RM OF ALEXANDER

Wastewater Lagoon
Manitoba Environment Act Proposal
FINAL

KGS Group 15-1274-003
October 2015

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October 23, 2015 File No. 15-1274-003

Environmental Approvals Branch
Manitoba Conservation and Water Stewardship
Suite 160, 123 Main Street
Winnipeg, Manitoba
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ATTENTION: Ms. Tracey Braun, M.Sc.
Director

RE: Environment Act Proposal
Rural Municipality of Alexander Wastewater Lagoon
Final Report

Dear Ms. Braun:

On behalf of the RM of Alexander, KGS Group is pleased to submit four (4) paper and one (1) electronic copy of the final Environment Act Proposal submission to obtain a licence to construct and operate a wastewater lagoon to meet the needs of the municipality, residents of the Bird River area and cottagers at Pointe du Bois. An agreement for the RM of Alexander to haul wastewater to the RM of Lac du Bonnet lagoon expired on December 31, 2014. A new agreement has been approved with the understanding that the RM of Alexander will construct a new lagoon as indicated in this proposal.

As part of the licensing process, a Manitoba Conservation Environment Act Proposal Form with the $7,500.00 application fee has been included with the Environmental Assessment report.

Please do not hesitate to contact the undersigned if you have any questions or require additional information.

Yours truly,

Shaun Moffatt, M.Sc.
Senior Environmental Scientist

SM/gs/jr
Enclosure

cc: Scott Spicer, RM of Alexander

EXECUTIVE SUMMARY

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) was retained by the Rural Municipality (RM) of Alexander to prepare a Manitoba Environment Act Proposal (EAP) to obtain the necessary Environment Act Licence (EAL) for the proposed Wastewater Lagoon. In accordance with the *Environment Act* (C.C.M.S. c. E125) wastewater lagoons are considered a Class 2 Development under Manitoba Regulation 164/88.

Currently the RM of Alexander residents in the Bird River area haul their holding tank waste to the RM of Lac du Bonnet lagoon, located at SE 19-15-12E. The long distance that the wastewater must be transported, equates to higher fees for residents and the agreement for the RM of Alexander to haul wastewater to the RM of Lac du Bonnet lagoon expired on December 31, 2014. A new agreement has been approved with the understanding that the RM of Alexander will construct a new lagoon as indicated in this proposal. Considering the cost of transporting sewage and the expiration of the agreement, the RM of Alexander commissioned KGS Group to investigate potential lagoon sites within the RM of Alexander.

The proposed lagoon site is located within a 13.5 ha parcel of land within NE 9-16-13E north of PR 313 and approximately 15 km west of Pointe du Bois. As this location is within the RM of Alexander it will provide a shorter haul distance for the municipality residents as well as for the cottagers at Pointe du Bois who also haul their sewage to the RM of Lac du Bonnet lagoon.

The proposed lagoon will be a two cell facultative lagoon, operating in series, providing a design capacity of 18,000 m^3 with a hydraulic retention time of 12 months prior to annual discharge. The site will include a gravel access road, a truck discharge facility into the solids separation cell and two sludge drying beds.

The proposed lagoon site was selected as it is currently being used by Manitoba Hydro as a clay borrow site under Quarry Lease (QL-1947) as part of the Pointe du Bois Spillway Replacement project. The benefits of selecting this site is that it has already been cleared and grubbed, it has a reasonable access road with an upgradeable gate system, there is constructed site drainage, the borrow excavation can be used reducing the lagoon construction cost and there is an extensive database of site soil conditions. The site is predominately surrounded by undeveloped forest, with the exception of some cleared land and camp buildings on the private property to the west located at NW 9-16-13E1.

Project-environment interactions were assessed to identify potential environmental effects associated with the project activities. As the site was previously disturbed as a clay borrow area, it is already known that there are no major environmental constraints such as rare species or archaeological resources on the site however the Manitoba Conservation Data Centre (MCDC) indicated that there was one occurrence of alternate-leaved dogwood (S3) on the site. Mitigation and follow-up measures were identified for potential adverse environmental effects including, air quality, soils, groundwater, surface water, fish and fish habitat, wildlife and vegetation, health and well-being, and worker safety.

Based on the available information on the project and the environment, the assessment of environmental effects outlined in this environmental assessment report, and the application of proposed mitigation measures and the conduct of required follow-up, the proposed RM of Alexander lagoon will not likely result in any significant residual adverse environmental effects.

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1.0 INTRODUCTION

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) was retained by the Rural Municipality (RM) of Alexander to prepare a Manitoba Environment Act Proposal (EAP) to obtain the necessary Environment Act Licence (EAL) for the proposed Wastewater Lagoon. In accordance with the *Environment Act (C.C.M.S. c. E125)* wastewater lagoons are considered a Class 2 Development under Manitoba Regulation 164/88.

Currently the RM of Alexander residents in the Bird River area haul their holding tank waste to the RM of Lac du Bonnet lagoon, located at SE 19-15-12E. The agreement for the RM of Alexander to accept wastewater to the RM of Lac du Bonnet lagoon expired on December 31, 2014. A new agreement has been approved with the understanding that the RM of Alexander will construct a new lagoon as indicated in this proposal. The long distance that the wastewater must be transported, equates to higher fees for residents. Considering the cost of transporting sewage and the expiration of the agreement, the RM of Alexander commissioned KGS Group to investigate potential lagoon sites within the RM of Alexander.

The proposed lagoon site is located within a 13.5 hectare (ha) parcel of land within NE 9-16-13E1 north of PR 313 and approximately 15 km west of Pointe du Bois, within the northeast quarter of Section 9 Township 16 Range 13E1 (NE-9-16-13E1, Figure 01). As this location is within the RM of Alexander it will provide a shorter haul distance for municipality residents as well as for the cottagers at Pointe du Bois who also currently haul their sewage to the RM of Lac du Bonnet lagoon.

The sewage facility will include a gravel access road, a truck discharge facility into the solids separation cell, a primary cell, a secondary cell, and two sludge drying beds. The proposed lagoon will be a two cell facultative lagoon, operating in series, with a design capacity of 18,000 m^3 and a hydraulic retention time of 12 months (365 days) prior to annual discharge. The sewage volume hauled from the RM of Alexander to the Lac du Bonnet lagoon in 2013 was 11,271 m^3 (2,977,638 USG) and in 2014 the volume was 11,007 m^3 (2,907,835 USB). The lagoon will not receive industrial wastewater.

Several potential sites were investigated by KGS Group, with the proposed lagoon site selected as it is currently being used by Manitoba Hydro as a clay borrow site under Quarry Lease (QL-1947) as part of the Pointe du Bois Spillway Replacement project. The benefits of selecting this site is that it has already been cleared and grubbed, it has a reasonable access road with an upgradeable gate system, there is constructed site drainage, the borrow excavation can be used to reduce the lagoon construction cost and there is an extensive database of site soil conditions.

This document provides the information required for the RM of Alexander to obtain a Class 2 Development Licence under the *Environment Act* for the construction and operation of the proposed wastewater lagoon.

2.0 DESCRIPTION OF DEVELOPMENT

The following sections have been structured to address the requirements of the Description of Development as outlined in the Environment Act Proposal Form.

2.1 CERTIFICATE OF TITLE

The proposed lagoon site is located on Provincial Crown Land within the RM of Alexander and the limits of NE-9-16-13E1 (Figure 01). As the property is Crown Land a Certificate of Title is not available, however, a copy of an abstract for the property was obtained from the Property Registry of Manitoba. Manitoba Hydro currently holds a Quarry Lease (QL-1947) for clay extraction from a portion of this quarter section. The RM of Alexander passed a resolution on April 14, 2015 to negotiate a Memorandum of Understanding (MOU) with Manitoba Hydro to transfer a portion of the Quarry Lease for construction of the proposed lagoon on the condition that the necessary Environment Act Licence is obtained. The MOU will also allow Manitoba Hydro to transfer the balance of the Quarry Lease to the RM of Alexander when Manitoba Hydro no longer requires the site. A copy of the property abstract, QL-1947 and the resolution are provided in Appendix A.

2.2 MINERAL RIGHTS

While Manitoba Hydro has a Quarry Lease for clay it is assumed that the owner of the mineral rights beneath the site is currently and will remain with the Province as it is Crown Land.

2.3 EXISTING AND ADJACENT LAND USE

The proposed lagoon site is currently being used by Manitoba Hydro as a clay borrow site, referred to as CL-3, as part of the Pointe du Bois Spillway Replacement project (Appendix B, Photo 1). Prior to being used as clay borrow site the area consisted of undeveloped Jack Pine Forest on bedrock (Photo 2) and Mixedwood Forest (Photo 3) similar to the majority of the surrounding area. Manitoba Hydro cleared an area of approximately 13.5 ha at CL-3 in the fall of 2012. The topsoil was stripped and stockpiled for revegetation in a long windrow along the north side of the site outside of the perimeter ditch. The silty subsoil was also stripped and

stockpiled along with reject clay for site reclamation in a long windrow stockpile along the west side of the site and on the inside of the perimeter ditch. Temporary site infrastructure was constructed which included an access road from PR 313 to the southeast corner of the site (Photo 4), on-site gravel access road, and perimeter ditching (Photo 5) which directed site drainage to a two-cell settling pond in the northwest corner of the site. The bottom of the settling pond is at elevation 264 m asl and the slope of the sides are designed at 2H:1V to an elevation of 268 m asl. The settling pond discharges over a rock-lined overflow weir (crest at elevation 267.0 m asl) into a natural creek bed which then drains into Rice Creek approximately 150 m north of the settling pond discharge. Clay material was excavated from the borrow excavation and dried and stockpiled on site until needed for construction (Photo 6). It is anticipated that when the site is handed over from Manitoba Hydro to the RM of Alexander that the access roads and remnant clay borrow excavation will be retained. Stockpiled material will be removed and the perimeter ditching will be filled in and re-graded unless the RM of Alexander indicates that they will maintain the ditching.

Land use adjacent to the proposed site is as follows:

- West – Predominately undeveloped Mixedwood Forest, with some areas cleared and camp buildings constructed on the adjacent private property on NW-9-16-13E1.
- North – Predominately undeveloped Mixedwood Forest and low lying wetland habitat along Rice Creek (Photo 7).
- East – Predominately undeveloped Jack Pine Forest on bedrock outcrops and Mixedwood Forest with low lying wetland habitat along Rice Creek.
- South – PR 313 (Photo 8) and predominately undeveloped Jack Pine Forest on bedrock outcrops with small pockets of low lying wetland habitat.

The Manitoba Conservation and Water Stewardship (MCWS) indicates that a lagoon site should be located as far as practicable from habitation or any area which may be built up within a reasonable future period. More specifically, the MCWS Design Objectives for Wastewater Treatment Lagoons indicates that lagoons should not be located any closer than 460 m from any center of population and individual residences should not be any closer than 300 m, as measured from the outer toe of the nearest dyke [(1)]. The nearest built up area is the housing and cottages in the Bird River area west of PR 315, approximately 3 km west of the lagoon site.

While there are structures within the private property adjacent to the west side of the site, the outer toe of the nearest dyke is approximately 550 m from the property line and therefore there is no concern about a residence within 300 m.

2.4 LAND USE DESIGNATION AND ZONING

The property has a land use designation of Natural Resource Area as per the Winnipeg River Planning District Development Plan and is zoned for Resource Development per the RM of Alexander Zoning By-Law. The proposed lagoon site, as previously noted, is located on Crown Land within the RM of Alexander and developed by Manitoba Hydro for clay extraction under QL-1947. The site is designated as Class 7RW, according to the Canada Land Inventory Soil Capability for Agriculture Map for the Pointe du Bois region. As such, the site is designated as water quality management zone N4 in accordance with the Nutrient Management Regulation 62/2008.

2.5 PREVIOUS STUDIES AND ACTIVITIES

Several studies and associated activities were initiated to explore alternatives for the disposal of wastewater for residents of the RM of Alexander. These were initiated in preparation for the December 31, 2014 expiration of the agreement for the RM of Alexander to haul wastewater to the RM of Lac du Bonnet lagoon. A brief summary of some of the key previous studies and activities is provided in the following sections.

2.5.1 Lagoon Feasibility Study

KGS Group was retained in 2013 by the RM of Alexander to undertake lagoon feasibility study at two potential lagoon sites in the Bird River area on land owned by the municipality [(2)]. Site #1 is situated just north of Still Cove Road, on the east side of Highway 315. Site #2 is located beside the active RM of Alexander Landfill near the south end of Highway 315 and Rice Creek. To identify if the site soils were suitable for construction of a sewage lagoon a test pitting program was completed with seven (7) test pits excavated at Site #1 and six (6) test pits excavated at Site #2.

