



Conservation

Environmental Stewardship Division
Environmental Assessment and Licensing Branch
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FAXED

CLIENT FILE NO.: 5089.00

May 20, 2008

Trevor Ouellette, P. Eng.
Manitoba Aboriginal & Northern Affairs
Bay 8 – 1680 Ellice Avenue
Winnipeg MB R3H 0Z2

Dear Mr. Ouellette:

Enclosed is Environment Act **Licence No. 2833** dated May 20, 2008 issued in accordance with The Environment Act to **Manitoba Aboriginal and Northern Affairs** for the construction and operation of the Development being a wastewater treatment lagoon to serve the Community of Matheson Island and surrounding area and located in NE 3-32-4 EPM.

In addition to the enclosed Licence requirements, please be informed that all other applicable federal, provincial and municipal regulations and by-laws must be complied with.

For further information on the administration and application of the Licence, please feel free to contact Robert Boswick, Environmental Engineer at (204) 945-6030.

Pursuant to Section 27 of The Environment Act, this licencing decision may be appealed by any person who is affected by the issuance of this Licence to the Minister of Conservation within 30 days of the date of the Licence.

Yours truly,

Tracey Braun, M. Sc.
Director
Environment Act

Enc.

c: B. Gillespie, Central Regional Director
Matheson Island Community Council (As Registry) & Office copy
Millennium Public Library/Manitoba Eco-Network
Selkirk-St. Andrews Regional Library

NOTE: Confirmation of Receipt of this Licence No. 2833 (*by the Licencee only*) is required by the Director of Environmental Assessment and Licensing. Please acknowledge receipt by signing in the space provided below and faxing a copy (letter only) to the Department by May 24, 2008.

On behalf of Aboriginal & Northern Affairs

Date

****A COPY OF THE LICENCE MUST BE KEPT ON SITE AT THE DEVELOPMENT AT ALL TIMES****

LICENCE

Licence No. / Licence n° 2833

Issue Date / Date de délivrance May 20, 2008

In accordance with The Environment Act (C.C.S.M. c. E125) /
Conformément à la Loi sur l'environnement (C.P.L.M. c. E125)

Pursuant to Section 11(1) / Conformément au Paragraphe 11(1)

THIS LICENCE IS ISSUED TO : / CETTE LICENCE EST DONNÉE À :

MANITOBA ABORIGINAL AND NORTHERN AFFAIRS; "the Licencee"

for the construction and operation of the Development being a wastewater treatment lagoon to serve the Community of Matheson Island and surrounding area and located in NE 3-32-4 EPM and with discharge from the wastewater treatment lagoon between June 15th and November 1st of any year to a ditch that flows southeast to a natural marsh that is connected to Lake Winnipeg, in accordance with the proposal filed under The Environment Act on January 25, 2005 and requested supplementary information provided in letters dated February 8, 2005 and February 18, 2005 and subsequent information provided in correspondences, with attachments, dated April 4, 2005, June 28, 2005, February 27, 2006 September 5, 2006 and December 14, 2007 and subject to the following specifications, limits, terms and conditions:

DEFINITIONS

In this Licence,

"**accredited laboratory**" means an analytical facility accredited by the Standard Council of Canada (SCC), or accredited by another accrediting agency recognized by Manitoba Conservation to be equivalent to the SCC, or be able to demonstrate, upon request, that it has the quality assurance/quality control (QA/QC) procedures in place equivalent to accreditation based on the international standard ISO/IEC 17025, or otherwise approved by the Director;

"**approved**" means approved by the Director, or an assigned Environment Officer, in writing;

"**appurtenances**" means machinery, appliances, or auxiliary structures attached to a main structure to enable it to function, but not considered an integral part of it;

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"as constructed drawings" means engineering drawings complete with all dimensions which indicate all features of the Development as it has actually been built;

"ASTM" means the American Society for Testing and Materials;

"base" means the exposed and finished elevation of the bottom of any cell of the wastewater treatment lagoon;

"bentonite" means specially formulated standard mill grade sodium bentonite conforming to American Petroleum Institute Specification 13-A;

"cut-off" means a vertical-side trench filled with compacted clay or a wall constructed from compacted clay;

