Application for an Environmental Act Licence for Two New Primary Cells at the Petersfield Truck Dump Lagoon in the Rural Municipality of St. Andrews

Stantec

Prepared for:
Manitoba Sustainable Development
Environmental Assessment and Licencing Branch
Suite 160, 123 Main Street
Winnipeg, MB R2C 1A5

Proponent:
The Rural Municipality of St. Andrews

Prepared by:
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Project No. 111215981

APEGM
Certificate of Authorization
Stantec Consulting Ltd.
No. 1301

July 2016

Stantec Consulting Ltd.
500–311 Portage Avenue, Winnipeg MB R3B 2B9

July 13, 2016
File: 111215981

Attention: Ms. Tracey Braun, M.Sc., Director
Environmental Assessment and Licencing Branch
Manitoba Sustainable Development
Suite 160, 123 Main Street
Winnipeg, MB R3C 1A5

Dear Ms. Braun,

Reference: Application for an Environmental Act Licence for Two New Primary Cells at the Petersfield Truck Dump Lagoon in the Rural Municipality of St. Andrews

On behalf of the Rural Municipality of St. Andrews, we are submitting five (5) paper copies and one (1) electronic copy (CD) of the Application for a new Environmental Act Licence for an Alteration to existing Licence No. 2211 issued on September 10, 1996 for the existing Petersfield lagoon. The Alteration will include the construction of two new 1.3 hectare HDPE lined primary cells.

The $7,500 Licence Application Fee, payable to the Minister of Finance, is enclosed and being sent by Stantec on behalf of the RM of St. Andrews. The undersigned is to be contacted regarding any questions that may arise.

Regards,

STANTEC CONSULTING LTD.

Tim Stratton, P.Eng., FEC
Senior Engineer, Associate
Phone: (204) 489-5900
Fax: (204) 453-9012
tim.stratton@stantec.com

Enclosures: 1. Five paper copies and one CD of the Application for a new Environmental Act Licence

2. $7,500 cheque payable to the Minister of Finance

c. Andrew Weremy, CAO, RM of St. Andrews
Nathan Wittmeier, P.Eng., MWSB

klb v:\1112\active\111215980\0500_reports\0502_final\envact\ltr_petersfield_eal_lagoon_20160627.docx

Environment Act Proposal Form

Manitoba
Conservation and Water Stewardship

Name of the development:
Petersfield Wastewater Lagoon Two Primary Cell Expansion, RM of St. Andrews

Type of development per Classes of Development Regulation (Manitoba Regulation 164/88):
Class 2 Development - Waste Treatment & Storage

Legal name of the applicant:
The RM of St Andrews

Mailing address of the applicant: Box 130, 500 Railway Avenue

Contact Person: Andrew Weremy, CAO

City: Clandeboye Province: MB Postal Code: R0C 0P0

Phone Number: (204) 738-2264 Fax: (204) 738-2500 email: andrew@rmofstandrews.com

Location of the development: The Rural Municipality of St. Andrews

Contact Person: Andrew Weremy, CAO

Street Address: RM of St. Andrews

Legal Description: Section 36, TWP 15, RGE 4E

City/Town: n/a Province: MB Postal Code: n/a

Phone Number: (204) 738-2264 Fax: (204) 738-2500 email: andrew@rmofstandrews.com

Name of proponent contact person for purposes of the environmental assessment:
Tim Stratton, P.Eng., Stantec Consulting Ltd.

Phone: (204) 478-8997 Fax: (204) 453-9012	Mailing address: 500-311 Portage Avenue, Winnipeg, Manitoba R3K 2B9

Email address: tim.stratton@stantec.com

Webpage address: www.stantec.com

Date: July 13, 2016	Signature of proponent, or corporate principal of corporate proponent:  Printed name: Tim Stratton, P.Eng. - Stantec

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 Conservation and Water Stewardship
Suite 160, 123 Main Street
Winnipeg, Manitoba R3C 1A5

For more information:
Phone: (204) 945-8321
Fax: (204) 945-5229
http://www.gov.mb.ca/conservation/eal

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Executive Summary

The Petersfield Truck Dump Wastewater lagoon in the RM of St. Andrews (RM), constructed in 1996, and located on southwest Sec 36 Twp 15 Rge 4E, requires expansion to handle current organic overloading. This is a truck dump lagoon only and does not receive wastewater from any other sources. The existing lagoon consists of a 0.6 hectare primary cell, 0.55 hectare secondary cell, and a 1.75 hectare constructed wetland. The system has been organically overloaded in the past necessitating the RM to close the facility. The system is not hydraulically overloaded.