The natural soils at Site #1 consisted of high quality silty clay considered very good for lagoon construction, although portions of Site #1 were covered by a mix of peat soils and wood waste, as the site was previously used to dispose of wood waste from a large wind storm. A large portion of the site was not accessible to drilling equipment as it was low and marshy so further investigations would be required to confirm the presence of clay soils. There is also exposed bedrock just north of and at the site entrance with a possibility that a local bedrock high could be encountered within the lagoon footprint. The very good quality clay soils would make it possible to effectively seal any bedrock highs, but it would be preferable if bedrock was not encountered in the lagoon footprint. In addition to soil conditions, there are houses or cabins situated west of Highway 315. While there is no direct line of site between the residences and the site, it appears that one of the structures is just within the allowable 300 m buffer zone for a lagoon such that the lagoon location would need to be shifted further east.

The soils at Site #2 had high silt content and there was water seeping into the test pits through the relatively permeable silt soils indicating the soil was not appropriate for lagoon construction. As such no further investigations were completed at Site #2 as it is not feasible.

As part of this study the required lagoon volume of approximately 12,500 m^3 was estimated based on records of hauled sewage from the RM of Alexander to the RM of Lac du Bonnet lagoon. To account for future growth and to allow for the receipt of wastewater from other areas (Pointe du Bois) the lagoon was expected to accommodate 18,000 m^3.

2.5.2 Lagoon/Wetland Compatibility Study

The RM of Alexander and Manitoba Hydro expressed interest in sharing the CL-3 site for lagoon construction and for wetland restoration, if possible. As such, KGS Group was jointly retained by the RM of Alexander and Manitoba Hydro to determine the compatibility of having a lagoon and a wetland to coexist within the CL-3 site [(3)]. In particular the purpose and scope of the compatibility study was to outline the lagoon and wetland requirements and assess whether there would be any regulatory or functional/technical restrictions associated with constructing a lagoon at the site and whether there would be any cost savings or at a minimum no adverse cost implications.

Based on the hauled sewage figures provided by the RM of Alexander, the required lagoon volume was approximately 12,500 m^3, although to allow for future growth and wastewater hauled from other areas, the lagoon was sized for 18,000 m^3. A practical treatment option for this wastewater is a conventional earthen two-cell facultative lagoon system, providing 12 months storage. The lagoon would require a total surface area of approximately 2.0 ha consisting of a 0.1 ha solids separation cell, 0.4 ha primary cell for storage and treatment, a 1.1 ha secondary cell for winter storage, and a sludge drying bed area of approximately 0.1 ha for removal of solids from the cells.

As part of the Pointe du Bois Spillway Replacement project, Manitoba Hydro committed to the restoration of 3.0 ha of wetland within the CL-3 site using the clay excavation area as a basis for the restored wetland. The site would be regraded to provide an environment that would foster the growth and propagation of wetland plant species. If developed, this would be a gravity flow through system that would have no long-term maintenance requirements for Manitoba Hydro. The remainder of the disturbed site not utilized for wetland restoration would also be revegetated by Manitoba Hydro during completion of the project using a mix of native grasses.

The only potential regulatory restriction to constructing a lagoon at the site identified during the study was the site designation as water quality management zone N4 in accordance with the Nutrient Management Regulation 62/2008. As specified under Section 14(1) of the regulation no person shall construct, install, site, locate, replace, expand or modify a wastewater treatment lagoon on land in nutrient management zone N4. However, as per Section 14(3) of the regulation, a written application for approval can be made to the Director. This would be on a site specific basis, providing that soil conditions and a geotechnical assessment support the technical requirements for containment to prevent significant harm to water or an aquatic ecosystem or public health. While the regional soils indicate the site consists of shallow soils with excess water, the localized soils at the site have good quality clay soils suitable for construction of a lagoon that would support written application to the Director for approval.

At this time there does not appear to be any technical/functional restrictions to having the lagoon and wetland at the same site. To protect water bodies from nutrient loading a minimum 3 m nutrient buffer zone would need to be established around the wetland, in accordance with the Nutrient Management Regulation 62/2008. There is sufficient space within CL-3 to

accommodate the total 3.0 ha area required for the two-cell facultative lagoon system, the 3.0 ha wetland restoration and the 3 m nutrient buffer zone around the wetland, while also considering the necessary set-backs from the private property adjacent the west side of the site.

Locating both the lagoon and the wetland within the CL-3 site could have potential cost savings for Manitoba Hydro and the RM of Alexander. Manitoba Hydro could have reduced costs as they would not have to remediate the 3.0 ha area that would be used for construction of the lagoon. As there is substantial geotechnical information available for the site there would be lower costs to the RM of Alexander for site investigations and design of the lagoon. Additionally, the site has already been cleared and an access road constructed which would provide further cost savings to the RM of Alexander.

Potential concerns identified during the study associated with locating both the lagoon and wetland at the site included the wetland attracting nuisance species with the potential to negatively impact the lagoon dykes. Nuisance species include burrowing rodents that can damage lagoon dykes, waterfowl that add nutrient loading and mosquitoes. These, however can be controlled through appropriate design measures and routine maintenance of the lagoon.

KGS Group concluded the study by making the following recommendations;

- The RM of Alexander follow-up with MCWS to confirm that a lagoon could be located at CL-3 considering the site designation as water quality management zone N4 under the Nutrient Management Regulation 62/2008.
- Manitoba Hydro consults with MCWS to confirm their approval and recognition of constructing a wetland and a lagoon within the CL-3 site.
- Both the RM of Alexander and Manitoba Hydro consult with each other to confirm schedule and any other potential conflicts that may have detrimental impact to each other's requirements and plans for the site.

2.5.3 Pointe du Bois Spillway Replacement Project – Clay Borrow CL-3

As part of the Pointe du Bois Spillway Replacement Project for Manitoba Hydro, KGS Group completed 9 test pits in the cleared area of CL-3 to inspect soil conditions and discuss material properties [(4)]. These test pits were completed to confirm and supplement the previous Stage IV

investigations completed at CL-3. The clay material obtained from the CL-3 borrow area was intended to be used as Class 1 Impervious Fill within the permanent earthfill dams and temporary cofferdams. During each test pit excavation, the team inspected the soil by visual classification and estimation of the effort for drying to near optimum moisture content. Samples were collected from the side walls of the test pits, for the full depth of the estimated readily useable soil.

The materials encountered were typical to the site as represented in the previous investigations. Generally, the stratigraphy consisted of topsoil/organic matter (typically 0.15 to 0.3 m thick) over silty clay of intermediate plasticity to a depth varying between 1.2 and 2.0 m over high plasticity clay. In addition to the visual material classification carried out on-site, test pit logs were prepared and samples of the material were submitted to Manitoba Hydro's Materials Testing Laboratory for testing of moisture content, plasticity limits, hydrometers, proctor compaction, and organic content. In general, the lab test results agreed with the observations made in the field and were consistent with the previous Stage IV investigations. Specific lab testing results indicated that the samples from 6 test pits generally in the South East quadrant of the site met the material requirements of the specification. It was concluded that the CL-3 site had sufficient material available to suit the needs of the project as a borrow source for Class 1 Impervious Fill.

2.6 PROPOSED DEVELOPMENT

2.6.1 Schedule

Final design of the lagoon and procurement of funding for construction is proposed to begin following receipt of the Environment Act Licence. Lagoon construction works are proposed to begin following the end of the Manitoba Hydro clay borrow operation currently ongoing at the property by Manitoba Hydro, and could extend into early summer 2016. Commissioning and operation of the lagoon is proposed to begin upon completion of construction and after approval for use is obtained from MCWS, currently summer 2016. No date for decommissioning has been set for the lagoon.

2.6.2 Capacity

As noted in section 2.5.1, as part of the lagoon feasibility study the required lagoon volume of approximately 12,500 m^3 was estimated based on records of hauled sewage from the RM of Alexander to the RM of Lac du Bonnet lagoon. To allow for future growth as well as to receive wastewater volume from other areas (Pointe du Bois), the required volume of the lagoon was estimated at 18,000 m^3. Due to the size of the clay borrow pit at CL-3 the secondary cell could accommodate as much as 28,600 m^3.

2.6.3 Design Criteria

Although the project effluent will be discharged overland to the forested area on the west side of the lagoons (Figure 1), the effluent will meet the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) – Tier 1 Water Quality Standards for discharge to a surface water body. The proposed discharge to the approximately 13 ha forest area is included as an added benefit to provide further nutrient uptake and for final polishing of the effluent. The Water Quality Standards include a limit of 200 fecal coliform (E.Coli) per 100 mL, 25 mg/L BOD_5 (or $CBOD_5$), 25 mg/L total suspended solids (TSS), and 1 mg/L total phosphorus (TP). Since the intermittent discharge period is longer than 30 days, total phosphorus standards will be calculated as a rolling average according to the MWQSOG. In addition, the project will adhere to the provisions of the Wastewater Systems Effluent Regulation (SOR/2012-139) for intermittent discharge to a water body. The effluent quality standards that apply to the R.M. of Alexander lagoon under this regulation include a limit of 25 mg/L CBOD, 25 mg/L TSS and 1.25 mg/L un-ionized ammonia (NH_3).

For the purpose of the preliminary design, the following raw wastewater quality was assumed:

INFLUENT WASTEWATER QUALITY PARAMETER	ASSUMED INFLUENT CONCENTRATION
BOD_5	300 mg/L
Total Dissolved Solids	560 mg/L
Total Suspended Solids	240 mg/L
Settleable Solids	4 ml/L
Un-ionized Ammonia	20 mg/L
Organic Nitrogen	20 mg/L
Total Phosphorous	8 mg/L

2.6.4 System Components

The proposed sewage treatment system would be a facultative wastewater lagoon treatment system with supplemental aeration, intermittent discharge, and hydraulic retention of 300 to 365 days or more. The lagoon includes a 0.1 ha solids separation cell, a 0.4 ha primary cell for storage and treatment, a 1.1 ha secondary cell for winter storage, and a sludge drying bed area of approximately 0.1 ha for removal of solids from the cells. The following components are included in the treatment system.

Solids Separation Cell

The solids separation cell includes a storage volume of approximately 1,500 m^3 at 1.5 m operating depth, with an estimated hydraulic retention time of approximately 1 month. The solids separation cell is included in the design for two purposes: to lower BOD within the primary and secondary cell and to facilitate de-sludging of the lagoon. The solids removal cell will be constructed prior to the primary cell with a sand bottom to allow sludge to be removed to adjacent sludge drying beds every two to three years.

A summary of the cell design parameters is shown below:

Annual wastewater volume	18,000 m^3/year
Estimated settleable solids	4 ml/L (or 0.4% of the total volume)
Annual settleable solids volume	72 m^3/year
Hydraulic residence time	~ 1 month

Based on typical estimates for primary settling tanks, an estimated 25% of BOD_5 will be removed within the solids separation cell, or an overall reduction to approximately 150 mg/L prior to flow into the primary cell. This does not include the degradation that would occur during the 1 month storage within the solids separation cell.

Primary Lagoon

The Manitoba Conservation and Water Stewardship – Design Objectives for Wastewater Treatment Lagoons specifies a maximum organic loading rate for primary cells of 56 kg/ha/day for BOD_5. Based on the estimated BOD_5 loading, and a primary cell area of 0.4 ha, the estimated loading rate is approximately 35 kg/ha/day for BOD_5, well below the design objectives. The hydraulic residence time of the primary cell is estimated at approximately 4 months. The primary cell would drain by gravity to the secondary cell. Typical BOD_5 levels for facultative primary cells at this type of loading rate and residence time would be <30 mg/L.

Secondary Lagoon

The storage volume of the secondary cell is approximately 15,000 m^3 at an operating depth of 1.5 m. The Manitoba Conservation and Water Stewardship – Design Objectives for Wastewater Treatment Lagoons specifies a minimum 7.5 months of hydraulic loading, including the secondary cell (minus the minimum 0.3 m residual depth) as well as half of the primary cell volume. The current design provides for 10.5 months of storage, including storage volume within the secondary cell (1.5 m depth) and half of the primary cell.

