Village of Limoges
Potable Water and Wastewater Master Plan

Amendment Report

FINAL

September 2, 2016

Prepared for:

R.V. Anderson Associates Limited
engineering · environment · infrastructure

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September 2, 2016

RVA 163302

The Nation Municipality
958 Route 500 West
Casselman, ON K0A 1M0

Attention: Doug Renaud, Waste Water Manager

Dear Mr. Renaud:

Re: Village of Limoges Potable Water and Wastewater Master Plan
AMENDMENT REPORT

R.V. Anderson Associates Limited (RVA) is pleased to submit our final Amendment Report for the Village of Limoges Potable Water and Wastewater Master Plan amendment. This project has been completed in accordance with the Municipal Class Environmental Assessment (MCEA) process.

This amendment was prepared to document the planning process followed in identifying and evaluating additional options for wastewater treatment for the Village of Limoges. The report should be read in conjunction with the Village of Limoges Potable Water and Wastewater Master Plan (January 2013).

Numerous options for wastewater treatment were identified and evaluated based on their ability to increase wastewater treatment capacity to 3,500 m^3/day, meet the recommended effluent criteria, be affordable, reliable, easy to operate and environmentally acceptable. The recommended solution is the addition of an Attached Growth BioCord Pre-Treatment Cell to the existing lagoon system. Disinfection, tertiary filtration and phosphorus offsetting are also required. The capital cost for this solution is estimated at $4.1M.

Should you have any questions, please feel free to contact the undersigned at 1-613-226-1844.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

Trevor Kealey, P.Eng.
Senior Associate, Regional Manager

Beth Hamley, EIT
Environmental Coordinator

Village of Limoges

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Village of Limoges
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EXECUTIVE SUMMARY

In 2013, the Nation Municipality completed the Village of Limoges Potable Water and Wastewater Master Plan to identify the additional water and wastewater infrastructure required to service future growth in the Village. The recommended wastewater treatment solution, a new mechanical wastewater treatment plant (WWTP), later proved to be unaffordable and the Municipality is now seeking other more cost-effective options.

This Amendment was prepared to document the planning process followed in identifying and evaluating additional options for wastewater treatment. The Amendment report should be read in conjunction with the Village of Limoges Potable Water and Wastewater Master Plan (January 2013). Note that only the changes to wastewater treatment proposed in the amendment are open for review.

The existing wastewater lagoon treatment system for the Village of Limoges has a rated capacity of 1,500 m^3/d, based on the re-rating completed in 2014 and is operated on a semi-annual discharge basis (spring and fall). The treatment system was operating at 81% of rated capacity in 2015.

This Amendment presents additional options to increase capacity of the treatment system to 3,500 m^3/day to meet future growth needs, up to a total population of 5,000 persons.

An Assimilative Capacity Study of the Castor River at Limoges was completed as part of the Master Plan and effluent criteria for average flows of 3,500 m^3/day on a continuous basis were identified, as shown below.

Table ES 1 – Recommended Effluent Criteria for 3,500 m^3/day (MOE, May 31 2012)

Parameter	Design Objective	Effluent Limit	Effluent Loading
$cBOD_5$ (mg/L)	3	5	17.3
Total Suspended Solids (mg/L)	3	5	17.3
Total Phosphorus (mg/L)	0.2	0.3	1.0
Total Ammonia-N (mg/L)			
- Summer (May 1 – Oct 31)	0.7	1	3.5
- Winter (Nov 1 – Apr 30)	3	5	17.3
E. coli (counts/100 mL)	100	200	n/a
Total Residual Chlorine (mg/L)	Non-detect	0.02	0.07

The effluent criteria are contingent on providing 210,000 m^3 of storage during low flow months (June, July, and August) to maintain adequate in-stream dissolved oxygen. The Castro River has also been identified as a Policy 2 receiver with respect to total phosphorus; therefore, there shall be no increase in phosphorus loads to the watershed as a result of the greater effluent flow.

Numerous options for wastewater treatment were identified and evaluated based on their ability to satisfy these criteria, to meet short and long term needs, be affordable, reliable, easy to operate and environmentally acceptable. Three composite solutions were identified for further evaluation, as follows:

- Composite Solution A – Attached Growth BioCord Pre-Treatment Cell
- Composite Solution B – Lagoon Retrofit with BioCord System
- Composite Solution C – Post-Lagoon Treatment with SAGR

Note that each composite solution includes disinfection, tertiary filtration and phosphorus offsetting to meet the effluent criteria for E.Coli, TSS and TP, respectively.

Based on further evaluation, including a comparison of preliminary capital cost estimates and consideration of operation and maintenance requirements, Option A (Attached Growth BioCord Pre-Treatment Cell) was put forth as the recommended solution. The capital cost for this solution is estimated at $4.1M.

Impacts of the recommended solution and mitigation measures are consistent with those presented in the Master Plan with no significant impacts. Monitoring requirements will include: reporting of effluent limits per the ECA; toxicity testing for rainbow trout and daphnia magna on a quarterly basis for the first two years; and, monitoring of total phosphorus loads through the South Nation Clean Water Program.

Consultation with the public was done through an open house style Public Information Centre (PIC). Notices of the PIC and filing of the Amendment were posted on the Municipality's website, in local papers, and sent to agencies and stakeholders previously identified during the Master Plan process. No written comments were received.

Following the 30-day public review process and subject to no Part II Order requests, the Municipality intends to proceed with design and construction of the recommended solution. Construction is anticipated to take place in 2017.

1.0 INTRODUCTION

In 2013, the Nation Municipality completed the Village of Limoges Potable Water and Wastewater Master Plan to identify the additional water and wastewater infrastructure required to service future growth in the Village.

The preferred wastewater treatment solution was the construction of a new mechanical wastewater treatment plant (WWTP) using Sequencing Batch Reactors (SBR), to be implemented in two (2) stages. The first stage includes installation of the WWTP adjacent to the existing lagoons with a rated capacity of 3,500 m^3/d and the second stage involves expansion of the plant to a rated capacity of 6,900 m^3/d. The cost estimates presented in the Master Plan for Stage 1 and 2 were $8.4M and $11.6M, respectively. An interim stage of the solution was to re-rate the existing facility from 1,073 m^3/d to 1,500m^3/d to permit imminent growth of approximately 1,100 persons. Re-rating was successfully completed in June 2014.

The Municipality proceeded with design of the WWTP for Stage 1 where the functional design-level cost estimate for the upgrades was $17M, which was double the estimate given at the Master Plan stage. Given the significant cost increase and lack of available grant funding, the solution proved unaffordable and the Municipality is now seeking other more cost-effective options.

R.V. Anderson Associates Limited (RVA) was retained by the Nation Municipality to reconsider wastewater treatment alternatives for the Village of Limoges. This amendment report was prepared to document the planning process followed to identify and evaluate additional alternative solutions.

1.1 Class Environmental Assessment Process

The Municipal Class Environmental Assessment (EA) is the planning process that proponents must follow to meet the requirements of the Ontario Environmental Assessment Act. The EA approach includes the evaluation of alternative solutions to a defined problem and mandatory requirements for public and agency input.

The wastewater treatment component of the Master Plan is considered a Schedule C project. As such, it is subject to the full Five Phase Planning Process in which the problem is defined, alternative solutions are presented, a preferred solution is selected, alternative methods of implementing the preferred solution are examined, and an Environmental Study Report (ESR) is completed to document the rationale, planning, design and consultation process (Figure 1.1).

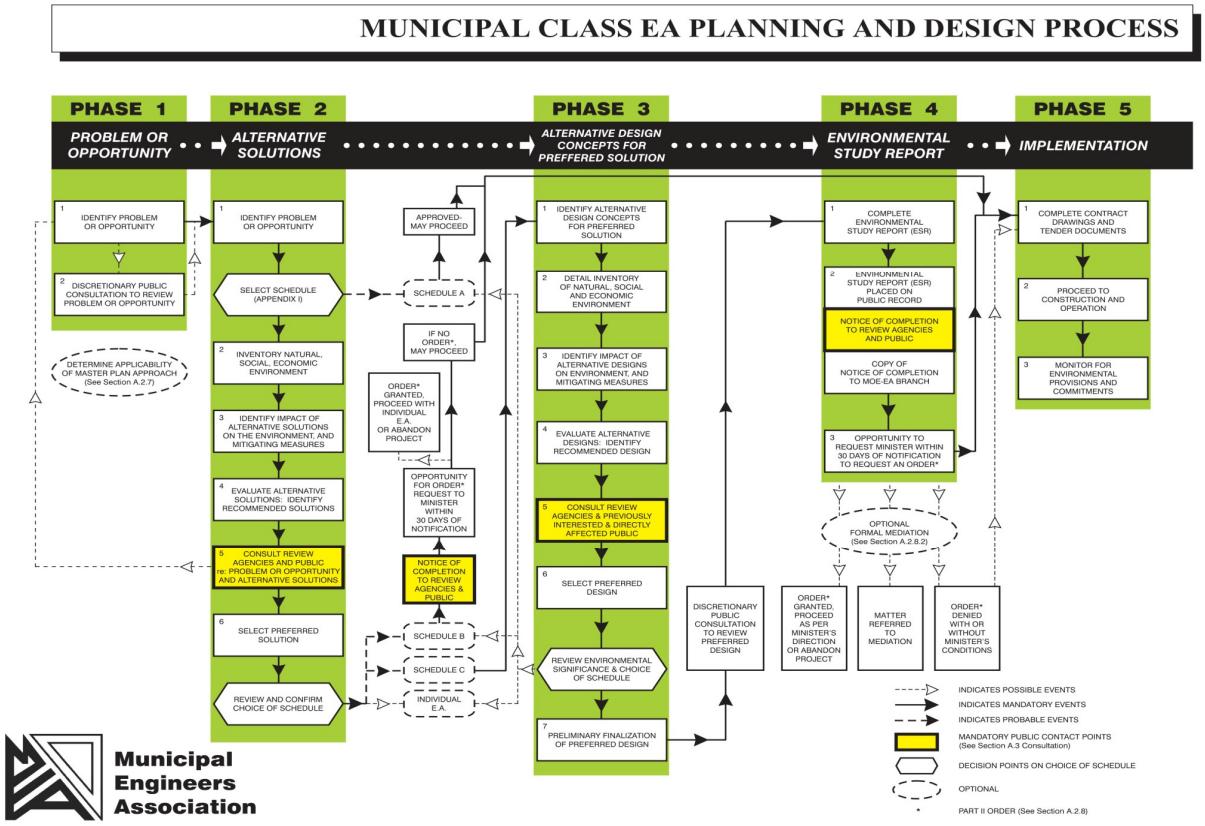

Figure 1.1 – Municipal Class Environmental Assessment Process (MEA, 2011)

Per the Municipal Class Environmental Assessment (October 2000 as amended in 2007 and 2011), an Amendment can be filed when circumstances render the recommended project unfeasible and the proponent is considering additional alternatives.

In this amendment, the preferred wastewater treatment solution is reviewed. There are no changes to the project definition or the existing environmental conditions presented in the Master Plan. The amendment should be read in conjunction with the Village of Limoges Potable Water and Wastewater Master Plan (January 2013); however, only the changes to wastewater treatment proposed in the amendment are open for review.

This study was completed in accordance with requirements of the Municipal Class Environmental Assessment (MCEA) process. Subject to comments received and necessary approvals, the Municipality intends to proceed with the design and construction of the recommended solution.

2.0 BACKGROUND

2.1 Existing Development

There are approximately 1271 units in Limoges (population of 3,813) that have municipal sewer services, of which the majority are low density residential dwellings. Most of the fully serviced developments are located in the Urban Policy Area designation, north of the 417 and east of Limoges Road.

Industrial/commercial/institutional (ICI) development is located in both the Urban Policy Area and the designated Trade and Industry Policy Area. There is currently about 27ha of ICI land serviced by sewers.

2.2 Future Development

The existing wastewater treatment system is near capacity now and additional growth cannot be accommodated in its present condition. There are currently numerous development applications for the Nation, which will remain pending until such time as additional capacity is provided.

The Master Plan Study considered future development in two stages when developing wastewater treatment options. Stage 1 corresponds to a total population of 5,000. Stage 2 considered long term growth, corresponding to an ultimate build-out population of 10,900. Further details on population projections are available in Section 2.0 of the Master Plan.

Wastewater treatment for Stage 1 (total population of 5,000) is addressed in this amendment.

2.3 Wastewater Flows

The Limoges Sewage Treatment Lagoon Facility has a rated capacity of 1,500 m^3/d, based on the re-rating completed in 2014. The effluent limits, as per ECA No. 3-1820-97-986 issued on June 3 2014, are shown in Table 2.1.

Table 2.1 – Current Effluent Limits

Effluent Parameter	Non-Compliance		Design Objectives	
	Concentration (mg/L)	Annual Loading (kg/yr)	Concentration (mg/L)	Annual Loading (kg/yr)
Carbonaceous biochemical oxygen demand ($cBOD_5$)	30	16,425	25	13,690
Total Suspended Solids (TSS)	40	21,900	30	16,425
Total Phosphorus (TP)	0.7	383	0.7	383
Total Ammonia Nitrogen (TAN)				
- Spring Discharge	14		12	
- Fall Discharge	3		2	
Total Hydrogen Sulphide	0.04		Non-detect	

The lagoon is operated on a semi-annual discharge basis with the following allowable discharge periods:

- Spring: March 1st – May 15th
- Fall: October 1st – December 15th

Per the ECA, spring discharge is to be as early as possible. Prior to and during fall discharge, the Castor River 7-day moving average flows must be monitored and dilution ratios greater than 7.5 to 1 must be maintained during discharge.

The average daily flow in 2015 was 1,209 m^3/d, or 81% of rated capacity. The maximum daily flow of wastewater entering the Limoges facility was 1822 m^3/d during month of May and the minimum was 893 m^3/d in February. The operating conditions and performance of the existing lagoon system (2013 to 2015) are summarized in Table 2.2.

Table 2.2 – Current Loading Rates and Effluent Quality at 1,283 m^3/d

Parameter	Average Influent Loadings (kg/ha-d)	Average Effluent Quality (mg/L)
Carbonaceous biochemical oxygen demand ($cBOD_5$)	9.8	5.2
Total Suspended Solids (TSS)	13.2	8.3
Total Kjeldahl Nitrogen (TKN)	2.2	-
Total Ammonia Nitrogen (TAN)		
– Summer	-	10.1
– Winter	-	2.7
Total Phosphorus (TP)	0.27	0.18

2.3.1 Future Flows and Effluent Criteria

The design flow for Stage 1 is 3,500 m^3/day. An Assimilative Capacity Study of the Castor River at Limoges, including field data collection and analysis, was carried out by Golder Associates Limited as part of the Master Plan and Feasibility Study for the recommended solution. Through consultation with the Ontario Ministry of the Environment and Climate Change (MOECC) during the Master Plan process, effluent criteria for an average flow of 3,500 m^3/day on a continuous discharge basis were defined (Table 2.3).

Table 2.3 – Recommended Effluent Criteria for 3,500 m^3/day (MOE, May 31 2012)

Parameter	Design Objective	Effluent Limit	Effluent Loading
$cBOD_5$ (mg/L)	3	5	17.3
TSS (mg/L)	3	5	17.3
TP (mg/L)	0.2	0.3	1.0
TAN (mg/L)			
- Summer (May 1 – Oct 31)	0.7	1	3.5
- Winter (Nov 1 – Apr 30)	3	5	17.3
E. coli (counts/100 mL)	100	200	n/a
Total Residual Chlorine (TRC) (mg/L)	Non-detect	0.02	0.07

It was noted in correspondence with the MOECC (May 31 2012) that:

> "During the months of June, July, and August, there will be certain low flow periods when discharge will not be allowed (based on maintaining adequate in-stream DO)".

As specified in the Mechanical Treatment Plant Feasibility Study (Golder, 2012), approximately 210,000 m^3 of storage must be provided for the low flow period in the Castor River (June, July and August).

The Castor River has been previously identified as Policy 2 (i.e. not meeting MOECC objectives) with respect to total phosphorus. As such, the future recommended effluent limit for phosphorus of 0.3 mg/L (1.0 kg/day) is conditional to ensuring that there will be no increase in phosphorus loads to the watershed as a result of the greater effluent flow.

This Amendment presents additional options to increase capacity of the treatment system to 3,500 m^3/day (to serve a population of approximately 5,000 persons) while meeting the recommended effluent criteria and storage requirements identified above.

3.0 ALTERNATIVE SOLUTIONS

Alternative solutions are presented below. The Municipality requires a solution that will provide additional treatment capacity to meet short and long term needs, be affordable, reliable, easy to operate and environmentally acceptable. Note that the best solution may be a combination of the options below.

3.1 Alternative 1: Do Nothing

The “Do Nothing” alternative does not satisfy the problem definition. The wastewater treatment capacity would remain unchanged, and would not be sufficient to serve future growth. This alternative is not carried forward for further consideration.

3.2 Alternative 2: New Treatment Cells (Lagoon)

Additional lagoon treatment cells could be added or the existing cells could be expanded in order to gain more treatment capacity. This option was evaluated in the 2013 Master Plan and was eliminated based on the potential need for additional land and multiple land ownership deals. This alternative is not carried forward for further consideration.

3.3 Alternative 3: Mechanical Wastewater Treatment Plant (WWTP)

The mechanical wastewater treatment plant alternative would include the construction of a stand-alone sewage treatment facility on or near the site of the existing sewage lagoons. This option was selected as the preferred alternative in the 2013 Master Plan. Extended Aeration was identified as the preferred type of WWTP with sub-options including: conventional extended aeration; Membrane Bioreactors (MBR); Sequencing Batch Reactors (SBR); and, Oxidation Ditch.

A SBR plant was ultimately selected as the best option due to relative low capital cost. However, this is solution is no longer feasible due to prohibitive costs and a lack of funding available to the Municipality. This alternative is not carried forward for further consideration.

3.4 Alternative 4: Connect to Adjoining Municipalities

This alternative would include the construction of a sewer forcemain to connect to an existing neighbouring municipality sewage collection system. This option was evaluated in the 2013 Master Plan and was eliminated due to high costs, construction complexities, lack of phasing options, and conveyance risks.

There may potentially be treatment capacity available at the Russell lagoon system. However, this would require the construction of a forcemain approximately 10km long

and other studies. Given these reasons and those identified in the Master Plan, this alternative is not carried forward for further consideration.

3.5 Alternative 5: Influent Pre-Treatment

Pre-treatment can be used at the front-end of the lagoon to improve the quality of the influent. By reducing influent loading rates of key parameters to or below the current values, the lagoon system would continue to provide the current effluent quality for $cBOD_5$, TSS and TP, along with enhanced ammonia removal. This alternative is short-listed for further consideration with the following pre-treatment options.

3.5.1 Suspended Growth Pre-Treatment Cell

This option would entail providing a new suspended growth aerated lagoon cell with a hydraulic residence time (HRT) of 3-5 days, upstream of the existing lagoon system. This would provide bulk removal of the $cBOD_5$ from the raw sewage and reduce the influent loads to the existing lagoons equal or below the current loads. This would ensure that the system could maintain the current effluent quality for a capacity of 3,500 m^3/d. However, one major drawback of this option would be its inability to remove sufficient ammonia in the winter months to meet future effluent criteria. As such this option is not carried forward for further consideration.

3.5.2 Attached Growth BioCord™ Pre-Treatment Cell

This option would entail providing a new attached growth aerated pre-treatment lagoon cell with a hydraulic residence time of 1 day, upstream of the existing lagoon system. The proposed attachment media is the proprietary BioCord units which would be placed at the influent and discharge sections of the pre-treatment cell and would serve the functions of $cBOD_5$ and ammonia removal, respectively. This system would provide bulk removal of the $cBOD_5$ from the raw sewage and reduce influent loads to equal or below current loads, and would provide ammonia removal to the levels required in the future effluent criteria.

The feature that sets this system apart from the suspended growth system is its ability to de-couple solids retention time (SRT) from HRT as it keeps the biomass from leaving the cell with the effluent due to its attachment to the media. Furthermore, the media allows maintenance of large and active inventories of biomass for BOD and ammonia removal which is not possible with a flow-through suspended growth system.

This alternative would ensure that the existing lagoons maintain the current effluent quality for $cBOD_5$, TSS and TP, and would facilitate compliance for TAN at a capacity of

3,500 m^3/d. As such this option is carried forward for further consideration. A proposal was obtained from Bishop Water Technologies for this option (Appendix 2).

3.5.3 Rotating Biological Contactor (RBC)

The rotating biological contactor is a fixed-film process that may be used to provide secondary treatment and can be operated in seasonal or continuous nitrification and denitrification modes (MOE, 2008). RBC processes require a relatively low power input to supply oxygen, requires no recycle process and has minimal maintenance, all of which result in low operational costs.

RBCs are typically used for small community applications with flows less than 1,000 m^3/d. The treatment capacity of a single RBC unit is limited by the shaft that rotates the biomass media discs and usually does not exceed 150 m^3/d. As such, capacities higher than 150 m^3/d require multiple units. Based on the design flow of 3,500 m^3/d, an RBC system for this application would potentially require a set of 24 units. Moreover, the necessity of a primary clarification facility for an RBC system will not only add an additional process but also increase operational requirements for primary sludge handling along with adding potential odour issues. Further, the units will have to be enclosed in a building for inspection and maintenance which would be an additional cost to the system.

A large number of moving parts, high level of structural maintenance and frequent shaft failures would make the operation and maintenance significantly more onerous and costly than the existing operation. As such, this alternative is not carried forward for further consideration.

3.5.4 Moving Bed Biofilm Reactor (MBBR)

This option being based on an attached growth system is similar to the BioCord pre-treatment option, with the key differences being that it utilizes a small concrete aeration tank as opposed to an earthen cell, and the media is suspended in the mixed liquor, unlike BioCord where the media is stationary.

While this option is technically viable and potentially cost competitive (from a capital cost viewpoint) with the fixed media options like BioCord, the aeration in this systems is governed by the requirement of keeping the media in suspension and mixed in the tank contents, as opposed to just meeting the biochemical demands for $cBOD_5$ and ammonia-N removal. This requirement necessitates coarse bubble aeration which is up to four (4) times less efficient than the fine bubble aeration used in the fixed media systems. This operational limitation leads to significantly higher operational costs for the

size of the proposed application which in turn could translate into unsustainable life cycle costs.

Since this solution was found to be a technically viable technology, a proposal for an MBBR system was obtained from a reputed supplier and reviewed for its financial sustainability. Refer to Appendix 2 for the supplier proposal.

The proposed MBBR system had an aeration system comprising of total installed blower power of 450 kW as opposed to 26 kW in the BioCord option. This translated into an operational cost for the MBBR system being an order of magnitude higher than the BioCord option. While this option has technical viability similar to that of the attached growth option, the MBBR option has not been carried forward for further consideration due to its evident low financial sustainability over the life cycle.

3.6 Alternative 6: Lagoon Optimization / Retrofit

To address high TKN, the lagoon can be retrofitted with an attached growth nitrification system at the effluent side. Such systems are known to provide effective nitrification at temperatures close to 1°C. The two (2) potential options to implement this alternative are discussed below.

3.6.1 Enhanced Aeration

The aeration capacity in the existing lagoon system will be inadequate for increased organic loading at a capacity of 3,500 m^3/day. As such this alternative would include enhancing the aeration capacity to treat the additional BOD loads. While this would enable the lagoons to treat the higher BOD loads, it would not be able to provide the required level of ammonia removal to meet future effluent criteria. The primary reason for that would be insufficient concentration and inventory of nitrifying biomass to compensate for the near freezing temperatures during the winter. Therefore, this alternative is not carried forward for further consideration.