"Director" means an employee so designated pursuant to the Environment Act;

"effluent" means treated wastewater flowing or pumped out of the wastewater treatment lagoon;

"fecal coliform" means aerobic and facultative, Gram-negative, nonspore-forming, rod-shaped bacteria capable of growth at 44.5 °C, and associated with fecal matter of warm-blooded animals;

"five-day biochemical oxygen demand" means that part of the oxygen demand usually associated with biochemical oxidation of organic matter within 5 days at a temperature of 20°C;

"flooding" means the flowing of water onto lands, other than waterways, due to the overtopping of a waterway or waterways;

"high water mark" means the line on the interior surface of the primary and secondary cells which is normally reached when the cell is at the maximum allowable liquid level or the line of the exterior of the perimeter dykes which is reached during local flooding;

"hydraulic conductivity" means the quantity of water that will flow through a unit cross-sectional area of a porous material per unit of time under a hydraulic gradient of 1.0;

"influent" means water, wastewater, or other liquid flowing into a wastewater treatment facility;

"in-situ" means on the site;

"low water mark" means the line on the interior surface of the primary and secondary cells which is normally reached when the cell is discharged;

"MPN Index" means the most probable number of coliform organisms in a given volume of wastewater which, in accordance with statistical theory, would yield the observed test result with the greatest frequency;

"PVC" means polyvinyl chloride;

"primary cell" means the first in a series of cells of the wastewater treatment lagoon system and which is the cell that receives the untreated wastewater;

"rip rap" means small, broken stones or boulders placed compactly or irregularly on dykes or similar embankments for protection of earth surfaces against wave action or current;

"secondary cell" means a cell of the wastewater treatment lagoon system which is the cell that receives partially treated wastewater from the primary cell;

"septage" means the sludge produced in individual on-site wastewater disposal systems such as septic tanks;

"sewage" means household and commercial wastewater that contains human waste;

"sludge solids" means solids in sludge;

"sludge" means accumulated solid material containing large amounts of entrained water, which has separated from wastewater during processing;

"Standard Methods for the Examination of Water and Wastewater" means the most recent edition of Standard Methods for the Examination of Water and Wastewater published jointly by the American Public Health Association, the American Waterworks Association and the Water Environment Federation;

"total coliform" means a group of aerobic and facultative anaerobic, Gram-negative, nonspore-forming, rod-shaped bacteria, that ferment lactose with gas and acid formation within 48 hours at 35 °C, and inhabit predominantly the intestines of man or animals, but are occasionally found elsewhere and include the sub-group of fecal coliform bacteria;

"wastewater" means the spent or used water of a community or industry which contains dissolved and suspended matter;

"wastewater treatment lagoon" means an impoundment into which wastewater is discharged for storage and treatment by natural oxidation; and

"wetland" means an area of land that is usually saturated with water, often a marsh or a swamp.

GENERAL TERMS AND CONDITIONS

This Section of the Licence contains requirements intended to provide guidance to the Licencee in implementing practices to ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for present and future Manitobans.

1. The Licencee shall direct all wastewater and septage generated within the Community of Matheson Island and immediate surrounding area toward the wastewater treatment lagoon or other approved sewage treatment facilities.
2. In addition to any of the limits, terms and conditions specified in this Licence, the Licencee shall, upon the request of the Director:
 - a) sample, monitor, analyze and/or investigate specific areas of concern regarding any segment, component or aspect of pollutant storage, containment, treatment, handling, disposal or emission systems, for such pollutants or ambient quality, aquatic toxicity, leachate characteristics and discharge or emission rates, for such duration and at such frequencies as may be specified;
 - b) determine the environmental impact associated with the release of any pollutant(s) from the Development; or
 - c) provide the Director, within such time as may be specified, with such reports, drawings, specifications, analytical data, descriptions of sampling and analytical procedures being used, bioassay data, flow rate measurements and such other information as may from time to time be requested.
3. The Licencee shall, unless otherwise specified in this Licence:
 - a) carry out all preservations and analyses on liquid samples in accordance with the methods prescribed in "Standard Methods for the Examination of Water and Wastewater" or in accordance with an equivalent analytical methodology approved by the Director;
 - b) have all analytical determinations undertaken by an accredited laboratory; and
 - c) report the results to the Director, in writing or in a format acceptable to the Director, within 60 days of the samples being taken.