Cell Liner

Based on previous geotechnical investigations at the site, the in-situ silty clay to clayey silt material will have a permeability below the required 10^{-7} m/s. A review of eight samples from the secondary cell location show clay contents between 22 to 53% and silt + clay contents between 80 to 96%. Additionally, the D_{10} of each of the samples was below 0.001 mm particle diameter during hydrometer testing. Using the empirical Hazen Approximation of hydraulic conductivity, each sample was estimated to have a hydraulic conductivity of $<10^{-8}$ m/s. As such, this material is deemed adequate for liner material in an in-situ state. A minimum of 1 m of this material will be left above bedrock during construction of the cells (Figure 2). In locations within the secondary cell where there is less than 1 m of material above bedrock, clay will be added and compacted to establish the 1 m minimum depth. It is estimated that at least 2 m of high plasticity clay overlies the bedrock over the majority of the secondary cell area.

Discharge System

It is proposed to discharge the effluent into the surrounding forest area (Figure 1). It should be noted that the lagoon is designed to meet the direct to surface water discharge guidelines. The proposed discharge to the forest area is included as an added benefit to provide further nutrient uptake and for final polishing. Some portion of the discharge will be taken up by the flora, with some seepage into the ground, and minimal overland flow toward Rice Creek. Discharge is proposed over a 2 month period every summer, with an average flow rate of 55 USgpm. Discharge during the 2 month period would be applied to an area of approximately 13 ha at a total depth of discharge of approximately 0.15 m (equivalent to 2.5 mm/day). The system would include a header pipe (75 mm diameter) that would split off into a number of perforated pipes for land application. An estimated 11 perforated discharge lines (20 mm diameter), average length of 400 m (200 m to either side of the header pipe), spaced at approximately 30 m apart, would be spread across the 13 ha area. Each perforated line would provide a discharge flow rate of 5 USgpm. The proposed discharge area is to the west of the cleared area.

The discharge system would include 3 – 2 HP submersible pumps. The pumps would be powered by battery packs charged using solar panels. Alternatively, power could be brought in to the site from a distance of approximately 3 to 4 km, although this option may be cost prohibitive relative to the limited power requirements. A third option that could be explored would be to bring in a generator to power the system.

An alternative option may be to pump to the south of PR 313 into a wetlands area at a distance of approximately 1 to 1.5 km from the lagoon. The advantage of this alternative would be additional effluent quality polishing, as well as dilution, prior to ultimate discharge to the Rice Creek. The design would include a horizontal bore under PR 313 and up to 1.6 km of 75 mm HDPE discharge line. The pipe would end-discharge into the wetland at a rate of approximately 55 USgpm for 2 months during the summer.

Supplemental Aeration System

In order to provide an additional level of organics breakdown, and to reduce odours, supplemental aeration could also be provided within the primary and secondary cells during the

spring/summer/fall. Additionally, as the system will include solar power and submersible pumps, these components can be utilized during non-discharge periods. The aeration system would include 3 – 2 HP pumps (used for discharge for 2 months/year), connected to 100 mm diameter HDPE headers looped around each cell. Sprinklers would be connected to these headers, with discharge back into the cell. This system would draw water from the lower anaerobic zone, oxidizing the wastewater through the sprinkler system, and also providing mixing between the aerobic and anaerobic zones. An initial literature search indicates that this should provide 1.5 to 3 lbs of oxygen per horsepower per hour. It should be noted that although the lagoon is designed to meet criteria without the supplemental aeration, this could be included as an added benefit, for further improvement of effluent quality or to handle increased loading.

Sludge Drying Beds

Sludge drying beds are utilized routinely to dewater sludge and collect/treat the sludge leachate. Sludge would be removed from the solids separation cell, as needed, at an assumed solids concentration of approximately 3 to 7%. The total volume of sludge is estimated to be about 70 m^3/year. A typical sludge depth applied on a drying bed is 0.3 m. Based on a semi-favourable drying season (high evaporation, low precipitation), a solids concentration of 40% to 50% should be achievable following 15 to 20 days of drying. In less favourable conditions, a longer period of time would be required to achieve this solids concentration.

The sludge drying beds would be underlain by a 1 m compacted clay liner with 0.2 m of gravel and 0.3 m of sand on top of it (Figure 2). Perforated 100 mm diameter PVC collection pipes would be placed within the gravel material. Sludge would be applied directly on top of the sand material to facilitate drainage into the collection system. The collection pipes would be graded at 1% toward a drying bed sump. The final design would include gradation for gravity flow of leachate from the sump into the solids separation cell.

The anticipated dewatered sludge volume would be approximately 10 to 15 m^3 following dewatering to 50% solids. The cells would be designed to hold several years of operations to allow at least 2 years of freeze-thaw thickening. The dewatered sludge could be land applied in an appropriate designated area on-site, or possibly to the landfill if required.

Additional Site Benefits

The groundwater table in the area is located high in the clay, and within about 1 metre of surface. The large, relatively deep excavation is very unique for a secondary cell with all of the fluid being held below the water table. As such, conventional groundwater hydraulics indicates that the cell will not leak any fluid and no groundwater flow into the cell is expected due to the low-permeability clays at the site. In any case, permeability testing will be conducted of the liner material.

2.6.5 Operation and Maintenance

Effluent Discharge Operations

Discharge will occur once per year over a two-month period, typically during summer or early fall. Water quality samples will be collected and submitted to the laboratory to determine if the quality is acceptable for discharge prior to discharge. The following steps are required for discharge:

- Collect samples with submission for laboratory analysis.
- Based on water quality, determine a discharge schedule.
- Close the transfer pipe valve between the primary and secondary cells.
- Turn off aeration pumps (if used).
- Pull aeration pumps out of the cells. Disconnect the aeration equipment from the pumps and connect the discharge piping to the pumps. Place the pumps back in the secondary cell.
- Turn the pumps back on, with pumping of secondary cell effluent to the discharge area.
- The secondary cell can be pumped out until the water level reaches approximately 30 cm.
- The valve between the primary and secondary cell can be re-opened.
- The pumps can be switched back to aeration.

The Operator should keep records of:

- Water quality.
- When discharge occurred.
- The amount of effluent discharged.
- Any colour and odours observed for the discharge water.
- Water levels in both cells prior to and after discharge.
- Sludge levels in both cells after discharge.

Sludge Drying Bed Operations

The sludge drying beds provide a method of dewatering and stabilizing the sludge collected in the solids separation cell. Once adequately dewatered, the sludge can be applied to land to be used as nutrients for plants. The sludge drying bed operations involve the following procedures:

- Empty out the solids separation cell as required, approximately every 2 to 3 years. Long-stick hoes can be used for this operation.
- Place the sludge onto the sludge drying bed to a sludge thickness of 0.3 m to 0.5 m. The beds are sized to handle over 3 years sludge volume.
- Following a minimum of 2 to 3 years of drying, the sludge can be removed from the sludge drying beds using local loaders and trucks and spread and worked into the on-site soils within the small cleared area around the lagoon, or possibly disposed of at the landfill if required.

The Operator should keep records of:

- When sludge is placed and removed from the drying beds.
- The amount of sludge placed and removed.

Cell Maintenance

Periodic maintenance (annually) of the lagoon cells must be conducted. Monitoring and maintenance includes:

- Erosion – check for erosion of the banks due to rainfall/snowmelt or waves. Re-grading of the banks, or adding rip rap can help mitigate erosion.
- Vegetation – maintaining grass cover on dikes or sideslopes.
- Animals – maintain a program to prevent burrowing animals.

Fence and Gates

Periodic inspection and maintenance (twice annually) of the fence and gates must be conducted to ensure unauthorized persons do not enter the site. The gates and access roads will be wide enough to accommodate winter snow removal and the turning radius of large vehicles.

Roads

The roadways must be maintained throughout the year to ensure safe hauling of wastes to the lagoon and allow for ease of access and turn-around for the truck operators.

Other Operational Records

Additional records for operation of the lagoon include:

- Annual record of wastewater hauled to the lagoon.
- General operations check of pumps, solar panels, valves, pipes, sprinklers for any required maintenance/replacement.

General Safety Considerations

Consideration of the hazards presented at the site requires the lagoon Operator to follow some general safety guidelines:

- Personal hygiene: discuss immunizations with a doctor, do not wear dirty clothes home, frequently clean safety equipment and tools after usage, wear rubber gloves when working on equipment that has had contact with wastewater, see a doctor if injured on the job-site.
- No smoking on-site.
- Ensure all persons with access to the site are aware of the health and safety hazards on the site.
- Properly trained and aware of the dangers of working on or near water.
- Stay off the ice in winter. Ice thickness may be highly variable, particularly in areas of flow from one cell to another.

2.6.6 Funding

The RM will attempt to secure grants for this project but is awaiting environmental approval before applications are made.

2.7 STORAGE OF GASOLINE AND ASSOCIATED PRODUCTS

Gasoline and associated products may be temporarily used and stored at the site during construction of the proposed lagoon upgrades. However, there is no requirement for these products to be used or stored at the site during operation.

3.0 PHYSICAL ENVIRONMENT

3.1 LOCATION, PHYSIOGRAPHIC SETTING AND CLIMATE

The proposed lagoon location is within NE-9-16-13-E1 in an approximately 14.7 hectare parcel of land previously developed by Manitoba Hydro as a clay borrow site north adjacent PR 313, approximately 13 km west of Pointe du Bois, Manitoba.

The project area lies within the Precambrian Drift Plain of the Canadian Shield physiographic region. The project area is located within the Pinawa Ecodistrict of the Lake of the Woods Ecoregion and Boreal Shield Ecozone [(5)]. The Pinawa Ecodistrict is a transition area between the Kenora Ecodistrict to the east with a rugged lake and bedrock-dominated environment and the Stead Ecodistrict to the west with a level to depressional glaciolacustrine plain.

Topographically, the Pinawa Ecodistrict ranges from 350 m above sea level (asl) on its eastern boundary to 305 m asl along its western boundary [(5)]. Slopes vary with grades up to 15 percent with the overall slope being approximately 2.0 m per km towards the west. The surface topography of the property slopes slightly to the northwest with a steeper section along the southeastern edge of the site. The elevation of the property ranges from approximately 278 m asl where the access road intersects PR 313 to approximately 272 m asl along the southeastern edge of the site and 267 m asl at the northwest corner of the site.

The Pinawa Ecodistrict is located within the Subhumid Transitional Low Boreal Ecoclimatic Region characterized by short, warm summers and long, cold winters [(5)]. Climate statistics presented below are from the nearest climate data centre at Pinawa WNRE, approximately 22 km south-southwest of the project area. The area is characterized by an annual daily maximum, average and minimum temperatures of 8.4 ºC, 2.8 ºC and -2.8 ºC, respectively, while the monthly daily average temperature ranges from 19.3 ºC in July to -16.6 ºC in January [(6)]. The average annual total precipitation is 578.3 mm, with 464.3 mm falling as rain and the rest as snow. June has the highest average rainfall (98.8 mm) and December has the highest average snowfall (24.0 cm).

3.2 GEOLOGY

3.2.1 Regional Geology

The project area falls within the Superior Geological Province of the Canadian Shield. The rock formations are Precambrian aged intrusive volcanics consisting primarily of tonalite, granite, minor granodiorite, and related gneiss and migmatites [(7)]. Contacts between the different rock types are usually tight, and no significant weathering is typically observed.

The overburden soils of the Pinawa Ecodistrict are typically local in extent and are of variable type, due to the variable topography of the bedrock [(5)]. West of Lac du Bonnet and Pinawa, the surface deposits are more influenced by glacial events, and larger deposits of lacustrine clay and glacial-fluvial granular material are normally found. Overburden near the Pointe du Bois area typically consists of minor deposits of wave washed sand, silt, and clay overlying bedrock [(7)].

3.2.2 Local Geology

Subsurface investigations, consisting of drill-rig and hand-auger test holes, were completed at CL-3 as part of the Pointe du Bois Spillway Replacement project to identify clay borrow areas. The deposit at CL-3 consists of intermediate and high plasticity silty clay of glacial lacustrine origin and is suitable for use as impervious material to line the lagoon. As part of the investigations KGS Group completed 9 test pits in the cleared area of CL-3 to inspect soil conditions and discuss material properties [(4)]. The materials encountered were typical to the site as represented in the previous Stage IV investigations. Generally, the stratigraphy consisted of topsoil/organic matter (typically 0.15 to 0.3 m thick) over silty clay of intermediate plasticity to a depth varying between 1.2 and 2.0 m over high plasticity clay.

