# Environmental Study Report for the Omemee Wastewater Pollution Control Plant

July 22nd, 2022


**Prepared for:**

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**Project No.: 20-1-7426**

# EXECUTIVE SUMMARY

The City of Kawartha Lakes (CKL) owns the municipal wastewater system and water pollution control plant (WPCP) in the Town of Omemee. It was originally constructed as a dual lagoon / spray irrigation system. In 2011, the CKL completed a Class Environmental Assessment based on a Growth Management Plan that forecasted substantial growth in the area. Accordingly, the CKL elected to upgrade the system by designing a large sub-surface disposal system (LSSDS) which was constructed in 2013. The original spray irrigation system was to be decommissioned after successful commissioning of the new works. The LSSD has not performed to its original design standards and is unable to handle the capacity of design flows, so the system is currently operating as a combination of the new LSSD and the original spray irrigation system.

In 2017, CKL engaged the Greer Galloway Group (GGG) to review the situation. After consultation with the Ministry of Environment, Conservation, and Parks (MECP) it was determined that a new Schedule 'C' Municipal Class EA would be required prior to seeking an amendment to the Environmental Compliance Approval (ECA). The following alternative solutions for expanding the wastewater treatment capacity were considered:

1) Do nothing
2) Implement upgrades and utilise both spray irrigation and the LSSDS
3) Replace or rehabilitate all or part of the system

The selected alternative was to run the existing LSSDS at a reduced but achievable capacity and continuing to run the spray irrigation system during the spray season. This option requires some improvements to the effluent that goes to the LSSDS and some valve/pump replacement to be reliable. This is the preferred alternative as it sufficiently addresses existing issues at the lowest cost.

The preferred design concept for the upgraded system increases retention time by staging flow through both lagoons in series, instead of operating them in parallel. Upgraded and additional filtration is included in the form of a new traveling screen for all effluent, followed by a Dissolved Air Flotation (DAF) unit for influent to the LSSD. Effluent for discharge to the spray irrigation system is stored in the existing primary wet well, and effluent that is to be discharged in the LSSDS is subject to additional DAF filtration and is stored in a new secondary wet well prior to discharge.

The new design and operational method incorporate the findings of aerosol and hydrogeological studies including limitation of effluent to the LSSDS in consideration of the hydrogeological limitations found and the movement of spray nozzles from the property boundaries to comply with MECP Guidelines.

This environmental study report (ESR) documents the results of the Class EA planning and consultation process for the Omemee WPCP Upgrade project.

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# 1. INTRODUCTION

## 1.1. Background

CKL owns the municipal wastewater system and water pollution control plant (WPCP) in the Town of Omemee. It was originally constructed as a dual lagoon/spray irrigation system in 1976.

In 2013, CKL received an ECA from the Ministry of Environment and Climate Change (MOECC) for construction of the new system. This included the cessation of the spray irrigation of effluent from the lagoons by December 31, 2015. Accordingly, CKL proceeded to construct the large sub-surface disposal system (LSSDS) in 2013. Unfortunately, the LSSD has not performed to its design capacity, and has had a history of malfunctions in the pumping chamber and tile bed.

In 2017, CKL entered into negotiations with Greer Galloway to examine the issues with the system, review the required capacity, and recommend updates to the system.

These upgrades and recommendations will be carried out as a Schedule 'C' project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act.

A Notice of Study Commencement was release on June 29th, 2020, to mark the beginning of the project and a PIC was held on July 15th, 2021, during which limitations and proposed upgrades to the system were described. A Preferred Design Report was completed in May 2022 and the final PIC was held on the 25th of May, 2022.

## 1.2. Study Area

The Municipality of Omemee is located in the City of Kawartha Lakes on the shore of Pigeon Lake. The municipal WPCP is located approximately 1.2km north/northwest of Omemee. The WPCP property is approximately 0.4 $km^2$ in area and contains two storage lagoons, several spray irrigation fields, and the LSSDS. The municipality also owns the neighboring property to the east of the WPCP, known as the Sanderson pit. Figure 1 shows the location of the WPCP.


*Figure 1: Aerial view of Omemee and Omemee WPCP*

## 1.3. Municipal Class Environmental Assessment Process

In Ontario, municipal water and wastewater projects are subject to the provisions of the Municipal Class Environmental Assessment (2000, amended in 2007, 2011 and 2015). The Class Environmental Assessment (Class EA) is an approved planning document which describes the process that proponents must follow in order to meet the requirements of the Environmental Assessment Act (EAA) of Ontario. The Class EA approach allows for the evaluation of the environmental effects of carrying out a project and alternative methods of carrying out a project, includes mandatory requirements for public input, and expedites the environmental assessment of smaller recurring projects.

The Class EA planning process was developed to ensure that the potential social, economic, and natural environmental effects are considered in planning water, storm water and sewage projects. Class EAs are a method of dealing with projects which display the following important common characteristics: recurring, usually small in nature, usually limited in scale, predictable range of environmental effects, and responsive to mitigation measures.

Projects which do not display these characteristics must undergo an individual environmental assessment. The Class EA planning process represents an alternative for Ontario municipalities to carrying out individual environmental assessments for most municipal sewage, storm water management, and water projects. Since sewage, storm water management and water projects undertaken by municipalities under the Class EA planning process vary in their environmental impact such projects are classified in terms of schedules.

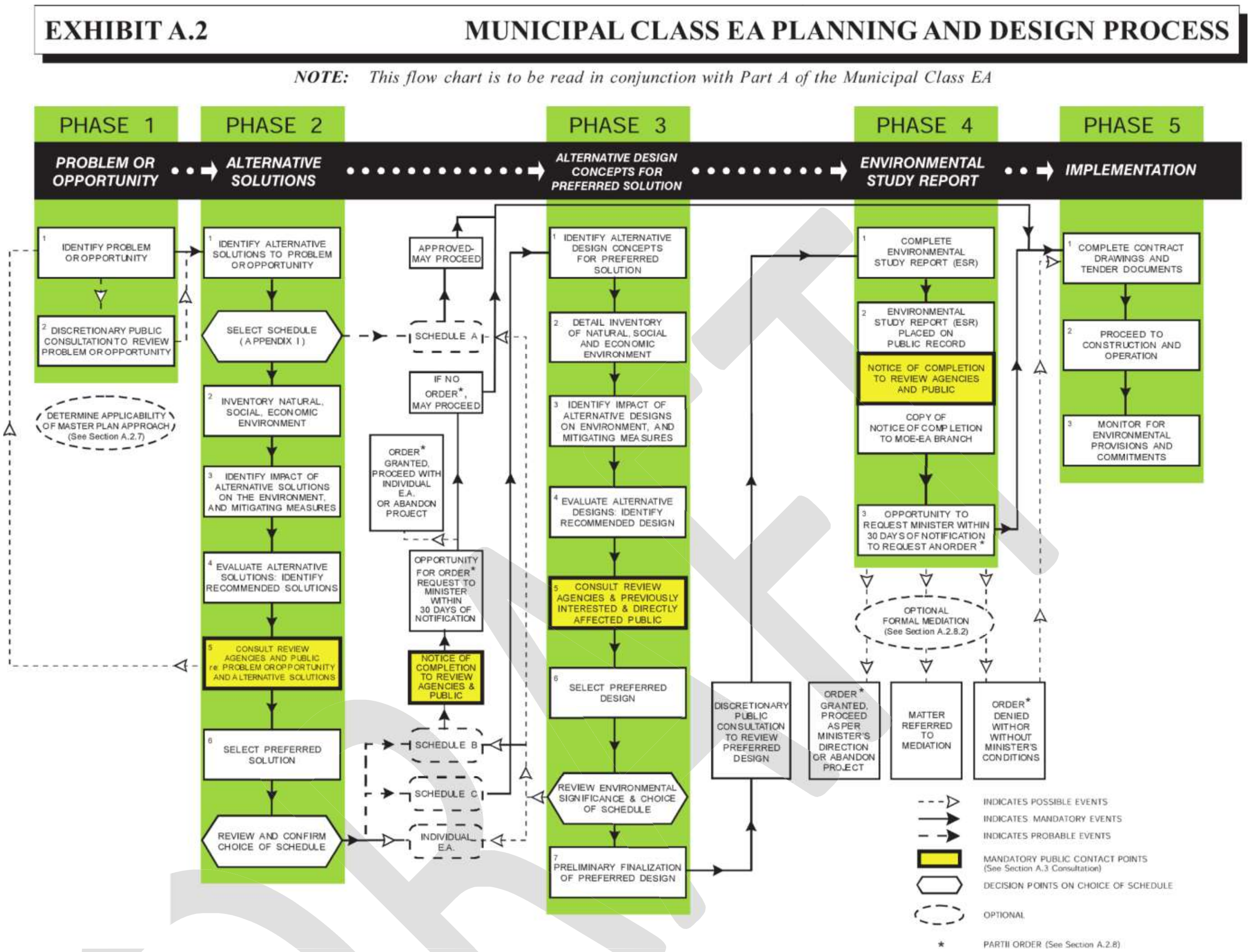


*Figure 2: Municipal Class EA Planning and Design Process Flow Diagram.*



Schedule A projects are limited in scale, have minimal adverse effects and include the majority of municipal sewage, storm water management and water operations as well as maintenance activities. These projects are pre-approved and may proceed to implementation without any further requirements under the provisions of the Class EA planning process. Schedule A+ projects are also pre-approved; however, the public must be informed prior to implementation.

Schedule B projects have the potential for some adverse environmental effects. The proponent is required to undertake a screening process involving mandatory contact with directly affected public and with relevant government agencies to ensure that they are aware of the project and that their concerns are addressed. If there are no outstanding concerns, then the proponent may proceed to implementation. If, however, the screening process raises a concern which cannot be resolved, then the Part II Order ("bump-up") procedure may be invoked; alternatively, the proponent may elect voluntarily to plan the project as a Schedule C undertaking. Typically, Schedule B projects involve extensions to existing Municipal infrastructure such as sewage collection systems and water distribution systems.

Schedule C projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class EA process. Schedule C projects require that an ESR be prepared and submitted for review by the public. If concerns are raised that cannot be resolved, the "bump-up" procedure may be invoked, which may result in the requirement to complete a full environmental assessment. Typically, these projects involve the construction of Municipal infrastructure such as wastewater treatment facilities, new sewage collection and water distribution systems, and water treatment facilities.

Proponents then proceed through the planning process beginning with Phase 1 (Problem Definition) and advancing towards the end of Phase 2 (Evaluation of Alternative Solutions), where the preferred alternative solution is determined. Having determined the preferred alternative solution, the appropriate project schedule and process to be followed for the completion of the project. The 2011 EA followed the Schedule C process.

For a Schedule C project, Phase 1 defines the nature and extent of the problem and the project opportunity. Often a discretionary public meeting is held to inform interested parties of the EA planning process and to discuss the problem.

Phase 2 involves the identification of the alternative solutions. Also included is an inventory of the natural, social, and economic environment; the identification of the impacts of alternative solutions on the environment; the identification of mitigation measures; an evaluation of alternative solutions; consultation with review agencies and the public regarding the identified problem and alternative solutions; the identification of the preferred alternative solution; and confirmation of the path or schedule to follow for the balance of the Class EA process. Public consultation is mandatory at this phase and includes review agencies and the affected public. The appropriate EA schedule for the project is also identified.

Phase 3 involves the identification of alternative designs for the selected alternative solution. Also included are a detailed inventory of the natural, social, and economic environment relating to the selected alternative solution; the identification of the impacts of alternative designs on the environment; the identification of mitigation measures; consultation with review agencies and the public regarding the alternative designs; and the identification of the recommended alternative design. Public consultation is mandatory at this phase and includes review agencies and the affected public.

Phase 4 represents the culmination of the planning and design process as set out in the Class EA. Phase 4 involves the completion of the documentation including the ESR, if required, and the Notice of Completion. The ESR documents all the activities undertaken through Phases 1, 2 and 3 including the consultation. The ESR is filed with the Clerk of the Municipality and is placed on the public record for at least 30 days to allow for public review. The public and mandatory agencies are notified through the Notice of Completion, which also discloses the Part II Order (“bump-up”) provisions.

Phase 5 is the implementation phase of the Class EA process, and includes final design, construction plans and specifications, tender documents, and construction and operation. It also includes monitoring for environmental provisions and commitments (e.g. mitigation measures) as defined in the ESR

There is an opportunity for any interested parties to request a Part II Order that results in the project being bumped up from a Class Environmental Assessment to an Individual Environmental Assessment. The “bump-up” opportunity exists at the Notice of Completion stage and must be filed with the Minister of Environment within thirty (30) days of the notice date. The Notice of Completion occurs near the end of Phase 4 for Schedule C projects. It signifies that the Class EA process has been completed for the project and that the resulting document has been placed on public record.

For projects subject to the provisions of the Class Environmental Assessment Process, a person or agency with a significant concern must communicate the concern to the proponent any time between Phases 2 and 4. If the concern cannot be resolved between the party and the proponent, then that person or agency can request a Part II Order from the Minister. This must be done during the thirty-day public review period after the Notice of Completion has been issued.

The Environmental Assessment Branch of the Ministry of the Environment then has forty-five days to prepare a report to the Minister, who then has twenty-one days to decide. The Minister may deny the request, deny the request with conditions, refer to the Environmental Assessment Advisory Committee, or comply with the request. Obviously since the Part II Order procedure is arduous, an individual or agency with a significant and legitimate concern is wise to engage in an early and meaningful dialogue with the proponent. The process is specifically referenced in the Notice and addressed in detail during the PICs.

This project is a Schedule “C” Class EA. The selected alternative following the 2011 Schedule “C” Class EA was constructed and commissioned, however, was not able to reliably operate as designed. Operations have reverted to discharge via spray irrigation (which was utilised prior to the current system) to avoid the use of emergency discharge to pigeon river when LSSD capacity is not sufficient. The usage of the spray irrigation was approved temporarily by the MECP. The use of spray irrigation discharge is not covered by the current ECA. This has led to the requirement for a new EA to be completed, to identify a suitable alternative to issues that are preventing the system from operating as designed. Project Team

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# 2. PROBLEM OR OPPORTUNITY

## 2.1. Problem Statement

The City of Kawartha Lakes initiated a Class Environmental Assessment (EA) study to address ongoing operational issues with the large sub-surface disposal system (LSSDS) at the Omemee Wastewater Treatment Plant located at 267 Beaver Road. The LSSDS, commissioned in the fall of 2013, was designed to provide increased wastewater treatment capacity for the community of Omemee. The spray irrigation was expected to be phased out over a two-year period following commissioning of the LSSDS and this was reflected in the site's environmental compliance approval (ECA). However, a shortfall in the effective operating capacity of the LSSDS has necessitated continued use of spray irrigation. Although the current ECA for the Omemee lagoon site no longer supports spray irrigation, the Ministry of the Environment (MECP) has continued to authorize its use as an emergency measure to minimize the risk of uncontrolled sewage discharges to the environment. In addition, the previous growth projection for the Village is being revised downward after a review of options to expand the drinking water system. The design capacity outlined in the 2011 is no longer required. A long-term solution is required to address the capacity issues with the existing LSSDS.

## 2.2. Review of Existing Lagoon Operations

There are two lagoons each of 3.6 Ha and each designed to receive raw sewage from a sewage acceptance chamber, located near the east end of the lagoons which is connected to each of the lagoons by way of underground piping. The Lagoons provide a total combined capacity of 178,000 $m^3$. There is also an underground mid-point cross pipe connection between the 2 lagoons. There are underground piped connections at the west end of each lagoon which connect directly to the wet well. The flow of wastewater to the wet well from either lagoon, either singularly or collectively, is controlled by a manually operated vertical steel handled shaft located close to the wet well that can open or close a gate to the wet well at the choice of the operational staff. Wastewater filters through a screen prior to entering the wet well. From the wet well effluent can be discharged to the LSSD year-round or the spray irrigation system in summer, but effluent cannot be discharged to both simultaneously. A schematic of the existing system can be seen in Appendix A.

The Omemee wastewater lagoons and collection system are operated by the Ontario Clean Water Agency (OCWA) on behalf of the Municipality.

Recent sewage flow data for the years 2017 – 2021, including average daily flows in $m^3$/day across the year to the spray irrigation system and to the LSSDS are presented in Table 1 below.

*Table 1 - Average Daily Flows (Annually, to Spray, LSSD and in Total)*

| Average Daily Flows (per year) | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| **Effluent to Spray Irrigation** | 439 | 340 | 188 | 384 | 0 |
| **Effluent to LSSD** | 383 | 238 | 530 | 306 | 620 |
| **Total** | 822 | 578 | 718 | 689 | 620 |

## 2.3. Existing Limitations

Limitations affecting the existing treatment system, and most significantly affecting the large sub-surface disposal system, are preventing current processes from operating at the current rated capacity of 1353 cubic metres per day. Primary limiting factors are the effluent quality at later stages in the system and hydrogeological limitations.

### 2.3.1. Slime and Suspended Solids

In spring and warmer months of the year, effluent from the lagoons contains expected seasonal spikes of suspended solids, partly due to seasonal and sometimes repeated algae blooms. These can clog the pumping system. Effluent undergoes a fixed screening process before the pump-chamber that removes some of the course solids. The finer solids are allowed to pass through to the pumping chamber. This causes an organic slime on both the pump intake screens and the side walls of the wet well. This material is subsequently conveyed and discharged as contaminated effluent into the tile bed. The course screen and pumps and require continuous attention to keep the system functioning. At the point of discharge the contaminated effluent can plug the holes in the dispersal system and/or form a cementation crust with the underlying silty sand soils. Issues associated with this limit capacity and increase costs due to additional maintenance.

### 2.3.2. Soil Composition

In the tile bed area, pockets of silty sand exist within the layers. The effluent is unable to filter through the dense lower level quick enough, causing build up and affecting the upper level. Other issues might be low permeability due to sand and silty sand or hydraulic segregation where different types of sand/silt/soil separate into layers, reducing permeability.

## 2.4. Forecasted Population Growth and Sewage Flows

The 2011 Class EA forecasted a future capacity requirement of 1353 m3/day, based on a growth forecast done by CKL. Since that time, CKL has down a full evaluation of the drinking water supply system for Omemee. It is not feasible to expand the capacity of the water system, and there is not enough water to support the original growth forecast. Therefore, it is unlikely that the 1353 m3/day capacity will be required.

As part of this new EA, the City considered what could supported by the existing infrastructure, using conservative estimates of the capacity of the wastewater treatment system. It is estimated that a minimum of 958 m3/day can be processed at the current site.

The maximum population that could be supported by the current site was calculated as part of the Technical Memo “Supported Population Growth”, included in Appendix B. This memo estimates that the proposed system could support a maximum of 2,128 people, considering a design value of 0.45 m3/day per person (i.e. average day flow of 958 m3). This provides for a population growth of 1,068, just over double the current population. It should be noted that the LSSDS is a modular system that can be expanded, in the event population projections increase significantly.

# 3. EXISTING ENVIRONMENT INVENTORY

A detailed inventory was taken as part of the 2010 ESR Ref. [1]. Since the submission of this ESR, there have been no physical changes to the WPCP site. Additionally, the solution selected through the EA process involves a series of minor upgrades that have little to no effect on the natural, social, economic, or cultural environments. The following contains excerpts from the ESR completed in 2010 in sections 3.1 to 3.4, with some minor updates.

## 3.1. Land Use and Planning

The urban development is predominately along Highway 7, in an east-west trend, with Sturgeon Road acting as the approximate central north to south axis of the Village. Land use is a mix of residential and commercial uses in the urban core. Surrounding the urban development, the land use is primarily agriculture use, rural development, or undeveloped rural lands. Some extractive industrial land was identified in the north-eastern portion of the study area. The lands surrounding the Omemee WPCP site consist of agriculture uses to the west, rural residences to the east and west, and undeveloped lands to the north and south.

The Provincial Policy Statement 2014 states that "planning for sewage services shall accommodate expected growth or development in a manner that promotes the efficient use and optimization of existing municipal sewage services"; is feasible, financially viable and complies with all regulatory requirements; and protects human health and the natural environment. The Project is consistent with both provincial and municipal planning policies since its purpose is to provide improved wastewater treatment capacity for growth and development in Omemee.

## 3.2. Natural Environment

### 3.2.1. Geophysical Environment - Geotechnical Investigation

The bedrock formations in the vicinity of Omemee are identified as Paleozoic limestones from the Lower Member of the Lindsay Formation and the Verulam Formation. The Lindsay Formation is described as very fine to coarse-crystalline nodular limestone with most limestone beds medium crystalline and fossiliferous. The Lindsay formation is underlain by the Verulam Formation, which consists of very fine-crystalline, fossil-free limestone to coarse-crystalline, bioclastic limestone, interbedded with shale.

Regionally, the study area is located within the Peterborough Drumlin field. This physiological unit is described as a drumlinized till plain, with sandy silt till. The overburden deposits in the vicinity of the Village are identified as glaciolacustrine silt and clay deposits and are shown of Figure 4. Glacial silty sand to sandy silt till deposits occur east and west of Omemee, and drumlin outcrops are observed to the north. Glaciolacustrine sand and silt deposits are observed north of the Village. Glaciofluvial deposits (esker) trend northeast to southwest and are found north and west of the Village.

The glacial till plain is identified directly west of the Sanderson Pit property and as a drumlin outcrop at the southeast portion of the lagoon site. The Omemee Esker is an identifiable landscape feature in the area, and a portion of this feature occurs on the northwestern portion of the site and within the Sanderson Pit area (Chapman, 1984) (Gravenor, 1957). The esker feature is 15 m to 23 m in height above the surrounding landscape. Eskers are topographic features consisting primarily of coarse-grained soils (sands and gravels) formed by melt channels within, on or under the glacier. The esker is cut through by the Pigeon River, northeast of the site. Generally, coarse-grained deposits are found within the core of the esker, and finer grained material overlain along the flanks of the feature. The existing sewage lagoons are constructed in a valley between the esker feature to the west and the drumlin to the east. Surficial soils are described as glaciolacustrine deposits consisting of silts and clays under the lagoons (Gravenor, 1957). Overburden depths range between 12.2'm to 21.6 m, according to MECP records for surrounding water wells (Ministry of the Environment, 2010).

An extensive geological investigation was undertaken on the WPCP site and the adjacent Sanderson Pit property in 2009 (Cambium Environmental Inc.,2010). During the investigation, 29 geological boreholes at 16 locations were drilled across the site, with 13 of the locations consisting of multilevel monitoring wells (shallow and deep monitoring wells).

The overburden deposits encountered across the site range between coarse-grained sand and gravel soils to fine-grained silts and clays or sandy-silt glacial till. Generally, the coarse-grained material is encountered in the esker deposit located in the western portion of the WPCP site in the spray irrigation area, and the adjacent Sanderson Pit property. The esker deposit forms a hilly complex in the western portion of the site. Overburden material with the esker encountered consists of sands with varying gravel content, as well as some silty-sand/sandy-silt layers.

Geological investigation in the southeast portion of the site encountered a substantial till deposit, which appears to be a drumlin feature. MECP water well records in this area show a substantial thickness of till deposits.

The existing sewage lagoons appear to lie in a valley bottom between the esker and drumlin which has been identified as glaciolacustrine silt and clay deposits. Soils encountered around the lagoons are predominately fine grained and range between sandy-silt to silty-clay.

A further geotechnical field investigation was done on the LSSDS. The complete report is contained in Appendix C. Seven (7) new boreholes were strategically placed within the tile bed. The soil types ranged from SP (fine sand) to SP-SM (sand and silty sand), to SM (silty sand). SP is the preferred soil type to be used with infiltrators. The entire LSSDS was determined to be comprised of both SP and SP-SM soils, in generally a 50/50 split. Pockets of silty sand were inter-mixed with the fine sand in the upper levels of the new tile bed and the native soils forming the lower levels of the tile bed were overly dense. The dense layering of the native soil affects the functioning of the system as the vertical permeability of the native soils is also curtailed by the lower permeability layers. This phenomenon is further discussed in the 2019 LSSDS report available in Appendix C.

### 3.2.2. Terrestrial Environment - Species at Risk Assessment

The ecological features of the Omemee WPCP site were inventoried during a previous Class EA study by Curry Jefferson and Associates (2005). The study inventoried the vegetation and wildlife on the Omemee WPCP site, described in the report as Zones A to D (Curry Jefferson & Associates Environmental Services lnc., 2005). Observations of the various vegetation species and wildlife were noted for each zone. No significant species (flora or fauna) or natural heritage features were identified on the site. Furthermore, no species at risk were identified in the vicinity of the Omemee WPCP site.

As part of the previous ESR (Ref. [1]) the Natural Resources and Values Information system (NRVIS) database of the Ministry of Natural Resources was consulted, and it was confirmed that there are no significant species (flora or fauna) or natural heritage features documented to be on the WPCP site.

### 3.2.3. Surface Water and Aquatic Environment

Surface water resources are inventoried in section 2.3.3 of the 2010 ESR. The following provides a more in-depth inventory of the Omemee WPCP site. The WPCP site lies within the boundaries of the Kawartha Region Conservation Authority.

No surface water features were observed to be located on the Omemee WPCP property. The pigeon River, a significant surface water feature in the area, is located approximately 1 km east of the site. Two small tributaries drain the lands north and south of the Omemee WPCP site, flowing east around a drumlin feature located on the southeastern portion of the site, and into the Pigeon River. The pigeon River is the largest surface water body in the study area and flows north into Pigeon Lake. The Pigeon River is also included in the Emily Park Provincially Significant Wetland (PSW) complex, although the wetland boundaries are limited to the margins of the Pigeon River.

The esker creates a surface water boundary across the site, separating surface water drainage between the Pigeon River and Emily Creek subwatersheds. A small tributary flows to the north of the Sanderson pit property into the Emily creek surface water system. A portion of the Emily Park PSW complex (No. 8) is located approximately 700 m north of the Sanderson Pit property, on the north side of Fox Road

### 3.2.4. Hydrogeology

The primary water supply in the study area is from groundwater resources. There are approximately 642 MECP water records within the study area. Of these, 500 well records indicate that the well is sourced from aquifer systems within the overburden deposits. The depth of overburden deposits is quite variable across the study area, with well depths ranging between 4.9 m to 83.8 m and averaging 19.3 m. Most of the overburden wells are sourced from buried sand and gravel deposits within the overburden material. Pumping rates reported an average rate of 82 L/min (18.0 igpm), and range between 45 L/min to 364 L/min (10 igpm to 80 igpm). There are larger capacity wells in the area; approximately 14% (72 well records) of the well records reporting a pumping rate greater than 136 L/min (30 igpm).

The remaining 142 well records indicate wells that are completed into the underlying bedrock aquifer. Well depths ranged between 4.9 m to 85.6 m, and average 17.9 m. Most of the bedrock wells are completed into a basal gravel deposit overlying the upper, fractured zone of the bedrock formation at the overburden/bedrock geological contact, which is a regionally extensive aquifer, Average well depth into the bedrock is 2.9 m, and is completed into the fractured bedrock zone, although some bedrock wells extend up to 25 m into the limestone formation. Pumping rates are slightly higher than the overburden wells with an average of 88.7 L/min (19.5 igpm), ranging between 45.5 L/min and 318.2 L/min (10 to 70 igpm). As with the overburden wells, there are larger capacity wells completed into the bedrock aquifer with approximately 18% (25 wells) of the well records reporting pumping rates greater than 136 L/min (30 igpm).

The two municipal supply wells located in the Victoria Glen subdivision were both drilled in 1976 and are completed in a basal gravel and fractured bedrock formation 9 m to 12 m below ground surface. The aquifer is overlain by 8 m of clay deposits, resulting in confined artesian conditions with a static water level above ground surface. Subsequent hydraulic testing was completed in 2001 to confirm well yields. Well 1 is capable of producing 138 L/min (30.4 igpm) or 198.7 $m^3$/day, while Well 2 can provide 182 L/min (40 igpm) or 262.1 $m^3$/day, with a combined well yield of 460.8 $m^3$/day. The production efficiency of Well 1 had not changed since 1976, while Well 2 was reported to be producing at 60% of its originally reported capacity of 303 L/min (66.7 igpm). Therefore, the original combined well yield in 1976 was reported to be 441 L/min (97 igpm) or 635 $m^3$/day. The

2001 well capacity study by Hydroterra recommended that Well 2 should be rehabilitated through acid/chlorine/jetting procedures in order to improve the well's current efficiency.

There are eight (8) MOE records for water wells within 1 km of the WPCP site. Of these well records, six (6) are for water wells completed in the overburden aquifer, while the remaining two water wells penetrate into the underlying limestone bedrock. The overburden wells typically encounter a substantial thickness of till deposits and are completed into a buried sand or gravel unit. The two bedrock wells are completed about 1 m into the basal gravel and fractured limestone aquifer. Depths average 16.3 m for overburden wells and 18.1 m for the bedrock wells. Static water depths range between 4.5 m and 7.6 m below ground surface, averaging 5.7 m, according to the well records. There are an additional 7 private water wells located within 500 m of the site, which do not have a corresponding MOE water well record. These private wells were surveyed during a 2010 hydrogeological investigation performed by Cambium, and are routinely monitored for water quality by OCWA as required by the Omemee WPCP Certificate of Approval. A preliminary wellhead protection area (WHPA) for Omemee has been delineated by Genivar. The WHPA propagates to the northwest of Omemee, and west of the WPCP site. The lagoon and the Sanderson pit properties are located east the WHPA.

As part of the 2010 ESR Single well hydraulic testing (rising head tests) was conducted on the WPCP site at eight (8) of the monitoring wells at five (5) different locations (three wells had multilevel monitoring wells). Permeability in the overburden soils were found to be 3.55 x 10-5 m/s in the coarse-grained deposits in the Sanderson Pit area, and range between 1.55 x 10^-7 m/s and 977 x 10^-9 m/s in the vicinity of the sewage lagoons where fine-grained soils are present.

Further hydrogeological analysis was completed as part of this EA, detailed in the report in Appendix C.

## 3.3. Social and Economic Environment

The social economic environment is defined by Omemee's population demographics, employment characteristics, land uses, and economic environment. The Table below summarizes the socio-economic information obtained from Statistic Canada from the 2021 census.

*Table 2 - Community Profile*

| | Omemee | Ontario |
|---|---|---|
| **Characteristics** | Total | Total |
| **Population; 2021** | 1060 | 14223942 |
| **0 to 14 years (%)** | 16.0 | 15.8 |
| **15 to 64 years (%)** | 64.6 | 65.6 |
| **65 years and over (%)** | 19.3 | 18.5 |
| **85 years and over (%)** | 1.9 | 2.4 |
| **Average age of the population** | 42.9 | 41.8 |
| **Median total income of households in 2020 ($)** | 83,000 | 91,000 |
| **Unemployment rate (%) (2016 Census)** | 10.7 | 7.4 |
| **Management occupations (%) (2016 Census)** | 10.7 | 11.1 |
| **Business; finance and administration occupations (%) (2016 Census)** | 14.8 | 15.7 |
| **Natural and applied sciences and related occupations (%)(2016 Census)** | 2.5 | 7.2 |
| **Health occupations (%)(2016 Census)** | 10.7 | 6.3 |

| | | |
|---|---|---|
| **Occupations in education; law and social; community and government services (%)(2016 Census)** | 8.2 | 11.6 |
| **Occupations in art; culture; recreation and sport (%)(2016 Census)** | 1.6 | 3.2 |
| **Sales and service occupations (%)(2016 Census)** | 18.9 | 22.9 |
| **Trades; transport and equipment operators and related occupations (%)(2016 Census)** | 24.6 | 13 |
| **Natural resources; agriculture and related production occupations (%)(2016 Census)** | 1.6 | 1.6 |
| **Occupations in manufacturing and utilities (%)(2016 Census)** | 3.3 | 5.1 |
| **Private households Owned (%) (2016 Census)** | 86 | 69.7 |
| **Private households Rented (%) (2016 Census)** | 14 | 30.2 |

### 3.3.1. Economic Environment

The developed area of Omemee is along the transportation routes of Highway 7, and County Roads 7 and 38. Therefore Omemee provides commuting routes to Lindsay, Peterborough, and Durham Region for employment opportunities. Current population demographics indicate that the majority of the residents are employed. Omemee is in close proximity to the Pigeon River for recreational activities. The proximity of Highway 7 through the urban core also provides a large traffic volume exposure for commercial development.

### 3.3.2. Recreation

The Pigeon River is commonly used for recreational fishing activities. A local sports complex on County Road #7 attracts large tournaments which supports the commercial development within the urban core of the Village. The Omemee WPCP site has no distinguished recreational uses on the property or surrounding lands.

### 3.3.3. Agriculture

There is a range in the classes of agricultural lands in the study area according to the Canada Land Inventory (CLI) Soil Capability for Agriculture mapping system Class 1 to 7 farmland is identified within the study area, with Class 1 lands described as being able to support continuous production of field crops with little to no restrictions and Class 7 lands are considered totally unsuitable for agriculture.

## 3.4. Cultural Environment - Archaeological Assessment

A Stage 1 Archaeological Assessment was completed for the 2007 Class EA (Northeastern Archaeological Associates, 2OO7). Areas which are located within 300 m of a primary water source or within 200 m of a secondary water source are considered to have a high potential for the presence of archaeological resources due to the proximity of potable water supplies. A search of known archaeological sites found that there were no known sites within the study area or the Omemee WPCP site. The Omemee WPCP site is not located near the historical settled or developed portion of Omemee or the historical rail line corridor, and is located over 1 km from the Pigeon River, therefore the site possesses a low potential for archaeological resources.

# 4. EVALUATION OF ALTERNATIVE SOLUTIONS

## 4.1. Alternative Solutions

The following alternative solutions to address the need to amend shortfalls in Omemee Wastewater Pollution Control Plant (WPCP) performance were considered:

1) Do nothing
2) Utilise Spray Irrigation and LSSDS Effluent Discharge
3) Replace/Rehabilitate the System

## 4.2. Evaluation of Alternatives

Selection of a preferred solution involves evaluating the relative merits of each alternative from a technical perspective as well as assessing the potential impacts on the natural, cultural, social and economic environments. Technical considerations include the ability to satisfy the problem statement while meeting applicable regulations, codes and standards including requirements for MECP approvals. Natural environment includes impacts to groundwater and surface water, terrestrial and aquatic environments, and species at risk. Cultural environment refers to cultural heritage and archaeological resources. Social environment includes impacts to people and communities (e.g. property impacts, noise, odour, aesthetics, recreation). Economic environment includes capital and operating costs as well as impacts on commercial or other activities contributing to overall economic health.

A description of each alternative and evaluation of environmental impacts is presented below:

### 4.2.1. Alternative 1: Do Nothing

This alternative would be the lowest capital cost and involves using the existing LSSDS to discharge all treated effluent, without supplementing by other means. This is what is approved under the current ECA. The LSSDS does not currently operate to its full capacity, and the actual available capacity is not sufficient to meet the demand required. In addition to this, the effluent quality and seasonal algae blooms are causing issues and additional maintenance costs within the system, which would not be addressed through this alternative. This alternative would provide no detriment to the natural environment or cultural environment. It would limit growth within the community as the current performance of the LSSDS is not sufficient to support any significant growth or development, negatively affecting the economic environment. This option is not feasible.

### 4.2.2. Alternative 2: Utilise Spray Irrigation and LSSDS Effluent Discharge

This option is the second highest in capital costs and construction time. It involves running the existing LSSDS at a reduced but achievable capacity and continuing to run the spray irrigation system during the spray season to make up the required capacity. his alternative would be unlikely to cause negative affect to the to the natural and cultural environment, as required construction would most likely be limited to a small building expansion on previously disturbed ground. This option would allow for growth within the community as it provides a solution to the existing performance issues to support future growth or development, positively affecting the economic environment. This option will require some improvements to effluent treatment prior to the LSSDS to be feasible.

### 4.2.3. Alternative 3: Replace/Rehabilitate the System

This option would be the highest in capital costs and construction time and would involve a full redesign of the treatment and discharge system, including replacement or rehabilitation of the LSSDS, to perform at the required capacity and address current issues in the system. This alternative is the most likely to be detrimental to the natural and cultural environment, as it would involve significant works and construction on the site, and may include expansion to other locations. This option would allow for growth within the community as it provides a solution to the existing performance issues to support future growth or development, positively affecting the economic environment, although capital costs would be significant, which is a detriment. The costs involved in this alternative would be prohibitive and a full replacement of the system is likely unnecessary to achieve the required capacity and address limitations.

