



MUNICIPALITY OF BRIGHTON
BRIGHTON WASTEWATER TREATMENT SYSTEM
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

PHASE 2 REPORT (DRAFT)

April 10, 2017

Submitted by:



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JLR 27271

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1.0 INTRODUCTION

1.1 Background

The Municipality of Brighton (the Municipality) initiated a Class Environmental Assessment (Class EA) of their wastewater treatment system in August 2016 to address various problems experienced with treatment (e.g. elevated ammonia concentrations in the treated effluent) and also to ensure that increased influent flows from future growth can be effectively accommodated. In order to fully define the problems and identify a preferred solution to address these issues, J.L. Richards & Associates Limited (JLR) was retained by the Municipality to assist in the completion of the Class EA.

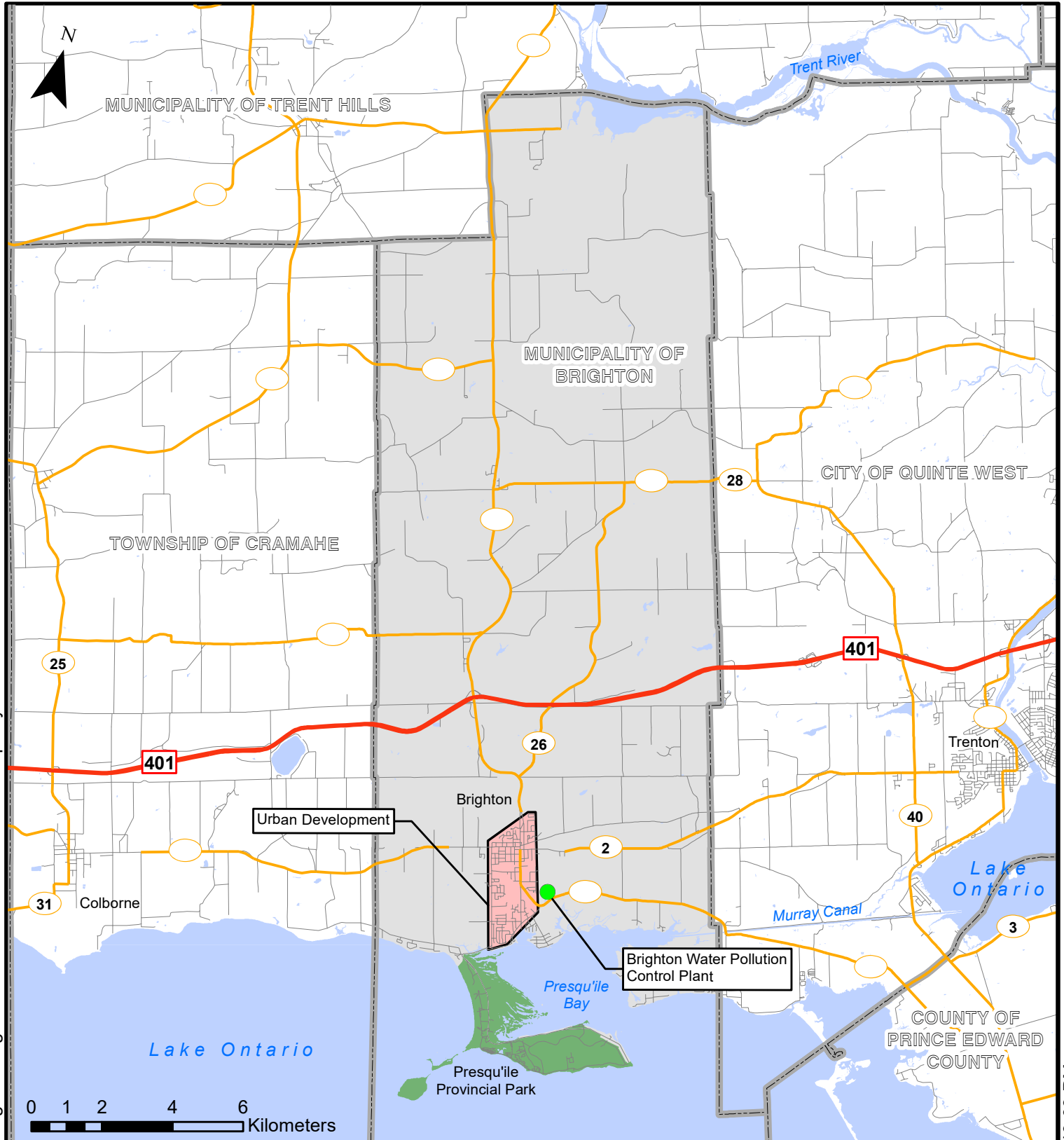
The Municipality includes the former Town and Township of Brighton and is the most eastern Municipality within the County of Northumberland. The Municipality is bounded by the City of Quinte West to the east and the Town of Cramahe to the west, with the shoreline of Lake Ontario to the south. Highway 401 provides the main east-west corridor through the Municipality, which tends to be a regional focus for hamlets in the surrounding areas. Refer to Figure 1-1 for an overview of the Municipality and study location.

The communal sewage system generally consists of the Brighton Wastewater Treatment Lagoon system (currently rated for 4,600 m³/day), the Harbour Street Sewage Pumping Station (SPS) and forcemain, a small sub-area sewage pumping station and forcemain servicing Presqu'île Provincial Park, and several kilometers of gravity collection sewer. Approximately half of the sewage generated in the collection system is directed to the Harbour Street SPS and pumped via a 8.2 km long, 300 mm forcemain to the Lagoon treatment system and the other half flows by gravity to the Lagoon treatment system. Refer to Figure 1-2 for an overview of the Brighton communal sewage system.

As noted above, the Harbour Street SPS receives sewage from approximately half of the existing collection system. The SPS generally consists of a wet well/dry well configuration and is equipped with three dry pit centrifugal type raw sewage pumps (lead/lag/standby operation) complete with inlet and outlet piping, a standby diesel generator, a wet well emergency overflow to Butter Creek, and related instrumentation and controls for the station.

The wastewater treatment system consists of a 0.68 ha single cell aerated lagoon followed by a single cell 5.44 ha waste stabilization pond with baffle partition curtains followed by a 2-cell constructed wetland with a total surface area of 6.2 ha. There is also a chemical storage/feed system used to facilitate continuous phosphorus removal. Chemical is introduced after the aerated lagoon and upstream of the waste stabilization pond. Treated effluent from the waste stabilization pond is discharged continuously to the constructed wetland and from the constructed wetland it continuously discharges to a natural wetland and ultimately to Presqu'île Bay, which is located off the northeast shore of Lake Ontario.