The design loading for this lagoon has been set at the 2013 measured truck dump hydraulic loading which was the highest recorded annual loading. The RM will monitor and control the number of loads in to the lagoon and will not accept additional trucked loading. Therefore, the design hydraulic and organic loading will be kept under control and the expanded lagoon will function to the design loading of 22, 644 m^3.

The proposed expansion would be two 1.3 hectare primary cells lined with 60 mil HDPE as shown on the following Drawing No. C-101. The new primary cells will be interconnected with the existing primary cell, the secondary cell, and the constructed wetland. Two new truck dump structures will be constructed at the new primary cells and the existing truck dump structure will be decommissioned.

The proposed expansion will create a net environmental impact improvement as the system will provide enhanced organic treatment of the wastewater, to Provincial standards.

Stantec's opinion of estimated project cost including construction, engineering, administration and contingency, is $2,610,000 in 2016 dollars. The wastewater treatment system will remain a "Small System" after expansion as it serves less than 500 persons (250), and has no mechanical treatment processes. The lagoon would be discharged in both spring and fall.

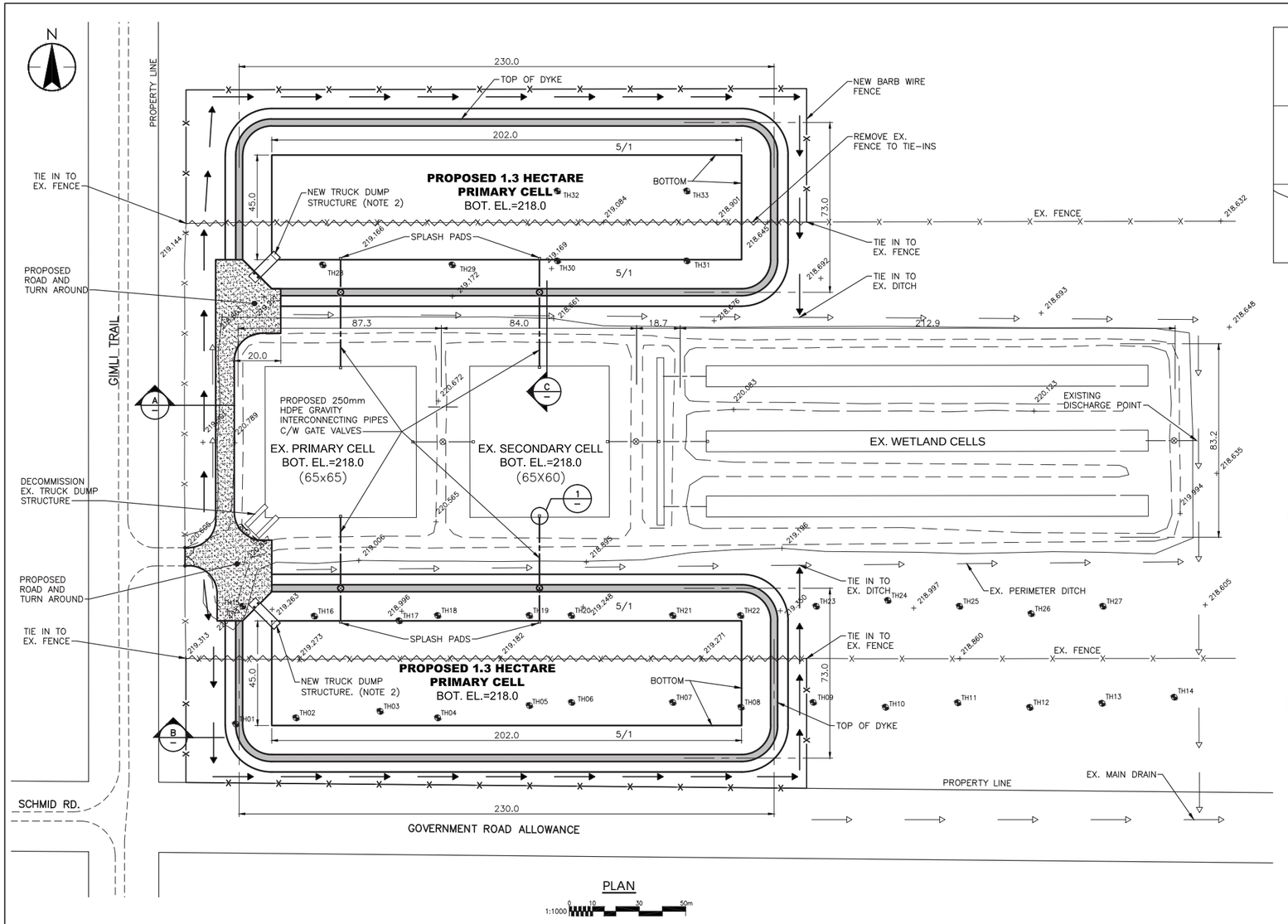
1.0 DEVELOPMENT INFORMATION

Stantec was retained in January, 2016 by the Manitoba Water Services Board (the Board), on behalf of the Rural Municipality of St. Andrews, to undertake the Petersfield Truck Dump Wastewater Lagoon Expansion Study and subsequent EAP Licence Application.

