Mapleton Wastewater Servicing Municipal Class Environmental Assessment

Public Information Centre

February 11, 2016

Welcome!

Welcome!

- Please sign in and take a comment sheet.
- The purpose of this PIC is to:
  - Review the project with the public
  - Present the alternative designs being evaluated
  - Present the preliminary preferred alternative design
  - Seek your input and comments
  - Explain next steps

- If you have questions, our team members are available to discuss the project with you.
- Please place your comment sheets in the "Comment Box" or send them before February 26, 2016 to:

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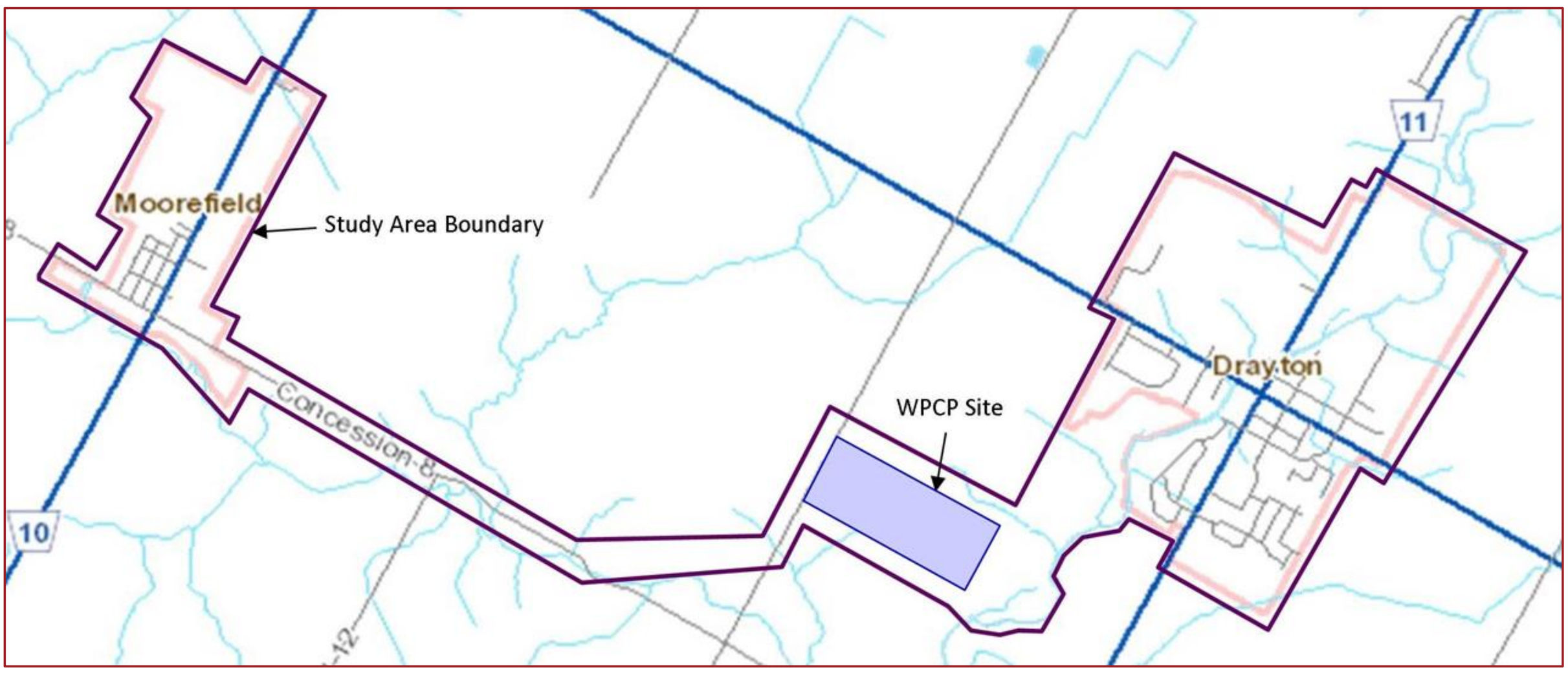
Project Study Scope

- To undertake Municipal Class EA to evaluate alternatives to potentially upgrade the Mapleton Wastewater Collection and Treatment System; and
- Prepare preliminary design of municipal wastewater system.

