


Environment Act Proposal Form



Name of the development: Wastewater Treatment Lagoon	
Type of development per Classes of Development Regulation (Manitoba Regulation 164/88): Class 2 development	
Legal name of the applicant: Riverside Colony	
Mailing address of the applicant: Riverside Colony, Box 278	
Contact Person: David Hofer	
City: Arden	Province: MB Postal Code: R0J 0B0
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Location of the development: Rural Municipality of Glenella-Lansdowne	
Contact Person: David Hofer	
Street Address: Box 278	
Legal Description: SE 1-15-14W	
City/Town: Arden	Province: MB Postal Code: R0J 0B0
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Date: April 29/20	Signature of proponent, or corporate principal of corporate proponent: Peter Grieger 
	Printed name:

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A complete **Environment Act Proposal (EAP)** consists of the following components:

- Cover letter**
- Environment Act Proposal Form**
- Reports/plans supporting the EAP** (see "Information Bulletin - Environment Act Proposal Report Guidelines" for required information and number of copies)
- Application fee** (Cheque, payable to Minister of Finance, for the appropriate fee)

Per Environment Act Fees Regulation (Manitoba Regulation 168/96):	
Class 1 Developments	\$1,000
Class 2 Developments	\$7,500
Class 3 Developments:	
Transportation and Transmission Lines ..	\$10,000
Water Developments	\$60,000
Energy and Mining.....	\$120,000

Submit the complete EAP to:

Director
Environmental Approvals Branch
Manitoba Sustainable Development
1007 Century Street
Winnipeg, Manitoba R3H 0W4

For more information:

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<http://www.gov.mb.ca/sd/eal>



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**Proposal for an Environment Act Licence to Construct New Domestic
Wastewater Lagoon and Livestock Slaughter Facility for Riverside Colony
at SE 1-15-14W in the Rural Municipality of Glenella-Lansdowne**

Submitted to:

Director

Environment Approvals Branch

Manitoba Conservation and Climate

1007 Century Street

R3H 0W4

Proponent:

Riverside Colony

Represented by

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April 29, 2020

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1 Executive Summary

The existing wastewater facility at Riverside Colony dates back to 1947. The facility was erected as a two-cell wastewater treatment facility. No engineering information is available for this facility. Riverside Colony recognizes the environmental risks associated with this facility and wishes to rectify the situation. A soil investigation also revealed that the facility may not adequately protect groundwater resources.

Riverside Colony is currently home to 70 persons. The Colony is set to slowly expand in population up to approximately 200 people, at which point the Colony will undertake plans to establish a separate daughter colony. Riverside Colony is also operating a seasonal livestock meat slaughter and packing facility, which contributes to the wastewater treatment volume and organic load.

As is typical for Colonies, Riverside Colony owns vast stretches of land and holds agricultural land adjacent to the existing facility, where construction of a new wastewater treatment lagoon is logical. Geotechnical investigations revealed that the soil at a location to the north of the Colony's premises and current lagoon is not suited for the construction of a wastewater treatment lagoon comprising a compacted clay liner. As a result, the new wastewater treatment lagoon is proposed to be located on SE 1-15-14W beside the existing earthen manure storage utilized for the long term storage of hog manure.

Owing to its location, the proposed site is ideal to mitigate any nuisance concerns to neighbors, and visitors of municipal Heritage Sites. No impacts to wildlife or fish are anticipated as a result of the proposed development. The new wastewater treatment lagoon will significantly improve Riverside Colony's environmental performance and eliminate the potential for flooding that exists at the current location.

Following issuance of an Environment Act Licence for construction and operation of the proposed wastewater treatment facility, Riverside Colony will take steps to ensure that a certified operator will be available to operate the new wastewater treatment facility.

2 Introduction

South-Man Engineering has been retained by Riverside Colony to conduct an engineering assessment of its existing wastewater treatment facility, provide alternative design solutions and complete the supporting documentation for preparation of the EAP. The development proposal is prompted by the Colony's intention to secure a licence to operate a wastewater treatment facility in compliance with *The Environment Act* as well as to facilitate an increase in the population size contributing to the lagoon from the current 70 to 200 people. This report has been compiled to provide the necessary information requested in The Environment Act Proposal Form to support the construction of a new domestic wastewater treatment lagoon and livestock slaughter facility.

2.1 Historical perspective

A review of Manitoba Conservation and Climate's records on existing licensed wastewater treatment facilities suggests that there is presently no licensed wastewater treatment facility at Riverside Colony. This situation arose from the historical development of Riverside Colony, which was founded in the 1940's. Under *The Environment Act's Classes of Development Regulation MR164/88*, all wastewater facilities fall under Class 2 development and can only be erected in compliance with *The Environment Act's* licensing process as prescribed by the *Licensing Procedures Regulation MR163/88* and be operated under the licence requirements defined by Manitoba Conservation and Climate. Riverside Colony is anxious to rectify the historical issues regarding their wastewater treatment process, and to submit a proposal under the aforementioned legislation to better serve the Colony and reduce its environmental impacts.

Currently, 70 people are residing at the Riverside Colony. However, the Colony intends to continue expanding up to a maximum of 200 people. The Colony also operates, on a seasonal basis, a small livestock slaughterhouse and packing facility providing primarily for the Colony's own meat and poultry consumption. Liquid waste from this facility is routed to the existing wastewater treatment facility, while segregated and screened solids are treated separately.

Given that the existing wastewater treatment lagoon had not been properly designed nor engineered, some deterioration has occurred over the many years of service. The

storage capacity and treatment capability has also be determined to be insufficient for the proposed population to be accommodated in the future.

2.2 Engineering Assessment

2.2.1 Facility construction and hydrogeology of the site

The existing domestic wastewater facility is comprised of a gravity system draining into a two-cell lagoon system (Figure 1). The primary cell is the largest and west-most cell of the system and measures approximately 54m×68.6m, with a depth of 3m. The secondary cell measures approximately 35.7×55.2m (on its longest side), and is reportedly at least 2.5m deep. Inside slopes vary between 2.5:1 and 3:1, while outside slopes range from 1:1 to 2:1. The treated effluent from the secondary cell is discharged into the Whitemud River situated several hundred feet from the facility.

Manitoba Conservation and Climate's groundwater well database reveals that the area presents highly variable hydrogeological features in the first 10m of soil deposits (Hydrogeological Section, 1985). The facility was likely constructed in a silty till soil and is possibly underlain with coarser material.

2.2.2 Wastewater treatment capacity

Owing to the size of the primary cell, the current population of Riverside Colony, and all sources of wastewater in addition to residential wastewater, the primary cell is estimated to afford a treatment rate of approximately 26 kg BOD₅/ha/day, well below the maximum BOD₅ allowed by the current guideline (56 kg/ha/day). This estimate was derived under the assumptions of a 2.5 m treatment depth and a freeboard of 0.5 m.

Although the treatment capacity is suitable, the required storage capacity can only be achieved within both cells by compromising the required 1.0m freeboard as required by Manitoba Conservation and Climate. Maintaining a 1.0m freeboard would limit the existing facility's capacity to approximately 153 days. In addition to this not facilitating twice per year emptying it does not provide sufficient storage capacity to protect against occasional years of excess precipitation, and is more susceptible to operational errors that could lead to overflow situations.

2.2.3 Proposed course of action

The Colony has considered a variety of solutions such as updating the existing facility to current design and construction standards, connection to an under-utilized municipal lagoon situated at Arden, and constructing a new wastewater treatment facility at an alternate site on the Colony's property.

The advantage of upgrading the current facilities resides in minimizing costs for connecting to the existing gravity sewage system. The disadvantage of this option is both close proximity to the Colony's residential development and, more importantly, the environmental challenges associated with granular soil conditions and proximity to the White Mud River which has occasionally overflowed its banks and threatened flooding of the existing facility. Limitations in area will also make accommodating the wastewater flow from 200 people substantially challenging.

Utilization of an existing domestic lagoon servicing the community of Arden were explored, however the topography and the presence of a railway line and provincial highway present significant hurdles and on-going monitoring and reporting to protect the rail and highway integrity.

The final alternative considered was construction of a new wastewater treatment facility at a more favourable location on site. The advantage of this alternative is that it offers the best opportunity to construct a facility providing adequate storage capacity while minimizing the potential environmental risks that would otherwise exist with the other options investigated. After weighing all the potential wastewater treatment facility alternatives with the objective of determining the optimal solution that will provide adequate environmental protection while remaining economically viable, Riverside Colony has selected construction of a new two-cell wastewater treatment facility in an area less susceptible to environmental impacts as the preferred solution.

3 Land Ownership and Municipal Land-Use Designation

The proposed site of the new domestic wastewater treatment lagoon is located on SE 1-15-14W in the rural municipality of Glenella-Lansdowne; this land is owned by Riverside Colony and it is situated south of the Colony's premises. A copy of the Certificate of Title for the land is included in Appendix A.

To date, Riverside Colony has used this land mainly for agricultural purposes, primarily for the cultivation of cereal, grain and oilseeds, and for managing its livestock operations. Under the provisions of Zoning Bylaw No 2074/00 of the Rural Municipality of Lansdowne, the development site and adjoining land is designated “Agriculture General Zone – AG80” (Figure 1). Part V, section 5 of the by-law indicates that wastewater treatment lagoons are allowed as a conditional use development in this Zone. The zoning bylaw further states that rural residential zones shall not be located within 457 m (1500 ft) of sewage lagoons.

There have been no previous studies or activities relating to this development site. As the surrounding property is primarily agricultural land mostly under the ownership of Riverside Colony, there is little expectation that any residential development will occur in the immediate area. Public consultations will be carried out as part of the conditional use application review process required by the Rural Municipality of Glenella-Lansdowne.

4 Site Conditions

4.1 Location

The proposed wastewater treatment lagoon is located approximately 1.86 km from the nearest neighboring rural residence. The only wastewater treatment facility located within 3 km radius of the project site is a facility owned by the rural community of Arden located at 2.95 km northeast of the proposed wastewater treatment site. The nearest urban residential development is Arden located approximately 3.10 km north of the lagoon. Information obtained from Google Earth indicates that there are approximately 12 residences within a 3 km radius of the site.

Access to the proposed development is attainable via PR 352 which runs approximately 900 m east of the development site and intersects Municipal Road 85N approximately 1,176 m northeast of the site.



Figure 1. Location of the proposed wastewater lagoon.

The location where the lagoon is to be situated is such that prevailing winds from the west to north-northwest, and south-southeast directions will not affect a significant number of people in the area (Figure 2). The nearest residence to the south-southwest is approximately 1.86 km away meeting the minimum setback requirements set by Manitoba Conservation and Climate. It is anticipated that this separation distance will significantly mitigate any odour concern as a result of the prevailing westerly and easterly winds in the area. These winds blow over farm fields, wetlands, and forests, which will help absorb and dilute odors associated with the facility. Consequently, the

proposed site affords adequate separation for mitigating most if not all nuisance odour concerns for neighbors not associated with Riverside Colony. The release of odorous hydrogen sulphide gas (H₂S) from wastewater treatment systems usually occurs during the spring season for a short period of time while the ice thaws and the system returns to an aerobic state following the melting of the ice. As the proposed location for the facility is adjacent to the existing manure storage for the hog operation, it is more likely that the odour from the manure storage will be more noticeable than that from the domestic lagoon. To date the proponent has not received any complaints from neighbouring residences about odour from the manure storage.

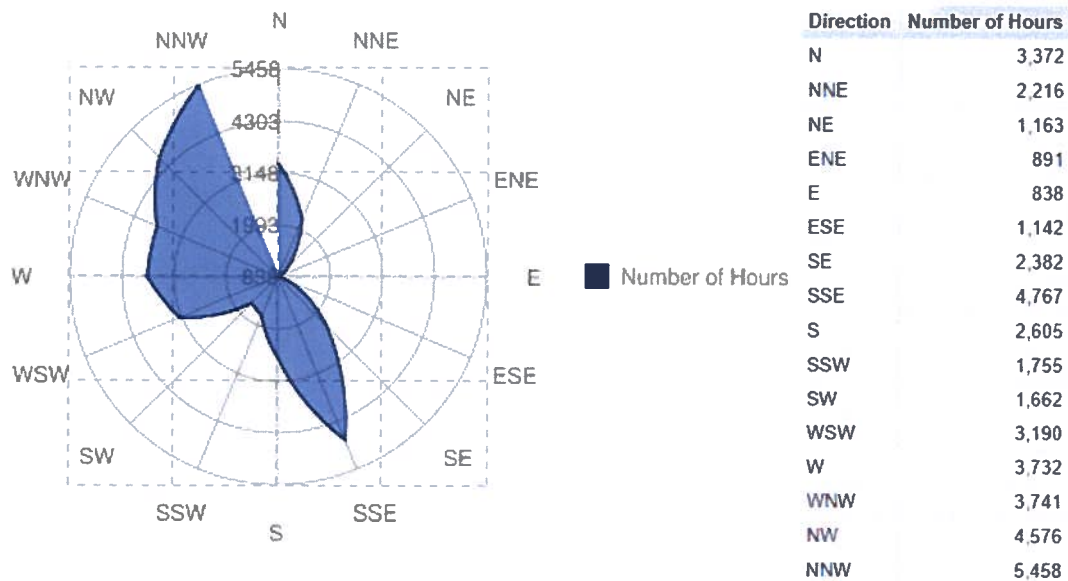


Figure 2. Historical wind direction at McCreary meteorological station

4.2 Groundwater and Surface Water Resources

Based on well logs recorded by Manitoba Water Stewardship (GW Drill Logs), it was found that there are two well records in NE 1-15-14W. Review of these well logs revealed that the water table in the area is generally in the range of 2.4 m to 5.5 m below the surface. The soil formation in the quarter section is generally characterized by the presence of yellow and blue till surface deposits in the top 50 cm underlain by coarse gravel, yellow limestone and lenses of sandstone with blue till.

In consultation with Manitoba Conservation and Climate, it was confirmed that there are no known licensed users of surface water along the proposed discharge path 33 km

downstream of the development site and up to the point where the river exists the Rural Municipality of Glenella-Lansdowne (Appendix D). Moreover, activities on the surface in this region are generally not considered a significant threat to groundwater quality, thereby resulting in a low pollution hazard potential.

The geography of the rural municipality of Glenella-Lansdowne is typical of the lowlands at the foothills of the Manitoba Escarpment which include the Riding Mountains. A physiographic feature is the Arden Ridge, which separates the low-lying areas from the Upper Assiniboine Delta deposits (Agriculture and Agri-Food Canada, 2000). The terrain gently slopes from the outskirts of the Riding Mountain towards the Whitemud River at a rate of approximately 1%; local relief in the proximity of Arden Ridge exceeds 9 m.

In consultation with Manitoba Infrastructure, it has been determined that there are no records of flood damage in the proposed development site (Appendix D). However, to prevent isolated surface accumulations from causing property damage it is recommended that any structure 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 1.22 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.

Surface soils were deposited during the last glaciation and during time of glacial Lake Agassiz. The Upper Assiniboine Delta consists of deep deposits of stratified silts and very fine sands, while the Lower Assiniboine Delta is in contrast characterized by lacustrine clays and glacial tills. Surface soils in section 1-15-14W are generally loamy lacustrine Gleysols.

At a large scale, the physiography of the area presents gently sloping land toward the east, between steep slopes of the Manitoba Escarpment, to a nearly flat landscape past this transition zone (Hydrogeological Section, 1985). Deposits around the Whitemud River are coarser textured material, mainly sands, underlain by clayey tills and bedrock.

The proximity to the Manitoba Escarpment led to the creation of deeply gouged water courses, inclusive of the Whitemud River, running in close proximity to the proposed site. Historical data collected between 2000 and 2013 for the area (The Weather Network, 2015) suggests that the area receives a mean annual precipitation of approximately 530 mm per year.

4.3 Soil Conditions

A geo-technical investigation was conducted by South-Man Engineering on June 14, 2017 in order to assess the soil characteristics to facilitate construction of the proposed wastewater lagoon. Five test holes were drilled in the vicinity of the existing lagoon and representative samples were collected for laboratory analysis. A previous investigation was conducted in 2007 in the vicinity of the earthen manure storage (EMS) currently utilized for the storage of manure from the livestock operation. As the proposed lagoon will be situated adjacent to the EMS these soil logs are considered to be relevant. Details of the soil test results are included in Appendix C.

Based on the particle size analysis determined from five soil samples collected from the existing lagoon site, the soil is generally classified as silty loam with the percent clay content in the range of 12% to 19%. Results of the Atterberg Limit tests indicate that the soil's Liquid Limit and Plasticity Index are in the ranges of 25% to 35% and 14% to 19%, respectively. Due to the marginal characteristics and limited quantity of suitable quality material it has been concluded that the in-situ soils are not suitable for use in the construction of a wastewater treatment lagoon with a compacted clay liner. The incorporation of a synthetic HDPE liner as the primary containment system has been recommended.

5 Design Criteria for the Proposed Wastewater Lagoon

5.1 Hydraulic Loading

5.1.1 Domestic

Hydraulic loading refers to the volume of raw sewage that will flow to 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. In discussion with Riverside Colony it is their intent to increase the population from 70 to 200 persons at the proposed development site.

