begins by using common reference points between the various sources. The historical maps are geo-referenced to provide the most accurate determination of the location of any

property on a modern map. The results of this exercise can often be imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including differences of scale and resolution, and distortions introduced by reproduction of the sources.

The 1865 Tremaine map (Figure 2) shows the Project Area just outside the southern limits of the urban area of the village of Simcoe, approximately 100 metres east of the Lynn River. The Project Area was on the lands owned by William Salmon, marked on the map as "Judge Salmon". The location of a homestead is not indicated. An unlabeled railroad (probably Great Western Railways) is shown passing through the northeast corner of Lot 1, approximately 150 metres east of the Project Area. The trajectory of the railroad is probably inaccurate, as it should show south and west of the Project Area.

The 1877 Illustrated Atlas (Figure 3) shows a less precise cartography, but the railroad is now more accurately placed on a trajectory crossing the Lynn River south and west of the Project Area. The landowner of the northern subdivision of Lot 1 is still William Salmon. The urban grid of the Town of Simcoe is shown approximately 300 metres west of the Project Area. No built structures are mapped within 100 metres of the Project Area.

The 1909 topographic map (Figure 4) shows the Project Area remained undeveloped in wooded land east of the river and approximately 150 meters northeast of the wooden bridge where the Grand Trunk railroad crosses the Lynn River. The map shows the growth of the Town of Simcoe, but no historic structures are shown within 100 metres of the Project Area.

By 1996 (Figure 5), the main facilities of the Simcoe WWTP had been constructed on the west side of Oakwood Avenue, adjacent to the west side of the Project Area. No structures are shown within its limits and the lot remained undeveloped. Except for the considerable growth of the Town of Simcoe, no other changes are apparent in the surroundings of the Project Area.

1.2.4 Aerial, Orthoimagery, and LiDAR Review

Historical aerial imagery from 1954 (City of Toronto Archives, 1954) (Figure 6) shows the Project Area just over 100 metres east of the Lake Erie and Northern Electric Railway that intersects the Canadian National Railway approximately 150 metres southwest of the Project Area. The surrounding lands are mostly agricultural lots. The area immediately to the exterior of the Project Area shows two contiguous rectangular dark features that may suggest mid-twentieth century disturbance by two open water reservoirs. The area adjacent to the west, where the modern WWTP stands today, looks affected by a series of contiguous polygonal shapes, possibly graded or excavated areas, perhaps indicating the early stages of the WWTP.

A review of available Google satellite imagery between 2003 and 2023 shows:

- Imagery from 2006 shows the presence of a small structure on the west side while the rest of the Project Area remained undeveloped (Image 10);
- By the Spring of 2010, a paved rectangular area appeared in the northwest corner of the Project Area, with a narrow and long white construction, probably a provisory feature (Image 11). The Project Area remained relatively unchanged through 2023.

The LiDAR-based Digital Terrain Model (DTM) of the Project Area provides a better understanding of the disturbed areas, with two graded areas along the western limits, one dirt pile near the northwest corner and an elongated berm perpendicular to the east limits of the Project Area (Figure 7).

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the Project Area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research: the site record forms for registered sites available

online from the MCM through "Ontario's Past Portal"; published and unpublished documentary sources; and the files of ASI.

1.3.1 Geography

In addition to the known archaeological sites, the state of the natural environment is a helpful indicator of archaeological potential. Accordingly, a description of the physiography and soils are briefly discussed for the Project Area.

The S & G stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources (intermittent streams and creeks, springs, marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential.

Water has been identified as the major determinant of site selection, and the presence of potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in Ontario since 5,000 B.P. (Karrow & Warner, 1990, Figure 2.16), proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

Other geographic characteristics that can indicate archaeological potential include elevated topography (eskers, drumlins, large knolls, and plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including food

or medicinal plants (migratory routes, spawning areas) are also considered characteristics that indicate archaeological potential (S & G, Section 1.3.1).

1.3.1.1. Physiography

The Project Area is located within the sand plains physiographic landforms of the Norfolk Sand Plain physiographic region of southern Ontario (Chapman & Putnam, 1984) (Figure 8).

The Norfolk Sand Plain physiographic region is a wedge-shaped feature that extends from the Lake Erie shoreline and tapers northward to a point in Brantford on the Grand River (Chapman & Putnam, 1984). The region encompasses an area of 3,134 square kilometres and consists of sands and silts that were deposited as a delta in glacial Lakes Whittlesey and Warren. A massive discharge of meltwater from the Grand River area entered the lakes between the ice front and the moraines to the northwest, building the delta from west to east as the glacier withdrew, thus covering most of the area west of the Galt Moraine with sand. In the vicinity of the subject property, glaciolacustrine deep water sediments belonging to mainly glacial Lake Warren and younger deposits and consisting of stratified to varved silt and clay, minor sand, are overlain by veneer of sand (Zone 10) (Cowan, 1972).

The Project Area is located approximately 200 metres south of a till moraine and within one kilometre of paleo-beaches situated to the east (Figure 8). The Project Area is also crossed by the fluvial terrace of the Lynn Reiver.

1.3.1.2. Surficial Geology

The surficial geology mapping (Figure 9) shows the Project Area is underlain mostly by fine-textured glaciolacustrine deposits (silt and clay, minor sand and gravel, massive to well laminated), and to a lesser extent by older alluvial deposits (clay, silt, sand, gravel, which may contain organic remains).

1.3.1.3. Soil Types and Drainage

The Project Area is sitting mostly on top of disturbed urban lands with no soil information (Land Resource Research Institute, 1983) (Figure 10).

1.3.1.4. Watershed, Water Sources

The Project Area is situated within the Black Creek – Lynn River watershed and within 150 metres of the Lynn River.

1.3.2 Previously Registered Archaeological Sites

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database maintained by the MCM. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The Project Area is situated in the Borden block *AeHb.*

According to the Ontario Archaeological Sites Database, 16 previously registered archaeological sites are located within one kilometre of the Project Area, none of which are located within 50 metres (MCM, 2025). A summary of the sites is provided below in Table 1.

Table 1: Registered Sites within One Kilometre of the Project Area

Borden number	Site Name	Temporal/ Cultural Affiliation	Site type	Researcher
AeHb-90	Pott's Homestead	Euro-Canadian	Homestead	Mayer Heritage Consultants (MHC), 1980
AeHb-91	Pott's 54	Pre-Contact	Findspot	MHC, 1982
AeHb-92	Pott's 92	Pre-Contact	Artifact scatter	MHC, 1981

Borden number	Site Name	Temporal/ Cultural Affiliation	Site type	Researcher
AeHb-93	Pott's 62	Pre-Contact	Findspot	MHC, 1982, 2008
AeHb-94	Pott's 64	Pre-Contact	Campsite	MHC, 1977, 2008
AeHb-95	Pott's 65	Pre-Contact	Campsite	MHC, 1980, 2008
AeHb-96	Pott's 69	Pre-Contact	Campsite	MHC, 1974, 2008
AeHb-97	Pott's 75	Pre-Contact	Campsite	MHC, 1980, 2008
AeHb-98	Pott's 1977	Pre-Contact	Campsite	MHC, 1982, 2008
AeHb-99	Pott's 36	Pre-Contact	Findspot	MHC, 1980, 2008
AeHb-100	Pott's 98	Middle/Late Woodland	Campsite	MHC, 1982, 2008
AeHb-103	Pott's 102	Pre-Contact	Findspot	MHC, 1981
AeHb-104	Pott's 103	Late Archaic	Findspot	MHC, 1981
AeHb-105	Pott's 47	Pre-Contact	Findspot	MHC, 1981

Borden number	Site Name	Temporal/ Cultural Affiliation	Site type	Researcher
AeHb-113	Pott's 82	Pre-Contact	Campsite	MHC, 2008
AeHb-114	Pott's 83	Pre-Contact	Artifact scatter	MHC, 2008

1.3.3 Previous Archaeological Assessments

No archaeological assessments of direct relevance to the present undertaking were identified within 50 metres of the Project Area.

2.0 Property Inspection

2.1 Field Methods

A Stage 1 property inspection must adhere to the S & G, Section 1.2, Standards 1-6, which are discussed below. The entire property and its periphery must be inspected. The inspection may be either systematic or random. Coverage must be sufficient to identify the presence or absence of any features of archaeological potential. The inspection must be conducted when weather conditions permit good visibility of land features. Natural landforms and watercourses are to be confirmed if previously identified. Additional features such as elevated topography, relic water channels, glacial shorelines, well-drained soils within heavy soils and slightly elevated areas within low and wet areas should be identified and documented, if present. Features affecting assessment strategies should be identified and documented such as woodlots, bogs or other permanently wet areas, areas of steeper grade than indicated on topographic mapping, areas of overgrown vegetation, areas of heavy soil, and recent land disturbance such as grading, fill deposits and vegetation clearing. The inspection should also identify and document structures and built features that will affect assessment strategies, such as heritage structures or landscapes, cairns, monuments or plaques, and cemeteries.

The Stage 1 archaeological assessment property inspection was conducted on May 20, 2025, under the field direction of Poorya Kashani (P1133) in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the Project Area. It was a systematic visual inspection from inside the property grounds and did not include excavation or collection of archaeological resources. Fieldwork was conducted when weather conditions were deemed clear with good visibility (partly cloudy, with seasonal temperatures of 5-12 degrees Celsius), as per S & G Section 1.2., Standard 2. Field photography is presented in Section 7.1 (Image 1-Image 9), and field observations are overlaid onto the existing conditions of the Project Area in Section 8 (Figure 11).

2.2 Current Land Use and Field Conditions

The Project Area is a rectangular parcel mostly covered by tall unmaintained grasses, trees, and woodlot on a higher terrain extending along its eastern limits. Two fenced areas near the northwest corner and adjacent to the west side of the Project Area contained graded surfaces partly paved or graveled. The northern one was once used as an equipment storage area, while the southern one contains functional facilities related to the WWTP. An irregular mound of pushed earth covers the area between the northernmost fenced area and the northern boundaries of the Project Area, presumably related to the grading of these locations. A second narrow berm crosses part of the Project Area transversally, in east-west direction, perpendicular to the eastern limits. There are multiple small concrete features across the Project Area, presumably old wells. Most of the property is heavily covered in overgrown vegetation, therefore reducing the visibility of the surface.

3.0 Analysis of Archaeological Potential

The S & G, Section 1.3.1, lists criteria that are indicative of archaeological potential. The Project Area meets the following criteria indicative of archaeological potential:

- Water sources within 300 metres: primary, secondary, or past water source (Lynn River);

- Elevated topography (Lynn River terrace); and
- Early settlements within 100 metres (possible homesteads).

According to the S & G, Section 1.4 Standard 1e, no areas within a property containing locations listed or designated by a municipality can be recommended for exemption from further assessment unless the area can be documented as disturbed. The Municipal Heritage Register of the Town of Simcoe was consulted and no property within the Project Area is Listed or Designated under the *Ontario Heritage Act*.

The property inspection determined that parts of the Project Area exhibit archaeological potential. These areas will require Stage 2 archaeological assessment prior to any construction activities or other proposed impacts. According to the S & G Section 2.1.2, test pit survey is required on terrain where ploughing is not viable, such as wooded areas, properties where existing landscaping or infrastructure would be damaged, overgrown farmland with heavy brush or rocky pasture, and narrow linear corridors up to 10 metres wide (Image 6-Image 9; Figure 11: areas highlighted in green).

Part of the Project Area has been subjected to deep soil disturbance events due to the construction of graded, paved areas for equipment storage and small built infrastructure, and a built-up berm along the northern fence. According to the S & G Section 1.3.2 these areas do not retain archaeological potential (Image 1-Image 4; Figure 11: areas highlighted in yellow) and do not require further survey.

3.1 Conclusions

The Stage 1 background research determined that 16 previously registered archaeological sites are located within one kilometre of the Project Area, but none within 50 metres. The property inspection determined that parts of the Project Area exhibit archaeological potential and will require Stage 2 archaeological assessment (Figure 11: areas highlighted in green).

4.0 Recommendations

The following recommendations are made:

1) Parts of the Project Area exhibit archaeological potential. These lands require Stage 2 archaeological assessment by test pit survey at five-metre intervals (cite figures again). Stage 2 is required prior to any proposed construction activities on these lands;

2) The remainder of the Project Area does not retain archaeological potential on account of deep and extensive land disturbance. These lands do not require further archaeological assessment; and,

3) Should the proposed work extend beyond the current Project Area, further archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

NOTWITHSTANDING the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. If archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Archaeology Programs Unit of the MCM should be immediately notified.

The above recommendations are subject to MCM approval, and it is an offence to alter any archaeological site without MCM concurrence. No grading or other activities that may result in the destruction or disturbance of any archaeological sites are permitted until notice of MCM approval has been received.

5.0 Advice on Compliance with Legislation

ASI advises compliance with the following legislation:

- This report is submitted to the Ministry 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 field work and report recommendations ensure the conservation, preservation, and protection 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 Ministry of Citizenship and Multiculturalism, a letter will be issued by the ministry stating that there are no further concerns with regards 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 Archaeological 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 of Cemeteries at the Ministry of Public and Business Services Delivery.

- Archaeological sites recommended for further archaeological field work or protection remain subject to Section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

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7.0 Images

7.1 Field Photography



Image 1: Project Area disturbed by grading and existing infrastructure – no archaeological potential.



Image 2: Project Area disturbed by grading and existing infrastructure – no archaeological potential.



Image 3: Project Area disturbed by grading and former construction activities – no archaeological potential.



Image 4: Project Area disturbed by berm – no archaeological potential (see also Figure 8).



Image 5: Part of Project Area disturbed by berm; areas beyond berm retain archaeological potential – test pit survey required.



Image 6: Project Area exhibits archaeological potential around small concrete structure (potential pier) – test pit survey required.



Image 7: Project Area exhibits archaeological potential – test pit survey required.



Image 8: Project Area exhibits archaeological potential – test pit survey required.



Image 9: Project Area exhibits archaeological potential – test pit survey required.

7.2 Historical Imagery



Image 10: Google Earth satellite view of the Project Area from 2006.



Image 11: Google Earth satellite view of the Project Area from 2010.

8.0 Maps

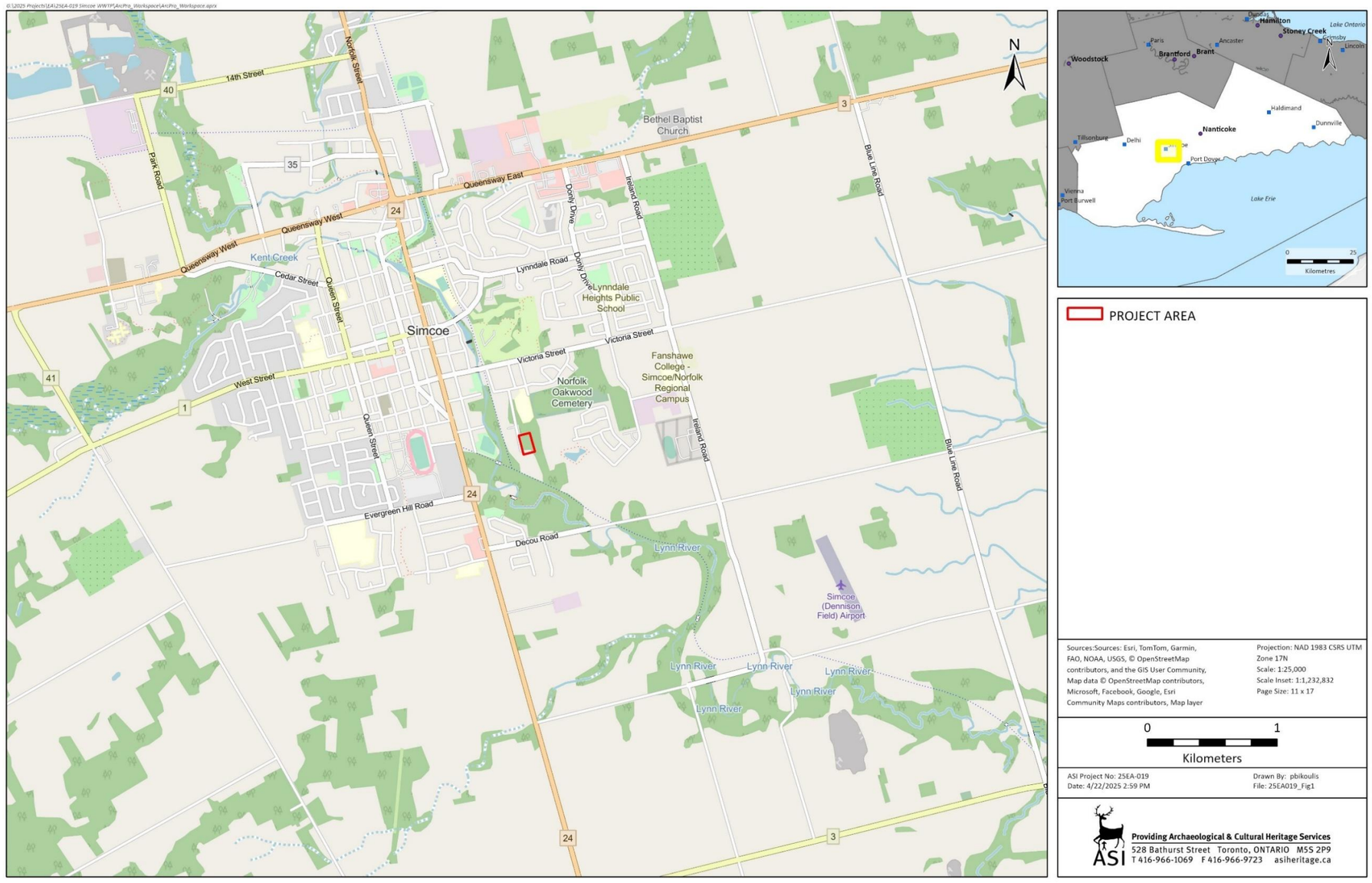


Figure 1: Location of the Project Area.



Figure 2: Project Area (Approximate Location) Overlaid on the 1865 Tremaine Map of Norfolk County.

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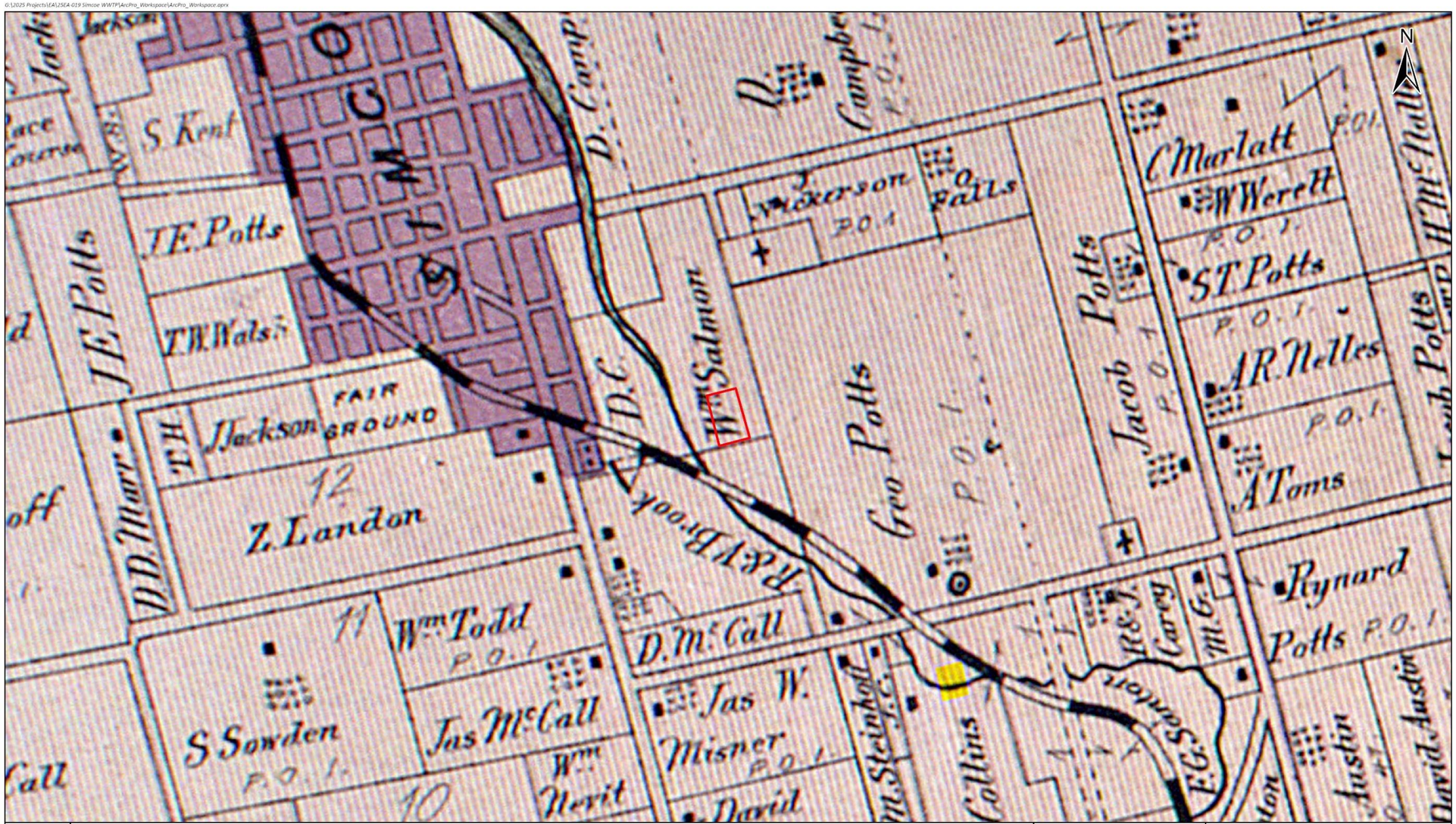


Figure 3: Project Area (Approximate Location) Overlaid on the 1877 Illustrated Atlas of Norfolk County.

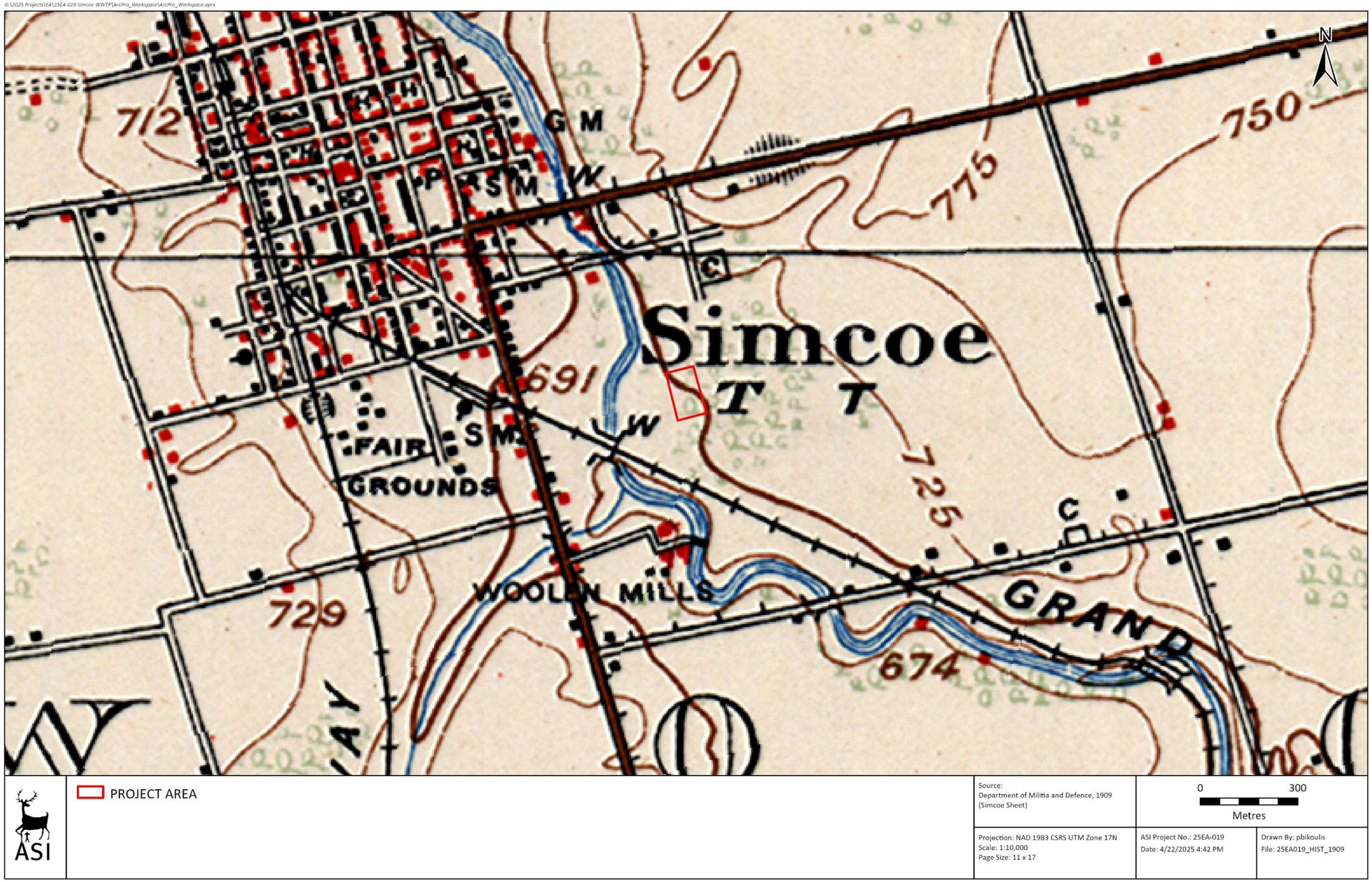


Figure 4: Project Area (Approximate Location) Overlaid on the 1909 Topographic Simcoe Sheet.

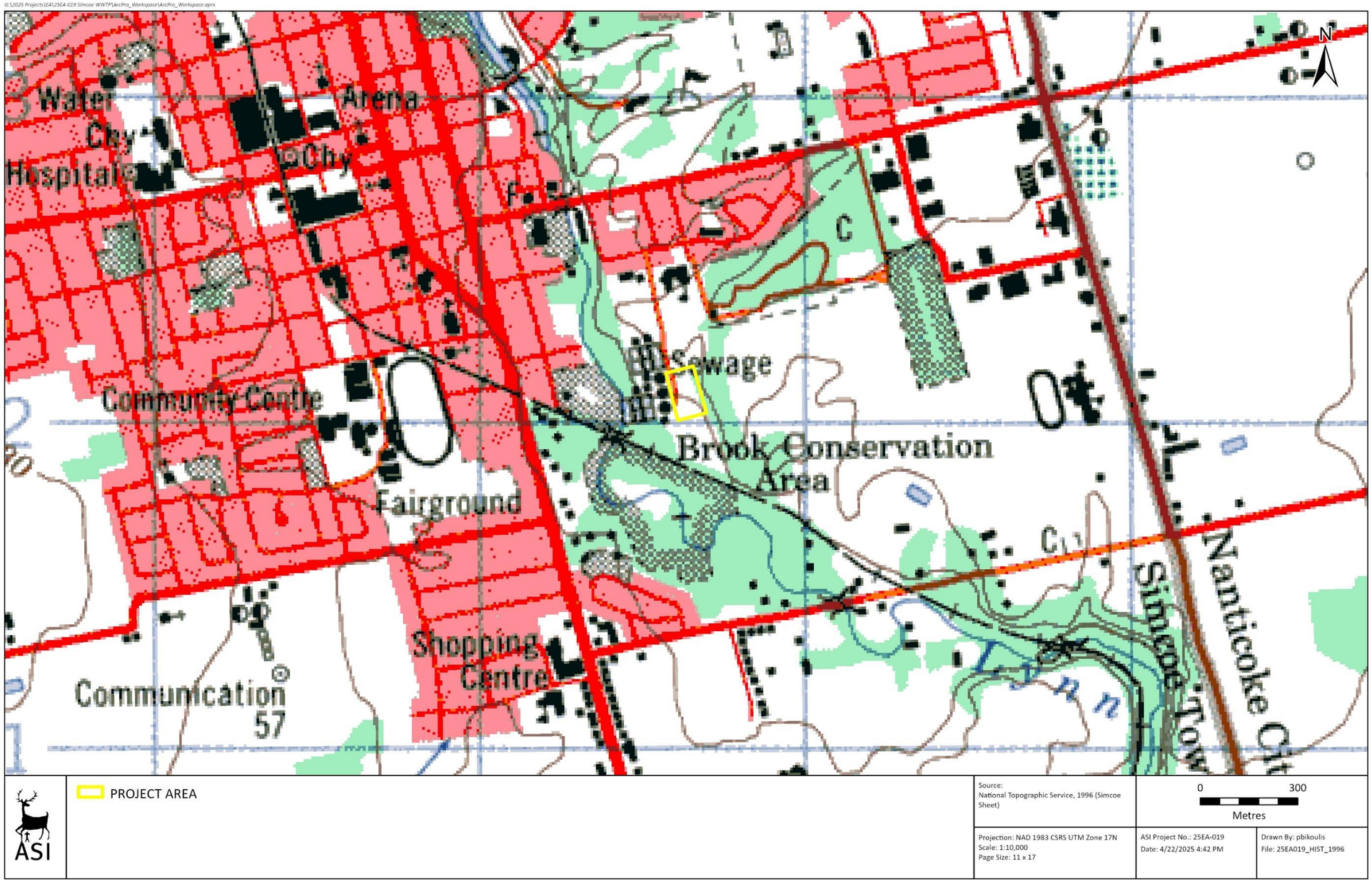


Figure 5: Project Area (Approximate Location) Overlaid on the 1996 Topographic Simcoe Sheet.



Figure 6: Project Area (Approximate Location) Overlaid on the 1954 Aerial Photograph.



Figure 7: Project Area Overlaid on the LiDAR-Based Digital Terrain Model (DTM).

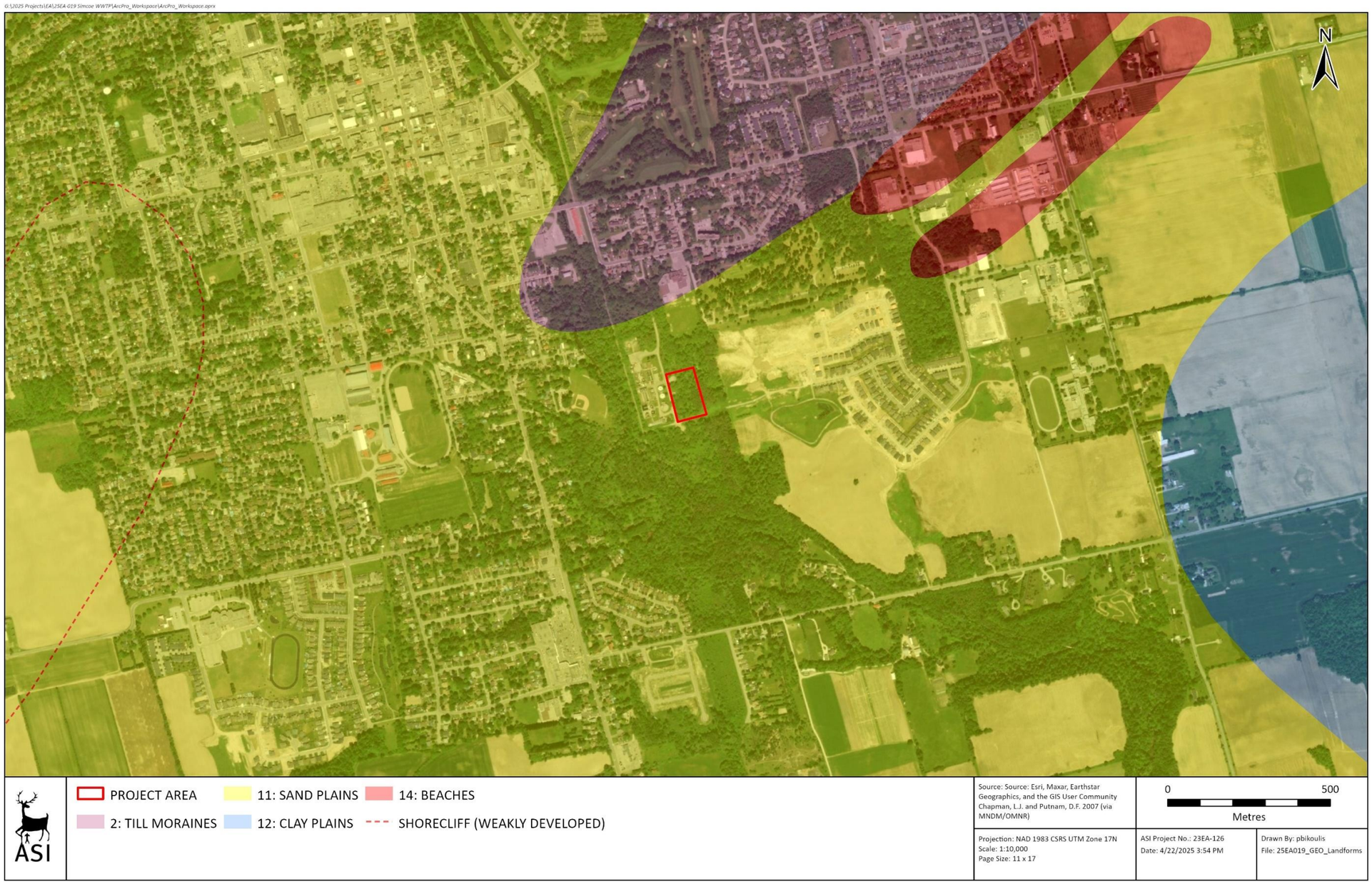


Figure 8: Project Area – Physiographic Landforms.

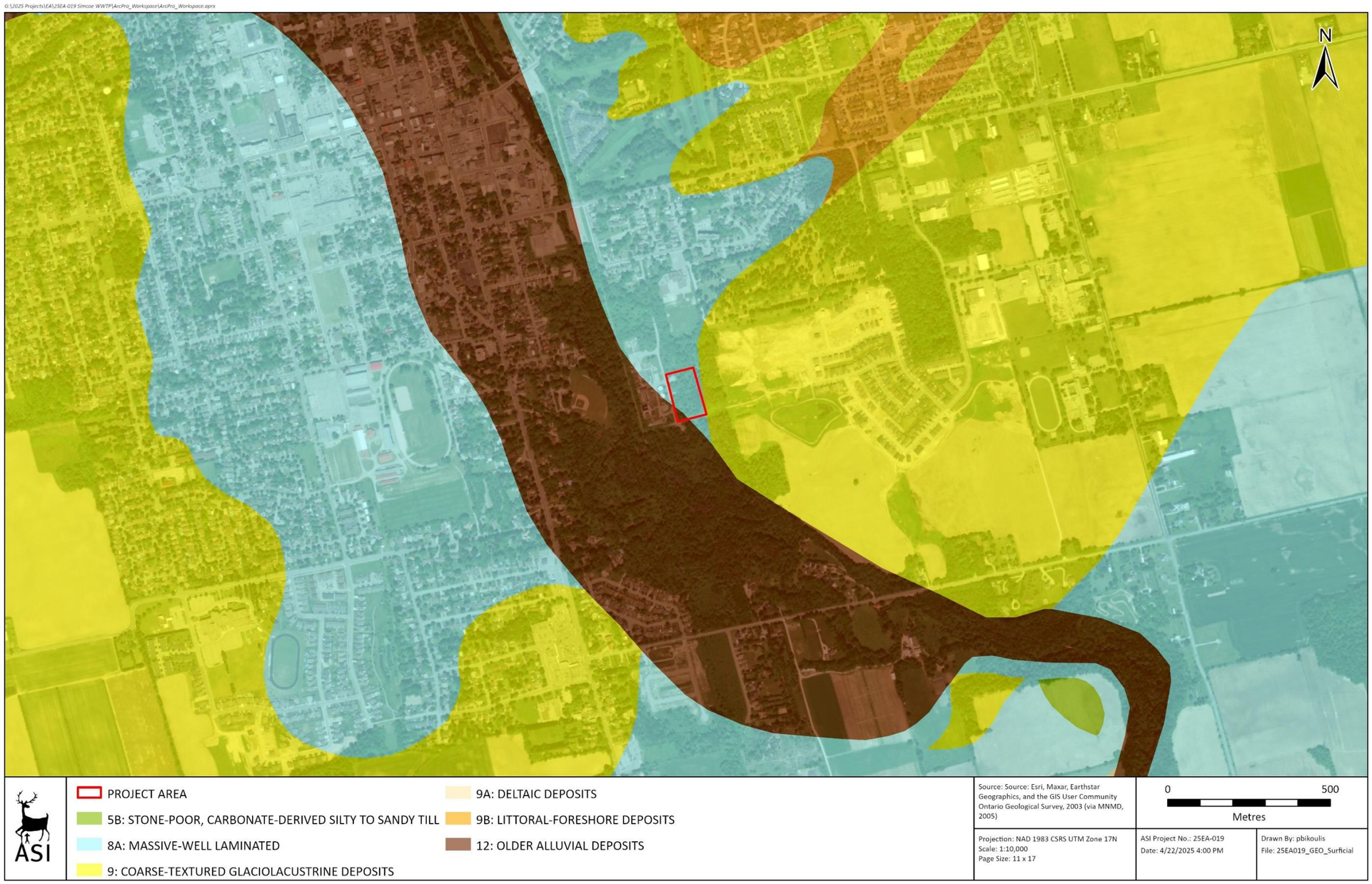


Figure 9: Project Area – Surficial Geology.

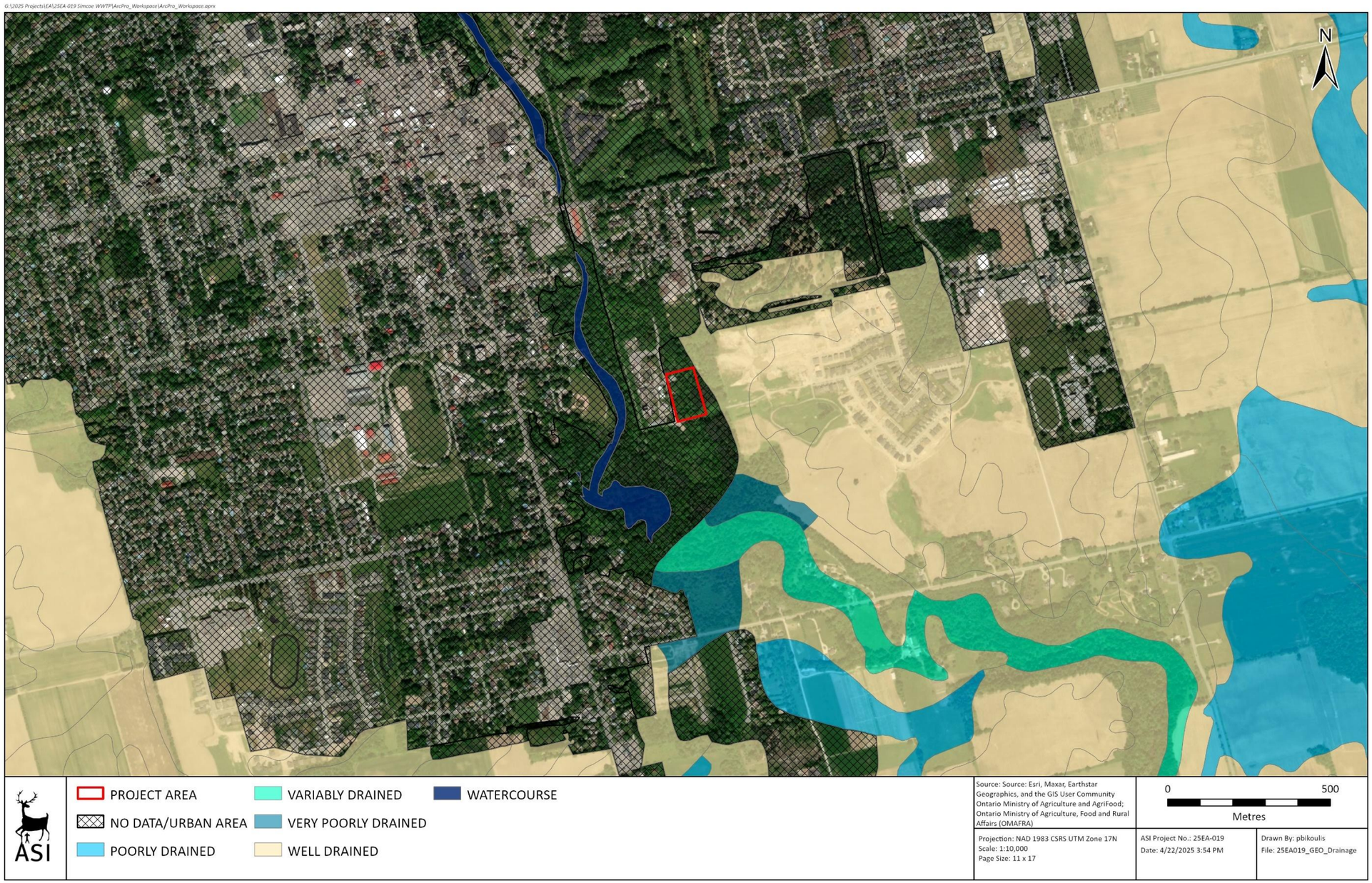


Figure 10: Project Area – Soil Drainage.



Figure 11: Results of the Stage 1 Archaeological Assessment.

Appendix C

Geotechnical and Hydrogeologic Investigations

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Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

GEOTECHNICAL INVESTIGATION
NORFOLK COUNTY
WASTE WATER TREATMENT PLANT EXPANSION
16 OAKWOOD AVENUE
SIMCOE, ONTARIO

PREPARED FOR: **Hatch**
5035 South Service Road, 6th Floor
Burlington, Ontario
L7L 6M9

ATTENTION: Mr. Glen Douglas
Project Manager

File No. 7-17-0120-01
November 8, 2017
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EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation carried out for the design of the planned expansion of the Norfolk County Waste Water Treatment Plant (WWTP) in Simcoe, Ontario.

The results of eight boreholes together with laboratory testing are reported. The predominant subsurface conditions at the site comprised loose surficial soils consisting of silty sand and sandy silt, overlying compact to dense sand. Two of the deeper boreholes fully penetrated the sand and were terminated in a deposit of dense silt layered with silty clay. The ground water levels measured in monitoring were in the range of about 4 to 6m below the existing ground surface.

A discussion of the geotechnical engineering aspects of the design of the various elements of the WWTP upgrading has been provided.

The construction of the headworks facility will require excavation to a depth approaching about 14m below the existing grade which corresponds to several metres below the reported ground water level. It is expected that the excavation will need to be shored and ground water control must be established and maintained. Some of the other plant will involve excavations below the ground water level and dewatering systems will be needed at those locations. At other locations the excavations may be marginally above the ground water level and further monitoring will be needed to assess the dewatering requirements at these locations.

The results of soil chemistry analyses did not identify concerns regarding the management of surplus excavated soil that may be generated during the construction.

This report has been issued in draft format for review and comment and for use in the preliminary design of the works.

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Appendix A Borehole Logs
Appendix B Geotechnical Laboratory Results
Appendix C Certificates of Analysis (Soil)

1. INTRODUCTION

This report presents the results of a geotechnical investigation carried out for the design of upgrades to the Norfolk County Waste Water Treatment Plant (WWTP) located at 16 Oakwood Avenue in Simcoe, Ontario. The location of the site is shown on Figure 1.

A proposal and work plan was initially outlined in our letter of August 4, 2016. A revised proposal that included a scope of work specified by Hatch was submitted on July 25, 2017. Authorization to proceed with the revised work plan was provided by Hatch on July 25, 2017.

The intents of the investigation were to determine the soil and ground water conditions in a series of boreholes drilled at the following venues:

- New headworks;
- new RAS/WAS chamber and
- new sludge receiving station;
- new digester;
- new biosolids holding tank;
- new administration building
- underground piping, and
- access roads

Information and advice on the geotechnical aspects of the design of the upgrades is provided based on the results of the boreholes. The anticipated construction conditions pertaining to excavation, backfill and temporary ground water control are discussed also, but only with regard to how these might influence the design. A hydrogeological investigation is being carried out in conjunction with the geotechnical investigation and will be reported under separate cover.

This report was previously issued in draft format for review and comment.

2. SITE DESCRIPTION

The site consists of the existing County of Norfolk wastewater treatment plant located at 16 Oakwood Avenue in Simcoe, Ontario. The existing WWTP complex is approximately 2 hectares in size and was comprised of various infrastructure and buildings. The site access consists of a paved road which extends south from Oakwood Avenue along the east side of the existing plant. The Lynn River is located to the west of the existing plant. The subject property gently slopes from the northeast to the southwest, with an overall grade change of about 6 metres across the site. An existing fenced-in hydro transformer is located adjacent to the northeast corner of the property.