In addition to the visual material classification carried out on-site, test pit logs were prepared and samples of the material were submitted to Manitoba Hydro's Materials Testing Laboratory for testing of moisture content, plasticity limits, hydrometers, proctor compaction, and organic content. In general, the lab test results agreed with the observations made in the field and were

consistent with the previous Stage IV investigations. Based on the laboratory results, the clay material at CL-3 had the following characteristics;

- Unified Soil Classification System of CI to CH, Clay of intermediate to high plasticity.
- Maximum dry density ranging from 1,417 to 1,722 kg/m^3.
- Optimum moisture content ranging from 16.7 to 30.4%.
- Clay content of 26 to 85.3%.
- Plasticity Index of 23.04 to 62.4%.

3.3 GROUNDWATER HYDROLOGY

Groundwater in the area is anticipated primarily within fractures and fracture zones in the bedrock, although there is no MCWS groundwater availability study. The bedrock aquifers have well yields varying locally with the extent of fracturing, generally ranging from 0.01 L/s to 0.5 L/s (0.2 to 8 USgpm) and occasionally up to 5 L/s (80 USgpm). A well yield of 0.01 L/s (860 L/day) is normally adequate for a residence but would likely require a storage tank to handle peak flows such as showers that have flow rates of approximately 0.3 L/s. Local shallow overburden aquifers are considered to be of limited capacity in the area, possibly occurring in the sand and gravel borrow areas.

A search of the provincial GWDrill database for wells surrounding the project indicated that the nearest well is a test well located approximately 1.5 km northwest on NW-15-16-13E, although no pump test data was available. There are also a large number of domestic wells located along the shoreline of the Lee River at Pinawa Bay, with the closest approximately 3 km southwest of the project area. Available records indicate that the wells are cased through the overburden and open hole within the bedrock. Granite bedrock is encountered between 5.5 to 12 m below ground surface and groundwater levels noted on the logs ranged between 2.5 to 12 m below existing grade. The pumping rates available for the few wells that were pump tested ranged from approximately 0.9 to 1.5 L/s (14 to 24 USgpm).

3.4 SURFACE WATER

The Pinawa Ecodistrict is located within the Winnipeg River watershed that is part of the Nelson River drainage system [(5)]. Rice Creek is the closest water body to the lagoon property and is

approximately 200 m north at the closest point. The land to the east, north and west of the lagoon naturally drains towards Rice Creek which then flows into the Lee River at Pinawa Bay approximately 6 km downstream. It is anticipated that the effluent will be discharged once or twice per year, as required, from the secondary cell of the lagoon into forest vegetation to the west of the lagoons.

Water Survey of Canada (WSC) does not measure the flows or levels along either Rice Creek or the Lee River and therefore we are unable to estimate the minimum flows in the vicinity of the lagoon. WSC does, however, have historical flow records from 1982 to 1996 collected on the Dead Creek near the Lee River north of Pinawa (WSC Gauge 05PF065) [(8)]. The Dead Creek drains an area of 122 km^2 of bedrock and peat areas with the headwaters adjacent Rice Lake and therefore the data is considered representative of flow conditions on the Rice Creek. The minimum daily flow throughout the year ranged from approximately 0.01 to 1.7 m^3/s with an average minimum flow of 0.24 m^3/s. The extreme low flows typically occur prior to the spring thaw (January to March) although low flows also occur during summer (July to September). The maximum daily flow throughout the year ranged from approximately 0.02 to 20.9 m^3/s with an average maximum flow of 2.5 m^3/s. Whereas, the average daily flows throughout the year range from approximately 0.02 to 5.5 m^3/s with an overall average flow of 0.7 m^3/s.

Water quality data for the Lee River as collected by MCWS, Water Science and Management Branch in 1997 and 1998 in Pinawa Bay (Station MB05PFS060) is provided in Appendix C [(9)]. Comparing the Lee River water quality data to the Canadian Council of Ministers of the Environment (CCME) Canada-wide Strategy for the Management of Municipal Wastewater Effluent, Effluent Quality Standards and the MWQSOG for the Protection of Freshwater Aquatic Life and Tier 1 Water Quality Standards for Municipal Wastewater Effluent key findings are as follows:

- The Ammonia (dissolved) concentrations have ranged from 0.01 to 0.07 mg/L with an average of 0.033 mg/L all of which were below the Effluent Quality Standard (1.25 mg/L). For the MWQSOG total ammonia limits shall not exceed a site-specific limit derived by Tier II calculations using pH and temperature.
- The *E.Coli* concentrations have ranged from <10 to 120 CFU/100 mL with only approximately 15% of the samples having measurable concentrations. None of the measured concentrations exceed the MWQSOG (200 CFU/100 mL).

- The TP concentrations have ranged from 0.038 to 0.062 mg/L with and average of 0.047 mg/L. None of the measured concentrations exceed the MWQSOG (1 mg/L).

3.5 FISH AND FISH HABITAT

Mr. Wade Biggin of MCWS, Fisheries Branch, conducted a review of the Fisheries Information and Habitat Classification System (FIHCS) species information for the water bodies in the project area including Rice Creek and found that they have no records describing the fish species or fish habitat. (Appendix C) [(10)].

3.6 WILDLIFE, HABITAT AND VEGETATION

The typical land cover in the project area consists of primarily Mixedwood Forest with black spruce, white spruce, balsam fir, birch, trembling aspen, and jack pine also present on bedrock outcrops. Other prominent land cover in the area includes peat bogs and water and, to a lesser extent, man-made development.

The project area is located within the Pinawa Ecodistrict of the Lake of the Woods Ecoregion of the Boreal Shield Ecozone. Deciduous trees such as bur oak and ash grow along streams, especially in the western sector. Jack pine is found primarily on bedrock and sandy deposits, or in combination with black and white spruce, balsam fir and trembling aspen on clayey and loamy upland sites. Bog and transitional peatlands support black spruce, alder and other shrubs, and a ground cover of moss. Sedge with tamarack, alder and birch shrub form the dominant vegetation in fens [(5)].

Characteristic wildlife includes mammals such as moose, black bear, wolf, lynx and snowshoe hare. Birds in the region include ruffed grouse, hooded merganser, pileated woodpecker, bald eagle, turkey vulture, herring gull as well as many waterfowl and songbird species. However, as the site is already disturbed as a clay borrow, it is unlikely that any wildlife sensitive to human disturbance would be present.

The Manitoba Conservation Data Centre (CDC) was contacted to determine if there are any species of concern in the project area. Mr. Chris Friesen of MCWS, CDC completed a search of the rare species database and found one occurrence on NE 9-16-13E, which the project site is

located within, of the alternate-leaved dogwood (*cornus alternifolia*). The plant is ranked S3 which means that it is uncommon throughout its range or in the province (21 to 100 occurrences) (Appendix C) [(11)].

3.7 SOCIOECONOMIC

The RM of Alexander stretches from the eastern shores of Lake Winnipeg east into the Whiteshell Provincial Park and north into the Canadian Shield. The 1,521 km^2 region is serviced by six modern highways, offers parkland, beaches, forest, agriculture, industry and the amenities of both urban and rural settings, and is the hydro power centre of Manitoba.

The RM of Alexander had a population of 2,983 according to the 2011 census [(12)] living in 1,373 of its 3,951 private dwellings, but the population grows to more than 20,000 in the summer. The Belair Provincial Forest can be found in the westernmost part of the RM and the northern half of Brightstone Sand Hills Provincial Forest in its central part. There are eight independent water facilities servicing the RM of Alexander and three waste disposal sites. All primary roads are paved. Secondary roads are graded, graveled and have dust control applied in some areas. The daily traffic flow on Highway #11 north and south bound is approximately 1,600 vehicles per day [(13)].

The RM of Lac du Bonnet had a population of 2,930 living in 1,209 of its 2,569 total private dwellings [(14).] The separately administered town of Lac du Bonnet lies within the borders of the municipality along the Winnipeg River and has a population of 1,069 living in 508 of its 542 total private dwellings.

Pointe du Bois is a small cottage community located northeast of Winnipeg, Manitoba, in an unincorporated section of Census Division No. 1. Pointe du Bois has a Manitoba Hydro generating station and the area provides great fishing for pickerel, northern pike and smallmouth bass.

3.8 HERITAGE RESOURCES

Ms. Heather McClean of the Historic Resources Branch of the department of Tourism, Culture, Heritage, Sport and Consumer Protection examined Branch records and provided KGS Group with shape files containing all known archaeological sites within the study area (Appendix C) [(15)]. It appears that there are numerous archaeological sites of varying types within the study area. Sites have been identified by the presence of ceramic pottery, projectile points and those sites closest to the study area have been identified by the presence of petroforms. Petroforms are figures laid out on bedrock in a variety of patterns including the forms of turtles, snakes and humans. First Nations people believe that they were left long ago and petroform sites are sacred places used from time to time by First Nations people for ceremonial purposes. The site closest to the project was a serpent petroform that was previously destroyed. The next nearest sites are approximately 0.5 km from the project area and include a disturbed and a mostly undisturbed petroform site. Nearly all the other sites are located in close proximity to the shoreline of the Lee River at Pinawa Bay, well away from the project area.

4.0 POTENTIAL ENVIRONMENTAL EFFECTS ASSESSMENT

An environmental effect includes any change that the project may cause to the environment (biological, physical, social and economic). Environmental effects were identified from interactions between proposed project activities and environmental components. Considering the proposed lagoon site is currently being used by Manitoba Hydro as a clay borrow site as part of the Pointe du Bois Spillway Replacement project, it is already known that there are no major environmental constraints such as rare species or archaeological resources on the site. Likewise creation of the proposed sewage lagoon will have a positive effect on several communities in the RM of Alexander and the RM of Lac du Bonnet including the cottages at Pointe du Bois. Mitigation measures and follow-up activities were identified for environmental effects determined to be adverse.

4.1 AIR QUALITY

Construction of the proposed lagoon may result in temporary increased fugitive dust levels in the local area. Dust may be generated during construction activities such as placing and shaping fill to create the lagoon cells and sludge drying beds as well as from vehicle and construction equipment on the gravel access road. It is unlikely that Manitoba's air quality guidelines would be exceeded during construction and any effects would be very short term. Therefore the potential adverse effects on air quality were assessed to be minor. The effects may be mitigated by using an approved dust suppressant such as water, controlling construction vehicle speeds, limiting construction activities during high wind events, and re-establishing vegetation on disturbed areas.

The shorter distance required for trucks to haul sewage from cottages and homes in the RM of Alexander and RM of Lac du Bonnet will mean that fewer greenhouse gas emissions will result from the project. However, increased volatile organic carbon (VOC) levels may result from fuels and other hazardous substances used during construction activities. During construction it is anticipated that the contractor will transport fuel to the site using a fueling truck in order to fuel equipment on-site. The potential adverse effects on air quality in the local area were assessed to be minor and short term in duration. However, proposed mitigation measures include requiring a high standard of maintenance for construction equipment and vehicles, limiting

unnecessary long-term idling, using low sulphur-containing fuels, using appropriate dispensing equipment and limiting fuelling of vehicles and equipment.

Lagoon operation has the potential for generation of odours. A non-aerated lagoon will typically freeze during the winter period and the ice cover largely prevents free oxygen from entering the water, which leads to the production of hydrogen sulphide gas by bacteria that do not require free oxygen. After the ice melts, the gas will quickly dissipate resulting in a short term release of odours in the local area. As there is only one nearby property, which is located west of the lagoon (upwind based on the prevailing wind conditions), and the odour release is short term the effect was assessed as minor. Mitigation measures proposed to reduce odours includes the use of supplemental aeration within the primary and secondary cells during the spring/summer/fall, as described in Section 2.6.4. The proposed aeration will introduce oxygen into the system preventing the production of hydrogen sulphide gas and reducing the build-up of sludge on the bottom of the cells.

4.2 SOILS

Soils in the project area may become contaminated during construction from leaks and accidental spills or releases of fuels or other hazardous substances and waste. The potential adverse effects on soil quality were assessed to be minor to moderate. Proposed mitigation includes preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, providing an emergency (spill) response plan and periodic inspection for leaks, spills and releases. If a spill should occur the contractor would be responsible to notify MCWS Emergency Response Program (204-944-4888) and the appropriate clean-up would be determined according to the size of spill and quantity of contamination. Small spills could be treated on site with regular working of the soil to aerate. Larger spills, however, would be assessed and delineated following Phase III Environmental Site Assessment standards and a remediation program would be developed to ensure that the site is cleaned to meet MCWS soil remediation criteria.