Based on historical water use determined from flow metering conducted by the Colony, the estimated water usage per person is 250 liters per day. Based on a population of 200 people the total flow will be 50,000 litres per day ($50 \text{ m}^3/\text{day}$). However, contribution from water infiltration into sewer systems was insignificant and was not taken into account.

$$\text{Domestic WW} = \frac{250 \text{ L/person.day} \times 200 \text{ person}}{1000 \text{ L/m}^3} = 50 \text{ m}^3/\text{day}$$

5.1.2 Slaughter House

In addition to domestic wastewater production, there will also be contribution from the existing slaughter house used strictly for butchering and packaging meat products for their own consumption. Based on FAO publication (FAO, 2009), average meat consumption in Canada in 2005 is 96.3 kg/person/year. For beef meat, Iowa State University Extension and Outreach determined the percentage yields from live weight killed to dressed weight (dressing percentage) and from dressed weight to packaged meat weight (carcass cutting percentage) as 61% and 67%, respectively (Thiboumery and Jepsen, 2009). Therefore, average live weight animal killed (LWK) for consumption per person per year in Canada is calculated as 236 kg LWK/person/year. For Riverside Colony, the total live weight of livestock that would be processed annually for consumption by 200 people would be 47,200 kg. Based on discussions with members of the Colony all blood-letting will take place outside of the facility and the paunches will be disposed of by means of 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 59,130 litres (59.13 m^3). Although it is likely that slaughtering will not occur on a daily basis, 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 162 litres/day ($0.162 \text{ m}^3/\text{day}$).

$$\text{Slaughterhouse WW} = \left(\frac{760 \text{ L}}{455 \text{ kg LWK} \times 1000 \text{ L/m}^3} \right) \times \left(\frac{47,200 \text{ kg LWK/yr}}{365 \text{ d/yr}} \right) = 0.22 \text{ m}^3/\text{day}$$

5.1.3 Truck Wash Bay

The truck wash bay is operated on average 2 hours per day, considering heavier uses in the summer, and less use in the winter months. The main purpose is for washing domestic vehicles and livestock trucks. The Colony intends to ship livestock twice a week, therefore there are only two trucks being thoroughly washed and disinfected each week. These trucks are washed and have the manure removed prior to returning home from their destination thereby eliminating any introduction of livestock manure. The other uses for the wash bay will include washing of other farm equipment and domestic vehicles. Nichols (2012) reports amounts as much as 2.4 m³/truck of wash water production for livestock haul trucks, using pressure spray washers. Riverside Colony will use a high-pressure washer as the main cleaning tool; the rated flow for the high-pressure washer is 13 L/min (Rich Silverman, n.d.). The use of this high-pressure washer over a continuous operation for 2 hours would result in 1.56 m³/day of wastewater on average throughout the year.

$$\text{Truck wash bay WW} = \left(\frac{13 \text{ L/min}}{1000 \text{ L/m}^3} \right) \times (2 \text{ h/d} \times 60 \text{ min/h}) = 1.56 \text{ m}^3/\text{day}$$

5.1.4 Total Hydraulic Loading

Therefore, the total hydraulic loading from domestic wastewater, slaughter house waste and truck wash bay waste is 51,780 litres per day (51.78 m³/day).

$$\text{Total daily hydraulic load} = 50 + 0.22 + 1.56 = 51.78 \text{ m}^3/\text{day}$$

5.2 Organic Loading

5.2.1 Domestic

Based on accepted practice the domestic daily BOD₅ (5 day Biochemical Oxygen Demand) production has been estimated to be 0.077 kg per person. The total daily BOD₅ contribution to the stabilization pond will be 15.40 kg based on a population of 200 people.

$$\text{Domestic BOD}_5 = 0.077 \text{ kg BOD}_5/\text{person.day} \times 200 \text{ person} = 15.40 \text{ kg BOD}_5/\text{day}$$

5.2.2 Slaughter House

The average daily BOD₅ contribution from the slaughter house is estimated to be **1.68 kg** based on 13 kg BOD₅ per tonne of live weight.

$$\frac{13 \text{ kg/tonne} \times 47.20 \text{ tonne/yr}}{365 \text{ days/yr}} = 1.68 \text{ kg/day}$$

Traditionally the BOD₅ 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 composting, these contributors have been subtracted resulting in an estimated 13 kg/tonne of live weight.

5.2.3 Truck Wash Bay

The BOD₅ from the truck wash water comes primarily from washing domestic vehicles, highway trucks and farm equipment. Tekere et al. (2012) reports an average BOD₅ generation of 257 mg/L from car wash bays. Therefore, based on the estimated daily hydraulic loading of 1.56 m³/day from the truck wash bay, the resulting daily BOD₅ production will be **0.40 kg**.

$$\text{Truck wash bay BOD}_5 = \left(\frac{257 \text{ mg BOD}_5/\text{L} \times 10^3 \text{ L/m}^3}{10^6 \text{ mg/kg}} \right) \times 1.56 \text{ m}^3/\text{day} = 0.40 \text{ kg BOD}_5/\text{day}$$

5.2.4 Total Organic Loading

Therefore, the total daily BOD₅ contribution to the stabilization pond has been estimated to be 17.48 kg based on a population of 200 people and the slaughterhouse activities indicated.

$$\text{Combined BOD}_5 \text{ loading} = 15.40 + 1.68 + 0.40 = 17.48 \text{ kg BOD}_5/\text{day}$$

5.3 General Design Parameters

The maximum design liquid depth in the storage is 1.15 meters. A one meter freeboard is provided to protect against catastrophic levels of precipitation and to shelter the liquid surface to minimize the effects of wave action. Moreover, a 0.35 m depth is set aside as reserve storage to hold the wastewater flow in the primary cell without surpassing the freeboard level when the transfer pipe connecting the primary cell to secondary cell is closed to facilitate effluent discharge. The interior slopes of the embankments will be constructed at 4:1 and the exterior slopes will be constructed at 5:1 in order to facilitate proper maintenance and grooming. The embankment top width will be 3.05 metres to permit access of maintenance equipment.

Due to the fact that the soils in the area are not suitable quality for clay liner material, it is recommended that the lagoon be lined with synthetic liner consisting of 60 mil HDPE. The synthetic liner material is proposed as a means of ensuring that any potential preferential flow paths are eliminated thereby maximizing environmental protection. With the exception of topsoil which is to be utilized for landscaping only, in-situ soils shall be used in constructing the outer embankments.

The first phase of construction will consist of removing all topsoil and organic matter from the entire foot print of the proposed cells, 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 fill 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 sheepsfoot packer to achieve a minimum of 95% of MDD. The amount of compaction effort required to achieve the minimum 95% will be dependent on the moisture content of the material. To achieve the desired compaction rate, the moisture content of the fill material should be within plus or minus two percent of the optimum moisture content as determined from the Standard Proctor moisture versus density relationship curve. In general, a minimum of 5 to 10 passes over each lift will be required. Discing or wetting of the fill material may be necessary to attain the optimum moisture content.

Construction of the interior of the storage will consist of removing all sharp objects from the finished surface or earth work to prevent puncturing the HDPE liner. The interior surface will be proof rolled to conceal small stones and gravel. However, all rocks greater than 50 mm are to be removed from the surface of the storage prior to proof rolling the interior surface. Surfaces containing sharp stones may require a 3" sand bedding layer or 12oz geotextile placed between the sub-base and HDPE liner, if physical removal is not possible. 12 oz nonwoven geotextile fabric will be installed under the concrete access ramps and any other appurtenances installed on top of the liner to prevent punctures during construction and after when in use. The HDPE liner will be anchored at the top of the berms via a 0.45x0.45m anchor trench. A 0.3 m thick ballast layer consisting of granular material will be installed onto the floor of each cell of the facility; this granular material shall be void of and sharp stones, shale and any stones greater than 20 mm in diameter.

A gas venting system and de-watering sump will be installed to prevent the formation of biogas under the liner material and removal of accumulated liquids beneath the liner as a result of ground water or precipitation. This system will also act as a leachate detection system in the event that the liner is breached.

For safety reasons it is recommended that fencing and warning signs be installed around the facility 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.

6 Design Capacity

6.1 Primary Cell

The size of the primary cell has been determined based on the liquid surface area at 0.58 m above the cell floor. The surface area at 0.58 m height is 5,070 m² (0.507 ha). Based on the BOD₅ contribution of 17.48 kg per day anticipated at the maximum design capacity, the primary cell BOD₅ loading will be 34.48 kg/ha/day. A conservative BOD₅ loading has been used to minimize the potential for odour production during spring thaw and to limit the potential for offensive odour production throughout the year. Given the geometry of the proposed cells the larger size minimizes the potential for short circuiting of effluent between the cells. Construction drawings for the lagoon are included in Appendix E.

6.2 Secondary Cell

Given the design criteria to be implemented, it is reasonable to assume that seepage losses from the storage will be negligible. Based on resources from the University of Manitoba (Figure 3) and historical data collected between 2000 and 2013 for the area (The Weather Network, 2015), annual precipitation for this area is approximately 530 mm while annual evaporation values from open water bodies are as high as 700 mm. Therefore, it is assumed that evaporation will at a minimum meet or exceed precipitation levels, thereby eliminating the need to provide additional storage capacity to facilitate excess precipitation.

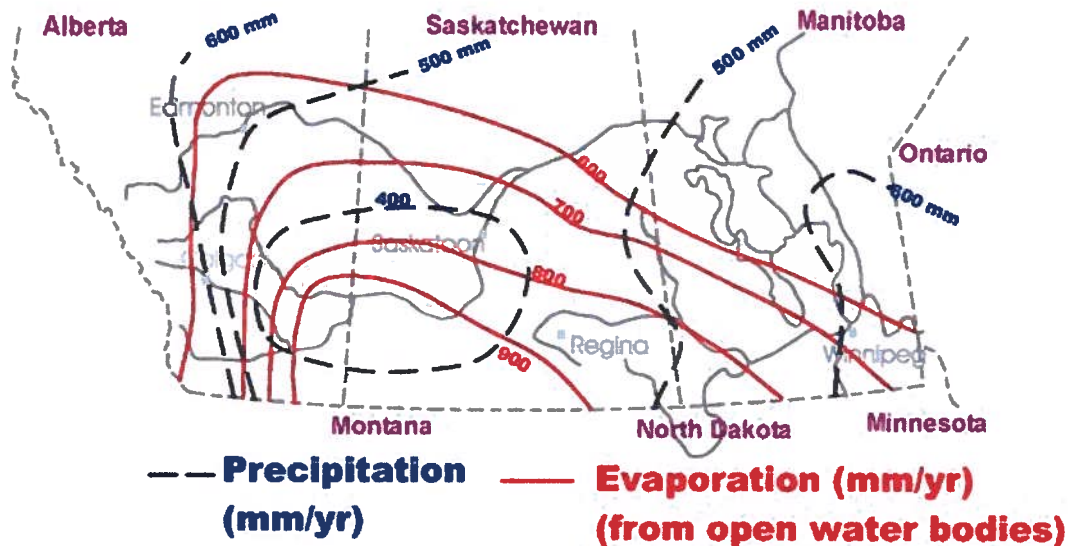


Figure 3. Annual precipitation and evaporation in Manitoba.

(Source: <http://home.cc.umanitoba.ca/~mlast/lakelevel/page3/page3.html>)

Operation of the lagoon is based on twice 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 twice per 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 230 days of retention time, not taking into consideration any contribution in allowable storage capacity of the primary cell. Therefore, the storage capacity of the secondary cell is 11,912 m³, excluding 0.3 m of dead storage

below the discharge pipe. The footprint of the storage is such that the design storage capacity is achieved at a maximum liquid depth of 1.15 m. In addition to the 1.0 m freeboard required to accommodate a significant rainfall event and to shelter the liquid surface from wind another 0.35 m depth is also available to accommodate flow in the primary cell during the period when effluent is discharged. The retention capacity of the secondary cell alone is 230 days, and when combined with 50% of the capacity of the primary cell will achieve a total retention time of 287 days at the design population.

7 Effluent Discharge

7.1 Method of Discharge

It is proposed that treated effluent from the wastewater lagoon will be discharged into 84N drain which runs along the south side of the development site and eventually flows to the Whitemud River. As the lagoon will be constructed partially above grade, it is proposed to accomplish the cleanout by means of gravity. The 84N drain will convey the effluent to the east where it ultimately joins Whitemud River at approximately 1.74 km from the development site. Installation of rip rap at the discharge of the effluent pipe at the point of entry into the drain will be required to prevent erosion of the embankments and disturbance of particulate matter in the water stream.

Trickle discharge will be implemented in order to limit the release of liquids into the drain as a means of trying to minimize the amount of liquids and particulates that actually enter into the Whitemud River. Over its entire length between the proposed construction site and the Whitemud River, the treated effluent flows through vegetated drains which are permanently grassed. This provides the unique opportunity to recapture any nutrients within the treated effluent as well as any sediment within the water stream. Trickle discharge will allow the opportunity for maximum infiltration to occur and under low flow conditions will provide additional opportunity for further treatment to occur. Under normal conditions where soil conditions are not saturated or following an intense rainfall event, it is anticipated that minimal effluent discharge will reach the Whitemud River. Due to the extended travel period and low flow rates, it is anticipated that the effluent reaching the Whitemud River will be equivalent to the water quality of the river under normal non-discharge conditions.

For the purpose of trickle discharge it is proposed to restrict the release of liquids to 0.006 m³/sec. This can be accomplished by restricting the valve opening to approximately 10% of its maximum opening area. Discharge duration is computed

iteratively as the total wastewater generated during the maximum residence period (230 days) (November 1 to June 15 of the next year) less the amount generated when the valve in the connecting pipe between the primary and secondary cells is closed (21 days plus discharge duration) divided by the trickle discharge ($0.006 \text{ m}^3/\text{sec}$). At this rate, it would be anticipated to take approximately 19 days to complete an entire discharge.

Discharges should not be undertaken or contribute to localize flooding as the result of excessive or intense rainfalls. In the event that significant rainfall is experienced during the discharge period, discharge shall be halted until such time that runoff accumulation in the drainage system has subsided.

7.2 Discharge Procedure

In order to facilitate emptying the secondary cell, it must first be proven that the treated effluent meets the minimum effluent standards. Consideration must be given to the time required for the final treatment in the 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 in excess of four weeks.

Following is the general discharge procedure to be implemented:

- 1) Close the valve in the connecting piping between the primary and secondary cells 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 samples from the secondary cell 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 .

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 all cells to equalize. This valve will remain open until the next discharge procedure is initiated. Sizing of the secondary cell is such that two discharges will be required per year at the maximum design population of 200 persons.
- 5) If additional discharges are required due to unforeseen scheduling issues, repeat the entire procedure.

8 Environmental Impact

8.1 Odor Production

Sizing of the primary cell has been based on an organic loading rate 34.48 kg BOD₅/ha/day. This level, which is significantly less than the maximum allowable 56 kg BOD₅/ha/day as prescribed in the Province of Manitoba's document "Design Objectives for Standard Sewage Lagoons" will ensure that the facility operates odour-free for the majority of the year.

Potential does exist for odour to be present during the spring thaw when gases such as hydrogen sulfide, which have been trapped under the ice, are released. Production of these gases are 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 lagoon will quickly return to an aerobic state and odour production will return to a minimal level.

The large separation distance between the lagoon and the nearest residence not associated with the lagoon (1.86 km) will serve to further reduce any potential impacts of odour production. Wind data available for the area indicates that the prevailing wind directions are from the west, west-northwest, north and east-northeast. The large separation distance to the neighbouring residence in the infrequent wind direction (from north) is such that little to no effect is anticipated based on the minimum setback requirements.

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

8.2 Impact of Discharge to Waterways

The treated effluent from the secondary cell of the lagoon will be discharged twice per year during the period prescribed in the Environmental 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 WASTERWATER
CBOD ₅ (mg/L)	Less than 25
Total Suspended Sediments (mg/L) (excluding growing algae)	Less than 25
Fecal Coliform (MPN/100mL)	Less than 200
Un-ionized ammonia (mg/L) expressed as nitrogen, at 15°C±1°C	Less than 1.25
Total Phosphorus (mg/L)	Less than 1

Stream flow statistics are available for the Whitemud River from a monitoring station located near Gladstone. Historical recorded data is available for the station from 1943 to 1957. Over this period, minimum daily flow rates of 0.000 m³/s were recorded at this station on a number of days during the period of record. For a more realistic representation of the minimum flow rates to be anticipated the average daily discharges are considered. The lowest average daily discharge rate during this period is 0.235 m³/s. Figure 4 presents average daily discharges of the station during the period of record. Under trickle discharge conditions which are anticipated to be approximately 6 L/s, the dilution rate would be close to 39:1, even if all of the treated effluent discharged from the facility were to reach this monitoring station. When minimal flow rates are

experienced in the Whitemud River, no flow would be anticipated to reach the river as most of the treated effluent would be absorbed into the soil or utilized by the vegetation within the drain.

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 flowing through the body of water is relatively small, resulting in a highly diluted solution. 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. In the event that discharge is necessary during a period of low flow in the waterway, it is anticipated that any precipitated salts will be re-suspended and diluted by the next significant rainfall and corresponding flow event.

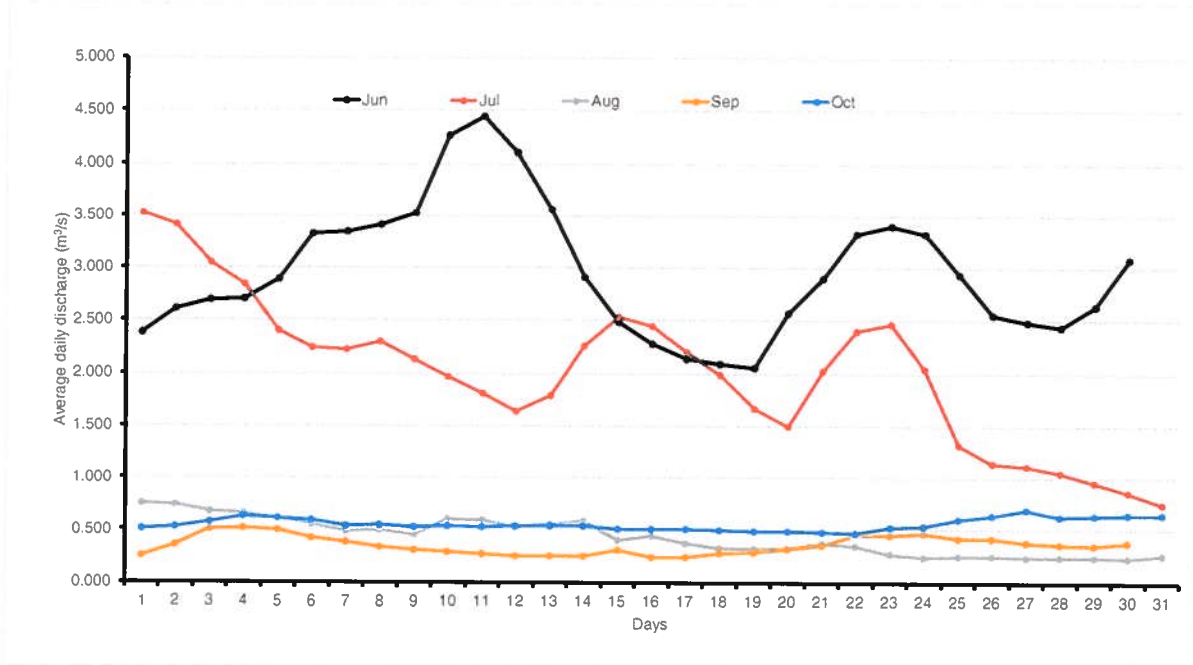


Figure 4. Average daily flow data of Whitemud River near Gladstone

The implementation of trickle discharge, except under extremely wet surface soil conditions, will in most situations prevent or minimize the amount of treated effluent from reaching the Whitemud River, thereby further minimizing the threat to downstream environment. During periods of increased flows, dilution of any residual constituents from the treated effluent will be afforded.