3.6.2 Attached Growth BioCord™ System

This option would entail installation of the proprietary attached growth BioCord units in two areas – at the influent side and at the effluent side – in one of existing lagoon cells. Both areas will be provided with their own dedicated diffused aeration systems. While the influent side area would treat the bulk BOD removal, and the effluent side area would provide nitrification to the levels required in the future effluent criteria. The basis of providing high level of BOD and ammonia removal by these systems is the concentration of active and large inventory of heterotrophs (BOD consumers) and autotrophs (ammonia removers) on the attachment media installed at appropriate locations in the

lagoon. As such, this option for the lagoon optimization/retrofit alternative is short-listed for further consideration. A proposal was obtained from Bishop Water Technologies for this option (Appendix 2).

3.7 Alternative 7: Post-Lagoon Treatment

3.7.1 Submerged Attached Growth Reactor (SAGR®)

The SAGR is a post treatment tertiary biological filter that uses submerged attached growth medium to polish effluent and reduce required residence time in a lagoon, both of which contribute to improved hydraulic performance. The technology has a small footprint consisting of aerated cells filled with crushed stone and treatment bacteria to polish the existing lagoon effluent.

This technology offers the potential to improve effluent quality, in particular relating to Total Ammonia, Carbonaceous Biochemical Oxygen Demand ($cBOD_5$), and Total Suspended Solids (TSS), as well as fecal and total coliforms. This alternative is short-listed for further consideration. A proposal was obtained from Nelson Environmental Inc. for this option (Appendix 2).

3.7.2 Rotating Biological Contactor (RBC)

As indicated in Section 3.5, an RBC system could be used to provide secondary treatment for both BOD and ammonia removal. However, for a post lagoon application like this, the RBC system would be expected to provide full nitrification at temperatures approaching 0℃ in winter – a unique requirement that RBCs are not typically designed for. Further, there is no historic evidence of the RBC systems having been used for such application. As such, there is a significant risk in using RBC system for this application. Therefore, and this alternative is not carried forward for further consideration.

3.7.3 New Hamburg Process

The New Hamburg Process involves intermittent sand filters through which lagoon effluent flows prior to discharge. This process can be located downstream of the existing lagoon and can deliver a high quality effluent; however, the filter system does not operate in freezing months and would require a minimum of 5-6 months of storage capacity. Filter clogging is a known operational issue, just one of many that have plagued existing installations. As such this alternative is not carried forward for further consideration.

3.7.4 Constructed Wetland

A constructed wetland system could be located downstream of the lagoon. Wetlands are self-sustaining systems with limited operational input. These have low capital and operational costs as there are no mechanical components. While a wetland would provide additional nitrogen and phosphorus removal, the effluent quality from these systems is known to be inconsistent as it can vary seasonally. In addition, the stringent TAN limits in the future effluent criteria are not achievable in this system. Also, this addition may cause disruption to the shore and flow patterns in the Castor River. As such this alternative is not carried forward for further consideration.

3.8 Alternative 8: Alternate Discharge to South Nation River

The recommended effluent limits for $cBOD_5$, TSS and TP of 5 mg/L, 5 mg/L and 0.3 mg/L respectively will either require tertiary filtration or an alternative discharge location that allows for higher effluent limits that can be achieved without tertiary filtration. This alternative entails discharging to an alternate location, the South Nation River. Note that additional EA work and an assimilative capacity study will be required if this option is carried forward.

Discharging to the South Nation River would involve the construction of a pumping station and forcemain with an approximate length of 8.0 km from the lagoon to a discharge point downstream of Casselman. The minimum flow in the South Nation River is about three times larger than that of the Castor River, which would provide an enhanced assimilative capacity potentially resulting in higher effluent limits for $cBOD_5$, TSS, TP and TAN. An Assimilative Capacity Study would be required for the South Nation River.

While most of this forcemain could be installed via an open cut excavation, some directional drilling would be required to cross Highway 417 and potentially in the regulation area of the South Nation River.

4.0 PRELIMINARY EVALUATION & SHORTLISTING

4.1 Short-List of Solutions

Based on the descriptions in Section 3, the following alternative solutions are shortlisted and carried forward for further evaluation.

1. Influent Pre-Treatment with Attached Growth BioCord Pre-Treatment Cell
2. Lagoon Retrofit with Attached Growth BioCord System
3. Post-Lagoon Treatment with SAGR; and,
4. Alternate Discharge to South Nation River.

It should be noted that none of the short-listed alternatives are capable of achieving compliance with the recommended future effluent criteria for E.Coli, TP and TSS. As such, disinfection and tertiary filtration will be essential components of any preferred alternative solution selected out of those described above. Refer to Section 5.4 for details on the additional treatment requirements.

4.2 Key Evaluation Factors

The evaluation of the shortlisted alternatives has been carried out as two (2) step process. In the first step, the shortlisted alternative solutions are evaluated based on their potential to address the two key factors for a successful solution.

4.2.1 Treatment to the Meet Effluent Criteria

This factor considers whether a solution can meet the recommended effluent criteria for the key effluent parameters ($cBOD_5$, TSS, TP, TAN) at a flow of 3,500 m^3/day.

4.2.2 Storage Capacity

At a flow of 3,500 m^3/day, 210,000 m^3 of storage is required for the low flow periods in the Castor River from June to August. This factor considers whether an alternative allows the existing lagoons to be used to provide the full storage required or it would need additional storage to be built alongside the existing lagoons.

4.3 Evaluation Summary

Table 4.1 presents a summary of evaluation for the short-listed alternatives. Each factor was evaluated on a yes/no basis. Green boxes represent “Yes” indicating that a solution addresses the factor, and red box represents “No” indicating that a solution does not address the factor.

Table 4.1 – Feasibility Evaluation Summary

Alternative Solutions	Treatment at 3,500 m^3/day (All limits in mg/L)				Storage Capacity	Comments
	cBOD5 5.0	TSS 5.0	TP 0.3	TAN 5.0/1.0	210,000 m^3	
1 Influent pre-treatment with BioCord						TSS, TP & E.Coli criteria to be achieved with tertiary filtration and disinfection in all alternatives.
2 Lagoon retrofit with BioCord system						
3 Post-Lagoon treatment with SAGR						
4 Alternative discharge to South Nation River						This option can provide a potential solution in conjunction with any of the other 3 solutions

Given below are the key observations from this evaluation.

1. A dedicated disinfection system will be required to meet future effluent requirements for E.Coli. As such, a disinfection facility will be a component of any solution.
2. Tertiary filtration is also a necessary component of any solution to meet effluent requirements for TSS.
3. Similarly, phosphorus offsetting will be a component of any solution to satisfy the future effluent criteria.
4. While an alternative discharge to the South Nation River would not meet the treatment objectives by itself, it could used in conjunction with one of the other three alternatives. This would potentially limit the need for tertiary filtration from the selected alternative.

5.0 COMPOSITE ALTERNATIVE SOLUTIONS

Based on the evaluation summary and the observations on the individual alternative solutions presented in Section 4, three (3) composite alternative solutions comprised of multiple individual alternatives are carried forward. Each composite solution includes disinfection and phosphorus offsetting, further described in Section 5.4.

Composite Solution A – Influent pre-treatment with attached growth BioCord pre-treatment cell followed by existing lagoon cells, disinfection, filtration/alternate discharge location, and phosphorus offsetting

Composite Solution B – Lagoon Retrofit with attached growth BioCord system followed by disinfection, filtration/alternate discharge location, and phosphorus offsetting

Composite Solution C – Existing lagoons, followed by post-lagoon treatment with SAGR, disinfection, filtration/alternate discharge location, and phosphorus offsetting

Each alternative solution has two (2) sub-options: Filtration and Alternate discharge location. In order to meet future effluent criteria for $cBOD_5$, TSS and TP at a flow of 3,500 m^3/day, one of these two sub-options is required.

5.1 Composite Solution A – Attached Growth BioCord Pre-Treatment Cell

This solution comprises of a new attached growth (BioCord) aerated lagoon preceding the existing lagoon cells, followed by disinfection and finally either tertiary filtration or an alternate discharge location. In addition, phosphorus offsetting in the watershed will form part of this solution, if/when required. With over 90% $cBOD_5$ removal in the pre-treatment cell, this option would enable part of the existing lagoon volume to be used for polishing treatment and maintain the current treatment levels for $cBOD_5$, TSS and TP.

Assuming a conservative 90% $cBOD_5$ removal in the pre-treatment cell, the effluent $cBOD_5$ from this cell would be approximately 13 mg/L (influent $cBOD_5$ of 129 mg/L), which translates into a $cBOD_5$ loading of 45.5 kg/d. In order to maintain the current loading rate of 9.8 kg $cBOD_5$/ha-d (Table 2.2), the lagoon area required for treatment would be 4.6 ha which translates into a treatment volume of 93,000 m^3. This means that out of the total 340,000 m^3 of existing lagoon volume, 247,000 m^3 will be available for effluent storage, which is greater than the storage requirement of 210,000 m^3 for a capacity of 3,500 m^3/d. See Figure 5.1 for a process schematic of this solution.

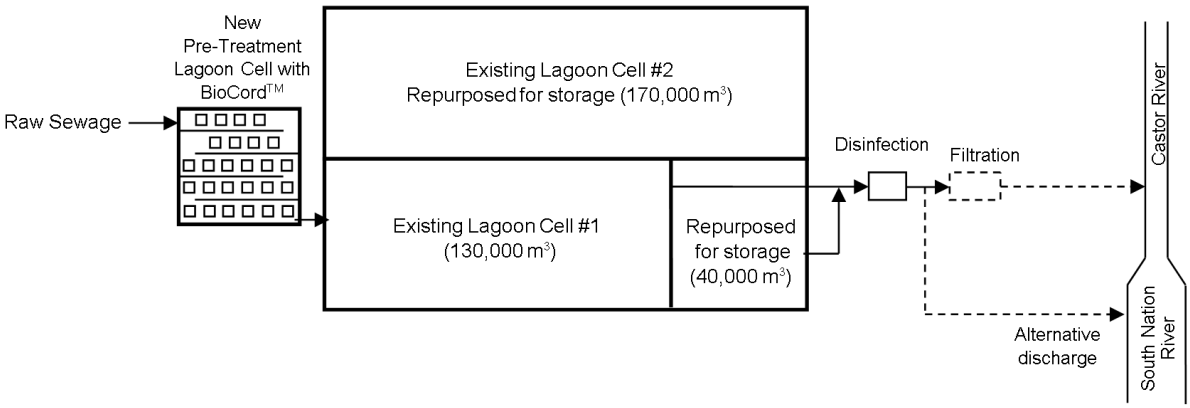

Figure 5.1 – Schematic of Composite Solution A

Note that the MOECC has reviewed the BioCord technology under the New Environmental Technology Evaluation (NETE) program. The evaluation letter, dated February 7, 2013, indicates that:

> "The BioCord treatment technology has the potential to be applied at sewage treatment works when an increase in capacity and/or performance (e.g., nitrification) is needed. This technology also has the potential to provide smaller footprint for the treatment system".

As such, the BioCord system is considered an MOECC accepted technology. Refer to Appendix 3 for the NETE evaluation letter from the MOECC. Bishop Water Technologies has also provided a proposal outlining the specifics of a BioCord pre-treatment system for the Limoges lagoon, including expected performance (Appendix 2).

5.2 Composite Solution B – Lagoon Retrofit with BioCord System

This solution includes retrofitting one of the existing lagoon cells with the BioCord attached growth media system, followed by disinfection and finally either tertiary filtration or an alternate discharge location. In addition, phosphorus offsetting in the watershed will form part of this solution, if/when required. This solution is similar in concept to Composite Solution A with the exception that the BioCord units are placed within an existing lagoon cell as opposed to a new pre-treatment cell. Figure 5.2 shows a process schematic of this solution.

Since the BioCord units are to be installed both at influent and discharge side of the existing lagoon, the pre-existing sludge deposits in the lagoon will have to be cleaned prior to BioCord installation for the treatment to be effective and efficient. Since this would have to be done with the lagoon system in operation, the clean out would have to be suitably staged during construction.

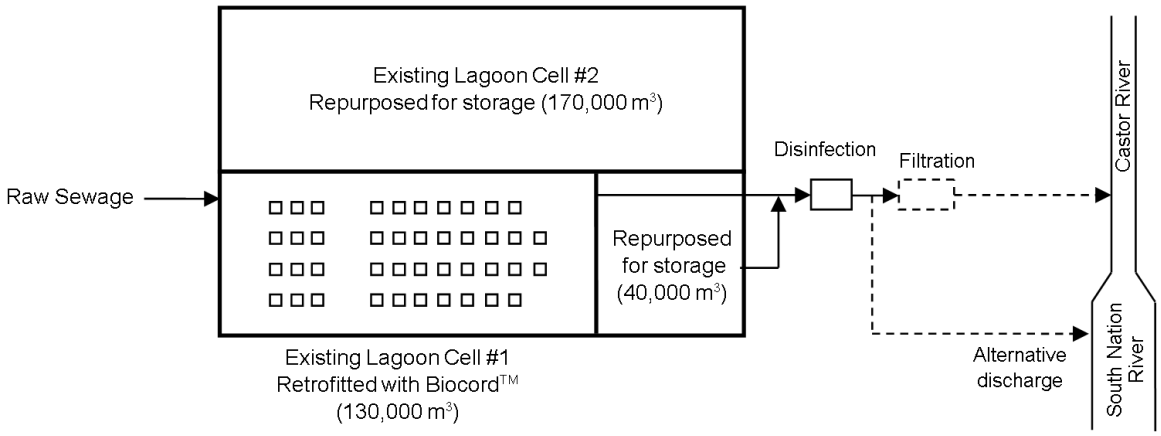

Figure 5.2 – Schematic of Composite Solution B

As noted in Section 5.1, the BioCord is considered an MOECC accepted technology. Refer to Appendix 2 for the proposal provided by Bishop Water Technologies and Appendix 3 for the NETE evaluation letter.

5.3 Composite Solution C – Post-Lagoon Treatment with SAGR

This option would retain the existing lagoons to provide the bulk of treatment for $cBOD_5$, TSS and TP, followed by a SAGR system for ammonia removal to meet the future criteria. Like the other two alternatives, this will also have tertiary treatment (filtration) and disinfection, or an alternate discharge location. In addition, phosphorus offsetting in the watershed will form part of this solution, if/when required.

A section in the existing lagoon will be converted to a fully aerated section to achieve effluent quality of 25 mg/L and 25 mg/L for $cBOD_5$ and TSS respectively. Effluent from this portion would then pass through the SAGR system which would provide TAN removal and polishing for $cBOD_5$ and TSS to meet the future effluent criteria. The remainder of the lagoon would be used for storage. See Figure 5.3 for schematic of this solution. Refer to Appendix 2 for additional details on the SAGR system.

Since this alternative requires the conversion of a section of the lagoon to a fully aerated cell, the sludge deposited in the aerated cell section would have to be removed prior to its conversion. Since this would have to be done with the lagoon system in operation, the clean out would have to be suitably staged during construction.

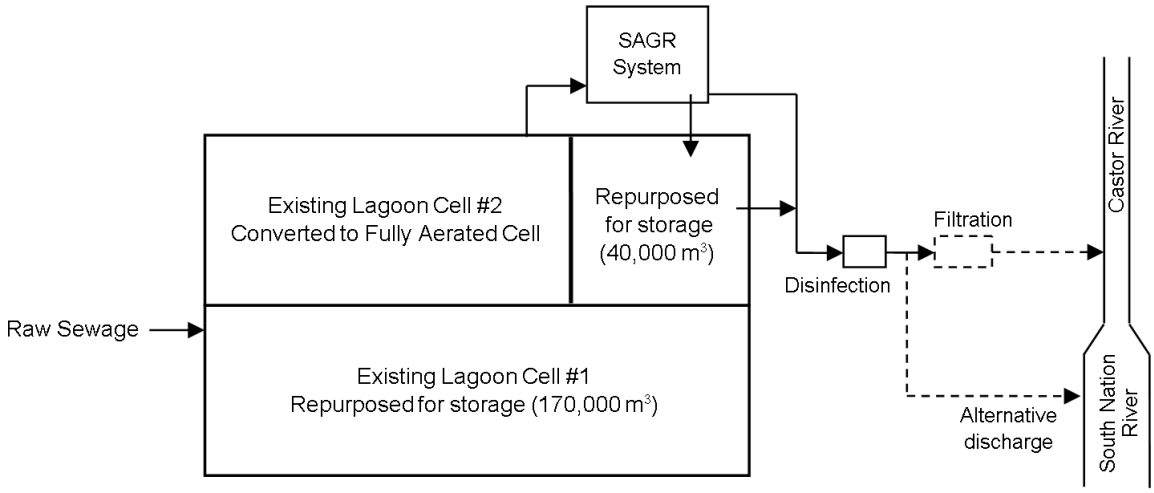

Figure 5.3 – Schematic of Composite Solution C

5.4 Additional Treatment and Upgrade Requirements

5.4.1 Disinfection

Effluent criteria for a flow of 3,500m^3/d stipulates an effluent limit of 200 CFU/100 mL for E.Coli. As such, disinfection would be an essential component of any solution. Disinfection will be done by either a UV or chlorination/dechlorination system. While chlorination/ dechlorination based disinfection has slightly lower capital and O&M costs, UV systems are typically easier to operate and monitor. An evaluation of the two systems will be done during the preliminary design stage to identify the preferred option.

5.4.2 Tertiary Filtration

The effluent criteria for a flow of 3,500 m^3/d stipulate effluent $cBOD_5$, TSS and TP of 5 mg/L, 5 mg/L and 0.3 mg/L respectively. The existing lagoon system at an average flow of 1,400 m^3/day produces effluent quality that marginally exceeds the future $cBOD_5$ limit but is well in compliance with the future TP limit. Average effluent TSS on the other hand exceeds the future limit. As such, a tertiary filtration system will be required after the existing lagoons to keep these parameters in compliance with the above limits. Fabric filters have comparable costs to conventional sand filters and are increasingly favoured against the latter due to their small foot print and easier operation and maintenance.

Tertiary filtration will be an essential component of any solution. The only exception where it may not be required is if an alternate discharge location is found feasible, cost effective and allows higher effluent limits for discharge.

5.4.3 Phosphorus Offsetting

The Castor River has been previously identified as Policy 2 (i.e. not meeting MOECC objectives) with respect to total phosphorus. As such, there shall be no increase in phosphorus loads to the watershed as a result of the greater effluent flow. While the alternative solutions will meet the recommended effluent criteria of 0.3mg/L TP, additional phosphorus offsetting in the watershed will be required to ensure no increase in total loadings.

The South Nation Clean Water Program is an award-winning program that has been in operation for over 20 years. As Limoges is in the South Nation watershed, the municipality may be eligible to participate in a total phosphorus management program. This will require negotiations with the Conservation Authority to determine the details of the agreement, including the total loading to be offset, the proposed offset ratio, and funding details. Note that the Municipality previously had an agreement with South Nation Conservation to offset phosphorus loads in the watershed when the lagoon system was constructed in 2000.

5.4.4 Power Requirements

The existing power supply at the facility is 200A/660V/3-phase. While the current facility load is approximately 120A, preliminary load calculations indicate that the proposed upgrades, including filtration and disinfection, would increase the loadings beyond 200A. As such a new transformer would likely be required to provide power for the future loads.

6.0 CAPITAL COST COMPARISON

6.1 Option Summary

Three composite solutions are being considered as viable options, each with two sub-options (Table 6.1). The sub-options address upgrades to accommodate a capacity of 3,500 m^3/d where either tertiary filtration is provided after lagoon treatment or the discharge is redirected to the South Nation River. Note that all options also include disinfection and phosphorus offsetting, discussed in Section 5.4.

Table 6.1 – Option Summary

No.	Description
A1	Attached Growth BioCord Pre-Treatment Cell and Filtration
A2	Attached Growth BioCord Pre-Treatment Cell and Alternate Discharge
B1	Lagoon Retrofit with BioCord System and Filtration
B2	Lagoon Retrofit with BioCord System and Alternate Discharge
C1	Post-Lagoon Treatment with SAGR and Filtration
C2	Post-Lagoon Treatment with SAGR and Alternate Discharge

6.2 Capital Cost Comparison

Preliminary capital cost estimates were prepared to compare the proposed options. Estimates are summarized in Table 6.2. Refer to Appendix 1 for a detailed breakdown.

As shown in Table 6.2, the options that include an alternate discharge are significantly more expensive than their respective filtration co-alternative (about $3M more). Moreover, it is possible that tertiary filtration may still be required in spite of a higher assimilative capacity of the South Nation River, which would further increase the cost of these alternatives. Changing the discharge location would also require additional studies on the South Nation River and would further delay the project. As such, this alternative is rejected based on higher cost and risk of project delay.

The SAGR alternative, while technically viable, is about 2.5 – 4 million dollars more expensive than BioCord options.

Of the two BioCord options, A1 (BioCord Pre-treatment Cell) is more cost effective than Option B1 (Lagoon Retrofit with BioCord system). In addition, the pre-treatment cell offers significantly easier operation and maintenance than the retrofit option.

Table 6.2 – Class C Cost Estimate Comparison

	A1	A2	B1	B2	C1	C2
Construction Costs	$2,331,200	$4,431,200	$3,077,600	$5,177,600	$4,835,000	$6,935,000
Phosphorus Offset Program*	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000
Engineering Fees (10%)	$263,120	$473,120	$337,760	$547,760	$513,500	$723,500
Construction Contingency (10%) & Bonds/Insurance (6%)	$420,992	$756,992	$540,416	$876,416	$821,600	$1,157,600
Estimating Contingency (20%)	$663,062	$1,192,262	$851,155	$1,380,355	$1,294,020	$1,823,220
TOTAL	**$4,000,000**	**$7,200,000**	**$5,100,000**	**$8,300,000**	**$7,800,000**	**$10,900,000**

** Estimate only- Total offset amount to be confirmed based on performance of preferred solution and in agreement with South Nation Conservation*

7.0 RECOMMENDED SOLUTION

Based on the evaluation presented in Sections 6.0, Option A1- Attached Growth BioCord Pre-Treatment Cell and Filtration is recommended as the preferred alternative.

Disinfection, by either a UV or chlorination/dechlorination system, will also form part of the solution and will be further evaluated during preliminary design. Similarly, phosphorus offsetting in the watershed will be implemented in agreement with South Nation Conservation. This will be better defined at the preliminary design stage.

7.1 Impacts and Mitigation

The impact assessment presented in Section 7.3 of the Master Plan is generally consistent with the impacts of the recommended solution presented herein as the study area has not changed. Table 7.1 shows a summary of the impacts considered in the Master Plan and how they differ when applied to the recommended solution of this amendment. In general, the recommended BioCord solution will have fewer impacts than the new mechanical WWTP recommended in the Master Plan.

Social environment impacts are expected to be less as the BioCord system will have a shorter construction period, thereby lessening the noise, vibration and air quality impacts. No additional land easements or property acquisition are required, so there will be no changes to land use. The effect on regulatory planning and policies are consistent with that presented in the Master Plan. The potential for disruption or disturbance of archaeological resources during construction remains unchanged as all work will take place at the lagoon site.

