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Proposal for an Environmental Act License for a New Domestic Wastewater Lagoon for Eagle Creek Colony at 25-5-8W in the Rural Municipality of Lorne

Submitted to:

Director
Environmental Approval Branch
Manitoba Conservation and Water Stewardship
Suite 160, 123 Main Street
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Proponent:
Eagle Creek Colony
As Represented by
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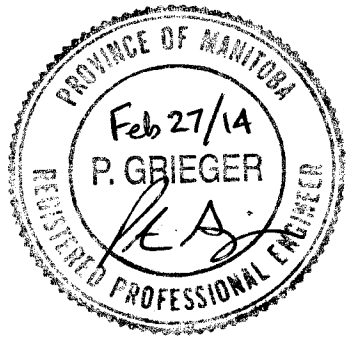

February 27, 2014.

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1.0 Introduction

Due to increasing population growth, Evergreen Hutterite Colony has decided to develop and ultimately populate a new colony called Eagle Creek Colony. The new colony is situated on 25-5-8W in the Rural Municipality of Lorne. The new colony will require a wastewater collection system emptying into a wastewater lagoon for the storage and treatment of all domestic waste. Sewage collection will consist of a pressure rated gravity system draining into a lift station, which will then be pumped into the proposed wastewater stabilization lagoon through a force main.

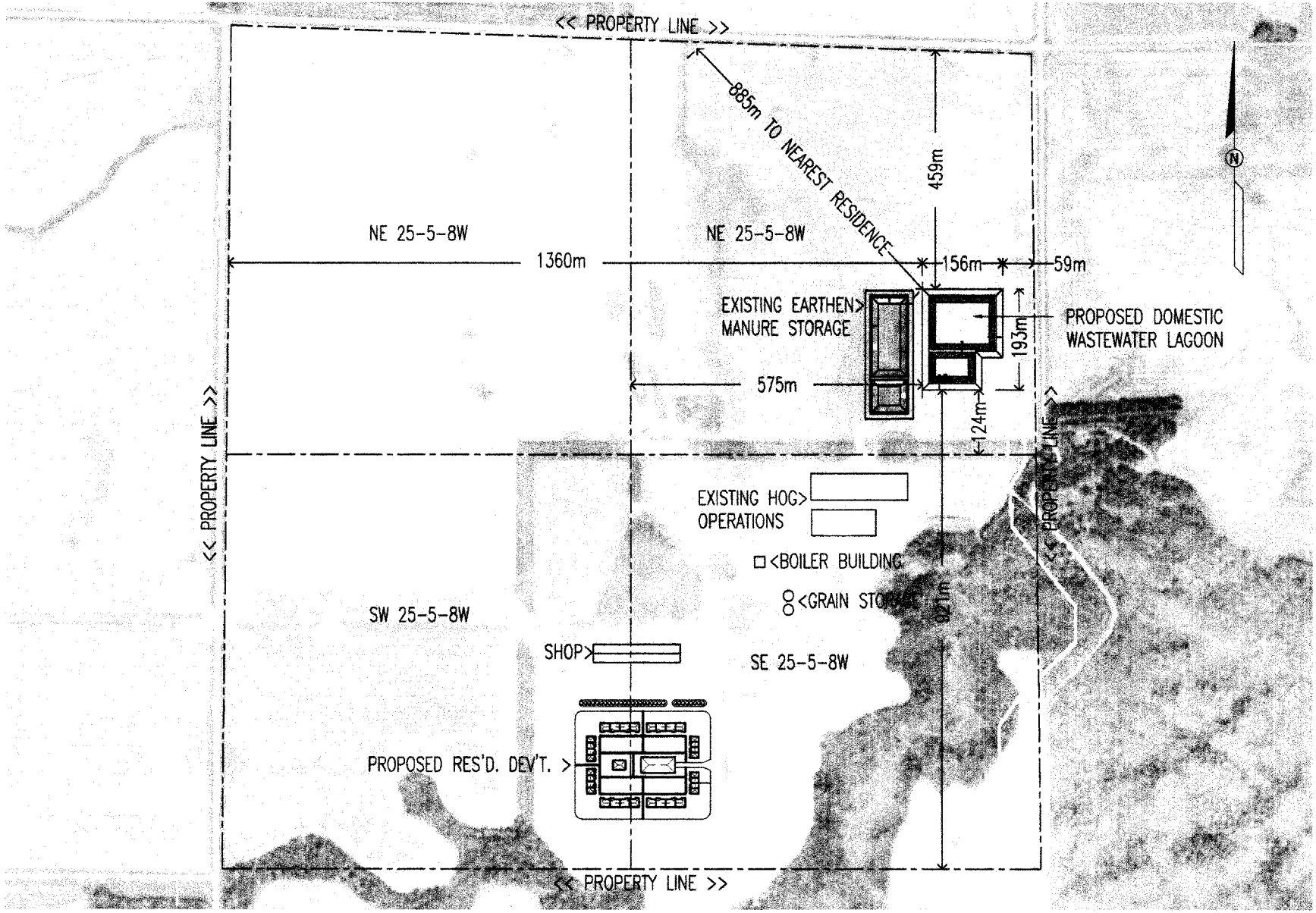
South-Man Engineering has been retained to provide design services in relation to the proposed stabilization lagoon and to prepare the Environment Act Proposal. This project is intended to commence after receipt of an Environment Act License. This report has been compiled to address the information requested in the Environment Act Proposal Form.