The minimum standards for effluent quality, requires that the maximum phosphorus level in the treated effluent be less than 1.0 mg/L. The colony has been made aware of this requirement and have committed to reducing the use of phosphate-based soaps in

order to achieve this goal. Testing of the treated effluent for phosphorus levels prior to discharge is suggested as a means of monitoring levels. In the event that levels exceed the allowable minimum, alum may be applied to the lagoon as a means of reducing the phosphorus level in the discharge effluent stream.

Periodic removal of vegetative growth within the grassed waterway is also recommended as a means of removing the nutrient stores within the plant material in order to minimize the long-term potential for nutrient movement into the river. Removal of this material, however, should be done in a manner that does not disturb the soil surface in order to avoid the potential for introducing sediments into the water stream. Removed material can be utilized as animal feed if of a desirable plant species or alternately recycled as organic material and applied to surrounding cropland as a source of fertilizer.

Agricultural waterways are generally classified into five fish habitat types (A, B, C, D or E) based on gross measurements of fish habitat complexity and the fish species presence (Melani, 2013). Type E habitat typically has insufficient flow duration for fish to complete one or more of their life processes (spawning, rearing, feeding, over wintering or migration) and provides indirect fish habitat, whereas type A habitat includes those fish with sport or commercial fishery value, and includes species at risk.

It has been determined that type E/D fish habitat exists in 84N drain (Figure 5). However, type A fish habitats are found further downstream once this drain runs into the Whitemud River at approximately 1.74 km downstream of the proposed development site. As this habitat represents 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.

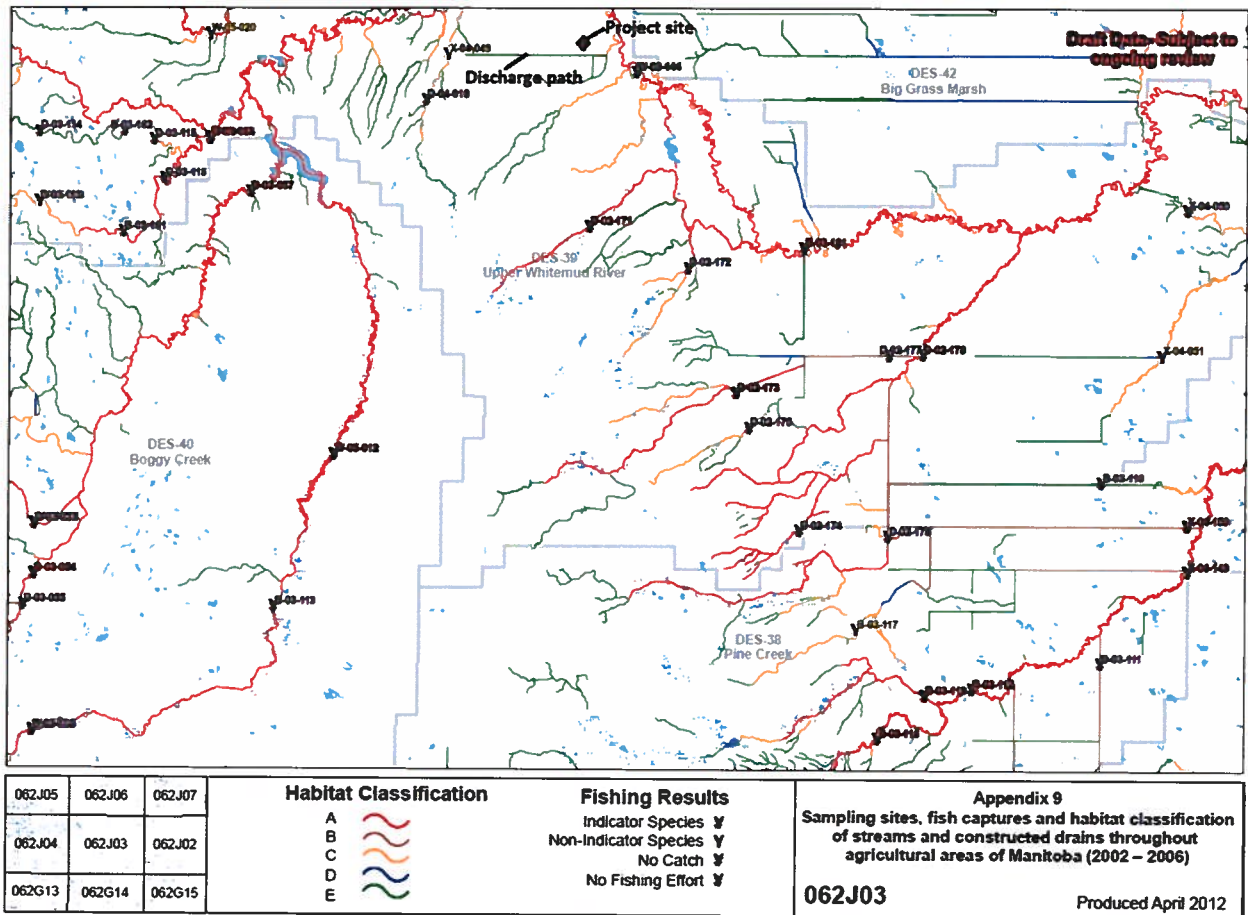


Figure 5. Fish habitat classification of 84N drain downstream of proposed project site

8.3 Impact on Groundwater

Construction methods to be utilized in constructing the lagoon will limit potential seepage losses to a minimum. The HDPE synthetic liner within the proposed lagoon will adequately protect the sub-surface groundwater resources beneath the facility. For this reason, the impact on groundwater is considered negligible. The presence of a dewatering system beneath the liner will also afford the opportunity for continued monitoring of the effectiveness of the liner system.

8.4 Impacts on Wildlife, Forestry and Heritage Resources

Currently the land at the proposed construction site is utilized for agricultural purposes and is cultivated on an annual basis. This area currently does not represent a significant

source of wildlife or forestry habitat, or heritage resource. Consequently, it is not anticipated that the proposed lagoon will have an impact on them.

In consultation with the Biodiversity Information Manager at the Manitoba Conservation Data Centre, it was determined that there are no rare species identified within the proposed development area at this time (Appendix D).

In consultation with Archaeological Services Office of Historic Resources Branch of Manitoba Sport, Culture and Heritage, it was determined that the potential to impact significant heritage resources in the proposed project site has been deemed low (Appendix D).

8.5 Gasoline and Associated Product Storage

No storage of gasoline or associated petroleum products are expected on site due to the proposed development. Refueling and storage of petroleum products will be done within the developed yard site far from the proposed lagoon, and is to maintain a minimum 100 m setback from any waterway.

8.6 Socio-economic Implication

As no significant environmental impacts are anticipated, no socio-economic implications are likely. Construction of the proposed facility will in fact generate economic opportunities for local contracts, having a beneficial impact.

9 Maintenance and Inspection

9.1 General Maintenance

Plastic liners require routine inspections to identify and repair punctured areas to protect leakage of wastewater. Damaged areas identified during routine inspections are exposed carefully by removing the soil cover and patched according to the manufacturer's specifications. The repaired area of the liner need to be recovered with soil and the project engineer should inspect all repairs and either approve the repairs or require additional protection such as erosion protection at inlet pipes, transfer lines, or

agitator pads and protection from wheel damage. Moreover, lagoon embankments should be inspected for signs of animal burrowing activity.

9.2 Monitoring Requirements

Operation of the lagoon is relatively self-sufficient, 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 cells is not frozen. This can be accomplished by comparing that the water levels in the cells are the same.

10 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 contending with frozen soil and freezing conditions.

11 Funding

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

12 Decommissioning Plan

The Colony proposes to implement the decommissioning plan outlined below immediately upon commissioning of the proposed wastewater treatment lagoon. The proposed decommissioning plan for the existing wastewater treatment lagoon comprises of the following three steps:

1. transferring wastewater and sludge from the existing lagoon to the primary cell of the new lagoon;
2. leveling the site of the existing lagoon to its original grade.

First, wastewater remaining in the existing lagoon will be pumped out by a registered sewage hauler and transferred to the primary cell of the new lagoon. Once the liquid wastewater is removed from the lagoon, the sludge from the existing lagoon will be removed and transported to the primary cell of the new lagoon. Lastly, the existing lagoon site will be levelled to its original grade by a registered contractor.

13 References

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14 Appendix A - Certificate of Title

STATUS OF TITLE

Title Number 1696192/5

Title Status Accepted

Client File

The Property Registry

A Service Provider for the Province of Manitoba



1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION

RIVERSIDE HUTTERIAN MUTUAL CORPORATION

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND:

E 1/2 1-15-14 WPM AND ALL THAT PORTION OF THE W 1/2 6-15-13 WPM WHICH LIES WEST OF THE WESTERN LIMIT OF FORT ELLICE TRAIL PLAN 881 NLTO
EXC FIRSTLY: OUT OF THE W 1/2 6 RIGHT-OF-WAY PLAN 296 NLTO
EXC SECONDLY: ALL THAT PORTION OF NW 1/4 6 WHICH LIES WEST OF AND AND PARALLEL TO AND PERP DISTANT THEREFROM 400 FEET FROM THE WESTERN LIMIT OF RIGHT-OF-WAY PLAN 296 NLTO
EXC THIRDLY: ALL THAT PORTION OF SW 1/4 6 BOUNDED AS FOLLOWS: - ON THE NORTH BY THE NORTH LIMIT OF SAID 1/4 SECTION ON THE SOUTH BY THE SOUTH LIMIT OF SAID 1/4 SECTION ON THE EAST BY THE WEST LIMIT OF RIGHT-OF-WAY PLAN 296 NLTO AND ON THE WEST BY A LINE DESCRIBED AS FOLLOWS: - COMMENCING ON THE NORTH LIMIT OF SAID SECTION 400 FEET WLY FROM ITS INTERSECTION WITH THE WESTERN LIMIT OF RIGHT-OF-WAY PLAN 296 NLTO THENCE SLY 17 DEGREES 17 MINUTES EAST TO INTERSECT THE SOUTH LIMIT OF SAID SECTION
EXC FOURTHLY: ROAD PLAN 4404 NLTO

The land in this title is, unless the contrary is expressly declared, deemed to be subject to the reservations and restrictions set out in section 58 of *The Real Property Act*.

2. ACTIVE INSTRUMENTS

Instrument Type: Mortgage

Registration Number: 1109674/5

Instrument Status: Accepted

Registration Date: 2014-09-26

From/By: RIVERSIDE HUTTERIAN MUTUAL CORPORATION

To: BANK OF MONTREAL

Amount: \$11,000,000.00

Notes: No notes

Description: No description

INSTRUMENTS THAT AFFECT THIS INSTRUMENT

<u>Registration Number</u>	<u>Instrument Type</u>	<u>Status</u>
1111004/5	Amending Agreement	Accepted

Instrument Type: Amending Agreement
Registration Number: 1111004/5
Instrument Status: Accepted

Registration Date: 2014-12-12
From/By: BANK OF MONTREAL
To: RIVERSIDE HUTTERIAN MUTUAL CORPORATION

Amount:
Notes: No notes
Description: No description

3. ADDRESSES FOR SERVICE

RIVERSIDE HUTTERIAN MUTUAL
CORPORATION
BOX 278
ARDEN MB
R0J 0B0

4. TITLE NOTES

No title notes

5. LAND TITLES DISTRICT

Neepawa

6. DUPLICATE TITLE INFORMATION

Duplicate not produced

7. FROM TITLE NUMBERS

47416/5 Balance

8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS

No real property application or grant information

9. ORIGINATING INSTRUMENTS

Instrument Type: Request To Issue Title - Internal
Registration Number: 1006779/5

Registration Date: 2000-01-12
From/By: RIVERSIDE HUTTERIAN MUTUAL CORPORATION
To:
Amount:

10. LAND INDEX

NW 6-15-13W
PART

SW 6-15-13W
PART

NE 1-15-14W

SE 1-15-14W

**CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE
SYSTEM OF TITLE NUMBER 1696192/5**

15 Appendix B – Location of the proposed development



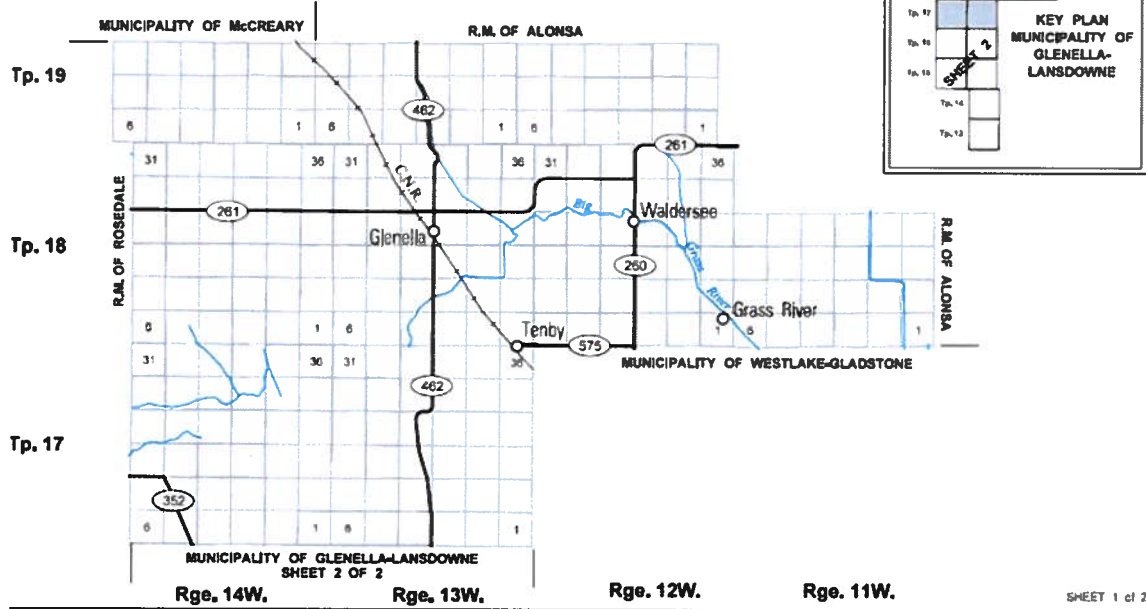
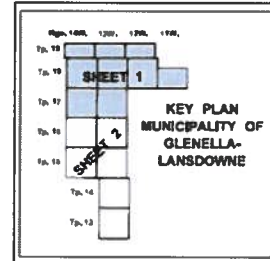
MUNICIPALITY OF GLENELLA-LANSDOWNE

0 5
SCALE IN KILOMETRES

PROVINCE OF MANITOBA
INFRASTRUCTURE
HIGHWAY PLANNING AND DESIGN BRANCH
GEOGRAPHIC & RECORDS MANAGEMENT SECTION
WINNIPEG
JANUARY 1, 2015

LEGEND

PROVINCIAL ROADS (261)
RAILWAYS + + + + +

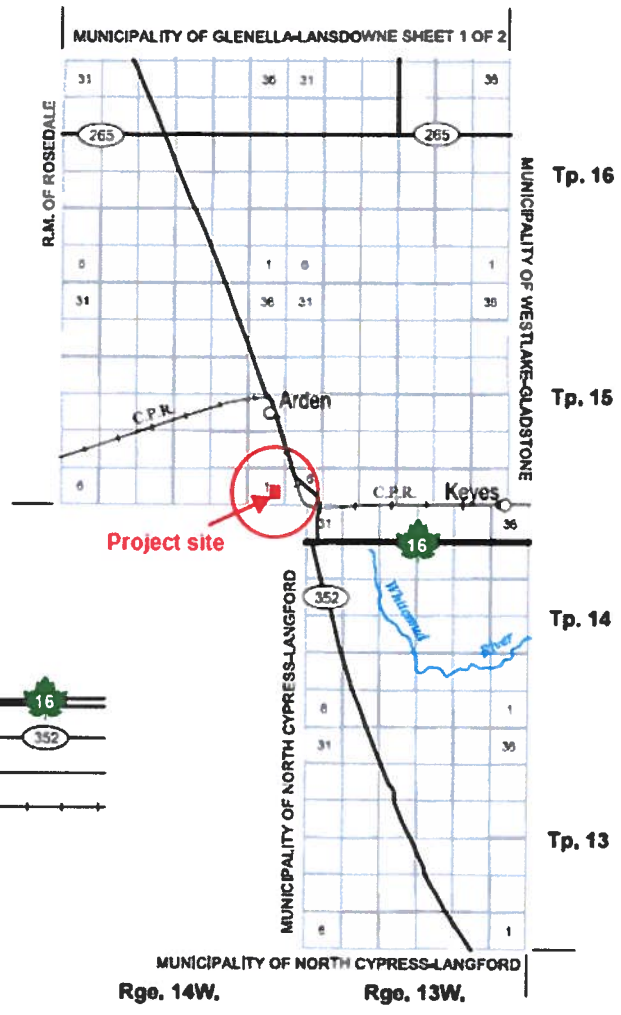
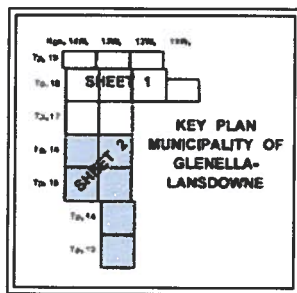








MUNICIPALITY OF GLENELLA-LANSDOWNE

0 5
SCALE IN KILOMETRES

PROVINCE OF MANITOBA
INFRASTRUCTURE
HIGHWAY PLANNING AND DESIGN BRANCH
GEOGRAPHIC & RECORDS MANAGEMENT SECTION
WINNIPEG
JANUARY 1 2015



- LEGEND**
- TRANS-CANADA HIGHWAY 
 - PROVINCIAL ROADS 
 - ACCESS ROADS 
 - RAILWAYS 

16 Appendix C – Bore hole log information



8-851 Lagimodiere Blvd
Winnipeg, MB R2J 3K4

Phone: 204.668.9652
Fax: 204.668.9204
E-mail: sme@southmaneng.com

TEST HOLE LOGS

For: Riverside Colony
Operation: Domestic Wastewater Treatment
Location: NW 6-15-13W
RM: Glenella-Lansdowne
City/Town, Prov.: Arden, Mb

Test Hole Logs by: Peter Grieger, P. Eng.
Drilling Performed by: Maple Leaf Drilling
Date: June 14, 2017

Test hole # 1

- 0-6" Topsoil/sod
- 6"-4' Brown clay till with sand, soft, med plastic
- 4'-13' Black/brown clay till with organics
- 13'-15' Grey clay till with sand fraction, med/high plastic
- 15'-19' Grey clay till with sand fraction, med/high plastic
- 19'-20' Grey silty clay till, low/med plastic

Test hole # 2 Corner

- 0-12" Topsoil
- 12"-3' Clay till
- 3'-3.5' Coarse sand
- 3.5'-6' Clay with sand mix, soft, moist
- 6'-7' Sandy gravelly organic layer, seepage
- 7'-13' Yellow clay till, firm, med plastic
- 13'-15' Grey clay till, firm, med plastic, slight gravel sizes
water at 10' from above

Test hole # 3 NW corner lagoon 20m east

- 0-6" Topsoil
- 6"-6' Grey clay till with sand fraction
- 6'-7' Clay till with gravel fraction
- 7'-9' Coarse gravel, wet, sewage smell
- 9'-18' Clay till, firm, med plastic, gravel fraction slight
- 18'-20' Clay till, sandier, increasing gravel fraction,
water at 2' open to 6'

Test hole # 4 Center field below lagoon and river north

- 0-6"** Sod
- 6"-3'** Sand, fine
- 3'-5'** Clay with sand lenses, moist, soft
- 5'-9'** Coarse sand and gravel wet
- 9'-10'** Clay till with gravel fraction,
water at 5'

Test hole # 5 South side common berm

- 0-2.5'** Sandy till
- 2.5'-5'** Grey clay till, soft, med plastic, sand fraction
- 5'-13'** Grey clay till, sand and gravel fraction, moist soft
- 13'-20'** Grey clay, firm, med plastic, gravel fraction slight

TEST HOLE LOGS

Riverside Colony

Box 278

Arden, MB

ROJ 0B0

Test Hole Logs by; Peter Grieger, P. Eng.