## 4.3. Results of Evaluation

After eliminating alternatives that are not considered feasible, due to its inability to fulfill effluent requirements, two alternatives remain:

- Utilise spray irrigation and LSSDS effluent discharge
- Replace/rehabilitate the system

The following scoring matrix summarizes the results of the evaluation of the relative merits of each solution based on technical considerations, as well as impacts to the natural, social, cultural and economic environments. Evaluation criteria are weighted to reflect their relative importance. The feasible alternative with the highest total weighted score is determined to be the preferred solution.



| The City of Kawartha Lakes WPCP Upgrades | | | Do Nothing | | Spray Irrigation and LSSDS | | Replace/Rehabilitate the System | |
|---|---|---|---|---|---|---|---|---|
| | Evaluation Criteria | Weight | SCORE | WEIGHTED | SCORE | WEIGHTED | SCORE | WEIGHTED |
| 1 | Meets Effluent Criteria - MANDATORY | n/a | NO | | YES | | YES | |
| 2 | Social Impacts (e.g.adjacent property use, recreation, visual, noise, odour) | 15% | 5 | 0.75 | 5 | 0.75 | 3 | 0.45 |
| 3 | Natural Environment Impacts | 15% | 5 | 0.75 | 5 | 0.75 | 2 | 0.3 |
| 4 | Archaeological Resources | 10% | 5 | 0.5 | 5 | 0.5 | 2 | 0.2 |
| 5 | Ease of Integration / Constructability | 10% | 5 | 0.5 | 4 | 0.4 | 1 | 0.1 |
| 6 | Expansion Potential | 10% | 0 | 0 | 4 | 0.4 | 5 | 0.5 |
| 7 | Ease of Operation | 10% | 4 | 0.4 | 4 | 0.4 | 4 | 0.4 |
| 8 | Capital/Operating Costs | 30% | 3 | 0.9 | 4 | 1.2 | 1 | 0.3 |
| | TOTAL WEIGHTED SCORE /5 | 100% | | N/A | | 4.4 | | 2.25 |

*Table 3: Evaluation Matrix to Determine Preferred Solution*

## 4.4. Preferred Solution

The preferred solution to amend shortfalls in Omemee WPCP performance is to utilise a combination spray irrigation and the LSSDS for effluent discharge. This solution would require the following components:

- Upgraded screening to remove weeds and debris and reduce maintenance.
- Reduce TSS to LSSD.
- Addition of a secondary Wet Well.
- Various upgrades to the pumping station and distribution valves as required.
- Hydraulic load control, utilisation of the existing spray irrigation system and some process reconfiguration.

This is the preferred alternative as it sufficiently addresses existing issues at the lowest capital cost and with the lowest affect to the natural and cultural environment while providing sufficient capacity for growth.

## 4.5. Mitigating Measures

Minimal impact to the natural environment is expected, as all works would be located on the existing WPCP site, with minimal disturbance. No ecological issues have been identified on-site in previous studies. The current spray irrigation and LSSDS practices have had low impact on the surrounding natural environment features. This option would reduce the risk of emergency discharge to the Pigeon River, thereby reducing or negating phosphorous loading this sensitive surface water receiver.

According to the operations team, there have not been any historical complaints regarding either the spray irrigation system or the LSSD.

There would be a relatively minor intermediate impact to economic environment due to the capital costs of the construction, but operational costs over time are expected to be lower than if no upgrades were completed due to improved effluent quality.

The option has a minimal impact to cultural heritage environment, with the site posing a low potential for historical significance.

Mitigation measures are expected to minimal to address negative environmental impacts. Proper sediment control will be required for the excavation of the new building addition.

# 5. DESIGN CONCEPT

The design concept for the Omemee Water Pollution Control Plant upgrades was developed based on analysis of the underperformance of the LSSDS, and the requirements of the system in terms of current flows, existing system components and future growth requirements. It utilises information from the environmental studies to implement the preferred solution in a cost-effective manner that minimizes any negative impacts to the natural/social/cultural environment.

## 5.1. Design Basis

### 5.1.1. Course Screening of the Lagoon Effluent

The lagoon effluent currently passes through a large, fixed screen, which is difficult to remove and clean. In order to improve performance and reduce maintenance requirement, a travelling screen will be introduced to the effluent flow process as an initial step towards cleansing the effluent. The travelling screen will intercept any large weeds and surface debris from the effluent, in advance of it entering the wet well and creating major clogging to any internal screens intended for removing only suspended solids and colloids, ahead of the pumping chamber. The large weeds and debris will be conveyed directly to a new sludge storage tank for ultimate removal to a disposal area and subsequent trucking from the site.

### 5.1.2. Treatment of the LSSD Influent

Suspended solids and colloids within the effluent must be virtually eliminated from the effluent if the system is to escape pumping problems and achieve proper performance within the new LSSDS. The following alternatives were investigated:

Self-Cleaning Cloth Filters

- continual expenses with chemical storage and use
- continual labor and on-site operator expense
- only minimal removal of wet well slime

An Auto-Cleaning Strainer

- no chemical requirements
- only minimal removal of wet well slime
- totally ineffective against BOD levels

Dissolved Oxygen Flotation (DAF)

- provides excellent removal of high TSS and BOD
- effective against seasonal spikes
- requires an addition to the existing building
- requires infrastructure and a power supply

A DAF was piloted at the site and performed well under a variety of conditions. A DAF is the preferred alternative because the LSSD pumping chamber and the tile bed both have a low tolerance for plant material, weeds, algae, and suspended solids including minerals. It is designed specifically to remove TSS, BOD5, and Oil and Grease from wastewater streams. The contaminants are removed using an air-in-water solution that injects air under pressure into a recycle stream of clarified DAF effluent. The recycle stream is then combined with incoming wastewater in an internal contact chamber where the dissolved air comes out of solution in the form of micro-sized bubbles that attach to the contaminants. The bubbles and contaminants rise to the surface of the chamber and form a floating bed of material that is automatically removed by a surface skimmer into an internal hopper for eventual conveyance to the new sludge storage tank and eventual trucking off site. A Chemical coagulant is used to assist the flocculation process.

### 5.1.3. Effluent Pumps

Pumps currently used for spray irrigation will remain in use as is (or replaced with similar). Pumps for the LSSDS will need to be assessed for ongoing suitability and, assuming operation and performance is deemed adequate, will be relocated and reinstalled as required.

## 5.2. Preferred Design Concept

The preferred design was detailed in a report submitted to CKL, available in Appendix D.

### 5.2.1. Treatment Process Overview

The preferred design consists of several improvements throughout the wastewater treatment process that aim to alleviate limitations that cause underperformance in the system and to maximise ongoing efficiency. To assist with the removal of suspended solids, the effluent is to undergo additional treatment before entering the LSSDS. Other system upgrades are also being implemented to improve the treatment process.

### 5.2.2. The Travelling Screen

A travelling screen intercepts any large weeds and surface debris from the lagoon effluent to avoid major clogging to the down stream system. The large weeds and debris will be conveyed directly to the same storage utilised by a new DAF system, for ultimate disposal. This screening system is intended to clear larger debris from the wastewater, in advance of a new DAF unit

### 5.2.3. Dissolved Oxygen Flotation (DAF)

A pilot study was completed in July of 2019 to assess the performance of a DAF system in sequence with the current system. The sampling and test results of effluents from the lagoon(s) during the pilot study proved the effectiveness of the DAF technology without chemical additives, and even more so when proper chemistry is added to the system. A new DAF unit will clean lagoon effluent that is to be dosed into the LSSDS. The spray irrigation system does not require treated effluent from the DAF system.

### 5.2.4. Addition of Secondary Wet Wall

The existing wet well will continue to feed the spray irrigation system using the existing spray irrigation pumps. This primary wet well will connect to a new secondary wet well through the new DAF system, where treated effluent will be stored and settlement will occur, before being pumped to the LSSDS.

### 5.2.5. The Pumping Station

The existing pumping fixtures require continuous care and attention due to the nature of the effluent. New pumps and fixtures may need to be introduced to meet the design requirements of the new system.

### 5.2.6. Distribution to LSSDS

Six-way distribution valves will be replaced with a new valving system to better distribute the influent to the LSSD.

### 5.2.7. Hydraulic Load Control

Hydraulic load to tile bed will be reduced as needed in accordance with field conditions.

### 5.2.8. Utilise Existing Spray Irrigation

The existing spray irrigation will continue to be utilised to supplement the LSSDS's current deficiencies as required.

### 5.2.9. Process Reconfiguration

This alternative will require some reconfiguration of process sequencing, and incorporation of the new components in the system.

#### 5.2.9.1. The Current Operating Procedures

There are 2 lagoons, each designed to receive raw sewage from a sewage acceptance chamber, located near the east end of the lagoons which is connected to each of the lagoons by way of underground piping. There is also an underground mid-point cross pipe connection between the 2 lagoons. There are underground piped connections at the west end of each lagoon which connect directly to the wet well. The wastewater flows to the wet well from either lagoon, either singularly or collectively, and flow is controlled by a manually operated vertical steel handled shaft located close to the wet well that can open or close a gate to the wet well at the choice of the operational staff. A schematic of the existing system can be seen in Appendix A.

#### 5.2.9.2. The Proposed New Operational Plan

In future, the lagoons should be operated in series, one after the other, thereby creating a primary settling area and secondary settling area for the wastewaters prior to leaving the second lagoon. Raw sewage should be entering the system only by way of the east end of the northerly upper lagoon. This particular lagoon should be identified as the Upper Primary Lagoon where the bulk of the solids in any incoming sewage product is allowed to settle out of the product onto the floor of the lagoon through a gravitational process. The resultant waste waters then flow to the second lagoon through the existing mid-point cross pipe connection. This second lagoon, located south of the first lagoon, should then be identified as the Lower Secondary Lagoon, where the solids remaining in the waste waters from the Upper Primary Lagoon would now undergo a repeat process of settling. If Septage is to be received at this site, provisions should be made that it is only directed to the head end of the upper lagoon (i.e. the start of the lagoon system).

The resultant wastewaters should pass through the travelling screen prior to entering the existing wet well. Wastewater from the existing wet well will either be pumped to the spray irrigation system directly or outlet to a newly installed DAF unit. Material removed by from the travelling screen and DAF unit are deposited into one sludge detention chamber or pond. The DAF unit discharges to a new secondary wet well where the clarified effluent is pumped to the LSSDS. The new operation shall include availability to pump to the LSSDS and the irrigation system simultaneously or independently. The most northerly spray nozzle shall be moved approximately an additional 32 meters from the property boundary to remain in compliance with Ministry of the Environment (MECP) Guidelines. A schematic of the proposed system and the proposed site plan can be seen in Appendix A.

## 5.3. Estimated Cost

A rounded construction cost estimates of the major components and ancillary equipment as detailed in the schematic flow process of the Enhancement program is provided as follows:

*Table 4: Cost Estimate of Preferred Design Concept*

| Item | Cost |
|---|---|
| **The Pre-Treatment Travelling Screen** | $100,000 |
| **The Sludge Storage Tank and Disposal Area** | $200,000 |
| **The Dissolved Air Flotation Package Plant (DAF)** | $300,000 |
| **A Concrete Block Building to House the Pre-treatment Equipment** | $150,000 |
| **The Wet Well Expansion** | $40,000 |
| **Modifications and Additions to the Pumping Station** | $100,000 |
| **The Effluent Distribution Valves and Piping** | $40,000 |
| **Total Equipment and Hard Costs** | **$930,000** |
| **Allowance for Labor Assembly and Operational Use** | **$1,000,000** |
| **TOTAL PROJECT COST** | **$1,930,000** |

## 5.4. Summary of Impacts

The selected alternative utilises mostly existing system components and involves no significant construction or disturbance outside of existing buildings and previously disturbed areas, therefore cultural heritage and natural environment studies are not necessary as part of this EA.

### 5.4.1. LSSDS – Hydrogeology Study

The LSSDS is comprised of four zones, each containing six infiltrator disposal area beds (or cells), with each cell containing 33 runs of 28 m long by approximately 0.7 m diameter Quick4 Chambers. The LSSDS is located on an esker deposit and was commissioned in the fall of 2013. The system has experienced persistent effluent breakout when operated at or near to its intended design capacity of 1,353 m3/day. In the recent past the tile field has been dosed at quantities of up to 600 m3 per day (or less than half of the intended design capacity).

While the Quick4 infiltrators offer substantial storage, all infiltration must occur across a planar surface beneath the infiltrator at a rate governed by the effective vertical hydraulic conductivity of the material. This vertical conductivity has likely been affected through slime formation and/or the segregation of fines which limits the capacity of the system. The capacity for the esker deposits to convey the infiltrated water away from the infiltration cells is also a potential limiting factor. Factors affecting the LSSDS along with potential rehabilitation concepts were discussed in greater detail in our 2019 assessment report Ref. [3].

There is no way to calculate a capacity from first principles since we cannot separate limiting factors related to primary infiltration vs. formation capacity. For this reason, we must take an observational approach where the interim rated capacity is derived from recent effluent discharge rates that were accommodated without visible breakout. These are summarized below:

*Table 5 - LSSDS Effluent Flows*

| Year | Effluent discharged to LSSDS (m3) | Effluent discharged to LSSDS (m3/day) |
|---|---|---|
| 2021 | 226,699.20 | 621 |
| 2020 | 98,900.92 | 271 |
| 2019 | 195,425.37 | 535 |
| 2018 | 87,589.19 | 240 |
| 2017 | 103,222.80 | 283 |

These actual discharge rates average 390 m3/day over the past five years.

Based on our analysis and the amount of effluent successfully infiltrated over the past five years we conclude that 350 m3/day is a reasonable and conservative estimate of the current capacity of the LSSDS. 350 m3/day is equal to a loading of approximately 17 L/m2/day or kv = 2 x 10-5 cm/s, which is conservative for silty sand.

We note that there may is potential to re-rate this capacity based on future observations and/or selective rehabilitation measures to locally increase vertical connections between poor-performing portions of the LSSDS and the deeper esker horizons. We suggest that limited operating flexibility be requested to facilitate obtaining such observations.

### 5.4.2. Spray Irrigation – Aerosolization and Capacity

The spray irrigation system is subject to restrictions outlined in the MOE's Design Guidelines for Sewage Works, 2008. The specific section that addresses Land Application of Treated Effluent, including spray irrigation, is Section 15.9. According to the guidelines, secondary treatment at minimum is required for land application. Omemee has secondary equivalent treatment in the form of two waste lagoons. CBOD and TSS remain within limits of 25 mg/L and 30mg/L respectively. In the past five years (2017-2021) CBOD levels have never exceeded this limit, with a maximum of 22 mg/L and TSS levels have exceeded this limit only once in November of 2020. This was due to low effluent levels in the lagoons. Aside from the November 2020 reading, TSS levels have not been recorded above 23.75 mg/L in the past five years. Treatment is considered adequate for land application purposes. Water table and contour data are available in the 2010 Cambium ESR (Ref. [1]).

The site is well isolated with the immediate surrounding land being municipal land suitable for accepting effluent. Section 15.9.4 (Site Buffer Zones) states:

> "…the distance from spray nozzles to the property limit should be 150 m"

The spray nozzles must remain at a distance of at least 150 meters from the property boundary. Currently, the most northerly spray nozzle is approximately 118 meters from the existing the property boundary to the north. To comply with requirements the spray nozzle will be moved to an alternative location, at a minimum of 150 meters from the northern property boundary. The new location should be at least approximately 32 meters southeast from the current location. Intended spray nozzle locations are at least 150m from the east and south boundaries. The Western boundary borders unused municipally owned land (the Sanderson Pit) and so is acceptable for spray irrigation. The spray head locations will comply with setback requirements and surrounding land uses are not considered in conflict with land applied effluent.

The design capacity of the irrigation system is 608 $m^3$/day according to Ref. [1]. The design capacity of the system can be verified with historical data prior to the installation of the LSSD in 2013, as the data from subsequent years might be affected by the presence of the LSSD. The following data was supplied by OCWA.

*Table 6 - Pre-LSSDS Effluent Flows*

| | 2012 | 2011 | 2009 | 2008 | 2007 |
|---|---|---|---|---|---|
| **Annual Effluent Flow (m3)** | 222056 | 304321 | 496092 | 386700 | 263700 |
| **Avg. Daily Effluent Flow (m3/day)** | 608.3726 | 833.7562 | 1359.156 | 1059.452 | 722.4658 |

The amount of effluent discharged over summer for the years above was equivalent to discharging at least 608 m3 each day across the year. The Omemee WPCP has been operating for over 40 years with no noted issues due to spray irrigation.

Since the Introduction of the LSSDS, the two south easterly spray fields, closest to the LSSDS, have not been used. Historically north and south spray areas have been available. The LSSDS has replaced the southern spray area. Originally the system was designed so that there was redundancy in the spray areas. They do not run the north and south fields concurrently, therefore use of the northern spray field only is not expected to create operational issues.

The sustainable capacity of the irrigation system has been demonstrated to be 608 m3/day through historic data and operation. The technical Memo regarding spray irrigation requirements is available in Appendix E

# 6. CONSULTATION

## 6.1. Notice of Commencement

The Notice of Commencement (available in Appendix F) dated June 29, 2020 was published on the Municipality of the Kawartha Lakes website and in the local newspaper. The notice provided contact information for the project and invited public participation and comments.

## 6.2. Public Information Centres

PICs were advertised on the website using the notices prepared in Appendix G and through the local newspaper.

### 6.2.1. Public Information Centre #1

Public information centre #1 was held on July 15, 2021. There were two attendees, who made the following inquiries following the prepared presentation, available in Appendix H:

**Q:** How large would the secondary wet well be?

**A:** Sizing of the tank would be determined in detail design of the system but a good estimation would be between twenty to thirty thousand liters.

**Q:** If the lagoons were emptied of sludge, would that provide extra capacity while upgrades are being performed?

**A:** In mechanical plants solids are removed on a more frequent basis, however, lagoons are larger and typically the sludge at the bottom is only 5-10% solids, so they do have to be cleaned but not nearly as frequently, and the solids removed don't typically provide much more capacity.

**Q:** Will the presentation be available online?

**A:** Yes.

**Q:** When will be the next opportunity for the public to comment?

**A:** Information on how to submit feedback will be available on the municipal website and a second PIC will be held toward the end of the project.

**Q:** Can growth still occur?

**A:** There are two types of growth, growth on a fully serviced system or growth on private systems, which can occur independently. There was an EA completed in 2014 regarding expansion of the municipal water system that went to council. The selected alternative at that time was to continue with the status quo. Only a small section is on municipal water, with the remaining on communal or private wells, so private expansion can still occur. Any growth question should be directed to the CKL planning department, who are currently working on an updated Growth management plan that considers growth within CKL more holistically. Estimations of the maximum population that can be supported on the proposed system can be viewed in Appendix B.

**Q:** Can the proposed system handle stormwater requirements?

**A:** Stormwater is not meant to be treated by the wastewater system. Any infiltration would be included in the most recent flow data, so has been considered within the analysis of flow data. CKL have also performed upgrades to the system to address or mitigate some of the infiltration into the system.

**Q:** I am interested in the growth projection and how that might be handled through the development charges. I believe the previous improvements were partially paid for through DC reserves and yet growth was not realised. Is this improvement essentially to recapture the previous intended design flow under the previous ECA.

**A:** Yes, within a margin, this essentially allows for the flow that was initially intended under the original ECA. In regard to the DC charge, there is a term on the charge, and they are revisited every 4 or 5 years. When we do the background study for the DC's we take the planning horizon, which is around the 2030's right now, and we look at all the growth that is predicted to happen within that planning horizon and consider all the infrastructure improvements that need to happen based on that growth, and that is used to calculate the DC Charges. So, the infrastructure costs are based on estimates. During the next DC cycle, they would be captured, funnelled into the new rate, and adjusted as required.

### 6.2.2. Public Information Centre #2

Public information centre #2 was held on May 25, 2022. There was one attendee, who made the following inquiries following the prepared presentation, available in Appendix H:

**Q:** Growth capacity has been downgraded for Omemee. Has COVID been taken into consideration? (People moving away from the city). Was this calculated before COVID, and is it still current?

**A:** The City completed a growth management strategy in 2010, which is currently being updated. That growth management strategy assumed expansion to sewer and water systems. The 2010 EA was then completed to expand the sewer systems which led to the installation of the LSSDS. The City then completed an EA to expand water. That EA concluded that it was cost prohibitive to expand the municipal system to service future developments. This result reduces potential the growth in Omemee regardless of the effect of COVID. Regardless of these growth projections, the proposed system is a modular system and could be expanded in future to accommodate revised growth.

**Q:** Originally, there were two lagoons in parallel, which could be filled in in an alternating manner, allowing each to be cleaned while the other is filled. Now the two lagoons will be in series. How will the primary/first lagoon be cleaned?

**A:** There are no physical changes to the lagoons so sludge removal will continue in the same manner as it has been in previous years.

**Q:** Was adding a third lagoon considered?

**A:** This option was considered as part of the 2010 EA and was not the preferred solution at that time. It was not considered as an individual alternative as part of the current EA.

**Q:** Did Greer Galloway look into why the previous LSSDS system performed poorly?

**A:** There was an extensive investigation performed and several factors were identified as to why the previous system did not perform as expected. Those factors have been considered and addressed as part of this EA.

**Q:** The project is located in proximity to Pigeon Lake. Will any contaminants reach the lake?

**A:** Contaminants are restricted by set RUC values, along with a contaminant attenuation zone. This controls the levels of various contaminants that are allowed to attenuate at a set boundary. Therefore, the affect of contaminants on areas outside the property boundary are restricted to a reasonable level.

**Q:** In the case of an emergency (tanks over capacity), is there a way for effluent to reach Pigeon Lake?

**A:** Yes, there is an operational option to perform emergency discharge to Pigeon River, however, with the proposed capacity, expected flows and significant storage provided by the two lagoons, emergency discharge is extremely unlikely

## 6.3. Agency Consultation

Consultation with review agencies has been undertaken throughout the project to establish requirements for approvals, determine the need for technical studies, evaluate environmental impacts of potential solutions and develop mitigating measures.

Project Notices were circulated to the list of project contacts, provided in Appendix I. Records of correspondence, meeting minutes, and responses from review agencies including MECP, MTCS, and MNRF are also included.

***Highlights of Agency Consultation/Correspondence:***

Meeting Minutes:

- March 11th, 2021 – Review Meeting
- November 18th, 2021 – Update Meeting
- May 10th, 2022 – Updated Meeting

Karla Barboza (MHSTCI) – email July 6th, 2021 – stating technical cultural heritage studies unnecessary since preferred solution is to utilise the existing system.

## 6.4. First Nations Consultation

The original notice with information regarding the EA process and goals of the project were distributed to first nations groups in June 2020. Both public information centre invitations were also distributed inviting comment and collaboration. The responses in Appendix J were received in response to the original project notice.

Dave Simpson (Alderville First Nation) - Email June 7th , 2021 – "RE: Omemee Wastewater Treatment System - Public Information Centre - July 15, 2021" request of notification at start of construction.

## 6.5. Notice of Completion

The Notice of Completion (see Appendix K) was issued on TBD for publication on the CKL website and local newspapers. This environmental study report is now available for the required 30-day review period.

# 7. CONCLUSION

The Village of Omemee WPCP currently relies on spray irrigation as a temporary measure to augment the LSSDS. The LSSDS does not perform at its original design capacity, and the capacity it does provide is insufficient to support existing flows or future growth. Existing issues and the overall status of the system were investigated. Three alternatives to resolve performance issues were analysed and a combination of use of the spray irrigation and LSSDS discharge was selected as the preferred alternative. This is essentially how the WPCP is currently operating under temporary approved measures. This solution would make spray irrigation an approved method of effluent discharge under the ECA, in addition to the LSSDS, and would implement a series of minor improvements to ensure the ongoing performance, operation, and efficiency of the system. Since this solution is essentially a continuation of current operation, with minor improvements, there is little impact to the natural, social, economic and cultural heritage environments. This solution supports growth as its capacity is calculated to accommodate for 2,128 persons assuming a design value of $0.45m^3$/day. This is approximately double the existing population of 1,060 as of the 2021 census (Ref. [4]). Additionally, the system is modular, so can be expanded in future, if further capacity was needed.

# 8. REFERENCES

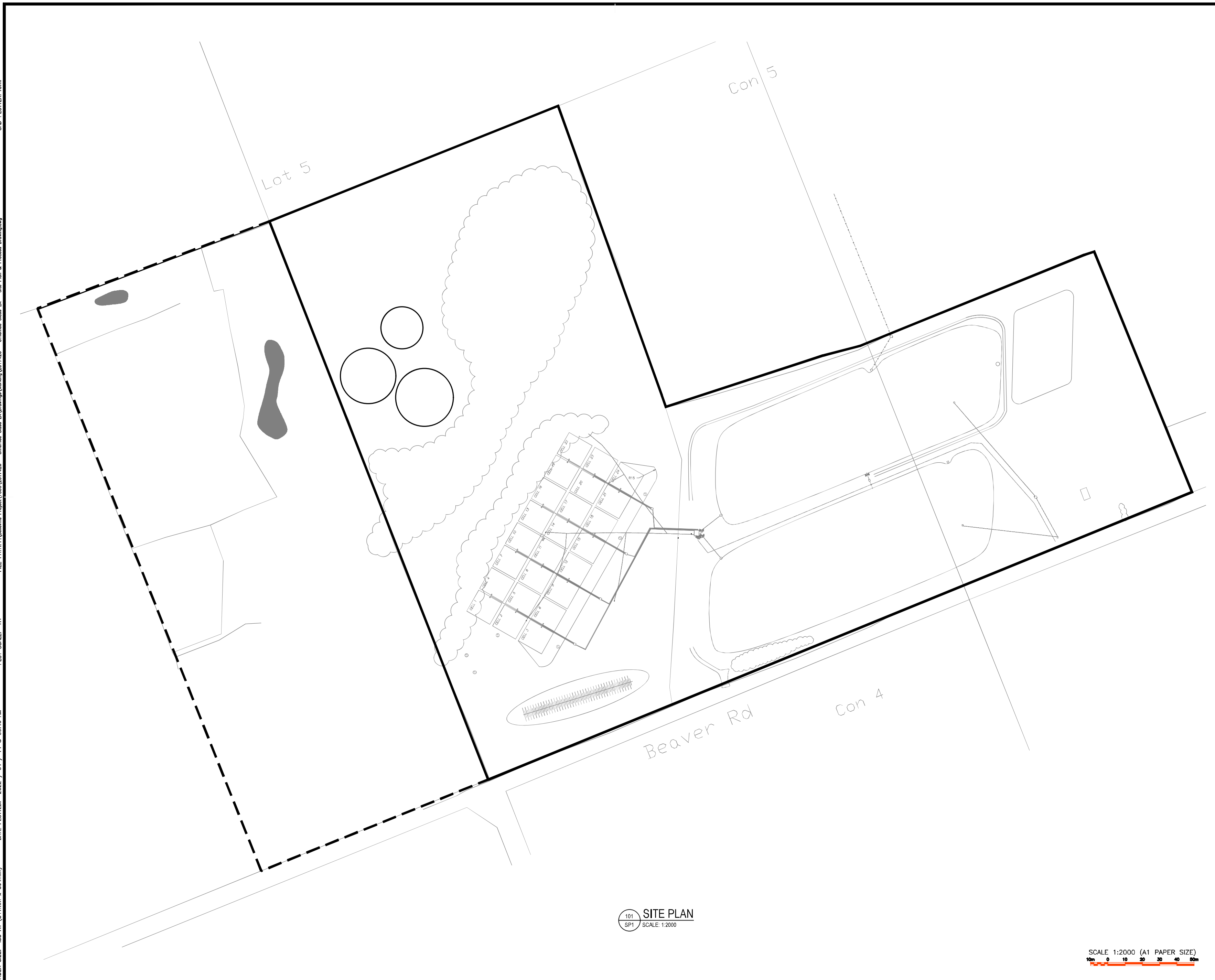
[1] Cambium Environmental Inc., "Addendum Envlronmental Study Report Class Environmental Assessment to Expand Wastewater Capacity for Omemee WPCP," Peterborough, 2010.

[2] The City of Kawartha Lakes, "Growth Management Strategy," The City of Kawartha Lakes, Lindsay, 2011.

[3] The Greer Galloway Group Inc., "Study Report on the LSSDS Wastewater Treatment System," Belleville, 2019.

[4] Statistics Canada, "Omemee, Ontario [population centre]," Statistics Canada, 27 April 2022. [Online]. Available: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=omemee&DGUIDlist=2021S05101307&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0. [Accessed 29 June 2022].

**APPENDIX A: Existing System, Proposed System, and Site Plan**




101 SP1 SITE PLAN
SCALE: 1:2000

GREER GALLOWAY
CONSULTING ENGINEERS
PETERBOROUGH
BELLEVILLE
KINGSTON
1620 WALLBRIDGE LOYALIST ROAD
BELLEVILLE, ONTARIO, K8N 4Z5
PHONE: 613-966-3068
FAX: 613-966-3087

NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH RELEVANT CODES AND GUIDELINES.
2. ALL DRAWINGS AND ADDENDA ARE TO BE READ AS, AND IN CONJUNCTION WITH THE SPECIFICATIONS.
3. ALL EQUIPMENT SHALL BE INSTALLED AS SPECIFIED OR APPROVED EQUIVALENT.
4. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH WORK AND BE RESPONSIBLE FOR SAME.
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6. ANY CHANGES MUST BE APPROVED BY THE ENGINEER.

A — A DETAIL NO.
B — B DRAWING NO. – WHERE DETAILED

LEGEND

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 01 | ISSUED FOR CLIENT REVIEW | 22/MM/DD |

NORTH

STAMP

PROJECT
OMEMEE WASTEWATER DISPOSAL SYSTEM
OMEMEE, ONTARIO
CITY OF KAWARTHA LAKES
TOWN OF OMEMEE, ONTARIO

DRAWING TITLE
SITE PLAN

DESIGNED BY: S. HUTTON
DRAWN BY: T. FUNARI
REVIEWED BY: T. GUERRERA
APPROVED BY: T. GUERRERA
PROJECT DATE: 2022/03/30 (YYYY/MM/DD)
PROJECT #: 20-1-7426
DRAWING #: SP1
DRAWING SCALE (ISO A1): HOR: AS SHOWN, VER: AS SHOWN

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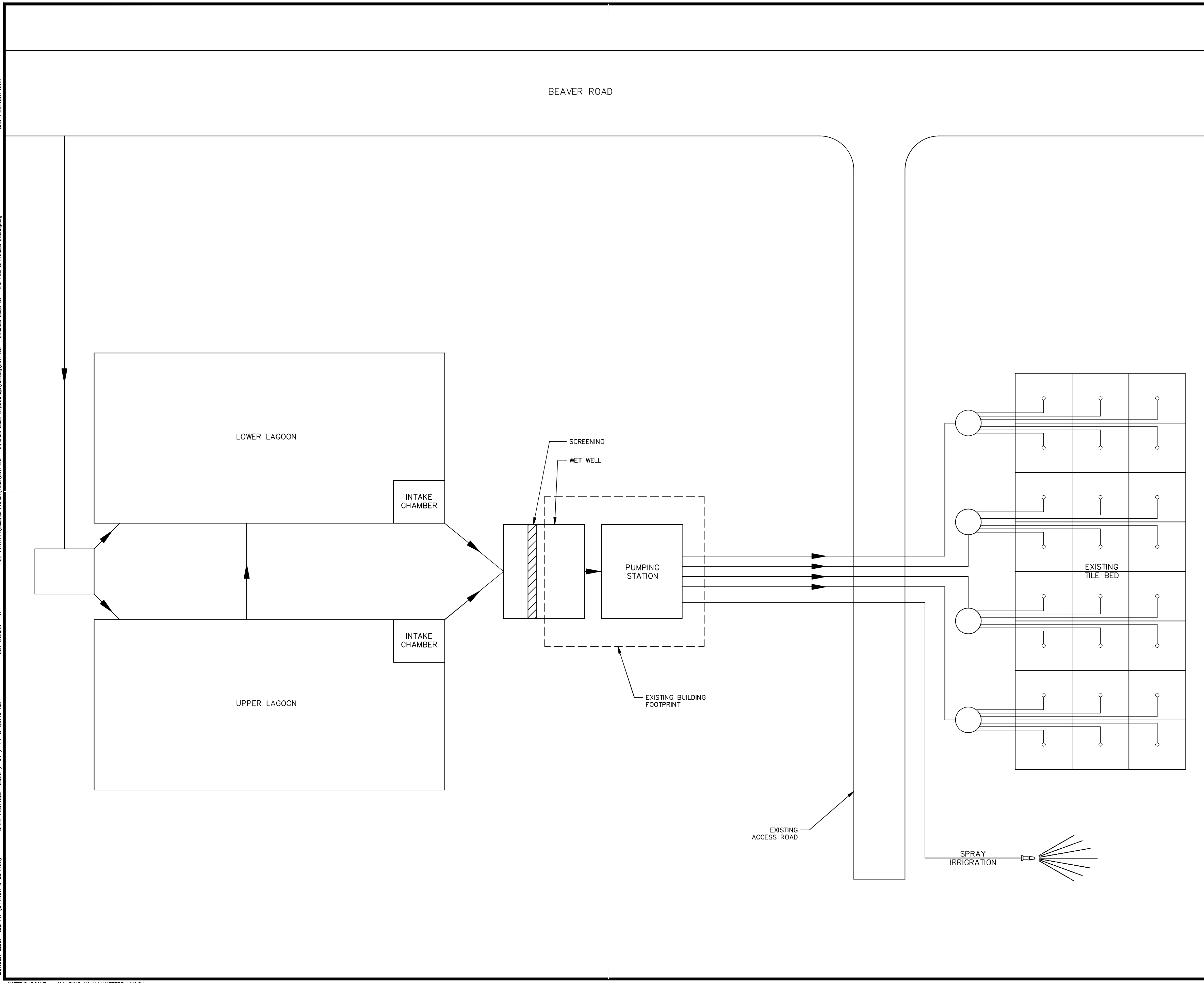
(METRIC SCALE – ALL DIMS IN MILLIMETERS U.N.O.)





GREER GALLOWAY
CONSULTING ENGINEERS
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BELLEVILLE, ONTARIO, K8N 4Z5
PHONE: 613-966-3068
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A/B — A DETAIL NO.; B DRAWING NO. – WHERE DETAILED

LEGEND

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 01 | ISSUED FOR CLIENT REVIEW | 22/MM/DD |

NORTH | STAMP

PROJECT
OMEMEE WASTEWATER DISPOSAL SYSTEM
OMEMEE, ONTARIO
CITY OF KAWARTHA LAKES
TOWN OF OMEMEE, ONTARIO

DRAWING TITLE
EXISTING TREATMENT SYSTEM

DESIGNED BY: S. HUTTON
DRAWN BY: T. FUNARI
REVIEWED BY: T. GUERRERA
APPROVED BY: T. GUERRERA
PROJECT DATE: 2022/03/30 (YYYY/MM/DD)
PROJECT #: 20-1-7426
DRAWING #: M1
DRAWING SCALE (ISO A1) HOR: AS SHOWN VER: AS SHOWN

(METRIC SCALE – ALL DIMS IN MILLIMETERS U.N.O.)