2.0 Land Ownership and Municipal Land-Use Designation

Spring Creek Holding Co. Ltd owns the proposed site. A copy of the Certificate of Title for the property is included in Appendix A. The wastewater stabilization pond will be situated on NE 25-5-8W; whereas the livestock and residential infrastructure will be situated on the SW and SE quarters of 25-5-8W as illustrated in Figure 1.

The land where the proposed development is to take place, and the immediate surrounding land, is currently designated for agricultural use and is used primarily for the production of cereal and oilseed crops. Under the provisions of the R.M. of Lorne Zoning By-Law, the development site and adjoining land is designated as "Agricultural General Zone". Under the terms of the Zoning By-law in the R.M. of Lorne, the property in question shall be preserved or utilized for agricultural activities. In discussion with municipal staff, it has been indicated that their office is aware of the proposed development and have expressed no concerns in so far as all By-laws are strictly observed. As the surrounding property is primarily agricultural land, there is little expectation that any significant residential development will occur in the area. In discussion with the Municipal Development Officer, it was indicated that the standard domestic sewage lagoon development By-law requirements for this particular area would be as indicated below:

1) A $200 application fee and public hearing requirement for a Conditional Use.
2) Minimum of 2 acres area for site requirement.
3) 200 foot minimum site width.
4) 125 feet front yard setback, which is from the property line along a municipal or provincial roadway.
5) 25 feet Side yard setback.
6) 25 feet rear yard setback.



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PROJECT NAME: EAGLE CREEK COLONY 25-5-8W		BUILDING AREA: N/A
SHEET TITLE: SITE PLAN		DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER/R. FLORES
DATE DRAWN: FEBRUARY 2014	DRAWING UNITS: SCALED TO FIT	SHEET NUMBER: FIG.-1

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According to the proponent and municipal staff, there have been no previous studies or activities relating to the proposed site development with the exception of the geo-technical investigation carried out on November 24, 2004. This investigation was carried out with the intent of development of a manure storage facility for the hog operation on site and in anticipation of completing this EAP for the construction of a domestic wastewater lagoon.

3.0 Site Conditions

3.1 Location

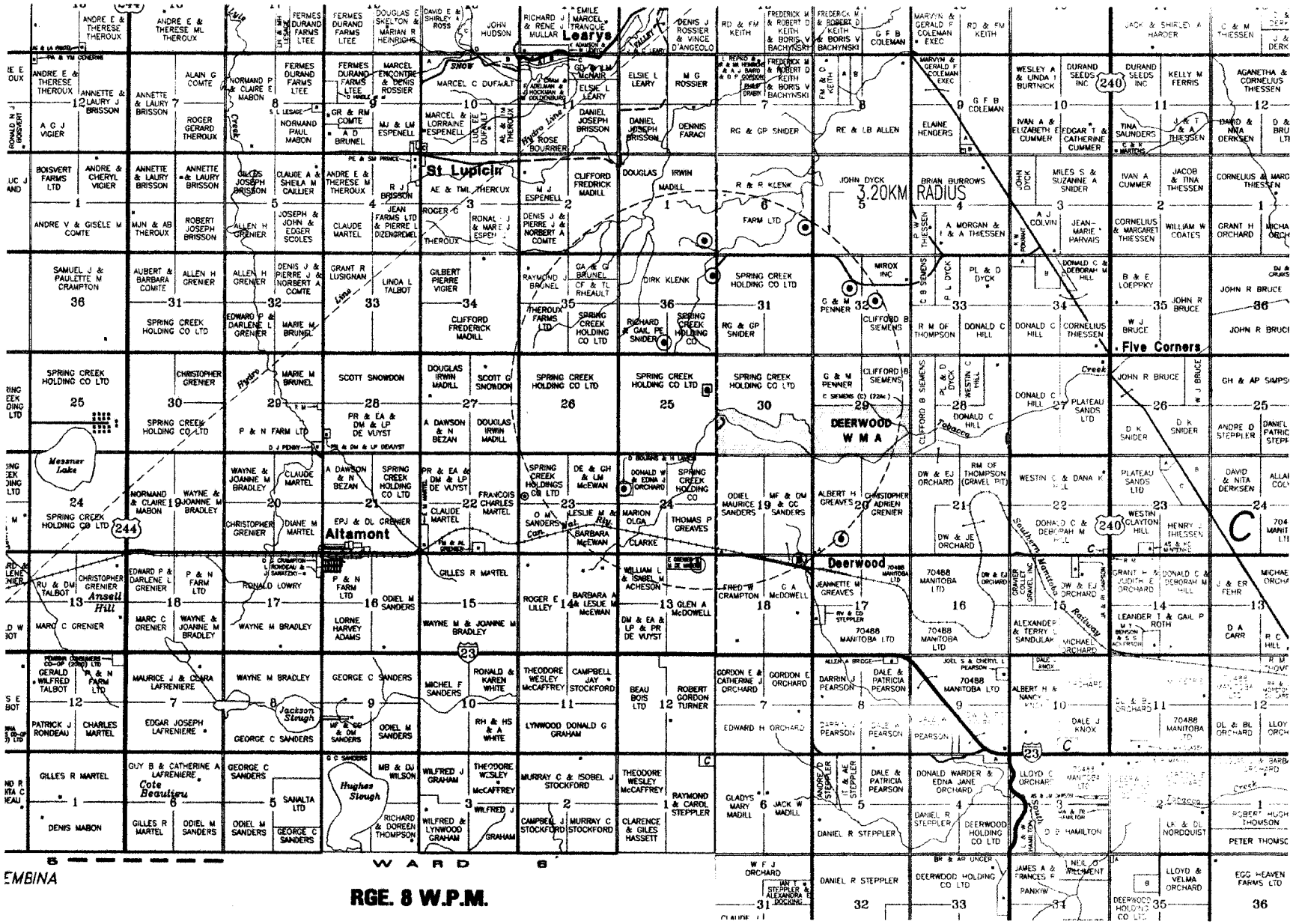
The proposed wastewater treatment lagoon is located approximately 885m from the nearest neighbouring residence which is to the northwest, and also approximately 200m from the nearest colony residence as illustrated on the site plan. The nearest residential area not associated with the colony is Altamont, situated approximately 6.0 km west-southwest from the proposed development site, Figure 2. As indicated in the Figure 2 there are 10 residences within a 3.2 km radius of the site.

