Township of Mapleton

Mapleton Wastewater Servicing Class EA

Environmental Study Report
FINAL

Project Number
BRM-605325-A0

EXP Services Inc.
1595 Clark Blvd
Brampton, ON L6T 4V1
Canada

Date Submitted
November 2017

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Legal Notification

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Executive Summary

ES-1. Introduction

ES-1.1. Overview

The Township of Mapleton currently owns and operates a wastewater conveyance system and a lagoon-based Wastewater Pollution Control Plant (WPCP) to manage wastewater for the communities of Moorefield and Drayton, which are located within the Township of Mapleton (the Township). The facility is operated under Amended Environmental Compliance Approval Number 0963-A4ZMVA, Issue Date January 22, 2016 (see Appendix A). Wastewater from these communities is collected through a wastewater conveyance system and then pumped from pumping stations located within in the communities to the WPCP, located near Drayton. Currently, the WPCP has an approved average annual capacity of 750 m^3/day.

The Wellington County Population, Household and Employment Forecast Update for 2011 – 2041 predicts that, combined, the populations of Moorefield and Drayton will increase from 2,300 in 2011 to 4,380 by 2031[1]. The Township determined that the existing wastewater conveyance system and WPCP would not have sufficient capacity to accommodate this growth and has therefore initiated a Municipal Class Environmental Assessment to address this issue.

This Class Environmental Assessment (EA) has been carried out following the Schedule 'C' planning process of the Municipal Class EA (as amended), as approved under the Environmental Assessment Act (EA Act) R.S.O. 1990, Chapter E.18. The process was completed over four phases:

- Phase 1: Problem/Opportunity Statement;
- Phase 2: Alternative Solutions;
- Phase 3: Alternative Design Concepts; and
- Phase 4: Environmental Study Report.

This Environmental Study Report documents the process that was followed in this Class EA to identify and evaluate alternative solutions and designs and to identify and avoid or mitigate potential environmental impacts.

ES-2. Overview of Existing Wastewater System

The Mapleton wastewater treatment facilities include the Mapleton WPCP, the Drayton sewage pumping station (SPS) and the Moorefield SPS. These facilities are operated by the Ontario Clean Water Agency (OCWA). The Mapleton WPCP receives municipal sewage from two separate sewage collection networks: Drayton and Moorefield.

Drayton Sewage Collection Network

The Drayton sewage collection network consists of 11.5 km of gravity sewers, including 167 manholes[2]. The sewer network was installed in 1988 and includes pipe diameters ranging

[1] Watson and Associates Economists Ltd. Wellington County Population Household and Employment Forecast Update, 2011-2041. May 5, 2015.
[2] R.J. Burnside & Associates Ltd. Village of Drayton Infiltration and Inflow Study Report. November 13, 2013.

between 150 to 350 mm. The collection system conveys all of the collected sewage to the Drayton SPS, which is located on north side of Mill Street at River Run Road, in Drayton.

The Drayton sewage collection network currently services a population of about 1,880 people. The future population (year 2031) to be serviced has been estimated by the Township to be 3,100 people.

The Drayton SPS consists of a wet well, two submersible sewage pumps (1 duty and 1 standby) and a 60 kW standby diesel generator. The sewage is pumped through a 1.6 km forcemain of 200 mm diameter that discharges at the raw splitter chamber at the Mapleton WPCP. The pumped flow is measured by a 150 mm flowmeter on the forcemain. The two pumps each have a rated capacity of 34.0 L/s at a TDH of 42.0 m[3]. The pumps are not intended to run together to provide additional flow.

The results of the hydraulic verification of the pumping system's capacity, including the forcemain, indicates that the pumping capacity required for current and future peak flow is:

- Current: 29 L/s at 31 m TDH
- Future: 47 L/s at 42 m TDH

Based on this analysis, the existing pumps do not have the capacity to meet the future peak flow. Therefore, they will need to be replaced in order to meet the future flow. Prior to the upgrade of the pumps, an investigation of the state of the forcemain should be carried out before deciding on any future expansion of the pumping capacity.

Moorefield Sewage Collection Network

The Moorefield sewage collection network consists of low pressure sewers, where individual connections have a small grinder pump discharging through 40 to 125 mm PVC pipe. The sewage is conveyed to the Moorefield pumping station, which is located on Booth Street.

The approximate number of connections in Moorefield is 160, servicing approximately 420 people. All connections use grinder pumps.

The Moorefield SPS consists of a wet well, two submersible sewage pumps (1 duty and 1 standby) and a 50 kW standby diesel generator. The sewage is pumped through a 5 km forcemain of 150 mm diameter that discharges at the raw splitter chamber at the Mapleton WPCP.

The two pumps each have a rated capacity of 14.14 L/s (1,222 m^3/d) at a TDH of 47 m. The pumps are not intended to run together to provide additional flow.

The current and future (2031) peak hourly flows are calculated to be 361 m^3/d (4.2 L/s) and 1,125 m^3/d (13 L/s), respectively. Based on this analysis, it appears that the capacity of Moorefield SPS is sufficient to meet the future peak flow.

Mapleton WPCP

The Mapleton WPCP receives raw sewage from Drayton and Moorefield sewage collection networks. The average daily flow into the facility is 714m^3/d (based on the peak of 2013).

[3] Ontario Ministry of the Environment. *Amended Environmental Compliance Approval Number 0963-A4ZMVA*. January 22, 2016.

The treatment facility consists of:

- An aerated lagoon (Cell 2) of 60,500 m^3. Air supply is provided by two high speed blowers (1 duty and 1 standby) having a capacity of 680 m^3/h at 45 kPa.
- A secondary settling lagoon (Cell 1) of 62,100 m^3.
- Three storage ponds (Cells 3, 4A and 4B) with a total volume of 350,000 m^3.
- An alum dosing system with a 15.000 L storage tank and two 7.1 L/h capacity metering pumps. Alum is dosed in the flow structure A located upstream of the storage pond (Cell 3). The flocculation takes place in Cell 3 using a diffused air system. Air supply for mixing is provided by a 25 hp compressor.
- Five tertiary sand filters, each having a 4.65 m^2 filtration area. The total capacity of the filters is 5580 m^3/d based on a filtration rate of 10 $m^3/m^2/h$.
- Two UV disinfection units, designed to handle a peak flow of 4,000 m^3/d.

The effluent is discharged into the Conestogo River via a 600 mm diameter pipe and a swale.

The Mapleton WPCP is operated by OCWA under the amended ECA number 0963-A4ZMVA. The discharge permit is seasonal, as described in Table ES-1.

Table ES-1: WPCP Effluent Discharge Limits (existing)

Month	Discharge Limits (m^3/day)
March	1,581
April	3,154
October	233
November	1,754
December	4,000
Discharge Limit Flexibility: Discharges in excess of these daily discharges is allowed if the minimum 10:1 of the streamflow to daily discharge rate for the applicable period of that design streamflow occurs, based on actual measurements of flow rate in the Conestogo River.	

Source: Ontario Ministry of the Environment. Amended Environmental Compliance Approval Number 0963-A4ZMVA. January 22, 2016.

The effluent compliance limits and objectives are summarised in Table ES-2 below.

Table ES-2: Mapleton WPCP Effluent Compliance Limits and Objectives (existing)

Parameter	Unit	Average Concentration	
		Compliance limits	**Objectives**
$CBOD_5$	mg/L	7.5 (Apr & Oct) 10.0 (Mar. Nov. & Dec)	5.0
TSS	mg/L	-	-
Total Ammonia Nitrogen (TAN) (NH_4+NH_3)	mg/L	5.0	3.0
Total Phosphorus (TP)	mg/L	0.5	0.3
E. coli	CFU/100 ml	200	100
pH	-	-	6.5 – 9.0

Source: Ontario Ministry of the Environment. Amended Environmental Compliance Approval Number 0963-A4ZMVA. January 22, 2016

The average concentration of all parameters regulated by the ECA have met the compliance limits between 2012 and 2015. The effluent also met the effluent concentration objectives for Total Phosphorus and *Escherichia coli* (*E. coli*).

ES-3. Problem/Opportunity Statement

The main driver for this Class EA was that the WPCP is operating very close to its rated average daily capacity of 750 m^3/day. In 2013, the facility's average daily inflow was 714 m^3/day, or about 95% of its rated capacity. This leaves the facility with little to no opportunity to manage flow increases and does not provide the Township with the ability to manage the additional wastewater generated by future growth. The rated capacity of the facility must therefore be increased to allow the Township to meet its projected service area growth to 2031.

Additionally, analysis of the wastewater collection systems for the communities of Drayton and Moorefield revealed that the Drayton system does not have sufficient pumping capacity to service that community's projected future population.

The problem statement for this Class EA, which was confirmed after reviewing with the public at Public Information Centre #1, includes two parts and is as follows:

a) The Township has a lagoon-based Wastewater Treatment system which currently only has the rated capacity for 750 cubic metres per day. The treatment capacity needs to be increased to permit growth within the served areas of the Township to meet the Township's projected serviced area growth until 2031.

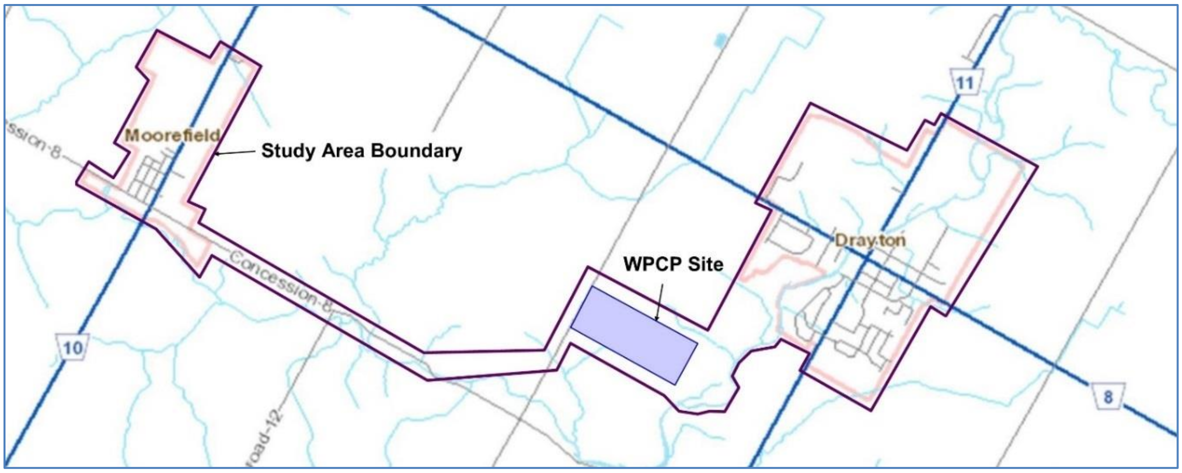
b) The Drayton Pumping Station does not have sufficient capacity to service Drayton's projected 2031 population. Pumping capacity will need to be increased in order to meet this service requirement.

The analysis of the WPCP and future demands indicates that the facility will require a rating of 1,300 m^3/day of average daily flow (1,019 m^3/day from Drayton and 281 m^3/day from Moorefield).

ES-4. Project Study Area

The study area for this project includes the communities of Moorefield and Drayton, the area including and surrounding the WPCP, and lands occupied by the wastewater collection system. Figure ES-1 depicts the study area.

Figure ES-1: Project Study Area



ES-5. Alternative Solutions

ES-5.1. Process Overview

Phase 2 of the Class EA process requires the consideration of alternative solutions or methods to address the problem or opportunity addressed in the problem statement. The approach that was followed in the identification and evaluation of alternative solutions included:

- The alternative solutions were divided into two categories:
  - Alternative treatment solutions – includes alternatives for the treatment of wastewater; and
  - Alternative discharge solutions – includes alternatives for the discharge of treated effluent.
- The categories of alternative treatment solutions were screened against the problem statement.
- Approaches for primary, secondary and tertiary treatment of wastewater were considered.
- Based on WPCP treatment requirements, three alternative treatment solutions were considered for upgrading the Mapleton WPCP, including:
  - Pre-lagoon nitrification with Moving Bed Biofilm Reactor;
  - Post-lagoon nitrification with SAGR technology; and
  - Extended Aeration.
- The three treatment alternative solutions were evaluated against evaluation criteria and a preliminary preferred treatment solution identified.
- Alternative discharge solutions were identified and reviewed.

- The preferred discharge solution was identified based on ability to meet the municipality's discharge requirements and on the results of an update to the Mapleton Receiving Water Impact Assessment.

Three categories of alternative treatment solutions were identified:

- Do nothing – continue to operate the facility as is;
- Control infiltration and inflow – implement infiltration and inflow measures to reduce the amount of non-wastewater flow into the WPCP; and
- Provide Additional Treatment Capacity – upgrade the WPCP to add additional treatment capacity.

ES-5.2. Treatment Alternative Solutions

The categories of treatment alternatives were pre-screened against the problem statement for further consideration in this study. The screening question was: Will the solution allow facility to increase its capacity to meet treatment demands projected for 2031? Based on the screening question, the "do nothing" and "Control infiltration and inflow" alternative treatment solutions were screened out and "Provide Additional Treatment Capacity" was carried forward.

Alternatives for adding additional treatment capacity at the WPCP were explored further. A key consideration was whether the technology or approaches would be complimentary to the existing WPCP system, as this would reduce capital upgrade costs and changes to operations.

One of the key issues in selecting the treatment process is the removal of ammonia nitrogen in the effluent. To ensure the selection of nitrification technologies would make maximum use of the existing installations, the following alternatives were identified for further study:

- Alternative 1 - Pre-lagoon nitrification with a Moving Bed Biofilm Reactor (MBBR);
- Alternative 2 - Post-lagoon nitrification with a submerged attached growth reactor (SAGR); and
- Alternative 3 – Sequencing Batch Reactor (SBR) extended aeration process.

A suite of evaluation criteria were developed in consultation with the Township to evaluate the alternative solutions. The MOECC and GRCA were also consulted on the evaluation criteria. The evaluation criteria are organized into four categories: technical, natural environment, social/cultural, and financial. The alternatives were ranked against each criterion relative to the other alternatives on a high, medium or low scale:

- A ranking of 'high' denoted best relative performance;
- A ranking of 'medium' denoted medium relative performance; and
- A ranking of 'low' denoted the lowest relative performance.

The evaluation identified Alternative 2 (post lagoon nitrification) as the preferred alternative solution. Based on the evaluation:

- Alternative 2 (post lagoon) was ranked "high" in five technical categories, while Alternatives 1 (pre lagoon) and 3 (extended aeration) were ranked "high" in only two categories.
- Alternative 2 (post lagoon) ranks highest for the Technical group of criteria because:
    - It would have good performance in winter;
    - It would require the least changes to existing operations;

  - It would be easier to implement than Alternative 1 or 3;
  - The alternative could be expanded if required in the future;
  - It would require the least maintenance compared to the other alternatives;
  - It would be easier to operate compared to the other alternatives;
  - While a relatively new process, it is approved for use in Ontario and Quebec.
- Alternatives 1 (pre lagoon) and 2 (post lagoon) both ranked high with respect to natural environment, as each will provide reliable protection of the environment. Alternative 3 may have reduced environmental performance in the winter season.
- Alternatives 1 (pre lagoon) and 2 (post lagoon) both ranked high with respect to social/cultural criteria, as each will have minimal noise, air or odour impacts or other nuisances. Alternative 3 (extended aeration) may have some odour impacts from sludge handling and storage.
- Alternative 2 (post lagoon) was ranked as high in both financial categories, meaning that it was among the lowest capital cost and lowest operating costs.

ES-5.3. Discharge Alternative Solutions

The second part of the identification and evaluation of alternatives dealt with discharge alternatives. To ensure adequate discharge is available to accommodate the estimated treatment flows at the WPCP, three discharge alternatives were assessed:

1. Alternative 1 – continuous discharge, whereby there would be some effluent discharge year-round, although flow rates would depend on river flow volume;
2. Alternative 2 – expanded discharge window, where the existing discharge window would be expanded to include the winter season (i.e., January and February); and
3. Alternative 3 – supplementing the existing discharge regime with spray irrigation.

A review of the discharge alternatives concluded that an expanded discharge window is the preferred alternative discharge solution, as neither continuous discharge all year or the existing discharge window with spray irrigation as suitable solutions for the Township.

ES-6. Alternative Designs

ES-6.1. Alternative Treatment Designs

Two alternative designs were considered for the proposed solution. They included:

- Alternative 1: Post lagoon nitrification using SAGR without the floating engineered wetlands; and
- Alternative 2: Post lagoon nitrification using SAGR that includes the use of floating engineered wetlands.

Both alternatives included a new alum mixing tank and new blowers building.

The Alternative Designs were evaluated against technical, natural environment, social/cultural and financial criteria. Each alternative design was evaluated against the above criteria to rank them as more preferred, preferred or less preferred in comparison to the other:

- More preferred - the alternative has the best performance or result based on the criterion;

- Preferred - performance or result for the alternative is not as good as the most preferred alternative but is better than the least preferred; and
- Less preferred - the alternative does not perform as well or have as good a result as the other alternatives.

Based on the evaluation results, Alternative 1: Post Lagoon Nitrification with SAGR is more preferred than the alternative that uses the floating island wetlands. The floating islands wetland add approximately $1.2M to the capital cost and are not critical elements to the wastewater treatment process.

ES-6.2. Effluent Discharge

The proposed discharge regime for the WPCP upgrade was developed through the Receiving Water Impact Assessment (RWIA) update (see Appendix B). The RWIA process (including consultation with the MOECC and GRCA) was used to help identify a proposed WPCP discharge regime that would provide adequate discharge for the expanded WPCP while having the acceptable impact on the receiving waters.

The proposed effluent discharge regime is presented in Table ES-3. As described in the RWIA, the effluent discharge regime has been designed to manage a daily influent rate of 1,300 m^3/day and an average daily accumulation of 158 m^3/day of precipitation. The existing discharge regime is included for comparison.

Table ES-3: Proposed and Existing Effluent Discharge Flow Regime

Month	Proposed Daily Discharge (m^3/day)	Existing Daily Discharge (2016 ECA) (m^3/day)
Jan	3,000	0
Feb	2,660	0
Mar	2,110	1,581
Apr	3,773	3,154
May	0	0
Jun	0	0
Jul	0	0
Aug	0	0
Sep	0	0
Oct	300	233
Nov	1,760	1,754
Dec	4,000	4,000

In addition, it is proposed that the discharge limit flexibility included in the existing ECA remain; that is, that discharges in excess of these daily discharges be allowed if the minimum 10:1 of the streamflow to daily discharge rate for the applicable period of that design streamflow occurs, based on actual measurements of flow rate in the Conestogo River.

The proposed effluent compliance limits and objectives for Total Ammonia Nitrogen (TAN) and TP were updated based on best-available treatment technology-based effluent, with the proposed effluent limits for TAN and TP decreasing compared to the existing. In addition, limits and objectives have bene proposed for total suspended solids (TSS), whereas the existing ECA does not have limits for TSS.

Table ES-4 presents the proposed effluent limits and objectives along with the existing, for comparison.

Table ES-4: Proposed and Existing Effluent Compliance Limits and Objectives

Parameter	**Unit**	**Proposed**		**Existing**	
		Average Concentration		Average Concentration	
		Compliance Limits	**Objectives**	**Compliance Limits**	**Objectives**
$CBOD_5$	mg/L	7.5 (Apr & Oct) 10.0 (Mar. Nov. & Dec)	5.0	7.5 (Apr & Oct) 10.0 (Mar. Nov. & Dec)	5.0
TSS	mg/L	15	10	-	-
TAN (NH_4+NH_3)	mg/L	3.0	1.0	5.0	3.0
TP	mg/L	0.3	0.17	0.5	0.3
E. Coli	CFU/100 ml	200	100	200	100
pH	-	-	6.5 – 9.0	-	6.5 – 9.0

ES-7. Preferred Design Concept

ES-7.1. Concept Overview

The WPCP upgrades are designed to satisfy the need for expanded treatment capacity of 550 m^3/day, from 750 m^3/day to 1,300 m^3/day. The future treatment needs were assessed based on forecasted growth for the communities of Moorefield and Drayton. The total treatment capacity of the upgraded WPCP will be 1,300 m3/day. The capacity design parameters are summarized in Table ES-5.