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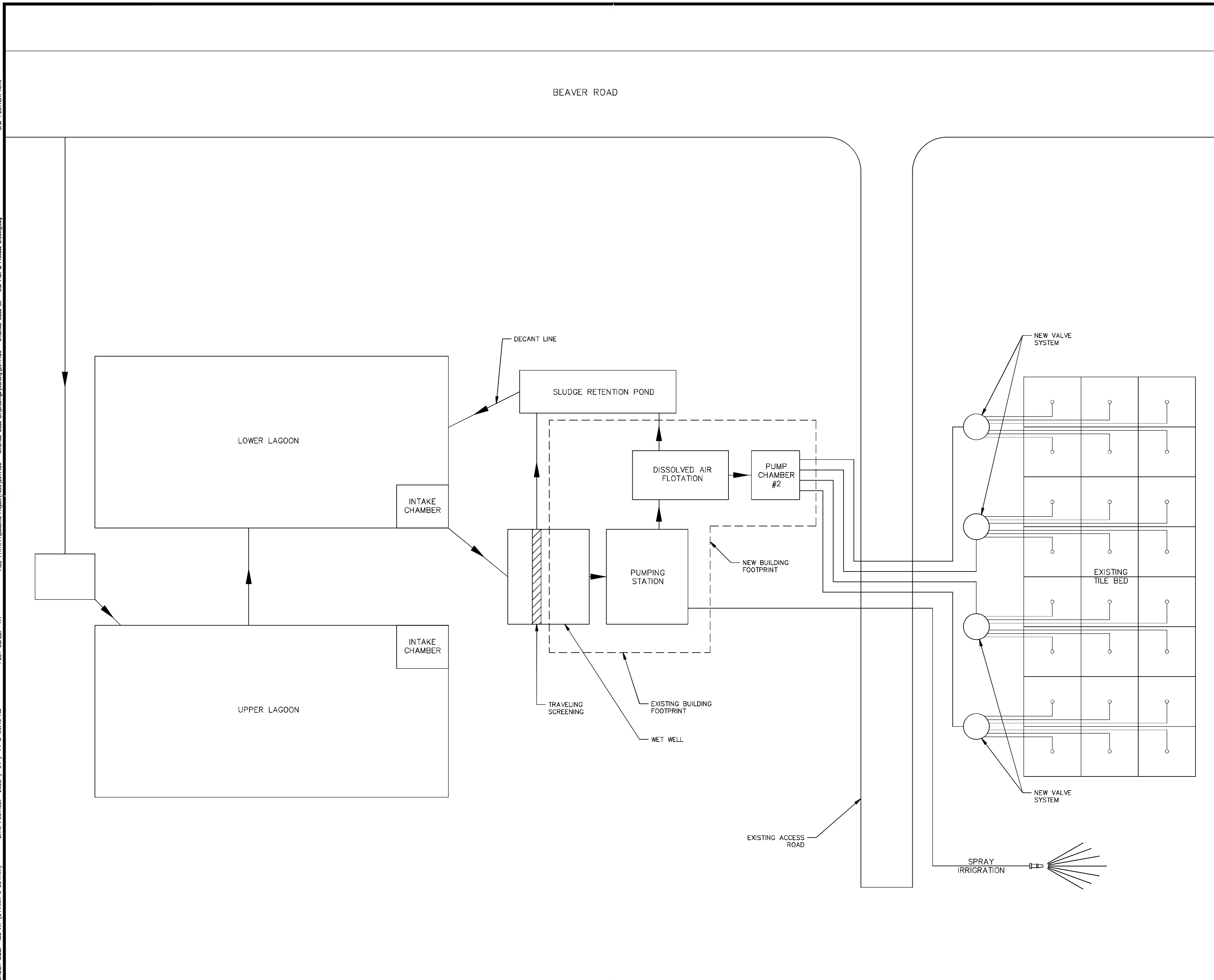


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GREER GALLOWAY
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PHONE: 613-966-3068
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NOTES:

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A — DETAIL NO.
B — DRAWING NO. – WHERE DETAILED

LEGEND

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 01 | ISSUED FOR CLIENT REVIEW | 22/MM/DD |

NORTH

STAMP

PROJECT
OMEMEE WASTEWATER DISPOSAL SYSTEM
OMEMEE, ONTARIO
CITY OF KAWARTHA LAKES
TOWN OF OMEMEE, ONTARIO

DRAWING TITLE
PROPOSED TREATMENT SYSTEM

DESIGNED BY: S. HUTTON
DRAWN BY: T. FUNARI
REVIEWED BY: T. GUERRERA
APPROVED BY: T. GUERRERA
PROJECT DATE: 2022/03/30 (YYYY/MM/DD)
PROJECT #: 20-1-7426
DRAWING #: M2
DRAWING SCALE (ISO A1) HOR: AS SHOWN VER: AS SHOWN

# APPENDIX B: Supported Population Growth

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Jun 1st, 2021

**Director, Engineering and Corporate Assets**
**City of Kawartha Lakes**
**26 Francis Street, P.O. Box 9000**
**Lindsay, ON K9V 5R8**

**Attn:** **Mr. Juan Rojas, P.Eng., PMP**

**Re:** **Omemee Class EA - Supported Population Growth**

Dear Mr. Rojas,

As discussed, the City of Kawartha is in the process of revising their Growth Management Strategy (title to be checked) to reflect a lower growth scenario and sewage capacity requirement than originally forecast in the 2011 Class Environmental Assessment (EA) conducted on the Omemee Wastewater Treatment system. The 2011 Class EA (Reference Document #1) determined that a Large Subsurface Disposal system (LSSD) was the best solution to provide the capacity required for their initial growth forecast.

Construction of the LSSD took place in 2012. The system was brought online in early 2013, however the LSSD did not result in the capacity increase that was originally forecast. Over the past few years, the system has been operating using the new LSSD, operating at a lower capacity than original designed, as well as a portion of the original spray irrigation field. The City is now seeking to review the capacity of the system as it is currently operated, and compare this to the lower growth scenario that is now forecast.

The following is a summary of the current system capacity, as well as the amount of growth that the system could potentially support using the existing components.

*Irrigation System Capacity*

The design capacity of the irrigation system is 608 $m^3$/day according to the 2011 Class EA report, based on the original Certificate of Approval for the site.

The design capacity of the original system can be verified with historical data prior to the commissioning of the LSSD in 2013. The spray irrigation system uses lagoon cells treat the sewage and provide storage over the course of the winter. Effluent from the lagoons is sprayed onto fields in the warmer weather months, as weather conditions allow. The following data was supplied by OCWA. The total annual effluent flow was sprayed onto the fields during the allowable spray periods only. However the average daily flow amount is calculated as the total annual effluent flow, divided by the total days in the year. The storage provide by the lagoon cells makes this feasible.

| | **2012** | **2011** | **2009** | **2008** | **2007** |
|---|---|---|---|---|---|
| **Annual Effluent Flow (m3)** | 222056 | 304321 | 496092 | 386700 | 263700 |
| **Avg. Daily Effluent Flow (m3/day)** | 608 | 834 | 1359 | 1059 | 722 |

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Belleville@greergalloway.com



Jun 1st, 2021

The amount of effluent discharged over summer for each of the years above was equivalent to discharging at least 608 $m^3$ each day across the year. The sustainable capacity of the irrigation system is therefore 608 $m^3$/day.

## *LSSD System Capacity*

The principal limiting factor of the LSSD system capacity is the primary infiltration of the effluent. For this reason, it is expected that the LSSD can continue sustain a similar rate of discharge as it is currently. The average annual discharge rate for 2017 to 2019 was 351.88 $m^3$/day.

The sustainable capacity of the LSSD system is conservatively predicted to be 350 $m^3$/day.

## *Available Capacity*

The sustainable capacity of the WPCP, with both systems available throughout the year in their current state, is 958 $m^3$/day. Please note that some piping and pumping changes will be required to run the systems simultaneously.

Using 0.45 $m^3$/day as the capacity required per person (Ref. [2]), the maximum population that could be supported by the WPCP is 2128. This is a population growth of 857 people from the last recorded population in 2016 (Ref. [3]) or the addition of 372 residences, assuming 2.3 people per residence (Ref. [2]).

Sincerely,

**THE GREER GALLOWAY GROUP INC.**
**CONSULTING ENGINEERS**

Tony Guerrera, P.Eng.
Project Manager

Jun 1st, 2021

## Assumptions

- This calculation is based on average capacities throughout the year and it is assumed the lagoon can support variation in flows throughout the year.
- The calculation assumes the use of both systems can be used in tandem for this future growth scenario.

## References


1. Addendum Environmental Study Report: Class Environmental Assessment to Expand Wastewater Capacity for Omemee WPCP (CAMBIUM, 2010)
2. City of Kawartha Lakes Sanitary Infrastructure Guidelines - 2020 (CKL, 2020)
3. 2016 Census (Statistics Canada, 2017)



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# APPENDIX C: 2019 LSSDS Study Report

# Study Report on The LSSDS Wastewater Treatment System

## In the Town of Omemee

City of Kawartha Lakes

12 Peel Street,
Lindsay, Ontario
K9V 5R8

Prepared by:

GREER GALLOWAY
CONSULTING ENGINEERS

973 Crawford Drive
Peterborough, Ontario
K9J 3X1

Project No. 17-1-7414
January 2019

# Table of Contents



# Appendices

# 1. Introduction

The City of Kawartha Lakes owns the municipal wastewater system in the Town of Omemee. It was originally constructed as a dual lagoon /spray irrigation system in 1976.

In 2013, the City received notice from the Ministry of Environment Conservation and Parks (MOECP) that spray irrigation of effluent from the lagoons would no longer be acceptable after December 31, 2015. Accordingly, the City elected to upgrade the system by designing a large sub-surface disposal system (LSSDS), equipped with Infiltrator Quick 4 dispersal units, to accept all effluents and eliminate the need for future spray irrigation. The up-graded system, based upon future per capita use estimates, was designed and constructed in 2014.

In 2017, however, the City entered into negotiations with Greer Galloway to recommend enhancements to the system. A detailed study of the lagoon effluent, the conveyance system to the infiltration bed, and the hydraulic efficiency of the infiltration bed was then initiated in 2018. This report contains the results of that Study.

# 2. Background Information

The system is located north of Omemee. It is accessed by way of County Road 7 heading north from Omemee for 1.5 km., thence westerly for 1.0 km., to 267 on Beaver Road. It is currently operated for the City by the Ontario Clean Water Agency (OCWA) and consists of two (2) facultative sewage lagoons, a pumping station, and a large sub-surface disposal area or tile bed of 18,816 $m^2$ (1.88 Ha.) The lagoons are each 3.6 Ha. in size and provide a combined raw sewage storage volume capacity of 178,000 $m^3$.

The capacity of the spray irrigation system, established in 1976, was 608 $m^3$/day. The 2014 upgrade eliminated the need for spray irrigation and provided for dosing a re-designed tile bed with clarified effluents from the lagoons at a new rate of 1,350 $m^3$/day.

The new infiltration system was designed as a large sub-surface disposal system (LSSDS) containing an infiltrator Quick 4 dispersal system involving the distribution of lagoon effluents to four (4) different zones in the tile bed, each containing six (6) disposal beds (cells) equipped with 33 infiltrator runs, 28 m long.

# 3. Limitations of The Existing System

## 3.1 The Lagoons and Pumping Chamber

During the Spring and warmer months of the year the effluent from the lagoons contain seasonal spikes of suspended solids (TSS) and biological oxygen demands (BOD5) which clog the pumping system that conveys the effluent to the LSSDS. The effluent undergoes a screening process at the front end of the wet well within the pump-chamber that removes some of the suspended solids, but not all, and which then forms as a dense organic slime on both the screen and the side walls of the wet well. The slime presence then exponentially increases the TSS levels even higher in the pump chamber. It clogs both the screen and the pumps and requires continuous operator monitoring to keep the system functioning and necessitates the need for repetitive screen clean-ups and repairs to malfunctioning pumps.

Appendix 3 contains graphs of the TSS, BOD5 and TP concentrations which illustrate the seasonal spikes that currently surpass MOECP tertiary limits.

### 3.2 The LSSDS Soil Composition

A further geotechnical field investigation was done on the LSSDS. The complete report is contained in Appendix 4. Seven (7) new boreholes were strategically placed within the tile bed. The soil types ranged from SP (fine sand), to SP-SM (sand and silty sand), to SM (silty sand). SP is the preferred soil type to be used with infiltrators. The entire LSSDS was determined to be comprised of both SP and SP-SM soils, in generally a 50/50 split. Pockets of silty sand were inter-mixed with the fine sand in the upper levels of the new tile bed and the native soils forming the lower levels of the tile bed were overly dense. The dense layering of the native soil affects the functioning of the system as the vertical permeability of the native soils is also curtailed by the lower permeability layers. This phenomenon is further discussed in Appendix 5.

### 3.3 The LSSDS and Infiltrator Quick 4 Dispersal System

A hydrogeological analysis was done on the LSSDS. The infiltration capacity of the current system was determined to be only 29 L/m$^2$/day. Although the Infiltrator system provides a substantial effluent storage capability, the infiltration into the soil below must occur over the planar surface of the entire tile bed and can only occur at a rate governed by the vertical hydraulic conductivity of the soil.

The potential issues with the existing system are as follows,

- a limited vertical infiltration capacity due to low intrinsic permeability of the SP-SM soils beneath the infiltrators.
- a limited vertical infiltration capacity due to fouling of the SP-SM soils beneath the infiltrators with suspended solid and colloids in the lagoon effluent.
- a limited vertical infiltration capacity due to hydraulic segregation of fines during the dosing of the infiltrators.
- hydraulic overloading of the underlying native soils beneath the infiltration cells.

## 4. System Enhancements and Repairs

### 4.1 The Travelling Screen

A travelling screen will be introduced to the effluent flow process as an initial step towards cleansing the effluent. The travelling screen will intercept any large weeds and surface debris from the effluent, in advance of it entering the wet well and creating major clogging to any internal screens intended for removing only suspended solids and colloids, ahead of the pumping chamber. The large weeds and debris will be conveyed directly to a new sludge storage tank for ultimate removal to a disposal area and subsequent trucking from the site.

## 4.2 Pre-Treatment of the Effluent

A fundamental decision was made that suspended solids and colloids within the effluent must be virtually eliminated from the effluent if the system is to escape pumping problems and achieve proper performance within the new LSSDS. The following alternatives were then investigated;

| | |
|---|---|
| Self-Cleaning Cloth Filters | - continual expenses with chemical storage and use<br>- continual labor and on-site operator expense<br>- only minimal removal of wet well slime |
| An Auto-Cleaning Strainer | - no chemical requirements<br>- only minimal removal of wet well slime<br>- totally ineffective against BOD levels |
| Dissolved Oxygen Flotation (DAF) | - provides virtual removal of all TSS and BOD<br>- effective against seasonal spikes<br>- requires an addition to the existing building<br>- requires infrastructure and a power supply |

A DAF is the preferred alternative because the pumping chamber and the tile bed both have a low tolerance for plant material, weeds, algae, and suspended solids including minerals. It is designed specifically to remove TSS, BOD5, and Oil and Grease from wastewater streams.

The contaminants are removed using an air-in-water solution that injects air under pressure into a recycle stream of clarified DAF effluent. The recycle stream is then combined with incoming wastewater in an internal contact chamber where the dissolved air comes out of solution in the form of micro-sized bubbles that attach to the contaminants. The bubbles and contaminants rise to the surface of the chamber and form a floating bed of material that is automatically removed by a surface skimmer into an internal hopper for eventual conveyance to the new sludge storage tank and eventual trucking off site. A Chemical coagulant is used to assist the flocculation process.

## 4.3 Enlargement of the Existing Wet Well

The existing wet well will be enlarged into a 2-stage baffled tank to provide an increased drawdown period of the effluent to enhance the settlement of any suspended substances that may have bypassed the DAF pre-treatment process.

## 4.4 The Pumping Station

The existing pumping fixtures require continuous care and attention due to the nature of the effluent. New pumps and fixtures may need to be introduced to meet the design requirements of the new system.

## 4.5 Distribution to the Rehabilitated LSSDS

Clarified effluent will leave the pumping station in sequence via a force main to 10,000 L distribution chambers designed for every two (2) cells and then to reconstructed infiltration cells by way of valved 100 mm gravity fed lines to a 150 mm diameter PVC header pipe containing 4 runs of 100 mm diameter perforated HDPE pipe on 8 m centers per cell and placed on a 150 mm thick clear stone pad.

## 4.6 Rehabilitation of the LSSDS

The Infiltrator Quick 4 dispersal system will be replaced with a more conventional tile system containing modular 25 m x 60 m cells and augmented with clear stone-filled 0.6 m diameter vertical drainage trenches constructed longitudinally and adjacent to the tile runs, to depths of 2 to 4 m depending on soil conditions. The cells will be carefully located to maximize the setbacks from the slopes of the tile bed to reduce the chance of effluent breakouts. Piezometers will be established to monitor the collective efficiency of the re-constructed bed.

The footprint of the existing system will be down-sized in area to reduce the hydraulic loading on the partially compacted native soils. The tile bed will be dosed using gravity and gate-type valves to allow for operational monitoring and maintenance.

Additional infiltration areas, as identified and located to the north and west of the existing system, will provide for a reasonable factor of safety of available tile bed and for future expansion.

# 5. The Construction Cost Estimate

A construction cost-estimate of the recommended enhancements is included in Appendix 2.

# 6. Concluding Comments

Adding a pre-treatment plant to the lagoon and the replacement of the existing Infiltrator Quick 4 Dispersal System with a conventional clear stone tile bed are the major components recommended to improve the operation of the LSSDS.

Detailed design of the enhancements to this existing system prior to construction may also contain minor changes or additional refinements to it. A pilot-scale implementation of one (1) reconstructed infiltration cell is recommended to validate the new design and to properly size the system footprint.

Prepared and Submitted by,

**GREER GALLOWAY**
**CONSULTING ENGINEERS**

01/25/19

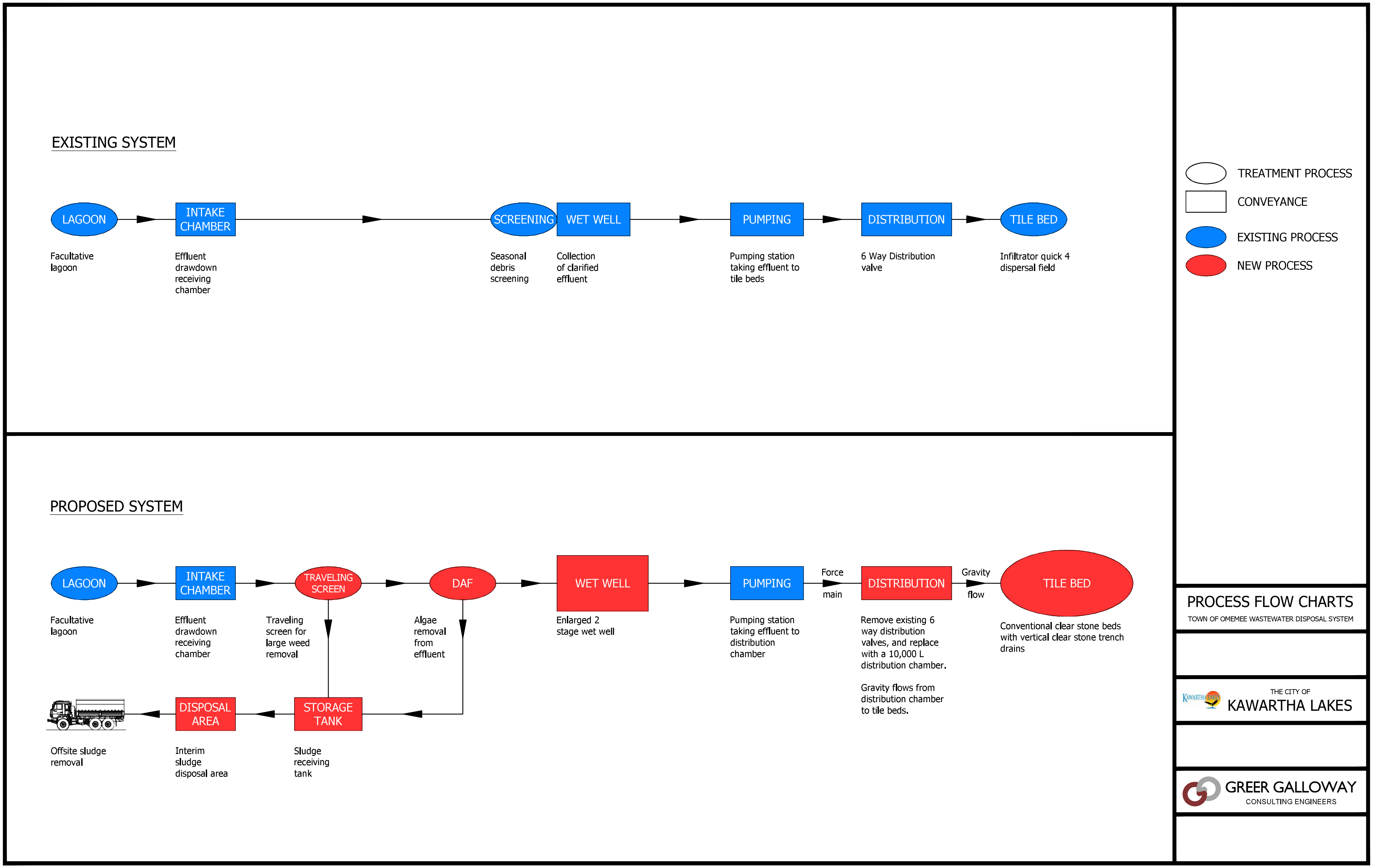
**Raja Chockalingam, M.Eng.**

REGISTERED PROFESSIONAL ENGINEER
CIVIL
W. R. GALLOWAY
PROVINCE OF ONTARIO
01/25/19

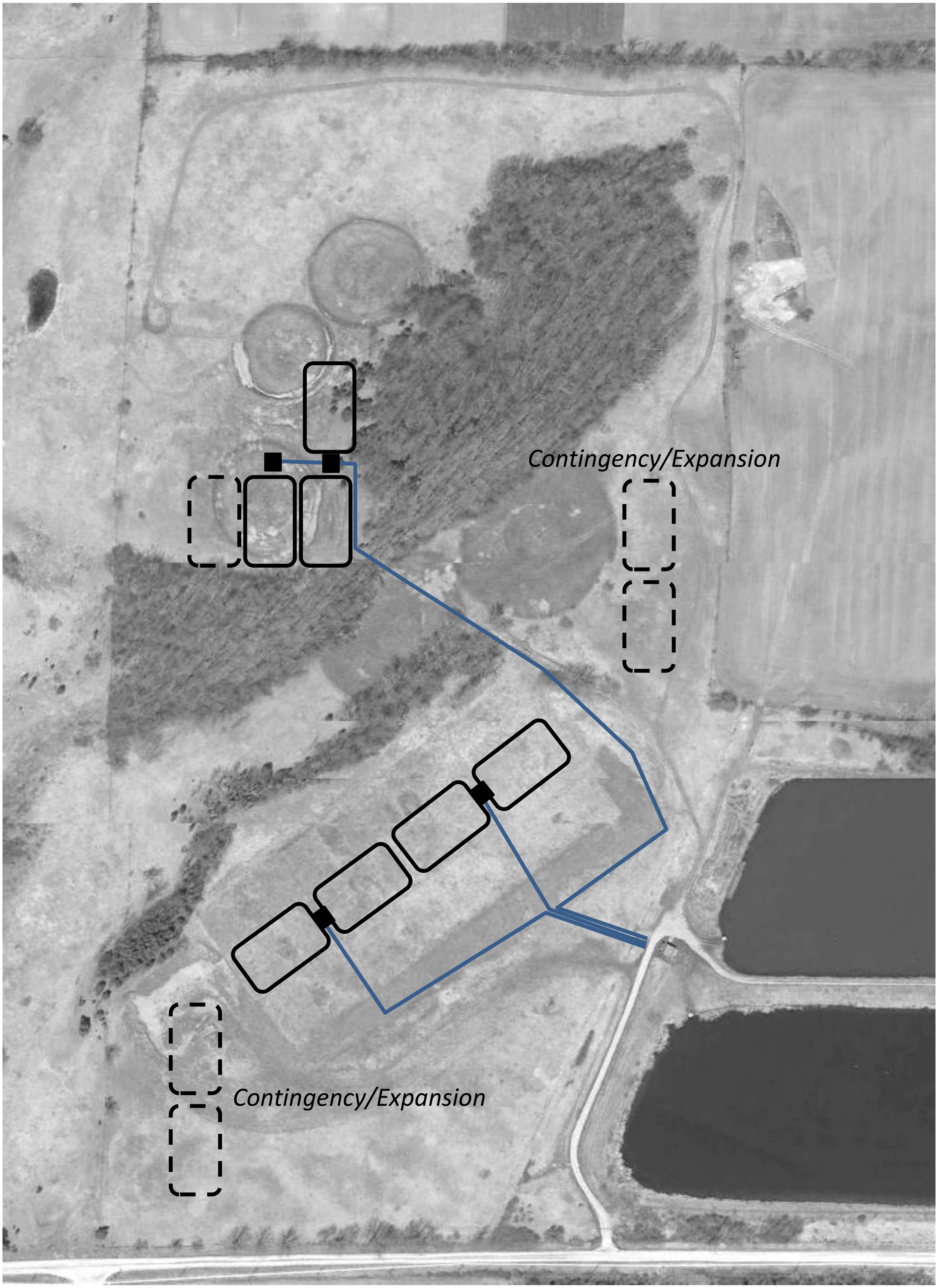
**W.R. Galloway, P.Eng.**

# APPENDIX 1 – FIGURES

- **Process Schematic Flow Charts**
- **Aerial Map**
- **Conceptual layout of the New Tile Bed**


EXISTING SYSTEM
LAGOON
Facultative lagoon
INTAKE CHAMBER
Effluent drawdown receiving chamber
SCREENING
Seasonal debris screening
WET WELL
Collection of clarified effluent
PUMPING
Pumping station taking effluent to tile beds
DISTRIBUTION
6 Way Distribution valve
TILE BED
Infiltrator quick 4 dispersal field
PROPOSED SYSTEM
LAGOON
Facultative lagoon
INTAKE CHAMBER
Effluent drawdown receiving chamber
TRAVELING SCREEN
Traveling screen for large weed removal
DAF
Algae removal from effluent
WET WELL
Enlarged 2 stage wet well
PUMPING
Pumping station taking effluent to distribution chamber
Force main
DISTRIBUTION
Remove existing 6 way distribution valves, and replace with a 10,000 L distribution chamber.
Gravity flows from distribution chamber to tile beds.
Gravity flow
TILE BED
Conventional clear stone beds with vertical clear stone trench drains
STORAGE TANK
Sludge receiving tank
DISPOSAL AREA
Interim sludge disposal area
Offsite sludge removal
TREATMENT PROCESS
CONVEYANCE
EXISTING PROCESS
NEW PROCESS
PROCESS FLOW CHARTS
TOWN OF OMEMEE WASTEWATER DISPOSAL SYSTEM
THE CITY OF
KAWARTHA LAKES
GREER GALLOWAY
CONSULTING ENGINEERS


Existing System Layout




GREER GALLOWAY
CONSULTING ENGINEERS

OMEMEE LSSDS INFILTRATION CELL LAYOUT

| PROJECT No. | Phase | Date | Figure |
|---|---|---|---|
| 1717414 | 160-200 | Dec 2018 | C-4 |

# APPENDIX 2 – Construction Cost Estimate

## The Construction Cost Estimate

A rounded construction cost estimates of the major components and ancillary equipment as detailed in the schematic flow process of the Enhancement program is provided as follows:

| | |
|---|---|
| • The Pre-Treatment Travelling Screen | $ 100,000 |
| • The Sludge Storage Tank and Disposal Area | $ 200,000 |
| • The Dissolved Air Flotation Package Plant (DAF) | $ 300,000 |
| • A Concrete Block Building to House the Pre-Treatment Equipment | $ 150,000 |
| • The Wet Well Expansion | $ 40,000 |
| • Modifications and Additions to the Pumping Station | $ 100,000 |
| • The Effluent Distribution Tank and Piping | $ 40,000 |
| • Modifications to the Existing Tile Bed | $ 330,000 |

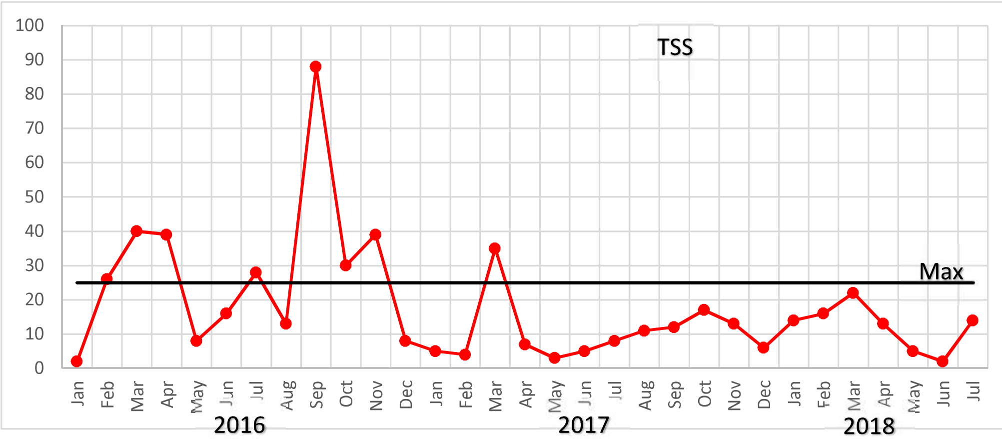
**Total Equipment and Hard Costs ………………………………………………………………. $ 1,260,000**

**Allowance for Labor Assembly and Operational Use ……………………………………. $ 1,000,000**

**TOTAL PROJECT COST ……………………………………………………………………………… $ 2,260,000**

# APPENDIX 3 – Lagoon Effluent Pre-Treatment

- **Effluent Concentrations Comparison (January 2016- July 2018)**
- **DAF Package Plant Brochure**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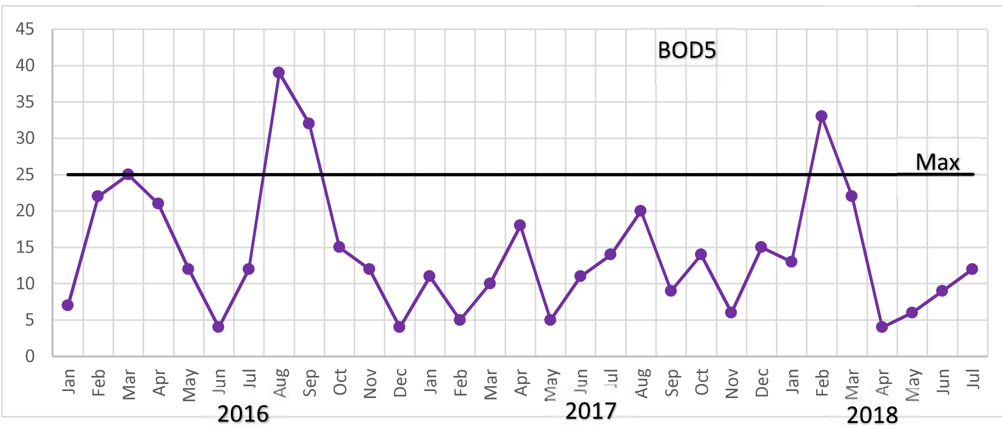
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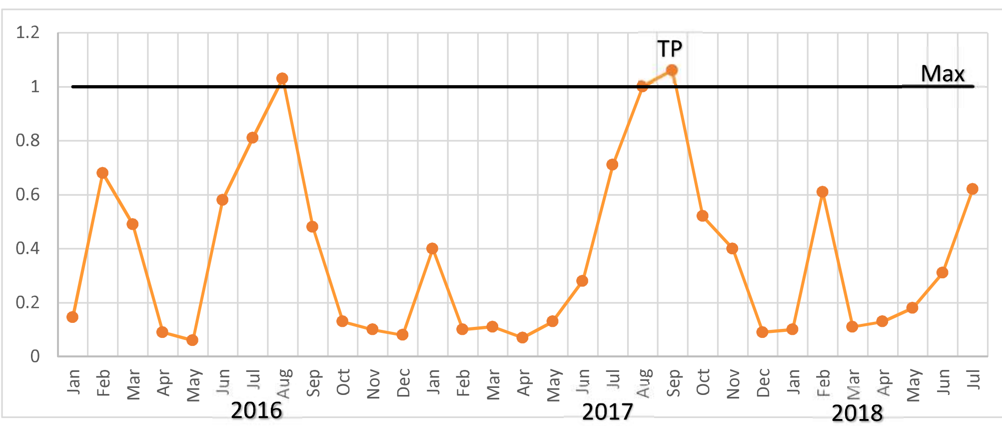
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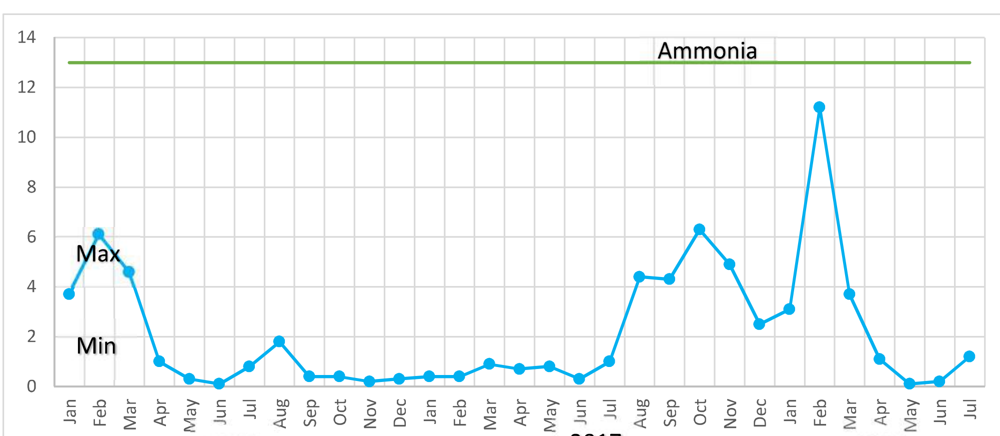
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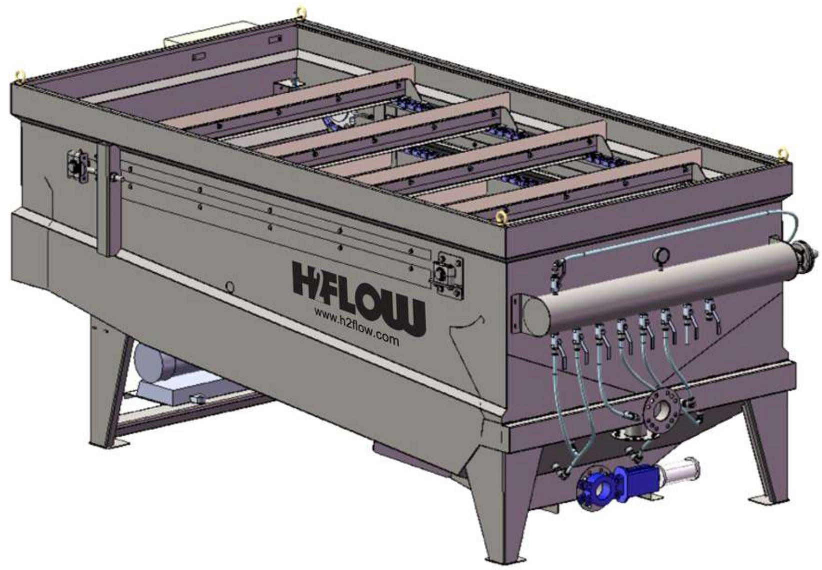
2016
2017
2018

# Product Information Sheet




| GENERAL INFORMATION | | |
|---|---|---|
| **Type** | : | Dissolved Air Flotation |
| **Model** | : | ALPHA 60 |

| DESIGN DETAILS | | | |
|---|---|---|---|
| **Hydraulic Capacity (maximum)** | : | 60 $m^3$/hr | 264 usgpm |
| **Overflow Rate** | : | 4 m/hr | 1.6 usgpm/$ft^2$ |
| **Recirculation Flow** | : | 12 $m^3$/hr (6 bar) | 53usgpm, 85 psi |
| **Free Surface Area** | : | 15 $m^2$ | 160 $ft^2$ |

| CONSTRUCTION DETAILS | | | |
|---|---|---|---|
| **Unit Length** | : | 8830 mm | 347.6 in |
| **Unit Width** | : | 2320 mm | 91.3 in |
| **Unit Height** | : | 2400 mm | 94.5 in |
| **Inlet** | : | DIN 150 mm | 6” ANSI |
| **Float Discharge** | : | DIN 150 mm | 6” ANSI |
| **Outlet** | : | DIN 200 mm | 8” ANSI |
| **Bottom Sludge** | : | DIN 100 mm | 4” ANSI |
| **Weight Empty** | : | 2500 kg | 5500 lbs |
| **Weight Full** | : | 22800 kg | 50265lbs |
| **Skimmer Drive Model** | : | NORD | |
| **Bottom Auger Drive Model** | : | NORD | |
| **Recycle pump** | : | Centrifugal pump | |
| **Bottom Valve** | : | Keystone or equal | |
| **Stairs and Sidewalk (Optional)** | : | L-Shape, 800 mm width | |