The location where the lagoon is to be situated is such that prevailing winds from the northwest to southwest directions and the southeast will not affect a significant number of residents. The nearest residence to the northwest is approximately 0.95 km away, while the nearest to the northeast and southeast are 2.9 km and 3.2 km away respectively, affording significant separation for mitigating any odour concerns. Currently there is forested habitat to the southeast of the proposed development which would serve as an obstruction to wind sweeps across the pond surface when winds are from the southeast direction. The presence of livestock at both the neighbouring property and Eagle Creek Colony would have a more pronounced impact than the proposed domestic lagoon from an odour perspective.

The most suitable access to the proposed development is via a municipal road extending directly north to the site from PR #23. This municipal road is gravel surfaced and is passable year round.

3.2 Groundwater and Surface Water Resources

A review of groundwater resources in the area has revealed the presence of the fractured Odanah shale bedrock aquifer as well as localized sand and gravel aquifers. Where encountered, water volumes tend to be limited from the fractured shale and poor in quality whereas the sand and gravel aquifers produce greater yields of good quality water. Wells developed in the area and test wells conducted by the colony have not yielded a reliable supply of good quality water sufficient in volume to satisfy the needs of the colony. Pipeline water from west of Hwy #244 has been provided to the development site as a source of good quality water in order to supplement the local wells.



LEGEND:

⊙ – RESIDENCES WITHIN 3.2kM RADIUS

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PROJECT NAME: EAGLE CREEK COLONY 25-5-8W	BUILDING AREA: N/A
SHEET TITLE: MUNICIPAL SITE MAP	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER/R. FLORES
DATE DRAWN: FEBRUARY 2014	DRAWING UNITS: SCALED TO FIT
	SHEET NUMBER: FIG.-2

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In general, clay and till layers overlay vast amounts of the shale aquifer in the region. As a result, agricultural activities on the surface in this region are considered a minimal threat to groundwater quality and when applied appropriately will result in a low pollution hazard potential.

Surface water in the area is used by surrounding residents to fill watering holes primarily for livestock use only. Tobacco Creek situated directly to the south of the proposed site has been determined to have little to no flowing water after spring thaw as a result of upstream damming and impoundments which are intended to reduce the impacts of peak storm water flows and spring runoff.

A review of area topography indicates that natural drainage patterns from the proposed site are to the east. Records revealed that there has not been any incidence of flood damage in this area or requests for flood protection assistance following the 1997 flood. To prevent isolated surface accumulations from causing property damage it is recommended that any structures built, be slightly elevated and graded to enhance drainage. Structures such as the wastewater treatment lagoon will be constructed with inherent flood protection by way of berms which will extend approximately 1.9 meters above surrounding grade. Any natural drainage impeded by the proposed facility will be re-established by the construction of drainage swales with a minimum 0.1% slope to ensure ponding does not occur adjacent to the structure.

3.3 Soil Conditions

A geo-technical investigation was conducted by Envirotech Ag Systems Ltd. on November 24, 2004 in order to assess the soil characteristics for the proposed lagoon. Six test holes were drilled in the vicinity of the lagoon to a depth of between 6 and 9 meters. Soil conditions were visually identified on site, and samples collected from the auger flighting for further laboratory analysis where required. The test hole logs for each of the test holes are shown in Appendix B. Soil conditions in the area were found to consist of topsoil over silty clay till. The depth of topsoil from the surface as determined from the on-site soil investigation was approximately 0.15 m. The soil profile remained relatively consistent between test holes with intermittent sand and gravel lenses encountered within the till which overlies the shale. Based on the visual identification and laboratory analysis of the soils encountered, the in-situ soils were found to be unsuitable for a reconstructed clay liner as insufficient quantities of suitable material were able to be located from which to reliably construct the clay liner. A synthetic HDPE liner has therefore been deemed to be most appropriate means for containment for this location.

4.0 Design Criteria for Proposed Wastewater Lagoon

4.1 Hydraulic Loading

Hydraulic loading refers to the volume of raw sewage that will flow into the treatment lagoon per day. This volume is impacted by the number of residents the system is servicing, the amount of water use by each resident and the amount of water infiltration into the infrastructure. Traditionally, Hutterite Colonies range in size from 120 to 150 persons before an additional colony is developed. In discussion with Eagle Creek Colony, it is their intent to maintain a population less than 150 persons at the proposed development.

Based on historical data, and industry adopted production rates for this type of application, an estimated 250 liters per day is used as the per capita consumption. With a maximum anticipated population of 150 people, the peak flow anticipated will be 37,500 liters per day (37.5 m^3/day). The contribution from water infiltration into the sewer system is considered negligible due to the absence of a high water table and use of a newly constructed pressure rated sewage collection system and the exclusion of external sources such as weeping tile collection.