4. The Licencee shall, in case of physical or mechanical breakdown of the wastewater collection and/or treatment system:
 - a) notify the Director immediately;
 - b) identify the repairs required to the wastewater collection and/or treatment system;
 - c) undertake all repairs to minimize unauthorized discharges of wastewater; and
 - d) complete the repairs in accordance with any written instructions of the Director.
5. The Licencee shall, during construction and operation of the Development, report spills of fuels or other contaminants to an Environment Officer in accordance with the requirements of *Manitoba Regulation 439/87* respecting *Environmental Accident Reporting* or any future amendment thereof.
6. The Licencee shall comply with the provisions of the Department of Fisheries and Oceans Canada/Manitoba Natural Resources publication, "*Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat*" (May, 1996).
7. The Licencee shall obtain all necessary provincial and federal permits and approvals for construction of relevant components of the Development prior to commencement of construction.

SPECIFICATIONS, LIMITS, TERMS AND CONDITIONS

8. The Licencee shall notify the assigned Environment Officer not less than two weeks prior to beginning construction of the Development. The notification shall include the intended starting date of construction and the name of the contractor responsible for the construction.
9. The Licencee shall:
 - a) conduct all ditch related work activities during no flow or dry conditions and not during the April 1 to June 15 fish spawning and incubation period.
 - b) not construct the wastewater treatment lagoon during periods of heavy rain;
 - c) place and/or isolate all dredged and construction material where it will not erode into any watercourse;
 - d) implement effective long-term sediment and erosion control measures to prevent soil-laden runoff, and/or silt from entering any watercourse during construction and until vegetation is established;
 - e) routinely inspect all erosion and sediment control structures and immediately complete any necessary maintenance or repair; and

- f) vegetate any disturbed areas by planting and seeding preferably native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate.
10. The Licencee shall, during construction of the wastewater treatment lagoon, operate, maintain and store all materials and equipment in a manner that prevents any deleterious substances (fuel, oil, grease, hydraulic fluids, coolant, paint, uncured concrete and concrete wash water, etc.) from entering the wastewater treatment lagoon, the discharge route and associated watercourses.
11. The Licencee shall locate all fuel storage and equipment servicing areas established for the construction and operation of the Development a minimum distance of 100 metres from any waterbody, and shall comply with the requirements of *Manitoba Regulation 188/2001* respecting *Storage and Handling of Petroleum Products and Allied Products Regulation* or any future amendment thereof.
12. The Licencee shall not alter local drainage patterns by the construction of the Development, including inflows and outflows from small wetlands adjacent to the wastewater treatment lagoon and the routes of any related roadway or pipe installations.
13. The Licencee shall, prior to the construction of the dykes of the wastewater treatment lagoon:
- a) remove all organic topsoil from the area where the dykes will be constructed; or
 - b) remove all organic material for a depth of 0.3 metres and a width of 3.0 metres from the area where the liner will be constructed.
14. The Licencee shall construct and maintain the wastewater treatment lagoon with a double liner system including:
- a) a continuous lowermost liner underlying all interior surfaces of the cells of the wastewater treatment lagoon that:
 - i) is constructed from PVC geomembrane that has been manufactured in accordance with ASTM Standard D 7176-06;
 - ii) has a minimum thickness of 30 mils;
 - iii) is immediately underlain by a protective non-woven geotextile;
 - iv) is installed in accordance with ASAE Standard EP340.2 for the Installation of Flexible Membrane Linings;
 - v) has all sections joined by dual track seaming;
 - vi) is installed to a minimum elevation of 2.5 metres above the bases of the cells;