# Product Information Sheet

| ELECTRICAL AND CONTROL | | | |
|---|---|---|---|
| **Power Supply** | : | 230V, 480V or 575V, 3 phase, 60 Hz | |
| **Control Voltage** | : | 24 VDC | |
| **Skimmer** | : | 0.37 kW | 0.5 Hp |
| **Bottom Auger** | : | 0.37 kW | 0.5 Hp |
| **Recirculation Pump** | : | 7.5 kW | 10 Hp |
| **Air Consumption** | : | 30Nl/min, 6 bar | 1 scfm, 115 psi |
| **Pneumatic Panel** | : | 24 VDC | |
| **Local Control Panel** | : | Optional | |

| MATERIAL OF CONSTRUCTION | | |
|---|---|---|
| **DAF Tank** | : | 304 SS, optional 316 SS |
| **Static Sludge Thickener** | : | 304 SS, optional 316 SS |
| **Skimmer System** | : | SS with fiberglass blades |
| **Chain** | : | Plastic |
| **Chain Wheel** | : | Plastic |
| **Bottom Auger** | : | 304 SS, optional 316 SS |
| **Recirculation Pump** | : | Stainless steel with SS shaft and impeller |
| **DAF Cover (Optional)** | : | Plastic or SS |
| **Lifting Lugs** | : | 304 SS |
| **Dissolved Air Make Up System** | : | 304 SS, optional 316 SS |
| **Aeration Valves** | : | Stainless steel |
| **Pneumatic Panel** | : | Fiberglass |
| **Bottom Valve (Butterfly)** | : | Body cast iron GGG-50, disc 316 SS, seal EPDM |
| **Stairs and Sidewalk (Optional)** | : | Galvanized steel or fiberglass |

Contact us: 1(888) 575-8642

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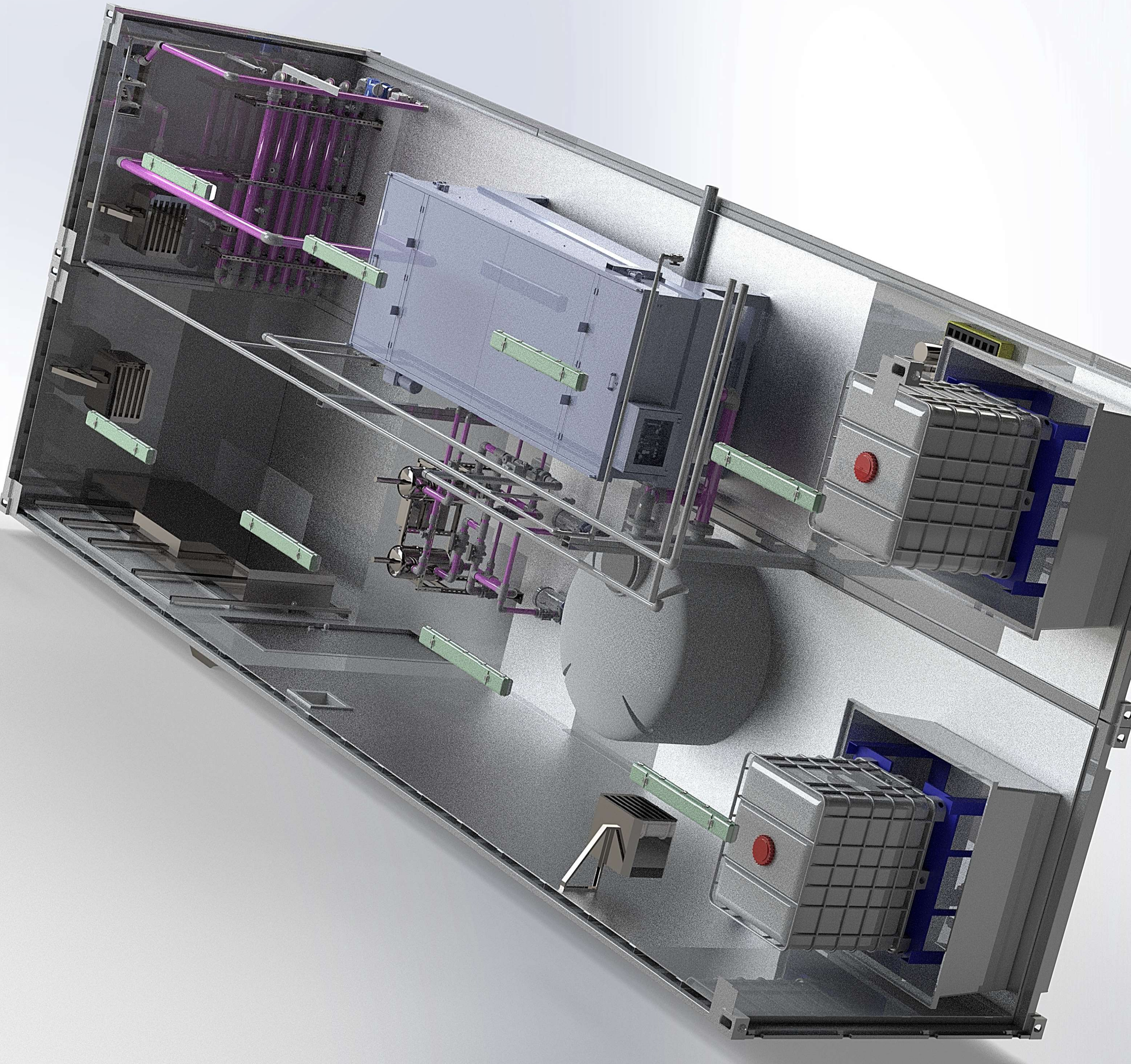

# APPENDIX 4 – Geotechnical Study

- **Omemee LSSDS Tile Field Investigation**

**terraspec engineering inc.**
**geotechnical engineers * materials testing**

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**Peterborough, Ontario** **Phone: (705) 743-7880**
**K9J 3X1** **Fax: (705) 743-9592**

January 24, 2019

The Greer Galloway Group Inc.
973 Crawford Drive
Peterborough, Ontario
K9J 3X1

**Re: Omemee LSSDS**
**Project Number 17-1-7414**

**Introduction**
This report details the findings of an investigation of the Omemee Large Subsurface Sewage Disposal System (LSSDS), located at 267 Beaver Road in Omemee. The system was built in 2014 to provide an alternative to spray irrigation at the facility.

**General Data**
The present system pumps water from the south sewage lagoon and sends it to a tile field equipped with Infiltrator Quick 4 dispersal units. The system installed has 4 pumps, 4sectors, 6 cells per bank, and therefore 24 sets of Infiltrators. During construction, the grades of the proposed tile field area were adjusted to make the tile field relatively flat. The west side of the tile field was cut down 3m, and the east side was filled with the cut material, up to 4m in height. Once the infiltrators were placed, the field was backfilled with typically 1.2m of soil overtop of the Infiltrators. All soils utilized to construct the tile field were obtained directly from the project site.

The tile field was last used on May 16, 2018. The tile field is dosed up to 500m3 per day, which the tile field can accept if the dosing is sent to the central beds. 500m3 per day is only 38% of the total intended design capacity. The winter flow capacity required is 1000m3 per day, and the total available capacity of the system was intended to be 1352m3 per day.

Currently all 4 east cells are isolated and are not dosed, due to breakout of the effluent from the east bank. Spring melt can also cause breakout of trapped water on the face of the east bank, at 4.6 to 6m below the top of bed surface. Some remedial work was done to the east bank to collect the observed breakout and direct it to drain downward into the tile field soils, however, the 4 east cells are still not dosed in order to avoid another breakout.

**Observations**
In 2015, inspection port cutouts on top of selected infiltrators were inspected by OCWA with a GoPro camera. It was observed that the flow of water into some infiltrators was just a trickle, suggesting that the pump pressure was low or that some of the valves in the tile field did not work properly. Many valves in the tile field were damaged by frost and subsequently repaired, however, it is possible that some valves still have impaired function.

Below is a schematic of the existing Infiltrator cells.

```
                    west
        1* | 4* 7 | 10   13 | 16 19   | 22*
south   2  | 5  8 | 11   14 | 17 20* | 23*   north
        3* | 6  9 | 12* 15 | 18 21* | 24
           |      |         |        |
           |      |         |        |
                    east
```

* indicates cells that would not drain properly (cells 1, 3, 4, 12, 20, 21, 22, 23).

At the pump house, large amounts of lagoon organic growth (weeds) are getting stuck in the collection well filters. Also, the duckweed in the lagoons is able to pass through these filters. The current pumps in the pump house do not have the ability to grind up organic content in the effluent. Subsequent to the pump house, the 4 automatic 6-way distribution valves in the tile field valve chambers do not function properly. It is believed that these valves have not functioned reliably since installation.

**Investigation**
There are a total of 23 observation well pipes in the Infiltrators, which have been numbered in the field from S to N, and E to W. These wells allow observation of the surface soils inside the Infiltrators. The elevation of the surface soils is typically 279m. Surface soils from observation wells 3, 15, and 22 were sampled to allow for chemical testing of Sodium and Calcium content.

Chemical Testing of Infiltrator Surface Soils for Calcium and Sodium (parts per million)

| Sample | Calcium | Sodium |
|---|---|---|
| 3 | 110,000 | 96 |
| 15 | 160,000 | 126 |
| 22 | 150,000 | 190 |

The Calcium content was fairly high. 150,000 ug/g indicates that 15% of the soil mass was in the form of Calcium.

The Infiltrator surface soil samples from wells 1, 2, 3, and 6 were sieved for grain size to check the silt content. The silt content of these samples was relatively low, ranging from 4 to 23 percent, however, it is expected that an elevated silt content at this elevation will impede percolation of the effluent.

Prior to placing boreholes on site, test pits were placed to expose the Infiltrator depths on October 23, 2018. Based on the test pit data, boreholes were situated on site to avoid drilling through the centre of an Infiltrator, to avoid damaging the distribution pipe inside the Infiltrator. Drilling of the tile field was conducted on October 29 & 30, 2018. Seven boreholes were placed on the tile field. Drilling was conducted to cut through the Infiltrator plastic at a typical depth of 0.9m to 1.3m below surface, then continuous in-situ soil samples were collected where possible utilizing sonic drilling. The sonic drilling technique forces transparent sample tubes into the soil so that an in-situ soil sample can be extracted from the ground. The inside diameter of the sample tubes was 60mm. Conventional augering and sampling was also conducted where the subsoils were particularly dense.

Once extracted from the site, the sample tubes were divided into 300mm vertical sections in the laboratory, for the purpose of soil testing. The soil tests consisted of natural moisture content and grain size analysis. This procedure generally provided a grain size test per each 300mm of sonic drilling within the borehole. The borehole logs and laboratory testing data have been appended to this report. Photos of the soil sample tubes have also been appended to this report.

There was typically 0.9 to 1.3m of backfill overtop of the Infiltrator units. This backfill consisted of a silty sand with gravel, which does not contribute to drainage of the effluent, as this soil rests above the Infiltrators.

At the Infiltrator elevation and below, the subsoils encountered in the tile field typically consisted of natural deposits of fine sand, fine sand with silt, and silty sand. The ASTM group classification of these soils are: fine sand (SP), fine sand with silt (SP-SM), and silty sand (SM). These ASTM designations were utilized to classify each soil sample tested for grain size. In terms of hydraulic conductivity, SP soil can be considered as Good, SP-SM soil can be considered as Borderline, and SM soil can be considered as Poor.

The subsoils from zero to 3m below the Infiltrators (4.35m below ground surface) was generally acceptable for infiltration of the effluent, assuming that the compactness (density) of the sand is not too high. The typical void ratio of the sand was 0.637. The typical in-situ moist density of the sand was 1715 kg/m3, although this density can be expected to increase with depth.

The subsoils beyond this depth (generally 4.35m to 10m below ground surface), typically consist of natural deposits of undisturbed, fine sand (SP), fine sand with silt (SP-SM), and silty sand (SM), such that the high in-situ density may be impeding percolation of the effluent. The boreholes placed by Golder Associates in 2015 typically had N values in the range of 30-60 blows per foot, which are classified as soils in a dense to very dense condition.

The high density of the soils in Boreholes 2, 4, 6, and 7 roughly corresponds to the poor drainage observed at the Infiltrator cells in these locations. As well, a silty sand (SM) layer right at the Infiltrator surface is expected to impede drainage, as was seen in Boreholes 1 and 7.

**Conclusions**
There are many potential problems with Infiltrator systems, detailed as follows:
The soil infiltration surface must be scarified (loosened) at least 300mm before installing the Infiltrators.
Similarly, the soil surface should consist of a significant layer of clean sand to promote percolation of the effluent. If the infiltrators are overwhelmed with water that does not drain into the soil quickly, the water can become muddy with fines, which eventually settle on top of and cement the soil surface, impeding future drainage of the soil. The soil above the Infiltrators must not be compacted, as compaction can put stress on the units and damage the effluent distribution pipes located in the top of the Infiltrators. Infiltrators are typically to be installed with gaps between the units to allow construction traffic to move over the site without driving on the Infiltrators. The Infiltrator units must be protected from plants with deep root structures.

Infiltrators are purported to work with native soil types as a no-gravel system, however, for optimal performance, Infiltrators typically require gravel or a very clean filter sand, with ASTM classification SP. (SP is the soil type typically used as a filter media in conventional tile bed systems.) The soil types encountered in the boreholes ranged from SP, to SP-SM, to SM.

The soils in the tile field are sufficient for drainage within the top 4.35m, or 3m below the Infiltrator units, assuming that silty sand (SM) is not the predominant soil type. 75% of the soil samples collected from the investigation were classified as SP or SP-SM. Soils of this type typically have a T time in the range of 2-20 min/cm, with a hydraulic conductivity in the range of $10^{-1}$ to $10^{-5}$ cm/sec. The hydraulic conductivity of these soils as found on site is estimated at 3 x $10^{-4}$ cm/sec.

The soil surface observed in the Infiltrators (at the Infiltrator elevation), was typically in a compact state. There was a high calcium content detected in the surface soils. It is possible that calcium in the form of calcium carbonate in the effluent may be contributing to cementing the top surface of the existing soils in the Infiltrators. The dense condition of the underlying, undisturbed natural sand formation is likely contributing to the poor hydraulic conductivity. There is a possibility that the natural soil deposit in this esker cannot accept the intended design effluent loading.

**Recommendations**
The pre-screening wells at the pump house should be altered to allow easier collection of seaweed and duckweed, and if possible decanting of the clear water into the pump collection chamber. The pumps in the pump house should probably be specified as grinder pumps, to grind any debris in the effluent that gets past the intake screens.

The automatic 6-way distribution valves should be replaced with an alternative system. A review of how the effluent can be reliably distributed throughout the tile field may also be warranted.

It is suggested that the Infiltrator units be replaced with a conventional septic tile design, utilizing crushed gravel around the distribution pipes, with an underlying clean filter sand layer directly below the pipes, placed as necessary based on the existing soil types.

Careful attention should be paid to frost protection of the tile field soil surface, and the distribution pipes feeding the field. Since the system operates intermittently in the winter, there is a potential for effluent to freeze within the distribution pipes.

To improve the hydraulic conductivity of the natural sand deposit below the tile field, consideration can be given to installing vertical sand drains in the tile field. This would involve drilling a series of boreholes full-depth in the tile field, and backfilling the boreholes with a free-draining gravel. This will make the full depth of available natural soil deposit more accessible for vertical and lateral infiltration of the effluent into the soil.

~ ~ ~

**TERRASPEC ENGINEERING INC.**
**GEOTECHNICAL ENGINEERS**

Shane Galloway, B.A.
Manager

N.A. MacKinnon, P.Eng.
Senior Engineer

**Borehole Data**
**Omemee LSSDS**
**October 29-30, 2018**

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**Notes**

1. Soil types, strata, and groundwater conditions have been established only at test hole locations.
2. Soils are described according to the MTO Soils Classification System and OPSD 100.06.
3. Dimensions are in millimetres up to 1 metre, then in metres thereafter.

**Abbreviations**

| | | | | | |
|---|---|---|---|---|---|
| asph | - | asphalt | & | - | and |
| blds | - | boulders | w | - | with |
| blk | - | black | so | - | some |
| br | - | brown | tr | - | trace |
| BR | - | bedrock | | | |
| cl | - | clay(ey) | S | - | soil sample |
| cob | - | cobbles | | | |
| conc | - | concrete | | | |
| cr | - | crushed | | | |
| f | - | fine | | | |
| gr | - | gravel(ly) | | | |
| gry | - | grey | | | |
| med | - | medium | | | |
| NFP | - | no further progress | | | |
| org | - | organics | | | |
| RF | - | rock fill | | | |
| sa | - | sand(y) | | | |
| si | - | silt(y) | | | |
| tps | - | topsoil | | | |

**1** (SE corner)

| | | | | |
|---|---|---|---|---|
| 0 | - 200 | br sa tps | | |
| 200 | - 2.2 | br si sa w gr -moist, loose to compact (infiltrator backfill) | | |
| 2.2m | | infiltrator | | |
| Sonic Sampling | | | | |
| 1 | 2.13-3.66 | br si sa -dry, compact | 7-12 | samples 1a,b,c,d,e |
| 2 | 3.66-4.57 | br f sa w si -dry, compact | 12-15 | samples 2a,b,c |
| 3 | 4.57-4.88 | br f sa w si -dry, dense | 15-16 | samples 3a |
| -cob at 4.88m | | | | |
| 4.88 | - 5.79 | br f sa w si -dry, dense | | S1 at 5.79m |
| 4 | 5.79-7.01 | br f sa w si -dry, dense | 19-23 | samples 4a,b,c,d |
| 5 | 7.01-7.62 | br si sa -dry, dense | 23-25 | samples 5a,b |
| 6 | 7.62-8.53 | br f sa w si -dry, dense | 25-28 | samples 6a,b,c |

-water not encountered

**2**

| | | | | |
|---|---|---|---|---|
| 0 | - | 200 | br sa tps | |
| 200 | - | 1.10 | br si sa w gr -moist, loose to compact (infiltrator backfill) | |
| 1.1m | | | infiltrator | |
| 1.10 | - | 4.27 | br f sa w si -dry, compact | S11 at 2.74m |
| 4.27 | - | 6.10 | br f sa -dry, compact to dense | S12 at 4.27m |
| 6.10 | - | 7.62 | br si sa tr gr -dry, dense | S13 at 7.32m |
| 7.62 | - | 9.14 | br si sa tr gr -dry, very dense | |
| 9.14 | - | 10.06 | br si sa tr gr -dry, very dense | S14 at 9.45m |

-water not encountered

**3**

| | | | | | |
|---|---|---|---|---|---|
| 0 | - | 200 | br sa tps | | |
| 200 | - | 1.10 | br si sa w gr -moist, loose to compact (infiltrator backfill) | | |
| 1.1m | | | infiltrator | | |
| Sonic Sampling | | | | | |
| 7 | 1.22-2.44 | | br f sa -dry, compact | 4-8 | samples 7a,b,c |
| 8 | 2.44-3.35 | | br f sa -dry, dense | 8-11 | samples 8a,b |
| 9 | 3.35-3.96 | | br f sa w si -dry, dense | 11-13 | samples 9a,b |
| 10 | 3.96-4.57 | | br f sa w si -dry, dense | 13-15 | samples 10a,b |
| 4.57 | - | 4.88 | br si sa -dry, dense | | S2 at 4.88m |
| 11 | 4.88-5.48 | | br si sa so gr -dry, dense | 16-18 | samples 11a,b |
| 5.48 | - | 9.14 | br f sa w si tr gr -dry, dense | | S3 at 9.0m |

-bld at 5.49

-trace water seepage at 5.18m

**3b** (not drilled - hole placed to locate infiltrator only)

| | | | |
|---|---|---|---|
| 0 | - | 200 | br sa tps |
| 200 | - | 1.3 | br si sa w gr -moist, loose to compact (infiltrator backfill) |
| 1.3m | | | infiltrator |

**4**

| | | | | | |
|---|---|---|---|---|---|
| 0 | - | 200 | br sa tps | | |
| 200 | - | 1.22 | br si sa w gr -moist, loose to compact (infiltrator backfill) | | S0 at 0.7m |
| 0.9m | | | infiltrator | | |
| Sonic Sampling | | | | | |
| 12 | 1.22-2.44 | | br f sa w si so gr -dry, compact | 4-8 | samples 12a,b,c |
| 13 | 2.44-3.05 | | br f sa -dry, compact | 8-10 | samples 13a,b |
| 14 | 3.05-3.35 | | br f sa -dry, dense | 10-11 | samples 14a,b |
| 3.35 | - | 7.01 | br f sa w si & gr -dry, very dense | | |
| -bld from 3.35-3.66m | | | | | |
| 7.01 | - | 8.68 | br f sa w si/gr/cob -dry, very dense | | |
| -cob at 7.0m | | | | | |
| 15 | 8.68-10.21 | | br f sa w si -dry, dense | 28.5-33.5 | samples 15a,b,c,d,e |
| -water not encountered | | | | | |

**5**

| | | | | | |
|---|---|---|---|---|---|
| 0 | - | 150 | br sa tps | | |
| 150 | - | 0.9 | br si sa w gr -moist, loose to compact (infiltrator backfill) | | |
| 0.9m | | | infiltrator | | |
| Sonic Sampling | | | | | |
| 16 | 0.91-2.44 | | br gr f sa -dry, compact | 3-8 | samples 16a,b,c |
| 17 | 1.52-2.90 | | br f sa w gr -dry, compact | 5-9.5 | samples 17a,b,c,d |
| 18 | 2.90-3.81 | | br f sa w gr -dry, compact | 9.5-12.5 | samples 18a,b,c |
| 19 | 3.81-4.42 | | br f sa w si&gr -dry, dense | 12.5-14.5 | samples 19a,b,c |
| 20 | 4.42-4.88 | | br gr f sa -dry, dense | 14.5-16 | samples 20a,b |
| perc test from 1.0-4.7m | | | T = 3 min/cm | | |
| 4.70 | - | 6.09 | br f sa w gr so cob -moist, dense | | |
| -bld at 5.94m | | | | | |
| 6.09 | - | 9.75 | br gr sa so cob -dry, very dense | S5 at 9.45m | |
| -water not encountered | | | | | |

**6**

| | | | | | |
|---|---|---|---|---|---|
| 0 | - | 300 | br sa tps | | |
| 300 | - | 1.3 | br si sa w gr -moist, loose to compact (infiltrator backfill) | | |
| 1.3m | | | infiltrator | | |
| Sonic Sampling | | | | | |
| 21 | 1.22-2.44 | | br gr f sa -dry, compact | 4-8 | samples 21a,b,c |
| 22 | 2.44-3.05 | | br f sa w si&gr -dry, dense | 8-10 | samples 22a,b |
| 3.05 | - | 5.94 | br f sa w si & gr -dry, dense | S6 at 4.6m | |
| 5.94 | - | 6.20 | gry/br f sa w gr -dry, dense | S7 at 5.9m | |
| 6.20 | - | 6.40 | gry/br f sa w si so gr -dry, dense | S8 at 6.3m | |
| perc test from 2.3-6.4m | | | T = 6 min/cm | | |
| -water not encountered | | | | | |

**7**

| | | | | | |
|---|---|---|---|---|---|
| 0 | - | 200 | br sa tps | | |
| 200 | - | 0.9 | br si sa w gr -moist, loose to compact (infiltrator backfill) | | |
| 0.9m | | | infiltrator | | |
| Sonic Sampling | | | | | |
| 23 | 0.91-1.52 | | br si sa -dry, compact | 3-5 | samples 23a,b |
| 24 | 1.52-3.05 | | br f sa w si -dry, compact | 5-10 | samples 24a,b,c,d,e |
| 25 | 3.05-3.96 | | br f sa -dry, compact | 10-13 | samples 25a,b,c |
| 26 | 3.96-4.27 | | br si sa -moist, compact | 13-14 | samples 26a |
| 4.27 | - | 6.10 | br si sa -moist, dense | | |
| 6.10 | - | 8.10 | br si sa -moist, dense | | S9 at 6.1m |
| 8.10 | - | 9.45 | br f sa w si so cob -dry, very dense | | S10 at 9.1m |

-cob at 8.1m
-water not encountered

Chemical Testing of Infiltrator Surface Soils for Calcium and Sodium (parts per million)

| Sample | Calcium | Sodium |
|---|---|---|
| 3 | 110,000 | 96 |
| 15 | 160,000 | 126 |
| 22 | 150,000 | 190 |

Grain Size Testing of Infiltrator Surface Soils for Silt Content

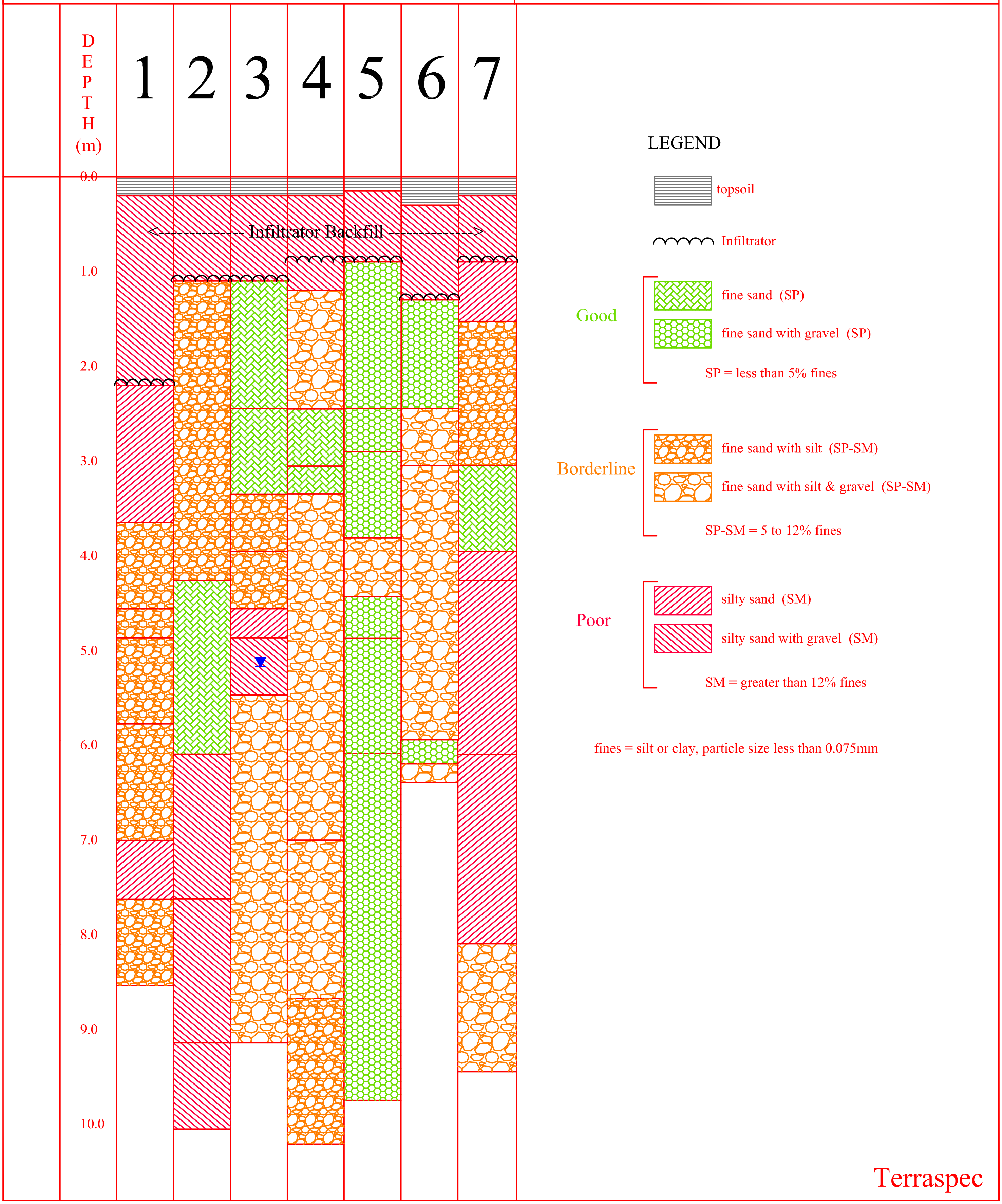
| **Well #** | **1** | **2** | **3** | **6** | |
|---|---|---|---|---|---|
| **Sieve** | **% Passing** | | | | |
| 9.50mm | 100 | 100 | 100 | 100 | grain size |
| 4.75mm | 99.5 | 100 | 99.2 | 95.6 | |
| 2.36mm | 98.4 | 99.7 | 97.5 | 94.3 | |
| 1.18mm | 97.5 | 99.2 | 93.3 | 89.9 | |
| 600um | 95.3 | 96.5 | 83.3 | 77.6 | |
| 300um | 70.9 | 56.0 | 65.1 | 60.5 | |
| 150um | 14.4 | 14.0 | 37.8 | 40.9 | |
| 75um | 3.6 | 4.3 | 16.5 | 23.4 | |
| %sand | 95.9 | 95.7 | 82.7 | 72.2 | sand content |
| %silt | 3.6 | 4.3 | 16.5 | 23.4 | silt content |
| ASTM | SP | SP | SM | SM | soil classification |

# BOREHOLE LOG DATA

PROJECT No.: 17-1-7414
CLIENT: CKL
PROJECT: Omemee LSSDS
DATE: October 29-30, 2018

SOIL DATA
METHOD:
130mm Solid Stem Auger & 60mm ID Sonic Drilling

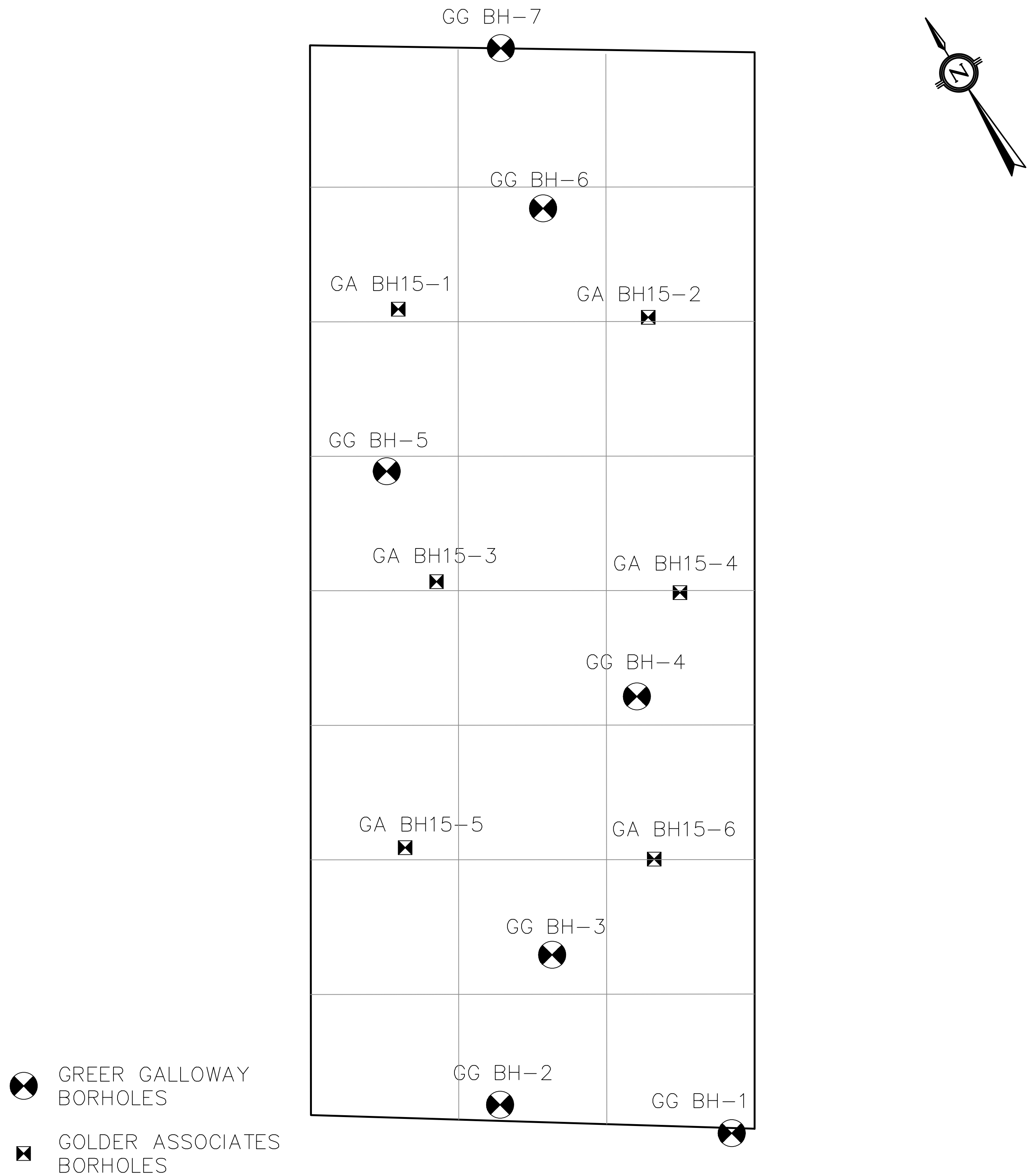
▼ encountered water seepage level




Terraspec

| Omemee LSSDS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil Samples by Colour Code** | | | | | | | | | | | | | | | | | | | | |
| **Hole 1** | | | **Hole 2** | | | **Hole 3** | | | **Hole 4** | | | **Hole 5** | | | **Hole 6** | | | **Hole 7** | | |
| **Depth** | **ASTM** | **Code** | **Depth** | **ASTM** | **Code** | **Depth** | **ASTM** | **Code** | **Depth** | **ASTM** | **Code** | **Depth** | **ASTM** | **Code** | **Depth** | **ASTM** | **Code** | **Depth** | **ASTM** | **Code** |
| 2.29 | SM | | 2.74 | SP-SM | | 1.5 | SP-SM | | 0.7 | SM | | 1.22 | SP | | 1.52 | SP-SM | | 1.07 | SM | |
| 2.59 | SM | | 4.27 | SP-SM | | 1.83 | SP | | 1.5 | SM | | 1.52 | SP | | 1.83 | SP | | 1.37 | SM | |
| 2.9 | SM | | 7.32 | SM | | 2.13 | SP | | 1.83 | SP | | 1.83 | SP | | 2.13 | SP | | 1.68 | SM | |
| 3.2 | SM | | 9.45 | SM | | 2.74 | SP | | 2.13 | SP | | 1.68 | SP | | 2.59 | SP-SM | | 1.98 | SM | |
| 3.5 | SP | | | | | 3.05 | SP | | 2.59 | SP | | 1.98 | SP | | 2.9 | SP | | 2.29 | SP-SM | |
| 3.81 | SP-SM | | | | | 3.35 | SP-SM | | 2.9 | SP | | 2.29 | SP | | 4.6 | SP-SM | | 2.59 | SP | |
| 4.11 | SP | | | | | 3.66 | SP-SM | | 3.05 | SP-SM | | 2.59 | SP | | 5.9 | SP | | 2.9 | SP | |
| 4.42 | SP | | | | | 4.11 | SP-SM | | 3.35 | SP | | 3.05 | SP | | 6.3 | SP-SM | | 3.2 | SP | |
| 4.72 | SP-SM | | | | | 4.42 | SP-SM | | 8.84 | SP-SM | | 3.35 | SP | | | | | 3.5 | SP | |
| 5.79 | SP-SM | | | | | 4.88 | SM | | 9.14 | SP-SM | | 3.66 | SP | | | | | 3.81 | SM | |
| 5.94 | SP-SM | | | | | 5.03 | SM | | 9.45 | SP-SM | | 3.81 | SW | | | | | 4.11 | SM | |
| 6.25 | SP-SM | | | | | 5.33 | SM | | 9.75 | SM | | 4.11 | SP-SM | | | | | 6.1 | SM | |
| 6.55 | SP | | | | | 9 | SP-SM | | 10.06 | SP-SM | | 4.42 | SP-SM | | | | | 9.1 | SP-SM | |
| 6.86 | SM | | | | | | | | | | | 4.57 | SP | | | | | | | |
| 7.16 | SP-SM | | | | | | | | | | | 4.88 | SP | | | | | | | |
| 7.47 | SM | | | | | | | | | | | 9.45 | SP | | | | | | | |
| 7.77 | SP-SM | | | | | | | | | | | | | | | | | | | |
| 8.08 | SP-SM | | | | | | | | | | | | | | | | | | | |
| 8.38 | SP-SM | | | | | | Good | | | Borderline | | | Poor | | | | | | | |