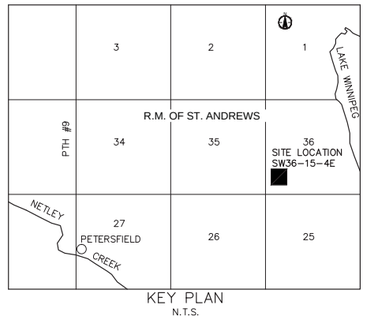
The existing lagoon is a truck dump facility only and was constructed in 1996. It accepts sewage and septage from holding and septic tanks throughout the RM. The lagoon system consists of a 0.6 hectare primary cell, 0.55 hectare secondary cell, and a 1.75 hectare constructed wetland. The wastewater lagoon system is classified as a "Small System" as it has less than 500 population served (250), and has no mechanical treatment processes. The existing lagoon is clay lined and has not shown signs of leakage.

The existing lagoon is organically overloaded due to over capacity truck dump loading. As a result the facility is closed for extensive periods of time. Additional primary cell treatment surface area is required to rectify this issue. The RM wishes to construct two new 60 mil HDPE lined 1.3 hectare primary cells, as shown on Drawing No. C-101, which would allow extensive domestic sewage truck dumping, and two truck loads of septage per day when septage dumping is permitted. The 20-year design of the expansion is to limit truck dumping to the 2013 truck dumping data, which was the maximum truck dumping year at the site. The RM will restrict dumping to 1915 truck loads of normal sewage, and two truck loads per day of septage between June 1 and October 15. Any design increase in septage dumping would not have been economically viable in terms of capital cost at this time.

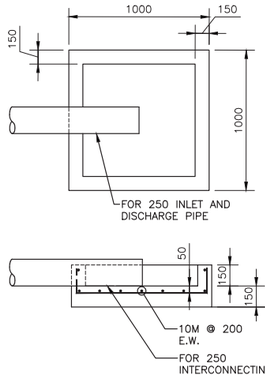
The land adjacent to the existing lagoon, where the expansion would take place, is hayfield and grassland adjacent to Netley Marsh.



PLAN
1:1000 0 10 30 50m

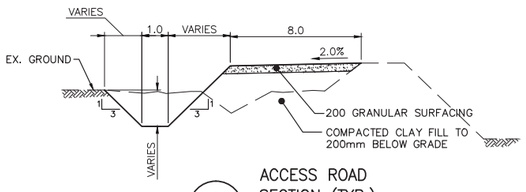


KEY PLAN
N.T.S.



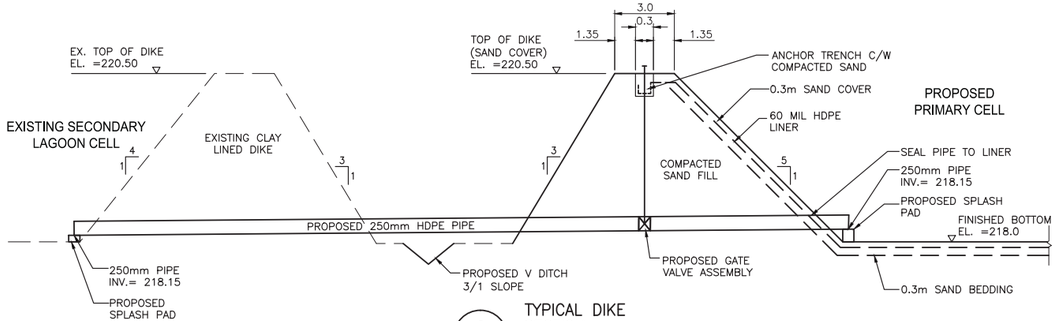
1 — SPLASH PAD DETAILS
N.T.S.

NOTE: CONCRETE TO BE SULPHATE RESISTANT, 30 MPa



A — ACCESS ROAD SECTION (TYP.)
N.T.S.

B — TYPICAL SECTION
N.T.S.



C — TYPICAL DIKE SECTION
N.T.S.