Table ES-5: Capacity Design Parameters

Estimated 2031 Population: Moorefield	1,310 persons
Per capita Sewage Flow: Moorefield	215 L/pers/day
Average Daily Flow: Moorefield	281 m^3/day
Estimated 2031 Population: Drayton	3,070 persons
Per capita Sewage Flow: Drayton	332 L/pers/day
Average Daily Flow: Drayton	1,019 m^3/day
Total Required Average Daily Treatment Capacity	**1,300 m^3/day**

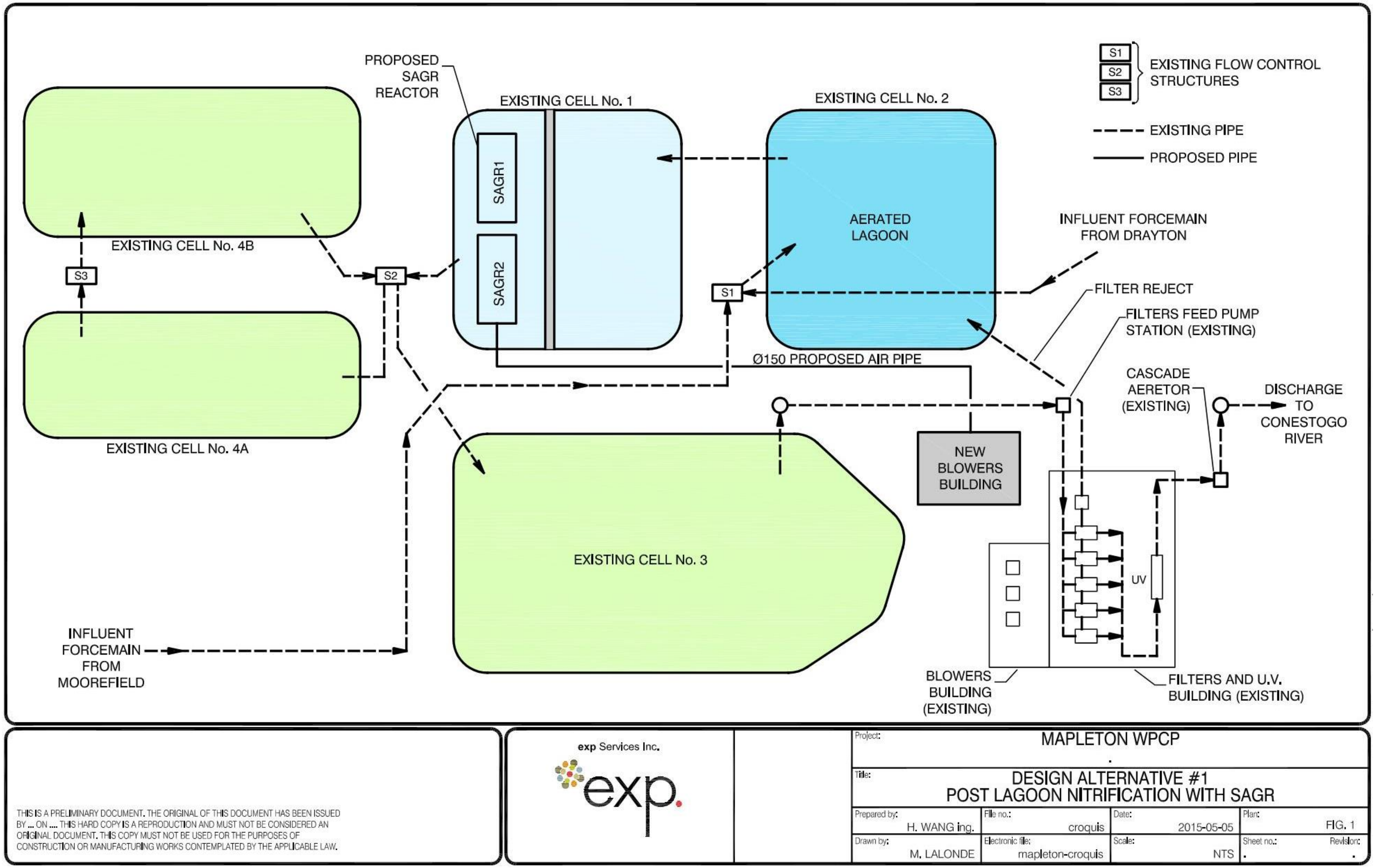
Key features of the alternative design will include:

- Installation of a SAGR system in the facultative lagoon, which would consist of a media bed, a coarse bubble air diffusers system, influent distribution piping and effluent collection piping, and a cover layer of wood chips or mulch. The media material used in the SAGR would be uniformly graded clean rock or stone. The two SAGR units would be installed in parallel, which allows for the possibility to isolate one of the reactors while keeping the other in operation (e.g., for maintenance or repair)
- A new alum mixing tank; and
- A new blowers building.

The concept diagram for the upgrade is presented in Figure 21. As Figure 21 is considered an EA-stage concept level design diagram, some aspects may change during preliminary and detailed design.

Overall, the proposed WPCP upgrade is expected to provide a net beneficial effect for the Township. The overall quality of wastewater effluent coming from the WPCP is expected to improve, which should in turn ensure improved protection of the Conestogo River and be therefore be consistent with the goals of the Grand River watershed water Management Plan. The upgrade will also allow for additional growth and development in the communities of Drayton and Moorefield, which in turn will encourage economic development.

Figure ES-2: Preferred Design for Mapleton WPCP Upgrade



exp.

ES-7.2. Interim Phasing

One of the primary concerns raised by the MOECC regarding adding discharge in January and February is the lack of available river water quality background data during cold winter months. To resolve this uncertainty, a meeting was held with MOECC on September 18, 2017. In the meeting, it was agreed that the Township would phase in the implementation of the expansion in two phases:

- Phase 1 - Interim Rating: The first phase of the expansion would raise the rated influent capacity of the WPCP to an interim-capacity. While the exact rating would be determined through the hydraulic and engineering assessment, it is estimated to be 900 m^3/day. This would be achieved through optimization of the existing WPCP, which will allow the Township to increase the WPCP's capacity without a large capital investment, thereby relieving the Township's immediate growth pressures while providing time for additional winter river water quality monitoring. As discussed previously, the GRCA has implemented a monitoring program for the Conestogo River, which would act as a source for the additional river water quality background data. The exact methods through which the WPCP would be optimized would be determined through the design and ECA amendment process. However, it would be ensured that the interim rating of the WPCP will meet MOECC's Policy 1 and Policy 2 water quality objectives.
- Phase 2 - Full Rating: The second phase of the expansion would increase the facility's influent rating to 1,300 m^3/day, to be achieved through implementation of the EA's preferred design. It would occur once sufficient data has been generated to verify the conclusions of the RWIA that the addition of January and February discharge period to the WPCP's existing discharge regime would not cause a negative impact on the Conestogo River.

  Prior to the full upgrade from 900 m^3/day to 1,300 m^3/day, the Township will complete an EA Addendum to revisit the RWIA, incorporate the additional river water quality data, and confirm the assimilative capacity of the Conestogo River. The RWIA will also ensure that the WPCP meets the MOECC's Policy 1 and Policy 2 water quality objectives as it proceeds to the ultimate rating of 1,300 m^3/day.

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1 Introduction

1.1 Overview

The Township of Mapleton currently owns and operates a wastewater conveyance system and a lagoon-based Wastewater Pollution Control Plant (WPCP) to manage wastewater for the communities of Moorefield and Drayton, which are located within the Township of Mapleton (the Township). The facility is operated under Amended Environmental Compliance Approval Number 0963-A4ZMVA, Issue Date January 22, 2016 (see Appendix A). Wastewater from these communities is collected through a wastewater conveyance system and then pumped from pumping stations located within in the communities to the WPCP, located near Drayton. Currently, the WPCP has an approved average annual capacity of 750 m^3/day.

The Wellington County Population, Household and Employment Forecast Update for 2011 – 2041 predicts that, combined, the populations of Moorefield and Drayton will increase from 2,300 in 2011 to 4,380 by 2031[4]. The Township determined that the existing wastewater conveyance system and WPCP would not have sufficient capacity to accommodate this growth and has therefore initiated a Municipal Class Environmental Assessment (Schedule C) to address this issue.

This Class Environmental Assessment (EA) has been carried out following the Schedule 'C' planning process of the Municipal Class EA (as amended), as approved under the Environmental Assessment Act (EA Act) R.S.O. 1990, Chapter E.18. The process was completed over four phases:

- Phase 1: Problem/Opportunity Statement;
- Phase 2: Alternative Solutions;
- Phase 3: Alternative Design Concepts; and
- Phase 4: Environmental Study Report.

This Environmental Study Report documents the process that was followed in this Class EA to identify and evaluate alternative solutions and designs and to identify and avoid or mitigate potential environmental impacts.

1.2 Class Environmental Assessment Process Overview

All Municipalities in Ontario are subject to the provisions of the Ontario Environmental Assessment Act (EAA) and its requirements to prepare a Class EA for applicable public works projects. These requirements can be met by following the Municipal Class EA Process as described by the Ontario Municipal Engineers Association (MEA) Municipal Class Environmental Assessment document (2007, amended 2011 and 2015). The Municipal Class EA applies to a group or class of municipal water, wastewater and road projects that occur relatively frequently and have relatively minor and predictable impacts.

Class EA projects fall into four schedules (i.e. categories) of undertakings depending on the extent of their potential impact. These include:

[4] Watson and Associates Economists Ltd. Wellington County Population Household and Employment Forecast Update, 2011-2041. May 5, 2015.

- Schedule A: Includes normal or emergency operational and maintenance activities; projects have minimal environmental effects and are pre-approved;
- Schedule A+: Projects are pre-approved, but public is to be advised of project before implementation;
- Schedule B: Includes improvements and minor expansions to existing facilities; projects may have potential for some adverse environmental impacts, therefore a screening process including consultation with potentially affected stakeholders required;
- Schedule C: Includes construction of new facilities or major expansions to existing facilities; project may have potential for significant environmental effects and must proceed through full Class EA planning process.

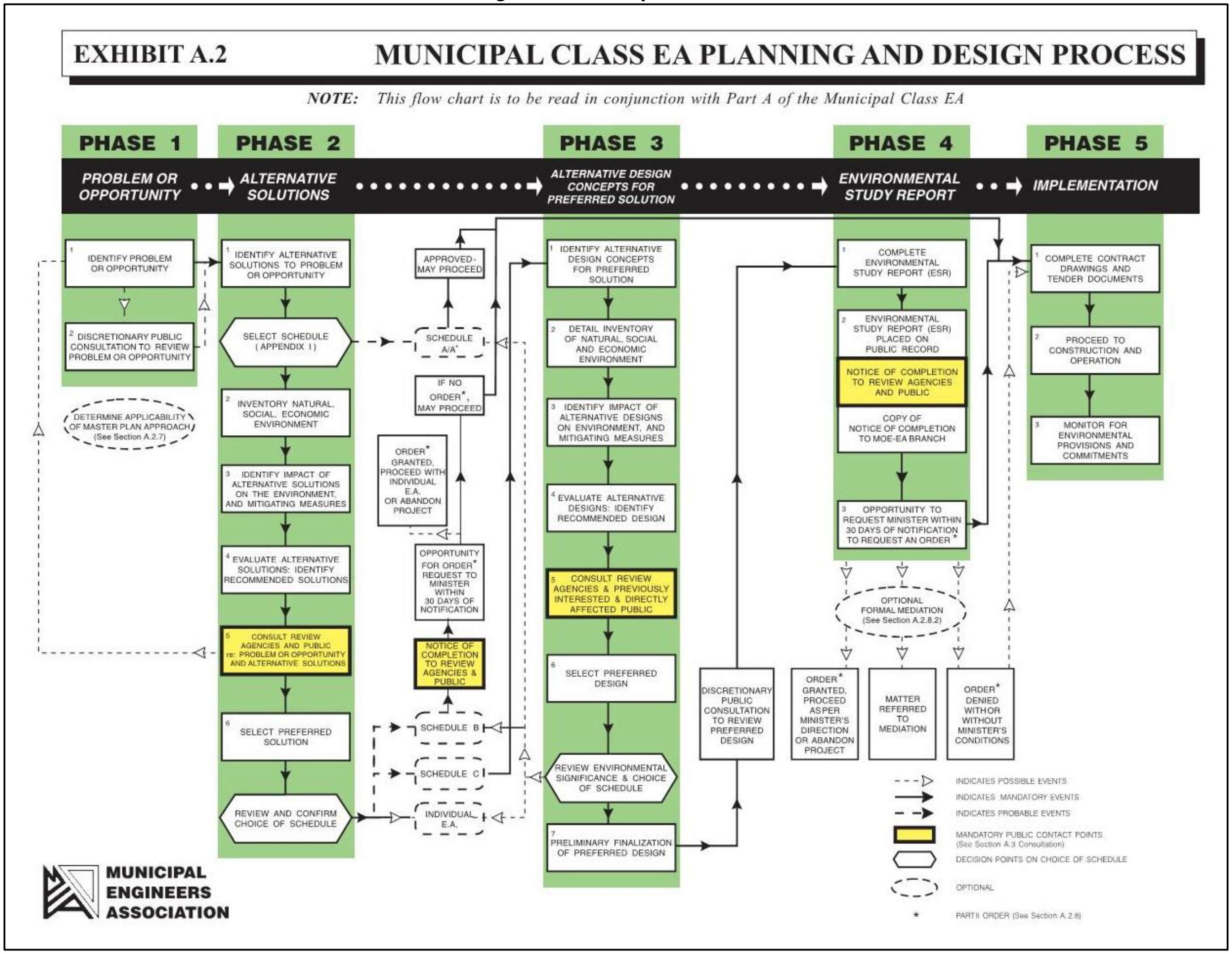
Expansion of an existing sewage treatment plant beyond its existing rated capacity is classified as a Schedule C project. Therefore, this Class EA is designated as a Schedule C Class EA.

There are five phases to a Schedule C Class EA process. These include:

- Phase 1: Identify the problem (deficiency) or opportunity: Identify the problem or the opportunity that the Class EA is intended to address.
- Phase 2: Identify and Evaluate Alternative Solutions: Identify alternative solutions to the problem or opportunity by taking into consideration the existing environment and establish the preferred solution accounting for public and agency review and input. Document the planning process in a Municipal Class EA project file and make such documentation available for scrutiny by review agencies and the public.
- Phase 3: Evaluation of Alternative Design Concepts: For Schedule “C” projects, examine alternative methods of implementing the preferred solution based upon the existing environment, public and government agency input, anticipated environmental effects, and methods of minimizing negative effects and maximizing positive effects.
- Phase 4: Environmental Study Report (ESR): For Schedule “C” projects, document, in an Environmental Study Report (ESR), a summary of the rationale and the planning, design and consultation process followed in the project and make such documentation available for scrutiny by review agencies and the public.
- Phase 5: Implementation: Complete contract drawings and documents, proceed to construction and operation and monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facilities.

Figure 1 illustrates the Municipal Class EA process.

Figure 1: Municipal Class EA Process



1.3 Project Team

The following project team was involved in completing this Class EA:

Proponent:

Township of Mapleton

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Contact: Arun P. Jain, M.Eng., P.Eng., Manager – Water and Wastewater Infrastructure

1.4 Project Timeframe

Table 1 provides a summary of key project dates and milestones.

Table 1: Key Project Milestones

Date	Milestone
March 6, 2015	Notice of Commencement Issued
June 16, 2015	Public Information Centre #1 (Phase 2) held
February 11, 2016	Public Information Centre #2 (Phase 3) held
November 17, 2017	Notice of Completion Issued
November 17, 2017	Environmental Study Report placed on Public Record

2 Project Background

This section provides some background information on the project, including:

- Past studies and projects concerning the existing wastewater facilities and their performance;
- The project area's natural environment;
- Municipal planning considerations; and
- The community's socio-economic environment.

2.1 Review of Past Studies and Projects

This Class EA will build upon the work that has been completed previously on the communities' wastewater system. These projects, studies and reports are summarized below.

Moorefield Wastewater Servicing Project – 2005/2006

The wastewater collection system for Moorefield, which includes the sanitary collection system, sewage pumping station and sewage forcemain, was constructed over 2005 and 2006 in conjunction with a water supply and distribution system. Prior to this, residents in Moorefield managed sewage using septic systems; residents were also serviced by private wells. Installation of the wastewater collection system was implemented due to environmental concerns arising from the contamination of a water course near the community.

The Moorefield Wastewater Servicing Project arises from a Class EA that was completed in 1997. The Class EA concluded that the lots in Moorefield were too small for conventional on-lot or raised septic disposal systems. To provide the community with wastewater collection, each home was outfitted with a low-pressure sewer system utilizing grinder pumps. A sewage pumping station was constructed to convey the sewage through a forcemain to the WPCP.

Receiving Water Impact Assessment (Revised), Mapleton WPCP, Conestogo River at Drayton – 2007 & 2008

In the late 1990's, the Township began implementing a series of phased upgrades to the WPCP as per a 1996 Class EA ESR. The Township had wished to increase the then-approved average daily flow (ADF) for the WPCP from 750 m^3/day to 950 m^3/day, pending the completion of a study indicating that the impact of the WPCP on the Conestogo River continued to be minimal. Field work was completed in 2003 and 2004 to assess the impacts of the WPCP on the Conestogo River and a Receiving Water Impact Assessment report was prepared in 2005. The Receiving Water Impact Assessment Report was revised in 2007 and 2008 to address comments from the GRCA and the MOE.

Based on a mass balance analysis, historical river water quality, and the effluent compliance limits at that time, the report recommended an update to the WPCP's seasonal schedule for final effluent discharge rates in order to allow the facility to be re-rated for an ADF of 950 m^3/day. Comments dated May 30, 2008 from the MOE on the 2008 report identified concerns held by the MOE, including:

- The Conestogo River's ability to assimilate wastewater discharge in the summer when river flow is very low;
- Phosphorous levels in the Conestogo River that continuously exceed the Provincial Water Quality Objective for Total Phosphorus, resulting in the river being a Policy 2 area for phosphorus;
- That any increase in hydraulic loading at the WPCP would require a corresponding reduction in effluent phosphorus concentration; and
- Concern over the facility's ability at that time to achieve discharge limits.

Drayton Wastewater Treatment Plant Class EA - 2010

In 2010, a Schedule B Class EA was prepared to address storage capacity and treatment capacity concerns with the WPCP. The facility had been experiencing problems with poor effluent quality during the spring discharge periods, which resulted in partial or full suspension of discharge during their approved spring discharge period. A suspension during their spring discharge would result in the WPCP not having sufficient storage capacity to accept and treat influent wastewater until the fall discharge period. This in turn would create the need for an emergency discharge of effluent in non-approved periods to prevent a spill. The recommended solution of the Class EA was to expand the effluent storage capacity of the WPCP by building two additional lagoons.

The two additional lagoons were built in 2013 and provided the facility with an additional 218,300 m^3 of effluent storage.

Overcapacity Investigation at the Drayton Wastewater Treatment Plant – 2012

In August and September 2011, the wastewater volume in the WPCP lagoons rose to critical levels in advance of the Plant's fall discharge period. While the situation was addressed by the MOE allowing increased discharge in the months of October and November, the MOECC then requested an investigation to determine what contributed to the event.

The investigation concluded that the raw sewage flowmeter used at the Drayton SPS at that time (a Bristol Babcock system) was underreporting flows during high flow events. This led to significantly higher flows being pumped to the Plant than were being recorded at the pumping station. In September 2012, a new flowmeter was installed and commissioned in the Drayton SPS.

Village of Drayton Infiltration and Inflow Study – 2013

In 2013, the Township undertook a wastewater infiltration and inflow study for the Village of Drayton as required by a Provincial Officer's Order. The objective of the study was to determine whether significant extraneous flows were entering Drayton's sanitary sewer collection system, and, if so, identify the most appropriate approach to address the problem. The study implemented a flow monitoring program to obtain real time data to help determine if there were extraneous flows entering the wastewater collection system and assessed the status of critical components of the sanitary collection system.

Mapleton WPCP Comprehensive Performance Evaluation – 2014/2015

Through its Grand River Optimization Program, the GRCA is working with municipalities within the Grand River watershed to optimize their wastewater treatment plants. In 2014, the program conducted an evaluation of the Mapleton WPCP to identify opportunities to improve its performance and provide additional capacity. The evaluation included:

- A tour of the facility;
- A review of available data summaries and performance checks;
- A review of major unit process capabilities;
- Special studies on ammonia removal and the impact of precipitation on storage;
- Interviews with WPCP personnel;
- An assessment of limiting factors; and
- An exit meeting to present the evaluation findings and recommendations.

The project resulted in a number of recommendations relating to planning, design, process control testing, and operations, including:

- Continue efforts to revise the Environmental Compliance Approval (ECA) to include more flexibility for discharge;
- Continue efforts to improve final effluent flow measurement and provide backup power during the discharge period;
- Review current process control monitoring to better characterize plant performance and capacity;
- Enhance trending and interpretation of available data;
- Initiate routine review of plant performance and water balance by OCWA, Mapleton and consultants;
- Determine ability of existing facility to provide ammonia removal at higher flows or investigate other processes for ammonia removal; and
- Document current procedure for cell management[5].

2.2 Natural Environment

This review of the natural environment in the project area summarizes the findings of the Natural environment study conducted as part of this Class EA. The Natural Heritage report is provided in Appendix C

2.2.1 Conestogo River and Subwatershed

The upper Conestogo River generally consists of several warmwater tributaries and municipal drains that flow into the main channel and eventually into Conestogo Lake, approximately 7.0km downstream from the community of Drayton. The adjacent lands surrounding the river are intensively farmed and heavily drained. The Conestogo River near the proposed project area consists of a relatively wide (10-20m) and flat channel, with depths of less than 1.0m during the summer months. Figure 2 depicts the Conestogo River upstream of the WPCP.

[5] Grand River Conservation Authority et. al. Results of the Comprehensive Performance Evaluation of the Mapleton Water Pollution Control Plant. March 2015.

Figure 2: Conestogo River Upstream of Site

Image source: Natural Resource Solutions Inc.

The aquatic habitat of the river is characterized by shallow pools, riffles, and runs that flow over a variety of substrates that range from cobble, pebble and gravel throughout the main channel to finer substrates, mainly silt within the backwater areas. The river suffers from impacts due to low baseflow, warm temperatures, lack of riparian vegetation and agricultural runoff input, as well as seasonal water level changes as manipulated by the downstream Conestogo dam. Algae mats can form through the backwater areas.

The Conestogo River is known to support a diverse warmwater fish community that includes a variety of sport fish species including northern pike (Esox lucius), smallmouth bass (Micropterus dolomieu), yellow perch (Perca flavescens), walleye (Sander vitreus), and carp (Cyprinus carpio), in addition to a variety of warmwater baitfish species. Historically, the river has been stocked by Brown Trout and is managed as such; however, the majority of stocking has occurred downstream of Conestogo Lake where water temperatures are lower. Near the town of Drayton, the river is also known to provide habitat that supports a variety of common mussel species.

A variety of common mussel species are known to occur, and one mussel Species at Risk (SAR) – the Rainbow Mussel (Villosa iris) – is known to occur in the Conestogo River near the WPCP. The Rainbow Mussel is listed as Endangered under the *Ontario Endangered Species Act*, giving the species and its habitat legal protection. It is also listed as Endangered and is protected under the federal *Species at Risk Act*, and Critical Habitat under this legislation has also been delineated by Fisheries and Oceans Canada.

2.2.2 Site Conditions

The WPCP is located on the west side of the upper branch of the Conestogo River, just south of the community of Drayton. The property is dominated by the presence of the open water lagoons, with the remainder of the site being agricultural land. The WPCP discharges to a swale, which flows overland into a wetland and then drains to the Conestogo River. The swale is an intermittent watercourse that conveys flow as part of the Conestogo River during high flows. The WPCP effluent provides flow during discharge at low and moderate river flows. Figures 3 and 4 depict the outlet and the swale. Figure 5 depicts the location of the outlet and swale relative to the WPCP.

Figure 3: WPCP Outfall

Image source: Natural Resource Solutions Inc.