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PROJECT:

BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA
 MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING:

LOCATION PLAN

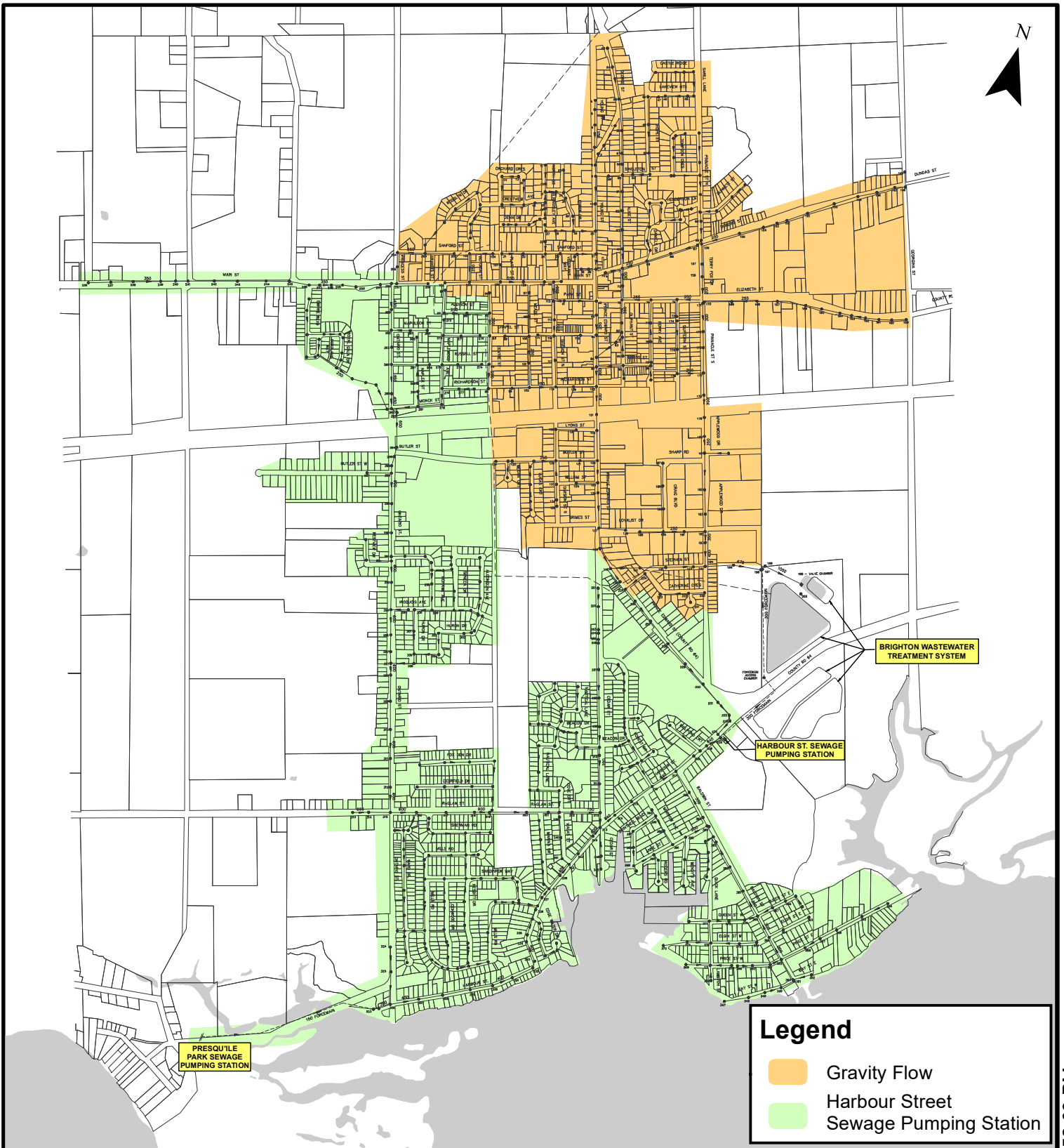


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FIGURE 1-1

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Legend

- Gravity Flow
- Harbour Street Sewage Pumping Station

PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
 MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **SYSTEM MAP (PUMPING STATION(S), FORCEMAIN, LAGOON SITE)**

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1.2 Class Environmental Assessment Process

The Ontario Environmental Assessment Act (the Act) sets out a planning and decision-making process so that potential environmental effects are considered before a project begins. The purpose of the Act is to provide for the protection and conservation of the natural environment (R.S.O. 1990, c.E.18, s.2).

The Municipal Class EA process is followed for common types of projects to streamline the review process while ensuring that the project meets the requirements of the Act. It involves detailed site-specific information gathering and studies, as well as consultation with the public and stakeholder agencies. In 1987 the first Class EA guidance document prepared by the Municipal Engineers Association (MEA) on behalf of Ontario Municipalities was approved under the Act. Updates and amendments were subsequently made in 1993, 2000, 2007, 2011, and 2015.

This Class EA has been initiated as a Schedule 'B' project. Projects categorized as Schedule 'B' undertakings have the potential for significant environmental effects, and are required to follow Phase 1 and Phase 2 specified under the Municipal Class EA. This includes consultation with all parties that may potentially be affected by the project, and the preparation of a Class EA Project File that documents the Class EA process for the project. At the end of Phase 2, the project Schedule is reviewed to determine if the project is complete under a Schedule 'B' Schedule or if the project needs to proceed as a Schedule C undertaking in which case Phases 3 and 4 of the Class EA process are completed.

The Class EA framework defines the process for each type of project (refer to Figure 1-3). For Schedule B projects, the completion of the following Phases of the Class EA process are required:

Phase 1 – Identify the Problem and/or Opportunity

Phase 2 – Identify Alternative Solutions to the Problem and/or Opportunity

The Project File shall be made available for public and agency review at the completion of Phase 2 of the Class EA process for a mandatory 30-day period. If there are no requests to the Ministry of the Environment and Climate Change (MOECC) for a 'Part II Order' within this 30-day review period, then the project may proceed to implementation (Phase 5).



PHASE 1
Identify & Describe the Problem or Opportunity

PHASE 1 COMPLETE
Draft Report and Consultation with Review Agencies and Project Stakeholders undertaken

← PROJECT IS AT THIS STAGE

Schedule 'A', 'B', & 'C' Projects



PHASE 2
Evaluate Alternative Solutions & Establish the Preferred Solution.
Review & Confirm Choice of Schedule.



Schedule 'A' Project

Schedule 'B' Project

Schedule 'C' Project

PHASE 3
Identify Alternative Design, Environmental Effects & Preferred Design.
Review & Confirm Choice of Schedule.