Impacts on the biological environment, such as the potential for disturbing species at risk or habitats, remains the same as the site is the unchanged. The potential for negative impacts on aquatic habitat and surface water are the same and the mitigation measures outlined in the Master Plan will be implemented. Similarly, there are no changes to the potential for impacts on the physical environment as the same remains unchanged.

Impacts from technical conditions are similar, given that the BioCord system will be designed to meet the same stringent effluent discharge parameters as a new mechanical WWTP. Mitigation measures and monitoring recommendations detailed in the Master Plan will be implemented as appropriate to ensure no negative impacts to water quality in the Castor River as a result of the increased flows.

Refer to the Best Management Practices and Site Specific Mitigation Measures presented in Section 7.2.4 of the Master Plan for details on the recommended mitigation measures.

Following construction, the BioCord system is expected to be a less cumbersome system to maintain and operate. The system is a passive system for the most part, with few moving parts to maintain. Furthermore, a WWTP would require a full time Class III operator whereas the BioCord system will only require a Class I or II level operator. Energy costs will also be lower than a mechanical WWTP.

Table 7.1 – Analysis of Impacts and Mitigation Measures

Environmental Value		Differs from Master Plan? (Yes/No)	Comments
Social	Regulatory Planning and Policy	No	
	Land Use	Yes	No additional land easements are anticipated.
	Noise	Yes	Recommended solution will have a shorter construction period.
	Vibration	Yes	Recommended solution will have a shorter construction period.
	Air Quality	Yes	Recommended solution will have a shorter construction period.
	Archaeological Resources	No	
	Registered Archaeological Sites	No	
	Areas of Potential Environmental Concern	Yes	The existing lagoon will not be significantly altered; therefore, no impacts to soil and groundwater quality due to lagoon disturbance are expected.
Biological	Species at Risk (SAR)	No	
	Aquatic Habitat / Surface Water	No	
	Provincially Significant Wetlands (PSW)	No	
	Significant Habitat	No	
Physical	Surficial Geology	No	
	Bedrock Geology	No	
	Hydrogeology	No	
Technical Conditions	Effluent Discharge	No	Recommended solution will be designed to meet the same effluent criteria as the Master Plan solution. Impacts, mitigation measures, and monitoring requirements all remain valid.
	Road Traffic Volumes and Capacities	No	Minimal construction requiring road closure is anticipated.
	Structures and Utilities	No	

7.2 Monitoring

Monitoring recommendations are consistent with those presented in Section 7.3 of the Master Plan.

The recommended solution, consisting of the BioCord pre-treatment cell, lagoon cells, filtration and disinfection will be designed to meet the effluent discharge limits to the Castor River defined during the Master Plan process.

During construction, there will be minimal disturbance to the existing lagoon system, and as such, no additional monitoring is required beyond the requirements of the existing ECA. Upon completion of construction and commissioning of the system, monitoring will be undertaken as per the amended ECA, to be issued by the MOECC.

An Assimilative Capacity Study of the Castor River was conducted as part of the Master Plan process. The recommended effluent limits, presented in Table 2.3, are based on monthly averages, with the exception of E. coli which based on a monthly geometric mean. Toxicity testing for rainbow trout and daphnia magna is to be conducted on a quarterly basis. If no acute lethality is observed after two years, then this will be reduced to annual monitoring.

For total phosphorus, the MOECC has stipulated that the effluent limit is conditional on ensuring no increase in loads to the Castor River watershed. This will be achieved through non-point source reductions elsewhere in the watershed. As discussed in Section 5.4, the Municipality will participate in the South Nation Clean Water Program for total phosphorus management. Monitoring is an integral part of the program. Details of the agreement will be determined during the design and approvals stage.

8.0 IMPLEMENTATION

The construction of the recommended solution will support the servicing needs of the Village of Limoges and planned growth. Upon completion of the Amendment process, the project classified as Schedule C may proceed to Phase 5, Implementation, subject to finalization of the 30-day review period and assuming no Part II Order is received.

8.1 Implementation Schedule

Following the 30-day public review process and subject to no Part II Order requests, the Municipality intends to proceed with design of the recommended solution. The proposed project schedule is shown in Table 8.1 below.

Table 8.1 – Proposed Project Schedule

Task	Anticipated Completion Date
Notice of Amendment Filing	September 2016
30-day Review & Comment Period	October 2016
Design & Approvals	Winter 2017
Construction	Fall 2017

9.0 PUBLIC AND AGENCY CONSULTATION

Refer to Appendix 4 for public consultation materials and comments.

9.1 Public Information Centre

A Public Information Centre (PIC) was held on August 17th 2016 at the Limoges Community Centre. Eighteen people attended the information centre.

The PIC was held as an Open House style gathering with information boards stationed around the room. The consultant project team and representatives from The Nation Municipality were available to answer questions and provide more information.

The information presented at the PIC included background information, design criteria, the three shortlisted composite solutions, additional treatment requirements, a summary of the recommended solution, and a schedule of next steps. Refer to Appendix 4 for the PIC material.

Clarification was offered to attendees in response to various questions; however, no written comments were received.

9.2 Consultation with Review Agencies and Other Stakeholders

Nation Municipality consulted with the agencies and stakeholders previously identified during the Master Plan process. The following agencies were notified of the Public Information Centre and filing of the amendment:

- United Counties of Prescott and Russell;
- Township of Russell;
- City of Ottawa;
- Ontario Ministry of the Environment and Climate Change; and
- South Nation Conservation Authority.

The Nation Municipality and the consultant project team met with the MOECC on July 12th 2016. The purpose of this pre-consultation meeting was to review the shortlisted options for increasing wastewater treatment capacity in Limoges and to confirm the EA amendment process.

9.3 Notice of Filing of Amendment

The Notice of Filing of Amendment was sent to interested parties at the beginning of the 30-day review period. The Notice was also posted on the Municipality's website, through social media, and in the local newspaper, indicating where the Amendment report was available for review during the 30-day public comment period.

APPENDIX 1

DETAILED COST ESTIMATES

Appendix A - Capital Cost Estimates

	A1 BioCord Pre-Treatment + Post-Lagoon Filtration	A2 BioCord Pre-Treatment + Discharge to South Nation River	B1 BioCord Lagoon Retrofit + Post-Lagoon Filtration	B2 BioCord Lagoon Retrofit + Discharge to South Nation River	C1 SAGR + Post-Lagoon Filtration	C2 SAGR + Discharge to South Nation River
Capacity = 3,500 m3/day						
Pre-Treatment lagoon cell	$ 300,000	$ 300,000	-	-	-	-
BioCord System	$ 636,200	$ 636,200	$ 842,600	$ 842,600	-	-
Installation Costs	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
Lagoon Clean-Out	$ -	$ -	$ 1,000,000	$ 1,000,000	$ 300,000	$ 300,000
Pre-Treatment cell aeration system	$ 100,000	$ 100,000	-	-	-	-
Partioning curtains in aerated cell	$ 60,000	$ 60,000	-	-	-	-
Storage section partitioning berm	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
SAGR sytem cost	-	-	-	-	$ 2,000,000	$ 2,000,000
SAGR civil works	-	-	-	-	$ 1,300,000	$ 1,300,000
Disinfection chamber and equipment	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000
Tertiary treatment Building	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000
Electrical	$ 75,000	$ 125,000	$ 75,000	$ 125,000	$ 75,000	$ 125,000
Fabric filter system	$ 600,000	-	$ 600,000	-	$ 600,000	-
FM to South Nation	-	$ 2,000,000	-	$ 2,000,000		$ 2,000,000
Pump Station for FM	-	$ 650,000	-	$ 650,000		$ 650,000
Phosphorus Offset Program	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000
SUBTOTAL	**$ 2,631,200**	**$ 4,731,200**	**$ 3,377,600**	**$ 5,477,600**	**$ 5,135,000**	**$ 7,235,000**
Engineering & Construction Fees / Contigency						
Construction Contigency (10%)	$ 263,120	$ 473,120	$ 337,760	$ 547,760	$ 513,500	$ 723,500
Bonds/Insurance (6%)	$ 157,872	$ 283,872	$ 202,656	$ 328,656	$ 308,100	$ 434,100
Engineering (10%)	$ 263,120	$ 473,120	$ 337,760	$ 547,760	$ 513,500	$ 723,500
CAPITAL SUBTOTAL	**$ 3,315,312**	**$ 5,961,312**	**$ 4,255,776**	**$ 6,901,776**	**$ 6,470,100**	**$ 9,116,100**
Class C Estimating Contingency (20%)	$ 663,062	$ 1,192,262	$ 851,155	$ 1,380,355	$ 1,294,020	$ 1,823,220
CAPITAL TOTAL	**$ 4,000,000**	**$ 7,200,000**	**$ 5,100,000**	**$ 8,300,000**	**$ 7,800,000**	**$ 10,900,000**

APPENDIX 2

SUPPLIER PROPOSALS

APPENDIX 2-1

Ecoprocess™ MBBR Proposal (Premier Tech Aqua)

Budget Proposal No. 5291

Project: **Limoges WWTP**
Moving Bed BioReactior (MBBR)

Consultant: **RV Anderson**
557 Southdale Road East Suite 200 London ON N6E 1A2

Harpreet Rai, PhD, P.Eng., BCEE
Associate, Process Engineer
Tel 519 681 9916 Ext 31 Fax 519 681 0899

Date: **July 13th, 2016**

Revision: **0**

Prepared by: **K. Khier Chibani, M.Sc.**
Process Design & Quote Manager
T: 450-471-8444 ext.7232,
khik@premiertech.com

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A INTRODUCTION

Moving Bed Bioreactor Ecoprocess™ MBBR as described here below will be provided for treatment of domestic wastewater generated by the village of Limoges. The system will be provided and shall be installed by contractor in a concrete plastic tanks.

The Moving Bed Bioreactor technology is a low foot print and robust technology. The technology has been developed for cold climate environment and if well designed will be able to provide meet discharge criteria in terms concentration of both soluble BOD and total ammonia in effluent.

B DESIGN DATA

Wastewater characterisation & effluent discharge

INFLUENT		
Average Flow	**3500**	**m3/d**
Monthly max .Flow	**8750**	**m3/d**
BOD5	**140**	**mg/L**
COD	280	mg/L
TSS	**175**	**mg/L**
TKN	**30**	**mg/L**
Nitrogen percentage in biomass (7 to 12% VSS based)	**7.0%**	
Percentage VSS/TSS	**70%**	

EFFLUENT		
BOD	**10**	**mg/L**
TSS	**10**	**mg/L**
Total Ammonia	**2**	**mg-N/L**

Site Parameters		
Elevation of site to mean sea level	**100**	**m**
Temperature of wastewater average	**15**	**oC**
Temperature of wastewater minumum	**10**	**oC**

For such application, lagoon upgrade with complete nitrification, the MBBR unit shall be installed upstream ahead of lagoon system in order to benefit from sewage heat during winter. This means that headworks need to include screening (6mm) and grit removal.

The MBBR unit will remove soluble BOD and oxidise ammonia. Subsequent lagoon cells will be used as settling lagoons that will trap solids.

Oil and grease if present in high concentration may hinder biological treatment therefore concentrations will have to be kept below 50 mg/L at the inlet of secondary biological treatment.

Although the MBBR process is known to have robust performances, the use of detergent in excess or any other toxic chemical may cause process upset (i.e. poor performance, foaming,..). It is therefore the responsibility of the end-user to make sure the system is not exposed to such reagents or any other factors that can deter the plant performances (i.e. extreme temperatures).

C DESIGN APPROACH

C.1 CHAIN OF TREATMENT

The proposed chain of treatment makes use of screening (6mm) with a stand by unit followed by grit removal and then lagoon system (see attached PFD).

A Control Panel is to be installed inside a mechanical room together with the Air blowers.

C.2 DESIGN PARAMETERS

VOLUMES		
surface area loading rate (COD)	3.231	g COD/m2/d
surface area loading rate (BOD) Medium load 5 to- 10 g/m2/d at 10oC	1.50	g BOD/m2/d
surface area loading rate (Nitrogen)	0.35	g NH4-N/m2/d
Protected surface area	590	m2/m3
Media volume	514.12	m3
Fill percentage	60%	
Tank volume	856.9	m3
Number of stages	2	
Tank volume for each stage	428.4	m3
Side water depth	4.0	m
Surface area per reactor	107.1	m2
L/W ratio	1.0	
Tank width	10.35	m
Tank Lenght	10.35	m
HRT	5.9	h

SILUDGE PRODUCTION		
Sludge production roughly 0.26 kg TSS/kg COD removed	0.4	kg TSS/kg COD removed
Daily sludge production	350	kg/d

AERATION (Coarse		
O2 for BOD t removed	1.20	kg/kg
Nitrification of TKN*	100%	
O2 for N nitrified	4.57	kg/kg
AOR for BOD t removed	546.00	kg O2/d
AOR for TKN t nitrified	401.47	kg O2/d
AOR t r	**947.47**	**kg O2/d**
Height of diffuser from botom of tank	0.30	m
Diffuser water depth (DWD)	3.7	m
DO dissoved Oxygen	5	mg/L
β salinity surface tension correction factor = Cs wastewater / Cs clean water	0.95	
α oxygen transfer correction factor for waste = Kla wastewater/Kla tap water	0.80	
O2 density M/V	0.0173	lbs/ft3
Pb	14.527	psi
Fine (1), Coarse (2)	2	
Csm(20)	9.092	mg /L
Csw	12.146	mg /L
Css	9.905	mg /L
AOR/SOR	0.417	ratio
SOR total	2274.5	kg/d
Aeration time per day	12.0	hours/day
SOR for aeration time	189.5	kg/h
Diffuser loading	15.0	Scfm/ ft
% O2 transf.	0.8	%/ft
% O2 transfer	9.7	%
Oxygen peak factor (≥ 1)	2.5	
Air requirement total	10367.8	scfm
Total lenght required	**691**	ft
Diffuser length	14	ft
Number of Omega	**50**	

PREMIER TECH AQUA
1 800 632-6356
418 862-6642
pta@premiertech.com
PREMIERTECHAQUA.COM

Mixing	342	scfm/ 1000 ft^
Typical air flow rate 6 to 8 m3/m2/h (floor area)	5.1	m3/m2/h
No. of blowers / tank	**4**	**units**
Capacity	2592.0	scfm
Relative humidity	80%	
Extreme air temperature	35	oC
Pression de vapeur de l'eau		
Log Pvap=	1.63	
Pvap=	42.5	mmHg
Pvap=	0.8	PSI
Capacity at inlet conditions	2903.7	acfm
Diffuser headloss	**0.3**	psi
Air piping headloss	**0.5**	psi
Water column at design flow	5.3	psi
Blower discharge pressure	**6.1**	psi
Blower mechanical efficiency	**70%**	
Brake horse power	105.6	BHP

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D SCOPE OF SUPPLY BY PTA

Fives (5)	Aerzen rotary lobe positive displacement blowers GM 90S DN 250 (four duty and one stand by) c/w standard accessories, combined inlet filter/silencer for local air intake, welded base/silencer, V-belt drive for 1 flow, self tensioning design c/w steel guard (OSHA), full flow pressure relief valve, check valve, isolation manual butterfly valve, startup unloading valve, acoustic enclosure c/w mechanical fan, inlet piping connection, temperature switch, pressure switch, pressure gauge, dirty filter indicator, spare filter element and spare belt set. Blower will have variable speed control Capacity / unit: 2592 scfm (2904acfm) @ 6.1psig, with 120HP, TEFC motor.
Two (2)	Aeration grids with coarse bubbles SS304 clog-free diffuser c/w SS304 drop / header piping (200 mm) and SS304 suppor.t
One (1)	Lot of 514m3 carrier High density plastic media
Two (2)	Flygt ENM-10 level detection float switches with SS304 supports and guiding wires, with standard length of cable.
Four (4)	Media retaining outlet SS304 screen 300mm diameter and 1m long c/w SS304 support
One (1)	Main Control panel, c/w NEMA 12 enclosure, Allen-Bradley CompactLogix L33- ER, HMI Panelview plus 6 (10 inches), UPS, power supply, control logic programming and control relays. • Selector switches, reset buttons and indicator lights shall provided **by others** • **Not included** all programming software. • **Not included** Motor control center (MCC) with starters and VFD,s for blowers. • Power supply of 120V/1Ø/60Hz (transformers) should be provided **by others**. • A telephone line with Internet access shall be available on site for communication from our office.

D.1 ENGINEERING AND EQUIPMENT SUPPLY

a- Process equipment sizing & Programming,
b- Operation & Maintenance Manual and Equipments technical data sheets
c- Drawings.

D.2 START-UP AND COMMISSIONING:

Start-up and commissioning for process related equipment including:
Total of 2 weeks onsite, two (2) trips and expenses

- One (1) technician for five (3) days on site to provide dry and wet inspection;

- One (1) process / control for five (3) days on site commissioning of the equipment and operator training;

These above estimated time are for information only and based on installation fully completed at the time of commissioning and no major correctives are to be performed on the system.

Each additional day if required due to site conditions (i.e. delayed installation, wastewater unavailability,...) will be charge at a cost of $950/day/technician plus expenses (based on maximum 8 hours working day). The cost will be charged starting from our head office in Terrebonne (Quebec).

E SCOPE OF SUPPLY BY OTHERS

- Site preparation and installation;
- Unloading of equipment;
- Civil works relating to concrete and/or steel;
- Architectural and engineering services;
- Electrical installation, Electrical wiring and junction boxes;
- Mechanical installation;
- Mechanical and/or chemical anchors except where indicated;
- All anchors and pipe supports for interconnecting piping and fitting are to be provided and installed by others.

- Wall sleeves;
- Interconnecting air and water piping;
- Piping above water level;
- All manual valves except where specifically mentioned in the Scope of Supply;
- Influent lift station equipment and control (if required);
- Flow meters on influent, effluent (if required);
- Pump lifting system;
- Overflow piping for tanks;
- Pre-treatment, post treatment and sludge treatment;
- Chemical dosing equipment (if required);
- Scum removal system (if required);
- Equipment for emptying and servicing the tanks;
- Stairways, ladders or walkways;
- Odor Treatment (if required);
- SCADA (optional, quote upon request);
- All portable and permanent lifting equipment except where indicated;
- Plumbing & fittings materials;
- Plumbing installation;
- Sampling equipment;
- Spare parts;
- Specialised tools and Machineries (if required);
- Biological seed during start-up (if required);
- Laboratory equipment and safety equipment;
- Performance test;
- Documents for approval (permit) from the government;
- Design, start-up and commissioning of equipment not provided by Premier Tech Aqua;
- **Any equipment not listed in the scope of supply of Premier Tech.**

F BUDGET PRICING

PRICING……..…… $1 260,000.00 (CAN Funds)

Please note the following conditions:

- No taxes included;
- Price validity: 30 days;
- Standard limited and conditional equipment warranty of one (1) year after the start-up, not exceeding eighteen (18) months from date of shipment (see appendix I);
- Should Premier Tech quotation be accepted we will require a commitment from the client for a payment (which reasonable amount will be negotiated) to cover engineering fee in case where the project is subject to cancellation or delay.

G TERMS OF PAYMENT

- Terms of payment (to be discussed)
- Terms of payment are subject to credit check and approval.
- Financial guaranties as required by Premier Tech

H TERMS OF SHIPPING

FCA: from our suppliers (QC, Canada) to job site (Incoterms 2000), equipments unloading at job site are not included.

I TERMS OF DELIVERY

Time to produce general assembly drawings and technical data sheet: 3 to 4 weeks after receipt of signed contract and down payment;

Shipment 14 to 16 weeks after receipt by Premier Tech of approved drawings;

A APPENDIX

A.1 GENERAL CONDITIONS FOR START-UP AND COMMISSIONNING

Important note
Start up and commissioning time is estimated as per the Premier Tech Aqua scope of supply.

Expenses
Unless otherwise specified in the above proposal, the following expenses are not included: transport 1to/from airport, to and from plane tickets, transport to/from airport at project site, special visas, hotel accommodation, transportation from hotel to job site, all meals for technical personal assigned to project on site.
Meals and hotel accommodations must meet North American standards (American or continental menu, room accommodation in standard North American hotel chain or similar).
Expenses for extra days are not included. Premier Tech Aqua recommends that the client takes care of all expenses. Administrative charges
of 10% will be added to the amount of expenses paid by and refundable to Premier Tech Aqua.

Description of activities
Start up and commissioning activities include the following:
- Electrical inspection
- Dry mechanical inspection
- Wet mechanical inspection
- Hydraulic inspection and sequence/controls testing with remote assistance (if necessary)
- Operator training (revision of operation manual and formal training)

Site conditions and items to be provided by client
The above estimated time is for information only and is based on the following assumptions:
· It is strongly recommended to send detailed photos of all works (including electrical panel) to Premier Tech Aqua before scheduling a start up visit.
· Installation has been completed and complies fully with the installation manual or installation instructions provided with the equipment included in the scope of Premier Tech Aqua. The technician will assess the works and insure that no major corrective is necessary for the system to function. The technician will indicate if all specifications have been addressed properly at the time of dry inspection, but may also identify additional problems during wet inspection.
· Tanks have to be empty and clean before the dry inspection can take place. A safe ladder must be provided.
· Client will provide clear water and wastewater in volumes and flow rate sufficient to perform start up. Ideally, flow design is required for this purpose.
If it is not possible to provide design flow, client should consider temporary works allowing storage of water with recycling of effluent to influent
through adequate bypass of piping and/or use of transfer pumps.

· If real sewage flow is very small compared to design flow, please advise in advance so that an operation strategy can be analyzed by Premier Tech
Aqua' Process engineers.
· Client will provide a fax-modem 54 Kbps or better communication line (if applicable) for remote sequence testing using an Internet connection and a
standard telephone line for phone calls between the site and our offices in Canada.
· Client will make sure an electrical and mechanical contractor is available on-call (preferably the contractor who installed the equipment) in the event
that corrective measures require their intervention (some minor correctives can be handled directly by Premier Tech Aqua technical staff).
· Due to safety concerns, it is our policy that no Premier Tech Aqua technician or employee will work alone in any facility. For that reason, another
person must be in the immediate vicinity while work is being performed on the equipment.

A.2 PURCHASE TERMS & CONDITIONS AND WARRANTY

Article 1 Entire Agreement
Only this proposal and its acceptation by both the Client and Premier Tech Aqua and/or Premier Tech Aqua's acceptation of the Client's purchase order shall materialize the Agreement between the parties in relation with the purchase of equipment, machinery, labour costs, parts or other items (hereinafter referred to as 'Material') by the Client from Premier Tech Aqua. The terms and conditions herein shall hold precedence over any inconsistent document or agreement and shall bind the parties, unless otherwise agreed upon in writing and duly signed by them. Moreover, and subject to their consistency with the terms and conditions herein, any other document preceding the Agreement shall bind the parties and complete the Agreement provided that the parties have accepted and agreed upon said documents and their content.

Article 2 Payment Terms and Conditions
The payment price of the Material shall be executed in accordance with the expiry dates appearing in the Agreement or Premier Tech Aqua's acceptation of the Client's purchase order. Upon expiration of such dates, any amount due or unpaid shall bear interest at eighteen percent (18%) per annum or one point five percent (1.5%) per month. Should the Client fail to execute payment within the fifteen (15) days following the payment date, the Client shall be deemed to be in default and therefore, Premier Tech Aqua shall be entitled to claim any amount due, including any amounts to fall due. Premier Tech Aqua shall also, at her sole discretion, suspend the execution of any work, duties or obligation
related to the Material.

