Township of North Stormont

Moose Creek Wastewater Treatment Lagoons Expansion Project

Environmental Study Report for 30-Day Review

Thursday, October 16, 2025

Z0028411

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Township of North Stormont

Environmental Study Report

Moose Creek Wastewater Treatment Lagoons Expansion Project

Project no. Z0028411

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Executive Summary

Background

The Village of Moose Creek is located in the Township of North Stormont (the Township). Wastewater treatment servicing for the community is currently provided by the Moose Creek Wastewater Treatment Lagoon (WWTL) which is owned by the Township and operated by OCWA. The Moose Creek WWTL is located at 16810 8th Road and currently operates under the ECA approval no. 3-1555-91-936, dated January 19, 1993. The facility has a rated storage capacity of 110,360 m^3/y for annual storage, with an average day flow (ADF) of 302 m^3/d.

A Master Servicing Plan Study (MSP) was previously undertaken for the Township and was completed in December 2024 by R.V. Anderson Associates Ltd. (RVA). The MSP completed Phase 1 and Phase 2 of the Class EA process and included future waster and wastewater servicing evaluations for the communities of Finch, Crysler and Moose Creek.

There is a critical need in increasing the treatment capacity of the existing Moose Creek WWTL, mainly due to the following key considerations:

- The Township is expecting considerable planned growth in the next 25-30 years with population projections forecasting an 86% increase in the current population of Moose Creek for the year 2051.
- The MSP findings determined that the existing WWTL lacks capacity, with the WWTL experiencing issues in recent years, in meeting effluent objectives and limits for TSS and TP.

The objective of this Class EA Study is to evaluate detailed design concepts based on technical, environmental, social and economic considerations and arrive at the preferred wastewater treatment expansion path for the existing Moose Creek Wastewater Treatment Lagoons, to continue the Class EA process from the 2024 MSP, in conjunction with the outcomes of the MSP.

Problem and Opportunity Statement

The problem/ opportunity statement was updated from the MSP to cover recent planning updates and to be more specific to the Village of Moose Creek. The problem/ opportunity statement for this Class EA is defined as follows:

The existing Moose Creek WWTL is currently operating at greater than 85% of its rated capacity based on average day flow; In the next 30 years, the population serviced by Moose Creek WWTL is projected to increase substantially, to a total of 1,060 persons.

The Township has received grant funding in the amount of $4.8M from the Province of Ontario to expand the WWTL, provided the expanded capacity is achieved in 2027.

The existing capacity constraints and opportunities to improve effluent treatment quality at the Moose Creek WWTL require further investigation, to service planned and future growth within the urban boundary, increase resiliency to treat high flows, and to consistently achieve compliance.

Population Projections & Future Growth

Population projections are critical since future wastewater inflow estimates utilise the per capita basis as a foundation. The MSP encompassed data from the Growth Management Study and Reserve Capacity Studies undertaken for the Township, to forecast growth across the Finch, Crysler, and Moose Creek communities. Based on the detailed data from these studies, Moose Creek's service population was projected to grow from the census population of 580 in 2021 to 1,080 by 2051. The same population growth projections have been carried forward in this Class EA.

Historic influent flow and characteristics

Historical wastewater flow and characteristics data for the timeframe of January 2020 to April 2025 were analysed to establish current flows and loadings for the Moose Creek WWTL.

It was determined that the ADF was 255.37 m^3/d, with a peak day flow of 849.27 m^3/d. The historical ADF corresponds to a per capita flowrate of 397.93 L/cap/d which is lower than typical per capita wastewater flows of 420 L/cap/d. Flow exceedances over the rated ADF seen in all five years, in March-April, possibly from inflow and infiltration during the spring melt period.

Concentrations and loadings for biochemical oxygen demand (BOD_5), total suspended solids (TSS), total phosphorus (TP), and total Kjeldahl nitrogen (TKN) were also established based on historical data. The historical raw influent can be characterized as low strength with respect to BOD_5 and TP, and medium strength with respect to TSS and TKN.

Historic effluent characteristics

It was observed that the Moose Creek WWTL has generally met its ECA limits for $CBOD_5$, TAN, and H_2S historically. However, several exceedances of effluent objectives and limits were noted, mainly for TSS which may be due to algal issues. Effluent limits for TSS (in 2020–2024), TAN once in 2025, H_2S once in 2024 and TP once in 2021 were not consistently met during the time frame of analysis.

Design Basis

The estimated per capital flows from the 2024 MSP have been carried forward and maintained for the Design Basis, providing a design ADF of 438 m^3/d, based on future flows and population growth. Based on historical background review, it was noted that while the MSP predicted that the rated storage capacity of the Moose Creek WWTL would be exceed in 2033, based on recent historical flows from 2023 and 2024, the Moose Creek WWTL is now predicted to exceed the rated storage capacity in 2028. Hence, the need for immediate upgrades has been noted to be critical.

The design loadings for wastewater characteristics of future flows was established based on typical per capita loadings, historical loadings, design service population and in conjunction with the data from the 2024 MSP. Design maximum month loadings were calculated by applying historical loading peaking factors to future contributions. The raw wastewater characteristic design basis is summarized in Table 7-5.

Effluent Criteria for the expanded Moose Creek WWTL

Effluent characteristics and criteria for the expansion were established through an assimilative capacity study undertaken by Hutchinson Environmental Scienced Ltd. (HESL).

To assess future discharge impacts, the ACS modeled eight different scenarios with varying durations of spring and fall discharges. Scenarios were assessed to ensure that effluent limits would not increase total annual pollutant loadings, in line MECP inputs during the pre-consultation meeting. Each scenario was evaluated for its impacts on creek flows for the discharge windows, and on the lagoon’s ability to store influent during non-discharge periods when considering projected flows for 2051.

The preferred scenario was determined to introduce a Fall discharge for 45 days (1 Nov – 15 Dec) and extended the exiting Spring Discharge to 90 days (1 Mar to 31 May), and was found to be the scenario that had the best balance of environmental protection and operational feasibility since it minimizes impacts on Moose Creek during low-flow fall periods while ensuring sufficient lagoon storage capacity. This scenario and ACS recommendations are detailed in the HESL ACS report as included in Appendix J.

Class EA Alternatives Evaluation Methodology

The Alternatives Evaluation Methodology consists of three major stages, as detailed below:

- Identification and Screening – Compile all viable alternatives, and narrow them down to feasible options for detailed evaluation. Process starts in Phase 2 of the Class EA.

- Detailed Evaluation – Assess short-listed alternatives using technical, environmental, socio-cultural, and economic criteria to compare and rank them based on benefits and feasibility.
- Selection and Recommendation – Recommend a preliminary preferred solution based on evaluation results and stakeholder inputs, subject to review by the public and agencies.

The same process of longlisting alternatives, shortlisting them and selecting a preferred alternative was performed for Phase 3, with the addition of more extensive "must-meet criteria" and a detailed list of scoring and weightage for the four main consideration categories of Technical & operational, Socio-Cultural, Natural Environment and Economic.

Class EA Alternatives Solutions

The MSP covered Phases 1 and 2 of the Class EA process, and evaluated a long-list of alternatives in Phase 2, covering all viable alternatives. Three alternatives were shortlisted, and on completion of the Phase 2 evaluation, "Alternative 4B-1: Treatment Optimization via Technology" was determined to be the preferred alternative (RVA, 2024).

the Phase 3 evaluation continued the evaluation process in conjunction with the MSP recommendations, by longlisting viable alternatives that could meet the criteria of Treatment Optimization via Technology as well as one additional process that showed preliminary feasibility. The Phase 3 long-list evaluation was carried out for the following technologies.

1. Submerged Attached Growth Reactor (SAGR)
2. Moving Bed Biofilm Reactor (MBBR)
3. In-Lagoon Media
4. Facultative Membrane Bioreactor (FMBR)

Based on the must-meet criteria, including the most recent planning considerations for the implementation timeline and grant funding, the non-feasible technologies were screened out. The SAGR and MBBR were shortlisted for further detailed evaluation.

Preferred design concept

Both the SAGR and MBBR were evaluated on the basis of a future ADF of 438 m3/d. Key considerations were the implementation and operational complexity, ability to treat peak flows, performance efficiency, footprint, ancillary requirements, impacts to surrounding environments (construction and operation), impacts to neighbouring properties (noise, odour, dust, etc.) and economic considerations.

In terms of Socio-Cultural and Natural Environment Considerations, both the SAGR and MBBR were observed to be comparable. Both alternatives offered a small area footprint and maximises utilisation of the existing lagoons for the facility expansion. The SAGR was found to require the least complex construction, while providing process resiliency for the plant with a high treatment capability. The SAGR alternative also demonstrated the lowest cost, lower operational and implementation complexity, and did not require the implementation of a solids separation unit, when compared to the MBBR. Hence, preferred design concept was the SAGR Retrofit, for implementation with the existing lagoons, with a twice-a-year discharge window.

The increased discharge window is vital to provide the required increased storage capacity for the existing lagoons and improving resilience to high flow events, without additional land acquisition or the construction of additional treatment lagoons.

The opinion of probable cost for preferred design concept totaled $7.6 M (excluding GST and escalation) as a Class 'D' probable cost (-20% to +30%) and will be refined further in detailed design.

Public consultation

Public consultation is one of the central principles of the Class EA process. Consultation aimed to inform and educate the public, Indigenous and First Nations, and gather feedback at all key stages of the project. The project team values public and stakeholder input, to enhance decision-making for the Class EA. A wide range of stakeholders were engaged in the Moose Creek WWTL Expansion Class EA, including residents, local associations, environmental agencies, provincial and federal authorities, and Indigenous communities. Agency consultation also included meetings with the MECP to discuss and receive inputs on the approach, study results, and discharge limits for the ACS.

The project contact list included a list of all stakeholders associated with the project, as well as all members of the public who wished to be included on project updates. The contact list was kept up to date throughout the course of the Class EA, based on all requests to be included or excluded. All individuals on the project list were contacted at key stages of the study to keep them informed.

Notices associated with this Class EA are as follows:

- A Notice of Study Commencement was issued 06th June 2025 primarily via email. Other channels such as newspaper postings, social media, hard copy mails were also utilised to inform stakeholders of the project commencement.
- On the completion of Phase 3, one Public Information Centre was held to inform stakeholders, present design alternatives and gather inputs. The PIC was held on 18th September, and was attended by approximately 17 people. Notice of PIC was issued on September 04th, 2025.
- A Notice of Study Completion has also been issued, to launch the 30-day review period and invite final public comments.

Potential Impacts and Mitigation Measures

Construction of the preferred design may cause temporary impacts like noise and dust, but these impacts are anticipated to be short-term and temporary in nature, and manageable with proper mitigation measures.
Strict safety standards and advance communication with nearby property owners are essential to minimize disruption and ensure compliance.

Receiving Water Quality & Source Water Protection

An assimilative capacity study set effluent limits for the Moose Creek WWTL expansion, considering low seasonal creek flows and MECP input.

Although the construction site avoids sensitive groundwater zones, its proximity to an Intake Protection Zone requires further groundwater protection measures during detailed design.

Disturbance to Natural Environment Features

Only one tree is near the construction zone and will be protected, with all work kept outside sensitive natural areas like Moose Creek and the municipal drain.

Indirect environmental impacts during construction will be minimized using best practices, and further protective measures will be defined in the detailed Natural Environment Assessment Report.

General Best Management Practices will be followed, such as :

- Maintaining required environmental setbacks
- Avoiding in-water work
- Providing required protections against contamination of the soil or groundwater or local watercourses (spill kits, liners, etc.).
- Ensuring all construction activities and areas of disturbance (including laydown areas) will be limited to areas that have been assessed through the necessary archaeological assessments, natural environment assessments, and site-specific geotechnical and hydrotechnical investigations

Social / Cultural Environment Impact Mitigation measures:

- Traffic is expected to remain unchanged during operations, with only a temporary increase during construction. Construction may also cause other short-term impacts like noise, dust, and vibration, but these are not expected to persist beyond the construction phase.
- Temporary noise and vibration impacts are expected during construction, especially from excavation and machinery, but levels for operations will remain at current levels. Noise impacts are anticipated to affect nearby properties only

during the construction phase and construction noise will be limited to daytime hours.

- Noise during operations will remain minimal, and blowers will be designed with appropriate noise control such as enclosures.
- Odours during operations are not expected to exceed the status quo and may in fact be better controlled due to the fully covered nature of the SAGR units.
- The preferred alternative occupies a small site footprint on-site and is expected to have minimal visual impacts, due to cover from the existing treeline and largely underground implementation of the SAGR units.

Implementation Plan

The project implementation will be as per the design basis confirmed in this Class EA, for a rated capacity of 438 m^3/d, with twice-a-year discharge windows and effluent objectives and limits as per the ACS study and MECP approval.

Key design constraints for the Moose Creek WWTL expansion that are to be considered for implementation are:

- Maintaining lagoon operations during construction.
- The project implementation is required to follow a strict timeline to meet HEWSF funding requirements, with design starting in Fall 2025 and construction completing by mid-2027.
- Due to projected exceedance of the lagoon storage capacity by 2028, the preferred solution needs to be implemented in the short-term, without delays or phasing.

Value engineering will be applied during preliminary design, especially for aeration systems and key equipment to refine costing.

Site specific study requirements such as archaeological assessments, natural environment assessments, and site-specific geotechnical and hydrotechnical investigations will need to be completed in the detailed design phase, and are required prior to the start of any construction activities on-site.

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List of abbreviations

ACS	Assimilative Capacity Study
ADF	Average Daily Flow
ANSI	Areas of national and scientific interest
BOD	Biochemical oxygen demand
cBOD	Carbonaceous biochemical oxygen demand
CCME	Canadian Council of Ministers of the Environment
CEPA	Canadian Environmental Protection Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CWA	Clean Water Act
DAF	Dissolved Air Flotation
DFO	Fisheries and Oceans Canada
DO	Dissolved Oxygen
EA	Environmental Assessment
EAA	Environmental Assessment Act
ECA	Environmental Compliance Approval
ESA	Endangered Species Act
ESR	Environmental Study Report
FMBR	Facultative Membrane Bioreactor
GFL	GFL Environmental Inc.
HESL	Hutchinson Environmental Scienced Ltd.
HVA	Highly Vulnerable Aquifer (areas)
I&I	Infiltration & inflow
LIO	Land Information Ontario
MBCA	Migratory Birds Convention Act
MBBR	Moving Bed Biofilm Reactor
MCEA	Municipal Class Environmental Assessment
MCM	Ministry of Citizenship and Multiculturalism

MEA	Municipal Engineer's Association
MECP	Ministry of the Environment, Conservation and Parks
MLSS	Mixed Liquor Suspended Solids
MNRF	Ministry of Natural Resources and Forestry
MSP	Master Servicing Plan
OP	Official Plan
OWES	Ontario Wetland Evaluation System
PDF	Peak Day Flow
PF	Peaking Factor
PIC	Public Information Center
PWQO	Provincial Water Quality Objectives
RVA	R.V. Anderson Associates Ltd.
SARA	Federal Species at Risk Act
SDG	(United Counties of) Stormont, Dundas and Glengarry
SGRA	Significant Groundwater Recharge Areas
SLR	Solids Loading Rate
SPA	Source protection area
SSWQO	Site Specific Water Quality Objective
SWH	Significant Wildlife Habitat
TAN	Total Ammoniacal Nitrogen
TKN	Total Kjedahl Nitrogen
TM	Technical Memorandum
TP	Total Phosphorous
TSS	Total Suspended Solids
WHPA	Wellhead Protection Areas
WSER	Wastewater System Effluent Regulations
WTP	Water Treatment Plant
WWTL	Wastewater Treatment Lagoon

1. Introduction

The Village of Moose Creek is located in the Township of North Stormont (the Township) is located approximately 70 km South-East of Ottawa and 9 km South-East of Casselman. Wastewater treatment servicing for the community is currently provided by the Moose Creek Wastewater Treatment Lagoon (WWTL) which is owned by the Township and operated by OCWA. The Moose Creek WWTL is located at 16810 8th Road and currently operates under the ECA approval no. 3-1555-91-936, dated January 19, 1993. The facility has a rated storage capacity of 110,360 m^3/y for annual storage, with an average day flow of 302 m^3/d.

A Master Servicing Plan Study (MSP) was previously undertaken for the Township in 2022, and was completed in December 2024 by R.V. Anderson Associates Ltd. (RVA). The MSP completed Phase 1 and Phase 2 of the Class EA process and included future waster and wastewater servicing evaluations for the communities of Finch, Crysler and Moose Creek.

The Township is expecting considerable planned growth in the next 25-30 years in the Village of Moose Creek. Additionally, the MSP findings determined that the existing WWTL lacks capacity. The WWTL is also experiencing difficulty in meet effluent limits and the limits for TSS and TP have been exceeded in recent years. This, coupled with population projections that forecast an 86% increase in the current population of Moose Creek for the year 2051, points to a need in increasing the treatment capacity of the existing Moose Creek WWTL.

The Township is initiating Phase 3 and Phase 4 of the Class EA process, and CIMA Canada Inc. (CIMA+) has been retained by the Township to prepare the Class EA of the Moose Creek Lagoon project.

1.1 Objectives of the Class EA Study

The objective of this Class EA Study is:

To evaluate detailed design concepts based on technical, environmental, social and economic considerations and arrive at the preferred wastewater treatment expansion path for the existing Moose Creek Wastewater Treatment Lagoons.

Other objectives of this Class EA include:

- To provide appropriate consultation with affected and interested parties, including participation of a broad range of stakeholders to allow for the sharing of ideas, education, testing of creative solutions and developing alternatives; and
- To document the study process in compliance with the Municipal Class EA planning process

1.2 Objectives of the Environmental Study Report

The Environmental Study Report (ESR) describes the stages, alterative design concepts and decision-making process followed during the Schedule C Class EA study for the Moose Creek WWTL, as well as the mitigative and environmental protective measures to protect the surroundings during the construction stage. Subsequent to the review period for the ESR, a notice indicating completion of the ESR will be issued to all members on the project contact list and the public. The project contact list which details the members of public, government review agencies, Indigenous communities and other stakeholders contacted through the public consultation is included in **Appendix A**.

The ESR details considerations during the extent of the planning process and describes the following:

- Various alternative design concepts considered for the Moose Creek WWTL,
- Evaluation methodology and criteria used to assess and compare these design concepts
- Anticipated potential impacts and proposed mitigation measures associated with these alternatives
- Rationale for the selection of the preferred solution and implementation plans
- Public and agency consultation records and feedback

1.3 Report Outline

This report was prepared to meet the requirements of the Ontario Municipal Engineer's Association (MEA) Municipal Class EA Planning Process (as amended in 2024). This report combines all phases of the planning process under one cover and includes steps that are considered essential for meeting the requirements of the Environmental Assessment Act (EAA). The report includes the following sections:

- **Section 1: Introduction** – Provides background information leading to the initiation of this study, provides the objectives for both the Class EA Study and the ESR, and describes the format of this report.
- **Section 2: Municipal Class Environmental Assessment Process** – Provides a summary description of the framework and activities to be completed to meet the Municipal Class EA process requirements.
- **Section 3: Wastewater Regulatory Framework** – Presents the Federal and Provincial legislations and policies related to the construction of the WWTL expansion.

- **Section 4: Public, Indigenous Communities, and Agency Consultation Process** – Describes the consultation program with the public, indigenous communities, and agencies, and input received.
- **Section 5: Study Area and Existing Conditions** – Presents an overview of the study area, including its social and environmental characteristics, and a review of the existing WWTL components.
- **Section 6: Background: Township's Water and Wastewater Master Plan** – Presents key details of the Water and Wastewater Master Plan undertaken by the Township in 2022-2024, covering Phase 1 and Phase 2 of the Municipal Class EA process. Also presents the updated Phase 1 – Problem and Opportunity Statement for the Class EA study.
- **Section 7: Design Basis for Class EA Study** – Presents the design basis for the Class EA study.
- **Section 8: Class EA Evaluation Methodology** – Presents the evaluation methodology, including evaluation criteria and scoring approach, used in this Class EA study as well as a summary of the MSP evaluation.
- **Section 9: Recap of Class EA Phase 2 – Alternative Solutions** – Presents a summary of the feasible alternative solutions developed for Phase 2, through the MSP.
- **Section 10: Class EA Phase 3 – Alternative Design Concepts** – Presents and evaluates the feasible alternative technologies and design concepts to further develop the preferred alternative identified in the MSP for Phase 2.
- **Section 11: Climate Change considerations** – Presents anticipated or potential considerations for the short-listed alternative technologies on the basis of climate change, based on historical data and predicted trends.
- **Section 12: Potential Impacts and Mitigation Measures** – Presents anticipated or potential adverse effects of the preferred alternative technologies and design concepts and mitigation measures proposed to reduce impacts.
- **Section 13: Implementation Plan** – Presents a proposed implementation plan for the preferred alternative technologies and design concepts.
- **Section 14: References** – Lists the key sources of information and reports that were used and consulted during the Class EA study process and in the preparation of the Class EA Report.