Drilling by: Kletke Enviro-Drilling

Date: March 5, 2007

Land Location: SE 1-15-14W

Test Hole #1

0-6" topsoil

6"-13' yellow/brown silty clay till, some sand, frozen to 4', medium plastic, firm, oxidation starting at 10'

13'-16' dark brown silty clay till w/ thin sand inclusions, pebbles, salts visible, oxidation, med. plastic

16'-19' grey sandy clay, low-medium plastic, soft

19'-20' grey clay till, medium-high plastic

20'-23' light grey/brown gravely clay till, low plastic, moist

23' 30' grey silty clay, soft becoming firmer w/ depth, slight pebbles

Water level 25.5 feet below grade after 4 hours.

Test Hole #2

0-4" topsoil

4"-4' yellow sandy till w/ silt

4'-5' yellow fine sand and silt

5'-7' yellow silty clay till, w/sand and gravel fraction, low plastic, oxidation

7'-16' brown silty clay till, some sand, gravel fraction decreasing w/ depth, medium plastic

16'-21' grey clay till w/ silt inclusions, oxidation, visible salts, pebbles, medium plastic

21'-30' grey clay till, pebbles, firm, medium-high plastic

No free water after drilling.

Test Hole #3

- 0-6" topsoil
 - 6"-5' yellow sandy till, frozen to 4'
 - 5'-8' yellow sandy clay till, w/ light grey silt inclusions, oxidation, low-medium plastic
 - 8'-15' brown clay till w/ oxidized silt and sand inclusions
 - 15'-23.5' brown silty sand, little clay, moist at 19'
 - 23.5'-28' grey sandy clay till w/ pebbles, medium plastic
 - 28'-30' grey clayey sand w/ pebbles, low plastic, moist
- Seepage encountered @ 19 feet.

Test Hole #4

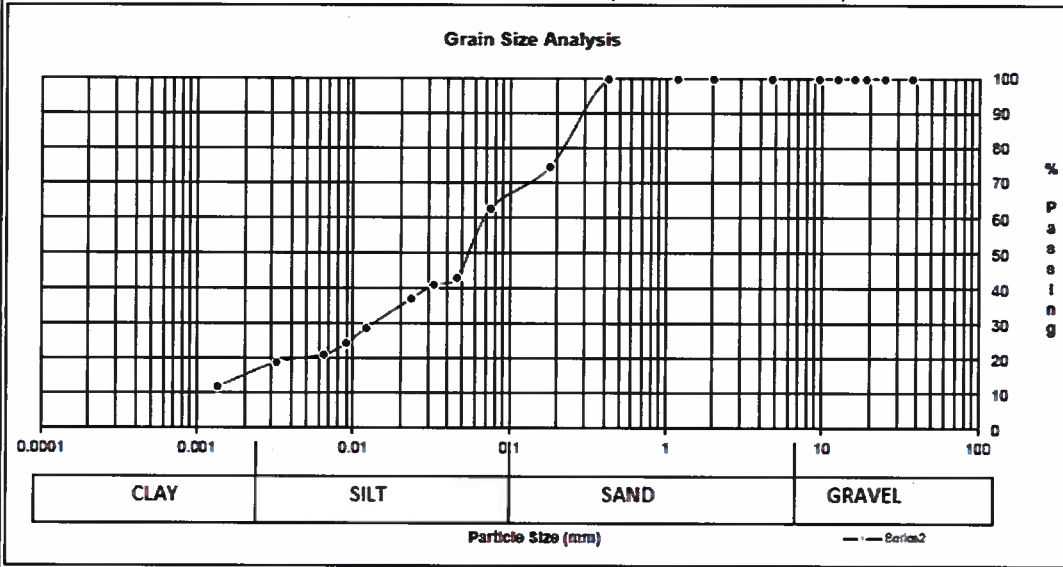
- 0-4" topsoil
 - 4"-3.5' medium/course sand
 - 3.5'-7' light grey/brown clay till, w/ silt and sand lenses, oxidation
 - 7'-16' brown clay till w/ thin oxidized silt and sand lenses, medium plastic
 - 16'-26' grey silty clay till w/ pebbles, becoming sandier w/ depth, moisture @ 22'
 - 26'-30' grey clay till w/ pebbles, firm, medium plastic, silt inclusions
- Seepage encountered @ 22 feet.

17 Appendix D – Geo-Technical Information

PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT:	Southman Engineering 1599 Dugald Road Winnipeg, MB R2J 0H3	PROJECT NO.	101-1703
ATTENTION:	Peter Grieger		
PROJECT:	Riverside 141		

Date Sampled:	16-Jun-17	Date Received:	16-Jun-17	Sieve Analysis		Hydrometer Analysis	
Sampled By:	Client	Date Tested:	23-Jun-17	Sieve (mm)	% Passing	Diameter	% Finer
				50.00	100.0		
				37.50	100.0		
				25.00	100.0		
				19.00	100.0		
				16.00	100.0		
Material Identification				12.50	100.0	0.0460	43.2
B.H./T.H. No.	TH2 @ 5'			9.50	100.0	0.0328	41.2
Sample No.	1			4.75	100.0	0.0235	37.2
Sample Source				2.00	100.0	0.0121	28.9
Specific Gravity of Material:	2.65			1.18	100.0	0.0090	24.6
				0.425	100.0	0.0065	21.2
				0.180	74.7	0.0032	18.9
				0.075	62.7	0.0014	12.0



SOIL DESCRIPTION	% Composition		D10	
	37.3	Gravel	D30	0.01210
SILT LOAM	50.7	Sand	D60	0.07500
	12.0	Clay	Cu	#DIV/0!
			Cc	#DIV/0!

Remarks: Test Method: ASTM D422, D2216, D4318

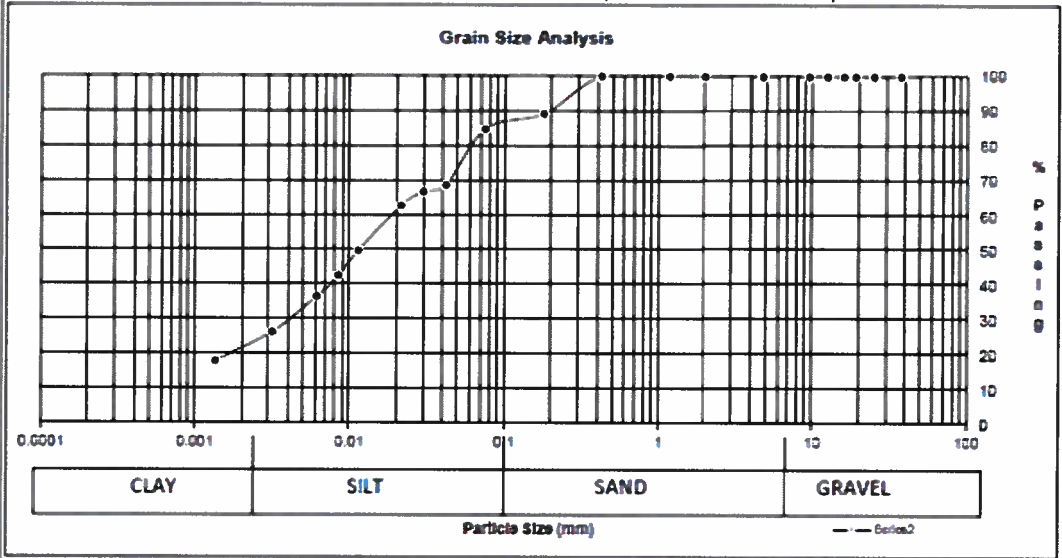
Technician: GM

Reviewed by: Hermie Manalo

PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT: Southman Engineering PROJECT NO. 101-1703
1599 Dugald Road
Winnipeg, MB R2J 0H3
ATTENTION: Peter Grieger
PROJECT: Riverside 141

Date Sampled:	16-Jun-17	Date Received:	16-Jun-17	Sieve Analysis		Hydrometer Analysis	
Sampled By:	Client	Date Tested:	23-Jun-17	Sieve (mm)	% Passing	Diameter	% Finer
Material Identification B.H./T.H. No. TH2 @ 10' Sample No. 2 Sample Source Specific Gravity of Material: 2.65				50.00	100.0		
				37.50	100.0		
				25.00	100.0		
				19.00	100.0		
				16.00	100.0		
				12.50	100.0	0.0420	68.8
				9.50	100.0	0.0300	66.8
				4.75	100.0	0.0215	62.8
				2.00	100.0	0.0114	49.7
				1.18	100.0	0.0085	42.5
			0.425	100.0	0.0061	36.4	
			0.180	89.3	0.0032	26.3	
			0.075	84.9	0.0014	18.0	



SOIL DESCRIPTION	% Composition		D10	D30	D60	Cu	Cc
	Gravel	Sand					
SILT LOAM	15.1	Sand	0.00613	0.02152	#DIV/0!	#DIV/0!	#DIV/0!
	68.9	Silt					
	18.0	Clay					

Remarks: Test Method: ASTM D422, D2216, D4318
Technician: GM

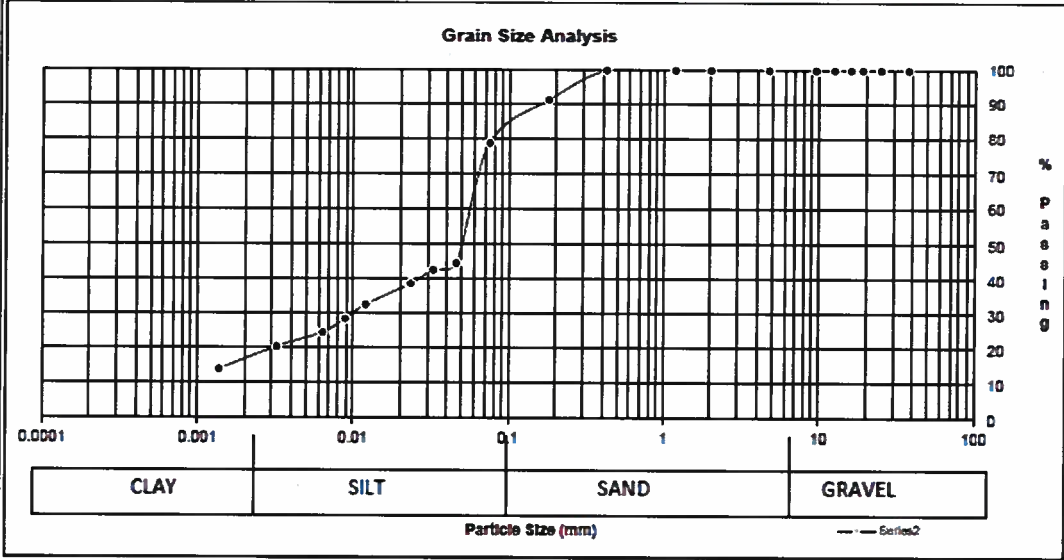
Hermano
Reviewed by: Hermie Manalo

PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT: Southman Engineering PROJECT NO. 101-1703
1599 Dugald Road
Winnipeg, MB R2J 0H3
ATTENTION: Peter Grieger
PROJECT: Riverside 141

Date Sampled:	16-Jun-17	Date Received:	16-Jun-17	Sieve Analysis		Hydrometer Analysis	
Sampled By:	Client	Date Tested:	23-Jun-17	Sieve (mm)	% Passing	Diameter	% Finer
				50.00	100.0		
				37.50	100.0		
				25.00	100.0		
				19.00	100.0		
				16.00	100.0		
				12.50	100.0	0.0460	44.8
				9.50	100.0	0.0327	42.8
				4.75	100.0	0.0235	38.8
				2.00	100.0	0.0120	32.7
				1.18	100.0	0.0089	28.7
				0.425	100.0	0.0064	24.6
				0.180	91.3	0.0032	20.5
				0.075	78.9	0.0014	14.0

Material Identification
B.H./T.H. No. TH3 @ 5'
Sample No. 3
Sample Source
Specific Gravity of Material: 2.65



SOIL DESCRIPTION	% Composition		D10	
	SILT LOAM	21.1	Gravel	D30
64.9		Sand	D60	0.07500
14.0		Silt	Cu	#DIV/0!
		Clay	Cc	#DIV/0!

Remarks: Test Method: ASTM D422, D2216, D4318
Technician: GM

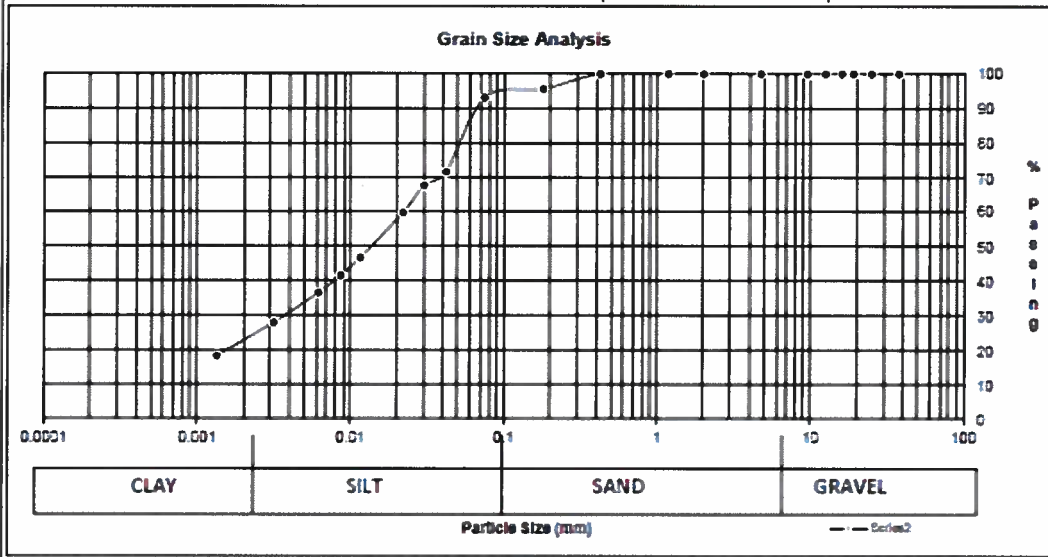
H. Manalo

Reviewed by: Hermie Manalo

PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT:	Southman Engineering 1599 Dugald Road Winnipeg, MB R2J 0H3	PROJECT NO.	101-1703
ATTENTION:	Peter Grieger		
PROJECT:	Riverside 141		

Date Sampled:	16-Jun-17	Date Received:	16-Jun-17	Sieve Analysis		Hydrometer Analysis	
Sampled By:	Client	Date Tested:	23-Jun-17	Sieve (mm)	% Passing	Diameter	% Finer
				50.00	100.0		
				37.50	100.0		
				25.00	100.0		
				19.00	100.0		
				16.00	100.0		
Material Identification				12.50	100.0	0.0418	71.8
B.H./T.H. No.	TH3 @ 15'			9.50	100.0	0.0301	67.8
Sample No.	4			4.75	100.0	0.0220	59.8
Sample Source				2.00	100.0	0.0116	46.7
Specific Gravity of Material:	2.65			1.18	100.0	0.0086	41.6
				0.425	100.0	0.0062	36.6
				0.180	95.8	0.0032	28.1
				0.075	93.3	0.0013	18.5



SOIL DESCRIPTION	% Composition		D10	
			D30	0.00818
SILT LOAM	6.7	Gravel	D60	0.02195
	74.8	Sand	Cu	#DIV/0!
	19.5	Silt	Cc	#DIV/0!