Figure 4: Swale Adjacent to Effluent Discharge

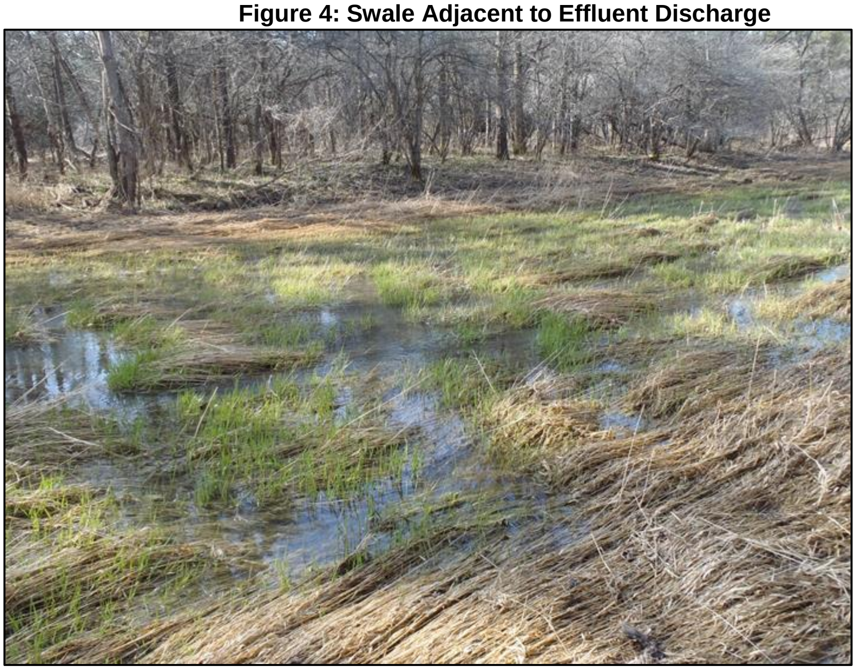
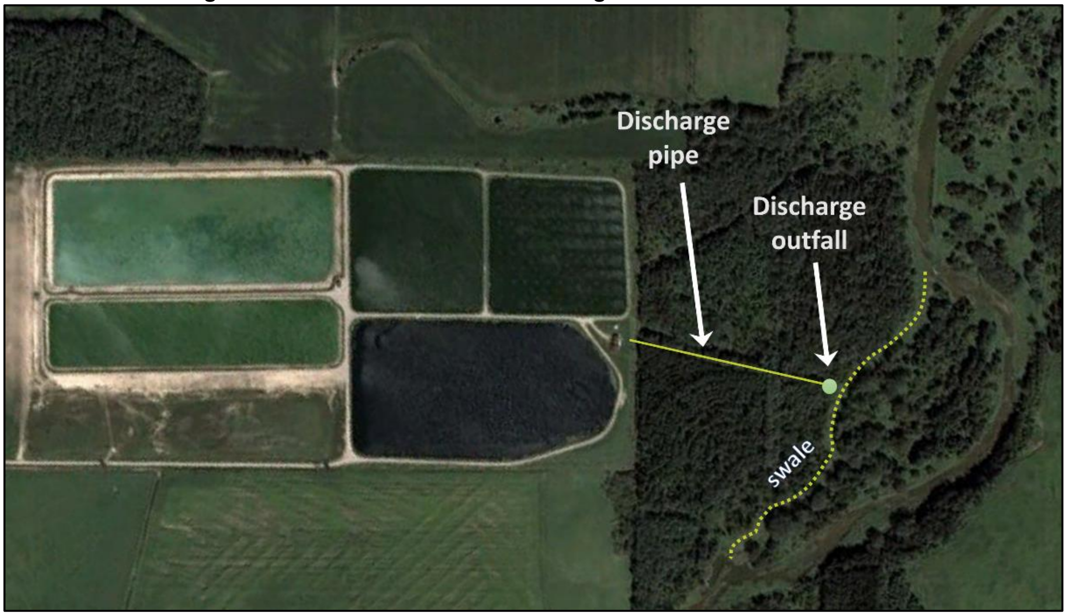


Image source: Natural Resource Solutions Inc.

Figure 5: Location of WPCP Discharge Outfall and Swale



Background Image: GoogleEarth.

The outlet traverses the Conestogo Lake Conservation Area lands, which are owned and managed by the Grand River Conservation Authority (GRCA). These lands are primarily forested with patches of deciduous and coniferous plantation and regenerating forest, with no designated significant natural features. There is a narrow band of meadow marsh along the swale. The receiving wetland is an unmapped and unevaluated natural feature regulated by GRCA. There is no defined channel in swale upstream or downstream of the outfall, until closer to Conestogo River confluence, approximately 300m downstream of the outfall. American Gromwell (Lithospermum latifolium), a Species of Conservation Concern, was identified throughout most of the surveyed vegetation communities.

During times of high water, the swale connects to Conestogo River at the upstream and downstream end. Based on the field investigation conducted by Natural Resource Solutions Inc, fish habitat is present in the lower portions of the swale near the confluence with the Conestogo River, including some large pools and deeper sections. The fish habitat is likely to be used in the swale when the pools are connected to the river. Northern pike spawning may occur throughout the swale, particularly in the lower sections following spring freshet when the swale is inundated. Terrestrial Crayfish Significant Wildlife Habitat was identified downstream of effluent discharge outlet, within the meadow marsh vegetation community. No amphibian callings were heard during the field investigation.

Figure 6 depicts some of the natural environment features surrounding the WPCP as generated by the Grand River Conservation Authority online Watershed Viewer (note that the Ortho layer is from 2010 and does not depict the new lagoons, built in 2013). Figure 7 depicts natural heritage features near the WPCP and the outfall area.

Figure 6: Natural Heritage (General Area)

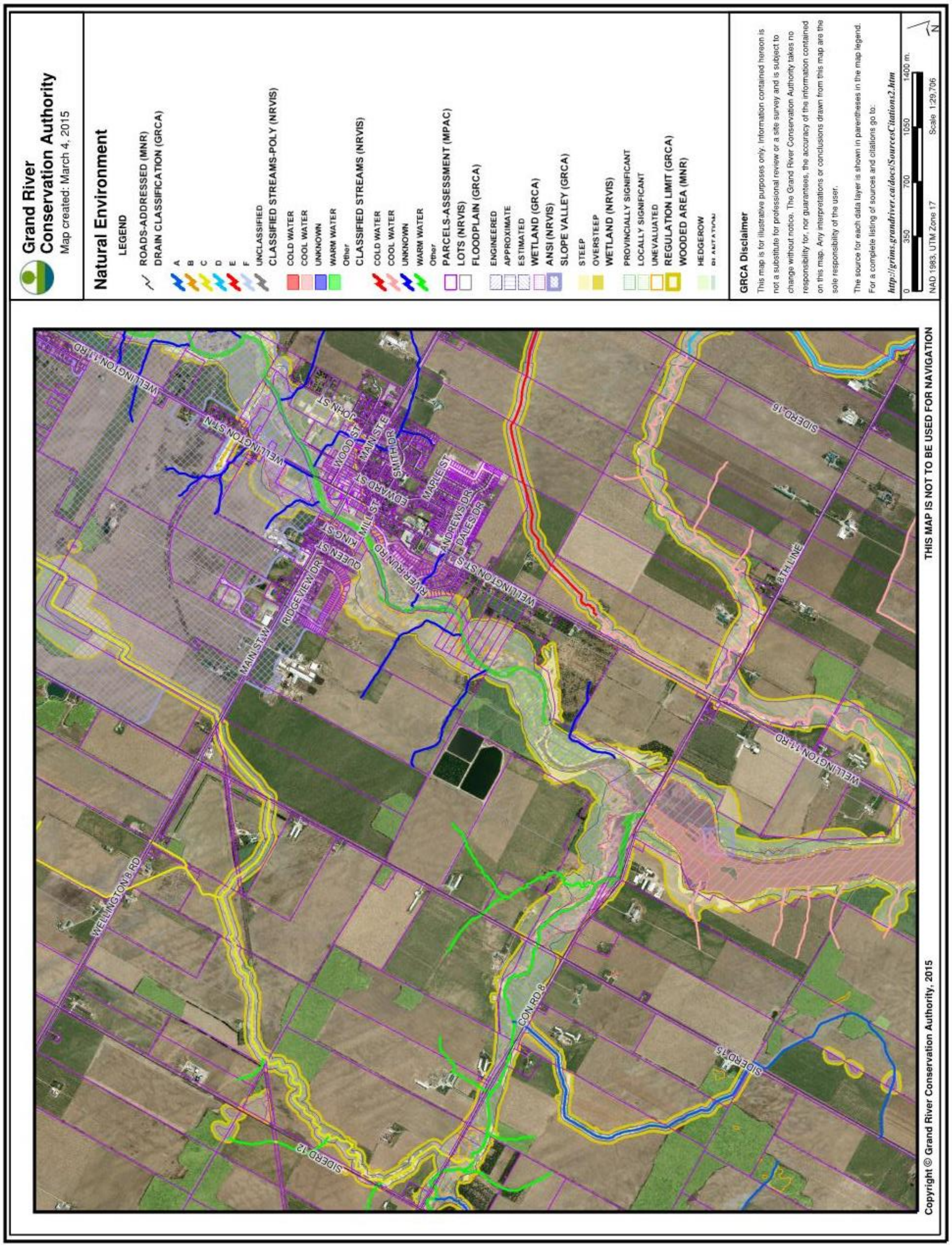
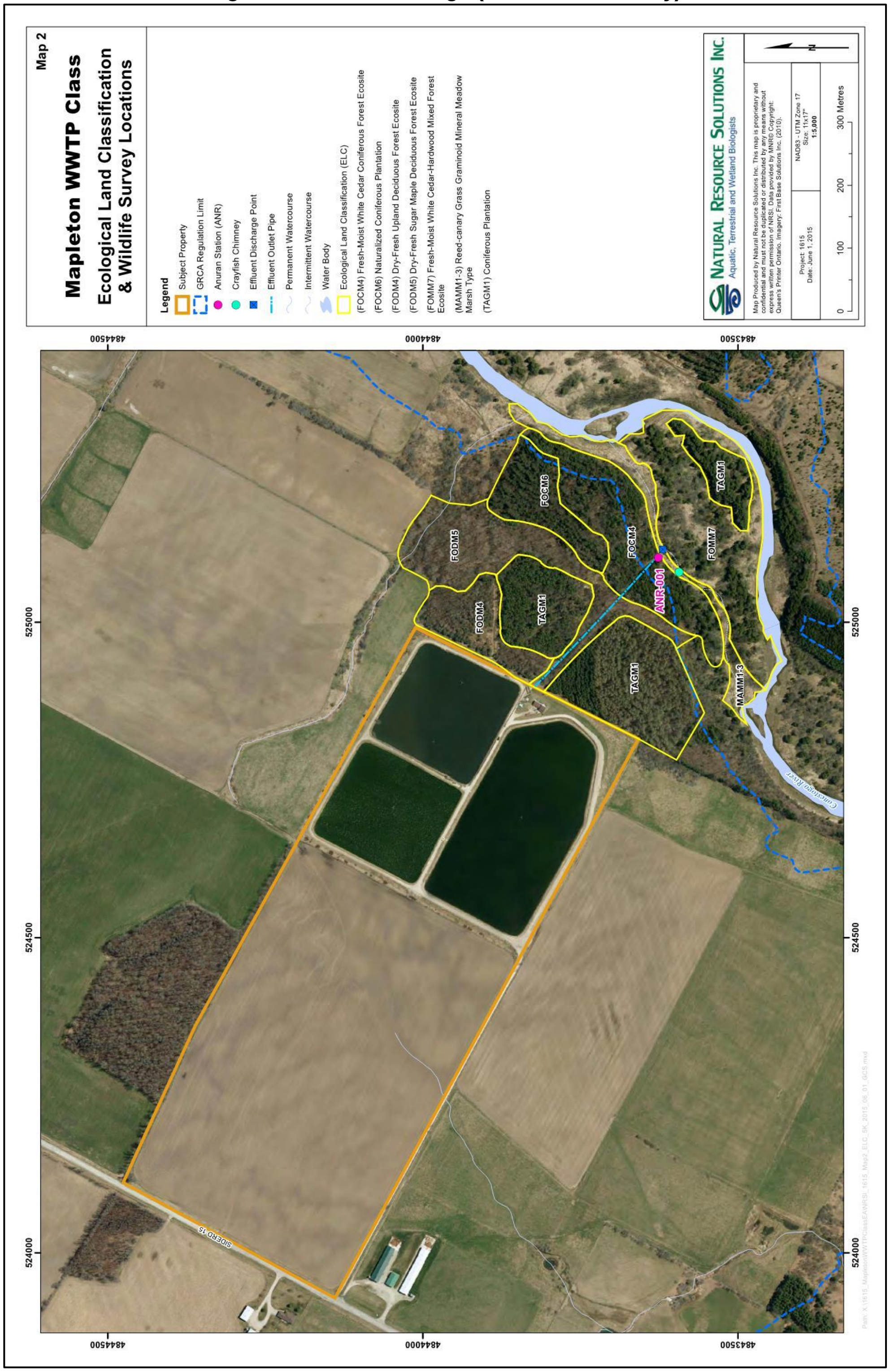


Figure 7: Natural Heritage (WPCP and Vicinity)



2.3 Planning Overview

2.3.1 Overview

The current use of the lands where the WPCP is located is a permitted land use under the policies of the plans and regulations described below. As a permitted use, expansion of the existing facilities would also be permitted, subject to Site Plan and Building Permit application approvals by the relevant approval authorities. The paragraphs below present the population forecast and Official Plans and Land Use Policies.

2.3.2 Population Forecasts

The current WPCP is operating near capacity, and has little room to accommodate future growth and service allocation. The WPCP is currently servicing approximately 160 service connections in Moorefield and 714 in Drayton, with a service population of approximately 420 and 1,880, respectively (based on 2011 population)[6].

The Wellington Official Plan population growth projection for Mapleton anticipates annual growth of approximately 3.33% to the year 2031 for the communities of Moorefield, and Drayton, with a projected population increase of 2,080 new residents. Current population in Drayton is approximately 2000 and 600 in Moorefield (2011 Census data), while the projected population for these communities for 2031 is 3,070 and 1,310, respectively[7]. Historically, the 2006 population for Mapleton was 9,851, which represented a 5.9% increase from 2001 (2006 Census data). Based on Official Plan population projections for Mapleton to the year 2031, there is a current and future need for an increase in the available sewage treatment servicing capacity in the Township.

For comparative purposes of projected growth rates, the population growth rate for Wellington County is projected to be ~1.18% over the 2006-2031 planning period (Wellington County Official Plan, 2011). The projected Provincial average population growth rate is ~ 1% (Ministry of Finance projection and 2011 Census data).

Based on historical projections from census data and Official Plan projections, the communities of Drayton and Moorefield have been growing at rates higher than the Provincial and Wellington County averages. Growth in Mapleton is expected to continue at a higher rate, with a projected annual average growth rate of 3.33%.

Based on the above provided and historical population projections and actual growth, it is reasonable to expect the continued growth of both Drayton and Moorefield at the projected rates. Planning for this anticipated growth will require ensuring that service and infrastructure capacity, including sufficient wastewater treatment service allocation, is planned and developed to meet these growing needs.

2.3.3 Property Description

The treatment plant is located on the east side of Sideroad 15, legally known as Part of Lots 16 & 17, Conc. 9, outside of the community of Drayton. The plant currently consists of five lagoons and two buildings, along with support structures including pumps and filtration equipment. The

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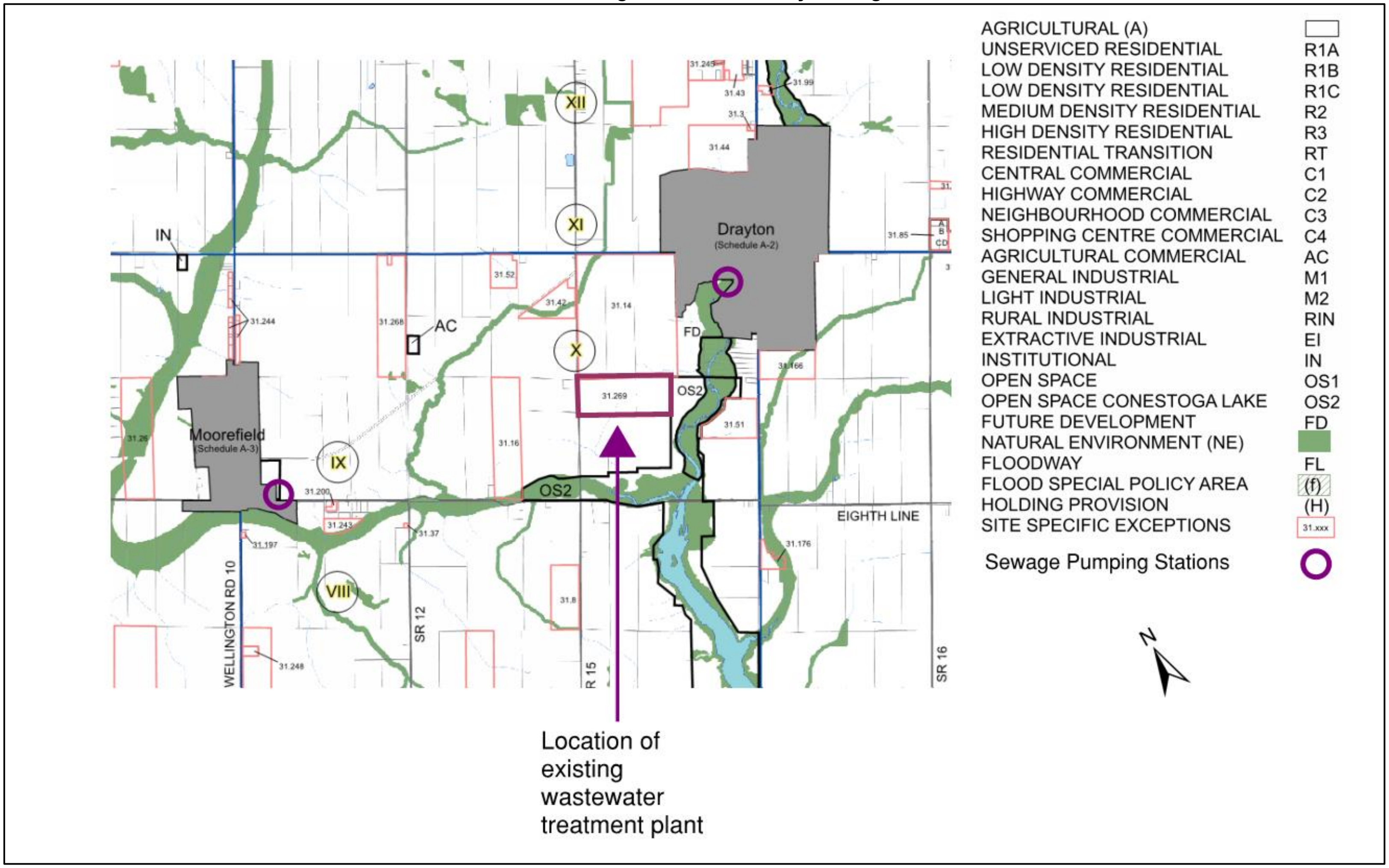
[6] Watson and Associates Economists Ltd. *Wellington County Population, Household and Employment Forecast Update, 2011 - 2041*. May 5, 2015.

[7] Watson and Associates Economists Ltd. 2015.

facility was most recently expanded in 2012 through the construction of two additional sewage lagoons.

Figure 8: Community Zoning



2.3.4 Official Plans, Land Use Policies and other Planning Considerations

Wellington County Official Plan

The site of the current Wastewater Facility is designated as Core Greenlands and Greenlands under the County Official Plan. Permitted uses include currently existing uses, and where provided for through zoning bylaws, appropriate expansion and alteration of existing land uses. (S.5.6.1; S.5.6.2)

Accordingly, the use of the site for currently existing uses (i.e. sewage treatment) is permitted, and expansion of the site for sewage treatment uses is also permitted, subject to the applicable Town of Mapleton Zoning Bylaw (see below).

The site of the Drayton Sewage Pumping Station is also designated as Core Greenlands.

The site of the Moorefield Sewage Pumping Station is designated as Residential under the Official Plan.

Township of Mapleton Official Plan

The Township of Mapleton does not currently have an Official Plan. Direction for land use policies are provided through the Official Plan of Wellington County.

Township of Mapleton Zoning Bylaw

Under the provisions of the Town of Mapleton Zoning Bylaw, the use of land for a water main, water treatment facility, sanitary sewer main, and pumping station is permitted in any zone (S.6.34)

If facilities are to be proposed in a residential zone, the facilities must comply with the requisite setbacks and applicable zoning standards.

The current lagoons are in an Agriculture (A) zoned area, which permits “legally established existing uses, buildings and structures”. In addition, the site has a special zoning exception permitting uses including:

> *“sewage lagoon, conduits for the conveyance of sanitary and storm sewage, lagoon discharge and appurtenance uses to serve a sewerage system for Drayton.” (S.31.269, Housekeeping By-law 2013-092)*

Accordingly, the use of the site for sewage treatment facilities, and expansion of those facilities, is permitted under the Town of Mapleton Zoning Bylaw.

Conservation Authority

As the effluent outfall into the Conestogo River from the lagoons is into the Regulated Area of the Grand River Conservation Authority (GRCA), any impact to the area due to the proposed upgrading of the wastewater facility would require their review and approval. Given this as well as the GRCA’s active role in advising local municipalities on wastewater management, the GRCA was identified early as a key stakeholder in this process.

Surrounding Land Uses (Treatment Plant)

The land uses surrounding the WPCP include:

- North: Agricultural
- South: Agricultural
- East: Open Space
- West: Agricultural

Surrounding Land Uses (Conestogo River and Subwatershed)

The Conestogo subwatershed is one of nine subwatersheds that make up the Grand River watershed[8]. It has some of the most intensive agricultural production and most intense municipal and tile drainage networks in the Grand River watershed. Runoff entering the Conestogo River is collected and stored in the Conestogo Reservoir. The dam forming the face of the reservoir is located approximately 9 km downstream of the WPCP. The reservoir reduces flooding impacts downstream but also supplies water to the lower Conestogo River during periods of lessened flow. The reservoir also provides recreational activities such as fishing, swimming, and boating[9].

Most of the land use in the subwatershed is agriculture (83%), with 41% of the land base using tile drainage. The main urban development along the Conestogo River is in the Town's of Arthur, Drayton and St. Jacobs. Four municipal wastewater treatment plants (WWTP) discharge into the Conestogo River[10]. These include:

- Arthur WWTP (rated capacity of 1,465 m^3/day, upper Conestogo River)
- Mapleton WPCP (rated capacity of 750 m^3/day, upper Conestogo River);
- St. Jacobs WWTP (rated capacity of 1,450 m^3/day, lower Conestogo River); and
- Alt Heidelberg Estates (rated capacity of 130 m^3/day, discharging to lower Conestogo River via Heidelberg Creek).