| Omemee LSSDS | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil Grain Size Testing and Moisture Content Data | | | | | | | | | | | | | | | | | | |
| Borehole | Soil Sample | Depth (m) | 26.5mm | 19.0mm | 13.2mm | 9.50mm | 4.75mm | 2.36mm | 1.18mm | 600um | 300um | 150um | 75um | Cu | Moisture | ASTM | Code | |
| 1 | 1a | 2.29 | ----------- | ----------- | ----------- | 100 | 97.9 | 94.9 | 91.2 | 86.3 | 73.6 | 47.6 | 22.3 | ----- | 12.7 | SM | | Hole 1 |
| 1 | 1b | 2.59 | ----------- | ----------- | ----------- | 100 | 99.3 | 94 | 88.2 | 83.5 | 78.5 | 69.5 | 44 | ----- | 16.9 | SM | | |
| 1 | 1c | 2.9 | ----------- | ----------- | ----------- | ----------- | 100 | 94.1 | 86.7 | 79.9 | 73.6 | 59.3 | 33.7 | ----- | 14.1 | SM | | |
| 1 | 1d | 3.2 | ----------- | ----------- | 100 | 99.3 | 96.7 | 94.7 | 93.8 | 90.8 | 77.4 | 57.3 | 24.1 | ----- | 13.2 | SM | | |
| 1 | 1e | 3.5 | ----------- | ----------- | 100 | 99.2 | 97.7 | 95.5 | 88.7 | 62.6 | 27.3 | 5.3 | 2.6 | 3.7 | 2.8 | SP | | |
| 1 | 2a | 3.81 | ----------- | ----------- | 100 | 99.1 | 97.4 | 95.5 | 89.7 | 72.7 | 53.8 | 17 | 6.2 | 4.2 | 4.5 | SP-SM | | |
| 1 | 2b | 4.11 | ----------- | ----------- | 100 | 99.1 | 97.7 | 96.3 | 91.4 | 64.8 | 39 | 5.9 | 2 | 3.1 | 2.9 | SP | | |
| 1 | 2c | 4.42 | ----------- | ----------- | ----------- | 100 | 98.9 | 98 | 93.2 | 78 | 39.5 | 8.6 | 2.6 | 2.8 | 3.1 | SP | | |
| 1 | 3a | 4.72 | ----------- | ----------- | 100 | 98.9 | 96.8 | 94.4 | 91.2 | 78.8 | 44.5 | 17.6 | 6.8 | 4.4 | 5.1 | SP-SM | | |
| 1 | 1 | 5.79 | ----------- | ----------- | ----------- | ----------- | 100 | 99.5 | 99.3 | 98.5 | 95.7 | 46.4 | 10.9 | 2.7 | 5.2 | SP-SM | | |
| 1 | 4a | 5.94 | ----------- | ----------- | 100 | 99.6 | 98.7 | 96.6 | 93.3 | 82.1 | 60.6 | 24 | 8.8 | 3.8 | 5.2 | SP-SM | | |
| 1 | 4b | 6.25 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 99.8 | 97.6 | 39.2 | 6.2 | 2.5 | 4.8 | SP-SM | | |
| 1 | 4c | 6.55 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 95.8 | 32.2 | 4.5 | 2.4 | 3.7 | SP | | |
| 1 | 4d | 6.86 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.3 | 61.9 | 12 | ----- | 4.8 | SM | | |
| 1 | 5a | 7.16 | ----------- | ----------- | 100 | 99 | 98.4 | 97.5 | 95.7 | 90.6 | 82.3 | 47.3 | 11.8 | 2.9 | 5.5 | SP-SM | | |
| 1 | 5b | 7.47 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 99.8 | 69.2 | 13.2 | ----- | 4.7 | SM | | |
| 1 | 6a | 7.77 | ----------- | ----------- | ----------- | 100 | 99.3 | 98.2 | 95.4 | 87.2 | 75.4 | 34.2 | 10.1 | 3.2 | 5 | SP-SM | | |
| 1 | 6b | 8.08 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.8 | 93 | 39.4 | 6.3 | 2.5 | 3.9 | SP-SM | | |
| 1 | 6c | 8.38 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 99.8 | 96.1 | 33.6 | 6.5 | 2.5 | 4.7 | SP-SM | | |
| 2 | 11 | 2.74 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.7 | 99.1 | 95.9 | 41.1 | 8.6 | 2.5 | 5.2 | SP-SM | | Hole 2 |
| 2 | 12 | 4.27 | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 99.1 | 89.2 | 67.3 | 20.4 | 5.2 | 2.9 | 3.1 | SP-SM | | |
| 2 | 13 | 7.32 | ----------- | ----------- | ----------- | 100 | 98.4 | 97.7 | 96.4 | 94.8 | 91.2 | 66 | 21.2 | ----- | 11 | SM | | |
| 2 | 14 | 9.45 | ----------- | ----------- | ----------- | 100 | 98.2 | 97.5 | 96.0 | 94.2 | 90.3 | 65.1 | 20.3 | ----- | 11.2 | SM | | |
| 3 | 7a | 1.5 | ----------- | ----------- | 100 | 98.6 | 95.5 | 94.6 | 92.9 | 87.7 | 48.9 | 14.0 | 5.3 | 3.4 | 4.2 | SP-SM | | Hole 3 |
| 3 | 7b | 1.83 | ----------- | ----------- | ----------- | ----------- | 100 | 99.8 | 99.6 | 94.0 | 47.7 | 5.7 | 0.6 | 2.2 | 2.9 | SP | | |
| 3 | 7c | 2.13 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 97.8 | 67.3 | 15.4 | 2.6 | 2.3 | 5.1 | SP | | |
| 3 | 8a | 2.74 | ----------- | ----------- | 100 | 99.5 | 98.3 | 97.8 | 97.1 | 95.4 | 74.1 | 16.2 | 4.7 | 2.6 | 4.2 | SP | | |
| 3 | 8b | 3.05 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.0 | 91.7 | 28.3 | 3 | 2.4 | 4.2 | SP | | |
| 3 | 9a | 3.35 | ----------- | ----------- | 100 | 98.9 | 96.5 | 96.4 | 95.3 | 91.4 | 65.6 | 25.8 | 10.2 | 4.0 | 4.7 | SP-SM | | |
| 3 | 9b | 3.66 | ----------- | ----------- | ----------- | ----------- | 100 | 99.5 | 98.0 | 91.5 | 75 | 37.8 | 9.5 | 3.1 | 6.5 | SP-SM | | |
| 3 | 10a | 4.11 | ----------- | ----------- | ----------- | 100 | 99.9 | 99.7 | 99.1 | 89.7 | 54.5 | 22.1 | 7.6 | 2.8 | 3.8 | SP-SM | | |
| 3 | 10b | 4.42 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 98.9 | 87.2 | 55.6 | 32.0 | 11 | 4.7 | 2.4 | SP-SM | | |
| 3 | 2 | 4.88 | ----------- | ----------- | ----------- | ----------- | 100 | 99.0 | 96.3 | 92.0 | 78.4 | 43.6 | 13.5 | ----- | 3.5 | SM | | |
| 3 | 11a | 5.03 | ----------- | ----------- | ----------- | 100 | 99 | 98.7 | 97.9 | 95.3 | 82.8 | 41.4 | 14.1 | ----- | 5.3 | SM | | |
| 3 | 11b | 5.33 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.7 | 95.1 | 50.3 | 13.2 | ----- | 4.1 | SM | | |
| 3 | 3 | 9 | ----------- | ----------- | ----------- | ----------- | 100 | 99.7 | 99.2 | 98.3 | 92.8 | 29.3 | 7.1 | 2.6 | 4.9 | SP-SM | | |
| 4 | 0 | 0.7 | 100 | 99.5 | 94.0 | 89.2 | 77.5 | 73.0 | 67.2 | 60.7 | 53.5 | 35.7 | 19.2 | ----- | 2.9 | SM | | Hole 4 |
| 4 | 12a | 1.5 | ----------- | ----------- | 100 | 98.2 | 90.0 | 86.5 | 81.4 | 75.8 | 59.9 | 38.6 | 21.6 | ----- | 11.8 | SM | | |
| 4 | 12b | 1.83 | 79.6 | 77.5 | 72.8 | 67.3 | 59.7 | 55.1 | 48.8 | 37.2 | 22.8 | 8.8 | 3.9 | 29.4 | 6.5 | SP | | |
| 4 | 12c | 2.13 | ----------- | ----------- | 100 | 99.1 | 96.6 | 95.6 | 94.0 | 80.2 | 38.5 | 10.8 | 4.5 | 2.9 | 6.1 | SP | | |
| 4 | 13a | 2.59 | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 98.6 | 76.3 | 25.7 | 7.3 | 3.0 | 2.8 | 3.2 | SP | | |
| 4 | 13b | 2.9 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.2 | 81.9 | 29.6 | 8.5 | 3.7 | 2.6 | 3.2 | SP | | |
| 4 | 14a | 3.05 | ----------- | ----------- | ----------- | 100 | 99.9 | 99.5 | 98.6 | 84.0 | 37.9 | 13.9 | 6.1 | 3.7 | 3.5 | SP-SM | | |
| 4 | 14b | 3.35 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.8 | 84.3 | 35.1 | 9.8 | 3.5 | 2.6 | 2.9 | SP | | |
| 4 | 15a | 8.84 | ----------- | ----------- | ----------- | 100 | 97.2 | 95.7 | 92.3 | 81.1 | 55.1 | 18.1 | 6.0 | 0.4 | 3.4 | SP-SM | | |
| 4 | 15b | 9.14 | ----------- | ----------- | ----------- | 100 | 99.6 | 99.2 | 98.7 | 97.0 | 89.5 | 39.4 | 9.8 | 2.7 | 3.2 | SP-SM | | |
| 4 | 15c | 9.45 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 95.7 | 42.4 | 9.8 | 2.5 | 3.7 | SP-SM | | |
| 4 | 15d | 9.75 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 97.7 | 51.7 | 13.0 | ----- | 4.7 | SM | | |
| 4 | 15e | 10.06 | ----------- | ----------- | ----------- | 100 | 99.5 | 99.2 | 98.9 | 94.7 | 76.2 | 29.3 | 6.7 | 2.9 | 3.0 | SP-SM | | |
| 5 | 16a | 1.22 | 72.3 | 65.8 | 60.0 | 56.9 | 50.1 | 44.2 | 37.4 | 25.5 | 13.2 | 5.8 | 1.7 | 45.2 | 3.4 | SP | | Hole 5 |
| 5 | 16b | 1.52 | 100 | 97.8 | 93.3 | 87.0 | 67.3 | 53.4 | 42.2 | 26.7 | 9.0 | 4.1 | 1.0 | 10.6 | 2.9 | SP | | |
| 5 | 16c | 1.83 | ----------- | 100 | 97.2 | 93.9 | 81.4 | 65.2 | 47.6 | 24.9 | 6.1 | 2.7 | 1.0 | 5.7 | 2.5 | SP | | |
| 5 | 17a | 1.68 | 100 | 93.6 | 82.5 | 75.3 | 59.8 | 51.9 | 43.2 | 28.4 | 11.8 | 5.0 | 1.5 | 18.8 | 2.6 | SP | | |
| 5 | 17b | 1.98 | 100 | 96.2 | 95.3 | 89.5 | 75.7 | 62.8 | 49.1 | 30.1 | 12.9 | 6.4 | 0.8 | 9.5 | 3.3 | SP | | |
| 5 | 17c | 2.29 | ----------- | ----------- | 100 | 98.3 | 89.3 | 77.3 | 61.1 | 34.3 | 12.0 | 5.6 | 2.3 | 4.8 | 3.1 | SP | | |
| 5 | 17d | 2.59 | 100 | 98.2 | 95.8 | 93.8 | 87.6 | 80.8 | 66.8 | 37.6 | 9.4 | 3.2 | 1.3 | 3.3 | 3.2 | SP | | |
| 5 | 18a | 3.05 | 95.2 | 93.5 | 84.4 | 81.5 | 72.1 | 64.7 | 53.6 | 49.8 | 17.7 | 8.3 | 1.6 | 10.6 | 3.7 | SP | | |
| 5 | 18b | 3.35 | 100 | 95.9 | 91.5 | 87.7 | 79.3 | 73.1 | 60.1 | 33.3 | 8.4 | 3.0 | 1.1 | 4.1 | 2.8 | SP | | |
| 5 | 18c | 3.66 | ----------- | 100 | 97.7 | 92.1 | 85.0 | 79.9 | 69.9 | 39.3 | 9.1 | 3.1 | 1.2 | 0.3 | 3.3 | SP | | |
| 5 | 19a | 3.81 | ----------- | ----------- | 100 | 98.3 | 88.0 | 77.5 | 63.9 | 43.5 | 23.5 | 11.3 | 2.9 | 7.1 | 3.0 | SW | | |
| 5 | 19b | 4.11 | ----------- | ----------- | ----------- | 100 | 99.7 | 99.7 | 99.7 | 98.4 | 76.8 | 29.6 | 8.8 | 3.0 | 3.2 | SP-SM | | |
| 5 | 19c | 4.42 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.9 | 98.3 | 83.0 | 37.5 | 10.5 | 3.1 | 5.0 | SP-SM | | |
| 5 | 20a | 4.57 | 94.5 | 89.6 | 86.7 | 80.1 | 66.6 | 61.9 | 52.3 | 33.4 | 15.6 | 7.9 | 1.2 | 11.1 | 4.1 | SP | | |
| 5 | 20b | 4.88 | ----------- | 100 | 98.0 | 92.5 | 81.5 | 75.3 | 64.1 | 45.3 | 28.0 | 10.7 | 3.9 | 6.7 | 3.3 | SP | | |
| 5 | 5 | 9.45 | 100 | 91.1 | 85.0 | 80.9 | 70.7 | 65.5 | 57.5 | 40.0 | 19.8 | 8.1 | 2.9 | 9.4 | 5.6 | SP | | |
| 6 | 21a | 1.52 | 100 | 97.5 | 91.9 | 87.4 | 76.1 | 73.7 | 68.5 | 57.9 | 46.2 | 28.0 | 11.8 | 10.0 | 10.5 | SP-SM | | Hole 6 |
| 6 | 21b | 1.83 | 90.2 | 81.2 | 73.2 | 67.2 | 55.8 | 50.4 | 43.6 | 28.8 | 9.6 | 3.8 | 0.9 | 20.0 | 4.0 | SP | | |
| 6 | 21c | 2.13 | 100 | 97.7 | 90.2 | 83.6 | 65.8 | 51.3 | 31.5 | 11.4 | 5.3 | 2.7 | 0.9 | 7.2 | 2.5 | SP | | |
| 6 | 22a | 2.59 | ----------- | 100 | 97.3 | 92.3 | 77.7 | 72.5 | 64.2 | 52.4 | 41.2 | 22.6 | 9.5 | 12.0 | 5.5 | SP-SM | | |
| 6 | 22b | 2.9 | 100 | 97.7 | 93.3 | 87.3 | 76.5 | 71.1 | 58.0 | 30.2 | 10.9 | 4.5 | 1.8 | 5.2 | 2.3 | SP | | |
| 6 | 6 | 4.6 | 100 | 97.2 | 89.4 | 80.9 | 59.8 | 52.9 | 45.3 | 37.3 | 29.3 | 17.9 | 8.5 | 57.6 | 7.8 | SP-SM | | |
| 6 | 7 | 5.9 | ----------- | 100 | 94.5 | 93.0 | 87.4 | 81.1 | 73.8 | 58.7 | 22.5 | 6.7 | 2.9 | 3.5 | 4.1 | SP | | |
| 6 | 8 | 6.3 | ----------- | ----------- | 100 | 97.2 | 92.2 | 89.4 | 85.3 | 78.0 | 54.3 | 20.5 | 9.8 | 4.9 | 3.2 | SP-SM | | |
| 7 | 23a | 1.07 | ----------- | ----------- | 100 | 98.1 | 92.4 | 91.5 | 89.8 | 86.4 | 72.7 | 39.8 | 17.3 | ----- | 10.0 | SM | | Hole 7 |
| 7 | 23b | 1.37 | ----------- | ----------- | 100 | 99.0 | 97.9 | 97.2 | 96.6 | 95.3 | 85.8 | 53.8 | 26.0 | ----- | 11.6 | SM | | |
| 7 | 24a | 1.68 | ----------- | ----------- | ----------- | 100 | 98.6 | 98.2 | 97.6 | 96.7 | 92.8 | 58.9 | 19.2 | ----- | 7.8 | SM | | |
| 7 | 24b | 1.98 | ----------- | 100 | 99 | 97.7 | 96.5 | 95.9 | 94.9 | 93.4 | 88.4 | 44.0 | 16.0 | ----- | 7.1 | SM | | |
| 7 | 24c | 2.29 | ----------- | ----------- | ----------- | 100 | 99.2 | 98.7 | 97.9 | 96.9 | 92.9 | 35.2 | 11.4 | 2.9 | 9.3 | SP-SM | | |
| 7 | 24d | 2.59 | 100 | 91.9 | 88 | 78.9 | 66.0 | 54.2 | 42.4 | 28.8 | 13.7 | 5.5 | 2.9 | 14.8 | 4.0 | SP | | |
| 7 | 24e | 2.9 | ----------- | ----------- | ----------- | 100 | 95.1 | 92.1 | 89.8 | 86.9 | 60.7 | 22.5 | 4.4 | 3.3 | 3.4 | SP | | |
| 7 | 25a | 3.2 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.8 | 99.2 | 56.5 | 5.6 | 2.3 | 1.9 | 3.1 | SP | | |
| 7 | 25b | 3.5 | ----------- | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.6 | 79.7 | 12.6 | 2.3 | 1.8 | 2.7 | SP | | |
| 7 | 25c | 3.81 | ----------- | ----------- | ----------- | ----------- | ----------- | 100 | 99.8 | 99.7 | 99.1 | 81.4 | 27.3 | ----- | 4.5 | SM | | |
| 7 | 26a | 4.11 | ----------- | ----------- | 100 | 98.5 | 95.2 | 91.8 | 87.3 | 82.9 | 75.1 | 43.4 | 14.1 | ----- | 4.3 | SM | | |
| 7 | 9 | 6.1 | ----------- | ----------- | ----------- | 100 | 99.7 | 99.4 | 98.6 | 97.7 | 91.2 | 61.6 | 25.5 | ----- | 7.0 | SM | | |
| 7 | 10 | 9.1 | ----------- | ----------- | ----------- | 100 | 98.3 | 96.9 | 95.8 | 93.0 | 68.9 | 25.6 | 9.9 | 3.5 | 3.9 | SP-SM | | |
| Borehole | Soil Sample | Depth (m) | 26.5mm | 19.0mm | 13.2mm | 9.50mm | 4.75mm | 2.36mm | 1.18mm | 600um | 300um | 150um | 75um | Cu | Moisture | ASTM | | |

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| 12/3/2018 | 1 | REVIEW |
| DATE | REV | ISSUED |

TITLE **OMEMEE LSSDS BOREHOLE LOCATIONS**

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| PROJECT NO. | SCALE | DRAWING NO. |
|---|---|---|
| 17-1-7414 | N.T.S. | SKS-01 |

# APPENDIX 5 – Hydrogeological Study

- **Rehabilitation Concept for the Omemee LSSDS**

# REHABILITATION CONCEPT FOR THE OMEMEE LSSDS

## BACKGROUND

The present system pumps water from the south sewage lagoon and sends it to a tile field equipped with Infiltrator Quick 4 dispersal units. The LSSDS is comprised of four zones, each containing six infiltrator disposal area beds (or cells), with each cell containing 33 runs of 28 m long by approximately 0.7 m diameter Quick4 Chambers. The LSSDS was commissioned in the fall of 2013 but has experienced persistent effluent breakout when operated at or near to its intended design capacity of 1,350 $m^3$/day.

The purpose of the rehabilitation project is to provide a system that can reliably achieve the intended infiltration rates without break-out, excessive operational complexity, or short-circuiting effluent back into the treatment lagoons.

## LIMITATIONS OF EXISTING SYSTEM

The infiltration capacity of the current system is roughly 29 L/$m^2$/day. The corresponding effective vertical hydraulic conductivity, assuming a unit vertical hydraulic gradient, is 3 x $10^{-5}$ cm/s for the (SM) silty sand to sand and silt material. This type of soil would normally be expected to have a higher hydraulic conductivity which makes us suspect that the soil immediately beneath the infiltrators has undergone hydraulic segregation under operation or has become fouled with slimes from the lagoon. Pre-filtration of the lagoon effluent is recommended as a component of the rehabilitation plan to ensure the longevity of the system.

While the Quick4 infiltrators offer substantial storage, all infiltration must occur across a planar surface beneath the infiltrator at a rate governed by the effective vertical hydraulic conductivity of the material. In addition to the potential for this conductivity to be reduced through slimes or the segregation of fines, esker deposits are heterogeneous by nature and typically exhibit a lateral anisotropy (i.e. the conductivity in the horizontal direction is different than that in the vertical). The degree of anisotropy ($K_h/K_v$) varies but the effective horizontal permeability of the fine sand strata is likely to exceed 3 to 4 times the value for $K_v$. This effect is illustrated on Sketches C-1 and C-2.

It is also possible that the deeper esker strata lack sufficient lateral transmissivity to convey the infiltrated water away from the infiltration cells. This possibility is discussed in greater detail under Design Constraints and Assumptions.

We conclude that the capacity shortfall in the existing system is affected by one or more of the following factors:

- Limited vertical infiltration capacity due to low intrinsic permeability of the silty sand soils beneath the infiltrators
- Limited vertical infiltration capacity due to fouling of the silty sand soils beneath the infiltrators with suspended solids and colloids in the lagoon effluent
- Limited vertical infiltration capacity due to hydraulic segregation of fines during the dosing of the infiltrators
- Hydraulically overloading the underlying native soils at depth beneath the infiltration cells

The rehabilitation concept must be capable of addressing each of these factors.

## DESIGN CONSTRAINTS AND ASSUMPTIONS

The capacity objective for the system is 1,350 $m^3$ per day. If we assume an automated 24 h/day dosing cycle this quantity corresponds to a dosing rate of 15.6 L/s. The rehabilitated system should be designed to infiltrate lagoon effluent at these rates without hydraulically overloading the underlying esker strata.

The capacity of the rehabilitated system is governed by two quantities: a) the rate at which filtered lagoon effluent can be infiltrated into the native sandy esker strata (i.e. primary infiltration) and b) the rate at which the esker strata can convey the effluent from the infiltration area into the overall groundwater flow regime (formation transmissivity). The original design assumed primary infiltration to be the limiting factor and assumed that formation transmissivity would not be a problem:

> *"Considering that the daily rate of spray irrigation is much greater than that proposed for the subsurface disposal system, this implies that the soils have a much higher capacity for hydraulic loading than that which will occur with subsurface disposal. Furthermore, the water table is positioned fairly deep (approximately 15 to 16 m) below ground surface in the vicinity of the subsurface disposal system, with coarse-grained soils to a deep depth, therefore, excessive groundwater mounding would not be anticipated at the site."*

The assumption that groundwater mounding (i.e. formation transmissivity being too low to convey away the infiltrated lagoon effluent) should not be a concern warrants closer examination. Breakout has been observed at some depth below the base of the infiltrators, and saturated conditions have been encountered in strata underlying the present system in borehole investigations by Greer Galloway and Golder. Also, spray irrigated effluent is removed primarily through evapotranspiration rather than infiltration. Even at the highest reported spray irrigation application rates of 7,600 $m^3$/day, little of this water may have actually infiltrated into the subsurface.

If we infiltrate 1,350 $m^3$ of effluent per day into the area of the existing system (238 x 96 m), then the underlying strata must be capable of transporting this amount of water away from the infiltration area. This must occur primarily along the longitudinal axis of the esker where a sufficient thickness of unsaturated sandy strata exists. Relatively little water will be conveyed laterally in the immediate area as the esker is bounded by fine-textured low-permeability deposits (OGS mapping and Cambium, 2011).

Assuming a useable unsaturated thickness of 10 m over a horizontal distance of 100 m yields a cross-sectional area of 1,000 $m^2$ (2,000 $m^2$ when we consider flow in both directions along the axis of the esker). The volume of water that can be transported away from the infiltration site is therefore:

$$Q = K_h A + \frac{dh}{dl}$$

If we assume an average horizontal hydraulic conductivity of $3 \times 10^{-5}$ cm/s (corresponding to the observed infiltration rate of about 29 L/$m^2$/day) and a unitary hydraulic gradient, then a maximum of 52 $m^3$/day can be accommodated (see Sketch C-3). Taking a more reasonable value of $1 \times 10^{-4}$ cm/s still results in a limiting value of 173 $m^3$/day. In order to successfully accommodate the design capacity of 1,350 $m^3$/day, the average horizontal hydraulic conductivity must be on the order of $8 \times 10^{-4}$ cm/s as shown below:

| Average $K_h$ (cm/s) | Maximum formation capacity (east lobe only), $m^3$ | Maximum formation capacity (both lobes), $m^3$ | Primary infiltration capacity per 25 x 60 m cell, $m^3$ | Minimum number of cells required for design capacity (1,350 $m^3$/day) | Minimum number of cells required for maximum formation capacity |
|---|---|---|---|---|---|
| **$3 \times 10^{-5}$** | 52 | 104 | 37.3 | 36 | 3 |
| **$1 \times 10^{-4}$** | 173 | 345 | 124 | 11 | 3 |
| **$2 \times 10^{-4}$** | 346 | 691 | 249 | 6 | 3 |
| **$3 \times 10^{-4}$** | 518 | 1036 | 373 | 4 | 3 |
| **$4 \times 10^{-4}$** | 691 | 1382 | 498 | 3 | 3 |

| Average $K_h$ (cm/s) | Maximum formation capacity (east lobe only), m³ | Maximum formation capacity (both lobes), m³ | Primary infiltration capacity per 25 x 60 m cell, m³ | Minimum number of cells required for design capacity (1,350 m³/day) | Minimum number of cells required for maximum formation capacity |
|---|---|---|---|---|---|
| **$8 \times 10^{-4}$** | 1382 | 2765 | 995 | 2 | 3 |

Based on our analysis, the ultimate capacity of the infiltration system is likely to be limited by the formation transmissivity of the esker, not the primary infiltration capacity of the replacement bed. If we assume the same value of $K_h$ for the upper 3 m (which governs primary infiltration) as for the full depth of the esker (which governs formation transmissivity), then the number of cells required to achieve maximum capacity is affected only by the decision to place cells on both the east lobe of the esker (the location of the existing system) and the west lobe, and the need to include an adequate safety factor for parameter uncertainties and for the degradation of the system over time due to fouling from mineral precipitates and the infiltration of fines. At this early stage of conceptual design, we propose a factor of safety of 2 with an additional cell maintained in reserve (for a total of 7 infiltration cells).

## DESCRIPTION OF PROPOSED REHABILITATION COMPONENTS

We propose replacing the existing Quick4 infiltrators with a conventional tile system constructed in modular 25 x 60 m cells and augmented where necessary by stone-filled vertical drains. The footprint of the current system would be reduced in the area opposite the lagoons and extended to the area to the western lobe of the esker complex to reduce the hydraulic loading to the underlying native soil formation. Additional infiltration areas are identified to the north and west of the existing infiltration system to provide for a factor of safety and to accommodate the potential for future expansion.

The lagoon water must be treated to remove fine particulate and colloidal matter before dosing to the infiltration cells. From the wet well, the effluent would be pumped in sequence to separate distribution chambers each of which delivers the filtered effluent to the new infiltration cells through valved 100 mm gravity fed lines to a 150 mm diameter PVC header with four runs of 100 mm diameter perforated HDPE pipe on 8 m centres and placed on a 150 mm thick clear stone pad. 0.6 m wide clear-stone filled vertical drainage trenches are to be constructed longitudinally immediately adjacent to the tile runs to depths ranging from 2 to 4 m depending on soil conditions.

The gravity drains from the distribution chamber to each cell are to be valved so that an individual cell can be isolated for maintenance work or to measure draw-down in the distribution chamber in order to estimate cell capacity as part of a regular program of operational testing. Specific aspects of the conceptual design are described in greater detail below:

### Site preparation

The central portion of the existing infiltration area must be removed and the fill stripped to expose a level native soil surface. The individual Quick4 infiltrators may be salvaged to the extent practical for re-use in the rehabilitated system for hydraulic storage and frost protection. Alternatively, conventional fill cover may be used in conjunction with a geotextile filter to prevent the infiltration of fines into the clear stone envelope. Perimeter swales should be used to isolate the exposed native soil surface from surface water runoff.

The proposed infiltration area within the west lobe of the esker should also be stripped of topsoil and graded to expose a level area of permeable native soils and perimeter swales constructed to control surface water.

**Layout of infiltration cells**

We propose to construct four new infiltration cells in the existing infiltration area within the east lobe of the esker to the immediate west of the lagoons, and three new infiltration cells within the west lobe of the esker to the northwest of the lagoons (subject to confirmation of favourable soil conditions through geotechnical investigation). Each new infiltration cell can be expanded by up to 50% through the addition of one or more additional tile runs and five potential expansion cell locations have been identified (subject to confirmation of suitable soil conditions). The tentatively proposed siting of the infiltration cells is shown on Sketch C-4.

Cells are located on both the east and west lobe of the esker in order to maximize the rate at which the esker strata can convey the effluent away from the infiltration area and into the overall groundwater flow regime. The partitioning of cells between the east and west lobes of the esker is imbalanced (4 within the east lobe and 3 in the west) based on our interpretation of the underlying geology from topography and air photographs. This partition should be re-visited following the geotechnical investigation of the area identified within the west lobe.

**Trench spacing and depth**

We propose a spacing of 8 m between infiltration trenches/tile runs. This spacing takes into account the lateral anisotropy of the esker soils (assuming an anisotropic ratio of 3 or better) and provides sufficient space for heavy equipment to be moved between the tile runs for maintenance activities or for the construction of vertical drains.

The infiltration trenches should be constructed to as great a depth as soil stability will allow. We have assumed an average depth of 3 m but deeper excavation may be possible. The maximum depth that may be practically achieved should be determined through a proposed proof-of-concept test.

**Trench fill media**

We propose to backfill the infiltration trenches with clear stone ranging from 20 to 50 mm diameter. No geotextile filter is proposed to prevent the infiltration of fines from the trench sidewalls as a small degree of sloughing of the sidewall material can be accommodated without affecting the system capacity, and because a small degree of sloughing will help prevent the fouling of the native soil surface.

**Distribution tiles**

100 mm diameter perforated ribbed HDPE is proposed for the distribution tiles in order to accommodate some suspended solids load. The tiles are to be placed immediately adjacent to (but not over) the infiltration trench. The tile is to be underlain by a minimum 150 mm thick clear stone pad placed on a non-woven geotextile. If possible, the tiles are to be covered with salvaged infiltrators to increase storage and to provide improved frost protection. Should the salvage of infiltrators prove to be impractical then the tile should be covered by a minimum 150 mm of clear stone and a geotextile placed over the clear stone prior to the placement of backfill material.

The tile runs are offset from the infiltration trench to allow for the construction of vertical drains through the trench material and into the deeper esker strata without interfering with the tiles.

**Header and footer**

We propose a 150 mm diameter header for the tile runs and a 100 mm diameter footer connecting the terminus of each run. The larger diameter header is intended to improve effluent distribution between tile runs while the footer is intended to allow flow to partition between runs that differ in infiltration capacity. Vents are recommended for the corners of the footer (Sketch C-5).

### Distribution chamber

In order to simplify system operation, we propose gravity dosing the individual infiltration cells from a 10,000 L capacity distribution chamber. Each distribution line would be provided with a gate-type valve to allow for operational monitoring and to isolate cells for maintenance.

### Vertical drains

Vertical drains are proposed as a contingency measure to address break-out and as a measure to increase infiltration capacity in areas where fine textured soils are underlain at depth by coarse, highly permeable strata. The vertical drains would be constructed through the infiltration trench to depths of between 8 to 12 m using a caisson-type auger rig or a conventional geotechnical drilling rig with large diameter hollow-stem augers. Once the liner has been advanced to the desired depth, the clear stone would be placed as the liner or hollow stems augers are removed.

## CONTINGENCY MEASURES

### Break-out

Even if the system functions according to the overall design and parameter estimates, localized breakout remains a possibility if the downward percolating effluent encounters highly permeable soils underlain by a low permeability stratum. The effluent would tend to move laterally along the high permeability layer and could breakout if the layer daylights on the slope of the esker. The risk of this happening can be reduced by maximizing the setback from the slope of the esker and mitigation is possible by constructing a vertical drain through the low permeability stratum to deeper and more permeable deposits.

### Deficient primary infiltration

If the hydraulic conductivity of the upper 3 m of soil is insufficient to achieve design loading rates and the capacity of the underlying native strata is not a limiting factor, then the infiltration cells to the immediate west of the lagoons can be extended to 6-runs per cell instead of the 4-runs per cell identified in this conceptual design. This would result in cells covering a 40 x 60 m area instead of 25 x 60 and the primary infiltration capacity would be increased proportionately. Primary infiltration capacity can also be increased by constructing additional infiltration cells and/or by constructing vertical drains to convey effluent to deeper permeable strata.

## LONG-TERM PERFORMANCE MONITORING INSTRUMENTATION AND MAINTENANCE

Piezometers are recommended for each of the clear stone-filled trenches to allow the rate of infiltration to be measured for each tile run. This data will allow for optimization of dosing quantities directed to each cell and will provide baseline data to assess any long-term decline in infiltration capacity due to fouling by suspended solids in the lagoon effluent.

## LIST MATERIAL QUANTITIES

The following material quantities are estimated for each 25 x 60 m cell:

| Material | Approximate quantity | Unit | Approximate unit cost | Approximate cost |
|---|---|---|---|---|
| **Clear stone (trench)** | 450 | $m^3$ | 35 | $33,075 |
| **Clear stone (blanket)** | 65 | $m^3$ | 35 | 4,800 |
| **100 mm perforated HDPE pipe** | 240 | lineal m | 25 | 6,000 |

| Material | Approximate quantity | Unit | Approximate unit cost | Approximate cost |
|---|---|---|---|---|
| **150 mm PVC pipe** | 60 | lineal m | 100 | 6,000 |
| **Filter fabric** | 360 | $m^2$ | 1.5 | 540 |
| **Cover material** | 1080 | $m^3$ | 10 | 10,800 |
| **Distribution chamber (10,000 L) and valves** | 0.5 | ea | 10,000 | 5,000 |
| **Piezometers** | 4 | ea | 600 | 2,400 |
| **Topsoil and seeding** | 1800 | $m^2$ | 4.5 | 8,100 |
| | | | **Engineering (10%)** | 7,600 |
| | | | **Contingency (25%)** | 20,000 |
| | | | **Approximate cost per cell** | $104,315 |

Assuming that seven cells are required, the approximate cost for the system would be in the neighbourhood of $750,000 including distribution piping and pump controls but excluding the cost for filtration of the lagoon effluent.

**RECOMMENDED NEXT STEPS**

The following steps should be incorporated into the rehabilitation plan in order to reduce uncertainties and project risk:

- A borehole investigation should be completed for the west lobe of the esker and for the identified contingency/expansion areas. This should include a minimum of five boreholes per area taken to the groundwater table along with grain size distribution and permeameter testing of the recovered soil samples. Rotosonic methods are suggested to allow for continuous core recovery.
- Proof-of-concept testing is recommended for a representative area of esker to confirm the degree of lateral anisotropy to be assumed for detailed design. This testing would involve the construction of an approximately 10 m length of 3 m deep stone-filled trench and its hydraulic dosing and observation rates.
- A pilot infiltration cell should be constructed and operated for a minimum of 6-months prior to the full-scale implementation of the rehabilitation project.

I trust that this memorandum will be helpful in your development of a rehabilitation plan for the Omemee LSSDS. Please call me at your convenience If you have any questions regarding the analysis presented herein.