Remarks: Test Method: ASTM D422, D2216, D4318

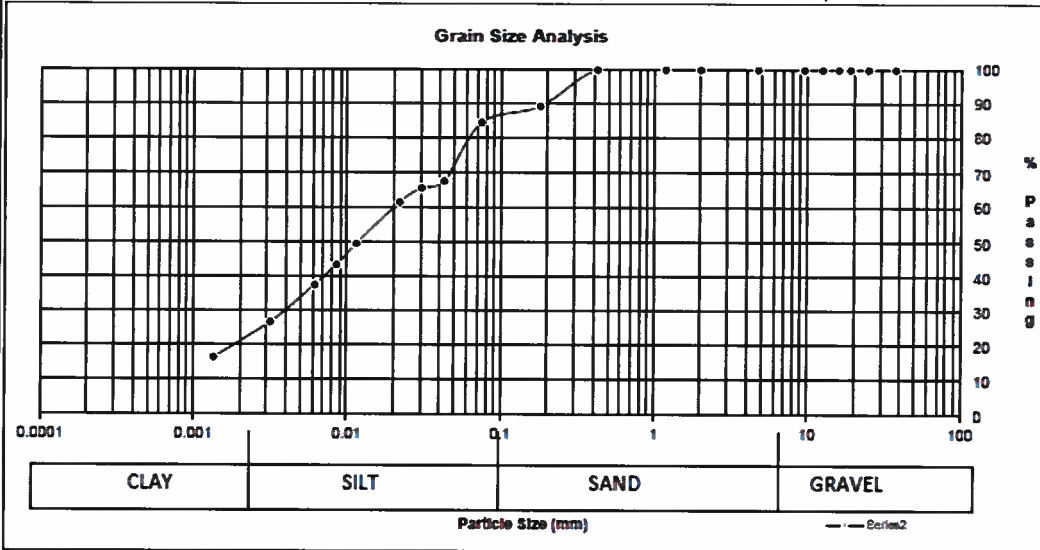
Technician: GM

Reviewed by: Hermie Manalo

PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT: Southman Engineering PROJECT NO. 101-1703
1599 Dugald Road
Winnipeg, MB R2J 0H3
ATTENTION: Peter Grieger
PROJECT: Riverside

Date Sampled:	16-Jun-17	Date Received:	16-Jun-17	Sieve Analysis		Hydrometer Analysis	
Sampled By:	Client	Date Tested:	23-Jun-17	Sieve (mm)	% Passing	Diameter	% Finer
Material Identification B.H./T.H. No. TH5 @ 10' Sample No. 5 Sample Source Specific Gravity of Material: 2.65				50.00	100.0		
				37.50	100.0		
				25.00	100.0		
				19.00	100.0		
				16.00	100.0		
				12.50	100.0	0.0428	67.7
				9.50	100.0	0.0305	65.7
				4.75	100.0	0.0219	61.7
				2.00	100.0	0.0115	49.7
				1.18	100.0	0.0085	43.6
0.425	100.0	0.0062	37.7				
0.180	89.3	0.0032	26.8				
0.075	84.6	0.0014	16.5				



SOIL DESCRIPTION	% Composition		D10	D30	D60	Cu	Cc
	Gravel	Sand					
SILT LOAM	15.4	Sand	0.00816		0.02191	#DIV/0!	#DIV/0!
	68.1	Silt					
	16.5	Clay					

Remarks: Test Method: ASTM D422, D2216, D4318
Technician: GM

H. Manalo

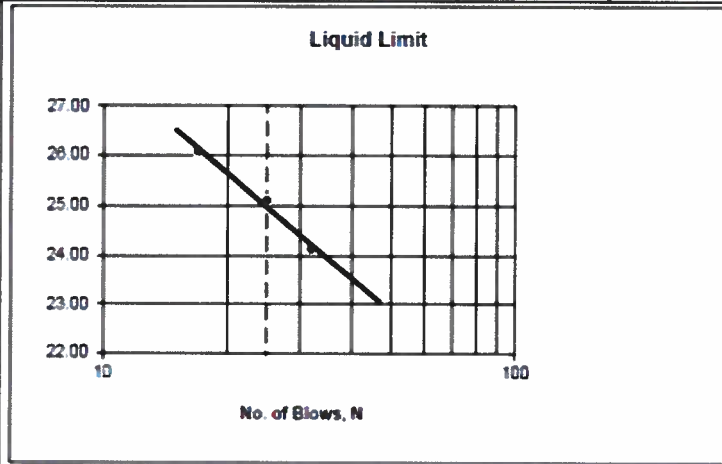
Reviewed by: Hermie Manalo

ATTERBERG LIMITS

CLIENT: Southman Engineering
1599 Dugald Road
Winnipeg, MB R2J 0H3
PROJECT NO.: 101-1703
ATTENTION: Peter Grieger
PROJECT: Riverside 141

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit 25 Blows
Wet Soil + Dish:	16.44	15.99	17.32		
Dry Soil + Dish:	14.09	13.65	14.62		
Moisture:	2.35	2.34	2.7		
Dish:	4.35	4.33	4.27		
Dry Soil:	9.74	9.32	10.35		
% Moisture:	24.13	25.11	26.09		
No. of Blows:	32	25	17		
Liquid Limits:	24.86	25.11	24.90		24.95



Material Identification:

T.H./B.H. No. 2
Depth: 5'
Liquid Limit, %: 25
Plastic Limit, %: 11
Plasticity Index: 14
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	12.91	13.64	13.63		
Dry Soil + Dish:	12.02	12.69	12.66		
Moisture:	0.89	0.95	0.97		
Dish:	4.22	4.3	4.27		
Dry Soil:	7.8	8.39	8.39		
% Moisture:	11.41	11.32	11.56		
Average:					11.43

Test Method : ASTM: D4318, D2216
HMCL Tech: GM
Date Tested: 23-Jun-17

Reviewed by: Hermie Manalo

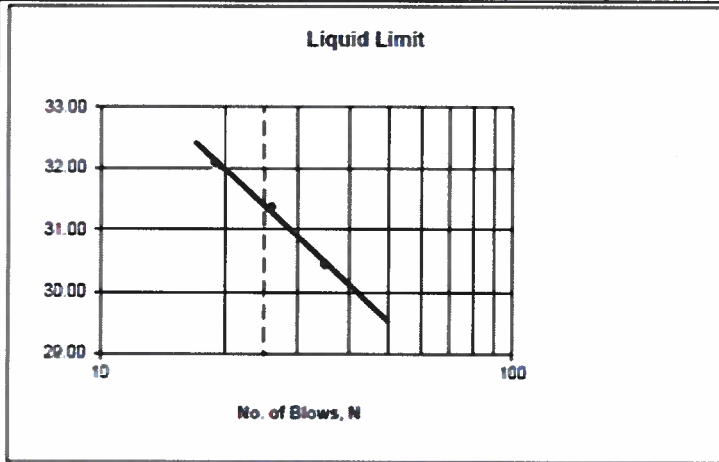
ATTERBERG LIMITS

CLIENT: Southman Engineering
1599 Dugald Road
Winnipeg, MB R2J 0H3
PROJECT NO.: 101-1703

ATTENTION: Peter Grieger
PROJECT: Riverside 141

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit 25 Blows
Wet Soil + Dish:	17.4	18.14	20.36		
Dry Soil + Dish:	14.35	14.84	16.51		
Moisture:	3.05	3.3	3.85		
Dish:	4.33	4.32	4.51		
Dry Soil:	10.02	10.52	12		
% Moisture:	30.44	31.37	32.08		
No. of Blows:	35	26	19		
Liquid Limits:	31.70	31.52	31.04		31.42



Material Identification:

T.H./B.H. No. 2

Depth: 10'

Liquid Limit, %: 31
Plastic Limit, %: 14
Plasticity Index: 18
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	13.36	13.12	13.45		
Dry Soil + Dish:	12.28	12.04	12.35		
Moisture:	1.08	1.08	1.1		
Dish:	4.28	4.28	4.27		
Dry Soil:	8	7.76	8.08		
% Moisture:	13.50	13.92	13.61		
Average:					13.68

Test Method : ASTM: D4318, D2216
HMCL Tech: GM
Date Tested: 23-Jun-17

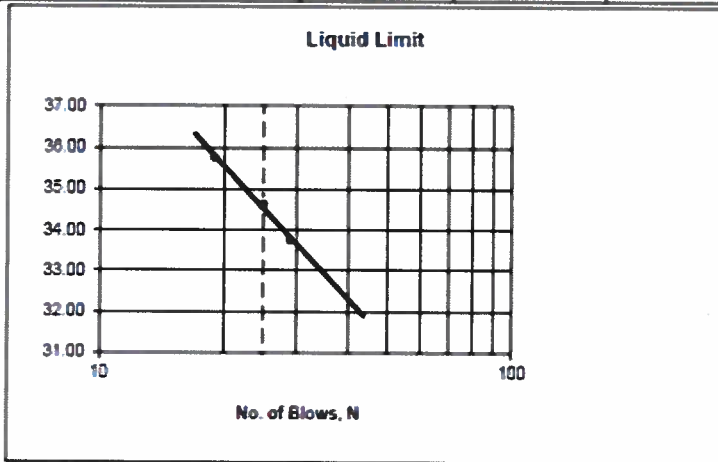
Reviewed by: Hermie Manalo

ATTERBERG LIMITS

CLIENT: Southman Engineering
1599 Dugald Road
Winnipeg, MB R2J 0H3
PROJECT NO.: 101-1703
ATTENTION: Peter Grieger
PROJECT: Riverside 141

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	16.9	15.21	16.18		25 Blows
Dry Soil + Dish:	13.71	12.39	13.04		
Moisture:	3.19	2.82	3.14		
Dish:	4.26	4.25	4.26		
Dry Soil:	9.45	8.14	8.78		
% Moisture:	33.76	34.64	35.76		
No. of Blows:	29	25	19		
Liquid Limits:	34.37	34.64	34.60		34.54



Material Identification:

T.H./B.H. No. 3
Depth: 5'
Liquid Limit, %: 34.54
Plastic Limit, %: 15.87
Plasticity Index: 18.67
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	13.12	12.34	12.67		
Dry Soil + Dish:	11.87	11.26	11.53		
Moisture:	1.25	1.08	1.14		
Dish:	4.25	4.27	4.29		
Dry Soil:	7.62	6.99	7.24		
% Moisture:	16.40	15.45	15.75		
Average:					15.87

Test Method : ASTM: D4318, D2216
HMCL Tech: GM
Date Tested: 23-Jun-17

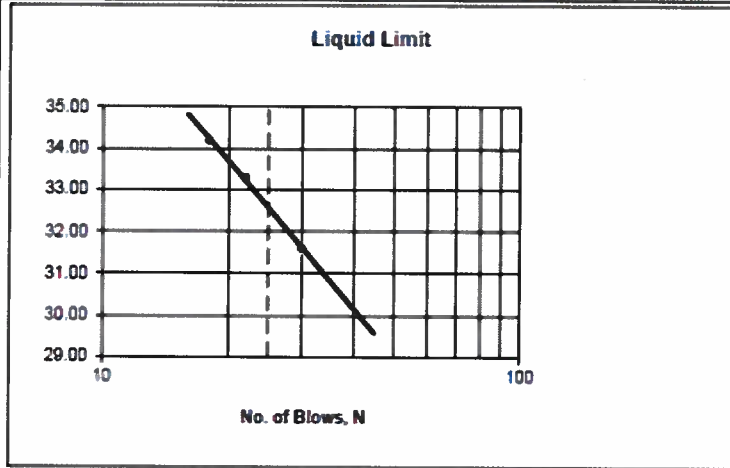
Reviewed by: Hermie Manalo

ATTERBERG LIMITS

CLIENT: Southman Engineering
1599 Dugald Road
Winnipeg, MB R2J 0H3
PROJECT NO.: 101-1703
ATTENTION: Peter Grieger
PROJECT: Riverside 141

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	15.97	16.18	16.71		25 Blows
Dry Soil + Dish:	13.16	13.19	13.54		
Moisture:	2.81	2.99	3.17		
Dish:	4.27	4.21	4.27		
Dry Soil:	8.89	8.98	9.27		
% Moisture:	31.61	33.30	34.20		
No. of Blows:	30	22	18		
Liquid Limits:	32.31	32.79	32.86		32.65



Material Identification:

T.H./B.H. No. 3
Depth: 15'
Liquid Limit, %: 33
Plastic Limit, %: 14
Plasticity Index: 19
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3	
Wet Soil + Dish:	12.96	12.82	12.99	
Dry Soil + Dish:	11.95	11.76	11.88	
Moisture:	1.01	1.06	1.11	
Dish:	4.52	4.26	4.26	
Dry Soil:	7.43	7.5	7.62	
% Moisture:	13.59	14.13	14.57	
Average:				14.10

Test Method : ASTM: D4318, D2216
HMCL Tech: GM
Date Tested: 23-Jun-17

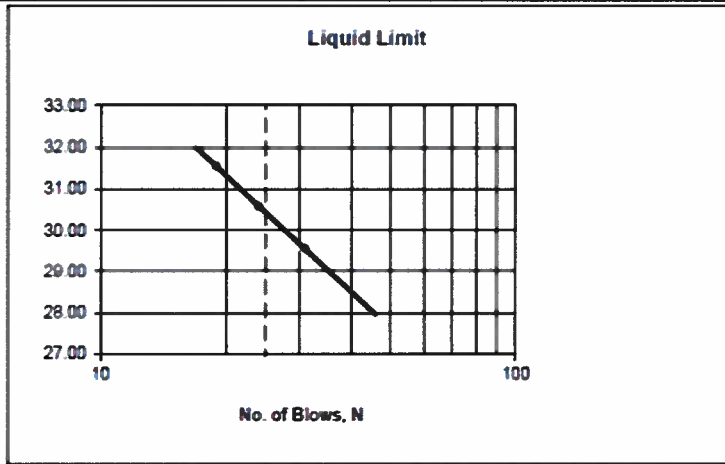
Reviewed by: Hermie Manalo

ATTERBERG LIMITS

CLIENT: Southman Engineering PROJECT NO.: 101-1703
1599 Dugald Road
Winnipeg, MB R2J 0H3
ATTENTION: Peter Grieger
PROJECT: Riverside141

Liquid Limit Determination

Dish No.:	1	2	3	Liquid Limit
Wet Soil + Dish:	17.52	15.77	17.34	25 Blows
Dry Soil + Dish:	14.49	13.07	14.22	
Moisture:	3.03	2.7	3.12	
Dish:	4.24	4.24	4.33	
Dry Soil:	10.25	8.83	9.89	
% Moisture:	29.56	30.58	31.55	
No. of Blows:	31	24	19	
Liquid Limits:	30.34	30.43	30.52	30.43



Material Identification:

T.H./B.H. No. 5
Depth: 10'
Liquid Limit, %: 30
Plastic Limit, %: 14
Plasticity Index: 16
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3	
Wet Soil + Dish:	12.58	12.74	12.7	
Dry Soil + Dish:	11.55	11.68	11.7	
Moisture:	1.03	1.06	1	
Dish:	4.23	4.3	4.22	
Dry Soil:	7.32	7.38	7.48	
% Moisture:	14.07	14.36	13.37	
Average:				13.93

Test Method : ASTM: D4318, D2216
HMCL Tech: GM
Date Tested: 23-Jun-17

H. Manalo
Reviewed by: Hermie Manalo

18 Appendix E – Correspondences

(no subject)

2 messages

Desalegn Edossa

Wed, Jul 12, 2017 at 10:03

<desalegn.southmaneng@gmail.com>

AM

To: "Butterfield, Tamara (SD)" <Tamara.Butterfield@gov.mb.ca>

Cc: Peter Grieger <peter@southmaneng.com>

Dear Tamara,

We are in the process of preparing an Environment Assessment Proposal (based on The Environment Act) to construct a Wastewater Treatment Lagoon for Riverside Colony located at NW 6-15-13W in the RM of Glenella-Lansdowne. The Colony is planning to discharge the treated effluent to Whitemud River. Could you please provide us with information if there are licensed surface water users downstream of the development site and up to the point where the river exists the rural municipality of Glenella-Lansdowne (approximately 33 km downstream of the development site along the watercourse).

Regards,

Desalegn Edossa (D.Eng., EIT)
South-Man Engineering
15-1599 Dugald Rd
Winnipeg, MB

Butterfield, Tamara (SD)

Wed, Jul 12, 2017 at 10:31

<Tamara.Butterfield@gov.mb.ca>

AM

To: Desalegn Edossa <desalegn.southmaneng@gmail.com>

Cc: Peter Grieger <peter@southmaneng.com>

Hi Desalegn,

As per your request, there are no registered/licensed surface water projects in our database on the Whitemud River from the project location (NW 6-15-13 WPM) to the point where the Whitemud exists the Rural Municipality of Glenella-Lansdowne.

Please note, that we do not licence a project if the water use associated with the project falls

within the domestic exemption category (< 25 000 Litres/day).
Therefore, we would not have any

records of domestic users in the area of interest.

If you need anything else, please let me know.

Tamara

Ph. 204-945-7431

Cell 204-918-6273

Information about historical record of flooding in the area



Desalegn Edossa
<desalegn.southmaneng@gmail.com>

Riverside Colony-Information about flood history

2 messages

Desalegn Edossa Wed, Jul 12, 2017 at 10:30 AM
<desalegn.southmaneng@gmail.com>
To: "Robert (MI)" <Robert.Belton@gov.mb.ca>
Cc: Peter Grieger <peter@southmaneng.com>, "Allum, Brad (MI)"
<Brad.Allum@gov.mb.ca>, "Methot, Michelle (MI)" <Michelle.Methot@gov.mb.ca>

Dear Robert,

I am contacting you once again for historical record of flood. A Wastewater Treatment Lagoon is proposed to be constructed for Riverside Colony located at NW 6-15-13W quarter section in the Rural Municipality of Glenella-Lansdowne. The colony is planning to discharge the treated effluent to Whitemud River. Could you please let us know if there is any historical record of flooding in the proposed project site. Please also let us know if we need any authorization to discharge the effluent to Whitemud river.

Regards,

Desalegn Edossa (D.Eng., EIT)
South-Man Engineering,
15-1599 Dugald Rd,
Winnipeg, MB R2J 0H3

Belton, Robert (MI) <Robert.Belton@gov.mb.ca> Mon, Jul 17, 2017 at 3:12 PM
To: Desalegn Edossa <desalegn.southmaneng@gmail.com>
Cc: "Methot, Michelle (MI)" <Michelle.Methot@gov.mb.ca>

Hi Desalegn,

The Riverside Colony lies immediately adjacent to the Whitemud River, with a portion of the NW 6-15-13W lying within the river embankment of the Whitemud River. The Whitemud River has a history of major, overland flooding, with major events occurring in 1969, 1970, and 1979. At this location, however, we do not have historic flood extents or topographic information with which to assess flood hazard.

The Whitemud River is not a provincial waterway, and therefore a permit from our branch will not be required for the discharge of treated effluent. Please note this applies only to Provincial Waterways authorizations only – all other permits from other departments will be required.

Please don't hesitate to let me know if you have any further questions or concerns.