Upgrades to the existing plant are proposed and new works are planned for the undeveloped property on the east side of the access road.

The site is situated in the Physiographic Region of southern Ontario known as the Norfolk Sand Plain. The soil stratigraphy characteristic to this region generally consists of deltaic sand deposits overlaying strata of silt and clay.

3. PROCEDURE

The fieldwork for this investigation was carried out between August 29 and 31, 2017 during which time eight (8) boreholes were drilled to depths in the range of 3.5 to 14.2m below the existing ground surface. On October 11, 2017 one of the boreholes (BH3), was explored an additional 7.6m to a depth to 21.8m below the existing ground surface. The locations and depths of the boreholes were specified by Hatch. The locations of the boreholes are shown on the Location Plan, Figure 2. The results of the boreholes are shown on the Log of Borehole sheets in Appendix A.

The existing underground services at the site were located in advance of the drilling by Ontario One Call. In addition, Frontier Utility Locating Services Inc. was retained to confirm that there were no private services conflicting with the borehole locations. Tree clearing was carried out by County forces to provide access to the boreholes located in the area to the east of the existing plant.

The drilling was carried out using fully equipped CME 75 truck and track mounted drill rigs supplied and operated by specialist, licenced (O. Reg. 903) drilling contractor. An engineer from our staff arranged for underground service locates, observed the drilling and sampling operations, logged the boreholes and cared for the samples obtained.

The boreholes were advanced using conventional interval augering using hollow core augers. Soil samples were recovered by split barrel sampling in accordance with ASTM Standard D1586 at regular intervals of depth. Soil samples recovered from the boreholes were sealed in clean, single use containers and transferred to Terraprobe's Stoney Creek laboratory for further examination and laboratory testing. Samples for soil quality analyses were stored in dedicated glass containers provided by the analytical laboratory.

The ground water conditions in the open boreholes were observed during and immediately after drilling. In addition, ground water monitoring wells were constructed in four selected boreholes. The wells were constructed using nominal 50mm diameter, Schedule 40 well screen and riser pipe. The wells were provided with protective steel casings and flush mount steel covers. As-built details on the wells are shown schematically on the Record of Borehole sheets in Appendix A.

The ground surface elevations at the borehole locations have been inferred from the site topographical mapping provided by Hatch.

A program of geotechnical laboratory testing was carried out on the soil samples recovered from the boreholes including moisture content (ASTM D 2216) and particle size analysis

(ASTM D422). The results of the laboratory testing are presented in Appendix B and are shown on the Records of Borehole sheets in Appendix A.

Selected soil samples were submitted to AGAT Laboratories for soil quality analyses. The analyses included O. Reg. 153-04 metals and inorganics. Details on the rationale for the analyses as well as the results of the analyses are discussed in Section 7 of this report. The Certificates of Analyses for the chemical analyses are provided in Appendix C.

4. SUBSURFACE CONDITIONS

4.1 General

The subsurface soil and ground water conditions encountered in the boreholes are shown on the Log of Boreholes sheets provided in the accompanying Appendix A. The subsurface conditions were confirmed at the borehole locations only and the conditions will vary between and beyond the boreholes. The boundaries between the various strata shown on the Record of Borehole sheets were based on non-continuous sampling and observations of drilling resistance. These boundaries typically represent a transition between the various stratigraphic units and are not to be interpreted as precise planes of stratigraphic change.

The subsurface conditions encountered at the site generally consisted of fill overlying near surface strata of loose silty sand and sandy silt. A stratum of sand was encountered beneath the fill and surficial soils. The deeper boreholes penetrated a layered silt and silty clay deposit beneath the sand.

Ground water observations were made in the boreholes during and after completion of drilling and ground water monitoring wells were constructed in selected boreholes. The results of short-term ground water level monitoring are reported. Fluctuation in the ground water levels will occur due to seasonal variations and precipitation conditions.

The following is a general description of the major stratigraphic units and the ground water conditions encountered in the boreholes.

4.2 Soil Conditions

4.2.1. Fill

Fill was encountered below asphalt pavement in boreholes 3, 4 and 6 and below topsoil in borehole 8. The fill in borehole 3, 4 and 8 generally consisted of sandy silt and the fill in borehole 6 consisted of clayey silt. The N values determined in the standard penetration testing carried out within the fill ranged from 4 to 12 blows per 0.3m inferring a relatively loose state of packing. The in-situ water content of the samples of fill recovered from the penetration testing was in the range of about 7 to 22 percent.

4.2.2. Sandy Silt and Silty Fine Sand

Strata of sandy silt and silty fine sand were encountered beneath the fill and topsoil in all of the boreholes. These strata were fully penetrated at depths of about 1.5 to 2.9m below the existing ground surface. The N values determined in these fine grained granular strata were in the range of 4 to 19 blows per 0.3m with an average N value of about 9 blows per 0.3m, generally

inferring a loose relative density. The natural water contents of the silty sand and sandy silt ranged from about 6 to 22 percent with an average natural water content of about 15 percent.

4.2.3. Sand

All of the boreholes encountered a stratum of medium sand below the silty sand and sandy silt. The sand was fully penetrated at depths of 9.4 and 9.8m below the existing ground surface in boreholes 3 and 4 respectively. The remaining boreholes were terminated in sand. The N values determined in the sand ranged from 10 to 59 with an average N value of about 22 blows per 0.3m inferring a compact relative density. The natural water content of the sand recovered above the ground water level was in the range of about 2 to 6 percent with an average of about 3 percent. The sand recovered from the penetration testing carried out near to and below the encountered ground water level ranged from 13 to 23 percent with an average of about 19 percent. Particle size distribution curves for selected samples of the medium sand are shown on Figure B2 in Appendix B.

4.2.4. Silt

Boreholes 3 and 4 encountered a deposit of silt with layers and seams of silty clay below the sand and to the depths explored. The N values determined in this deposit ranged from 20 to 74 blows per 0.3m with an average N value of about 49 blows per 0.3m inferring a dense relative density. The natural water content of the silt ranged from about 15 to 21 percent with an average natural water content of about 18 percent. Particle size distribution curves for samples of the silt are shown on Figure B2 in Appendix B.

4.3. Ground Water Conditions

Boreholes 5 and 6 which were explored to depths of 6.0 and 3.5m respectively were dry during and upon completion of drilling. Ground water was encountered in the remaining boreholes at depths of about 4.5 to 6.0m below ground surface or between elevations 205.9 and 206.8m. These encountered ground water conditions are not interpreted as representing stabilized conditions.

Table 4.1 provides a summary of ground water levels subsequently measured in the monitoring wells.

Table 4.1 Summary of Ground Water Level Monitoring					
Borehole No.	Screened Interval (m)	Soil Stratum	Elevation of Ground Water Level (m)		
			Aug. 31, 2017	Sept. 13, 2017	October 1, 2017
1	58.8 – 60.3	Sand	206.6	206.5	206.6
4	52.3 – 53.8	Silt	206.6	206.6	206.6
7	70.7 – 73.8	Sand	206.4	206.4	206.4
8	66.9 – 69.9	Sand	206.3	206.3	206.3

Some variation in ground water levels is expected due to seasonal effects and precipitation conditions.

5. DISCUSSION

The following discussion and recommendations are based on the factual data obtained from this investigation and is intended for use by the owner and the design engineer(s). Comments made regarding the construction aspects are provided only in as much as they may impact on design considerations. Contractors bidding on or undertaking work at the site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, equipment capabilities, costs, sequencing and the like.

The following discussion is based in part on the preliminary design drawings provided by Hatch. Some aspects of the following discussion are therefore considered preliminary and needs to be reviewed and updated as necessary when the final design information is available.

This following discussion is provided on the presumption that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards and guidelines of practice.

5.1 Overview

5.1.1. Headworks Facility

The headworks facility will generally consist of a new single storey building approximately 12 by 18m in plan, which will house a wet well, control room and screen room. As presently proposed, the finished main floor elevation will be at 212.6m or about 0.3m above the finished exterior grade. The valve room finished floor will be at 208.5m. The wet well finished floor elevation will be at 199.1 or some 13.2m below grade.

The results of boreholes 3 and 4 drilled at this site indicated a ground water level at about elevation 206.5m. Based on the results of boreholes 3 and 4, excavation for the wet well will penetrate the sand deposits and terminate in the underlying dense silt stratum. Excavation to a depth of some 8m below the ground water level will be required. Ground water control will be needed to construct the facility. A supported excavation will be needed at this site and the ground water control plan should be developed in conjunction with the excavation plan.

While considered competent to support the expected foundation loading, the silt stratum on which the deeper elements of the facility will be supported, is highly susceptible to disturbance, particularly when ground water seepage is encountered. For this reason measures

will be required to preserve the integrity of the bearing stratum during construction. This can be achieved by constructing a working slab using lean concrete of adequate thickness or by placing a 300mm thick layer of nominally compacted clear crushed stone on a suitable nonwoven geotextile (Terrafix 270R or equivalent). Use of vibratory compaction equipment is not recommended during this stage of the work.

5.1.2. RAS/WAS

The proposed RAS/WAS building is about 5 by 9 m in plan and will provide access to valves and piping. This building will be supported on a slab foundation with an underside of slab elevation at about 207.3m or some 5m below the existing ground. The results of borehole 8 indicated that the foundation slab will be supported on sand, marginally above the ground water level measured at the time of the investigation.

The design of this facility is not considered problematic however it is expected that the ground conditions for the support of the slab may be adversely affected by excavations for the pipes that will enter the building. Although the foundation slab may be above the ground water level, the invert elevations of some of the piping may be deeper and it may be necessary to lower the ground water level slightly to maintain the stability of the bearing stratum during the underground construction. Additional ground water level monitoring will be beneficial in assessing the dewatering requirements for final design purposes.

It will be important that the excavations for the underground plant are adequately supported and then properly backfilled so that the foundation soil will not be compromised.

Consideration should be given to constructing a working pad of 200mm of well compacted Granular “A” to preserve the integrity of the bearing stratum during construction.

5.1.3. New Sludge Receiving Building

The new sludge receiving building will be about 10 by 12m in plan with an attached sludge receiving tank some 5m by 5m in plan and a septage/leachate receiving tank some 5m by 10 m in plan. The base slab at this facility will be at elevation 209.0m or at about 4m below the existing grade. The results of borehole 5 indicate that the foundation slab will be supported on sand, above the ground water level. Additional ground water level monitoring will be required to verify these conditions.

A working pad of Granular “A” is recommended to protect the bearing stratum during construction.

5.1.4. Digester Facility

The digester will consist of two 12.8m diameter digester tanks with an interconnecting control building. The top of basement floor slab in the control building will be at 209.3m. The floor of the tanks will be sloped toward the centre with an invert elevation of about 207.3m or about 6m below the existing grade.

Based on the results of boreholes 1 and 2, the excavations for the tanks will penetrate the sand stratum to depths approaching the ground water level. Dewatering may be required to construct the tank bases. Additional ground water level monitoring will be beneficial in assessing the dewatering requirements for final design purposes.

A working pad of Granular "A" is recommended to protect the bearing stratum during construction.

5.1.5. Biosolids Holding Tank No. 1

The biosolids holding tank will be a large diameter tank of similar design to the digester tanks. The invert elevation of the tank floor will be about 6m below grade (204.4m) or about 2m below the measured ground water level. Dewatering will also be required at this venue. A working pad of Granular "A" is recommended to protect the bearing stratum during construction.

5.1.6. New Administration Building

As presently proposed the new administration building will be a single storey floor slab on grade structure approximately 26 by 9m in plan. It is proposed to support the building on conventionally designed strip footings at a nominal depth of 1.2m below the existing ground surface.

Borehole 6 was drilled near the southeast corner of the proposed building site and encountered clayey fill to a depth of about 2.1m below the existing ground. On this basis it will be necessary to lower the footings sufficiently that they will be supported in the native undisturbed compact sand that underlies the site. Alternatively consideration could be given to excavating all existing fill and constructing engineered fill to restore the grade and support the foundations and slabs on grade.

5.2 Foundation Design Parameters

The subsurface conditions at the various venues and the potential impacts on the foundation design at each site are outlined above. The following Table 5.1 provides a summary of the geotechnical parameters that are recommended for the design of the foundations at the various venues.

Table 5.1 – Summary of Foundation Design Parameters

Venue	Anticipated Founding Elevation (m)	Bearing Stratum	Dewatering Required	Geotechnical Resistance (kPa)		Subgrade Modulus (MPa/m)
				SLS	ULS	
Headworks	208.1 - 205.8 198.8	Sand Silt	Yes	200 300	300 450	25 25
RAS/WAS	207.3	Sand	Possibly	200	300	25
Sludge Receiving	208.6	Sand	No	150	225	20
Digester	206.6 – 208.9	Sand	Possibly	150	225	20
Biosolids Holding	204.0 ±	Sand	Yes	150	225	20
Admin Bldg.	209.4 or lower	Sand	No	150	225	20

Where required, the dewatering must be carried out in advance of excavating for the foundations. In all cases, the adequacy of the bearing strata must be confirmed by the geotechnical engineer at the final excavation stage. As outlined above some works that are intended to protect the bearing stratum during construction have been recommended.

In cases where permanent foundation drainage is not provided, the foundations must be designed to resist uplift forces due to buoyancy computed using the ground water levels provided in Table 4.1. This will be especially critical at the headworks facility. Where the mass of the foundations is not sufficient to resist the uplift, consideration could be given to extending the base slabs outward beyond the end walls in order that the weight of the backfill can also be used to resist uplift. Alternatively consideration could be given to the use of micropiles or helical pier tie downs to resist uplift.

In the case of the headworks facility, such anchorages will develop resistance in the dense saturated cohesionless deposit encountered below elevation 203.5m. It is expected that nominal 150mm diameter post grouted micropiles within the dense silt will safely resist up to 60kN/m of adhered anchor length. Conventional earth anchors made in this deposit can be designed using a working adhesion of 60kPa. Helical piers (SS5 square shaft HPs) anchored in the silt can be designed using s tensile capacity of 80 kN ULS. One or more prototype anchors must be performance tested to 200% of the design load to demonstrate the anchor capacity and validate the design assumptions.

5.3 Seismic Site Classification

The Ontario Building Code (2012) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4A of the Ontario Building Code (2012). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken. Alternatively, the classification is estimated on the basis of rational analysis of undrained shear strength (s_u) or penetration resistance (N-values).

Based on the results of the boreholes the site designation for seismic analysis is best represented by **Site Class D**, as shown in Table 4.1.8.4.A of the Ontario Building Code (2012). Tables 4.1.8.4.B and 4.1.8.4.C. of the same code provide the applicable acceleration- and velocity-based site coefficients.

Table 5.2 Summary of Seismic Design Parameters

Site Class	Values of F_a as a Function of Site Class and Sa(0.2)				
	$S_a(0.2) \le 0.25$	$S_a(0.2) = 0.50$	$S_a(0.2) = 0.75$	$S_a(0.2) = 1.00$	$S_a(0.2) \ge 1.25$
D	1.3	1.2	1.1	1.1	1.0
	Values of F_v as a Function of Site Class and Sa(0.1)				
	$S_a(1.0) \le 0.1$	$S_a(1.0) = 0.2$	$S_a(1.0) = 0.3$	$S_a(1.0) = 0.4$	$S_a(1.0) \ge 0.50$
	1.4	1.3	1.2	1.1	1.1

5.4 Earth Pressure Design Parameters

The appropriate values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

Table 5.3 - Summary of Soil Parameters for Computation of Earth Pressures

Soil Type / Parameter	γ (kN/m^3)	ϕ (^{o})	K_a	K_o	K_p
Compact Granular Fill Granular 'B' (OPSS.MUNI 1010)	21	32	0.31	0.47	3.26
Select excavated sand	20	30	0.33	0.50	3.0
Non-select excavated earth	19	28	0.36	0.53	2.78

The above earth pressure coefficients pertain to a horizontal grade condition behind a retaining structure. Values of earth pressure parameters for an inclined retained grade condition will vary.

Walls subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following equation:

$$P = K[\gamma(h - h_w) + \gamma' h_w + q] + \gamma_w h_w$$

where,

P	=	the horizontal pressure at depth, **h** (m)
K	=	the earth pressure coefficient
h_w	=	the depth below the ground water level (m)
γ	=	the bulk unit weight of soil, (kN/m^3)
γ'	=	the submerged unit weight of the exterior soil, (γ - 9.8 kN/m^3)
q	=	the complete surcharge loading (kPa)

The ground water levels shown in Table 4.1 should be considered for design purposes. In cases where the wall backfill can be drained effectively to eliminate hydrostatic pressures on the wall that would otherwise act in conjunction with the earth pressure, the above equation is simplified to:

$$P = K[\gamma h + q]$$

Consideration must also be given to the possible effects of frost on structures retaining earth.

5.5 Underground Services

5.2.1. General

The precise layout and invert elevations of the underground piping have not been provided however it is expected that the pipes will be located at depths in the range of about 3 to 5m below the existing ground surface.

Based on the results of the boreholes it is expected that the excavations for the pipes will generally penetrate fill and surficial soils and will terminate in the medium sand stratum that underlies the site. Ground water was generally encountered at depths of about 5 to 6m below ground surface and it is likely that dewatering will be required for the deeper services.

5.2.2. Pipe Bedding

A Class B bedding condition as shown on OPSD 802.031 is generally required for conventional sewer construction. The bedding for the pipes should consist of well graded free

draining granular material such as Granular "A", which is compatible with the size and type of pipe and consistent with the current County standards. Bedding materials with a high porosity, such as clear stone are not recommended for this project unless adequate filter protection is provided. Such protection could be achieved using a suitable geotextile.

It is possible that fill and or loose surficial soil could be encountered at the pipe invert elevation in some sections. Care will be required to ensure that fill and any loose or disturbed soil is removed prior to placing pipe bedding.

5.2.3. Backfill

It is anticipated that the excavated soil will generally consist of the surficial soils (silty sand and sandy silt) and medium sand. The natural water content of the silty sand and sandy silt was variable but generally within a range where mechanical compaction to an acceptable standard is feasible. The medium sand was generally dry of the laboratory optimum water content for compaction although somewhat wetter near to and below the ground water level. Based on the above it is expected that most of the excavated soil will be suitable for re-use as trench backfill however it may be necessary to add water to the backfill to achieve the specified degree of compaction. Any fill, topsoil or excessively wet soil should be excluded from the backfill material.

The trench backfill must be placed in lifts of 300mm thickness or less and uniformly compacted to 95 percent of standard Proctor maximum dry density. The upper 1m of backfill, forming pavement subgrade, should be uniformly compacted to 98 percent of standard Proctor maximum dry density. For optimal performance, the placement water content of the backfill should be within about 2 percent of the corresponding laboratory optimum water content for compaction.

5.2.4. Soil Corrosivity

The aggressiveness of the subsurface environment to underground plant has been assessed by carrying out a suite of analyses on soil samples recovered from the boreholes at depths approximately corresponding to the expected invert elevations. A copy of the Certificate of Analysis for the testing is included in Appendix C. The results of the analysis are summarized in the following Table 5.4.

Table 5.4 - Summary of Corrosion Analysis			
Parameter	**BH3 Sa3 Silty Sand**	**BH6 Sa3 Sand**	**BH1 Sa6 Sand**
pH (pH)	8.64	9.11	9.13
Chloride (µg/g)	31	5	2
Sulphate (µg/g)	39	10	10
Sulphide (µg/g)	<0.05	<0.05	<0.05
Redox Potential (mV)	203	193	186
Resistivity (ohm-cm)	6580	13700	15400
Moisture	moist	dry	Wet
AWWA Rating	6	5	7

The water soluble sulphate concentrations reported for the three samples tested ranged were below the range of concentrations that has been categorized as “Moderate” or a “Class S-3" degree of exposure with respect to sulphate attack on Portland cement concrete as shown in CSA A23.1-14, Table 3. On this basis the potential for sulphate attack on underground concrete at this site is considered low. The mix design requirements for concrete exposed to various conditions are provided in the above document.

The soil resistivity in combination with other parameters and environmental factors provides an indication of the potential for corrosion of buried metal pipe. Application of the American Water Works Association (AWWA) ten point soil evaluation criteria to the results of the testing indicated a rating in the range of 5 to 7 for the samples tested. A rating of greater than 10 is considered to represent a potentially corrosive environment. Other studies suggest that soil with a resistivity of less than about 2000 ohm-cm should be considered aggressive.

Based on the above analysis, the subsurface conditions at the site are not regarded as being particularly aggressive to buried metal or concrete plant. It must be noted that the analytical results provide only an indication of the potential for corrosion. Irrespective of the results of the testing, if a high incidence of corrosion related failure has been reported in the area of the site, corrosion protection or the use of PVC pipe should be considered.

5.6 Pavements

New vehicular pavements and surface parking will be required in the area to be developed for the new digester facility and sludge receiving building located to the east of the existing facilities. This area was tree covered at the time of the investigation.

Development of this area will consist of clearing and grubbing and pre-grading. It is expected that some cutting and filling may be needed to achieve the design subgrade elevation. The

subgrade soil will generally consist of sandy silt and silty fine sand. Where fill is required to achieve the design grade it may consist of select cut material from the site or select surplus excavated soil from the adjacent construction. Subgrade fill should be placed and uniformly compacted in 300mm thick lifts to at least 95 percent of standard Proctor maximum dry density.

The final subgrade surface beneath all pavements should be shaped and grade to promote drainage. The subgrade in areas of cut may be in a relatively loose condition and for this reason the final subgrade surface should be uniformly compacted using a large diameter smooth drum roller. The subgrade should be proof-rolled under the direction of a geotechnical engineer to identify any soft or weak zones requiring remedial work.

5.2.5. Asphaltic Concrete Pavement Design

The precise nature of the traffic loading at the site is not known however it is expected that the pavement will be subjected to relatively heavy loading, possibly consisting of semi tanker trailers and the like. Parking for staff and service vehicles is also proposed. The pavement component thicknesses shown in Table 5.4 are recommended for preliminary design consideration for flexible pavements at the site.

Table 5.4 – Pavement Component Thickness Design

Pavement Layer	Compaction Requirements	Heavy Duty Thickness	Surface Parking Thickness
Surface Course Asphaltic Concrete HL4 (OPSS 1150)	92-96.5% MRD	50 mm	40 mm
Base Course Asphaltic Concrete HL8 (OPSS 1150)	92-96.5% MRD	80 mm	40 mm
Base Course: Granular A (OPSS 1010)	98% standard Proctor Maximum Dry Density (ASTM-D1557)	150 mm	150 mm
Subbase Course: Granular B Type II (OPSS 1010)	98% standard Proctor Maximum Dry Density (ASTM-D1557)	300 mm	300 mm

Some adjustment to the thickness of the granular subbase material may be required depending on the condition of the subgrade at the time of the pavement construction. The need for such adjustments can be best assessed by the geotechnical engineer during construction. Equivalent Super Pave mixes may be used in place of the Marshall mix designations given above.

Consideration should be given to the use of rigid pavement for improved durability in some locations such as aprons, unloading zones and other hard standing areas.

5.2.6. Drainage

Control of surface water is a significant factor in achieving good pavement performance and longevity. Grading adjacent to the pavement must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb. The native soils are highly susceptible to frost heave, and pavements must be designed accordingly. The subgrade must be free of depressions and sloped (preferably at a minimum grade of two percent) to provide effective drainage toward subgrade drains.

Continuous, adequately filtered pavement subdrains along both sides of the roadways, or alternatively roadside ditches should be provide along both sides of the roadways to provide effective drainage of the granular pavement materials. The subdrain invert should be maintained at least 0.3 metres below subgrade level. Subdrains should also be provided at all catch-basins.

It should be noted that in addition to a strict adherence to the above pavement design recommendations an effective quality assurance inspection and testing program is required to verify compliance of the materials to the design and that the various compaction requirements are consistently being achieved.

6. DESIGN CONSIDERATIONS FOR CONSTRUCTABILITY

6.1 Excavation

Excavations must be carried out in accordance with the *Occupational Health and Safety Act and Regulations for Construction Projects, Ontario Regulation 213/91 as amended by Ontario Regulation 142/17 (Part III - Excavations, Section 222 through 242).* These regulations designate four (4) broad classifications of soils to stipulate appropriate measures for excavation safety. Within this context, *Type 3 Soil* conditions should be assumed for all excavations provided that ground water seepage is adequately controlled and surface water is directed away from open excavations. It is noted that flatter excavations may be needed in the dry sand deposits

Where workmen must enter a trench or excavation deeper than 1.2 m, the soil must be suitably sloped and/or braced in accordance with the regulation requirements. Minimum support system requirements for steeper excavations are stipulated in Sections 235 through 238 and 241 of the Act and Regulations and include provisions for timbering, shoring and moveable trench boxes.

6.2 Dewatering

The ground water levels have been measured between about elevations 206.3 and 206.6m in the monitoring wells constructed at the site. It is expected that excavation for the foundations at some of the venues will extend below the ground water level. Adequate ground water control will be necessary to maintain the stability of the excavations, to prevent bottom heave and to properly construct the foundations.

A hydrogeological investigation is being carried out in conjunction with the geotechnical investigation which will be reported under separate cover as it becomes available. The following comments are provided for preliminary design consideration.

It is anticipated that the excavation for the biosolids holding tank may extend to some 2m below the ground water level and the excavations at the digester may be only marginally above the ground water level. It is likely that effective ground water control at these sites can probably be achieved by pumping from a ring of vacuum well points. The ground water level should be lowered to and maintained at 1m below the deepest excavation.

The dewatering requirements at the headworks facility are more onerous due to the depth of the excavation required. It is likely that a shoring system consisting of interlocking steel sheet piling supported with walers and struts or restrained using soil anchors may be required. Depending on the design, the sheet piling would extend at least several metres into the

interlayered silt and silty clay deposit which may also be required to control ground water seepage. Continuous pumping from properly filtered sumps located in the excavation will be required to lower the ground water level and to manage the seepage volumes expected.

6.3 Shoring

It is expected that a shoring system will be needed to support the excavations for the headworks facility. Open cut excavations may be feasible at the other venues.

Shoring systems must be designed and constructed in accordance with the Occupational Health and Safety Act of Ontario (OHSA). The shape of the soil pressure distribution diagram to be considered for designing the shoring depends on the type and condition of the soil encountered and the amount of movement that can be tolerated. The shoring system can be restrained, fixed or flexible. Earth pressure computations must also take into account the ground water level. Earth pressure above the ground water level is computed based on the bulk unit weight of the retained soil. Earth pressures below the ground water level will be computed using the submerged (buoyant) unit weight of the soil. A hydrostatic pressure is also applied if the retained soil is not fully drained.

As outlined in Section 6.2, the shoring system may be an integral part of the dewatering scheme at the headworks site. The depth of excavation at this site will approach about 14m. Based on the results of boreholes 3 and 4 drilled at the site and the design information presently available, it is expected that excavations for the headworks will penetrate the surficial soils, the sand deposit and terminate in the underlying interlayered silt and silty clay stratum. A ground water level at 206.6m or about 5.8m below the existing ground surface has been reported at this venue. The recommended unfactored soil parameters that may be considered in the design of the support system are shown in Table 6.1.

Table 6.1 - Soil Parameters for Shoring Design

Elevation (m)	Stratigraphic Unit	ϕ (degrees)	γ (kN/m³)	γ' (kN/m³)	Earth Pressure Coefficient		
					K_a	K_o	K_p
210.0 – 212.3	Surficial Soil Loose	28	18	-	0.36	0.53	2.787
206.6 – 210.0	Sand Compact	30	19	-	0.33	0.50	3.00
202.5 - 206.6	Sand Compact – dense	30	19	9.2	0.33	0.50	3.00
198.1 – 202.5	Silt/Silty Clay Dense	32	20	10.2	0.31	0.47	3.22

The shoring could consist of a system of interlocking steel sheet piling supported with walers and struts or restrained using earth anchors. Depending on the design, the sheet piling would need to extend at least several metres into the silt deposit which will also be required to control ground water seepage.

Use of soil anchors to support the shoring system is considered feasible. Soil anchors can be installed as the excavation proceeds, minimizing the potential for relaxation in the supported soil. Soil anchors placed in the sand deposit can be designed for a working adhesion of up to 60 kPa. The upper level shoring anchorages must not be placed lower than 3.0 metres below the top of level ground surface. The installations would require pressure grouting through hollow stem augers to preserve the integrity of the bored holes and the anchor bond zone. The contractor must decide the anchor capacity and confirm its availability. All anchors must be tested as indicated in the Canadian Foundation Engineering Manual, 4th edition and the PTI Guidelines. It is suggested that 10 percent % of all tiebacks be Performance tested and 100 percent of all tiebacks be Proof Tested.

6.4 Quality Control

The on-site review of the condition of the foundation soil as the foundations are constructed is an integral part of the geotechnical design function and is required by Section 4.2.2.2 of the Ontario Building Code. The geotechnical engineer should be retained to review the geotechnical aspects of the final design and to verify the conditions encountered during construction.

The design advice in this report is based on an assessment of the subgrade support capabilities as indicated by the boreholes. These conditions may vary across the site depending on the final design grades and therefore, the preparation of the subgrade and the compaction of all fill should be monitored by the geotechnical engineer at the time of construction to confirm material quality, thickness, and to ensure adequate compaction.

The requirements for backfill placement on this project have been stipulated relative to Standard Proctor Maximum Dry Density (SPMDD). In situ determinations of density during fill and asphaltic pavement placement on site are required to demonstrate that the specified placement density is achieved.

Concrete design and construction should be specified in accordance with the requirements of CAN3 - CSA A23.1.

7. SOIL QUALITY

7.1 General Soil Quality

7.1.1. Methodology

Chemical analyses were carried out on sixteen (16) soil samples recovered from the boreholes drilled at the site. The soil samples were submitted to AGAT Laboratories. The chemical parameter groups selected for analysis were chosen to provide general information regarding the soil quality and to be considered in developing a soil management plan for the construction.

The analyses were conducted for the following parameters groups, as specified in Ministry of Environment and Climate Change (MOECC) *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act"*, July 1, 2011.

Inorganic Parameter Groups

- Metals (M)
- Metals, Hydride-Forming As, Se and Sb (H-M)
- Other Regulated Parameters (ORPS):
    - boron, hot water soluble (HWS)
    - cyanide
    - electrical conductivity
    - hexavalent chromium
    - mercury
    - pH
    - sodium adsorption ratio (SAR)

The certificates of analyses are provided in Appendix C.

The results of the chemical analysis was compared to the Ministry of Environment and Climate Change (MOECC) Standards as found in the *"Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act"*, April 15, 2011. The Standards which the results were compared to were the following:

Table 1 Full Depth Background Site Condition Standards (Table 1)

Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Industrial, Commercial and Community Land Use (Table 3 ICC)

The Standards were chosen for the following reasons:

Table 1 – The results were compared to the Table 1 Standards in order to determine if the soil material was suitable as clean fill for reuse by any potential receiving site.
Table 3 ICC – The results were compared to the Table 3 ICC Standards in order to determine if the soil material should be considered a waste.

7.1.2. Results of Analyses

The results of the Ontario Regulation 153-04 analyses are presented in Table 7.1 of this report. The results of the analyses indicated that all of the samples tested met the MOECC Table 1 and Table 3 standards. On this basis the soil quality is not considered a major constraint in managing the excess excavated soil from the site.

7.2 TCLP Analysis

One composite soil sample of the soil recovered from the boreholes was submitted for analysis of Ontario Regulation 558 Schedule 4 parameters (TCLP analysis) for waste classification purposes.

The analyses were conducted for the following parameters

- Benzo(a)pyrene (bulk)
- Metals & Inorganics (leachate)
- Volatile Organic Compounds (leachate)

The laboratory Certificates of Analysis are included in Appendix C and summarized in Table 7.2. The results of the analyses indicate that the soil can be managed as solid, non-hazardous waste.

7.3 Other Considerations

The following additional comments regarding soil quality and management should be considered.

Receiving sites accepting soil may have a soil fill management plan with specific aesthetic, engineering property requirements as well as specific requirements for chemical analysis (additional parameters and/or frequency of sampling) that have not been assessed in this investigation.

The above conclusions were based on limited analytical data. The actual quality of the excavated soils will vary and additional sampling and analyses may be warranted during

construction, if dissimilar materials are encountered or if aesthetic impact (staining or odours) is observed. Additional sampling and analysis of the soil may also be required by the receiver based on the volume of soil to be received. Qualitative monitoring of the excavated soil should be considered part of the inspection tasks during construction.

Additional information on soil management practices is provided in the Ontario Ministry of the Environment (Central Region) publication entitled 'Management of Excess Soil – A Guide for Best Management Practices', dated January 2014.

8. LIMITATIONS AND USE OF REPORT

8.1 Procedures

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained from this investigation.

The drilling and sampling was carried out by specialist drilling contractors and was observed and recorded by Terraprobe on a full time basis. The boreholes were made using continuous flight power auger equipment and hollow stem augers. A Terraprobe technician logged the boreholes and examined the samples recovered from the boreholes. The samples obtained were sealed in clean, air-tight containers and transferred to the Terraprobe laboratory, where they were reviewed for consistency of description by a geotechnical engineer. Ground water observations were made in the boreholes as drilling proceeded. Ground water monitoring wells were constructed in selected boreholes and water levels measured on specific dates are reported. Fluctuations in the ground water levels are expected due to precipitation conditions and seasonal effects.

The samples of the strata penetrated were obtained using the Split-Barrel Method technique (ASTM D1586). The samples were taken at intervals. The conventional interval sampling procedure used for this investigation does not recover continuous samples of soil at any borehole location. There is consequently some interpolation of the borehole layering between samples and indications of changes in stratigraphy as shown on the borehole logs are approximate.

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. A comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing design parameters and advice, that the conditions that exist between sampling points are similar to those found at the sample locations.

It may not be possible to drill a sufficient number of boreholes, or sample and report them in a way that would provide all the subsurface information and geotechnical advice to completely identify all aspects of the site and works that could affect construction costs, techniques, equipment and scheduling. Contractors bidding on or undertaking work on the project must be

directed to draw their own conclusions as to how the subsurface conditions may affect them, based on their own investigations and their own interpretations of the factual investigation results, and their approach to the construction works, cognizant of the risks implicit in the subsurface investigation activities.

The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose. This report provides the factual results of the chemical analysis only for the specific parameters analysed. The chemical analysis, while completed in general accordance with the requirements of Ontario Regulation 153/04 (as amended), do not constitute a Phase Two ESA under the Regulation. The chemical analyses were not conducted for the purposes of supporting a Record of Site Condition.

8.2 Changes in Site and Scope

The subsurface conditions may potentially be altered with passage of time, natural occurrences, and direct or indirect human intervention at or near the site. Caution should be exercised in the consideration of contractual responsibilities as they relate to control of seepage, disturbance of soils, and frost protection.

The design parameters provided and the engineering advice offered in this report are based on the factual data obtained from this investigation made at the site by Terraprobe and are intended for use by the owner and its retained design consultants in the design phase of the project. If there are changes to the project scope and development features, the interpretations made of the subsurface information, the geotechnical design parameters, advice and comments relating to constructability issues and quality control may not be relevant or complete for the project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report.

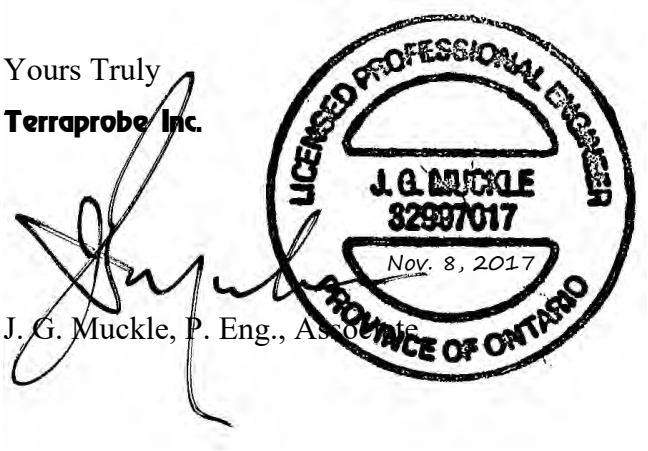
8.3 Use of Report

This report is prepared for the express use of Hatch, the County of Norfolk and other consultants retained to complete the design of the works described herein. The report is not intended for use by others or for other intents. This report is copyright of Terraprobe Inc., and no part of this report may be reproduced by any means, in any form, without the prior written permission of Terraprobe.

We trust that this report is satisfactory for your present requirements. If there is any point requiring further clarification, please contact the undersigned.

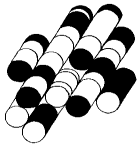
Yours Truly

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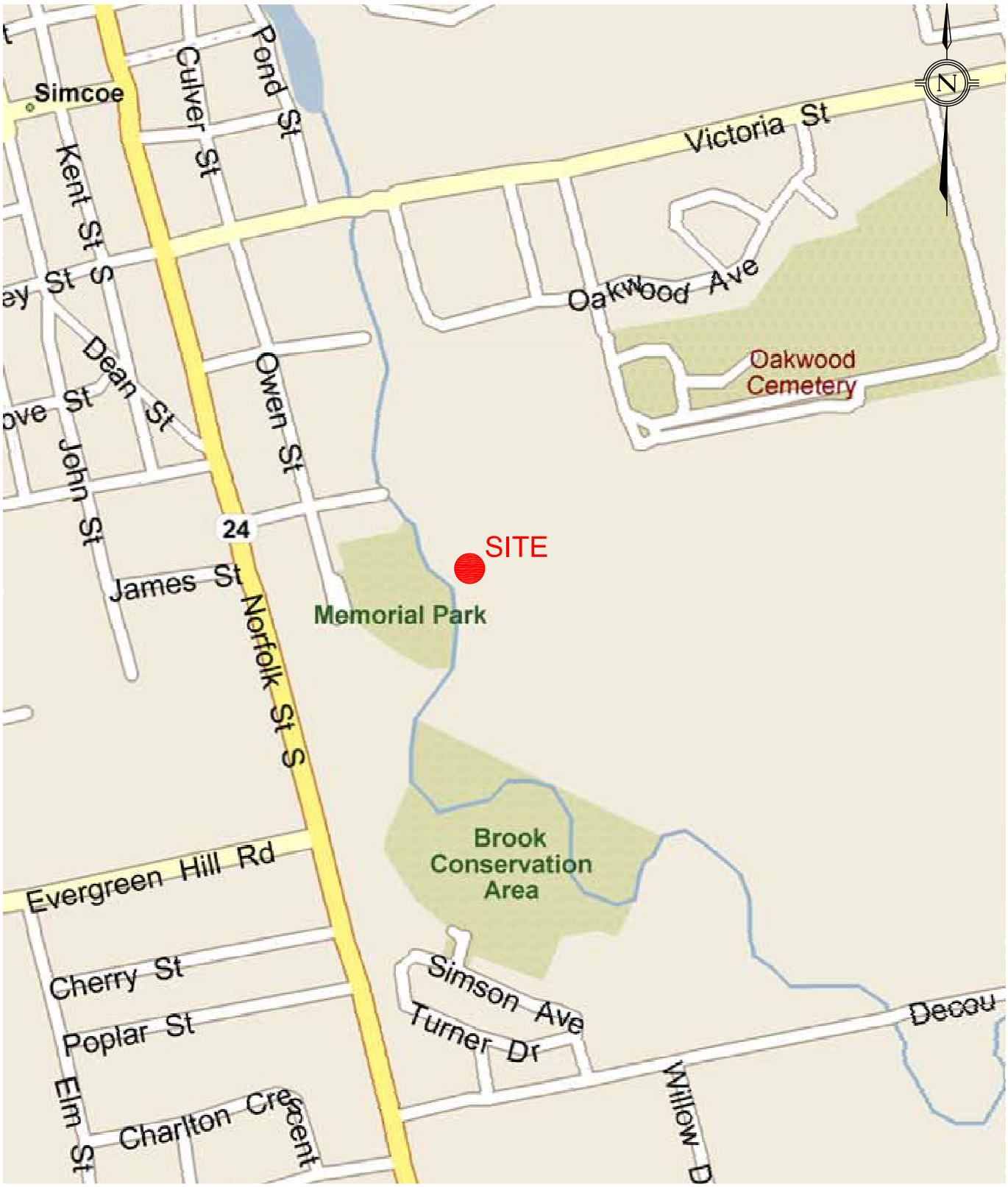


J. G. Muckle, P. Eng., Associate

FIGURES



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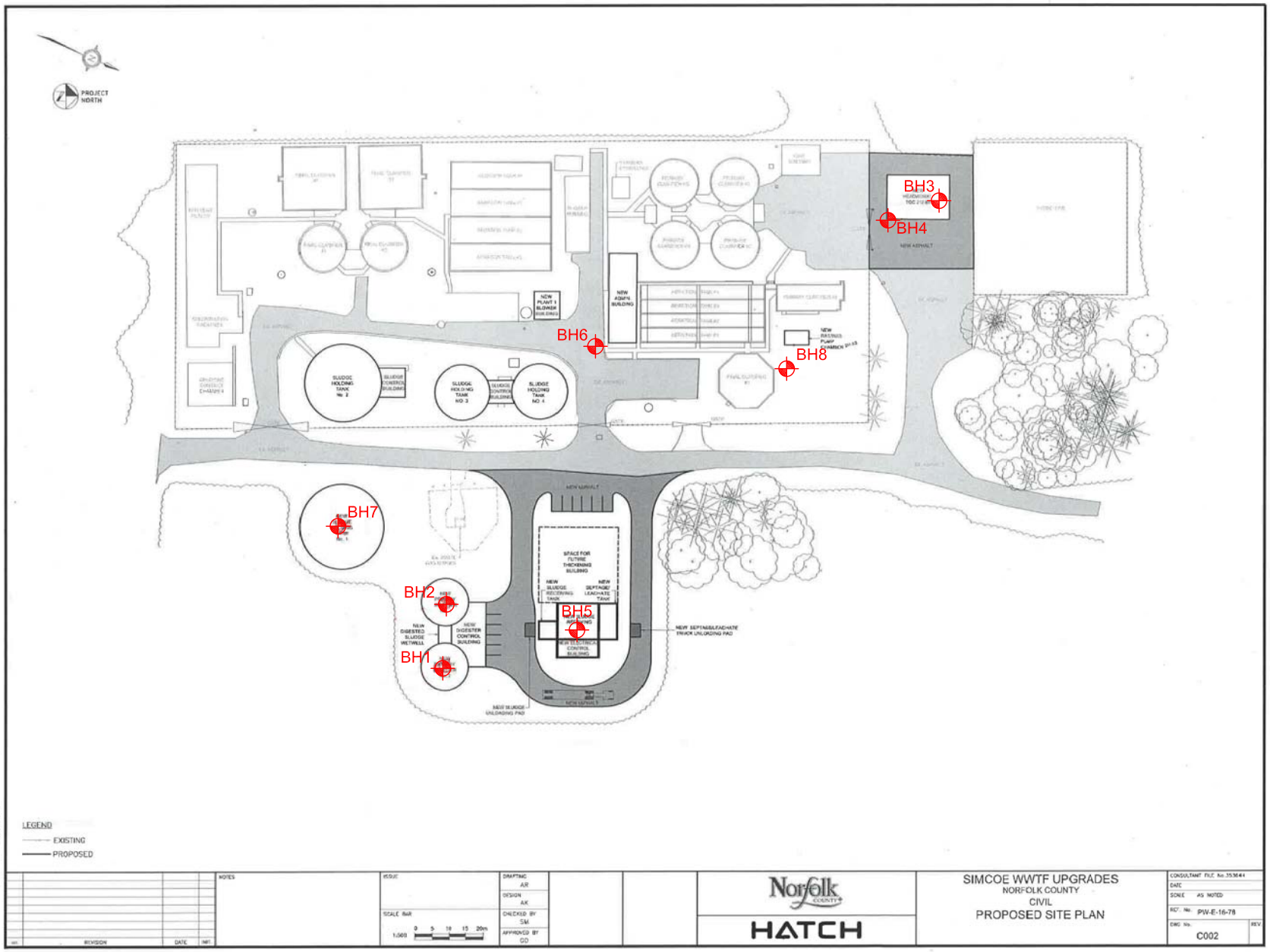


Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: SITE LOCATION PLAN

File No. 7-17-0120-01

FIGURE : 1



LEGEND

BH1 Borehole Location

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903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

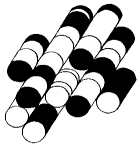
Title: BOREHOLE LOCATION PLAN

File No. 7-17-0120-01

FIGURE : 2

LOGS OF BOREHOLES

APPENDIX A



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ABBREVIATIONS AND TERMINOLOGY

SAMPLING METHODS

AS	auger sample
CORE	cored sample
DP	direct push
FV	field vane
GS	grab sample
SS	split spoon
ST	shelby tube
WS	wash sample

PENETRATION RESISTANCE

Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).

Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.)."

COHESIONLESS SOILS

Compactness	'N' value
very loose	< 4
loose	4 – 10
compact	10 – 30
dense	30 – 50
very dense	> 50

COHESIVE SOILS

Consistency	'N' value	Undrained Shear Strength (kPa)
very soft	< 2	< 12
soft	2 – 4	12 – 25
firm	4 – 8	25 – 50
stiff	8 – 15	50 – 100
very stiff	15 – 30	100 – 200
hard	> 30	> 200

COMPOSITION

Term (e.g)	% by weight
trace silt	< 10
some silt	10 – 20
silty	20 – 35
sand *and* silt	> 35

TESTS AND SYMBOLS

MH	mechanical sieve and hydrometer analysis
w, w_c	water content
w_L, LL	liquid limit
w_P, PL	plastic limit
I_P, PI	plasticity index
k	coefficient of permeability
γ	soil unit weight, bulk
φ'	internal friction angle
c'	effective cohesion
c_u	undrained shear strength

▽	Unstabilized water level
▼	1st water level measurement
▼	2nd water level measurement
▼	Most recent water level measurement
3.0 +	Undrained shear strength from field vane (with sensitivity)
C_c	compression index
c_v	coefficient of consolidation
m_v	coefficient of compressibility
e	void ratio

FIELD MOISTURE DESCRIPTIONS

Damp	refers to a soil sample that does not exhibit any observable pore water from field/hand inspection.
Moist	refers to a soil sample that exhibits evidence of existing pore water (e.g. sample feels cool, cohesive soil is at plastic limit) but does not have visible pore water
Wet	refers to a soil sample that has visible pore water

Terraprobe Inc.

Greater Toronto
11 Indell Lane
Brampton, Ontario L6T 3Y3
(905) 796-2650 Fax: 796-2250

Hamilton – Niagara
903 Barton Street, Unit 22
Stoney Creek, Ontario L8E 5P5
(905) 643-7560 Fax: 643-7559

Central Ontario
220 Bayview Drive, Unit 25
Barrie, Ontario L4N 4Y8
(705) 739-8355 Fax: 739-8369

Northern Ontario
1012 Kelly Lake Rd., Unit 1
Sudbury, Ontario P3E 5P4
(705) 670-0460 Fax: 670-0558

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LOG OF BOREHOLE 1

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 29, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742120, N: 557635 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	211.7	**GROUND SURFACE**				
	211.5	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, compact, brown		1	SS	11
1				2	SS	13
	210.5					
	1.2	**SILTY FINE SAND**, loose, brown		3	SS	6
2	209.3					
	2.4	**MEDIUM SAND**, occasional gravel, compact, brown		4	SS	10
3				5	SS	10
4						
				6	SS	12
5						
				7	SS	22
6	205.1					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 211, 210, 209, 208, 207, 206

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Unstabilized water level measured at 4.9 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	5.1	206.7
Sep 13, 2017	5.2	206.5

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 2

Terraprobe

Project No. : 7-17-0120-01 | Client : Hatch | Originated by : AF

Date started : August 29, 2017 | Project : 16 Oakwood Avenue | Compiled by : KB

Sheet No. : 1 of 1 | Location : Simcoe, Ontario | Checked by : KB

Position : E: 4742118, N: 557632 (UTM 17T) | Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted | Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	211.6	**GROUND SURFACE**				
0	211.4	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, loose, brown		1	SS	8
	210.7					
1	0.9	**SILTY FINE SAND**, loose, brown		2	SS	6
				3	SS	6
2	209.5					
	2.1	**MEDIUM SAND**, occasional gravel, compact, brown		4	SS	20
3				5	SS	25
4						
				6	SS	18
5						
6				7	SS	20
	205.0					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 211, 210, 209, 208, 207, 206

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) | Natural Water Content (MC) | Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm) | Instrument Details | Unstabilized Water Level | Lab Data and Comments | GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and caved to 4.9 m below ground surface upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 3

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : October 11, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742219, N: 557478 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)
	212.3	**GROUND SURFACE**					
	211.7 / 0.6	100mm **ASPHALTIC CONCRETE**					
		FILL, Granular Base		1	SS	7	
	210.6 / 1.7	**FILL**, sandy silt, trace topsoil, occasional gravel, loose, brown		2	SS	8	
	209.7 / 2.6	**SANDY SILT to SILTY SAND**, loose, brown		3	SS	19	
		MEDIUM SAND, occasional gravel, compact, brown		4	SS	30	
				5	SS	28	
				6	SS	14	
	205.3 / 7.0	**MEDIUM SAND**, occasional gravel, dense to very dense, brown		7	SS	33	
				8	SS	52	
	202.5 / 9.8	**SILT**, with seams and layers of silty clay and silty sand, dense to very dense, brown		9	SS	32	
				10	SS	38	
				11	SS	54	
				12	SS	20	
				13	SS	30	
	194.0 / 18.3	**SILTY CLAY**, hard, brown / grey		14	SS	32	
	192.8 / 19.5	**SILT**, trace clay, dense, grey		15	SS	65	
	190.5 / 21.8			16	SS	29	

Penetration Test Values (Blows / 0.3m)
Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa)
Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40 80 120 160

Moisture / Plasticity
Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL)
10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

	GR	SA	SI	CL
13	0	23	63	14
14	0	3	62	35

END OF BOREHOLE

Combined Borehole from two separate Drill dates. Aug 31 & Oct. 11 2017.

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 4

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 30, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742193, N: 557983 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth (m)	Elev Depth (m)	Description	Number	Type	SPT 'N' Value	Elevation (m)	Lab Data and Comments (GR SA SI CL)
0	212.4	**GROUND SURFACE**					
		100mm **ASPHALTIC CONCRETE**					
	211.8	**FILL**, Granular Base					
	0.6	**FILL**, sandy silt, trace topsoil, occasional rootlets, trace gravel, loose, brown	1	SS	4		
1	211.2					212	
	1.2	**SANDY SILT to SILTY SAND**, loose, brown	2	SS	7	211	
2	210.3						
	2.1	**MEDIUM SAND**, occasional gravel, compact, brown	3	SS	24	210	
3			4	SS	15	209	29 67 3 1
4						208	
5			5	SS	22	207	
6			6	SS	10	206	4 92 1 3
7	205.4					205	
	7.0	**MEDIUM SAND**, occasional gravel, dense to very dense, brown	7	SS	35		2 93 3 2
8						204	
9	203.0		8	SS	59	203	
	9.4	**SILT**, with seams and layers of silty clay, dense to very dense, brown					
10			9	SS	55	202	
11						201	
12			10	SS	74	200	
13						199	
14	198.2		11	SS	46		
	14.2	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit — PL MC LL 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

GRAIN SIZE DISTRIBUTION (%) (MIT)

Unstabilized water level measured at 5.7 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	5.8	206.6
Sep 13, 2017	5.8	206.6

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 5

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 28, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742127, N: 557628 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	213.4	**GROUND SURFACE**				
0	213.2	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, compact, brown		1	SS	10
	212.5					
1	0.9	**SILTY FINE SAND**, loose, brown		2	SS	14
				3	SS	7
2				4	SS	16
	210.5					
3	2.9	**MEDIUM SAND**, occasional gravel, occasional silty seams, compact, brown		5	SS	21
4						
				6	SS	21
5						
6				7	SS	18
	206.8					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 213, 212, 211, 210, 209, 208, 207

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Borehole was dry and caved to 4.9 m below ground surface upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 6

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 29, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742124, N: 557553 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	211.5	**GROUND SURFACE**				
	211.3	150mm **ASPHALTIC CONCRETE**				
	0.2	**FILL**, Granular Base				
	210.9					
	0.6	**FILL**, clayey silt, trace sand, occasional gravel, firm, brown		1	SS	7
1				2	SS	4
2	209.4					
	2.1	**MEDIUM SAND**, occasional gravel, compact, brown		3	SS	18
3				4	SS	22
	208.0					
	3.5	**END OF BOREHOLE**				

Elevation Scale (m): 211, 210, 209, 208

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 7

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 29, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742073, N: 557633 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	210.4	**GROUND SURFACE**				
	210.2	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, loose, brown		1	SS	10
	209.8					
1	0.6	**SILTY FINE SAND**, loose, brown		2	SS	4
	208.9					
2	1.5	**MEDIUM SAND**, occasional gravel, compact, brown		3	SS	18
				4	SS	13
3				5	SS	12
4				6	SS	15
5				7	SS	22
6				8	SS	12
7						
8	202.3					
	8.1	**END OF BOREHOLE**				

Elevation Scale (m): 210, 209, 208, 207, 206, 205, 204, 203

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Unstabilized water level measured at 4.5 m below ground surface; borehole caved to 4.3 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	4.1	206.4
Sep 13, 2017	4.0	206.4

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 8

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 30, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742187, N: 557540 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	212.0	**GROUND SURFACE**				
		100mm **TOPSOIL**				
		FILL, sandy silt, trace topsoil, trace rootlets, loose to compact, brown		1	SS	12
1				2	SS	8
	210.8					
	1.2	**SANDY SILT to SILTY SAND**, loose to compact, brown		3	SS	9
2				4	SS	6
	209.2					
	2.8	**MEDIUM SAND**, occasional gravel, compact, brown		5	SS	21
3						
4				6	SS	27
5						
6				7	SS	21
7						
8				8	SS	17

Elevation Scale (m): 211, 210, 209, 208, 207, 206, 205, 204

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10, 20, 30, 40

Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40, 80, 120, 160

Moisture / Plasticity — Plastic Limit, Natural Water Content, Liquid Limit: PL, MC, LL; 10, 20, 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Unstabilized water level measured at 6.1 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

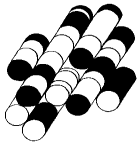
WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	5.7	206.3
Sep 13, 2017	5.7	206.3

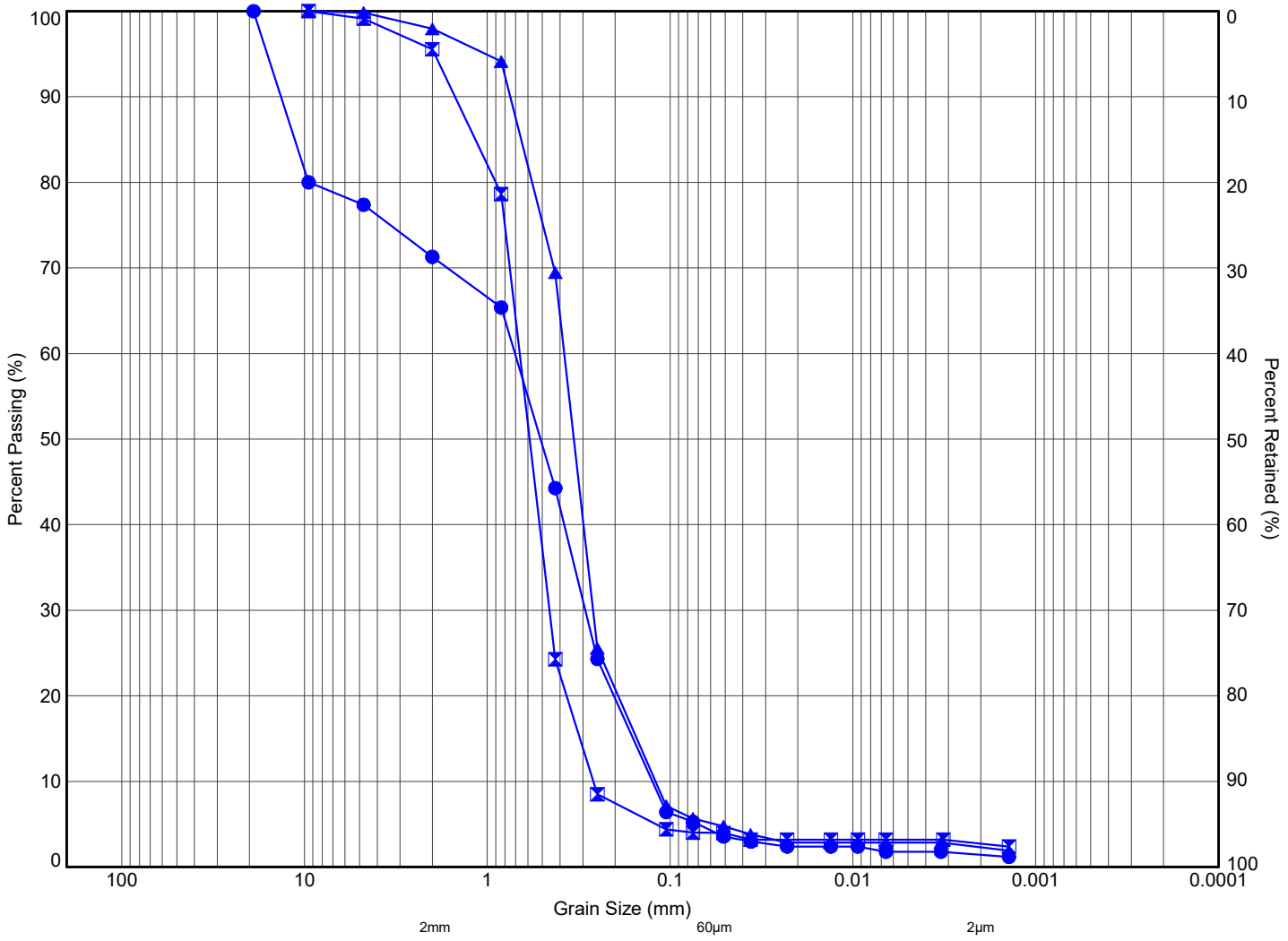
file: 7-17-0120-01 - simcoe wwtf.gpj

GEOTECHNICAL LABORATORY RESULTS

APPENDIX B



Terraprobe Inc.



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

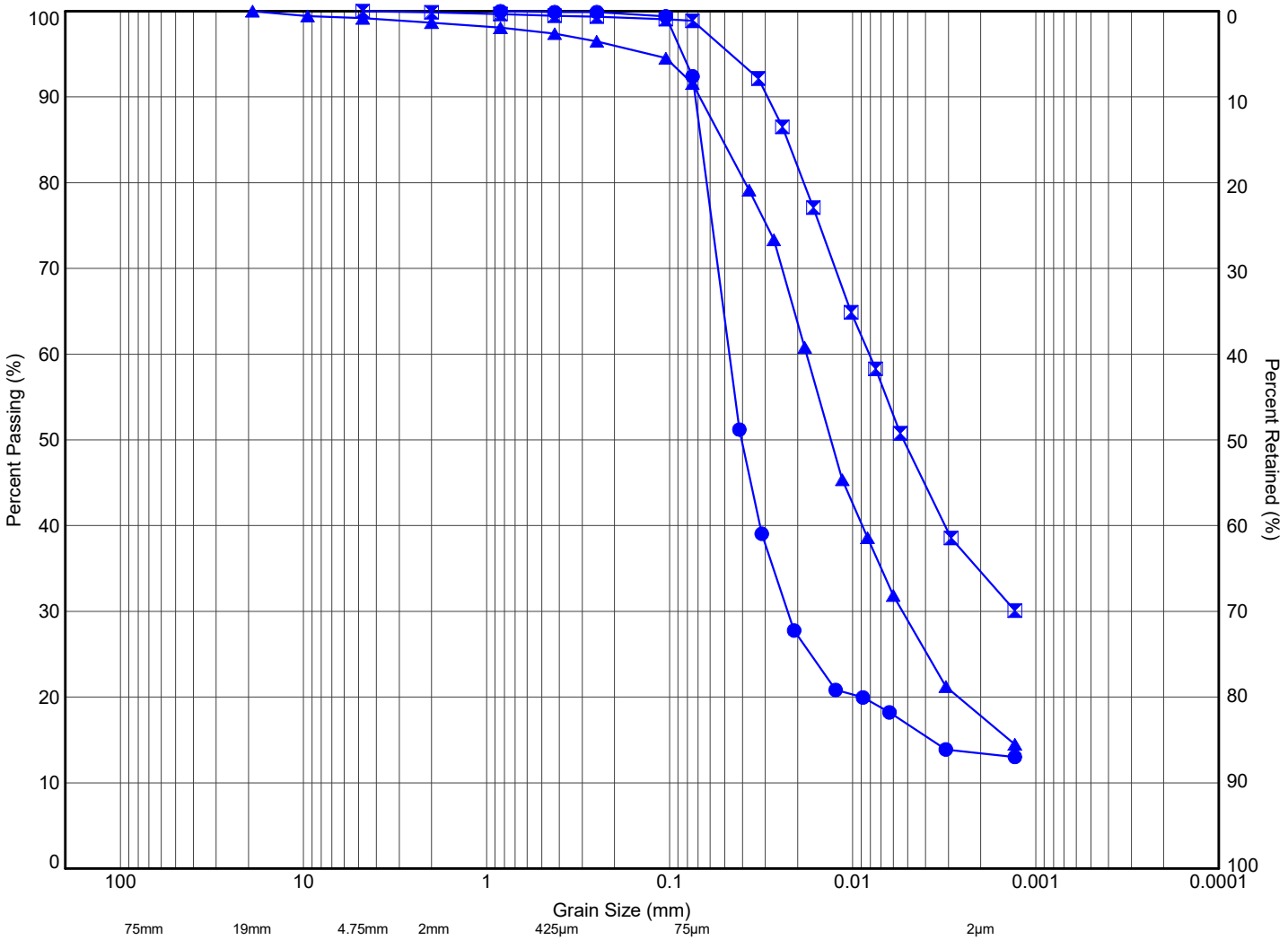
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**4**	SS4	3.3	209.1	29	67	3	1	
⊠	**4**	SS6	6.3	206.1	4	92	1	3	
▲	**4**	SS7	7.8	204.6	2	93	3	2	

Sand

Terraprobe
903 Barton Street, Unit 22, Stoney Creek ON L8E 5P5
(905) 643-7560

Title: **GRAIN SIZE DISTRIBUTION** **Figure B-1**

File No.: **7-17-0120-01**



	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**3**	SS13	17.0	195.3	0	7	79	14	
⊠	**3**	SS14	18.5	193.8	0	1	64	35	
▲	**3**	SS10	12.4	199.9	1	7	74	18	

Silt with Silty Clay Layers

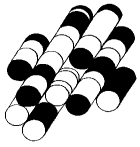
Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION** **Figure B2**

File No.: **7-17-0120-01**

CERTIFICATES OF ANALYSES AND QUALITY ASSURANCE REPORT - SOIL

APPENDIX C



Terraprobe Inc.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPROBE INC
903 Barton Street
Stoney Creek, ON L8E5P5
(905) 643-7560

ATTENTION TO: Kyle Byckalo

PROJECT: 7-17-0120-01

AGAT WORK ORDER: 17H255265

SOIL ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

TRACE ORGANICS REVIEWED BY: Gyulhan Yalamova, Report Reviewer

DATE REPORTED: Sep 08, 2017

PAGES (INCLUDING COVER): 13

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

Corrosivity Package

DATE RECEIVED: 2017-09-01

DATE REPORTED: 2017-09-08

Parameter	Unit	G / S	RDL	BH3 SA3 Corrosivity Soil 2017-08-31 8682231	BH6 SA3 Corrosivity Soil 2017-08-31 8682244	BH1 SA6 Corrosivity Soil 2017-08-31 8682253
Chloride (2:1)	µg/g		2	31	5	2
Electrical Conductivity (2:1)	mS/cm		0.005	0.152	0.073	0.065
Redox Potential (2:1)	mV		5	203	193	188
Resistivity (2:1)	ohm.cm		1	6580	13700	15400
Sulfide (S2-)	%		0.05	<0.05	<0.05	<0.05
Sulphate (2:1)	µg/g		2	39	10	10
pH (2:1)	pH Units		NA	8.64	9.11	9.13

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8682231-8682253 EC, pH, Chloride, Sulphate and Redox Potential were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

*Sulphide analyzed at AGAT 5623 McAdam

Certified By:



Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-09-01

DATE REPORTED: 2017-09-08

		SAMPLE DESCRIPTION:		BH1 SA2	BH1 SA5	BH2 SA2	BH2 SA5	BH3 SA2	BH3 SA4	BH4 SA2	BH4 SA4
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31
Parameter	Unit	G / S	RDL	8682222	8682227	8682228	8682229	8682230	8682237	8682238	8682239
Antimony	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g		1	5	3	4	3	4	2	4	2
Barium	µg/g		2	37	10	33	11	39	11	29	12
Beryllium	µg/g		0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/g		5	<5	10	<5	7	<5	<5	6	<5
Boron (Hot Water Soluble)	µg/g		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g		2	17	8	15	7	16	7	12	11
Chromium VI	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cobalt	µg/g		0.5	8.2	3.5	7.1	3.2	7.5	2.3	6.2	2.9
Copper	µg/g		1	23	16	21	15	16	7	17	8
Cyanide	µg/g		0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Electrical Conductivity	mS/cm		0.005	0.067	0.066	0.078	0.063	0.198	0.070	0.373	0.088
Lead	µg/g		1	9	7	9	6	11	4	6	4
Mercury	µg/g		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Molybdenum	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g		1	17	8	15	7	13	4	13	5
Selenium	µg/g		0.4	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sodium Adsorption Ratio	NA		NA	0.077	0.051	0.075	0.073	0.595	0.320	2.40	0.599
Thallium	µg/g		0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g		0.5	0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	µg/g		1	31	12	26	11	26	13	21	36
Zinc	µg/g		5	45	29	46	27	43	27	35	23
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.25	8.02	6.79	8.03	7.55	8.14	7.68	8.12

Certified By:



Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-09-01

DATE REPORTED: 2017-09-08

		SAMPLE DESCRIPTION:		BH5 SA2	BH5 SA5	BH6 SA1	BH6 SA4	BH7 SA3	BH7 SA6	BH8 SA2	BH8 SA5
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31	2017-08-31
Parameter	Unit	G / S	RDL	8682240	8682241	8682242	8682243	8682246	8682250	8682251	8682252
Antimony	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g		1	4	3	7	3	3	2	3	3
Barium	µg/g		2	28	14	60	16	10	11	17	10
Beryllium	µg/g		0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/g		5	<5	6	6	7	<5	6	<5	<5
Boron (Hot Water Soluble)	µg/g		0.10	<0.10	<0.10	0.23	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g		2	14	6	23	8	7	7	9	6
Chromium VI	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cobalt	µg/g		0.5	6.4	3.1	10.0	4.9	2.4	3.2	4.3	3.0
Copper	µg/g		1	15	14	32	17	10	13	11	10
Cyanide	µg/g		0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Electrical Conductivity	mS/cm		0.005	0.100	0.057	0.186	0.084	0.073	0.098	0.086	0.055
Lead	µg/g		1	8	7	12	6	5	6	5	4
Mercury	µg/g		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Molybdenum	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g		1	13	6	22	9	5	7	8	5
Selenium	µg/g		0.4	<0.4	<0.4	1.0	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sodium Adsorption Ratio	NA		NA	0.062	0.056	1.72	0.329	0.090	0.069	0.051	0.059
Thallium	µg/g		0.4	<0.4	<0.4	0.5	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g		0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	µg/g		1	26	10	38	13	17	12	18	12
Zinc	µg/g		5	33	34	59	30	24	24	25	20
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.35	8.06	7.16	8.01	8.02	7.83	7.78	8.21

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8682222-8682252 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:



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AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2017-09-01

DATE REPORTED: 2017-09-08

		SAMPLE DESCRIPTION:		TCLP 1
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2017-08-31
Parameter	Unit	G / S	RDL	8682254
Arsenic Leachate	mg/L		0.010	<0.010
Barium Leachate	mg/L		0.100	0.177
Boron Leachate	mg/L		0.050	0.069
Cadmium Leachate	mg/L		0.010	<0.010
Chromium Leachate	mg/L		0.010	0.015
Cyanide Leachate	mg/L		0.05	<0.05
Fluoride Leachate	mg/L		0.05	0.20
Lead Leachate	mg/L		0.010	<0.010
Mercury Leachate	mg/L		0.01	<0.01
(Nitrate + Nitrite) as N Leachate	mg/L		0.70	<0.70
Selenium Leachate	mg/L		0.010	<0.010
Silver Leachate	mg/L		0.010	<0.010
Uranium Leachate	mg/L		0.050	<0.050

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CANADA L4Z 1Y2
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AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 - VOCs

DATE RECEIVED: 2017-09-01

DATE REPORTED: 2017-09-08

		SAMPLE DESCRIPTION:		TCLP 1
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2017-08-31
Parameter	**Unit**	**G / S**	**RDL**	**8682254**
Benzene	mg/L		0.020	<0.020
Carbon Tetrachloride	mg/L		0.020	<0.020
Chlorobenzene	mg/L		0.010	<0.010
Chloroform	mg/L		0.020	<0.020
1,4-Dichlorobenzene	mg/L		0.010	<0.010
1,2-Dichlorobenzene	mg/L		0.010	<0.010
1,2-Dichloroethane	mg/L		0.020	<0.020
1,1 Dichloroethene	mg/L		0.020	<0.020
Dichloromethane	mg/L		0.030	<0.030
Methyl Ethyl Ketone	mg/L		0.090	<0.090
Tetrachloroethene	mg/L		0.050	<0.050
Trichloroethene	mg/L		0.020	<0.020
Vinyl Chloride	mg/L		0.030	<0.030
Surrogate	**Unit**	**Acceptable Limits**		
Toluene-d8	% Recovery	60-130		93

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8682254 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Certified By:



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Quality Assurance

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Sep 08, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Corrosivity Package															
Chloride (2:1)	8682244	8682244	5	6	NA	< 2	95%	80%	120%	102%	80%	120%	96%	70%	130%
Electrical Conductivity (2:1)	8682227	8682227	0.066	0.067	1.5%	< 0.005	95%	90%	110%	NA			NA		
Redox Potential (2:1)	8682244	8682244	193	188	2.6%	< 5	105%	70%	130%	NA			NA		
Sulfide (S2-)	8682253	8682253	< 0.05	< 0.05	NA	< 0.05	99%	80%	120%						
Sulphate (2:1)	8682244	8682244	10	11	9.5%	< 2	93%	80%	120%	95%	80%	120%	82%	70%	130%
pH (2:1)	8682244	8682244	9.11	9.14	0.3%	NA	100%	90%	110%	NA			NA		
O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	8684649		< 0.010	< 0.010	NA	< 0.010	100%	90%	110%	110%	80%	120%	109%	70%	130%
Barium Leachate	8684649		0.293	0.295	NA	< 0.100	95%	90%	110%	103%	80%	120%	106%	70%	130%
Boron Leachate	8684649		0.067	0.066	NA	< 0.050	96%	90%	110%	99%	80%	120%	103%	70%	130%
Cadmium Leachate	8684649		< 0.010	< 0.010	NA	< 0.010	93%	90%	110%	101%	80%	120%	107%	70%	130%
Chromium Leachate	8684649		0.020	0.020	NA	< 0.010	103%	90%	110%	115%	80%	120%	105%	70%	130%
Cyanide Leachate	8684649		< 0.05	< 0.05	NA	< 0.05	90%	90%	110%	101%	90%	110%	101%	70%	130%
Fluoride Leachate	8684649		0.34	0.34	0.0%	< 0.05	104%	90%	110%	108%	90%	110%	98%	70%	130%
Lead Leachate	8684649		< 0.010	< 0.010	NA	< 0.010	103%	90%	110%	108%	80%	120%	111%	70%	130%
Mercury Leachate	8684649		< 0.01	< 0.01	NA	< 0.01	104%	90%	110%	100%	80%	120%	108%	70%	130%
(Nitrate + Nitrite) as N Leachate	8684649		<0.70	<0.70	NA	< 0.70	100%	80%	120%	100%	80%	120%	98%	70%	130%
Selenium Leachate	8684649		< 0.010	< 0.010	NA	< 0.010	94%	90%	110%	107%	80%	120%	110%	70%	130%
Silver Leachate	8684649		< 0.010	< 0.010	NA	< 0.010	96%	90%	110%	100%	80%	120%	105%	70%	130%
Uranium Leachate	8684649		< 0.050	< 0.050	NA	< 0.050	100%	90%	110%	106%	80%	120%	111%	70%	130%
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8682227	8682227	<0.8	<0.8	NA	< 0.8	101%	70%	130%	95%	80%	120%	84%	70%	130%
Arsenic	8682227	8682227	3	3	NA	< 1	108%	70%	130%	94%	80%	120%	98%	70%	130%
Barium	8682227	8682227	10	10	0.0%	< 2	100%	70%	130%	99%	80%	120%	101%	70%	130%
Beryllium	8682227	8682227	<0.5	<0.5	NA	< 0.5	108%	70%	130%	120%	80%	120%	104%	70%	130%
Boron	8682227	8682227	10	11	NA	< 5	81%	70%	130%	115%	80%	120%	102%	70%	130%
Boron (Hot Water Soluble)	8682227	8682227	<0.10	<0.10	NA	< 0.10	80%	60%	140%	95%	70%	130%	96%	60%	140%
Cadmium	8682227	8682227	<0.5	<0.5	NA	< 0.5	100%	70%	130%	101%	80%	120%	110%	70%	130%
Chromium	8682227	8682227	8	9	NA	< 2	101%	70%	130%	108%	80%	120%	117%	70%	130%
Chromium VI	8682242	8682242	<0.2	<0.2	NA	< 0.2	97%	70%	130%	100%	80%	120%	103%	70%	130%
Cobalt	8682227	8682227	3.5	3.7	5.6%	< 0.5	104%	70%	130%	109%	80%	120%	112%	70%	130%
Copper	8682227	8682227	16	17	6.1%	< 1	94%	70%	130%	113%	80%	120%	103%	70%	130%
Cyanide	8682222	8682222	<0.040	<0.040	NA	< 0.040	90%	70%	130%	103%	80%	120%	102%	70%	130%
Electrical Conductivity	8682227	8682227	0.066	0.067	1.5%	< 0.005	95%	90%	110%	NA			NA		
Lead	8682227	8682227	7	8	13.3%	< 1	103%	70%	130%	112%	80%	120%	101%	70%	130%
Mercury	8682227	8682227	<0.10	<0.10	NA	< 0.10	104%	70%	130%	111%	80%	120%	107%	70%	130%
Molybdenum	8682227	8682227	<0.5	<0.5	NA	< 0.5	99%	70%	130%	103%	80%	120%	114%	70%	130%
Nickel	8682227	8682227	8	8	0.0%	< 1	107%	70%	130%	112%	80%	120%	108%	70%	130%

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Results relate only to the items tested and to all the items tested

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5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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Quality Assurance

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

Soil Analysis (Continued)

RPT Date: Sep 08, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Selenium	8682227	8682227	<0.4	<0.4	NA	< 0.4	106%	70%	130%	105%	80%	120%	106%	70%	130%
Silver	8682227	8682227	<0.2	<0.2	NA	< 0.2	85%	70%	130%	100%	80%	120%	93%	70%	130%
Sodium Adsorption Ratio	8682227	8682227	0.051	0.050	2.0%	NA	NA			NA			NA		
Thallium	8682227	8682227	<0.4	<0.4	NA	< 0.4	103%	70%	130%	107%	80%	120%	100%	70%	130%
Uranium	8682227	8682227	0.6	0.6	NA	< 0.5	103%	70%	130%	114%	80%	120%	106%	70%	130%
Vanadium	8682227	8682227	12	12	0.0%	< 1	106%	70%	130%	104%	80%	120%	111%	70%	130%
Zinc	8682227	8682227	29	30	3.4%	< 5	98%	70%	130%	118%	80%	120%	116%	70%	130%
pH, 2:1 CaCl2 Extraction	8682222	8682222	7.25	7.19	0.8%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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MISSISSAUGA, ONTARIO
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Quality Assurance

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Sep 08, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 - VOCs															
Benzene	8678642		< 0.020	< 0.020	NA	< 0.020	77%	70%	130%	101%	70%	130%	NA	60%	140%
Carbon Tetrachloride	8678642		< 0.020	< 0.020	NA	< 0.020	77%	70%	130%	100%	70%	130%	NA	60%	140%
Chlorobenzene	8678642		< 0.010	< 0.010	NA	< 0.010	100%	70%	130%	102%	70%	130%	NA	60%	140%
Chloroform	8678642		< 0.020	< 0.020	NA	< 0.020	85%	70%	130%	106%	70%	130%	NA	60%	140%
1,4-Dichlorobenzene	8678642		< 0.010	< 0.010	NA	< 0.010	118%	70%	130%	103%	70%	130%	NA	60%	140%
1,2-Dichlorobenzene	8678642		< 0.010	< 0.010	NA	< 0.010	110%	70%	130%	100%	70%	130%	NA	60%	140%
1,2-Dichloroethane	8678642		< 0.020	< 0.020	NA	< 0.020	90%	70%	130%	93%	70%	130%	NA	60%	140%
1,1 Dichloroethene	8678642		< 0.020	< 0.020	NA	< 0.020	77%	70%	130%	118%	70%	130%	NA	60%	140%
Dichloromethane	8678642		< 0.030	< 0.030	NA	< 0.030	93%	70%	130%	113%	70%	130%	NA	60%	140%
Methyl Ethyl Ketone	8678642		< 0.090	< 0.090	NA	< 0.090	105%	70%	130%	122%	70%	130%	NA	60%	140%
Tetrachloroethene	8678642		< 0.050	< 0.050	NA	< 0.050	89%	70%	130%	103%	70%	130%	NA	60%	140%
Trichloroethene	8678642		< 0.020	< 0.020	NA	< 0.020	72%	70%	130%	96%	70%	130%	NA	60%	140%
Vinyl Chloride	8678642		< 0.030	< 0.030	NA	< 0.030	78%	60%	140%	105%	60%	140%	NA	60%	140%

Comments:
When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

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Method Summary

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Redox Potential (2:1)		McKeague 4.12 & SM 2510 B	REDOX POTENTIAL ELECTRODE
Resistivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Sulfide (S2-)	MIN-200-12025	ASTM E1915-09	GRAVIMETRIC
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Arsenic Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Barium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Boron Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cadmium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Chromium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cyanide Leachate	INOR-93-6052	EPA SW-846-1311 & MOE 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
Fluoride Leachate	INOR-93-6018	EPA SW-846-1311 & SM4500-F- C	ION SELECTIVE ELECTRODE
Lead Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Mercury Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & SM 4500 - NO3- I	LACHAT FIA
Selenium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Silver Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H255265

PROJECT: 7-17-0120-01

ATTENTION TO: Kyle Byckalo

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Uranium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Trace Organics Analysis			
Benzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Vinyl Chloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS

Results relate only to the items tested and to all the items tested

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 17H255265

Cooler Quantity: LG cooler

Arrival Temperatures: 7.8 | 7.9 | 8.0 | 7F | 73 | 69

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes: ON ICE

Report Information:

Company: Terraprobe Inc.
Contact: Kyle Bychkalo
Address: 903 Barton Street, Unit #22, Stoney Creek, ON L8E 5P5
Phone: (905) 643-7560 Fax: (905) 643-7559
Reports to be sent to:
1. Email: kbychkalo@terraprobe.ca
2. Email: afelice@terraprobe.ca

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☒ Regulation 153/04
Table 1 (Indicate One)
☒ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture *(Check One)*
☒ Coarse
☒ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region _____ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☒ No

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply): _____

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 7-17-0120-01
Site Location: Simcoe
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	All Metals ☐ 153 Metals (excl. Hydrides)	Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FDC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	Corrosivity Package
~~BH1 SA1~~																						
BH1SA2	Aug 31/17	AM	1	soil	1 x 250mL water jar		X															
BH1SA5							X															
BH2SA2							X															
BH2SA5							X															
BH3SA2							X															
BH3SA3 Corrosivity																						X
BH3SA4							X															
BH4SA2							X															
BH4SA4							X															
BH5SA2							X															
BH5SA5							X															

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Anthony Felice	Aug 31/17	3:30pm	Daniella Tajic	8/31/17	3:30pm
			Simon	9/1/17	9:14

Page 1 of 2

N°: T 052862

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: February 22, 2017

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 17H255265
Cooler Quantity: 1 Gr cooler
Arrival Temperatures: 7.8 | 7.9 | 8.0
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: ON ICE

Report Information:

Company: Terraprobe Inc.
Contact: Kyle Bychala
Address: 903 Barton Street, Unit #22, Stoney Creek, ON, L8E 5P5
Phone: (905) 643-7560 Fax: (905) 643-7559
Reports to be sent to:
1. Email: kbychala@terraprobe.ca
2. Email: afelice@terraprobe.ca

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☒ Regulation 153/04 — Table: ☒ Ind/Com ☐ Res/Park ☐ Agriculture — Soil Texture (Check One): ☒ Coarse ☒ Fine
☐ Sewer Use — ☐ Sanitary ☐ Storm — Region: *Indicate One* — ☐ MISA
☒ Regulation 558 for TCLP — ☐ CCME — ☐ Prov. Water Quality Objectives (PWQO) — ☐ Other — *Indicate One*

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 7-17-0120-01
Site Location: Simcoe
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☒ No ☐
Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	All Metals ☐ 153 Metals (exc. Hydrides)	Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN	☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg	☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN	☐ NO_3 ☐ NO_2 ☐ NO_2+NO_3	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☒ M&I ☒ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	Corrosivity Package
BH6 SA1	Aug 31/17	AM	1	Soil	1 x 250mL amber jar		X																		
BH6 SA4							X																		
BH6 SA3	Corrosivity																							X	
BH7 SA3							X																		
BH7 SA6							X																		
BH8 SA2							X																		
BH8 SA5							X																		
BH1 SA6	Corrosivity																							X	
TCLP1																							X		

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Anthony Felice	Aug 31/17	3:30pm	Daniella Jail	8/31/17	3:30pm
			Sina	17/9/1	914

Page 2 of 2
N°: T 052861

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

HYDROGEOLOGIC INVESTIGATION
NORFOLK COUNTY
WASTEWATER TREATMENT PLANT UPGRADES
16 OAKWOOD AVENUE
SIMCOE, ONTARIO

Prepared For: **Hatch**
5035 South Service Road, 6th Floor
Burlington, Ontario
L7L 6M9

Attention: Mr. Glen Douglas, Project Manager

File No. 7-17-0120-46
January 18, 2018

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1.0 INTRODUCTION

Terraprobe was retained by Hatch to complete a hydrogeologic investigation for the proposed upgrades to the Wastewater Treatment Facility (WWTF) located at 16 Oakwood Avenue (the Site) in Simcoe Ontario. The Site consists of the existing County of Norfolk WWTF covering an area of approximately 2 hectares in size comprised of various infrastructure and buildings. The Site access consists of a paved road which extends south from Oakwood Avenue along the east side of the existing plant. The Lynn River is located to the west of the existing plant. The site location is shown on the attached Figure 1.

Upgrades to the existing plant and new works are proposed for the property on the east side of the access road. This property was tree covered and sloped upward toward the east. The following infrastructure is proposed as part of the Simcoe WWTF upgrading:

- New headworks;
- New RAS/WAS chamber and sludge receiving station;
- New digester and bio-solids holding tank;
- New administration building; and
- Underground piping and access roads.

The purpose of the hydrogeologic investigation was to assess shallow ground water levels in relation to the proposed works for the WWTF to provide for the estimation of ground water dewatering rates required for construction. An assessment was completed to evaluate the potential for impacts to surround ground water uses and natural features, and to provide recommendations regarding ground water monitoring, mitigation and contingency plans over the duration of active dewatering for the proposed upgrades.

2.0 SCOPE OF WORK

The following tasks were undertaken in order to address the requirements of the PTTW application:

- *Review of available background information*. A review of available geotechnical and hydrogeologic information for the site was conducted, including topographic mapping, geologic mapping, and results of the geotechnical investigation (Terraprobe) and subsurface investigations completed at the site.

- *Confirmation of Site Conditions*. Ground water levels were monitored on several occasions to confirm the shallow ground water level at the Site. Water quality sampling was completed from an installed monitoring well and was analyzed for the parameters contained within the County of Norfolk sewer-use bylaws. Water quality sampling was completed to assess ground water discharge options and treatment requirements during active dewatering.

- *Assessment for Construction Dewatering*. Engineering plans for proposed WWTF upgrades were reviewed to assess volumes of ground water taking for construction. Soil and ground water conditions were reviewed in relation to the proposed invert elevations for the proposed works.

3.0 DESCRIPTION OF SITE CONDITIONS

3.1 Site Description and Physiography

The site is located south of Oakwood Avenue immediately east of the Lynn River. Land uses in the vicinity of the site consist of municipally serviced residential homes to the north and west of the site, St. Joseph's Catholic School to the north, the Oakwood Cemetery situated to the east of the site and a woodlot and rail trail to the south. The Site is serviced with municipal water and sewer servicing.

The Site is situated in the physiographic region of Southern Ontario known as the Norfolk Sand Plain. The soil stratigraphy characteristic to this region generally consists of deltaic sand deposits overlying strata of silt and clay.

Topographical relief in this area gently slopes from the northeast to the southwest (OBM, 2002), with an overall grade change of about 6 metres across the site. A topographic high of approximately 216.0 masl exists to the northeast sloping to 210.0 masl to the southwest toward the Lynn River. The Lynn River is situated at an elevation of approximately 206.0 masl to the west of the Site.

3.2 Site Geology and Hydrogeology

Based upon geologic mapping for the area (Barnett, 1978) the Site is within an area characterized by glaciolacustrine deep water silt deposits. The Lynn River to the west of the site is characterized by medium to very coarse grained sands and pebbles, and lands to the east form a regionally extensive area of glaciolacustrine shallow water sand deposits. Geologic mapping for the vicinity of the site is provided in the attached Figure 4.

Drift thickness in the vicinity of the Site is reported at 30 to 38 metres, overlying limestone of the Onondaga Formation. Bedrock elevations are anticipated at elevations of approximately 177.0 masl. Bedrock is reported to slope to the south and west toward Lake Erie.

Ground water at the subject site will be largely influenced by the Lynn River, with shallow ground water discharging through shallow deposits of medium to coarse sands to the river. Ground water flow direction is expected to follow topography and flow to the southwest toward the Lynn River. Shallow ground water levels were measured between 4 to 6 metres below existing grades and are expected to fluctuate seasonally.

Hydraulic conductivity of soils were assessed based on in-situ hydraulic conductivity testing completed for the series of four monitoring wells established at the Site as part of the subsurface investigation completed for the geotechnical investigation for the proposed WWTF upgrades. Results of in-situ hydraulic conductivity testing are provided in Section 3.4 below.

3.3 Summary of Geotechnical Investigation

A geotechnical investigation was completed at the subject site by Terraprobe. A series of eight (8) boreholes were completed at the site in August 2017 to investigate the subsurface conditions present at the Site. Boreholes were completed to various depths between 3.5 and 14.2 metres below existing grades. The subsurface conditions encountered at the Site generally consisted of fill overlying near surface strata of loose silty sand and sandy silt. A stratum of sand was encountered beneath the fill and surficial soils. The deeper boreholes penetrated a layered silt and silty clay deposit beneath the sand.

An additional borehole was completed in October 2017 in close proximity to borehole 3 completed at a greater depth to penetrate into underlying silt deposits. This borehole was completed to a depth of 21.8 m. Borehole logs and laboratory results of grain size analysis are provided in the attached Appendix A. Borehole locations are indicated on the attached Figure 2.

The following is a general description of the major stratigraphic units and ground water conditions observed in the boreholes.

3.3.1 Fill

Fill was encountered below asphalt pavement in boreholes 3 (A and B), 4 and 6 and below topsoil in borehole 8. The fill in borehole 3, 4 and 8 generally consisted of sandy silt and the fill in borehole 6 consisted of clayey silt. The thickness of fill deposits ranged from 1.2 to 2.1 metres below existing grades.

3.3.2 Sandy Silt and Silty Fine Sand

Strata of loose sandy silt and silty fine sand were encountered beneath the fill and topsoil in all of the completed boreholes. These strata were fully penetrated at depths of about 1.5 to 2.9 metres below existing grades.

3.3.3 Sand

Each of the completed boreholes encountered a stratum of compact medium sand below the silty sand and sandy silt. The sand was fully penetrated at depths of 9.4 and 9.8 metres below existing grades in

boreholes 3 and 4 respectively. Grain size distribution curves completed from samples obtained within this stratum indicated about 5% fine grained soils (i.e. soil finer than 60 μm).

3.3.4 Silt

Boreholes 3 and 4 encountered a deposit of dense silt with layers and seams of silty clay beneath the sand and to the depths explored. Grain size distribution curves completed from samples obtained within this stratum indicated about 88% fine grained soils (i.e. soil finer than 60 μm).