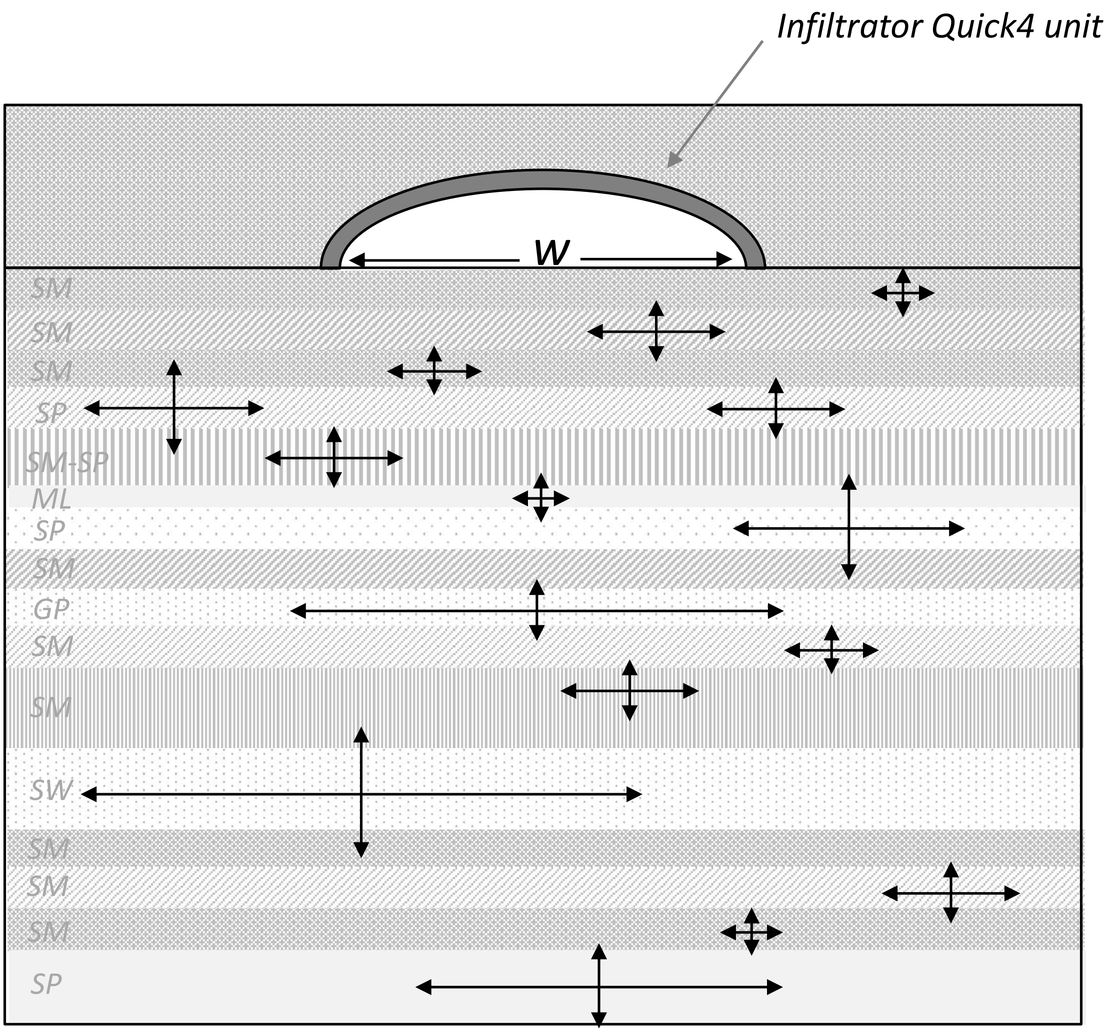
Yours very truly,

**THE GREER GALLOWAY GROUP INC.**
**CONSULTING ENGINEERS**

Charles Mitz, Ph.D., P.Geo.
Senior Hydrogeologist

*A) Anisotropic Ratio > 40*

*B) Anisotropic Ratio ≈ 2*

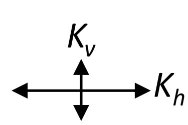



*Silty sand (USCS = SW)*

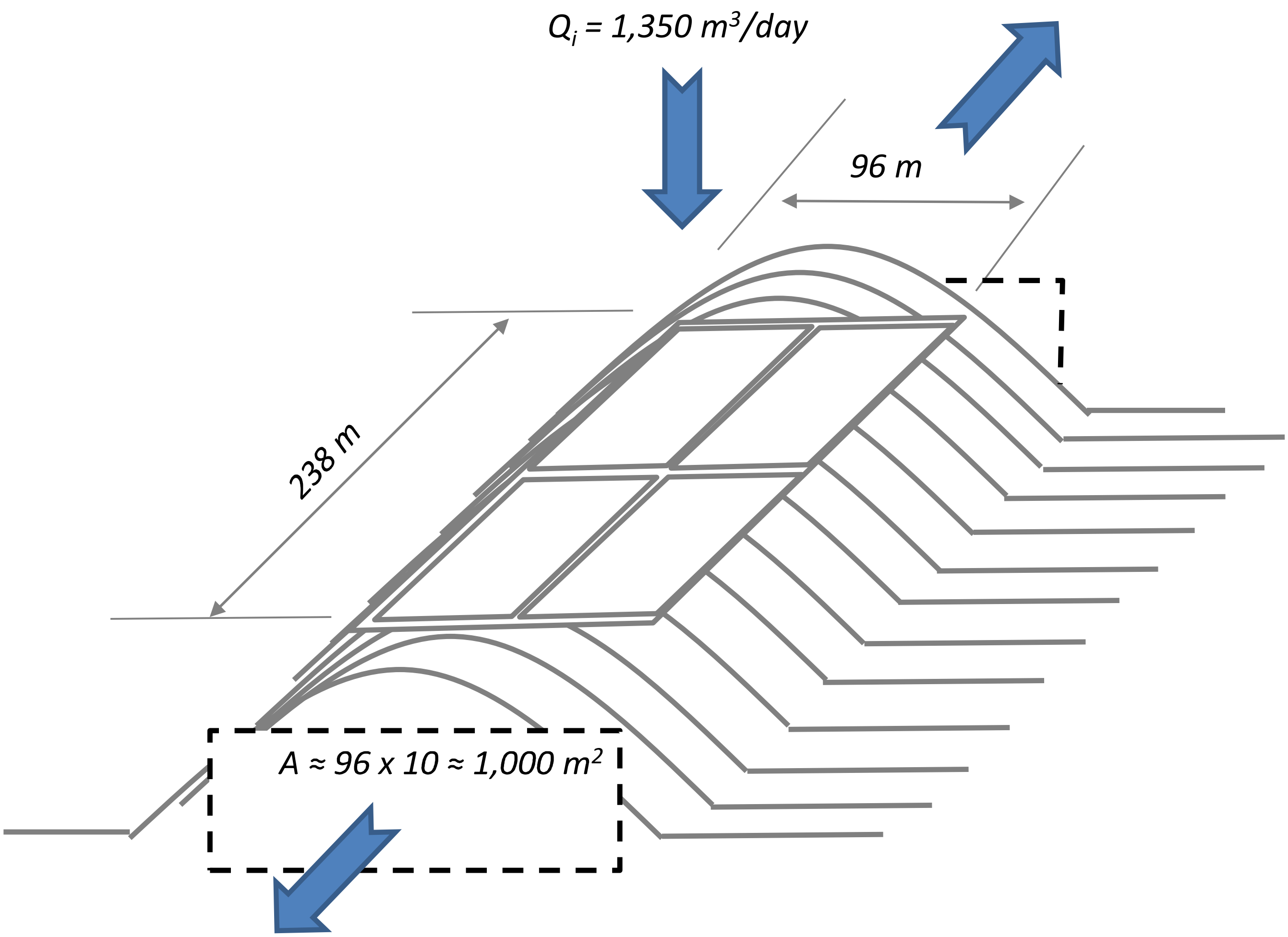
$K_v = 3x10^{-5}$ cm/s

$K_h = 1x10^{-4}$ cm/s

$Q = K_v w = 26$ L/m²/day




*Note: stratigraphy is illustrative but typical of water-lain strata*




*$Q_2 = K_h \times A \times dh/dl$*

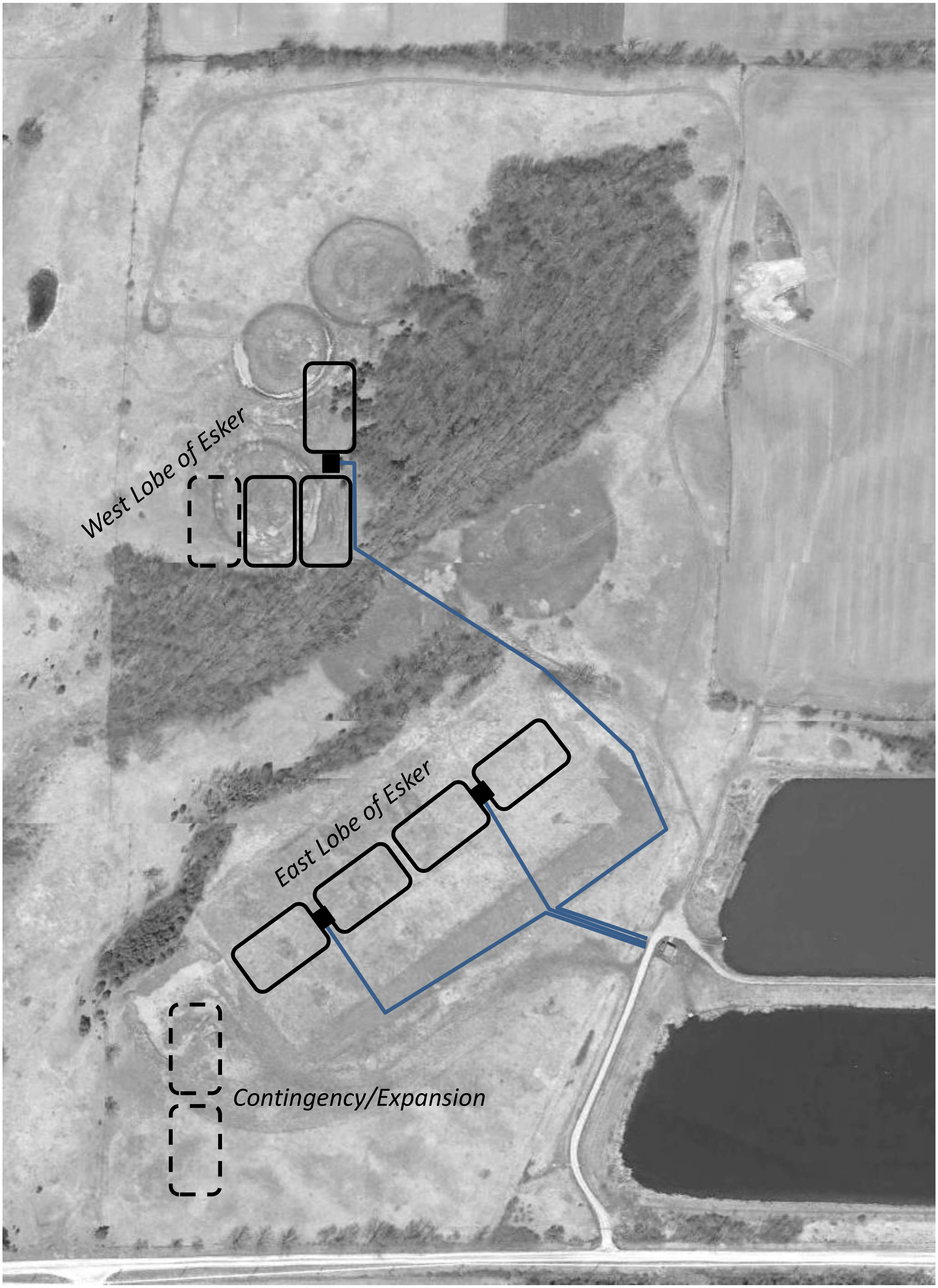
*If $K_h = 1 \times 10^{-4}$ cm/s and dh/dl is assumed = 1*
*Then $Q_2 = 86\ m^3/day$*

*For $Q_2 = Q_i/2$, $K_h$ must be at least $8 \times 10^{-4}$ cm/s*

GREER GALLOWAY
CONSULTING ENGINEERS

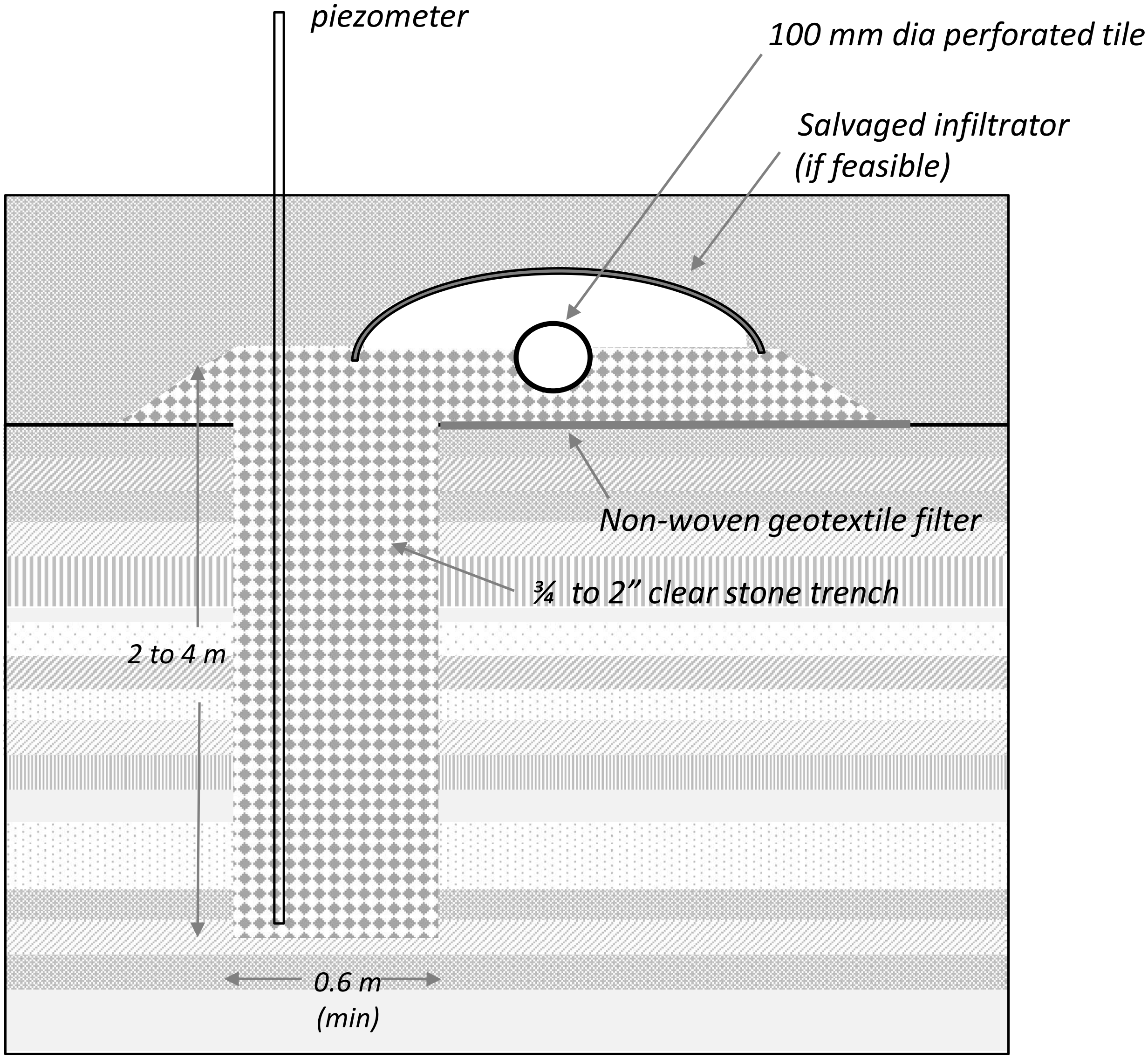
**OMEMEE LSSDS LATERAL ANISOTROPY IN ESKER DEPOSITS**

| PROJECT No. | Phase | Date | Figure |
| --- | --- | --- | --- |
| 1717414 | 160-200 | Dec 2018 | C-3 |

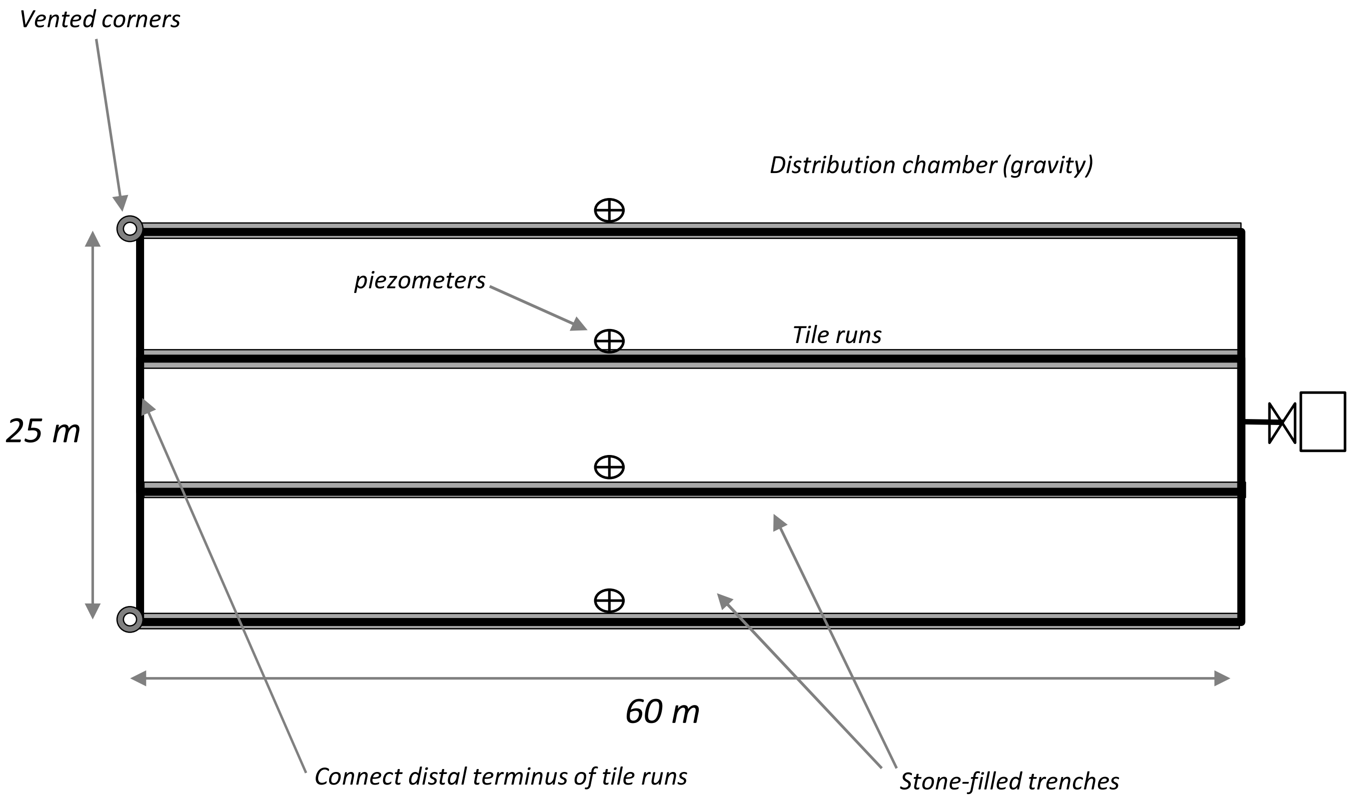



GREER GALLOWAY
CONSULTING ENGINEERS

| OMEMEE LSSDS INFILTRATION CELL LAYOUT | | | |
|---|---|---|---|
| PROJECT No. | Phase | Date | Figure |
| 1717414 | 160-200 | Dec 2018 | C-4 |




*Note: vertical drains to be constructed through the trench to a depth of 8 to 10 m if necessary to address poor hydraulic connection to deep strata*




GREER GALLOWAY CONSULTING ENGINEERS

OMEMEE LSSDS: PROPOSED INFILTRATION CELL PLAN

| PROJECT No. | Phase | Date | Figure |
| --- | --- | --- | --- |
| 1717414 | 160-200 | Dec 2018 | C-6 |

# APPENDIX 6 – Effluent Sampling Test Results

- **Lagoon Effluent Sampling Test Results**
- **Lagoon Effluent and Wet Well Slime Sampling Test Results**

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Project :** Omemee

12-November-2018

**Terraspec**
Attn : Shane Galloway

973 Crawford Drive
Peterborough, ON
K9J 3X1, Canada

Phone: 705-743-7880
Fax:705-743-9592

**Date Rec. :** 25 October 2018
**LR Report:** **CA14604-OCT18**
**Reference:** Omemee Shane Galloway

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: Pump Station | 6: Intake Chamber | 7: Lagoon | 8: From Surface |
|---|---|---|---|---|---|---|---|---|
| Temperature Upon Receipt [°C] | | | | | 5.0 | 5.0 | 5.0 | 5.0 |
| Total Suspended Solids [mg/L] | 29-Oct-18 | 06:29 | 29-Oct-18 | 16:30 | 5 | 5 | 3 | 18 |
| Biochemical Oxygen Demand (BOD5) [mg/L] | 25-Oct-18 | 17:18 | 30-Oct-18 | 15:50 | < 12 | < 12 | < 4 | --- |
| Phosphorus (total) [mg/L] | 30-Oct-18 | 17:44 | 31-Oct-18 | 13:55 | 0.21 | 0.20 | 0.22 | --- |
| Nitrite (as N) [mg/L] | 31-Oct-18 | 09:23 | 02-Nov-18 | 16:13 | 0.09 | 0.08 | 0.09 | --- |
| Nitrate (as N) [mg/L] | 31-Oct-18 | 09:23 | 02-Nov-18 | 16:13 | 1.18 | 1.14 | 1.19 | --- |
| Nitrate + Nitrite (as N) [mg/L] | 31-Oct-18 | 09:23 | 02-Nov-18 | 16:13 | 1.27 | 1.22 | 1.28 | --- |
| pH [no unit] | 25-Oct-18 | 16:13 | 26-Oct-18 | 11:53 | --- | 8.35 | --- | --- |
| Silver (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | < 0.00005 | --- |
| Aluminum (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.058 | --- |
| Arsenic (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.0002 | --- |
| Barium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.0832 | --- |
| Beryllium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | < 0.000007 | --- |
| Boron (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.103 | --- |
| Bismuth (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.000018 | --- |
| Calcium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 83.7 | --- |
| Cadmium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.000004 | --- |
| Cobalt (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.000132 | --- |
| Chromium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | < 0.00003 | --- |
| Copper (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.00040 | --- |
| Iron (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.128 | --- |
| Potassium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 24.2 | --- |
| Lithium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 0.0053 | --- |
| Magnesium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:22 | --- | --- | 22.9 | --- |
| Manganese (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.0225 | --- |
| Molybdenum (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00041 | --- |
| Sodium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 225 | --- |
| Nickel (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.0005 | --- |
| Lead (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00008 | --- |
| Antimony (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.0005 | --- |
| Selenium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00006 | --- |
| Silicon (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.32 | --- |
| Tin (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00014 | --- |
| Strontium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.528 | --- |
| Titanium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00176 | --- |
| Thallium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | < 0.000005 | --- |

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Project :** Omemee

**LR Report :** **CA14604-OCT18**

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: Pump Station | 6: Intake Chamber | 7: Lagoon | 8: From Surface |
|---|---|---|---|---|---|---|---|---|
| Uranium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.000149 | --- |
| Vanadium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00070 | --- |
| Tungsten (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.00050 | --- |
| Yttrium (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.000051 | --- |
| Zinc (total) [mg/L] | 29-Oct-18 | 16:24 | 31-Oct-18 | 09:23 | --- | --- | 0.003 | --- |

Chris Sullivan

CHARTERED
Christopher Sullivan
CHEMIST
ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

OnLine LIMS

0001573416

# FINAL REPORT

## CA14146-DEC18 R

Prepared for

**Terraspec**

# FINAL REPORT

## First Page

| CLIENT DETAILS | | LABORATORY DETAILS | |
|---|---|---|---|
| Client | Terraspec | Project Specialist | Brad Moore Hon. B.Sc |
| | | Laboratory | SGS Canada Inc. |
| Address | 973 Crawford Drive<br>Peterborough, ON<br>K9J 3X1. Canada | Address | 185 Concession St., Lakefield ON, K0L 2H0 |
| Contact | Shane Galloway | Telephone | 705-652-2000 |
| Telephone | 705-743-7880 | Facsimile | 705-652-6365 |
| Facsimile | 705-743-9592 | Email | |
| Email | terraspec@cogeco.net | SGS Reference | CA14146-DEC18 |
| Project | | Received | 12/07/2018 |
| Order Number | | Approved | 12/14/2018 |
| Samples | Water (1) | Report Number | CA14146-DEC18 R |
| | | Date Reported | 12/14/2018 |

COMMENTS

Temperature of Sample upon Receipt: 3 degrees C

Cooling Agent Present: yes

Custody Seal Present: no

Chain of Custody Number: N/A

Note: 'error' message in QC report for Aluminum QC Batch ID EMS0069-DEC18. Data file was corrupted and no data from file was use in this report.

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

# FINAL REPORT

**Client:** Terraspec
**Project:**
**Project Manager:** Shane Galloway
**Samplers:** S Galloway

PACKAGE: **REG153 - General Chemistry** (WATER)

L1 = REG153 / GROUND WATER / COARSE - TABLE 1 - All Types of Property Uses - UNDEFINED

| | | | | |
|---|---|---|---|---|
| | | | **Sample Number** | 7 |
| | | | **Sample Name** | 1 |
| | | | **Sample Matrix** | Water |
| | | | **Sample Date** | 06/12/2018 |
| **Parameter** | **Units** | **RL** | **L1** | **Result** |
| **General Chemistry** | | | | |
| Dissolved Oxygen | mg/L | 1 | | 1.5 |
| Biochemical Oxygen Demand (BOD5) | mg/L | 2 | | 135 |
| Total Suspended Solids | mg/L | 2 | | 9060 |
| Chemical Oxygen Demand | mg/L | 8 | | 315 |
| Total Kjeldahl Nitrogen | as N mg/L | 0.5 | | 47.5 |
| Total Organic Carbon | mg/L | 1 | | 12 |
| Total Solids (LOI) | mg/L | 30 | | 2220 |

PACKAGE: **REG153 - Metals and Inorganics** (WATER)

L1 = REG153 / GROUND WATER / COARSE - TABLE 1 - All Types of Property Uses - UNDEFINED

| | | | | |
|---|---|---|---|---|
| | | | **Sample Number** | 7 |
| | | | **Sample Name** | 1 |
| | | | **Sample Matrix** | Water |
| | | | **Sample Date** | 06/12/2018 |
| **Parameter** | **Units** | **RL** | **L1** | **Result** |
| **Metals and Inorganics** | | | | |
| Sulphate | µg/L | 200 | | 28000 |
| Aluminum (total) | mg/L | 0.001 | | 30.5 |
| Calcium (total) | mg/L | 0.01 | | 193 |
| Phosphorus (total) | mg/L | 0.003 | | 13.5 |
| Sodium (total) | mg/L | 0.01 | | 108 |

# FINAL REPORT

**Client:** Terraspec
**Project:**
**Project Manager:** Shane Galloway
**Samplers:** S Galloway

PACKAGE: **REG153 - Other (ORP)** (WATER)

L1 = REG153 / GROUND WATER / COARSE - TABLE 1 - All Types of Property Uses - UNDEFINED

| | | | | |
|---|---|---|---|---|
| | | | **Sample Number** | 7 |
| | | | **Sample Name** | 1 |
| | | | **Sample Matrix** | Water |
| | | | **Sample Date** | 06/12/2018 |
| **Parameter** | **Units** | **RL** | **L1** | **Result** |
| **Other (ORP)** | | | | |
| pH | no unit | 0.05 | | 7.30 |
| Chloride | µg/L | 200 | 790000 | 240000 |

## EXCEEDANCE SUMMARY

No exceedances are present above the regulatory limit(s) indicated

## QC SUMMARY

### Anions by IC

**Method: EPA300/MA300-Ions1.3 I Internal ref.: ME-CA-[ENV]IC-LAK-AN-001**

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Chloride | DIO0141-DEC18 | µg/L | 200 | <200 | 3 | 20 | 99 | 80 | 120 | 107 | 75 | 125 |
| Sulphate | DIO0141-DEC18 | ug/L | 200 | <200 | 10 | 20 | 95 | 80 | 120 | 96 | 75 | 125 |

### Biochemical Oxygen Demand

**Method: SM 5210 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-007**

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Biochemical Oxygen Demand (BOD5) | BOD0013-DEC18 | mg/L | 2 | < 2 | 5 | 30 | 89 | 70 | 130 | NV | 70 | 130 |

### Carbon by SFA

**Method: SM 5310 I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-009**

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Total Organic Carbon | SKA0076-DEC18 | mg/L | 1 | <1 | ND | 20 | 91 | 90 | 110 | 85 | 75 | 125 |

## QC SUMMARY

### Chemical Oxygen Demand

### Method: HACH 8000 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Chemical Oxygen Demand | EWL0181-DEC18 | mg/L | 8 | <8 | 7 | 20 | 80 | 80 | 120 | 92 | 75 | 125 |

### Metals in aqueous samples - ICP-MS

### Method: SM 3030/EPA 200.8 I Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Aluminum (total) | EMS0044-DEC18 | mg/L | 0.001 | <0.001 | 3 | 20 | 96 | 90 | 110 | NV | 70 | 130 |
| Calcium (total) | EMS0044-DEC18 | mg/L | 0.01 | <0.01 | 0 | 20 | 92 | 90 | 110 | NV | 70 | 130 |
| Sodium (total) | EMS0044-DEC18 | mg/L | 0.01 | <0.01 | 1 | 20 | 91 | 90 | 110 | 125 | 70 | 130 |
| Calcium (total) | EMS0054-DEC18 | mg/L | 0.01 | <0.01 | 10 | 20 | 100 | 90 | 110 | NV | 70 | 130 |
| Aluminum (total) | EMS0069-DEC18 | mg/L | 0.001 | Error! | Error! | 20 | Error! | 90 | 110 | Error! | 70 | 130 |

# FINAL REPORT

## QC SUMMARY

### Metals in aqueous samples - ICP-OES

Method: SM 3030/EPA 200.8 I Internal ref.: ME-CA-[ENV]SPE-LAK-AN-003

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Phosphorus (total) | EMS0044-DEC18 | mg/L | 0.003 | <0.003 | ND | 20 | 92 | 90 | 110 | NV | 70 | 130 |
| Phosphorus (total) | EMS0054-DEC18 | mg/L | 0.003 | <0.003 | ND | 20 | 98 | 90 | 110 | NV | 70 | 130 |

### pH

Method: SM 4500 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| pH | EWL0147-DEC18 | no unit | 0.05 | NA | 0 | | 100 | | | NA | | |

### Solids Analysis

Method: SM 2540 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-005

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Total Solids (LOI) | EWL0122-DEC18 | mg/L | 30 | <30 | 5 | 20 | | | | NA | | |

# FINAL REPORT

## QC SUMMARY

### Suspended Solids

Method: SM 2540D I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Total Suspended Solids | EWL0158-DEC18 | mg/L | 2 | < 2 | 0 | 10 | NV | 90 | 110 | NA | | |

### Total Nitrogen

Method: SM 4500-N C/4500-NO3- F I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Total Kjeldahl Nitrogen | SKA0060-DEC18 | as N mg/L | 0.5 | <0.5 | 4 | 10 | 95 | 90 | 110 | NV | 75 | 125 |

## QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure.  Used to assess laboratory contamination.

Duplicate:  Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure.  Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added.  Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike:  A sample to which a known amount of the analyte of interest has been added.  Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material:  a material or substance matrix matched to the samples that contains a known amount of the analyte of interest.  A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC:  Acceptance criteria

**Multielement Scan Qualifier**: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

**Duplicate Qualifier**: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

**Matrix Spike Qualifier**: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

## LEGEND

### FOOTNOTES

**NSS** Insufficient sample for analysis.
**RL** Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
**NA** The sample was not analysed for this analyte
**ND** Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. “Temperature Upon Receipt” is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act” published by the Ministry and dated March 9, 2004 as amended.



-- End of Analytical Report --

# APPENDIX D: Preferred Design Report

# Environmental Assessment - Preferred Design Omemee Wastewater Pollution Control Plant

Prepared for:

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Submitted by:

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May 2022

GREER GALLOWAY
CONSULTING ENGINEERS

## Table of Contents

## Tables

# 1. Introduction

The Greer Galloway Group was retained by the City of Kawartha Lakes (CKL) to carry out a Schedule 'C' Municipal Class Environmental Assessment to compare alternatives to amend shortfalls in Omemee Wastewater Pollution Control Plant (WPCP) performance. Our assessment of alternatives included an examination of factors including but not limited to:

- Federal and provincial wastewater and treatment requirements
- Estimated capital and operational costs
- Capacity requirements
- Future planning and development
- Hydrogeological performance
- Seasonal variations in operation
- Environmental and Natural Heritage impacts.

This report details an analysis of the alternatives that were considered and a description of the selected preferred alternative and details of supporting studies.

# 2. Background

The CKL owns the municipal wastewater system in the Town of Omemee. It was originally constructed as a dual lagoon /spray irrigation system in 1976.

In 2013, CKL received an approval from the Ministry of Environment and Climate Change (MOECC) to upgrade the system by adding a large sub-surface disposal system (LSSDS), which was ultimately constructed in 2014. Unfortunately, it has never performed to its initial standards and has been continually plagued with malfunctions in the pumping chamber and tile bed.

In 2017, CKL entered into negotiations with Greer Galloway to examine the problem areas with the upgrade, and to recommend enhancements to the system to achieve the intended design capacity. These recommendations included an expansion of the LSSD area, at a considerable expense.

Since that time, the City's Growth Management Plan has been reconsidered, and the village no longer requires the wastewater treatment capacity that was approved in 2013. A simplified system that is able to achieve the new capacity requirements should suffice.

These changes must be examined and planned as a Schedule 'C' EA project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act.

A Notice of Study Commencement was release on July 29$^{th}$, 2020, to mark the beginning of the project and a PIC was held on July 15$^{th}$, 2021, during which limitations and proposed upgrades to the system were described.

# 3. Existing Limitations

Limitations affecting the existing treatment system, and most significantly affecting the large sub-surface disposal system, are preventing current processes from operating at the intended design performance. Primary limiting factors are the effluent quality at later stages in the system and hydrogeological limitations.

## 3.1 Slime and Suspended Solids

In spring and warmer months of the year, effluent from the lagoons contains expected seasonal spikes of suspended solids, partly due to seasonal and sometimes repeated algae blooms. These can clog the pumping system. Effluent undergoes a fixed screening process before the pump-chamber that removes some of the course solids. The finer solids are allowed to pass through to the pumping chamber. This causes an organic slime on both the pump intake screens and the side walls of the wet well. This material is subsequently conveyed and discharged as contaminated effluent into the tile bed. The course screen and pumps and require continuous attention to keep the system functioning. At the point of discharge the contaminated effluent can plug the holes in the dispersal system and/or form a cementation crust with the underlying silty sand soils. Issues associated with this limit capacity and increase costs due to additional maintenance.

## 3.2 Soil Composition

In the tile bed area, pockets of silty sand exist within the layers. The effluent is unable to filter through the dense lower level quick enough, causing build up and affecting the upper level. Other issues might be low permeability due to sand and silty sand or hydraulic segregation where different types of sand/silt/soil separate into layers, reducing permeability.

# 4. Evaluation of Alternative Solutions

During this EA, the following alternatives have been considered.

## 4.1 Do Nothing

This alternative would be the lowest capital cost and involves using the existing LSSDS to discharge all treated effluent. The LSSDS does not currently operate to its full capacity, and the actual available capacity is not sufficient to meet the demand required. In addition to this, the effluent quality and seasonal algae blooms are causing issues and additional maintenance costs within the system, which would not be addressed through this alternative. This option is not feasible.

## 4.2 Utilise Spray Irrigation and LSSDS Effluent Discharge

This option is the second highest in capital costs and construction time. It involves running the existing LSSDS at a reduced but sustainable capacity and continuing to run the spray irrigation system during the spray season to make up the required capacity. This option will require some improvements to effluent treatment prior to the LSSDS to be feasible. There are no impacts to the current land use, as this system already exists.

## 4.3 Replace/Rehabilitate the System

This option would be the highest in capital costs and construction time and would involve a full redesign of the treatment and discharge system, including replacement or rehabilitation of the LSSDS, to perform at the required capacity and address current issues in the system. The costs involved in this alternative would be prohibitive and a full replacement of the system is likely unnecessary to achieve the required capacity and address limitations. Various alternatives were reviewed in the initial EA completed prior to the LSSD implementation, all of which were cost prohibitive.