Regards,

Information about rare species in the area



Desalegn Edossa
<desalegn.southmaneng@gmail.com>

Riverside Colony WWT

1 message

Friesen, Chris (SD) <Chris.Friesen@gov.mb.ca> Tue, Jul 18, 2017 at 12:06 PM
To: "desalegn.southmaneng@gmail.com" <desalegn.southmaneng@gmail.com>

Desalegn

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database and found no occurrences at this time for your area of interest.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. An absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present; in many areas, comprehensive surveys have never been completed. Therefore, this information should be regarded neither as a final statement on the occurrence of any species of concern, nor as a substitute for on-site surveys for species as part of environmental assessments.

Because the Manitoba CDC's Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. Please contact the Manitoba CDC for an update on this natural heritage information if more than six months pass before it is utilized.

Third party requests for products wholly or partially derived from Biotics must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using Biotics data, as follows as: Data developed by the Manitoba Conservation Data Centre; Wildlife & Fisheries Branch, Manitoba Sustainable Development.

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

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

If you have any questions or require further information please contact me directly at [\(204\) 945-7747](tel:2049457747).

Chris Friesen
Coordinator
Manitoba Conservation Data Centre
[204-945-7747](tel:2049457747)
chris.friesen@gov.mb.ca
<http://www.manitoba.ca/conservation/cdc/>

-----Original Message-----

From:

Sent: July-12-17 10:55 AM

To: Friesen, Chris (SD) <Chris.Friesen@gov.mb.ca>

Subject: WWW Form Submission

Below is the result of your feedback form. It was submitted by WWW Information Request () on Wednesday, July 12, 2017 at 10:55:01

DocumentID: Manitoba_Conservation

Project Title: Riverside Colony WWT

Date Needed: 2017/07/19

Name: Desalegn Edossa

Company/Organization: South-Man Engineering

Address: 15-1599 Dugald RD

City: Winnipeg

Province/State: MB

Phone: (204) 668-9652

Email: desalegn-southmaneng@gmail.com

Project Description: The information will be used to determine the impacts on species by a proposed wastewater treatment lagoon to serve a total population of 90 people.

Information Requested: Would like to know if there are any species at risk or endangered in region that may be impacted by the livestock operation.

Format Requested: Microsoft Word Document as email attachment.

Location: NE 1-15-14W and NW 6-15-13W in the RM of Glenella-Lansdwone.

action: Submit

Information about heritage sites in the area



Memorandum

.....End of Protected Section.....

DATE: → July 2017

TO: Desalegn Edossa
South-Man-Engineering
15-1599-Dugald-Rd.
Winnipeg, MB
Desalegn.southmaneng@gmail.com

FROM: Perry Blomquist
Archaeological
Services Officer
Historic Resources
Branch
Main Floor-213-Notre-
Dame-Avenue
Winnipeg-MB
R3B-1N3
PHONE NO: → (204) 945-1071

SUBJECT: → Wastewater Treatment Lagoon
R.M. Glenella-Lansdowne
NW-06-15-13-W

HRB FILE: AAS-17-12039

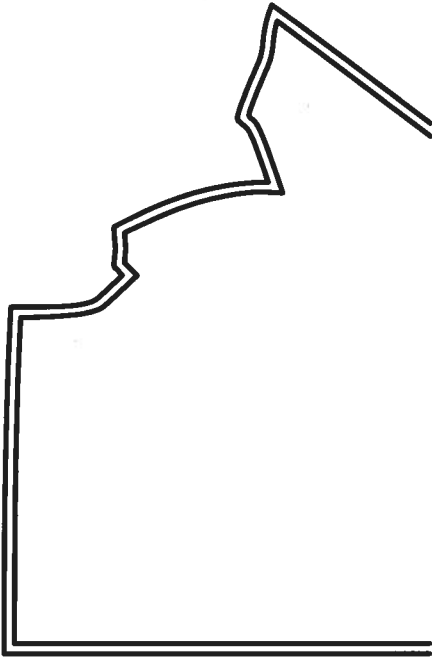
Further to your memo regarding the above-noted wastewater treatment lagoon development project, I have examined the locations in conjunction with Branch records for areas of potential concern. The potential to impact significant heritage resources has been deemed low in the delineated area therefore, the Historic Resources Branch has no concerns with the project.

If at any time however, heritage resources are encountered in association with these lands during development, the Historic Resources Branch may require that an acceptable heritage resource management strategy be implemented by the developer to mitigate the affects of development on the heritage resources.

If you have any questions or comments, please feel free to contact me (Perry Blomquist), Archaeological Assessment Services at 945-1071.

Perry Blomquist

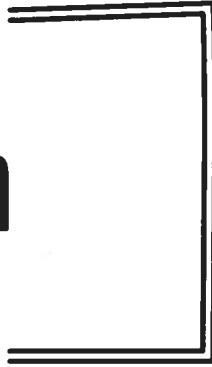
19 Appendix F – Design Drawings



PROJECT NAME:

**RIVERSIDE COLONY
SE01-15-14W
DOMESTIC WASTE WATER LAGOON**

South-Man Engineering



UNIT 15-1599 DUGALD ROAD | WINNIPEG, MANITOBA | R2J 0H3
PH: 204.668.9652 | FAX: 204.668.9204
sme@southmaneng.com



SHT NO.	SHEET SCHEDULE																
CS	COVER SHEET																
GN-1	GENERAL NOTES																
SP	SITE PLAN																
S-1	FLOOR PLAN																
S-2	CROSS-SECTION DETAIL																
S-3	INLET PIPING DETAILS																
S-4	TRENCH DETAIL																
S-5	RAMP DETAILS																
S-6	GAS VENTING PLAN																
S-7	GAS VENTING DETAILS																
S-8	GATE VALVE DETAILS																
S-9	FENCE DETAIL																
S-10	CLEANOUT DETAIL																
<table border="1"> <tr> <td>PROJECT NAME</td> <td>RIVERSIDE COLONY SE01-15-14W</td> <td>BUILDING AREA</td> <td>N/A</td> </tr> <tr> <td>SHEET TITLE</td> <td>COVER SHEET</td> <td>DRAWN BY</td> <td>R. FLORES SOUTH-MAN ENGINEERING</td> </tr> <tr> <td>DATE DRAWN</td> <td>APRIL 2020</td> <td>DRAWING SCALE</td> <td>N/A</td> </tr> <tr> <td colspan="2"></td> <td>SHEET NUMBER</td> <td>CS</td> </tr> </table>		PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A	SHEET TITLE	COVER SHEET	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING	DATE DRAWN	APRIL 2020	DRAWING SCALE	N/A			SHEET NUMBER	CS
PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A														
SHEET TITLE	COVER SHEET	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING														
DATE DRAWN	APRIL 2020	DRAWING SCALE	N/A														
		SHEET NUMBER	CS														

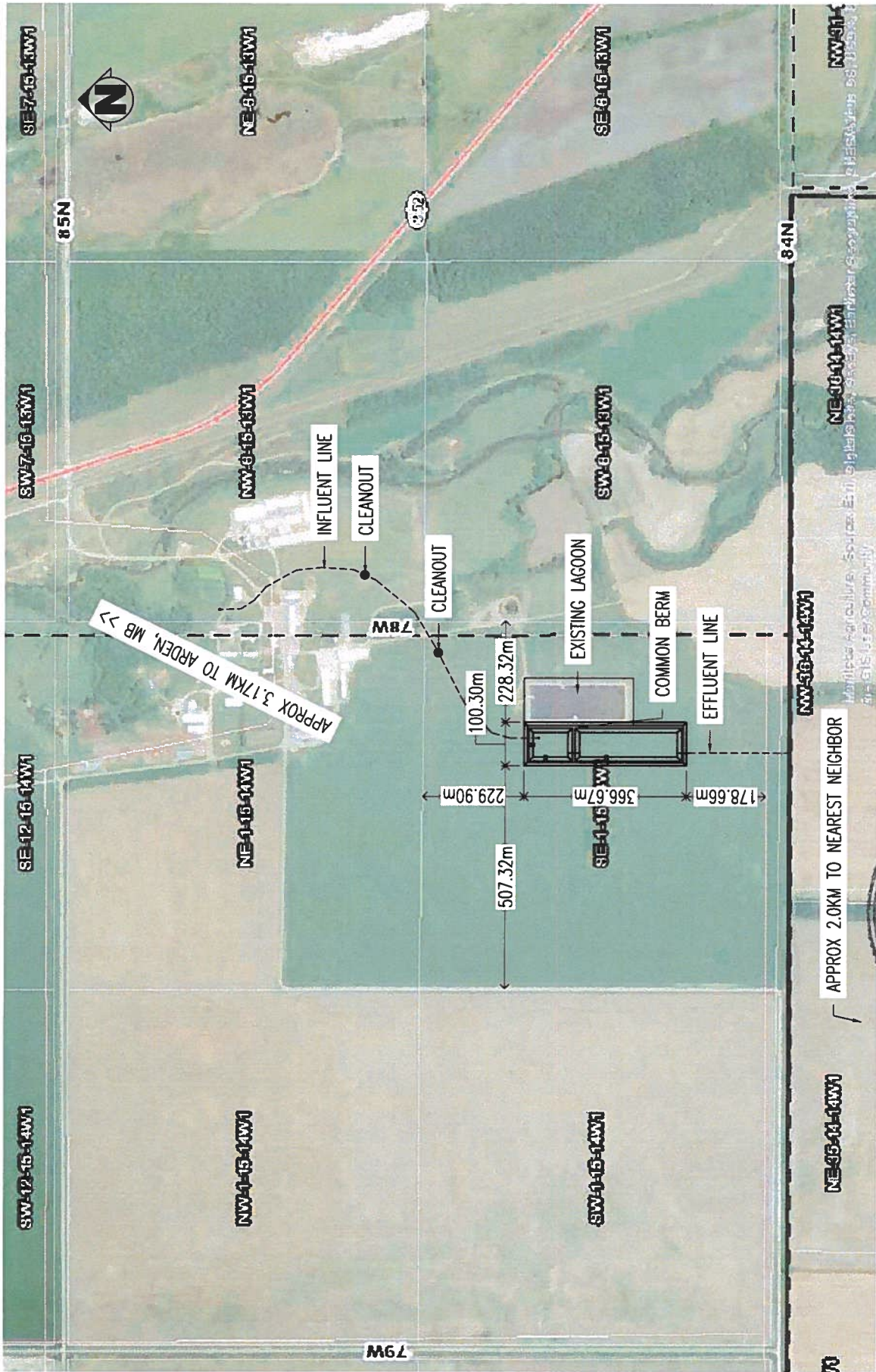
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GENERAL NOTES:

- THIS WASTE WATER LAGOON AND ASSOCIATED PRODUCTS SHALL CONFORM TO ASTM AND AWWA STD. SPECIFICATIONS. ALL CONSTRUCTION SHALL CONFORM TO SPECIFICATIONS.
- STRIP ALL ORGANIC MATERIAL AND TOPSOIL FROM STORAGE SITE TO OUTSIDE TOE OF BERM. REMOVE MATERIAL TO STOCK PILE FOR USE IN LANDSCAPING IN THE FUTURE.
- PROVIDE A .3 DEEP X 2.44 WIDE KEYWAY BENEATH BERMS PRIOR TO STARTING CONSTRUCTION OF BERMS. REMOVE ALL TOP SOIL AND ORGANIC MATERIAL BENEATH NEW BERM CONSTRUCTION.
- INTERIOR SURFACE OF FACILITY TO CONSIST OF A 60 mil HDPE LINER (TEXTURED SHEET) WITH .3 THICK GRANULAR COVER MATERIAL OVERTOP THE SYNTHETIC LINER ON BOTTOM OF CELL.
- CONSTRUCT BERMS IN MAXIMUM 150mm LIFTS. COMPACT EACH LIFT USING A FULLY BALLASTED SHEEPSFOOT PACKER (2400kPa OF COMPACTION PRESSURE) TO ACHIEVE 95% OF STANDARD PROCTOR DENSITY. PRIOR APPROVAL REQUIRED FOR OTHER TYPES OF PACKING EQUIPMENT.
- UNACCEPTABLE MATERIAL CONSISTING OF ORGANIC MATERIAL, FROZEN SOIL OR STONES GREATER THAN 75mm SHALL NOT BE USED IN CONSTRUCTION OF THE BERMS. CONSULT ENGINEER IF QUALITY OF MATERIAL IS QUESTIONABLE.
- THE MOISTURE CONTENT OF THE FILL MATERIAL SHALL BE SUCH THAT PROPER PACKING CAN BE ACHIEVED (0.9-1.2 OPTIMUM). MATERIAL SHOULD BE STIFF TO THE TOUCH BUT NOT CRUMBLE WHEN HANDLED. ALLOW DRYING OR PROVIDE WETTING BETWEEN CONSECUTIVE LIFTS AS REQUIRED.
- THE FINISHED INTERIOR SURFACE OF STORAGE SHALL BE LEVELED AND PROOF ROLLED WITH A SMOOTH DRUM VIBRATORY ROLLER TO CONCEAL ALL STONES, GRAVEL AND POTENTIALLY SHARP OBJECTS.
- WHERE SHARP OBJECTS OR STONY MATERIAL IS STILL PRESENT ON INTERIOR SURFACE OF STRUCTURE, EITHER A 76mm LAYER OF CLEAN SAND OR 12oz. NON-WOVEN GEOTEXTILE SHALL BE INSTALLED OVER THE INTERIOR SURFACE LAYER TO PROTECT THE HDPE LINER FROM PUNCTURE OR ABRASION.
- ACCESS RAMPS AND SPLASH PADS TO BE CONSTRUCTED USING .15 REINFORCED CONCRETE, C/W 10M @ .40 O/C BOTH WAYS. ACCESS RAMPS TO HAVE .15 WIDE BY .3 HIGH RAISED CURB ALONG EDGES. PROVIDE 12 oz. NON-WOVEN GEO-TEXTILE SEPARATING CONCRETE FROM LINER WHERE POURED IN DIRECT CONTACT.
- ALL CONCRETE TO BE 25MPa TYPE 10 W/5-7% AIR ENTRAINMENT.
- CONCRETE PLACED IN COLD WEATHER (BELOW 0°C AIR TEMP. AND WINDCHILL) SHALL BE PROTECTED WITH INSULATED TARPS. BELOW -3°C CONCRETE IS TO BE HEATED TO MAINTAIN 10° CELSIUS FOR A MINIMUM OF TWO DAYS AFTER PLACEMENT. REMOVE INSULATION AND HEATING GRADUALLY TO AVOID THERMAL SHOCK.
- INSTALL FENCE AROUND ENTIRE PERIMETER OF WASTE WATER LAGOON AS PER DETAIL ATTACHED.
- SIGNAGE SHALL BE PROVIDED INDICATING THAT POTENTIAL FOR DANGER EXISTS.
- SIGNAGE SHALL BE POSTED IN ACCORDANCE TO ASAE S441 AND INCLUDE CONTACT NUMBERS IN CASE OF EMERGENCY.
- SEED BERMS WITH GRASS TO PREVENT LONG TERM EROSION.
- SYNTHETIC LINER MATERIAL SPECIFICATION: 60mil PREMIUM GRADE HDPE GEOMEMBRANE (TEXTURED SHEET) OR EQUIVALENT.
- SYNTHETIC LINER INSTALLATION TO BE IMPLEMENTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. INSTALLATION OF THE HDPE LINER SHALL BE CONTINUOUSLY SUPERVISED BY A QUALIFIED INSTALLATION SUPERVISOR. PROOF OF CERTIFICATION OR TRAINING REQUIRED UPON DEMAND.



PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A
SHEET TITLE	GENERAL NOTES	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	APRIL 2020	DRAWING UNITS	N/A
THIS DRAWING IS THE PROPERTY OF SOUTH-MAN ENGINEERING, WINNIPEG, MANITOBA, CANADA.		SHEET NUMBER	
		GN-1	



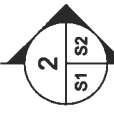
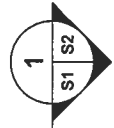
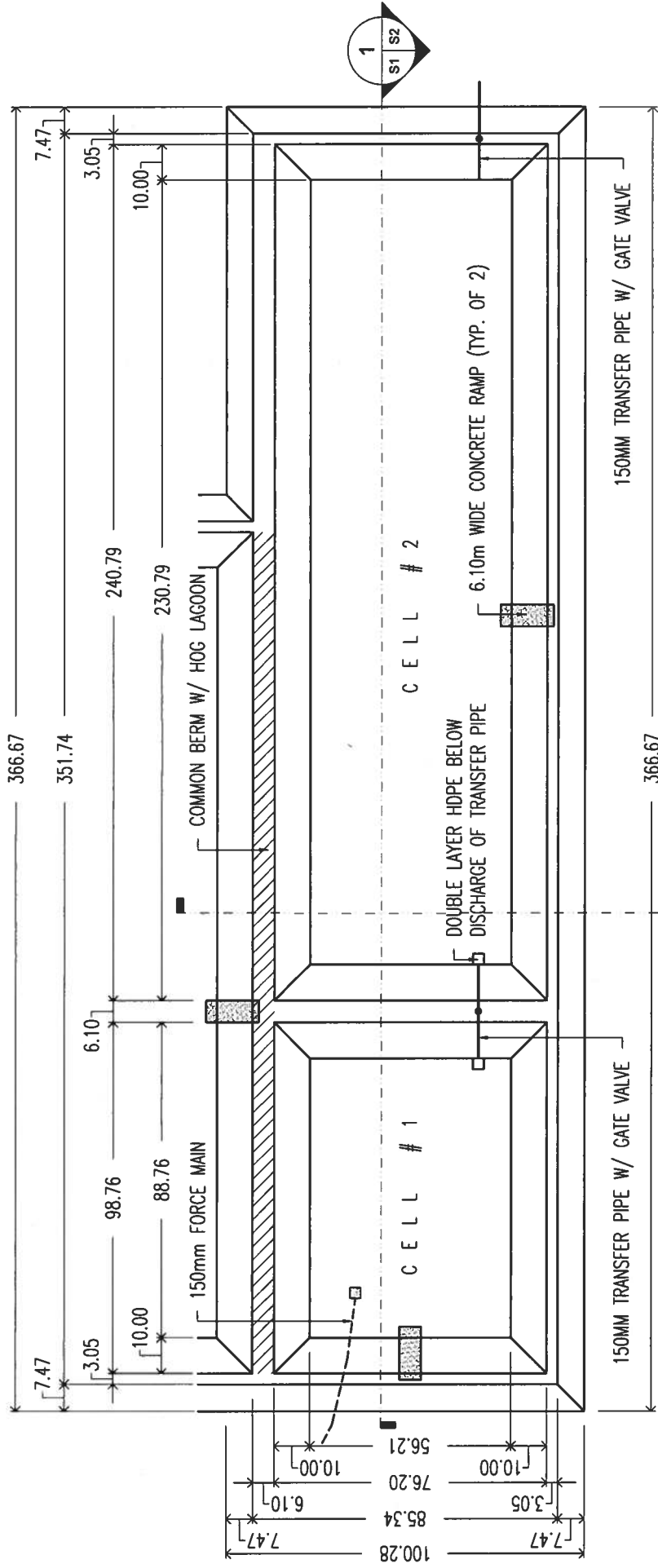
BUILDING AREA	N/A
PROJECT NAME	RIVERSIDE COLONY SE01-15-14W
DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
SHEET TITLE	SITE PLAN
DATE DRAWN	APRIL 2020
DRAWING UNITS	METRIC
SHEET NUMBER	SP