Soils in the area may become contaminated during operation of the lagoon from leaks or releases of sewage. Based on previous geotechnical investigations at the site, the in-situ silty clay to clayey silt material will have a permeability below the required 10^{-7} m/s, which indicates that the clay material is sufficient to prevent leaks. As such the potential effect from leaks was assessed as negligible and no further mitigation measures besides the 1 m thick compacted clay liner are required.

4.3 GROUNDWATER

Groundwater in the project area may become contaminated during site preparation and construction from leaks, accidental spills, or releases of fuels or other hazardous substances. Groundwater quality at the site has not been tested for hydrocarbons. The potential adverse effects on groundwater quality were assessed to be minor. Proposed mitigation includes preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, providing an emergency (spill) response plan and periodic inspection for leaks, spills and releases.

No seepage from the lagoon to groundwater is expected to occur. The compacted clay liner of the cells will be a minimum of 1.0 m thick. Based on previous geotechnical investigations at the site, the in-situ silty clay to clayey silt material will have a permeability below the required 10^{-7} m/s. Using the empirical Hazen Approximation of hydraulic conductivity, each sample was estimated to have a hydraulic conductivity of $<10^{-8}$ m/s. The liner will meet all testing requirements set forth by MCWS. In addition, the depth of the clay borrow pit is about 6 m deep. Based on the extensive Manitoba Hydro data base the completed secondary cell, even with a usable depth of 2.5 m, would be well below the local water table. The proposed project will have a negligible effect by preventing groundwater contamination from seepage and no further mitigation measures are required.

4.4 SURFACE WATER

Surface water in the project area may become contaminated during construction from leaks and accidental spills or releases of fuels or other hazardous substances. The potential adverse effects on water quality were assessed to be minor to moderate. Proposed mitigation includes preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, providing an emergency (spill) response plan and periodic inspection for leaks, spills and releases.

Surface water may become contaminated during operation of the lagoon from leaks (seepage) or uncontrolled releases of sewage. As previously noted, the compacted clay liner of the cells will be a minimum of 1.0 m thick, have a permeability not exceeding $1x10^{-7}$ cm/sec and meet all testing requirements set forth by MCWS thus preventing leaks. Prior to effluent discharge, water quality samples will be collected and submitted to the laboratory to determine if the quality is acceptable for discharge. The effluent being discharged will meet the CCME Canada-wide Strategy for the Management of Municipal Wastewater Effluent, Effluent Quality Standards and the MWQSOG Tier 1 Water Quality Standards for Municipal Wastewater Effluent. Additionally the effluent will be land applied to provide further nutrient uptake and for final polishing. Therefore the potential effect of the project on surface water was assessed as negligible. Regardless, proposed mitigation includes requiring regular maintenance of the system during operation and regular inspections for seepage.

4.5 FISH AND FISH HABITAT

Construction activities such as placing and shaping fill to create the lagoon cells can result in wind-carried dust and exposed soils that are more easily carried away with surface water run-off, which may increase sedimentation to nearby water bodies. Construction activities associated with the proposed project will be occurring within approximately 120 m of Rice Creek. As such, suspended sediment levels may become temporarily elevated if exposed soil is carried into the river with surface water runoff, particularly after major precipitation events. Elevated levels of suspended sediment can reduce water quality, which may interfere with fish

spawning, navigation, and the ability to locate food and escape predators. Settling suspended particles can potentially smother and kill fish eggs or larvae. The potential adverse effects were assessed to be minor. Proposed mitigation includes minimizing dust levels during construction by using an approved dust suppressant such as water, maintaining the existing site drainage channels and settling pond and minimizing disturbance to the riparian vegetation along Rice Creek which will act as a buffer to prevent sediment run-off.

Effluent will be discharged from the lagoon to the forested area surrounding the sewage treatment facility and not directly to Rice Creek. As such, there is expected to be no effect from project operation on the water chemistry. The secondary cell of the proposed project will have a retention time of approximately 365 days and treatment in both the primary and secondary cells will include aeration by sprinkler which will increase oxygen levels in the cells and enable bacteria to convert the waste into carbon dioxide, water, and inert ash prior to effluent discharge. Effluent discharged from the project will meet the CCME Canada-wide Strategy for the Management of Municipal Wastewater Effluent, Effluent Quality Standards and the MWQSOG Tier 1 Water Quality Standards for Municipal Wastewater Effluent. As such no further mitigation measures are required.

4.6 WILDLIFE, HABITAT AND VEGETATION

Construction of the proposed lagoon will result in the minor loss and disturbance of vegetation and wildlife habitat. While the majority of the project is located within the area already cleared and developed as a clay borrow pit for the Pointe du Bois Spillway Replacement project there is a very small area (approximately 250 m^2) of additional tree clearing required to accommodate the secondary cell (Figure 1). Additionally, installation of the effluent discharge piping for land application west of the previously cleared area will potentially disturb the vegetation in this area. The amount of vegetation clearing and disturbance is very small relative to the abundant high quality habitat surrounding the project area. As the site is already disturbed it is unlikely that any wildlife sensitive to human disturbance would be present. Additionally, the CDC found no occurrences or rare or endangered plant and wildlife species at the project area, although an occurrence of the provincially uncommon (S3) alternate-leaved dogwood (*cornus alternifolia*) was reported on NE 9-16-13E. As such effects on wildlife, habitat and vegetation as a result of the project are expected to be minor. Mitigation measures to implement include minimizing loss

and disturbance of vegetation and wildlife habitat by limiting area cleared, limiting construction activities to designated and previously disturbed areas and re-vegetating disturbed or reclaimed areas after construction.

4.7 EMPLOYMENT/ECONOMY

The proposed sewage lagoon project will create temporary construction employment opportunities and increase the economy in the local and surrounding areas associated with purchase of construction materials, fuel, supplies and lodgings. Additionally, the facility will have operational requirements which will require employment of a certified operator. The potential effects of the project on employment and economy were assessed as positive. No mitigation or follow-up has been proposed.

4.8 HUMAN HEALTH AND WELL BEING

Soil, surface water and groundwater in the project area may become contaminated during construction activities, as previously noted, from leaks and accidental spills or releases of fuels or other hazardous substances, which could adversely affect human health. The potential adverse effects of the project on human health were assessed to be minor. Proposed mitigation measures include preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing spill clean-up equipment and materials, providing fuel handling training for operators, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, and providing an emergency (spill) response plan.

4.9 PUBLIC AND WORKER SAFETY

The public does not have access to the existing borrow area as the entry is gated. Modifying the purpose of the project area from a borrow pit to a sewage lagoon should not have any effect on public safety. However, the handling and storage of fuels and hazardous materials, such as greases and lubricants, poses a threat to worker health and safety during construction. Operational activities will typically not require the use of fuels or hazardous materials. The potential hazard to worker safety will therefore only be for a short period and was assessed as

minor. Proposed mitigation includes providing fuel handling training for operators, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, complying with Manitoba Workplace Safety and Health regulations, conducting safety briefings with workers and providing employee training.

4.10 HERITAGE RESOURCES

Ms. Heather McClean at the Historic Resources Branch (HRB) of Manitoba Tourism, Culture, Heritage, Sport and Consumer Protection examined Branch records to determine if there are any known archaeological sites in the project area. It was found that 3 petroform sites exist within 1 km of the project area in various conditions, including mostly undisturbed, disturbed and destroyed. As the site is already disturbed and only requires reshaping with no further excavation, the potential adverse effects of the project on heritage resources were assessed to be negligible and therefore, no specific mitigation measures or follow-up are proposed. In the case that heritage resources are discovered, appropriate precautions will be used to preserve them and HRB will be contacted.

5.0 ENVIRONMENTAL MANAGEMENT PRACTICES

Environmental management practices proposed to be employed to prevent or mitigate environmental effects that were determined to be adverse, as described in Section 4, are summarized in the following sections. Mitigation is defined under the *Canadian Environmental Assessment Act* as the elimination, reduction and control of the adverse effects of a project and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. The proposed measures will mitigate the release of impacts to air and water in accordance with the *Canadian Environmental Protection Act*. Mitigation measures must be technically and economically feasible, and implemented.

5.1 AIR QUALITY

Applying an approved dust suppressant such as water, controlling construction vehicle speeds, limiting construction activities during high wind events, and re-establishing vegetation on disturbed areas can mitigate increased fugitive dust levels generated during construction of the lagoon upgrades. By controlling fugitive dust levels it is unlikely that Manitoba's air quality guidelines would be exceeded during construction activities.

Requiring a high standard of maintenance for construction equipment and vehicles, limiting unnecessary long-term idling, using low sulphur-containing fuels, using appropriate dispensing equipment and limiting fuelling, can mitigate increased levels of greenhouse gases and vehicle emissions from equipment and increased VOC levels from fuels and other substances during construction activities.

Maintaining and ensuring use of the supplemental aeration within the primary and secondary cells during the spring/summer/fall, will introduce oxygen into the system preventing the production of hydrogen sulphide gas, and mitigate generation of odours during lagoon operation.

5.2 SOILS

Preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, providing an emergency (spill) response plan and periodic inspection for leaks, spills and releases can mitigate potential soil contamination from leaks and accidental spills during construction.

5.3 GROUNDWATER

Preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, providing an emergency (spill) response plan and periodic inspection for leaks, spills and releases can mitigate potential groundwater contamination from leaks and accidental spills during construction.

5.4 SURFACE WATER

Preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, providing an emergency (spill) response plan, and periodic inspection for leaks, spills and releases can mitigate potential surface water contamination from leaks and accidental spills during construction.

The proposed land application of effluent to provide further nutrient uptake and for final polishing and requiring regular maintenance of the compacted clay liner and effluent discharge system with inspections for seepage can mitigate potential surface water contamination during operation.

5.5 FISH AND FISH HABITAT

Minimizing dust levels during construction by using a dust suppressant such as water, maintaining the existing site drainage channels and settling pond, and minimizing disturbance to the riparian vegetation along the Rice Creek that will act as a buffer to prevent sediment run-off can mitigate potential impacts to fish and fish habitat associated with elevated levels of suspended sediment.

5.6 WILDLIFE, HABITAT AND VEGETATION

Limiting the area cleared during construction, limiting construction activities to designated and previously disturbed areas and re-vegetating disturbed or reclaimed areas after construction can minimize loss and disturbance of vegetation and wildlife habitat and mitigate effects on wildlife and vegetation.

5.7 HUMAN HEALTH AND WELL BEING

Preventing leaks, spills and releases by providing secondary containment for fuel storage, requiring drip trays for equipment, providing fuel handling training for operators, providing spill clean-up equipment and materials, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, and providing an emergency (spill) response plan can mitigate potential soil, groundwater and surface water contamination during construction and operation that could otherwise effect human health.

5.8 PUBLIC AND WORKER SAFETY

Providing fuel handling training for operators, complying with provincial fuel storage and dispensing regulations, storing hazardous materials in approved containers, complying with Manitoba Workplace Safety and Health regulations, conducting safety briefings with workers and providing employee training can mitigate the threat to worker health and safety during construction.

5.9 RESIDUAL ENVIRONMENTAL EFFECTS

The significance of residual environmental effects, the effects remaining after the implementation of mitigation measures, was evaluated following procedures outlined in the Canadian Standards Association Draft environmental assessment standard [16]. Significance was evaluated based on the criteria below:

- **Societal value** of the affected environmental components – includes nature and degree of protection provided
- **Ecological value** – includes rarity and uniqueness, fragility, importance within ecosystem, importance to scientific studies
- **Duration** – length of time the project activity will last
- **Frequency** – rate of reoccurrence of the project activity causing the effect
- **Geographic extent** – area over which the effect will occur
- **Magnitude** – predicted disturbance compared to existing conditions
- **Reversibility** – time the environmental component will take to recover after the source of the effect ceases

Based on the available information on the project and the environment, the assessment of environmental effects outlined in this environmental assessment report, and the application of proposed mitigation measures and the conduct of required follow-up, the proposed project will not likely result in any significant residual adverse environmental effects.

6.0 FOLLOW-UP ACTIVITIES

Follow-up is defined under the *Canadian Environmental Assessment Act* as a program to verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate the adverse environmental effects of the project. Follow-up activities include monitoring, surveillance, inspection, and may include data collection, analysis, evaluation, and reporting. For the proposed lagoon project standard mitigation and best practices will be applied and therefore, a formal follow-up program is not required. Monitoring of implementation of the standard mitigation measures identified for environmental effects determined in Section 4.0 to be adverse are described in the following sections.

