

SUMMARY OF COMMENTS/RECOMMENDATIONS

PROPONENT: Manitoba Aboriginal and Northern Affairs
PROPOSAL NAME: Matheson Island Wastewater Treatment Lagoon
CLASS OF DEVELOPMENT: 2
TYPE OF DEVELOPMENT: Wastewater Treatment Lagoon
CLIENT FILE NO.: 5089.00

OVERVIEW:

On January 25, 2005, the Department received an Environment Act Proposal (EAP) on behalf of Manitoba Aboriginal and Northern Affairs for the construction and operation of a wastewater treatment lagoon located in NE 3 – 32 – 4EPM to serve the Community of Matheson Island. Treated wastewater from the wastewater treatment lagoon will be discharged between June 15th and November 1st of any year to a ditch that will flow southeast to a natural marsh that is connected to Lake Winnipeg. The existing wastewater treatment plant currently serving the Community of Matheson Island will be decommissioned once the wastewater treatment lagoon is commissioned. Delivery of wastewater and septage to the wastewater treatment lagoon will be by truck haul as was the practice with the wastewater treatment plant.

On January 31, 2005, the Department requested that the consultant provide additional supporting information prior to commencing review of the EAP.

On February 18, 2005 and April 4, 2005, the Department received the additional supporting information.

The proposal and supporting documentation prepared by Cochrane Engineering Ltd., identified clay type soils at the proposed site. The supporting documentation indicated that the clay soil is expected to meet provincial standards regarding hydraulic conductivity of soils used for construction of wastewater treatment lagoons.

The Department, on April 8, 2005, placed copies of the EAP report in the Public Registries located at 123 Main St. (Union Station); the Centennial Public Library, Manitoba Eco-Network, St. James-Assiniboia Public Library, Selkirk-St. Andrews Regional Library and the Community of Matheson Island and provided copies of the EAP report to the Canadian Environmental Assessment Agency and TAC members. As well, the Department placed public notifications of the EAP in the Interlake Spectator on

Monday, April 18, 2005. The newspapers and TAC notifications invited responses until May 13, 2005.

There were no comments from the public. On May 26, 2005, Manitoba Conservation submitted responses from the TAC members to the appropriate Public Registries. Six TAC responses were received. Health Canada and Environment Canada offered to provide specialist advice. Department of Fisheries and Oceans Canada (DFO) indicated that Clauses relating to their most common concerns should be incorporated as standard Clauses.

On June 3, 2005, a letter, summarizing directly related items of interest presented by the TAC and federal government representation and requesting comments on these items of interest, was sent to the proponent's consultant. On June 30, 2005 Manitoba Conservation received a response to the request.

On July 15, 2005 the response material was distributed to TAC and federal government representation for review and comment. There were no additional comments from the TAC at this time.

On August 18, 2005 a Summary and a draft Environment Act Licence for this proposal was distributed to the TAC.

On September 6, 2005 Manitoba Water Stewardship forwarded comments regarding the EAP and the draft Environment Act Licence indicating that a risk assessment regarding the contamination of water wells (private or public) on Matheson Island should be a requirement. It was determined that such an assessment would be required to be completed prior to issuing a Licence.

On October 7, 2005 Manitoba Conservation requested that Manitoba Water Stewardship provide criteria for the risk assessment that they requested. On October 18, 2005 Manitoba Water Stewardship provided the criteria to Manitoba Conservation.

On October 20, 2005 Manitoba Conservation sent a letter to the proponent identifying the need for them to undertake a groundwater contamination risk assessment in accordance with the criteria provided by Manitoba Water Stewardship.

On February 27, 2006 the proponent submitted a groundwater contamination risk assessment report to Manitoba Conservation. On March 3, 2006 Manitoba Conservation forwarded the groundwater contamination risk assessment report to Manitoba Water Stewardship. On March 20, 2006 Manitoba Water Stewardship provided comments on the groundwater contamination risk assessment.