File Project File Report

PHASE 4
Prepare Environmental Study Report (ESR) Documenting Phases 1-3 or Opportunity



Environmental Study Report



Opportunity for Part II Order Request (formerly referred to as "Bump-up")

PHASE 5
Complete Drawings & Documents - Proceed to Construction, Operate & Monitor Projects

— Indicates Schedule 'C' mandatory events

PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **CLASS EA PROCESS**



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1.3 Objectives of the Class EA

The objective of this Class EA is to identify the preferred strategies for wastewater treatment and for the main sewage pumping station and associated forcemain for the Brighton communal sewage system over a 20-year planning period.

The purpose of this Report is to summarize the results of Phase 2 of the Class EA process, including providing a review of the various options that have been considered to address the Problem Statement determined during Phase 1 and to recommend a preferred alternative. This Report also summarizes Phase 1 findings (based on a separate report completed for that Phase) and summarizes agency and public consultation activities;

2.0 SUMMARY OF PHASE 1 FINDINGS

2.1 Key Findings

The following are some of the key Phase 1 findings:

- The raw sewage is relatively “high strength” for a domestic sewage, with monthly samples each year falling in the range of literature values for medium to high strength raw municipal wastewater. Some maximum values are reported to be even higher. This suggests that non-residential contributions to the waste stream (e.g. industrial wastes or other sources) may be significant and may be loading the lagoon at a higher rate than it was originally designed for treating.
- The main concern over the past several years is related to treated effluent quality. In particular, ammonia concentration has exceeded the ECA limits (stabilization pond effluent) and objectives (wetland effluent) on several occasions. Additionally, in four of the six years reviewed, the ECA limits for total phosphorous were not met in the stabilization pond. There are no limits specified in the ECA for E. Coli, but the objective (wetland) was not met in five of the six years reviewed.
- A detailed review of the wastewater treatment system performance indicates that the existing system experiences a number of challenges including: regular organic overloading, potential short circuiting, and limited hydraulic detention time, issues with inefficient aeration, rapid sludge accumulation, and poor ammonia effluent quality throughout the year.
- The wetland portion of the treatment system does not appear to be providing significant treatment with the exception of some marginal decreases in Total Phosphorus.

- Due to the age and condition of the existing infrastructure, it is estimated that approximately \$500,000 in infrastructure rehabilitation and maintenance at the Harbour Street SPS and Lagoon is required over approximately the next 7 years.
- Updated population and flow projections show that the currently approved ECA rated capacity of the existing treatment system is not anticipated to be exceeded in the 20-year planning period for this study.

2.2 Phase 1 Problem and Opportunity Statement

Based on the information developed and analyzed during Phase 1 of this Class EA, the following problem/opportunity statement was developed for the project:

The Brighton communal sewage system generally consists of several kilometers of gravity collection sewers, a main pumping station, a smaller sub-area pumping station and a continuously discharged lagoon based treatment system that includes an aeration cell, a waste stabilization pond, a constructed wetland and a continuous chemical feed system for phosphorus removal. The treatment system is currently licensed under Environmental Compliance Approval (ECA) No. 3081-9XQNZK which stipulates certain operational and performance requirements. The system currently services an estimated population of 6462 and some population growth is projected to occur within the 20 year planning period that will generate additional flows and increase hydraulic loading to the treatment system. The system is currently only operating at approximately 60% to 70% of its ECA rated "hydraulic" capacity.

Based on an evaluation of the available operational historical treated effluent data, it has been determined that the treatment system has regular difficulties in achieving the effluent quality required by ECA No. 3081-9XQNZK, particularly for ammonia and in some cases Total Phosphorus. A review of historical raw sewage quality, hydraulic input and the overall physical configuration of the Lagoon based treatment system, indicates that the relatively high strength raw sewage combined with physical limitations of the treatment system is the primary cause for the treated effluent exceedances. The system, as currently configured, is not capable of treating the organic loadings received from the collection system. Further the constructed wetland portion of the treatment system is not providing any significant treatment with respect to the parameters of concern.

In addition, the Harbour Street SPS and the Lagoon based treatment system were evaluated as part of Phase 1 of the Class EA. Due to the age and condition of the existing infrastructure, within the next 7 years approximately \$500,000 in infrastructure rehabilitation and maintenance is required.

3.0 PHASE 2 PUBLIC AND AGENCY CONSULTATION

The Class EA process requires consultation with parties that may potentially be affected by the project. As part of Phase 2, the consultation plan developed in Phase 1 was followed in order to facilitate communication with the public and various agencies and other interested parties. Refer to Appendix A for the Phase 2 Public Consultation Summary and supporting documentation.

Key components of Phase 2 Stakeholder consultation include:

- Reviewing the Public Consultation Plan (developed in Phase 1)
- Project Team/Committee Meetings
- Responding to Public Stakeholder Comments
- Responding to Review Agency Comments
- Maintaining Project Mailing List and Contacts
- Public Information Centre
- Notice of Completion

Key consultation correspondence from Phase 2 is included in Appendix A. A brief summary of some of the key results of this consultation is presented below:

- MOECC - The MOECC reviewed the Phase 1 Report and other available information on the project and determined that the existing effluent limits will remain in place. The Ministry noted that the Class EA evaluation should consider that some add-on treatment options could provide incidental improvements in overall effluent quality. Improvements in BOD and TSS in addition to ammonia were of particular interest in to the MOECC. The MOECC indicated that they do not anticipate giving credit to the effluent quality improvements that the constructed wetland may provide.
- MNRF – The Ministry of Natural Resources and Forestry (MNRF) provided general information on the databases available. It was also noted that any expansions of the existing infrastructure should not be placed within the Provincially Significant Wetland (adjacent to the engineered wetland). A site assessment was also recommended to identify the presence of any Species at Risk and/or their habitat.

A mandatory Public Information Centre (PIC) will be held in advance of finalizing this Phase 2 Report. The PIC will solicit additional input for consideration in establishing the final preferred alternative.

4.0 ADDITIONAL CONDITIONS AND CONSTRAINTS

Phase 1 of the Class EA involved problem/opportunity definition, which included identifying all relevant existing conditions and constraints to ensure that feasible alternative solutions could be properly identified and evaluated in consideration of all of the project specific circumstances. Some additional key conditions and constraints were also confirmed early on in Phase 2 and are outlined below.

4.1 Treated Effluent Requirements

The wastewater treatment system is rated for an Average Day Flow (ADF) of 4,600 m³/day. An evaluation of projected growth within the service area was undertaken as part of Phase 1 of this Class EA and based on this evaluation, the 20-year design average day raw sewage flow to the lagoon is anticipated to be less than the current rated capacity and there is no need for an increase to the ECA rated capacity during this time period.