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UNIT 15-1599 (LUGOLD ROAD) WINNIPEG, MB R2J 0K0
 PH: 204-786-8204
 email@south-man-eng.com



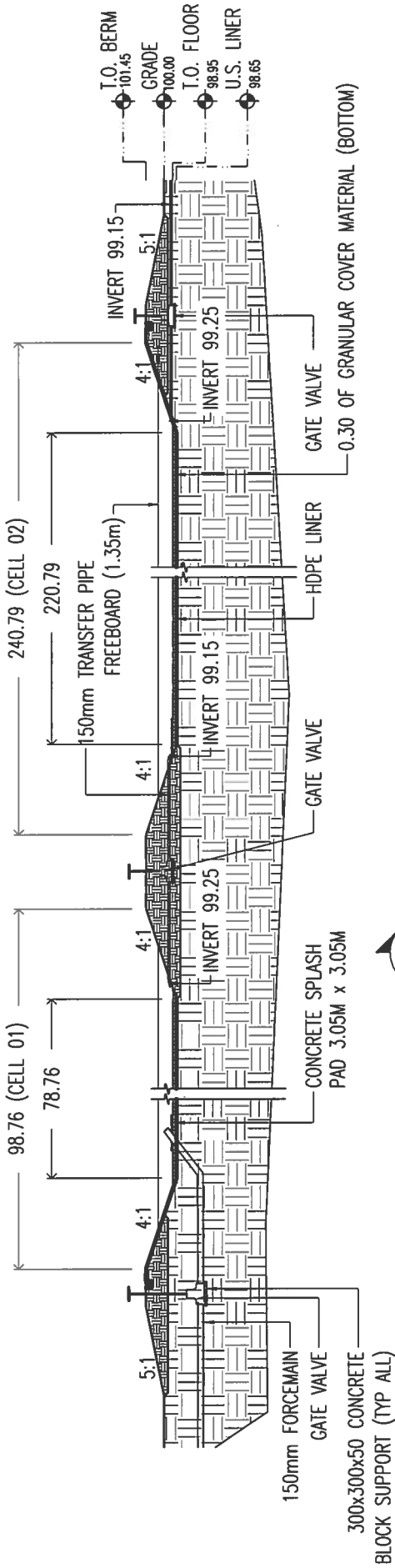
APPROX 2.0KM TO NEAREST NEIGHBOR



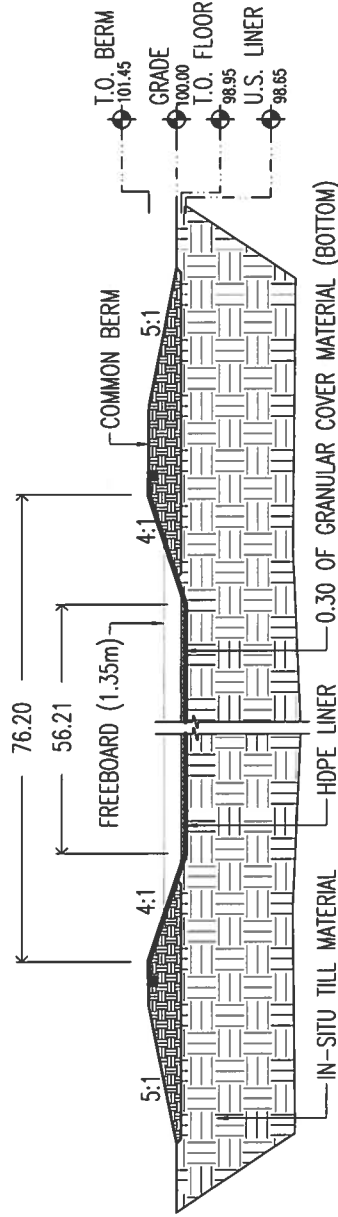
South-Man Engineering

UNIT 15-199 DUCALO ROAD | WINNIPEG, MB | R2J 0K9
 PH: 204.666.6666 | FAX: 204.666.5004
 info@south-man-eng.com

PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A
SHEET TITLE	FLOOR PLAN	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	APRIL 2020	DRAWING UNITS	METRIC
			SHEET NUMBER
			S-1



1 CROSS SECTION DETAIL
 SCALE S1 | S2
 N.T.S.



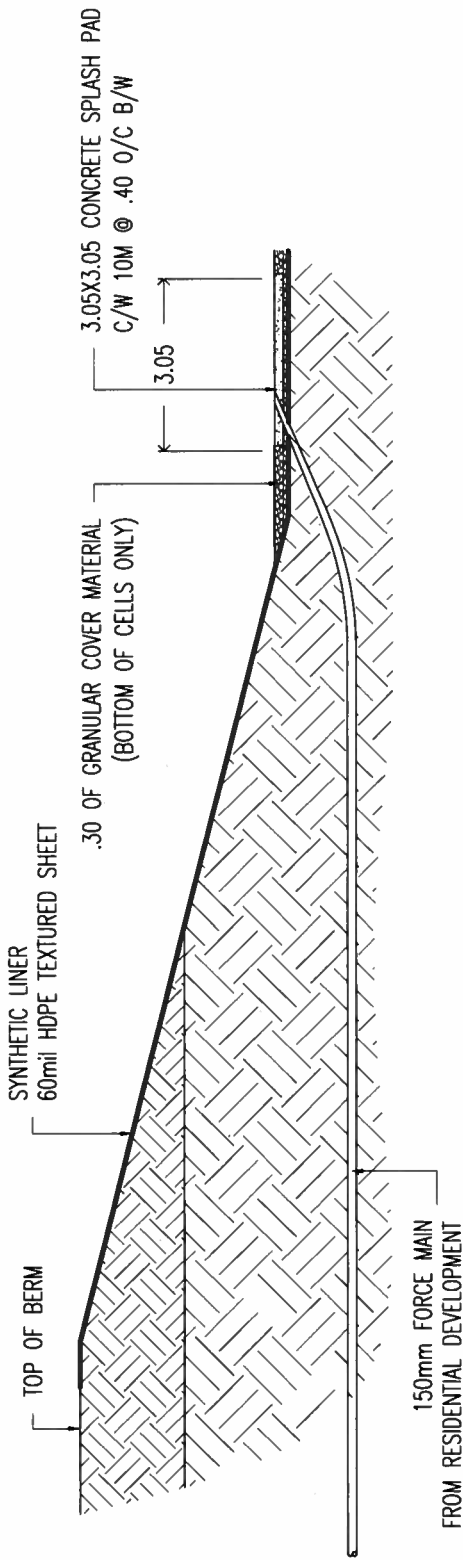
2 CROSS SECTION DETAIL
 SCALE S1 | S2
 N.T.S.



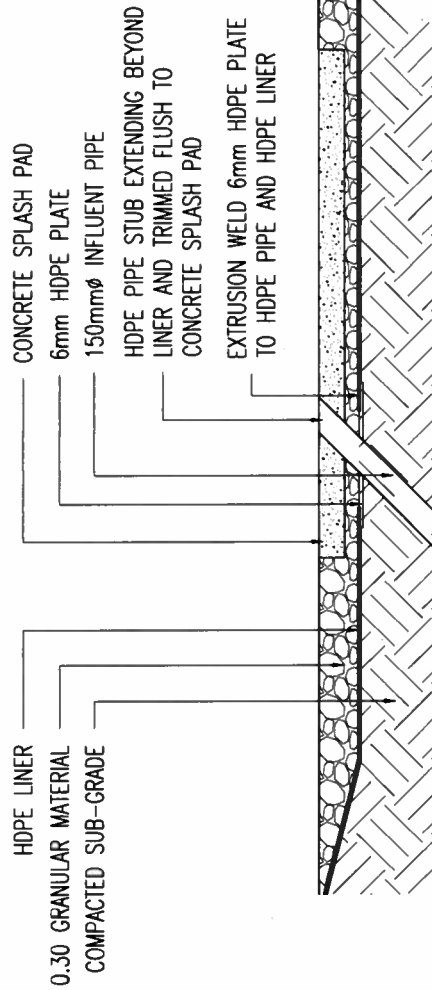
UNIT 15-1599 DUGALD ROAD | WINDYBEE, MB | R2J 0K0
 PH: 204.666.5052 | FAX: 204.666.5004
 info@south-man-eng.com

PROJECT NAME	RIVERSIDE COLONY SE01-15-14W
SHEET TITLE	CROSS-SECTION DETAIL
DATE DRAWN	APRIL 2020
BUILDING AREA	N/A
DRAWN BY	R. FLORES
FRAMING UNITS	METRIC
SHEET NUMBER	S-2

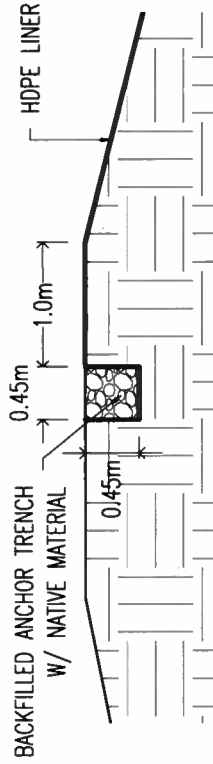
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INLET PIPING DETAIL: SIDE VIEW



INLET PIPING DETAIL



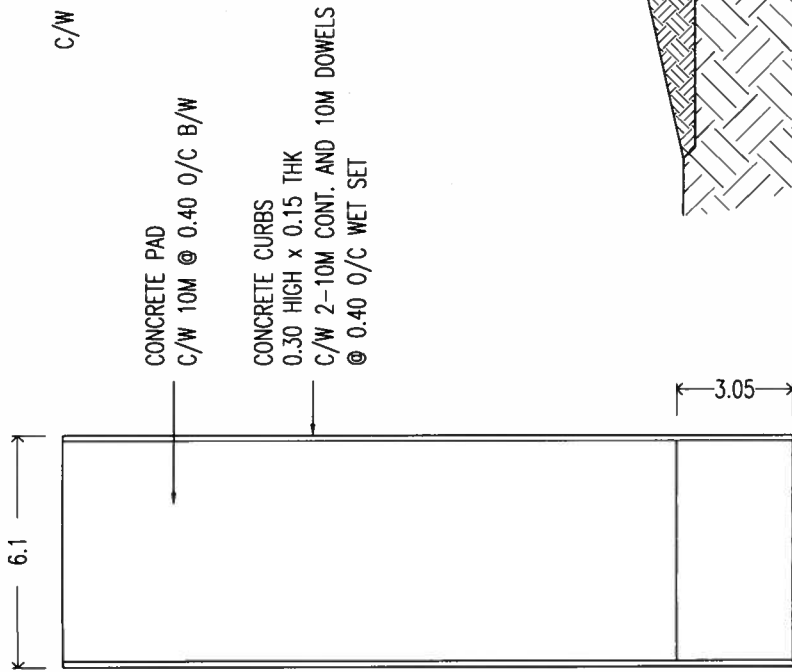
ANCHOR TRENCH DETAIL



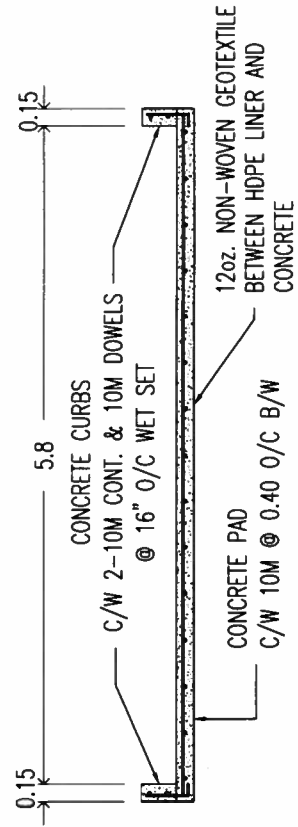
South-Man Engineering
 UNIT 15-1599 DUCALD ROAD | WINNIPEG, MB | R2J 0R3
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 info@south-man.com

PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A
SHEET TITLE	INLET PIPING DETAILS	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	APRIL 2020	DRAWING UNITS	METRIC
			SHEET NUMBER
			S-3

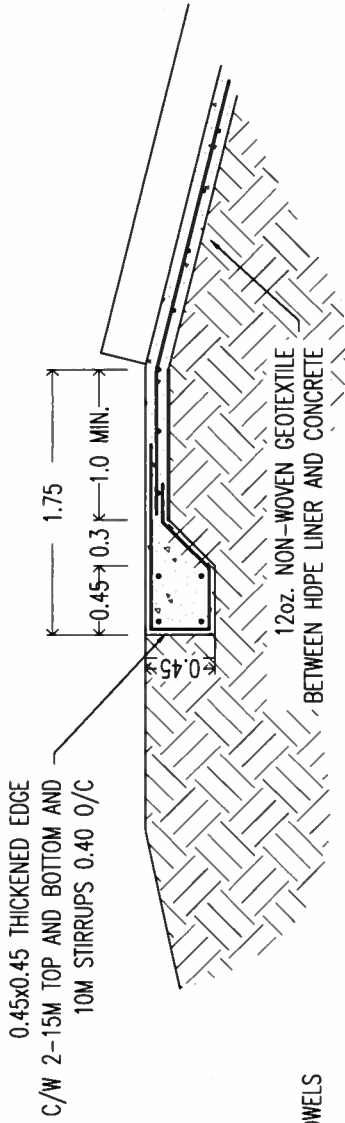
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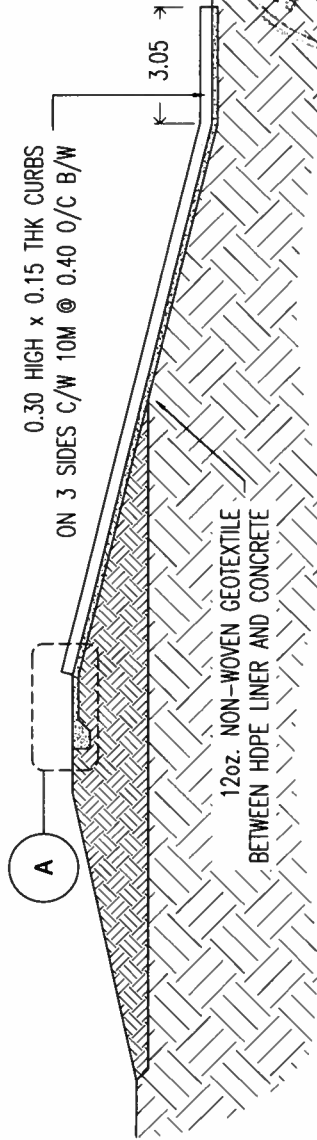
ACCESS RAMP: TOP VIEW



ACCESS RAMP: CROSS-SECTION DETAIL



ACCESS RAMP: ANCHORAGE DETAIL



ACCESS RAMP: SIDE VIEW

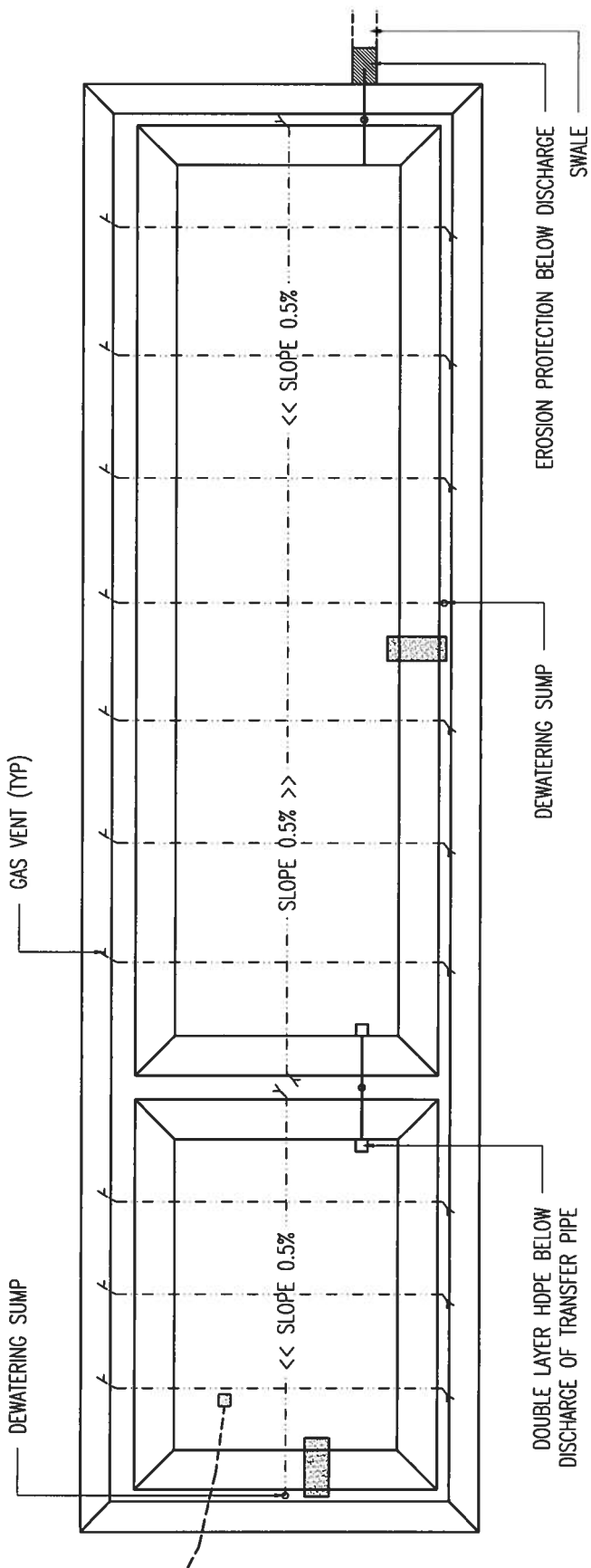
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NOTE: ALL CONCRETE TO BE 25MPa TYPE 10 W/5-7% AIR ENTRAINMENT.