2. Municipal Class Environmental Assessment Process

This section describes the Environmental Assessment (EA) process, and the specific requirements associated with this Study.

2.1 Environmental Assessment Act

Ontario's Environmental Assessment Act, R.S.O. 1990 (henceforth referred to as the EAA) was passed in 1975 and proclaimed in 1976. The planning of major municipal projects or activities is subject to the EAA and requires the proponent to complete an EA, including an inventory and description of the existing environment in the area affected by the proposed activity (Ontario, 2025).

The EAA defines the environment broadly as:

- Air, land, or water
- Plant and animal life, including human life.
- The social, economic, and cultural conditions that influence the life of humans or a community.
- Any building, structure, machine or other device or thing made by humans.
- Any solid, liquid, gas, odour, heat, sound, vibration, or radiation resulting directly or indirectly from human activities, or
- Any part or combination of the foregoing and the interrelationships between any two or more of them

The purpose of the EA is the betterment of the people in the whole or any part of Ontario by providing for the protection, conservation, and wise management of the environment in the province in question.

As set out in the Environmental Assessment Act, an Environmental Assessment document must include the following:

1) A description of the purpose of the undertaking including:
    a) The undertaking,
    b) The alternative methods of carrying out the undertaking, and
    c) Alternatives to the undertaking.
2) A description of:
    a) The environment that would be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking or alternatives to the undertaking,

b) The effects that would be caused or that might reasonably be expected to be caused to the environment by the undertaking or alternatives to the undertaking,
c) The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the undertaking or alternatives to the undertaking, and
d) An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.
e) Principles of Environmental Planning

The Municipal Class Environmental Assessment sets a framework for a systemic, rational, and replicable environment planning process that is based on the following five key principles, as mentioned in Section A1 of the Municipal Class Environmental Assessment (MCEA) (MEA, 2024):

1) **Consultation with affected parties (technical agencies, the public, property owners, interest groups, other municipalities, and Indigenous Communities) –** Proponents should seek to involve potentially affected parties as early as possible. In fact, early consultation allows for improved understanding of environmental concerns.
2) **Consideration of a reasonable range of alternatives –** Alternatives should include functionally different situations to the proposed undertaking and alternative methods of implementing the preferred solution. The "Do Nothing" alternative must be considered.
3) **Identification and consideration of the effects of each alternative on all aspects of the environment –** This includes the natural, social, cultural, technical, and economic environments. The level of detail will vary depending on the stage of the study.
4) **Systematic evaluation of alternatives –** Planning process include distinct points where the alternatives are evaluated, and the net environment effects must be identified.
5) **Clear and complete documentation –** Should set out the approach and allow traceability of decision-making with respect to the project. The planning process must be documented in such a way that it may be repeated with similar results.

2.2 Municipal Class Environmental Assessment

The Municipal Class Environmental Assessment process was approved by the Minister of the Environment in 1987 to satisfy the requirements of the EAA for municipal projects having predictable and preventable impacts. The Class EA approach streamlines the planning and approvals process for municipal projects which have the following characteristics:

- Are recurring,
- Are similar in nature,
- Are limited in scale,
- Have a predictable range of environmental impacts, and
- Involve environmental impacts that can be mitigated.

The Moose Creek WWTL Class EA Study has been undertaken in accordance with the requirements of the Ontario Municipal Class Environmental Assessment (October 2000, as amended in 2024). The Class EA is an approved decision-making and planning process to ensure that potential effects of a project are identified and managed prior to implementation. It applies to public sector projects that have predictable and manageable environmental effects, including municipal water and wastewater projects.

This project follows the requirements of the 2024 MCEA, the most recent version at the time the project was initiated.

The Class EA process includes five (5) phases that must be followed to ensure that the best approach is identified to address a specific problem, requiring the evaluation of possible solutions, design concepts, and recommends the best approach based on a comprehensive evaluation of environmental effects and how to minimize them. As shown in Figure 2-1, the five phases include:

- **Phase 1:** Problem Definition
- **Phase 2:** Alternative Solutions
- **Phase 3:** Alternative Design Concepts for the Preferred Solution
- **Phase 4:** Environmental Study Report
- **Phase 5:** Implementation

Public and agency consultation is an important part of the Class EA planning process. Gaining input from individuals and groups can help identify project concerns early, and to find ways to address concerns wherever possible. Public consultation is carried out at key stages of the Class EA process to allow time to review and provide input related to the project.

Projects subject to the Class EA process are classified into three (3) possible “schedules” (or categories), depending on the degree of expected impacts (MEA, 2024):

- **Exempt Projects:** Primarily includes projects that were previously classified as Schedule A and A+. These projects generally include rehabilitation, operational and maintenance, minor reconstruction, etc. The environmental effects of these projects are minimal and thus, they are exempt from the requirements of the EAA.
- **Eligible for Screening to Exempt:** These projects are those that may be eligible for exemption, however, a screening process is required to ascertain this. Projects Proponents may proceed with the screening process outlined in the MCEA to determine their eligibility for an exemption, or they may proceed with a Schedule B or C process.
- **Schedule B:** These projects require screening of alternative solutions based on their environmental impacts. Phases 1 and 2 must be completed and are typically presented in a report with a Notice of Completion from the project proponent, followed by a 30-day public review period. If no significant impacts are identified and there are no requests for an Order by the Minister under Section 16 related to Aboriginal or Treaty rights, then the Schedule B projects are approved and may proceed to Phase 5.
- **Schedule C:** These projects typically have greater potential to impact the environment and must complete all five phases of the Class EA planning process. In addition to Phases 1 and 2, Phase 3 involves the assessment of alternative solutions followed by a public consultation of the preferred design concept. Phase 4 typically entails the preparation of the Environment Study Report (ESR) to be filed for public review. As long as no significant impacts are identified and no Section 16 Order related to Aboriginal or Treaty rights is received from the Minister, then Schedule C projects are approved and proceed to Phase 5.

2.3 The Moose Creek WWTL Class Environmental Assessment Process

The planning and development of preferred design concepts for the Moose Creek WWTL expansion has been conducted as a Schedule C undertaking under the Municipal Class EA process, building on Phase 1 (Identify the Problem) and Phase 2 (Identify and Assess Alternative Solutions) that were carried out in the 2024 MSP. Phase 3 (Identification and Assessment of Alternative Methods/Design Concepts and Selection of Preferred Alternative) has been carried out for this Class EA Study, in line with the Schedule C requirements. Review agencies and the public were regularly consulted at several points in this project to solicit input and comments. This document comprises Phase 4 of the Class EA process (completion of an ESR). The ESR will be placed on the public record for at least 30 calendar days, for comment by the public. Notification to the public and the agencies will be through the issuance of a Notice of Completion.

2.4 Information on Section 16 Order Requests

Public and agency consultation are integral to the Class EA planning process, with minimum consultation requirements established depending on the project's Class EA Schedule classification.

The Minister of the Environment, Conservation and Parks (MECP) has the authority and discretion to make an Order under Section 16 of the Environmental Assessment Act. A Section 16 order may require that the proponent of a project going through a Class EA process (Ontario, 2021):

1) Submit an application for approval of the project before they proceed; or,
2) Meet further conditions in addition to the conditions in the Class EA.

The public may request the Minister to make a Section 16(6) Order if:

1) They have outstanding concerns that a project going through a Class EA process may have a potential adverse impact on constitutionally protected Aboriginal and treaty rights; and,
2) They believe that an Order may prevent, mitigate, or remedy this impact.

If the public wants to request a Section 16 Order for a project, on the grounds that an Order may prevent, mitigate or remedy potential adverse impacts on constitutionally protected, Aboriginal and treaty rights, this request must be made before the public comment period is complete. Additional information on how to request an Order can be found under the following link:

https://www.ontario.ca/page/class-environmental-assessments-section-16-order

Section 16 Order requests must be sent to the Minister of Environment, Conservation and Parks and the Director of Environmental Assessment Branch, and can be submitted by mail, email, fax, or hand delivered to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca;

and,

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

2.4.1 Other comments and concerns

Interested persons may provide written comments to the project team, within the established comment period. Other comments and concerns about the proposed works related to the preferred recommended design concept or the Class EA study should be dealt directly with the Township.

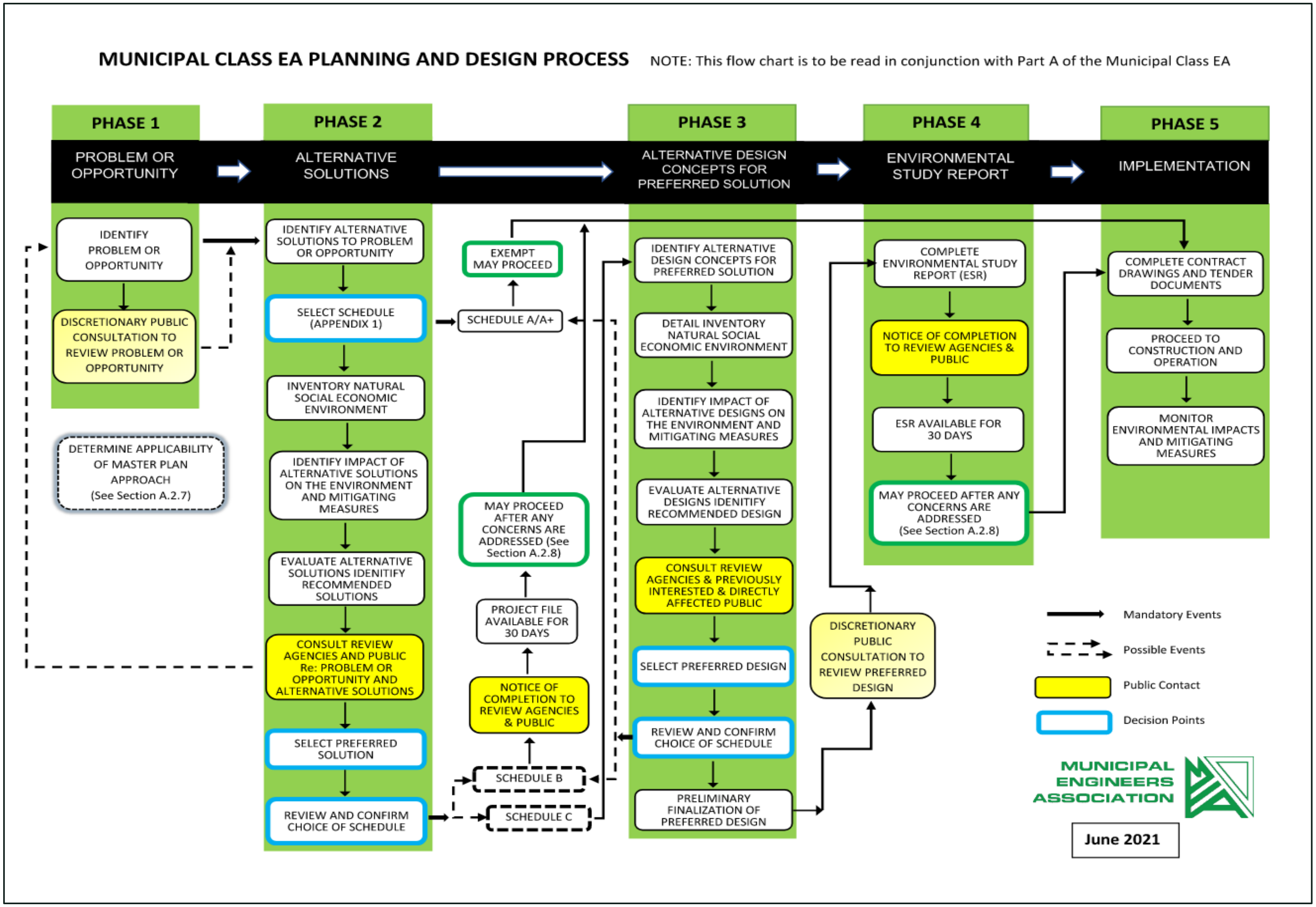

Figure 2-1: Municipal Class EA Planning and design process (Source: (MEA, 2024))

3. Wastewater Regulatory Framework

3.1 Federal Legislation and Policy

3.1.1 The Canadian Environmental Protection Act (CEPA)

The Canadian Environmental Protection Act (CEPA) was established in September of 1999 and provides the Government of Canada the power to protect the environment and human health while contributing to sustainable development. The CEPA does not directly apply to municipal wastewater treatment but helps advise and direct provincial policies. For example, it has supported stricter wastewater effluent ammonia limits for some municipal wastewater treatment facilities through its Guideline for the Release of Ammonia Dissolved in Water Found in Wastewater Effluents, released in 2004.

3.1.2 Canadian Council of Ministers of the Environment (CCME) Guidelines

The CCME was established in 1964, and is composed of environmental ministers from the federal, provincial, and territorial governments. The CCME supports evidence-based environmental policy making by researching, reporting, and developing guidelines and standards.

3.1.2.1 Canada-wide Strategy for the Management of Municipal Wastewater Effluent

The *Canada-wide Strategy for the Management of Municipal Wastewater Effluent* was developed in 2019 by the CCME. The strategy sets out a framework that addresses issues related to governance, wastewater facility performance, effluent quality and quantity and its associated risk and economic considerations in a way that provides consistency and clarity to the wastewater sector across Canada.

The Strategy requires that all facilities achieve minimum National Performance Standards and develop and manage site-specific Effluent Discharge Objectives. The Strategy also outlines risk management activities to be implemented to reduce the risks associated with combined and sanitary sewer overflows. The Strategy requires, among other elements, that overflow frequencies for sanitary sewers did not increase due to development or redevelopment. The same applies for combined sewers, unless occurring as part of an approved combined sewer overflow management plan. Neither should occur during dry weather, except during spring thaw and emergencies. Source control of pollutants is recommended and monitoring and reporting on effluent quality is required.

3.1.2.2 Wastewater Systems Effluent Regulations

The Wastewater System Effluent Regulations (WSER), developed under the Fisheries Act, issued in 2012 and amended in 2024, is the primary instrument that Environment Canada uses to implement the CCME Canada-wide Strategy for the Management of Municipal Wastewater Effluent. WSER governs the final discharge point of the wastewater effluent from a facility that is designed to collect an average day volume of influent of 100 m^3/d or more. The regulations outline the monthly concentration limits for the discharge of effluent to a waterbody and minimum requirements for wastewater effluent sampling. This WSER is used as a foundation for wastewater regulations set out by the province of Ontario.

3.1.3 Fisheries Act

The Fisheries Act, enacted in 1985, is a federal legislation for the protection of fish habitat from biological, physical, or chemical alterations that are harmful and/or destructive. Fisheries and Oceans Canada (DFO), in conjunction with various other agencies are responsible for the enforcement and management of fisheries resources. The following sections of the Act are relevant to this Class EA Study regarding fish and fish habitat protection and pollution prevention:

- Section 35(1): No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery.
- Section 36(3): No person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

3.1.4 Migratory Bird Convention Act

The Migratory Birds Convention Act (MBCA) was established in 1917 and amended in 1994 and more recently in 2017, to protect migratory birds, their eggs, and their nests. The MBCA was created to implement the Migratory Birds Convention between Canada and the United States.

The Act, administered by Environment Canada, lists protected families and subfamilies of migratory birds, and lays out legislation surrounding activities, such as construction, that may impact migratory birds or nests, including when and where activities may occur.

3.1.5 Species at Risk

The Species at Risk Act (SARA), established in 2002 and amended in 2025, administered by Environment Canada, focuses on restoring and maintaining populations of species that are at risk of extinction due to human activity such as habitat destruction, hunting, introduction of competing species, or other anthropogenic causes.

Species are designated at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) by using biological information on a species deemed to be in danger. The COSEWIC reviews research information on population and habitat status, trends and threats and applies assessment criteria based on international standards. Once a species is part of the List of Wildlife Species at Risk, it benefits from legal protection afforded and the mandatory recovery planning required under the Act.

If a species listed is found within the study area, further effort and consultation with Environment Canada will be required to ensure that the habitat is not negatively impacted.

3.2 Provincial Legislation and Policy

All municipalities in Ontario must operate within the administrative, legislative, and financial framework established by the federal government. The following sections summarize key provincial initiatives relevant to this Class EA Study.

3.2.1 Endangered Species Act

The Endangered Species Act (ESA) was originally written in 1971 and amended in 2025. Like the Federal Species at Risk Act (SARA), the ESA aims to provide protection to animal species that are at risk of extinction or extirpation from Ontario.

Species thought to be at risk in Ontario are initially determined by the Committee on the Status of Species at Risk in Ontario (COSSARO), and if approved by the provincial Ministry of Natural Resources and Forestry (MNRF), these species are included in the provincial list of endangered and threatened species in compliance with the ESA. The ESA provides habitat protection to all species listed as threatened, endangered, or extirpated.

The ESA provides guidance on determining whether anthropogenic activities, such as construction, could impact regulated species and considers biology and behaviour of the species, details of the activity, and how the activity may affect the species' ability to carry out its life processes.

Amendments to ESA were passed on 05 June 2025 as part of Bill 5 and while not yet in effect, the ESA is set to be replaced with the Species Conservation Act, 2025 (SCA).

3.2.2 Clean Water Act

The Clean Water Act (CWA), adopted in 2006, establishes watershed-based processes and a multi-barrier approach dedicated to protecting sources of water that have been identified by a Township or Municipality as being future or current sources of drinking water for a community.

The Drinking Water Source Protection Program was established under the CWA. The program resulted in the development of local Source Protection Plans for Source Protected Areas. Conservation Authorities are responsible for the development of the Drinking Water Source Protection Program and its Plans, which identifies actions and locally developed policies to protect existing and future sources of municipal residential drinking water systems.

The source protection committee recognizes four types of vulnerable areas within source protection areas (SPAs) including:

- Wellhead Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge areas
- Intake Protection Zones

Relevant Source Water Protection Plans (under separate cover) must be reviewed when establishing a new or increasing an existing wastewater effluent discharge to ensure that there is no adverse effect to current or potential drinking water sources.

3.2.3 Environmental Protection Act & Ontario Water Resources Act

The Environmental Protection Act (EPA), established in 1999, is the primary pollution control legislation in Ontario and is used interchangeably with the Water Resources Act described below to protect air and water quality in Ontario. The EPA prohibits the discharge of contaminants into the environment that are likely to cause adverse effects, by establishing limits for air emissions and wastewater effluent that must not be exceeded. Environmental Compliance Approvals (ECAs) are issued under this Act. ECAs sets out rules of operation of a WWTP and Water Treatment Plant (WTP) such as effluent limits that are intended to protect the natural environment. This Act also controls the removal, transport, and disposal of excess soils, if they are deemed to be contaminated.

The Ontario Water Resources Act focuses on the protection of groundwater and surface water in Ontario. The Act regulates the approval, construction, and operation of wastewater treatment facilities, including ensuring that effluent discharges to receiving waters meet Provincial Water Quality Objectives (PWQOs). Permits-to-take-water from the ground or surface water sources of more than 50,000 liters of water per day are also regulated under the Water Resources Act (NBMCA, 2022).

3.2.3.1 Water Management – Policies, Guidelines, PWQO

To support municipalities in meeting the Environmental Protection and Ontario Water Resources Act, the Ministry of Environment, Conservation and Parks (MECP) has developed water management guidelines. The two most relevant to this Class EA study are described below:

MECP Procedure F-5-1

Procedure F-5-1 outlines treatment requirements for municipal and private sewage treatment works discharging to surface waters. Effluent requirements are established on a case-by-case basis considering the characteristics of the receiving water body. All sewage treatment works shall provide secondary treatment or equivalent as the “normal” level of treatment unless individual receiving water assessment studies indicate the need for higher levels of treatment. Existing works not complying with the guideline are required to upgrade as soon as possible.

MECP Procedure B-1-5

Procedure B-1-5 establishes receiving-water based effluent requirements for point source discharges to surface waterbodies. The procedure specifies the use of Provincial Water Quality Objectives (PWQO) as a starting point in determining effluent criteria to be enforced within an ECA for new and expanded effluent discharges. This procedure states that by incorporating receiving water quality-based limits into enforceable control documents such as the ECA, the guidelines for water quality management become legally enforced. Violations of an effluent limit typically incur a requirement for the discharger to undertake a study and report on the causes and impacts of the violations. Surface waters in Ontario can be subject to the requirements of five Policies depending on their water quality conditions:

- **Policy 1** applies to water bodies with quality that is better than PWQO and specifies that water quality must be maintained at or above the PWQO.
- **Policy 2** applies to water bodies with quality that does not currently meet PWQO and shall not be further degraded. Policy 2 states that “all practical measures shall be taken to upgrade the water quality to the Objectives.”
- **Policies 3 and 4** prohibit the release of banned hazardous substances and to minimize the release of no-hazardous substances, respectively.