6.1 AIR QUALITY

Proposed follow-up during construction involves periodic observations for fugitive dust levels, inspections of the local area for accumulated dust, monitoring of complaints, adherence to contract specifications, and periodic inspection for VOC sources.

6.2 SOILS

Follow-up proposed during construction includes periodic inspections of equipment and storage containers for leaks, spills and releases, periodic observation for potential soil contamination, monitoring of soil quality as required, and ensuring adherence to contract specifications. Follow-up proposed during operation includes regular inspections for evidence of seepage through lagoon dikes.

6.3 GROUNDWATER

Follow-up proposed includes periodic inspection during construction for leaks, spills and releases, regular inspections for evidence of seepage through lagoon dikes during operation and ensuring adherence to contract specifications.

6.4 SURFACE WATER

Follow-up proposed includes periodic inspection for leaks, spills and releases during construction, regular inspections for evidence of seepage through lagoon dikes during operation and ensuring adherence to contract specifications. To confirm effluent quality satisfies the MWQSOG and the Effluent Quality Standards, monitoring and reporting of effluent will be completed in accordance with the CCME Canada-wide Strategy for the Management of Municipal Wastewater Effluent and in accordance with licence terms and conditions.

6.5 FISH AND FISH HABITAT

Proposed follow-up involves periodic observations during construction for fugitive dust levels, inspections of the local area for accumulated dust and sediment run-off and adherence to contract specifications.

6.6 WILDLIFE, HABITAT AND VEGETATION

Proposed follow-up during construction involves periodic observations of disturbance levels to vegetation, periodic inspections of the local area for accumulated dust on vegetation and adherence to contract specifications. Follow-up proposed during operation includes maintenance of re-vegetated areas.

6.7 HUMAN HEALTH AND WELL BEING

Follow-up proposed during construction includes periodic inspections of equipment and storage containers for leaks, spills and releases, periodic observation for potential soil or surface water contamination, monitoring of soil or surface water quality as required, and ensuring adherence to contract specifications.

6.8 PUBLIC AND WORKER SAFETY

Follow-up proposed includes recording any occurrence of workplace accidents, confirming compliance with provincial fuel storage and dispensing regulations and updating training and safety guidelines as required.

7.0 STATEMENT OF LIMITATIONS

7.1 THIRD PARTY USE OF REPORT

This report has been prepared for the RM of Alexander to whom this report has been addressed and any use a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

7.2 GEO-ENVIRONMENTAL STATEMENT OF LIMITATIONS

KGS Group prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to KGS Group during the investigation and upon the services described, which were performed within the time and budgetary requirements of the RM of Alexander. As the report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate or contradicted by additional information. KGS Group makes no representation concerning the legal significance of its findings or the value of the property investigated.

8.0 REFERENCES

1. Manitoba Conservation and Water Stewardship. September 2014. Information Bulletin – Design Objectives for Wastewater Treatment Lagoons.

2. KGS Group. August 2013. RM of Alexander, Lagoon Feasibility Study, Letter Report.

3. KGS Group. March 2014. RM of Alexander and Manitoba Hydro, Lagoon/Wetland Compatibility Study, Letter Report.

4. KGS Group. October 2012. Pointe du Bois Spillway Replacement Project, Clay Borrow CL-3 – Contractor Test Pits Report of Findings. Stage V File No: 245751-0010-MMO-DN005-Rev00-20121031.

5. Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, W.R. Fraser, and G.W. Lelyk. 1998. Terrestrial Ecozones, Ecoregions and Ecodistricts: An Ecological Stratification of Manitoba's Natural Landscapes. Technical Bulletin 98-9E. Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada, Winnipeg, Manitoba.

6. Environment Canada. Canadian Climate Normals 1981-2010, Pinawa WNRE, Manitoba. Visited April 2015 at http://climate.weather.gc.ca/climate_normals/index_e.html.

7. Manitoba Mineral Resources 2013: Geological Compilation of Southeast Manitoba; in Map Gallery – Geoscientific Maps, Manitoba Mineral Resources. Visited April 2015 at http://web15.gov.mb.ca/mapgallery/mgg-gmm.html.

8. Environment Canada. Water Survey of Canada/Wateroffice. Historical Hydrometric Data; Dead Creek near Lee River North of Pinawa, Station ID 05PF065. Visited May 2015 at http://wateroffice.ec.gc.ca/report/data_availability_e.html?type=h2oArc&station=05PF065&dataType=Flow.

9. Manitoba Conservation and Water Stewardship, Water Science and Management Branch. April 2015. Personal Communication with Kevin Jacobs, Senior Water Protection Officer.

10. Manitoba Conservation and Water Stewardship, Fisheries Branch. May 2015. Personal Communication with Wade Biggin, Commercial Database Specialist.

11. Manitoba Conservation and Water Stewardship, Manitoba Conservation Data Centre. Personal Communication with Chris Friesen, Coordinator.

12. Statistics Canada. 2012. RM of Alexander Census Profile. 2011 Community Profiles. Website visited June 2015 at http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=4601071&Geo2=CD&Code2=4601&Data=Count&SearchText=alexander&SearchType=Begins&SearchPR=01&B1=All&Custom=&TABID=1

13. RM of Alexander. 2015. Public Utilities. Website visited June 2015 at http://www.rmalexander.com/main.asp?id_menu=84&parent_id=78

14. Statistics Canada. 2012. Corrections and updates: Population and dwelling count amendments, 2011 Census. Website visited June 2015 at http://www12.statcan.gc.ca/census-recensement/news-nouvelles/corr/cgen004-eng.cfm

15. Manitoba Culture, Heritage, and Tourism, Historic Resources Branch. April 2015. Personal Communication with Heather McClean, Heritage Resources Registrar.

16. Canadian Standards Association, 1999, Preliminary Draft Standard: Environmental Assessment, produced for: The Working Group of the EIA Technical Committee, Draft #14, July 26.

FIGURES

SW-16-16-13E1

SE-16-16-13E1

SW-15-16-13E1

NE-9-16-13E1

RICE CREEK

RICE CREEK

POND

POND

A 02

B 02

C 02

SLUDGE DRYING BEDS

SOLIDS SEPARATION CELL

PRIMARY LAGOON

SECONDARY LAGOON WL. 267.5m (FORMER BORROW PIT)

3" DIA. SOLID HDPE HEADER PIPE

PROPOSED PROPERTY LINE FOR MEMORANDUM OF UNDERSTANDING (M.O.U.) WITH MANITOBA HYDRO

RELOCATE DITCH

EXISTING GRAVEL ACCESS ROAD

NW-9-16-13E1

NW-10-16-13E1

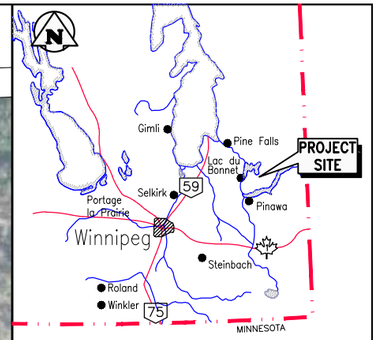
PR 313

3/4" DIA. PERFORATED HDPE DISCHARGE PIPES AT 28m O.C., TYP

SW-9-16-13E1

SE-9-16-13E1

SW-10-16-13E1



KEY MAP

LEGEND:

269 CONTOUR LINES

QUARTER SECTIONS

QUARRY LEASE (QL-1947)

MAXIMUM OPERATION LEVEL EL. 269.9

CAPACITY PRIMARY LAGOON		
DEPTH	ELEVATION	VOLUME (m^3)
0.5	268.9	1,100
1.0	269.4	4,000
1.5	269.9	6,400

MAXIMUM OPERATION LEVEL EL. 267.5

CAPACITY SECONDARY LAGOON		
DEPTH	ELEVATION	VOLUME (m^3)
0.5	265.5	4,400
1.0	266.0	9,300
1.5	266.5	14,900
2.0	267.0	21,300
2.5	267.5	28,600

MAXIMUM OPERATION LEVEL EL. 269.9

CAPACITY SOLIDS SEPARATION CELL		
DEPTH	ELEVATION	VOLUME (m^3)
0.5	268.9	400
1.0	269.4	900
1.5	269.9	1,500

50 0 50 100 150m

SCALE: 1:4000 (11x17)

NO.	YY/MM/DD	DESCRIPTION	BY
0	15/10/20	ISSUED WITH FINAL REPORT	RDS
A	15/08/19	ISSUED WITH DRAFT REPORT	RDS

REVISIONS / ISSUE

KGS GROUP CONSULTING ENGINEERS

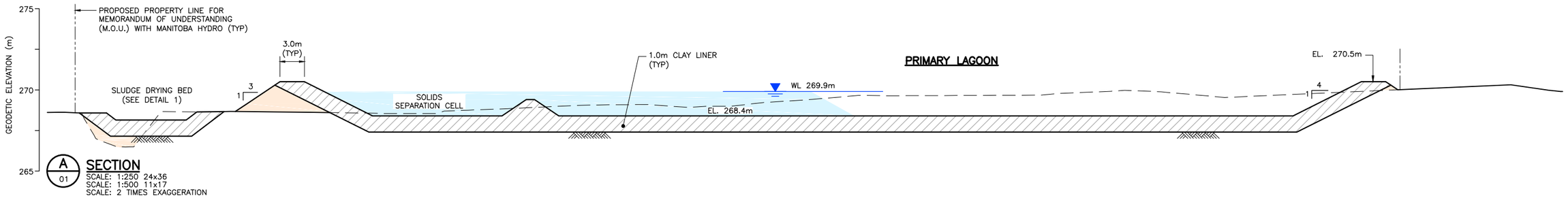
RM OF ALEXANDER

WASTE WATER LAGOON
ENVIRONMENT ACT PROPOSAL

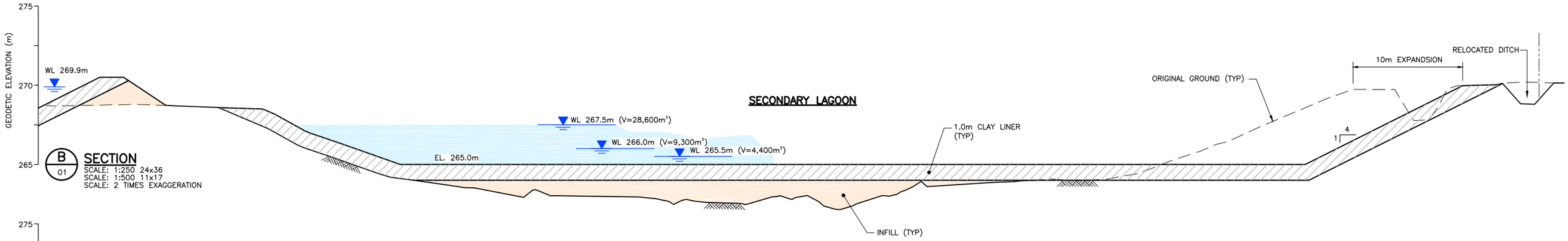
SITE LOCATION PLAN

OCTOBER 2015 | FIGURE 01 | REV: 0

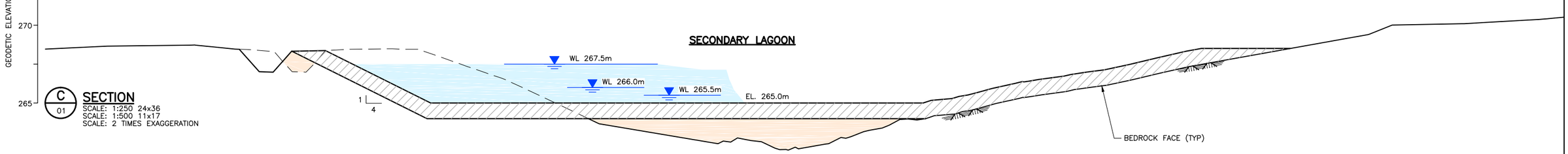
FileName: U:\FMS\15-1274-003\15-1274-003_Fig01.dwg - Tab: FIG 1 Plotted By: EMiguel 10/23/2015 [Fri 3:53pm]



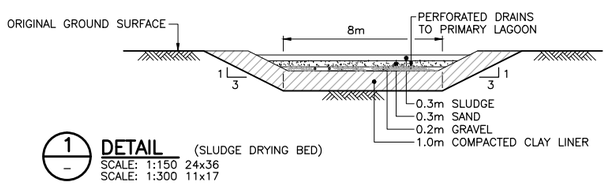
A 01 **SECTION**
SCALE: 1:250 24x36
SCALE: 1:500 11x17
SCALE: 2 TIMES EXAGGERATION