Stantec

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Tel. 204.489.5900 Fax. 204.453.9012
www.stantec.com

Legend

EXISTING	LEGEND-PLAN	PROPOSED
	DITCH	
⊗	GATE VALVE	⊗
	CULVERT	
	FENCE	
	INTERCONNECTING PIPE	
	TEST HOLE	
x 218.605	ELEVATION	
	ROADWAY	

Notes

1. FOUR STRAND BARB WIRE FENCE AND GATE WILL BE AS PER MANITOBA WATER SERVICES BOARD STANDARD CONSTRUCTION SPECIFICATIONS, SECTION 027110
2. TRUCK DUMP TO BE "SEPTIC WASATE DUMP STATION" DRAWING AS DETAILED IN SECTION 025940 OF THE WATER SERVICES BOARD STANDARD CONSTRUCTION SPECIFICATIONS, SECTION 027110 EXCEPT WITH 5/1 SLOPE

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

5				
4				
3				
2				
1				
Revision		By	Appd.	YY.MM.DD
E				
D				
C				
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Issued		By	Appd.	YY.MM.DD
File Name: 15980c-101	K.R.	T.L.S.	T.L.S.	16.07.04
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

APEGM Certificate of Authorization
Stantec Consulting Ltd.
No. 1301

PROVINCE OF MANITOBA
T.L. STRATTON
MEMBER 4381
REGISTERED PROFESSIONAL ENGINEER

Client/Project
R.M. OF ST. ANDREWS

PROPOSED PETERSFIELD TRUCK DUMP
WASTEWATER LAGOON EXPANSION STUDY - 2016
St. Andrews, MB Canada

Title
SITE PLAN AND DETAILS

Project No.	Scale	
111215980	AS NOTED	
Drawing No.	Sheet	Revision
C-101	1 of 1	0

2.0 DESCRIPTION OF DEVELOPMENT

2.1 CERTIFICATE OF THE TITLE AND LEGAL DESCRIPTION

The existing lagoon, and proposed two primary cell addition, are located on SW Sec 36 Twp 15 Rge 4E in the Rural Municipality of St. Andrews, Province of Manitoba. The owner of the land is the RM of St. Andrews Certificate of Title Number 1603055/1 is attached in Appendix 2.

2.2 OWNER

The land is owned by the Rural Municipality of St. Andrews in the Province of Manitoba.

2.3 MINERAL RIGHTS

The Province of Manitoba is the owner of mines and mineral rights.

2.4 EXISTING LAND USE

The existing land is used for a two cell wastewater treatment lagoon with constructed wetland. The proposed two primary cell expansion will be connected to the existing lagoon.

2.5 LAND USE DESIGNATION

The land is zoned A-80 – Agricultural General under RM of St. Andrews Zoning By-Law No. 4066.

2.6 PUBLIC MEETINGS OR HEARINGS

Public meetings or hearings have not been held for this project.

2.7 DESCRIPTION OF THE PROPOSED DEVELOPMENT

A complete engineering description of the design and operation of the proposed development is contained in Appendix 1 “Petersfield Truck Dump Wastewater Lagoon Expansion Study”.

2.8 AGRICULTURAL OF INDUSTRIAL WASTES

No agricultural or industrial wastes, including petroleum products, will be put in the lagoon or stored on site.

2.9 DOMESTIC WATER SUPPLY

There are no domestic water supply sources in the vicinity of the lagoon, as detailed in Section 3.2 (d).

2.10 MANITOBA GUIDELINES, OBJECTIVES AND BULLETINS

The following Province of Manitoba Guidelines, Objectives and Bulletins will be adhered to in design and construction.

a) Information Bulletin – Environmental Act Proposal Report Guidelines

b) Information Bulletin – Design Objectives for Wastewater Treatment Lagoons

c) Information Bulletin – Facility Classification

d) Wastewater Treatment Form Supplemental Information

2.11 APPLICATION FOR WASTEWATER TREATMENT FACILITY CLASSIFICATION

The completed form for the Application for Wastewater Treatment Facility Classification is attached in Appendix 3. The Petersfield Wastewater Treatment Lagoon is classified as a "Small System" as it treats wastewater for a population of less than 500 people and has no mechanical treatment processes, as per the "Wastewater Treatment Form Supplemental Information".

3.0 ENVIRONMENTAL IMPACT AND MANAGEMENT PRACTICES

3.1 INTRODUCTION AND BACKGROUND

The Project site is located in the RM of St. Andrews, located approximately 800 metres north and 3.3 km east of Petersfield, MB bordering on Netley Lake (Marsh). The Project involves the addition of two new primary cells to the existing wastewater lagoon that comprises an existing primary cell, a secondary cell and a constructed wetland. As part of the proposed lagoon expansion a road and turnaround will be extended along the west side of the lagoon site allowing access to both new primary cells (see Drawing No. C-101). A complete description of the proposed lagoon expansion is provided in Appendix 1 "Petersfield Truck Dump Wastewater Lagoon Expansion Study". The organic loading on the existing primary cell exceeds the allowable limit of 56 kg/day/ha and as a result the lagoon has had to be closed occasionally to allow for treatment in order for the lagoon to meet licenced discharge requirements.