- **Policy 5** addresses mixing zone effects; the mixing zone is defined as an area where the receiving water quality is degraded at the point of discharge and may hinder beneficial use of the water body. Policy 5 prescribes that mixing zones should be as small as possible to limit effects on beneficial use and shall not be used in lieu of reasonable and practical treatment.

4. Public, Indigenous Communities, and Agency Consultation Process

Public consultation is an integral component of the Class EA study process. Successful public consultation programs build and maintain community trust and credibility, improve project decision-making, and identify community issues far enough in advance so that they can be effectively addressed. For the purposes of the public and agency consultation program, a notice of commencement was issued, and one (1) Public Information Centre (PICs) was held on completion of Phase 3 and of the Class EA process, respectively.

This section provides a summary of public and agency consultation activities that was undertaken at key stages of the Moose Creek WWTL Expansion Project Class EA. Letters, comments and feedback received throughout the course of the Class EA studies, from review agencies and the public related to the Moose Creek WWTL Class are described in the following sections

For further reference, detailed information regarding public and agency consultation can be found in **Appendix A** to **Appendix E**.

4.1 Goals and Objectives of Public Consultation

The project team firmly believes that the quality of decisions regarding the evaluation and identification of preferred alternatives for the Moose Creek WWTL Expansion Class EA would be improved by soliciting and acting on input from the public and stakeholders.

Specifically, the objectives of public consultation in this project were to:

- Inform the public, stakeholders, and Indigenous and First Nations of the project,
- Offer educational information regarding the project,
- Obtain input on project components at key decision-making points, and
- Meet or exceed the consultation requirements of the Class EA process.

4.2 Public Consultation, Communication Strategies, and Campaigns

The following outlines the specific consultation activities undertaken to support the Moose Creek WWTL Expansion Project Class EA.

4.2.1 Stakeholders

A number of primary stakeholders were considered to have an interest in the Moose Creek WWTL Expansion Project Class EA, as outlined below:

- Residents: includes all Moose Creek area residents, comprising those currently serviced by existing municipal wastewater system.
- Resident Associations
- Environmental stakeholders: such as the MECP
- Pre-consultation and consultation meetings with the MECP have taken place throughout the course of the study to discuss the proposed scope of work, preliminary results of the Assimilative Capacity Study, and proposed effluent discharge limits.
- Review agencies such as Provincial Ministries and Agencies, Federal Departments and Agencies, local area municipalities, district and planning boards, emergency services (fire, police, ambulance), school boards, transit, utilities (natural gas, cable, telephone, etc.). Specific Agencies identified in the Master Project Contact List are included in **Appendix A**.
  - Indigenous and First Nations groups.
  - Local Groups and Association
  - Other local Agencies, organisations and stakeholders

All project notices were sent to the following Indigenous Communities, as identified by the MECP:

- Algonquins of Ontario (AOO)
- Algonquins of Pikwàkanagàn First Nation
- Mohawks of Akwesasne First Nation
- Huron-Wendat First Nation

4.2.2 Project Contact List

As mentioned above, all Notices were emailed to all members on the Project Contact List, which has been provided in **Appendix A**.

The project contact list is a key tool for public consultation and is typically compiled at the initiation of a project to identify and inform all relevant stakeholders. The project contact list was kept up to date throughout the course of the Class EA, based on all requests to be included or excluded. All individuals on the project list were contacted at the appropriate stages of the study to inform them of meetings and events.

Key stakeholders are listed below:

1) Residents and members of the public includes all Moose Creek area residents, comprising those currently serviced by existing municipal wastewater system
2) Resident Associations, Local Groups and Association
3) Environmental and Review agencies such as Federal and Provincial Ministries and Agencies, Federal Departments and Agencies. Local area municipalities, district and planning boards, emergency services (fire, police, ambulance), school boards, transit, utilities (natural gas, cable, telephone, etc.) were also included. .
4) Indigenous and First Nations Communities

4.2.3 Public Notification

Notices are an essential component of public consultation and are utilised to inform and invite the public, First Nation Communities, Review Agencies and other stakeholders to provide inputs and their perspectives.

All Notices were emailed to all members on the Project Contact List (shown in **Appendix A**). Hard copies were also mailed to First Nation Communities. Each Notice was also included in the local newspaper for two consecutive weeks, in addition to postings on the Township's website.

Details on key information for the project, locations of the PIC, Township's project website, contact information for the Project Team and instructions on requesting to be placed on the project contact list or providing inputs were outlined in these Notices.

The Class EA includes the issuance of the following notices, and a copy of all issued Notices to date are provided in **Appendix B**.

- **Notice of Study Commencement:** A Notice of Study Commencement was developed to briefly outline the purpose and justification for the Study to the ministries, organizations, agencies, and other stakeholders that may be affected and/or interested in the Moose Creek WWTL Upgrades. The notice was placed on the Township's webpage and sent to all in the project mailing list on 06th June 2025. The mailing list and Notice and can be found in **Appendix A** and **Appendix B** respectively. The notice was also issued in the local newspaper, published the week of June 05th and June 12th.
- **One public information center (PIC)** was held to obtain public input for the Class EA process. The PIC was held on 18th September 2025 at the Moose Creek Recreation Centre, and was attended by approximately 17 people.

  - The PIC was held on the completion of Phase 3. The purpose of the PIC was to present the alternative design concepts considered for the expansion of the Moose Creek WWTL, the results of the Phase 3 evaluation process, the preliminary preferred design concept, and the potential anticipated impacts and mitigation measures for the preliminary preferred design concept.
  - All relevant agencies and members of the public were invited. The Notice of PIC was issued via email to the stakeholders identified at the onset of the project on September 04th, 2025, as well as additional stakeholders and members of the public who requested future notification through the various project communication platforms. The notice was also issued in the local newspaper, published the week of September 11th and September 18th.
- **Notice of Study Completion:** A Notice of Study Completion will be advertised to the public of the commencement of the 30-day review period and the opportunities to provide additional comments before obtaining approval. A copy of the Notice will be sent out to all required agencies, local associations and interested residents.

4.2.4 Public Comments

At the PIC, comment sheets were distributed for attendees to provide feedback. No comments were received on the completion of the PIC via email or through hard-copy mail ins. A copy of the attendance sign-in sheet for the PIC has been provided in **Appendix C**, as part of the public consultation compilation for this Class EA.

4.3 Consultation with Utilities and Local Organisations

4.3.1 Consultation with Hydro One

In response to the Notice of commencement of the project, a response from Hydro One response was received on 19 June 2025, which noted the presence of Hydro One assets within the project study area, along with a request for continued consultation once areas for anticipated construction are better developed.

Accordingly, once sufficient progress was made and at the completion of Phase 3 of the Class EA, Hydro One was notified via email, along with a reference map of the construction area and areas of potential disturbance (such as laydown areas) within the study area for consideration and comments. A copy of the correspondence has been provided in **Appendix C**.

4.3.2 Consultation with GFL

GFL Environmental Inc. (GFL) was also engaged early on in the project. The GFL Eastern Ontario Waste Handling Facility (EOWHF) is located approximately 4.5 km North of the Project Study Area and has recently undertaken the EA process for the EOWHF expansion. Owing to the proximity to the study area, and in light of the extensive surface water quality data that was compiled by GFL through sampling and monitoring for the EOWHF expansion EA process, the project team requested access to any relevant surface water data that was eligible to be shared. GFL extended the courtesy of sharing historical monitoring and flow data for Moose Creek for 2019-Apr 2025. A copy of the correspondence has also been provided in **Appendix C**.

4.4 Agency Consultation

4.4.1 Consultation with the Ministry of the Environment, Conservation and Parks

At the commencement of the project, the Ministry of the Environment, Conservation and Parks (MECP) was notified directly through filing of the Notice of Commencement. In response, the MECP identified key indigenous communities in the study area as well as important cultural and archaeological land use considerations, which has been provided in **Appendix D**.

A pre-consultation meeting was held with the MECP on July 08th, 2025 to introduce the project and receive input from the MECP on the requirements of the Assimilative Capacity Study (ACS) for the Class EA. Meeting minutes can be found in **Appendix D**.

Comments were received from the MECP regarding the ACS once submitted to the MECP. An associated consultation meeting was held to address these comments. The MECP Comments on the ACS and meeting summary are provided in **Appendix D**.

4.4.2 Ontario Ministry of Citizenship and Multiculturalism

Email correspondence was received from the Ontario Ministry of Citizenship and Multiculturalism (MCM) in response to the Project's Notice of Commencement was received on July 07th , 2025 and has been provided in **Appendix D**.

A Stage 1 Archaeological Assessment was prepared in association with the Moose Creek WWTL Expansion Project Class EA process. The Stage 1 assessment was completed in July 2025 and is detailed in Section 5.5.1.

The findings and recommendations of the Archaeological assessments were noted and incorporated in the development and evaluation of the Moose Creek WWTL expansion design concepts, as described in subsequent sections of this report.

Stage 02 Archaeological Assessment has been initiated for Late Fall 2025. All associated findings and recommendations will be incorporated in the detailed design stage.

With regard to Cultural Heritage, no other resources were identified in the project study area. Cultural heritage considerations are detailed in Section 5.5.2. The MCM requested that a copy of the Form for *Criteria for Evaluating Potential for built Heritage Resources and Cultural Heritage Landscapes* be filled for this Class EA and included with the ESR. Accordingly, a copy of the Form has been provided in **Appendix D**.

4.4.3 South Nation Conservation Authority

South Nation Conservation (SNC) Authority was notified of Notice of Commencement and the PIC. In response to the Notice of Commencement, a response was received from the SNC for continued consultation, and the project team has continued all key notifications to the SNC as requested. In response to the Notice of PIC, the SNC requested an electronic copy of the PIC Boards, which was provided by the Project Team. No other comments have been received to date. Copies of the correspondence are provided in **Appendix D**.

All necessary permitting requirements from the SNC will be evaluated in detail in the detailed design stage and will be followed prior to construction start.

4.4.4 Other Agencies

Early on in the Class EA Study, standard response letters or emails were received from some of the provincial and federal review agencies, including Ministry of Natural Resource, Ministry of Transport etc. in response to the Notice of Study Commencement and PIC No.1.

Copies of the correspondence are included in **Appendix D**. General comments from these agencies included the need for the proponent to determine the applicability of their regulations or their involvement in the Moose Creek WWTL Expansion Project Class EA based on the location of the project and the potential features to be impacted as a result of the project. No other comments or additional feedback was received from these agencies.

4.5 Indigenous Community Consultation and Engagement

Based on a series of Supreme Court rulings over the last decade, First Nations, indigenous communities, and groups are increasingly being consulted to a greater degree on development projects that may impact their traditional territory and the resources upon which their cultures and livelihoods depend. The following Indigenous Communities and groups have been consulted during this Class EA study to determine their interest and desired level of communication:

- Algonquins of Ontario
- Algonquins of Pikwakanagan First Nation
- Mohawks Council of Akwesasne
- Huron-Wendat First Nation

Public notices and invitations to the project PICs were distributed to the groups noted above via email and by mail, to all the above First Nation Communities to request input/feedback on the project.

While the Stage 2 Archaeological Assessment will be completed in the detailed design phase, the assessment process has been initiated during the course of this Class EA. All First Nation communities in the project contact list were also informed of the Stage 2 Archaeological Assessment and were invited to participate and provide their inputs and perspectives. As of the time of publication of this report, two First Nation communities (Algonquins of Ontario and Algonquins of Pikwakanagan First Nation) have confirmed attendance of their representatives for the Stage 2 Test pit survey on-site, while a third First Nation community (Huron-Wendat First Nation) has requested a copy of the Stage 2 report on completion of the assessment.

A log documenting the consultation activities that took place with First Nations and Indigenous Communities and groups as part of the Moose Creek WWTL Expansion Project Class EA is included in **Appendix E**.

5. Study Area and Existing Conditions

5.1 Study Area Location and Site Features

The Study Area for this Class EA Study includes the existing WWTL and an adjacent plot area, South-Eastward of the WWTL property. The extent of the study area is presented in Figure 5-1.

Figure 5-1: Moose Creek WWTL Class EA Study Area

5.2 Existing Wastewater Treatment Plant

The existing Moose Creek WWTL is located at 16810 8th Road and was constructed in 1994, and currently operates under the ECA approval no. 3-1555-91-936, dated January 19, 1993. The facility has a rated storage capacity of 110,360 m^3/y for annual storage, with an average day flow of 302 m^3/d.

The final effluent is discharged to Moose Creek, which flows northward along the existing property's eastern boundary. As per the current ECA, the facility discharges effluent once a year, as an annual discharge. The discharge window is between March 15th to April 30th, with a maximum discharge flow rate of 11,040 m^3/d.

The Moose Creek WWTL consists of the following components:

- Two facultative aerated lagoon cells with a total surface area of 5.2 ha
- Influent distribution chamber, with three inner chambers
- Aeration building with two positive displacement blowers
- Alum feed and metering building two positive displacement mild chemical diaphragm pumps
- Discharge and Metering chamber
- Effluent discharge outfall

A site layout depicting the existing WWTL infrastructure is presented in Figure 5-2.

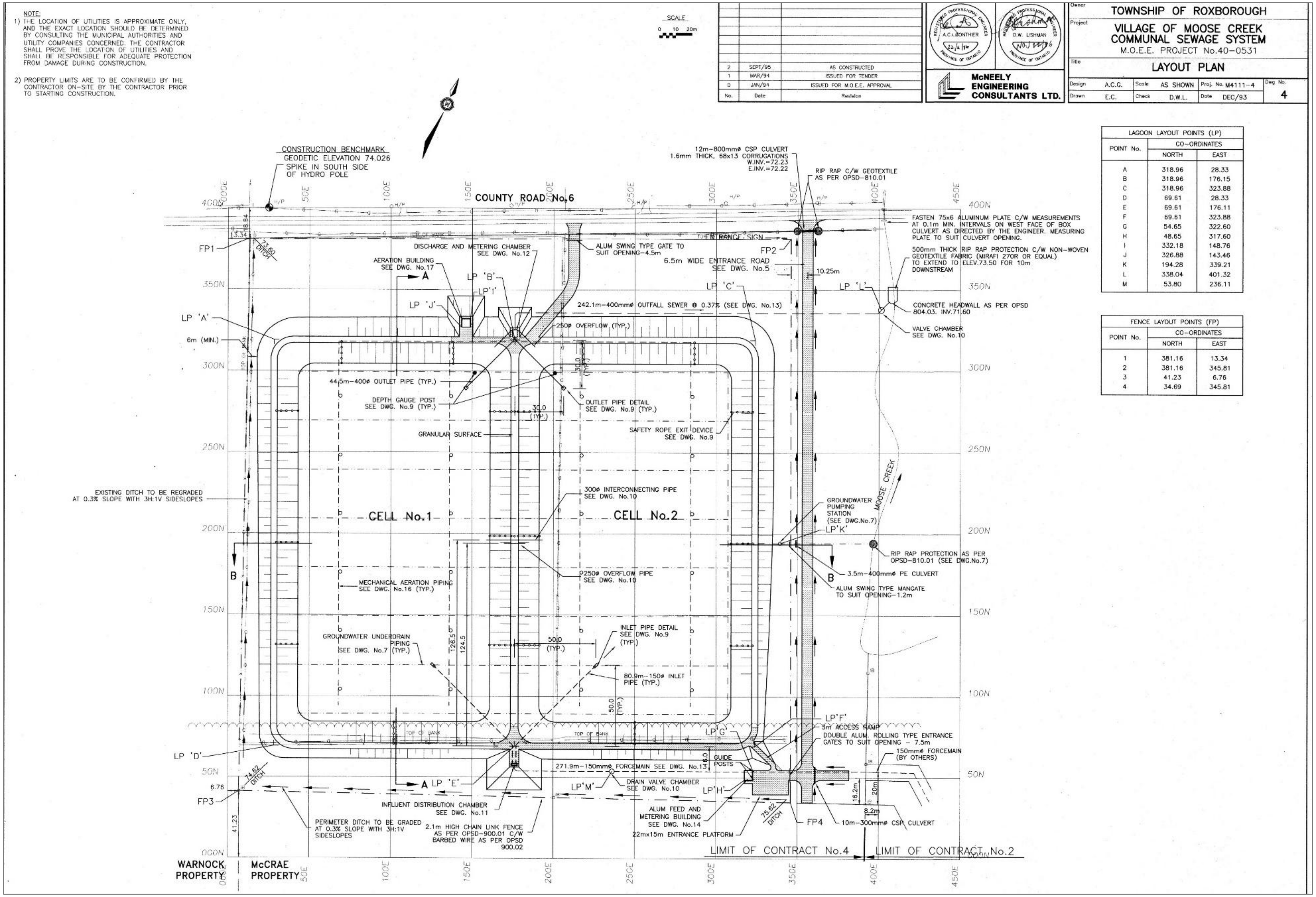

Figure 5-2 Site layout of the existing Moose Creek WWTL (McNeely Engineering Consultants Ltd., 1995)

5.3 Source Water Protection

The Study area is located approximately 1km to the West of the village of Moose Creek. The drinking water intake wells for the Village are located approximately 2.5 km to the South-East of the Study Area. The source water protection in the locality was verified using the South Nation Conservation's Map geoportal (SNC, 2025) and it was found that the Study Area is located outside the boundaries of Source Water Protection Zones in the region. The source water plan for the Raisin Region Conservation Authority - South Nation Conservation Authority was also reviewed and the same was confirmed.

5.4 Existing Environmental Conditions

Several studies were conducted in order to support this Class EA from the context of the ACS, Natural Environment, Archaeological, Geotechnical and Hydro-geotechnical., in line with the requirements of the Class EA Process.

5.4.1 Natural Environment

Natural Environment studies are vital to identify, evaluate and protect natural heritage features. A Natural Environment Desktop Screening study was undertaken for this Class EA, and the resulting Natural Heritage Background Report (NHBR) has been provided in full in **Appendix F**.

The NHBR presents the findings of the screening for natural features and the evaluation of significance of these features. Site investigations for the adjacent plot of land, which is heavily forested, are ongoing at the time of publishing this report as the Natural Environment Study was initiated at the project onset, when both plots of land were under consideration for the Moose Creek WWTL expansion.

Since it has been determined that the preferred alternative will exist on a small portion of the existing site and will not require any disturbance to the adjacent plot of land, the NHBR in **Appendix F** focuses on the natural environment features surrounding the area of potential disturbance from construction on the existing site, along with recommendations on preliminary mitigation measures.

The NHBR will be updated in the detailed design stage in Late Fall 2025, once site investigations on the adjacent site are completed, along with a review of the alternative(s) to meet MCEA requirements, and an assessment of the preferred alternative's impacts on the natural features and a more detailed list of avoidance and mitigation measures, as a Natural Environment Assessment report (NEAR).

To date the following site investigations have been completed within the Property in 2025:

- Vegetation community descriptions and wetland delineations
- Cavity tree survey and snag classification of the single tree situated near the Work Area
- Fish habitat assessment of the ditch
- Breeding Bird Surveys
- Species at risk flora survey

Site investigations and background review noted that the following features are absent on the Property and the adjacent lands:

- Areas of national and scientific interest (ANSIs)
- Provincially significant wetlands
- Locally significant wetlands
- Significant Valleylands

Features identified as present, potentially present, or assumed present, and these are

- Habitat of endangered and/or threatened species
- Significant woodland
- Unevaluated wetlands
- Significant Wildlife Habitat and
- Fish habitat / watercourses

Details are summarised below for each natural heritage feature.

5.4.2 Terrestrial Environment

The NHBR noted that a majority of the Property is likely a cultural meadow and a single tree is present along the northern fence line. The existing property is almost rectangular in shape and the other three boundaries of the property, and the adjacent lands appear to be a mix mixed treed swamp (primarily to the south) and deciduous forest (east and west). The work area including the construction area, laydown, etc. was noted to be entirely cultural meadow with no woody vegetation.

The woodlands extending into the property and adjacent lands were identified as significant on the OP Schedule B2. These woodlands are situated to the east of the existing access road and are more than 50 m from the Work Area.