Borehole 3B was extended to a greater depth to fully penetrate the silt stratum. This stratum was fully penetrated at a depth of 15.2 metres below existing grades followed by a compact to dense silty sand with silt seams to a depth of 18.3 m followed by a dense to very dense clayey silt to silt to the depth of completion at a depth of 21.8 m.

3.4 Ground Water Conditions

Monitoring wells were established in boreholes 1, 3B, 4, 7 and 8 to allow for the monitoring of long-term stabilized ground water levels at the Site. Numbering for monitoring well (MW) locations followed the assigned borehole numbers within the geotechnical investigation. Monitoring well locations consisted of 50 mm diameter PVC pipe with a 3.0 metre length slotted well screen. The following table summarizes the construction details and measured water levels from installed monitoring well locations:

Summary of Ground Water Elevations

Monitoring Well Location	Surface Elevation (masl)	Well Depth (m)		Water Level					
				31-Aug-17		13-Sep-17		16-Oct-17	
		mbgl	masl	mbgl	masl	mbgl	masl	mbgl	Masl
MW-1	211.7	5.4	206.3	5.1	206.7	5.2	206.5	5.3	206.4
MW-3B	212.3	21.4	190.9	Not Measured		Not Measured		5.8	206.5
MW-4	212.4	13.7	198.7	5.8	206.6	5.8	206.6	5.7	206.7
MW-7	210.4	6.8	203.6	4.1	206.3	4.0	206.4	4.1	206.3
MW-8	212.0	6.8	205.2	5.7	206.3	5.7	206.3	5.8	206.2

masl – metres below sea level

mbgl – metres below ground level

Monitoring well location 3-B was completed within deeper subsurface deposits underlying near surface sand deposits. Water levels observed within MW3-B were similar to shallow ground water elevations observed at other shallow monitoring installations. Head pressures within silt underlying sand deposits at

the site are expected to be similar to the near surface sand unit. Ground water flow direction is expected to the southwest toward the Lynn River and is indicated on the attached Figure 3.

In-situ hydraulic conductivity testing was completed on October 16, 2017 for the above monitoring well installations. The testing involved the removal of water from the well (i.e. bail test) and the recovery of ground water was observed over time. Water level data obtained from the in-situ testing was interpreted using the Hvorslev analysis method for a point piezometer. Methodology of the analysis of in-situ hydraulic conductivity is provided in the attached Appendix B. A summary of the calculated rates of hydraulic conductivity are summarized in the table below:

Summary of In-Situ Hydraulic Conductivity

Monitoring Location	Screened Formation	Hydraulic Conductivity (m/s)
MW-1	Sand	1×10^{-4} m/s*
MW-3B	Clayey Silt to Silt	1.5×10^{-7} m/s
MW-4	Silt	5.6×10^{-6} m/s
MW-7	Sand	1.7×10^{-4} m/s*
MW-8	Sand	1.7×10^{-4} m/s*

* hydraulic conductivity based on grain size analysis curve (Appendix A) and permeability coefficients within SG-9 Supplementary Guidelines to the Ontario Building Code (1997)

Rates of hydraulic conductivity within sand deposits could not be determined based on in-situ conductivity testing due to the rate of recovery for monitoring wells screened within the sand unit following the removal of ground water. The hydraulic conductivity of the sand unit was estimated based on the grain size analysis completed from representative samples obtained from the Site as detailed in the above table using the Hazen method (Hazen, 1911) as follows:

$$K = C(D_{10})^2$$

Where: K is the hydraulic conductivity (m/s)
C is Hazen's empercial coefficient (100 for medium sand).
D_{10} is the diameter of the 10th percentile grain size of the material (1.3×10^{-3} m)

D_{10} was estimated at 1.3 mm from grain size analysis completed for borehole 4, samples 6 and 7 as shown in the attached grain size analysis curves (Appendix A). These samples were obtained from depths below the anticipated shallow ground water level. The estimated hydraulic conductivity for the sand unit was calculated at 1.7×10^{-4} m/s.

3.5 Summary of Proposed WWTF Infrastructure

The following table summarizes the infrastructure proposed as part of the Simcoe WWTF upgrades:

Summary of Proposed WWTF Infrastructure

Infrastructure		Footing Depth (masl)	Area (m^2)	Ground Water Elevation (masl)	Dewatering Target (masl)
Headworks Facility	Wet Well (1)	199.074	76.5	206.6	198.1
	Wet Well (2)	200.824	123.5	206.6	199.8
	Valve Room	208.48	113.6	206.6	207.5
RAS/WAS Chamber		207.72	36.9	206.3	206.7
Sludge Receiving Station		209.00	272.2	206.7	208.0
Digester	Basement	209.3	299.0	206.7	208.3
	Tanks (x2)	207.7	347.8	206.7	206.7
Bio-Solids Holding Tank		204.4	527.7	206.3	203.4
Administration Building		209.5	296.0	206.1	208.5
Blower Building		209.5	90.7	206.1	208.5
Sanitary Sewer Lines		202.579	60*	206.6	201.6

*length of sewer line proposed to feed to proposed headworks facility assumed at 60 m length

The dewatering target is proposed at approximately 1.0 m below the proposed footing elevations for the above proposed infrastructure. Shallow ground water levels were based on observed water levels at the site from the site inspection completed on August 31, 2017. Water levels from August 31, 2017 were used as water levels observed on this date represented the observed seasonal high ground water conditions based on completed monitoring events completed at the site. It is recommended that additional water levels be obtained from the site to confirm seasonal fluctuations in shallow ground water at the site.

Based on the observed site conditions and the footing depths for proposed infrastructure it is anticipated that ground water dewatering will be required to facilitate the construction of the headworks facility (wet well structure) and the bio-solids holding tank. The remaining infrastructure is anticipated to have footprint depths above the level of shallow ground water at the Site. Engineering drawings for the proposed WWTF upgrades are provided in Appendix C.

3.6 Dewatering Requirements

Based on the attached proposed plan (Appendix C) the following drawdown of shallow ground water levels is anticipated for construction works requiring dewatering:

Summary of Dewatering Requirements

Location	Ground Water Elevation	Excavation Depth	Dewatering Target	Dewatering Thickness	Radius of Influence
Headworks Facility (Wet Well)	206.6 masl	199.1 masl	198.1 masl	12.2 m	86.6 m
	206.6 masl	200.8 masl	199.8 masl	10.5 m	74.5 m
Bio-Solids Holding Tank	206.3 masl	204.4 masl	203.4 masl	5.0 m	195.6 m
Sanitary Sewer	206.6 masl	202.6 mals	201.6 masl	8.6 m	336 m

The above assessment assumes a shallow ground water level as observed during the site inspection completed on August 31, 2017. The dewatering assessment was based upon the installation of sheet piling which would effectively cut lateral ground water flow from the upper sand unit for the wet well excavations. It is anticipated that dewatering for the wet well feature would be completed from within silt deposits encountered from depths of approximately 202.5 to 197.1 masl. Dewatering for the bio-solids holding tank is expected within the sand unit encountered from 208.9 to 202.5 masl.

The radius of influence was calculated at a maximum of 86.6 m surrounding the proposed wet well feature for the headworks facility, and 195.6 m surrounding the bio-solids holding tank. The Lynn River is located approximately 100 m west of the proposed headworks facility and approximately 180 m west of the bio-solids holding tank. A further analysis of rates of water taking and potential impacts of water taking activities is further discussed in Section 4.0 below. Locations of proposed water taking are shown on the attached Figure 5.

3.7 Summary of Ground Water Quality

Ground water quality sampling was completed on October 16, 2017 from MW-7 located in the area proposed for the bio-solids holding tank. Water quality sampling was completed for parameters contained within the County of Norfolk Sewer Use By-Law. Two sets of water quality samples were obtained. One set consisted of un-filtered ground water and a second set was filtered using a 20 micron filter to remove suspended solids.

The monitoring well was purged of three casing volumes prior to sampling to remove standing water from within the monitoring well. Samples were collected in laboratory supplied sample bottles required for the requested analysis. All collected samples were stored on ice and transported to the Stoney Creek office for courier to Agat Laboratories of Mississauga for analysis. Laboratory Certificates of Analysis are provided in the attached Appendix E. Results of analysis are provided in the attached Table 1.

Results of water quality sampling were compared to parameters within the Provincial Water Quality Objectives (PWQO) for discharge to the natural environment (i.e. Lynn River), and the County of Norfolk

Sewer Use By-Laws (both storm and sanitary). Based on the collected ground water sample the following treatment was determined to be required for discharge:

- For discharge to the Lynn River – exceedances of the PWQO were noted for cadmium, chromium, copper, lead, zinc, iron and E-coli. Treatment would be required for suspended solids, metals and microbiology. Treatment would include (but not limited to) greensand filters and UV disinfection;

- For discharge to the County of Norfolk storm sewer exceedances were noted for total suspended solids and E-coli. Treatment would be required consisting of UV disinfection and settling tanks; and

- For discharge to the County of Norfolk sanitary sewer exceedances were noted for total suspended solids and treatment via settling tanks or other filtration methodology would be required prior to discharge.

Given that the proposed Simcoe WWTF upgrades are being completed by the County of Norfolk and the proximity of the works to the sanitary sewer it is anticipated that discharge of ground water from dewatering would be directed to the sanitary sewer.

4.0 ASSESSMENT OF GROUND WATER CONTROL REQUIREMENTS

Based on the subsurface conditions observed as part of site investigations and a review of background information, the potential dewatering required for completion of Simcoe WWTF upgrades have been assessed.

4.1 Summary of Site Conditions and Ground Water Features

In summary, the results of the site investigation and information review indicate the following:

- Based on three completed boreholes completed at the Site subsurface materials consist of silty sand and sandy silt overlying sand followed by silt to clayey silt. Sand was encountered to a depth of approximately 202.5 masl. It is anticipated that excavations for the bio-solids holding tank and sanitary sewer lines will be completed within the sand subsurface materials. Underlying silt soils were encountered to a depth of 197.1 masl. It is expected that the wet well feature of the headworks facility will be completed within silt soils.

- The stabilized ground water levels are expected to be within approximately 4 to 6 m of the ground surface.

- The site is situated in an area which is serviced with municipal piped water and sewage services. Private potable water wells are not located in the vicinity of the site.

On the basis of the above, it is expected that excavations carried below the water table in the native soil materials will encounter ground water seepage. It is noted that these recommendations are provided for the purposes of assessing general requirements for design and obtaining a Permit to Take Water. They are not intended to provide direction to contractors with respect to appropriate methods of ground water control for the site.

4.2 Anticipated Rates of Dewatering

Excavations required for the proposed WWTF upgrades are expected to be up to approximately 14.2 m below existing ground level through sand deposits and into underlying silt soils. Seepage is expected for excavations carried out in this area for sewer lines, the headworks facility (wet well feature) and for the proposed bio-solids holding tank. It is anticipated that ground water control can generally be accomplished from pumping a series of well points constructed around the perimeter of proposed excavations. The total volume of ground water pumped from excavations for the proposed WWTF

upgrades are expected to stabilize in the range of 1,410,000 litres per day. A safety factor of approximately 50% was applied for calculated rates to account for higher initial rates of water taking to drawdown shallow ground water levels, uncertainties in estimated hydraulic conductivity rates of soils and the potential for higher rates of dewatering as a result of precipitation events during active dewatering. The anticipated maximum rate of dewatering was estimated at 2,114,000 L/day. The table below summarizes the calculated rates of dewatering:

Summary of Calculated Dewatering Rates

Infrastructure	Subsurface Materials	Average Dewatering Rates	Maximum Dewatering Rates	Conditions/Assumptions
Headworks Facility	Silt	11,000 L/d	17,000 L/d	Shoring precluding lateral ground water flow
	Silt	15,000 L/d	22,000 L/d	Shoring precluding lateral ground water flow
Bio-Solids Holding Tank	Sand	300,000 L/d	450,000 L/d	Shoring precluding lateral ground water flow
Sanitary Lines	Sand	1,084,000 L/d	1,625,000 L/d	Excavation staged and open in 10 m lengths

It is anticipated that dewatering for the Simcoe WWTF upgrades can be facilitated through a Category 3 Permit to Take Water (PTTW) application. The PTTW is applicable for construction dewatering projects requiring dewatering in excess of 400,000 L/day.

A review of the above dewatering assessment should be reviewed along with current site plans, construction staging and updated site water levels prior to finalization of the dewatering plan. The above assessment was based on site conditions observed at the time of site inspection at the locations of completed monitoring well installations. A summary of dewatering flow calculations are provided in the attached Appendix D.

It should be noted that the above values are representative of short term rates of dewatering for construction purposes. In the event that permanent drainage is required for footings (i.e. weeping tile underlying structure footings) it is anticipated that a PTTW will be required for the long term water taking at the site. Long term water taking for footing sub-drains would form a separate PTTW application with the MOECC if required.

4.3 Discharge of Ground Water

The results of ground water quality sampling are provided in Section 3.7 above. It is anticipated that ground water discharge will be directed to the County of Norfolk sanitary sewer given the close proximity of the site to sanitary servicing. It is recommended a ground water quality monitoring program is in place to verify compliance with discharge to the municipal sanitary sewer. Well points/eductors should be filtered to ensure that fines are not pumped in the ground water discharge system. The outlet should be checked frequently to ensure that the discharge water is not carrying fines. Appropriate methods to control transport of silt in discharge water, such as filter bags or settling tanks, should be fitted to the outlet of the discharge.

Potential sources of ground water contamination in the vicinity of the site were not identified. Land use surrounding the site consists of residential dwellings to the north of the site. The Oakwood cemetery is located to the northeast of the site. The cemetery is not expected to represent a source of potential source of ground water contamination, ground water levels are expected to be below the depth of burial (i.e. approximately 1.8 m below ground) and based on current burial practices (i.e. underground vaults) potential ground water contamination is not expected.

4.4 Potential Zone of Influence

The potential zone of influence arising from ground water taking activities was calculated based on the anticipated drawdown and hydraulic conductivity determined for the site. The calculated zone of influence will extend to an anticipated maximum distance of 196 m surrounding the proposed excavation areas. It is anticipated that the Lynn River will act as a boundary condition to the west of the site. The existing WWTF and surrounding residential dwellings are municipally serviced. Ground water supply wells, surface water features (i.e. Lynn River) and potential sources of ground water contamination were not identified within the anticipated radius of influence of dewatering work for the WWTF upgrades.

4.5 Impact on Local Features and Uses

Potable water wells are not expected within the anticipated radius of influence. Surrounding wells listed within the MOECC water well record database pertain to wells completed for monitoring and/or dewatering purposes. Potable water supply wells are expected to have been decommissioned with connection of local residents to municipal water servicing. Dewatering is not expected to have impacts for surrounding land uses in the vicinity of the subject site. Locations of well records on file with the

MOECC within 200 m of the Site are shown on the attached Figure 5. A summary of well records is provided on the attached Table 2.

Surrounding natural surface water features consist of the Lynn River located approximately 100 metres west of the Site. The Lynn River is not situated within the expected radius of influence of dewatering work for the Simcoe WWTF upgrades. Impacts to the river as a result of dewatering are not anticipated.

4.6 Geotechnical Considerations

Lowering of ground water levels during construction activities has the potential to create ground subsidence or settlement. Surrounding building foundations and pavements should be inspected frequently to assess potential settlement surrounding existing structures for the Simcoe WWTF. Dewatering discharge should be inspected frequently to ensure discharge is clear and free of sediment in order to prevent possible ground loss with active dewatering.

4.7 Requirements for Record Keeping

Based on the results of the hydrogeologic investigation, it is expected there will be no significant impacts created by the dewatering activities. Nonetheless, it is important to maintain records to ensure that any unforeseen impacts are properly identified and that appropriate contingency measures can be implemented. The following record keeping measures are recommended:

- The location and extent (depth and approximate dimensions) of all excavations on the site should be recorded on a daily basis.

- The requirements for ground water control including volumes and duration of pumping from each excavation should be recorded on a daily basis.

- Ground water discharge from ground water control systems should be inspected frequently to ensure they are not carrying fines.

5.0 SUMMARY AND CONCLUSIONS

Based on the results of the investigation, the following summary and conclusions are provided:

i. The results of the investigation indicate the site is generally underlain sand materials. Hydraulic conductivity was estimated based on grain size gradation curves for soil samples obtained as part of the geotechnical investigations completed at the site using the Hazen method. For the purposes of estimating rates of dewatering a hydraulic conductivity of 1.7×10^{-4} m/s was considered.

ii. Ground water levels in the vicinity of infrastructure proposed for the Simcoe WWTF upgrades are expected within 4 to 6 m below existing grades. Significant variations in water level between shallow (MW 1, 4, 7 and 8) and deep (MW 3-B) installations were not noted for completed monitoring wells at the site.

iii. Based on the sand material present at the site it is expected that dewatering will generally be accomplished through a series of well points or eductors completed around the perimeter of the proposed excavations.

iv. The total volume of ground water pumped from excavations for the proposed WWTF upgrades are expected to stabilize in the range of 1,410,000 L/day. The anticipated maximum rate of dewatering was estimated at 2,114,000 L/day. These rates are representative of the short term rates of dewatering required for construction. Long term rates for dewatering for footing sub-drains (if proposed) were not assessed.

v. Discharge of pumped ground water is recommended to the municipal sanitary sewer. Water quality samples obtained from the Site generally meet the requirements of the County of Norfolk sanitary sewer use by-law. Based on the close proximity of excavations to the existing sanitary system, and that the proposed works are being completed for the municipality it is anticipated that discharge to the sanitary system will be the most effective discharge option for dewatering discharge.

vi. Ground water control activities are not expected to cause any significant impacts to local water resources, surface water features or significant ground settlement. The anticipated zone of influence surrounding the site is expected at a maximum of 60 metres surrounding open excavations.

vii. Water quality concerns for discharge water are not anticipated. Measures should be taken to insure that fines are not pumped in the ground water discharge system, and that erosion at the point of discharge to the existing open channel west of the site is limited.

We trust this report meets with your requirements. Should you have any questions regarding the information presented, please do not hesitate to contact our office.

Yours truly,

Terraprobe Inc.







Paul L. Raepple, P. Geo.

R. Baker Wohayeb, M.A.Sc., P.Eng., QP_{RA}
Principal

Stoney Creek Office

6.0 REFERENCES

Barnett, P.J. 1978: Quaternary Geology of the Simcoe Area, Southern Ontario; Ontario Division of Mines, GR162, 74p. Accompanied by Maps 2369, 2370, and 2371, scale 1:50,000.

County of Norfolk By-Law 83-74, Sewer Use By-Law (as Amended by 173-86, 186-87, 208-89, 192-91 and 160-92), dated February 13, 1975.

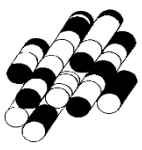
Ontario Base Mapping, Sheet 10 17 5550 47400. Ontario Ministry of Natural Resources, 2002; scale 1:10,000.

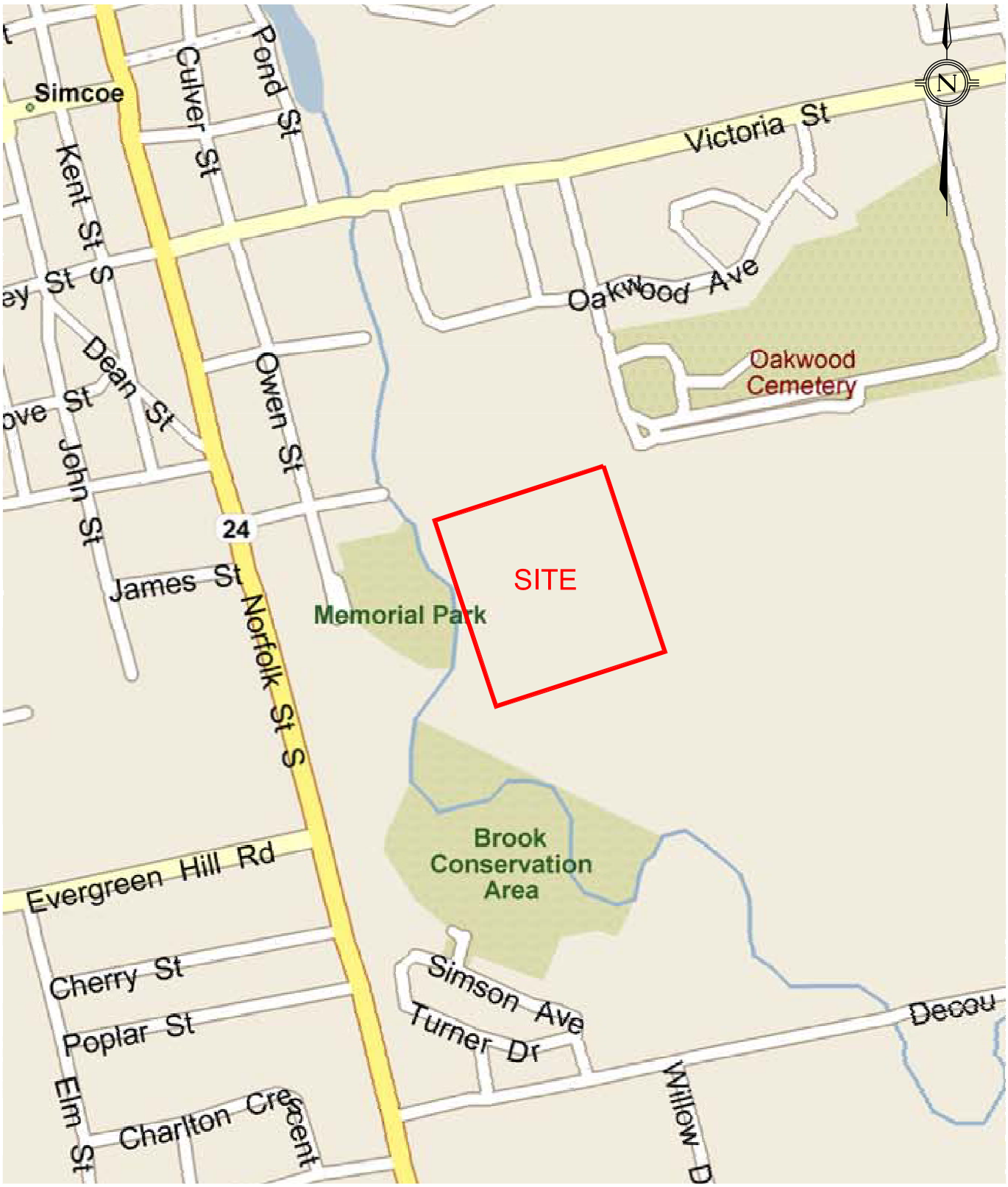
Terraprobe, (2017), *Geotechnical Investigation, Norfolk County, Wastewater Treatment Plant Upgrades, 16 Oakwood Avenue, Simcoe, Ontario.*

Water Management Policies Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy (1994). Queen's Printer for Ontario. PIBS 3303E.

FIGURES

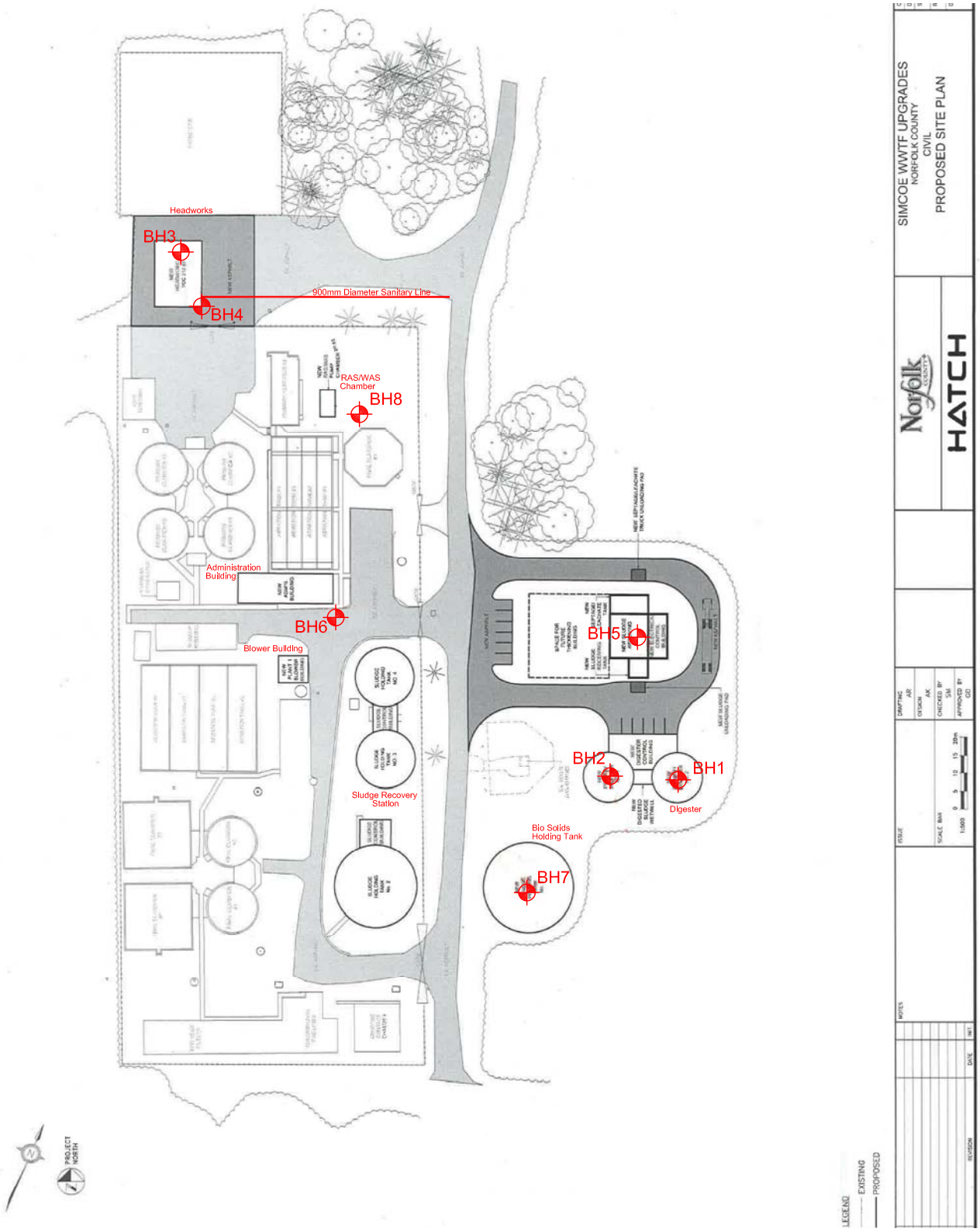
Terraprobe Inc.





Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title:	FIGURE :
SITE LOCATION PLAN	1
File No. 7-17-0120-01	



LEGEND

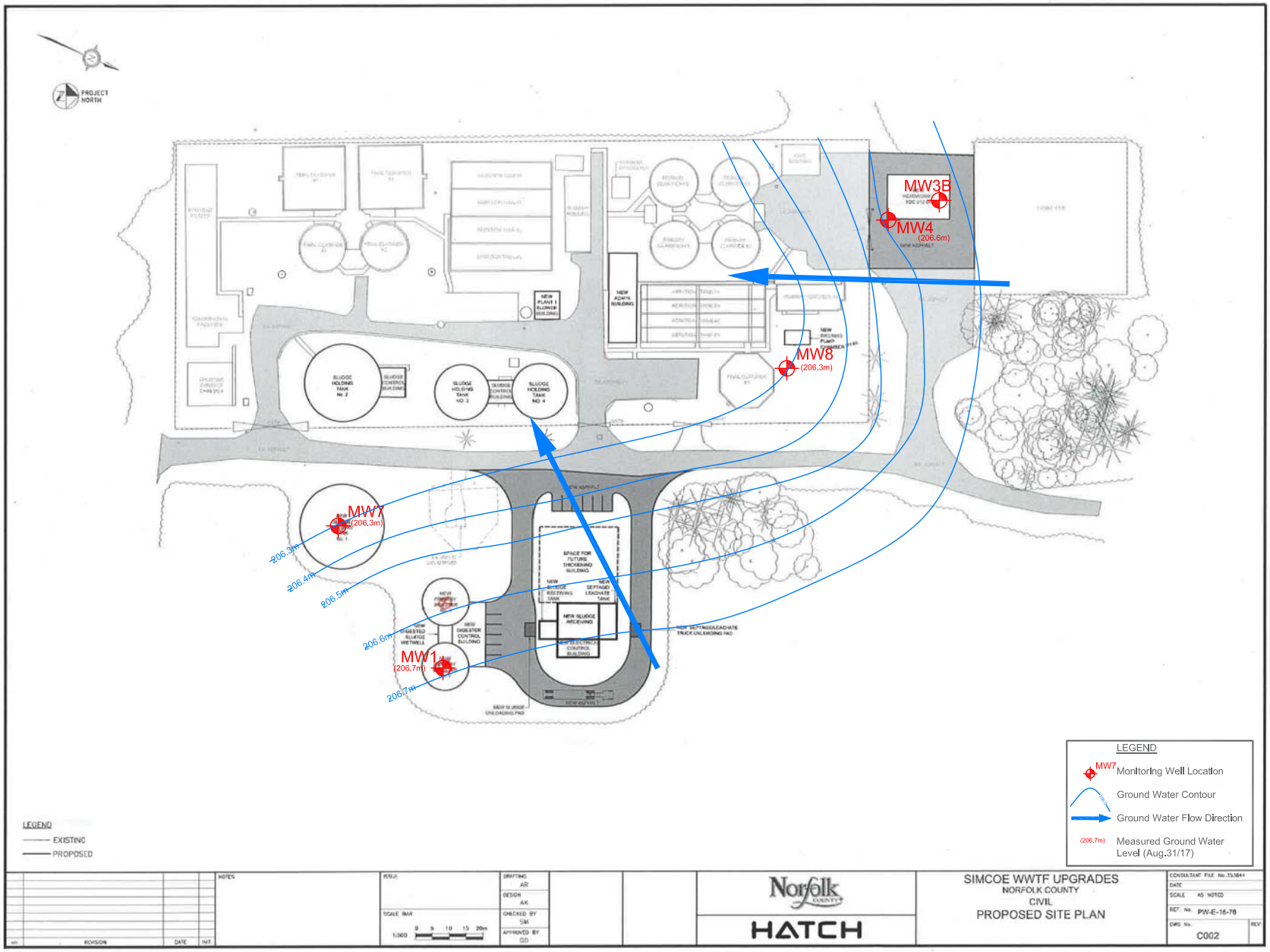
BH1 Borehole Location

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903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: BOREHOLE LOCATION PLAN

File No. 7-17-0120-01

FIGURE : 2

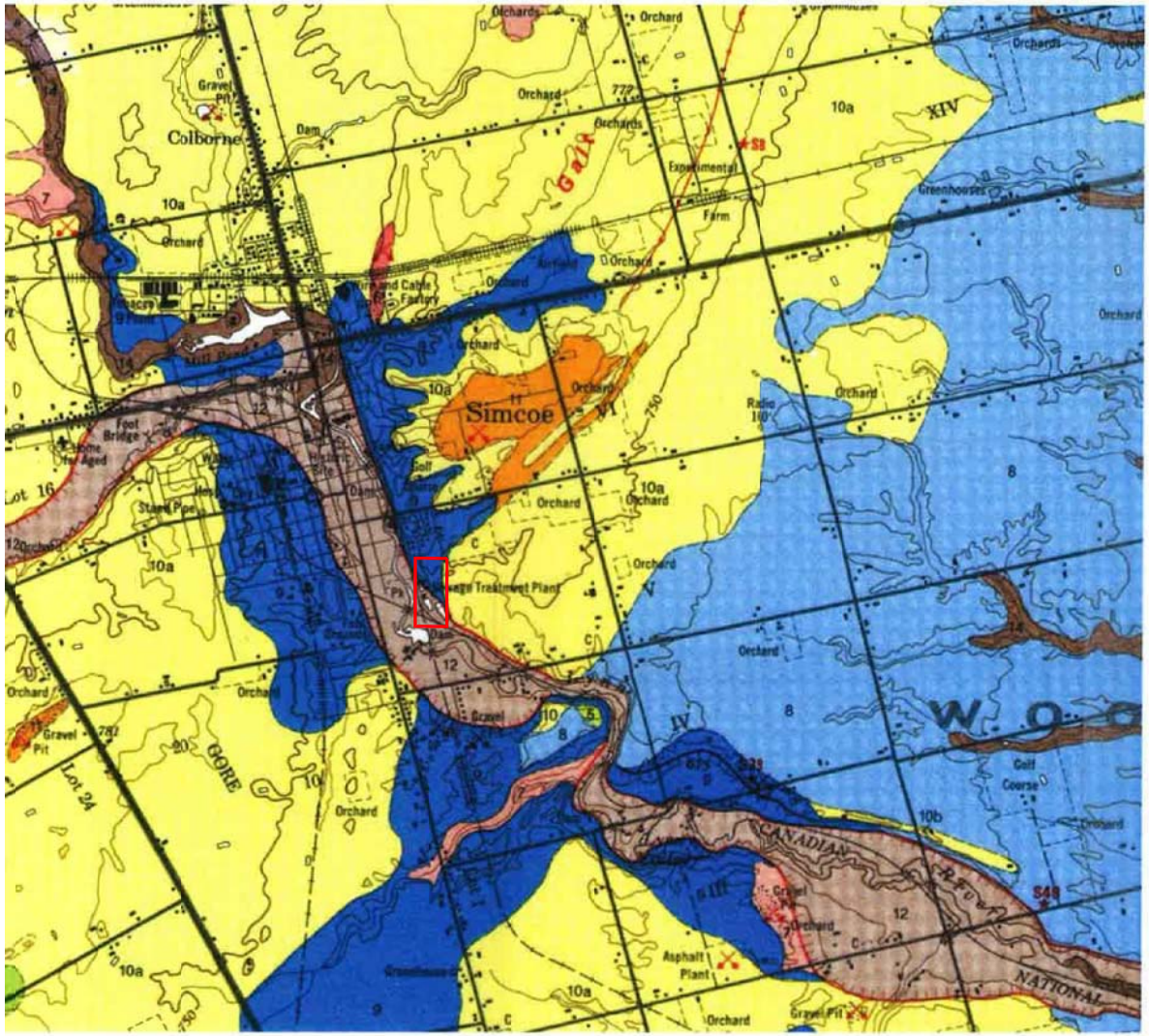


Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: SHALLOW GROUND WATER FLOW DIRECTION

File No. 7-17-0120-01

FIGURE : 3



HALDIMAND-NORFOLK (RM)

QUATERNARY

RECENT

16 *Fill.*

15 *Modern Lake Erie beach deposits: (sand, gravel and sand, shingle).*

14 *Modern alluvium: undifferentiated, (clay, silt, sand, muck).*

13 *Bog deposits: a, muck and peat; b, marl.*

PLEISTOCENE

LATE WISCONSINAN

12 *Older alluvium in terrace remnants, (medium to very coarse grained sand with occasional pebbles).*

11 *Glaciolacustrine beach, bar, or near shore deposits, (gravel to very coarse grained sand with pebbles).*

10 *Glaciolacustrine shallow water sand deposits: (very fine to coarse grained sand, massive to faintly laminated).*
10a *May be modified slightly by wind.*
10b *Large dunes.*
10c *Varved very fine to fine grained sand.*

9 *Glaciolacustrine deep water silt deposits, (massive to laminated and varved silt).*

8 *Glaciolacustrine deep water clay deposits, (massive to laminated and varved clay).*

7 *Glaciofluvial, outwash, deltaic deposits, (gravel to gravelly sand).*

6 *Ice-contact stratified drift, (moraine and kame gravel and sand).*

5 *WENTWORTH TILL (stony, fine, sandy silt to silty, fine, sand till).*
5a *In moraine or till plain.*
5b *In drumlin.*

4 *Glaciolacustrine sand related to Lake Maumee.*

3 *PORT STANLEY TILL, (gritty clayey silt to silty clay till).*

UNCONFORMITY

PALEOZOIC

Source: Quaternary Geology, Simcoe, Southern Ontario; Ontario Division of Mines, 1976 - Map2369

Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: Site Geology

File No. 7-17-0120-01

FIGURE : 4



LEGEND

(10) MOECC Well Record Location

Proposed Dewatering Location

Terraprobe
903 Barton Street - Unit 22, Stoney Creek, Ontario, L8E 5R7
Tel: (905) 643-7560, Fax: (905) 643-7559

Title: Dewatering Locations & MOECC Well Record Locations

File No. 7-17-0120-01

FIGURE : 5

TABLES

Terraprobe Inc.

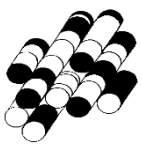


Table 1: Summary of Water Quality Sampling
Simcoe WWTF Expansion
16 Oakwood Avenue
Simcoe, Ontario

Sample Description	Unit	PWQO	Storm	Sanitary	BH 7a	BH 7b
Date Sampled					**16-Oct-17**	**16-Oct-17**
Inorganics						
pH	pH Units	6.5-8.5	6.5-9.5	6.5-8.5	7.89	7.86
BOD (5)	mg/L				<5	<5
Total Suspended Solids	mg/L		15	350	**4480**	**680**
Phenols	mg/L	0.005	0.020	0.10	<0.001	<0.001
Total Cyanide	mg/L	0.005	0.1	2	<0.002	<0.002
Sulphide	mg/L		1	2	<0.05	<0.05
Chloride	mg/L		1500	1500	6.21	6.21
Sulphate	mg/L		1500	1500	65.7	65.8
Cadmium	mg/L	0.0002	1	3	**<0.001**	**<0.001**
Chromium	mg/L	0.001	1	3	**0.014**	**0.004**
Copper	mg/L	0.005	1	3	**0.050**	**0.013**
Lead	mg/L	0.025			**0.073**	0.024
Nickel	mg/L	0.025	1	3	0.004	<0.003
Zinc	mg/L	0.03			**0.116**	0.030
Iron	mg/L	0.3			**10.6**	**5.10**
Organics						
Oil and Grease (animal/vegetable) in water	mg/L	[a]	15	100	0.6	0.8
Oil and Grease (mineral) in water	mg/L	[a]	15	15	<0.5	<0.5
Microbiological						
Total Coliforms	CFU/100mL	100	2400		NDOGT	**13000**

BH 7a indicates un-filtered sample
BH 7b indicates filtered sample (20 microns)
Storm and sanitary criteia obtained from the County of Norflok Sewer Use By-Laws (83-74)
(a) PWQO for oil and grease is set at no visible sheen, odour or discolouration of discharge water
PWQO - Provincial Water Quality Objetives
CFU - Colony Forming Units

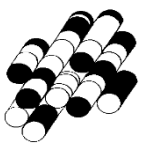
TABLE 2: Summary of MOECC Well Records
Simcoe WWTF Expansion
16 Oakwood Avenue
Simcoe, Ontario

Well ID	Well Number	Water Level (m)	Well Use	Stratigraphy (Depth Encountered in metres)
1	7044570	1.8	Observation Well	Fine Sand (1.8) Coarse Sand (4.6)
2	7243484	n/a	Monitoring Well	Sand Fill (0.9) Water Bearing Sand (3.7)
3	4401194	0.9	n/a	Coarse Sand (5.5)
4	4401186	n/a	Test Hole	Clay (3.0) Sand (8.2) Silt/Clay (42.4)
5	4402034	11.2	Domestic	Sand (6.0) Sand/Gravel (12.5)
6	4402032	10.8	Domestic	Silt (3.0) Gravel (9.1) Fine Gravel (12.2)
7	4401187	n/a	Municipal	Clay (1.5) Sand (4.6) Clay/Gravel (39.6) Gravel (40.1)
8	7280339	n/a	Monitoring Well	Sand (6.7) Clay/Silt (7.6)
9	7116488	n/a	Monitoring Well	Sand Fill (5.4) Sand/Silt (12.0)
10	7135497	n/a	Monitoring Well	Topsoil (0.3) Silt/Sand (6.0)
11	7101397	18.5	Domestic	Sand (4.2) Clay (9.7) Sand (22.9)
12	4404974	1.2	Domestic	Sand (1.2) Clay (18.3) Limestone (20.4)

Borehole Logs and Grain Size Analysis

APPENDIX A

Terraprobe Inc.



LOG OF BOREHOLE 1

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 29, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742120, N: 557635 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	211.7	**GROUND SURFACE**				
	211.5	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, compact, brown		1	SS	11
1				2	SS	13
	210.5					
	1.2	**SILTY FINE SAND**, loose, brown		3	SS	6
2	209.3					
	2.4	**MEDIUM SAND**, occasional gravel, compact, brown		4	SS	10
3				5	SS	10
4						
				6	SS	12
5						
				7	SS	22
6	205.1					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 211, 210, 209, 208, 207, 206

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Unstabilized water level measured at 4.9 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	5.1	206.7
Sep 13, 2017	5.2	206.5

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 2

Terraprobe

Project No. : 7-17-0120-01 | Client : Hatch | Originated by : AF

Date started : August 29, 2017 | Project : 16 Oakwood Avenue | Compiled by : KB

Sheet No. : 1 of 1 | Location : Simcoe, Ontario | Checked by : KB

Position : E: 4742118, N: 557632 (UTM 17T) | Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted | Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	211.6	**GROUND SURFACE**				
0	211.4	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, loose, brown		1	SS	8
	210.7					
1	0.9	**SILTY FINE SAND**, loose, brown		2	SS	6
				3	SS	6
2	209.5					
	2.1	**MEDIUM SAND**, occasional gravel, compact, brown		4	SS	20
3				5	SS	25
4						
				6	SS	18
5						
6				7	SS	20
	205.0					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 211, 210, 209, 208, 207, 206

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) | Natural Water Content (MC) | Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm) | Instrument Details | Unstabilized Water Level | Lab Data and Comments | GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and caved to 4.9 m below ground surface upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 3

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : October 11, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742219, N: 557478 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)
	212.3	**GROUND SURFACE**					
0	211.7	100mm **ASPHALTIC CONCRETE**					212
	0.6	**FILL**, Granular Base		1	SS	7	
1		**FILL**, sandy silt, trace topsoil, occasional gravel, loose, brown					211
	210.6			2	SS	8	
2	1.7	**SANDY SILT to SILTY SAND**, loose, brown					210
	209.7			3	SS	19	
3	2.6	**MEDIUM SAND**, occasional gravel, compact, brown		4	SS	30	209
4							208
5				5	SS	28	
							207
6				6	SS	14	
	205.3						206
7	7.0	**MEDIUM SAND**, occasional gravel, dense to very dense, brown					
				7	SS	33	205
8							204
9				8	SS	52	203
	202.5						
10	9.8	**SILT**, with seams and layers of silty clay and silty sand, dense to very dense, brown					202
				9	SS	32	
11							201
12							
				10	SS	38	200
13							
				11	SS	54	199
14							198
15							
				12	SS	20	197
16							196
17				13	SS	30	
							195
18	194.0						
	18.3	**SILTY CLAY**, hard, brown / grey		14	SS	32	194
19	192.8						
	19.5	**SILT**, trace clay, dense, grey					193
20				15	SS	65	
							192
21							
	190.5			16	SS	29	191
	21.8						

Penetration Test Values (Blows / 0.3m)
Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa)
Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40 80 120 160

Moisture / Plasticity
Plastic Limit, Natural Water Content, Liquid Limit
PL MC LL
10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

0 23 63 14

0 3 62 35

END OF BOREHOLE

Combined Borehole from two separate Drill dates. Aug 31 & Oct. 11 2017.