The existing two-celled lagoon was constructed in 1996. The existing lagoon has a primary cell, secondary cell and a constructed wetland. Wastewater from the constructed wetland is discharged to existing marshland to the east along Netley Lake. The RM of St. Andrews decided to proceed with a two primary cell expansion to meet current truck dump needs. The existing discharge pipe, originating on the east side of the existing constructed wetland, will continue to be used for the expanded lagoon. The treated effluent will continue to flow into a marshy area east of the site, flowing downstream to Netley Creek located approximately 2.8 km to the south and ultimately to Netley Lake. Wastewater will only be discharged from the lagoon after it meets prescribed levels of treatment. The existing primary cell at the site will be connected to the two new primary cells. The two new primary cells will also connect to the existing secondary cell. The system is classified as a "Small System" as it has less than 500 population served (250) and has no mechanical treatment processes.

a) Ownership of Land and Material Rights

The owner of the land is the Rural Municipality of St. Andrews as registered in the Winnipeg Land Titles Office of the Property Registry as Certificate of Title (CT) Number 1603055/1 (Appendix A). Mineral rights are expected to be held by the Province of Manitoba.

b) Existing Land Use and Designation

The site contains an existing two-cell wastewater lagoon – an existing 0.6 ha primary cell, an existing 0.5 ha secondary cell and a constructed wetland. The proposed lagoon expansion locations are immediately north and south of the existing cells in an open grassed area. The Immediate adjacent neighboring properties consist of open agricultural land to the west, north

and south, with scattered pockets of forest cover, tree-lined dugout, shelterbelts, and marsh land to the east. The land for the existing lagoon and proposed expansion is designated as "Resource and Agriculture" under the Selkirk and District Planning Area Development Plan By-law No. 190/08 (Selkirk and District Planning Area 2011). The applicable zoning for the lagoon site is "A80 – Agricultural General" Zone under the RM of St. Andrews Zoning By-law No. 4066 (The Rural Municipality of St. Andrews 2002). Lagoons are a conditional use under Zoning By-law No. 4066 and require a licence or permit from the provincial government. The nearest residence to the site is a farm site located approximately 600 metres to the southwest.

c) Public Meetings or Hearings

No public consultation was undertaken for the project.

3.2 DESCRIPTION OF THE ENVIRONMENT

a) Terrestrial Vegetation

The lagoon site is located in the Interlake Plain Ecoregion, Gimli Ecodistrict, a level to depressional glaciolacustrine lowland and gently undulating lake terrace. Surficial materials are characterized by fluvioglacial, shallow glaciolacustrine deposits and water-worked glacial till. The southern portion of the ecodistrict is part of the Red River drainage division. The soils in the region south of Lake Winnipeg are predominantly poorly drained Peaty Gleysols and shallow organic soils. Lake terrace soils are dominantly Dark Gray Chernozems, well to imperfectly drained, on water-worked glacial till and shallow loamy, glaciolacustrine veneers (Matile and Keller 2004; Smith et al. 1998). A geotechnical soil assessment of the proposed north and south expansion site locations determined that surficial materials are clay and silt with till at depths below excavation limits (Stantec 2016).

Vegetation in the region is dominated by trembling aspen. Deciduous trees such as Manitoba maple, green ash elm and cottonwood are found along rivers, particularly the Red River. Sedges, meadow grasses and willow ring depressional areas. Marsh areas include reed, cattail and sedge species (Smith et al. 1998). Vegetation at the Project site consists of grass cover hayfields and shrub marshland (see Figure C-101).

b) Wildlife and Fish Species

Wildlife in the region has been affected by agricultural development. White-tailed deer, black bear, coyote, beaver and snowshoe hare are widespread throughout the area. Bird species are found in the region include ruffed grouse, raptors, songbirds and various species of waterfowl. The wetlands in the area serve as important waterfowl breeding and migratory bird staging areas (Smith et al. 1998). Various frogs, snakes, and turtles are also common, including northern leopard frog, wood frog, smooth green, plains and red-sided garter snakes, common snapping and western painted turtles, common mudpuppy, and blue-spotted salamander (NatureNorth

2016). Wildlife habitat at and immediately surrounding the Project site consists of grass covered hayfields, agricultural cropland and shrub marshland.

A search of the Manitoba Herp Atlas database found no records of amphibian or reptile species at the Project site (NatureNorth 2016). However, a record of a leopard frog was recorded at a marsh area along Wavey Creek approximately 6.0 km kilometres southwest of the site. This species is widespread and abundant in southern Manitoba (NatureNorth 2016).

Netley Creek supports several recreationally important species of fish, including: carp, channel catfish, goldeye, northern pike, sauger, walleye, white bass, white sucker, yellow perch and brook trout (North/South Consultants Inc. 2008). According to Milani (2013), Netley Creek is considered type A habitat (complex habitat, indicator species present).