There were no identified Significant Wildlife Habitat (SWH) observed through provincial databases or in the OP Schedules for this area. However, OP Section 5.5.5 indicates that SWH shall be assessed on a case-by-case basis. Based on a desktop review of habitats that may be present, potential candidate habitats are noted in the table below. This will be fully assessed in the NEAR using the habitat description data collected in the NBHR.

Regarding the lone tree to the north, (with potential for bat habitat), the NHBR recommended no direct impacts occur that a setback from nearby trees be established to protect their roots, where feasible. The work area does not include any tree disturbances and recommended setbacks will be maintained for this tree.

Wetlands

The NBHR noted two unevaluated wetlands identified by Land Information Ontario (LIO), a small riverine wetland, and a larger wetland to the south of the existing lagoons. As per the Ontario Wetland Evaluation System (OWES) guidelines noted above, the first, at 0.6 ha, is much too small to trigger evaluation. Further it is situated on the opposite side of the existing access road. The second, does meet the minimum size requirement to trigger evaluation. This wetland appears to be a mixed treed swamp and is >200 m and to the south of the existing lagoons. As such, it is outside of the adjacent lands for the Work Area.

Fish and Fish Habitat

With regard to fish habitat / watercourses, the report noted the proximity of Moose Creek at 50m from the areas of potential construction disturbances. Since typical minimum setbacks for work near waterbodies are 30m, there is sufficient setback in this regard. A municipal ditch to the north of the site is at 22m from areas of potential construction disturbances. Typical setbacks for these are at 15m, hence, sufficient distances are maintained. In line with the NHBR recommendations, efforts will be made to avoid indirect impacts during construction by ensuring that there is no impact to the water quality or quantity reaching the ditch. To note, this project does not require any in-water works. Hence, no work will be carried out in the municipal ditch or in Moose Creek.

5.4.3 Species at Risk Screening

A list of potential endangered and threatened species was compiled, including bird and fish species. A list of 17 endangered or threatened species were identified as potentially occurring, .and is provided in the NHBR in **Appendix F.**

A detailed evaluation of the project’s potential to interact with these species or their habitat will be further reviewed in the NEAR.

Similarly, the Significant Woodland is significant based on the OP Schedules. It is also >50 m and on the other side of the existing access road from the proposed Work Area.

5.4.4 Geotechnical and hydro-geotechnical Study

A Desktop Hydrogeological and Geotechnical Assessment was undertaken by CIMA+ in conjunction with the Class EA. The study was aimed at providing at preliminary description of baseline hydrogeological and geotechnical site conditions. Existing information and previous investigations in the area were utilised to evaluate the potential for significant impacts on constructability or to soil and groundwater conditions on-Site and in the surrounding area, within 500m of the project study area.

With regard to geotechnical considerations:

The Desktop Assessment report noted that subsurface conditions are expected to include silty clay over glacial till, with a stiff upper crust and softer layers beneath it. Both the shortlisted alternatives were noted to be generally suitable for the site's soil conditions. However, soft silty clay has the possibility to affect foundation stability, and the glacial till with cobbles and boulders could complicate excavation, thereby causing construction delays.

With regard to hydrogeological considerations:

Regional geological and hydrogeological data demonstrated the overburden thickness of 5–7 m and groundwater levels 3–6 m below ground, with expected seasonal fluctuations. Dewatering needs are minimal in silty clay but may be significant in glacial till. Groundwater drawdown from dewatering is expected to be limited in extent, with only localized changes in flow direction. After construction and backfilling, groundwater levels and flow patterns are anticipated to return to their original state.

Source Protection:

Based on background information, it was deemed likely that properties in the surroundings of the Study Area likely depend on private wells for drinking water. The assessment report noted that while Study Area is not located within any Wellhead Protection Areas (WHPA), Highly Vulnerable Aquifer (HVA) areas, or Significant Groundwater Recharge Areas (SGRA), the area within 500m of the intended ground disturbance area on the north-western portion of the site is located within a mapped Intake Protection Zone-3 (IPZ-3a). Potential impacts from construction and dewatering should be carefully considered in the facility’s design to protect these water sources.

The Desktop Hydrogeological and Geotechnical Report has been provided in **Appendix G**.

Prior to the start of construction activities, a Site-Specific Hydrogeological Investigation will be completed, in-line with the recommendations of the Desktop Hydrogeological and Geotechnical Report. Based on the results of this site-specific investigation, detailed recommendations for the foundation design of the new structures and required bearing capacity will be evaluated and developed. Measures to protect groundwater resources from potential impacts from construction and dewatering will also be evaluated in the detailed design stage.

5.5 Existing Social & Cultural Resources

5.5.1 Stage 1 Archaeological Assessment.

True North Archaeological Services Inc. (True North) was retained to perform the Stage 1 Archaeological Assessment (AA) for the Class EA. A visual property inspection, completed on 06 June 2025, with the report completion on 30 July 2025.

The Stage 01 AA was undertaken in line with the requirements of the Standards and Guidelines for Consultant Archaeologists issued by the Ministry of Citizenship and Multiculturalism (MCM 2011) and was aimed at identifying and assessing the archaeological potential of the study area and its vicinity and to recommend additional archaeological investigations, if required. The Stage 01 AA was undertaken for the entire study area, of the existing property and the adjacent plot.

Based on the findings of the Stage 01 AA it was found that the Study Area holds Archaeological significance, primarily due to early 19th century settlements in the area now known as the Village of Moose Creek. Three main features of archaeological significance were identified in the Stage 1 AA report.

- Seven 19th century homesteads were identified in the vicinity of the Project Study Area.
- The road running parallel to the northern boundary of the Study Area, 8th road, has also existed since the early 19th century.
- Additionally, Moose Creek, which forms part of the Eastern boundary of the study area, was also historically used for navigation and transportation.

Given the proximity of these three main drivers, it was determined that further investigation, under a Stage 2 Archaeological Assessment will need to be undertaken to verify the presence of archaeological items of significance within the areas designated for expansion activities and construction disturbances, under this Class EA.

The Stage 2 Archaeological Assessment has been scheduled for Late Fall (October) 2025 under the detailed design phase. All First Nation communities in the project contact list have been informed of the Stage 2 AA and have been invited to participate and provide their inputs and perspectives. As of the time of publication of this report, two First Nation communities (Algonquins of Ontario and Algonquins of Pikwakanagan First Nation) have confirmed attendance of their representatives for the Stage 2 Test pit survey on-site, while a third First Nation community (Huron-Wendat First Nation) has requested a copy of the Stage 2 report on completion of the assessment.

If any further archaeological assessments are found to be required (Stage 3 and Stage 4), these assessments will be completed during the detailed design phase. Prior to any ground disturbance, all necessary archaeological assessment requirements will be fulfilled.

The Archaeological Assessment Report for Stage 01 has been provided in full in **Appendix H**, along with the MCM acknowledgement of submission. Additionally, due to the tight timelines for this project's design and build phases (arising from the funding deadlines), a request for expedited review for the Stage 1 Archaeological Assessment Report was submitted to the MCM. This request was accepted by the MCM on 05 Sept 2025, and a copy has been provided in **Appendix H.**

5.5.2 Cultural Heritage Screening

In line with the Official Plan (OP) for the Stormont, Dundas and Glengarry United Counties (SDG counties) and the Ontario Heritage Act, the project aims to identify, document, protect and conserve heritage resources, where applicable.

The property area is almost rectangular in shape and is surrounded by forested areas on three sides, namely to the East, West and South. The Northern site boundary runs along 8^{th} road and neighbouring lands to the north are agricultural in nature with a few homes. The project location is at the periphery of the Village of Moose Creek and surrounding areas are sparsely populated.

Based on available information for cultural resources in the region, it was determined that no culturally significant resources were identified in the project study area.

- No areas in the project vicinity were identified as designated heritage resources by the Municipality, under the Ontario Heritage Act or the Official Plan of the SDG Counties. No other built heritage resources (buildings, structures, monuments etc.) or cultural heritage landscapes (historically designed districts or parks, scenic lookout points, etc.) were noted in project vicinity.
- No places of worship or cemeteries were identified in the project vicinity or adjacent lands.
- Under the Ontario Heritage Register, some buildings categorized under places of worship were observed in the heart of the Village of Moose Creek, at least 1 km away from the project site.
    - Notre-Dame-des-Anges/Our Lady of the Angels Church, on 8 Church Street, was identified as the nearest place of worship, at approximately 1.2

km away from the project location. The Church does not fall under the Protected category and does not have a plaque. Data on the year in which the Church was built was unavailable on the Ontario Heritage Register.

- The nearest cemetery is at least 1.2 km away, adjacent to Our Lady of the Angels Church
- Another location noted through the Ontario Heritage Register was Knox Fine Dining on 16976 McLean Road. While the property is currently used for commercial and non-religious purposes, the building was originally constructed in 1928 as a Church. The building does not fall under the Protected category and does not have a plaque. This location is also at least 1.2 km away, eastward from the project site.

The areas to be disturbed for the intended expansion are located only within the existing property boundary and takes up a small portion of the norther part of the site. All areas to be temporarily disturbed during construction such as areas for temporary storage, staging, work areas etc. are also only located within the existing property.

To address the archeological components of heritage resources, this area will undergo a Stage 2 archaeological assessment, as detailed in Section 5.5.1. Hence, no site work or ground disturbances will commence prior to the completion and associated ‘all-clear’ from the Archaeological assessment for the construction area.

Copies of the communication received from the MCM in response to the Project’s notice of commencement have been provided in **Appendix D,** along with a copy of the Form for “*Criteria for Evaluating Potential for built Heritage Resources and Cultural Heritage Landscapes*”.

6. Background : Township's Water and Wastewater Master Servicing Plan (MSP) and Phase 1

A detailed evaluation of both the water and wastewater servicing systems was by R.V. Anderson Associated Ltd. (RVA) as part of the Township's Water and Wastewater Master Servicing Plan (the MSP), in 2024. This MSP was carried out for the Village of Finch and Crysler, in addition to Moose Creek, and fulfilled the requirements of the Municipal Class Environmental (Class EA) process, for Phase 1 (Problem or Opportunity Statement) and Phase 2 (Alternative Solutions) (RVA, 2024). Summary details of Phase 1 and Phase 2 undertaken by the MSP have been detailed in subsequent sections of this report.

6.1 Key Constraints

The key constraints associated with the Moose Creek WWTL were identified through observations noted in the MSP, as well as through the background review undertaken for this Class EA, and are listed as follows:

- The current rated storage capacity of the existing lagoon facility is 110,360 m^3/d.
- Projected wastewater generation rates indicate insufficient treatment capacity for the forecasted population growth of the Village of Moose Creek.
- The facility has had some difficulty in meeting effluent quality limits in recent years from issues such as algae. The WWTL effluent TSS concentrations were exceeded in 2019, 2020, 2023 and 2024. Issues meeting effluent limits for Ammonia (TKN) and Total Phosphorous (TP) also exist. Opportunities to improve and enhance efficiency are seen.
- Limited area is available on the existing property for modification and upgrade works
- Based on recent influent flows from 2023 and 2024, the Moose Creek WWTL is predicted to exceed its rated capacity in 2028, establishing the need for immediate upgrades to be critical.
- Additionally, the Township has received grant funding under the HEWSF grant for the expansion of the Moose Creek WWTL. The grant requires implementation of the facility's expansion prior to June 2027. Hence, extremely tight timelines need to be met.

6.2 Class EA Phase 1 – Problem and Opportunity (MSP)

As per the requirements for the Class C EA Process, a project-specific Problem or opportunity Statement is required to first document factors leading to the conclusion that the improvement is needed and develop a clear statement of the problem/opportunity to be investigated.

While the MSP initially defined a problem/opportunity statement for Phase 1, the statement encompassed the Villages of Finch and Crysler as well as Moose Creek. Hence, it was determined that an updated problem/opportunity statement would be beneficial for this Class EA, to be more specific to the Village of Moose Creek, and to reflect planning considerations that have arisen since the completion of the MSP.

The problem/ opportunity statement for this Class EA study is defined as follows:

> *The existing Moose Creek WWTL is currently operating at greater than 85% of its rated capacity based on average day flow; In the next 30 years, the population serviced by Moose Creek WWTL is projected to increase substantially, to a total of 1,060 persons.*
>
> *The Township has received grant funding in the amount of $4.8M from the Province of Ontario to expand the WWTL, provided the expanded capacity is achieved in 2027.*
>
> *The existing capacity constraints and opportunities to improve effluent treatment quality at the Moose Creek WWTL require further investigation, to service planned and future growth within the urban boundary, increase resiliency to treat high flows, and to consistently achieve compliance.*

The preferred solution shall:

1) Comply with applicable regulations to provide:
    a) safe and reliable management and treatment of wastewater
    b) environmentally minimal impacts that will be identified and mitigated wherever possible
2) Address stakeholder comments and concerns
3) Be financially viable
4) Be operationally sustainable
5) Align with the Township’s social and environmental objectives

The preferred solutions will be prioritized and implemented such that the immediate needs and the long-term vision of the Township are addresses. Implementation of the preferred solutions will be subject to financial viability and approval of the Township.

7. Design Basis for Class EA Study

7.1 Population Projections & Future Growth

Population projections are foundational for establishing a design basis, since future flows projections are projected on a per capita basis.

A comprehensive population analysis was carried out in conjunction with the 2024 MSP as the Growth Management Study (GMS). The GMS was undertaken by Watson and Associates in 2023 for the Regions of Finch, Crysler and Moose Creek, for a 30-year planning window, from 2021 until the year 2051. The GMS detailed the projected economic and residential growth in these three Villages, in association with growth considerations for the adjacent regions of Ottawa and Cornwall to account for the commuter shed in the Township. Reserve Capacity Studies (RCS) were also undertaken by the Township in 2022 and 2024. The 2024 MSP utilised results from all the above studies to arrive at population projections for the Township's waster and wastewater servicing systems (RVA, 2024).

The MSP hence projected the service population for the Moose Creek Wastewater Treatment System as 1080 persons for the year 2051, using population trends, historic data and population projections. The MSP considered its current population based on the 2021 census population of 580 persons for Moose Creek.

The resulting projected population to be serviced by the Moose Creek WWTL for the year 2051 has been depicted in Figure 7-1.

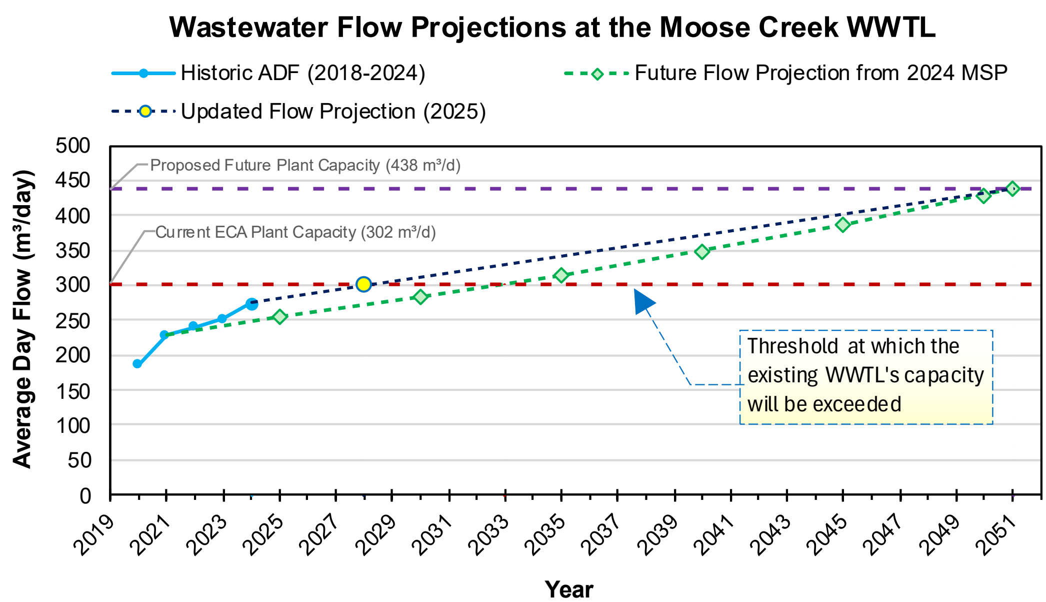

Figure 7-1: Projected wastewater flow projections for the Moose Creek WWTL

As observed in Figure 7-1, the MSP predicted that the rated storage capacity of the existing Moose Creek WWTL to be exceeded in 2033 (based on historic data up to the year 2022).

However, background review for the Class EA noted considerable influent flow increases in 2023 and 2024, exceeding the MSP projections. A new flow projection trend was formulated utilising the endpoint of 2051 (maintaining consistency with the MSP). It was hence observed that the timeline for exceedance of the existing rated storage capacity of the Moose Creek WWTL was potentially pulled forward to 2028, as noted in Figure 7-1. Therefore, the need for immediate upgrades to the Moose Creek WWTL were found to be critical.

The 2024 MSP also detailed future average day flows (ADF) for 2051, based on historic flows and the detailed population projections in the GMS. These considerations have been maintained and elaborated on in the subsequent sections.

7.2 Historical Raw Wastewater Characteristics and Loadings

7.2.1 Historical Raw Wastewater Flows

Historical wastewater flow and characteristic data from January 2020 to April 2025 were analyzed and current flows and loadings for the existing Moose Creek WWTL were established, as shown in Table 7-1, which also includes historical average day flow (ADF), peak day flow (PDF).

Table 7-1: Moose Creek WWTL Historical Raw Influent Flows (January 2020 – April 2025)

Parameter	Historical Value	Historical Peaking Factor (PF)	Typical Peaking Factor [1]
ADF	255 m^3/d	-	-
PDF	849 m^3/d	3.43	3.00

Notes:

1) Typical peaking factors adapted from Metcalf & Eddy, 2014.

According to the data, the historical ADF corresponds to a per capita flowrate of 398 L/cap/d (based on the serviced population of 580 persons in 2021 that was considered as the current population, at the time of the MSP). This is lower than typical per capita wastewater flows of 420 L/cap/d (Metcalf & Eddy, 2014).

Figure 7-2 shows the historical daily influent wastewater flows plotted against the rated capacity (302 m^3/d) of the Moose Creek WWTL.

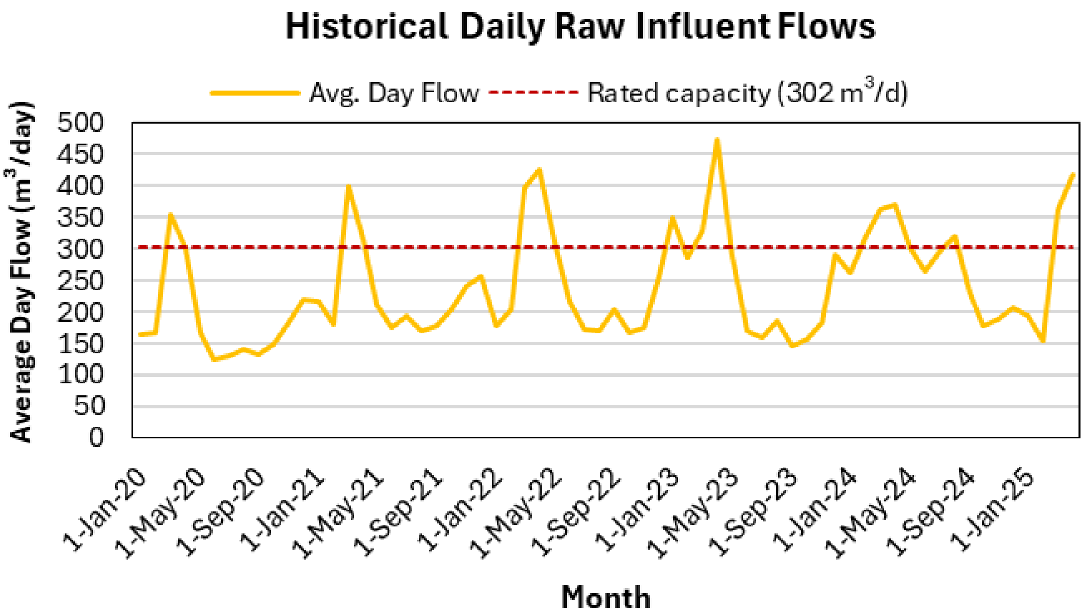

Figure 7-2: Historical Daily Raw Influent Flows (January 2020 –April 2025)

From Figure 7-2, it is clear that in recent years, the WWTL has had several instances where it exceeded its Rated Capacity for the ADF. Exceedances are noted to occur consistently in the spring months (April – May), possibly from inflows from snow melt through infiltration & inflow (I&I) in the collection system. Outside of the spring periods, the Moose Creek WWTL has historically, for the most part, experienced only minor peak flow events within the timeframe analysed.