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 3A

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 31, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742210, N: 557485 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	212.3	**GROUND SURFACE**				
		100mm **ASPHALTIC CONCRETE**				
	211.7	**FILL**, Granular Base				
	0.6	**FILL**, sandy silt, trace topsoil, occasional gravel, loose, brown		1	SS	7
	210.6					
	1.7	**SANDY SILT to SILTY SAND**, loose, brown		2	SS	8
	209.7			3	SS	19
	2.6	**MEDIUM SAND**, occasional gravel, compact, brown		4	SS	30
				5	SS	28
				6	SS	14
	205.3					
	7.0	**MEDIUM SAND**, occasional gravel, dense to very dense, brown		7	SS	33
				8	SS	52
	202.5					
	9.8	**SILT**, with seams and layers of silty clay and silty sand, dense to very dense, brown		9	SS	32
				10	SS	38
				11	SS	52
	198.1					
	14.2	**END OF BOREHOLE**				

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Elevation Scale (m): 212 211 210 209 208 207 206 205 204 203 202 201 200 199

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

1 11 70 18

Unstabilized water level measured at 6.1 m below ground surface; borehole caved to 6.1 m below ground surface upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 3B

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : October 11, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742219, N: 557478 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)
	212.3	**GROUND SURFACE**					
	211.7 / 0.6	100mm **ASPHALTIC CONCRETE**					
		FILL, Granular Base					
	210.6 / 1.7	**FILL**, sandy silt, trace topsoil, occasional gravel, loose, brown					
	209.7 / 2.6	**SANDY SILT to SILTY SAND**, loose, brown					
	205.3 / 7.0	**MEDIUM SAND**, occasional gravel, compact, brown					
	202.5 / 9.8	**MEDIUM SAND**, occasional gravel, dense to very dense, brown					
	197.1 / 15.2	**SILT**, with seams and layers of silty clay and silty sand, dense to very dense, brown		1	SS	30	
				2	SS	54	
	194.0 / 18.3	**SILTY SAND**, with seams and layers of silt, compact to dense, grey		3	SS	20	
				4	SS	30	
	190.5 / 21.8	**CLAYEY SILT to SILT**, with seams and layers of silty sand, dense to very dense, grey		5	SS	32	
				6	SS	65	
				7	SS	29	

Penetration Test Values (Blows / 0.3m)
Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa)
Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40 80 120 160

Moisture / Plasticity
Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL)
10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 4

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 30, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742193, N: 557983 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth (m)	Elev Depth (m)	Description	Number	Type	SPT 'N' Value	Elevation (m)	Lab Data and Comments (GR SA SI CL)
0	212.4	**GROUND SURFACE**					
		100mm **ASPHALTIC CONCRETE**					
	211.8	**FILL**, Granular Base					
	0.6	**FILL**, sandy silt, trace topsoil, occasional rootlets, trace gravel, loose, brown	1	SS	4		
1	211.2					212	
	1.2	**SANDY SILT to SILTY SAND**, loose, brown	2	SS	7	211	
2	210.3						
	2.1	**MEDIUM SAND**, occasional gravel, compact, brown	3	SS	24	210	
3			4	SS	15	209	29 67 3 1
4						208	
5			5	SS	22	207	
6			6	SS	10	206	4 92 1 3
7	205.4					205	
	7.0	**MEDIUM SAND**, occasional gravel, dense to very dense, brown	7	SS	35		2 93 3 2
8						204	
9	203.0		8	SS	59	203	
	9.4	**SILT**, with seams and layers of silty clay, dense to very dense, brown					
10			9	SS	55	202	
11						201	
12			10	SS	74	200	
13						199	
14	198.2		11	SS	46		
	14.2	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit — PL MC LL 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

GRAIN SIZE DISTRIBUTION (%) (MIT)

Unstabilized water level measured at 5.7 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	5.8	206.6
Sep 13, 2017	5.8	206.6

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 5

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 28, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742127, N: 557628 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	213.4	**GROUND SURFACE**				
0	213.2	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, compact, brown		1	SS	10
	212.5					
1	0.9	**SILTY FINE SAND**, loose, brown		2	SS	14
				3	SS	7
2				4	SS	16
	210.5					
3	2.9	**MEDIUM SAND**, occasional gravel, occasional silty seams, compact, brown		5	SS	21
4						
				6	SS	21
5						
6				7	SS	18
	206.8					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 213, 212, 211, 210, 209, 208, 207

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Borehole was dry and caved to 4.9 m below ground surface upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 6

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 29, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742124, N: 557553 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	211.5	**GROUND SURFACE**				
	211.3	150mm **ASPHALTIC CONCRETE**				
	0.2	**FILL**, Granular Base				
	210.9					
	0.6	**FILL**, clayey silt, trace sand, occasional gravel, firm, brown		1	SS	7
1				2	SS	4
2	209.4					
	2.1	**MEDIUM SAND**, occasional gravel, compact, brown		3	SS	18
3				4	SS	22
	208.0					
	3.5	**END OF BOREHOLE**				

Elevation Scale (m): 211, 210, 209, 208

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 7

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 29, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742073, N: 557633 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	210.4	**GROUND SURFACE**				
	210.2	150mm **TOPSOIL**				
	0.2	**SANDY SILT**, trace topsoil, trace rootlets, loose, brown		1	SS	10
	209.8					
1	0.6	**SILTY FINE SAND**, loose, brown		2	SS	4
	208.9					
2	1.5	**MEDIUM SAND**, occasional gravel, compact, brown		3	SS	18
				4	SS	13
3				5	SS	12
4				6	SS	15
5				7	SS	22
6				8	SS	12
7						
8	202.3					
	8.1	**END OF BOREHOLE**				

Elevation Scale (m): 210, 209, 208, 207, 206, 205, 204, 203

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Unstabilized water level measured at 4.5 m below ground surface; borehole caved to 4.3 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	4.1	206.4
Sep 13, 2017	4.0	206.4

file: 7-17-0120-01 - simcoe wwtf.gpj

LOG OF BOREHOLE 8

Terraprobe

Project No. : 7-17-0120-01	Client : Hatch	Originated by : AF
Date started : August 30, 2017	Project : 16 Oakwood Avenue	Compiled by : KB
Sheet No. : 1 of 1	Location : Simcoe, Ontario	Checked by : KB

Position : E: 4742187, N: 557540 (UTM 17T) Elevation Datum : Geodetic (NAD83)

Rig type : Track-mounted Drilling Method :

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	212.0	**GROUND SURFACE**				
		100mm **TOPSOIL**				
		FILL, sandy silt, trace topsoil, trace rootlets, loose to compact, brown		1	SS	12
1				2	SS	8
	210.8					
	1.2	**SANDY SILT to SILTY SAND**, loose to compact, brown		3	SS	9
2				4	SS	6
	209.2					
	2.8	**MEDIUM SAND**, occasional gravel, compact, brown		5	SS	21
3						
4				6	SS	27
5						
6				7	SS	21
7						
8				8	SS	17

Elevation Scale (m): 211, 210, 209, 208, 207, 206, 205, 204

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10, 20, 30, 40

Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40, 80, 120, 160

Moisture / Plasticity — Plastic Limit, Natural Water Content, Liquid Limit: PL, MC, LL; 10, 20, 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

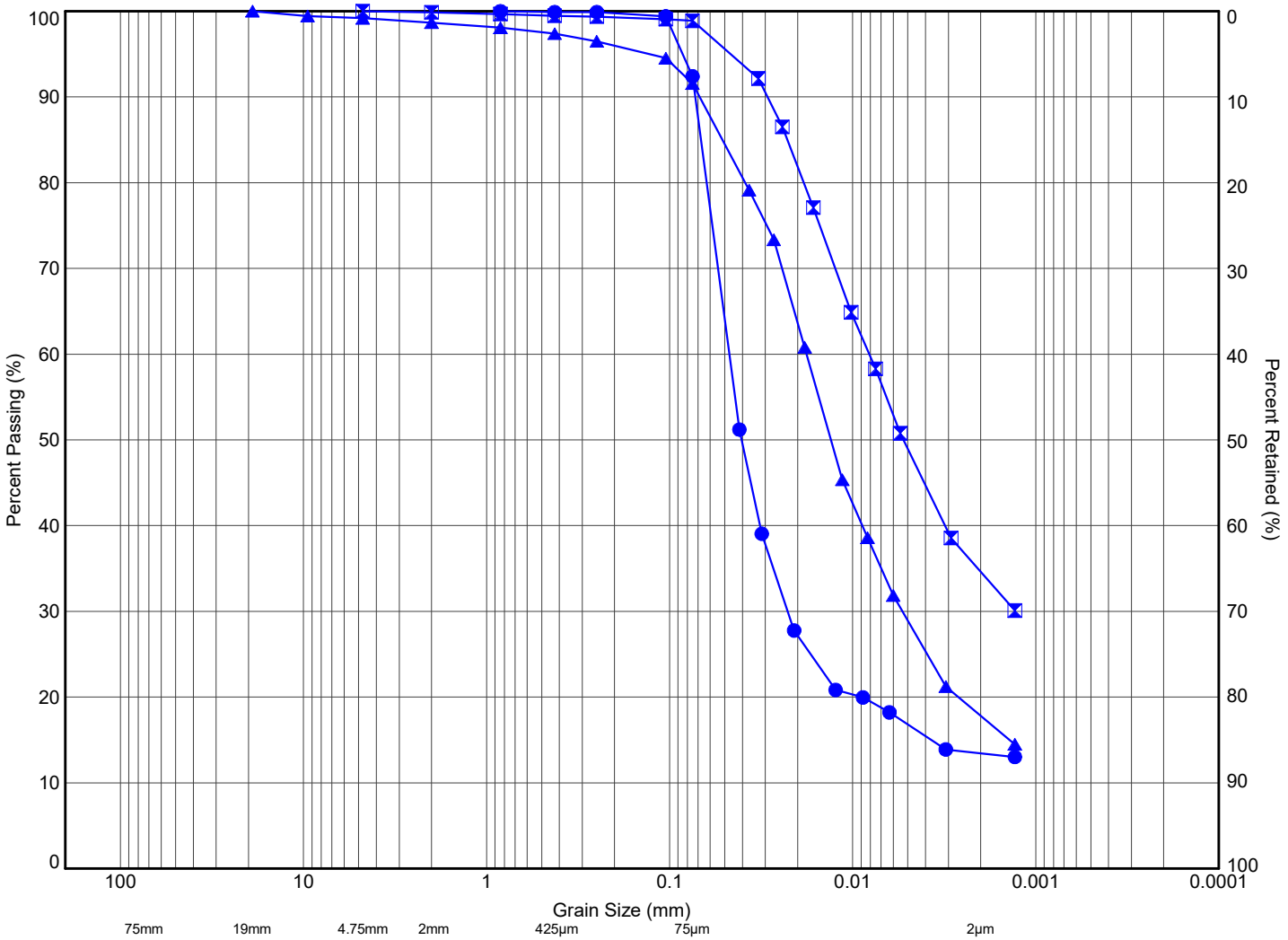
Unstabilized water level measured at 6.1 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Aug 31, 2017	5.7	206.3
Sep 13, 2017	5.7	206.3

file: 7-17-0120-01 - simcoe wwtf.gpj

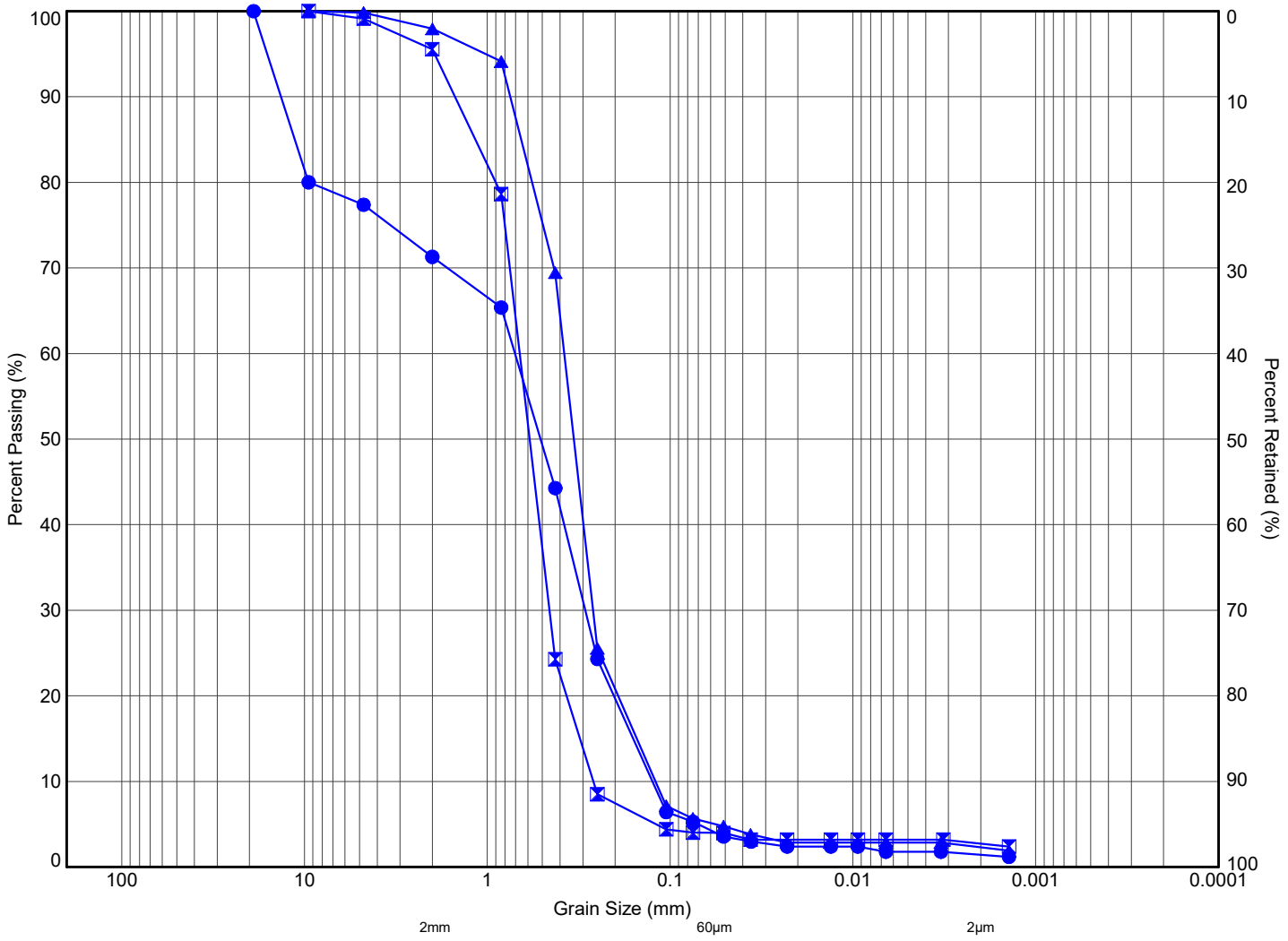


	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**3**	SS13	17.0	195.3	0	7	79	14	
⊠	**3**	SS14	18.5	193.8	0	1	64	35	
▲	**3A**	SS10	12.4	199.9	1	7	74	18	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title: **GRAIN SIZE DISTRIBUTION**

File No.: **7-17-0120-01**



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**4**	SS4	3.3	209.1	29	67	3	1	
⊠	**4**	SS6	6.3	206.1	4	92	1	3	
▲	**4**	SS7	7.8	204.6	2	93	3	2	

Terraprobe
903 Barton Street, Unit 22, Stoney Creek ON L8E 5P5
(905) 643-7560

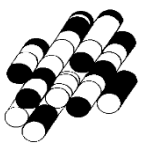
Title: **GRAIN SIZE DISTRIBUTION**

File No.: **7-17-0120-01**

Results of In-Situ Hydraulic Conductivity Testing

APPENDIX B

Terraprobe Inc.



Appendix B: Aquifer Response Test Results
Monitoring Well MW 3B
Simcoe WWTF Expansion
16 Oakwood Avenue
Simcoe, Ontario

Test Completed on	16-Oct-17	
well depth	190.90	m
r (casing radius)	0.025	m
L (length of screen)	3.2	m
R (filter pack [borehole] radius)	0.03	m
To (time lag*)	2972	sec
H (initial water level before slug)	206.53	m
Ho (water level at t=0)	199.22	m
h (recorded water level at time t)	See Column F	

* To = t when (H-h)/(H-Ho) = 0.37 and ln(H-h)/H-Ho)=-1

Hydraulic Conductivity (K) =(r^2 ln(L/R))/(2LTo)

1.53E-07 m/sec

Time lag is defined as the time required for the complete equalization of the head difference if the original rate of inflow were maintained.

Water Level (masl)	(H-h)/(H-Ho)	Elapsed Time (s)
199.25	1.00	15
199.33	0.98	30
199.52	0.96	45
199.60	0.95	60
199.65	0.94	75
199.72	0.93	90
199.76	0.93	105
199.80	0.92	120
199.90	0.91	150
199.99	0.89	180
200.10	0.88	210
200.21	0.86	240
200.32	0.85	270
200.38	0.84	300
200.52	0.82	360
200.68	0.80	420
200.76	0.79	480
200.87	0.77	540
200.94	0.76	600
201.09	0.74	720
201.23	0.73	840
201.37	0.71	960
201.45	0.69	1080
201.57	0.68	1200
201.82	0.64	1500
202.02	0.62	1800

Appendix B: Aquifer Response Test Results
Monitoring Well MW 4
Simcoe WWTF Expansion
16 Oakwood Avenue
Simcoe, Ontario

Test Completed on	16-Oct-17	
well depth	198.70	m
r (casing radius)	0.025	m
L (length of screen)	3	m
R (filter pack [borehole] radius)	0.03	m
To (time lag*)	86	sec
H (initial water level before slug)	206.67	m
Ho (water level at t=0)	206	m
h (recorded water level at time t)	See Column F	

* To = t when (H-h)/(H-Ho) = 0.37 and ln(H-h)/H-Ho)=-1

Hydraulic Conductivity (K) =(r^2 ln(L/R))/(2LTo)

5.58E-06 m/sec

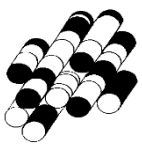
Time lag is defined as the time required for the complete equalization of the head difference if the original rate of inflow were maintained.

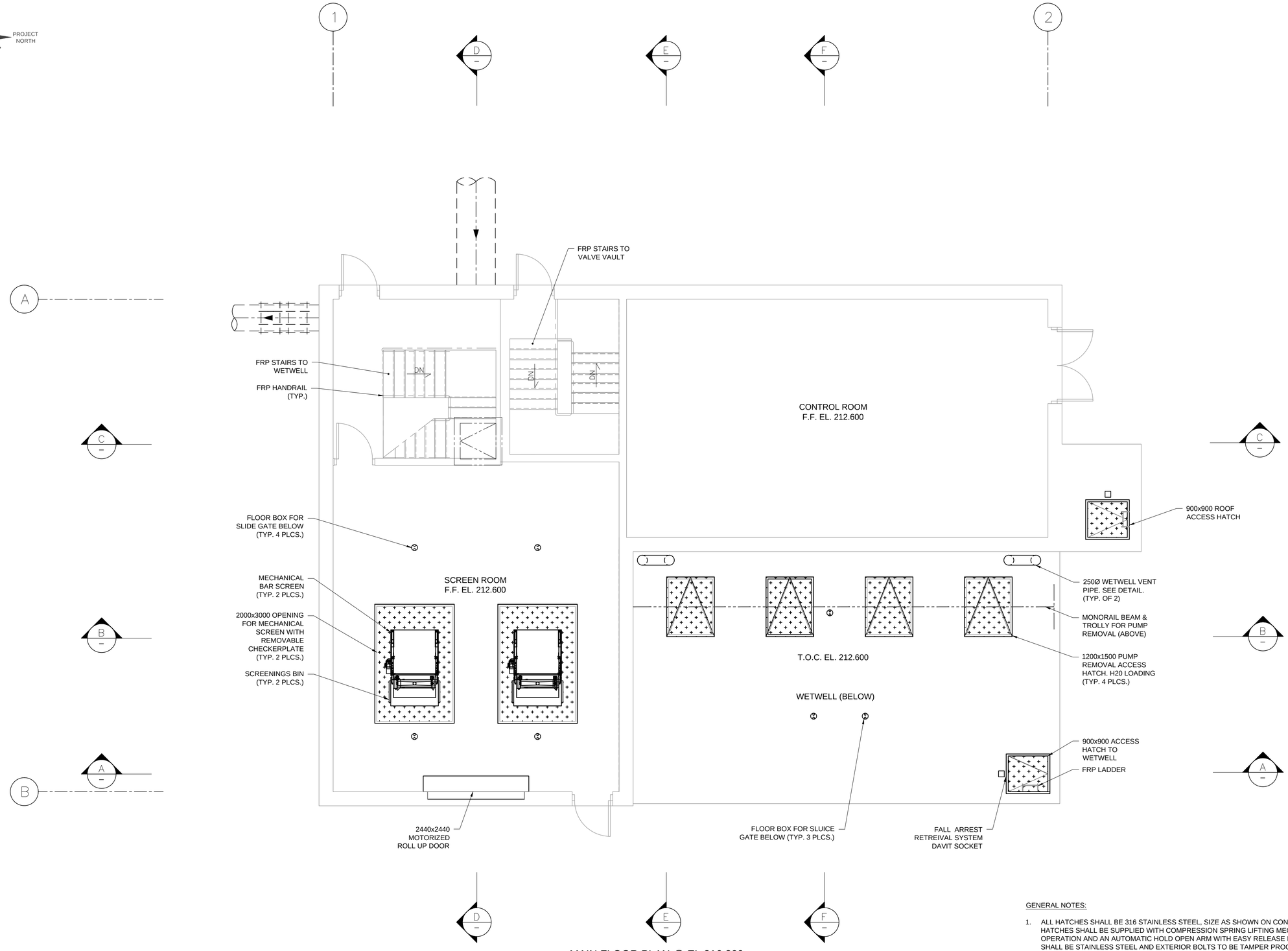
Water Level (masl)	(H-h)/(H-Ho)	Elapsed Time (s)
206.08	0.88	15
206.18	0.73	30
206.30	0.55	45
206.32	0.52	60
206.40	0.40	75
206.45	0.33	90
206.47	0.30	105
206.50	0.25	120
206.53	0.21	150
206.56	0.16	180
206.58	0.13	210
206.60	0.10	240
206.61	0.09	270
206.62	0.07	300
206.62	0.07	360
206.63	0.06	420
206.63	0.06	480
206.64	0.04	540
206.64	0.04	600
206.64	0.04	720
206.64	0.04	840
206.64	0.04	960
206.64	0.04	1080
206.64	0.04	1200
206.64	0.04	1500
206.64	0.04	1800

Engineering Site Plans

APPENDIX C

Terraprobe Inc.





MAIN FLOOR PLAN @ EL 216.200

GENERAL NOTES:

1. ALL HATCHES SHALL BE 316 STAINLESS STEEL, SIZE AS SHOWN ON CONTRACT DRAWINGS. ALL HATCHES SHALL BE SUPPLIED WITH COMPRESSION SPRING LIFTING MECHANISM FOR EASY OPERATION AND AN AUTOMATIC HOLD OPEN ARM WITH EASY RELEASE HANDLE. ALL HARDWARE SHALL BE STAINLESS STEEL AND EXTERIOR BOLTS TO BE TAMPER PROOF. HATCHES SHALL BE AS MANUFACTURED BY BILCO OR AN APPROVED EQUAL.
2. ALL INTERIOR PIPING AND FITTINGS SHALL BE 316 STAINLESS STEEL UNLESS OTHERWISE NOTED.
3. ALL PROCESS PIPING TO BE RATED FOR 150 PSI COLD WATER WORKING PRESSURE.

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

DRAFTING: AR
DESIGN: SM
CHECKED BY: GD
APPROVED BY: GD

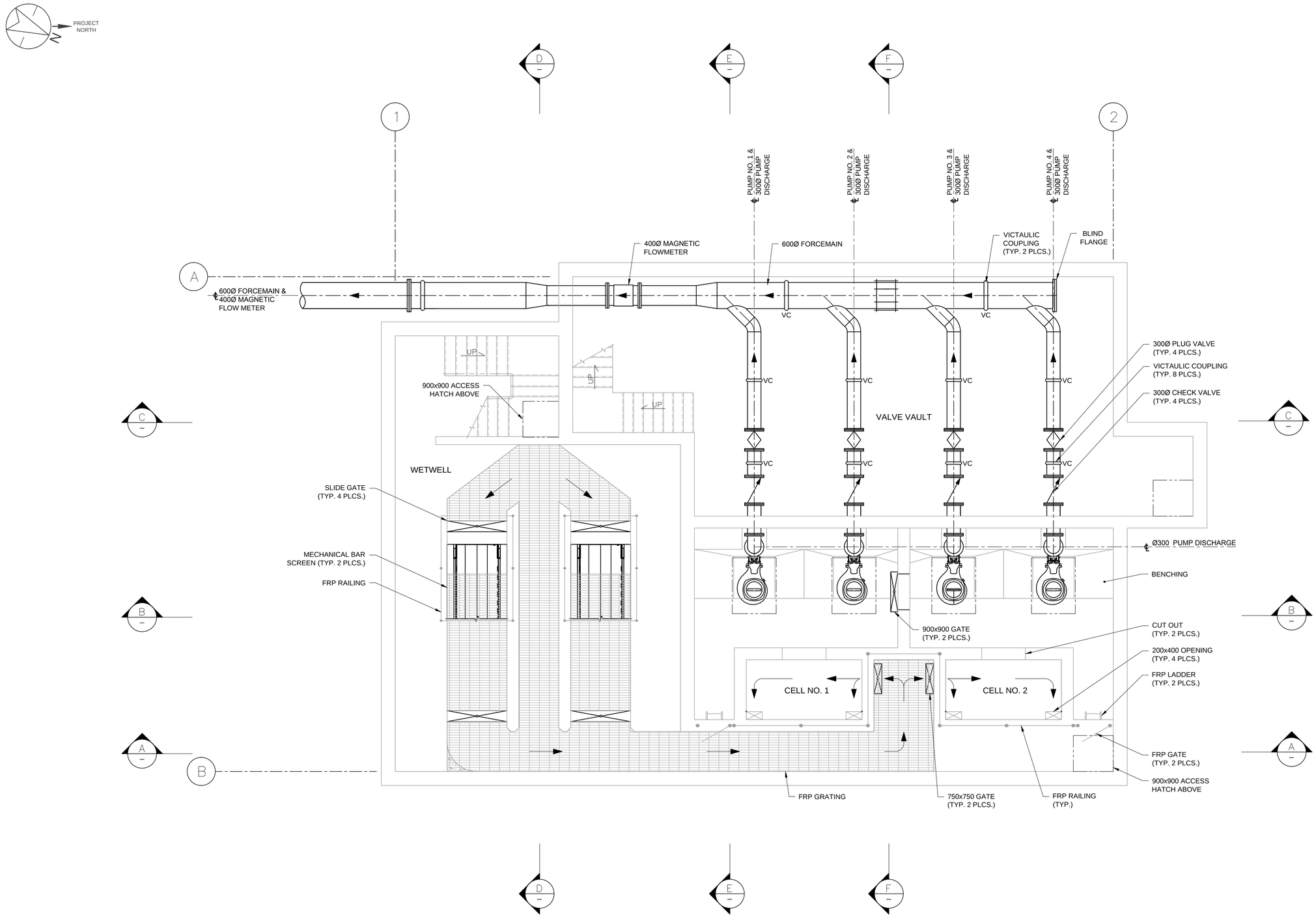
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
MAIN FLOOR PLAN

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P201
REV.

8/21/2017 353644-Process Headworks.dwg



INTERMEDIATE PLAN @ EL 210.000

NOTE:

1. ——► REPRESENTS DIRECTION OF FLOW

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

DRAFTING: AR
DESIGN: SM
CHECKED BY: GD
APPROVED BY: GD

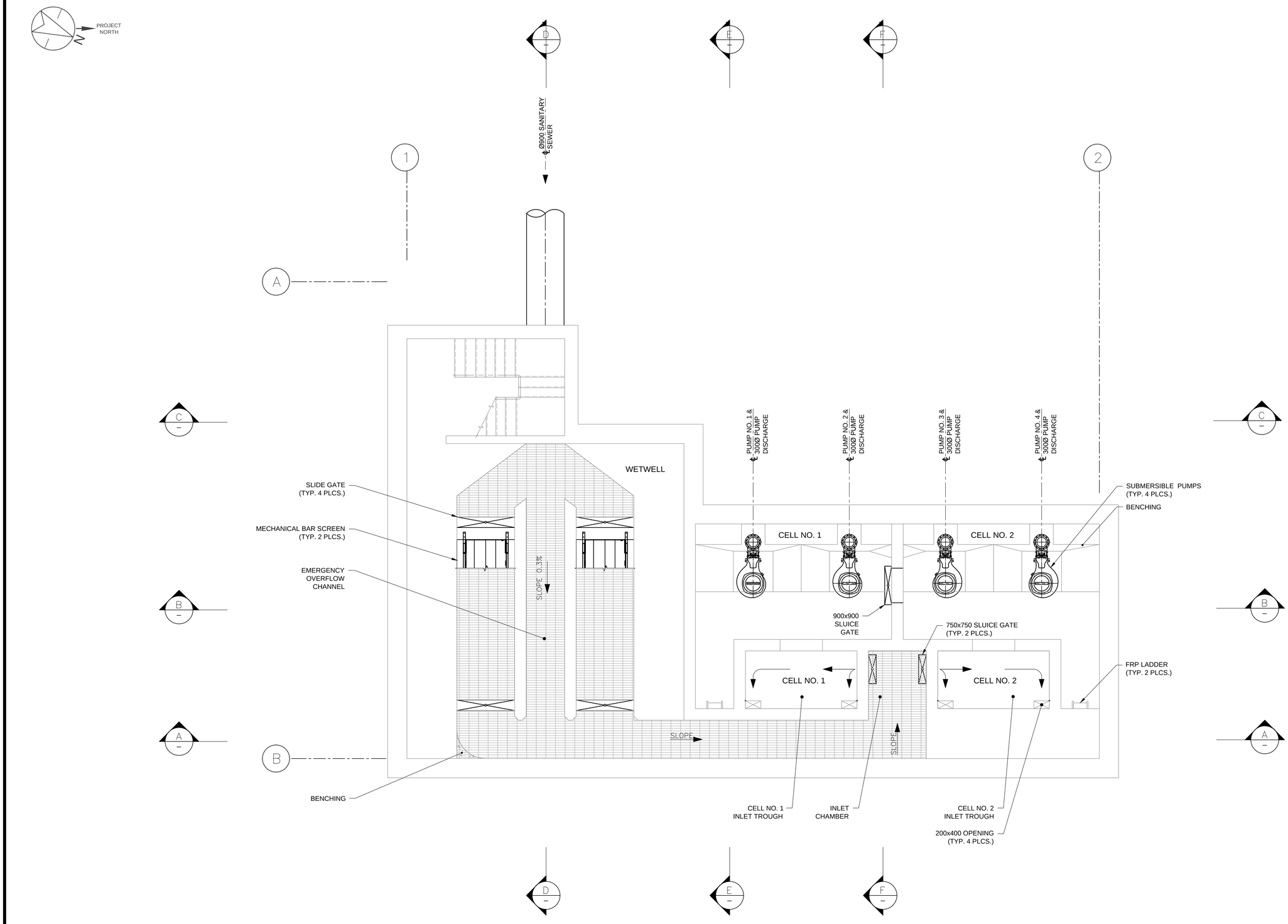
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
INTERMEDIATE PLAN

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P202
REV.

8/21/2017 353644-Process Headworks.dwg



LOWER PLAN @ EL 204.000

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

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DESIGN: SM
CHECKED BY: GD
APPROVED BY: GD

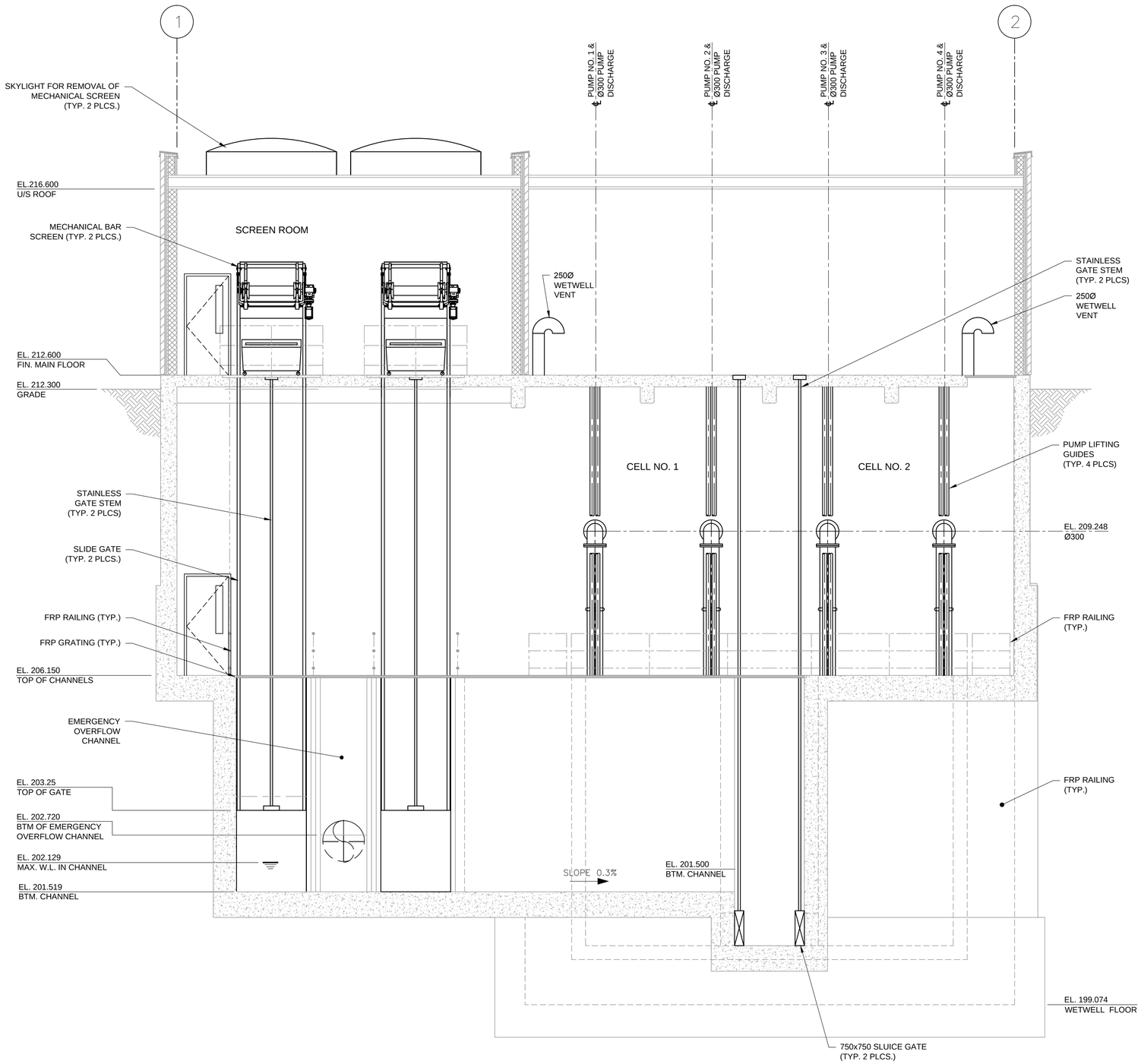
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
LOWER PLAN

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P203
REV.

353644-Process Headworks.dwg
8/21/2017



SECTION A – 1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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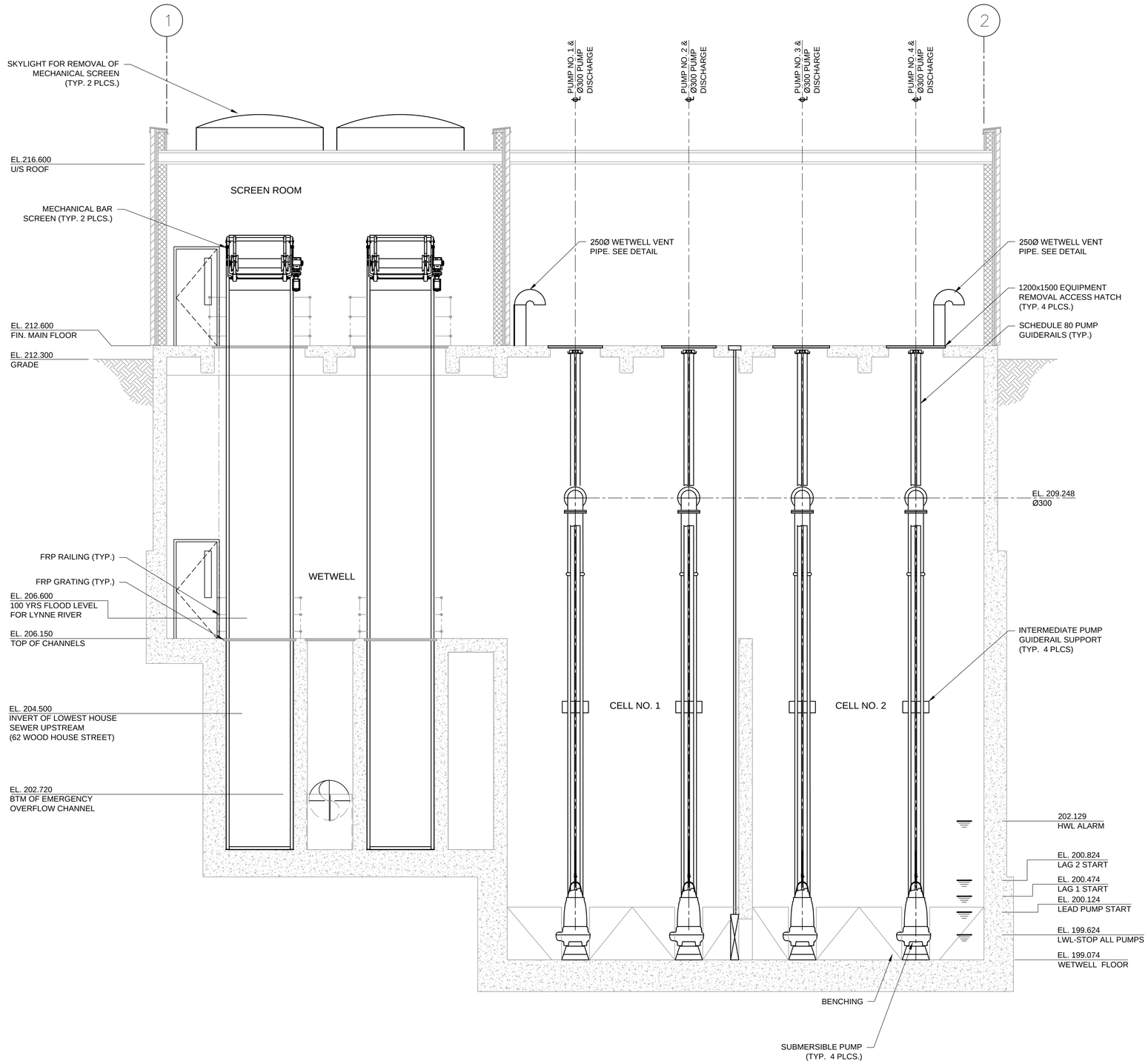
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
SECTION A-A

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P204
REV.

8/21/2017 353644-Process Headworks.dwg



SECTION B
1:50

no.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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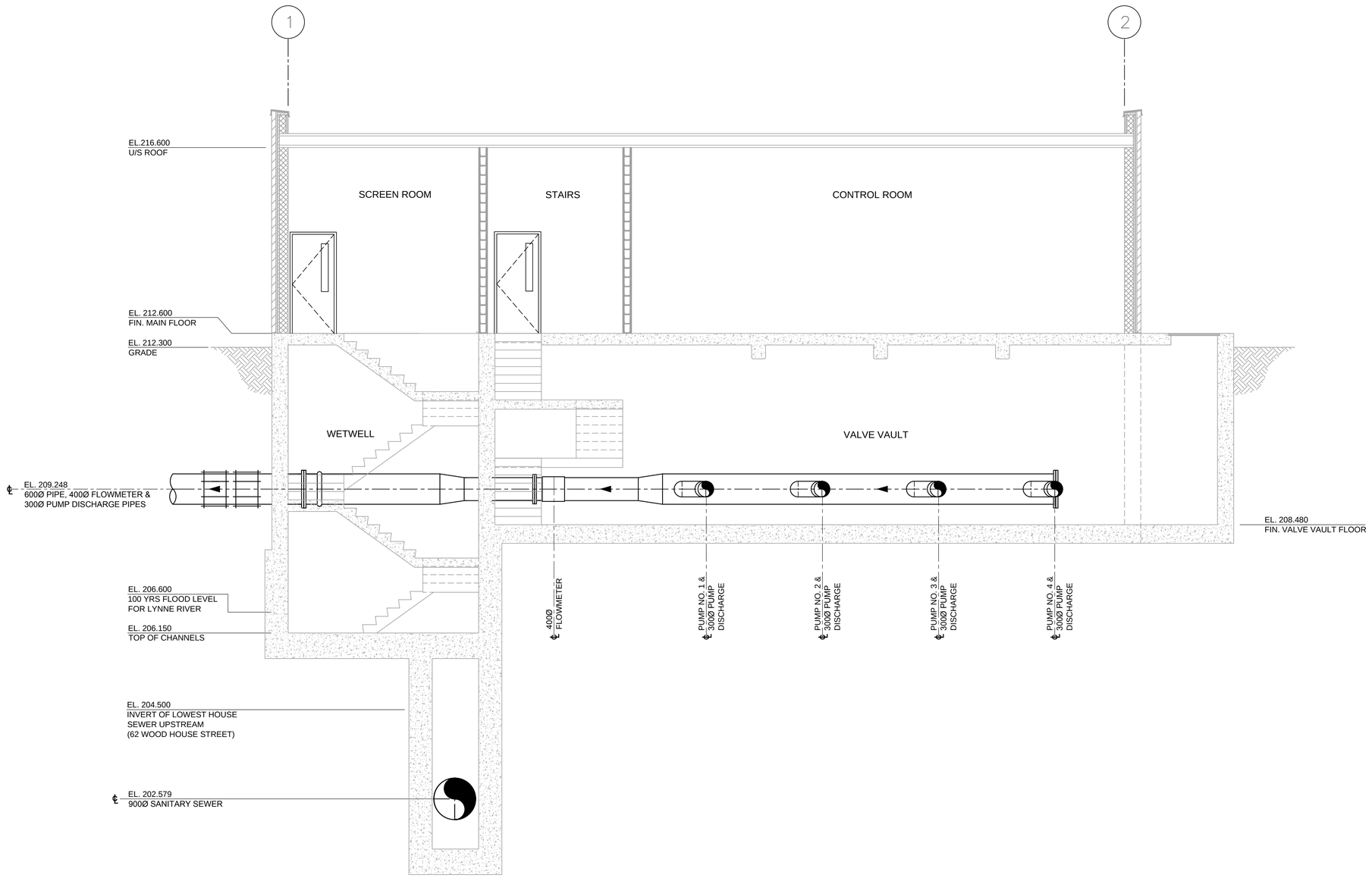
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
SECTION B-B

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P205
REV.

8/21/2017 353644-Process Headworks.dwg



SECTION C
1:50

NO.	REVISION	DATE	INIT.

NOTES

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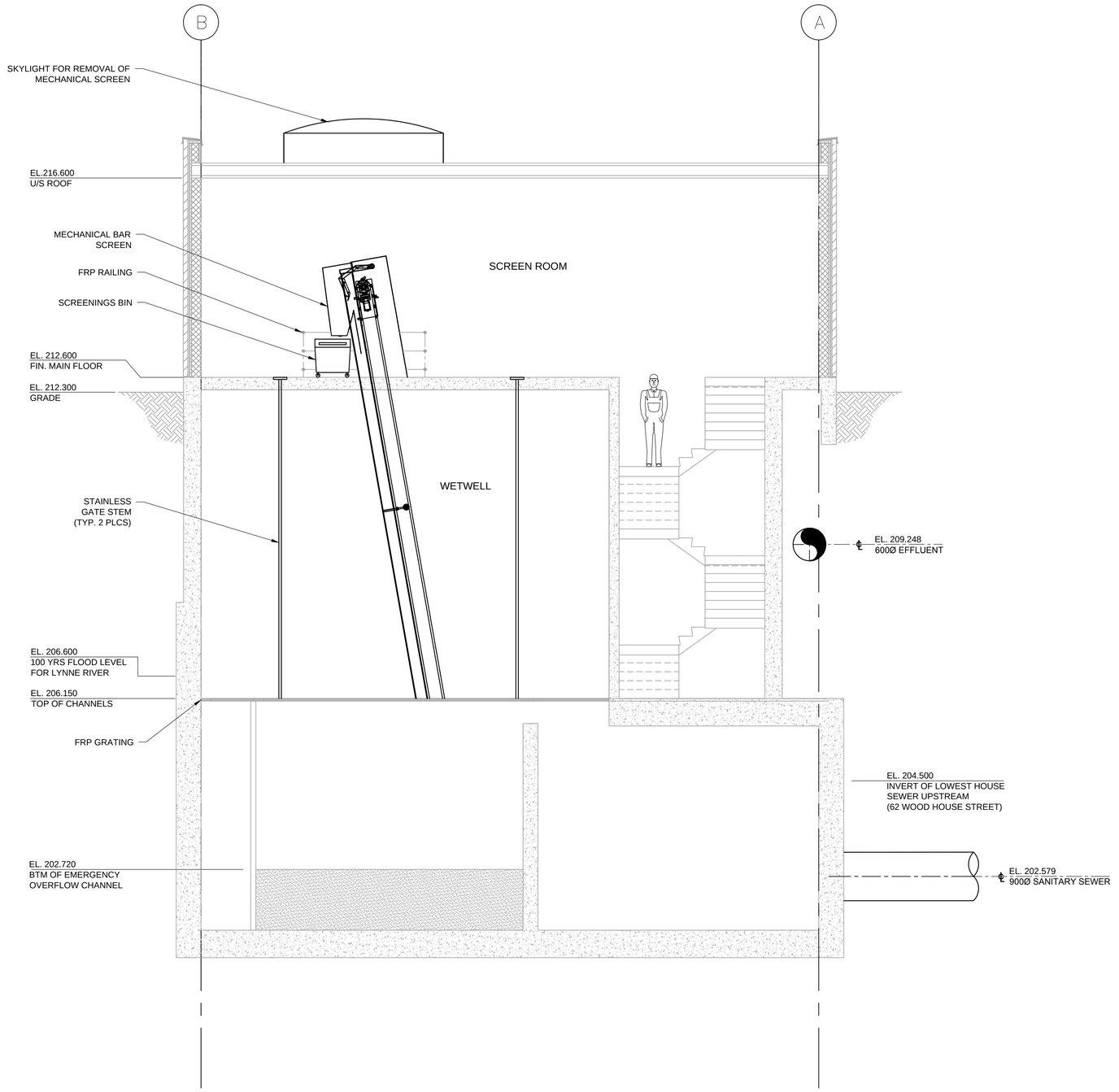
Norfolk COUNTY

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
SECTION C-C

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P206
REV.