- vii) is free of holes and has a hydraulic conductivity not exceeding 3.0×10^{-9} centimetres per second over the entire surface area of the liner;
 - viii) is tested using non-destructive test methods to test the integrity of:
 - A) all field seams joining liner sections of this component of the liner in accordance with ASTM Standard D 7177-05; and
 - B) all other field seams of this component of the liner in accordance with ASTM Standard D 4437-99;
 - ix) is reported on in a testing report prepared and submitted to the Director within 30 days of commencing the installation of this component of the liner; and
 - x) is covered with;
 - A) compacted sand or other granular cover material deemed suitable by the PVC geomembrane manufacturer to a minimum depth of 0.15 metre measured perpendicular to the surface of the liner; or
 - B) a medium to heavy weight non-woven geotextile; and
- b) a continuous uppermost liner underlying all interior surfaces of the cells of the wastewater treatment lagoon in accordance with the following specifications:
- i) this component of the liner shall be made of clay;
 - ii) this component of the liner shall be at least one metre in thickness;
 - iii) this component of the liner shall have a hydraulic conductivity of 1×10^{-7} centimetres per second or less at all locations; and
 - iv) this component of the liner shall be constructed to an elevation of 2.5 metres above the bases of the cells.
15. The Licencee shall construct and maintain an effective gas relief system under the PVC geomembrane component of the liner of the wastewater treatment lagoon.
16. The Licencee shall notify the Director one week prior to commencing the installation of the gas relief system and the PVC geomembrane component of the liner of the wastewater treatment lagoon.
17. The Licencee shall not cover the PVC geomembrane component of the liner of the wastewater treatment lagoon until receiving the approval of the Director of the report submitted pursuant to sub-Clause 14 a) ix) of this Licence.
18. The Licencee shall construct and maintain an effective means of detecting seepage through any portion of the clay soil liner.

19. The Licencee shall:
 - a) advise the Director of the commissioning date of the wastewater treatment lagoon;
 - b) fill both the primary and secondary cells with water, to an elevation of 0.75 metres above the floor elevation of each respective cell, after all required soil sampling and testing requirements have been met and within 8 months of the commissioning date for the wastewater treatment lagoon;
 - c) after the wastewater treatment lagoon has been commissioned for a period of 8 months, maintain the liquid depth in the primary cell at an elevation of not less than 0.75 metres above the floor elevation of primary cell, at all times; and
 - d) after the wastewater treatment lagoon has been commissioned for a period of 8 months, maintain the liquid depth in the secondary cell at an elevation of not less than 0.3 metres above the floor elevation of secondary cell at all times.

20. The Licencee shall operate and maintain the wastewater treatment lagoon in such a manner that:
 - a) the organic loading on the primary cell, as indicated by the five-day biochemical oxygen demand, is not in excess of 56 kilograms per hectare per day;
 - b) the depth of liquid in the primary cell or secondary cell does not exceed 1.5 metres; and
 - c) the release of offensive odours is minimized.

21. The Licencee shall not discharge effluent from the wastewater treatment lagoon:
 - a) where the organic content of the effluent, as indicated by the five day biochemical oxygen demand, is in excess of 30 milligrams per litre;
 - b) where the fecal coliform content of the effluent, as indicated by the MPN index, is in excess of 200 per 100 millilitres of sample;
 - c) where the total coliform content of the effluent, as indicated by the MPN index, is in excess of 1500 per 100 millilitres of sample;
 - d) between the 1st day of November of any year and the 15th day of June of the following year;
 - e) when flooding from any cause is occurring along the effluent drainage route; or
 - f) when such a discharge would cause or contribute to flooding in or along the effluent drainage route.

22. The Licencee shall install and maintain a fence around the wastewater treatment lagoon to limit access. The fence shall be a minimum of 1.2 meters high and have a locking gate, which shall be locked at all times except to allow access to the wastewater treatment lagoon.

23. The Licencee shall construct and maintain an all-weather access road and a sewage dumping station for truck handled sewage. The dumping facility shall have a surface splash ramp with a smooth hard surface that can be easily washed free of solids.
24. The Licencee shall not discharge septage into the wastewater treatment lagoon between the 15th day of October of any year and the 1st day of June of the following year.
25. The Licencee shall, if in the opinion of the Director, significant erosion of the interior surfaces of the dykes occurs, repair the dyke and install rip rap as necessary. The rip rap shall be placed on the interior dyke surfaces from 0.6 metres above the high water mark to at least 0.6 metres below the low water mark to protect the dykes from wave action.
26. The Licencee shall provide and maintain a grass cover on the dykes of the wastewater treatment lagoon and shall regulate the growth of the vegetation so that the height of the vegetation does not exceed 0.3 metres on all dykes.
27. The Licencee shall annually remove by mechanical methods all reeds, rushes and trees located above the low water mark in every cell of the wastewater treatment lagoon.
28. The Licencee shall implement an ongoing program to remove burrowing animals from the site of the wastewater treatment lagoon.
29. The Licencee shall actively participate in any future watershed-based management study, plan and/or nutrient reduction program, approved by the Director, for Lake Winnipeg and/or associated waterways and watersheds.