Article 3 Transport and Delivery
Premier Tech Aqua shall deliver the Material at the contemplated date agreed upon by the parties. Nevertheless, Premier Tech Aqua will not be responsible for any delay in delivery if any such delay is attributable to an event out of the control of Premier Tech Aqua including force majeure or is imputable to the Client. In such event, and unless otherwise specified, delivery will be postponed accordingly and shall not affect the enforceability nor the terms of the Agreement. Premier Tech Aqua shall not be held responsible for any delay in the delivery related to these events and no

penalty or fee should be charged to her in these situations. Shipments shall be F.C.A. Lachenaie (Incoterms 2000),
unless otherwise specified. The Client is responsible for the risks of losses and/or damages during transportation once any Client's expeditor or carrier takes possession of the Material.

Article 4 Property Reserve and Confidentiality
Until full payment of the purchase price and transfer in favour of the Client of its property title, Material shall remain Premier Tech Aqua's property, and the Client undertakes not to sell, transform or alter the Material or allow that any lien or security be created on the Material without the prior written consent of Premier Tech Aqua. The Client shall keep confidential and not disclose to any third party without Premier Tech Aqua's prior written consent, any information provided by Premier Tech Aqua as a result of this Agreement, including but not limited to: contractual documents, proposal, drawings, data, technical, strategic or commercial information.

Article 5 Warranty
Premier Tech Aqua warrants that the Material is constructed and assembled in accordance with Premier Tech Aqua's recognized standards, methods, as well as the Client's specifications as more fully described in this Agreement. Premier Tech Aqua warrants that the Material shall be free from defects for a period of one (1) year commencing at the advent of the earliest of: the date of Material's start up or six (6) months following the date of shipping of the Material by Premier Tech Aqua, unless otherwise specified. During this period, Premier Tech Aqua shall provide, free of charge, a replacement part for any defective part, provided that the Client returns the defective part to Premier Tech Aqua.
Premier Tech Aqua does not warrant:
a) items consumed by the Material (grease, silicon, Teflon, etc.)
b) items or parts subject to normal wearing
c) defects due to abuse, improper installation, faulty use or abnormal conditions of temperature, humidity, storage, dirt, corrosion, etc.
d) labour and transportation costs for the replacement of the defective part.
If, during the warranty period, a Client's employee or a third party other than Premier Tech Aqua's authorized representative modifies, repairs or transforms the Material, without Premier Tech Aqua's prior written consent, the warranty shall cease to apply upon knowledge by Premier Tech Aqua of such prohibited handling on the Material, and therefore Premier Tech Aqua shall be authorized not to accept any warranty claim that would otherwise have been covered in virtue of the warranty. In such case, the Client shall assume all costs for the Material repairs. No additional warranty, express or implied, excluding any direct or indirect consequential damages (not limited to but including loss of profit and
Client's liability to its customers or to third parties, etc.) concerning the design, sale or use of the Material and/or services provided by Premier Tech Aqua is hereby granted. Premier Tech Aqua's liability under her warranty obligation shall in no case exceed the cost of the Material.

Article 6 Client Responsibility
It is the Client's responsibility to use and operate the Material in a secure and safely manner and in accordance with the safety rules, advices
and recommendations contained in the operation and maintenance manual attached with the Material; the Client acknowledges that it has
received such advices and recommendations. The Client further acknowledges that in accordance with quality and safety standards and

regulations that may govern Premier Tech Aqua, it has been advised of the potential risks with respect to the operation and use of the Material
and provided by Premier Tech Aqua with useful information in order to minimize and prevent injuries and accidents. Therefore, the Client agrees to indemnify and hold Premier Tech Aqua harmless from and against all claims, actions, demands and damages arising out of the use of the Material, in any manner and by any person to whom the Client may have permitted the access and use of such Material.

Article 7 Cancellation and Defaults
If the Client is in default under the Agreement for any reason whatsoever and if such default is not remedied within ten (10) days following the receipt of a notice to this extent, Premier Tech Aqua may at her sole discretion, cancel the Agreement or refuse to honour its correlative obligations. Consequently, Premier Tech Aqua will be entitled to and shall be compensated by the Client with a minimum of thirty percent (30%) up to a maximum of a hundred percent (100%) of the purchase price, according to the level or percentage of completion of the conception and/or manufacturing of the Material at the time of cancellation. Premier Tech Aqua shall keep any amounts paid by the Client at the time of such default and shall reimburse the Client, interests and charges free, any sum which Premier Tech Aqua is not entitled to under this section.

Article 8 Governing Law
This contract shall in all respects be treated and construed in conformity with the laws of Québec (Canada). The parties hereby agree that all actions, claims or demands shall be brought in the judicial district of Kamouraska, Province of Québec, Canada, where they hereby elect domicile.

ENTEX Technologies

Engineering a Clean Water Environment

BioPortz™ Installations

Updated: February 2013

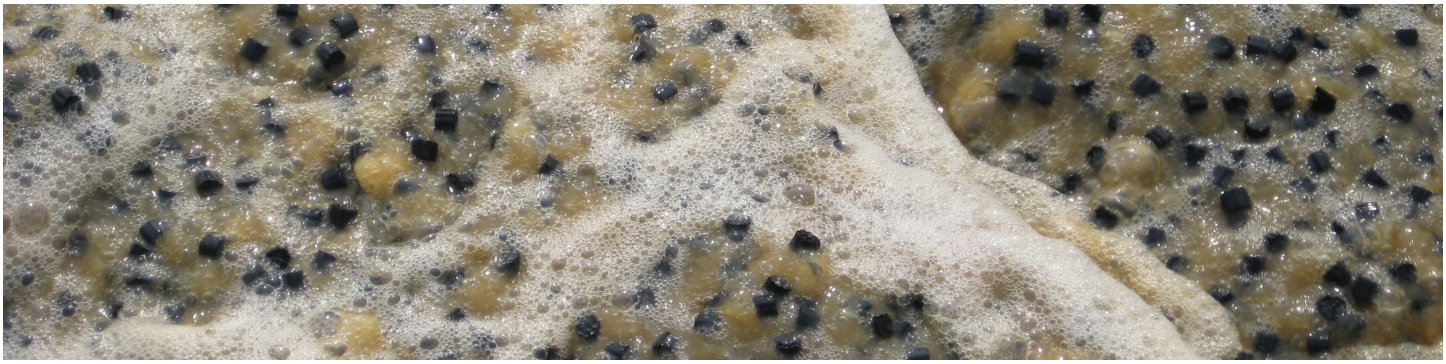
Facility	Location	Start Up	Flow	Process
Chevron Phillips	Orange, TX	2006	15,000 GPD	IFAS Package Plant
MPI Papers	Portneuf, QC	2006	1.6 MGD	
Frontier Refining Inc. – North Plant	Cheyenne, WY	2007	0.36 MGD	IFAS
Frontier Refining Inc. – South Plant	Cheyenne, WY	2008	0.36 MGD	IFAS
Specialty Chemicals Manufacturer	Franklinton, NC	2008	0.75 MGD	SFF or IFAS
Kenneth R Olson Middle School	Tabernacle, NJ	2009	28,000 GPD	Anoxic SFF
Town of Oak Creek WWTP	Oak Creek, CO	2010	0.25 MGD	SFF
Seneca Landfill	Mars, PA	2010	25,000 GPD	SFF
Owens Corning	Starr, SC	2011	0.14 MGD	SFF
Seneca Landfill – Phase 2	Mars, PA	2011	25,000 GPD	SFF
Ciales WWTP	Ciales, PR	2012	0.92 MGD	IFAS
Horse Cave Wastewater Pretreatment Plant	Horse Cave, KY	In progress	0.2 MGD	SFF
Brattleboro WWTF	Brattleboro, VT	2013	3.0 MGD	Swing Zone SFF

* IFAS – Integrated Fixed-Film Activated Sludge
* SFF – Submerged Fixed Film

400 Silver Cedar Court, Suite 260, Chapel Hill, NC 27514
919.933.2770 phone 919.287.2258 fax www.entexinc.com

Installations existantes Ecoprocess™ MBBR

201505



CLIENT	PROVINCE/ PAYS	DATE	DESCRIPTION	DÉBIT
Vermont Livestock Slaughter & Processing	États-Unis	2014	Abattoir	4,5 m^3/d
Filterbox	AB, Canada	2014	Camp de travailleurs	10 m^3/d
Tim Hortons de Nipigon	ON, Canada	2014	Restaurant	10 m^3/d
Usine de Sixpro à Notre-Dame-du-Bon-Conseil	QC, Canada	2014	Usine	132 m^3/d
Les Terrasses de Redoute	Martinique	2014	Condos/Édifice à logements	12 m^3/d
MPM Sidrep	Martinique	2014	Usine	45 m^3/d
Cartwright Springs Brewery	ON, Canada	2014	Brasserie	1,5 m^3/d
Ormosia	Martinique	2013	Condos/Édifice à logements	17 m^3/d

PREMIER TECH AQUA

1 800 632 -6356
PREMIERTECHAQUA.COM

APPENDIX 2-2

BioCord™ Proposal (Bishop Water Technologies)

BISHOPWATER
220 Carswell St Renfrew ON K7V 2G4 Phone: (343)361-0463 Fax: 1(844)272-6102
www.bishopwater.ca info@bishopwater.ca
INTELLIGENT SOLUTIONS FOR WATER

Limoges BioCord™ Upgrade Proposal

Prepared for:

Harpreet Rai, PhD, P.Eng., BCEE
Associate, Process Engineer
557 Southdale Road East Suite 200 London ON N6E 1A2
Tel 519 681 9916 Ext 31 Fax 519 681 0899

By:

Rene Hawkes
Head of Research
Bishop Water Technologies
220 Carswell St.
Renfrew, Ontario, Canada
K7V 2G4

May 30, 2016

1. Scope of Work

We have been informed RV Anderson wishes to upgrade the municipal treatment lagoon in Limoges, Ontario. The following proposal is a solution that can be added into the existing cells of the treatment system to improve BOD and ammonia removal.

Traditional wastewater treatment facilities and technologies are increasingly expensive and complex to operate. The following report shows a solution that is both effective, affordable and low maintenance.

2. Planned Wastewater Treatment Facilities

The existing lagoon is composed of two cells, each with a volume of 170,000m^3 per cell and a depth of 2m. The lagoon is facultative with some aeration, and with chemical dosing for P removal. The average temperature of the water is 15°C, while the winter water temperature reaches close to 0°C.

The design daily flow rate of the system is 3500m^3/day, with a peaking factor of 2.5. The current average daily flow rate for 2014 is 1410m^3/day, with a peak of 2222m^3/day (April 2014). Winter is considered to be November 1 to April 30. The wastewater characteristics are found below:

Parameter	Influent (mg/L)	Average Effluent (mg/L)	Max Historical Effluent (mg/L)	Discharge Limit (mg/L)
BOD	**140**	**10**	**22**	**5**
TSS	**175**	**10**	**21.5**	**5**
TP	**3.6**	**0.3**	**0.31**	**0.3**
Nitrogen	**30 (ammonia)**	**5/1 (TAN W/S)**	**22.3 (TAN Dec 2014)**	**5/1 (TAN W/S)**

Figure 1: Limoges Lagoon System

3. Advanced Treatment Using BioCord™/Biofilm Technology

BioCord™ Reactors can be integrated into one of the aerated treatment cells, improving BOD and ammonia removal. The BioCord Reactor process will create a series of self-sustained, high-rate biological reactors.

The use of fixed BioCord™ Reactors offers several advantages. BioCord™ Reactors provide the ideal environment for bacteria to grow and aggregate as biofilm. The multiple layers of bacterial mass that form on the surface of BioCord™ provide a very resilient treatment system.

Figure 2: BioCord™ (left) and BioCord™ covered in Biofilm (right)

Don Bishop first saw the concept of fixed film systems for water treatment when developing options for aquaculture. Bishop Water Technologies has developed 10 different types of BioCord™ using numerous different polymer fibers, which create different effects on treatment results.

Figure 3: Biofilm Media installation in a lagoon

As treatment bacteria in a lagoon are not concentrated, it can be difficult to establish an efficient treatment system. With the permanent fixture of BioCord substrate installed in a wastewater treatment system, treatment bacteria can attach itself on the BioCord™ without the possibility of being removed from the lagoon.

The optimal mass of biofilm bacteria is permitted to grow on the extended surface area of the BioCord™, hence creating more treatment capacity for the wastewater it comes into contact with.

Figure 4: Biofilm Media installation in a lagoon

BioCord™ Reactors are engineered to actively manage the attached biomass to optimize treatment performance. Aerated Reactors enhance mixing, while adding dissolved oxygen and biomass to what can otherwise be a limited treatment environment.

The biofilm that treats the waste is naturally occurring within the existing pond or vessel. No chemical additives are required. No regular cleaning or replacement of the BioCord™ reactors is required. Hence operating costs are minimal. Aside from the purchase and installation costs the target pond or vessel must have a relatively low level of in situ sludge for the bacteria to optimize treatment.

4. BioCord™ Reactor Upgrade to existing lagoon– 2000m³/day

Based on the information provided to Bishop Water Technologies, 24 aluminum frame BioCord™ Reactors can be installed in the cell of the lagoon system. Each frame will have a channel installed at the bottom to anchor the frame and prevent damage to the liner of the lagoon.

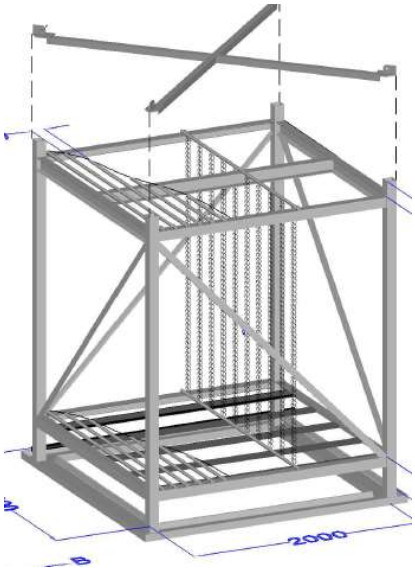


Figure 5: BioCord™ Reactor design

Each frame will measure 2 meters wide, 2 meters long, with a height of 2 meters. An attachment system will be fixed at the top of the frame for installation into the lagoon and to facilitate removal in the case of future maintenance. Each reactor can be lowered into the lagoon with a crane or installed when the lagoon is being constructed. The Reactors will be shipped onsite in parts and assembled.

The BioCord Reactor system was designed with the following parameters. The addition of the system is designed to meet the discharge criteria for both the summer and winter.

Current Flow rate	Design parameters
Rated flow rate	2000m³/day
BOD Influent	140mg/L
Influent NH4	30mg/L
Discharge Criteria BOD	5mg/L
Effluent NH4 Winter Criteria	5mg/L
Effluent NH4 Summer Criteria	1mg/L

The conditions in the lagoon cells will have to be assessed, as to how the temperature changes from the start to the discharge. This will allow an optimization of the amount and location of the BioCord Reactors.

Location of the BioCord Reactors would be as shown in Figure 6, with 6 reactors near the start of the lagoon and 18 reactors near the end of the lagoon:

Figure 6: BioCord Reactor location 2000m3/day

Twenty-four (24) ¾hp air compressors will be supplied to provide air to the aeration system installed underneath each frame. Air lines would be run from the blower to the pre-installed diffuser system on each reactor.

The aeration diffuser system installed under each frame contains Bubble Tubing, an energy efficient high-pressure airflow system with high anti-fouling performance. The fine bubbles generated by the Bubble Tubing move and mix the wastewater around the BioCord, as well as provide dissolved oxygen to the treatment bacteria that grows on the BioCord itself. Bubble Tubing is developed and made in Canada.

Each BioCord Reactor is supplied with air by an individual small compressor, providing significant redundancy over the use of a single large compressor. Each small compressor is available in 120V, allowing for simpler electrical installation. The compressors will be installed in an outdoor, weatherproof and heated cabinet.

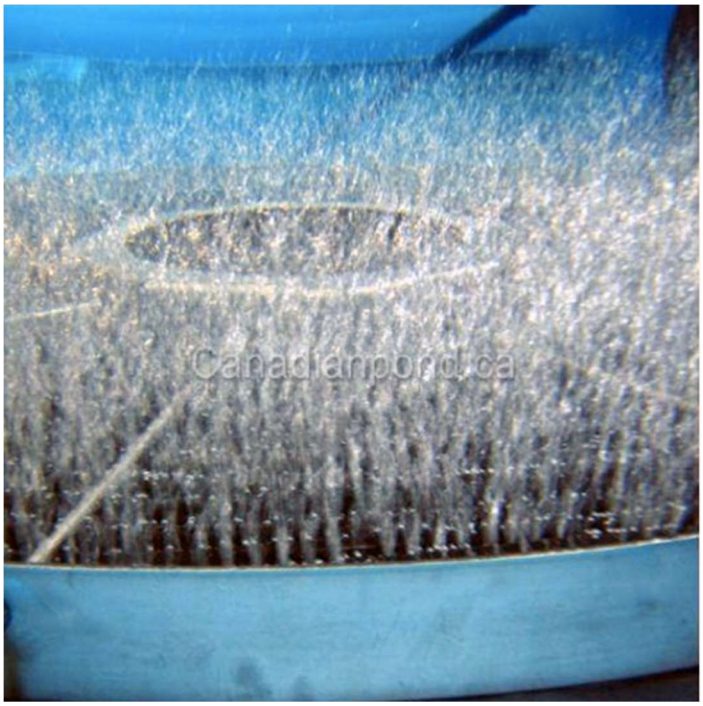


Figure 7: Bubble tubing

5. BioCord™ Reactor Upgrade to existing lagoon– 3500m³/day

To increase the treated flow rate to 3500m³/day, an additional twenty (20) BioCord Reactors can be installed into the lagoon, for a total of forty-four (44) reactors. Forty-four (44) ¾hp air compressors will be supplied to provide air to each reactor, and the reactors would be distributed in the lagoon as shown in Figure 8:

Figure 8: BioCord Reactor Location - 3500m3/day

The system is designed to meet the following criteria:

Current Flow rate	Design parameters
Rated flow rate	3500m³/day
BOD Influent	140mg/L
Influent NH4	30mg/L
Discharge Criteria BOD	5mg/L
Effluent NH4 Winter Criteria	5mg/L
Effluent NH4 Summer Criteria	1mg/L

6. BioCord™ Reactor Upgrade with new cell– 2000m³/day

Another option to improve the treatment at the Limoges lagoon is to add another cell to the lagoon to treat before discharging to the existing lagoons. This new cell would have a depth of 3m, which lowers the footprint of the cell and allows the BioCord™ Reactors to have a greater height. Baffle curtains will be used to direct the wastewater in plug flow.

A total of thirteen (13) BioCord reactors will be installed in the new cell, as shown in Figure 9. Each frame will measure 2 meters wide, 2 meters long, with a height of 3 meters, with thirteen (13) 3/4hp compressors.

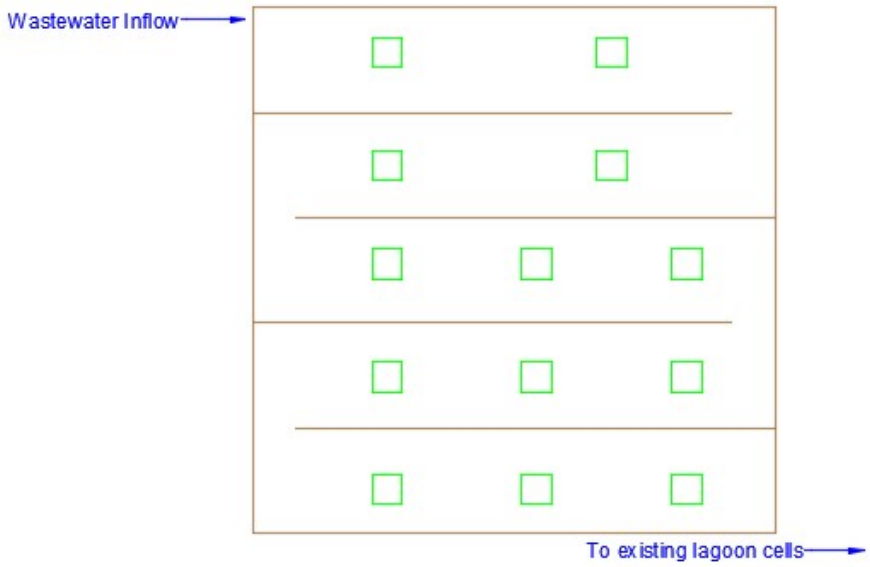


Figure 9: BioCord Reactor placement - 2000m3/day

The BioCord Reactor system was designed with the following parameters. The addition of the system is design to meet the discharge criteria for both the summer and winter. This design assumes an inflow wastewater temperature of 15°C.

Current Flow rate	Design parameters
Rated flow rate	2000m³/day
BOD Influent	140mg/L
Influent NH4	30mg/L
Discharge Criteria BOD	5mg/L
Effluent NH4 Winter Criteria	5mg/L
Effluent NH4 Summer Criteria	1mg/L

7. BioCord™ Reactor Upgrade with new cell- 3500m³/day

To increase the treated flow rate to 3500m³/day, an additional thirteen (13) BioCord Reactors can be installed into the new cell, for a total of twenty-six (26) reactors. Twenty-six (26) ¾hp air compressors will be supplied to provide air to each reactor, and the reactors would be distributed in the cell as shown in Figure 10:

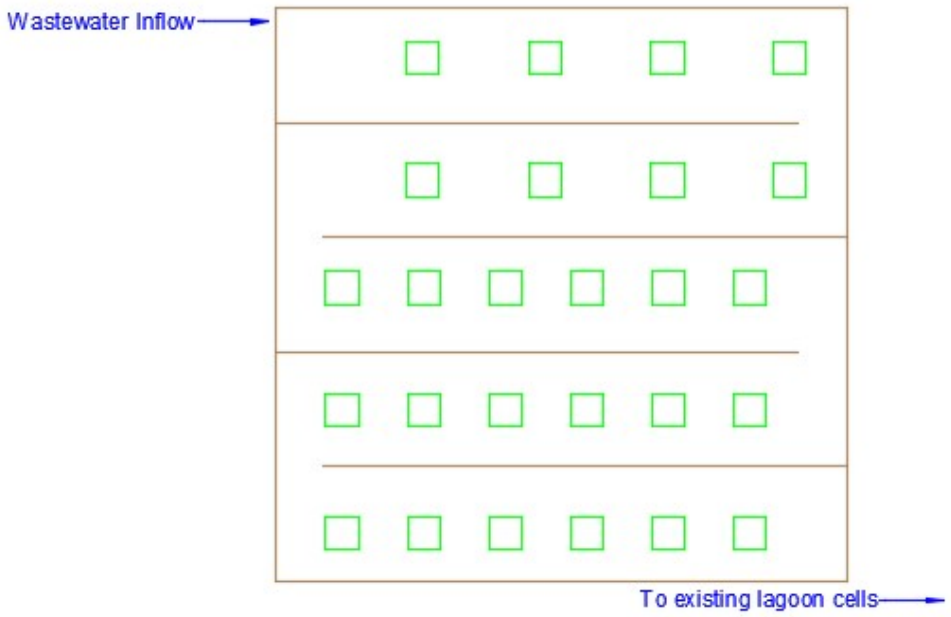


Figure 10: BioCord Reactor placement - 3500m3/day

This design assumes an inflow wastewater temperature of 15°C.