Additionally, it is to be noted that the Moose Creek WWTL is currently operating at above 85% of its rated capacity for the ADF, and is fast approaching its lagoon storage capacity.

7.2.2 Historical Raw Wastewater Characteristics

Table 7-2 summarizes the historical raw wastewater (raw influent) characteristic data in terms of concentrations and loadings for biochemical oxygen demand (BOD_5), total suspended solids (TSS), total phosphorus (TP), and total Kjeldahl nitrogen (TKN), for the period of (January 2020 – April 2025). The historical raw influent wastewater can be characterized as low strength with respect to BOD_5 and TP, and medium strength with respect to TSS and TKN (Metcalf & Eddy, 2014).

Table 7-2: Moose Creek WWTL Historical Raw Wastewater Characteristics (January 2020 – April 2025)

Parameter	Average Concentration (mg/L) [1]	Average Loading (kg/d) [1]	Maximum Month Loading (kg/d) (PF) [1,2]	Estimated Per Capita Contribution (g/cap/d) [3]	Typical Per Capital Contribution (g/cap/d) [4]
BOD_5	171	39.7	122	66	70 – 110
TSS	191	45.3	216	75	60 – 115
TKN (as N)	58.7	13.1	28.6	22.0	9 – 14
TP	6.02	1.36	3.11	2.27	2 – 5

Notes:

1) Average and Maximum Month Concentrations and Loadings are based on raw wastewater data from January 2020 to April 2025.
2) Maximum Month Loadings are based on single data points per month, excluding outliers.
3) Based on historical average load divided by the total service population projected each year, based on the 580 persons in 2021.
4) Typical per capita loadings adapted from Metcalf & Eddy (2014).

7.2.3 Historical Final Effluent Characteristics

Generally, the plant has historically met its ECA objectives for 5-day carbonaceous biochemical oxygen demand ($CBOD_5$), Total Ammoniacal Nitrogen (TAN), and Hydrogen Sulphide (H_2S). However, there are several months within the historical period analyzed (January 2020 – April 2025) where the plant exceeded its objective or limit for one or multiple of these parameters, primarily for TSS due to possible algal issues. The WWTL effluent TSS concentrations were exceeded in 2020, 2023 and 2024. TAN limits were exceeded once in 2025, H_2S limits were exceeded once in 2024 and TP limits were exceeded once in 2021. A summary of the Historical Final Effluent Characteristics is depicted in Table 7-3.

Table 7-3: Moose Creek WWTL Historical Final Effluent Characteristics (January 2020 – April 2025)

Parameter	Average Concentration	Max Month Concentration	ECA Effluent Objective	ECA Effluent Limit
$cBOD_5$	6.6 mg/L	30 mg/L	15	30
TSS	27.9 mg/L	70 mg/L	20	30
TAN	7.7 mg/L	19.4 mg/L	-	15
TP	0.37 mg/L	1.13 mg/L	<0.5	1

Parameter	Average Concentration	Max Month Concentration	ECA Effluent Objective	ECA Effluent Limit
H_2S	<0.08 mg/L	0.4 mg/L	N/D	0.17

7.3 Moose Creek WWTL Design Basis

7.3.1 Hydraulic Design Basis

The estimated per capital flows from the 2024 MSP have been carried forward and maintained for the Design Basis. The overall wastewater flow design basis is summarized in Table 7-4.

Table 7-4: Moose Creek WWTL Hydraulic Design Basis

Parameter	Service Population	ADF (m^3/d)	Per Capita ADF (L/cap/d)	PDF (m^3/d) (PF)
Existing Conditions (2020–2025)	580 (in 2021)	255	398	849 (3.43)
Existing WWTL Rated Capacity	N/A	302	N/A	N/A
Design Basis Conditions	1081	438	406	1432 (3.0)

An additional flow consideration is that as shown in Figure 7-1, the 2024 MSP predicted that the rated storage capacity of the Moose Creek WWTL would be exceed in 2033. However, owing to recent historical flows from 2023 and 2024, the Moose Creek WWTL is now predicted to exceed its rated storage capacity in 2028.

Based on these considerations, it was determined that increasing the discharge period from the existing once-a-year discharge to a twice-a-year discharge would be highly beneficial in attaining the required additional lagoon storage capacity, while maximising utilisation of the existing lagoons. This approach would also avoid the need for the construction of additional lagoons, and in-turn, would eliminate the need for additional land acquisition or use of the adjacent forested plot of land, which would conserve local biodiversity, while reducing implementation complexity, costs and construction timelines. Details on the discharge windows for this approach have been elaborated on in Section 7.4.

7.3.2 Raw Wastewater Characteristic Design Basis

The design loadings for the Moose Creek WWTL were based on the historical loadings, design service populations, and were developed in conjunction with the data from the 2024 MSP. To maintain consistency with planning guidelines, future design loadings were allocated using typical per capita loadings of 75 g BOD_5/cap/d, 90 g TSS/cap/d, 2.1 g TP/cap/d, and 13.2 g TKN-N/cap/d (Metcalf & Eddy, 2014).

Although these are slightly higher than existing contributions for TSS and BOD_5, they are within the lower to middle range of typical per capita raw wastewater loadings, as outlined in Table 7-2. Design maximum month loadings were calculated by applying historical loading peaking factors to future contributions. Table 7-5 summarizes the raw wastewater characteristic design basis.

Table 7-5: Moose Creek WWTL Raw Wastewater Characteristic Design Basis

Parameter	Average Concentration (mg/L)	Average Loading (kg/d)	Maximum Month Loading (kg/d)	Estimated Per Capita Contribution (g/cap/d) [2]	Maximum Month Loading Peaking Factor
BOD_5	176	77.2	178	75	1.5
TSS	206	90.4	284	90	1.5
TKN (as N)	45.2	19.8	38.6	13.2	1.5
TP	5.51	2.41	4.69	2.1	1.5
Temperature[1]	11.4 °C	N/A	N/A	N/A	N/A

Note:

1) Minimum temperatures of 1°C were considered for preliminary design.

2) Based on historical average load divided by the total service population projected each year, based on the 580 persons in 2021.

The detailed design basis has been provided in **Appendix I**.

7.4 Effluent Criteria

Hutchinson Environmental Scienced Ltd. (HESL) was retained to undertake the Assimilative Capacity Study (ACS). The study considered historical plant flows from 2015 to 2025. The ACS Report has been provided in full in **Appendix J**.

The MECP's Guideline B-1-5 "Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters" establishes the framework for determining proposed effluent discharge limits based on the quality of the receiving water body, through an

ACS. The guideline recommends using low flow statistics or the “7Q20” flows which are the 7-day average minimum flow, for a recurrence period of 20 years (MECP, 2021).

For the ACS, the 7Q20 flows for Moose Creek were estimated on scaling flows from a nearby proxy gauge (Payne River near Berwick) since historic flow data measurements for Moose Creek were limited. The ACS estimated the 7Q20 flows to be 0.0488 m^3/s during the existing spring lagoon-discharge period (15 Mar – 30 Apr), and 0.0104 m^3/s and 0.0164 m^3/s for the proposed future extended spring discharge window (1 Mar to 31 May) and (additional) fall lagoon-discharge period (1 Nov – 15 Dec), respectively.

Historical effluent sampling for Moose Creek WWTL depict that the effluent is an enriching influence on E. coli, TAN, TKN, and TP (and, less consistently, TSS) concentrations during lagoon discharge periods. The year-round dataset collected by GFL Environmental (GFL) in nearby sampling stations on Moose Creek demonstrated that the receiver is Policy 2 for NO_3-N and TP while concentrations of $CBOD_5$, TSS, and ammonia (TAN and UAN) are relatively low.

Modelling for future scenarios was based on effluent concentrations limits that would not increase total annual loadings, as recommended by the Ministry of Environment, Conservation and Parks (MECP) during pre-consultation.

The ACS considered a set of eight (8) scenarios, with various combinations on the number of discharge days for each discharge window (Spring and Fall). Firstly, the scenarios were analysed in detail to verify the 7Q20 flows in Moose Creek for the relevant window and the impacts of the additional discharge volume, to minimize impacts of discharge on the receiver.

Secondly, the ability of the lagoons to accommodate and store influent in the non-discharge periods were verified, to ensure the presence of sufficient lagoon storage capacity on the basis of flows for 2051. Overall, the ACS was found that the Scenario 6.1, with 90 days of Spring discharge and 45 days of Fall discharge was the preferred discharge scenario that has the least impacts on Creek flows in the Fall while accommodating the required additional storage capacity. The discharge scenarios also considered discharge of the total seasonal discharge volume evenly distributed over the total number of discharge days for each discharge window.

When compared to the existing once-a-year discharge occurring at the Moose Creek WWTL, the preferred discharge scenario requires the extension of the existing Spring discharge window to 90 days, and the addition of a Fall discharge window.

Table 7-6 depicts a summary of the preferred discharge scenario from the ACS (HESL, 2025).

Table 7-6: Summary of preferred effluent discharge scenario from the ACS

Parameter	Spring Discharge	Fall Discharge
No. of discharge days	90	45
Discharge period	1 Mar–31 May	1 Nov–15 Dec
ADF (m^3/d)	1555.2	0.0052449.3
Total seasonal discharge volume (m^3)	139,722	20,148

The recommended effluent limits, based on the outcome of the ACS, are provided in Table 7-7. The recommended effluent concentration limits do not lead to an increase in total annual loadings, as discussed with the MECP during the pre-consultation. There is also no change to the total annual loading limits specified in the current ECA.

Table 7-7: Effluent Criteria and based on the ACS recommendations

Parameter	Existing	Future
Rated Capacity (m^3/d)	302	438
$CBOD_5$ (mg/L)	30.0	20
H_2S (mg/L)	0.17	0.12
TAN (mg/L)	15.0	3
TP (mg/L)	1.00	0.5
TSS (mg/L)	30.0	20

Comments were received from the MECP with clarifications on some aspects of the ACS, on 3rd October 2025. A consultation meeting was held with the MECP to address these comments on 08th October 2025, with the outcome of no major changes required to the ACS, and effluent limits being preliminarily approved by the MECP. A meeting summary has been provided in **Appendix D**.

8. Class EA Evaluation Methodology

8.1 Overview

The evaluation process for this Class EA study consists of the following major steps:

1) **Identification and Screening of the Alternative Solutions** – Identifying a long-list of all viable alternative solutions and preliminary screening them to short-list only those that are feasible. All other alternatives are eliminated, which also aids in enhancing efficiency by narrowing down alternatives for the detailed evaluation stage. This process begins in Phase 2 of the Class EA.
2) **Detailed Evaluation of Feasible Alternative Solutions** – The short-listed alternative solutions identified in the previous stage are further developed and evaluated based on detailed evaluation criteria that include aspects from technical & operational, natural environment, socio-cultural and economic considerations. Alternatives will be compared against each-other to determine advantages, impacts and associated ranking.
3) **Selection and Recommendation of the Preferred Alternative Solution** – Through the detailed evaluation and its results, a preliminary preferred solution will be recommended, in conjunction with inputs from the Township and OCWA. This preliminary preferred solution will be presented to stakeholders during the Public Information Centre (PIC) and is subject to review by the public, and review agencies, before any final recommendations are made for the Class EA.

A general schematic of the evaluation methodology is outlined in Figure 8-1

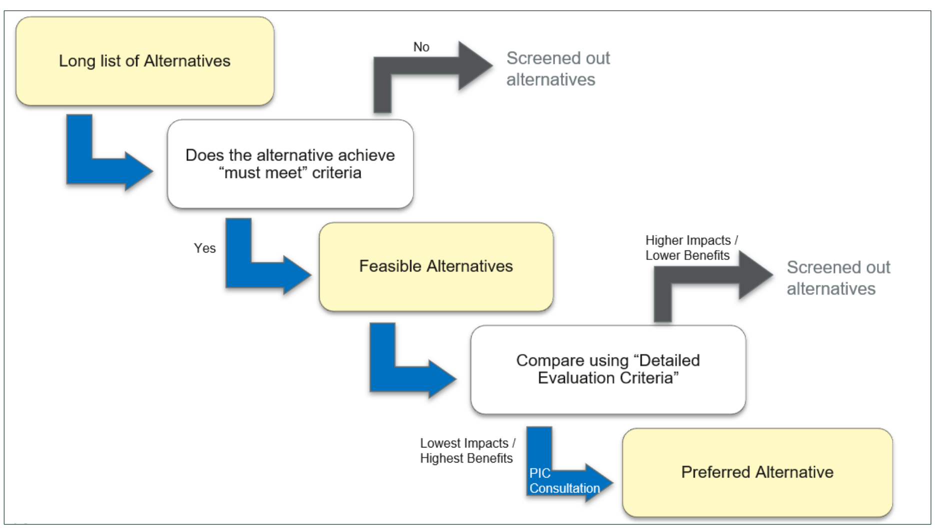

Figure 8-1: Overview of the Evaluation Approach

8.2 Phase 2: Alternative Solutions (MSP)

8.2.1 Selection of Preferred Wastewater Servicing Solution

The shortlisted alternative wastewater servicing solutions were assessed, relative to each other, with scores assigned for each of the four (4) evaluation categories of technical & operational, natural environment, socio-cultural and economic considerations. Alternatives will be compared against each-other to determine advantages, impacts and associated ranking.

An overall score for each shortlisted alternative solution was produced, with the highest scoring being selected as the preferred alternative.

8.3 Phase 3 Detailed Evaluation

This Schedule C Class EA builds upon the findings and recommendations of the 2024 MSP, and will carry out the necessary activities to fulfill Phase 3 and Phase 4 of the Class EA process. Phase 3 of the Municipal Class EA process examines alternative concepts/ technologies and methods of implementing the preferred wastewater treatment solution.

In Phase 3 of the Class EA process, design concepts were developed for the shortlisted wastewater treatment design concepts. A detailed comparative evaluation was completed using a weighting and ranking system to compare the alternative design concepts. This resulted in a systematic, rational, and reproducible comparison of alternative treatment alternatives and a straightforward identification of the preferred design concept.

The Phase 3 evaluation was carried out in two stages: a preliminary screening, which was followed by a detailed evaluation of the short-listed alternatives. These steps are detailed below in the following sections.

8.3.1 Preliminary Screening

As prescribed in the Municipal Class EA process, long lists of alternative wastewater servicing solutions and design concepts are developed at Phases 2 and 3 of the Class EA process, respectively. These included the Status Quo, reflecting the current conditions of the Moose Creek WWTL. At Phase 2, these alternatives represented broad solutions to the Problem/Opportunity Statement. At Phase 3, alternative design concepts and technologies were considered for different wastewater treatment unit processes consistent with the Problem/Opportunity Statement and the preferred Phase 2 solution.

In line with the recommended MSP Alternative of "Treatment Optimization via Technology", a Phase 3 preliminary technology screening was developed to evaluate viable technologies that can serve to optimize the lagoon capacity at the Moose Creek WWTL.

For the preliminary screening, each long-listed alternative wastewater servicing solution and design concept was assessed against a set of preliminary screening criteria with the purpose of narrowing down the list to only those that are considered "feasible". Alternatives which did not meet the preliminary screening criteria were eliminated from further analysis. This preliminary screening step also helped to avoid the need to carry forward unrealistic or incompatible alternatives through the next steps of the evaluation process.

Preliminary screening was accomplished by applying the "must-meet" criteria, as shown in Table 8-1. Must-meet criteria were established to capture key objectives for the Moose Creek WWTL Expansion Project Class EA. The "must-meet" criteria were considered on a "yes/no" or "pass/fail" basis. Alternative solutions were required to pass all "must-meet" criteria to be shortlisted and carried forward through the next step in the evaluation process.

Table 8-1: Preliminary "Must-Meet" Screening Criteria

Must-Meet Criteria	Description
Compliance	• Does the alternative solution address the lack of wastewater treatment capacity due to future population growth in the Village of Moose Creek? • Can the alternative solution meet the anticipated treatment needs for the effluent? • Is the alternative solution a proven technology? • Are there any constraints in terms of permitting and approval from the MECP, etc.?
Technical Feasibility	• Does the alternative solution maximize the use of the existing infrastructure at the Moose Creek WWTL? • Is the alternative solution compatible with existing treatment processes and operational practices, such that its implementation will not significantly impact the existing operations?

Must-Meet Criteria	Description
Site Conditions Compatibility	• Suitability of the alternative solution given the site-specific constraints (i.e., limited area on existing site, footprint requirements for technology, etc.). • Is the alternative solution anticipated to be constructable within the required project timelines?
Financial Feasibility	• Is the alternative solution economically mindful in terms of capital and operating costs, relative to other alternative solutions being considered in the study?

8.3.2 Detailed Evaluation Criteria and Scoring Approach

For each unit process, applicable treatment technologies were evaluated against a set of criteria that represent all aspects/factors of importance, as a means to identify the preferred design concept. The evaluation methodology was used as a basis to compare the benefits of each treatment technology, relative to each other, and their ability to perform under each evaluation criterion.

The criteria that were used during the detailed evaluation of treatment technologies are subdivided in two categories: primary and secondary criteria. The primary criteria capture global issues that need to be addressed and were further broken down into the secondary criteria. The primary and secondary criteria were assigned weight factors based on their degrees of importance, with the primary criteria scores being determined by their weight factors and the weighted scores of the secondary criteria. Factors were assigned such that the higher the significance of the criterion, the higher the weighting.

Each treatment technology was assessed for each of the evaluation criteria in the model and assigned a total score out of 100. Each score represents how well the specific treatment alternative meets the criterion, such that the higher the ability to meet the criterion, the higher the score assigned (i.e., score of 100 for best performing option, score of 0 to worst performing option).

The primary criteria, secondary criteria, and weight factors are presented in Table 8-2.

Table 8-2: Phase 3 Evaluation Criteria and Weights

Primary Criteria (Weight)	Sub-Criteria	Relative Weight
Technical & Operational Considerations (35)	Ability to reliably meet effluent quality criteria	15

Primary Criteria (Weight)	Sub-Criteria	Relative Weight
	Flexibility to respond to variable raw wastewater quality and low initial loads	15
	Compatibility with existing infrastructure, existing site boundary	10
	Compatibility with hydraulic grade line requirements	5
	Constructability and Construction Schedule	15
	Proven Technology with strong track record; pilot testing, start-up needs, ease of approvals with MECP	5
	Process complexity & operator training	5
	Process robustness (likelihood of process upsets) and redundancy	10
	Operation and maintenance requirements (need for additional resources/equipment, frequency of additional checks and maintenance requirements)	20
	Maximum Sub-total Score – Technical =	**100**
Socio-Cultural Considerations (15)	Minimize footprint and site impacts /architectural aesthetics (plant appearance)	10
	Minimize truck traffic (during construction & operation)	10
	Minimize noise (during construction & operation)	15
	Minimize odour (during construction & operation)	40
	Minimize impacts on neighboring properties	25
	Maximum Sub-total Score – Socio-Cultural =	**100**
Natural Environment Considerations (20)	Minimize air/solids emissions	15
	Minimize impacts on species at risk	10
	Source water protection	25

Primary Criteria (Weight)	Sub-Criteria	Relative Weight
	Minimize impacts on and of climate change (greenhouse gas emissions & carbon footprint, energy intensity), promotes sustainability	25
	Flexibility of treatment processes to adapt and respond to varying climatic conditions	25
	Maximum Sub-total Score – Natural Environment =	**100**
Economic Considerations (30)	Capital costs	60
	Operational costs / LCC	40
	Maximum Sub-total Score – Economic =	**100**

8.3.3 Economic Analysis

For each shortlisted alternative design concept, Class D (-30%, +50%) preliminary capital cost estimates were developed. These cost estimates were developed through a combination of budgetary quotes provided by vendors for key equipment as well as the recent experience of CIMA+ for similar projects. A contingency allowance has been added to each cost estimate to account for its level of accuracy. The economic analysis of each design concept was developed using these estimated capital costs. Detailed cost estimates have been provided in **Appendix K**.

8.3.4 Selection of Preferred Design Concept

Shortlisted wastewater treatment design concepts were assessed relative to each other and evaluated against all criteria shown in Table 8-2. Each treatment alternative was scored on a 0-100 basis, with higher scores assigned to better performing alternatives.

The evaluation approach was also subjected to a sensitivity analysis to examine how a change of criteria weights affects the scoring results. In essence, the weightage for the technical and economic scoring will be inversed with those of the socio-cultural and natural environment. This will aid in verifying that any decisions made using this process are robust.

9. Recap of Class EA Phase 2 – Alternative Solutions (MSP)

As detailed in Section 6, the 2024 y undertaken for the Township completed Phase 1 and Phase 2 of the Municipal Class EA Process. The 2024 MSP identified alterative treatment solutions based on the need for additional treatment and storage capacity for the Moose Creek WWTL, in addition to concerns regarding the treatment efficiency.