# 5. Preferred Solution

The preferred solution to amend shortfalls in Omemee WPCP performance is to utilise a combination spray irrigation and the LSSDS for effluent discharge. This solution would require the following components:

- Upgraded course screening.
- Reduction of high TSS sent to the LSSD. Dissolved air flotation (DAF) was piloted on site.
- Addition of a secondary Wet Well.
- Various upgrades to the pumping station and distribution valves as required.
- Hydraulic load control, utilisation of the existing spray irrigation system and some process reconfiguration.

This is the preferred alternative as it sufficiently addresses existing issues and provides sufficient capacity at the lowest capital cost.

# 6. Design Concept

## 6.1 Pre-Treatment of the Effluent

A travelling screen will be introduced to the lagoon effluent to remove course solids. The travelling screen will intercept any large weeds and surface debris from the effluent, in advance of it entering the wet well and creating major clogging to any internal screens intended for removing only suspended solids and colloids, ahead of the pumping chamber. The large weeds and debris will be conveyed directly to a new sludge storage tank for ultimate removal for subsequent disposal.

## 6.1 Pre-Treatment of the Effluent

A fundamental decision was made that suspended solids and colloids within the effluent must be virtually eliminated from the effluent if the system is to escape pumping problems and achieve proper performance within the LSSDS. The following alternatives were then investigated:

| | |
|---|---|
| Self-Cleaning Cloth Filters | • continual expenses with chemical storage and use<br>• continual labor and on-site operator expense<br>• only minimal removal of wet well slime |
| An Auto-Cleaning Strainer | • no chemical requirements<br>• only minimal removal of wet well slime<br>• totally ineffective against BOD levels |
| Dissolved Oxygen Flotation (DAF) | • provides virtual removal of all TSS and BOD<br>• effective against seasonal spikes of algae<br>• requires an addition to the existing building<br>• requires infrastructure and a power supply |

A DAF is the preferred alternative because the pumping chamber and the tile bed both have a low tolerance for plant material, weeds, algae, and suspended solids including minerals. It is designed specifically to remove TSS, BOD5, and Oil and Grease from wastewater streams. The contaminants are removed using an air-in-water solution that injects air under pressure into a recycle stream of clarified DAF effluent. The recycle stream is then combined with incoming wastewater in an internal contact chamber where the dissolved air comes out of solution in the form of micro-sized bubbles that attach to the contaminants. The bubbles and contaminants rise to the surface of the chamber and form a floating bed of material that is automatically removed by a surface skimmer into an internal hopper for eventual conveyance to the new sludge storage tank and eventual trucking off site. A chemical coagulant is used to assist the flocculation process.

## 6.3 Effluent Pumps

Pumps currently used for spray irrigation will remain in use as is. The original "north" spray field will remain in operation as required. The "south" spray field was converted into the LSSD during the 2014 upgrade. Adequate capacity exists within the north field to sustain the original design flow prior to the 2014 upgrade.

Pumps for the LSSDS will need to be assessed for ongoing suitability and, assuming operation and performance is deemed adequate, will be relocated and reinstalled in the new secondary wetwell.

# 7. Preferred Design Concept

The preferred design consists of several improvements throughout the wastewater treatment process that aim to alleviate limitations described in Section 3 and to maximise ongoing efficiency. To assist with the removal of suspended solids, the effluent is to undergo additional treatment before entering the LSSDS. Other system upgrades are also being implemented to improve the treatment process.

## 5.1 The Travelling Screen

A travelling screen intercepts any large weeds and surface debris from the effluent to avoid major clogging to any downstream TSS removal systems, which are intended for removing only suspended solids and colloids. The large weeds and debris will be conveyed directly to the same storage utilised by a new DAF system, for ultimate disposal. This screening system is intended to clear larger debris from the wastewater, in advance of a new DAF unit.

## 5.2 Dissolved Oxygen Flotation (DAF)

A pilot study was completed in July of 2019 to assess the performance of a DAF system in sequence with the current system. The sampling and test results of effluent from the lagoon(s) during the pilot study proved the effectiveness of the DAF technology without chemical additives, and even more so when proper chemistry is added to the system. A new DAF unit will clean effluent that is to be dosed into the LSSDS. This will lead to sustained capacity in the LSSD.

## 5.3 Addition of Secondary Wet Well

The existing wet well will continue to feed the spray irrigation system using the existing spray irrigation pumps. This primary wet well will connect to a new secondary wet well through the new DAF system, where treated effluent will be stored and settlement will occur, before being pumped to the LSSDS.

## 5.4 The Pumping Station

The existing pumping fixtures require continuous care and attention due to the nature of the effluent. New pumps and fixtures may need to be introduced to meet the design requirements of the new system.

## 5.5 Distribution to LSSDS

Six-way distribution valves will be replaced with a new valving system.

## 5.6 Hydraulic Load Control

Hydraulic load to tile bed will be reduced as needed in accordance with field conditions.

## 5.7 Utilise Existing Spray Irrigation

The existing “north” spray irrigation will continue to be utilised to supplement the LSSDS’s current deficiencies as required.

## 5.3 Process Reconfiguration

This alternative will require some reconfiguration of process sequencing, and incorporation of the new components in the system.

### 5.3.1 The Current Operating Procedures

There are 2 lagoons, each designed to receive raw sewage from a sewage acceptance chamber, located near the east end of the lagoons which is connected to each of the lagoons by way of underground piping. There is also an underground mid-point cross pipe connection between the 2 lagoons. There are underground piped connections at the west end of each lagoon which connect directly to the wet well. The wastewater flows to the wet well from either lagoon, either singularly or collectively, and flow is controlled by a manually operated vertical steel handled shaft located close to the wet well that can open or close a gate to the wet well at the choice of the operational staff. A schematic of the existing system can be seen in Appendix A.

### 5.3.2 The Proposed New Operational Plan

In future, the lagoons should be operated in series, one after the other, thereby creating an initial settling area and then a second settling area for the wastewaters prior to leaving the second lagoon. Raw sewage should be entering the system only by way of the east end of the northerly upper lagoon. This particular lagoon should be identified as the Upper Primary Lagoon where the bulk of the solids in any incoming sewage product is allowed to settle out of the product onto the floor of the lagoon through a gravitational process. The resultant waste waters then flow to the second lagoon through the existing mid-point cross pipe connection. This second lagoon, located south of the first lagoon, should then be identified as the Lower Lagoon, where the solids remaining in the waste waters from the Upper Lagoon would now undergo a repeat process of settling.

The resultant wastewaters should pass through the travelling screen prior to entering the existing wet well. Wastewater from the existing wet well will either be pumped to the spray irrigation system directly or outlet to a newly installed DAF unit. Suspended solids (TSS) from the travelling screen and DAF unit are deposited into one sludge detention chamber or pond. The DAF unit discharges to a new secondary wet well where the clarified effluent is pumped to the LSSDS. The new operation shall include availability to pump to the LSSDS and the irrigation system simultaneously or independently. The most northerly spray nozzle shall be moved approximately an additional 32 meters from the property boundary to remain in compliance with current Ministry of the Environment (MECP) Guidelines. A schematic of the proposed system and the proposed site plan can be seen in Appendix B.

# 8. Cost Estimate

A rounded construction cost estimates of the major components and ancillary equipment as detailed in the schematic flow process of the Enhancement program is provided as follows:

**Table 1 - Cost Estimates**

| Item | Cost |
|---|---|
| **Pre-Treatment Travelling Screen** | $100,000 |
| **Sludge Storage Tank and Disposal Area** | $100,000 |
| **Dissolved Air Flotation Package Plant (DAF)** | $300,000 |
| **Concrete Block Building to House the Pre-treatment Equipment** | $300,000 |
| **Wet Well Expansion** | $100,000 |
| **Modifications and Additions to the Pumping Station** | $100,000 |
| **Effluent Distribution Valves and Piping** | $100,000 |
| **Total Equipment and Hard Costs** | **$1,100,000** |
| **Allowance for Labor, Assembly and Commissoning** | **$600,000** |
| **Engineering and CA at 10%** | **$170,000** |
| | |
| **TOTAL PROJECT COST (HST EXCLUDED)** | **$1,870,000** |

# 9. Supporting Studies

The following studies were completed in support of the preferred alternative and proposed capacities.

## 7.1 LSSDS - Hydrogeological Study

The LSSDS is comprised of four zones, each containing six infiltrator disposal area beds (or cells), with each cell containing 33 runs of 28 m long by approximately 0.7 m diameter Quick4 Chambers. The LSSDS is located on an esker deposit and was commissioned in the fall of 2013. The system has experienced persistent effluent breakout when operated at or near to its intended design capacity of 1,350 m3/day. In the recent past the tile field has been dosed at quantities of up to 600 m3 per day (or less than half of the intended design capacity).

While the Quick4 infiltrators offer substantial storage, all infiltration must occur across a planar surface beneath the infiltrator at a rate governed by the effective vertical hydraulic conductivity of the material. This vertical conductivity has likely been affected through slime formation and/or the segregation of fines which limits the capacity of the system. The capacity for the esker deposits to convey the infiltrated water away from the infiltration cells is also a potential limiting factor. Factors affecting the LSSDS along with potential rehabilitation concepts were discussed in greater detail in our 2019 assessment report Ref. [1].

There is no reliable way to calculate a capacity from first principles since we cannot separate limiting factors related to primary infiltration vs. formation capacity. For this reason, we must take an observational approach where the interim rated capacity is derived from recent effluent discharge rates that were accommodated without visible breakout. These are summarized below:

**Table 2 - LSSDS Effluent Flows**

| Year | Effluent discharged to LSSDS (m3) | Effluent discharged to LSSDS (m3/day) |
|---|---|---|
| 2021 | 226,699.20 | 621 |
| 2020 | 98,900.92 | 271 |
| 2019 | 195,425.37 | 535 |
| 2018 | 87,589.19 | 240 |
| 2017 | 103,222.80 | 283 |

These actual discharge rates average 390 m3/day over the past five years.

Based on our analysis and the amount of effluent successfully infiltrated over the past five years we conclude that 350 m3/day is a reasonable and conservative estimate of the current capacity of the LSSDS. 350 m3/day is equal to a loading of approximately 17 L/m2/day or kv = 2 x 10-5 cm/s, which is conservative for silty sand.

We note that there may is potential to re-rate this capacity based on future observations and/or selective rehabilitation measures to locally increase vertical connections between poor-performing portions of the LSSDS and the deeper esker horizons. We suggest that limited operating flexibility be requested to facilitate obtaining such observations.

## 7.2 Spray Irrigation – Aerosolization and Capacity

The spray irrigation system is subject to restrictions outlined in the MOE's Design Guidelines for Sewage Works, 2008. The specific section that addresses Land Application of Treated Effluent, including spray irrigation, is Section 15.9. According to the guidelines, secondary treatment at minimum is required for land application. Omemee has secondary equivalent treatment in the form of two waste lagoons. CBOD and TSS remain within limits of 25 mg/L and 30mg/L respectively. In the past five years (2017-2021) CBOD levels have never exceeded this limit, with a maximum of 22 mg/L and TSS levels have exceeded this limit only once in November of 2020. This was due to low effluent levels in the lagoons. Aside from the November 2020 reading, TSS levels have not been recorded above 23.75 mg/L in the past five years. Treatment is considered adequate for land application purposes. Water table and contour data are available in the 2010 Cambium ESR (Ref. [2]).

The site is well isolated with the immediate surrounding land being municipal land suitable for accepting effluent. Section 15.9.4 (Site Buffer Zones) states:

> "…the distance from spray nozzles to the property limit should be 150 m"

The spray nozzles must remain at a distance of at least 150 meters from the property boundary. Currently, the most northerly spray nozzle is approximately 118 meters from the existing the property boundary to the north. To comply with requirements the spray nozzle will be moved to an alternative location, at a minimum of 150 meters from the northern property boundary. The new location should be at least approximately 32 meters southeast from the current location. Intended spray nozzle locations are at least 150m from the east and south boundaries. The Western boundary borders unused municipally owned land (the Sanderson Pit) and so is acceptable buffer land for spray irrigation. The spray head locations will comply with setback requirements and surrounding land uses are not considered in conflict with land applied effluent.

The design capacity of the irrigation system is 608 $m^3$/day according to Ref. [2]. The design capacity of the system can be verified with historical data prior to the installation of the LSSD in 2013, as the data from subsequent years might be affected by the presence of the LSSD. The following data was supplied by OCWA.

**Table 3 – Pre-LSSDS Effluent Flows**

| | 2012 | 2011 | 2009 | 2008 | 2007 |
|---|---|---|---|---|---|
| Annual Effluent Flow (m3) | 222056 | 304321 | 496092 | 386700 | 263700 |
| Avg. Daily Effluent Flow (m3/day) | 608 | 833 | 1359 | 1059 | 722 |

The amount of effluent discharged over summer for the years above was equivalent to discharging at least 608 m3 each day across the year. The Omemee WPCP has been operating for over 40 years with no noted issues due to spray irrigation.

Since the Introduction of the LSSDS, the two south easterly spray fields, closest to the LSSDS, have not been used. Historically north and south spray areas have been available. The LSSDS has replaced the southern spray area. Originally the system was designed so that there was redundancy in the spray areas. They do not run the north and south fields concurrently, therefore use of the northern spray field only is not expected to create operational issues.

The sustainable capacity of the irrigation system has been demonstrated to be 608 m3/day through historic data and operation.

## 7.3 Cultural Heritage and Natural Environment Studies

The selected alternative utilises mostly existing system components and involves no significant construction or disturbance outside of existing buildings and previously disturbed areas, therefore cultural heritage and natural environment studies are not necessary as part of this EA.

# 6. Conclusion

The combined use of spray irrigation and LSSDS effluent discharge would be the least costly feasible option of the three alternatives considered. The “do nothing” option would cost less, however, it would not address ongoing issues, would not provide capacity to meet demands and ongoing environmental and operational costs may continue to be an issue. Completely rehabilitating or replacing the system could address issues and provide sufficient capacity but is the option with the highest cost and complexity and is not necessary to resolve issues and reach required capacities.

The option of the combined use of spray irrigation and the LSSDS is well supported by historical data. The optimal alternative would therefore be proceeding with parallel use of LSSD and spray irrigation to attain required capacities.

All of which is respectfully submitted.

**THE GREER GALLOWAY GROUP INC.**
**CONSULTING ENGINEERS**

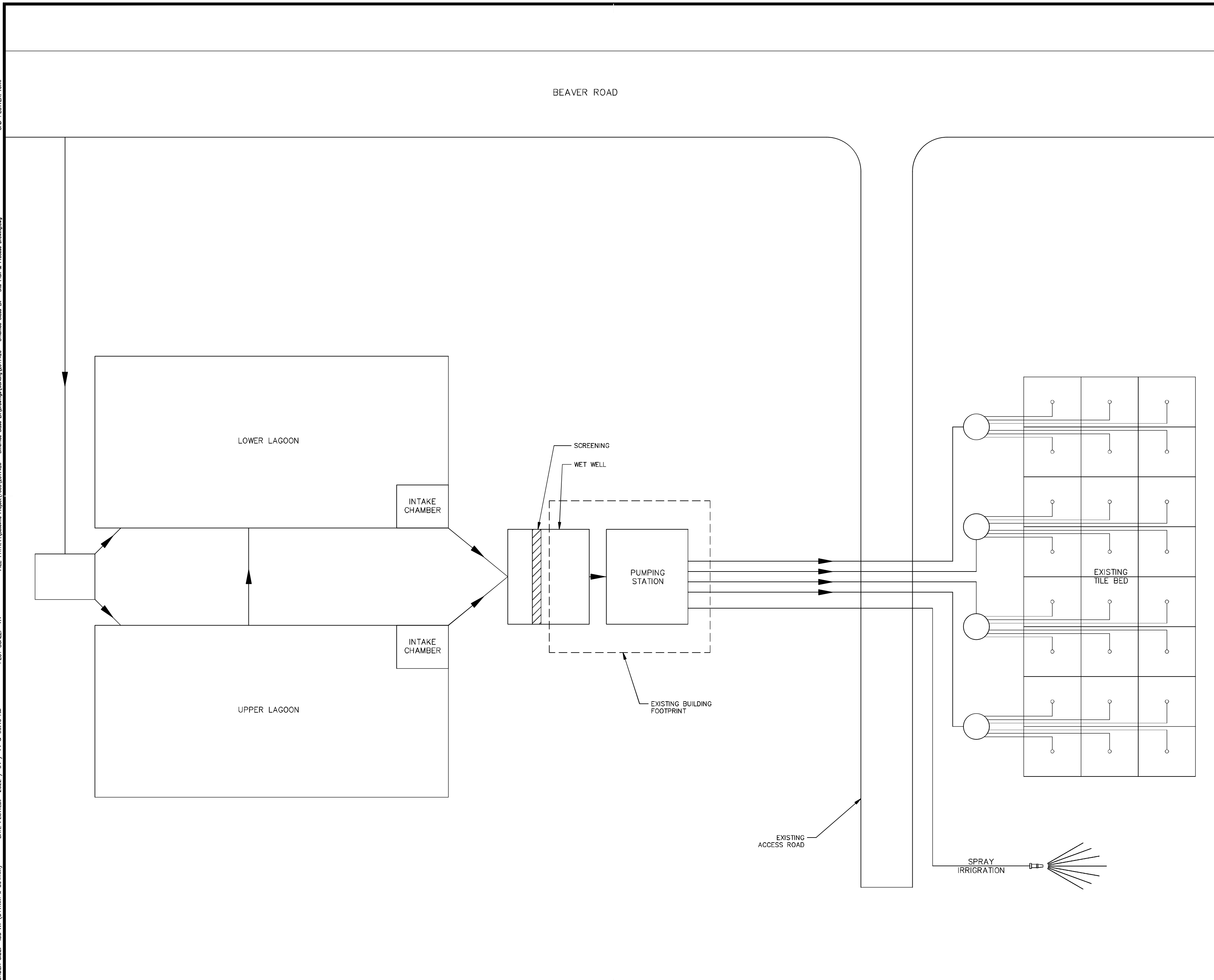

Tony Guerrera, P.Eng

# References

[1] The Greer Galloway Group Inc., "Study Report on the LSSDS Wastewater Treatment System," Belleville, 2019.

[2] Cambium Environmental Inc., "Addendum Envlronmental Study Report Class Environmental Assessment to Expand Wastewater Capacity for Omemee WPCP," Peterborough, 2010.

# Appendix A – Existing Treatment System

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NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH RELEVANT CODES AND GUIDELINES.
2. ALL DRAWINGS AND ADDENDA ARE TO BE READ AS, AND IN CONJUNCTION WITH THE SPECIFICATIONS.
3. ALL EQUIPMENT SHALL BE INSTALLED AS SPECIFIED OR APPROVED EQUIVALENT.
4. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH WORK AND BE RESPONSIBLE FOR SAME.
5. CONTRACTOR MUST REPORT ANY DISCREPANCIES TO ENGINEER FOR RESOLUTION BEFORE COMMENCING THE WORK.
6. ANY CHANGES MUST BE APPROVED BY THE ENGINEER.

A DETAIL NO.
B DRAWING NO. – WHERE DETAILED

LEGEND

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 01 | ISSUED FOR CLIENT REVIEW | 22/MM/DD |

NORTH

STAMP

PROJECT
OMEMEE WASTEWATER DISPOSAL SYSTEM
OMEMEE, ONTARIO
CITY OF KAWARTHA LAKES
TOWN OF OMEMEE, ONTARIO

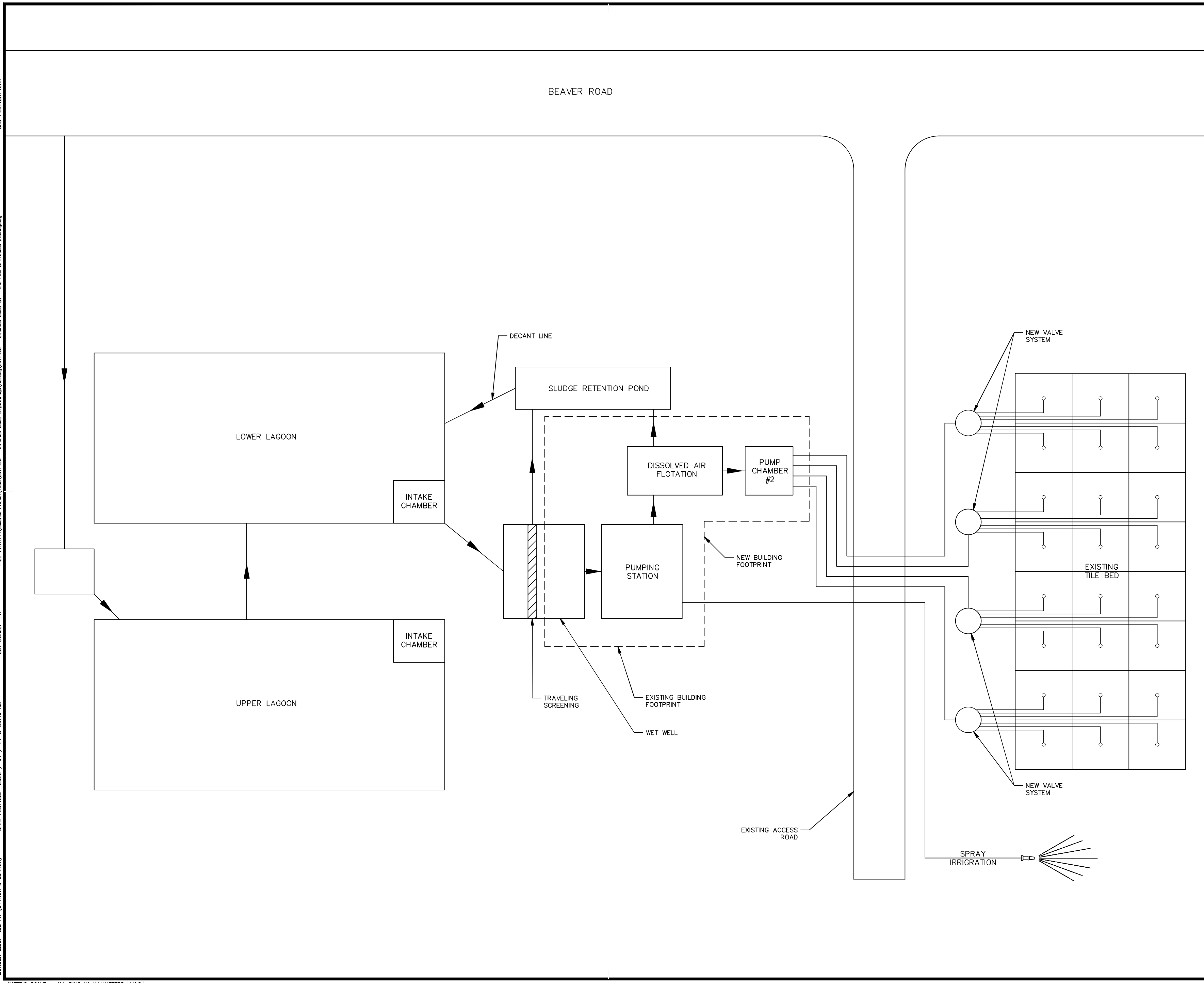
DRAWING TITLE
EXISTING TREATMENT SYSTEM

DESIGNED BY: S. HUTTON
DRAWN BY: T. FUNARI
REVIEWED BY: T. GUERRERA
APPROVED BY: T. GUERRERA
PROJECT DATE: 2022/03/30 (YYYY/MM/DD)
PROJECT #: 20-1-7426
DRAWING #: M1
DRAWING SCALE (ISO A1) HOR: AS SHOWN VER: AS SHOWN

(METRIC SCALE – ALL DIMS IN MILLIMETERS U.N.O.)

BORDER SIZE: ISO A1 (841mm x 594mm) DATE PLOTTED: 2022 / 04 / 14 @ 09:46 AM PLOT SCALE: 1:1 FILE PATH: P:\Belleville Project\7000\2017426\2017426 – Omemee Class EA\Drawings\Working\2017426 – Omemee Class EA – Site Plan & Process Drawing.dwg CAD PLOTTER: TomF

# Appendix B – Proposed Treatment System




GREER GALLOWAY
CONSULTING ENGINEERS
PETERBOROUGH
BELLEVILLE
KINGSTON
1620 WALLBRIDGE LOYALIST ROAD
BELLEVILLE, ONTARIO, K8N 4Z5
PHONE: 613-966-3068
FAX: 613-966-3087

NOTES:
1. ALL WORK SHALL BE IN ACCORDANCE WITH RELEVANT CODES AND GUIDELINES.
2. ALL DRAWINGS AND ADDENDA ARE TO BE READ AS, AND IN CONJUNCTION WITH THE SPECIFICATIONS.
3. ALL EQUIPMENT SHALL BE INSTALLED AS SPECIFIED OR APPROVED EQUIVALENT.
4. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH WORK AND BE RESPONSIBLE FOR SAME.
5. CONTRACTOR MUST REPORT ANY DISCREPANCIES TO ENGINEER FOR RESOLUTION BEFORE COMMENCING THE WORK.
6. ANY CHANGES MUST BE APPROVED BY THE ENGINEER.

A — DETAIL NO.
B — DRAWING NO. – WHERE DETAILED

LEGEND

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 01 | ISSUED FOR CLIENT REVIEW | 22/MM/DD |

NORTH

STAMP

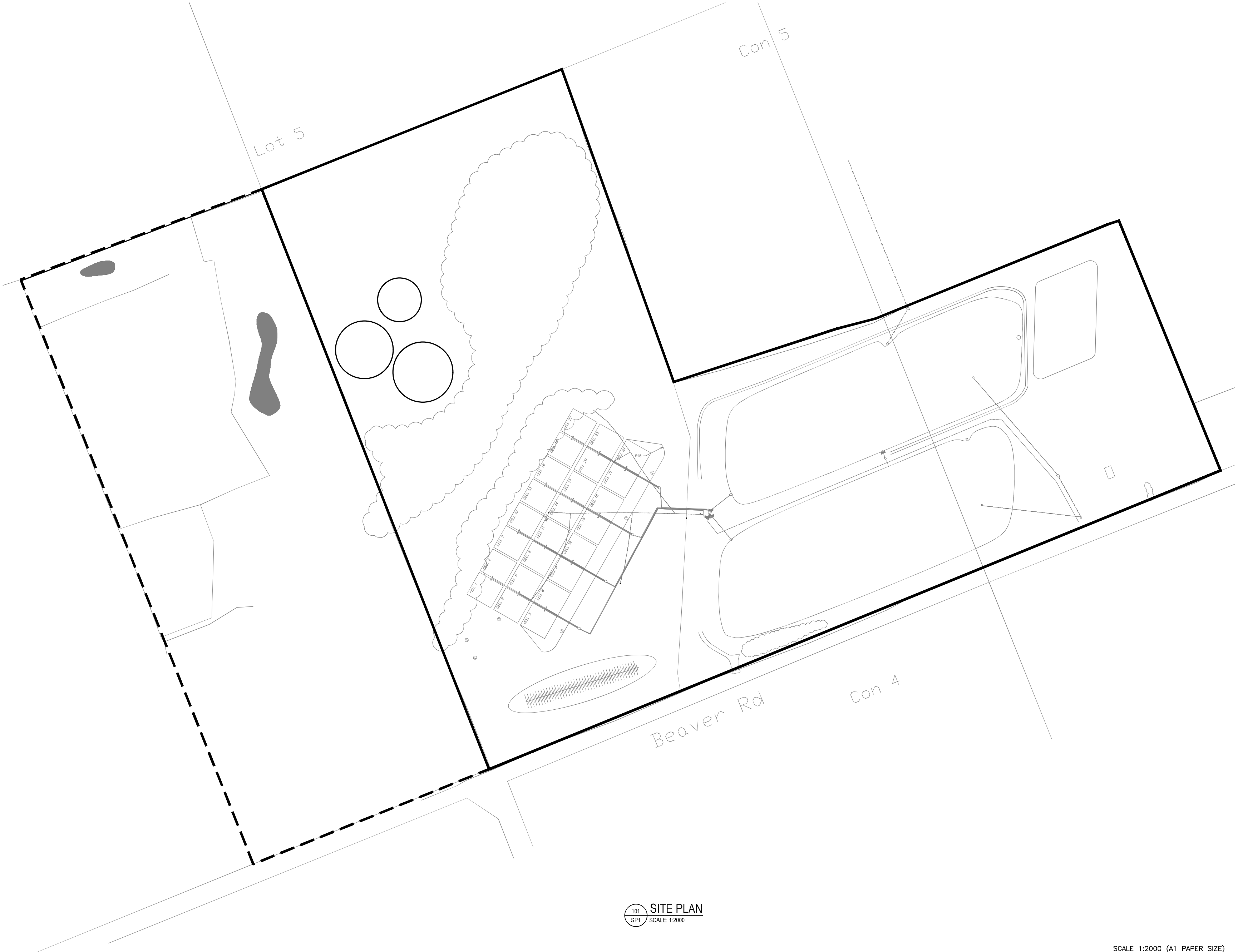
PROJECT
OMEMEE WASTEWATER DISPOSAL SYSTEM
OMEMEE, ONTARIO
CITY OF KAWARTHA LAKES
TOWN OF OMEMEE, ONTARIO

DRAWING TITLE
PROPOSED TREATMENT SYSTEM

DESIGNED BY: S. HUTTON
DRAWN BY: T. FUNARI
REVIEWED BY: T. GUERRERA
APPROVED BY: T. GUERRERA
PROJECT DATE: 2022/03/30 (YYYY/MM/DD)
PROJECT #: 20-1-7426
DRAWING #: M2
DRAWING SCALE (ISO A1) HOR: AS SHOWN VER: AS SHOWN

CAD PLOTTER: TomF
FILE PATH: P:\Belleville Project\7000\2017426\2017426 - Omemee Class EA\Drawings\Working\2017426 - Omemee Class EA - Site Plan & Process Drawing.dwg
PLOT SCALE: 1:1
DATE PLOTTED: 2022 / 04 / 14 @ 09:46 AM
BORDER SIZE: ISO A1 (841mm x 594mm)
(METRIC SCALE – ALL DIMS IN MILLIMETERS U.N.O.)

# Appendix C – Site Plan




101 SP1 **SITE PLAN**
SCALE: 1:2000

SCALE 1:2000 (A1 PAPER SIZE)
10m 0 10 20 30 40 50m


GREER GALLOWAY
CONSULTING ENGINEERS
PETERBOROUGH
BELLEVILLE
KINGSTON
1620 WALLBRIDGE LOYALIST ROAD
BELLEVILLE, ONTARIO, K8N 4Z5
PHONE: 613-966-3068
FAX: 613-966-3087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A — A DETAIL NO.
B — B DRAWING NO. – WHERE DETAILED

LEGEND

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 01 | ISSUED FOR CLIENT REVIEW | 22/MM/DD |

NORTH | STAMP

PROJECT
OMEMEE WASTEWATER DISPOSAL SYSTEM
OMEMEE, ONTARIO
CITY OF KAWARTHA LAKES
TOWN OF OMEMEE, ONTARIO

DRAWING TITLE
SITE PLAN

DESIGNED BY: S. HUTTON
DRAWN BY: T. FUNARI
REVIEWED BY: T. GUERRERA
APPROVED BY: T. GUERRERA
PROJECT DATE: 2022/03/30 (YYYY/MM/DD)
PROJECT #: 20-1-7426
DRAWING #: SP1
DRAWING SCALE (ISO A1) HOR: AS SHOWN VER: AS SHOWN

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(METRIC SCALE – ALL DIMS IN MILLIMETERS U.N.O.)

# APPENDIX E: Spray Irrigation Requirements Memo

GREER
GALLOWAY
CONSULTING
ENGINEERS

1620 Wallbridge Loyalist Road
R.R. #5
Belleville, Ontario
K8N 4Z5

Telephone
(613) 966-3068

Facsimile
(613) 966-3087

E-mail
tguerrera@greergalloway.com



December 23rd, 2021

**Juan Rojas, Director, Engineering and Corporate Assets**
26 Francis Street, P.O. Box 9000
Lindsay, Ontario

**Attention:** **Juan Rojas (CKL)**

**CC:** **Bryan Armstrong (MECP)**

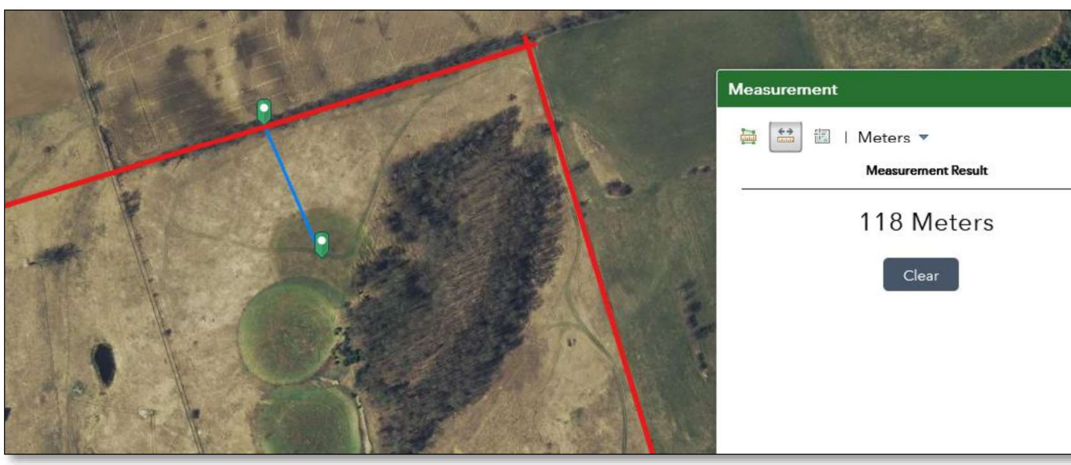
**Re:** **Compliance with Design Guidelines for Sewage Works, 2008**

Mr. Rojas,

As part of the addendum to the Schedule 'C' Municipal Class Environmental Assessment process for the Omemee Wastewater Treatment System, the spray irrigation system is to conform to those restrictions as outlined in Section 15.9 of the Design Guidelines for Sewage Works, 2008. Section 15.9.4 (Site Buffer Zones) states:

> "In the absence of detailed assessments, the distance from spray nozzles to the property limit should be 150 m"

Currently, the most northerly spray nozzle is approximately 118 meters from the existing the property boundary. To comply, Greer Galloway recommends moving the spray nozzle to an alternative location, a minimum of 150 meters from the property boundary, or approximately 32 meters southeast from the current location.




If you have any questions or concerns, please contact us.

Thank you,

**THE GREER GALLOWAY GROUP INC.**
**ENGINEERS AND PLANNERS**

**Tony Guerrera, P. Eng.**
**Senior Project Manager**

# APPENDIX F: Notice of Commencement

# Kawartha Lakes Municipal Bulletin 705-324-9411

**Notice of Study Commencement:**
Omemee Wastewater Treatment Operations
Class Environmental Assessment

**Project Location Map**
**Omemee Wastewater Treatment Plant**


The City of Kawartha Lakes is initiating a Class Environmental Assessment (EA) study to address ongoing operational issues with the large sub-surface disposal system (LSSDS) at the Omemee Wastewater Treatment Plant located at 267 Beaver Road. The LSSDS, commissioned in the fall of 2013, was designed to provide increased wastewater treatment capacity for the community of Omemee, eliminating the need for the spray irrigation process which had been in operation at the Omemee lagoon site since 1976. Spray irrigation was expected to be phased-out over a two-year period following commissioning of the LSSDS and this was reflected in the site's environmental compliance approval (ECA). However, a shortfall in the effective operating capacity of the LSSDS has necessitated continued use of spray irrigation. Although the current ECA for the Omemee lagoon site no longer supports spray irrigation, the Ministry of the Environment (MECP) has continued to authorize its use as an emergency measure to minimize the risk of uncontrolled sewage discharges to the environment. A long-term solution is required to address the capacity issues with the existing LSSDS.

The existing LSSDS system, which provides on-site disposal of treated effluent from the Omemee sewage lagoons, was approved as part of a previous Municipal Class Environmental Assessment and subsequent Addendum which considered a wide variety of wastewater treatment alternatives and involved several years of study and public consultation dating back to 2005.

The objective of the current Class EA study is to develop a preferred solution for providing cost-effective and reliable on-site disposal of treated wastewater from the Omemee sewage lagoons to meet existing servicing needs and support planned development. The City is considering formal re-instatement of on-site spray irrigation to supplement the operation of the LSSDS, along with pre-treatment of lagoon effluent to extend the life of the LSSDS and prevent performance degradation due to fouling. More extensive rehabilitation or reconstruction of the existing LSSDS is also an option.