On May 11, 2006 Manitoba Conservation sent a letter to the proponent indicating that design details for the recently proposed modified liner system must be provided for

inclusion with the EAP review. In addition, the letter conveyed the requirement that a site characterization program must be completed and an acceptable detailed design for a groundwater monitoring system be proposed as components of this EAP.

On September 5, 2006 the proponent submitted a proposed groundwater investigation/monitoring program. On October 5, 2006 Manitoba Conservation forwarded the new information to Manitoba Water Stewardship for consideration. It was noted that the new information did not include details regarding a modified liner system. On October 11, 2006 and January 25, 2007 Manitoba Water Stewardship and on December 19, 2006 the Canadian Environmental Assessment Agency submitted comments on the proposed groundwater investigation/monitoring program.

On February 16, 2007 Manitoba Conservation sent a letter to the proponent indicating that a site characterization program must be completed and detailed design for a groundwater monitoring system, acceptable to Manitoba Water Stewardship, be proposed. The letter also indicated that the results of the site characterization and assessment may influence liner design requirements.

An August 23, 2007 report by Friesen Drillers Ltd., distributed directly to Manitoba Water Stewardship, provided recommendations with respect to the design and construction of the liner, background groundwater sampling and analyses from the monitoring wells installed during the study, proper abandonment of existing abandoned wells, and groundwater monitoring were provided.

A December 14, 2007 letter from the proponent's engineering consultant provided a proposal for the design of a double liner system with a direct leakage monitoring system for the lagoon. On January 24, 2008 Manitoba Conservation forwarded the design information to Manitoba Water Stewardship for consideration.

On January 25, 2008, Manitoba Water Stewardship provided comments regarding the monitoring well sampling requirements.

On March 27, 2008 Manitoba Conservation distributed the most recent groundwater monitoring and liner system and direct leakage monitoring system information to the TAC and federal representatives that remained active in the extended EAP review.

The draft Environment Act Licence contains clauses regarding groundwater monitoring requirements that were developed with direct input from the Water Resources Branch – Groundwater Section of Manitoba Water Stewardship.

COMMENTS FROM THE PUBLIC:

There were no comments from the public

COMMENTS FROM THE TECHNICAL ADVISORY COMMITTEE:

Historic Resources

- *No concerns.*

Manitoba Conservation - Regional Operations

- *Which provincial park sites would have wastewater directed to Matheson Island. My understanding is that the only provincial park in the area is Beaver Creek and waste produced from this site is to be routed to the proposed lagoon at Pine Dock. Later in the document the consultant does reference cottage development on crown land in the area in the sizing information, but no further reference is made to provincial park sites. Are there additional sites to be included to the sizing information or was the addition of provincial park sites wastewater made in error;*
- *Is the population assessment reasonable? The document contains no information to indicate if population trends in the area have been increasing or decreasing over the previous twenty or twenty five years;*
- *Estimates for the volume of wastewater produced by cabins may be low. Flow data from camps installing onsite systems range from 150 – 400 l/person/day. Similarly, onsite systems for residences are sized assuming 330-gal (1500L) daily wastewater flow. Assuming a three-bedroom home contains four people onsite values are nearly double the 800-L estimate provided by Cochrane;*
- *The Lake Winnipeg Stewardship Board has recommended that the province evaluate increasing storage capacity of lagoons to 400 days from 220 days.*

Proponent Response – June 28, 2005:

- The Park sites referred to in the EAP are seasonal sites designated for Manitoba Conservation Parks Department staff for personnel assigned to fire fighting duties in the area. The units are located on the mainland. Manitoba Conservation Parks Department has also requested an allowance for 45 future sites for Islandview;
- Population has dropped from 150 in 1985 to 99 in 2001 and somewhat stabilized. We allowed for modest growth to 140 in consultation with Manitoba Aboriginal and Northern Affairs;
- As no application data was available for the area, industry standard values were used from the US EPA manual “Wastewater Treatment/Disposal for Small Communities” as referenced in the EAP and from conversations with haulers in the cottage areas; and
- Current licences state storage capacity is for 227 days. If the province increases the storage capacity regulation, the situation will be reviewed at that time.