In addition to domestic wastewater production, there will also be contribution from a slaughter house used strictly for butchering and packaging meat products for Eagle Creek Colony's own consumption. In total, it is estimated that 37,000 kg live weight of meet (includes 10,000 layers, 4000-5000 broilers, 100 pigs, and 10 cows) will be processed on an annual basis. From discussions with the authorities of the Colony, all blood-letting will take place outside of the facility and the paunches will be disposed of by means of rendering or composting. Based on the low range of wastewater production from simple commercial slaughter houses and low-processing packing houses it is estimated that 760 litres of wash water will be produced per 455 kg of live weight killed. On an annual basis, this represents a total hydraulic load of 61,802 litres (61.8 m^3). Although it is likely that slaughtering will not occur on a daily basis, but more likely on a weekly or bi-weekly schedule, for the purpose of determining the daily hydraulic loading, the annual production has been divided evenly into each day. The resulting daily hydraulic loading from the slaughter house is 169.3 litres/day (0.169 m^3/day).

Total hydraulic loading from domestic wastewater and slaughter house waste is 37,669 litres per day (37.669 m^3/day).

$$\frac{37000\ kg/yr \times 760\ L}{455\ kg} = 61802.2\ L/yr = 0.169 m^3/day$$

Combined hydraulic loading = 37.5 m^3/day + 0.169 m^3/day = 37.669m^3/day

4.2 Organic Loading

Based on accepted practice, the daily BOD_5 (5 day Biochemical Oxygen Demand) production has been estimated to be 0.077 kg per person. The average daily BOD_5 contribution from the slaughter house is estimated to be 1.32 kg based on 13 kg BOD_5 per tonne of live weight.

150 people x 0.077kg BOD/person = 11.55kg/day

$$\frac{13 \text{ kg/tonne} \times 37 \text{ tonne/yr.}}{365 \text{ days/yr.}} = 1.32 \text{ kg/day}$$

Traditionally the BOD_5 of wastewater from a red meat slaughter house is estimated at 26 kg/tonne of live weight, with blood being the single largest contributor. As the blood will not be disposed of through the sewer and the paunch will be disposed of through rendering or composting, these contributors have been subtracted resulting in an estimated 13 kg/tonne live weight.

The total daily BOD_5 contribution to the stabilization pond will be 12.87 kg based on a population of 150 people and the additional organic loading from the slaughter house.

Combined organic loading = 11.55kg/day + 1.32kg/day = 12.87kg/day

4.3 Other Factors Influencing Effluent Quality

It is proposed that the domestic water will be softened using a sodium based ion exchange treatment system. To minimize the salinity as referenced to SAR (sodium adsorption ratio), it is proposed only to soften water which will be used for laundry and food preparation services. Wastewater produced as a result of the softening process will empty into the pond affecting the SAR of the treated effluent. Based on past experience, the SAR of treated wastewater which is comprised of backwash water from a water softening process is between 6-8, which is slightly above the recommended levels for irrigation, particularly on fine texture and low permeability soils similar to those experienced within the development area. As it is anticipated that repeated application of treated effluent to irrigated land will have a negative impact on the productivity of the agricultural land, it was decided to utilize discharge to a waterway as the preferred method of disposal.

It is proposed to mitigate any potential impacts with regards to discharging the treated effluent in a waterway by means of trickle discharge which will significantly dilute the effluent and achieve an effective SAR level well below levels considered to be deleterious to waterways. In addition to limiting the quantity of softened water to essential needs, Eagle Creek Colony has also agreed to participate in any regional programs focusing on improving treated wastewater quality and nutrient reduction initiatives.

4.4 General Design Parameters

The design liquid depth in the facility is 1.5 metres. A one meter freeboard will also be provided to protect against catastrophic levels of precipitation and shelter the liquid surface from the effects of wave action. The interior slopes of the embankments will be constructed at 4:1 to provide stability and resistance to long term slumping. The exterior slopes of the embankments will be constructed at 5:1 in order to facilitate proper maintenance and grooming. The embankment top width will be 3.05 meters to permit access of maintenance equipment.

Due to the soil conditions on site, it is recommended that the facility be constructed utilizing a synthetic HDPE liner as the primary containment barrier. With the exception of topsoil, organic matter and material containing a high percentage of stone or stones greater than 6" diameter, all excavated material may be used to construct the embankments.

The first phase of construction will consist of removing all topsoil and organic matter from the entire foot print of the facility, including beneath the embankments. This material is to be stockpiled for future use in landscaping and final dressing of the embankments in order to promote the growth of grass. In addition to the removal of the topsoil a 0.3 m deep key is to be constructed beneath the embankments to provide additional lateral support. Prior to starting placement of material to construct the embankments the material in the key is to be scarified and compacted to 95% of maximum dry density (MDD).

During construction of the embankments, the material is to be placed in maximum 150 mm thick lifts and compacted using a fully ballasted sheepsfoot packer to achieve a minimum of 95% of MDD. The lift thickness is to be adjusted to shallower thicknesses if the compaction equipment is unable to penetrate through the most recently placed lift into the previous lift. To achieve the desired compaction rate, the moisture content of the clay material should be between 90 and 120 percent of optimum moisture as determined from the moisture versus density relationship curve. The amount of compaction effort required to achieve the minimum 95% will be dependent on the moisture content of the material and the overall lift thickness. In general, a minimum of 5 to 10 passes over each lift will be required. The HDPE liner will be installed upon completion of the embankments, and will be secured by use of an anchor trench running along the top of the storage berm.