The system is designed to meet the following criteria:

Current Flow rate	Design parameters
Rated flow rate	3500m³/day
BOD Influent	140mg/L
Influent NH4	30mg/L
Discharge Criteria BOD	5mg/L
Effluent NH4 Winter Criteria	5mg/L
Effluent NH4 Summer Criteria	1mg/L

8. Costing

8.1. BioCord™ Reactor Upgrade to existing lagoon– 2000m³/day

-Estimated Cost: $436,013, including:

BioCord Reactor	Twenty-four (24) BioCord Reactors, providing over 34,560 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 2m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Twenty-four (24) 3/4hp compressors, providing over 180CFM to the integrated diffuser system. 120V
Compressors Cabinets	Four (4). Weather hood and oil heater for outdoor operation
Airline Piping	3000 ft of 0.5” reinforced PVC piping included. Additional piping $2.5 per foot.

8.2. BioCord™ Reactor Upgrade to existing lagoon– 3500m³/day

-Estimated Cost: $802,607, including:

BioCord Reactor	Fourty-four (44) BioCord Reactors, providing over 63360 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 2m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Fourty-four (44) 3/4hp compressors, providing over 330CFM to the integrated diffuser system. 120V
Compressors Cabinets	Eight (8). Weather hood and oil heater for outdoor operation
Airline Piping	5000 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

8.3. BioCord™ Reactor Upgrade with new cell– 2000m³/day

-Estimated Cost: $306,211, including:

BioCord Reactor	Thirteen (13) BioCord Reactors, providing over 29580 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 3m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Thirteen (13) 3/4hp compressors, providing over 97CFM to the integrated diffuser system. 120V
Compressors Cabinets	Three (3). Weather hood and oil heater for outdoor operation
Airline Piping	1250 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

8.4. BioCord™ Reactor Upgrade with new cell– 3500m³/day

-Estimated Cost: $606,182, including:

BioCord Reactor	Twenty-six (26) BioCord Reactors, providing over 59160 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 3m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Twenty-six (26) 3/4hp compressors, providing over 195CFM to the integrated diffuser system. 120V
Compressors Cabinets	Five (5). Weather hood and oil heater for outdoor operation
Airline Piping	2500 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

-Pricing includes BioCord Reactors assembled and equipment onsite ready for installation.
-Installation Cost: TBD, including installation and commissioning, travel, accommodations and reasonable expenses.

Costing does not include applicable taxes or shipping and handling. Costs are subject to change based on final design parameters. Pricing valid for 30 days.

9. Contact Information

Any questions or comments regarding this proposal can be directed to Rene Hawkes.

Rene Hawkes – email: rene@bishopwater.ca – phone: 343-361-0463
Kevin Bossy – email: kevin@bishopwater.ca - phone: 613-433-0289

BISHOPWATER
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INTELLIGENT SOLUTIONS FOR WATER

Limoges BioCord™ Upgrade Proposal
Installation, O&M Costing and Usage of Large Compressors

Prepared for:

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June 14, 2016

1. Scope of Work

This document is an addendum to the original BioCord Upgrade Proposal dated May 30.

2. Installation costs

Pricing on the proposal dated May 30 includes BioCord Reactors assembled and equipment onsite ready for installation.

Not included are:

- Pricing for crane
- Electrical connection for compressors
- Base for cabinets. Cabinets needs to rest on a firm base for the legs to stay on the ground and not sink down into it with vibration. This can be a gravel or concrete base
- Commissioning, travel and accommodations

3. Operational and Maintenance Costs

3.1. Maintenance

After 40,000 to 50,000 hours of operation, the 3/4hp unit will need a rebuild kit in order to continue working another 40,000 to 50,000 hours. After this second period, the whole unit will need to be changed.

The filter is to be checked regularly in case it gets clogged, as no air will be given to the system. It is more likely to get clogged if the compressors are in a dusty area and less if in a clean area.

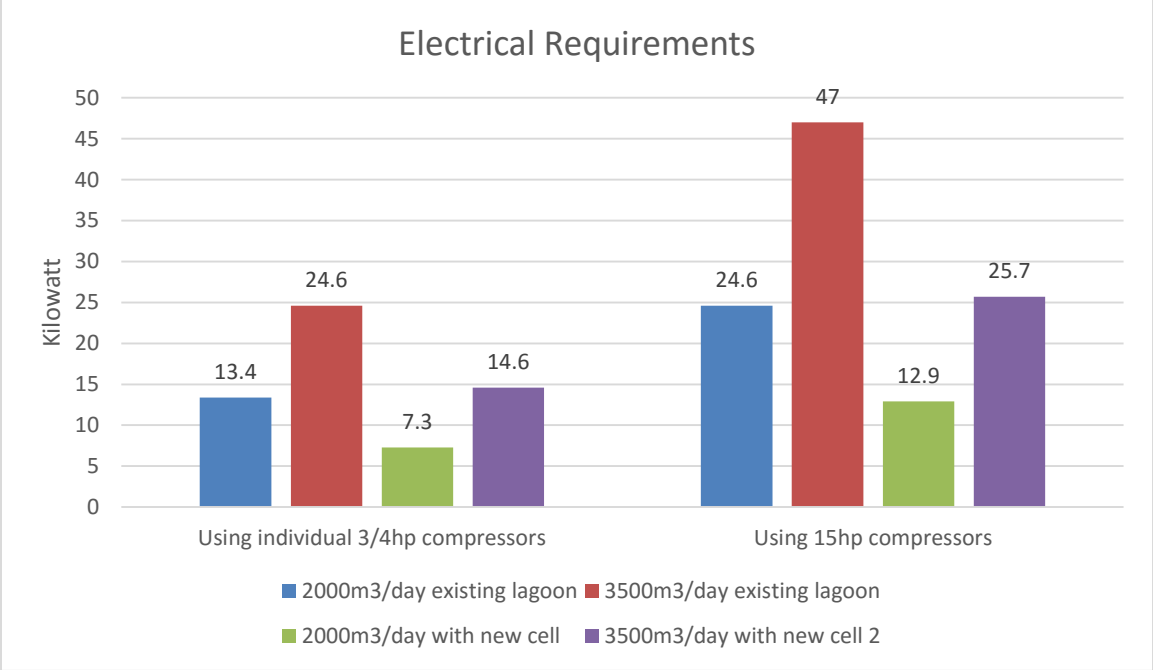
- The repair kit is $444.70
- Replacement air filter is $27.30
- The 3/4hp 115V compressor is $1721.00

Rebuilding the compressors should take 1.5 hours for each unit by the plant operators. The compressors can also be sent to an authorized repair center for rebuild.

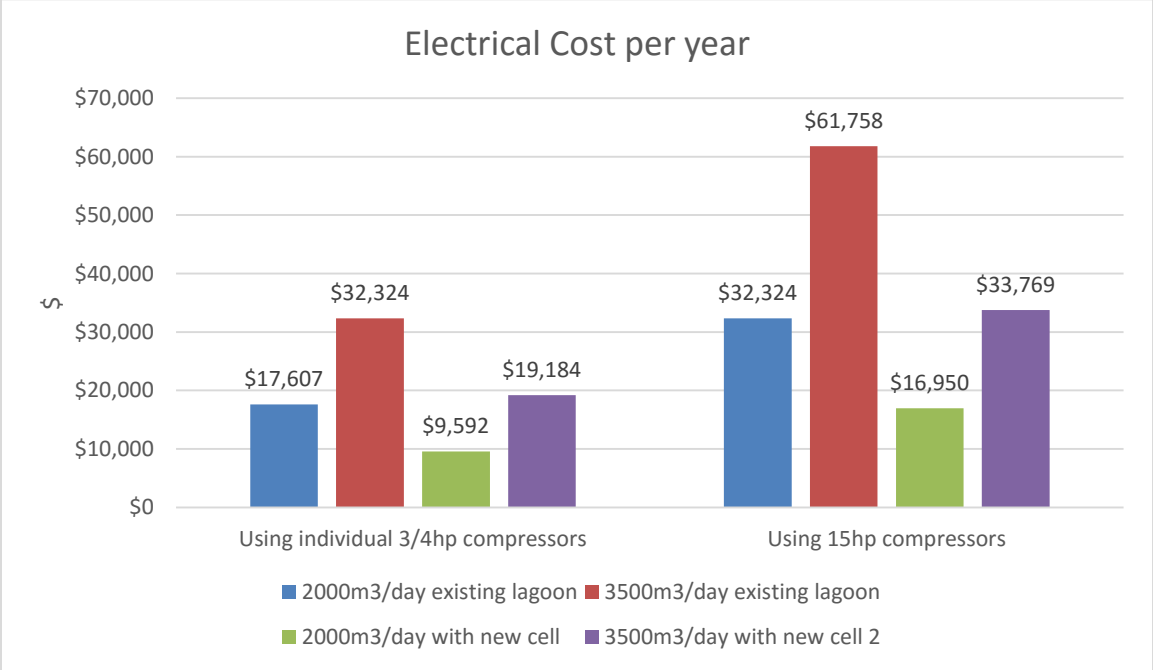
No other maintenance cost is anticipated over the 10-year life span of the BioCord Reactors.

3.2. Operational

The power requirements for each scenario is shown in graph 1, and yearly electrical costs in graph 2 (assuming $0.15/kwh). Note that using larger compressors has significantly higher power requirement than using the individual compressors, and the payback period on using individual compressors over larger compressors is less than 6 months.

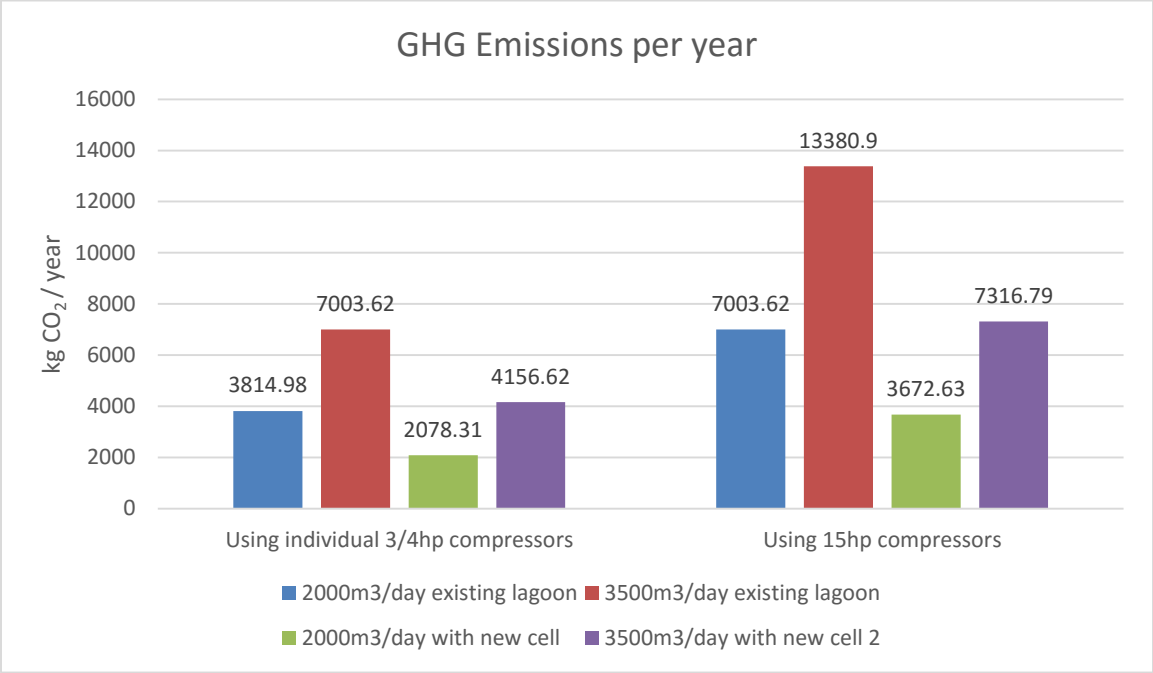


Graph 1: Electrical requirements in kw



Graph 2: Electrical costs per year

As well the greenhouse gas emissions for each scenario are found in graph 3:



Graph 3: GHG Emissions

4. Using large compressors

Rather than using individual 3/4hp compressors providing 7.5CFM for each BioCord Reactor, 15hp, 79CFM compressors can be used to supply multiple BioCord Reactors. These larger compressors require 575V, 3 phase power.

Pricing using the large 15hp compressors is shown in section 5. The original pricing using the 3/4hp compressors is shown as a reference in section 6.

5. BioCord Upgrade using 15hp compressors

5.1. BioCord™ Reactor Upgrade to existing lagoon– 2000m³/day

-Estimated Cost: $431,296, including:

BioCord Reactor	Twenty-four (24) BioCord Reactors, providing over 34,560 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 2m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Two (2) 15hp 575V compressor each and (4) 3/4hp 120v compressors, providing over 188CFM to the integrated diffuser system.
Compressors Cabinets	Three (3). Weather hood and oil heater for outdoor operation
Airline Piping	3000 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

5.2. BioCord™ Reactor Upgrade to existing lagoon– 3500m³/day

-Estimated Cost: $786,934, including:

BioCord Reactor	Fourty-four (44) BioCord Reactors, providing over 63,360 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 2m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Four (4) 15hp 575V compressor each and four (4) 3/4hp 120v compressors, providing over 346CFM to the integrated diffuser system.
Compressors Cabinets	Five (5). Weather hood and oil heater for outdoor operation
Airline Piping	5000 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

5.3. BioCord™ Reactor Upgrade with new cell– 2000m³/day

-Estimated Cost: $300,733, including:

BioCord Reactor	Thirteen (13) BioCord Reactors, providing over 29,580 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 3m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	One (1) 15hp 575V compressor each and three (3) 3/4hp 120v compressors, providing over 101CFM to the integrated diffuser system.
Compressors Cabinets	Two (2). Weather hood and oil heater for outdoor operation
Airline Piping	1250 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

5.4. BioCord™ Reactor Upgrade with new cell– 3500m³/day

-Estimated Cost: $595,226, including:

BioCord Reactor	Twenty-six (26) BioCord Reactors, providing over 59,160 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 3m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Two (2) 15hp 575V compressor each and six (6) 3/4hp 120v compressors, providing over 203CFM to the integrated diffuser system.
Compressors Cabinets	Three (3). Weather hood and oil heater for outdoor operation
Airline Piping	2500 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

-Pricing includes BioCord Reactors assembled and equipment onsite ready for installation.
-Installation Cost: TBD, including installation and commissioning, travel, accommodations and reasonable expenses.

Costing does not include applicable taxes or shipping and handling. Costs are subject to change based on final design parameters. Pricing valid for 30 days.

6. Original Costing using 3/4hp 120V compressors

6.1. BioCord™ Reactor Upgrade to existing lagoon– 2000m³/day

-Estimated Cost: $436,013, including:

BioCord Reactor	Twenty-four (24) BioCord Reactors, providing over 34,560 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 2m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Twenty-four (24) 3/4hp compressors, providing over 180CFM to the integrated diffuser system. 120V
Compressors Cabinets	Four (4). Weather hood and oil heater for outdoor operation
Airline Piping	3000 ft of 0.5” reinforced PVC piping included. Additional piping $2.5 per foot.

6.2. BioCord™ Reactor Upgrade to existing lagoon– 3500m³/day

-Estimated Cost: $802,607, including:

BioCord Reactor	Fourty-four (44) BioCord Reactors, providing over 63,360 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 2m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Fourty-four (44) 3/4hp compressors, providing over 330CFM to the integrated diffuser system. 120V
Compressors Cabinets	Eight (8). Weather hood and oil heater for outdoor operation
Airline Piping	5000 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

6.3. BioCord™ Reactor Upgrade with new cell– 2000m³/day

-Estimated Cost: $306,211, including:

BioCord Reactor	Thirteen (13) BioCord Reactors, providing over 29,580 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 3m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Thirteen (13) 3/4hp compressors, providing over 97CFM to the integrated diffuser system. 120V
Compressors Cabinets	Three (3). Weather hood and oil heater for outdoor operation
Airline Piping	1250 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

6.4. BioCord™ Reactor Upgrade with new cell– 3500m³/day

-Estimated Cost: $606,182, including:

BioCord Reactor	Twenty-six (26) BioCord Reactors, providing over 59,160 square meters of surface area. Complete with aluminum frame, mending plate and channel footings. Frame dimensions 2m x 2m x 3m.
Integrated Diffuser Aeration	Fine bubble aeration for biofilm growth management on each frame
Blower	Twenty-six (26) 3/4hp compressors, providing over 195CFM to the integrated diffuser system. 120V
Compressors Cabinets	Five (5). Weather hood and oil heater for outdoor operation
Airline Piping	2500 ft of 0.5" reinforced PVC piping included. Additional piping $2.5 per foot.

-Pricing includes BioCord Reactors assembled and equipment onsite ready for installation.
-Installation Cost: TBD, including installation and commissioning, travel, accommodations and reasonable expenses.

Costing does not include applicable taxes or shipping and handling. Costs are subject to change based on final design parameters. Pricing valid for 30 days.

7. Contact Information

Any questions or comments regarding this proposal can be directed to Rene Hawkes.

Rene Hawkes – email: rene@bishopwater.ca – phone: 343-361-0463
Kevin Bossy – email: kevin@bishopwater.ca - phone: 613-433-0289

APPENDIX 2-3

SAGR® Proposal (Nelson Environmental Inc.)

Nelson Environmental Inc

OPTAER™

WASTEWATER TREATMENT SYSTEM

Preliminary Proposal for:

Design, Supply, and Installation of

OPTAER Wastewater Treatment System

Limoges ON, Canada

June 13, 2016

NE reference: cd2191.02

www.nelsonenvironmental.com

5 Burks Way, Winnipeg, Manitoba R2J 3R8
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1.0 Project Overview

An OPTAER wastewater treatment system is proposed for the community of Limoges, ON. The proposed system upgrade would utilize the existing lagoon infrastructure and consist of the following processes and technologies:

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- Retain existing partial mix lagoons. Continue alum addition at primary influent.
- Construct one berm to divide a portion of the partial mix lagoon into storage (by others)
- Implement OPTAER partial mix aeration with two (2) floating laterals in partial mix Cell 1.
- Implement floating baffles to minimize short circuiting in partial mix cell.
- Provide for 3 months of summer storage.
- Implement a multiple-cell aerated SAGR® for nitrification (ammonia removal), BOD, and TSS polishing following the existing lagoon system.
- Implement an Infini-D™ cloth disk filter system for final TSS polishing (particulate TP removal).
- UV disinfection if required (by others).

2.0 System Design Parameters

Preliminary design loads and flows, as well as effluent requirements are summarized in the following table:

		System Influent	System Limits	System Objectives
Design Flow	m^3/day	3,500		
cBOD	mg/L	140	<5	<3
TSS	mg/L	175	<5	<3
TP	mg/L	3.6	<0.3	<0.25
TAN*	mg/L	30	<1/5*	<0.75/3*

* summer/winter

Approximate cell sizes are shown in the following table:

Cell	Basin Type	Water Depth (m)	Water Volume (m^3)	Retention time (design) (days)
1a	Aerated Partial Mix	2.0	40,379	11.5
1b	Aerated Partial Mix	2.0	32,831	9.4
1c	Aerated Partial Mix	2.0	26,459	7.6
	SAGR	2.1		
	Totals		**99,668**	**28.5**

OPTAER Aeration design parameters are summarized in the following table:

Aeration Design Parameters - OPTAER Aeration System				
	Cell 1a (PM)	**Cell 1b (PM)**	**Cell 1c (PM)**	**Totals**
Alpha	0.60	0.60	0.60	
Beta	0.95	0.95	0.95	
Theta	1.024	1.024	1.024	
Site elevation (m)	65	65	65	
Min. Dissolved Oxygen (mg/l)	2.0	2.0	2.0	
# HT25 diffusers (Fine Bubble)	110	40	16	**166**
SCFM per diffuser	12	12	12	-
Total SCFM	**1,320**	**480**	**192**	**1,992**

SAGR aeration design parameters are summarized in the following table:

Aeration Design Parameters - SAGR Aeration System	
	SAGR
Alpha	0.70
Beta	0.95
Theta	1.024
Site elevation (m)	65
Min. Dissolved Oxygen (mg/l)	3.0
Max SAGR Loading Rate (g BOD/m^2/day)	115.7
Max SAGR Loading Rate (lbs NH_3/1000 ft^3)	0.433
Total SCFM (design)	**1,424**

3.0 OPTAER Treatment Process

i. Partial Mix (PM) Cells

With aerated partial mix cells, the diffuser density is based upon oxygen demand. The OPTAER system does not rely on algae or natural surface aeration for providing oxygen to the wastewater.

The diffusers are suspended near the bottom of the cells. Through the rise of the bubbles and subsequent mixing, convection cells are created between the diffusers. Not only does the water rise with the bubbles, the solids settle out through the downward motion of the water between the diffusers where the circulation loop is completed. This combined with the slow rate of bubble rise contributes to the overall efficiency of the system. Because of low sludge production in the system, retention time is retained for long term BOD_5 removal.

When the solids reach the bottom of the lagoon, additional oxygen for biodegradation is provided through the diffusers near the cell bottom. This process results in minimal organic bottom sludge accumulation. Aerobic digestion takes place within the aerated cells at the sludge water interface.

ii. Submerged Attached Growth Reactor (SAGR)

The Submerged Attached Growth Reactor (SAGR) is a patented process designed to provide nitrification (ammonia removal) in cold to moderate climates. The SAGR is essentially a clean aggregate media bed with evenly distributed wastewater flow across the width of the cell, and a horizontal collection chamber at the end of the treatment zone.

Two SAGR cells are operated in parallel; piping allows any cell to be isolated and bypassed LINEAR aeration throughout the floor of the SAGR provides aerobic conditions that are required for nitrification.

The gravel bed is covered with a layer of peat or mulch to prevent freezing.

The following variables need to be considered during nitrification design:

- *Dissolved Oxygen Levels* - Nitrifying bacteria require aerobic conditions. A minimum dissolved oxygen concentration of 3 mg/L must be present for the process to fully occur.
- *BOD concentration* – Nitrifying bacteria require low BOD concentrations to be effective. Primary BOD removal occurs in the upstream lagoon system. The SAGR provides additional BOD polishing if necessary to reduce BOD concentrations below 25 mg/l.
- *Surface area* - Bacteria require a medium of some form to grow on. High surface area medium allows for higher-density nitrifying bacteria population.

- *Bacteria* - In order to convert ammonia (NH_3) to nitrite (NO_2^-) and ultimately nitrate (NO_3^-) (nitrification) sufficient quantities of two bacteria are required, *Nitrosomonas* and *Nitrobacter*.
- *Alkalinity* - The nitrification process reduces pH levels and consumes alkalinity. In order for nitrification to occur, 7.1 mg of alkalinity must be available for each mg/L of ammonia removed
- *Temperature* - Nitrification in a SAGR occurs at water temperatures as low as 0.5^{o}C. The long sludge age inherent in an attached growth system allows for full nitrification at temperatures where bacteria reproduction is greatly inhibited.
- *pH* - Nitrification is enhanced at higher pH levels. pH levels of 7.5 to 8.5 are ideal, although nitrifying bacteria can adapt outside of this range.

4.0 Treatment Process Equipment

i. HT-25 Fine Bubble Membrane Diffusers (Aerated Partial Mix)

HT-25 fine bubble diffusers are used to provide oxygen to the wastewater. The diffusers consist of an HDPE air distribution body with individual tubular EPDM membranes extending outwards in a horizontal plane. This design prevents bubbles from coalescing, and results in an excellent oxygen transfer rate with minimal head loss.