Disposition:

- The proposed design and operation of the wastewater treatment lagoon meet current requirements and the draft Licence contains clauses specific to the construction and operation requirements for wastewater treatment lagoons in Manitoba.

Sustainable Resource Management Branch

- *The proposal indicates that discharged treated effluent from the new lagoon facility will flow a short distance along a drainage ditch and then pass through a natural wetland before emptying into Lake Winnipeg. The proponent states that effluent from the existing wastewater treatment plant is currently discharged to pass through a different location within the same wetland. The proponent should provide some assurance that the effluent from the proposed facility will not have a negative impact on the wetland over the long-term. For example, what is the potential for salinity or nutrient concentrations in the wetland to eventually exceed the assimilative capacity of the existing vegetation? Periodic monitoring should be considered in order to determine whether or not the effluent is negatively impacting the vegetation and/or wildlife of the wetland.*
- *While the wastewater treatment lagoon should provide better effluent than the current SBR system, given the recent eutrophication issues and the diversity and commercial and recreational importance of fish species present in Lake Winnipeg, effluent quality and discharge times are a concern. Discharge after June 15th could overlap with the latter stages of sauger egg development and in the fall coincide with whitefish spawning. Both species are commercially fished in Lake Winnipeg. Ammonia levels should be monitored at not only the pond outlet but also at the end of the discharge route and along the shoreline in the vicinity where the effluent enters Lake Winnipeg.*
- *Sediment and erosion control measures need to be implemented before, during and after the construction of the cells, perimeter ditch, discharge route, culvert installation and road improvements, until all sites are stabilized to ensure no sediment enters the natural marsh and ultimately Lake Winnipeg.*
- *Insufficiently stabilized sludge from the decommissioned mechanical treatment plant will be disposed at the waste disposal grounds (ref page 14 Section 5.2.2 of the EIA report). It is recommended that the waste disposal grounds for the disposal of the sludge be identified specifically indicating the classification of such disposal grounds to ensure adherence to the requirements of MR. Regulation 150/91 Schedule C and D.*
- *The EIA report indicates the effluent would be discharged to a natural wetland area, which eventually leads to Lake Winnipeg. While the wetland vegetation would absorb in the initial stages, nutrient from the effluent, nutrient from*

detritus from the vegetation would eventually be discharged to the water column. It is recommended that a monitoring program be established to determine the nutrient loading conditions at the entrance of the discharge route to Lake Winnipeg.

- The EIA report indicates that most residences on Matheson Island have drilled wells and that the quality of groundwater is such that it must be treated to be potable. It is recommended that monitoring wells be installed upgradient and downgradient at the proposed site of the wastewater treatment lagoon to determine whether any leakage from the proposed lagoon cells would increase the adverse impact of such leakage on the quality of the groundwater sources which may be used for the proposed water treatment facility and thereby increase the treatment costs for obtaining potable drinking water.*
- The EIA report indicates that subsoil conditions from the selected area for the proposed wastewater treatment lagoon consist of well-defined fractures. It is recommended that clay from the area if used in the construction of the lagoon liner be reworked to ensure a hydraulic conductivity of 1×10^{-7} cm/s or less.*

Proponent Response – June 28, 2005:

- Sediment and erosion control measures will be adhered to as outlined in the Environment Act Licence;
- Sludge will be transferred to the new primary cell if it is not sufficiently stabilized for disposal at the Matheson Island waste disposal ground (ref page 14 Section 5.2.2 of the EIA report);
- As per the recommendation of the Geotechnical Report, page 5, Section 6.0, Step 3 (ref Appendix D Section of the EAP). For the proposed bottom and interior dykes, excavate down to the bottom depth of the 1 m liner. Scarify (mix) the excavated in-situ soil prior to placement of the excavated soil to the depth of the design elevation. Compact the scarified soil to 98% standard Proctor density near the optimum moisture content (+/- 2 to 3 % of optimum moisture content) with a sheepsfoot roller in 150 mm to 200 mm lifts. Any unsuitable material such as sand, boulder, silt and gravel materials should be removed and replaced with in-situ clay compacted to 98% standard Proctor density. Ensure that the inside and bottom liner consists of at least one metre of compacted clay. A shrinkage factor of about 25% should be used in calculating volumes of material to be used; and
- In regards to concerns and comments about sampling and monitoring the proponent will abide by the sampling and monitoring requirements set forth in the Environment Act Licence.