STUDY AREA



Municipal Class EA Process

- A Class EA is a study to plan for a proposed project, which includes background and technical studies, a review and assessment of potential environmental, social and economic impacts and how they can be avoided, and an evaluation of possible alternatives.
- The result is an Environmental Study Report (ESR), which documents the process and lists the commitments made by the proponent.
- The Class EA process is completed in accordance with the *Environmental Assessment Act*.

Phase 1: Problem or Opportunity Statement

- Definition of Problem or Opportunity
- Identify Problem Statement

Phase 2: Alternative Solutions

- Identify, assess and evaluate alternative solutions
- Consult with public, government agencies, stakeholders
- Select a preferred solution

We are here

Phase 3: Alternative Design

- Alternative Design Concepts
- Identify, assess and evaluate alternative designs
- Consult with public, government agencies, stakeholders
- Select the preferred alternative design

Phase 4: Environmental Study Report

- Complete Environmental Study Report (ESR)
- Submit for 30-day public and agency review period

Phase 5: Implementation

- Detailed design
- Construction
- Monitoring

Wastewater Collection System: *Current and Future Flows*

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 flows	2,497 m^3/d 29 L/s	4,077 m^3/d 47 L/s

The current maximum pumping capacity is 36 L/s. This will not meet the projected peak flow rate of 47 L/s for 2031.
Therefore, the pumping capacity of the SPS must be increased.

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 m^3/d	281 m^3/d
Peak flows	361 m^3/d 4.2 L/s	1,125 m^3/d 13 L/s

The current maximum pumping capacity is 14 L/s. This is adequate to meet the projected peak flow rate of 13 L/s for 2031.

Overview: Wastewater Pollution Control Plant (WPCP)

Storage Lagoons
350,000 m^3 (combined)
- Treated wastewater stored until it can be discharged
- Treated wastewater dosed with Alum before entering storage lagoons

Settling Lagoon
62,100 m^3
- Solids settle out of treated wastewater

Aerated Lagoon
60,500 m^3
- Wastewater enters here for treatment

Tertiary Treatment Building
- Five sand filters, to filter treated wastewater before discharge
- Ultraviolet disinfection, to ensure treated wastewater is disinfected before discharge

Discharge Swale
- Treated wastewater discharged to a swale, which then flows to Conestoga River

Wastewater Pollution Control Plant Performance

- Effluent from WPCP is monitored regularly
- Effluent objectives and limits based on provincial approval
- Effluent Limit: maximum allowable concentration for a parameter
- Effluent objective: a target that is more stringent than the limit

Effluent Parameter	Effluent Objective	Effluent Limit	Measured Final Effluent (2013 - 2014)
cBOD5	5.0 mg/L	Apr/Oct: 7.5 mg/L Mar/Nov/Dec: 10.0 mg/L	Apr/Oct: ~ 2 to 5 mg/L Mar/Nov/Dec: ~ 2 to 3.5 mg/L
Total Suspended Solids (TSS)	None	None	Spring 2-8 mg/l Fall 2-7 mg/l
Total Ammonia Nitrogen (TAN)	3.0 mg/L	5.0 mg/L	~0.01 to 4.75 (highest in March)
Total Phosphorus (TP)	0.3 mg/L	0.5 mg/L	~0.05 to 0.25
E.Coli	100 org./100 mL	200 org./100 mL	nil

The Mapleton WPCP is performing well. Effluent from the WPCP is consistently below the regulated limit and is generally below the more-strict effluent objective.