The diffusers are suspended with a marine grade rope directly under the lateral, at a uniform depth. The rope is attached to the floating header for ease of diffuser retrieval. Each diffuser is attached to a small concrete weight, encased in HDPE pipe. Diffuser assemblies can be retrieved from a boat with no special equipment.

ii. OPTAER Header System (Aerated Cells)

Galvanized metal manifold/discharge piping is used to dissipate the heat produced by the blowers. Shallow buried HDPE header piping connects to the galvanized metal header, and supplies air to the aeration laterals. The header has flanged connections for each lateral as shown on the drawings.

The laterals connect to the shallow buried header, and float on the water surface. Each lateral is individually valved for ease of maintenance. With floating laterals, there are no concrete weights required to be in contact with the bottom of the lagoon. Laterals are secured against wind action with a stainless steel cable system. The cables are fastened to anchors in the lagoon berm using a self-adjusting lateral tensioning assembly. All header and lateral piping, joints, and fittings are thermally fused HDPE.

With the OPTAER aeration system, the cells do not have to be dewatered or taken out of service for system installation or maintenance. All maintenance can be performed from a boat with a 2-person crew.

All header, lateral, and feeder piping are designed to accommodate increased airflow for high pressure and volume cleaning without increasing header friction losses by more than 1 psi. This allows for management of additional organic load, improved diffuser maintenance and additional odor control.

iii. Submerged Attached Growth Reactor (SAGR) LINEAR Aeration System

LINEAR coarse bubble diffusers are used to provide oxygen to the wastewater. Diffuser lines are manufactured from LDPE (Low Density Polyethylene) with reinforced air releases along the tubing. The diffuser tubing is designed for direct burial in the SAGR bed.

The diffuser locations have been spaced according to the projected oxygen demand in the SAGR. The design diffuser distribution is critical to ensure that nitrification occurs.

In addition to providing oxygen for nitrification the proposed aeration system brings numerous other long-term performance benefits to this sub-surface flow system.

- Full aeration grid ensures that wastewater channeling cannot occur in the gravel layer (maximize retention time and media contact).
- Sludge digestion in gravel layer is enhanced due to aerobic conditions.
- Year-around odor free operation.

iv. SAGR HDPE Header & Feeder System

High Density Polyethylene (HDPE) laterals run along the top on each side of the SAGR. The laterals are located in the top layer of insulating mulch. All HDPE piping connections and fittings are thermally fused to ensure maximum strength and durability. A shallow buried header connects blowers to the SAGR laterals.

HDPE service saddles are thermally fused to the lateral piping for each diffuser line. HDPE drop legs provide air to the individual diffuser lines.

All header and feeder piping is designed to accommodate increased airflow for high pressure and volume cleaning without increasing header friction losses by more than 1 psi. This allows for management of additional organic load, improved diffuser maintenance and additional odor control.

v. Positive Displacement Blowers

Positive displacement blowers are used to provide air supply for the OPTAER treatment system. Blowers are designed to provide the required airflow at normal system operating pressure, and have the capability of operating at the maximum required pressure intermittently for diffuser purging. The blowers are equipped with sound attenuating enclosures and are compatible with VFDs.

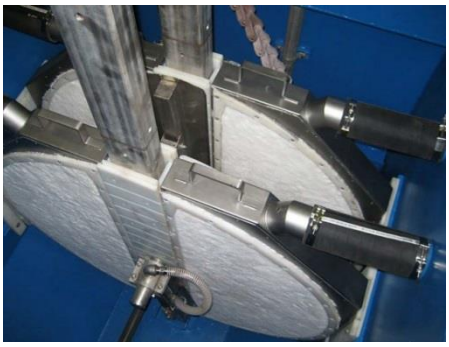
Blower requirements are summarized in the following table:

		Aerated Lagoon Blowers	**SAGR Blowers**
Number of blowers total		2	3
Number of blowers on duty		2	2
Number of blowers on standby		0*	1
Motor nameplate horsepower	hp	40	50
Design airflow per blower	SCFM	1011	819
Normal operating pressure	psi	4.7	5.2
Maximum required pressure	psi	6.0	8.2
Actual Power Consumption (per blower)	bhp	33.0	28.9
Actual Sound level	dB(A)	73	72

*Standby provided by SAGR aeration blower.
SAGR standby blower equipped with VFD motor to meet lagoon standby airflow requirements

vi. Infini-D™ Disk Filters for Tertiary Filtration

The Infini-D™ disk filter utilizes an outside-in flow pattern, and a stationary disk to minimize mechanical requirements of the system. The disk modules are designed for easy removal without the need to dewater the tank or take the system offline. All components of the system are constructed from corrosion resistant materials that have been designed for continuous operation.



During the normal filtration process, the entire filter is in a static mode. As the filter cloth collects solids on the outer surface, headloss across the media gradually increases to a set point elevation in the tank. At this point, the backwash cleaning system energizes in a set sequence of cleaning operations. Influent will continue to be processed during the backwash cleaning cycle, allowing for continuous filtration, 24 hours per day. Backwash from the filters would be directed back to the primary lagoons.

The backwash cleaning system is controlled by a relay based operation system furnished with the filter equipment. The cleaning mechanism will not be in contact with the filter cloth. This eliminates any possibility of solids being forced into and through the cloth or unnecessary wear to the cloth. The filter cloth is removable and replaceable in the field.

5.0 Operation and Maintenance

The following table presents the expected operation and maintenance costs of the OPTAER system.

			*Electrical Rate:	**0.08**	$/kW-h
	Motor Power		**Monthly**	**Unit**	**Annual**
	Quantity	**bhp**	**kW**	**cost**	**cost**	**Cost**
Aeration Lagoon Blowers	**2**					
Normal Operating Conditions	2	33	24.6	$2,875	-	$34,505
Filter Change (6 months)	**-**	-	-	-	$80	$320
Oil Change (12 months)	**-**	-	-	-	$70	$140
Belt Replacement (24 months)	**-**	-	-	-	$250	$250
SAGR Blowers	**3**					
Normal Operating Conditions	2	28.9	21.6	$2,518	-	$30,218
Filters (6 months)	**-**	-	-	-	$80	$320
Oil (12 months)	**-**	-	-	-	$70	$140
Belts (24 months)	**-**	-	-	-	$250	$250
Diffuser Membrane Replacement	1328	-	-	-	$25	$6,640
Infini-D Phosphorus Removal System	1					
Power Consumption	1	3	1.1	$ 65.00		$780
Cloth Media Replacement	6				$2,000	$4,000
Total Operation & Materials						$77,562
* Electrical rate estimated by Nelson Environmental Inc						

The OPTAER system will require one operator for approximately 1.0 to 2.0 hours per day for routine inspection & maintenance.

6.0 Budgetary Capital Cost

Budgetary Capital cost for the **OPTAER Wastewater Treatment System** is as follows:

Lagoon Aeration System

- NEI System Process Design (Ontario P. Eng. Stamped)
    - CAD Drawings (Ontario P. Eng. Stamped)
- Aeration lateral piping, feeder piping, diffusers, valves, and fittings as required
- Self-tensioning lateral assemblies
- HDPE shallow buried main header piping
- Two (2) 40 hp positive displacement blower with full sound attenuating enclosure
- Metal blower manifold and connection pipe
- Blower control panel
- Two (2) floating baffle curtains
- ***System installation /start-up /commissioning /training***
- Operation and maintenance manuals
- As-built Drawings

Submerged Attach Growth Reactor (SAGR)

- NEI System Process Design (Ontario P. Eng. Stamped)
    - CAD Drawings (Ontario P. Eng. Stamped)
- Shallow buried HDPE main air supply header piping
- Aeration lateral piping, feeder piping, diffusers, valves, and fittings as required
- SAGR Influent distribution and effluent collection piping
- Three (3) 50 hp positive displacement blowers with full sound attenuating enclosures
- Metal blower manifold and connection pipe
- Blower control panel
- ***SAGR Process equipment installation /start-up /commissioning /training***
- Operation and maintenance manuals
- As-built Drawings

Infini-D™ Disk Filter System

- NEI System Process Design (Ontario P. Eng. Stamped)
    - CAD Drawings (Ontario P. Eng. Stamped)
- Cloth Disk Filter unit with integrated stainless steel tankage
- Stainless frame and center tube assemblies and drive assemblies
- Cloth media and assemblies
- Backwash system assembly, including vacuum heads and pump
- Sludge removal system
- Control panel
- System start-up /commissioning /training

- Operation and maintenance manuals
- As-built Drawings

Budgetary cost for the design, supply, and installation of the OPTAER process equipment*:

$2,416,000 CAD plus applicable taxes, FOB Jobsite

All budgets are subject to final design review.
All budgetary prices include shipping to jobsite but do not include taxes.
Budget prices are valid for 90 days.

Items Specifically Not Included:

- Material offloading and on-site storage
- Berm construction for division of lagoon to partial storage

- Civil works including SAGR cells design and construction, cell liner, transport piping, inter-cell piping, discharge piping, manholes, valves, access roads to site, site roads and landscaping, etc.
- Trenching and backfill for shallow buried aeration headers

- Materials and construction required for the SAGR:
    - granular material
    - insulating wood chips or mulch
- Building to house blowers/ filters
- Filter installation (below ground or above ground in a building)
- Remove and dispose existing lagoon aeration equipment

- All electrical work
- Restoration

7.0 Civil Works Required for OPTAER Implementation

The intent of this proposal is not to provide details regarding civil works required but rather to provide a general overview as to the anticipated scope of work. The following quantities are not included in the Nelson Environmental scope of work, but are provided below for cost estimation purposes.

- Construct new SAGR cells
- Construct inter-cell piping for lagoon/SAGR
- Construct discharge control structure after SAGR
- Materials and construction required specifically for the SAGR (estimated material quantities are shown in the following table):

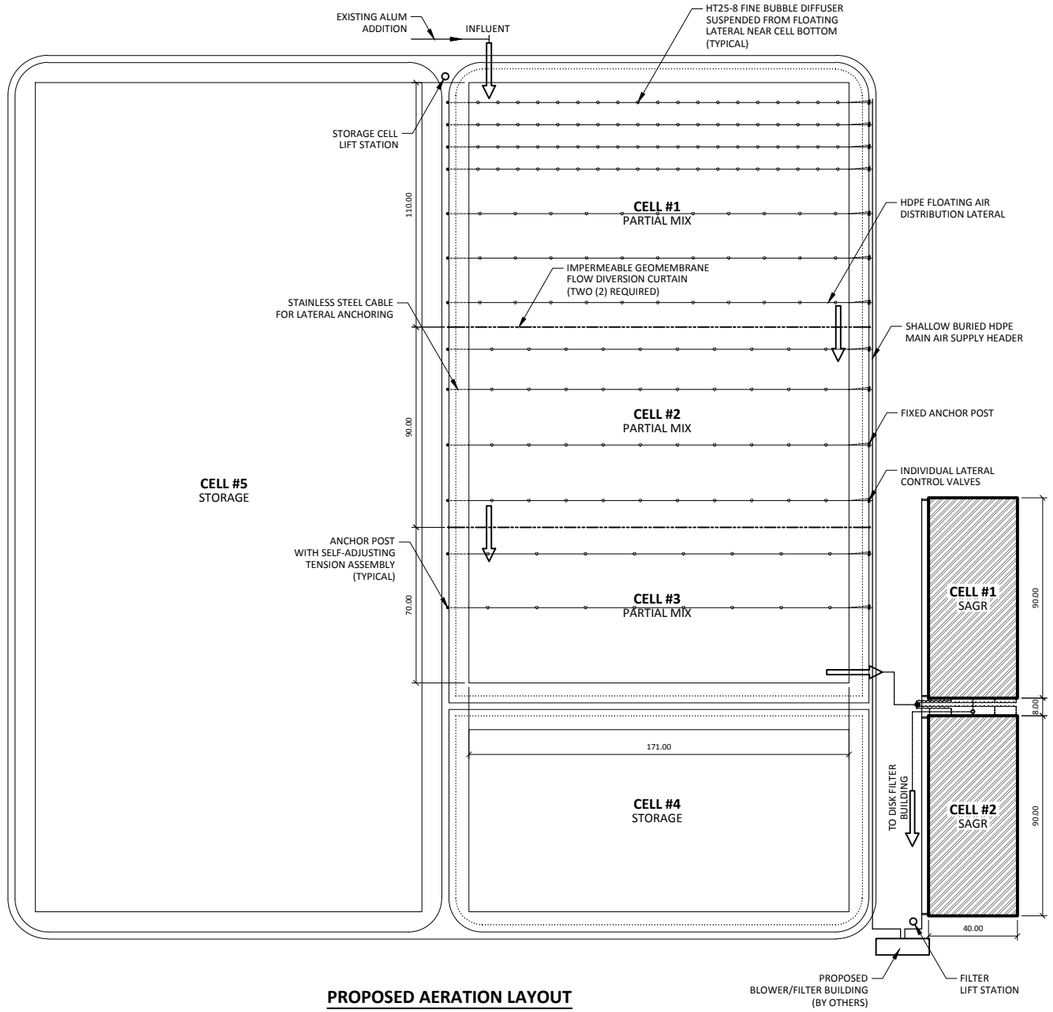
Item Description	UOM	Quantity	Unit Price	Total Cost
Uniform Graded Clean Rock	m3	**17,830**	$ 50.00	$ 891,500.00
Insulating Wood Chips	m3	**2,480**	$ 20.00	$ 49,600.00
Non-Woven Geotextile (8oz)	m2	**17,420**	$ 2.00	$ 34,840.00
HDPE Liner (60mil)	m2	**9,490**	$ 20.00	$ 189,800.00
Wall Framing & Sheathing	m	**550**	$ 50.00	$ 27,500.00
Influent Flow Splitter Structure	ea	**1**	$ 15,000.00	$ 15,000.00
Piping, fittings, valves from splitter to SAGR	LS	**1**	$ 60,000.00	$ 60,000.00
Effluent Level Control MH	ea	**2**	$ 7,500.00	$ 15,000.00
Additional Civil Works (As Required)				
Common Excavation - Backfill	m3	**TBD**	$ -	$ -
New Berm Construction	m3	**TBD**	$ -	$ -
Piping from Lagoon to Splitter	LS	**TBD**	$ -	$ -
Piping from SAGR to discharge	LS	**TBD**	$ -	$ -
TOTAL				**$ 1,283,240.00**

Any questions or comments can be directed to:

Nelson Environmental Inc.
5 Burks Way
Winnipeg, MB R2J 3R8
Tel: 204-949-7500
info@nelsonenvironmental.com

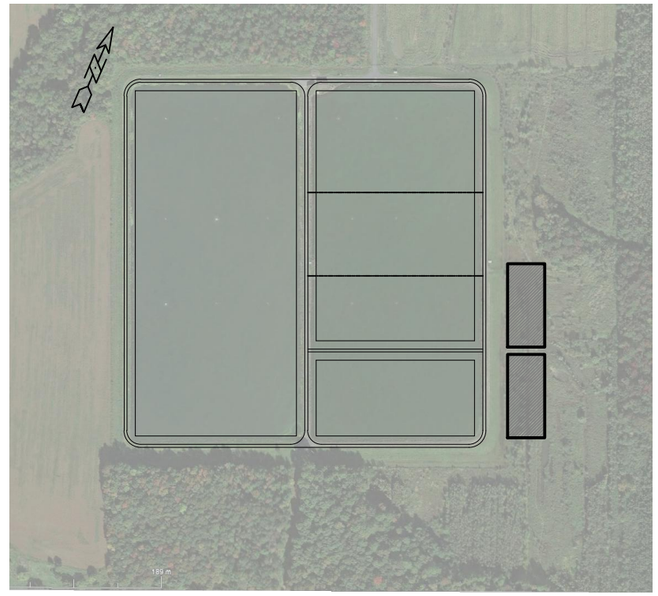
PLOT SIZE: 610mm x 914mm (24" x 36")

REDUCED SIZE PLOT - DO NOT SCALE



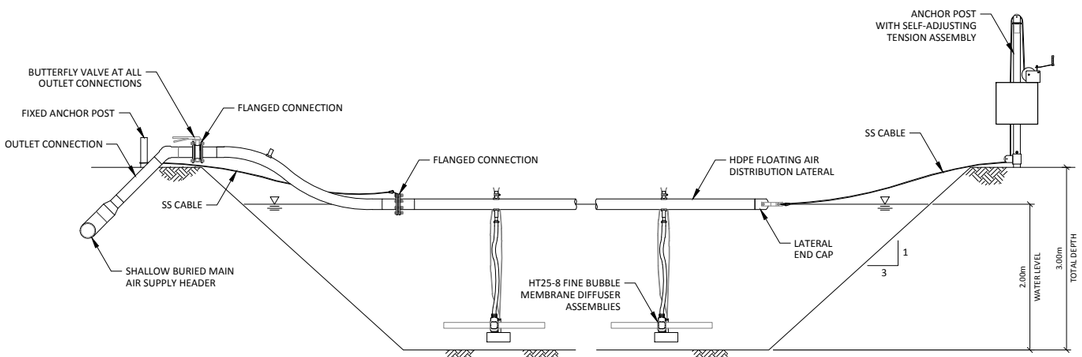
PROPOSED AERATION LAYOUT

SCALE: 1:1250



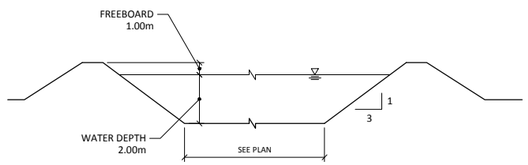
LOCATION PLAN

SCALE: N.T.S.



AERATED LAGOON SECTION

SCALE: N.T.S.



TYPICAL SECTION - AERATED CELLS

SCALE: N.T.S.

NELSON ENVIRONMENTAL INC.

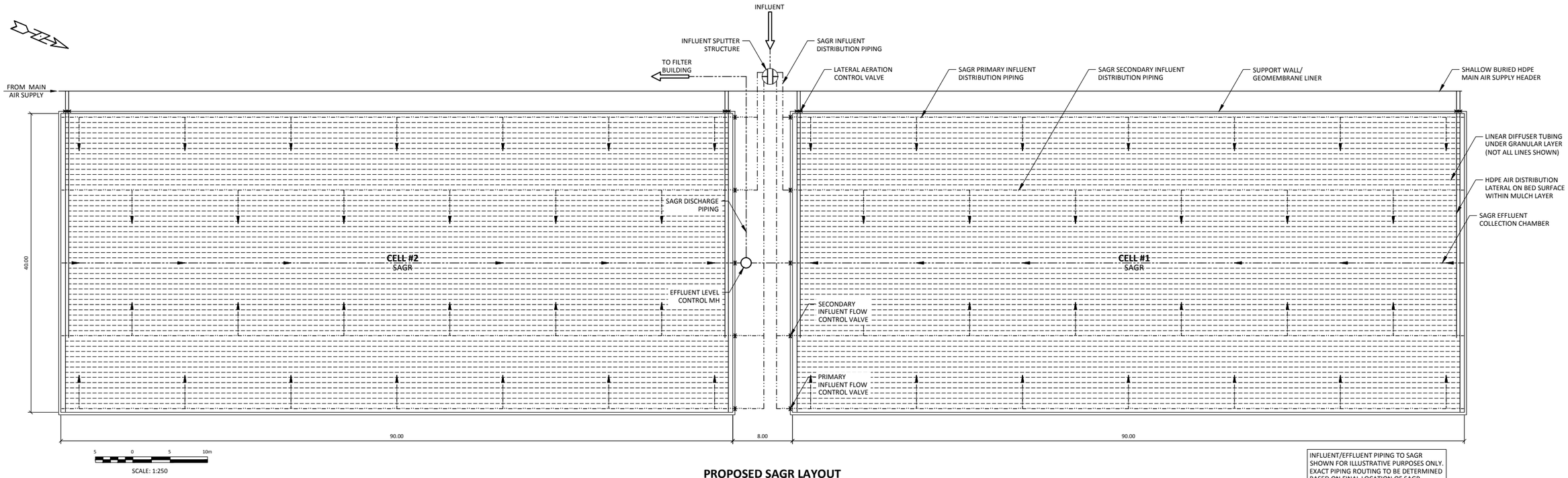
5 BURKS WAY
WINNIPEG, MANITOBA
CANADA R2J 3R8

Ph: (204) 949-7500
Fax: (204) 237-0660
www.nelsonenvironmental.com

PROJECT: LIMOGES, ON PROPOSED WASTEWATER TREATMENT SYSTEM							
TITLE: PROPOSED OPTAER SYSTEM PROPOSED AERATION LAYOUT, TYPICAL SECTIONS, LOCATION PLAN							
DRAWN BY: AM	APPROVED BY: LE	SCALE: AS NOTED	DRAWING NO. NE01	SHT. 1 of 3	REV. 0
DATE: 2016/06/13	FILE # CD2191.05				

PLOT SIZE: 610mm x 914mm (24" x 36")

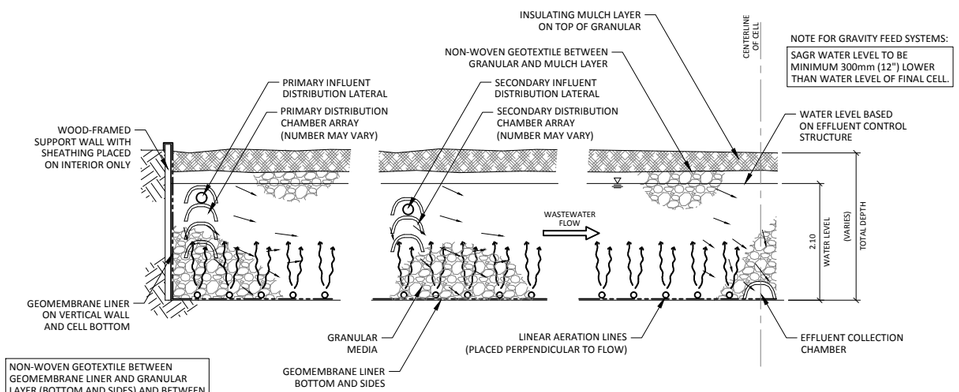
REDUCED SIZE PLOT - DO NOT SCALE



PROPOSED SAGR LAYOUT

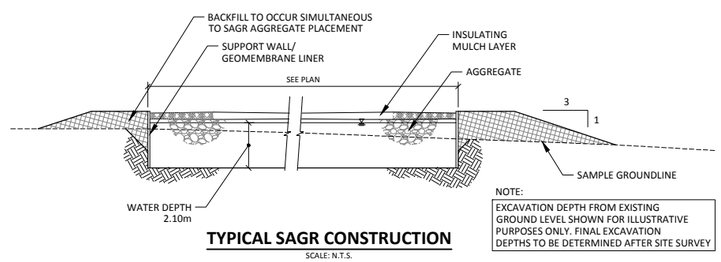
SCALE: 1:250

INFLUENT/EFFLUENT PIPING TO SAGR SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. EXACT PIPING ROUTING TO BE DETERMINED BASED ON FINAL LOCATION OF SAGR.



HORIZONTAL FLOW SAGR - SECTION

SCALE: N.T.S.



TYPICAL SAGR CONSTRUCTION

SCALE: N.T.S.

NELSON ENVIRONMENTAL INC.