Disposition:

- Clause 32 of the draft Environment Act Licence requires that the Licencee 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 to monitor for the integrity of the soil liner;

- Clauses 33 and 34 of the draft Environment Act Licence require that the Licencee monitor effluent being discharged during each discharge campaign and the receiving surface body of water for a period of at least five years. The liquids shall be analyzed for total phosphorus, total dissolved phosphorus, inorganic phosphorus, total Kjeldahl nitrogen, ammonia and nitrate-nitrite. The results of the analyses shall be reported to the Director in accordance with the requirements of Clause 3 c) of the Licence;
- The draft Environment Act Licence contains Clauses that require the Licencee to construct and operate the wastewater treatment lagoon in such a manner as to prevent the disruption of natural wildlife and fish habitats;
- Clauses 45 and 46 of the draft Environment Act Licence identify required decommissioning activities for the existing wastewater treatment plant; and
- The draft Environment Act Licence includes limits, terms and conditions that identify requirements relating to the clay soil liner and the underlying HDPE liner.

Transportation & Government Services

- *No concerns.*

Water Quality Management – Manitoba Water Stewardship

Following Initial Review of EAP – April 14, 2005

- *The proponent should be required to actively participate in any future watershed based management study, plan/or nutrient reduction program, approved by the Director, for Lake Winnipeg and associated waterways and watersheds.*

Following Review of DRAFT EA Licence – September 6, 2005

- *Manitoba Water Stewardship has reviewed the above noted Draft Environment Act Licence. Clause 28 of the draft licence requires the Licensee submit to the Director, for approval, a groundwater quality investigation and monitoring plan for the site of the Development to monitor for liner integrity. We suggest the draft licence also require an assessment of the risk of contamination of water wells (private or public) on Matheson Island from the proposed wastewater treatment lagoon.*
- *The risk assessment study should consider but not necessarily be limited to the following:*
 - *Consider the entire hydrogeological system from the seepage of wastewater from the proposed engineered lagoon into the underlying soil and bedrock and the potential for migration of wastewater contamination from the lagoon site to private wells located in the community of Matheson Island.*

- *Based on the proposed lagoon design, determine the expected seepage losses from the lagoon to the underlying bedrock aquifer. The methods and assumptions used to calculate the expected seepage losses should be documented.*
- *Evaluate the potential for the migration of wastewater contamination to water wells located within the community of Matheson Island. The methods and assumptions used to undertake this evaluation should be documented.*
- *Because of the lack of information on the hydrogeological conditions for Matheson Island, it is expected the proponent will need to undertake a groundwater investigation to obtain the required information to determine the expected seepage losses from the lagoon to the underlying soil and bedrock and the potential for migration of wastewater contamination to the water wells within the underlying bedrock aquifer. The groundwater investigation should be designed to collect the necessary hydrogeological information required to undertake the risk assessment (i.e., aquifer depth and thickness, permeability of soils, bedrock and aquifer materials, groundwater flux and flow direction). Information obtained on the hydrogeological conditions of the site will also prove beneficial for any future licence requirements respecting the design of site monitoring plans to monitor for liner integrity.*
- *Based on the results of the risk assessment, confirm the suitability of the current lagoon design or provide a recommendation to consider an alternate design.*
- *A comprehensive risk assessment report should be submitted to Manitoba Conservation addressing the issues outlined above. It is recommended the proponent retain the services of an experienced hydrogeologist registered with the Association of Professional Engineers and Geoscientists of Manitoba.*