MONITORING AND REPORTING

30. The Licencee shall prior to each effluent discharge campaign obtain grab samples of the treated wastewater and have them analyzed for:
 - a) the organic content as indicated by the five day biochemical oxygen demand and expressed as milligrams per litre;
 - b) the fecal coliform content as indicated by the MPN index and expressed as MPN per 100 millilitres per sample; and
 - c) the total coliform content as indicated by the MPN index and expressed as MPN per 100 millilitres per sample.

31. The Licencee shall:
- a) during each year maintain records of:
 - i) wastewater sample dates;
 - ii) original copies of laboratory analytical results of the sampled wastewater;
 - iii) effluent discharge dates;
 - b) make the records being maintained pursuant to sub-Clause 31 a) of this Licence available to an Environment Officer upon request; and
 - c) keep the maintained records of any one calendar year available for inspection for a period of three years following the respective calendar year in which they were recorded.
32. The Licencee shall submit to the Director for approval, to be obtained prior to commencement of operation of the wastewater treatment lagoon, a seepage detection and monitoring plan, relative to the requirements of Clause 18 of this Licence, regarding the integrity and performance of the clay soil liner of the Development.
33. The Licencee shall, for a period of at least five years following the commencement of operation of the wastewater treatment lagoon under this Licence, obtain samples of effluent during each effluent discharge campaign from the secondary cell of the wastewater treatment lagoon. The samples shall be preserved, analyzed and reported in accordance with the requirements of Clause 3 of this Licence, and shall be analyzed for:
- a) total phosphorus;
 - b) total dissolved phosphorus;
 - c) inorganic phosphorus;
 - d) total Kjeldahl nitrogen;
 - e) ammonia; and
 - f) nitrate-nitrite.
34. The Licencee shall, for a period of at least five years following the commencement of operation of the wastewater treatment lagoon under this Licence and during each discharge campaign, obtain samples of water from the receiving surface bodies of water. Such samples shall be obtained from the natural marsh into which effluent is discharged and from Lake Winnipeg in the vicinity of where it connects to the natural marsh. Samples shall also be obtained in each year from the same locations in the spring prior to each discharge campaign and in late August. The samples shall be preserved, analyzed and reported in accordance with the requirements of Clause 3 of this Licence, and shall be analyzed for:
- a) total phosphorus;
 - b) total dissolved phosphorus;

- c) inorganic phosphorus;
 - d) total Kjeldahl nitrogen;
 - e) ammonia; and
 - f) nitrate-nitrite.
35. The Licencee shall report the results from the sampling required by Clauses 33 and 34 of this Licence to the Director in accordance with the requirements of Clause 3 c) of this Licence.
36. The Licencee shall install and maintain monitoring wells at a minimum of three effective locations in the immediate vicinity of the wastewater treatment lagoon in a manner that will allow representative sampling of groundwater from the saturated portions of the carbonate aquifer and the sandstone aquifer. Each monitoring well shall:
- a) hydraulically isolate the saturated portions within the carbonate aquifer and the upper portion of the sandstone aquifer;
 - b) have the annulus around the casing properly grouted so as to prevent surface water or soil water from entering the well; and
 - c) have the casing extending above ground protected with a steel lockable cover.
37. The Licencee shall, for each monitoring well sampling campaign:
- a) measure and record the static water level in each monitoring well prior to purging;
 - b) purge each monitoring well prior to sampling to ensure a representative groundwater sample is collected;
 - c) record the purging method and measure and record the volume of water purged from each monitoring well; and
 - d) field filter all samples using a 0.45µm pore size filter.
38. The Licencee shall:
- a) measure and record static groundwater elevations in and obtain samples from the monitoring wells annually;
 - b) analyze the samples for the constituents listed in Schedule "B" of this Licence for the two initial sampling events;
 - c) analyze the samples for the constituents listed in Schedule "C" of this Licence for subsequent sampling events; and
 - d) provide to the Director within eight weeks of the results being received following each sampling event a report that provides:
 - i) tabulated results for all recording and sampling events to the date of the report;