The long-list of alternatives that were identified in Phase 2 of the 2024 MSP for the Moose Creek WWTL, have been listed below:

- Alternative 1 – Do nothing
- Alternative 2 – Limit Community Growth
- Alternative 3 – Infiltration and Inflow Control and Reduction
- Alternative 4 – Upgrade Existing Wastewater Collection and Treatment Facilities
- Alternative 5 – Expansion of Wastewater System via New Facilities

Alternatives 1 and 2 were screened out due to incompatibility with the problem & opportunity statement. The remaining alternatives were short-listed for further evaluation (RVA, 2024).

9.1 Assessment of Alternative Solutions

For the short-listed alternatives, each alternative was evaluated on the basis of four major categories which were: Technical, Social & Cultural, Environmental and Economic, with a weightage of 25% for each category. The MSP evaluated each of the short-listed alternatives in detail and determined that **"Alternative 4 – Upgrade Existing Wastewater Collection and Treatment Facilities"** was the preferred alternative among these (RVA, 2024).

9.2 Preferred Alternative

Following the detailed evaluation process considering the Technical, Social & Cultural, Environmental and Economic factors, "Alternative 4 – Upgrade Existing Wastewater Collection and Treatment Facilities", was selected as the preferred solution.

As a part of this preferred alternative, two sub-alternatives were also preliminarily identified as viable options in the MSP, as follows:

- Alternative 4B-1: Treatment Optimization via Technology
- Alternative 4B-2: Modified Lagoon Operation

The MSP subsequently evaluated both these alternatives in detail, with preliminary vendor costing for cost estimates.

For Alternative 4B-1: Treatment Optimization via Technology, the MSP carried out a preliminary evaluation of technologies such as the:

- Integrated Fixed-Film Activated Sludge (IFAS)
- Suspended Attached Growth Reactor (SAGR)

These technologies were primary considered due to their ability to maximise use of the existing lagoons, without the need for land acquisition. Alternative 4B-1 also presented lower costing (capital and O&M) as compared to a conventional mechanical treatment plant. This alternative also required far lesser retrofitting and had a much lower cost than Alternative 4B-2.

Alternative 4B-2: Modified Lagoon Operation primarily consisted of incorporating conventional extended-aeration treatment (CEA) utilising activated sludge for treatment. The alternative was determined to require extensive upgrades and additions to the existing Moose Creek WWTL, such as a new headworks facility, tertiary filtration, aeration equipment, return activated sludge pumping requirements etc. while additional land acquisition was not deemed necessary, this alternative was also found to have a much higher economic burden than Alternative 4B-1.

On completion of the Phase 2 evaluation, "**Alternative 4B-1: Treatment Optimization via Technology**" was determined to be the preferred alternative (RVA, 2024). Figure 9-1 depicts a summary of the MSP's Phase 2 evaluation process.

LONG LIST EVALUATION

S.N.	Alternative Servicing Strategy	Shortlisted
1	Do Nothing	No
2	Limit Community Growth	No
3	**Infiltration and Inflow Control and Reduction**	YES
4	**Upgrade Existing Wastewater Collection and Treatment Facilities**	YES
5	**Expansion of Wastewater System via New Facilities**	YES

SHORT LIST EVALUATION

Alternative Servicing Strategy
Alternative 3: Infiltration and Inflow Control and Reduction
Alternative 4: Upgrade Existing Wastewater Collection and Treatment Facilities (Lagoon capacity expansion)
• Alternative 4B-1: Treatment Optimization via Technology; or • Alternative 4B-2: Modified Lagoon Operation.
Expansion of Wastewater System via New Facilities
• Alternative 5A: New Pumping Station • Alternative 5B-1: New Facultative Lagoon • Alternative 5B-2: Convert to Mechanical Treatment Facility

Figure 9-1: Summary of evaluation of long-list of Alternatives for Phase 2, by 2024 MSP (illustrated based on MSP (RVA, 2024))

10. Class EA Phase 3 – Alternative Design Concepts

10.1 Identification of Wastewater Treatment Alternative Design Concepts

To evaluate alternative design concepts, individual wastewater treatment unit processes were analysed as a longlist:

10.1.1 Phase 3 Long-List of Alternatives

The following viable technologies were identified for preliminary screening in Phase 3, as follows:

1. Submerged Attached Growth Reactor (SAGR)
2. Moving Bed Biofilm Reactor (MBBR)
3. In-Lagoon Media
4. Facultative Membrane Bioreactor (FMBR)

Each technology is briefly described below.

10.1.1.1 Submerged Attached Growth Reactor (SAGR)

The Submerged Attached Growth Reactor (SAGR) is a technology trademarked by Nexom®, and is primarily used to aid in pollutant control for effluents wastewater treatment plants. The technology is known to function well in cold climates, in the vicinity of 1°C, and is particularly efficient in nitrification.

The reactor is constructed using rock aggregates that support biofilm growth, and is insulated with materials like mulch. Diffuser grids that promote efficient aeration are placed at the bottom of the reactor, while water flows laterally through the system. The treated water exits the reactor by gravity. The enclosed design and stable media protect the bacteria protection from high flows and low temperatures. Hence, the SAGR has a high treatment efficiency and meets effluent regulations.

The footprint of area required for the SAGR is compatible with the existing site conditions. The SAGR is also a well-known technology and there are several installations in Ontario, as well as numerous installations world-wide. The low complexity and ease of integration make this a viable option for the Moose Creek WWTL.

10.1.1.2 Moving Bed Biofilm Reactor (MBBR)

The Moving Bed Biofilm Reactor (MBBR) is another biofilm based technology that is gainly popularity in the wastewater industry in recent years. The technology was first developed in the 1980s is also aimed at nitrification treatment in cold weather conditions. The MBBR works on the principle of biofilm growth on the surfaces of a large quantity of plastic media. The MBBR media can be easily added into existing lagoons, or into stand-alone tanks. Aeration is supplied through diffuser grids at the bottom of the tank.

For the Moose Creek WWTL, the MBBRs have extremely efficient footprint areas and efficiently optimise the available land area at site. The MBBR has several installations in Ontario and provides high treatment efficiency, with low operational complexity. In the context of Moose Creek WWTL, a solids separation unit such as Dissolved Air Flotation (DAF) system or tertiary filters, will be required for the MBBR to meet effluent regulations. Overall, it is a viable option for the Moose Creek WWTL that meets the project needs.

10.1.1.3 In-Lagoon Media

In-lagoon media are often in the form of media (such as rope), that are fixed in place on metal sections, and are then immersed into lagoons or treatment basins. Examples of such emerging technology are the BioCord®, developed by Bishop Water and the Ecofixe developed by Technologies Ecofixe. The technology can be easily installed by dropping them into existing lagoons and is capable of treatment in low temperatures. Similar to the SAG and MBBR, the BioCord® is a biofilm based technology, where bacteria grow on the rope media surfaces and have a stable environment. Each BioCord® system requires a fine bubble aeration unit for constant aeration, which aids in optimising treatment and constant mixing within the lagoon.

The small footprint and ease of installation make this a viable option to be considered for the Moose Creek WWTL. However, since this technology is relatively newer, it is not yet a widely-used or proven technology in Ontario. Higher pilot testing requirements are anticipated to verify compatibility, along with longer durations of permitting approvals.

Images of existing installations of the BioCord® and the Ecofixe are shown in Figure 10-1 and Figure 10-2, respectively.

Figure 10-1: BioCord® installation (Courtesy of Bishop Water)

Figure 10-2: Ecofixe in Lagoons (Courtesy of Technologies Ecofixe)

10.1.1.4 Facultative Membrane Bioreactor (FMBR)

The Facultative Membrane Bioreactor (FMBR), as its name suggests, is a combination of a typical facultative process coupled with a Membrane Bioreactor (MBR). In a typical MBR, the biological treatment process is achieved in conjunction with a membrane filtration system. On the other hand, a facultative process refers to biological treatment in aerobic and anerobic conditions, i.e., in the presence and absence of oxygen, respectively. Hence, in the FMBR, treatment is achieved through some parts of the reactor that operate aerobically while other parts operate anaerobically. The membrane then acts as a barrier that removes treated water from the biomass/sludge.

While the FMBR falls outside the purview of the preferred alternative from the MSP's Phase 2, and tends to be more similar to a mechanical treatment facility, the FMBR provides an efficient level of effluent treatment and has, hence, been evaluated for the Moose Creek WWTL. Figure 10-3 depicts the typical components in an FMBR process.

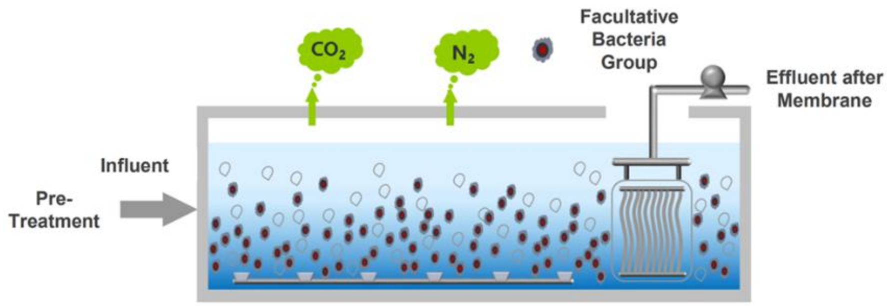

Figure 10-3: FMBR components (Courtesy of JDL)

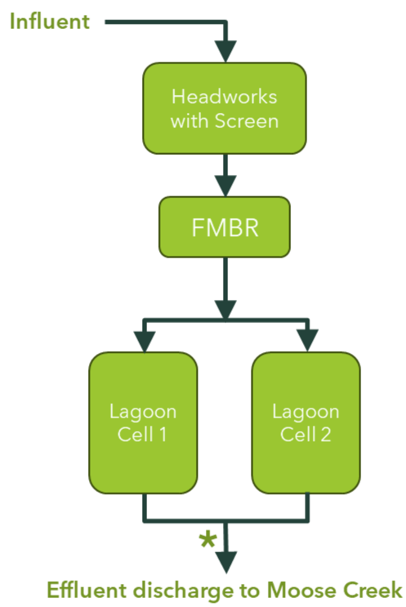

Figure 10-4: Flow diagram for FMBR addition to the Moose Creek WWTL

The FMBR implementation will need to be upstream of the Lagoons. As depicted in the flow diagram in Figure 10-4, it can be seen that the resulting treatment train will necessitate the treated effluent storage in the lagoons for an extended period of time (until the next effluent discharge window). The additional considerations for such a storage include an uncertainty in effluent quality after the storage period and higher possibility of contamination from algal growth, migratory birds and geese, etc. Hence, while the quality of the final effluent might meet the effluent limit criteria at the output of the FMBR, the same cannot be guaranteed downstream of the lagoons.

Additionally, similar to the In-Lagoon media, the FMBR technology is relatively newer, it is not yet a widely-used or proven technology. Its is also new in Ontario in terms of implementation. Higher pilot testing requirements are anticipated to verify compatibility, along with significant durations for permitting approvals.

10.1.2 Phase 3 Preliminary Alternatives Screening

Preliminary Phase 3 screening criteria that were identified in previous sections were utilized for screening the long-list of technologies. The results have been summarized in Table 10-1.

Table 10-1: Phase 3 Preliminary Alternatives Screening Results

Technology	Compliance Feasibility	Technical Feasibility	Conditions Compatibility	Financial Feasibility	Pass / Fail	Comments
Submerged Attached Growth Reactor (SAGR)	Yes	Yes	Yes	Yes	**Pass**	Low area footprint and has a robust & high treatment efficiency. Proven track record, hence, easier technology approvals are expected. Compatible with the site and project needs.
Moving Bed Biofilm Reactor (MBBR)	Yes	Yes	Yes	Yes	**Pass**	Very low area footprint and has high treatment efficiency. Proven track record, hence, easier technology approvals are expected. Some additional needs are expected from the additional solids separation system, but is compatible with the site and project needs.
In-Lagoon Media	No	Yes*	No	Yes	Fail	Is not yet a proven technology and carries some risk compared to technologies such as the SAGR and MBBR that have proven a track record and high performance. Has the potential for short-circuiting flows with direct in-lagoon installations. Pilot tests are expected prior to technology approval, and may cause delays in the project schedule.
Facultative Membrane Bioreactor (FMBR)	No	Yes*	No	Yes	Fail	Is not yet a proven widely used technology and is new to Ontario. The process is new and carries some risk. Pilot tests are expected and approvals from MECP may be laborious. Overall, it may cause significant delays in the project schedule. Low compatibility with the site, in terms of constructability.

**More information is required in terms of this Technology's technical capability, since it is an emerging technology and does not have major installations in Ontario and is hence, not a proven widely-used technology.*

10.1.3 Summary of Phase 3 Short-listed Alternatives

Based on the outcome of the preliminary screening, the following two alternative technologies were short-listed for detailed evaluation:

1. Submerged Attached Growth Reactor (SAGR)
2. Moving Bed Biofilm Reactor (MBBR)

10.2 Concept-Level Development of Shortlisted Alternatives

10.2.1 Common Components

For this evaluation, certain components have been identified as common, irrespective of the short-listed alternatives, as follows.

10.2.1.1 Blowers

The existing process blowers for the lagoon aeration system at the Moose Creek WWTL are approximately 30 years old, and have utilised a considerable amount of their service life. Upgrades that may be necessary to the existing lagoon aeration system will be assessed in value engineering, during the detailed implementation phase.

10.2.1.2 Chemical Phosphorus Removal

Phosphorous removal from wastewater is an integral step to meet the effluent limits for discharge. This is typically completed by chemical precipitation, accomplished by dosing coagulants such as aluminium salts (alum) or iron salts (ferric or ferrous) upstream of the clarifiers to induce precipitation of the soluble phosphorous in the clarifiers.

To help ensure the plant is able to continue to meet its final effluent phosphorus compliance requirements, a chemical phosphorus removal system is recommended to be installed through these upgrades. This will include chemical storage, dosing pumps into a slip stream to the lagoons, and related piping, electrical, and controls systems.

10.2.1.3 Effluent recycle

Owing to the longer duration of storage required between the discharge windows, an effluent recycle system will be required, for both the short-listed alternatives. Once the effluent has been treated in via the SAGR or the MBBR, the treated effluent will be recycled back to the lagoons for storge, prior to final disposal. Associated piping, pumping and control systems will be required and will be evaluated in detail during the detailed design phase.

10.2.2 Technologies for consideration

10.2.2.1 Submerged Attached Growth Reactor (SAGR)

The Submerged Attached Growth Reactor (SAGR) is a technology trademarked by Nexom®, and is primarily used to aid in pollutant control for effluents wastewater treatment plants.

The technology is particularly efficient in nitrification. Nitrification is the process by which harmful nitrogen polluters such as ammonia, are neutralised by conversion to less harmful and simpler compounds such as nitrates.

The SAGR is also known to function well in cold climates at about 1°C. Typically, in conventional biological wastewater treatment technologies, the Nitrifying bacteria, which are bacteria responsible for the nitrification process, are impeded by cold temperatures. This leads to reduced bacterial growth and rate of treatment which causes sub-optimal nitrification. The SAGR technology, owing to its set up and installation, effectively prevents the loss of performance of these nitrifiers, even in cold weather.

The reactor build consists of rock aggregates that act as the media for biofilm growth, and uses an impermeable HDPE liner. The top of the reactor is covered in insulating material such as mulch. The bottom of the reactor is well-aerated through diffuser grids that ensure efficient aeration as the water flows across the reactor in a lateral manner. As biofilm grows on the rock surfaces, the nitrifying bacteria convert ammonia into simpler nitrates. The treated effluent then flows out of the reactor via gravity. The closed vessel and stable rock surfaces provide the bacteria with adequate protection from high flows and low temperatures, thus producing a high treatment capacity.

The SAGR technology has seen increasing use in wastewater treatment plants and in lagoon systems over the past decade. Though the degree of treatment is dependent on the quality of the influent and the flow, and requires aeration, the SAGR provides a highly efficient and compact method of treatment (Nexom, n.d.). Figure 10-5 depicts the schematic of a typical SAGR unit during installation, and Figure 10-6 illustrates the Process Flow Diagram for SAGR Retrofit at the Moose Creek WWTL.

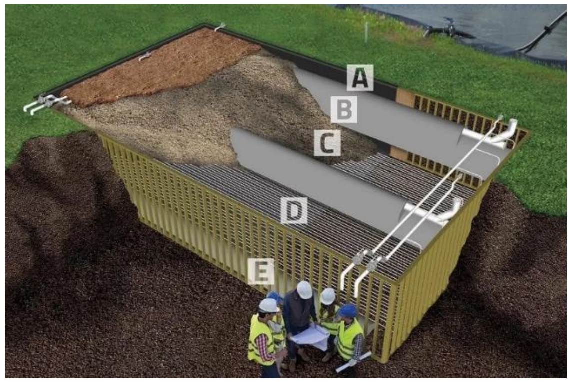

Figure 10-5 Schematic of a typical SAGR unit during installation (Courtesy of Nexom)

Figure 10-6: Process Flow Diagram for SAGR Retrofit

The conceptual site layout for the SAGR Retrofit is shown in Figure 10-7. Two SAGR cells will be required, with each cell having a width of 30 m and a length of 13 m. The depth of each unit will be 10m, with some additional height allowance for the mulch layer on top.

The retrofit will require additional installations such as new process blowers for the SAGR units. New piping will be required for the process blowers. The new SAGR blowers will be installed in a new blower room adjacent to the existing process air blowers for the lagoons. The need to replace these existing blowers will be assessed during value engineering. Additional requirements for this alternative include piping for effluent recycle stream (back to the lagoons) for storage during non-discharge periods, as well as chemical storage, dosing pumps etc. for the phosphorous removal, and any related piping, electrical, and controls systems. The existing outfall will be reused.

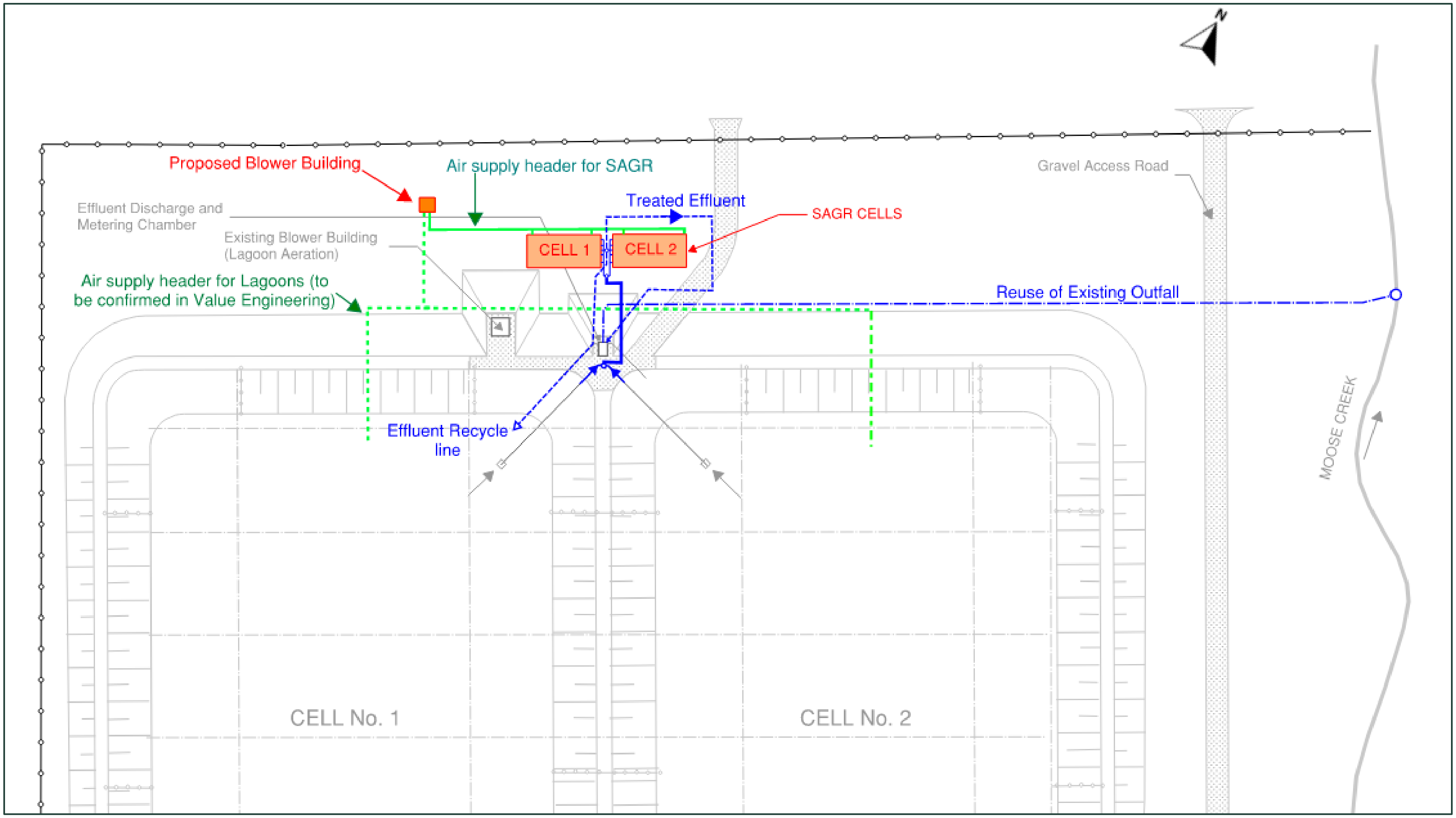

Figure 10-7: SAGR Retrofit Concept Layout

10.2.2.2 Moving Bed Biofilm Reactor (MBBR)

The Moving Bed Biofilm Reactor (MBBR) is another biofilm based technology that is gainly popularity in the wastewater industry in recent years. The technology was first developed in the 1980s in Norway and is also aimed at nitrification treatment in cold weather conditions. The MBBR works on the principle of biofilm growth on the surfaces of a large quantity of plastic media. It should be noted that while the plastic media move within the tank, the biofilm itself remains fixed onto the media, giving rise to the MBBR’s name.