The existing ECA compliance requirements for the treatment system are outlined in Table 4-1. The MOECC was consulted near the end of Phase 1 and early on into Phase 2 of the Class EA. During this consultation, it was confirmed that the current ECA requirements are to remain in effect as part of this undertaking. It was noted by the MOECC that enhanced treatment should focus on addressing the issues associated with ammonia removal and to a lesser extent total phosphorous. The MOECC indicated that during the evaluation of options in Phase 2 and moving forward into preliminary design, consideration should be given to alternatives that can provide some incidental improvements in the treatment of TSS and cBOD₅. Documentation of this correspondence with the MOECC is provided in the Consultation Summary (Appendix A).

Table 4-1 Existing Effluent Compliance Limits – Waste Stabilization Pond

Parameter	Concentration in Effluent	Loading in Effluent	Non-compliance
CBOD ₅	30.0 mg/L	138.0 kg/day	Annual Average
Total Suspended Solids	40.0 mg/L	184.0 kg/day	Annual Average
Ammonia + Ammonium Nitrogen	14.0 mg/L * 17.0 mg/L **	64.4 kg/day * 78.2 kg/day **	Monthly Average
Total Phosphorus	1.0 mg/L	4.6 kg/day	Monthly Average
Notes: * from May 01 to October 30 ** from November 01 to April 30			

4.2 Receiving Water Assessment

Based on the above-noted consultation with the MOECC and given the fact that an increase in the rated capacity is not required for this particular undertaking, a receiving water assessment was deemed not to be required.

5.0 IDENTIFICATION OF WASTEWATER TREATMENT ALTERNATIVES

5.1 Evaluation and Selection Methodology

The main objective of Phase 2 of a Class EA is to identify and evaluate possible alternative solutions to the problem(s) (and/or opportunities) identified in Phase 1. All reasonable potential solutions to the problem(s), including the 'Do Nothing' option, are considered. Class EAs for wastewater projects generally result in the identification and review of a broad range of solutions. It is also important to note that the objective of Phase 2 is to focus on a determining an overall "generalized solution" to the problem and not necessarily all of the intricate details which are typically further explored as part of Phase 3 of a Schedule C Class EA and then further developed during a preliminary and detailed design stage (i.e. included as part of Phase 5 of the Class EA process and referred to as Implementation).

In order to facilitate the evaluation and selection of the preferred solutions during Phase 2, a transparent and logical three part assessment process was established. This process included:

- Initial screening of alternatives;
- Detailed evaluation of screened alternatives; and
- Selection of a preferred alternative.

The first evaluation stage considers the overall feasibility of the potential solutions and identifies those alternatives that fully address the problem statement. This step ensures that unrealistic alternatives are not carried forward to a more detailed evaluation stage.

Based on the initial screening, a detailed assessment of the short list of alternatives is conducted. Evaluation criteria were developed based on a review of the background information, experience on similar assessments and in consultation with Municipal staff. The evaluation was conducted using criterion in the following four major criteria categories:

- Natural Environment and Archeology
- Engineering and Technical Considerations
- Social and Community Well Being
- Financial Impacts

Once the detailed evaluation was completed, a recommended preferred alternative or alternative(s) was identified for presentation to stakeholders and to solicit input prior to finalizing a preferred alternative.

5.2 Initial Screening of Alternatives

Several alternatives are presented in Table 5-1 along with a summary of the review carried out to support a recommendation to either carry the alternative forward for further evaluation or not.

Table 5-1 Description and Preliminary Evaluation of Wastewater Treatment Alternatives

Alternative	Review/Recommendation
Option 1: Do nothing	
1) Do nothing	<p>Review: This option would have a negative effect on the environment as effluent would likely continue to exceed the ECA limits and could also result in fines to the Municipality. This option has not been carried forward as it does not address the problem.</p> <p>Recommendation: Do not carry forward</p>
Option 2: Optimize/Modify Current Lagoon Operations	
2A) Remove sludge from lagoon cells	<p>Review: Sludge removal has proven in the past to not address the identified issues on its own. This alternative should only be considered in combination with other options.</p> <p>Recommendation: Carry forward but only as an option to be considered in <u>combination</u> with other alternatives</p>
2B) Optimize baffle design and upgrade/refurbish existing baffles	<p>Review: Optimizing baffle design in the stabilization pond (Cell No. 2) will not address all the identified problems on its own but it should provide some additional treatment by improving lagoon retention time and reduce overall risks in not meeting ECA requirements. This alternative should be only considered in combination with other options.</p> <p>Recommendation: Carry forward but only as an option to be considered in <u>combination</u> with other alternatives</p>
2C) Modify lagoon operating volume and/or aeration	<p>Review: Previous upgrades to the existing lagoon aeration system have proven not to be effective in addressing the identified problems. A new aeration system is part of some of the other options being carried forward (see below). Adding additional lagoon volume will not address the issues associated with ammonia treatment.</p> <p>Recommendation: Do not carry forward</p>

<p>2D) Optimize alum dosage for phosphorous removal</p>	<p>Review: Optimizing alum dosage will not address all of the identified problems on its own but should help to resolve the issues with periodic phosphorous exceedances from the lagoon.</p> <p>Recommendation: Carry forward but only as an option to be considered in <u>combination</u> with other alternatives</p>
<p>2E) Upgrade/refurbish the constructed wetland</p>	<p>Review: Refurbishing the wetland is not anticipated to address all of the identified issues on its own. Initial conversations with the MOECC suggest that the effluent objects on the wetland are for data collection purposes only. Refurbishing the wetland, however, may provide some additional treatment and reduce overall risks in not meeting ECA requirements.</p> <p>Recommendation: Carry forward but only as an option to be considered in <u>combination</u> with other alternatives</p>
<p>1F) Investigate and divert any identified high strength waste streams away from the lagoon system</p>	<p>Review: As part of the preferred alternative, the Municipality should continue to work with its ICI customers in the community to assess options for reducing high strength sewage discharges to the collection system. Reducing the strength of the influent loading to the lagoon system will assist in mitigating risks of impacts to the existing treatment system (and any new systems) and the resulting treated effluent concentrations.</p> <p>Recommendation: Carry forward but only as an option to be considered in <u>combination</u> with other alternatives</p>
<p>Option 3: Install Specialized Treatment System to Complement the Existing Lagoon System</p>	
<p>3A) Install complete mix activated sludge process upstream of existing lagoons (e.g. Biolac Treatment System)</p>	<p>Review: These options (Option 3) have all been reviewed based on information received from technology providers and all have the potential to meet the current effluent criteria and address the key issues in the problem statement.</p> <p>Recommendation: Carry forward</p>
<p>3B) Upgrade aeration in the existing aeration cell and install submerged aerated bio-film reactors in the existing stabilization pond (e.g. WCS Bio-Shell)</p>	
<p>3C) Upgrade/expand aeration in the existing cells and install an attached growth reactor following the existing stabilization pond (e.g. SAGR)</p>	
<p>3D) Add pre-screening and install a fixed film biological treatment process upstream of the existing lagoons (e.g. SMBR, MBBR)</p>	