The Maple Leaf Foods Rothsay-Moorefield plant also discharges sanitary sewage, process wastewater and stormwater to the upper Conestoga River via Moorefield Creek[11].

Federal Wastewater Systems Effluent Regulations

The Federal Wastewater Systems Effluent Regulations are established under the Fisheries Act and include mandatory minimum effluent quality standards that can be achieved through secondary wastewater treatment. The regulations apply to wastewater treatment plants collects or is designed to collect more than 100 m^3 of influent per day. The regulations apply the following effluent concentration limits:

- Carbonaceous biochemical oxygen demand: less than 25 mg/L;
- Suspended solids: less than 25 mg/L;

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[8] Water Quality Working Group, Grand River Conservation Authority. *Grand River Watershed Water Management Plan: Sources of Nutrients and Sediments in the Grand River Watershed*. Dec. 19, 2013.
[9] Loomer, H.A., and Cooke, S.E. *Water Quality in the Grand River Watershed: Current Trends and Conditions (2003 - 2008)*. October 2011.
[10] Loomer, H.A., and Cooke, S.E. 2011.
[11] Ontario Ministry of the Environment. *Amended Environmental Compliance Approval Number 4258-96MJKD*. July 5, 2013.

- Total residual chlorine (if chlorine or one of its compounds is used in the treatment process): less than 0.02 mg/L; and
- Un-ionized ammonia: less than 1.25 mg/L, expressed as nitrogen (N), at 15 °C ± 1°C.

For continuous wastewater systems with an average daily discharge of 2,500 m^3/day or less, the regulations also require: the continuous measurement of the volume of the influent or effluent or of the rate of flow of the influent or effluent; grab or composite effluent samples taken monthly but at least 10 days after any other sample; and annual reporting.

Grand River Watershed Water Management Plan

The Grand River Watershed Water Management Plan (GRWWMP) is a multi-partner integrated water management plan that includes the following four goals:

- Ensure sustainable water supplies for communities, economies and ecosystems;
- Improve water quality to improve river health and reduce the river's impact on Lake Erie;
- Reduce flood damage potential; and
- Increase resiliency to deal with climate change.

The GRWWMP includes a number of recommendations with respect to WWTPs and improving water quality. The recommendation with specific relevance to this project includes:

- Recommendation D2: municipalities that own WWTPs adopt voluntary effluent quality performance targets that go beyond the compliance objectives as stated in their ECA's, including 0.15 mg/L for total phosphorus, 1 mg-N/L for ammonia in summer and 2 mg-N/L in the winter.

The GRWWMP calls for annual progress reporting in implementation of the plan, starting in 2015[12].

2.4 Economic Environment

The land use in the Township of Mapleton is generally agricultural and rural. According to the 2006 Agricultural Community Profile, there are over 51,000 hectares of farmland within the Township's total area of 535 square kilometres (i.e., 95%), and over 43,000 hectares are used for crops. The primary crops are corn, alfalfa, soybeans and wheat.

According to the 2011 National Household Survey, Mapleton's largest industry sector (by employees) is agriculture and other resource-based industries, followed by manufacturing and construction (see Table 2). The most common occupations are in management, trades, sales and service and business or finance (see Table 3).

[12] Grand River Conservation Authority. *Grand River Watershed Water Management Plan*. 2014.

Table 2: Mapleton – Employment by Industry

Industry	Labour Force	Percent
All industries	*5335*	*100%*
Agriculture; forestry; fishing and hunting	1295	24%
Manufacturing	725	14%
Construction	545	10%
Health care and social assistance	385	7%
Educational services	345	6%
Other services (except public administration)	325	6%
Wholesale trade	290	5%
Retail trade	290	5%
Transportation and warehousing	210	4%
Accommodation and food services	215	4%
Finance and insurance	135	3%
Professional; scientific and technical services	140	3%
Administrative and support; waste management and remediation services	135	3%
Public administration	145	3%
Information and cultural industries	75	1%
Arts; entertainment and recreation	60	1%
Mining; quarrying; and oil and gas extraction	0	0%
Utilities	0	0%
Real estate and rental and leasing	0	0%
Management of companies and enterprises	0	0%

Source: Statistics Canada; 2011 National Household Survey.

Table 3: Mapleton – Employment by Occupation Type

Occupation	Labour Force	Percent
All occupations	*5340*	*100%*
Management occupations	1080	20%
Trades; transport and equipment operators and related occupations	1025	19%
Business; finance and administration occupations	680	13%
Sales and service occupations	685	13%
Natural resources; agriculture and related production occupations	545	10%
Occupations in education; law and social; community and government services	500	9%
Occupations in manufacturing and utilities	360	7%
Health occupations	240	4%
Natural and applied sciences and related occupations	150	3%
Occupations in art; culture; recreation and sport	75	1%

Source: Statistics Canada; 2011 National Household Survey.

The average household income in 2010 in Mapleton was $92,091, which was slightly higher than the provincial average of $85,772. Most families in Mapleton own their own home; 90% of households own their dwelling, while 10% rent. The average value of a dwelling is $346,440[13].

As can be seen in the above tables, the construction sector and trades occupations are important contributors to Mapleton's economy. In March 2015, the project team met with stakeholders from the development sector to discuss their interest in the WPCP upgrades. The general consensus was that they each had developments in the Drayton and Moorefield (primarily residential) on hold because the municipality was unable to allocate to them wastewater connections, as the WPCP did not have sufficient capacity. Increasing the capacity of the WPCP will have a near-immediate economic benefit to municipality, as it will be able to allocate wastewater connections and allow the developments to proceed, which in turn will provide employment and tax revenue opportunities.

2.5 Overview of Existing Wastewater System

The Mapleton wastewater treatment facilities include the Mapleton WPCP, the Drayton sewage pumping station and the Moorefield sewage pumping station. These facilities are operated by the Ontario Clean Water Agency (OCWA).

The Mapleton WPCP receives municipal sewage from two separate sewage collection networks: Moorefield and Drayton.

These system components are discussed in more detail below.

2.5.1 Drayton Sewage Collection System

2.5.1.1 Collection System

The Drayton sewage collection network consists of 11.5 km of gravity sewers, including 167 manholes[14]. The sewer network was installed in 1988 and includes pipe sizes ranging between 150 to 350 mm. The collection system conveys all of the collected sewage to the Drayton SPS located on north side of Mill Street.

The available documentation obtained from the Township (e.g., annual reports, monthly process and compliance reports) indicates the sewers are in relatively sound condition.

The Drayton sewage collection network currently services a population of about 1,880 people. The future population (year 2031) to be serviced has been estimated by the Township to be 3,100 people. The average and maximum daily flows from 2012 to 2014 are shown in Table 4.

[13] Statistics Canada. 2013. National Household Survey Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released June 26 2013.

[14] R.J. Burnside & Associates Ltd. Village of Drayton Infiltration and Inflow Study Report. November 13, 2013.

Table 4: 2012 to 2014 Sewage Flows (Drayton)

Year	Average daily flow (m^3/d)	Maximum Daily Flow (m^3/d)
2012	506	1,300
2013	624	2,622
2014	601	2,335

Source: OCWA sewage flow data

The maximum daily flow between 2012 and 2014 occurred on March 11, 2013. On that day, the temperature reached a high of 10 °C, compared to a high of -1°C in the previous week. Therefore, the peak flow was most likely due to the snow melt. Furthermore, previous investigation by the Township on extraneous wastewater flow indicated manhole repair and sewer flushing issues relating to reported overflows during storm events[15].

2.5.1.2 Pumping Station and Forcemain

The Drayton SPS is located at the intersection of Mill Street and River Run Road, in Drayton. The SPS consists of a wet well, two submersible sewage pumps (1 duty and 1 standby) and a 60 kW standby diesel generator. The sewage is pumped through a 1.6 km forcemain of 200 mm diameter that discharges at the raw splitter chamber at the Mapleton WPCP. The pumped flow is measured by a 150 mm flowmeter on the forcemain.

The two pumps each have a rated capacity of 34.0 L/s at a TDH of 42.0 m[16]. The pumps are not intended to run together to provide additional flow.

The capacity of a pumping station needs to meet the peak hourly flow of the sewage requiring pumping. By considering an hourly peak factor of 4.0, we have calculated the projected peak hourly flow for 2031 as shown in Table 5.

Table 5: Current and Future Peak Hourly Sewage Flows - Drayton

Parameter	Current	Future (2031)
Population	1,880 persons	3,070 persons
Per capita flow	332 L/pers/d	332 L/pers/d
Average daily flow	624 m^3/d	1,019 m^3/d
Peak hour factor	4	4
Peak hourly flow	2,497 m^3/d 29 L/s	4,077 m^3/d 47 L/s

Source: Annual Performance Reports for 2012, 2013 and 2014 for the Mapleton Water Pollution Control Plant.

The results of the hydraulic verification of the pumping system's capacity, including the forcemain, is presented in the table above. This theoretical verification indicates that the pumping capacity required for current and future peak flow is:

- Current: 29 L/s at 31 m TDH
- Future: 47 L/s at 42 m TDH

[15] R.J. Burnside & Associates Limited. Village of Drayton Infiltration and Inflow Study Report. November 13, 2013.
[16] Ontario Ministry of the Environment. *Amended Environmental Compliance Approval Number 0963-A4ZMVA*. January 22, 2016.

Based on this analysis, the existing pumps do not have the capacity to meet the future peak flow. Therefore, they will need to be replaced in order to meet the future flow. Prior to the upgrade of the pumps, an investigation of the state of the forcemain should be carried out before deciding on any future expansion of the pumping capacity.

2.5.2 Moorefield Sewage Collection System

2.5.2.1 Collection System

The Moorefield sewage collection network consists of low pressure sewers, where individual connections have a small grinder pump discharging through 40 to 125 mm PVC pipe. The sewage is conveyed to the Moorefield pumping station, which is located on Booth Street.

The approximate number of connections in Moorefield is 160, servicing approximately 420 people. All connections use grinder pumps. The average and maximum daily flows from 2012 to 2014 are shown in the table below.

Table 6: 2012 to 2014 Sewage Flows (Moorefield)

Year	Average daily flow (m^3/d)	Maximum Daily Flow (m^3/d)
2012	81.7	301
2013	90.2	211
2014	85.7	222

Source: OCWA sewage flow data

According to the 2008 Moorefield Wastewater Collection, Pumping Station and Forcemain Operating and Maintenance (O&M) Manual, infiltration and inflow is not a concern in Moorefield. The per capita sewage discharge of Moorefield (215 L/pers/d) is much lower than that of Drayton (332 L/pers/d), primarily due to its sealed low pressure sewers network.

The SPS and sewer network were completed in 2006 and are expected to be in good condition. Implementation of water efficiency measures in Moorefield is expected to result in reduced sewage flows.

2.5.2.2 Pumping Station and Forcemain

The Moorefield SPS consists of a wet well, two submersible sewage pumps (1 duty and 1 standby) and a 50 kW standby diesel generator. The sewage is pumped through a 5 km forcemain of 150 mm diameter that discharges at the raw splitter chamber at the Mapleton WPCP.

The two pumps each have a rated capacity of 14.14 L/s (1,222 m^3/d) at a TDH of 47 m. The pumps are not intended to run together to provide additional flow.

The current and future (2031) peak hourly flows are calculated to be 361 m^3/d (4.2 L/s) and 1,125 m^3/d (13 L/s), respectively. These values are presented in Table 7.

Based on this analysis, it appears that the capacity of Moorefield SPS is sufficient to meet the future peak flow.

Table 7: Current and Future Peak Hourly Sewage Flows - Moorefield

Parameter	Current	Future (2031)
Population	420 persons	1,310 persons
Per capita flow	215 L/pers/d	215 L/pers/d
Average daily flow	90 m³/d	281 m³/d
Peak hour factor	4.0	4.0
Peak hourly flow	361 m³/d 4.2 L/s	1,125 m³/d 13 L/s

Source: Annual Performance Reports for 2012, 2013 and 2014 for the Mapleton Water Pollution Control Plant.

2.5.3 Wastewater Pollution Control Plant

2.5.3.1 WPCP Overview

The Mapleton WPCP receives raw sewage from Drayton and Moorefield sewage collection networks. The average daily flow into the facility is 714m³/d (based on the peak of 2013).

The treatment facility consists of:

- An aerated lagoon (Cell 2) of 60,500 m³. Air supply is provided by two high speed blowers (1 duty and 1 standby) having a capacity of 680 m³/h at 45 kPa.
- A secondary settling lagoon (Cell 1) of 62,100 m³.
- Three storage ponds (Cells 3, 4A and 4B) with a total volume of 350,000 m³.
- An alum dosing system with a 15.000 L storage tank and two 7.1 L/h capacity metering pumps. Alum is dosed in the flow structure A located upstream of the storage pond (Cell 3). The flocculation takes place in Cell 3 using a diffused air system. Air supply for mixing is provided by a 25 hp compressor.
- Five tertiary sand filters, each having a 4.65 m² filtration area. The total capacity of the filters is 5580 m³/d based on a filtration rate of 10 m³/m²/h.
- Two UV disinfection units, designed to handle a peak flow of 4,000 m³/d.

The effluent is discharged into the Conestogo River via a 600 mm diameter pipe and a swale.

The Mapleton WPCP is operated by OCWA under the amended ECA number 0963-A4ZMVA (at the outset of this project, the facility was operated under EAC number 7875-95DQSC. The amended ECA was approved in January 2016. A key change in the amended ECA is that it allows for flexibility in the discharge based on measured river flow and discharge for the entire month of April). The rated capacity is 750 m³/d of influent (based on the raw sewage flow). The discharge permit is seasonal, as described in Table 8.

Table 8: WPCP Effluent Discharge Limits (existing)

Month	Discharge Limits (m^3/day)
March	1,581
April	3,154
October	233
November	1,754
December	4,000
Discharge Limit Flexibility: Discharges in excess of these daily discharges is allowed if the minimum 10:1 of the streamflow to daily discharge rate for the applicable period of that design streamflow occurs, based on actual measurements of flow rate in the Conestogo River.	

Source: Ontario Ministry of the Environment. Amended Environmental Compliance Approval Number 0963-A4ZMVA. January 22, 2016.

The effluent compliance limits and objectives are summarised in Table 9 below.

Table 9: Mapleton WPCP Effluent Compliance Limits and Objectives (existing)

Parameter	Unit	Average Concentration	
		Compliance limits	**Objectives**
$CBOD_5$	mg/L	7.5 (Apr & Oct) 10.0 (Mar. Nov. & Dec)	5.0
TSS	mg/L	-	-
Total Ammonia Nitrogen (TAN) (NH_4+NH_3)	mg/L	5.0	3.0
Total Phosphorus (TP)	mg/L	0.5	0.3
E. coli	CFU/100 ml	200	100
pH	-	-	6.5 – 9.0

Source: Ontario Ministry of the Environment. Amended Environmental Compliance Approval Number 0963-A4ZMVA. January 22, 2016.

2.5.3.2 WPCP Performance

The performance of the WPCP from 2012 to 2015 is summarized in Table 10.

Table 10: Monthly Average Effluent Concentration of Mapleton WPCP (2012 – 2015)

Date	Final effluent				
	CBOD5	*E. coli*	TAN (NH3+NH4)	TP	TSS
	(mg/L)	(CFU/100 ml)	(mg/L)	(mg/L)	(mg/L)
Mar. 2012	7.3	2.0	3.5	0.3	10.0
Apr. 2012	7.5	2.0	0.8	0.1	6.0
Oct. 2012	2.4	2.0	0.1	0.0	4.4
Nov. 2012	2.3	2.0	0.2	0.0	3.3
Dec. 2012	2.7	2.0	0.4	0.1	2.7
Mar. 2013	2.6	2.0	4.6	0.2	2.2
Apr. 2013	5.0	2.0	2.3	0.1	7.5
Oct. 2013	2.0	2.0	0.1	0.2	2.0
Nov. 2013	2.0	2.0	0.1	0.1	7.0
Dec. 2013	2.2	2.0	0.2	0.1	2.8
Mar. 2014	2.0	2.0	1.3	0.2	2.0
Apr. 2014	2.0	2.0	0.4	0.1	3.0
Oct. 2014	2.0	2.0	0.1	0.1	2.0
Nov. 2014	2.0	1.0	0.3	0.2	2.0
Dec. 2014	2.0	4.6	0.2	0.2	2.0
Mar. 2015	4.6	3.9	0.2	0.17	2.8
Apr. 2015	2.3	2.9	0.1	0.13	13.0
Oct. 2015	2.3	1.7	0.2	0.16	4.4
Nov. 2015	2.0	1.7	0.1	0.08	2.0
Dec. 2015	2.4	3.8	0.16	0.12	10.0

Sources: Annual Performance Reports for 2012, 2013, 2014 and 2015 for the Mapleton WPCP.

The average concentration of all parameters regulated by the ECA meet the compliance limits. The effluent met also the effluent concentration objectives for Total Phosphorus and *Escherichia coli* (*E. coli*).

Starting from January 2015, a new federal standard for ammonia has come into force. This was taken into account in the planning of the WPCP expansion.

3 Problem/Opportunity Statement

3.1 Problem/Opportunity Statement

The main driver for this Class EA was that the WPCP is operating very close to its rated average daily capacity of 750 m^3/day. In 2013, the facility's average daily inflow was 714 m^3/day, or about 95% of its rated capacity. This leaves the facility with little to no opportunity to manage flow increases and does not provide the Township with the ability to manage the additional wastewater generated by future growth. The rated capacity of the facility must therefore be increased to allow the Township to meet its projected service area growth to 2031.

Additionally, analysis of the wastewater collection systems for the communities of Drayton and Moorefield revealed that the Drayton system does not have sufficient pumping capacity to service that community's projected future population.

The problem statement for this Class EA, which was confirmed after reviewing with the public at Public Information Centre #1, includes two parts and is as follows:

a) The Township has a lagoon-based Wastewater Treatment system which currently only has the rated capacity for 750 cubic metres per day. The treatment capacity needs to be increased to permit growth within the served areas of the Township to meet the Township's projected serviced area growth until 2031.

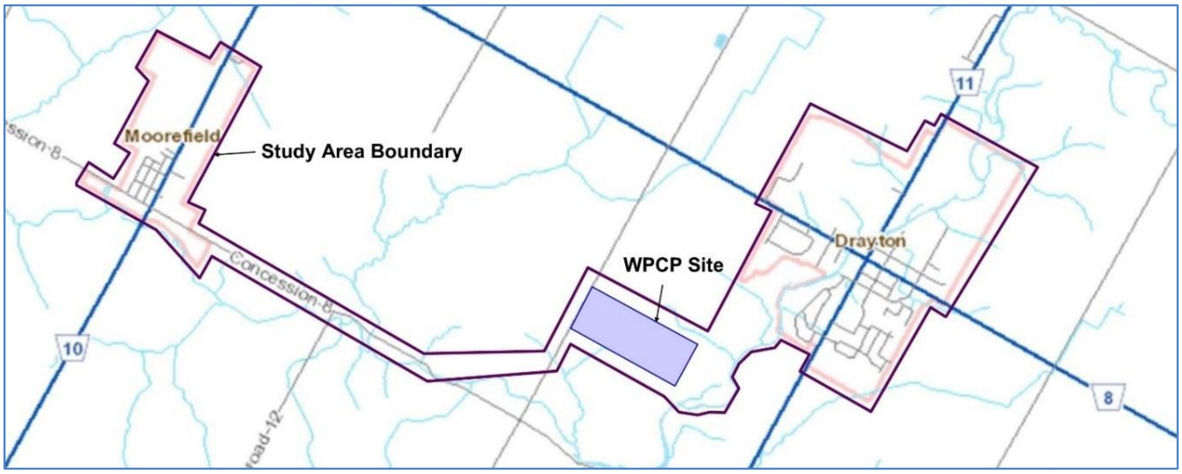
b) The Drayton Pumping Station does not have sufficient capacity to service Drayton's projected 2031 population. Pumping capacity will need to be increased in order to meet this service requirement.

The analysis of the WPCP and future demands (as presented in Tables 5 and 7) indicates that the facility will require a rating of 1,300 m^3/day of average daily flow (1,019 m^3/day from Drayton and 281 m^3/day from Moorefield).

3.2 Project Study Area

The study area for this project includes the communities of Moorefield and Drayton, the area including and surrounding the WPCP, and lands occupied by the wastewater collection system. Figure 9 depicts the study area.

Figure 9: Project Study Area



4 Alternative Solutions

Phase 2 of the Class EA process requires the consideration of alternative solutions or methods to address the problem or opportunity addressed in the problem statement. This section describes the alternative solutions considered and the screening and evaluation process used to select a preferred alternative solution.

The approach that was followed in the identification and evaluation of alternative solutions included:

- The alternative solutions were divided into two categories:
  - Alternative treatment solutions – includes alternatives for the treatment of wastewater; and
  - Alternative discharge solutions – includes alternatives for the discharge of treated effluent.
- The categories of alternative treatment solutions were screened against the problem statement.
- Approaches for primary, secondary and tertiary treatment of wastewater were considered.
- Based on WPCP treatment requirements, three alternative treatment solutions were considered for upgrading the Mapleton WPCP, including:
  - Pre-lagoon nitrification with Moving Bed Biofilm Reactor;
  - Post-lagoon nitrification with SAGR technology; and
  - Extended Aeration.
- The three treatment alternative solutions were evaluated against evaluation criteria and a preliminary preferred treatment solution identified.
- Alternative discharge solutions were identified and reviewed.
- The preferred discharge solution was identified based on ability to meet the municipality's discharge requirements and on the results of an update to the Mapleton Receiving Water Impact Assessment.

This process is described in detail in the following paragraphs.

4.1 Treatment Alternatives

4.1.1 Pre-Screening of Treatment Alternatives

Three categories of alternative treatment solutions were identified:

- Do nothing – continue to operate the facility as is;
- Control infiltration and inflow – implement infiltration and inflow measures to reduce the amount of non-wastewater flow into the WPCP; and
- Provide Additional Treatment Capacity – upgrade the WPCP to add additional treatment capacity.

The categories of treatment alternatives were pre-screened against the problem statement for further consideration in this study. The screening question was:

Will the solution allow facility to increase its capacity to meet treatment demands projected for 2031?