8/21/2017 353644-Process Headworks.dwg



SECTION D
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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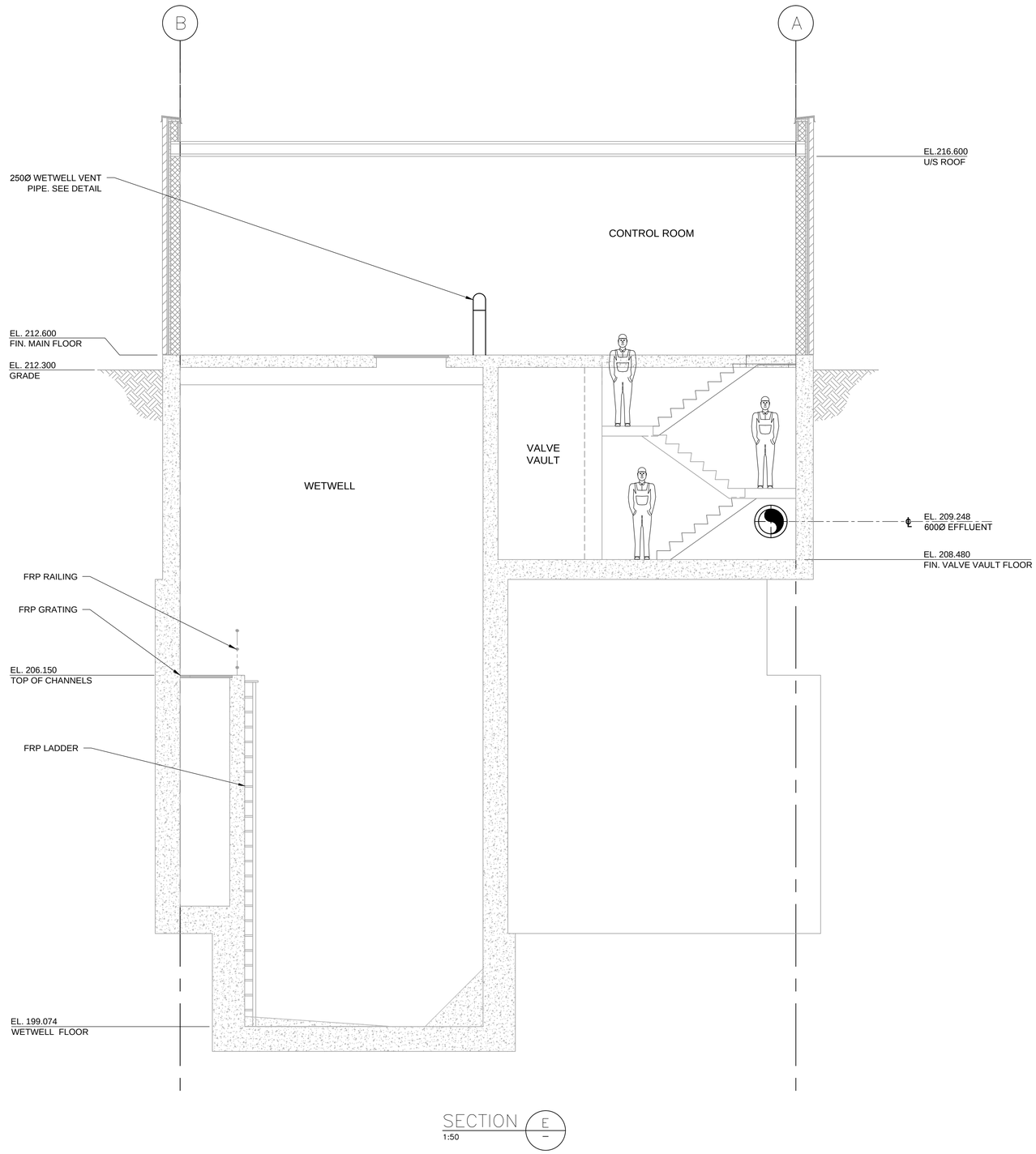
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
SECTION D-D

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P207
REV.

8/21/2017 353644-Process Headworks.dwg



SECTION E
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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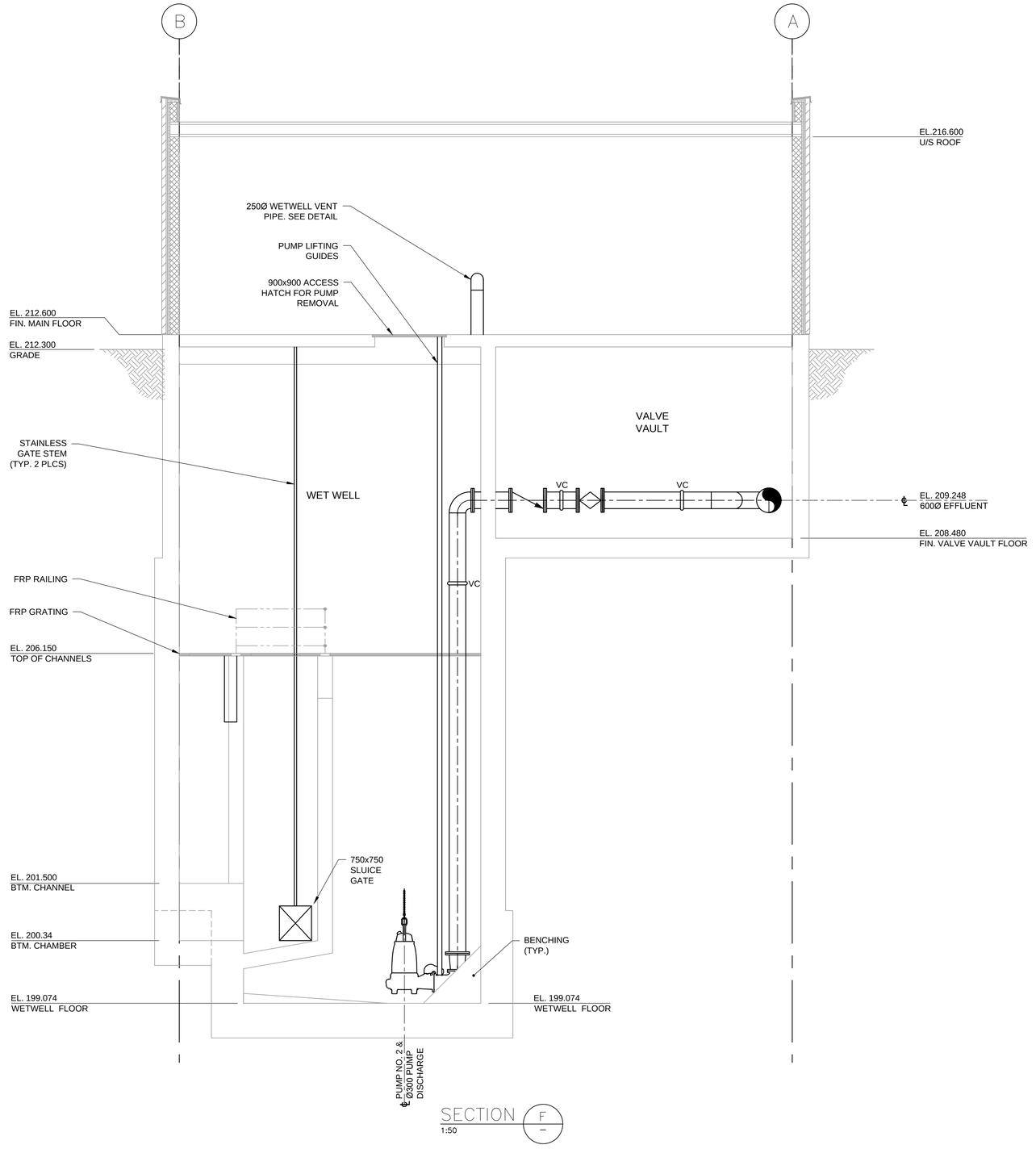
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
SECTION E-E

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P208
REV.

8/21/2017 353644-Process Headworks.dwg



NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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APPROVED BY: GD

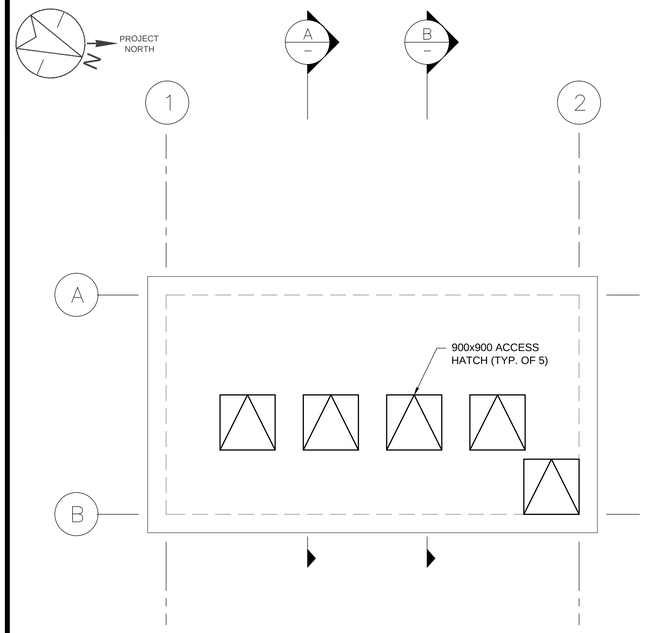
Norfolk County

HATCH

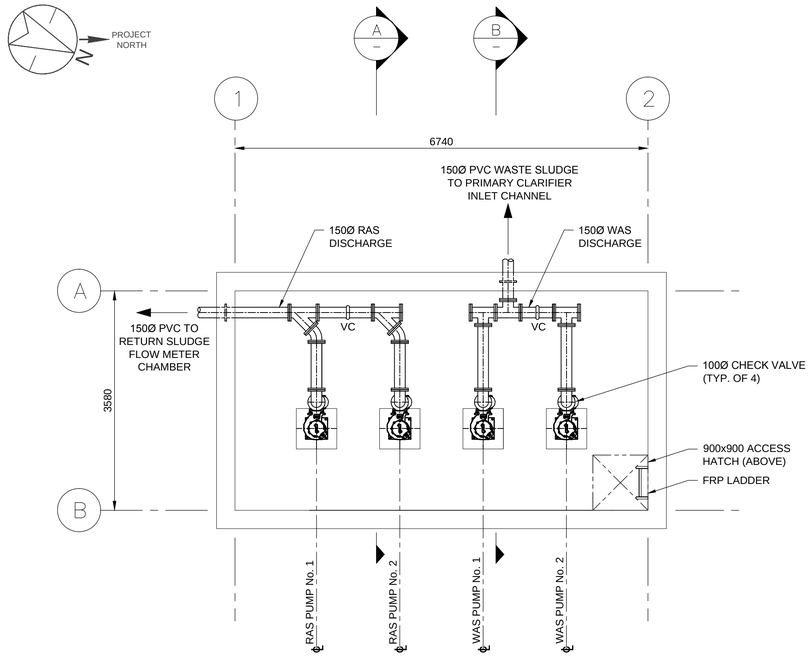
SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
HEADWORKS FACILITY
SECTION F-F

CONSULTANT FILE No.353644
DATE 2017/03/21
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P209
REV.

8/21/2017 353644-Process Headworks.dwg

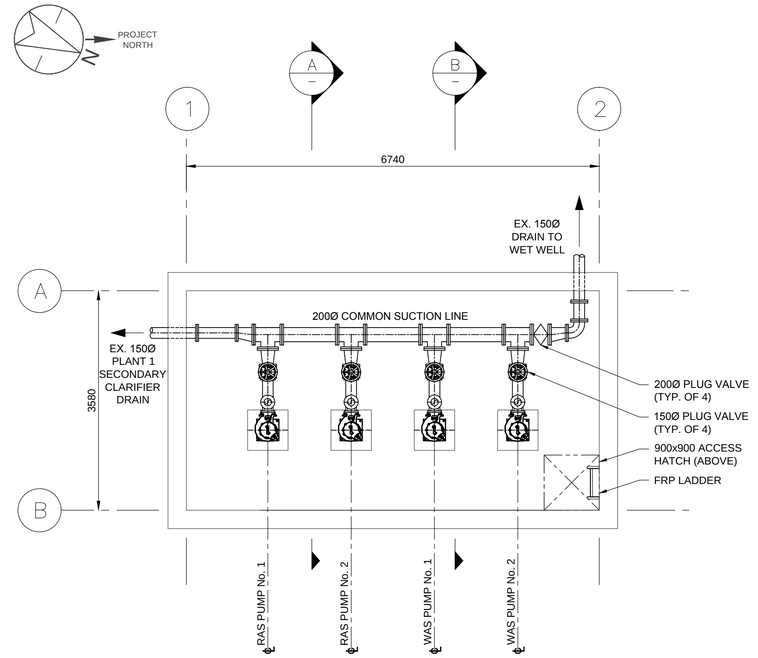


ROOF PLAN
1:50



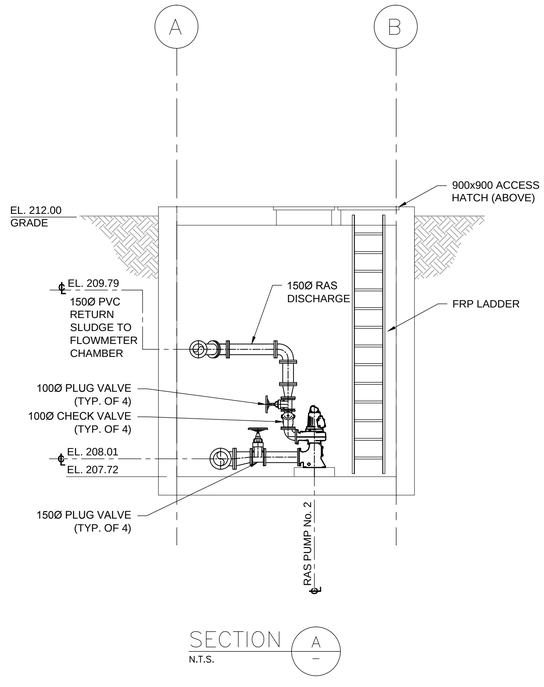
PLAN@EL.210.00
1:50

*NOTE: LOWER PIPING NOT SHOWN FOR CLARITY

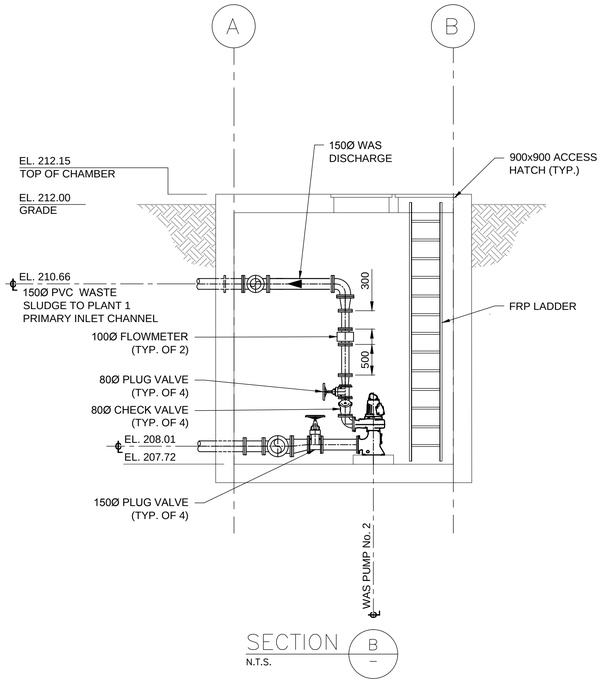


PLAN@EL.209.00
1:50

*NOTE: UPPER PIPING NOT SHOWN FOR CLARITY



SECTION A
N.T.S.



SECTION B
N.T.S.

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

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APPROVED BY: GD

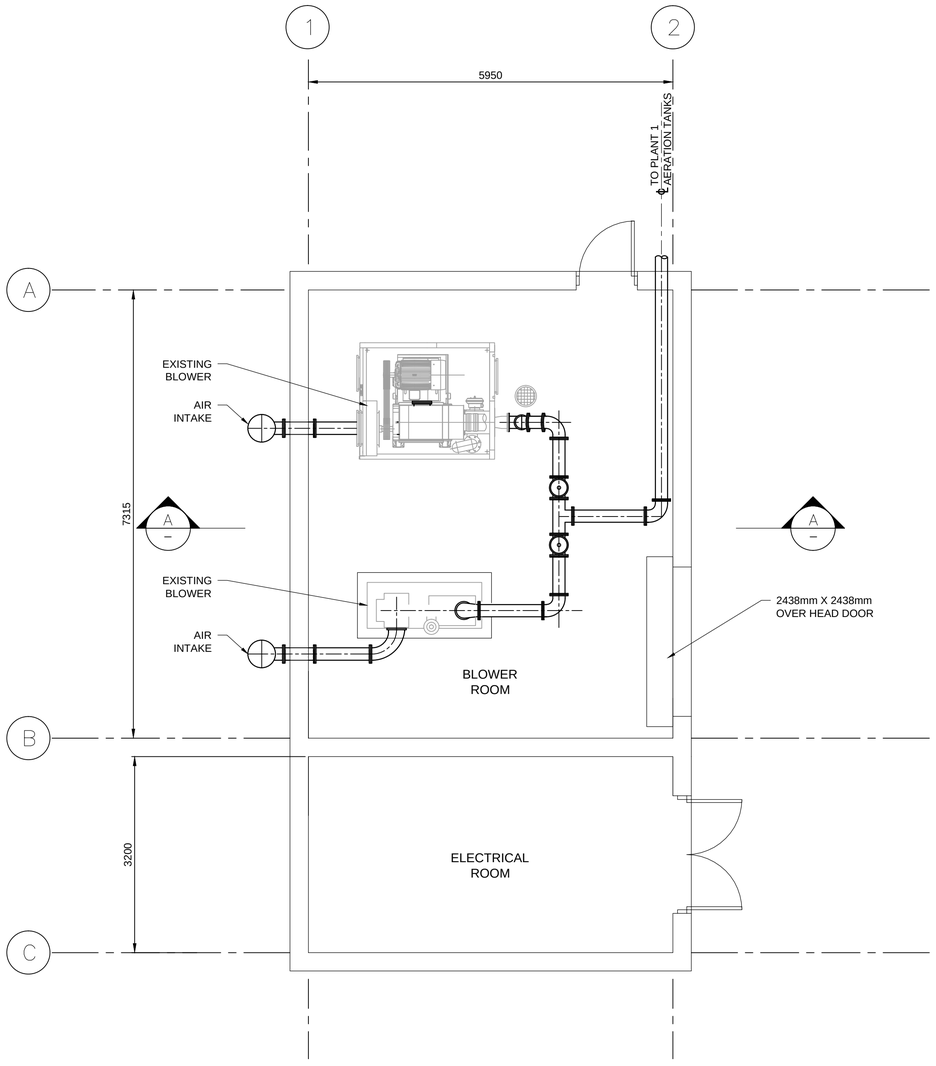
Norfolk County

HATCH

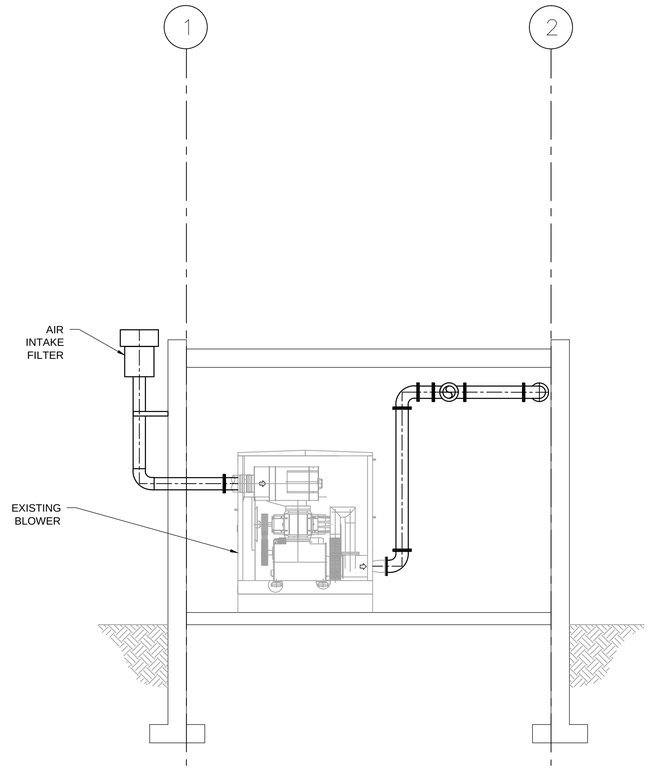
SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
RAS/WAS
PLANS AND SECTIONS

CONSULTANT FILE No.353644
DATE 2017/06/07
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P301
REV.

PROJECT NORTH



PLAN
1:50



SECTION A
1:50

NOTES:

1. EXISTING BLOWERS TO BE RELOCATED FROM THE EXISTING PLANT 1 BLOWER BUILDING TO THE NEW PLANT 1 BLOWER BUILDING.

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

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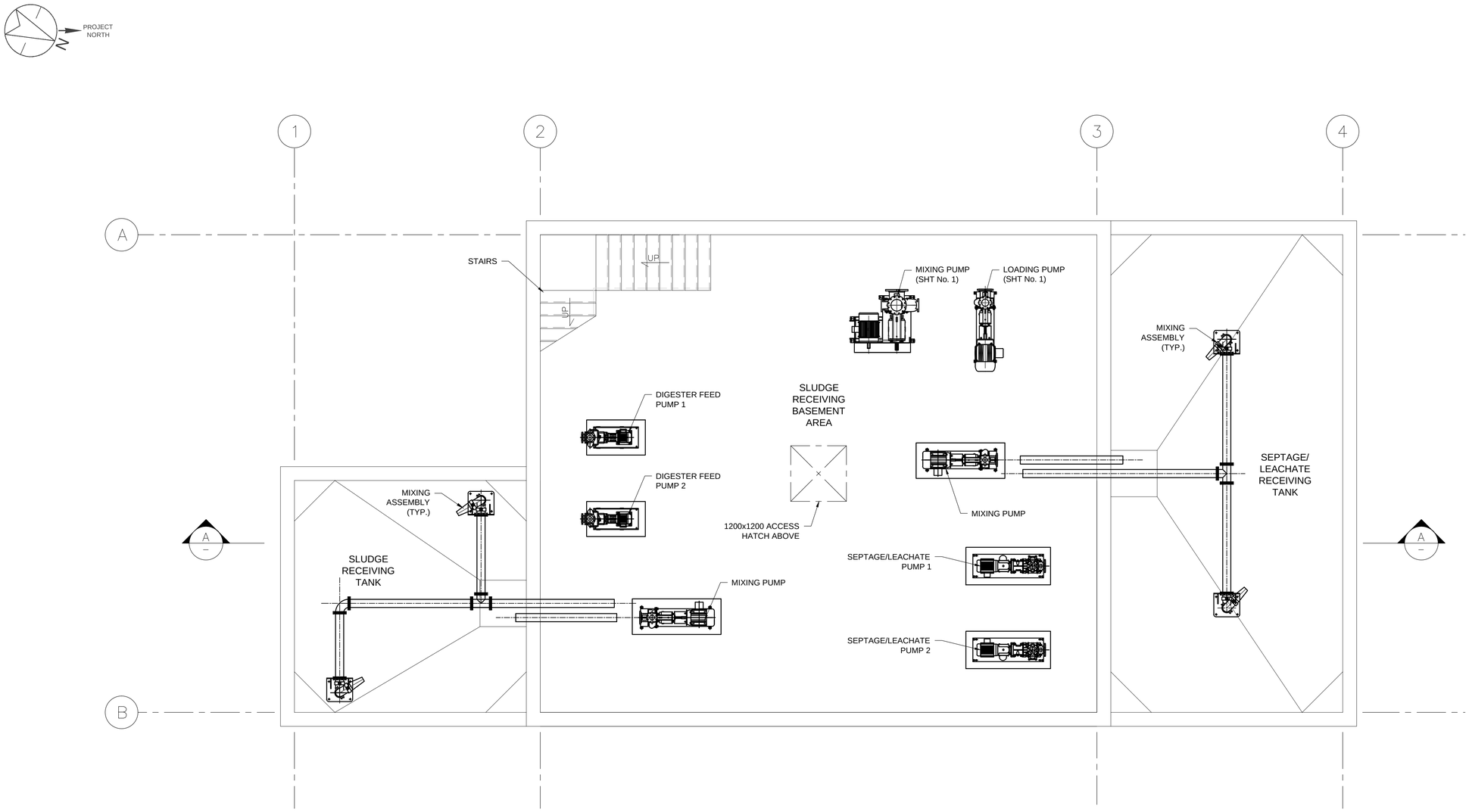
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
PLANT 1 BLOWER BUILDING
PLAN AND SECTION

CONSULTANT FILE No.353644
DATE 2017/07/31
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P401
REV.

8/21/2017 353644-Process Blower Building.dwg



PLAN@EL. 212.00

1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

DRAFTING: AR

DESIGN: AK

CHECKED BY: SM

APPROVED BY: GD

Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
SLUDGE RECEIVING FACILITY
BASEMENT PLAN

CONSULTANT FILE No.353644

DATE 2017/06/07

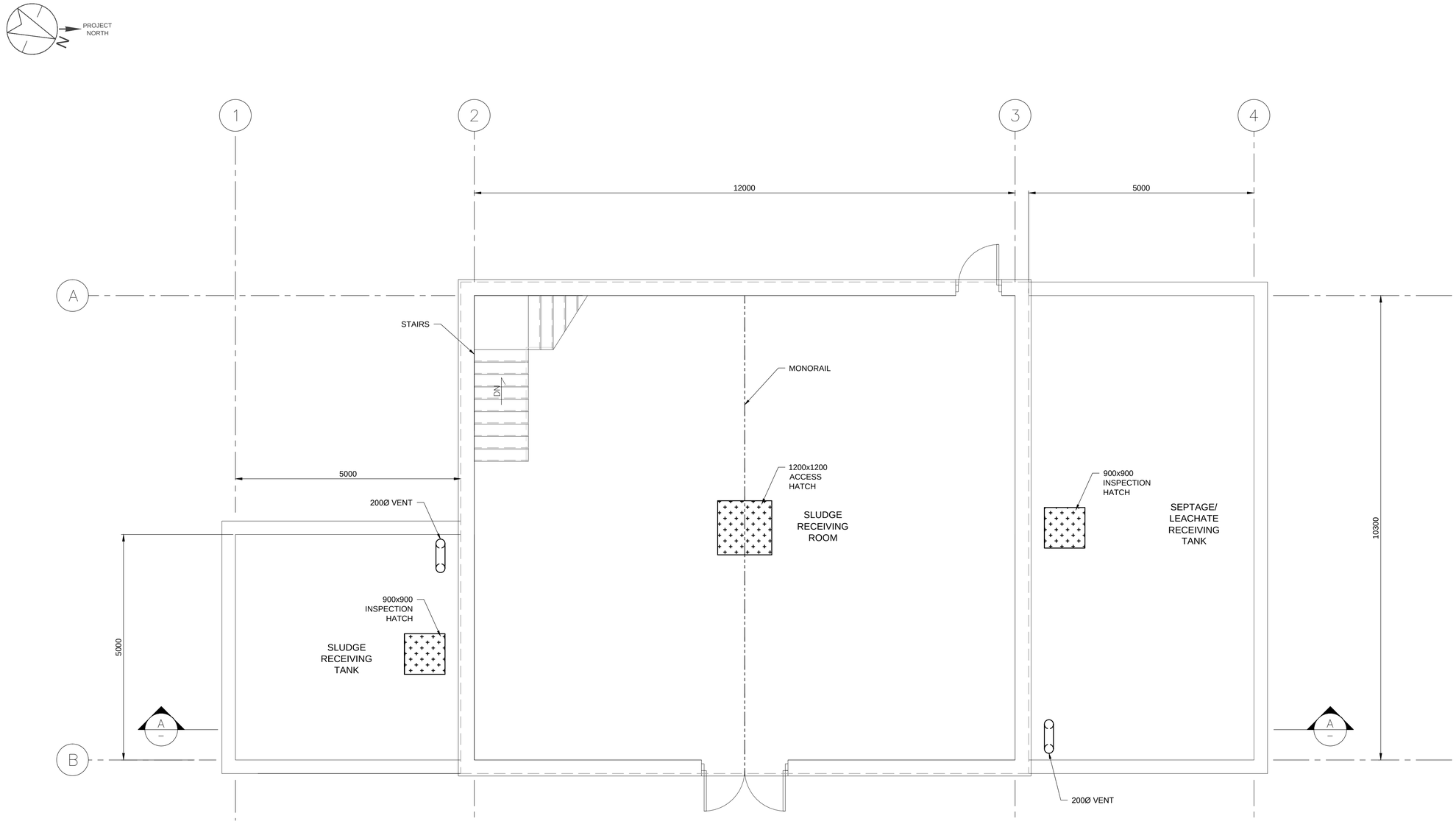
SCALE AS NOTED

REF. No. PW-E-16-78

DWG No. P501

REV.

8/22/2017 353644-Process Sludge Receiving Facility.dwg



PLAN@EL. 217.00

1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 (0, 1, 2m)

DRAFTING: AR

DESIGN: AK

CHECKED BY: SM

APPROVED BY: GD

Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
SLUDGE RECEIVING FACILITY
MAIN FLOOR PLAN

CONSULTANT FILE No.353644

DATE 2017/06/07

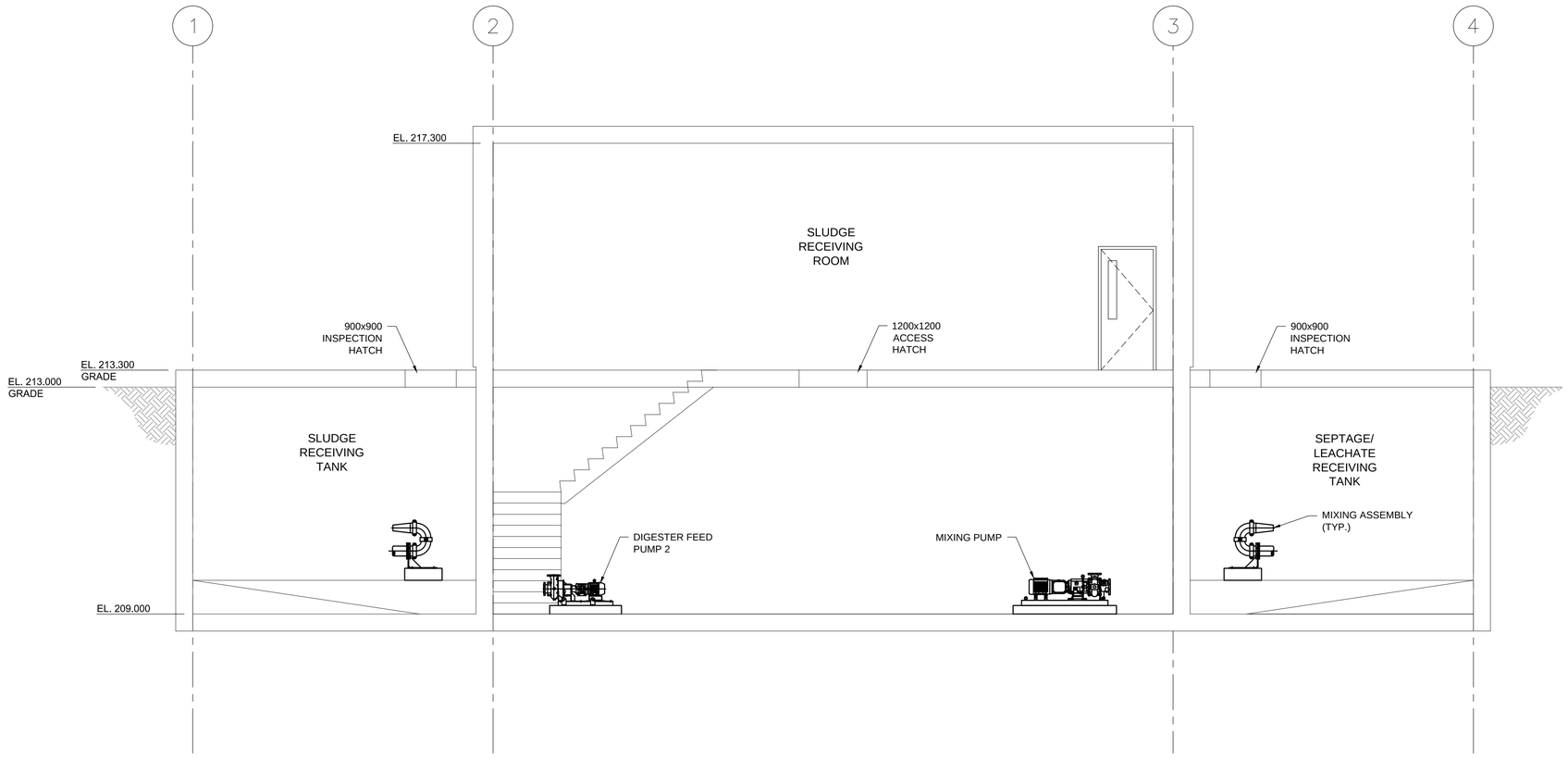
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REF. No. PW-E-16-78

DWG No. P502

REV.

8/22/2017 353644-Process Sludge Receiving Facility.dwg



SECTION A
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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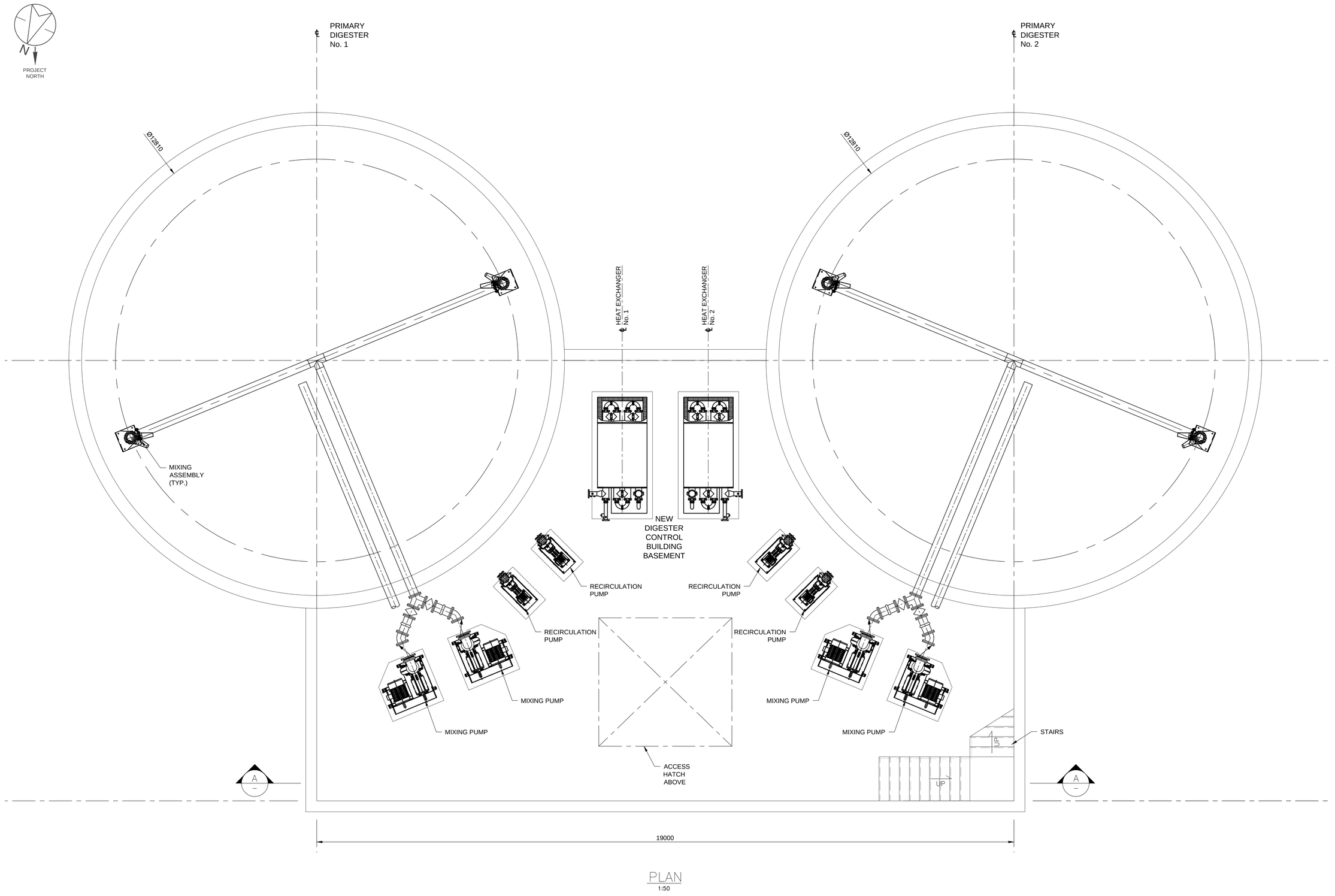
Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
SLUDGE RECEIVING FACILITY
SECTION A-A

CONSULTANT FILE No. 353644
DATE 2017/06/07
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P503
REV.

8/22/2017 353644-Process Sludge Receiving Facility.dwg



PLAN
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 — 0 1 2m

DRAFTING: AR
DESIGN: AK
CHECKED BY: SM
APPROVED BY: GD

Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
DIGESTER FACILITY
BASEMENT PLAN

CONSULTANT FILE No.353644
DATE 2017/07/26
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P601
REV.

PROJECT NORTH

PRIMARY DIGESTER No. 1

PRIMARY DIGESTER No. 2

Ø12810

Ø12810

GAS ROOM

DIGESTER CONTROL BUILDING

MIXING ASSEMBLY (TYP.)

12000

3500x3500 EQUIPMENT REMOVAL HATCH

MCC ROOM

STAIRS

DN

DN

3 TON MONORAIL SYSTEM

A

A

7497

PLAN
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 — 0 1 2m

DRAFTING: AR

DESIGN: AK

CHECKED BY: SM

APPROVED BY: GD

Norfolk County

HATCH

SIMCOE WWTF UPGRADES

NORFOLK COUNTY

PROCESS

DIGESTER FACILITY

MAIN FLOOR PLAN

CONSULTANT FILE No. 353644

DATE 2017/07/26

SCALE AS NOTED

REF. No. PW-E-16-78

DWG No. P602

REV.

PROJECT NORTH

PRIMARY DIGESTER No. 1

PRIMARY DIGESTER No. 2

Ø12810

Ø12810

NEW DIGESTER CONTROL BUILDING

A

A

PLAN
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

SCALE BAR: 1:50 — 0, 1, 2m

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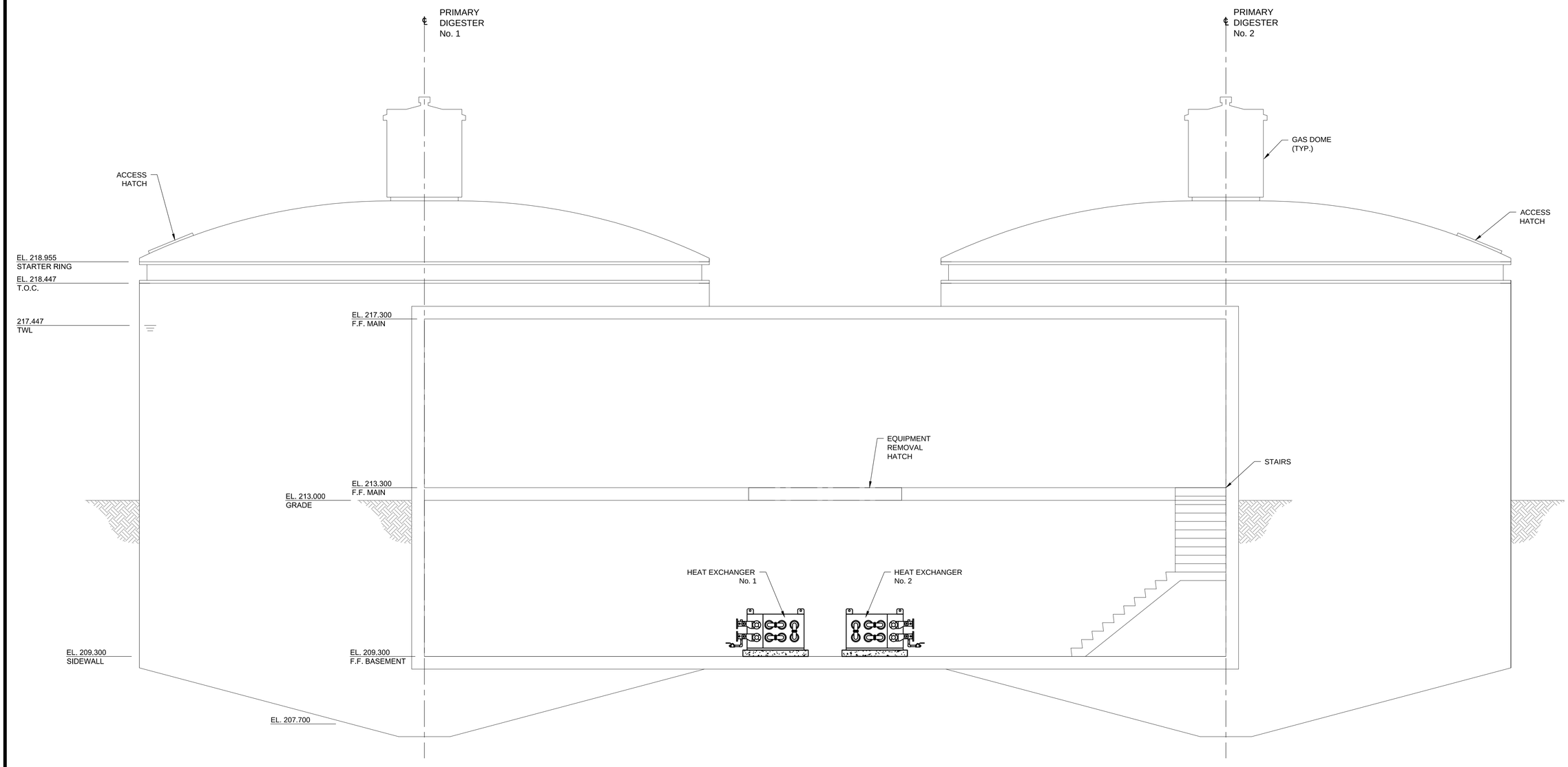
APPROVED BY: GD

Norfolk County

HATCH

SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
DIGESTER FACILITY
ROOF PLAN

CONSULTANT FILE No.353644
DATE 2017/07/26
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P603
REV.