<p>3E) Upgrade aeration in the existing aeration cell and install a fixed film biological treatment process downstream of the existing lagoons (e.g. SMBR, MBBR)</p>	
<p>3F) Add pre-screening and install a bioreactor with activated sludge process and membrane technology upstream of the existing lagoons (e.g. MBR)</p>	
<p>Option 4: New Mechanical Treatment Plant</p>	
<p>4) Replace lagoon completely with a new mechanical treatment plant</p>	<p>Review: This option has the proven ability to meet the current effluent criteria and address the key issues in the problem statement; however, the costs are anticipated to be much higher than the other options and significant changes to the site and operations would be required making it unaffordable to the Municipality. Costs are estimated to be \$15M to \$25M with annual operating costs in the \$750,000 range.</p> <p>Recommendation: Do not carry forward</p>

5.3 Detailed Evaluation of Wastewater Treatment Alternatives

5.3.1 Probable Costs - Capital Costs

An Opinion of Probable Construction Costs (OPCC) with a Class 'D' (Indicative Estimate) level of accuracy was developed for each of the alternates and includes allowances for design elements that have not fully been developed. The OPCC's were developed based on past experience on similar projects, professional judgment, and equipment costs provided by suppliers.

Table 5-2 Total Estimated Cost of Treatment Alternatives (2017 \$)

Option	Estimated Capital Cost (2017 \$)
Option 2: Optimize/Modify Current Lagoon Operations	
2a. Remove sludge from lagoon cells ^{1.}	\$ 1,000,000
2b. Upgrade/refurbish existing baffles ^{2.}	\$ 300,000
2d. Optimize alum dosage (study component only)	\$ 30,000
2e. Refurbish the constructed wetland	\$150,000
2f. Divert high strength waste streams	No on-site cost
Option 3: Install Specialized Treatment System to the Existing Lagoon System	
3a. Complete Mix Activated Sludge Process	\$4.5M
3b. Submersible Aerated Bio-Film Reactors ^{3.}	\$4.5M
3c. Submerged Attached Growth Reactor ^{4.}	\$7.0M
3d. Fixed Film Biological Process – upstream	\$4.5M
3e. Fixed Film Biological Process – downstream ^{3.}	\$3.0M
3f. Activated Sludge with Membrane Technology	\$10.0M
Notes:	
1. Estimated cost of full desludging of aeration and stabilization pond.	
2. Includes computational fluid dynamics (CFD) modelling to optimize design and new, as well as modified baffles in the stabilization pond.	
3. Includes aeration upgrades in existing aeration cell.	
4. Includes upgraded/expanded aeration in both existing cells.	

5.3.2 Probable Costs – Lifecycle Costs

Based on the cost of existing operations and information from suppliers and similarly sized facilities, the annual operating costs of each particular treatment alternative have been summarized in Table 5-3. For the purposes of establishing operational costs it has been assumed that the treatment system is operating at its ECA rated capacity. Costs include operations staff and electricity costs for blowers and pumps. Chemical costs associated with the phosphorous removal system and equipment replacement costs have not been included.

Table 5-3 Estimated Annual Operational Costs of Treatment Alternatives (2017 \$)

Option	Estimated Operations Cost (\$/year)
3a. Complete Mix Activated Sludge Process	\$200,000
3b. Submersible Aerated Bio-Film Reactors	\$200,000
3c. Submerged Attached Growth Reactor	\$300,000
3d. Fixed Film Biological Process - upstream	\$200,000
3e. Fixed Film Biological Process - downstream	\$200,000
3f. Activated Sludge with Membrane Technology	Info not provided by supplier

5.3.3 Evaluation Overview

Table 5-5 summarizes the detailed evaluation of the screened alternatives for the treatment system. Each option was assigned an evaluation impact level (refer to Table 5-4) for each evaluation criteria. This method provides an overall assessment of the positive and negative impacts of each alternative. This method was used as it is recognized that there could be more than one option or technology that can address the problem and that additional consideration of these technologies could be undertaken either as part of a Phase 3 (i.e. Schedule C continuation of this Class EA) or as part of a pre-design stage. For the detailed evaluation refer to Appendix B.

Table 5-4 Evaluation Impact Level

Evaluation Impact Level	Indicator
Potential for Positive Impact	+1
No Anticipated Impact	0
Potential for Negative Impact	-1

Appendix C contains conceptual layouts of each of the technologies and how they could be integrated into the existing site.

Table 5-5 Summary Evaluation Matrix

MAJOR CRITERIA	MINOR CRITERIA	OPT 3A COMPLETE MIX ACTIVATED SLUDGE PROCESS	OPT 3B SUBMERSIBLE AERATED BIO- FILM REACTORS	OPT 3C SUBMERGED ATTACHED GROWTH REACTOR	OPT 3D FIXED FILM BIOLOGICAL PROCESS (UPSTREAM)	OPT 3E FIXED FILM BIOLOGICAL PROCESS (DOWNSTREAM)	OPT 3F ACTIVATED SLUDGE WITH MEMBRANE TECHNOLOGY
NATURAL ENVIRONMENT AND ARCHAEOLOGY	Effect on Fish and Aquatic Habitat	+1	+1	+1	+1	+1	+1
	Effect on Wetlands, Woodlands, Wildlife Habitat	0	0	-1	0	0	0
	Effect on Archeological Potential Impacts	0	0	0	0	0	0
ENGINEERING AND TECHNICAL CONSIDERATIONS	Proven Cold Weather Installations	+1	-1	+1	+1	+1	-1
	Ability to Meet Effluent Criteria	+1	0	+1	+1	+1	+1
	Degree of Process Control	+1	-1	-1	+1	+1	+1
	Ease of Operation	-1	+1	+1	0	0	-1
	Capability with existing site	+1	+1	-1	+1	0	+1
	Opportunities for Future Expansion	+1	-1	-1	+1	+1	+1
SOCIAL/ COMMUNITY WELL BEING	Impacts During Construction	0	0	-1	0	0	0
	Compatibility with Surrounding Land Use and Visual Impact	0	0	-1	0	0	0
	Noise and Odour Effects during Operation	+1	+1	+1	+1	+1	+1
Maintenance (Short Term and Long Term Requirements)		-1	-1	0	-1	+1	-1
Capital Cost		0	0	-1	0	+1	-1
TOTAL		5	0	-2	6	8	2