Table 11 presents the results of the pre-screening. Both the 'do nothing' and the 'control infiltration and inflow' categories were screened out for further consideration. While controlling infiltration and inflow would be beneficial to the wastewater system as a whole, on its own it would not adequately address the problem statement. The screening concluded that additional treatment capacity would be required to adequately address the problem statement.

Table 11: Pre-screening of Alternative Solutions

Category	Will solution allow facility to increase its capacity to meet treatment demands projected for 2031?	Conclusion
Do Nothing	No. The WPCP would either exceed approved & design capacity with increased population growth, or growth in the Drayton and Moorefield communities would be unable to continue.	"Do nothing" would not allow the Mapleton wastewater treatment system to address the problem statement. Therefore, this alternative is **screened out**.
Control Infiltration/Inflow	No. The Mapleton wastewater treatment system currently has some infiltration and inflow. While infiltration/inflow control measures may reduce wet weather inflow and provide some hydraulic load handling improvements at the WPCP, it will not provide additional treatment capacity.	While infiltration and inflow control measures would likely be beneficial to the Mapleton wastewater treatment system, it would not address the problem statement. Therefore, this alternative is **screened out**.
Additional Treatment Capacity	Yes. Providing additional capacity through upgrades or replacement would allow the WPCP to meet capacity requirements and adequately manage increased volumes of wastewater.	Providing community with additional wastewater treatment capacity (either by upgrading the plant or replacing it) would address problem statement. Therefore, this alternative is **carried forward**.

4.1.2 Identification of Treatment Alternatives

Alternatives for adding additional treatment capacity at the WPCP were explored further. A key consideration was whether the technology or approaches would be complimentary to the existing WPCP system, as this would reduce capital upgrade costs and changes to operations.

The approach to the selection of treatment alternatives is discussed below.

Overview of Ammonia Removal Technologies

One of the key issues in selecting the treatment process is the removal of ammonia nitrogen in the effluent. Many treatment technologies have been developed for ammonia removal and can be grouped in three general categories:

- Physicochemical ammonia removal technologies, such as breakpoint chlorination, air stripping, and ion exchange;
- Biological ammonia removal technologies; and
- Natural treatment, i.e., constructed wetlands.

The physicochemical technologies are less popular in practical application, as the capital and operations and maintenance (O&M) costs are relatively high compared to other approaches. These treatment systems are generally technically complex and require frequent operator attention and a high level of operation skills. Given these characteristics, these technologies will not be considered in the study.

Compared to physico-chemical technologies, biological ammonia removal technologies are more economic and better adapted to municipal applications. This is particularly true for Mapleton WPCP, since the existing lagoon system is a biological treatment process. Therefore, these types of technologies were included in the assessment.

A constructed wetland is a green technology that mimics a natural ecological system whereby nutrients contained in wastewater (i.e., nitrogen and phosphorus) is removed though a number of physical, chemical and biological process with microbial communities, emergent plants, soil, and sediments. This may include a constructed, engineered wetland or floating treatment wetland. The wetland system is self-sustaining and requires very low energy input and low operational maintenance. However, its performance with respect to nutrient removal can vary and depends on climatic conditions. In the context of Mapleton WPCP, a constructed wetland can be implemented in the existing storage lagoons to provide additional nitrogen and phosphorous removal.

Overview of Nitrification

One of the key challenges in selecting the treatment process is the removal of ammonia nitrogen in the effluent, especially in cold weather.

Ammonia in water exists in two forms: the ammonium ion (NH_4+) and un-ionized ammonia (NH_3). The relative portion of the two ammonia forms in solution depends mostly on the pH level. At a high pH, most of the ammonia in solution is in the unionized form, whereas at a low pH the ammonia is mostly in the ionic form.

Nitrification is a biological process whereby ammonia is oxidized to nitrite in the presence of nitrifying bacteria. The oxidation occurs in two steps:

1. The oxidation of ammonia (NH_4+) to nitrite (NO_2-) by the bacterium *Nitrosomonas*; and then,
2. The oxidation of nitrite (NO_2-) to nitrate (NO_3) by the bacterium *Nitrobactor*.

The stoichiometric equations for nitrification are, in order:

$$NH_4^+ + 1.5O_2 \rightarrow 2H^+ + H_2O + NO_2^-$$

$$NO_2^- + 0.5O_2 \rightarrow NO_3$$

Being chemosynthetic autotrophs, nitrifying bacteria derive their energy from ammonia and nitrite and their carbon from carbon dioxide.

Nitrification in a biological treatment system is affected by several factors:

- Water temperature - Little or no growth of nitrifying bacteria is expected below 4°C.
- pH - Nitrification will be inhibited when pH is less than 6.
- Alkalinity - Alkalinity is the carbon source for nitrifier growth. Nitrification of 1 g of ammonia will consume 7.2 g of alkalinity.
- Solids retention time (SRT) – The SRT required for nitrification is much longer than for the removal of BOD. Also, a longer SRT is required for nitrification with decreasing temperature.
- Dissolved oxygen (DO) - Nitrifies are strict aerobes; that is, they require oxygen to survive. The residual DO level must be maintained at 2 mg/L or above in order to allow nitrification to occur.

Shortlisting of Nitrification Technology Alternatives

The biological nitrification technologies can be divided into two general categories:

- Suspended growth nitrification, where the bacteria are suspended in the mixed liquid (i.e., the wastewater mixture); and
- Attached growth nitrification, where a media (such as a synthetic fabric or plastic) is added to the treatment tank, and the bacteria grow on the media surfaces.

Many of the suspended growth nitrification technologies require a sludge return process. A common example of this type of process is the conventional activated sludge process. In this process, the liquid mixture is inoculated with sludge containing the nitrifying bacteria (i.e., the activated sludge). When the liquid mixture moves from the treatment tank to the settling pond, a portion of the activated liquid mixture is recycled back to the new liquid mixture entering the process. This inoculates the liquid mixture and the treatment process is repeated. The growth of nitrifying bacteria requires a long sludge SRT, especially during colder seasons. This can be achieved through an extended aeration process, which provides a longer mixing time for the wastewater liquid. Extended aeration is especially suited for relatively small volumes of wastewater, as may be generated in a small community. Given the relatively small size of the Mapleton WPCP and need to operate in a winter climate, extended aeration was the type of suspended growth nitrification process selected for further evaluation.

A relatively new technology that combines suspended growth with attached growth is called Integrated Fixed Film Activated Sludge (IFAS). The IFAS process is a suspended growth reactor that incorporates attached growth media. However, some IFAS technologies also require sludge return. Sludge return is not desirable for the Mapleton WPCP because it requires a higher level of operational complexity. These technologies were eliminated from further consideration in order to avoid sludge handling equipment and practice.

Unlike suspended growth nitrification, attached growth technologies do not rely on SRT, since the biomass growth is on the surface of media. An outcome of this is that a smaller reactor tank is required. Different methods of attached growth nitrification use different types of media, including textile, rope, sponges, plastics, stones, etc. Some advantages of attached growth over the suspended growth nitrification include a smaller foot print, better resilience to shock loads, less production of biological sludge (i.e., the sludge left over after the treatment process, which typically requires dewatering and disposal), and better sludge settling properties. In this category, two technologies well suited for the Mapleton WPCP that have seen applications in Ontario include Moving Bed Biofilm Reactor (MBBR) and Submerged Attached Growth Reactor (SAGR). Descriptions of the MBBR and SAGR processes are provided in Section 4.1.3.

The selection of nitrification technologies should make maximum use of the existing installations. Based upon these general considerations, the following alternatives were retained for further study:

- Alternative 1 - Pre-lagoon nitrification with MBBR;
- Alternative 2 - Post-lagoon nitrification with SAGR; and
- Alternative 3 – Sequencing Batch Reactor (SBR) extended aeration process.

These alternatives are described in more details in the following section.

4.1.3 Review of Treatment Alternatives

The central processes for alternatives under consideration are discussed below. While the central process differ, two specific process upgrades or enhancements were carried forward for all three alternatives. These include:

- Potential for installation of floating wetlands in the lagoons; and
- A new alum mixing tank.

The floating wetlands would consist of artificial wetlands and, if installed, could provide greater polishing of nutrients in the effluent.

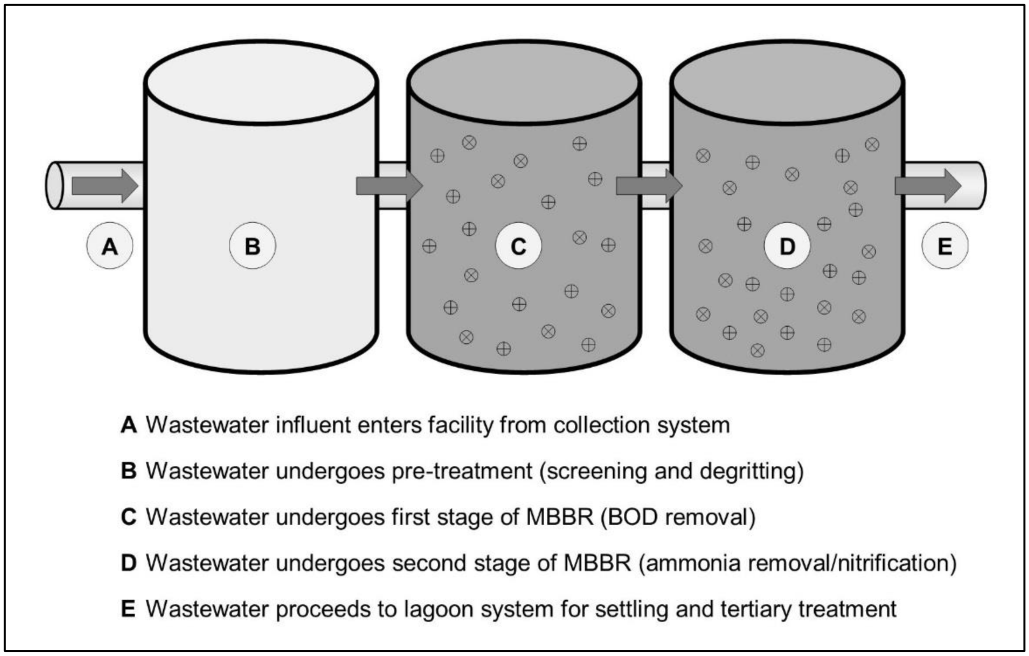
A new alum mixing tank was included for improved phosphorus removal.

4.1.3.1 Alternative 1: Pre-lagoon nitrification with MBBR

The Moving Bed Biofilm Reactor (MBBR) is a combined suspended/attached growth system that uses plastic media held in suspension. The plastic media have a specific gravity slightly less than 1.0. The media typically has a cylindrical shape with internal and external fins. This shape maximizes the surface area per unit volume that is also protected from shear force, thereby maximizing biofilm growth on the media. There is no sludge return required for the process.

For nitrification applications, multi-stage MBBR is required. The initial stage provides for Biological Oxygen Demand (BOD) removal, with nitrification occurring in the subsequent stage. MBBR systems are more resilient to shock loads, produce less biological sludge production, and have better sludge settling properties compared to other technologies. However, the performance of the MBBR relies partly on a secondary settling tank. Figure 10 provides a simplified description of the MBBR process.

Figure 10: MBBR Process



As noted above, temperature of the wastewater is a key factor influencing the efficiency of the nitrification process. While the temperature of the wastewater travelling through the collection system during the winter season will vary, it would typically be at a minimum of 4°C. To minimize loss of this latent heat, the MBBR unit would be installed as the first part of the treatment process; that is, wastewater arriving at the facility would enter the MBBR tanks first before continuing to the lagoon system. This would minimize the heat loss of the wastewater through the open lagoons.

A flow diagram of the Alternative 1 process for the Mapleton WPCP is shown in Figure 11, and would include:

- A new pre-treatment building for screens and grit removal units (normal MBBR pretreatment includes a unit of Fin screens [< 6 mm], along with a degritter for the removal of sand that may end up in the raw sewage);
- New MBBR's in concrete tanks;
- Location of the pre-treatment building and MBBR tanks located next to lagoon cell 3;
- Gravity feed of effluent to the lagoon system from the MBBR tanks, using the existing route: Cell 2 > Cell 1 > Cell 4A > Cell 4B > Cell 3 > filters > UV;

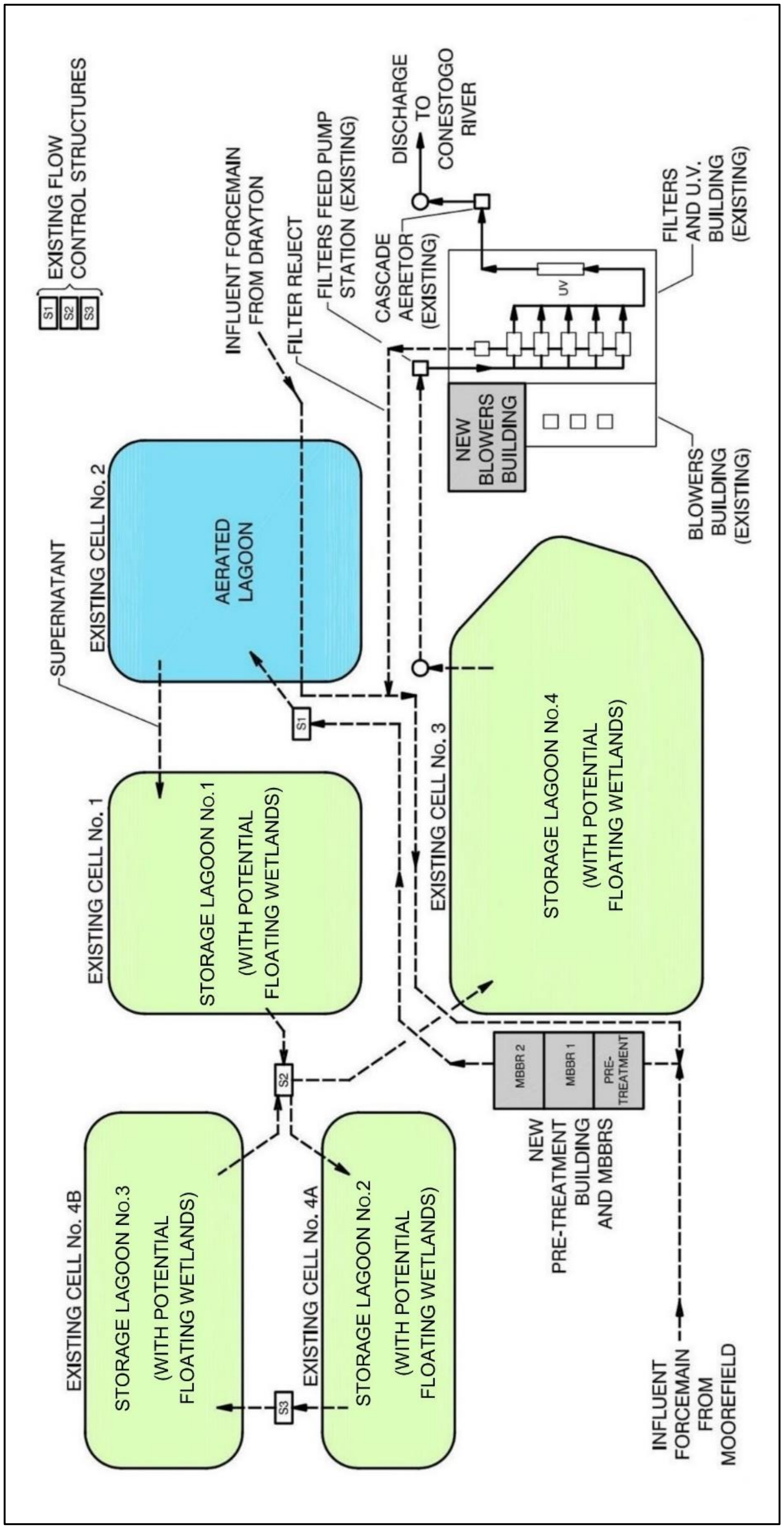
- Continued operation of the existing tertiary filters and UV disinfection unit;
- A new alum mixing tank; and
- The possible addition of wetland functions to the lagoon system by installing floating wetland islands in the lagoons;

Some key characteristics of this type of system include:

- It is able to operate generally without diminished performance in cold, winter conditions;
- There is no need for a sludge return;
- Adding a MBBR upstream of a lagoon-based system will not increase sludge production;
- SRT controls are not required;
- This type of system is fairly robust and is well resilient to load shocks;
- Pre-treatment of wastewater (i.e., screening and grit removal) as it enters the system is required prior to entering the MBBR tanks;
- While the pre-treatment would add some additional O&M costs, the MBBR system is a relatively simple process to operate;
- Some civil engineering works will be required onsite, specifically:
    - Extending the influent forcemain from Drayton to the MBBR tanks;
    - Access roads to the new pre-treatment building;
    - Structure for the pre-treatment building and the MBBR tanks;
- Chemical dosing may be required to prevent foaming in the MBBR reactor;
- Performance of the MBBR system relies partly on the downstream settling tank.

The construction cost of the alternative is estimated to be in the order of $4.2M (plus contingencies).

Figure 11: Alternative 1 (MBBR) Process Flow Diagram



4.1.3.2 Alternative 2: Post-lagoon nitrification with SAGR

Alternative 2 would have nitrification occur after the lagoon treatment through the use of a submerged attached growth reactor (SAGR), which in addition to nitrification would also allow for additional reduction of BOD and Total Suspended Solids (TSS). The SAGR consist of a media bed, a coarse bubble air diffusers system, influent distribution piping and effluent collection piping, and a cover layer of wood chips or mulch. The media material used in SAGR is uniformly graded clean rock or stone.

The SAGR is a proprietary technology, and is less widely known comparing to the other two technologies. However, the technology has several applications in small municipalities in Ontario and other parts of Canada, and data from other installations have shown that SAGR can deliver a high performance for ammonia removal in cold weather, as well as a significant reduction in fecal and total coliform. For example:

- A SAGR demonstration project in Steinbech, MB achieved 99.5% removal of Total Ammonia Nitrogen (TAN), with average effluent concentrations of 0.12 mg/L over the January 13 - April 21, 2010 monitoring period[17].
- The Glencoe ON WWTP uses SAGR in its wastewater treatment process and achieved monthly average effluent concentrations for TAN of <0.1 to 0.45 mg/L in 2013[18] and <0.1 to 1.5 mg/L in 2014[19].

Examples of SAGR installations in Canada include:

- Steinbech, MB (demonstration site);
- Lloydminster, SK (demonstration site);
- Doaktown, NB;
- Dawson Creek, BC;
- Glencoe, ON;
- Long Plain First Nations, MB;
- Perth, ON (demonstration site);
- Shellbrook, SK;
- Blumenort, MB (demonstration site);
- Balcarres, SK;
- Misipiwistik First Nations, MB;
- Greenbryre, SK;
- Guthrie School, ON;
- Sundridge, ON;
- Waterford, ON; and
- Jackhead First Nation, MB (under construction);

[17] Nelson Environmental Inc. SAGR performance data for Steinbech, MB demonstration project.
[18] Ontario Clean Water Agency. *Glencoe Wastewater Treatment Plant 2013 Annual Report*.
[19] Ontario Clean Water Agency. *Glencoe Wastewater Treatment Plant 2014 Annual Report*.

- Lake St. Martin First Nations, MB (under construction);
- Brights Grove, ON (under construction).

A flow diagram of the post-lagoon nitrification process for the Mapleton WPCP is shown in Figure 12. In general, the in-plant flows follow the existing route, with the addition of two SAGRs installed in the downstream side of the existing Cell 1.

The performance of SAGR for nitrification requires that the majority of the BOD load be removed by upstream lagoons. Therefore, it would be necessary to upgrade the existing lagoon Cells 1 and 2 in order to meet that requirement. The upgrades could include additional air diffusers and/or adding blower capacity.

As with the other alternatives, this includes:

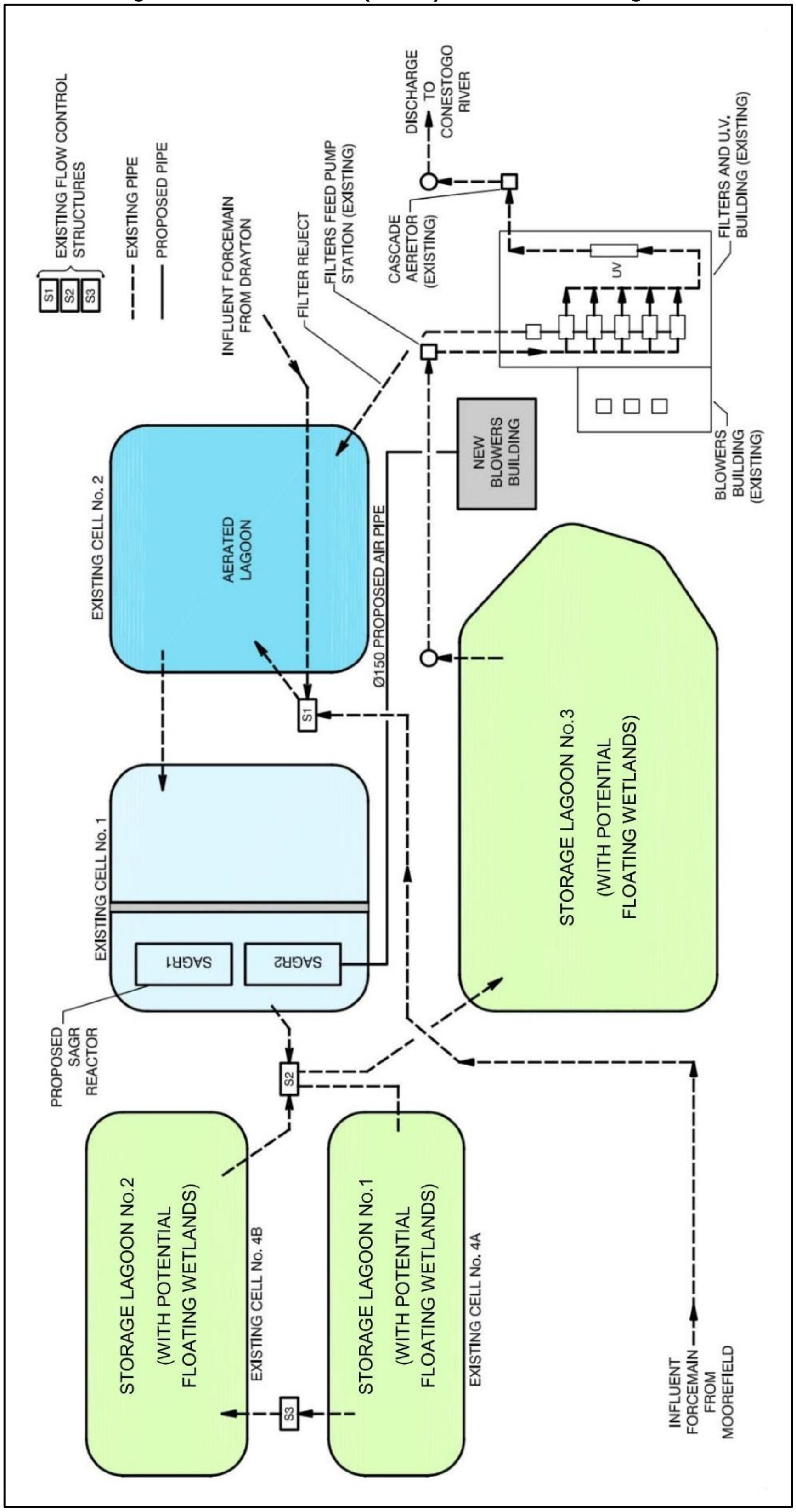
- Potential for the addition of floating island wetlands to existing the cells 3, 4A and 4B, which could provide addition nutrient removal; and
- A new alum mixing tank.