According to the Manitoba Conservation Data Centre, rare, endangered or uncommon species of concern potentially found within the Lower Interlake Watershed, as listed in Table 1, include Chimney Swift, Piping Plover, Least Bittern, Red-headed woodpecker, Blue-spotted Salamander, Little Brown Bat, Chortjaw Cisco, and Mapleleaf Mussel (MBCDC 2013). A request submitted to the Manitoba Conservation Data Centre (MBCDC) for existing records of species of concern at the Project site indicated one occurrence – a Bobolink (Friesen 2016). The prevalence of grassed areas surrounding the lagoon site reduces the chances of rare and protected species being present in the Project site.

Table 1: Species of Concern in Lower Interlake Watershed

Species	Federal SARA / COSEWIC Species Status	MCWS Species at Risk Status	MBCDC Conservation Status Rank
Mapleleaf Mussel (*Quadrala quadrala*)	Endangered	Endangered	S2
Little Brown Bat (*Myotis lucifugus*)	Endangered	Endangered	S2N
Blue-spotted Salamander (*Ambystoma laterale*)	Special Concern	n/a	S3S4
Northern Leopard Frog (*Lithobates pipiens*)	Special Concern	n/a	S4
Shortjaw Cisco (*Coregonus zenithicus*)	Threatened	n/a	S3
Western Grebe (*Aechmophorus occidentalis*)	Special Concern	n/a	S4B
Chimney Swift (*Chaetura pelagica*)	Threatened	Threatened	S2B
Piping Plover (*Charadrius melodus*)	Endangered	Endangered	S1B
Common Nighthawk (*Chordeiles minor*)	Threatened	Threatened	S3B
Olive-sided Flycatcher (*Contopus cooperi*)	Threatened	Threatened	S3S4B
Yellow Rail (*Coturnicops noveboracensis*)	Special Concern	n/a	S3S4B
Bobolink (*Dolychonyx oryzivorus*)	Threatened	n/a	S4B
Least Bittern (*Ixobfrychus exilis*)	Threatened	Endangered	S2S3B
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	Threatened	Threatened	S2B
Canada Warbler (*Wilsonia candensis*)	Threatened	Threatened	S4B

Source: MBCDC 2013; MCWS 2015a; SARA 2016 (Schedule 1)
Notes: MBCDC conservation status ranks as follows:
S1B – vary rare throughout its range or in the province (5 of fewer occurrences), breeding status

Species	Federal SARA / COSEWIC Species Status	MCWS Species at Risk Status	MBCDC Conservation Status Rank
S2, S2B, S2N – rare throughout its range or in the province, (6 to 20 occurrences), breeding status, non-breeding status of a migratory species **S3, S3B** – uncommon throughout its range or in the province (21 to 100 occurrences), breeding status **S4, S4B** – widespread, abundant or apparently secure (>100 occurrences), breeding status			

c) Surface Water

The Project site is located within the East Interlake Conservation District (EICD). Streamflow in the Lower Interlake Watershed, including Netley Creek, peaks in spring but varies considerably due to daily, seasonal and annual changes (MCWS 2008a). In terms of water allocation, most surface water sourced allocations in the Netley – Grassmere Watershed are for irrigation and other uses. Most irrigators pump from Netley Creek or Wavey Creek (MCWS n.d.1). Approximately 96% of all water allocated under licence for irrigation purposes is from surface water sources. However, this represents only about 4% of the total volume of water allocated in the watershed (MCWS n.d.1). Over a 44 year period (1963-2007), daily streamflows from a monitoring station along Netley Creek were recorded in the northern portion of the Lower Interlake watershed. The streamflow ranged from a maximum daily discharge of approximately 70 m^3/s to a minimum near zero over this period (MCWS 2008a).

Information on water quality in the Netley – Grassmere Watershed has been collected by the Province from a long-term water quality monitoring station on the Red River located at the PR 204 bridge in Selkirk, MB (MCWS 2008b). A wide range of water quality variables was recorded, including nutrients, general chemistry, bacteria, pesticides, and metals. Total phosphorus and total nitrogen concentrations at the long-term monitoring station were analyzed for trends based on variations in river flow over a period from 1978 to 2000. The analysis showed a trend of increasing total phosphorus and total nitrogen (MCWS 2008b).

Data from the long-term water quality monitoring station on the Red River at Selkirk, MB was used to calculate a Water Quality Index (WQI) based on The Canadian Council of Ministers of the Environment (CCME) Water Quality Index. The WQI ranges from 0 to 100 and is used to rank water quality ranging from poor to excellent. Water Quality for the Red River at this location was calculated for the period 1993 to 2007. In general, the WQI for the river ranged from “Marginal” to “Fair” (MCWS 2008b).