Proponent Responses – February 27, 2006:

- It was stated in your letter that the TAC requires a groundwater contamination risk assessment in order to proceed with its review of the project. Mr. Jeff Bell, P.Eng. of Friesen Drillers Ltd. was commissioned to carry out this task.
- Recommendations – Friesen Drillers Ltd. – February 3, 2006:
 - The wastewater pond, in addition to the natural clay liner, be lined with a flexible synthetic engineered liner, with the natural clay compacted liner, which both have been properly designed and constructed under the supervision of a qualified geotechnical engineer, to provide protection to the underlying aquifers on Matheson Island. In addition, we recommend that at least two nested monitoring wells be installed in carbonate bedrock aquifer and underlying sandstone aquifer. These monitoring wells should be sampled to determine background water qualities in the aquifers prior to utilizing the pond. The background data would be useful in documenting any localized impacts (if any) in both aquifers, prior to using the ponds.
 - The monitoring wells should be grouted and sealed into each specific aquifer. The construction supervision and logging should be undertaken by qualified

- personal with experience in rotary drilling and local bedrock conditions in the sandstone and bedrock aquifers.
- Any nearby abandoned water wells should be located and properly abandoned, following provincial guidelines. All wells should be shock chlorinated prior to abandonment.
 - Groundwater sampling should be conducted annually in the spring to monitor any changes in the groundwater quality.

Following Review of February 3, 2006 Recommendations – March 20, 2006

- *At the direction of Cochrane Engineering Ltd, the report prepared by Friesen Drillers Ltd. was limited in scope to a “desk top” analysis of available information. Portions of items one, three and five from the above list of considerations were addressed in their assessment. No site specific groundwater investigation was undertaken but rather the hydrogeological conditions at the site of the proposed lagoon were inferred from existing information and reports.*
- *The proposed liner system for the wastewater treatment lagoon is a continuous clay liner that is at least one metre thick and has a hydraulic conductivity of 1×10^{-7} cm/s or less. The report identifies two main concerns respecting the soil/bedrock conditions and design considerations of the lagoon liner. These include:*
 - *The natural soil cover and shale aquitard which confines the underlying Winnipeg formation sandstone aquifer is not sufficient to protect the aquifer from any potential seepage that might result in the event of leakage from the clay lined lagoon; and*
 - *Seasonal and climatic events are likely to result in the freezing/thawing and wetting/drying of the clay liner which could result in an increase of seepage from the wastewater treatment lagoon into the underlying, shallow carbonate aquifer. This seepage could potentially migrate towards Lake Winnipeg or towards and into local water wells completed within the underlying sandstone aquifer.*
- *These concerns suggest there is a potential risk for aquifer and water well contamination based on the current understanding of the site hydrogeology and proposed lagoon design. Subsequently, it is recommended that an alternate design be considered for the lagoon liner to minimize the potential risk of contamination to local aquifers and water well users.*
- *The report’s recommendation that the wastewater lagoon include a flexible synthetic engineered liner, in addition to the natural clay compacted liner, appears to be a reasonable design improvement to the proposed liner system. Design details of the proposed synthetic engineered liner were not provided as this was not within the scope of the report. Any alternate liner system design should clearly identify and quantify the additional groundwater protection that it is to provide for the local aquifer system.*

- *In regards to the report's recommendation of monitoring wells, considering the vulnerable groundwater environment it is agreed that groundwater monitoring should be carried out. Because of the inherent complexity of the multi-aquifer system, it is important to properly design a functional groundwater monitoring system. Prior to the design of a groundwater monitoring system, a site characterization program should be undertaken to collect any necessary hydrogeological information on the aquifer system (i.e., aquifer depths and thickness, permeabilities, groundwater flow directions, water quality conditions). This information should then be used in the detailed design of a groundwater monitoring system. The groundwater monitoring detailed design proposal should include but not necessarily be limited to information on well locations, well depths, construction details, sampling protocol and reporting.*