Overview: Existing System – Effluent Discharge Window

- Current rated capacity is 750 m^3/day (or 273,872 m^3/year of influent flow)
- Current Effluent Seasonal Discharge Window:

Month	Discharge Limit m^3/day
March	1,581
April	3,154
October	233
November	1,754
December	4,000

- The Township's recent Environmental Compliance Approval amendment allows for flexible increased discharge during these months, under conditions:
  - 10:1 streamflow to discharge rate (based on streamflow data from Grand River Conservation Authority website)
  - Discharge rate cannot exceed maximum design capacity of sand filter/UV disinfection unit (4,000 m^3/d)
- In addition, it is estimated that ~147 m^3/day (53,655 m^3/year) of precipitation accumulates in the plant, which needs to be discharged
- It is desirable that the new effluent discharge window addresses accumulated precipitation

Agency / Stakeholder Consultation

- Study includes consultation with agencies, including detailed discussion with the Grand River Conservation Authority (GRCA) and the Ministry of Environment and Climate Change (MOECC)
- Key outcomes:
  - MOECC and GRCA advised of project and process to be followed
  - Data and background information provided by agencies to project team
  - Input received from agencies on alternative solutions and evaluation criteria
  - Reasonable opportunity to explore expanded discharge windows for WPCP
  - On-going engagement regarding finalization of proposed discharge window
- Meeting also held with developers in March 2015 to provide project details, including background, EA process and expected time frames etc.

Natural Heritage Investigation

Conestoga River Subwatershed

- A warmwater system of tributaries and municipal drains that flow into the main channel and eventually into Conestogo Lake, approximately 7 km downstream of Drayton.
- The adjacent lands are intensively farmed and heavily drained.
- In the local area, the river is relatively wide (10-20m) flat, and less than 1 m deep during the summer months.
- Aquatic habitat includes shallow pools, riffles, and runs that flow over a variety of substrates, with silt in the backwater areas.
- River suffers from low baseflow, warm temperatures, lack of riparian vegetation and agricultural runoff input, and water level changes due to the Conestoga dam.
- Algae mats can form throughout backwater areas.

Fish and Mussels in the Conestoga

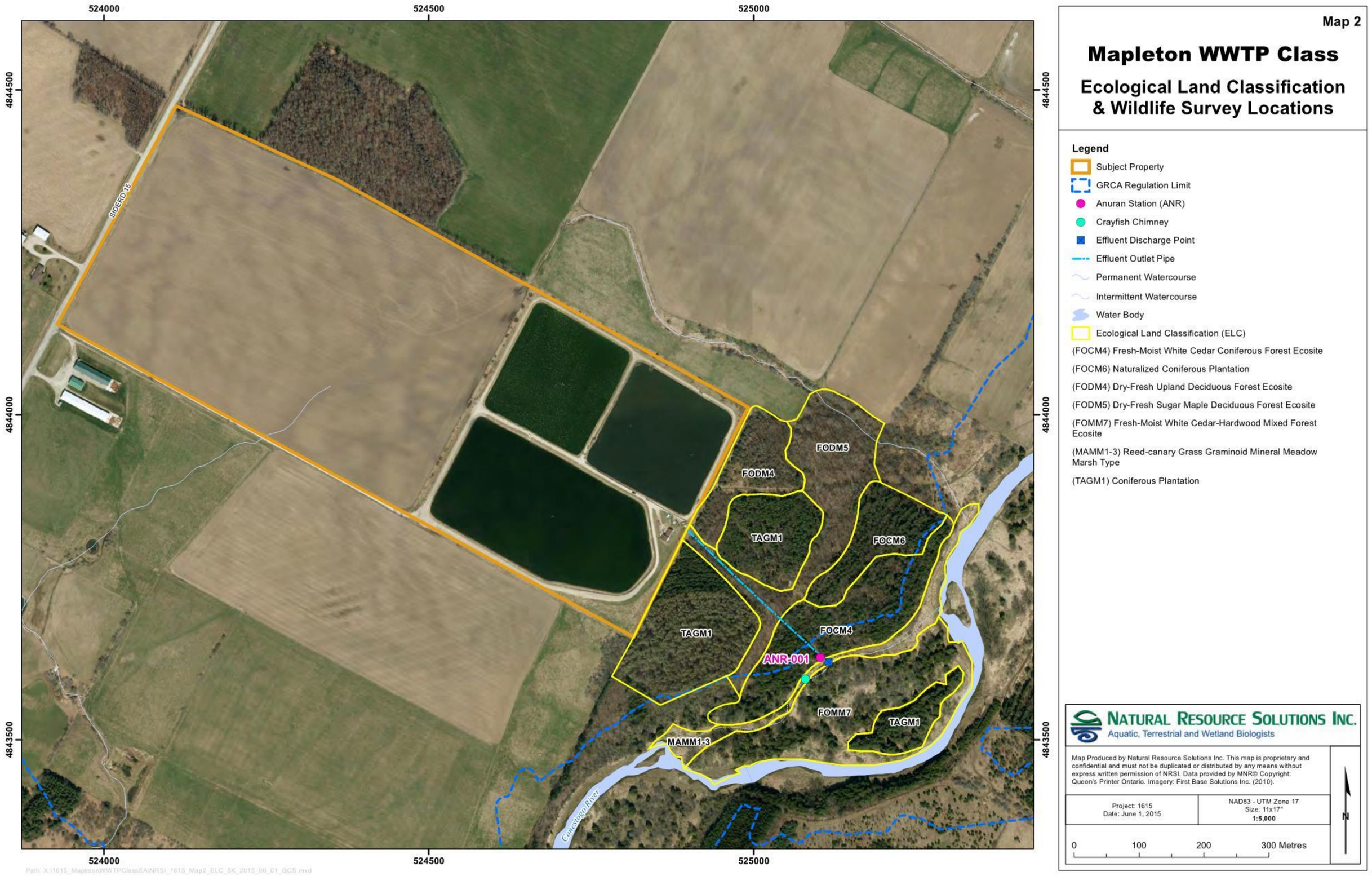
- The river has a diverse warmwater fish community including Northern Pike, Smallmouth Bass, Yellow Perch, Walleye, and Common Carp, and a variety of warmwater baitfish species.
- The river was historically stocked with Brown Trout (a coldwater species) downstream of Conestoga Lake.
- A variety of common mussel species are known to occur.
- One mussel Species at Risk, the Rainbow (*Villosa iris*) is known to occur in the Conestoga River near the WPCP.
  - Rainbow is listed Endangered under the Ontario *Endangered Species Act*, giving the species and its habitat legal protection.
  - Rainbow is also listed 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.