Some key characteristics of this type of system include:

- It provides maximum use of the existing lagoons (i.e., no need for a new lagoon);
- There is no need for pre-treatment of influent or a separate settling tank;
- Sludge return is not needed;
- There is no need for SRT control for nitrification;
- The system is resistant to hydraulic and load shocks;
- The SAGR beds have a moderately sized foot-print;
- Construction costs depend heavily on local availability of granular material;
- SAGR beds rely on performance of upstream lagoons; and
- The technology is unique and proprietary.

The construction cost of the alternative is estimated to be in the order of $3.8M (plus contingencies).

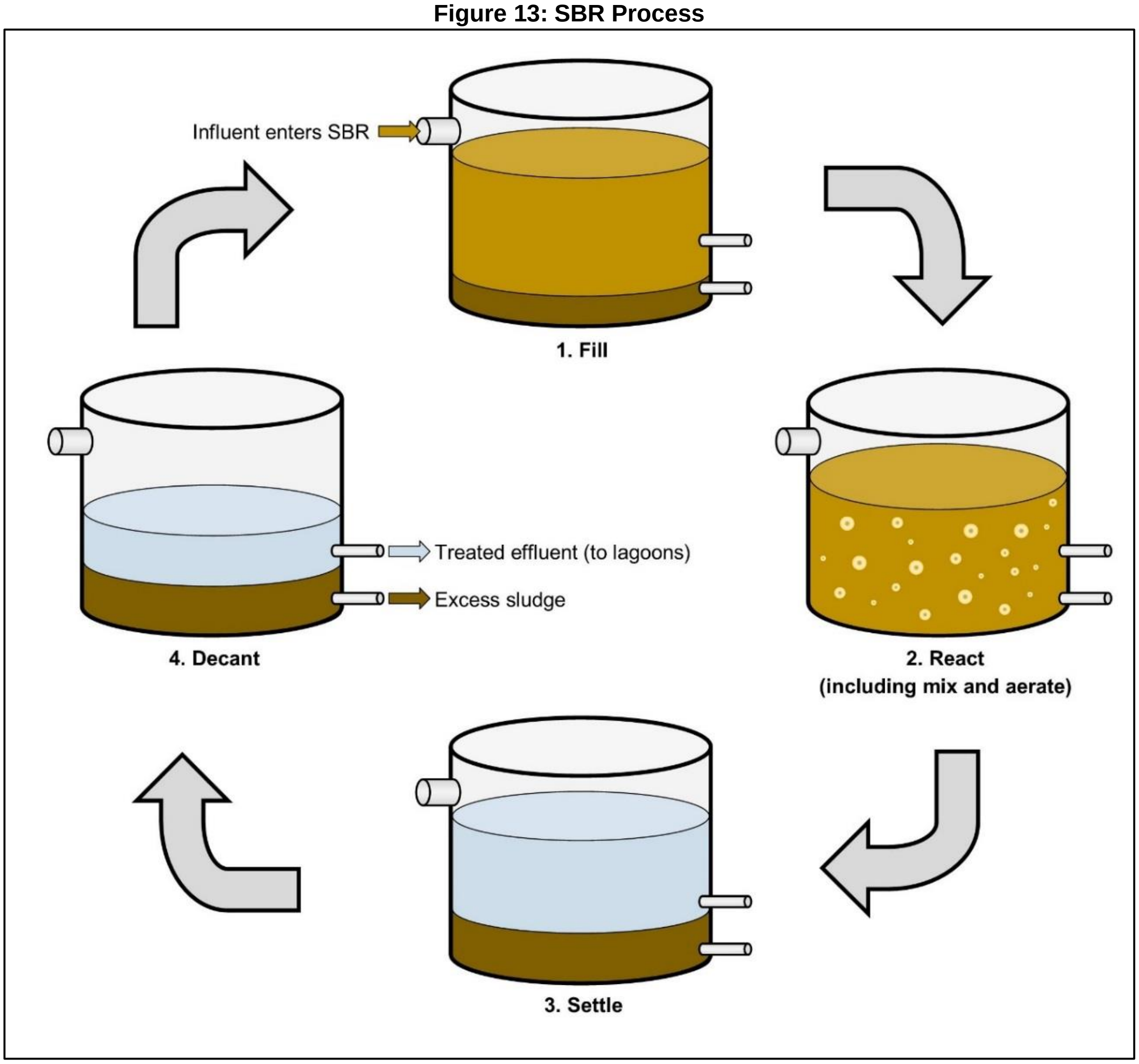
Figure 12: Alternative 2 (SAGR) Process Flow Diagram



4.1.3.3 Alternative 3: Extended Aeration Process using Sequential Batch Reactor

Treatment through extended aeration uses a type of activated sludge process and includes a long SRT and low organic loading. The extended aeration process can be implemented using Sequencing Batch Reactors (SBR). In an SBR, all treatment steps are performed sequentially in a single reactor tank, thus eliminating the need for a separate settling tank and sludge return. Normally, SBRs use four basic phases: fill, react, settle, and decant. An idle period is normally reserved for adjustment of cycle time. Due the sequential nature, the process normally consists of multiple SBRs, or a single SBR with an equalization tank. Figure 13 illustrates the SBR process.

Figure 13: SBR Process



As with the other alternatives, this includes the addition of the floating wetlands and a new alum mixing tank. Figure 14 depicts the process that Alternative 3 would follow, which includes:

- Upon arriving at the WPCP, raw sewage would be directed to the existing lagoon Cell 1, which would be divided in two sections. The first section of Cell 1 would serve as an equalization tank, which would receive wastewater entering the facility. The second section would be converted SBR reactor tank and would include a new aeration system. Raw sewage would move into the SBR for treatment from the equalization tank. While the SBR is processing a batch, any incoming influent would be stored in the equalization tank until the SBR process has finished and SBR decanted.

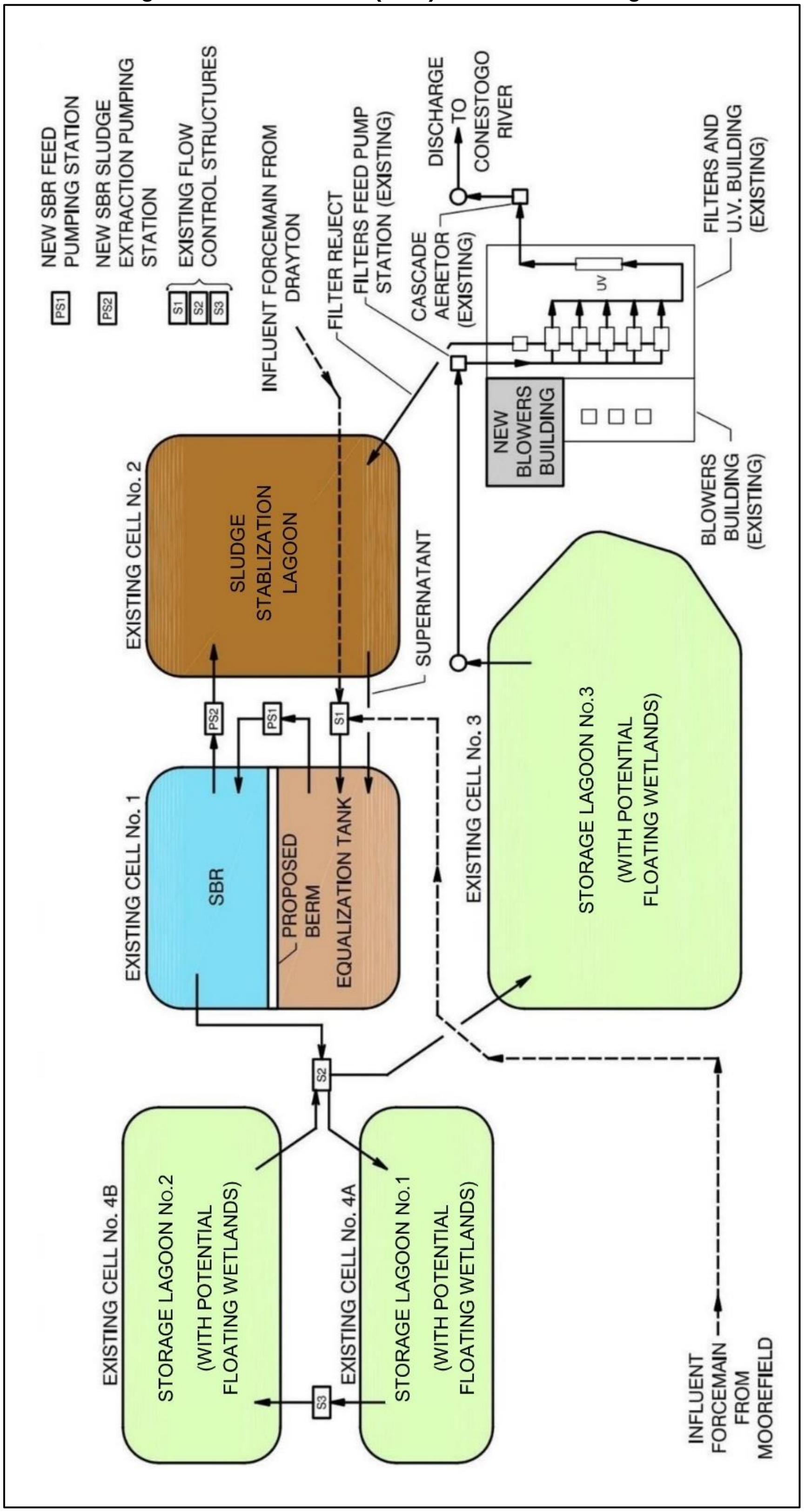
- After treatment in the SBR, sludge would be extracted to Cell 2, which would be converted to a sludge stabilization tank. The existing aeration system in Cell 2 would be maintained.
- The supernatant would be returned to the equalization tank.
- The effluent from the SBR would flow from Cell 4A to Cell 4B, and then to Cell 3. The three cells would be upgraded with floating wetlands to provide further natural treatment for nutrients reduction.
- The existing tertiary filters and UV disinfection unit would be maintained.
- A new pumping station would be installed to feed the SBR.
- A new sludge extraction pumping station would be installed between Cells 1 and 2.
- New blowers for the SBR, and a new building for the blowers, would be required.
- A new alum mixing tank.

Some key characteristics of this type of system include:

- It would maximize use of the existing lagoons (i.e., no need for a new lagoon);
- There is no need for primary treatment;
- There is no need for pre-treatment of influent or a separate settling tank;
- No need for sludge return;
- There is a long SRT in the existing lagoons for nitrification;
- The system is resistant to hydraulic and load shocks;
- The process is equipped with automated controls;
- A large foot print is required for the equipment;
- More mechanical equipment comparing to other alternatives;
- Higher air demand due to larger tank;
- The process produces excessive amounts of sludge;
- Sludge stabilization is required;
- The process requires operator attention to avoid process upsets (e.g. sludge bulking, etc.)
- The performance of extended aeration technology for nitrification in winter is uncertain.

The construction cost of the alternative is estimated to be in the order of $3.8M (plus contingencies).

Figure 14: Alternative 3 (SBR) Process Flow Diagram



4.1.3.4 Evaluation of Alternative Treatment Solutions

A suite of evaluation criteria were developed in consultation with the Township to evaluate the alternative solutions. The MOECC and GRCA were also consulted on the evaluation criteria. The evaluation criteria are organized into four categories: technical, natural environment, social/cultural, and financial. The alternatives were ranked against each criterion relative to the other alternatives on a high, medium or low scale:

- A ranking of 'high' denoted best relative performance;
- A ranking of 'medium' denoted medium relative performance; and
- A ranking of 'low' denoted the lowest relative performance.

Table 12 presents the evaluation criteria, with the results of the evaluation presented in Table 13.

Alternative 2 (post lagoon nitrification) was identified as the preferred alternative solution.

Based on the evaluation in Table 13:

- Alternative 2 (post lagoon) was ranked "high" in five technical categories, while Alternatives 1 (pre lagoon) and 3 (extended aeration) were ranked "high" in only two categories.
- Alternative 2 (post lagoon) ranks highest for the Technical group of criteria because:
  - It would have good performance in winter;
  - It would require the least changes to existing operations;
  - It would be easier to implement than Alternative 1 or 3;
  - The alternative could be expanded if required in the future;
  - It would require the least maintenance compared to the other alternatives;
  - It would be easier to operate compared to the other alternatives;
  - While a relatively new process, it is approved for use in Ontario and Quebec.
- Alternatives 1 (pre lagoon) and 2 (post lagoon) both ranked high with respect to natural environment, as each will provide reliable protection of the environment. Alternative 3 may have reduced environmental performance in the winter season.
- Alternatives 1 (pre lagoon) and 2 (post lagoon) both ranked high with respect to social/cultural criteria, as each will have minimal noise, air or odour impacts or other nuisances. Alternative 3 (extended aeration) may have some odour impacts from sludge handling and storage.
- Alternative 2 (post lagoon) was ranked as high in both financial categories, meaning that it was among the lowest capital cost and lowest operating costs.

Table 12: Evaluation Criteria for Alternative Treatment Solutions

Criterion
Technical
Ability to meet effluent quality objectives *
Impacts on existing operations
Ease of implementation
Flexibility to meet long-term objectives
Maintainability of plant equipment and processes
Ease of operation
Track record of technology
Natural Environment
Impact on aquatic resources
Impact on terrestrial environment, such as woodlots, parks or habitats
Social/Cultural
Noise, air, odour and other nuisances
Financial
Capital costs
Operating and maintenance costs

* Indicates a key evaluation criterion.

Table 13: Alternative Treatment Solutions Evaluation

Evaluation Criteria Category	Evaluation Criteria	Alternative 1: Pre-Lagoon Nitrification with MBBR	Alternative 2: Post-Lagoon Nitrification with SAGR	Alternative 3: Extended Aeration with SBR
Technical	**Ability to meet Effluent Quality Objectives (key criteria)**	**High** • Can meet all effluent objectives consistently • Good performance during winter season	**High** • Can meet all effluent objectives consistently • Good performance during winter season	**Medium** • Performance for nitrification in cold temperatures may be sub-optimal
	Impacts on Existing Operations	**Medium** • Some impacts on existing operations due to addition of new technology	**High** • Least impact on existing operations	**Low** • Most impact on existing operations due to need to handle more sludge and more process control. • Need to train staff on new processes and control requirements.
	Ease of Implementation	**Medium** • Can be implemented with relative ease, with minor interruption to plant operation • MBBR tanks can be added to empty/vacant space on WPCP property. • Due to existing site configuration, alternative will require more civil works, including extending (on site) the influent forcemain from Drayton and access roads to the new pre-treatment building	**High** • Can be implemented easily, with little interruption to plant operation. • Installation of post lagoon treatment will occur in existing storage lagoon without any interruption of lagoon based treatment.	**Low** • The implementation will require using one of the existing treatment lagoons. • Conversion of treatment lagoon to SBR may cause interruption to plant operation. • Requires installation of more mechanical equipment compared to other alternatives.
	Flexibility to Meet Long Term Objectives	**High** • Easily expandable using higher density of the growth media • Aeration tank is modular and can be added easily.	**Medium** • Can be expanded if lagoon volume is available or on empty space on WPCP property	**High** • Expansion would likely require upgrade of mechanical equipment only, with little additional civil works.
	Maintainability of Plant Equipment and Process	**Medium** • Maintenance of pre-treatment equipment required.	**High** • Little maintenance required.	**Low** • Maintenance of sludge pumping and equipment required. • Process control maintenance required.
	Ease of Operation	**Medium** • MBBR requires pre-treatment	**High** • Easily operable process	**Low** • Will require regular operator attention to avoid process upset (e.g., bulking of sludge, etc.) • Need to monitor and control biomass (MLSS) and sludge age etc. on an ongoing basis.
	Track Record of Technology	**Medium** • Established treatment technology	**Medium** • Relatively new process • Approved in provinces of Ontario and Quebec	**High** • Long established treatment technology

	Technical: Summary	• Alternative 2 (Post Lagoon) was ranked "high" in five technical categories, while Alternatives 1 (Pre Lagoon) and 3 (Extended Aeration) were ranked "high" in only two categories.
		• Alternative 2 (Post Lagoon) ranks highest for the Technical group of criteria because:
		  • It would have good performance in winter;
		  • It would require the least changes to existing operations;
		  • It would be easier to implement than Alternative 1 or 3;
		  • The alternative could be expanded if required in the future;
		  • It would require the least maintenance compared to the other alternatives;
		  • It would be easier to operate compared to the other alternatives;
		  • While a relatively new process, it is approved for use in Ontario and Quebec.		

Natural Environment	Minimization of Impact on Aquatic Resources	**High** • Will meet effluent discharge standards	**High** • Will meet effluent discharge standards	**Medium** • Will meet effluent discharge standards most of the time • Nitrification in winter may be less than optimal
	Minimization of Impact on Terrestrial Environment	**High** • Little or no impact on terrestrial environment	**High** • Little or no impact on terrestrial environment	**High** • Little or no impact on terrestrial environment
	Natural Environment: Summary	• Alternatives 1 (Per Lagoon) and 2 (Post Lagoon) will each provide reliable protection of the environment, while Alternative 3 may have reduced environmental performance in the winter season.		

Evaluation Criteria Category	Evaluation Criteria	Alternative 1: Pre-Lagoon Nitrification with MBBR	Alternative 2: Post-Lagoon Nitrification with SAGR	Alternative 3: Extended Aeration with SBR
Social/Cultural	Noise/air/odour and other nuisances	**High** • Little or no impacts	**High** • Little or no impacts	**Medium** • May have some odor impacts from sludge handling /storage
	Social/Cultural: Summary	• Alternatives 1 (Per Lagoon) and 2 (Post Lagoon) will each have minimal noise, air or odour impacts or other nuisances, while Alternative 3 (Extended Aeration) may have some odour impacts from sludge handling and storage.		
Financial	Capital Cost	**Medium** • ~ 4.2 M + contingencies	**High** • ~ 3.8 M + contingencies	**High** • ~ 3.8 M + contingencies
	Annual Operating Cost	**High** • Aeration costs for MBBR • Will have some mechanical maintenance costs	**High** • Aeration costs for lagoon and SAGR • Will have least mechanical maintenance costs	**Medium** • High aeration costs for extended aeration • Will have more mechanical maintenance costs • Sludge handling and disposal costs
	Financial: Summary	• Alternative 2 (Post Lagoon) was ranked as 'High' in both financial categories, meaning that it was among the lowest capital cost and lowest operating costs.		

Based on the evaluation, Alternative 2 (Post Lagoon) is identified as the preferred treatment alternative for the following reasons:

- It had the best ranking for technical performance among the alternatives evaluated;
- It provides reliable protection of the natural environment;
- It will have little to no impacts on noise, air or odour or other nuisances; and
- The estimated capital and operating costs are lower than other alternatives.

4.2 Discharge Alternatives

The second part of the identification and evaluation of alternatives dealt with discharge alternatives. Currently, the WPCP's approved discharge window is limited and dependant on the time of year:

- March – up to 1,581 m^3/day;
- April – up to 3,154 m^3/day;
- October – up to 233 m^3/day;
- November – up to 1,754 m^3/day;
- December – up to 4,000 m^3/day.

In the past, the MOECC had approved extended discharge windows in the past, either for emergency discharge or during conditions when the Conestogo River has elevated river flows. For example:

- In September 2011, the WPCP was allowed to discharge into the Conestogo River because the lagoons were almost full. The impact on the Conestogo was determined to be low, as there was sufficient river flow from the extra rainfall experienced. This event occurred prior to building of Cells 4A and 4B.
- In spring 2015, the WPCP was temporarily allowed to increase discharge volumes due to the high river flows experienced.

This flexibility has since been incorporated in the WPCP's ECA, which includes a provision that allows the facility to discharge more than the approved discharge limit if the streamflow to effluent discharge flow is greater than 10:1 (up to a maximum discharge equivalent to the maximum design capacity of the sand filtration and ultra-violet (UV) disinfection unit, of 4,000 m^3/day).

To ensure adequate discharge is available to accommodate the estimated treatment flows at the WPCP, three discharge alternatives were assessed:

1. Alternative 1 – continuous discharge;
2. Alternative 2 – expanded discharge window;
3. Alternative 3 – existing discharge regime supplemented with spray irrigation.

4.2.1 Alternative 1 – Continuous Discharge

Alternative 1 would see some effluent discharge year-round, although flow rates would depend on river flow volume. In discussions with MOECC and GRCA, both agencies expressed reservation over allowing discharge in the summer months. Some of the issues raised by the agencies with respect to discharge in the summer included:

- The Conestogo River is the receiver for the effluent discharge, and the flow of the Conestogo in the summer is often low.
- If the river flow is low, then the Conestogo Reservoir would act as the main receiver, and it regularly experiences algae blooms in the summer.
- The low river flow in the summer may not sufficiently dilute the effluent. Insufficiently diluted effluent could harm fish in the river and provide algae easier access to nutrients.

- The MOECC guidelines base discharge limits on 7Q20, and the 7Q20 values for summer months would be too low to allow for discharge.