SECTION A
1:50

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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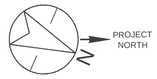
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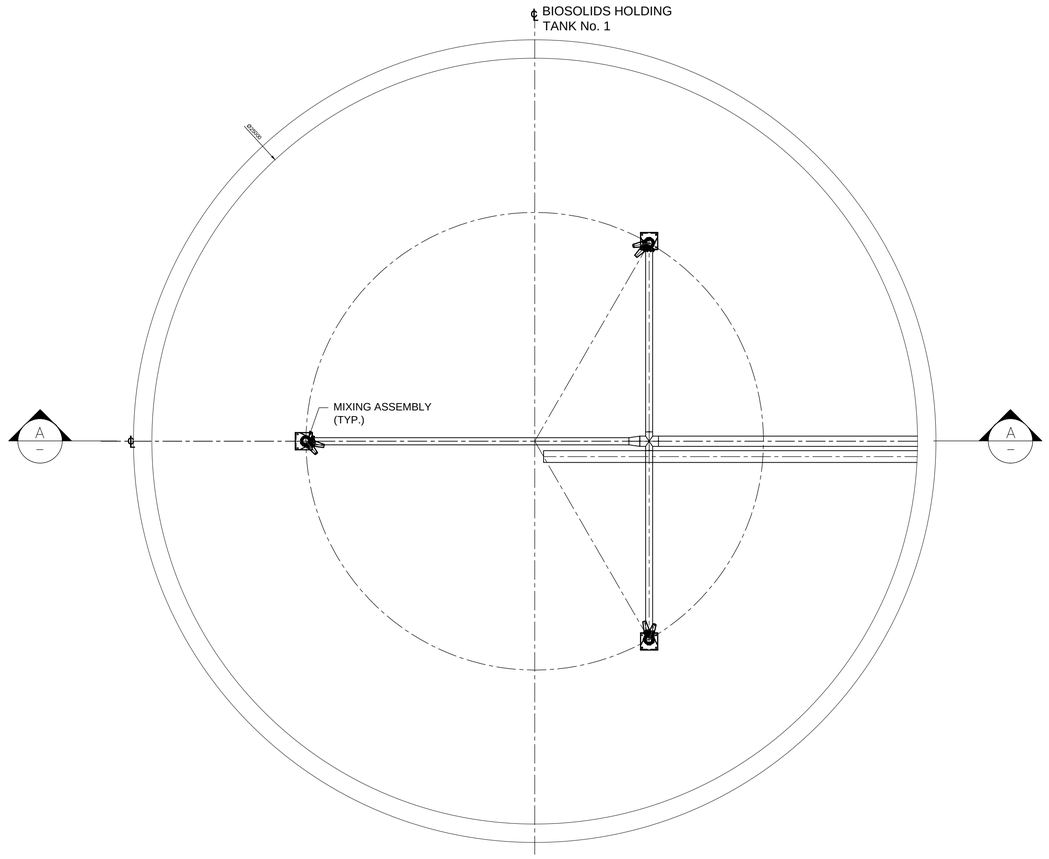
Norfolk County

HATCH

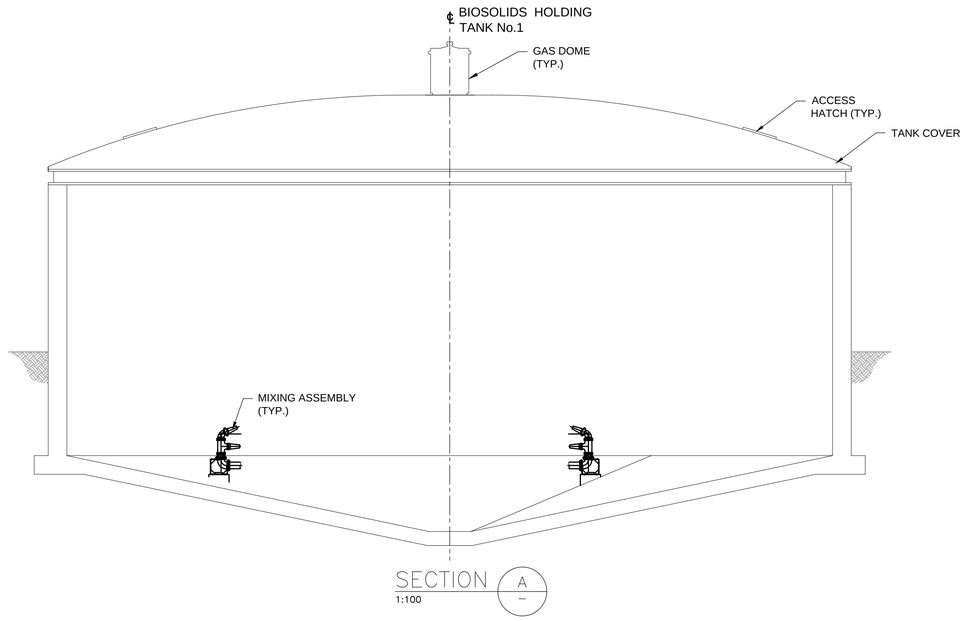
SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
DIGESTER FACILITY
SECTION A-A

CONSULTANT FILE No.353644
DATE 2017/07/26
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P604
REV.





PLAN
1:100



SECTION A
1:100

NO.	REVISION	DATE	INIT.

NOTES

ISSUE: PRELIMINARY

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APPROVED BY: GD

Norfolk County

HATCH

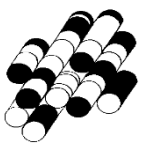
SIMCOE WWTF UPGRADES
NORFOLK COUNTY
PROCESS
BIOSOLIDS HOLDING TANK No. 1
PLAN AND SECTION

CONSULTANT FILE No.353644
DATE 2017/07/26
SCALE AS NOTED
REF. No. PW-E-16-78
DWG No. P701
REV.

Dewatering Analysis

APPENDIX D

Terraprobe Inc.



Simcoe WWTF Expansion - Headworks Building Wet Well

Job No. 7-17-0120-1

Site Statistics

Excavation Area (m2)	Excavation Depth (mbgl)	Excavation Perimeter (m)	Water Level (mbgl)	Excavation Depth (m below water table)	Vertical Area Below Water Table (m2)
76.5	14.2	37.2	2	12.2	454
123.5	12.5	56.4	2	10.5	592

Darcy - flow into excavation

$$Q = kiA$$

	Q (m^3/s)	A (m^2)	i	k (m/s)	Q (m^3/hr)	Q (L/hr)	Q (gal/min)	Q (L/day)	Factor of Safety = 1.5 Q (L/day)
Vertical	2.54E-04	454	0.1	5.60E-06	0.9149	915	4.03	10979	**16,469**
	3.32E-04	592	0.1	5.60E-06	1.1939	1194	5.26	14327	**21,490**

Horizontal	Q (m^3/s)	A (m^2)	i	k (m/s)	Q (m^3/hr)	Q (L/hr)	Q (gal/min)	Q (L/day)	**Q (L/day)**

No Horizontal Component of Dewatering Expected Based on Use of Impervious Sheet Piling to Stabilize Open Excavations

Radius of Influence - Sichardt's equation

$$R = 3000\sqrt{k}$$

R (m)	drawdown (m)	K (m/s)
86.6	12.2	5.60E-06
74.5	10.5	5.60E-06

Simcoe WWTF Expansion - Bio-Solids Holding Tank

Job No. 7-17-0120-1

Site Statistics

Excavation Area (m2)	Excavation Depth (mbgl)	Excavation Perimeter (m)	Water Level (mbgl)	Excavation Depth (m below water table)	Vertical Area Below Water Table (m2)
527.7	7.0	81.4	2	5	407

Darcy - flow into excavation

$$Q = kiA$$

	Q (m^3/s)	A (m^2)	i	k (m/s)	Q (m^3/hr)	Q (L/hr)	Q (gal/min)	Q (L/day)	Factor of Safety = 1.5 Q (L/day)
Vertical	6.92E-03	407	0.1	1.70E-04	24.9084	24908	109.68	298901	**448,351**

Horizontal	Q (m^3/s)	A (m^2)	i	k (m/s)	Q (m^3/hr)	Q (L/hr)	Q (gal/min)	Q (L/day)	Q (L/day)

No Horizontal Component of Dewatering Expected Based on Use of Impervious Sheet Piling to Stabilize Open Excavations

Radius of Influence - Sichardt's equation

$$R = 3000\sqrt{k}$$

R (m)	drawdown (m)	K (m/s)
195.6	5	1.70E-04

APPENDIX D: Dewatering Calculations
Proposed Simcoe WWTF Expansion
16 Oakwood Avenue
Simcoe, ON

$R_0 = 3000*dH*K^{0.5}$ (Sichart and Dryieleis, dH and R_0 in meters, K in m/sec)

$r_e = (ab/3.14)^{0.5}$ applies when a/b <1.5 and $R_0 >> r_e$

$$Q = \frac{3.14*K*(H^2-h_w^2)}{\ln(R_0/r_e)} + 2 * \frac{x*K*(H^2-h_w^2)}{2L_0}$$

Static Water Level	206.6	m
Dewatering Target	201.6	m
Aquifer Bottom*	194	m

*Top of clayey silt layer as observed in BH-3B

900 mm Diameter Sewer Line

K =	1.70E-04	m/s	Hydraulic Conductivity
or	14.69	m/day	
H =	12.6	m	From static wate table to the assumed aquifer bottom
h_w =	7.6	m	From the dewatering target to the assumed aquifer bottom
dH =	5.0	m	Dewatering Thickness
$R_{0\,=}$	196	m	Radius of Influence
a =	4.0	m	Depth of dewatering trench
b =	3	m	Width of dewatering trench
$r_{e\,=}$	1.922	m	Assumed for a small rectangular area at the end of the dewatering trench
x =	10	m	Length of dewatering trench
$L_{0\,=}$	196	m	Distance between maximum drawdown and zero drawdown

Q =	**1,084**	**m3/day**
or	752	L/min

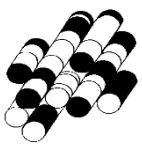
Factor of Satety 50% **1,625 m3/day**
1,129 L/min

Reference: J. Patrick Powers… [et al.] (2007), "Construction Dewatering and Groundwater Control: New Methods and Applications, 3rd ed." Wiley, Hoboken, NJ.

Laboratory Certificates of Analysis

APPENDIX E

Terraprobe Inc.



AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPROBE INC
903 Barton Street
Stoney Creek, ON L8E5P5
(905) 643-7560

ATTENTION TO: Paul Raepple

PROJECT: 7-17-0120-46

AGAT WORK ORDER: 17H272380

MICROBIOLOGY ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Oct 27, 2017

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

Microbiological Analysis (water)

DATE RECEIVED: 2017-10-17

DATE REPORTED: 2017-10-27

				SAMPLE DESCRIPTION:	BH 7a	BH 7b
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2017-10-16	2017-10-16
Parameter	Unit	G / S	RDL		8822460	8822468
Total Coliforms	CFU/100mL	2400	100		NDOGT	**13000**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Norfolk Storm
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8822460 RDL >1 indicates dilutions of the sample.
NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

8822468 RDL >1 indicates dilutions of the sample.

Certified By: Divine Basily

Results relate only to the items tested and to all the items tested

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Certificate of Analysis

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

Norfolk Sanitary/Storm Sewer Use By-Law - Organics

DATE RECEIVED: 2017-10-17

DATE REPORTED: 2017-10-27

					SAMPLE DESCRIPTION:	BH 7a	BH 7b
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2017-10-16	2017-10-16
Parameter	Unit	G / S: A	G / S: B	RDL		8822460	8822468
Oil and Grease (animal/vegetable) in water	mg/L	100	15	0.5		0.6[<B]	0.8[<B]
Oil and Grease (mineral) in water	mg/L	15	15	0.5		<0.5	<0.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Norfolk Sanitary, B Refers to Norfolk Storm
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: N Popnikolof

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CANADA L4Z 1Y2
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Certificate of Analysis

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

Norfolk Sanitary/Storm Sewer Use By-Law - Inorganics

DATE RECEIVED: 2017-10-17

DATE REPORTED: 2017-10-27

					SAMPLE DESCRIPTION:	BH 7a	BH 7b
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2017-10-16	2017-10-16
Parameter	Unit	G / S: A	G / S: B	RDL		8822460	8822468
pH	pH Units	6.5-8.5	6.5-9.5	NA		7.89	7.86
BOD (5)	mg/L			5		<5	<5
Total Suspended Solids	mg/L	350	15	10		4480[>A]	680[>A]
Phenols	mg/L	0.10	0.020	0.001		<0.001	<0.001
Total Cyanide	mg/L	2	0.1	0.002		<0.002	<0.002
Sulphide	mg/L	2	1	0.05		<0.05	<0.05
Chloride	mg/L	1500	1500	0.20		6.21[<A]	6.21[<A]
Sulphate	mg/L	1500	1500	0.20		65.7[<A]	65.8[<A]
Cadmium	mg/L	3	1	0.001		<0.001	<0.001
Chromium	mg/L	3	1	0.003		0.014[<B]	0.004[<B]
Copper	mg/L	3	1	0.002		0.050[<B]	0.013[<B]
Lead	mg/L			0.002		0.073	0.024
Nickel	mg/L	3	1	0.003		0.004[<B]	<0.003
Zinc	mg/L			0.005		0.116	0.030
Iron	mg/L			0.010		10.6	5.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Norfolk Sanitary, B Refers to Norfolk Storm
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8822460-8822468 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Certified By: Divine Basily

Results relate only to the items tested and to all the items tested

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

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http://www.agatlabs.com

CLIENT NAME: TERRAPROBE INC

ATTENTION TO: Paul Raepple

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8822460	BH 7a	Norfolk Sanitary	Norfolk Sanitary/Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	350	4480
8822460	BH 7a	Norfolk Storm	Norfolk Sanitary/Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	15	4480
8822468	BH 7b	Norfolk Sanitary	Norfolk Sanitary/Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	350	680
8822468	BH 7b	Norfolk Storm	Microbiological Analysis (water)	Total Coliforms	CFU/100mL	2400	13000
8822468	BH 7b	Norfolk Storm	Norfolk Sanitary/Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	15	680

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Oct 27, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Microbiological Analysis (water)															
Total Coliforms	8822940		NDOGT	NDOGT	NA	< 1									

Comments: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth; NA - % RPD Not Applicable

Certified By: Divine Basily

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Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CANADA L4Z 1Y2
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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 27, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Norfolk Sanitary/Storm Sewer Use By-Law - Organics															
Oil and Grease (animal/vegetable) in water	TW	< 0.5	< 0.5	NA	< 0.5	NA	70%	130%	96%	70%	130%	106%	70%	130%	
Oil and Grease (mineral) in water	TW	< 0.5	< 0.5	NA	< 0.5	NA	70%	130%	84%	70%	130%	81%	70%	130%	

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

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Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CANADA L4Z 1Y2
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Quality Assurance

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 27, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Norfolk Sanitary/Storm Sewer Use By-Law - Inorganics															
pH	8824838		7.73	7.67	0.8%	NA	100%	90%	110%						
BOD (5)	8827751		7	8	NA	< 5	102%	75%	125%						
Total Suspended Solids	8822809		<10	<10	NA	< 10	102%	80%	120%						
Phenols	8819259		<0.001	<0.001	NA	< 0.001	96%	90%	110%	102%	90%	110%	104%	80%	120%
Total Cyanide	8816722		<0.002	<0.002	NA	< 0.002	102%	80%	120%	95%	90%	110%	98%	70%	130%
Sulphide	8810749		<0.05	<0.05	NA	< 0.05	102%	80%	120%	102%	85%	115%	101%	70%	130%
Chloride	8819294		157	154	1.9%	< 0.10	91%	90%	110%	110%	90%	110%	106%	80%	120%
Sulphate	8819294		<0.50	<0.50	NA	< 0.10	100%	90%	110%	108%	90%	110%	103%	80%	120%
Cadmium	8820302		<0.001	<0.001	NA	< 0.001	100%	90%	110%	104%	90%	110%	103%	70%	130%
Chromium	8820302		<0.003	<0.003	NA	< 0.003	99%	90%	110%	99%	90%	110%	106%	70%	130%
Copper	8820302		<0.002	<0.002	NA	< 0.002	98%	90%	110%	103%	90%	110%	101%	70%	130%
Lead	8820302		0.007	0.008	NA	< 0.002	100%	90%	110%	105%	90%	110%	103%	70%	130%
Nickel	8820302		<0.003	<0.003	NA	< 0.003	98%	90%	110%	100%	90%	110%	101%	70%	130%
Zinc	8820302		0.012	0.012	NA	< 0.005	98%	90%	110%	103%	90%	110%	106%	70%	130%
Iron	8820302		0.025	0.033	NA	< 0.010	96%	90%	110%	93%	90%	110%	110%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Results relate only to the items tested and to all the items tested

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERRAPROBE INC

AGAT WORK ORDER: 17H272380

PROJECT: 7-17-0120-46

ATTENTION TO: Paul Raepple

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Trace Organics Analysis			
Oil and Grease (animal/vegetable) in water	VOL-91-5011	EPA SW-846 1664A & SM 5520	GRAVIMETRIC
Oil and Grease (mineral) in water	VOL-91-5011	EPA SW-846 1664A & SM 5520	GRAVIMETRIC
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B;SM 2310 B	PC TITRATE
BOD (5)	INOR-93-6006	SM 5210 B	DO METER
Total Suspended Solids	INOR-93-6028	SM 2540 D	BALANCE
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Total Cyanide	INOR-93-6051	MOE 3015 & SM 4500 CN- A,B,C	TECHNICON AUTO ANALYZER
Sulphide	INOR-93-6054	SM 4500 S2- D	SPECTROPHOTOMETER
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020 & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

Results relate only to the items tested and to all the items tested

AGAT Laboratories

M131

Short Holding Time

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only
Work Order #: 17H272380
Cooler Quantity: 4G cooler
Arrival Temperatures: 6.2 | 6.5 | 16.6 / 3.8 | 3.5 | 3.3
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Report Information:
Company: Terraprobe Inc.
Contact: Paul Kaeppli
Address: 903 Barton Street Unit 22, Stoney Creek L8E 5P5
Phone: 905-643-7560 Fax: 905-643-7559
Reports to be sent to:
1. Email: pkaeppli@terraprobe.ca
2. Email:

Regulatory Requirements: ☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☑ Sewer Use
☑ Sanitary ☑ Storm
Region Norfolk County (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:
Project: 17-0120-46
Site Location: 16 Oakwood Ave Simcoe.
Sampled By: SG
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☐ Yes ☑ No

Invoice Information: Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email: lrossi@terraprobe.ca

Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	Metals and Inorganics: ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_2+NO_3	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
~~16 OCT~~	~~16:40~~	16																	
BH 7a	Oct 16	16:40	8	GW	Sample Field Filtered	Y													✓
BH 7b	Oct 16	16:45	8	GW	Unfiltered Sample	N													✓
					20 micron Field Filter used for Sample BH 7a														

Samples Received By (Print Name and Sign): Daniela Jalic
Time: 10:05am
Date: 10/17/17
Samples Received By (Print Name and Sign):
Date: 10/17/17
Time: 2:45
Page 1 of 1
N°: T 055978

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: February 22, 2017

Please use an unpreserved 40ml vial for each analytical parameter listed. Sample is required for moisture content. Application requirements set forth by

Appendix D

Project Contact List

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Norfolk County - Simcoe WWTP Contact List						
Indigenous Communities						
Indigenous Community	**Chief**	**Contact**	**CC**	**Email**	**Address**	**Phone**
Mississaugas of the Credit First Nation (MCFN)	Claire Sault	claires@mncfn.ca	Councillor Fawn Sault, Pillar 3 Lead: Environment and Sustainability Stewardship for Land, Air, Water and Natural Resources	FawnS@mncfn.ca	2789 Mississauga Road Hagersville, Ontario N0A 1H0	(905) 768-1133
Six Nations of the Grand River First Nation (SNGRFN)	Chief Sherri-Lyn Hill	(519) 445 - 2201; chief@snfuture.ca	Nicole Kohoko, Executive Director of Corporate Administration	LRCS@sixnations.ca	1695 Chiefswood Road Ohsweken, ON N0A 1M0	(519) 445- 2201
HCCC/HDI	N/A	Brian Doolittle, HCCC Delegate briandoolittle@hdi.land	Tracey General, Office Manager	info@hdi.land	16 Sunrise Court, Suite 600 P.O. Box 714 Ohsweken, ON N0A 1M0	(519) 445-4222
Metis Nation of Ontario Region #9 (MNO #9)	N/A	consultations@metisnation.org	N/A	N/A	Suite 1100 – 66 Slater Street Ottawa, ON K1P 5H1	(613) 798-1488
Government Ministries						
Organization	**Department**	**Name/Job Title**	**Email**	**Address**	**Notes**	
Ministry of Environment, Conservation and Parks	EA Notification; Environmental Assessment Branch	N/A; Director, Environmental Assessment Branch	eanotification.cregion@ontario.ca; enviropermissions@ontario.ca	135 St. Clair Avenue West, 1st Floor Toronto, Ontario M4V 1P5		
Ministry of Natural Resources	Policy Division - Environmental Planning Unit	N/A	ea.mnrf@ontario.ca	300 Water Steet, 2nd Floor South Peterborough, ON K9J 8M5		
Ministry of Tourism, Culture and Sport	Culture Division - Programs and Services Branch	N/A	MTCSheritageunit@ontario.ca	401 Bay Street, Suite 1700 Toronto, ON M7A 0A7		
Ministry of Indigenous Affairs and First Nations Economic Reconciliation	EA Review Team	Environmental Assessment Coordinator	moeccpermissions@ontario.ca	160 Bloor Street East, Suite 400 Toronto, ON M7A 2E6		
Ministry of Municipal Affairs and Housing	Municipal Services Office	N/A	MSO-Central@ontario.ca	777 Bay Street, 13th Floor Toronto, ON M7A 2J3		

Appendix E

Long Point Region Conservation Authority – Engagement Meeting Minutes

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Minutes of Meeting

H353644

October 16, 2025

Norfolk County
Simcoe Wastewater Treatment Plant

Engagement Meeting:
Norfolk County: Simcoe WWTP Class EA

Meeting Date:	October 9, 2025	
Location:	Virtual (Microsoft Teams)	
Present:	Paolo Oddi (Norfolk County) Mariana Balaban (Norfolk County) Samantha Fraser (Hatch) Rizwan Rizvi (Hatch) Susanne Prince (Hatch) Mateo Gonzalez (Hatch)	Braedan Ristine (LPRCA)
Purpose:	Present and discuss the proposed biosolids upgrade project, including its environmental assessment under Schedule 'B', preferred design alternatives, and associated infrastructure improvements such as access road planning. The team reviewed long-term goals aligned with Ontario's Nutrient Management Act, evaluated technical and environmental feasibility, addressed community and conservation concerns, and outlined next steps for regulatory approvals, traffic safety, and conceptual design development.	

1. Presentation of Public Information Center Boards

- Samantha presented the Public Information Center (PIC) boards, providing an overview on the purpose of the project, review of alternative solutions, presentation of the preferred solution, and mitigation measures that will be implemented for the surrounding community.

2. Questions & Discussion

- Braedan noted that the LPRCA has no major concerns about the biosolids management upgrades based on preliminary review. However, the proposed access road will require permitting and further discussions due to proximity to the conservation area. He noted a few key considerations are:
  - Topography next to the Lynn River
  - Drainage stability and erosion assessments
  - Location of road with respect to the existing LN&E trail

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    - Policies exist regarding road and public construction; more information is needed on how much of the plateau will be used.

- Rizwan confirmed that the road is in conceptual design phase currently, but alignment, plateau and drainage strategy will be evaluated. He reiterated the importance of complying with the regulatory approvals for the design and asked that Braedan provide current LPRCA policies for review.
- Rizwan questioned if full hydraulic simulation and stormwater modeling would be required as part of the permitting. Braedan noted that a grading plan showing the drainage paths will be required.
- Mariana noted the wants from the community to preserve the trail. She also noted the new road will be a 2-lane collector road between Sherman/Victoria and Trillium Way which will serve the treatment plant and future residential developments.
- Rizwan and Mariana noted that the elevation differences are significant and drainage crossings through the proposed road alignment will be reviewed during design.
- Mariana asked Braedan if there was a historical dam located in the conservation authority land near the treatment plant. Braedan noted he was unsure but would look into it and provide an update.
- Braedan noted that regulatory boundaries may change from what is currently available online, and this must be considered during the conceptual design process.

3. Next Steps & Action Items

- Conceptual design updates are expected to be ready by **January 2026**. A meeting will be held to present more information on the road, mitigation strategies, and regulatory measures. The meeting will also advise on permit application processes and requirements.
- A site visit to walk the proposed road path is scheduled for **October 17**. The invitation will be extended to Braedan and the LPRCA.
- Braeden to provide LPRCA policies and any available floodplain information to Hatch and Norfolk County.
- Braeden to confirm details of the possible historical dam located in the conservation area near the treatment facility.

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Appendix F

Mississaugas of the Credit First Nation – Engagement Meeting Minutes

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Minutes of Meeting

H353644

7/28/2025

Norfolk County
Simcoe Wastewater Treatment Plant

Engagement Meeting:
Norfolk County and Mississaugas of the Credit First Nation

Meeting Date:	July 28, 2025	
Location:	Virtual (Microsoft Teams)	
Present:	Paolo Oddi (Norfolk County) Mariana Balaban (Norfolk County) Oya Koc (Hatch) Susanne Prince (Hatch) Carson Brennen (Hatch)	Abby Lee (MCFN DOCA) Jeremy Sardine (MCFN DOCA)
Purpose:	To engage with the Mississaugas of the Credit First Nation Department of Consultation and Accommodation (MCFN DOCA) regarding the Simcoe Wastewater Treatment Plant Biosolids Management Upgrade and associated Schedule 'B' Class Environmental Assessment (EA) process.	

1. Project Overview

- Oya Koc provided an overview of the project and the purpose of the Class EA under Schedule ‘B’.
- The goal was to share project background, outline current activities, and review key milestones (2016, 2019, and 2029).
- Focus remains on biosolids management, infrastructure components, and environmental considerations.

2. Study Area & Environmental Review

- Oya outlined the study area and reviewed the existing conditions and natural environment assessment.
- MCFN indicated familiarity with the site and its surroundings.
- Road inclusion is under consideration. Oya asked for direction on this potential component.

3. Traffic and Access Concerns

- Paolo Oddi emphasized access and the need to minimize impacts through the design process.
- Traffic congestion and safety for truck access were discussed.
- Mariana Balaban noted increased traffic and the challenges posed by road elevations. The new facility will aim to optimize flow and reduce community impacts.

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4. Archaeological Assessments

- A Stage 1 Archaeological Assessment is underway.
- Oya offered to share the report with MCFN.
- Abby Lee requested copies of the Stage 1 report and any subsequent Stage 2 assessments.
- Oya confirmed a Stage 2 assessment will be conducted if required and will also be shared.
- ASI has been retained to complete archaeological work; MCFN expressed support due to their familiarity with MCFN protocols.

5. Alternatives Review

- Oya presented the Long List of Alternative Solutions and the evaluation table.
- Four alternatives were discussed.
- Jeremy Sardine had no immediate comments but requested consultation and document sharing if a road is constructed.

6. Environmental & Design Considerations

- Abby inquired about mitigation related to a creek bed near the trail system.
- Oya confirmed that the road alignment has not been finalized but the creek and trail will be considered in design and construction.
- Hatch is responsible for the EA and Public Information Centre (PIC); ASI is handling archaeological assessments.

7. Public Information Centre (PIC)

- Tentative date set for August 13, 2025.
- Stakeholders, including Indigenous communities, will be notified in advance.
- Abby noted that MCFN typically does not attend PICs but appreciated the invitation.

8. Project Benefits

- Mariana outlined the benefits of the upgrade, including reduced biosolids holding time (currently 8 months), improved biosolids quality, and compliance with upcoming regulations.
- Technology upgrades will produce fertilizer and reduce odor impacts.
- Biogas recovery systems and flaring for emission control are planned.
- Simultaneous upgrades to both biosolids management and liquid trains are essential to the project's success.

9. Follow-up and Information Sharing

- MCFN reiterated interest in receiving all archaeological and environmental reports (Stage 1, Stage 2 if applicable, and environmental memo).
- Mariana requested that MCFN provide costs associated with technical report reviews.
- Abby confirmed that costs would be shared with Paolo Oddi.
- Paolo committed to distributing reports to both Abby and Jeremy once available.
- Oya clarified that the environmental report would be issued as a memorandum.

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Appendix G

Engagement Tracking Log

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Line Item	Date of Receipt	Indigenous Community/Stakeholder	Correspondent(s)	Method of Communication	Subject	Date of Response	Response and Resolution
1	6/20/2025	Mississaugas of the Credit First Nation (MCFN)	Paolo Oddi (Norfolk County)	Email	Notice of Commencement	7/2/2025	See line item 11
2	6/20/2025	Six Nations of the Grand River First Nation (SNGRFN)	Paolo Oddi (Norfolk County)	Email	Notice of Commencement	N/A	N/A
3	6/20/2025	Haudenosaunee Confederacy Chiefs Council (HCCC) and Haudenosaunee Development Institute (HDI)	Paolo Oddi (Norfolk County)	Email	Notice of Commencement	N/A	N/A
4	6/20/2025	Metis Nation of Ontari0 #9 (MNO #9)	Paolo Oddi (Norfolk County)	Email	Notice of Commencement	N/A	N/A
5	6/20/2025	Ministry of Environment, Conservation and Parks (MECP)	Carson Brennen (Hatch)	Email	Notice of Commencement	6/30/2025	See line item 10
6	6/20/2025	Ministry of Natural Resources (MNR)	Carson Brennen (Hatch)	Email	Notice of Commencement	N/A	N/A
7	6/20/2025	Ministry of Tourism, Culture and Sport (MTCS)	Carson Brennen (Hatch)	Email	Notice of Commencement	N/A	N/A
8	6/20/2025	Ministry of Indigenous Affairs and First Nations Economic Reconciliation (MIAFNER)	Carson Brennen (Hatch)	Email	Notice of Commencement	N/A	N/A
9	6/20/2025	Ministry of Municipal Affairs and Housing (MMAH)	Carson Brennen (Hatch)	Email	Notice of Commencement	N/A	N/A
10	6/30/2025	MECP	Serina Liu; CC'd Joan Del Villar Cuicas (MECP)	Email	MECP required additional information to proceed with issuing the Acknowledgment Letter.	N/A	N/A

11	7/2/2025	MCFN	Abby LaForme (MCFN)	Email	Interest in holding meeting to review the project. Following dates MCFN is available: July 21, 2025- 9:30am- Noon July 22, 2025- Noon- 3pm July 28, 2025- 9:30am – Noon & 1pm- 3pm.	7/23/2025	See line item 13
12	7/4/2025	MECP	Joan Del Villar Cuicas; CC'd Neil Hannington; Jeremy Gamble (MECP)	Email	MECP issued their Acknowledgment Letter	N/A	N/A
13	7/23/2025	MCFN	Paolo Oddi (Norfolk County)	Email	The county provided their availability. Offered to meet virtually on Monday, July 28th from 10:00 a.m. to 11:00 a.m.	7/28/2025	See line item 18
14	7/28/2025	MCFN	Paolo Oddi (Norfolk County)	Email	Notice of Public Information Centre	N/A	N/A
15	7/28/2025	SNGRFN	Paolo Oddi (Norfolk County)	Email	Notice of Public Information Centre	N/A	N/A
16	7/28/2025	HCCC/HDI	Paolo Oddi (Norfolk County)	Email	Notice of Public Information Centre	N/A	N/A
17	7/28/2025	MNO #9	Paolo Oddi (Norfolk County)	Email	Notice of Public Information Centre	N/A	N/A
18	7/28/2025	MCFN	Paolo Oddi (Norfolk County)	Microsoft Teams	Review of project materials and information	N/A	N/A

Appendix H

Notices

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Notice of Public Information Centre: Simcoe Wastewater Treatment Plant – Biosolids Management Upgrade - Municipal Class Environmental Assessment

Norfolk County (County) has initiated a Municipal Class Environmental Assessment (Class EA) for the Simcoe Wastewater Treatment Plant (WWTP). The Norfolk County Integrated Sustainable Master Plan (ISMP), finalized in September 2016, identified upgrades to the Simcoe WWTP's solids handling processes, including utilizing biosolids storage tanks at the Simcoe WWTP to store biosolids from Port Dover and Port Rowan WWTPs based on a planning horizon year of 2041.

The purpose of this study is to review and update the proposed upgrades in the ISMP based on the best available technologies and updated regulatory compliance requirements for biosolids management servicing needs projected to 2051 at County-wide level.

A map of the study area is provided in Figure 1. This Study is being undertaken in accordance with the requirements for Schedule 'B' projects within the Municipal Class EA document (2000, as amended), under the Ontario Environmental Assessment Act.

Public Information Centre

Public consultation is an essential component of the Class EA process, and we welcome your feedback. Norfolk County plans to host a Public Information Centre (PIC) during the study on DAY/MONTH, 2025. The PIC will provide background information on the study, compare the alternative solutions, and compare the alternative design concepts to identify a preliminary preferred design concept to be implemented.

Additional information on the PIC and study will be provided closer to the event date and made available on the County's website: https://norfolkcounty.ca/Public-Notices.

The PIC will take place as follows:

Date:	**DAY/MONTH, 2025**
Time:	**TIME (Drop-in Centre Format)**
Location:	**LOCATION**

If you would like more information about the study or would like to be added to the contact list to receive future notices, please contact:

Paolo Oddi, C. Tech
Project Manager
Norfolk County
Tel.: +1 (519) 426-5870 ext. 5035
Email: paolo.oddi@norfolkcounty.ca

Oya Koç, P.Eng.
Project Manager
Hatch Ltd.
Tel.: +1 (289) 326-1808
Email: oya.koc@hatch.com

Information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This Notice was first issued on DAY/MONTH, 2025.

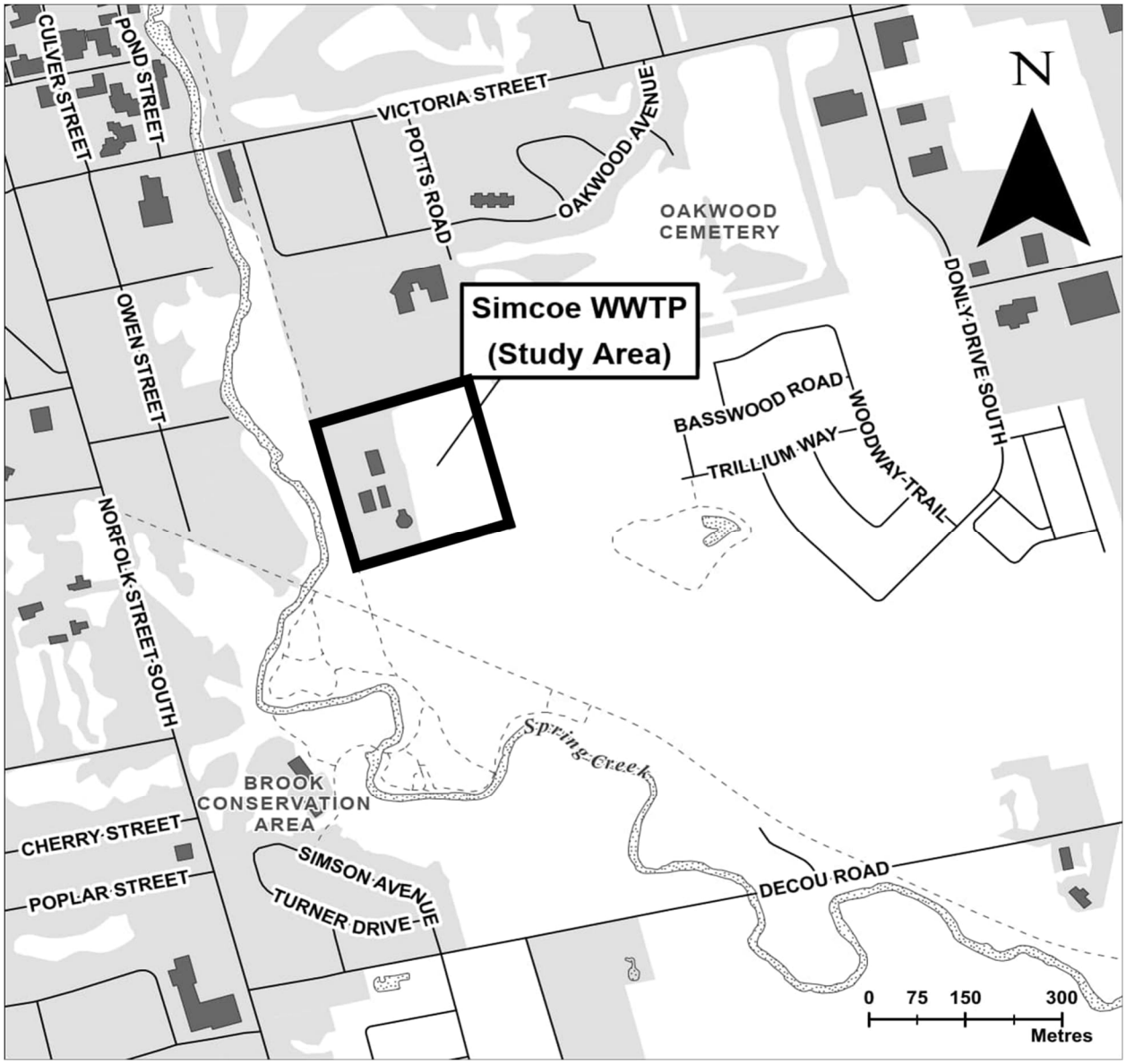


Figure 1: Study Area Location

Appendix I

Public Information Centre Poster Boards

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Welcome to Norfolk County's Public Information Centre!

Simcoe Wastewater Treatment Plant – Biosolids Management Upgrade

Tuesday August 12, 2025, from 5:00pm to 7:00pm

Share your Feedback

Norfolk COUNTY

Simcoe Wastewater Treatment Plant – Biosolids Management Upgrade

Schedule “B” Municipal Class Environmental Assessment

Public Information Centre

August 12, 2025, from 5:00pm to 7:00pm

Norfolk County Administration Building Council Chambers
50 Colborne St S, Simcoe ON

Indigenous Acknowledgement

The Municipality of Norfolk County is committed to furthering Truth and Reconciliation in our communities. We recognize the historical and current contributions of Indigenous Peoples throughout Canada, and particularly in Norfolk County, that have added to the rich cultural and social fabric that exists here today.

We will strive to continually strengthen and develop the spirit of respect, co-operation and collaboration to the mutual benefit of all Norfolk County residents.

Welcome!

Objectives of Public Information Centre (PIC):

1. Introduce the project with background
2. Provide an overview of the study process
3. Present the alternative solutions being considered
4. Present the evaluation process used to identify the recommended preferred solution
5. Discuss next steps and obtain your input

What should I be doing?

- ✓ Reviewing the PIC presentation boards
- ✓ Ask questions or share your comments with the team members in attendance
- ✓ Complete the feedback form or provide comment via email. Any feedback received will inform the selection and finalization of the preferred solution

Norfolk COUNTY

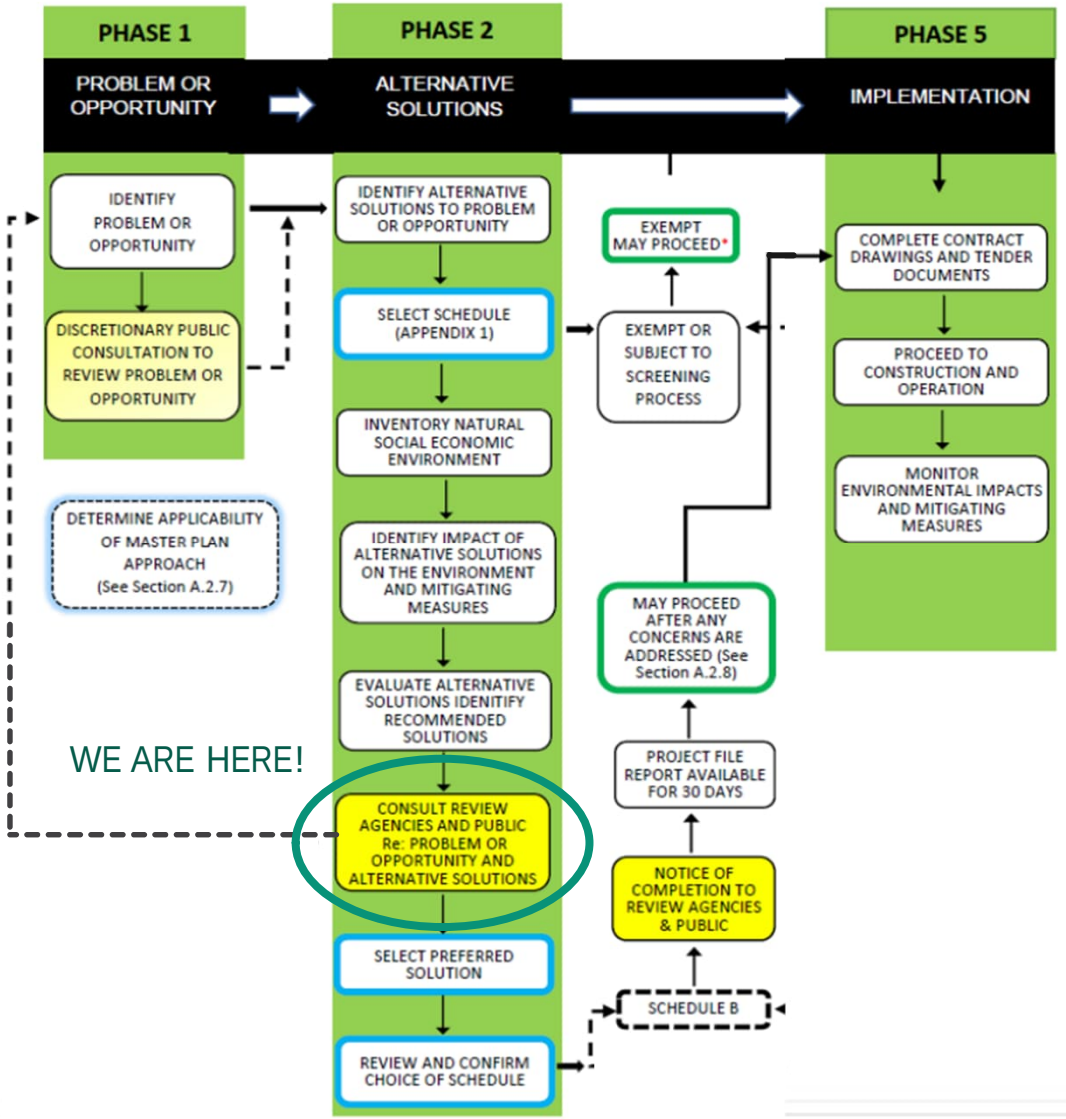
Class Environmental Assessment (EA) Study Process

As the proponent, Norfolk County is committed to conducting a Schedule “B” Class EA for this project.

Schedule “B” projects have the potential for some adverse environmental effects. It requires that the proponent contact affected members of the public and relevant review agencies.

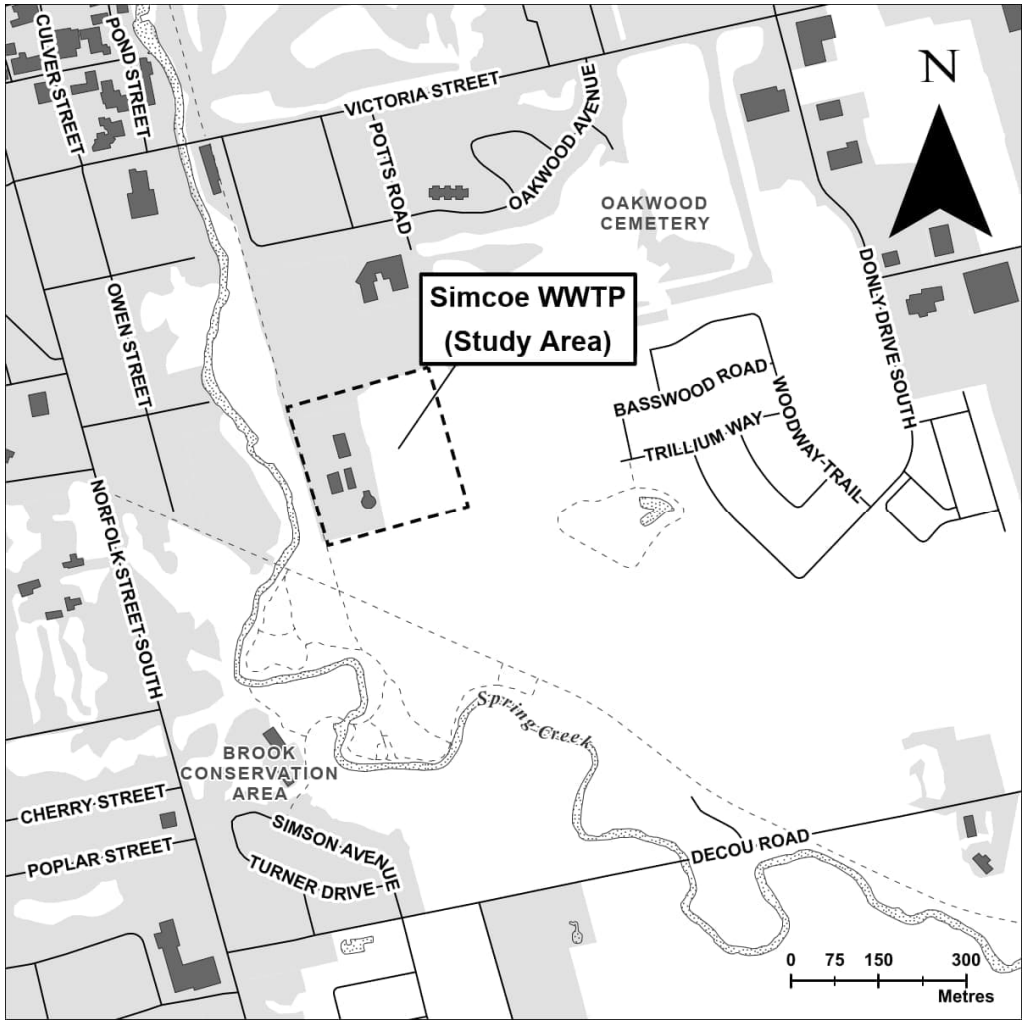
Where are We?