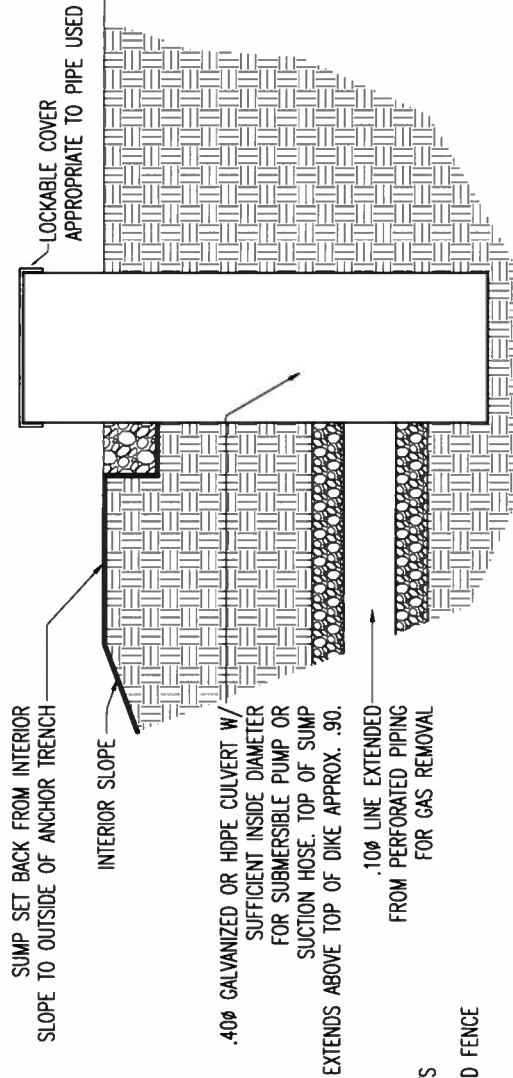
UNIT 15-1599 DUGALD ROAD | WINNIPEG, MB | R2J 0P3
 PH: 204.668.9622 | FAX: 204.668.9204
 info@southmaneng.com

PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A	
SHEET TITLE	RAMP DETAILS	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING	
DATE DRAWN	APRIL 2020	DRAWING SCALE	METRIC	
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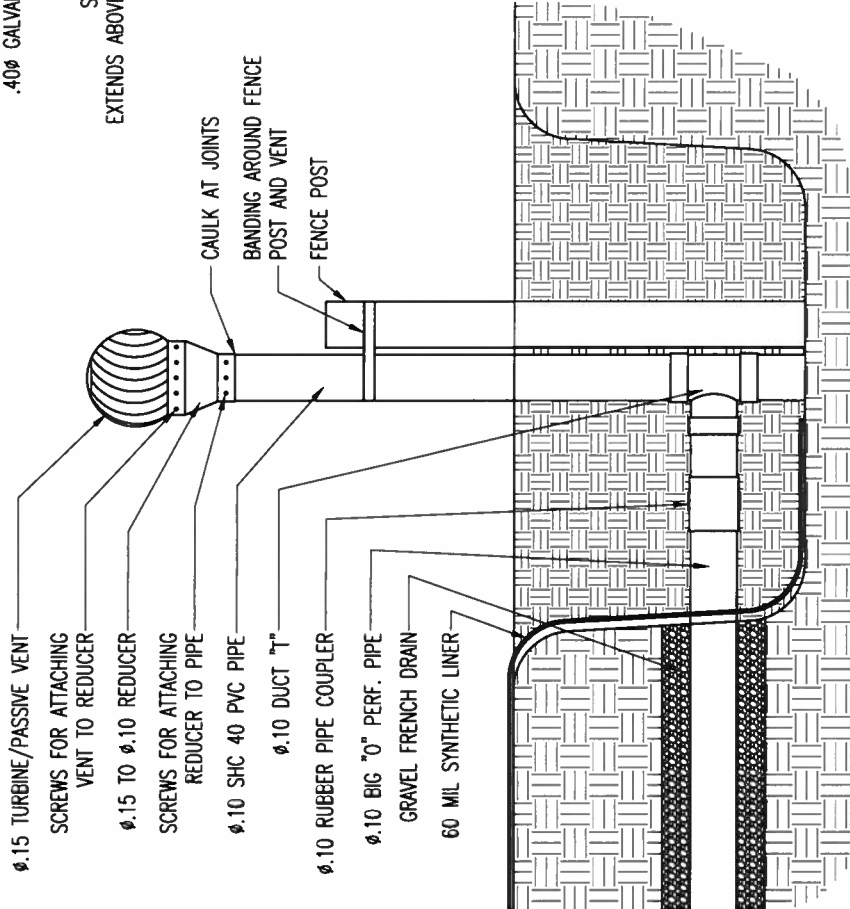


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 email@southmaneng.com

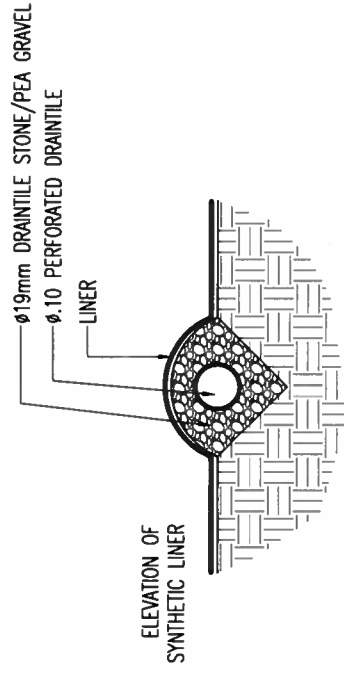
PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A
SHEET TITLE	GAS VENTING PLAN	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	APRIL 2020	DRAWING UNITS	METRIC
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			S-6



DEWATERING SUMP DETAIL

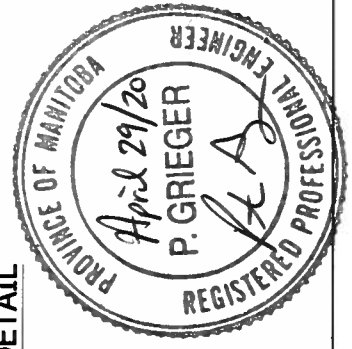


GAS REMOVAL V-TRENCH DETAIL

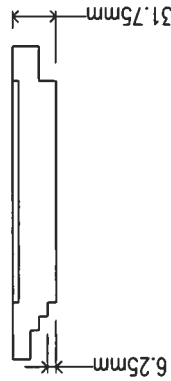
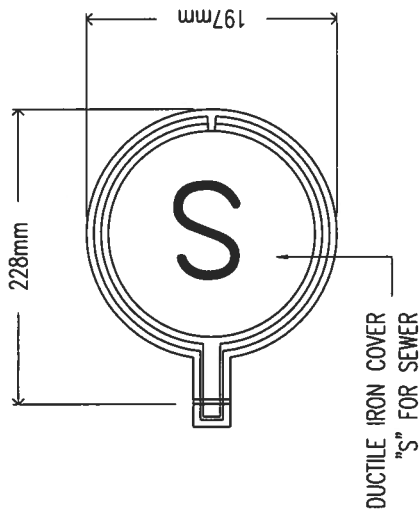


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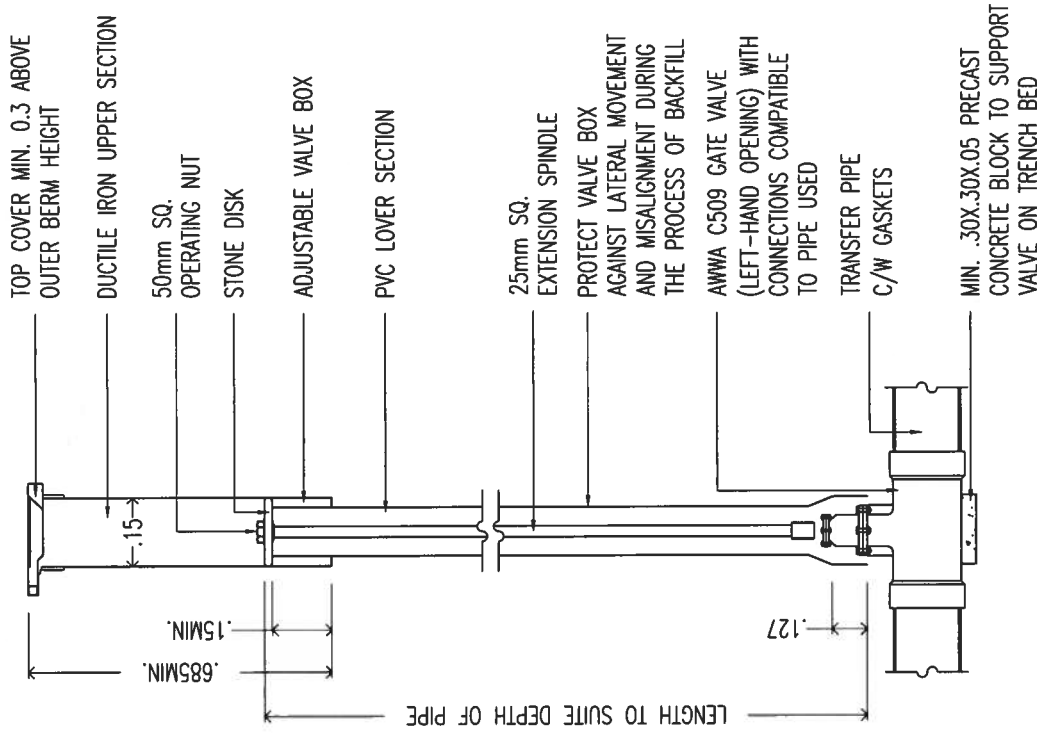
UNIT 15-1599 DUGALD ROAD | WINNIPEG, MB | R3J 0K3
 PH: 204.665.9452 | FAX: 204.665.9704
 email@southmaneng.com




PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A
SHEET TITLE	GAS VENTING DETAIL	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	APRIL 2020	DRAWING SCALE	METRIC
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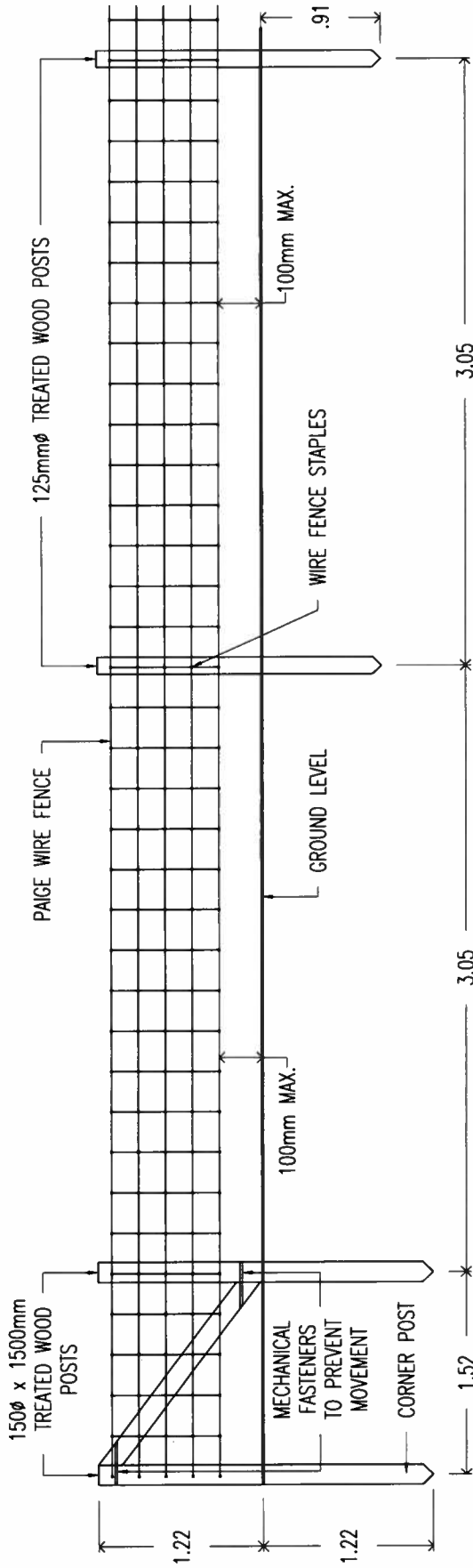


GATE VALVE COVER

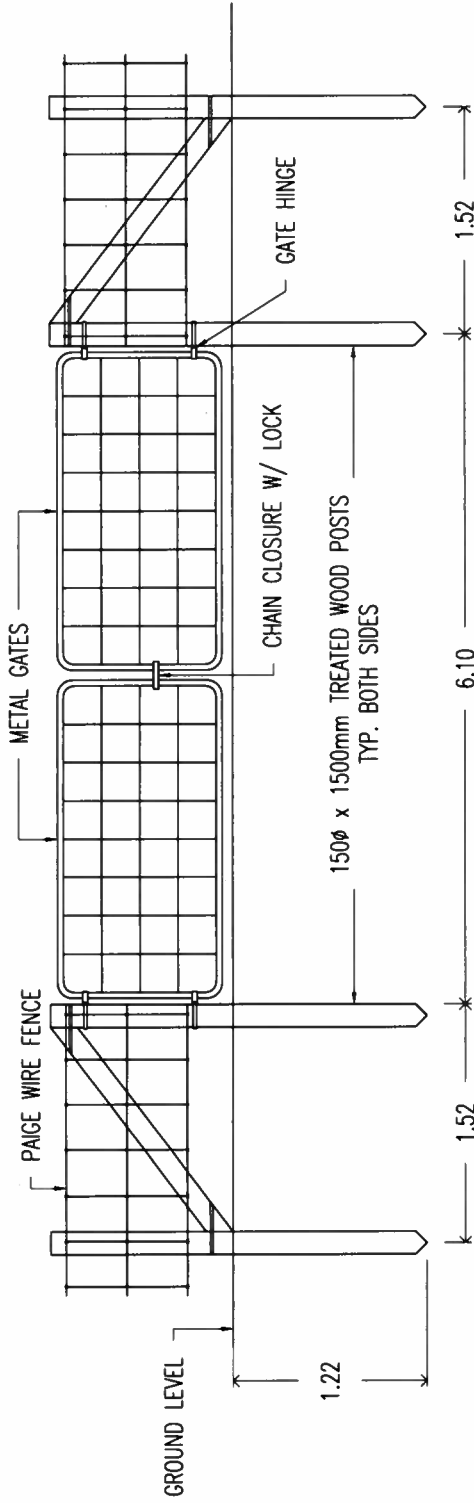


GATE VALVE INSTALLATION

 <p>UNIT 15-1599 DUGOLD ROAD WINNIPEG, MB R2J 0K3 PH: 204.668.9652 FAX: 204.668.9204 enr@southmaneng.com</p>		RIVERSIDE COLONY SE01-15-14W	N/A
South-Man Engineering		GATE VALVE DETAILS	R. FLORES SOUTH-MAN ENGINEERING
APRIL 2020		METRIC	S-8
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FENCING CORNER DETAIL

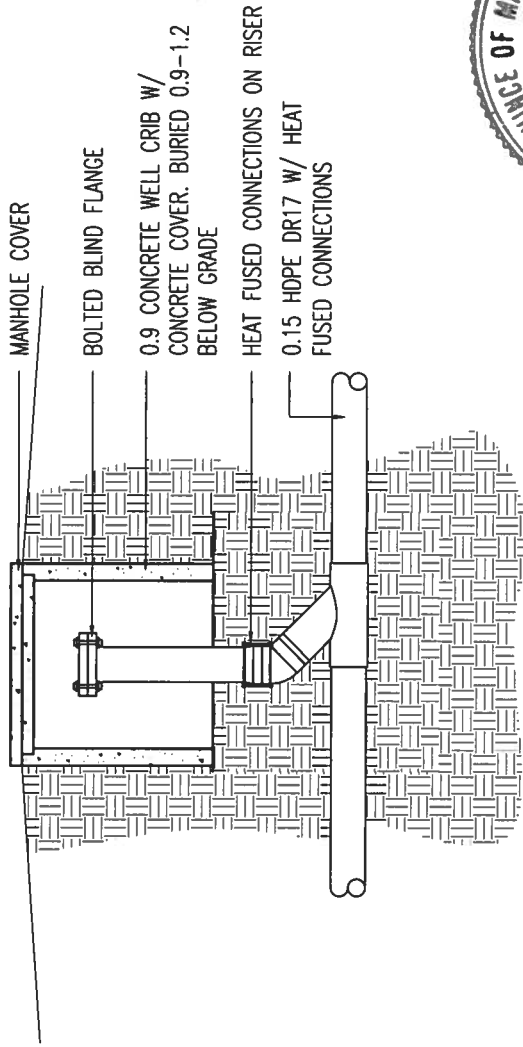


GATE DETAIL



South-Man Engineering
 UNIT 15-1599 DUCALD ROAD | WINDYBEEG, MB | R2Z 0H9
 PH: 204.688.9621 | FAX: 204.688.6204
 info@south-man.com

PROJECT NAME	RIVERSIDE COLONY SE01-15-14W	BUILDING AREA	N/A
SHEET TITLE	GATE & FENCE DETAIL	DRAWN BY	R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN	APRIL 2020	DRAWING SCALE	METRIC
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			S-9



CLEANOUT DETAIL



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Engineering

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PH: 204-781-8200
WWW.SOUTHMANENGINEERING.COM

PROJECT NAME RIVERSIDE COLONY SE01-15-14W	BUILDING AREA N/A
SHEET TITLE CLEANOUT DETAIL	DRAWN BY R. FLORES SOUTH-MAN ENGINEERING
DATE DRAWN APRIL 2020	DRAWING SCALE METRIC
THIS DRAWING IS THE PROPERTY OF SOUTH-MAN ENGINEERING, WINNIPEG, MANITOBA, CANADA.	
SHEET NUMBER S-10	