The plastic media is typically made of durable polymer such as HDPE, and comes in varying sizes, shapes and configurations. Air is supplied from the bottom of the tank. Scouring, the process by which intense bursts of air are used to control biofilm growth, is typically not required for the MBBR. This is due to the fact that the constant motion of the media aids in a passive control of the biofilm growth, as they brush against each other, which helps to maintain optimum biofilm thickness levels. Figure 10-8 depicts examples of MBBR media with and without the biofilm growth.

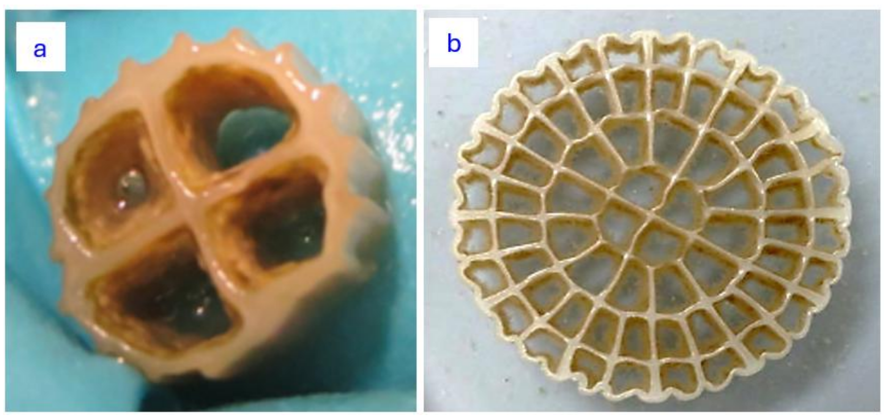

Figure 10-8: Example of media used for MBBR, (a) with and (b) without biofilm growth (Courtesy of Veolia)

There are several MBBR installations all over Ontario, and the technology has widely been implemented across the world. The MBBR offers several advantages. Due to the lack of filtration seen in other biofilm technologies, the MBBR does not exhibit clogging issues. The stable surface also prevents the “washout” or loss of microorganisms, during high-flow events which increases the overall resiliency of the facility. Additionally, if increase in the treatment capacity is required, the amount of MBBR media used can be increased, which provides a simple and swift method to increase treatment capacity. Overall, it offers several benefits and its compact size and high treatment efficiency make it a good fit for retrofitting the Moose Creek WWTL.

Additional consideration include the higher amount of aeration that MBBR requires to function effectively when compared to conventional activated sludge processes, and although media typically have long lifespans greater than 20 years, they require replacement at the end of life. The aeration supply also requires careful control to maintain optimum levels required for biofilm development.

Two MBBR tanks will be required, with each tank having a width of 5.8 m and a length of 5.8 m. The depth of each unit will be 7.5 m. Additionally, the MBBR retrofit will require the inclusion of a solids separation unit such as a DAF or tertiary filters to provide additional control for solids, given the storage of effluent required during the summer months and potential sloughing events. Hence, there is an anticipated increase in implementation and complexity when compared to the SAGR Alternative.

The conceptual site layout for the MBBR retrofit is shown in Figure 10-10.

Figure 10-9: Process Flow Diagram for an MBBR Process

The retrofit will require additional ancillary upgrades to support the new process. This will include the installation of new MBBR process blowers to provide air to media. New piping will be required for the process blowers and the solids separation unit. The new MBBR blowers and solids separation unit will be installed in a new blower room adjacent to the existing process air blowers. The need to replace the existing blowers will be assessed during value engineering. Additional piping will also be required for the effluent recycle stream back to the lagoons for storage during non-discharge periods. Similar to the SAGR alternative, the MBBR implementation will also require chemical storage, dosing pumps etc. for phosphorous removal, as well as additional requirements for the solids separation unit, and related piping, electrical, and controls systems. The existing outfall will be reused.

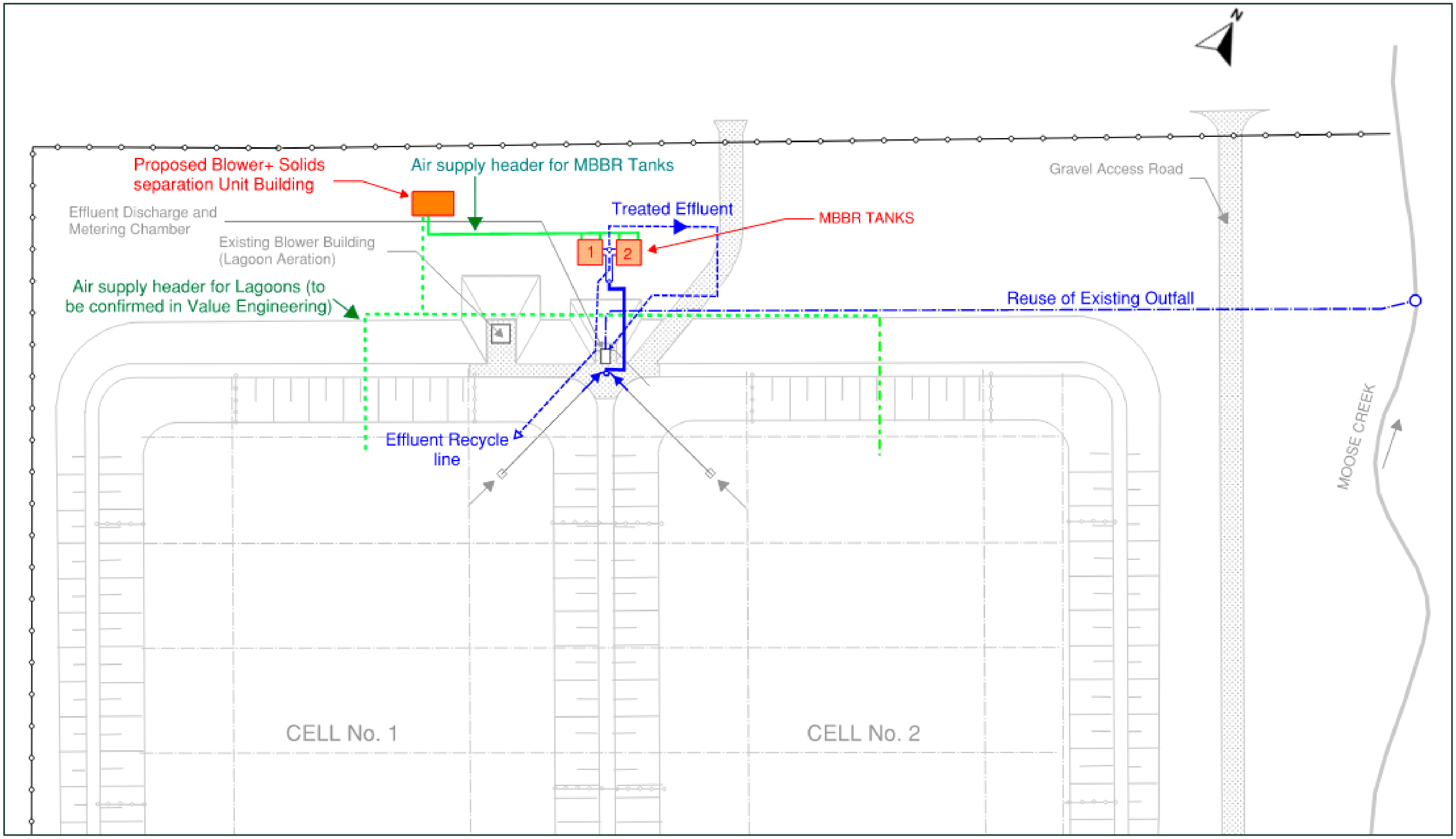

Figure 10-10: MBBR Retrofit Concept Layout

10.3 Evaluation of Shortlisted Alternatives

10.3.1 Alternatives Evaluation Scoring

Based on the outcome of the detailed Phase 3 evaluation, a summary of the scoring and rankings for the two short-list alternatives are presented in Table 10-2 below. The detailed evaluation is presented in Section 10.3.3.

Table 10-2: Alternatives Evaluation Scoring Summary

Primary Criteria (Weight)	Weight	Alternative 01-SAGR	Alternative 02-MBBR
Technical & operational Considerations	35	19.6	17.5
Socio-Cultural Considerations	15	10.7	10.8
Natural Environment Considerations	20	14.1	15.2
Economic Considerations	30	30.0	20.4
Overall Scores	100	**74.4**	**67.5**
Scoring Rank	--	**1**	2
Overall Scores – Inverted Bias	100	72.8	70.6
Scoring Rank – Inverted Bias	--	1	2

In terms of Socio-Cultural and Natural Environment Considerations, both the SAGR and MBBR were observed to be comparable. The SAGR Retrofit scored the highest score, primary due to its relative ease of implementation and lower economic burden. The ranking for both alternatives remains consistent if the criteria weight bias is inverted between the ‘Technical & Economic’ criteria and ‘Social & Natural Environmental’ criteria, demonstrating robustness. The detailed scoring matrix has been provided in Table 10-3.

10.3.2 Main Differentiators and Key Advantages

In summary, the SAGR Retrofit alternative was the preferred alternative for the expansion for the Moose Creek WWTL.

This alternative offers key advantages such as:

- Small footprint requirement

- Has the lowest economic burden when compared to the other shortlisted alternative
- Requires the least complex implementation since it does not require an additional solids separation unit, and will improve process resiliency for the plant while proving a high treatment capability
- Furthermore, it maximises future expansion within the existing footprint of the plant.

10.3.3 Alternatives Evaluation Scoring Matrix

Table 10-3: Alternatives Evaluation Scoring Matrix

Primary Criteria	Weight	Sub-Criteria	Relative Weight	Alternative 01 - SAGR Scoring Rationale	Score out of 10	Weighted -for each section	Alternative 02 - MBBR Scoring Rationale	Score out of 10	Weighted -for each section
Technical & operational	**35**	Ability to reliably meet effluent quality criteria	**15**	This alternative can fully meet the effluent criteria. Works well in cold weather.	10	15	This alternative can fully meet the effluent criteria.	10	15
		Flexibility to respond to variable raw wastewater quality and low initial loads	**15**	This alternative has good flexibility to operate with variable raw wastewater quality and loads.	7	10.5	The MBBR process provides additional flexibility to manage variable raw wastewater quality and will not be negatively impacted by some variations in loads.	7	10.5
		Compatibility with existing infrastructure, existing site boundary	**10**	This alternative has a larger footprint but is compatible with the existing site. Requires new tankage for the SAGR, including some piping, new blowers, and change in aeration system. Requires new aeration systems for the lagoons and an effluent recycle line, similar to Alternative 02.	9	9	This alternative can be implemented within the existing infrastructure at the site and media can be easily added to the lagoons. Requires new aeration systems for the lagoons and an effluent recycle line, similar to Alternative 01. However, this alternative involves the construction of tankage at the site for the MBBR, some construction for the additional equipment, and requires additional chemical systems, and poses slightly higher complexity for implementation than Alternative 01.	7	7
		Compatibility with hydraulic grade line requirements	**5**	This alternative is compatible with the future HGL of the facility.	10	5	This alternative is compatible with the future HGL of the facility.	10	5
		Constructability and Construction Schedule	**15**	This alternative requires excavation and construction for the new SAGR units, with aggregates and insulation; Also required are influent, effluent, and aeration piping, as well as electrical and control upgrades. Based on preliminary site observations, excavation is expected to be the primary determiner for construction times. Requires new lagoon aeration systems	8	12	Relatively simple requirements for the MBBR media, which can directly be added into the tanks. Requirements for solids separation unit and chemical systems are seen to be additional, and excavation may be required. Requires influent, effluent, and aeration piping, as well as electrical and control upgrades. Requires new lagoon aeration systems. added systems pose slightly higher complexity compared to Alternative 01.	6	9
		Proven Technology with strong track record; pilot testing, start-up needs, ease of approvals with MECP	**5**	This alternative wastewater treatment technology has installations in Ontario and throughout Canada in similar applications. It is compatible with existing processes at the site. Need for pilot tests are not anticipated	9	4.5	This alternative is used in Ontario in similar applications. It is compatible with existing processes at the site. There is a higher possibility with algae-related challenges without additional equipment such as a solids separation unit.	7	3.5

Primary Criteria	Weight	Sub-Criteria	Relative Weight	Alternative 01 - SAGR Scoring Rationale	Score out of 10	Weighted -for each section	Alternative 02 - MBBR Scoring Rationale	Score out of 10	Weighted -for each section
		Process complexity & operator training	**5**	This alternative's process complexity is considered standard, but operator training will be required. Has a longer start up time for biofilm growth, but otherwise is low complexity in terms of operations	9	4.5	This alternative's process complexity is considered standard, but operator training will still be required. The additional treatment for algae adds complexity to operations.	7	3.5
		Process robustness (likelihood of process upsets) and redundancy	**10**	The SAGR process provides increased resistance to process upsets due to the robustness of the fixed growth biofilm on the stable media surfaces. Has a stable performance even in cold weather. Comparable to Alternative 02	9	9	The MBBR process provides increased resistance to process upsets due to washout during high flows due to the robustness of the fixed growth biofilm on the stable media surfaces. Comparable to Alternative 01.	9	9
		Operation and maintenance requirements (need for additional resources/equipment, frequency of additional checks and maintenance requirements)	**20**	Operation and maintenance requirements for this alternative are considered standard. Additional O&M requirements are considered to be minor due to lesser moving parts.	8	16	Operation and maintenance requirements for this alternative are considered to be slightly higher, due to the solids separation unit. MBBR Media and aeration systems also require slightly higher monitoring.	7	14
		Maximum Sub-total Score – Technical =	**100**		**—**	**56**		**—**	**50**
		Sub-total Score – Technical =	**35**		**—**	**19.6**		**—**	**17.5**
Socio-Cultural	**15**	Minimize footprint and site impacts /architectural aesthetics (plant appearance)	**10**	The footprint of this alternative occupies a smaller section of the available area on the site but is higher than that of Alternative 02. Both Alternatives require a blower building.	7	7	The footprint of this alternative is slightly lower than that of Alternative 01 but has the added need for the solids separation unit and chemical storage. Both Alternatives require a blower building.	8	8
		Minimize truck traffic (during construction & operation)	**10**	Truck traffic is not anticipated to be impacted during operation beyond the status quo. A temporary increase in traffic is anticipated during construction for site works. Impacts are expected to be slightly higher than Alternative 02, due to the larger scope of site works required (excavation) for the SAGR.	7	7	Truck traffic is not anticipated to be impacted during operation beyond the status quo. A temporary increase in traffic is expected during construction but impacts are anticipated to be lower than Alternative 01, due to the smaller scope of site works required for the MBBR tanks.	8	8
		Minimize noise (during construction & operation)	**15**	Noise during operations is not anticipated to change from existing levels. Some temporary noise production is expected during construction activities. Impacts are comparable to Alternative 02.	7	10.5	Noise during operations is not anticipated to change from existing levels. Some temporary noise production is expected during construction activities. Impacts are comparable to Alternative 01.	7	10.5

Primary Criteria	Weight	Sub-Criteria	Relative Weight	Alternative 01 - SAGR Scoring Rationale	Score out of 10	Weighted -for each section	Alternative 02 - MBBR Scoring Rationale	Score out of 10	Weighted -for each section
		Minimize odour (during construction & operation)	**40**	Odours produced during operations are not expected to exceed conventional levels for a wastewater treatment facility. Due to the covered nature of the SAGR units, a higher degree of odour control is anticipated compared to Alternative 02.	8	32	Odours produced during operations are not anticipated to exceed conventional levels for a wastewater treatment facility. There remains some odour production potential during operation of the facility.	7	28
		Minimize impacts on neighboring properties	**25**	Due to works associated with construction, such as excavation, noise, dust etc., this alternative will result in some impacts on neighbouring properties. Impacts are expected to be slightly higher than Alternative 02, due to the larger excavation area required. Impacts are expected to be temporary during the construction period, and are not anticipated to change during operations beyond the status quo	6	15	Due to works associated with construction, such as excavation, noise, dust etc., this alternative will result in some impacts on neighbouring properties. Impacts are expected to be slightly lower than Alternative 01, due to the reduced excavation area needed. Impacts are expected to be temporary during the construction period, and are not anticipated to change during operations beyond the status quo	7	17.5
		Sub-total Score – Socio-Cultural =	**100**		**—**	**71.5**		**—**	**72**
		Sub-total Score – Socio-Cultural =	**15**		**—**	**10.7**		**—**	**10.8**
Natural Environment	**20**	Minimize air/solids emissions	**15**	The additional concrete used for this alternative contributes to an increase in air emissions. Solids emissions are not reduced or exacerbated by this alternative.	5	7.5	Relatively smaller construction scope and minimal anticipated concrete works will result in a lower quantity of air emissions. Solids emissions are not reduced or exacerbated by this alternative.	7	10.5
		Minimize impacts on species at risk	**10**	Species at risk are not anticipated to be impacted by this alternative. Impacts from all alternatives do not deviate beyond the status quo.	8	8	Species at risk are not anticipated to be impacted by this alternative. Impacts from all alternatives do not deviate beyond the status quo.	8	8
		Source water protection	**25**	The construction and wastewater effluent quality of this alternative are not anticipated to impact source water quantity or quality.	8	20	The construction and wastewater effluent quality of this alternative are not anticipated to impact source water quantity or quality.	8	20
		Minimize impacts on and of climate change (greenhouse gas emissions & carbon footprint, energy intensity), promotes sustainability	**25**	This alternative is energy and resource intensive in terms of aerations. GHG emissions are expected to be less than those of conventional systems and comparable to Alternative 02. GHG impacts during construction activities are expected to be temporary and negligible.	6	15	This alternative is slightly less intensive for energy and resources in terms of aerations. But the solids separation unit requires additional energy considerations. GHG emissions are expected to be less than those of conventional systems and comparable to Alternative 01. GHG impacts during construction activities are expected to be temporary and negligible.	7	17.5

Primary Criteria	Weight	Sub-Criteria	Relative Weight	Alternative 01 - SAGR Scoring Rationale	Score out of 10	Weighted -for each section	Alternative 02 - MBBR Scoring Rationale	Score out of 10	Weighted -for each section
		Flexibility of treatment processes to adapt and respond to varying climatic conditions	**25**	SAGR offers resistance to high flows and maintains treatment quality in varying flow conditions and can aid in some increase of the capacity of the WWTL to respond to varying climatic conditions such as high flow events caused by significant storms.	8	20	MBBR also offers resistance to high flows and maintains treatment quality in varying flow conditions, and can aid in some increase of the capacity of the WWTL to respond to varying climatic conditions such as high flow events caused by significant storms.	8	20
		Sub-total Score – Natural Environment =	**100**		**—**	**70.5**		**—**	**76**
		Sub-total Score – Natural Environment =	**20**		**—**	**14.1**		**—**	**15.2**
Economic	**30**	Capital costs	**60**	Discharge Scenario 03 with 45-day discharges each for Spring and Fall has been considered for the sizing and associated total estimated capital costs, since it seems to be the most likely discharge scenario. Capital costs for this scenario are **$7,600,000**	10	60	Discharge Scenario 03 with 45-day discharges each for Spring and Fall has been considered for the sizing and associated total estimated capital costs, since it seems to be the most likely discharge scenario Capital costs for this scenario are: **$9,200,000**	8	48
		Operational costs / LCC	**40**	Typical maintenance activities such as maintenance for the Blowers, etc.	10	40	Operational costs are expected to be slightly higher than those of Alternative 01, given the presence of the solids separation unit for this alternative. Typical maintenance activities such as maintenance for the Blowers, etc.	8	32
		Sub-total Score – Economic =	**100**		**—**	**100**		**—**	**80**
		Sub-total Score – Economic =	**30**		**—**	**30.0**		**—**	**24.0**
		Overall Scores	**100**		—	**74.4**		—	**67.5**
		Overall Scores - Inverted Technical vs. Social 65%/35%	**100**		—	**72.8**		—	**70.6**

10.4 Recommended Preferred Design Concept

To summarize, following a detailed analysis which considered Natural Environment, Socio-Cultural, Technical & Operational and Economic criteria, the preferred design concept was the:

- SAGR Retrofit, for implementation with the existing lagoons, with a twice-a-year discharge window

This preferred design concept offers the full utilisation of the existing Moose Creek Lagoons, and is to be built within the existing property boundary.