Rainbow Mussel (*Villosa iris*)

Natural Heritage Investigation

Site Conditions

- Effluent is piped through GRCA-owned Conestoga Lake Conservation Area lands, and discharges to a swale that outlets to the Conestoga River.
- GRCA property is mainly forested with deciduous and coniferous forest, and coniferous plantation. There is a narrow band of meadow marsh along the swale.
- The swale is an intermittent watercourse that conveys flow as part of the Conestoga River during high flows. WPCP effluent provides flow during discharge at low/moderate river flows.
- Fish habitat present in the swale, including some large pools and deeper sections downstream of the effluent discharge that can be used when connected to the river.
- Northern pike spawning habitat exists throughout the swale, and would be used in the spring when the swale is inundated.
- Terrestrial Crayfish Significant Wildlife Habitat identified downstream of effluent discharge outlet, within the meadow marsh vegetation community.



Problem Statement

- Facility operating close to rated capacity of 750 m^3/d
- Average 2013 inflow: 714 m^3/d (95% of rated capacity)
- Rated capacity of facility must be increased to 1,300 m^3/day allow the Township to meet projected service area growth to 2031 (with consideration for future expandability)
- New effluent discharge window to also consider discharge of accumulated water from precipitation
- Drayton system does not have sufficient pumping capacity to service projected future population

Problem Statement

- *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. Proposed effluent discharge window to also address discharge of water from precipitation.*
- *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.*

Treatment Alternatives: Selection and Evaluation

- Pre-screening of alternative solution categories conducted, based on problem statement
- Treatment approaches for primary, secondary and tertiary treatment considered
- Based on WPCP treatment requirements, three alternative solutions were considered for upgrading the Drayton WPCP:
    1. Pre-lagoon nitrification with Moving Bed Biofilm Reactor (MBBR)
    2. Post-lagoon nitrification with Submerged Attached Growth Reactor (SAGR) technology
    3. Extended Aeration
- The three alternatives were evaluated against evaluation criteria and Post-lagoon nitrification with SAGR technology identified as preferred alternative treatment solution
- Two alternative designs prepared and evaluated