This project is being planned in accordance with the requirements for a Schedule "C" Municipal Class Environmental Assessment. The Class EA process includes consultation with the public and review agencies, an evaluation of viable alternative solutions, an assessment of the environmental impacts of the alternative solutions, identification of measures to mitigate any adverse impacts, and the selection of a preferred solution.

Public input into the planning and design of this project is encouraged. If you have any comments or questions regarding this project, or would like to receive further information, please send an email to one of the following project contacts:


**Juan Rojas, P.Eng.**
City of Kawartha Lakes
26 Francis Street, P.O. Box 9000
Lindsay, ON. K9V 5R8
705-324-9411 extension 1151
jrojas@kawarthalakes.ca

**Tony Guerrera, P. Eng**.
The Greer Galloway Group Inc.
1620 Wallbridge Loyalist Road
Belleville, ON. K8N 4Z5
613-966-3068
tguerrera@greergalloway.com


KAWARTHA LAKES

*This notice issued June 29, 2020. Under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this project and will be released, if requested, to any person.*

# APPENDIX G: Notices of PIC

# Notice of PIC

June 30, 2021
For Immediate Release

## Notice of a Public Information Centre | Omemee Wastewater Treatment System – Environmental Assessment

Kawartha Lakes – The City of Kawartha Lakes (The City) is undertaking a planning process for the Wastewater Treatment System for the community of Omemee. The system was upgraded in 2013. The intent was to increase capacity by replacing the spray irrigation system by a Large Subsurface Disposal System (LSSD). Kawartha Lakes has identified that the LSSD system is not operating at its expected capacity and measures may be required to ensure adequate capacity exists for future demands and growth in the community. Options being considered include continued operation of the LSSD in conjunction with the previous spray irrigation system.

The project is being carried out with the requirements for an addendum to the Schedule 'C' project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act. As part of the Class EA process for reviewing the upgrade of the sewage treatment system, public comment during the evaluation of alternative solutions will be requested.

Kawartha Lakes is conducting a virtual public information centre:

**When:** Thursday July 15, 2021. From 6pm to 7pm
**Where:** Virtual Zoom Meeting: https://kawarthalakes.zoom.us/meeting/register/tJIrdO-rqDovG9RcNMjGxJuMsrnIVeEOfIMc

After registering, you will receive a confirmation email containing information about joining the meeting.

We are interested in hearing any comments or concerns that you may have about this project. Should you wish to ask a question, **please send content in advance of the meeting to a member of the project team below**. A public database of comments will be maintained and, except for personal information, included in the study documentation that will be made available for public review. Parties interested in providing input or that wish to obtain additional information at this stage of the study are asked to submit comments in writing to:

Mr. Tony Guerrera, P.Eng.
Project Manager
The Greer Galloway Group Inc.
1620 Wallbridge Loyalist Road
Belleville, Ontario
K8N 4Z5
(613) 966-3068
F: (613) 966-3087
tguerrera@greergalloway.com

Juan Rojas, P.Eng., PMP
Director, Engineering and Corporate Assets
City of Kawartha Lakes
26 Francis Street, P.O. Box 9000
Lindsay, Ontario
K9V 5R8
705-324-9411 ext. 1151
jrojas@kawarthalakes.ca

- 30 -

Media Inquiries

# Notice of PIC

## Notice of a Public Information Centre | Omemee Wastewater Treatment System – Environmental Assessment

The City of Kawartha Lakes (The City) is undertaking a planning process for the Wastewater Treatment System for the community of Omemee. The system was upgraded in 2013. The intent was to increase capacity by replacing the spray irrigation system by a Large Subsurface Disposal System (LSSD). Kawartha Lakes has identified that the LSSD system is not operating at its expected capacity and measures may be required to ensure adequate capacity exists for future demands and growth in the community. The recommended option includes continued operation of the LSSD in conjunction with the previous spray irrigation system.

The project is being carried out with the requirements for an addendum to the Schedule 'C' project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act. As part of the Class EA process for reviewing the upgrade of the sewage treatment system, public comment will be requested.

**Kawartha Lakes is conducting a virtual public information centre:**

Wednesday May 25, 2022 at 6pm to 7pm
**To attend the meeting, please visit:** www.kawarthalakes.ca/majorprojects to find the Zoom link for the meeting.

We are interested in hearing any comments or concerns that you may have about this project. Should you wish to ask a question, **please send content in advance of the meeting to a member of the project team below**. A public database of comments will be maintained and, except for personal information, included in the study documentation that will be made available for public review. Parties interested in providing input or that wish to obtain additional information at this stage of the study are asked to submit comments in writing to:


Mr. Tony Guerrera, P.Eng.
Project Manager
The Greer Galloway Group Inc.
1620 Wallbridge Loyalist Road
Belleville, Ontario
K8N 4Z5
(613) 966-3068
F: (613) 966-3087
tguerrera@greergalloway.com

Juan Rojas, P.Eng., PMP
Director, Engineering and Corporate Assets
City of Kawartha Lakes
26 Francis Street, P.O. Box 9000
Lindsay, Ontario
K9V 5R8
705-324-9411 ext. 1151
jrojas@kawarthalakes.ca

LOCAL : LIFE

# Second meeting held to garner input on Omemee wastewater treatment system project

Public information session takes place virtually on Wednesday (May 25) from 6 to 7 p.m. and will focus on details regarding environmental assessment efforts

Set Kawartha Lakes as My Local news

By **This Week**
Wed., May 18, 2022 | 2 min. read

The City of Kawartha Lakes is holding a second public information session to share updates regarding the progress, and continued process, needed to upgrade the Omemee wastewater treatment system.

The meeting takes place virtually on Wednesday (May 25) from 6 to 7 p.m. and will focus on details regarding environmental assessment efforts.

The village's wastewater treatment system was last upgraded in 2013. The intent of this was to increase capacity by replacing the spray irrigation system by a Large Subsurface Disposal System (LSSD). Kawartha Lakes has identified that the LSSD system is not operating at its expected capacity and measures may be required to ensure adequate capacity exists for future demands and growth in the community.

The recommended option includes continued operation of the LSSD in conjunction with the previous spray irrigation system.

The project is being carried out with the requirements for an addendum to the Schedule 'C' project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act. As part of the Class EA process for reviewing the upgrade of the sewage treatment system, public comment will be requested.

Those wishing to attend the meeting, do not need to pre-register; simply visit https://us02web.zoom.us/j/89959896234 at the meeting time. The meeting can be accessed from a smart device or computer with a supported web browser. There is also the option of joining via phone by dialing 1-647-374-4685 and entering meeting ID 899 5989 6234.

The municipality is interested in hearing any comments or concerns the public may have about this project. Those wishing to ask a question are asked to send content in advance of the meeting to either municipal engineering and corporate assets director Juan Rojas via jrojas@kawarthalakes.ca or calling 705-324-9411 ext. 1151 or Tony Guerrera, project manager with The Greer Galloway Group Inc. via tguerrera@greergalloway.com or call 1-613-966-3068.

A public database of comments will be maintained and, except for personal information, included in the study documentation that will be made available for public review. Parties interested in providing input or would like additional information at this stage of the study are asked to submit comments to the above listed individuals.

SHARE:

**New Feature!** Go to the MyLocal page to customize your local news.

Select a community for local news

LOCAL : NEWS

## North Etobicoke residents need Toronto council advocate, community says

10 mins ago

LOCAL : NEWS

## Where is the cheapest gas in Muskoka today, June 29?

6 mins ago

LOCAL : NEWS

## 70-year-old woman dies while swimming at Wasaga Beach near Beach Area 6

1 hr ago

# APPENDIX H: PIC Presentations

GREER GALLOWAY
CONSULTING ENGINEERS

# Welcome

# Public Information Centre

# Omemee Wastewater Treatment Upgrade

July 15th, 2021

Location: Virtual Zoom Meeting
Time: 6pm until 7pm

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Background Information

The City of Kawartha Lakes owns the municipal wastewater system in the Town of Omemee. It was originally constructed as a dual lagoon /spray irrigation system in 1976.

In 2011, the City completed a Class Environmental Assessment based on a Growth Management Plan that forecasted substantial growth in the area. Accordingly, the City elected to upgrade the system by designing a large sub-surface disposal system (LSSDS) which was constructed in 2014. The original spray irrigation system was to be decommissioned. Unfortunately, the LSSD has not performed to its original design standards, and is unable to handle the capacity of design flows. The system is currently operating as a combination of the new LSSD and the original spray irrigation system.

Since that time, the growth forecast has been revised downward. Omemee will not require the wastewater treatment capacity that had originally been forecasted. The City and Greer Galloway are reviewing the current system to determine the best path forward.

These upgrades and recommendations will be carried out as a Schedule 'C' project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS


Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Limitations of The Existing System

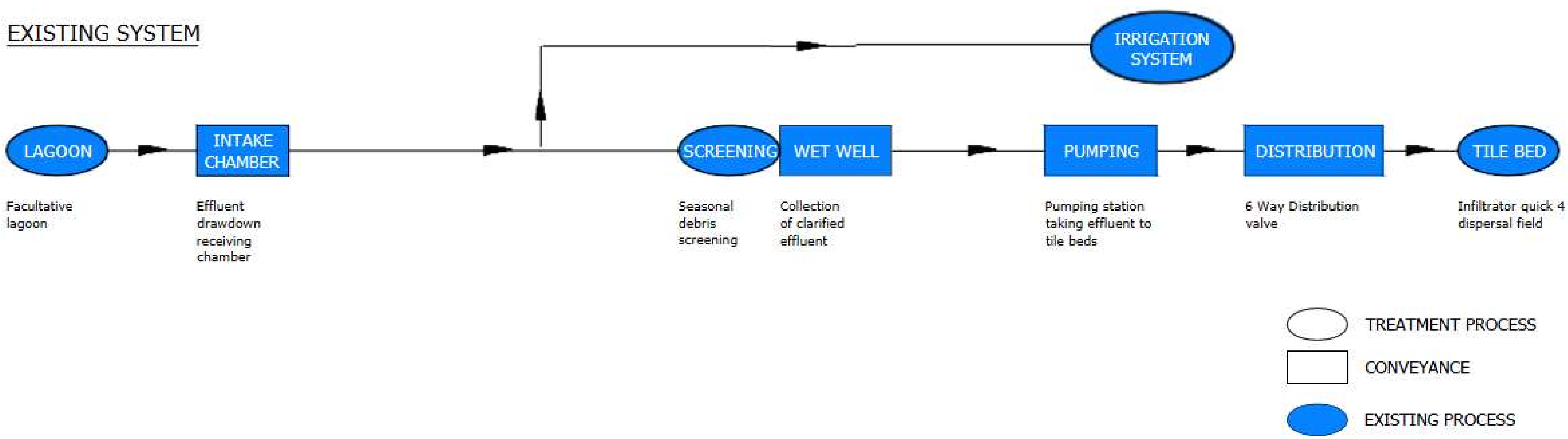
**Slime and Suspended Solids -** In spring and warmer months of the year, effluent from the lagoons contain expected seasonal spikes of suspended solids. These can clog pumping systems. Effluent undergoes a screening process before the pump-chamber that removes some of the suspended solids, but not all. This causes an organic slime on both the screen and the side walls of the wet well. The presence of slime clogs the screen and the pumps and requires continuous attention to keep the system functioning.

**Soil Composition –** In the tile bed area, pockets of silty sand exist within the layers. The effluent is unable to filter through the dense lower level quick enough, causing build up and affecting the upper level. Other issues might be low permeability due to sand and silty sand, fouling of the sand due to slime/suspended solids or hydraulic segregation where different types of sand/silt/soil separate into layers, reducing permeability.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Existing Process




Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Proposed Upgrades – Pre-Wet Well

**Pre-Treatment of the Effluent**

To assist with the removal of suspended solids, the effluent could be treated before entering the wet well. Options include:

Self-Cleaning Cloth Filters

This type of filter only removes a minimal amount of wet well slime, requires labour and chemical storage.

An Auto-Cleaning Strainer

This type of filter only removes a minimal amount of wet well slime and is ineffective against BOD levels.

Dissolved Oxygen Flotation

Removes almost everything required but requires new infrastructure and power.

The Travelling Screen

This screen Intercepts weeds and debris before entering the wet well, reducing clogging in the well.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Proposed Upgrades – Post-Wet Well

**Enlargement of the Existing Wet Well**
A larger 2-stage tank would increase the amount of time for any suspended substances to settlement.

**New Pumps**
In the case that existing pumps do not meet the design requirements of the new system.

**Distribution to LSSDs**
Replace six-way distribution valve with two-way valves

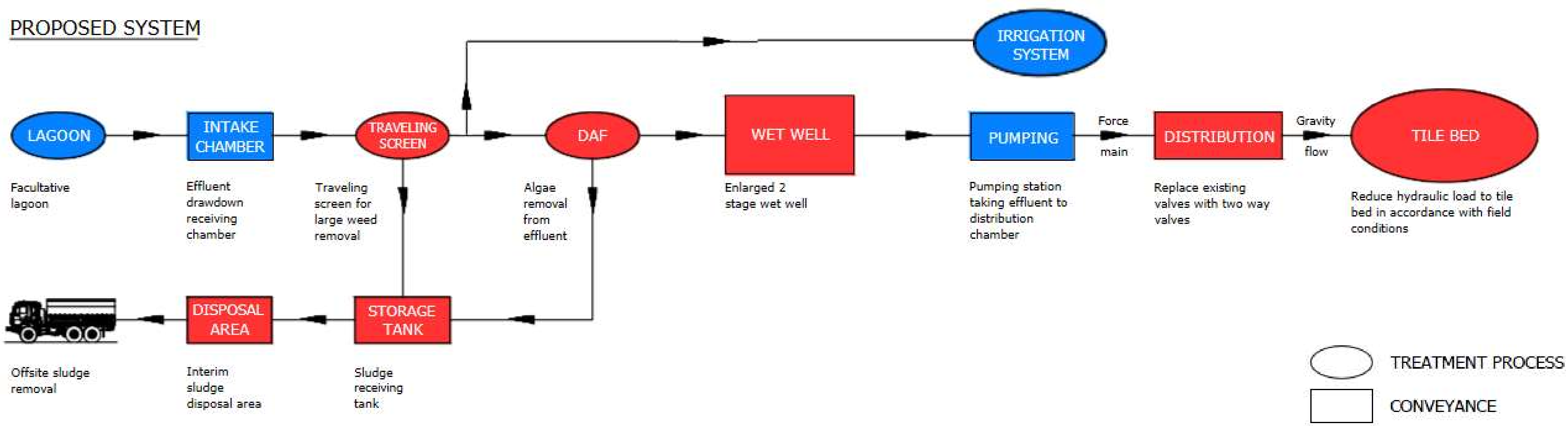
**Hydraulic Load Control**
Reduce the hydraulic load to tile bed in accordance with field conditions.

**Utilise Existing Spray Irrigation**
Continue to use the spray irrigation to supplement the LSSD system's current deficiencies.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Proposed Upgrades




Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Cost Estimates

| Upgrade | Cost ($) |
|---|---|
| The Pre-Treatment Travelling Screen | 200,000 |
| The Sludge Storage Tank and Disposal Area | 300,000 |
| The Dissolved Air Flotation Package Plant (DAF) | 400,000 |
| A Concrete Block Building to House Pre-Treatment Equipment | 400,000 |
| The Wet Well Expansion | 100,000 |
| Modifications and Additions to the Pumping Station | 200,000 |
| The Effluent Distribution Valves and Piping | 100,000 |
| TOTAL PROJECT COST | 1,700,000 |

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Next Steps…

- Confirm the alternatives to be implemented
- Confirm the details of design for new stages to implemented
- Identify operational procedure for using the spray irrigation in conjunction with the LSSD

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Welcome

# Public Information Centre

# Omemee Wastewater Treatment Upgrade

May 25th, 2022

Location: Virtual Zoom Meeting
Time: 6pm until 7pm

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Background Information

The City of Kawartha Lakes owns the municipal wastewater system in the Town of Omemee. It was originally constructed as a dual lagoon /spray irrigation system in 1976.

In 2011, the City completed a Class Environmental Assessment based on a Growth Management Plan that forecasted substantial growth in the area. Accordingly, the City elected to upgrade the system by designing a large sub-surface disposal system (LSSDS) which was constructed in 2014. The original spray irrigation system was to be decommissioned. Unfortunately, the LSSDS has not performed to its original design standards, and is unable to handle the capacity of design flows. The system is currently operating as a combination of the new LSSDS and the original spray irrigation system.

Since that time, the growth forecast has been revised downward. Omemee will not require the wastewater treatment capacity that had originally been forecasted. The City and Greer Galloway are reviewing the current system to determine the best path forward.

These upgrades and recommendations will be carried out as a Schedule 'C' project under the terms of the Municipal Class Environmental Assessment (Class EA) process, which is approved under the Environmental Assessment Act.

Kawartha Lakes

GREER GALLOWAY

CONSULTING ENGINEERS


Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Limitations of The Existing System

**Slime and Suspended Solids -** In spring and warmer months of the year, effluent from the lagoons contain seasonal spikes of suspended solids. These can clog pumping systems. Effluent undergoes a screening process before the pump-chamber that removes some of the suspended solids, but not all. This causes an organic build up on both the screen and the side walls of the wet well. The presence of slime clogs the screen and the pumps and requires continuous attention to keep the system functioning.

**Soil Composition –** In the tile bed area, pockets of silty sand exist within the layers. The effluent is unable to filter through the dense lower level quickly enough, causing build up and affecting the upper level. Other issues might be low permeability due to sand and silty sand, fouling of the sand due to slime/suspended solids or hydraulic segregation where different types of sand/silt/soil separate into layers, reducing permeability.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Alternatives

**Do Nothing**

This alternative would have the lowest capital cost and would involve using the existing LSSDS to discharge all treated effluent. This option is not feasible due to low LSSDS capacity and maintenance issues.

**Replace/Rehabilitate the System**

This would option would have the highest capital cost and construction time. It would involve a full redesign of treatment and discharge system. The costs of this option would be prohibitive, and a full replacement is unnecessary to achieve required capacity and address limitations.

**Utilise Spray Irrigation and LSSDS Effluent Discharge**

This option is the second highest in capital costs and construction time. It involves running the LSSDS at reduced capacity and using the spray irrigation system to make up the required capacity. This is the preferred alternative as it addresses existing issues and provides sufficient capacity at the lowest capital cost.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Preferred Alternative

- The preferred alternative consists of several improvements throughout the wastewater treatment process that aim to alleviate limitations described and to maximise ongoing efficiency.
- To assist with the removal of suspended solids, the effluent is to undergo additional treatment before entering the LSSDS.
- Other system upgrades are also being implemented to improve the treatment process.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Preferred Alternative – Pre-Wet Well

**Pre-Treatment of the Effluent**

To assist with the removal of suspended solids, the effluent is to be treated before entering the wet well:

**Travelling Screen**

This screen intercepts weeds and debris before entering the wet well, reducing clogging in the well. Screened weeds and debris will be sent to a storage tank and disposed of.

**Dissolved Oxygen Flotation**

Highly effective in removing algae and other contaminants. Will clean effluent to be sent to a new wet well.

Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Preferred Alternative – Post-Wet Well

**Second Wet Well**
To contain clean effluent for pumping to the LSSDS.

**New Pumps**
Existing pumping equipment needs to be closely monitored and may require replacement based on the requirements of the new system.

**Distribution to LSSDs**
Replace six-way distribution valve to be replaced with a new valving system

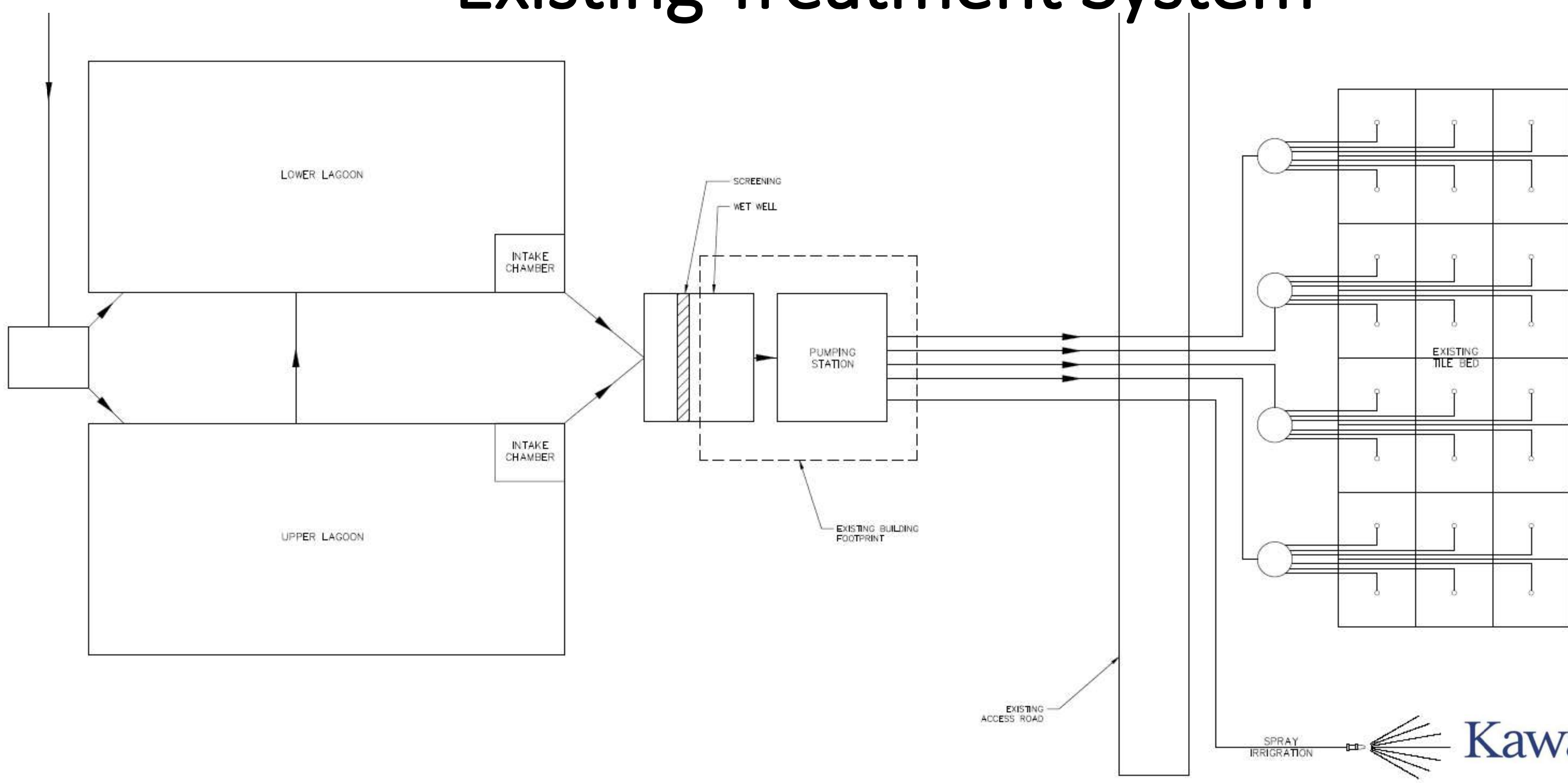
**Hydraulic Load Control**
Reduce the hydraulic load to tile bed in accordance with field conditions.

**Utilise Existing Spray Irrigation**
Continue to use the spray irrigation to supplement the LSSD system's current limitations.

Kawartha Lakes

GREER GALLOWAY CONSULTING ENGINEERS

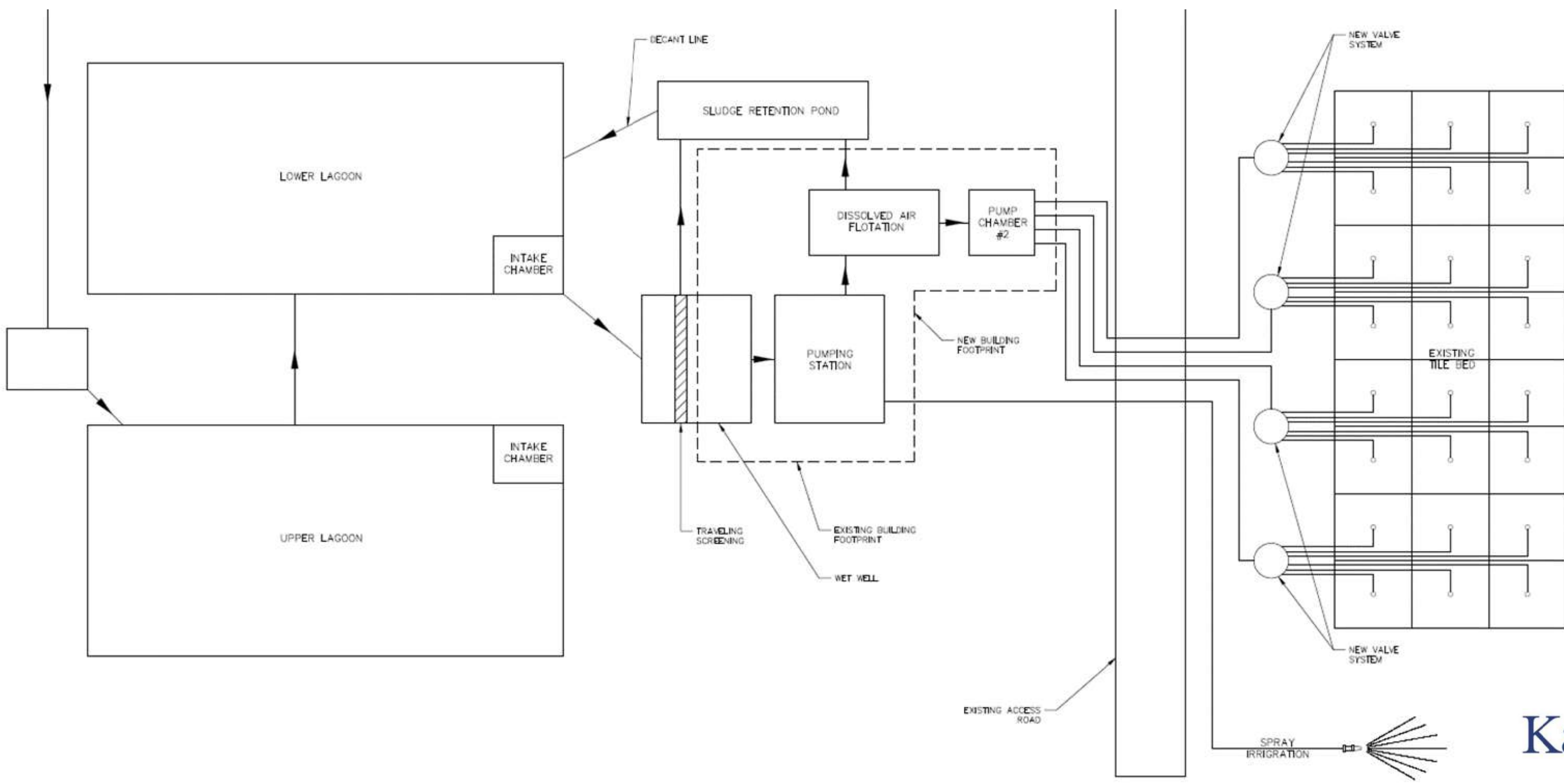
# Existing Treatment System




Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Proposed Treatment System




Kawartha Lakes

GREER GALLOWAY
CONSULTING ENGINEERS

# Supporting Studies

- **LSSDS - Hydrogeological Study**
  - Based on our analysis and the amount of effluent successfully infiltrated over the past five years we conclude that 350 m3/day is a reasonable and conservative estimate of the current capacity of the LSSDS. 350 m3/day is equal to a loading of approximately 17 L/m2/day or kv = 2 x 10-5 cm/s, which is conservative for silty sand.

- **Spray Irrigation – Aerosolization and Capacity**
  - Currently, the most northerly spray nozzle is approximately 118 meters from the existing the property boundary to the north. To comply with requirements the spray nozzle will be moved to an alternative location, at a minimum of 150 meters from the northern property boundary.
  - The sustainable capacity of the irrigation system has been demonstrated to be 608 m3/day through historic data and operation.

Kawartha Lakes

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CONSULTING ENGINEERS

# Cost Estimates

| Item | Cost |
|---|---|
| **The Pre-Treatment Travelling Screen** | $100,000 |
| **The Sludge Storage Tank and Disposal Area** | $200,000 |
| **The Dissolved Air Flotation Package Plant (DAF)** | $300,000 |
| **A Concrete Block Building to House the Pre-treatment Equipment** | $150,000 |
| **The Wet Well Expansion** | $40,000 |
| **Modifications and Additions to the Pumping Station** | $100,000 |
| **The Effluent Distribution Valves and Piping** | $40,000 |
| **Total Equipment and Hard Costs** | **$930,000** |
| **Allowance for Labor, Assembly and Operational Use** | **$1,000,000** |
| **TOTAL PROJECT COST** | **$1,930,000** |

Kawartha Lakes

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# Thank you

Kawartha Lakes

# APPENDIX I: Project Contacts

**Project Contacts/Stakeholder List**

M.F. McKenzie
556 Hwy 7A
Bethany Ontario
705 277 2677
smmckenzie1965@gmail.com

c.miller@start.ca
Chris Miller

MHSTCI

Harvey, Joseph (MHSTCI) <Joseph.Harvey@ontario.ca>

Barboza, Karla (MHSTCI) <Karla.Barboza@ontario.ca>

MECP

Orpana, Jon (MECP) Jon.Orpana@ontario.ca

EA Notices to ERegion (MECP) eanotification.eregion@ontario.ca

FN

info@scugogfirstnation.com;

emilyw@curvelake.ca;

juliek@curvelake.ca;

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consultation@mbq-tmt.org;

consultation@alderville.ca;

shardayj@ramafirstnation.ca;

ptbometis@gmail.com

consultation@mbq-tmt.org

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nicoles@mbq-tmt.org

CC: consultations@metisnation.org; inquiries@williamstreatiesfirstnations.ca;

Kawartha Conservation

geninfo@kawarthaconservation.com;

jstephens@kawarthaconservation.com

MNRF

hal.leadlay@ontario.ca

Kawartha Lake Stewards Association

mike.dolbey@sympatico.ca

# APPENDIX J: FN Responses

Government Services Building
22 Winookeedaa Road
Curve Lake, Ontario K0L1R0

Phone: 705.657.8045
Fax: 705.657.8708
www.curvelakefirstnation.ca

CURVE LAKE FIRST NATION

July 3rd, 2020

Juan Rojas, P. Eng.
Director, Engineering and Corporate Assets
City of Kawartha Lakes
26 Francis Street, P.O. Box 9000
Lindsay, ON K9V 5R8

**RE: Omemee Wastewater Treatment Operations - Class Environmental Assessment**

Dear Mr. Rojas,

I would like to acknowledge receipt of your correspondence, which was received on June 29th, 2020, regarding the above noted project.

As you may be aware, the area in which this project is proposed is situated within the Traditional Territory of Curve Lake First Nation. Our First Nation's Territory is incorporated within the Williams Treaties Territory and was the subject of a claim under Canada's Specific Claims Policy, which has now been settled. All 7 First Nations within the Williams Treaties have had their harvesting rights legally re-affirmed and recognized through this settlement. We strongly suggest that you provide Karry Sandy-Mackenzie, Williams Treaty First Nation Claims Coordinator, 8 Creswick Court, Barrie, ON L4M 2S7, with a copy of your proposal as your obligation to consult may also extend to the other First Nations of the Williams Treaties.

Curve Lake First Nation is requiring a File Fee for this project in the amount of $250.00 as outlined in our *Consultation and Accommodation Standards*. This Fee includes project updates as well as review of standard material and project overviews. Depending on the amount of documents to be reviewed by the Consultation Department, additional fees may apply. **Please make this payment to Curve Lake First Nation Consultation Department and please indicate the project name or number on the cheque.**

If you do not have a copy of *Curve Lake First Nation's Consultation and Accommodation Standards* they are available at https://www.curvelakefirstnation.ca/services-departments/lands-rights-resources/ consultation/. Hard copies are available upon request.

Based on the information that you have provided us with respect to the Omemee Wastewater Treatment Operations - Class Environmental Assessment, Curve Lake First Nation may require a Special Consultation Framework for this project. Information on this Framework can be found on page 9 of our *Consultation and Accommodation Standards* document.

In order to assist us in providing you with timely input, it would be appreciated if you could provide a summary statement indicating how the project will address the following areas that are of concern to our First Nation within our Traditional and Treaty Territory: possible environmental impact to our

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Curve Lake, Ontario K0L1R0

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drinking water; endangerment to fish and wild game; impact on Aboriginal heritage and cultural values; and to endangered species; lands; savannas etc.

After the information is reviewed it is expected that you or a representative will be in contact to make arrangements to discuss this matter in more detail and possibly set up a date and time to meet with Curve Lake First Nation in person (or virtually).

Although we have not conducted exhaustive research nor have we the resources to do so, there may be the presence of burial or archaeological sites in your proposed project area. Please note, that we have particular concern for the remains of our ancestors. Should excavation unearth bones, remains, or other such evidence of a native burial site or any other archaeological findings, we must be notified without delay. In the case of a burial site, Council reminds you of your obligations under the *Cemeteries Act* to notify the nearest First Nation Government or other community of Aboriginal people which is willing to act as a representative and whose members have a close cultural affinity to the interred person. As I am sure you are aware, the regulations further state that the representative is needed before the remains and associated artifacts can be removed. Should such a find occur, we request that you contact our First Nation immediately.

Furthermore, Curve Lake First Nation also has available, trained Cultural Heritage Liaisons who are able to actively participate in the archaeological assessment process as a member of a field crew, the cost of which will be borne by the proponent. **Curve Lake First Nation expects engagement at Stage 1 of an archaeological assessment** so that we may include Indigenous Knowledge of the land in the process. We insist that at least one of our Cultural Heritage Liaisons be involved in any Stage 2-4 assessments, including test pitting, and/or pedestrian surveys to full excavation.

Although we may not always have representation at all stakeholder meetings, as rights holders', it is our wish to be kept apprised throughout all phases of this project. Please note that this letter does not constitute consultation, but it does represent the initial engagement process.

Should you have further questions or if you wish to hire a Liaison for a project, please contact Julie Kapyrka or Kaitlin Hill, Lands and Resources Consultation Liaisons, at 705-657-8045 or via email at JulieK@Curvelake.ca and KaitlinH@Curvelake.ca .

Yours sincerely,

Chief Emily Whetung
Curve Lake First Nation

# MOHAWKS OF THE BAY OF QUINTE

## *KENHTEKE KANYEN'KEHÀ:KA*

***COMMUNITY INFRASTRUCTURE / TECHNICAL SERVICES / ENVIRONMENT***
***24 Meadow Drive., Tyendinaga Mohawk Territory, ON K0K 1X0***
***Phone 613-396-3424 Fax 613-396-3627***


August 17th, 2020

Juan Rojas
Director: Engineering and Corporate Assets
City of Kawartha Lakes
26 Francis Street, P.O. Box 9000,
Lindsay, ON K9V 5R8

**RE: Omemee Wastewater Treatment Operations**
**Notice of Study Commencement, Class Environmental Assessment**
**City of Kawartha Lakes**

Dear Mr. Rojas,

We acknowledge your invitation to participate in the environmental assessment process as it relates to the Omemee Wastewater Treatment Operations project in the City of Kawartha Lakes.

As a First Nation with limited resources and capacity it is difficult to actively participate in all environmental assessments in the surrounding area; however, the Mohawks of the Bay of Quinte (MBQ) would be concerned if the preliminary archaeological investigations found burial remains. There is a traditional process that must be followed for the repatriation or re-interment of remains.

The Mohawks of the Bay of Quinte expect the project to be carried out in an environmentally sensible manner that is consistent with the laws and regulations governing the said project. We appreciate your efforts in our endeavors to determine proper use of lands of interest to the community, the prevention or mitigation of anticipated and non-anticipated effects of the proposed project, and efforts to ensure maximum benefit to our community and generations to come.

The above shall not be construed so as to derogate from or abrogate any inherent, Aboriginal, treaty, constitutional, or legal rights of the Mohawks of the Bay of Quinte.

Sincerely,

R. Donald Maracle, Chief
Mohawks of the Bay of Quinte

Cc: File

**APPENDIX K: Notice of Completion**