- ii) a calculation of the groundwater flow direction in both the carbonate and sandstone aquifers and comparison of the flow directions with previous calculations; and
 - iii) an interpretation of the measuring and analytical results with regard to whether any significant change in the groundwater characteristics has occurred and, if so, whether this change in groundwater characteristics may reflect seepage from the wastewater treatment lagoon.

- 39. The Licencee shall arrange with the designated Environment Officer a mutually acceptable time and date for any required soil sampling between the 15th day of May and the 15th day of October of any year.

- 40. The Licencee shall take and test undisturbed soil samples, in accordance with Schedule "A" attached to this Licence, from the liner of the wastewater treatment lagoon; the number and location of samples and test methods to be specified by the designated Environment Officer up to a maximum of 30 samples.

- 41. The Licencee shall, not less than 2 weeks before the wastewater treatment lagoon is placed in operation, submit to the Director the results of the tests carried out pursuant to Clause 40 of this Licence.

- 42. The Licencee shall take action to maintain the soil and PVC liners of the wastewater treatment lagoon. If any portion or portions of the liners become displaced from its design position, the Licencee shall immediately report the displacement(s) to the Director and take any measures required by the Director to restore the liner(s) to its design position and state.

- 43. The Licencee shall, after the completion of construction:
 - a) monitor the sites where work occurred to evaluate the effectiveness of erosion control and sediment control measures and the physical stability of roadside ditches and watercourse crossings; and
 - b) where monitoring identifies any problems, immediately take appropriate action to rectify the situation and advise the Department of Fisheries and Oceans – Manitoba District – Winnipeg Office of the situation and any corrective measures taken.

- 44. The Licencee shall:
 - a) prepare "as constructed drawings" for the Development and shall label the drawings "As Constructed"; and
 - b) provide to the Director, on or before the 27th day of February, 2009, two sets of "as constructed drawings" of the wastewater treatment lagoon.

DECOMMISSIONING

45. The Licencee shall, after placing the Development into operation, prevent any additional wastewater from being discharged into the existing sewage treatment plant.
46. The Licencee shall, within one year of placing the Development into operation, decommission the existing sewage treatment plant in accordance with the following decommissioning terms and any written instructions of the Director:
 - a) liquid from the sequencing batch reactor tanks shall be removed to the primary cell of the wastewater treatment lagoon;
 - b) waste solids and sludge from the sequencing batch reactor tanks shall be removed to;
 - i) a waste disposal ground operated under the authority of a permit issued under Manitoba Regulation 150/91 or a Licence issued pursuant to The Environment Act; or
 - ii) the primary cell of the wastewater treatment lagoon;
 - c) all mechanical and electrical equipment, piping and wiring from the inside of the building shall be removed;
 - d) remove all mechanical components of the sewage treatment plant, including all above and below grade tanks, and dispose of all components;
 - i) at a waste disposal ground operated under the authority of a permit issued under Manitoba Regulation 150/91 or a Licence issued pursuant to The Environment Act; or
 - ii) at an appropriate recycling facility;
 - e) the site shall be tested for contamination, a contamination report shall be submitted to the Director and the site shall be remediated in accordance with any written instructions of the Director;
 - f) the site shall be backfilled with compacted granular or till material and graded to surrounding natural grade; and
 - g) the site shall be seeded with grass to prevent erosion.

REVIEW AND REVOCATION

- A. Licence No. 1518 is rescinded upon approved successful commissioning of the wastewater treatment lagoon and decommissioning of the sewage treatment plant located on Lot 16, Plan 2927 WLTO in Township 32, Range 4EPM in the Community of Matheson Island.