Water quality has been monitored in several regional creeks within the Lower Interlake Watershed. Netley Creek water quality was monitored in 2005 for *E.coli* and nutrients at a site at a crossing of PTH 8 (approximately 5.5 km upstream of Petersfield). Nutrients were found to be high in Netley Creek at PTH 8. Total phosphorus concentrations and ammonia levels at the PTH 8 site were also high (MCWS 2008b). Water quality monitoring along the main stem of Wavey Creek and agricultural drains was undertaken in 1995 (MCWS 2008b). Concentrations of total and dissolved phosphorus, ammonia, and nitrogen were collected at 10 sampling locations from

both upstream and downstream sites on Wavey Creek, including at the most downstream site east of PTH 9, approximately 4.0 km southeast of Petersfield. Total phosphorus concentrations at the mouth of Wavey Creek with Netley Creek were found to be the second highest following an agricultural drain further upstream west of PTH 9 when compared to eight other sampling locations (MCWS 2008b). Water quality sampling conducted by the East Interlake Conservation District for creeks in its watershed between 2007 and 2008 found lower concentrations of total phosphorus in Netley and Wavey creeks compared to other creeks sampled (MCWS 2008b).

d) Groundwater

Groundwater throughout the Interlake area is available from the major limestone and dolostone Carbonate aquifer as the primary water supply source in the region. Shales and sandstones forming the Winnipeg Formation underlie this major fresh water aquifer. The bedrock is overlain by clay and glacial till of variable thickness. The overburden layer in the watershed varies in thickness to approximately 40 metres (EICD 2011). Lenses of sand and gravel aquifers are located locally at contact points between the till and bedrock (MCWS n.d.2). Regional groundwater flow is primarily northwest to southeast across the watershed. Water quality is generally good with most sources of groundwater exceeding one or more aesthetic objectives for drinking water; water is often hard with iron and manganese also present. Trace metal concentrations have not been found to exceed drinking water guidelines, save for some slightly higher uranium concentrations in a few wells (MCWS n.d.2). There are numerous provincial observation wells in the watershed, including one on Netley Creek located west of Petersfield near PTH 8 (EICD 2010).

There are two groundwater-based public drinking water sources along Netley Creek at Petersfield in the form of seasonal wells. These private wells are located at Netley Resorts Ltd. and Chelsey's Family Resort and Campground and serve a population of approximately 480 (MCWS 2015b). Both well locations are identified as source water protection zones with an established 1.5 km buffer (EICD 2011). Groundwater is deemed sensitive to pollution in areas where the overburden thickness is less than 6 metres and can be impacted by quarries, gravel pits, and abandoned or poorly constructed wells that puncture an aquifer, and from septic systems and wastewater lagoons through the leaching of contaminants (EICD 2011). The area of the existing lagoon and proposed expansion sites has an overburden thickness of approximately 18 to 24 metres of clay and is not located within any source water protection zones (EICD 2010; 2011).

e) Land Use

Agriculture is the predominant land use within the Netley – Grassmere Watershed, almost half as annual cropland. Areas of grassland and wetlands are found in the vicinity of Netley Lake (Marsh). Rural residential subdivision development and seasonal recreational land development is evident along both Netley and Wavey creeks in the vicinity of Petersfield (EICD 2011). There

are a number of navigable recreational waterways in the watershed, including Netley Lake, Netley and Wavey creeks and the Red River. Netley Lake (Marsh) is located approximately 1.1 km to the east of the Project site. It is not designated a vulnerable water body under *The Water Protection Act*, Nutrient Management Regulations (62/2008) which stipulates nutrient buffer zones and sensitive lands that should not receive application of nutrients (MCWS 2015c). The Project site is not located within a vulnerable water body nutrient buffer zone.

According to the Canada Land Inventory (CLI) for Agricultural Land Capability (AAFC 2009; CLI 1968), land at and adjacent to the Project site is classified as follows:

- Classes 2W and 3W – land with moderate to moderately severe limitations that restrict the range of crops with excess water as a factor.
- Classes 6 and 7 – lands with very severe limitations that restrict the production of perennial forage crops, improvement practices not feasible and no capability for arable culture or permanent pasture.