Alternative Treatment Solutions

- Alternative 1: Pre-Lagoon Nitrification with MBBR
- Alternative 2: Post-lagoon with SAGR
- Alternative 3: Extended Aeration (using Sequencing Batch Reactor)

Preferred Treatment Alternative Solution

Based on the evaluation, Alternative 2 (Post Lagoon with SAGR) is identified as the preliminary 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.

SAGR: An Overview

Process Overview

- Provides nitrification (ammonia removal) in cold to moderate climates.
- Consists of a clean aggregate media bed with evenly distributed wastewater flow across width of cell.
- Two SAGR cells operate in parallel, allowing either cell to be isolated and bypassed if required (e.g., for maintenance or repair).

Examples in Other Jurisdictions

Steinbach (Demo)	2007
Lloydminster (Demo), SK	2008
Doaktown, NB	2010
Dawson Creek, BC	2011
Mentone, IN	2011
Glencoe, ON	2011
Long Plain FN, MB	2012
Sylvan Lake, SD	2012
Walker, IA	2012
Perth (Demo), ON	2012
Lamar, MO	2012
Shellbrook, SK	2012
Blumenort (Demo)	2012
Balcarres, SK	2013
Misipiwistik FN, MB	2013
Greenbryre, SK	2013
Kennard, IN	2013
Guthrie School, ON	2013
Kingsley, IA	2013
Sundridge, ON	2014
New London, IA	2014
Colesburg, IA	2014
Hull, IA	2014

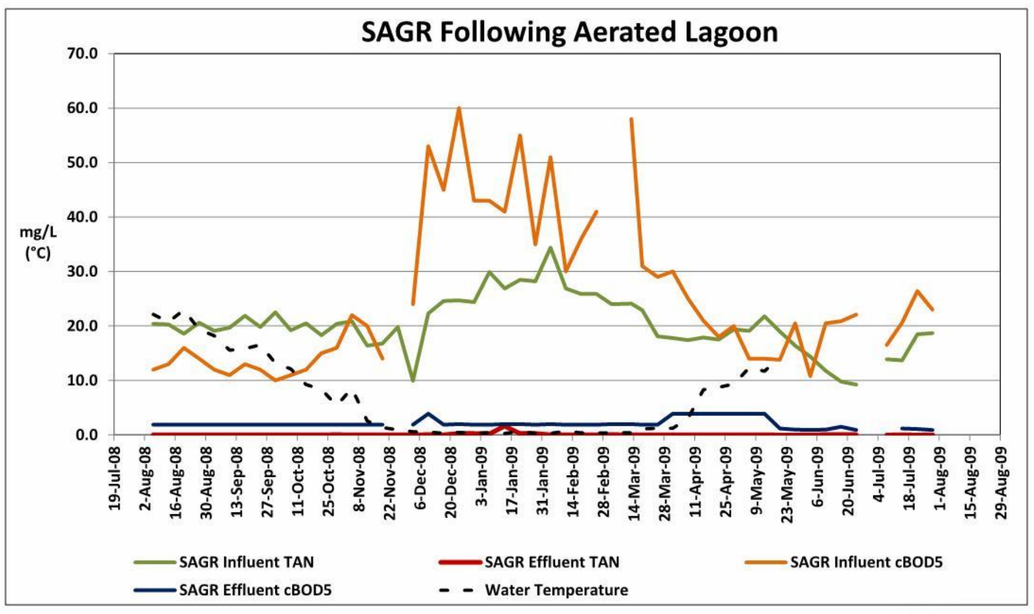
Example of Performance Data

SAGR Performance Data

University of Manitoba Third Party Winter Operation Verification Data
(JANUARY 13 – APRIL 21, 2010)