Based on these points, the continuous discharge alternative is not carried forward.

4.2.2 Alternative 2 – Expanded Discharge Window

Alternative 2 would expand the existing discharge window to include the winter season. Discharge would not occur in the summer months. The base discharge flow rate would depend on the 7Q20 values for the river flow, but discharge could potentially be increased temporally if there is sufficient river flow. Factors that help make the winter season more suitable for discharge include that river flows are higher in winter compared to in summer, ammonia is less toxic in cold weather conditions, and there is limited biological activity in the winter. Given that the MOECC and GRCA have expressed a willingness to consider an expanded discharge window, this alternative is carried forward.

4.2.3 Alternative 3 – Existing Discharge Window with Spray Irrigation

Alternative 3 involves supplementing the existing discharge window with spray irrigation. In this alternative, treated effluent from the WPCP would be discharged to a holding pond and then used to irrigate land as needed. The MOECC's *Design Guidelines for Sewage Works* (2008) limit spray irrigation to within the frost-free period, up to a maximum of 100 days. A potential location that has been proposed to use the WPCP effluent for spray irrigation is on the proposed Drayton Ridge Golf Course. The Drayton Ridge Golf Course is a development proposed by Glenaviland Development Corporation (GDC) and would be located on the property adjacent to the WPCP. Correspondence provided to the project team between R.F. Moote & Associates Ltd and the Township (dated January 31, 2014) provide some details of the proposed initiative:

- The golf course would have an average annual irrigation demand of about 99,300 m^3.
- The total on-site effluent storage capacity would be about 14,500 m^3.
- The total area that would be able to receive the effluent is 27.0 acres.
- Under ideal conditions, the volume of effluent that could be spray irrigated on the golf course is about 32,700 m^3 (or about 12% of the Township's current annual permitted discharge volume).

The *Design Guidelines for Sewage Works* also provide guidance on spray irrigation of treated wastewater effluent. Examples of certain conditions include:

- Irrigation can only take place within the area's frost free period, which is the recommended limit for the length of the irrigation season when the land is not underdrained. The amount of final effluent that may be applied will depend on the infiltration/permeability of the soil and the crop water deficit, which the guidelines note is very small usually amounts only to a few centimetres of liquid per year. Regardless of these conditions, the spray season cannot exceed 100 days nor can the average effluent application rate be more than 55,000 L/(ha-d). (Section 15.9.3)
- Effluent storage and irrigation areas should be enclosed with suitable fencing to exclude livestock and to discourage trespassing. (Section 15.9.4)
- Pilot testing is recommended to assess the feasibility of the spray irrigation and to provide design data on application rates and quantities. (Section 15.9.5)

- Wastewater effluent being applied on recreational lands such as golf courses must be treated with secondary biological activated sludge treatment or equivalent, with the resulting effluent being discharged to the first of two ponds connected in series. The retention period of the ponds must be at least 30 days. The effluent to be sprayed should be disinfected with chlorination at 0.5 mg/L residual and 30-minute contact time or equivalent. (Section 15.9.6)
- The municipality should be able to show that the irrigation lands will be available when there is a need to dispose of the effluent. The MOECC guidelines recommends that either the municipality owns the lands or the lands are leased over a long enough term and with renewal clauses to ensure that alternate disposal options could be developed if the need arose. The guidelines also recommend that the terms of the lease should grant the municipality the right to irrigate, even if it might damage or destroy the crops being grown (in the case of the golf course, the turf). This provides the municipality with the ability to discharge if necessary. The recommendation also suggest that the lease include terms to compensate the landowner for losses if this occurs. (Section 15.9.10)

There would also likely be a requirement for groundwater monitoring.

While use of effluent in spray irrigation may have some holistic benefit from the perspective of groundwater conservation, it would not provide the Township with adequate control over the ability to discharge effluent as required. Therefore, spray irrigation is not being carried forward as an alternative for discharge.

4.2.4 Preferred Discharge Alternative Solution

Based on the discussion above, an expanded discharge window is the preferred alternative discharge solution, as neither continuous discharge all year or the existing discharge window with spray irrigation as suitable solutions for the Township.

4.3 Preferred Alternative Solution for Treatment and Discharge

Based on the evaluation and discussion alternative treatment and discharge solutions, the preferred alternative solution for the WPCP upgrade is Alternative 2 (post-lagoon nitrification) and includes the following characteristics:

- Post lagoon nitrification would take place using a SAGR system. This upgrade would allow for the ammonia removal, even in cold weather conditions, as well as reduce fecal and total coliform.
- BOD removal from Cells 1 and 2 would be upgraded to ensure the wastewater is partially treated before entering the SAGR system. This could possibly include the addition of new air diffusers or adding additional blower capacity.
- The increase in blower capacity may require an addition to the existing blower building or an additional blower building.
- Cells 3, 4A and 4B could potentially be supplemented with floating, engineered wetlands to help polish the treated wastewater after it has been through the SAGR system. The wetlands would aid in the removal of nutrients, including phosphorus and nitrogen.
- A new alum mixing tank would be installed inside of the alum dosing building. This would optimize the dosing of alum, which will help optimize phosphorus removal
- The treated wastewater would continue to use the existing sand filters and UV disinfection before being discharged.

- The WPCP's discharge would be expanded to include winter months. The proposed discharge window and flowrates are discussed in Section 5.4 and are based on the results of the Receiving Water Impact Assessment update.

5 Alternative Designs

The discussion on alternative designs is organized into two sub-categories: Alternative Treatment Designs and Effluent Discharge. The section on Alternative Treatment Designs (Section 5.1) considers two alternative designs for the preferred treatment technology. The section on Effluent Discharge (Section 5.4) discusses the proposed effluent discharge regime.

5.1 Alternative Treatment Designs

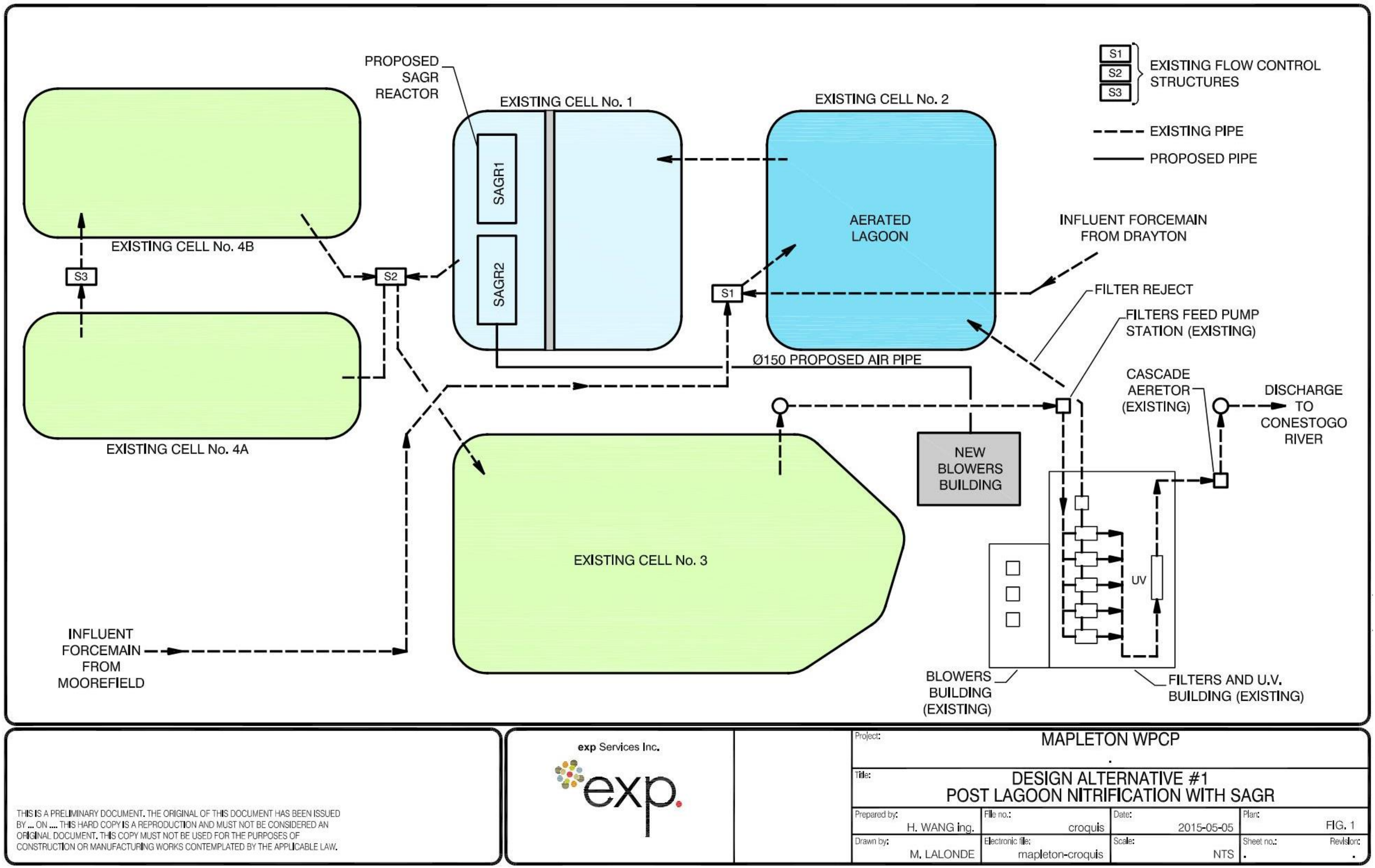
Two alternative designs are being considered for the proposed solution. They are discussed below.

5.1.1 Alternative 1: Post Lagoon Nitrification with SAGR

Alternative Design #1 is presented in Figure 15. Key features of the alternative design include:

- Installation of a SAGR system in the facultative lagoon, which would consist of a media bed, a coarse bubble air diffusers system, influent distribution piping and effluent collection piping, and a cover layer of wood chips or mulch. The media material used in the SAGR would be uniformly graded clean rock or stone. The two SAGR units would be installed in parallel, which allows for the possibility to isolate one of the reactors while keeping the other in operation (e.g., for maintenance or repair)
- A new alum mixing tank; and
- A new blowers building.

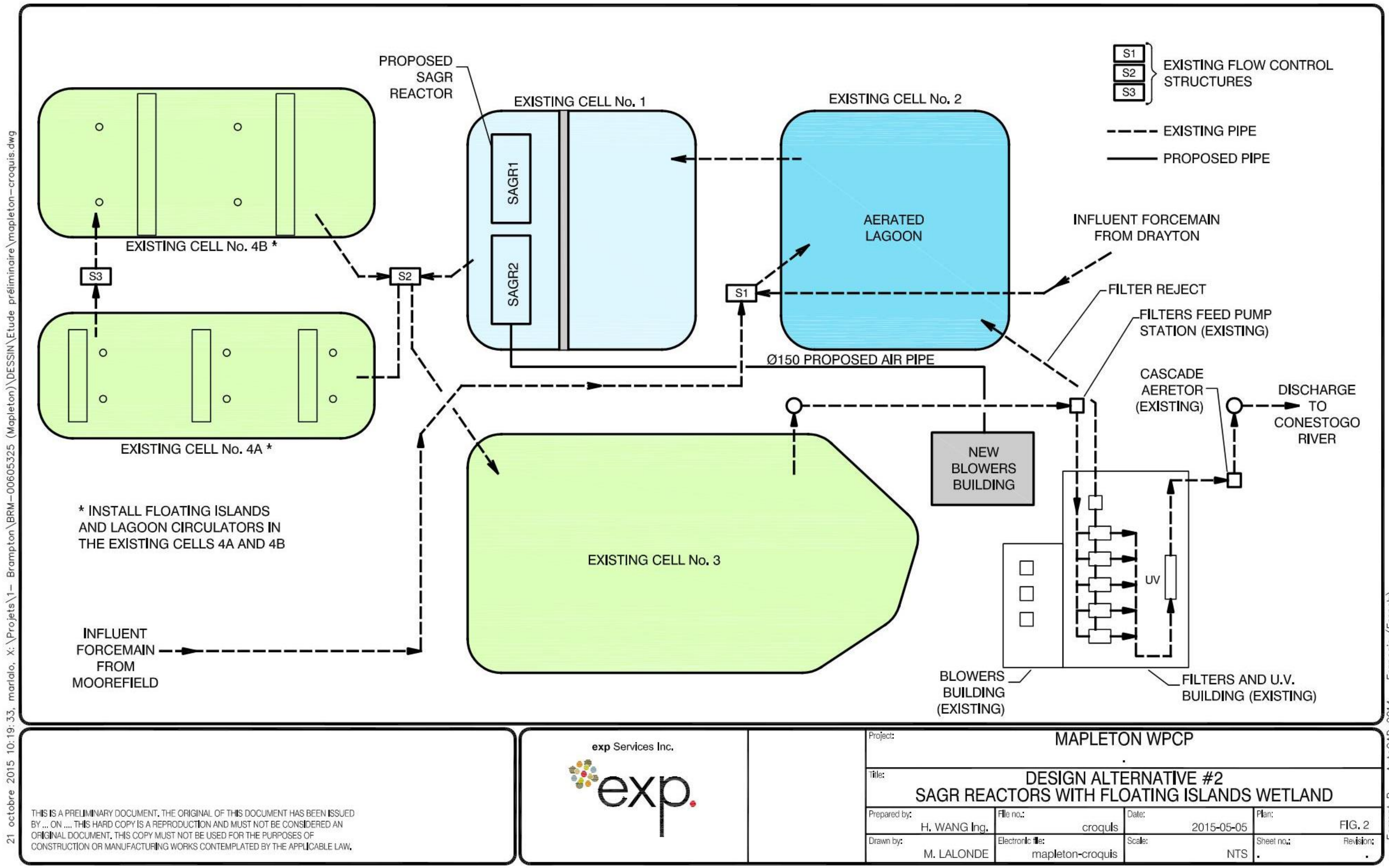
Figure 15: Alternative Design #1 – Post Lagoon Nitrification with SAGR



5.2 Alternative 2: SAGR Reactors with Floating Islands Wetland

Alternative Design #2 is presented in Figure 16. Key features of the alternative design include the same as Alternative 1 but with the addition of floating island wetlands and lagoon circulators in lagoons 4A and 4B. A new blowers building would be proposed as per Figure 16.

Figure 16: Alternative Design #2 – SAGR Reactors with Floating Islands Wetland



5.3 Evaluation of Alternative Designs

5.3.1 Evaluation Criteria

The Alternative Designs were evaluated against technical, natural environment, social/cultural and financial criteria. The table below presents a summary of the evaluation criteria.

Table 14: Alternative Design Evaluation Criteria

Category	Criteria	Definition
Technical	Effluent water quality	Ability of the alternative to meet effluent limits
	Ease of implementation	Whether implementation of the solution will be relatively straight-forward or will be technologically complex or disruptive
	Approvals Required	The number and complexity of approvals required
Natural Environment	Impact on terrestrial environment, such as woodlots, parks or habitats	The potential impact of the solution on the terrestrial environment
	Impact on aquatic environment, such as within the Conestogo River or Conestogo Lake	The potential impact of the solution on the aquatic environment
Social/Cultural	Archaeological	The potential impact of the solution on archaeological resources
	Nuisance to Local Community during Construction	The potential impact of dust, noise and odours from construction activity on nearby residents
	Nuisance to Local Community during operations	The potential impact of dust, noise and odours during operations on nearby residents
Financial	Capital Costs	The estimated capital cost of the solution
	Operating Costs	The estimated annual operating cost of the solution

Each alternative design was evaluated against the above criteria to rank them as more preferred, preferred or less preferred in comparison to the other:

- More preferred - the alternative has the best performance or result based on the criterion;
- Preferred - performance or result for the alternative is not as good as the most preferred alternative but is better than the least preferred; and
- Less preferred - the alternative does not perform as well or have as good a result as the other alternatives.

A summary of the evaluation results is provided in Table 15.

Table 15: Alternative Design Evaluation Summary

Category	Criteria	Alternative 1 Post Lagoon Nitrification with SAGR	Alternative 2 SAGR Reactors with Floating Islands Wetland
Technical	Effluent water quality	**Preferred** The effluent discharged from the facility will be able to meet approved effluent limits.	**More Preferred** The floating island wetland treatments will provide some additional polishing treatment and sludge digestion compared to Alternative Design #2. However, the treatments are not required to ensure the facility meet effluent limits.
	Ease of implementation	**More Preferred** Implementation of Alternative Design #2 would not require additional coordination otherwise required for the for the floating island wetland treatments.	**Less Preferred** Implementation of the floating island wetland treatments into the lagoons may experience some delays compared to the rest of the upgrade implementation, as the floating island wetland will require time for the vegetative material to grow before installation.
	Approvals Required	**Preferred** There would be no difference between approvals required for either Alternative Design #1 or Alternative Design #2.	**Preferred** There would be no difference between approvals required for either Alternative Design #1 or Alternative Design #2.
Natural Environment	Impact on terrestrial environment, such as woodlots, parks or habitats	**Preferred** The alternative designs for Alternative Design #1 and Alternative Design #2 will take place within the WPCP's footprint. Therefore, neither alternative is expected to have any impact on the terrestrial environment.	**Preferred** The alternative designs for Alternative Design #1 and Alternative Design #2 will take place within the WPCP's footprint. Therefore, neither alternative is expected to have any impact on the terrestrial environment.
	Impact on aquatic environment, such as within the Conestogo River or Conestogo Lake	**Preferred** Both alternatives would operate within the approved effluent limits and improve the quality of the discharge effluent. Neither alternative is expected to have a negative impact on the aquatic environment	**Preferred** Both alternatives would operate within the approved effluent limits and improve the quality of the discharge effluent. Neither alternative is expected to have a negative impact on the aquatic environment
Social/ Cultural	Archaeological	**Preferred** The alternative designs for Alternative Design #1 and Alternative Design #2 will take place within the WPCP's footprint and on soil previously disturbed. Therefore, neither alternative is expected to have any impact on archaeological resources.	**Preferred** The alternative designs for Alternative Design #1 and Alternative Design #2 will take place within the WPCP's footprint and on soil previously disturbed. Therefore, neither alternative is expected to have any impact on archaeological resources.

	Nuisance to Local Community during Construction	**Preferred** There may be some potential for disturbance due to noise and dust during construction. However, these can be mitigation through standard construction mitigation activities. The level of disturbance from noise and dust during construction is expected to be the same for both alternative designs. No nuisance odours are anticipated due to construction activities There may be some potential for disturbance due to increased construction traffic, for example for the delivery and installation of the SAGR units' stone media. However, this construction traffic would be short-term and could be mitigated through traffic control measures, such as limiting construction traffic to regular working hours.	**Preferred** There may be some potential for disturbance due to noise and dust during construction. However, these can be mitigation through standard construction mitigation activities. The level of disturbance from noise and dust during construction is expected to be the same for both alternative designs. No nuisance odours are anticipated due to construction activities. There may be some potential for disturbance due to increased construction traffic, for example for the delivery and installation of the SAGR units' stone media and the floating island wetlands. However, this construction traffic would be short-term and could be mitigated through traffic control measures, such as limiting construction traffic to regular working hours.
	Nuisance to Local Community during Operations	**Preferred** No nuisances due to noise, dust, odour or maintenance traffic are anticipated as part of regular facility operations.	**Preferred** No nuisances due to noise, dust, odour or maintenance traffic are anticipated as part of regular facility operations.
Financial	Capital Costs	**Most Preferred** Estimated Capital Costs: Medium (~$3.8M + contingency)	**Less Preferred** Estimated Capital Costs: High (~$5M + contingency)
	Operating Costs	**Preferred** Comparable but slightly higher than Alternative 2	**Preferred** Comparable but slightly lower than Alternative 1
Summary		**Most Preferred** Alternative 1 is identified as most preferred as it will provide the desired wastewater treatment at lower capital costs.	**Less Preferred** Alternative 2 is less preferred due to the additional cost of the floating island wetlands.

5.3.2 Evaluation Conclusion

Based on the evaluation results, Alternative 1: Post Lagoon Nitrification with SAGR is more preferred than the alternative that uses the floating island wetlands. The floating islands wetland add approximately $1.2M to the capital cost and are not critical elements to the wastewater treatment process.

5.4 Effluent Discharge

The proposed discharge regime for the WPCP upgrade was developed through the Receiving Water Impact Assessment (RWIA) update (see Appendix B). The RWIA process (including consultation with the MOECC and GRCA) was used to help identify a proposed WPCP discharge regime that would provide adequate discharge for the expanded WPCP while having the acceptable impact on the receiving waters. The process for identifying a proposed discharge regime included:

- Consultation with MOECC and GRCA on the WPCP and on river water quality concerns to be considered when setting a proposed discharge regime;
- Calculation of upset maximum allowable (theoretical) effluent discharge flow rates, based on assimilative capacity of un-ionized ammonia;
- Adjust maximum allowable discharge to improve upon or maintain the minimum dilution ratio, to ensure existing effluent mixing zones are not negatively impacted upon;
- Propose a discharge regime that is adequate to discharge the proposed future treated influent plus accumulated precipitation; and
- Maintaining Total Phosphorus (TP) loading at the same level as or better than the existing discharge regime, in keeping with the Policy 2 requirements.

The process is discussed in full in the updated RWIA, which is provided in Appendix B. The sections below discuss the proposed discharge regime and the resulting concentrations of TP and NH_3 in the Conestogo River.

5.4.1 Proposed Discharge Regime

During the EA process, there was considerable consultation with the MOECC and GRCA, including in-person meetings, telephone conversations with GRCA and MOECC, and reviews of drafts of the RWIA (see Appendix E for copies of correspondence). Key take-aways for the exp-team in preparing a proposed effluent discharge regime included:

- Un-ionized ammonia (NH_3) and TP are the key parameters of concern, as NH_3 can be toxic at elevated levels in aquatic environments, and the Conestogo River is a Policy 2 waterbody with respect to TP.
- Given the Conestogo River's traditionally low flows in the summer months and the concern over feeding phosphorus to Conestogo Lake in the summer (due to the potential for algal blooms), both the MOECC and the GRCA agreed that there should not be any effluent discharge during the summer months.
- Given the improvements in recent years to the WPCP, and the proposed reduction to the total ammonia effluent limit, the MOECC and GRCA agreed that they would be open to effluent discharge from the WPCP in the winter months.