For safety reasons it is recommended that fencing and warning signs be installed around the pond to discourage the entry of livestock, wildlife and trespassers. Gates sufficient to permit the entry of mowing and maintenance equipment shall be provided and be locked when access is not required.

5.0 Design Capacity

5.1 Primary Cell

The size of the primary treatment cell has been determined on the basis of a maximum BOD_5 loading of 43 kg/ha/day. Based on the BOD_5 contribution of 12.87 kg per day the primary cell requires a minimum water surface area of 0.299 hectares at the design depth of 0.75m. The actual design surface area as per the design drawings has been determined to be 0.299 hectares as per the requirements. A conservative BOD_5 loading has been used to minimize the potential for odor production during spring thaw and limit the potential for offensive odor production throughout the year. Given practical limitations for effective construction practices to be employed, the conservative approach adopted is beneficial to a cell size that is better suited for large equipment and minimizes the potential for short circuiting of effluent between cells. Construction drawings for the proposed lagoon are included in Appendix C.

Primary cell sizing: Based on surface area at 0.75m depth, using a BOD_5 loading of 43 kg/ha/day.

$$\frac{\text{Organic loading kg/day}}{\text{Design loading of 43 kg/ha/day}}$$

$$\frac{12.87 \text{kg/day}}{43 \text{ kg/ha/day}} = 0.299 \text{ ha surface area at 0.75m depth}$$

5.2 Secondary Cell

Due to the HDPE liner used, seepage losses from the storage will be negligible. Based on precipitation records compiled from Environment Canada, average annual precipitation for this area is 544.4 mm while annual evaporation values are as high as 818 mm. Therefore, it is assumed that evaporation will at a minimum meet or exceed precipitation levels, as is generally the case in southern Manitoba, thereby eliminating the need to provide additional storage capacity to facilitate excess precipitation.

Operation of the lagoon is based on once per year discharge, thereby requiring that the total storage capacity of the wastewater lagoon be equivalent to the estimated hydraulic flow, multiplied by the retention time. To eliminate the need for discharging treated effluent more than once a year, or discharging in the period between November 1st and June 15th of the following year, the secondary cell is sized to accommodate a minimum of 365 days of retention time in combination with a maximum of 50% of the primary cell design capacity. The available storage capacity of the secondary cell is 11697.1 m^3 excluding the volume represented by 0.3 m of dead storage below the discharge pipe and excluding

any allowance for evaporation or seepage. The footprint of the storage is such that the design storage capacity is achieved at a maximum liquid depth of 1.5 m. In addition, a 1.0 m freeboard is provided to facilitate a significant rainfall event and to shelter the liquid surface from wind thereby reducing wave action. The retention capacity of the secondary cell alone is 310 days and when combined with 50% of the capacity of the primary cell will achieve a total retention time of 370 days at the design population.