- B. If, in the opinion of the Director, the Licencee has exceeded or is exceeding or has or is failing to meet the specifications, limits, terms, or conditions set out in this Licence, the Director may, temporarily or permanently, revoke this Licence.
- C. If the Licencee has not commenced construction of the Development within three years of the date of this Licence, the Licence is revoked.
- D. If, in the opinion of the Director, new evidence warrants a change in the specifications, limits, terms or conditions of this Licence, the Director may require the filing of a new proposal pursuant to Section 11 of The Environment Act.



Tracey Braun, M.Sc.
Director
Environment Act

FILE: 5089.00

Schedule "A" to Environment Act Licence No. 2833

Soil Sampling:

1. The Licencee shall provide a drilling rig, acceptable to the designated Environment Officer, to extract soil samples from the liner which is not placed or found at the surface of the lagoon structure. This includes all wastewater treatment lagoons constructed with clay cutoffs at the interior base of the dyke or with a clay cutoff in the centre of the dyke. The drill rig shall have the capacity to drill to the maximum depth of the clay cutoff plus an additional 2 metres. The drill rig shall be equipped with both standard and hollow stem augers. The minimum hole diameter shall be 5 inches.
2. For lagoon liners placed or found at the surface of the lagoon structure, the Licencee shall provide a machine, acceptable to the designated Environment Officer, capable of pressing a sampling tube into the liner in a straight line motion along the centre axis line of the sample tube and without sideways movement.
3. Soil samples shall be collected and shipped in accordance with ASTM Standard D 1587 (Standard Practice for Thin-Walled Tube Sampling of Soils), D 4220 (Standard Practice for Preserving and Transporting Soil Samples) and D 3550 (Standard Practice for Ring-Lines Barrel Sampling of Soils). Thin-walled tubes shall meet the stated requirements including length, inside clearance ratio and corrosion protection. An adequate venting area shall be provided through the sampling head.
4. At the time of sample collection, the designated Environment Officer shall advise the Licencee as to the soil testing method that must be used on each sample. The oedometer method may be used for a sample were the Environment Officer determines that the soil sample is taken from an undisturbed clay soil which has not been remoulded and which is homogeneous and unweathered. The triaxial test shall be used for all samples taken from disturbed and remoulded soils or from non homogenous and weathered soils.
5. The Licencee shall provide a report on the collection of soil samples to the designated Environment Officer and to the laboratory technician which includes but is not limited to: a plot plan indicating sample location, depth or elevation of sample, length of advance of the sample tube length of soil sample contained in the tube after its advancement, the soil test method specified by the Environment Officer for each soil sample and all necessary instructions from the site engineer to the laboratory technician.
6. All drill and sample holes shall be sealed with bentonite pellets after the field drilling and sampling has been completed.

Soil Testing Methods:

1. Triaxial Test Method

- a) The soil samples shall be tested for hydraulic conductivity using ASTM D 5084 (Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter).
- b) Soil specimens shall have a minimum diameter of 70 mm (2.75 inches) and a minimum height of 70 mm (2.75 inches). The soil specimens shall be selected from a section of the soil sample which contains the most porous material based on a visual inspection. The hydraulic gradient shall not exceed 30 during sample preparation and testing. Swelling of the soil specimen should be controlled to adjust for: the amount of compaction measured during sample collection and extraction from the tube and the depth or elevation of the sample. The effective stress used during saturation or consolidation of the sample shall not exceed 40 kPa (5.7 psi) or the specific stress level, that is expected in the field location were the sample was taken, which ever is greater.
- c) The complete laboratory report, as outlined in ASTM D 5084, shall be supplied for each soil sample collected in the field.

2. Oedometer Test Method

- a) The soil samples shall be tested for hydraulic conductivity using ASTM D 2435 (Standard Test Method for One-Dimensional Consolidation Properties of Soils).
- b) Soil specimens shall have a minimum diameter of 50 mm (2 inches) and a minimum height of 20 mm (0.8 inches). The soil specimens shall be selected from a section of the soil sample which contains the most porous material based on a visual inspection. The soil specimen shall be taken from an undisturbed soil sample. The soil specimen shall be completely saturated.
- c) The complete laboratory report, as outlined in ASTM D 2435, shall be supplied for each soil sample collected in the field.