B 01 **SECTION**
SCALE: 1:250 24x36
SCALE: 1:500 11x17
SCALE: 2 TIMES EXAGGERATION



C 01 **SECTION**
SCALE: 1:250 24x36
SCALE: 1:500 11x17
SCALE: 2 TIMES EXAGGERATION



1 – **DETAIL** (SLUDGE DRYING BED)
SCALE: 1:150 24x36
SCALE: 1:300 11x17

5 0 5 10 15 20m
SCALE: 1:500 (11x17)

NO.	YY/MM/DD	DESCRIPTION	BY
0	15/10/20	ISSUED WITH FINAL REPORT	RDS
A	15/08/19	ISSUED WITH DRAFT REPORT	RDS

REVISIONS / ISSUE

KGS GROUP CONSULTING ENGINEERS

RM OF ALEXANDER

WASTE WATER LAGOON
ENVIRONMENT ACT PROPOSAL

SECTIONS AND DETAIL

OCTOBER 2015 | **FIGURE 02** | REV: 0

FileName: U:\FMS\15-1274-003\15-1274-003_Fig02.dwg – Tab: FIG 02 Plotted By: EMiguel 10/23/2015 [Fri 3:54pm]

APPENDICES

APPENDIX A

PROPERTY INFORMATION

N. E. Quarter of Section 9

BOOK	No. of Instrument	INSTRUMENT	ITS DATE	DATE OF REGISTRY	GRANTOR
	4162	Plan	3 apr 1940	9 aug 1940	G. a Warrington
	47207	R. P. Appp	31 Mch 1952	2 Apl 1952	H.M. the Queen
N.W.					
app.	38682	R.P. Act-	15 July 1936	22 July 1936	H.W. of Poplar Bay "2
	209281	Cert. Cert-	15 Dec 1934	22 " "	do
	209605	Patent	13 July 1926	5 Sept "	Crown
S.E.	4162	Plan	3 apr 1940	9 aug 1940	G. a Warrington
	47207	R. P. Appp.	31 Mch 1952	2 Apl 1952	H.M. the Queen
S.W.	4162	Plan	3 apr 1940	9 aug 1940	G. a. Warrington
	47207	R.P. Appp.	31 Mch 1952	2 Apl 1952	H.M. the Queen

Township 16 Range 13 6

GRANTEE	CONSIDERATION	LAND AND REMARKS
✓	✓	Pt. for road " " " Plan 4162
S.W. of Poplar Bay ✓ 2175 Nestor K. Johnson	27.50 ✓	All. ", filed in Lfp 38662. ", do.
✓	✓	Pt. for road " " " Plan 4162
✓	✓	Pt. for road " " " Plan 4162

iMaQs

Manitoba

Integrated Mining and Quarrying System

Current time: 04 May 2015, 2:22:19 PM

Quarry Search

Back **New Search** **Print**

Disposition/Lease Detail

Disposition/Lease Number	QL-1947
Status	Issued
GIS ID	1771
Disposition/Lease Type	Quarry Lease
Location	SEC 9 TWP 16 RGE 13 E1
Further Description	THE SOUTH HALVES AND THE SOUTH HALVES OF THE NORTH HALVES OF LEGAL SUBDIVISIONS 15 AND 16 OF SECTION 9-16-13 EPM; THE N 1/2 OF THE W 1/2 , THE N 1/2 OF THE N 1/2 OF THE E 1/2 OF LEGAL SUBDIVISION 9 OF SAID SECTION; ALL THAT PORTION OF THE W 1/2 OF THE W 1/2 OF THE S 1/2 OF SAID LEGAL SUBDIVISION 9 OF AND ALL THAT PORTION OF LEGAL SUBDIVISION 10 OF SAID SECTION, WHICH LIES NORTH OF THE NORTHERN LIMIT OF ROAD PLAN 4162 WLTO (CL3-3).
Issue Date	2008-04-04
Anniversary Date	2015-04-04
Expiry Date	2015-05-04
Material	GRAVEL ROCK OR STONE (COMMON STONE) ROCK OR STONE (PROCESSED STONE) ROCK OR STONE (DIMENSION STONE) CLAY
Quarry Material Applied For	CLAY, GRAVEL, ROCK OR STONE
Inspector	MIKE THERRIEN
Area in Hectares	42.724
Term	1
Term Expiry Date	2018-04-04
Mark Boundary Method	
Rural Municipality	
Holders	100152 MANITOBA HYDRO (PROPERTY)

Disposition/Lease Events:

Effective Date	Event	Event Description	Submitter Id	Submitter Name
2014-04-14	338556	Quarry Lease Annual Rental and Return	100152	MANITOBA HYDRO (PROPERTY)
2013-05-06	273882	Quarry Lease Annual Rental and Return	100152	MANITOBA HYDRO (PROPERTY)
2012-09-24	253602	Quarry Lease Relief from Forfeiture Approved		Speranza, Ana
2012-08-28	252624	Quarry Lease Lapse		Speranza, Ana
2012-08-23	252636	Quarry Lease Relief from Forfeiture Application	100152	MANITOBA HYDRO (PROPERTY)
2012-08-23	252618	Quarry Lease Annual Rental and Return	100152	MANITOBA HYDRO (PROPERTY)
2011-04-29	215336	RENTAL FROM PERIOD 04/04/2011 TO PERIOD 03/04/2012		iMaQs Migration
2010-03-30	212948	RENTAL FROM PERIOD 04/04/2010 TO PERIOD 03/04/2011		iMaQs Migration
2009-04-20	212046	RENTAL FROM PERIOD 04/04/2008 TO PERIOD 03/04/2010		iMaQs Migration
2008-04-04	211037	APPLICATION FEE FOR QUARRY LEASE OR EXPLORATION PERMIT		iMaQs Migration
2008-04-04	210429	RENTAL FROM PERIOD 04/04/2008 TO PERIOD 03/04/2009		iMaQs Migration

Back **New Search** **Print**

RURAL MUNICIPALITY OF ALEXANDER
RESOLUTION 2015
2015 203

April 14, 2015

Moved By Councillor: Mac Kinghorn
Seconded By Councillor: Gerry Dupont

BE IT RESOLVED that the Council of the Rural Municipality of Alexander instruct administration to negotiate a Memorandum of Understanding (MOU) with Manitoba Hydro to transfer a portion of the Provincial Lease site CL3 for the purposes of constructing a lagoon on the condition that environmental approval for a lagoon is obtained from Manitoba Conservation and Water Stewardship under *The Environment Act*;

AND BE IT FURTHER RESOLVED that the MOU will contain the ability for Manitoba Hydro to transfer the balance of the Provincial Lease Site CL3 to be transferred to the RM of Alexander once Manitoba Hydro no longer requires the site.

Carried

Certified to be a true copy of Resolution
No. 2015 203 of the Rural Municipality of Alexander

Assistant Chief Administrative Officer

APPENDIX B

SITE PHOTOGRAPHS

Photo 1 – Looking north along the access road at the remnant clay borrow excavation.

Photo 2 – Typical jack pine forest cover on bedrock outcrops adjacent the site.

Photo 3 – Typical mixedwood forest cover surrounding the site.

Photo 4 – Looking north from PR 313 at the constructed access road to CL-3.

Photo 5 – Looking north along the perimeter ditch along the east edge of the site.

Photo 6 – Typical clay material excavated and stockpiled on-site.

Photo 7 – Looking northwest at wetland habitat along Rice Creek at the location where site drainage would flow into the creek.

Photo 8 – Looking west along PR 313 at the access road to site CL-3.

APPENDIX C

GOVERNMENT CORRESPONDENCE

Manitoba
Conservation and Water Stewardship

Water Science and Management Branch
Suite 160, 123 Main Street, Winnipeg, Manitoba, Canada R3C 1A5
T 204-945-4304 **F** 204-948-2357
www.manitoba.ca/conservation

April 22, 2015

Shawn Moffat
KGS Group
3rd Floor – 865 Waverley Street
Winnipeg MB R3T 5P4
Smoffat@kgsgroup.com

Dear Mr. Moffat,

WATER QUALITY DATA: Rice Creek and Pinawa Bay

In accordance with your request, please find attached water quality data for Pinawa Bay. Unfortunately we do not have data for Rice Creek. Although we have taken all reasonable measures to ensure that the enclosed data are correct and free of errors, it is recommended that you review these data carefully in the context of your intended application. Please note that concentrations preceded by an "L" were measured as less than the method detection limit.

Should these data be used in a report, technical manuscript, presentation, or other document, would you please reference as follows:

> Water Quality Management Section
> Manitoba Conservation and Water Stewardship
> 123 Main Street, Suite 160
> Winnipeg MB R3C 1A5

Please provide a copy of any report or manuscript arising from the use of these data to the undersigned. Should you receive any requests for these data from a third party, please direct them to the undersigned.

Should you have any questions with regard to this information, or identify data that may be anomalous, please do not hesitate to contact our section at the above address, or by e-mail at kevin.jacobs@gov.mb.ca.

Sincerely,

Kevin Jacobs
Manitoba Conservation and Water Stewardship

From: Shaun Moffatt [mailto:SMoffatt@kgsgroup.com]
Sent: April-22-15 10:38 AM
To: Jacobs, Kevin (CWS)
Subject: RE: RM of Alexander Wastewater Lagoon - Rice Creek Water Quality

Kevin

Thanks for checking. Is it also possible to check for the upstream water body, Rice Lake (preferred), or alternatively the downstream water body that Rice Creek drains into which is Lac du Bonnet at Pinawa Bay, see attached google image, thanks.

Shaun Moffatt, M.Sc.
Senior Environmental Scientist
KGS Group
3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Phone: 204-896-1209 ext 467
Fax: 204-896-0754

From: Jacobs, Kevin (CWS) [mailto:Kevin.Jacobs@gov.mb.ca]
Sent: Wednesday, April 22, 2015 10:04 AM
To: Shaun Moffatt
Subject: RE: RM of Alexander Wastewater Lagoon - Rice Creek Water Quality

Mr. Moffatt,

With respect to your query, unfortunately we have no station matching the description you provided in our water quality database.

Regards,

Kevin Jacobs, M.Sc.
Senior Water Protection Officer
Water Science and Management Branch
Manitoba Conservation and Water Stewardship
Suite 160- 123 Main Street (Box 20)
Winnipeg, Manitoba
R3C 1A5
Phone: 204 945 4304
Fax: 204 948 2357

From: Shaun Moffatt [mailto:SMoffatt@kgsgroup.com]
Sent: April-21-15 4:21 PM
To: Jacobs, Kevin (CWS)
Subject: RM of Alexander Wastewater Lagoon - Rice Creek Water Quality

Kevin

KGS Group is conducting an Environment Act Proposal for the proposed RM of Alexander Wastewater Lagoon. The lagoon is proposed to be developed within QL-1947 held and developed by Manitoba Hydro as a clay borrow area (CL-3), which is located north adjacent PR 313 approximately 13 km west of Pointe du Bois within NE-9-16-13E1. Effluent will be discharged annually (or twice/yr if necessary) over the summer and early fall into the surrounding forested area. The land surrounding the lagoon site naturally drains towards Rice Creek which is the nearest surface water body, approximately 175 m north (at its closest point).

Specifically we are requesting available water quality data for Rice Creek, preferably within the last 10 years (2005 to 2015). The information obtained will be used to describe the existing environment in the project area and to assess potential project effects. If you have any questions or need clarification don't hesitate to contact me, thanks.