The alternative was primarily selected for its ability to address treatment and capacity constraints, and its high treatment capability and robustness, easy implementation, low footprint area. A key differentiator was also the lower economic burden offered by the SAGR alternative when compared to the MBBR alternative. The alternative will also be implemented without the need for land acquisition or disturbance of biodiversity in the adjacent land. Furthermore, requirements for an additional solids separation unit (such as a DAF or tertiary filter) are also not needed in the SAGR retrofit, further increasing feasibility and implementation, while reducing cost considerations.

The opinion of probable cost for preferred design concept totaled $7.6 M (excluding GST and escalation) and is detailed in **Appendix K**. The Class 'D' level opinion of probable cost (-20% to +30%) was developed in 2025 $CAD and assumed one construction contract for the facility expansion upgrades. The opinion of probable cost shall be further refined in detailed design.

Other considerations being proposed for implementation through the Moose Creek WWTL expansion are:

- Current effluent discharge frequency is once a year. The proposed effluent discharge is twice a year, with the addition of a Fall discharge window of 45 days (1 Nov–15 Dec), and an extension of the current Spring discharge window to 90 days(1 Mar–31 May), which will allow the expansion of the rated capacity of the Moose Creek WWTL from 302 m3/d to 438 m3/d.
- This will also provide the required increase in storage capacity for the existing lagoons and improve resilience to high flow events, without additional land acquisition or the construction of additional treatment lagoons.
- The increase in flows as well as the discharge window for the newly proposed Fall discharge, changes to the Spring discharge, and the new effluent limits will be as per the recommendations of the ACS (provided in **Appendix J**) as detailed in Section 7.4, and according to associated MECP approvals.

11. Climate Change Considerations

A stand-alone report detailing climate change considerations for the Class EA has been compiled and provided in **Appendix L**.

The findings of the Climate Change Information Report are summarized below:

- No major continued flood risks were observed and risk of forest fires was found to be low. Periodic mitigation such as fire bans are recommended where appropriate.
- Drought: Increased heat waves in the summer may stretch into the Fall, causing low flows in Moose Creek. This has the potential to affect Fall discharge window's duration (window may be shortened).
- High precipitation: Risk of reduction in lagoon storage volume. In the worst-case event (a 1 in 100 year storm when lagoons are at full capacity and receiving continued inflows), the lagoon system was found to be capable of accommodating rainfall, from the design freeboard to the minimum allowable MECP freeboard.
- The lagoon height, coupled with electrical power independence, adds to system resilience. However, the Spring discharge window can be adversely impacted during power outages from extreme winter storms. Thus, a backup generator may be considered by the Township for future implementation, to increase resiliency.
- The future WWTL was found to demonstrate a moderate degree of resiliency towards potential reduced discharges owing to:
    - Proposed twice-a-year discharge scenario, and
    - Resulting potential storage volume in the lagoons (subject to the final approvals from the MECP)
- Erosion Management: recommendations for periodic inspections and stormwater management measures, as needed, particularly for the lagoon berms.
- Proposed technologies: The SAGR and MBBR technologies are robust, efficient and anticipated to use sustainable material sourcing.
- GHG emissions: It was determined that both the SAGR and MBBR alternatives have comparable GHG emissions.
- Coagulant usage: It was anticipated that the coagulant usage will also be comparable between SAGR and MBBR. For both alternatives, a phosphorus slipstream will need to be implemented for chemical dosage into the lagoon. It is to be noted that for the SAGR, there is no requirement for an additional treatment unit such as a solids separation unit/tertiary filter. Hence, there is no associated requirement of chemical

usage (or additional coagulant) downstream of the SAGR, which adds resiliency to the alternative.

- Biodiversity Conservation: supported by the project's aim to avoid construction within the adjacent forested area.

Overall, the SAGR showed a slightly higher performance in terms of climate change considerations.

12. Potential Impacts and Mitigation Measures

This section describes the potential impacts anticipated from the construction and operation of the preferred design concept, as well as the recommended mitigating measures to avoid or minimize such impacts.

Implementation of the preferred solutions are not expected to have significant impacts on the existing natural environment during operation; however, as with any construction project, there will be some temporary potential impacts to the public and environment during construction in areas such as noise, dust, vibration and visuals during the construction period. Most of the impacts will be of short-term duration and expected to occur only during construction. Property owners adjacent to the sites where construction activities will take place should be notified in advance and provided with the Municipality's contact information should they encounter any problems during construction.

Construction of new infrastructure should adhere to strict safety guidelines and all applicable codes and standards. All construction work shall be carried out in accordance with the Occupational Health and Safety Act and other local regulations.

Specific mitigation measures, as described below, are recommended for implementation to reduce anticipated potential impacts

12.1 Receiving Water Quality & Source Water Protection

An assimilative capacity study was completed as part of this Class EA to assess impacts of this expansion and the increased discharge window on the quality of the receiving water and recommend associated effluent limits to the facility.

The ACS established effluent limits in Consultation with the MECP with considerations for the low flows seen in Moose Creek during the Fall periods.

While the intended construction area is outside Wellhead Protection Areas (WHPA), Highly Vulnerable Aquifer (HVA) areas, or Significant Groundwater Recharge Areas (SGRA), it was noted that the area within 500m of work area is located within a mapped Intake Protection Zone-3 (IPZ-3a). Measures to protect groundwater resources from potential impacts from construction and dewatering will also be evaluated in the detailed design stage.

12.2 Disturbance to Natural Environment Features

There is only one tree in the immediate vicinity of the intended construction area. The tree is located towards the northern boundary of the existing site, as shown in Figure

12-1. While the actual area of construction is much smaller, the area of potential disturbance during construction (including laydown areas) have been demarcated in Figure 12-1. All construction activities will avoid this tree.

As per the recommendations of the Desktop Natural Environment Report with regard to potential and actual fish habitats, the area of potential disturbance during construction is away from and does not intersect with the municipal drain to the North along 8th road, and is also 50m away from Moose Creek. No direct impacts are anticipated and indirect impacts can be avoided through traditional best management practices (i.e., minimize lighting and noise, ensure that drainage and dust does not affect habitats or functions).

The detailed Natural Environment Assessment Report (NEAR) will be completed in late Fall 2025, to build upon the findings and recommendations of the Natural Environment Screening. Any additional measures that are identified through the report for the protection of natural environment heritage features will be implemented during the construction stage.

Figure 12-1: Tree on-site in the vicinity of intended construction area

12.2.1 General Best-Management Practices

The following best-management practices will be applied:

- The setbacks determined in the Natural Environment Report will be maintained, in line with minimum setback requirements from the DFO. No in-water work is anticipated during construction.
- All laydown area work, vehicle access, and heavy machinery use & movement will be limited to the identified area for potential disturbance, shown in Figure 12-1,

which will have undergone Stage 2 archaeological assessments and any other subsequent archaeological assessments that may be required.

- All required archaeological reporting will be completed prior to the start of any ground disturbance in association with construction activities.
- Required liners such as geo-textile liners will be used where necessary to prevent any leakages or contamination into the surrounding environment and ground water.
- All loose materials or materials with the potential to create dust and airborne particles will be covered as needed, to prevent dispersion and or erosion.
- Spill control kits will be situated on-site, as needed. All spills will be immediately mitigated and cleaned, as per spill control procedures and applicable regulatory requirements.
- All waste disposal from construction activities will be carried out in accordance with applicable regulatory requirements and in a safe manner, so as to protect the environment and human health.

12.3 Social / Cultural Environment Impact Mitigation

Potential impacts with regard to social and cultural aspects for the construction and operational periods are not anticipated to be significant. Impacts are anticipated to be temporary and minor in nature.

12.3.1 Traffic

Truck traffic is not anticipated to be impacted during operation beyond the status quo. A temporary increase in traffic is anticipated during construction for site works. Not change is expected during operations.

12.3.2 Noise, Dust and Vibration during Construction

Noise and vibration levels during operations is not anticipated to change from existing levels. Some temporary noise production and vibration is expected during construction activities and heavy machinery.

Due to works associated with construction, such as excavation for the SAGR units, implementation will result in some impacts on neighbouring properties. Impacts are expected to be temporary during the construction period, and are not anticipated to change during operations beyond the status quo.

12.3.3 Odours and Noise During Operation

Odours produced during operations are not expected to exceed conventional levels for a wastewater treatment facility. Due to the covered nature of the SAGR units, a higher and good degree of odour control is anticipated.

Noise impacts to the surroundings are expected to be temporary in nature, and are anticipate only during the construction period. Noise-intensive construction activities will be limited to day-time hours. For operations, noise levels are expected to remain comparable to existing levels, as the SAGR does not necessitate major moving parts. The blowers for the SAGR (and any associated blower upgrades for the existing lagoon aeration system, as determined in detailed design) will be implemented with all the necessary noise protections and containments.

12.3.4 Visual / Architectural

The footprint of this alternative occupies a relatively smaller section of the available area on the site.

Visually, the site is not highly visible from existing roads outside the property boundary, such as 8th Road primarily due to the shrubbery and tree line around the property. Additionally, the SAGR units will be situated underground for the most part. Therefore, visual and aesthetic impacts are expected to be minor or negligible.

12.3.5 Cultural and Archaeological

Based on the findings of the Stage 1 AA for the study area, a Stage 2 AA was recommended by True North, to verify the presence of archaeological items of significance within the areas designated for expansion activities and construction disturbances under this Class EA. The Stage 2 Archaeological Assessment has been scheduled for Late Fall (October) 2025 and will be completed under the detailed design phase. If any further archaeological assessments are found to be required (Stage 3 and Stage 4), these assessments will also be completed during the detailed design phase.

Prior to any ground disturbance, all necessary archaeological assessment requirements will be fulfilled, and all First Nation communities in the project contact list will continue to be invited to participate and provide their inputs and perspectives.

13. Implementation Plan

In addition to the recommended preferred design concept for the expansion of the Moose Creek WWTL, this study confirmed the following design constraints to be adhered to in the implementation stage:

- The design basis for a rated capacity of 438 m^3/d, with twice-a-year discharge windows and effluent objectives and limits as per the ACS study and MECP
- The preliminary site plan for the new facility
- The existing lagoons will need to remain fully operational during construction of the new facility to maintain continual wastewater treatment for the Village of Moose Creek
- The need to implement the preferred solution within the specified timeline for the funding grant is a key factor that should be considered and adhered to
- The lagoon aeration system and key equipment should be reviewed during the preliminary design stage as a value engineering exercise

The timeline for this Class EA, as well as the proposed construction timeline are detailed below:

- With the completion of this Class EA project in Fall 2025, detailed design is set to begin immediately.
- Design is expected to proceed from Fall 2025 (Q4) to early Q1 of 2026.
- Construction is required to start in mid-2026, with a completion goal of mid-2027.

The above mentioned project timeline is an accelerated timeline when compared to typical Class EA timelines, primarily due to the critical need to meet the deadlines for the funding grant issued to this project under the HEWSF grant. Additionally, it is also essential to implement the preferred design concept well ahead of the year 2028, based on the predicted exceedance of the existing capacity of the Moose Creek WWTL according to the most recent historical influent flow trends.

Hence, due to these deadlines, the facility cannot consider a staged or phased approach for construction. The entire design and build will need to be completed as planned, in one continuous stretch.

Table 13-1 details the timeframe for implementation of key project tasks.

Table 13-1:Timeframe for implementation of key project tasks

Key Tasks	Timeframe
Notice of Completion of this Class C EA	Late Fall Q4, 2025
Detailed Design	Late Fall Q4, 2025 – Early Q1 2026
Tendering and Award	Early Q1 2026 – Q2 2026
Start of Construction	May-June 2026
End of Construction and commissioning	June 2027

The primary risk involved is any unforeseen delay that may impact this design and build timeline, affecting the funding grant which is essential for project implementation. Hence, it is paramount that the Project Team be proactive in completion of the design and tender phases, as well as in coordinating with all the relevant approval authorities (such as the MECP), to secure the required permits for construction at the earliest.

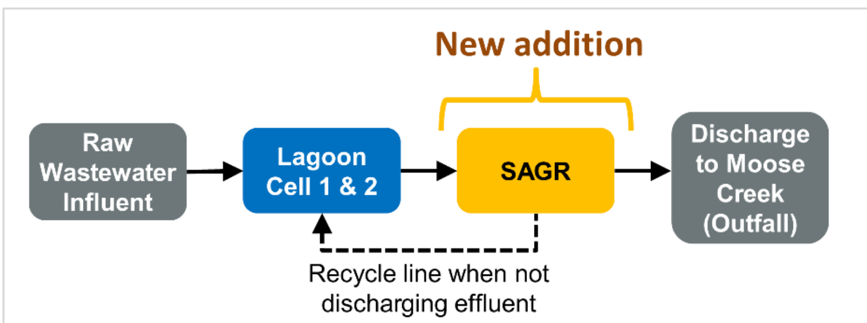

Figure 13-1: Process Flow Diagram for Implementation

The process diagram for implementation is depicted in Figure 13-1 . The need for upgrades to the lagoon's aeration grid and existing blowers will be evaluated in value engineering during detailed design.

The preliminary site plan for implementation based on the preferred alternative is shown in Figure 13-2.

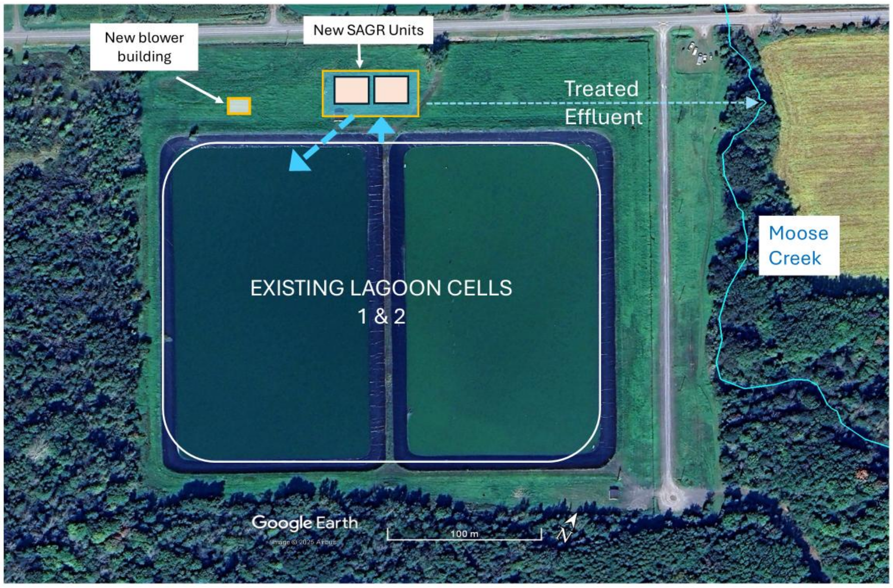

Figure 13-2: Preliminary site layout for implementation

The opinion of probable cost for implementation has been provided in Table 13-2, as a preliminary Class D (-30%, +50%) estimates, based on budgetary quotes provided by vendors for key equipment as well as the recent experience of CIMA+ for similar projects. Detailed costing is also provided in Appendix K.

Table 13-2:Conceptual capital costs for the Moose Creek WWTL Expansion

Item	Cost (in $)
Site Works & Structural / Architectural (SAGR components, excavation, general civil work, blower building, etc.)	$1,080,000
Process and Equipment	
Intermediate Pump Station	$650,000
SAGR and related Process Units	$1,770,000
Other process components (Piping, Valving, Miscellaneous, etc.)	$680,000
HVAC & Plumbing	$27,322
Instrumentation and Controls	$75,000
Electrical	$410,000
A: Sub-Total Costs	$4,700,000

Item	Cost (in $)
B: General Contractor's Overhead & Profit, Mob., bond (15% of A)	$710,000
Construction Contingency (25% of B)	$1,350,000
Engineering (15% of B)	$810,000
Total Estimated Construction Costs (C) - Excluding Escalation, GST & Engineering	**$7,600,000**

13.1 Permits

A list of the following permits were preliminarily identified as required prior to construction. Prior to construction start, it is recommended that the below list be updated as needed, in accordance with the latest requirements from relevant approval authorities:

- Ministry of Environment, Conservation & Parks (MECP) for the updated Environmental Compliance Approval (ECA)
- Building Permit
- Electrical Permit requirements to be determined during detailed design
- Utilities, such as Hydro one
- South Nation Conservation Authority Permit requirements to be determined during detailed design
- The need for an Environmental Activity Sector Registry (EASR) to be determined during detailed design based on anticipated construction dewatering needs

Additionally, the following organisations will be notified, as stakeholders.

- Ministry of Citizenship and Multiculturalism (MCM)
- South Nation Conservation Authority
- Fisheries and Oceans Canada (DFO)

14. References

Eggleston, S., Buendia, L., Miwa, K., Ngara, T., & K. Tanabe, E. (2006). *2006 IPCC guidelines for national greenhouse gas inventories: Volume 5—Waste.* Institute for Global Environmental Strategies. Intergovernmental Panel on Climate Change. Retrieved from https://www.ipcc-nggip.iges.or.jp/public/2006gl/

HESL. (2025). *Moose Creek Wastewater Treatment Lagoon Assimilative Capacity Study.* Township of North Stormont.

Mattson, R., Wildman, M., & Just, C. (2018). Submerged attached-growth reactors as lagoon retrofits for cold-weather ammonia removal: performance and sizing. *Water Sci Technol, 78*(8), 1625-1632.

MEA. (2024). *Municipal Class Environment Assessment.* Municipal Engineers Association .

MECP. (2021, July 12). *B-1-5 Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters*. Retrieved from Ontario.ca: https://www.ontario.ca/page/b-1-5-deriving-receiving-water-based-point-source-effluent-requirements-ontario-waters#section-7

Metcalf & Eddy. (2014). *Wastewater EngineeringTreatment and Resource Recovery.*

Nexom. (n.d.). *SAGR*. Retrieved July 03, 2025, from Nexom: https://nexom.com/sagr/

Ontario. (2021, October 07). *Government of Ontario*. Retrieved from Class environmental assessments: Section 16 Order: https://www.ontario.ca/page/class-environmental-assessments-section-16-order

Ontario. (2025). *Environmental Assessment Act, R.S.O. 1990, c. E.18*. Retrieved from Government of Ontario: https://www.ontario.ca/laws/statute/90e18

Ribeiro, R. P., Kligerman, D. C., & Oliveira, J. L. (2024). Nitrogen removal and nitrous oxide emission from moving bed biofilm reactor (MBBR) under different loads and airflow,. *Journal of Environmental Chemical Engineering,, 12*(3), 112574.

RVA. (2024). *Villages of Crysler, Finch, and Moose Creek Water and Wastewater Master Plan .* Berwick, ON: Township of North Stormont.

Sabba, F. T., & et al. (2018). Nitrous oxide emissions from biofilm processes for wastewater treatment. *Appl Microbiol Biotechnol, 102*, 9815–9829.

SNC. (2025, August 20). *Maps*. Retrieved from South Nation Conservation: https://www.nation.on.ca/resources/maps

Zhou, X., Yang, F., Yang, F., Feng, D., Pan, T., & Liao, H. (2022). Analyzing greenhouse gas emissions from municipal wastewater treatment plants using pollutants parameter normalizing method: a case study of Beijing. *Journal of Cleaner Production, 376*(134093).