Proponent Responses – September 5, 2006:

- Further to the letter from Rob Boswick of May 11, 2006 and subsequent meeting of June 2, 2006, Friesen Drillers Ltd. (Jeff Bell) and Ecological Services Division (Laurie Frost) have come up with a groundwater investigation/monitoring program as per the attached August 24, 2006 Friesen Drillers Ltd. letter
- The intent of the program is to undertake a drilling program to gather information on the carbonate and sandstone aquifers to enable a monitoring well system to be developed that will allow:
 - Sampling down gradient of new wastewater pond.
 - Sampling before construction/operation of new wastewater pond.
 - Pressure transducers (2) to be installed to monitor fluctuations of the static water levels especially during the spring recharge period to confirm groundwater flow direction in both aquifers.
 - Review of above data by hydrogeological engineer or hydrogeologist in case any additional monitoring wells are required to adequately monitor facility.
 - Follow-up groundwater sampling as may be required by an Environment Act Licence.

• Recommendations – Friesen Drillers Ltd. – August 24, 2006:

We recommend the monitoring program be undertaken in two phases: an initial groundwater investigation program, followed by a secondary groundwater monitoring/sampling program.

Following Review of August 24, 2006 Report & Recommendations – October 11, 2006

- *In response to your request for a review of Cochrane Engineering Ltd.'s September 5, 2006 letter and associated August 24, 2006 Preliminary Hydrogeological Assessment – Groundwater Monitoring Program report prepared by Friesen Drillers Ltd. regarding the site of the proposed wastewater treatment lagoon on Matheson Island, the Groundwater Management Section is pleased to provide the following comments.*

- *Cochrane Engineering Ltd. recognizes that an initial groundwater investigation/monitoring program is required prior to construction of the wastewater treatment lagoon to help characterize the local multi-aquifer system (i.e., aquifer depths and thickness, fracture intensity, permeabilities, groundwater flow directions, water quality conditions). Once this initial information is collected, Cochrane Engineering Ltd. will have it reviewed by a hydrogeological engineer or hydrogeologist to determine what additional monitoring may be needed to ensure that a properly designed and functional groundwater monitoring system is established for the long-term monitoring of groundwater conditions within the local multi-aquifer system. Based on the size of the proposed lagoon and type of multi-aquifer system present, additional monitoring wells beyond the proposed 3 monitoring well nests will almost certainly be required to develop a functional groundwater monitoring system. It is recommended that the groundwater monitoring system be designed and installed no later than one year following the commissioning date of the wastewater treatment lagoon.*

- *In addition to the details provided in Friesen Drillers Ltd. proposed groundwater monitoring program, the following comments are provided:*
 - *During the initial groundwater investigation/monitoring program it is proposed to install an initial set of 3 nested monitoring wells with monitoring zones completed in the carbonate and sandstone aquifers. The proposed wells will provide the minimum information to determine groundwater flow directions and establish the general area down gradient of the proposed wastewater treatment lagoon. As noted in the Friesen Drillers Ltd. report, depending on the aquifer conditions, an additional well may be needed to help determine the groundwater flow direction.*

 - *The locations of the 3 test/nested monitoring wells relative to the location of the proposed lagoon have not yet been identified. From a water quality monitoring point of view, the monitoring wells should be located in close proximity to the proposed lagoon if the wells are to be established as part of the functional groundwater monitoring system. From a construction point of view, care should be taken in locating the wells to minimize the risk of damage to the wells during the construction of the lagoon. Protective steel casings should be considered in the monitoring well design.*

 - *As part of the test hole logging details, the location of all fractures and their ability to produce water should be noted.*

 - *It is proposed to isolate the carbonate and sandstone aquifers within a single test hole using shale packers installed into the sandstone aquifer, with cement grout placed by tremie line on top of the shale packers, through the shale aquitard. During the grouting procedure, care must be taken to ensure an adequate grout seal is established within this portion of the test hole so that the carbonate and sandstone aquifers are not artificially hydraulically connected. If it is determined that any of the carbonate and sandstone monitoring wells installed within a single*

test hole are artificially hydraulically connected, then new monitoring wells would need to be established and the old wells sealed as per instruction by Manitoba Water Stewardship.