Parameters	SAGR Influent Averages (mg/L)	SAGR Effluent Averages (mg/L)	Removal
cBOD	47	2.1	95.5%
TSS	30	1.3	95.7%
TAN	24.9	0.12	99.5%
TKN	32.5	1.8	94.5%
FC (cfu /100 ml)	253000	13.5	99.99%
Average water temperature (°C)	0.3	1.0	

Steinbach, MB Data



Installation in Glencoe, Ontario

Data/images from Nelson Environmental

Alternative Treatment Designs

- Two alternative designs being considered.
  - Alternative 1: Post-lagoon SAGR treatment without floating island wetlands
  - Alternative 2: Post-lagoon SAGR treatment with floating island wetlands
- Main difference in design is the inclusion of floating island wetlands.
- Alternative designs evaluated against technical, natural environment, social/cultural and financial criteria.

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 Conestoga River	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

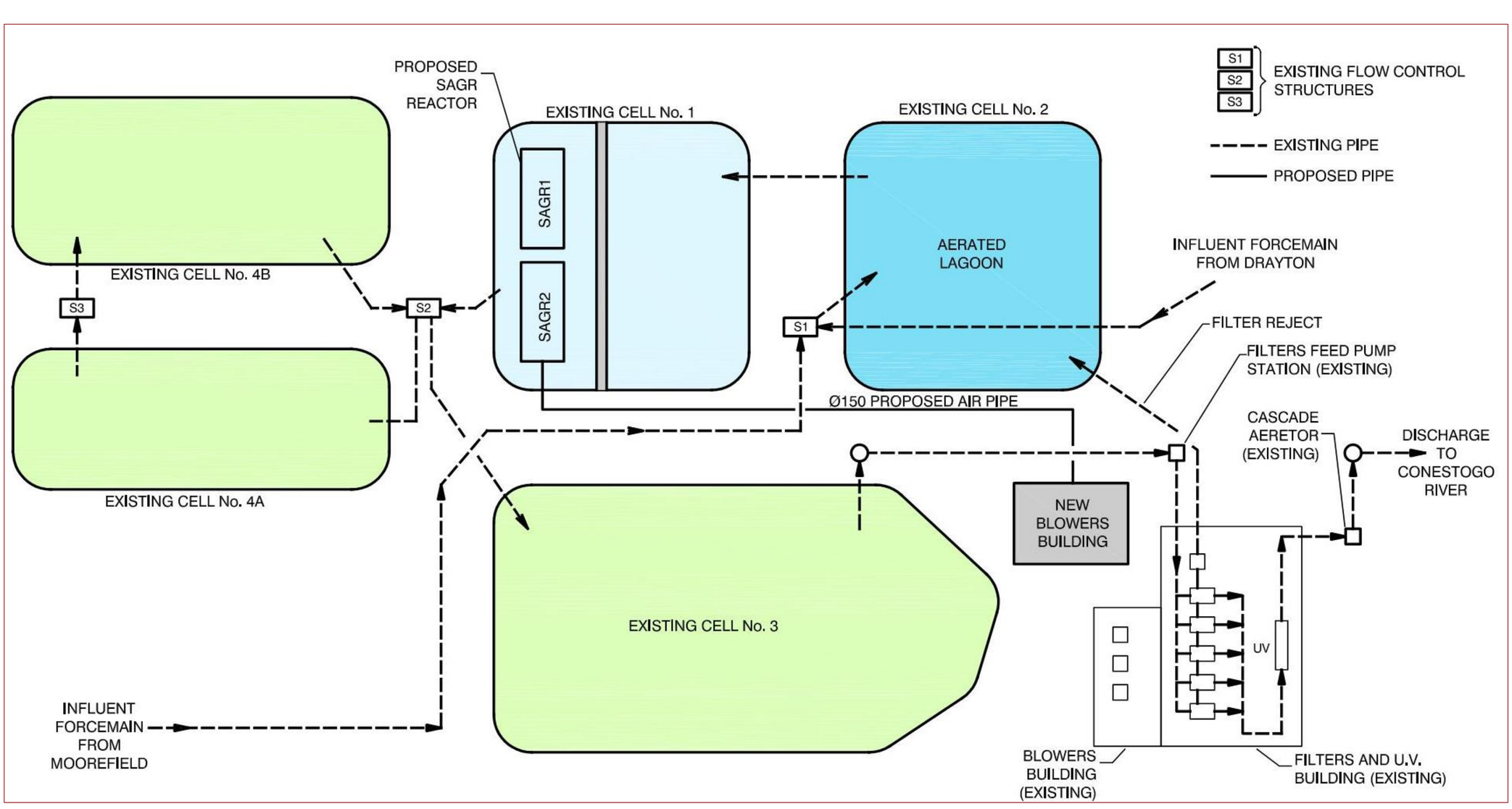
Alternative Treatment Designs

Alternative 1: Post Lagoon Nitrification with SAGR

Key features 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.