Secondary cell minimum sizing for once per year discharge capacity

= 365days x hydraulic loading less 50% capacity of primary cell

= 365 days x 37.669 m^3/day less 50% of 4502.7 m^3

= 13749.19 m^3 – 2251.35 m^3

= 11497.84 m^3

6.0 Effluent Discharge

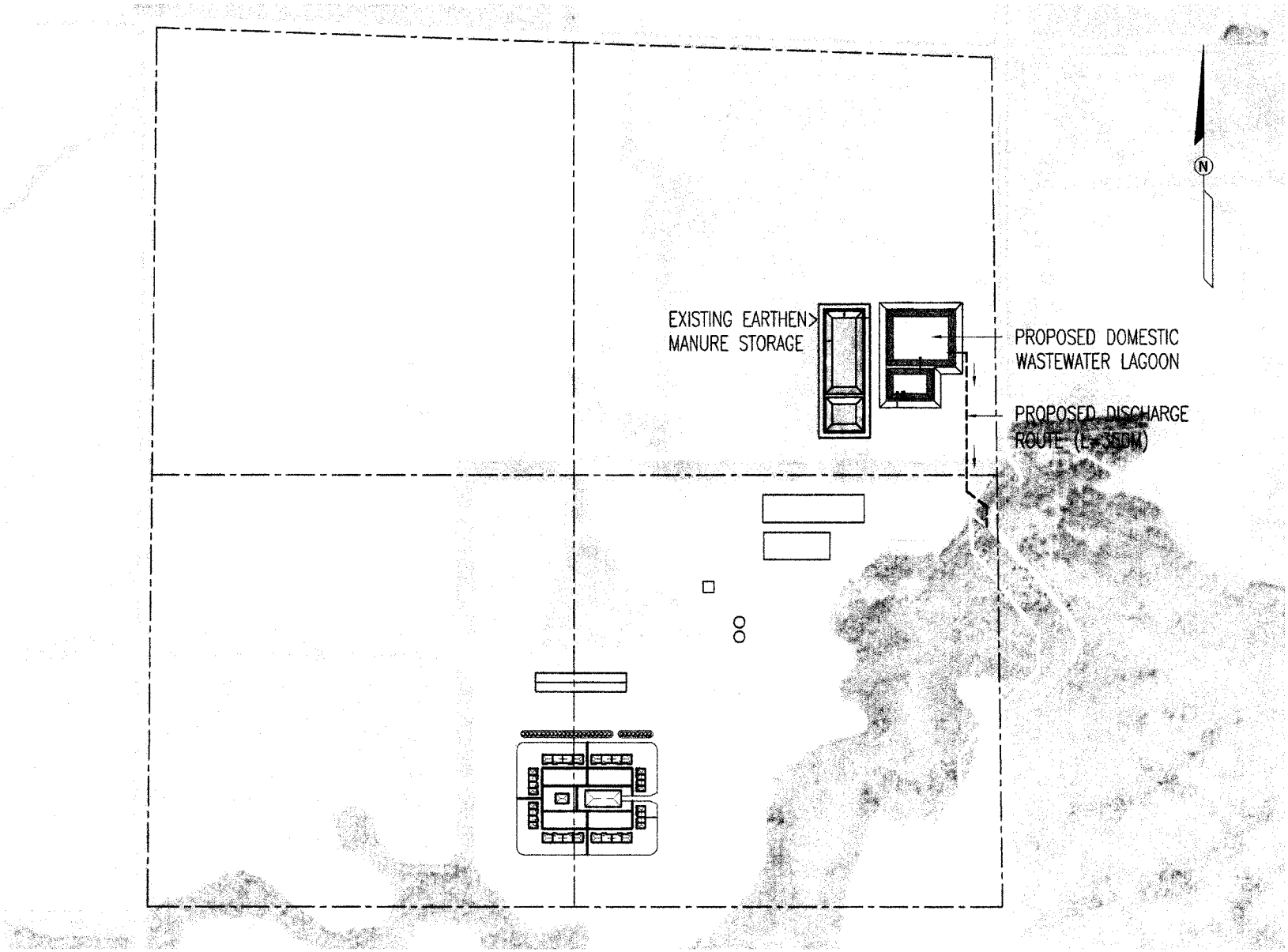
6.1 Method of Discharge

It is proposed that treated effluent from the wastewater lagoon be discharged into a swale constructed on the east side of the storage the adjacent agricultural land, Figure 3. The depth of this swale will be adjusted to enable discharge of the cell by means of gravity. The effluent will flow in this grassed swale to the south approximately 500m before emptying into the municipal drainage ditch which ultimately empties into Tobacco Creek. Installation of rip rap at the discharge into the municipal ditch will be required to prevent erosion of the embankments and disturbance of particulate matter in the water stream. Where the municipal ditch empties into Tobacco Creek the need for rip rap is not expected as the associated flows due to discharge are only a small fraction of the peak flows experienced during spring thaw and following a significant rainfall. Trickle discharge will be implemented in order to limit the release of liquids into the waterway as a means of trying to minimize the amount of liquids and particulates that actually enter into the Tobacco Creek.

To accomplish effective trickle discharge, it is proposed to restrict the release of liquids to 0.006 m^3/sec. This can be accomplished by restricting the valve opening to approximately 10% of its maximum opening area. At this rate it would be anticipated to take approximately 27 days to complete an entire discharge.

6.2 Discharge Procedure

In order to facilitate emptying the secondary cell, it must first be proven that the effluent meets the minimum effluent standards. Consideration must be given to the time required for the final treatment in the secondary cell and the time required to perform the necessary testing in order to meet a specific discharge period as may be specified in the License. Realistically, the final treatment and testing phase may take four weeks or more.



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PROJECT NAME: EAGLE CREEK COLONY 25-5-8W	BUILDING AREA: N/A
SHEET TITLE: PROPOSED DISCHARGE ROUTE	DRAWN BY: SOUTH-MAN ENGINEERING P. FERRER/R. FLORES
DATE DRAWN: FEBRUARY 2014	DRAWING UNITS: SCALED TO FIT
SHEET NUMBER: FIG.-3	

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The following general discharge procedures are to be implemented:

1) Close the valve in the connecting piping between the primary and secondary cell a minimum of two weeks before collecting the effluent samples for laboratory analysis. This valve is to remain closed until discharge of the secondary cell is complete.

2) Collect sample from the secondary cell only and submit for analysis. Laboratory results can usually be expected in approximately two weeks.

3) If the results of the laboratory analysis meet the minimum effluent quality requirements, discharge of the secondary cell can proceed. If the results are not favorable, additional treatment will be required. In the event that the BOD_5 level exceeds the limit, additional time will be required to allow the contents of the secondary cell to further stabilize. Alternately, mechanical aeration can be provided to speed up the treatment process. If the coliform MPN exceeds the limit, dry chlorine may be spread over the surface of the secondary cell at a rate of 100 kg/ha, to eradicate further remaining pathogens. Re-testing to verify that the minimum standards are met will be required. Discharge the secondary cell when all requirements are met.

4) With discharge of the secondary cell complete, the discharge valve is closed and the valve between the primary and secondary cells is opened to allow the liquid levels of both cells to equalize. This valve will remain open until the next discharge procedure is initiated. Sizing of the secondary cell is such that no additional discharges are required until the following year.

5) If additional discharges are required, repeat the entire procedure.

7.0 Environmental Impact

7.1 Odour Production

Sizing of the primary cell has been based on an organic loading rate 44 kg BOD_5/ha/day. This level, which is considerably less than the maximum allowable 56 kg BOD_5/ha/day as prescribed in Province of Manitoba document "Design Objectives for Standard Sewage Lagoons", will ensure that the pond operates relatively odour free for the majority of the year.