Shaun Moffatt, M.Sc.
Senior Environmental Scientist
KGS Group
3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Phone: 204-896-1209 ext 467
Fax: 204-896-0754

SAMPLE_NO	STATION_NO	STATION_ NAME	STATION_DESCRIPTION	SAMPLE_DATETIME	AMMONIA DISSOLVED	CHLOROPHYLL A PHYTOPLANKTON	COLIFORMS FECAL	DEPTH OF SAMPLING FROM SURFACE	NITROGEN DISSOLVED NO3 & NO2	NITROGEN TOTAL KJELDAHL (TKN)	PHOSPHORUS TOTAL (P)	PHOSPHORUS TOTAL DISSOLVED	SECCHI DISC
					604	418	433	497	628	626	730	731	3551
					mg/L	ug/L	CFU/100ML	m	mg/L	mg/L	mg/L	mg/L	M
97-A42974	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	7/27/1997	0.02	8	20	1.7	0.01	0.6	0.038	0.011	0.85
97-A46619	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	8/10/1997	0.04	11	L10	1.64	0.01	0.8	0.061	0.027	0.82
97-A50851	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	8/24/1997	0.02	34	L10	1.46	L0.01	1	0.046	0.015	0.73
97-A54692	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	9/7/1997	0.03	22	L10	1.5	L0.01	0.9	0.038	0.005	0.75
97-A58079	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	9/21/1997	0.02	3	L10	1.4	0.03	0.6	0.043	0.015	0.7
98-A26421	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	5/24/1998	0.02	6	L10	1.34	L0.01	0.9	0.041	0.021	0.67
98-A29607	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	6/7/1998	0.04	1	L10	1.22	0.02	0.8	0.042	0.015	0.61
98-A33141	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	6/21/1998	0.07	L1	L10	1.1	0.04	0.7	0.041	0.024	0.55
98-A36848	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	7/5/1998	0.06	2	L10	1.28	L0.01	0.9	0.044	0.016	0.64
98-A39679	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	7/19/1998 1:50:00 PM	0.04	4	L10	1.64	0.04	0.8	0.041	0.014	0.82
98-A42828	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	8/3/1998 3:24:00 PM	0.02	28	L10	1.4	L0.01	0.9	0.054	0.019	0.7
98-A45902	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	8/16/1998 12:19:00 PM	0.01	14	L10	1.4	L0.01	1.4	0.043	0.012	0.7
98-A49547	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	8/30/1998 2:15:00 PM	0.03	3	L10	1.46	0.02	0.9	0.06	0.022	0.73
98-A54662	MB05PFS060	LEE RIVER	LEE RIVER AT PINAWA BAY	9/20/1998	0.04	6	120	1.24	0.03	0.8	0.062	0.022	0.62

Shaun Moffatt

From: Biggin, Wade (CWS) [Wade.Biggin@gov.mb.ca]
Sent: Wednesday, May 20, 2015 11:44 AM
To: 'Shaun Moffatt'
Subject: RE: FIHCS Information for Rice Creek

Sorry Shaun. We have nothing on Rice Creek

From: Shaun Moffatt [mailto:SMoffatt@kgsgroup.com]
Sent: May-15-15 10:58 AM
To: Biggin, Wade (CWS)
Subject: FW: FIHCS Information for Rice Creek

Wade
I am following up on my email request below to see if you have any information that can be provided, thanks.

Shaun Moffatt, M.Sc.
Senior Environmental Scientist
KGS Group
3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Phone: 204-896-1209 ext 467
Fax: 204-896-0754

From: Shaun Moffatt [mailto:SMoffatt@kgsgroup.com]
Sent: Wednesday, April 22, 2015 9:47 AM
To: 'Biggin, Wade (CWS)'
Subject: FIHCS Information for Rice Creek

Wade

KGS Group is conducting an Environment Act Proposal for the proposed RM of Alexander Wastewater Lagoon as shown in the attached figure. The lagoon is proposed to be developed within QL-1947 held and developed by Manitoba Hydro as a clay borrow area (CL-3), which is located north adjacent PR 313 approximately 15 km west of Pointe du Bois within NE-9-16-13E1. Effluent will be discharged annually (or twice/yr if necessary) over the summer and early fall into the surrounding forested area. The land surrounding the lagoon site naturally drains towards Rice Creek which is the nearest surface water body, approximately 175 m north (at its closest point).

Specifically we are requesting any available information through the FIHCS or other available sources regarding fish species and habitat that may be found in Rice Creek. The information obtained from the Fisheries Branch will be used to identify typical species composition and fish habitat in the area and develop mitigation measures for potential project impacts.

Thank you.

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KGS Group
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Wpg. MB. R3T 5P4

Phone: 204-896-1209 ext 467
Fax: 204-896-0754

Shaun Moffatt

From: Friesen, Chris (CWS) [Chris.Friesen@gov.mb.ca]
Sent: Monday, May 04, 2015 10:09 AM
To: 'Shaun Moffatt'
Subject: RM of Alexander Wastewater Lagoon

Follow Up Flag: Follow up
Flag Status: Flagged

Shaun

Thank you for you information request. I completed a search of the Manitoba Conservation Data Centre database for your area of interest and found one occurrence on NE 9-16-13E:

Alternate-leaved Dogwood (Cornus alternifolia), S3

Further information on this ranking system can be found on our website at http://www.gov.mb.ca/conservation/cdc/consranks.html.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre of the Wildlife and Ecosystem Protection Branch at the time of the request. These data are dependent on the research and observations of our scientists and reflects our current state of knowledge. An absence of data does not confirm the absence of any rare or endangered species. Many areas of the province have never been thoroughly surveyed, therefore, the absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. The information should not be regarded as a final statement on the occurrence of any species of concern, nor should it substitute for on-site surveys for species or environmental assessments. Also, because our Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request.

Please contact the Manitoba CDC for an update on this natural heritage information if more than six months passes before it is utilized.

Third party requests for products wholly or partially derived from our Biotics database must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using data from our database, as the Manitoba Conservation Data Centre; Wildlife Branch, Manitoba Conservation and Water Stewardship.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information contact me directly at (204) 945-7747.

Chris Friesen
Coordinator
Manitoba Conservation Data Centre
204-945-7747
chris.friesen@gov.mb.ca
http://www.gov.mb.ca/conservation/cdc/

-----Original Message-----
From:
Sent: April-21-15 3:39 PM
To: Friesen, Chris (CWS)
Subject: WWW Form Submission

Below is the result of your feedback form. It was submitted by WWW Information Request () on Tuesday, April 21, 2015 at 15:39:12

DocumentID: Manitoba_Conservation

Project Title: RM of Alexander Wastewater Lagoon

Date Needed: 2015/05/05

Name: Shaun Moffatt

Company/Organization: KGS Group

Address: 865 Waverley Street

City: Winnipeg

Province/State: Manitoba

Phone: 204-896-1209

Fax: 204-896-0754

Email: smoffatt@kgsgroup.com

Project Description: Construction of a wastewater lagoon with two sludge drying beds and two facultative cells operating in series. While the site was previously disturbed the information will be used to assess potential project impacts on species at risk and their habitat (if any) as well as develop appropriate mitigations measures and follow-up.

Information Requested: We request information regarding the locations of any plant, wildlife and aquatic Species at Risk occurrences at the site and the adjacent surrounding quarter sections.

Format Requested: Our preference is for the data to be presented in Microsoft Excel Spreadsheet and ArcView Shapefile (providing the location of each occurrence), sent by email.

Location: The lagoon development will be located within QL-1947 currently held by Manitoba Hydro and developed as a clay borrow area (CL-3). This is located within NE-9-16-13E1. The surrounding quarter sections include:
SW and SE 16-16-13E1
SW 15-16-13E1
NW and SW 10-16-13E1 and
NW, SW and SE 9-16-13E1

action: Submit

Shaun Moffatt

From: McClean, Heather (TCHSCP) [Heather.McClean@gov.mb.ca]
Sent: Friday, April 24, 2015 9:52 AM
To: 'Shaun Moffatt'
Cc: 'Gene Senior'; Smith, Brian (TCHSCP); Butterfield, David (TCHSCP)
Subject: RE: Heritage Resources - RM of Alexander Wastewater Lagoon
Attachments: Archaeology_Sites_-_Wastewater_Lagoon.dbf; Archaeology_Sites_-_Wastewater_Lagoon.prj; Archaeology_Sites_-_Wastewater_Lagoon.sbn; Archaeology_Sites_-_Wastewater_Lagoon.sbx; Archaeology_Sites_-_Wastewater_Lagoon.shp; Archaeology_Sites_-_Wastewater_Lagoon.shp.xml; Archaeology_Sites_-_Wastewater_Lagoon.shx

Thank you Shaun for your acknowledgement. Attached is a shape file containing all known archaeology sites located within the specified areas.

Heather McClean
Heritage Resources Registrar
Historical Assessment Services
Historic Resources Branch
Main Floor, 213 Notre Dame Avenue
Winnipeg MB R3B 1N3
Heather.McClean@gov.mb.ca
Phone: (204) 945-7146
Fax: (204) 948-2384

From: Shaun Moffatt [mailto:SMoffatt@kgsgroup.com]
Sent: April-24-15 9:43 AM
To: McClean, Heather (TCHSCP)
Cc: 'Gene Senior'; Smith, Brian (TCHSCP); Butterfield, David (TCHSCP)
Subject: RE: Heritage Resources - RM of Alexander Wastewater Lagoon

Heather

I acknowledge the terms and conditions of the disclaimer. As discussed the data requested is simply to provide general background information about whether heritage resources are present or not in the area surrounding our project, without providing specific location details of any resources if present. Thanks.

Shaun Moffatt, M.Sc.
Senior Environmental Scientist
KGS Group
3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Phone: 204-896-1209 ext 467
Fax: 204-896-0754

From: McClean, Heather (TCHSCP) [mailto:Heather.McClean@gov.mb.ca]
Sent: Friday, April 24, 2015 9:12 AM
To: 'Shaun Moffatt'

Cc: 'Gene Senior'; Smith, Brian (TCHSCP); Butterfield, David (TCHSCP)
Subject: RE: Heritage Resources - RM of Alexander Wastewater Lagoon

Shaun - Thank you for your data request. Please find attached our disclaimer statement for use of the data we have prepared for you. Please review and acknowledge the terms and conditions of its use by return e-mail to:Heather.McClean@gov.mb.ca. Your requested data will be sent once your agreement to these terms has been received by our office.

Please note: the information to follow only pertains to currently known and recorded heritage resources within the area of your request. This does not necessarily indicate the potential of the area to contain additional heritage sites. Therefore this data set cannot be used to obtain heritage clearance for development projects and the user should be aware that all development proposals must be approved directly by the Historic Resources Branch Archaeological Assessment Services Unit (Contact at hrb@gov.mb.ca)

The information provided is to be considered as confidential and with the specific intent to assist in heritage resource protection. Under no circumstances is the information provided to be used, passed on, or shared with other parties for public consumption (for example, but not limited to: Websites, PowerPoint Presentations or Poster Displays), unless prior approval for such use has been obtained in writing from the Historic Resources Branch. The unapproved use of data may result in future requests being denied to the applicant.

Please also note that requests for scanned sites forms of 5 or less will be considered (if time and resources allow), anything above that number will be provided in the form of an Excel spreadsheet.

If you require any clarification or additional information, please do not hesitate to contact me.

Thank you.

Heather McClean
Heritage Resources Registrar
Historical Assessment Services
Historic Resources Branch
Main Floor, 213 Notre Dame Avenue
Winnipeg MB R3B 1N3
Heather.McClean@gov.mb.ca
Phone: (204) 945-7146
Fax: (204) 948-2384

From: Shaun Moffatt [mailto:SMoffatt@kgsgroup.com]
Sent: April-22-15 10:00 AM
To: McClean, Heather (TCHSCP)
Cc: 'Gene Senior'
Subject: Heritage Resources - RM of Alexander Wastewater Lagoon

Heather

KGS Group is conducting an Environment Act Proposal for the proposed RM of Alexander Wastewater Lagoon as shown in the attached figure. The lagoon is proposed to be developed within QL-1947 held and developed by Manitoba Hydro as a clay borrow area (CL-3), which is located north adjacent PR 313 approximately 15 km west of Pointe du Bois within NE-9-16-13E1. Effluent will be discharged annually (or twice/yr if necessary) over the

summer and early fall into the surrounding forested area. The land surrounding the lagoon site naturally drains towards Rice Creek which is the nearest surface water body, approximately 175 m north (at its closest point).

Specifically we are requesting you search the HRB database for known site information data as background information for the project. As noted the site is located at NE-9-16-13E1 but we would be interested in the location of any known heritage resources within the surrounding sections which include Sections 3, 4, 5, 8, 9, 10, 15, 16 and 17 all in township 16, range 13E1. Additionally, in a meeting between the RM of Alexander and the Integrated Resource Management Team on August 12, 2013 it was noted that there were petrography sites located 1 or 2 miles away from the site. If possible could you provide the location of these.

If you have any questions don't hesitate to contact me, thanks.

Thank you.

Shaun Moffatt, M.Sc.
Senior Environmental Scientist
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3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Phone: 204-896-1209 ext 467
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KGS GROUP

CONSULTING ENGINEERS