Schematic for Alternative 1



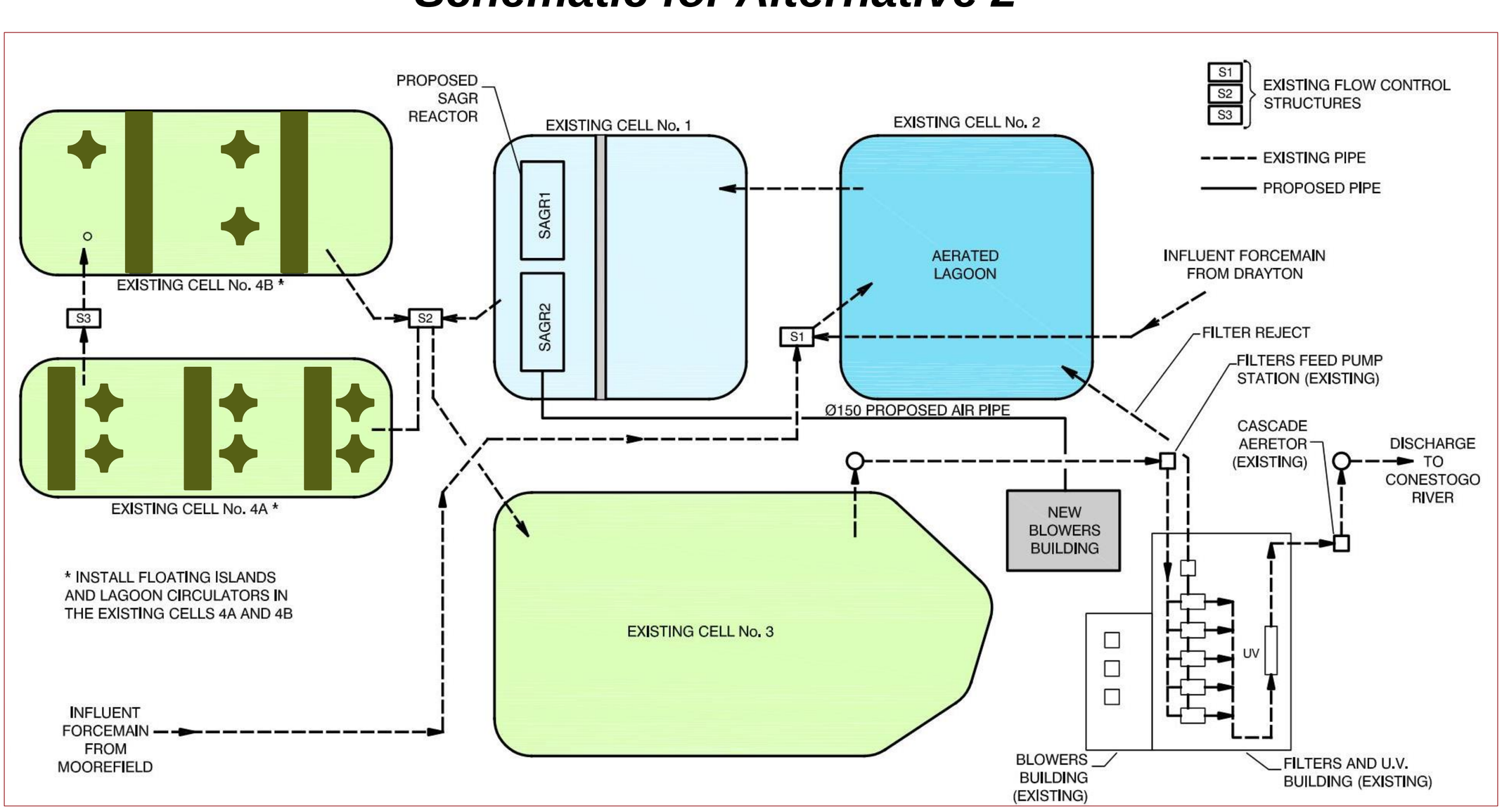
Alternative Treatment Designs

Alternative 2: SAGR with Floating Island Wetland

Key features 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;
- A new blowers building;
- Floating island wetlands and lagoon circulators in lagoons 4A and 4B

Schematic for Alternative 2



Evaluation of Alternative Treatment Designs

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.
Technical	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 Conestoga River	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 mitigated 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 mitigated 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 is anticipated as part of regular facility operations.	Preferred No nuisances due to noise, dust, odour or maintenance traffic is 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 least preferred due to the additional cost of the floating island wetlands.

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

Updated Conestogo River Low Flow Values and Potential Expanded Effluent Discharge Window

- Updated 7Q20 values calculated based on data from 1973 to 2013.
- Proposed discharge window considers updated 7Q20 values and assimilative capacity of Conestogo River.
- Discharge window volumes are currently under review by MOECC / GRCA.

Month	7Q20 Low Flow (m^3/d)	Current Discharge Window (m^3/d)	Proposed Discharge Window (m^3/d)
Jan	22,918	0	4,000
Feb	17,740	0	3,150
Mar	21,129	1,581	3,800
Apr	45,407	3,154	4,000
May	14,738	0	0
Jun	1,643	0	0
Jul	639	0	0
Aug	1,312	0	0
Sep	712	0	0
Oct	3,057	233	180
Nov	15,085	1,754	1,500
Dec	24,402	4,000	4,000