- The County completed the initial studies and developed the preliminary preferred solution
- This PIC represents the “Consult Review Agencies and Public in Problem or Opportunity and Alternative Solutions” step



Project Study Area

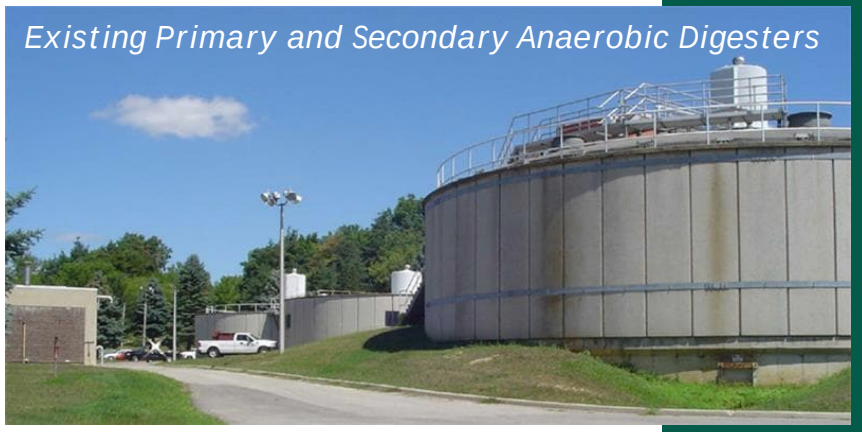
- The limits of the Study Area extend to the municipal property boundary of the Simcoe Wastewater Treatment Plant (WWTP)
- Location: 16 Oakwood Ave, Simcoe, ON N3Y 1H3
- Plant Vicinities:
  - North: Medium-density residential
  - East: Residential & Institutional/Services
  - South: Low-density residential & Brook Conservation Area
  - West: Residential, light commercial fringe & LE&N Trail
- Community Features Nearby: School, Cemetery, Conservation Land, Trail, Park, Memorial Site, Public Facilities, Recreation Areas
- Lynn River, Small Pond in Wellington Park, Watershed – Drains into Lake Erie



Problem and Opportunities

- **Regulatory Requirements: Biosolids management options must be reviewed in alignment with the current planning horizon to 2051 and in accordance with Ontario's Nutrient Management Act**
- **Current operation of the plant is experiencing issues with ESA Code and regulatory compliance with respect to digester performance and biosolids quality**
- The Norfolk County Integrated Sustainable Master Plan (ISMP) from 2016 identified that upgrades to the Simcoe WWTP solids handling processes are required
- Older technologies, close to end-of-life service life and safety compliance issues with the existing biosolids handling facilities at Simcoe and Port Dover WWTPs
- Newer technologies have become more prominent in the wastewater treatment industry and should be evaluated against conventional technologies
- Possibility to convert biosolids to higher value final product such as Class A product that complies with Canadian Food Inspection Agency (CFIA) fertilizer quality designation
- Lack of expansion space at the other four plants within the Norfolk County to expand/upgrade biosolids facilities to meet the current requirements





Existing Primary and Secondary Anaerobic Digesters

Norfolk County must develop a long-term biosolids management solution to effectively handle materials generated at all wastewater treatment plants. The solution should accommodate future growth, evaluate emerging technologies, maximize value, be fiscally responsible, and minimize environmental impacts.

Norfolk COUNTY

Project Background

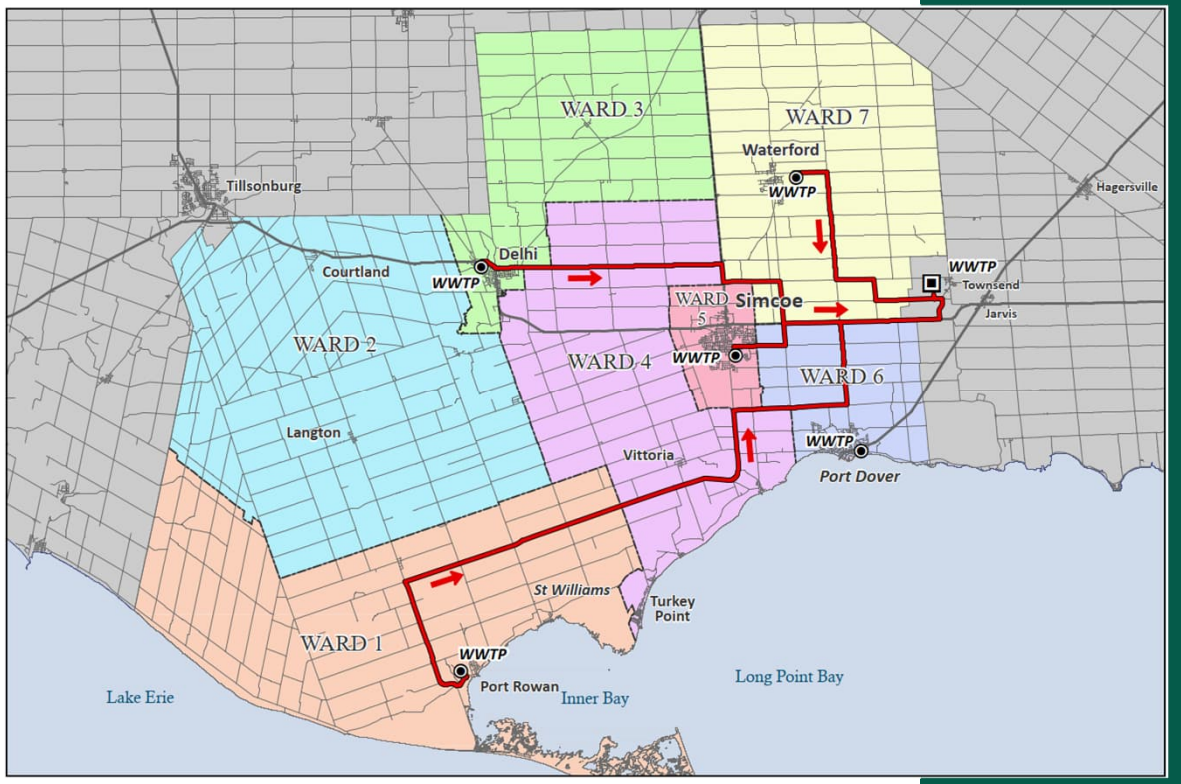
- **In 2016**, the Integrated Sustainable Master Plan (ISMP) presented a Biosolids Management Solution for the Simcoe WWTP for the 25-year planning horizon and growth management plan
  - Aerobic digestion and thickening of Simcoe WWTP Biosolids
  - Repurposing of the existing anaerobic digesters for storage of biosolids from Simcoe, and excess biosolids from Port Rowan and Port Dover WWTPs in future
  - Builds on 2007 Biosolids Management Options Report
- **In 2019**, the Biosolids Management Solution was re-evaluated for a design year of 2041
  - Considered Delhi WWTP as an additional source of biosolids
  - Recommended technology change to anaerobic digestion at Simcoe WWTP
- **Starting 2024**, Norfolk County started the process to re-evaluate solutions for three reasons
  - County-wide review of biosolids management was necessary
  - New growth projection to 2051, including addition of Waterford WWTP sludge to the design basis
  - New technologies, including Thermal Hydrolysis Process (THP), became more feasible



Simcoe Wastewater Treatment Plant – Overview

2025 Biosolids Disposal Routes (Current)

Wastewater Treatment Plants	Design Capacity (ADF m^3/d)	Biosolids Class B Production (kg/d)	# trucks per week	Disposal Route
Simcoe	15,400-Rated Capacity 7,261-Actual	1,918	5.5	• 75% to Townsend Lagoons • 25% to Land Application
Delhi	3,182	426	1.5	• 33% to Townsend Lagoons • 67% to Land Application
Waterford	2,200	153	0.5	• 100% Facultative Lagoon Clean Up sent to Townsend Lagoons (2002 & 2025)
Port Dover	5,400	740	2.5	• 100% to Land Application with Storage at the Plant
Port Rowan	1,140	226	1	• 50% to Townsend Lagoons • 50% to Land Application
Norfolk County Totals	**27,322**	**3,463**	**11**	• 51% to Townsend Lagoons • 49% to Land Application



Current Truck Route for Sludge Hauling to Townsend Lagoons





What are Biosolids?

Biosolids are nutrient-rich organic materials produced during the treatment of domestic sewage sludge. Once treated to meet regulatory standards, biosolids can be beneficially reused most commonly through land application.

There are two classifications of biosolids considered in this project:

Class A and Class B

Class B Biosolids have undergone treatment to reduce pathogens but do not eliminate them entirely. They are subject to additional restrictions for public health and environmental safety. Non-Agricultural Source Material (NASM) Plans (OMAFRA protocols) are required prior to land application. All five wastewater facilities currently produce Class B biosolids.

Nutrient Management Act, O. Reg. 267/03

E-Coli < 2,000,000 CFU/g (dry solids).

Class A Biosolids must have pathogens reduced to virtually all non-detectable levels and comply with very strict standards for odours, metals, and vector attraction reduction. Class A biosolids are safe for residential home use for lawns and gardens and in agricultural applications. Class A Biosolids are considered fertilizers and therefore NASM Plans are not required.

Nutrient Management Act, Fertilizers Act,

E-Coli < 1,000 CFU/g (dry solids).

All municipal biosolids that are land applied must meet safety standards for trace metals, pathogen indicators, dioxins and furans and pesticide residues if applicable



Transfer from Truck to Field Applicator

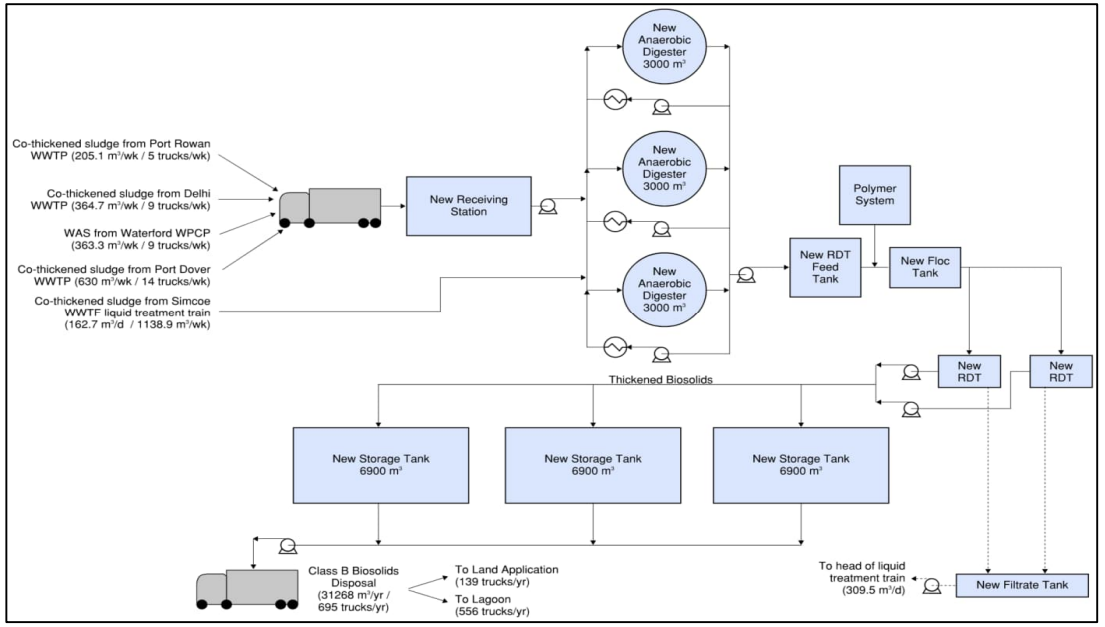


Fertilizer (Class A Biosolids) Land Application

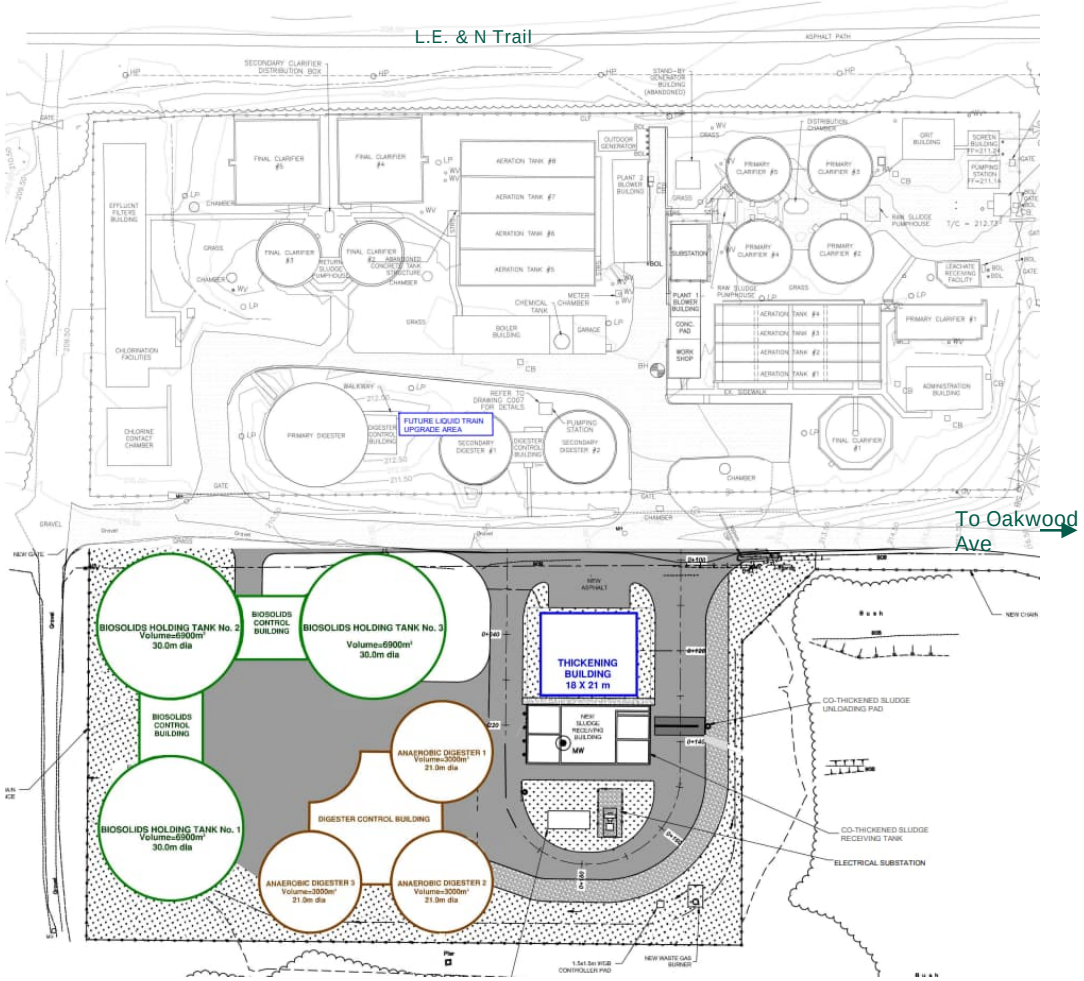
Long List of Alternative Solutions Evaluation

Alternative Number	Alternative Solution	Meets 2051 Growth Requirements?	Feasible Solution?
1	Do Nothing	**No**	**No** *Ruled out*
2	2016 Master Plan (ISMP) Solution – Aerobic digestion and thickening of Simcoe Biosolids, and repurposing of the Simcoe WWTP anaerobic digesters for storage of biosolids from Simcoe, and excess biosolids from Port Rowan and Port Dover WWTPs in future	**No** •*Meets only 2041 planning horizon* •*Did not include Delhi and Waterford WWTPs* •*2019 Delhi WWTP was added*	**No** *Ruled out due to high cost & failure to provide a complete solution for the County*
3	Centralized (for all WWTPs) Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP	**Yes**	**Yes** *Carried Forward*
4	Centralized (for all WWTPs) Thermal Hydrolysis Process (THP) Stabilization and Biosolids Storage at Simcoe WWTP	**Yes**	**Yes** *Carried Forward*

Short Listed Alternative Solution 3 – Centralized Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP

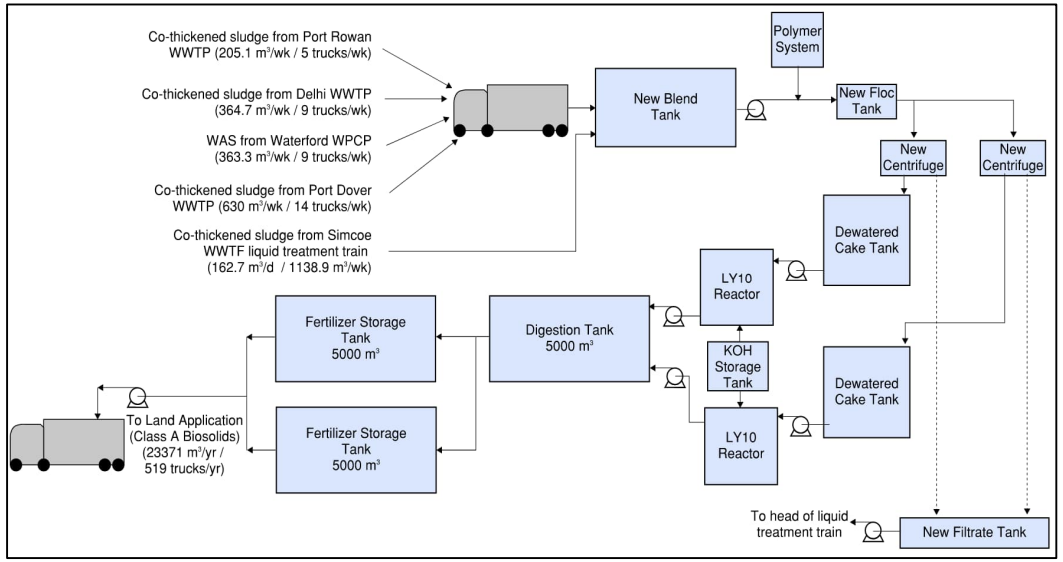


Proposed Process Flow Schematic

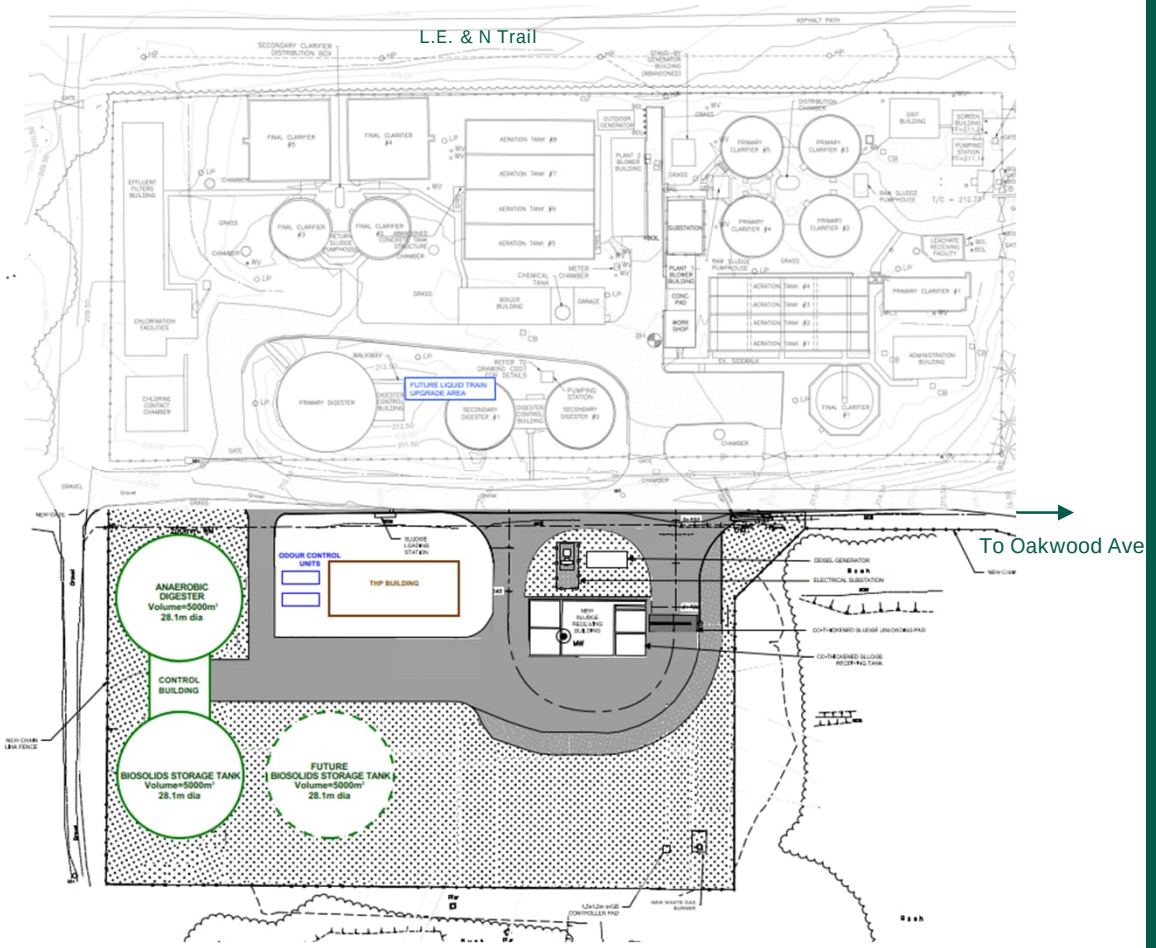


Preliminary Site Layout

Short Listed Alternative Solution 4 – Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP



Proposed Process Flow Schematic



Preliminary Site Layout

Technical Feasibility Comparison

Alternative Solution 3 – Centralized Anaerobic Digestion

- Produces Class B biosolids, with higher pathogen levels – less ideal for reuse near communities
- Odours can be more noticeable, potentially affecting nearby residents
- Limited operating flexibility as all system components need to be sized to ultimate 2051 flows and loadings, which will impact short term performance if growth is delayed
- Treatment process produces larger volume of biosolids, requiring more trucks (4/week) for hauling compared to THP process and requires larger storage capacity (e.g., 240 days) – increasing land and footprint needs

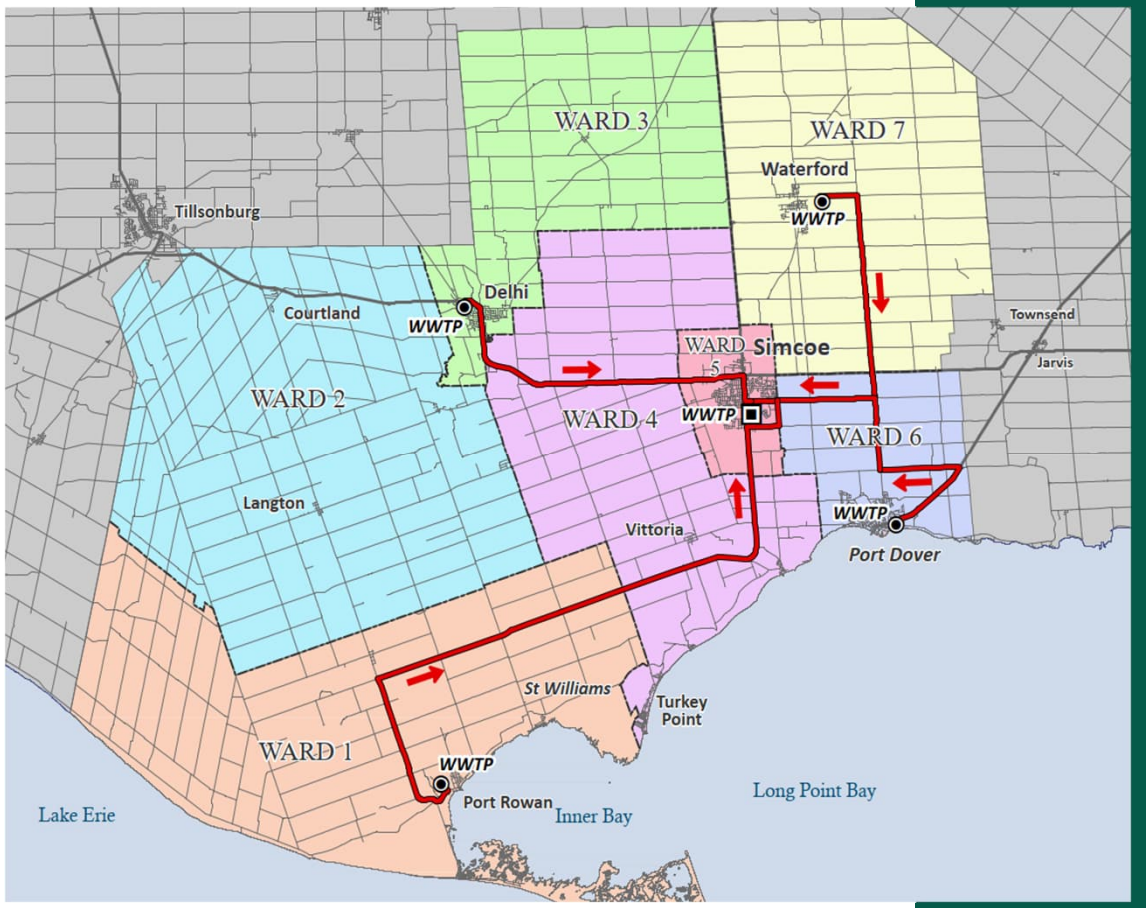
Alternative Solution 4 – Centralized Thermal Hydrolysis Process

- Advanced treatment delivers Class A biosolids, safest for community and environment
- Significantly reduces pathogens and odours, minimizing nuisance to neighbors
- Higher operating flexibility allows system run time to be adjusted to increase treatment capacity, having no impact on short term performance
- Onsite storage is not regulated - treatment process produces lower volume of biosolids, requiring fewer trucks for hauling and reducing overall storage requirements – smaller footprint, less land use

Norfolk COUNTY

2051 Biosolids Management Forecast (Future)

Wastewater Treatment Plants	Design Capacity Forecast (ADF m3/d)	Sludge Production Forecast (m3/d)	# Sludge trucks per week to Simcoe	# Biosolids trucks to land per week from Simcoe Alternative 3	# Fertilizer trucks to land per week from Simcoe Alternative 4
Simcoe	15,400	4,475	Sludge Treated on Site	14	10
Delhi	3,182	1,563	9	0	0
Waterford	3,500	779	8	0	0
Port Dover	7,500	1,889	14	0	0
Port Rowan	2,280	790	4	0	0
Norfolk County Totals	**31,862**	**9,496**	**35**	**14**	**10**



Truck Route for Sludge Hauling with County-wide Biosolids Management Facility at Simcoe WWTP

Financial Impact Comparison

Indicator / Alternative	Alternative 3 – Centralized Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP	Alternative 4 – Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP
Capital Cost	$100,330,000*	$56,264,000*
Annual Operation and Maintenance Cost	$530,000**	$915,000**
27-year Life Cycle Cost (to 2051)	$121,305,000	$92,455,000

Recommended Preferred Alternative

* *Proposed Access Road worth $7M-$9M is not included in the capital cost*

** *Annual Operation and Maintenance Costs including core process elements for each alternative for comparison purposes*

Norfolk COUNTY

Detailed Evaluation of Short-listed Alternatives

Evaluation Criteria	Alternative 3 – Centralized Anaerobic Digestion and Biosolids Storage with Thickening at Simcoe WWTP	Rating	Alternative 4 – Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP	Rating
Environmental	• Reduction in current CO_2 emissions • Produces lower quality **Class B** biosolids – E. coli levels must be < 2,000,000 CFU/g • A Non-Agricultural Source Material (NASM) Plan is required for an agricultural operation/ application • Storage at Townsend lagoons required when land application is not feasible	◑	• Reduction in current CO_2 emissions • Achieves **Class A** biosolids standard – E. coli < 1,000 CFU/g; produces higher quality biosolids • Pathogen and Odour Reduction • Storage at Townsend lagoons no longer required • Enhanced Biogas Production which will be used for energy recovery	◔
Social	• Higher biosolids volume to be hauled from Simcoe WWTP (14 trucks per week) • Increased incoming sludge truck traffic (35 trucks/week) than current operation	◑	• Lower biosolids volume to be hauled from Simcoe WWTP (10 trucks per week) • Increased incoming sludge truck traffic (35 trucks/week) than current operation	◔
Economic	• Higher capital cost • Lower operating cost • Higher life cycle cost	●	• Lower capital cost • Higher operating cost • Lower life cycle cost	◑
Technical	• Follows NASM regulatory requirements • Product quality will restrict its use • 240 days of storage and a larger storage footprint • Lower operational risk: • Operating temperatures (<40C) • Process includes gas emissions and explosion risk	◑	• Follows Canadian Food Inspection Agency (CFIA) regulations • Pathogen destruction • Product quality will not restrict its use • Operational flexibility for increased capacity • Higher operational risk: • Operating temperatures (<100C) • Process includes high speed rotating equipment, chemical use, gas emissions, explosion risk	◑
Planning	• Larger footprint with no room for future expansion	◑	• Smaller footprint with room for future expansion	◔

Legend: Most preferred ○ ◔ ◑ ◕ ● Least Preferred

Recommended Preferred Alternative

Recommended Preferred Solution: Alternative 4 – Centralized Thermal Hydrolysis Process Stabilization and Biosolids Storage at Simcoe WWTP

New Norfolk County Biosolids Management Facility to be located east of the Simcoe WWTP – Phase 1 Upgrades

Facility will receive biosolids from all other WWTPs in Norfolk County to produce a Class A product

- Suitable for use as a fertilizer with minimal restrictions
- Proven through testing to produce Class A quality and low PFAS concentrations

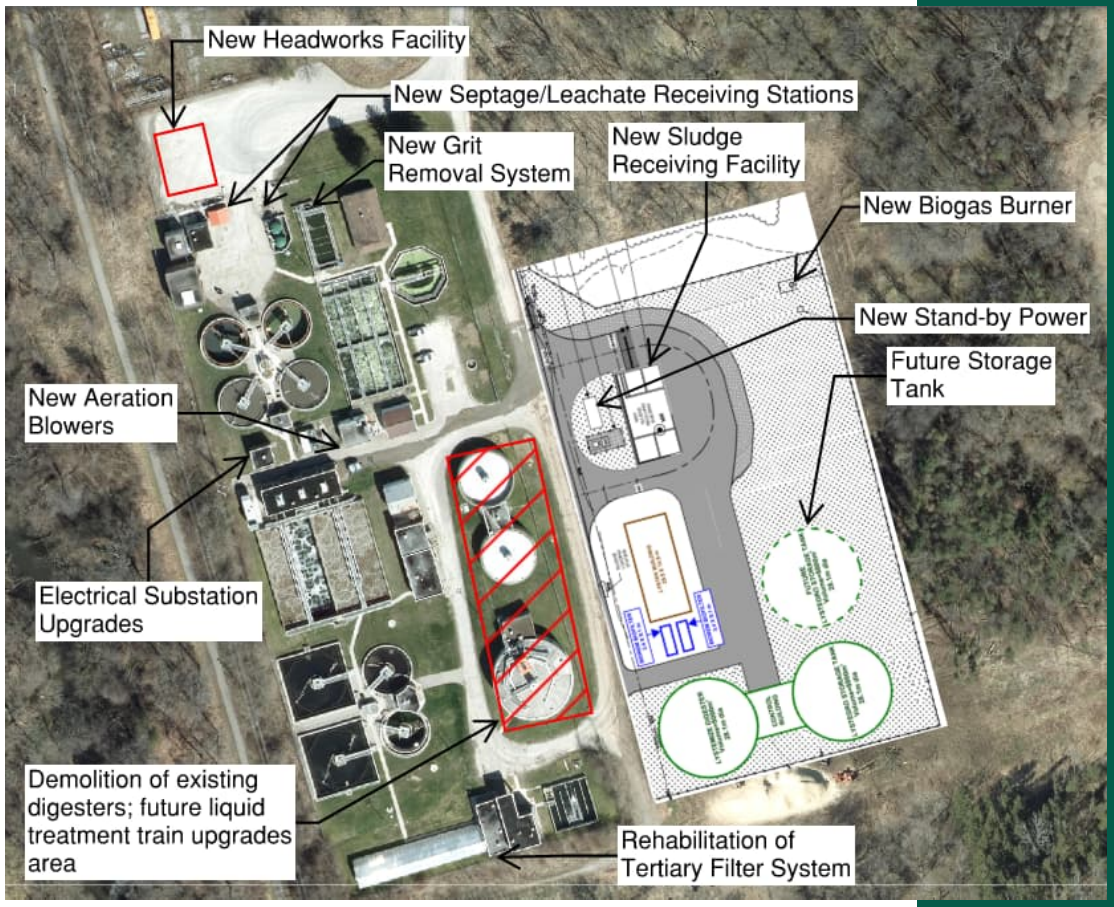
Overall sludge truck traffic will increase to a total of 35 trucks (in and out) per week on average

A new access road will be constructed to mitigate traffic impacts on the surrounding community

Highest economic benefit of all options, with lower life cycle costs

Planned Simcoe WWTP Phase 2 upgrades to support the biosolids facility will include

- New headworks facility with screening and grit separators
- New septage, raw sewage and leachate receiving stations
- Electrical substation and stand-by power unit
- Sludge recirculation pumping stations



Alternative 4 has been identified as the preferred solution, offering the best overall balance of environmental protection, community benefit, cost efficiency, and long-term planning

Typical Thermal Hydrolysis Process Application





Dewatering centrifuge and dewatered biosolids tank



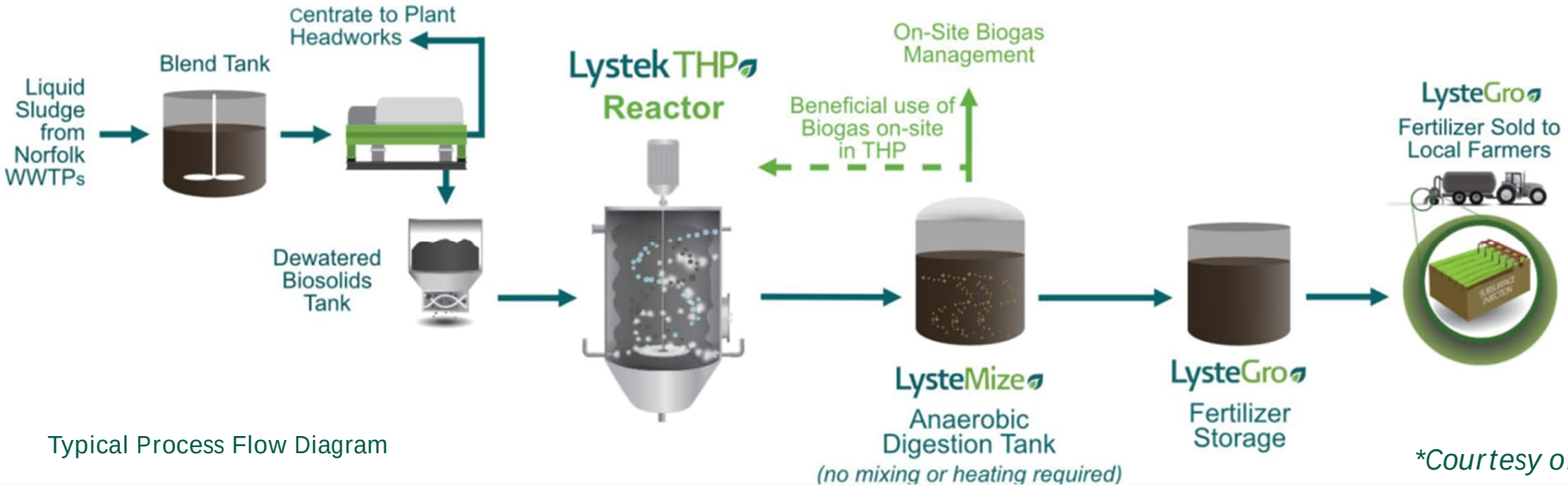
Odour Control Unit



Typical THP Building



Storage Tanks



Typical Process Flow Diagram

*Courtesy of Lystek

Proposed Access Road – Phase 1 Upgrades

Projecting up to twice as many trucks entering and leaving the plant by 2051

The current Oakwood Avenue access is not feasible for future increased truck traffic due to:

- Restricted truck access times due to school drop offs/pickups means increased truck traffic during other times
- Safety concerns for both public and operations staff

Proposing a new access road, approximately 1km long, from either Victoria Street or Sherman Avenue to the plant. Alignment feasibility under review, pending Class EA completion

Traffic impact mitigation includes controlled hauling routes that divert heavy trucks away from sensitive areas near the school and cemetery to improve road safety and reduce disturbances

Scope includes a road extending to the south side of the plant, with width and construction designed to meet municipal standards and accommodate safe, two-way traffic

The road alignment will be designed to prioritize the preservation of existing trails and natural areas

The design will accommodate potential future plant expansions or infrastructure upgrades, ensuring long-term value and operational flexibility

Additional cost estimated between $7M and $9M, depending on site conditions and mitigation measures (slope, watershed, soil type)



*Includes leachate, septage, raw sludge, chemical delivery, and sludge trucks
**Includes trucks for leachate, septage, raw sludge and chemical deliveries

Norfolk County

Archaeological Assessment

- The Stage 1 Archaeological Assessment showed that parts of the Project Area have archaeological potential, and a Stage 2 assessment is required due to:
  - 16 previously registered archaeological sites within 1km
  - Water sources within 300m (Lynn River)
  - Elevated topography (Lynn River Terrace)
  - Early settlements within 100m (possible homesteads)
- Norfolk County is committed to completing the Stage 2 assessment prior to any construction activities



Natural Environment Assessment

- 35 species of birds and 2 mammal species observed. Species at Risk were seen near south-west corner of existing site (possibly outside construction area):
  - Red-headed Woodpecker (endangered)
  - Chimney Swift (threatened)
- Preliminary vegetation assessments characterized the property as primarily cultural meadow habitat with deciduous-dominant mixed woodlands adjacent



Existing L.E. & N Trail West of Study Area



Potential Impacts and Proposed Mitigation



Short-Term Construction Impacts
Noise, Dust, Traffic, Vibration, Public and Workers Safety

- Health and safety is a priority to the County. All construction will adhere to strict safety guidelines
- Traffic management controls will be maintained on surrounding streets
- Construction activities will comply with local noise by-laws



Natural Environment Impacts

- Complete Stage 2 Archaeological Assessments to ensure no archaeological potential is disrupted
- Ensure construction area is clear of nesting sites prior to start of work

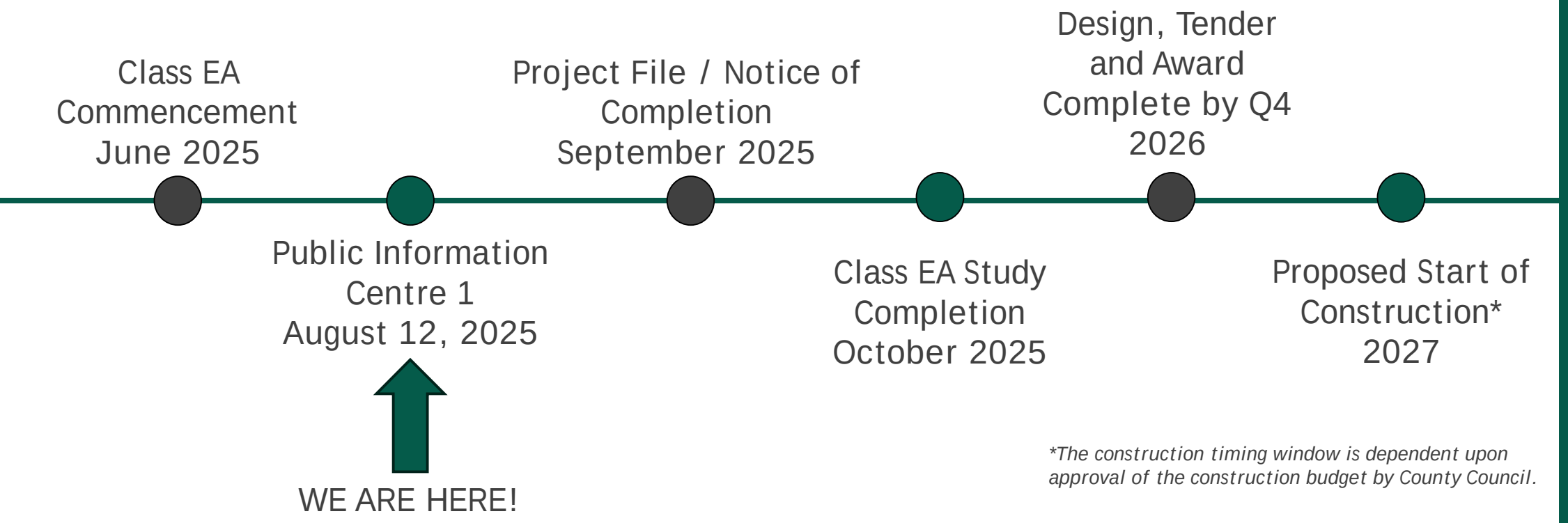


Long-Term Community Impacts
Odour Control, Traffic

- Implementation of odour, noise and emissions control measures to limit impact on surrounding community
- Considering an alternative road to improve access to the plant as well as public and operational traffic safety

Norfolk County

Project Timeline



**The construction timing window is dependent upon approval of the construction budget by County Council.*

Next Steps

- Review and consider all input received from stakeholders and the community
- Confirm the preferred solution based on evaluation and feedback
- Release the Project File for a 30-day public review period
- Issue the Notice of Completion
- Proceed with the detailed design and engineering of the preferred solution
- Continue to engage with the community and provide updates throughout the project

Thank you!

Comments or Questions?

Your questions and comments are greatly appreciated!

Please email them by September 9, 2025, to:
Paolo Oddi, Project Manager
paolo.oddi@norfolkcounty.ca

Appendix J

Feedback Forms

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Norfolk County – Simcoe WWTP – Biosolids Management Upgrade
Public Information Centre - August 12, 2025
Sign-In Sheet

HATCH

Name	Email	Phone Number	Interested in future Project Updates?
[redacted]			
[redacted]			

Additional comments?

If you would like to receive a written response to your comments, please provide us with the following information:

Name: [redacted]

Email Address: [redacted]

☑ Yes, I would like to be added to the e-mail distribution list.

PLEASE LEAVE YOUR COMPLETED FEEDBACK FORM AT THE REGISTRATION TABLE ON THE WAY OUT.

Thank you.

Please forward all feedback by August 26, 2025.

Paolo Oddi, C. Tech
Project Manager
paolo.oddi@norfolkcounty.ca

WELCOME

Simcoe WWTP – Biosolids Management Upgrade
Municipal Class Environmental Assessment

Public Information Centre, August 12, 2025

Objectives of the Public Information Centre #1:

- Introduce the project with background.
- Provide an overview of the study process.
- Present the alternative solutions being considered.
- Present the evaluation process used to identify the recommended preferred solution.
- Discuss next steps and obtain your input.

How does the Public Meeting work?

The Meeting will provide an update on progress to date, present the preliminary preferred design concept and outline next steps. The Meeting will be held in an open house style for individuals to drop-in with members of the Project Team available to answer questions. Feedback is welcome from all.

FEEDBACK FORM

1. Do you have any feedback for the Project Team regarding the preliminary preferred design concept?

Fully support the thermal plan. My only concern is ~~the~~ to ensure that the trail connection can be maintained

2. Do you have any feedback or concerns regarding the impacts and benefits of preliminary preferred solution?

Only the trail considerati

3. Do you have any outstanding questions or concerns regarding the project schedule?

None

4. Do you have any outstanding questions or concerns with the next steps of the consultation process?

None