An alternative to isolating the carbonate and sandstone aquifers within a single test hole would be to drill individual test holes for the construction of each of the carbonate and sandstone monitoring wells. Either method of monitoring well construction is considered acceptable, there's just a higher risk of adequately isolating the carbonate and sandstone aquifers within a single test hole.

- *As part of the monitoring well testing, adequate testing (short-term pumping or slug tests) should be undertaken to help establish the permeability characteristics of the monitoring zones completed within the carbonate and sandstone aquifers.*
- *It is proposed to equip two of the monitoring wells with pressure transducers to monitor water levels. The two wells to be monitored have not been identified. The proposed transducer monitoring will provide useful information on seasonal water level variations within the two wells monitored, however will not provide sufficient information to confirm groundwater flow directions in either the carbonate or sandstone aquifer. Information on local groundwater flow directions must be collected to identify the area down gradient of the proposed lagoon. In order to obtain sufficient information to help establish the groundwater flow direction and track water level trends in the carbonate and sandstone aquifers, it is recommended that water levels be measured 1) after they have stabilized following the drilling and installation of the monitoring wells (as per the Friesen Drillers Ltd. report), 2) at the time of water quality sampling (every 4 months) during the first year of operation of the lagoon, and 3) during annual sampling following the first year of operation of the lagoon.*
- *Prior to the start of any groundwater sampling, a detailed sampling protocol should be established to ensure all sampling is carried out in a standard and acceptable manner to allow sampling consistency and comparison of ongoing data collection. The protocol should include, but not necessarily be limited to information on pumping method (i.e., Waterra type sampling pumps), well purging, sample filtering, field and laboratory analyses (pre- and post-lagoon operation), sample preservation and QA/QC requirements. Manitoba Water Stewardship is available upon request to work with Cochrane Engineering Ltd. in developing a detailed sampling protocol.*
- *In regards to the design of a modified liner system for the wastewater treatment lagoon, Groundwater Managements main concern with the original design of a continuous clay liner (that is at least one metre thick and has a hydraulic conductivity of 1×10^{-7} cm/s or less) was whether the integrity of the liner could be maintained during seasonal and climatic events such as the freezing/thawing and wetting/drying of the clay liner which could result in an increase of seepage from the lagoon into the underlying aquifer system. During the projects June 2, 2006 meeting, Mr. Ross Webster of Cochrane Engineering Ltd. indicated he did not feel the bottom of the clay*

liner would dry out prior to filling of the lagoon however the slopes of the lagoon may be more susceptible to drying. It was also noted by Mr. Robert Boswick of Manitoba Conservation that Clause 15 of the draft Environment Act Licence addresses the commissioning and filling of the wastewater treatment lagoon. Provided the integrity of the clay liner is maintained following the construction and commissioning of the lagoon and with the establishment of a functional groundwater monitoring system that allows for the long-term monitoring of groundwater conditions within the local multi-aquifer system, then a modified liner design system may not be considered necessary.

Disposition:

- In the fall of 2007 Friesen Drillers Ltd. completed a hydrogeological investigation of the site of the proposed wastewater treatment lagoon. The investigation included site characterization and the establishment of monitoring wells. The draft Environment Act Licence includes clauses associated with the recommendations resulting from the investigation, including monitoring criteria that was developed with direct input from the Water Resources Branch – Groundwater Section of Manitoba Water Stewardship;
- The draft Environment Act Licence includes limits, terms and conditions that identify the need for a clay soil liner as well as an underlying HDPE liner, including a direct leakage monitoring system for the clay soil liner; and
- The draft Environment Act Licence contains a clause that requires that the Licencee 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.