- Total potential annual discharge based calculated discharge window can be up to 624,580 m^3/year.
- Proposed effluent discharge window will easily accommodate new annual effluent flow of 474,688 m^3/year, as well as 53,655 m^3/year of flow resulting from accumulated water from precipitation.
- Total Required Storage (design year) for 5 months @ 1,447 m^3/day is 217,127 m^3 to store effluent and rainwater.
- With a total existing storage of 350,000 m^3, there is sufficient storage available for future needs.

New Proposed Plant Capacity and Effluent Objectives and Limits

- New proposed treatment capacity of the plant is 1,300 m^3/day
- Plant will be designed to hydraulically handle additional 147 m^3/day of precipitation
- New effluent objectives and limits being proposed are based on assimilative capacity assessment and technically achievable standards
- Proposed effluent objectives and limits are subject to provincial approval

Effluent Parameter	Current Effluent Objective	Current Effluent Limit	Proposed Effluent Objective	Proposed Effluent Limit
cBOD5	5.0 mg/L	Apr/Oct: 7.5 mg/L Mar/Nov/Dec: 10.0 mg/L	**5.0 mg/L**	**Apr/Oct: 7.5 mg/L Jan-Mar/Nov/Dec: 10.0 mg/L**
Total Suspended Solids (TSS)	None	None	**10 mg/L**	**15 mg/L**
Total Ammonia Nitrogen (TAN)	3.0 mg/L	5.0 mg/L	**1.0 mg/L**	**3.0 mg/L**
Total Phosphorus (TP)	0.3 mg/L	0.5 mg/L	**0.17 mg/L**	**0.3 mg/L**
E.Coli	100 org./100 mL	200 org./100 mL	100 org./100 mL	200 org./100 mL

Next Steps

Steps	Timing
File ESR	March 2016
Design	March – June 2016
Tendering	July 2016
Construction	August 2016 – March 2017 (pending funding)

We want to hear from You!

Please send us your thoughts, comments and suggestions by February 26, 2016.

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