6.0 PREFERRED SOLUTION

6.1 Description of the Preferred Alternative

Based on the evaluation methodology utilized, it was determined that Option 3 - Install a Specialized Treatment System to Complement the Existing Lagoon System provided the highest overall net benefit to the Municipality. In order to mitigate risk and ensure appropriate treatment redundancy and to take advantage of existing facilities/infrastructure (i.e. the existing lagoon and constructed wetland), this option should be completed in combination with some of the items identified in Option 2 – Optimizing and Modifying Current Lagoon Operations as being part of the overall preferred solutions. This includes a very thorough de-sludging program prior to any new technology implementation, upgrading baffles in the stabilization pond, optimizing alum dosage, refurbishing the constructed wetland, and diverting high waste streams. With regards to the particular specialized treatment system to be selected, the complete mix activated sludge process (3A) and the fixed film biological process (3D or 3E) appear to provide the highest overall benefit to the Municipality based on information available at this time.

The main benefits of each of the preferred solutions in Option 3 are the following:

- Proven full scale Canadian and cold weather installations;
- Ability to meet current effluent criteria, with quality that is better than current ECA limits;
- Controlled process that can be adjusted to achieve consistent effluent quality;
- Easily expandable process with minimal capital cost to increase treatment capacity; and
- Moderate upfront capital costs and ongoing operational costs.

In addition, the fixed film biological process located downstream of the stabilization pond (3E) has several added benefits for consideration by the municipality:

- Comparatively lower capital cost investment
- Potential for reduced necessity to upgrade aeration equipment in Cell 1
- Manufacturer's warrantee on effluent quality (with effluent at ECA compliance measurement point)

6.2 Opinion of Probable Cost for Preferred Solution (including lifecycle upgrades)

An Opinion of Probable Construction Costs (OPCC) with a Class 'D' (Indicative Estimate) level of accuracy was developed for full implementation of all elements of the preferred solution. Allowances for design elements that have not fully been developed are included. The OPCC's

were developed based on past experience on similar projects, professional judgment, and equipment costs provided by suppliers.

Table 6-1 Opinion of Probable Cost for Preferred Solution

Component	Estimated Capital Cost (2017 \$) (Option 3E)
Install Specialized Treatment System	\$3,000,000
Remove sludge from lagoon cells	\$1,000,000
Upgrade/refurbish existing baffles	\$ 300,000
Optimize alum dosage (study component only)	\$ 30,000
Refurbish the constructed wetland	\$ 150,000
Complete Lifecycle Upgrades at SPS and Lagoon	\$ 500,000
Sub-Total	\$4,980,000
Engineering and Contingency (30%)	\$ 1,500,000
Grand Total (rounded)	\$ 6,500,000





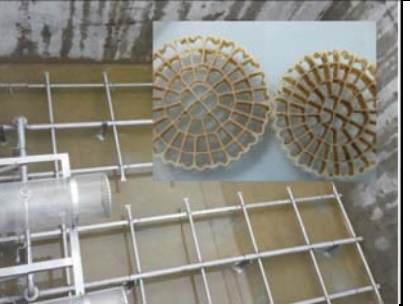

7.0 CONCLUSIONS AND NEXT STEPS

A Public Information Centre will be held to inform the general public, project stakeholders, and review agencies of the preliminary findings of the Phase 1 and Phase 2 reports and to obtain input on the recommendation of the preferred alternative. In addition, the Phase 2 report will be circulated to the MOECC for comment. Following the public meeting, receipt of comments from affected parties and review agencies, and confirmation of a preferred alternative, the Municipality will be in a position to post the Class EA Project File that documents the Class EA process. After the 30-day period for comment closes the Municipality will be in a position to implement the preferred option and proceed directly into preliminary design. The design would be based on the analysis presented within this Schedule B and the conceptual layouts for the preferred alternatives identified in Phase 2 that take the environmental factors into consideration (e.g. potential impacts to the constructed wetland, etc.).

Alternatively, the Municipality may elect to further define the technologies presented as part of Option 3 (each of which would meet the treatment level criteria) by undertaking a Schedule C Class EA.

Appendix A
Public Consultation Summary

Appendix B
Detailed Treatment Technology Evaluation

MAJOR CRITERIA	MINOR CRITERIA	OPT 3A COMPLETE MIX ACTIVATED SLUDGE PROCESS	OPT 3B SUBMERSIBLE AERATED BIO- FILM REACTORS	OPT 3C SUBMERGED ATTACHED GROWTH REACTOR	OPT 3D FIXED FILM BIOLOGICAL PROCESS (UPSTREAM)	OPT 3E FIXED FILM BIOLOGICAL PROCESS (DOWNSTREAM)	OPT 3F ACTIVATED SLUDGE WITH MEMBRANE TECHNOLOGY
							