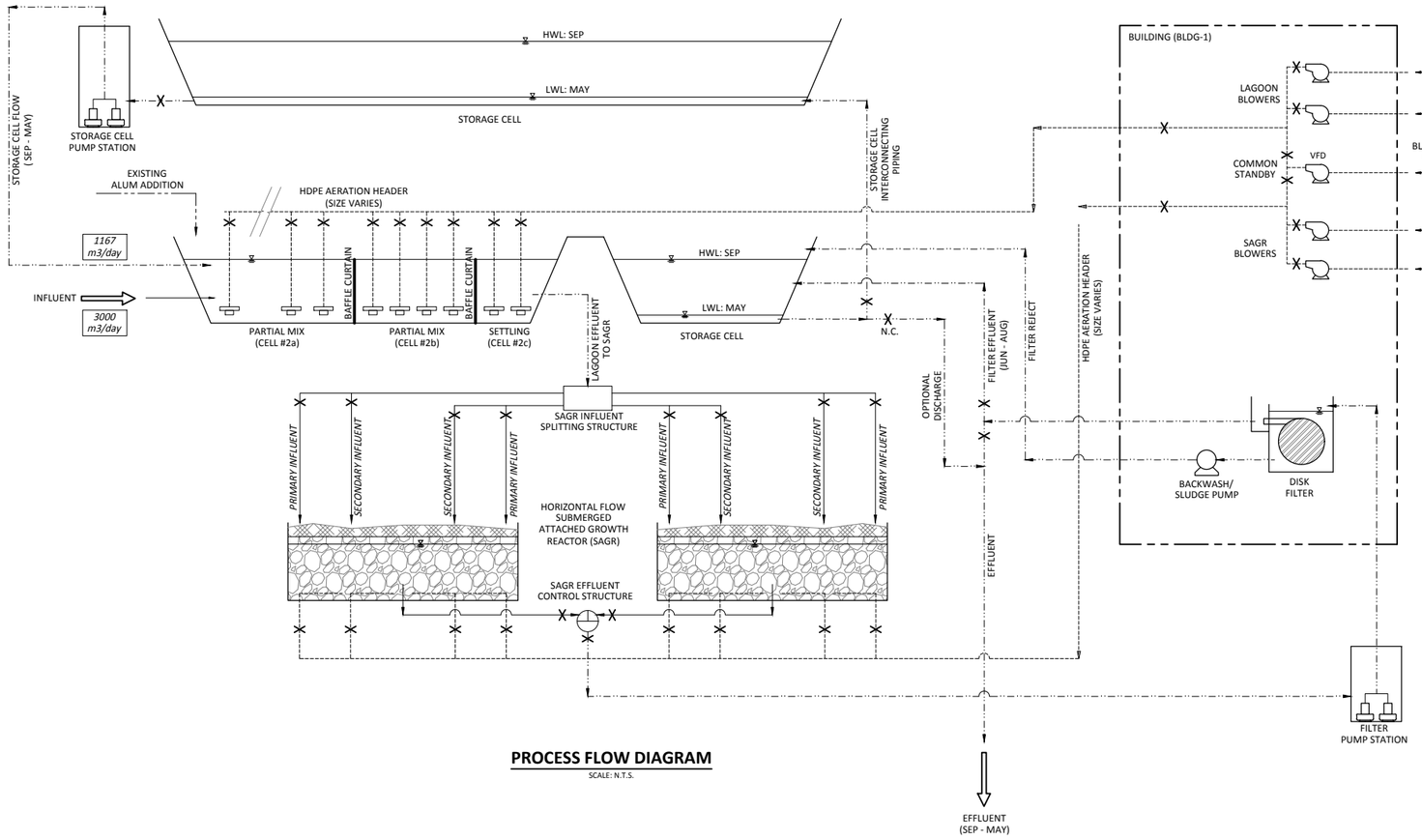
5 BURKS WAY
WINNIPEG, MANITOBA
CANADA R2J 3R8

Ph: (204) 949-7500
Fax: (204) 237-0660
www.nelsonenvironmental.com

PROJECT:	**LIMOGES, ON** PROPOSED WASTEWATER TREATMENT SYSTEM
TITLE:	PROPOSED OPTAER SAGR SYSTEM PROPOSED SAGR LAYOUT, TYPICAL SECTIONS
DRAWN BY: AM	APPROVED BY: LE
SCALE: AS NOTED	
DRAWING NO. **NE02**	SHT. 2 of 3
REV. 0	
DATE: 2016/06/13	FILE # CD2191.05

PLOT SIZE: 610mm x 914mm (24" x 36")

REDUCED SIZE PLOT - DO NOT SCALE



PROCESS FLOW DIAGRAM

SCALE: N.T.S.

NELSON ENVIRONMENTAL INC.

5 BURKS WAY
WINNIPEG, MANITOBA
CANADA R2J 3R8

Ph: (204) 949-7500
Fax: (204) 237-0660
www.nelsonenvironmental.com

PROJECT:	**LIMOGES, ON** PROPOSED WASTEWATER TREATMENT SYSTEM
TITLE:	PROPOSED OPTAER SYSTEM PROCESS FLOW DIAGRAM
DRAWN BY: AM	APPROVED BY: LE
SCALE: AS NOTED	DRAWING NO. **NE03**
SHT. 3 of 3	REV. 0
DATE: 2016/06/13	FILE # CD2191.05

APPENDIX 3

BIOCORD NETE EVALUATION LETTER

Ministry of the Environment

Standards Development Branch

40 St. Clair Ave. West
7th Floor
Toronto ON M4V 1M2

www.ene.gov.on.ca

Tel.: 416 327-5543
Fax: 416 327-2936

Ministère de l'Environnement

Direction de l'élaboration des normes

40, avenue St. Clair ouest
7e étage
Toronto ON M4V 1M2

www.ene.gov.on.ca

Tél.: 416 327-5543
Téléc.: 416 327-2936

Ontario

February 7, 2013

Kevin Bossy
C.E.O
Bishop Water Technologies, Inc.
P.O. Box 669
110-B Bonnechere St. W
Eganville, ON
K0J 1T0

Dear Mr. Kevin Bossy:

Re: Biofilm Technology Using BioCord Reactors

The Ministry of the Environment completed a review of the information submitted by Bishop Water Technologies, Inc. in relation to Biofilm Technology Using BioCord Reactors under the New Environmental Technology Evaluation (NETE) program.

This evaluation is based upon a review of the technology against, where appropriate and applicable, relevant Ministry of the Environment standards, regulations, policies and guidelines, principles of environmental engineering, anticipated process performance and environmental effects. Our review did not include architectural, mechanical, structural or electrical components of the technology, nor did it include any assessment of the relative economic viability of the technology. Furthermore, the Ministry relied on the information as presented in the submission received from Bishop Water Technologies, as well as those provided in the company's website, without verifying such information.

The information submitted included a Technical Report prepared by Bishop Water Technologies, Inc., dated October 26, 2012. The report was titled "New Environmental Technology Application Program, Opinion Letter of Technological Assessment, Biofilm Technology Using BioCord Reactors".

BioCord is a looped cord type of media. Length of BioCord are sewn onto fabric, strung vertically on large rectangular frames and placed in the process tanks of sewage treatment plants (including lagoons). The BioCord provides a high surface area for biofilm to develop as attached growth. In an activated sludge sewage treatment plant, the incorporation of biofilm support media into the aerobic tank can maintain additional biomass without substantially increasing the solids loading on the clarifiers.

Ontario requires that all sewage treatment works shall provide secondary treatment, i.e., less than or equal to 15 mg/L of 5-day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) and 15 mg/L of Total Suspended Solids (TSS), generally, as monthly average concentrations, or equivalent as the "normal" level of treatment. However, many sewage treatment works are required to meet higher levels of treatment requirements (i.e., lower concentrations than 15 mg/L), including meet many additional requirements (such as total phosphorus, total ammonia nitrogen and *E. coli*) depending on site-specific conditions. The limited short-term performance data submitted by the applicant (not verified by the Ministry) based on pilot testing at Eganville Sewage Treatment Plant shows that the BioCord treatment systems can meet 3-35 mg/L of BOD_5 and 3-23 mg/L TSS (as single sample concentrations) depending on the hydraulic retention time in the treatment system.

The BioCord treatment technology has the potential to be applied at sewage treatment works when an increase in capacity and/or performance (e.g., nitrification) is needed. This technology also has the potential to provide smaller footprint for the treatment system.

The specific applications of BioCord technology will require site-specific process and engineering design to ensure compliance with the intended performance requirements. The necessary environmental approvals under the Ontario Water Resources Act (OWRA) and the Environmental Protection Act (EPA) would be required for each installation. For specific installations, it is necessary that a proponent follow the instructions identified in the Guide to apply for Municipal & Private Sewage Works and/or Industrial Sewage Works. A pre-submission consultation with the ministry's District Office may be necessary to identify local environmental issues and requirements.

I trust that this evaluation will be of assistance to you. Should you have any queries regarding the above, please contact Dr. Mano Manoharan, P. Eng. of this Branch at (416) 327-8128.

Sincerely

S. Klose

Steve Klose
Director, Standards Development Branch

APPENDIX 4

PUBLIC CONSULTATION

Village of Limoges Potable Water and Wastewater Master Plan –
Wastewater Treatment (Schedule C)

NOTICE OF AMENDMENT & PUBLIC MEETING

In 2013, the Nation Municipality completed the Potable Water and Wastewater Master Plan for the Village of Limoges, which considered water and wastewater infrastructure requirements to satisfy long term development and growth. The preferred alternative for wastewater treatment was to construct a new mechanical wastewater treatment plant (WWTP) using Sequencing Batch Reactors on the existing lagoon site. An interim stage of the solution was to re-rate the existing lagoon to 1,500 m^3/d to permit growth of approximately 1,100 persons. Re-rating was successfully completed in June 2014.

The design of the WWTP for Stage 1 (3,500 m^3/d) was completed; however, the solution proved unaffordable and the Municipality is now seeking more cost-effective options. Accordingly, an Amendment to the Master Plan has been initiated to consider additional alternatives to gain wastewater treatment capacity through lagoon optimization. Only the changes to wastewater treatment proposed in the amendment are open for review.

A public meeting will be held to present the amendment information, as follows:

PUBLIC MEETING
Date: Wednesday, August 17 2016
Time: 7:00pm – 9:00pm

Location: Limoges Community Centre
205 Limoges Road, Limoges ON

Following the public meeting, the study team will finalize the preferred design and prepare the Amendment Report. The report will be placed on the public record for review in accordance with the requirements of the Municipal Class Environmental Assessment.

Public consultation is an important part of the process and we are interested in hearing any comments that you may have about this study. Please send any comments or requests to:

Nation Municipality
Mary McCuaig, CAO/Clerk
958 Route 500 West
Casselman, ON K0A 1M0
Phone: 613.764.5444 x222
E-mail: mmccuaig@nationmun.ca

R.V. Anderson Associates Limited
Beth Hamley, Environmental Coordinator
220-1750 Courtwood Crescent
Ottawa, ON K2C 2B5
Phone: 613.226.1844
E-mail: ehamley@rvanderson.com

Plan directeur du Village de Limoges relatif à l'eau potable et aux eaux usées
Traitement des eaux usées (annexe C)

AVIS DE MODIFICATION ET ASSEMBLÉE PUBLIQUE

En 2013, la Municipalité de La Nation a complété le plan directeur du Villages de Limoges relatif à l'eau potable et aux eaux usées prévoyant une infrastructure de traitement des eaux usées qui pourrait répondre à ses besoins à long terme compte tenu de sa croissance et de son développement. La solution retenue pour le traitement des eaux usées était de construire une nouvelle usine de traitement mécanique des eaux usées utilisant des réacteurs discontinus séquentiels sur le site même du bassin d'épandage. Comme mesure provisoire, la capacité du bassin existant avait été portée à 1 500 m^3/j ce qui pouvait accommoder 1 100 personnes. La réévaluation a été complétée en 2014.

La conception de l'usine de traitement des eaux usées pour la Phase 1 (3 500 m^3/j) a été accomplie, mais cette solution s'avérait trop onéreuse et la Municipalité est maintenant à la recherche de solutions moins coûteuses. C'est pourquoi une modification du plan directeur est proposée pour trouver des solutions de rechange pour le traitement d'un plus grand volume d'eaux usées en optimisant la capacité du bassin. Seuls les changements au traitement des eaux usées proposés dans la modification font l'objet d'un examen.

Une assemblée publique sera tenue pour présenter l'information sur la modification comme suit :

ASSEMBLÉE PUBLIQUE
Date: Mercredi, le 17 août 2016
Heure: 19h00 – 21h00

Endroit: Centre communautaire de Limoges
205 chemin Limoges, Limoges (Ontario)

À la suite de l'assemblée publique, l'équipe responsable de l'étude finalisera le concept retenu et préparera un rapport sur la modification. Ce rapport sera mis à la disposition du public aux fins d'examen et conformément aux exigences de l'évaluation environnementale municipale de portée générale.

La consultation publique est une étape importante du processus et nous tenons à prendre connaissance de tout commentaire que vous souhaitez formuler au sujet de cette étude. Veuillez faire parvenir vos commentaires ou vos questions à :

Municipalité de La Nation
Mary McCuaig, Directrice générale/Greffière
958, route 500 ouest
Casselman (Ontario) K0A 1M0
Téléphone: 613.764.5444 x222
Courriel: mmccuaig@nationmun.ca

R.V. Anderson Associates Limited
Beth Hamley, Coordinateur Environnemental
220-1750 Courtwood Crescent
Ottawa (Ontario) K2C 2B5
Téléphone: 613.226.1844
Courriel: ehamley@rvanderson.com

Newspaper page

MAISONS à louer / HOUSES for rent

.MIN ST-ALBERT, maison complète 3 CAC, chauffé, ni éclairé, pas d'animaux, disponible .r août, "visite seulement après le 18 juillet", .200$/mois. (613)443-3482

EMBRUN, 3 CAC, semi-détaché en ICF avec garage, bien située, bord de l'eau, climatiseur, lave-vaisselle, plancher en céramique et bois franc. 1700$/mois plus les services. Disponible en septembre. Pas d'animaux, non-fumeur, 613-443-9971 ou 613-222-2603.

VILLAGE DE CASSELMAN, 3 CAC, cour privée garage attaché, appareils ménagers inclus. 900$/mois plus les services. 613-443-3296

SERVICES

COUTURIÈRE/DESSINATRICE DE MODE HÉLÈNE. Services: Altération et vêtement sur mesure. **SEAMSTRESS/FASHION DESIGNER HÉLÈNE.** Services: Alterations and garments made to measure. Sur rendez-vous/By app. C: 613-715-2884 H: 613-443-4422

CEDAR RIDGE DESIGNS — COMMERCIAL and RESIDENTIAL WOODWORKER

Cedar Ridge Designs is a growing residential and commercial cabinet maker located outside Maxville, Ontario, 45 minutes east of Ottawa. We are seeking an experienced **Commercial and Residential Cabinets Woodworker**. This position has significant growth potential for an organized and ambitious person.

Scope of the position:
- Position is responsible to build and follow custom parts projects through to installation, and ensure they are done to specification.

Critical competencies:
- Read, interpret, and clarify drawings.
- Have the ability to visualize the project from the drawing.

Key areas of responsibility:
- Read, interpret, and clarify drawings with Shop Foreman.
- Establish an efficient production/assembly plan and create a custom piece list if required.
- Plane, saw, rip and sand custom parts.
- Laminate and glue plastic laminates and veneers.
- Assemble cabinets and millwork according to plans.
- Use variety of woodworking tools, both hand tools and electric.
- Able to work without supervision.
- Comprehend all aspects of the custom job from start to finish.
- Problem solve and be eager to learn.
- Have enough strength to lift and manage heavy parts up to 60 kgs.
- Maintain tools and understand the setup of tools you use.
- Be mindful of shop procedures and safety of others.
- Complete job in time allocated.

Hours: Mon-Thurs: 7am to 5pm, Friday: 7am to 3pm, occasionally evening or Saturday work.

Compensation: Wage $17 – $21/hour, commensurate with experience.
Standard Group Benefits Package
Only those candidates selected for an interview will be contacted. Current references required.

Please send your résumé to:
Colin Unruh at info@cedarridgedesigns.ca Fax to: 613-527-1600
For more info on Cedar Ridge Designs: www.cedarridgedesigns.ca

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La The Nation
MUNICIPALITÉ | MUNICIPALITY

Village of Limoges Potable Water and Wastewater Master Plan – Wastewater Treatment (Schedule C)

NOTICE OF AMENDMENT & PUBLIC MEETING

In 2013, the Nation Municipality completed the Potable Water and Wastewater Master Plan for the Village of Limoges, which considered water and wastewater infrastructure requirements to satisfy long term development and growth. The preferred alternative for wastewater treatment was to construct a new mechanical wastewater treatment plant (WWTP) using Sequencing Batch Reactors on the existing lagoon site. An interim stage of the solution was to re-rate the existing lagoon to 1,500 m^3/d to permit growth of approximately 1,100 persons. Re-rating was successfully completed in June 2014.

The design of the WWTP for Stage 1 (3,500 m^3/d) was completed; however, the solution proved unaffordable and the Municipality is now seeking more cost-effective options. Accordingly, an Amendment to the Master Plan has been initiated to consider additional alternatives to gain wastewater treatment capacity through lagoon optimization. Only the changes to wastewater treatment proposed in the amendment are open for review.

A public meeting will be held to present the amendment information, as follows:

PUBLIC MEETING
Date: Wednesday, August 17, 2016
Time: 7p.m. – 9p.m.

Location: Limoges Community Centre
205 Limoges Road, Limoges ON

Following the public meeting, the study team will finalize the preferred design and prepare the Amendment Report. The report will be placed on the public record for review in accordance with the requirements of the Municipal Class Environmental Assessment.

Public consultation is an important part of the process and we are interested in hearing any comments that you may have about this study. Please send any comments or requests to:

Nation Municipality
Mary McCuaig, A.M.C.T. CAO/Clerk
958 Route 500 West
Casselman ON K0A 1M0
Phone: 613-764-5444 x222
E-mail: mmccuaig@nationmun.ca

R.V. Anderson Associates Limited
Beth Hamley, Environmental Coordinator
220-1750 Courtwood Crescent
Ottawa ON K2C 2B5
Phone: 613-226-1844
E-mail: ehamley@rvanderson.com

La The Nation
MUNICIPALITÉ | MUNICIPALITY

Plan directeur du Village de Limoges relatif à l'eau potable et aux eaux usées Traitement des eaux usées (annexe C)

AVIS DE MODIFICATION ET ASSEMBLÉE PUBLIQUE

En 2013, la Municipalité de La Nation a complété le plan directeur du village de Limoges, relatif à l'eau potable et aux eaux usées, prévoyant une infrastructure de traitement des eaux usées qui pourrait répondre à ses besoins à long terme, compte tenu de sa croissance et de son développement. La solution retenue pour le traitement des eaux usées était de construire une nouvelle usine de traitement mécanique des eaux usées utilisant des réacteurs discontinus séquentiels sur le site même du bassin d'épandage. Comme mesure provisoire, la capacité du bassin existant avait été portée à 1 500 m^3/j ce qui pouvait accommoder 1 100 personnes. La réévaluation a été complétée en 2014.

La conception de l'usine de traitement des eaux usées pour la Phase 1 (3 500 m^3/j) a été accomplie, mais cette solution s'avérait trop onéreuse et la Municipalité est maintenant à la recherche de solutions moins coûteuses. C'est pourquoi une modification du plan directeur est proposée pour trouver des solutions de rechange pour le traitement d'un plus grand volume d'eaux usées en optimisant la capacité du bassin. Seuls les changements au traitement des eaux usées proposés dans la modification font l'objet d'un examen.

Une assemblée publique sera tenue pour présenter l'information sur la modification comme suit :

ASSEMBLÉE PUBLIQUE
Date: Le mercredi 17 août 2016
Heure: 19h – 21h

Endroit: Centre communautaire de Limoges
205, chemin Limoges, Limoges (Ontario)

À la suite de l'assemblée publique, l'équipe responsable de l'étude finalisera le concept retenu et préparera un rapport sur la modification. Ce rapport sera mis à la disposition du public aux fins d'examen et conformément aux exigences de l'évaluation environnementale municipale de portée générale.

La consultation publique est une étape importante du processus et nous tenons à prendre connaissance de tout commentaire que vous souhaitez formuler au sujet de cette étude. Veuillez faire parvenir vos commentaires ou vos questions à :

Municipalité de La Nation
Mary McCuaig, A.M.C.T. directrice générale/greffière
958, route 500 ouest
Casselman (Ontario) K0A 1M0
Téléphone: 613-764-5444 x222
Courriel: mmccuaig@nationmun.ca

R.V. Anderson Associates Limited
Beth Hamley, coordinateur environnemental
220-1750 Courtwood Crescent
Ottawa (Ontario) K2C 2B5
Téléphone: 613-226-1844
Courriel: ehamley@rvanderson.com

Municipalité de La Nation
The Nation Municipality

Recherche un (e) / Requires a

Commis aux services à la clientèle
Pour le bureau central – Casselman
Temps plein – 35 heures semaine

Sommaire des fonctions
- Offrir un service exceptionnel aux clients;
- Perception d'impôts fonciers, frais services publics;
- Gérer la cédule de réservation;
- Classement;
- Répondre au téléphone et acheminer les appels;
- Autres tâches connexes;

Éducation et compétences
- Diplôme de 12e année;
- Deux années d'expérience à gérer une caisse;
- Deux années d'expérience de travail dans une municipalité seraient un atout;
- Autonomie et travail en équipe;
- Connaissances de la suite Microsoft;
- Bonnes connaissances de l'informatique;
- Dois être bilingue;
- Dynamique;
- Grande capacité d'apprentissage;

Salaire : 17.18 $ à 19.45 $ l'heure

Client Services Clerk
For the central office – Casselman
Full time –35 hours a week

Job Description
- Serve clients with exceptional customer service;
- Collection of taxes, utilities, accounts receivable;
- Facility Scheduling;
- Filing;
- Answer the phone and direct the calls;
- Other related duties:

Education and qualifications
- Grade 12 diploma;
- Two years of experience handling cash;
- Two years working experience in municipal environment would be an asset;
- Able to work without supervision or in a team;
- Knowledge of Microsoft office;
- Good working knowledge of computer software;
- Must be bilingual;
- Dynamic;
- Good Learning skills.

Salary: $17.18 to $19.45 per hour

Pour plus d'information communiquer avec
Cécile Lortie(613) 764-5444 poste/ext 224
For more information, contact:

Les candidat(e)s intéressé(e)s sont prié(e)s de faire parvenir leur curriculum vitae avant 12h00 (midi) le 5 août 2016, en indiquant le numéro de référence TR-1-2016 à l'adresse suivante:

Interested candidates are invited to submit their curriculum vitae no later than 12:00 p.m. (noon), August 5th, 2016 indicating reference number TR-1-2016 to the following address:

Municipalité de La Nation Municipality
ATT: Cécile Lortie
958 Route 500 Ouest / West
Casselman Ont
K0A 1M0

Courriel/E-Mail : clortie@nationmun.ca
Télécopieur/Fax : (613)764-3310 Attention Cécile Lortie

La Municipalité de La Nation tient à remercier toutes les personnes qui soumettront leur candidature. Cependant, nous communiquerons seulement avec celles choisies pour une entrevue.

The Nation Municipality wishes to thank all applicants, but only those chosen for an interview will be contacted.

Égalité des chances d'emploi
À La Nation, nous valorisons la diversité de notre main d'œuvre et encourageons tous les candidats qualifiés à soumettre une demande d'emploi. Bien que nous apprécions toutes les candidatures reçues, seuls les candidats convoqués en entrevue seront contactés.