Canadian Environmental Assessment Agency

- *CEAA responses have indicated that application of The Canadian Environmental Assessment Act with respect to this proposal will be required.*
- *Health Canada and Environment Canada indicated that they may be able to provide specialist information with respect to the project review while Fisheries and Oceans Canada and Department of Indian Affairs and Northern Development provided no comments.*
- *Western Diversification (WD) indicates that an environmental assessment under the Canadian Environmental Assessment Act is required as the project is being considered for funding under the Canada-Manitoba Infrastructure Program.*

November 27, 2006 – General Discussion by WD to Manitoba Water Stewardship

There would seem to be some fundamental concerns here that need to be addressed. I have talked to Vic Klassen (PFRA) about this and he shares our concerns and suggested as you have, the lagoon should include some redundancy such as the clay and HDPE liners. Vic suggested a double HDPE liner with some material in between to collect and monitor seepage or leaks.

December 19, 2006 – General Discussion by WD to Manitoba Water Stewardship

There is a vast difference between implementing a monitoring program and installing a secondary liner, both in cost and environmental impact. Monitoring instrumentation needs to be placed at the correct location to intercept contaminants should they occur which in this case may be difficult to identify but would likely need to be beneath as well as adjacent to the lagoon. There would be a significant cost associated with devising a monitoring plan, and purchasing and installing monitoring equipment not to mention the ongoing cost of sampling and testing. I suggest that those costs would likely exceed the cost of a secondary liner.

A decision comparing a secondary liner to a monitoring program should consider risk and consequence. The consequence in this case would be contamination of the carbonate aquifer. The risk of this occurring increases dramatically with only a clay liner barrier, to the point where the monitoring plan should include a plan of what to do if contamination occurs. Decontaminating would likely start with decommissioning of the lagoon and installing additional instrumentation to track the contaminant plume while ceasing to obtain water from the contaminated aquifer. I suggest that such a cost would be unacceptably high. Assurances that a clay liner is dependable if constructed and operated correctly place great dependance on the absence of human error, which in the case of high consequence, would normally dictate that secondary protection measures be incorporated.

There is an old saying that "an ounce of prevention is worth a pound of cure" which I believe applies in this case. There is another old saying that "common sense is not always common" which may also apply if the carbonate aquifer at Matheson Island is not protected with a secondary liner. I further suggest that a secondary liner can incorporate a leak detection system which would indicate if the primary liner has failed and only the secondary barrier remains intact. That would be a prudent measure to allow time to devise a strategy to continue to protect the carbonate aquifer. Such measures are common design practise for engineered landfills and are within the engineering community's ability to design and construct. Why would we monitor to identify when contamination occurs rather than protect the aquifer in an environmentally responsible manner?

The fact that a risk assessment has not been completed suggests that the residents of Matheson Island are not being provided with the proper tools to identify appropriate design measures and are instead faced with the prospect of potential future contamination of their aquifer. I think such an assessment is necessary to

identify the risk and consequence of liner failure and I also think that the cost of a secondary liner would be less than the cost of ongoing monitoring and certainly less than the cost of decontaminating the aquifer if that would even be possible.

Disposition:

- In the fall of 2007 Friesen Drillers Ltd. completed a hydrogeological investigation of the site of the proposed wastewater treatment lagoon. The investigation included site characterization and the establishment of monitoring wells. The draft Environment Act Licence includes clauses associated with the recommendations resulting from the investigation, including monitoring criteria that was developed with direct input from the Water Resources Branch – Groundwater Section of Manitoba Water Stewardship;
- The draft Environment Act Licence includes limits, terms and conditions that identify the need for a clay soil liner as well as an underlying HDPE liner, including a direct leakage monitoring system for the clay soil liner; and
- The draft Environment Act Licence contains a clause that requires that the Licencee 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.

PUBLIC HEARING:

A public hearing has not been requested.

RECOMMENDATION:

An Environment Act Licence should be issued in accordance with the attached draft. Enforcement of the Licence should be assigned to the Environmental Assessment and Licensing Branch until the required soil testing has been completed.

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May 5, 2008

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