NATURAL ENVIRONMENT AND ARCHAEOLOGY	Effect on Fish and Aquatic Habitat	POSITIVE: Quality of effluent discharged to surface water will improve.	POSITIVE: Quality of effluent discharged to surface water will improve.	POSITIVE: Quality of effluent discharged to surface water will improve.	POSITIVE: Quality of effluent discharged to surface water will improve.	POSITIVE: Quality of effluent discharged to surface water will improve.	POSITIVE: Quality of effluent discharged to surface water will improve.
	Effect on Wetlands, Woodlands, Wildlife Habitat	NO IMPACT: No construction will occur in the engineered or natural wetland.	NO IMPACT: No construction will occur in the engineered or natural wetland.	NEGATIVE: New treatment cells will reduce the engineered wetland area by approximately 50%.	NO IMPACT: No construction will occur in the engineered or natural wetland.	NO IMPACT: Minimal footprint of new treatment cell could be placed outside of the constructed wetland.	NO IMPACT: No construction will occur in the engineered or natural wetland.
	Effect on Archeological Potential Impacts	NO IMPACT: No archeological potential has been identified on site.	NO IMPACT: No archeological potential has been identified on site.	NO IMPACT: No archeological potential has been identified on site.	NO IMPACT: No archeological potential has been identified on site.	NO IMPACT: No archeological potential has been identified on site.	NO IMPACT: No archeological potential has been identified on site.
ENGINEERING AND TECHNICAL CONSIDERATIONS	Proven Cold Weather Installations	POSITIVE: Numerous Canadian/ and cold weather installations, however, process subject to extreme environmental conditions.	NEGATIVE: No full scale Canadian installations and limited number of cold weather installations generally.	POSITIVE: Numerous Canadian/ and cold weather installations, however, subject to extreme environmental conditions.	POSITIVE: Numerous Canadian/ and cold weather installations, however, subject to extreme environmental conditions.	POSITIVE: Numerous Canadian/ and cold weather installations, however, subject to extreme environmental conditions.	NEGATIVE: Limited number of cold weather installations, influent temperature must be above 9 deg. C.
	Ability to Meet Effluent Criteria	POSITIVE: High quality effluent will be produced that is better than the ECA limits for all parameters. Ammonia will be in the range of <5 mg/L.	NO IMPACT: The effluent quality will meet the ECA limits.	POSITIVE: High quality effluent will be produced that is better than the ECA limits for all parameters. Ammonia will be in the range of <5 mg/L.	POSITIVE: Good quality effluent will be produced that is better than the ECA limits for all parameters. Ammonia will be in the 5 – 15 mg/L range.	POSITIVE: Good quality effluent will be produced that is better than the ECA limits for all parameters. Ammonia will be in the 5 – 15 mg/L range.	POSITIVE: High quality effluent will be produced that is better than the ECA limits for all parameters. Ammonia will be in the range of <5 mg/L.
	Degree of Process Control & Availability of Performance Guarantee	POSITIVE: There are a number of process variables that can be controlled. The existing lagoon is not required for treatment; however, it would be used for sludge storage/stabilization.	NEGATIVE: The submersible aerated bio-film reactors have a higher degree of control than a lagoon alone, however, process control is limited and the system may be slow to respond.	NEGATIVE: Submerged attached growth reactors have a higher degree of control than a lagoon alone, however, process control is limited and the system may be slow to respond.	POSITIVE: There are a number of factors that can be controlled in the fixed film biological process; however, the lagoon is still required for treatment.	POSITIVE: There are a number of factors that can be controlled in the fixed film biological process; however, the lagoon is still required for treatment.	POSITIVE: There are a number of process variables that can be controlled in this process. The existing lagoon is not required for treatment.
	Ease of Operation	NEGATIVE: Automated process that may require more regular operator input.	POSITIVE: Limited operator input is required once established.	POSITIVE: Limited operator input is required once established.	NO IMPACT: Automated process that may require periodic operator input.	NO IMPACT: Automated process that may require periodic operator input.	NEGATIVE: A technically advanced process that may require full/part time operator input. Membranes require regular cleaning.
	Capability with existing site (i.e. HGL, electrical servicing, etc)	POSITIVE: No new tankage or buildings are required; flow except for RAS would be by gravity. Site electrical servicing would need upgrading.	POSITIVE: No new tankage or buildings required, flow would continue to be by gravity. Site electrical servicing would need upgrading.	NEGATIVE: New cells are required. Pumping may be required depending on the location of reactor cells. Site electrical servicing would need upgrading.	POSITIVE: No new tankage or buildings are required; flow would continue to be by gravity. Site electrical servicing would need upgrading.	NO IMPACT: New downstream tankage and a blower building would have a minimal footprint. Site electrical servicing may not need upgrading.	POSITIVE: No new tankage or buildings are required; flow except for RAS would be by gravity. Site electrical servicing would need upgrading.

Appendix C
Conceptual Layouts

File Location: K:\27000\27271 - Brighton Lagoon\JLR DWG\Plan\27271 Option 3A.mxd



Note: Wastewater Treatment System property limits are approximate only. Not a legal survey.

PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **COMPLETE MIX ACTIVATED SLUDGE**

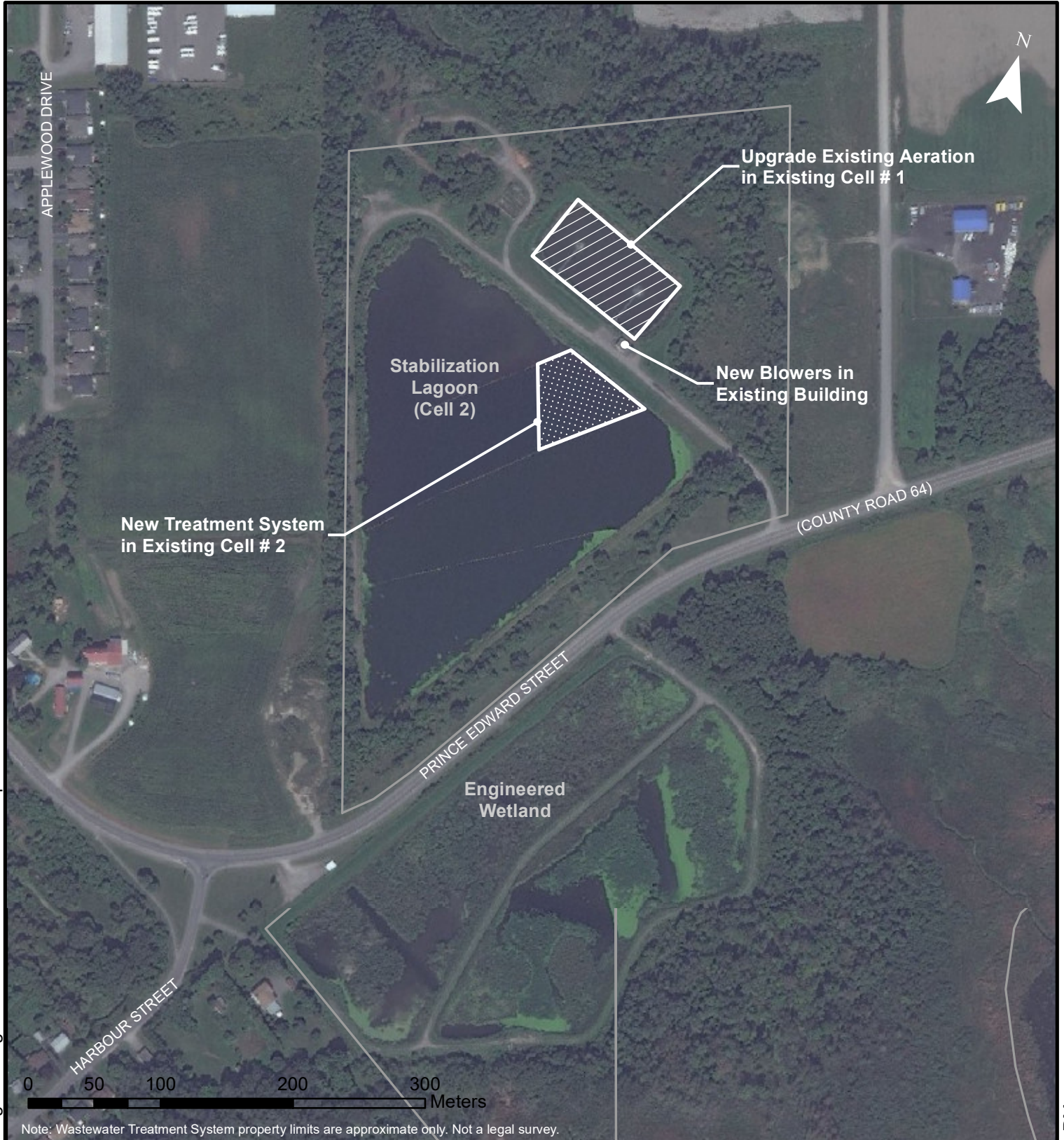
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DESIGN:	JW
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JLR NO:	27271
DRAWING NO.:	OPTION 3A