Schedule B
To Environment Act Licence No. 2833

Parameter	Notes	Detection Limit	Units
Alkalinity-Total (as CaCO ₃)		1	mg/L
Alkalinity-Bicarbonate (HCO ₃)		0.5	mg/L
Alkalinity-Carbonate (CO ₃)		0.5	mg/L
Alkalinity -Hydroxide (OH)		0.5	mg/L
pH		0-14	units
Conductivity		1	uscM
Total Dissolved Solids		5	mg/L
Fluoride (F)	Dissolved	0.05	mg/L
NH ₃ -N	Dissolved	0.01	mg/L
Silica Reactive (SiO ₂)	Dissolved	0.05	mg/L
Chloride (Cl)	Soluble	0.2	mg/L
NO ₃ NO ₂ N	Soluble	0.01	mg/L
Sulphate (SO ₄)	Soluble	0.5	mg/L
Total Soluble P	Field Filtered	0.001	mg/L
Hardness (as CaCO ₃)	Field Filtered	1	mg/L
Aluminum (Al)	Field Filtered	0.001	mg/L
Antimony (Sb)	Field Filtered	0.0002	mg/L
Arsenic (As)	Field Filtered	0.0002	mg/L
Barium (Ba)	Field Filtered	0.0002	mg/L
Beryllium (Be)	Field Filtered	0.0002	mg/L
Bismuth (Bi)	Field Filtered	0.0002	mg/L
Boron (B)	Field Filtered	0.01	mg/L
Cesium (Cs)	Field Filtered	0.0001	mg/L
Cadmium (Cd)	Field Filtered	0.00004	mg/L
Calcium (Ca)	Field Filtered	0.01	mg/L
Chromium (Cr)	Field Filtered	0.0002	mg/L
Cobalt (Co)	Field Filtered	0.0002	mg/L
Copper (Cu)	Field Filtered	0.0002	mg/L
Iron (Fe)	Field Filtered	0.0002	mg/L
Lead (Pb)	Field Filtered	0.0002	mg/L
Lithium (Li)	Field Filtered	0.0002	mg/L
Magnesium (Mg)	Field Filtered	0.05	mg/L
Manganese (Mn)	Field Filtered	0.0002	mg/L
Molybdenum (Mo)	Field Filtered	0.0001	mg/L
Nickel (Ni)	Field Filtered	0.0002	mg/L
Phosphorus (P)	Field Filtered	0.002	mg/L
Potassium (K)	Field Filtered	0.02	mg/L
Rubidium (Rb)	Field Filtered	0.0002	mg/L
Selenium (Se)	Field Filtered	0.0002	mg/L
Silicon (Si)	Field Filtered	0.1	mg/L
Silver (Ag)	Field Filtered	0.00005	mg/L
Sodium (Na)	Field Filtered	0.01	mg/L
Tellurium (Te)	Field Filtered	0.0002	mg/L
Thallium (Tl)	Field Filtered	0.00002	mg/L
Thorium (Th)	Field Filtered	0.0001	mg/L
Tin (Sn)	Field Filtered	0.0002	mg/L
Titanium (Ti)	Field Filtered	0.0002	mg/L
Uranium (U)	Field Filtered	0.0001	mg/L
Vanadium (V)	Field Filtered	0.0002	mg/L
Zinc (Zn)	Field Filtered	0.001	mg/L
Zirconium (Zr)	Field Filtered	0.002	mg/L

Schedule C
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Parameter	Notes	Detection Limits	Units
Conductivity		1	usc/m
Alkalinity-Bicarbonate (HCO ₃)		0.5	mg/L
NH ₃ -N	Dissolved	0.01	mg/L
Chloride (Cl)	Soluble	0.2	mg/L
NO ₃ NO ₂ N	Soluble	0.01	mg/L
Sulphate (SO ₄)	Soluble	0.5	mg/L
Potassium (K)	Field Filtered	0.02	mg/L
Calcium (Ca)	Field Filtered	0.01	mg/L
Magnesium (Mg)	Field Filtered	0.05	mg/L
Sodium (Na)	Field Filtered	0.01	mg/L