Equal Opportunity Employer
At Nation Municipality, we value diversity in our workforce and encourage all qualified candidates to apply. We appreciate all responses and advise that only those candidates selected for an interview will be contacted.

VILLAGE OF LIMOGES – MASTER PLAN AMENDMENT / VILLAGE DE LIMOGES – MODIFICATION DU PLAN DIRECTEUR

PUBLIC INFORMATION CENTER / ASSEMBLÉE PUBLIQUE
205 chemin Limoges Road

August 17 2016 / 17 août 2016

Sign-In Sheet
Feuille de Présence

NAME / NOM	COMPANY / ORGANISATION	ADDRESS / ADDRESSE	E-MAIL / COURIEL
Conrad Racine Shirley Racine	Residents	2173 Route 400 W Limoges	shirley_racine@sympatico.ca
François Sigouin Rachel Sigouin	Residents	2100 des Pins	sigouin.francois@3web.com
RON THERIAULT LUCIE LAPOINTE		2157 ROUTE 400 W LIMOGES	RON@ELICOR.CA
ROBERT LEDUC	Resident	1195 Ste Angustine Bat 1019 Embrun	
Ronda Bautz	South Nation Cons.	38 Victoria St. Finch	rbautz@nation.on.ca
Sandra Mancini	SNC	"	smancini@nation.on.ca
Phil Wan	Resident	116 Simon	philvw@bell.net

VILLAGE OF LIMOGES – MASTER PLAN AMENDMENT / VILLAGE DE LIMOGES – MODIFICATION DU PLAN DIRECTEUR

La Nation
MUNICIPALITÉ | MUNICIPALITY

PUBLIC INFORMATION CENTER / ASSEMBLÉE PUBLIQUE
205 chemin Limoges Road

August 17 2016 / 17 août 2016

Sign-In Sheet
Feuille de Présence

NAME / NOM	COMPANY / ORGANISATION	ADDRESS / ADDRESSE	E-MAIL / COURIEL
Sylvain Viau			Sylvain.V@hotmail.com.
Jean Leduc			jean/leduc@ russell.ca
Ron Clark			
Pierre Mainville			pierre.mainville@Ottawa.ca.
Yvon Bergeron			Yvonbergeron007@gmail.com
Vincent Detillieux			Vincent@saintjosephproperties.com
R Racine			Robbo FORD @ gmail.com

VILLAGE OF LIMOGES – MASTER PLAN AMENDMENT / VILLAGE DE LIMOGES – MODIFICATION DU PLAN DIRECTEUR

La The Nation
MUNICIPALITÉ | MUNICIPALITY

PUBLIC INFORMATION CENTER / ASSEMBLÉE PUBLIQUE
205 chemin Limoges Road

August 17 2016 / 17 août 2016

Sign-In Sheet
Feuille de Présence

NAME / NOM	COMPANY / ORGANISATION	ADDRESS / ADDRESSE	E-MAIL / COURIEL
Sylvain Ouellet		33 Oasis	kaswild.1@hotmail.com

WELCOME

Public Information Centre
August 17, 2016
7pm – 9pm

The Nation Municipality welcomes you to this Public Information Centre about the Amendment to the Village of Limoges Potable Water and Wastewater Master Plan, completed in 2013. This Amendment considers additional alternatives to gain wastewater treatment capacity through lagoon optimization. Only the changes to wastewater treatment addressed in the amendment are open for review.

PLEASE SIGN IN

Please review the materials and provide your comments on the forms available. Staff are available to answer your questions.

BIENVENUE

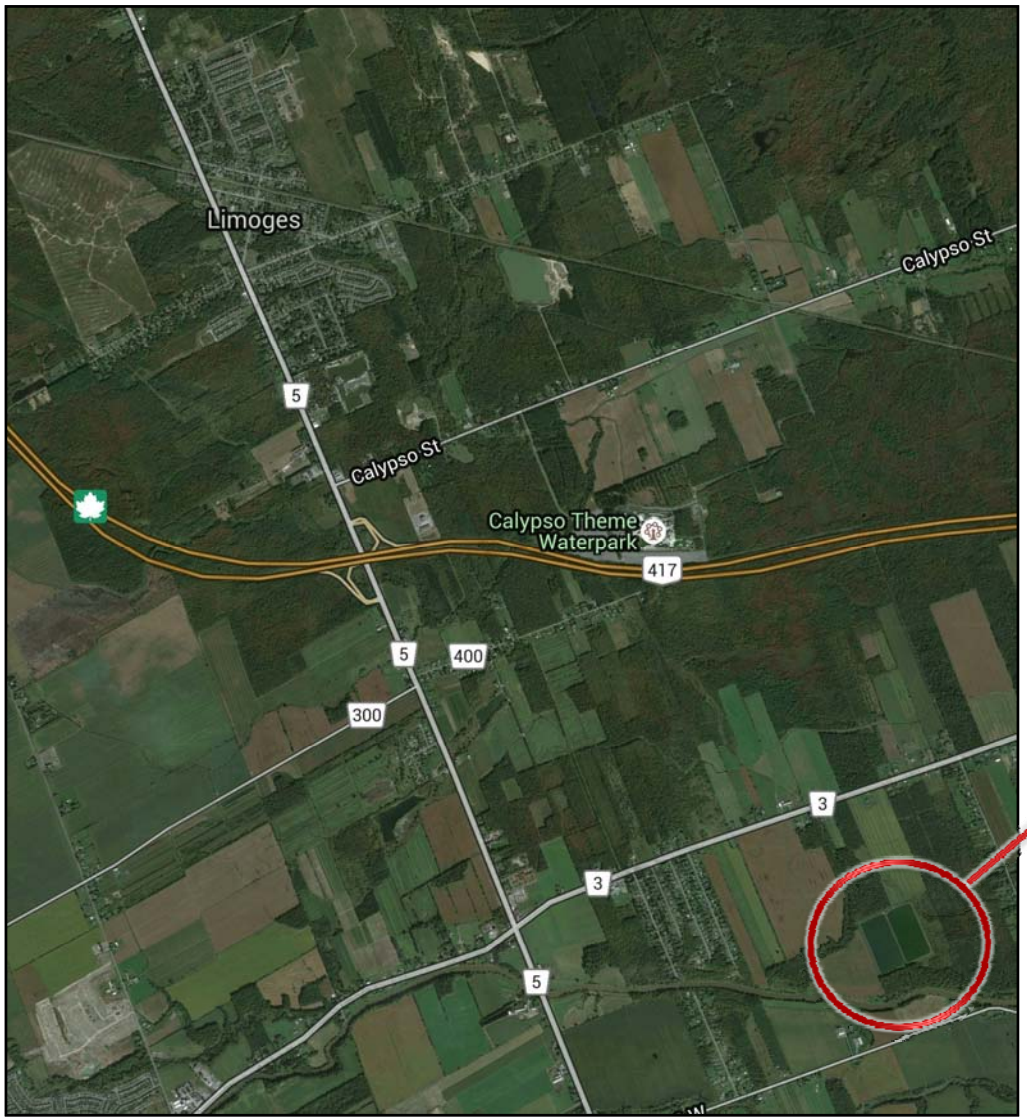
Assemblée Publique
le 17 août 2016
19h00 – 21h00

La Municipalité de La Nation vous souhaite la bienvenue à cette assemblée publique concernant la modification du Plan directeur du Village de Limoges relatif à l'eau potable et aux eaux usées, complété en 2013. Cette modification suggère des solutions de rechange additionnelles visant à augmenter la capacité de traitement des eaux usées en optimisant la capacité du bassin. Seuls les changements au traitement des eaux usées proposés dans la modification font l'objet d'un examen.

VEUILLEZ VOUS INSCRIRE

Veuillez prendre connaissance des documents et formuler vos commentaires sur les formulaires mises à votre disposition. Des représentants sont présents pour répondre à vos questions.

STUDY AREA / RÉGION D'ÉTUDE



BACKGROUND

Existing Treatment System:

- 2-cell lagoon
- Capacity: 1,500 m^3/day
- Semi-annual discharge (SPRING AND FALL)

2013 Master Plan Solution:

- Re-rate lagoons to 1,500 m^3/d (COMPLETED IN 2014)
- New mechanical wastewater treatment plant using Sequencing Batch Reactors to increase capacity to 3,500 m^3/d (FUNCTIONAL DESIGN COMPLETED IN 2014)
  → Estimated Cost: $17 M

Purpose of Amendment:

- Consider additional solutions & lagoon optimization
- Cost-effective wastewater treatment
- Treatment capacity of 3,500 m^3/d to support population growth beyond 5,000 people

CONTEXTE

Système de traitement actuel :

- Deux étangs de stabilisation
- Capacité : 1 500 m^3/jour
- Décharge semestrielle (PRINTEMPS ET AUTOMNE)

Solution du plan directeur de 2013 :

- Porter la capacité des étangs à 1 500 m^3/j (COMPLÉTÉ EN 2014)
- Nouvelle usine de traitement des eaux usées utilisant des réacteurs discontinus séquentiels pour augmenter la capacité à 3 500 m^3/j (CONCEPTION FONCTIONNELLE COMPLÉTÉE EN 2014) → Coût estimé : 17 M$

But de la modification :

- Considère d'autres solutions et optimisation du bassin
- Traitement efficace par rapport au coût
- Capacité de traitement de 3 500 m^3/j pour desservir une population de plus de 5 000 personnes

DESIGN CRITERIA

Recommended Effluent Criteria for 3,500 m^3/day:

Parameter	Effluent Limit (mg/L)	Loading (kg/d)
Carbonaceous biochemical oxygen demand ($CBOD_5$)	5	17.3
Total Suspended Solids (TSS)	5	17.3
Total Phosphorus	0.3	1.0
Total Ammonia - Summer (May-Oct) - Winter (Nov-Apr)	 1 5	 3.5 17.3
E.Coli (count/100mL)	200	n/a
Total Residual Chlorine (TRC)	0.02	0.07

(MOECC, May 31 2012)

- Continuous discharge with storage for low flow periods (June, July, August) = 210,000 m^3 of storage
- No increase in phosphorus loads to the watershed as a result of greater flows

Review of Alternative Solutions:

- Many options were reviewed and assessed for their ability to meet the design criteria, constructability, and operation & maintenance requirements.

  → 3 viable options were shortlisted for further consideration.

CRITÈRES DE CONCEPTION

Critères recommandés pour 3 500 m^3/jour :

Paramètre	Limite de rejet des effluents (mg/l)	Charge (kg/j)
Demande biochimique en oxygène (DBO5)	5	17,3
Solides totaux en suspension	5	17,3
Phosphore total	0,3	1,0
Ammoniac total - Été (mai/octobre) - Hiver (novembre/avril)	 1 5	 3,5 17,3
E.Coli (numération/100mL)	200	s.o.
Chlore résiduel total (CRT)	0,02	0,07

(MEACCO, 31 mai 2012)

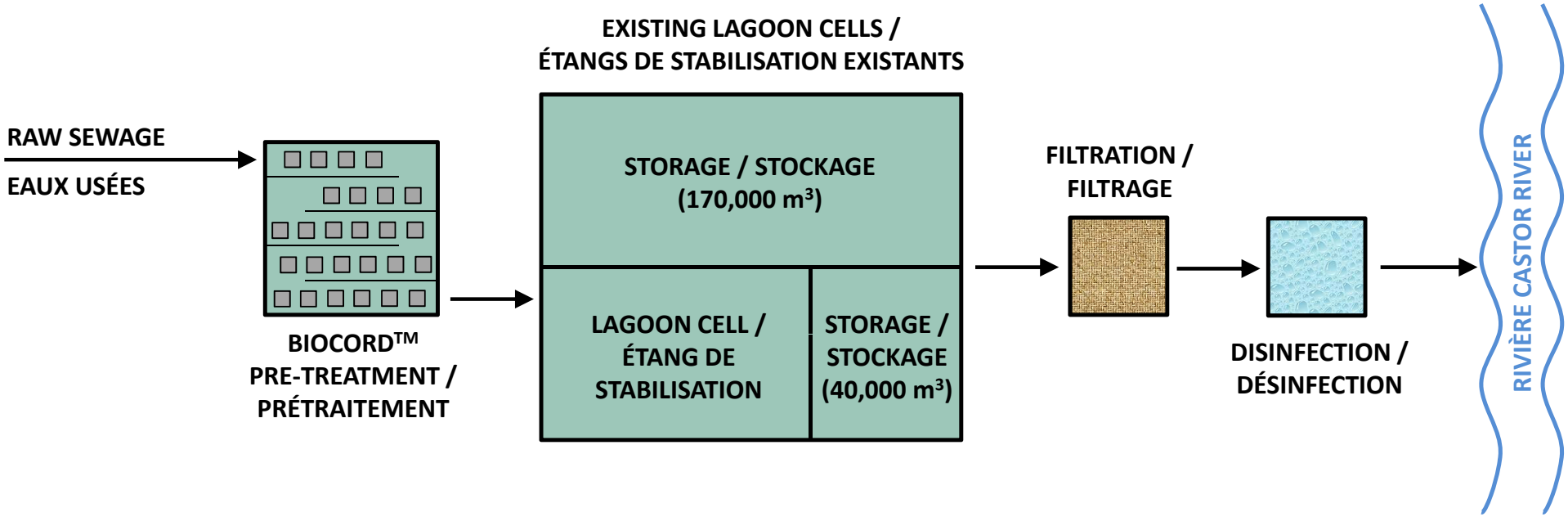
- Décharge continue et stockage pour les périodes de faible débit (juin, juillet, août) = 210 000 m^3
- Aucune augmentation de charges de phosphore dans le bassin versant attribuable au débit plus important

Examen des solutions alternatives :

- Plusieurs solutions alternatives ont fait l'objet d'examens et d'évaluations afin de déterminer les critères de conception et les exigences de constructibilité, d'exploitation et d'entretien.

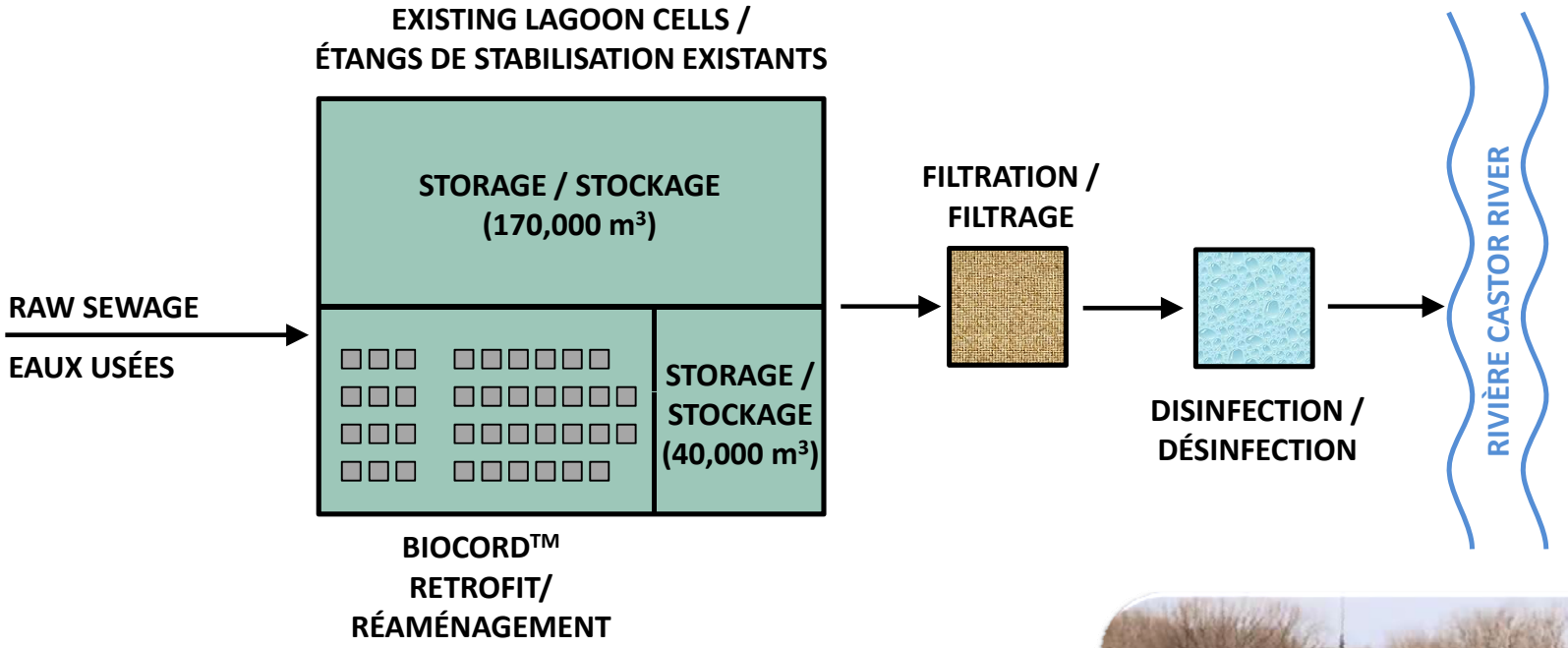
  → 3 options viables ont été retenues aux fins d'étude.

Option A: BioCord™ Pre-Treatment Cell / Installation de prétraitement BioCord™



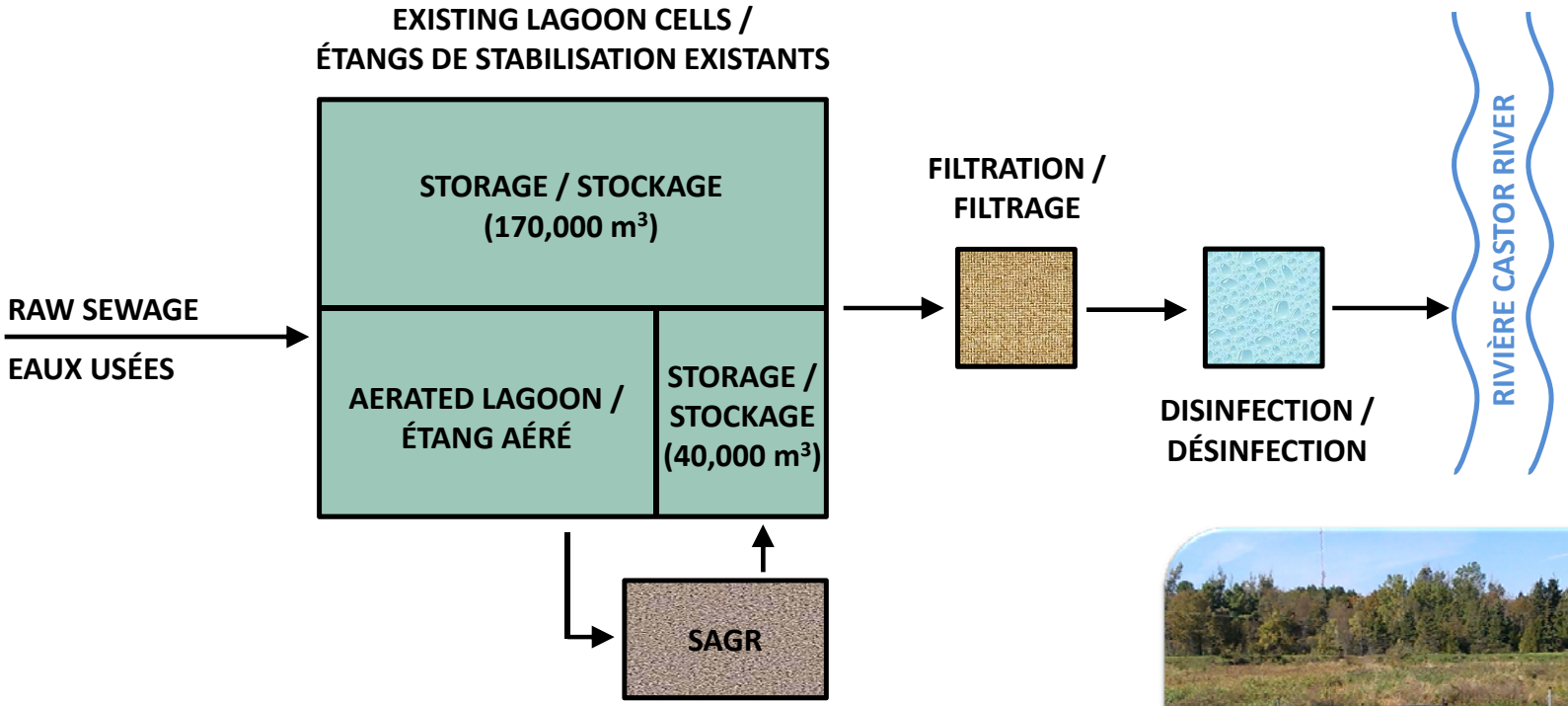
Cost Estimate / Prix Estimé = $4.0 M

Option B: BioCord™ Lagoon Retrofit / Réaménagement du bassin avec BioCord™



Cost Estimate / Prix Estimé = $5.1 M

Option C: Submerged Attached Growth Reactor (SAGR) Post-Treatment / Traitement subséquent par réacteur de croissance immergé à demeure



Cost Estimate / Prix Estimé = $7.8 M

ADDITIONAL REQUIREMENTS

All shortlisted options include the following:

Disinfection:

- Required to meet E.Coli limit
- A UV or chlorination/dechlorination disinfection system will be used following the lagoon.

Tertiary Filtration:

- Required to meet TSS Limit of 5 mg/L
- Fabric filters will be used following the lagoon

Phosphorus Offsetting:

- No allowable increase in phosphorus loads to the watershed as a result of the greater effluent flow
- Total Phosphorus Management through the South Nation Conservation Clean Water Program

EXIGENCES ADDITIONNELLES

Toutes les options retenues comportent les caractéristiques suivantes :

Désinfection :

- Exigée pour respecter la limite d'E.Coli
- Système de désinfection UV ou par chloration/ déchloration installé dans le bassin

Filtrage tertiaire :

- Nécessaire pour respecter la limite STS de 5 mg/l
- Un séparateur à tissu filtrant sera utilisé dans le bassin

Contrôle du phosphore :

- Aucune augmentation de charges de phosphore dans le bassin versant attribuable au débit plus important
- Gestion totale du phosphore grâce au Programme d'assainissement de l'eau de Conservation de la Nation Sud

RECOMMENDED SOLUTION:

Option A (BioCord™ Pre-Treatment Cell) is recommended as the preferred alternative, based on evaluation of costs and operation & maintenance requirements.

NEXT STEPS

No.	Task	Anticipated Completion Date
1	Incorporate Comments	August 2016
2	Prepare Amendment Report	September 2016
3	Notice of Amendment Filing	September 2016
4	30-day Review & Comment Period	Sept - Oct 2016
5	Design & Approvals	Winter 2017
6	Construction	Spring / Summer 2017

SOLUTION RECOMMANDÉE :

L'option A (Installation de prétraitement BioCord™) est recommandée comme solution de rechange préférée basée sur l'évaluation des coûts et des exigences en exploitation et en entretien.

PROCHAINES ÉTAPES

Nº	Tâche	Achèvement prévu
1	Intégration des commentaires	Août 2016
2	Préparation du rapport de modification	Septembre 2016
3	Signification de l'avis de modification	Septembre 2016
4	Période d'examen et de commentaires de 30 jours	Septembre/ octobre 2016
5	Conception et approbations	Hiver 2017
6	Construction	Printemps/été 2017