Plot Date: April 11, 2017 3:15:12 PM

File Location: K:\27000\27271 - Brighton Lagoon\JLR DWG\Plan\27271 Option 3B.mxd



PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **SUBMERSIBLE AERATED BIO-FILM REACTORS**

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JLR NO:	27271
DRAWING NO.:	OPTION 3B

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Note: Wastewater Treatment System property limits are approximate only. Not a legal survey.

PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **SUBMERGED ATTACHED GROWTH REACTOR**

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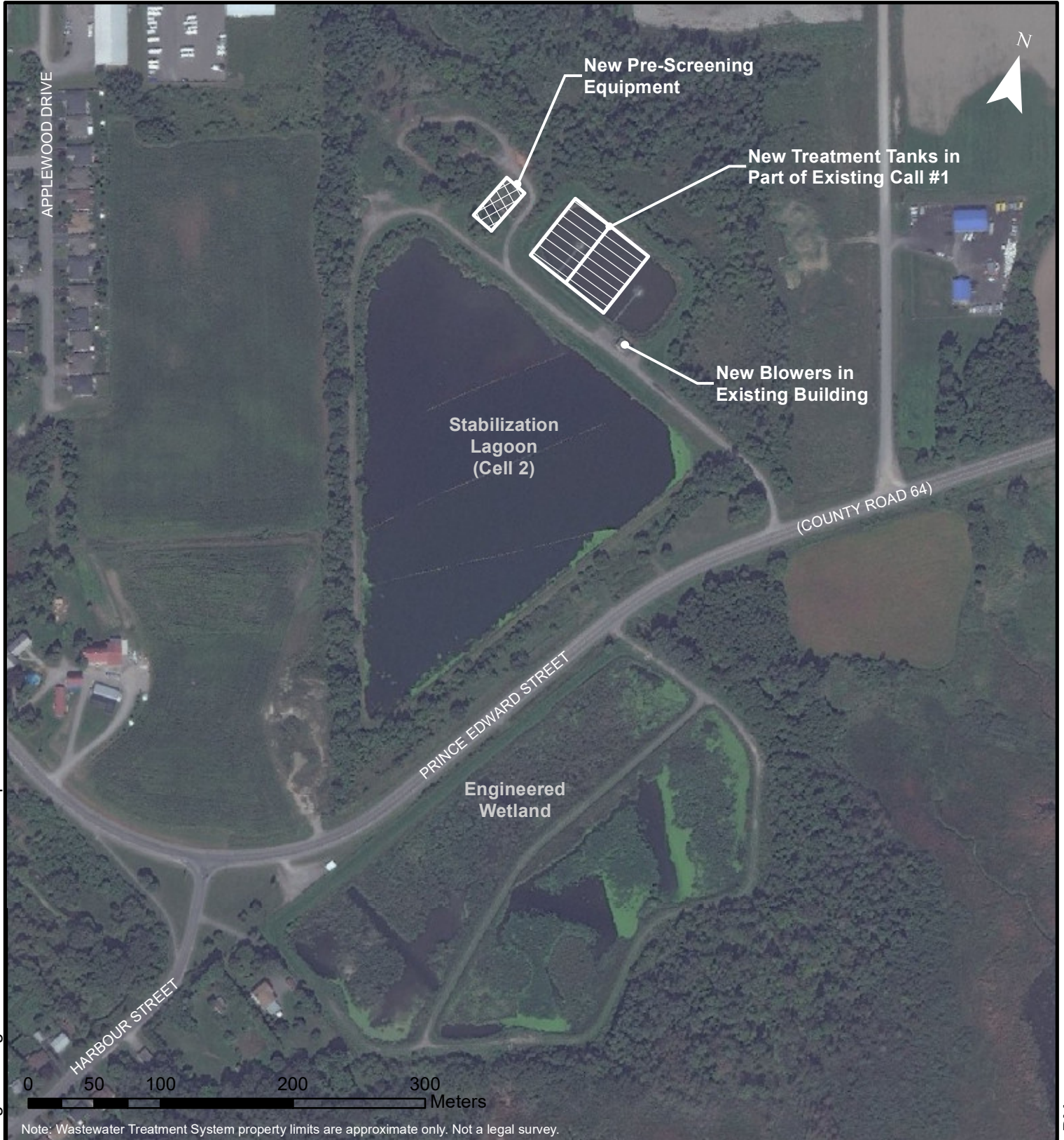
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JLR NO:	27271
DRAWING NO.:	OPTION 3C

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PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **FIXED FILM BIOLOGICAL PROCESS (UPSTREAM)**

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JLR NO:	27271
DRAWING NO.:	OPTION 3D

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File Location: K:\27000\27271 - Brighton Lagoon\JLR DWG\Plan\27271 Option 3E.mxd



Note: Wastewater Treatment System property limits are approximate only. Not a legal survey.

PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
 MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **FIXED FILM BIOLOGICAL PROCESS (DOWNSTREAM)**

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JLR NO:	27271
DRAWING NO.:	OPTION 3E

Plot Date: April 11, 2017 3:29:17 PM

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Note: Wastewater Treatment System property limits are approximate only. Not a legal survey.

PROJECT: **BRIGHTON WASTEWATER TREATMENT SYSTEM CLASS EA**
MUNICIPALITY OF BRIGHTON, ONTARIO

DRAWING: **ACTIVATED SLUDGE WITH MEMBRANE**

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DESIGN:	JW
DRAWN:	KTK
CHECKED:	SS

JLR NO:	27271
DRAWING NO.:	OPTION 3F

Plot Date: April 10, 2017 3:29:04 PM