There is a negligible potential for odour issue during the spring thaw when gases such as hydrogen sulfide, which have been trapped under the ice, are released. Production of these gases is the result of anaerobic decomposition of organic compounds which occurs when the ice cover prevents the introduction of oxygen into the wastewater. The duration of these odours is not anticipated to last any longer than two to three weeks depending on the time it takes for the ice cover to completely melt.

With the removal of the ice cover the pond will quickly return to an aerobic state; and odour production subsides.

The large separation distance between the lagoon and the nearest residence not associated with the facility (885m) will serve to further reduce any potential impacts of odour production. Wind data available for the area indicates that the predominant wind directions range from northwest to southwest, as well as the southeast. Of the 15 residences within a 3.7 km radius, 4 are located northwest of the proposed site; 0.95 to 3.6 km away, 5 are located northeast within 2.7 to 3.7 km away, 2 are located between 3.0 to 3.3 km southeast, and 4 are located within 2.0 to 3.6 km southwest. These large separation distances are anticipated to provide a sufficient buffer to minimize any odour related impacts. Many of these residences are also surrounded by treed and wooded areas, which would absorb and mitigate potential odour impacts.

In summary, odour reduction has been taken into consideration in the design of the treatment lagoon and separation distances from neighboring residences are significantly greater than the required minimums. For these reasons it is anticipated that odour will not have any significant environmental impacts.

7.2 Impact of Discharge to Waterways

The treated effluent from the secondary cell of the lagoon will be discharged once per year during the period prescribed in the Environment License. In order to discharge treated domestic effluent into a waterway, specific treatment levels must be achieved before any release is permitted. Laboratory analysis of the treated effluent will be used to verify that the minimum requirements as specified in the Environmental Licence are met. Discharge will not be permitted unless the minimum requirements are met. Table 1, summarizes published information for the minimum accepted standards of specific constituents.

Table 1: Minimum Standards for Effluent Quality

CONSTITUENT	TREATED WASTEWATER
BOD_5 (mg/L)	Less than 30
NH3 (mg/L)	Less than 15
Total Coliform (MPN/100mL)	Less than 1500
Fecal Coliform (MPN/100mL)	Less than 200
Total Suspended Sediments (mg/L) (excluding growing algae)	Less than 30
Total Phosphorus (mg/L)	Less than 1
Total Nitrogen (mg/L)	30

Streamflow statistics are available for the Tobacco Creek from a monitoring station located near Rosebank during the period between 1964 to 2010. Over this period, mean daily flow rates of 0.000 m^3/s were recorded during the months of July through October. For a more realistic representation of the minimum flow rates to be anticipated, the upper quartiles of daily discharge volumes were considered between the months of July through October and was determined to be 0.000 m^3/s as well, indicating that zero flow is a common occurrence within Tobacco Creek.

It is proposed to empty the facility using trickle discharge methods which regulate the rate of discharge at approximately 6 to 7 L/s. The intent would be to discharge during dry conditions when most if not all of the treated effluent discharged from the facility would be absorbed within the discharge path before entering into Tobacco Creek. When minimal flow rates are experienced in Tobacco Creek, no flow would be anticipated in the local municipal drainage system thus allowing for maximum opportunity for the treated effluent to absorb into the soil and for vegetation within the drainage path to utilize the residual nutrients.

It is anticipated that the level of SAR will be between 6 and 8 based on typical colony applications. To reduce the level of SAR it has been proposed to limit the quantity of softened water to that used for laundry and food preparation services. If it is determined that the SAR level is excessive in the treated wastewater as a result of the softening process, alternative methods of water softening should be explored. The focus during development and installation of the water softening equipment for the colony has been to reduce the need for salts. Although the level of effectiveness has not been measured, it is anticipated that backwash requirements and the quantity of salt solution required will be reduced from typical installations in the past.

Moderate levels of SAR in treated wastewater are not anticipated to affect the quality of water significantly in waterways. The proportion of treated wastewater to the volume of water which would flow through Tobacco Creek during peak flow periods is relatively small, resulting in a highly diluted solution if the precipitated salts are re-suspended. The cumulative effect of numerous sources within the watershed region should be considered in coordinating the discharge periods in order to lessen the impact on water quality, however as there are no upstream sources which would contribute in a similar manner, and a proposed discharge regime which strives to retain the treated effluent from entering Tobacco Creek, the importance of this coordination is greatly diminished.

The implementation of trickle discharge, except under extremely wet surface soil conditions, will in most situations either eliminate or at least minimize the amount of treated effluent that will reach Tobacco Creek. The large catchment area associated with this single source and no other upstream contributors further minimizes the threat to waterways through dilution during periods of increased flows.

7.3 Impact on Groundwater

Soil types and construction methods utilized in constructing the lagoon will limit potential seepage losses to a minimum. The HDPE liner within the proposed lagoon will adequately protect the sub-surface groundwater resources beneath the facility. The presence of clay till soils within the discharge path will also afford protection to groundwater resources determined to be approximately 3 to 5 m below grade near the proposed construction site. For these reasons the impact on groundwater is considered negligible.

7.4 Impacts on Wildlife, Forestry and Heritage Resources

Currently the land at the proposed construction site is utilized for agricultural purposes and therefore does not represent a significant source of wildlife habitat, forestry or heritage resources and is not expected to have an impact on them.

It has been determined that the Tobacco Creek is habitat for numerous species of fish the, most common of which are the Brook Stickleback, and Fathead Minnow. On very rare occasions, the following species have also been found, Central Mud minnow, Creek Chub, and Sand Shiner. As this habitat and the tributaries that flow from the Tobacco Creek into the Little Morris River represent potential spawning grounds, discharge of treated wastewater during the spawning period is not recommended. It is generally accepted that discharge after June 15th will mitigate any negative effects on fish spawning.