Based on these key considerations, the proposed expanded discharge window was designed to add January and February to the existing discharge regime. Further, based on the consultations, the proposed discharge flow rates were designed to ensure that new proposed dilution rates would not fall below the minimum existing dilution rate of 6.1 (in December, assuming 7Q20 conditions), and that the dilution rates for January and February were maintained as conservative as possible while not negatively impacting the flow rates for the other months.

The proposed effluent discharge regime is presented in Table 16. As described in the RWIA, the effluent discharge regime has been designed to manage a daily influent rate of 1,300 m^3/day and an average daily accumulation of 158 m^3/day of precipitation. The existing discharge regime is included for comparison.

Table 16: Proposed and Existing Effluent Discharge Flow Regime

Month	Proposed Daily Discharge (m^3/day)	Existing Daily Discharge (2016 ECA) (m^3/day)
Jan	3,000	0
Feb	2,660	0
Mar	2,110	1,581
Apr	3,773	3,154
May	0	0
Jun	0	0
Jul	0	0
Aug	0	0
Sep	0	0
Oct	300	233
Nov	1,760	1,754
Dec	4,000	4,000

In addition, it is proposed that the discharge limit flexibility included in the existing ECA remain; that is, that discharges in excess of these daily discharges be allowed if the minimum 10:1 of the streamflow to daily discharge rate for the applicable period of that design streamflow occurs, based on actual measurements of flow rate in the Conestogo River.

5.4.2 Proposed Effluent Compliance Limits and Objectives

The proposed effluent compliance limits and objectives for Total Ammonia Nitrogen (TAN) and TP were updated based on best-available treatment technology-based effluent. The effluent limits for TAN and TP were decreased compared to the existing. In addition, limits and objectives have been proposed for total suspended solids (TSS), whereas the existing ECA does not have limits for TSS.

Table 17 presents the proposed effluent limits and objectives along with the existing, for comparison.

Table 17: Proposed and Existing Effluent Compliance Limits and Objectives

Parameter	Unit	Proposed		Existing	
		Average Concentration		Average Concentration	
		Compliance Limits	**Objectives**	**Compliance Limits**	**Objectives**
$CBOD_5$	mg/L	7.5 (Apr & Oct) 10.0 (Mar. Nov. & Dec)	5.0	7.5 (Apr & Oct) 10.0 (Mar. Nov. & Dec)	5.0
TSS	mg/L	15	10	-	-
TAN (NH_4+NH_3)	mg/L	3.0	1.0	5.0	3.0
TP	mg/L	0.3	0.17	0.5	0.3
E. Coli	CFU/100 ml	200	100	200	100
pH	-	-	6.5 – 9.0	-	6.5 – 9.0

5.4.3 Proposed Discharge Regime and Ammonia

To assess the potential impact of the proposed discharge regime and proposed effluent limit for TAN on the Conestogo River, the RWIA compared the proposed regime/limit to the existing under a worst-case scenario; that is, at the maximum TAN effluent limit under 7Q20 conditions. The analysis showed that the after-mixing concentration of NH_3 in the river based on the proposed discharge regime and TAN effluent limit not only remained below the Ontario Provincial Water Quality Objective (PWQO) but also provided substantial water quality improvements as compared to the existing discharge regime. Table 18 compares the after-mixing concentrations of NH_3 in the Conestogo River as a percentage of the PWQO, based on effluent limits and 7Q20 conditions.

Table 18: Comparison of NH_3 After-mixing Concentrations as a Percentage of the PWQO under 7Q20 River Flow Conditions

Month	% of PWQO (existing ECA)	% of PWQO (proposed)	Change in Percentage (2)
Jan	6% *(1)*	28%	22% *(1)*
Feb	7% *(1)*	31%	25% *(1)*
Mar	51%	42%	-10%
Apr	20%	16%	-4%
May	No discharge	No discharge	Not applicable
Jun	No discharge	No discharge	Not applicable
Jul	No discharge	No discharge	Not applicable
Aug	No discharge	No discharge	Not applicable
Sep	No discharge	No discharge	Not applicable
Oct	68%	52%	-15%
Nov	25%	17%	-8%
Dec	48%	30%	-18%

(1) January and February do not have discharge flow under the current ECA.
(2) Calculated using decimal values but presented as rounded to nearest percentage point.

5.4.4 Proposed Discharge Regime and Total Phosphorus

To assess the potential impact of the proposed discharge regime and proposed TP effluent limit on the Conestogo River, the RWIA compared the TP loading for proposed regime/limit to the existing. The analysis showed that the total annual TP for the proposed discharge regime/TP effluent limit is lower than the existing regime/TP effluent limit as described in the existing ECA. Further, during the months of existing discharge, the monthly TP loading based on effluent limits decreases by between 20% to 40%, depending on the month. Table 19 presents monthly and annual TP loading for the proposed discharge regime, for both the proposed and existing TP effluent limits.

Table 19: Total Phosphorus Annual Loading (based on proposed discharge regime, comparing proposed and existing TP effluent limits)

Month	Number of Discharge Days	Proposed Daily Flow (m^3/day)	Monthly Discharge (m^3/month)	Future Loading Based on Proposed Effluent Limit (0.3 mg/L)		Existing Loading Based on Existing Effluent Limit (0.5 mg/L) (2016 ECA)	
				Daily TP Loading (kg/day)	Monthly TP Loading (kg/month)	Daily TP Loading (kg/day)	Monthly TP Loading (kg/month)
Jan	31	3,000	93,000	0.90	27.9	-	-
Feb	28	2,660	74,480	0.80	22.3	-	-
Mar	31	2,110	65,410	0.63	19.6	0.79	24.5
Apr	30	3,773	113,190	1.13	34.0	1.58	47.3
Oct	31	300	9,300	0.09	2.8	0.12	3.6
Nov	30	1,760	52,800	0.53	15.8	0.88	26.3
Dec	31	4,000	124,000	1.20	37.2	2.00	62.0
Annual (kg/year)					**159.7**		**163.7**

6 Preferred Design Concept

6.1 WPCP Concept Overview

The WPCP upgrades are designed to satisfy the need for expanded treatment capacity of 550 m^3/day, from 750 m^3/day to 1,300 m^3/day. The future treatment needs were assessed based on forecasted growth for the communities of Moorefield and Drayton. The total treatment capacity of the upgraded WPCP will be 1,300 m3/day. The capacity design parameters are summarized in Table 20.

Table 20: Capacity Design Parameters

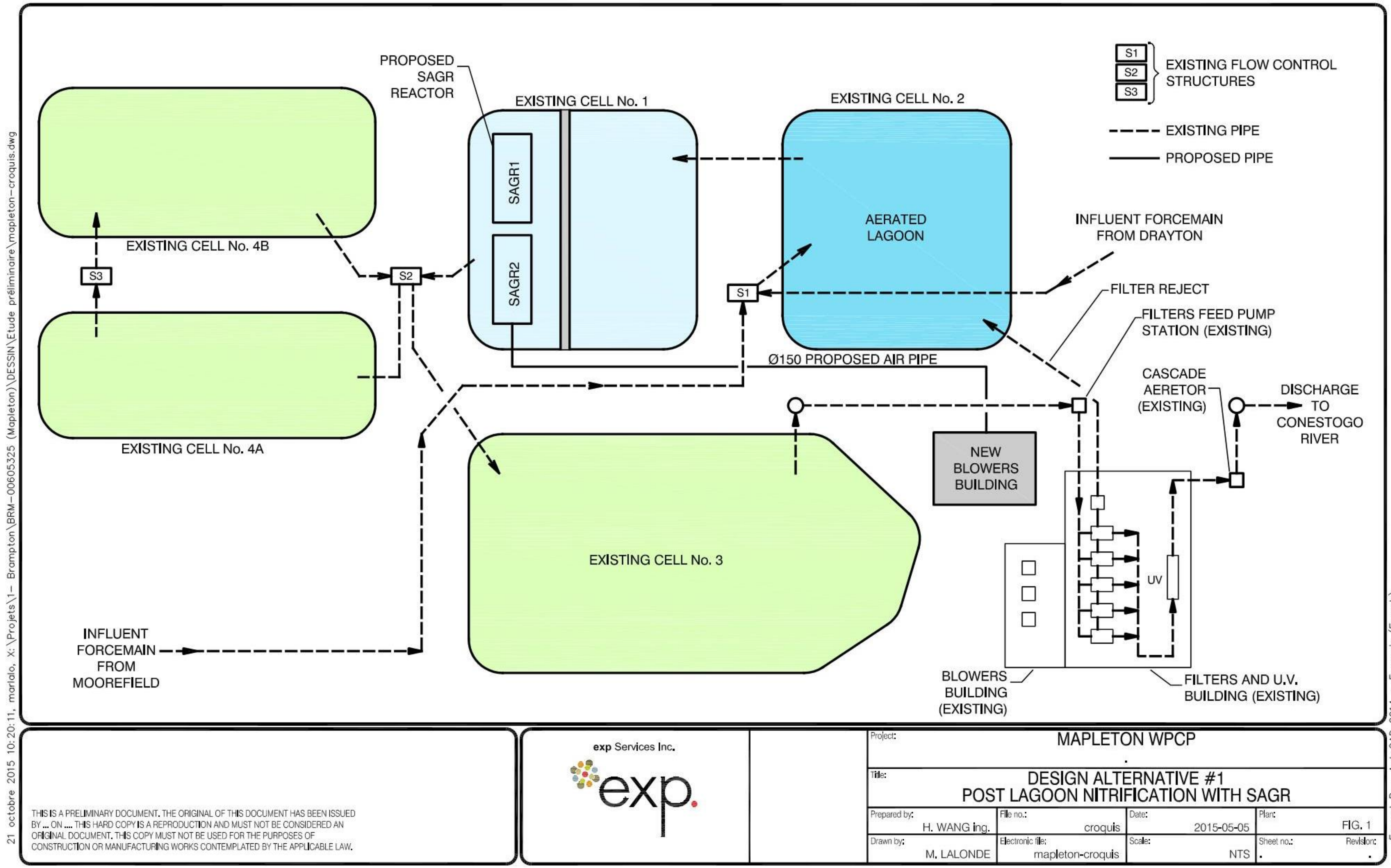
Estimated 2031 Population: Moorefield	1,310 persons
Per capita Sewage Flow: Moorefield	215 L/pers/day
Average Daily Flow: Moorefield	281 m^3/day
Estimated 2031 Population: Drayton	3,070 persons
Per capita Sewage Flow: Drayton	332 L/pers/day
Average Daily Flow: Drayton	1,019 m^3/day
Total Required Average Daily Treatment Capacity	**1,300 m^3/day**

Key features of the alternative design will include:

- Installation of a SAGR system in the facultative lagoon, which would consist of a media bed, a coarse bubble air diffusers system, influent distribution piping and effluent collection piping, and a cover layer of wood chips or mulch. The media material used in the SAGR would be uniformly graded clean rock or stone. The two SAGR units would be installed in parallel, which allows for the possibility to isolate one of the reactors while keeping the other in operation (e.g., for maintenance or repair)
- A new alum mixing tank; and
- A new blowers building.

The concept diagram for the upgrade is presented in Figure 17. As Figure 17 is considered an EA-stage concept level design diagram, some aspects may change during preliminary and detailed design.

Figure 17: Preferred Design for Mapleton WPCP Upgrade



6.2 Interim Phasing

One of the primary concerns raised by the MOECC regarding adding discharge in January and February is the lack of available river water quality data during cold winter months. While the assimilative capacity assessment calculations discussed in Sections 8 show that river water quality for ammonia will remain below the PWQO, the limited dataset for background river water quality and its age provide some uncertainty regarding the existing background conditions for January and February.

To resolve this uncertainty, a meeting was held with MOECC on September 18, 2017. In the meeting, it was agreed that the Township would phase in the implementation of the expansion in two phases as noted below:

- **Phase 1 - Interim Rating**: The first phase of the expansion would raise the rated influent capacity of the WPCP to an interim-capacity. While the exact rating would be determined through the hydraulic and engineering assessment, it is estimated to be 900 m^3/day. This would be achieved through optimization of the existing WPCP, which will allow the Township to increase the WPCP's capacity without a large capital investment, thereby relieving the Township's immediate growth pressures while providing time for additional winter river water quality monitoring. As discussed previously, the GRCA has implemented a monitoring program for the Conestogo River, which would act as a source for the additional river water quality background data. The exact methods through which the WPCP would be optimized would be determined through the design and ECA amendment process. However, it would be ensured that the interim rating of the WPCP will meet MOECC's Policy 1 and Policy 2 water quality objectives.
- **Phase 2 - Full Rating**: The second phase of the expansion would increase the facility's influent rating to 1,300 m^3/day, to be achieved through implementation of the EA's preferred design. It would occur once sufficient data has been generated to verify the conclusions of the RWIA that the addition of January and February discharge period to the WPCP's existing discharge regime would not cause a negative impact on the Conestogo River.

  Prior to the full upgrade from 900 m^3/day to 1,300 m^3/day, the Township will complete an EA Addendum to revisit the RWIA, incorporate the additional river water quality data, and confirm the assimilative capacity of the Conestogo River. The RWIA will also ensure that the WPCP meets the MOECC's Policy 1 and Policy 2 water quality objectives as it proceeds to the ultimate rating of 1,300 m^3/day.

7 Potential Impacts and Mitigation Measures

This section of the Environmental Study Report documents the potential effect of the proposed upgrade (including the construction and operation) on the natural and socio-economic environment and mitigation measures to minimize or eliminate the identified impacts. The potential effects, mitigation measures and net effects for the proposed expansion are presented in Table 21.

Overall, the proposed WPCP upgrade is expected to provide a net beneficial effect for the Township. The overall quality of wastewater effluent coming from the WPCP is expected to improve, which should in turn ensure improved protection of the Conestogo River and be therefore be consistent with the goals of the Grand River watershed water Management Plan. The upgrade will also allow for additional growth and development in the communities of Drayton and Moorefield, which in turn will encourage economic development.

Table 21: Potential Impacts, Proposed Mitigation and Net Effects

Potential Effect	Proposed Mitigation and Monitoring	Net Effect
Natural Environment		
Water quality in the Conestogo River	The proposed upgrades will be designed to meet the effluent criteria set by the MOECC. The improved treatment capacity of the upgrade will result in cleaner effluent discharge, thereby reducing potential impact on the river from the WPCP. The interim and ultimate phasing of the WPCP will meet MOECC's Policy 1 and Policy 2 water quality objectives. OCWA currently monitors the discharging effluent for quality parameters. Continued monitoring of the effluent will allow the municipality to monitor changes to effluent quality and take corrective action as required. The GRCA is currently undertaking additional river water quality monitoring of the Conestogo River. This additional data will be incorporated into an updated RWIA, which will be completed prior to the WPCP's full expansion from 900 m^3/day to 1,300 m^3/day.	Positive effect on effluent quality entering the river.
Species at Risk (SAR) or of Special Concern	*Aquatic* One SAR mussel species is known to be in the Conestogo River in the vicinity of the study area; however, it has historically been observed upstream of the study area between Main Street and Wellington Street. Given this location, and given that effluent quality will be improved by the upgrade, no impact to the SAR mussel species is anticipated. No SAR fish are known to occur within the vicinity of the study area. *Birds* Habitat for 5 SAR bird species is present adjacent to the WPCP property. No bird habitat would be disturbed during the construction of the WPCP upgrades, as any disturbance would be restricted to the WPCP property. *Mammals* Two mammal SAR have the potential to occur in the suitable forested habitat adjacent to the WPCP property. However, this habitat would not be disturbed during the construction activities.	No impact on SAR or Species of Concern.

Potential Effect	Proposed Mitigation and Monitoring	Net Effect
Impact on Terrestrial Environment / loss of vegetation	Construction for the proposed WPCP upgrades would be limited to the WPCP property. As such, there would be no impact on the terrestrial environment or loss of vegetation due to construction. As the effluent water quality will be improved by the upgrades, no impact to vegetation within the receiving swale is anticipated.	Limited to no impact
Dewatering during construction	Dewatering requirements will be assessed during the design phase once geotechnical and hydrogeological information is available. Depth of excavation and appropriate construction methods will be used to minimize any dewatering requirements. Appropriate dewatering methods will be identified to minimize the impact on the groundwater table and any surrounding wells. Dewatering requirements and proposed dewatering methods will be reviewed with GRCA.	Potential impact mitigated to acceptable level
Erosion control during construction	Erosion and sediment measures will be implemented during construction to mitigate potential impacts.	Potential impact mitigated to acceptable level
Technical		
Wastewater treatment disruption during construction and continuity of operations	Staging of construction would be done in a way to minimize disruption to existing operations.	Little to no impact
Social / Cultural		
Archaeological	The study area is previously and extensively disturbed. As such, the area has low or no archaeological potential (see archaeological screening self-assessment, Appendix D).	No impact
Noise impacts (construction and operations)	*Construction* Construction equipment should include a proper exhaust system to reduce noise impacts. Construction activities are to take place in compliance with Township's noise by-law (By-law number 5001-05). *Operations* The design of the new blower building will include noise-dampening to minimize the potential noise impact of new blowers within the building.	Potential impact mitigated to acceptable level
Odours (construction and operations)	No impacts from odours are expected from construction or operation of the WPCP upgrade.	No impact
Dust (construction and operations)	*Construction* Dust from the construction of the upgrade is expected to be minimal. Standard construction dust controls will be put in place to ensure dust levels do not become a nuisance. *Operations* Dust during operations is not expected to become a nuisance.	No impact

Potential Effect	Proposed Mitigation and Monitoring	Net Effect
Traffic (construction and operations)	*Construction* There will be increased car and truck traffic to and from the WPCP during construction. However, the increase will not be extensive and will only be for the duration of the construction. *Operation* Increased traffic due to the WPCP upgrade is expected to be minimal.	Potential impact during construction is unavoidable
Economic		
Local economy	The WPCP expansion is required for planned future development in the communities of Drayton and Moorefield. Once the expansion is completed, the development and associated economic development will be able to occur.	Positive impact

8 Monitoring

8.1 River Water Quality Monitoring During Interim Rating

The GRCA has a river water quality monitoring program underway for the Conestogo River for the foreseeable future. This river water quality data generated from this program would be used to supplement the Ontario Provincial Water Quality Monitoring Network data used in a future RWIA update prior to the WPCP's full expansion from 900 m^3/day to 1,300 m^3/day, thereby verifying there is sufficient assimilative capacity in the Conestogo River. The program's monitoring sites are located upstream and downstream of the Mapleton WPCP; the upstream site is located at Wellington Street in Drayton, while the downstream site is located at Concession Road 6.

8.2 Construction

Monitoring will be undertaken during the construction process through the contract administration. The tender document and resulting contract will outline the impact monitoring and mitigation activities to be implemented. The construction monitoring will ensure compliance with the contractual agreements relating to the construction, assess the overall performance and effectiveness of mitigation measures, and make recommendations as to when modifications are required. The key environmental mitigation measures outlined in Table 21 will be integrated in to the tender document and subsequently the contact between the contractor and the Township. These measures may relate to:

- Equipment fueling, maintenance, and storage;
- Impacts on adjacent lands;
- Noise and dust control activities;
- Ensuring rights-of-way remain clear;
- Site drainage and sediment and erosion control measures;
- Dewatering activities; and
- Site restoration.

8.3 Operation Compliance Monitoring

The WPCP will continue to be operated by OCWA after expansion activities and plant commissioning are completed. The Township intends for monitoring procedures include in the existing ECA to continue with the operation of the expanded WPCP to satisfy both the MOECC's provincial requirements and the plant's operational needs.

Samples will continue to be collected and analyzed to provide plant operations staff with the necessary information for process control and for maintaining effluent quality. An annual report will continue to be prepared to document the WPCP's performance and any non-compliance will be reported in a timely manner to the MOECC.

9 Future Approval Requirements

9.1 Ministry of Environment and Climate Change Approvals

A two-step approval process will be used, with one approval for the interim-rating and then another for the full expansion:

- An amended ECA for interim-rating (to approximately 900m^3/day, to be confirmed in detailed design); and
- An amended ECA for the full expansion to 1300m^3/day.

Prior to the full upgrade from 900 m^3/day to 1,300 m^3/day, the Township will complete an EA Addendum to revisit the RWIA, incorporate the additional river water quality data, and confirm the assimilative capacity of the Conestogo River.

If water-takings of 50,000 litres per day are required due to construction activities, then a Permit to Take Water will be required.

9.2 Ministry of Natural Resources Species at Risk

Based on the work completed to date, no impacts to SAR or their habitat are anticipated.

9.3 Municipal Approval

A site plan approval and building permit from the Township will be required.

10 Consultation Activities

Public and stakeholder consultation was a central component of this Class EA process. Table 22 summarizes the consultation activities. A copy of notifications, PIC display boards, and correspondence is provided in Appendix E.

Table 22: Summary of Consultation Events

Public Consultation Milestone / Event	**Approximate Date**
Contact information database of public/agency/other stakeholders prepared	• Generated February 2015 • Stakeholder list includes public/community stakeholders, agencies, and Aboriginal/First Nation communities • Updated on an-going basis
Notice of Commencement	• Issued March 6, 2015 • Posted on Town's website and advertised in the Wellington Advertiser • Circulated to stakeholder contact list with consultation form
Council Updates	• Phase 1 update - March 24, 2015 • Phase 2 update and PIC 1 draft display boards – May 26, 2015 • Project update to Council - November 17, 2015
Stakeholder Meeting #1	• Stakeholder meeting held with community developers – March 24, 2015
Public Information Centre # 1	• Notice of PIC #1 advertised on Town's website, in the Wellington Advertiser, and circulated to stakeholder contact list • PIC #1 held on June 16, 2015
Stakeholder Meeting # 2	• Stakeholder meeting held with community developers – February 11, 2016
Public Information Centre # 2	• Notice of PIC #2 advertised on Town's website, in the Wellington Advertiser, and circulated to stakeholder contact list • PIC #2 held on February 11, 2016
Agency Stakeholder Meetings	• Meeting with GRCA – April 22, 2015 • Meeting with MOECC and GRCA – May 7, 2015 • Meeting with MOECC and GRCA – November 19, 2015 • Meeting with GRCA – August 26, 2016 • Meeting with GRCA – September 19, 2016 • Meeting with MOECC and GRCA - September 18, 2017 • On-going dialogue with MOECC and GRCA, including review of RWIA drafts
Agency Review of Draft ESR	• Draft ESR provided to MOECC and GRCA for review – April 25, 2016
Notice of Completion & Public Review of ESR	• November 17, 2017