Portions of Tobacco Creek would be anticipated to sustain similar species of fish as the Little Morris River particularly during periods of high water levels and as a consequence represents a source of recreational fishing. These areas, however, would be restricted to only those portions of the creek in close proximity to the Little Morris River. The portion of Tobacco Creek into which it is proposed to discharge treated effluent is far removed from potential recreational fishing areas as flows are intermittent and unreliable and are unable to sustain game fish throughout the year. Regardless, to protect water quality and minimize any effects on fish habitat, strict adherence to maximum nutrient levels in the treated wastewater as specified in the Licence must be ensured. Participation in nutrient reduction programs is also recommended to further reduce nutrient loading.

Manitoba Conservation Wildlife and Ecosystem Branch Data Center database has confirmed there are currently a number of species at risk in this area. The Hop-Hornbeam is a small tree that grows near edges of swamps, rivers and bottomland hammocks. The Honewort is a short stemmed plant commonly found in mesic deciduous woodlands, woodland borders, shady seeps, wooded areas around springs, bluffs, and areas overgrown with trees. Lopseed is a short stemmed plant that is common around moist woods and thickets. Wild Ginger is a short groundcover plant common to rich woods, dense stands, partially sunny wooded areas, and cultivated areas. Small Bellwort is common in wooded slopes, moist

woods, and ravine bottoms. All of these plants may be found close to the proposed location of the wastewater lagoon. To prevent the further destruction of these species, construction will take place on cultivated land and away from the creek bed and surrounding area. Also, caution will be taken in installation of the grassed swale and rip rap on entry into the Tobacco Creek if required. The lone animal species determined to be at risk is the Yellow Rail, which is a small bird, commonly found in sedge marshes and wetlands. It prefers moist areas with little or no standing water. It spends winter in drier fresh-water and blackish marshes or deep dense grass fields. This species is not expected to be at risk due to the proposed lagoon being constructed on cultivated land.

Based on information from the Wildlife and Ecosystem Protection Branch, the Deerwood Wildlife Management Area is in the immediate vicinity of the proposed development and within the proposed discharge path. Situated on the S ½ of 30-5-7W and S ½ 29-5-7W, the Deerwood WMA consists of 262 hectares of land which consists of primarily aspen-oak forest and significant remnants of mixed grass prairie which provides important habitat for deer and other wildlife. Tobacco Creek meanders through this area and would provide a source of water during significant flow events. During dry periods accumulations of water in pools may reside, however if not routinely replenish would become brackish and undesirable.

Historic resources have indicated that there are currently three Centennial farms in the area. These historic farms are situated on NW 21-5-8W which is 6.0 km west-southwest of Eagle Creek, NE 27-5-8W which is 3.7 km west of Eagle Creek, and SW 3-5-8W which is 8.2 km southwest of Eagle Creek. All three sites are sufficiently separated and upstream of any drainage to the Tobacco Creek, therefore it is not anticipated that the lagoon will have an impact on them.

Also of interest is the former Miami Northern Pacific and Manitoba Railway Station situated within the community of Miami, MB located 13 km southeast of the proposed development. Due to the separation distance no impacts are anticipated to this historical resource.

7.5 Gasoline and Associated Product Storage

No storage of gasoline or associated products is expected on site due to the proposed development. Refueling and storage of petroleum products will be done within the developed yard site to the west of the proposed lagoon, well removed from the Tobacco Creek.

7.6 Socio-economic Implication

As no significant environmental impacts are anticipated, no socio-economic implications are likely.

8.0 Maintenance and Inspection

8.1 General Maintenance

Several aspects require regular attention throughout the year, particularly during the growing season. Regular mowing of the grass on the embankments is required to minimize and discourage habitation by burrowing rodents which may impair the water holding capacity. Manual or mechanical removal of aquatic vegetation from the bottom and interior slopes of the embankments is required to prevent over population by these species. Significant populations of aquatic plants remove considerable amount of oxygen from the wastewater during its decay, which would otherwise be used in the breakdown of organic compounds. Also aquatic plant populations will prevent sunlight from penetrating the surface of the wastewater, further reducing the efficiency of the natural treatment process.

8.2 Monitoring Requirements

Operation of the lagoon is relatively self-controlled, however regular inspections are required to ensure operation and water flows are occurring as designed.

During moderate temperature when the lagoon surface is free of ice, it should be noted whether the wastewater introduced into the primary cell is dispersed evenly or whether it is short-circuiting to the cross-over into the secondary cell. Odour levels are to be assessed and if excessive, the cause of the odours determined and rectified. General condition of the embankments and any rip-rap should also be assessed for damage from wind and wave action and repaired as necessary.

Winter monitoring is limited to checking for frozen piping and verifying that the cross-over piping between the two cells is not frozen. This can be accomplished by comparing that the water levels in the primary and secondary cells are the same.

9.0 Construction Schedule

It is proposed that construction would begin as soon as the Environmental Licence has been granted and weather conditions are favorable. For practical purposes construction would occur between May 1st and October 31st to avoid challenges associated with frozen soil and freezing conditions.

10.0 Funding

Construction of the domestic lagoon will be funded primarily by Eagle Creek Colony, however a grant will be requested from the Canada/Manitoba Infrastructure Program to potentially recover some of these costs.