Recreational activities in the vicinity of the Project site at Petersfield include a golf course, seasonal RV campsite-Trailer Park, anchorage, canoe access (put-in/take-out), paddling (canoe-kayak) and snowmobiling (Mussio Ventures Ltd. 2015). Access to the Project site is provided off of a north-south municipal road (Gimli Trail) allowance to the east of Petersfield (RM of St. Andrews 2015).

f) Heritage Resources

There is a large inventory of heritage resource sites (i.e., buildings) that have been documented in the RM of St. Andrews, principally along the Red River between the city of Winnipeg and Lake Winnipeg (SIPD 2011). There is one heritage site located along Netley Creek, the Netley River Cottage at NE22-15-4E, that is designated a municipal heritage site under *The Heritage Resources Act* (The RM of St. Andrews 2003). A review of the provincial Archaeological Sites Inventory Database revealed no records on the Project site; however, three records were within 5 km of the Project site, all along Netley Creek. The first site is a Late Precontact campsite (A.D. 750 to 1700) found in a cultivated field, approximately 3.6 km to the west of the Project site. The second, a surface collected bison bone, was recorded approximately 2.9 km to the southwest of the Project site. The third site consists of an early historic (A.D. 1721 to 1821) campsite and undated burial located approximately 3.3 km to the south (McLean 2016). All of the three recorded sites are considered to be of low heritage resource potential (McLean 2016).

3.3 ENVIRONMENTAL IMPACTS

a) Type, Quantity and Concentration of Pollutants to be Released into the Air, Water or on Land.

Wastewater from the existing Petersfield wastewater lagoon will be retained and treated using an expanded four-cell lagoon system, including two new primary cells combined with an existing primary and secondary cell and a constructed wetland. Current organic loading in the primary cell exceeds the allowable limit. The existing lagoon system does have adequate winter hydraulic storage and the additional storage created with the two new primary cells would be considered surplus. The new expanded lagoon cells will have 60 mil HDPE liners and will be properly sized to meet the maximum allowable primary cell loading (i.e., 56 kg/day). Winter design storage equal to 230 days is incorporated in the system design. Wastewater will be monitored to ensure effluent quality meets Licence requirements in terms of biological oxygen demand, fecal coliform content, total coliform content, total nitrogen and total phosphorus. The expanded wastewater treatment system will result in the improvement in organic loading and wastewater treatment compared to the current operation.

b) Effects on Wildlife

There is potential for disturbing or displacing wildlife species present in the general Project area via construction activities and noise generation from equipment and vehicles.

A request submitted to MBCDC for existing records of rare and protected wildlife species indicated no occurrences of such species in the Project area. Similarly, a search of the MHA database did not reveal the presence of amphibians or reptile species in the immediate area; however, the absence of data from either database does not confirm the absence of any listed species. The location of the treatment lagoon expansion in a grass covered hayfield area reduces the likelihood of species of concern being present in the Project footprint.

Project construction is anticipated to occur upon receipt of funding. Project-related disturbance activities to wildlife habitat will be reduced by avoiding the sensitive breeding window for migratory bird wildlife species – mid-April to end of August (Environment Canada 2014). To avoid potential disturbance to nesting migratory birds, if there is a need for any vegetation clearing it will be conducted prior to mid-April or after August 30. If clearing is to occur during the sensitive nesting period, a pre-construction nest survey to locate and buffer active bird nests will be completed.

Due to the presence of water bodies, mixed-wooded areas and open grassed areas, there is potential for amphibian and reptile species to occur in the general Project area. Species such as common snapping turtles are known to make seasonal movements between breeding and overwintering habitats in late May to late June, and again in mid- to late September (COSEWIC

2008). Construction workers should be aware of the potential for amphibian and reptile species to be present in the Project area and take caution to avoid harming a sensitive species.

It is expected that effects on wildlife as a result of the Project will be low as the proposed site for the new lagoons is a cleared, grassed and partially disturbed site.

c) Effects on Fisheries

Potential effects on fish and fish habitat are related to the release of sediments from construction activities associated with excavation work (i.e., blown dust, exposed surface run-off) and from lagoon effluent discharges into surface water bodies utilized by fish. However, silt fences and other silt collection means will be installed to trap silt during the entire construction operation.

The nearest water body to the Project site is Netley Lake (Marsh), some 1.1 km to the east. The new lagoon system will continue to discharge treated effluent via an existing discharge point to an existing marshy area that discharges via marshy ponds and paths to Netley Creek, which is considered type A habitat (Milani 2013) located approximately 2.8 km to the south, and ultimately to Netley Lake. The expanded lagoon system has been designed for annual winter storage of 230 days. It is expected that the lagoon system will discharge treated effluent between June 16 and October 31 of any given year. This discharge period avoids and protects common fish species found in Netley Creek (e.g., walleye, northern pike, yellow perch, sauger, and white sucker) during the springtime spawning period (i.e., April 1 to June 15). However, fish species may be present in Netley Creek, including channel catfish, freshwater drum, goldeye, and white bass during the summer spawning period (i.e., May 1 to June 30) and brook trout during the fall spawning period (i.e., September 15 to April 30) (DFO 2013).

The likelihood of erosion/deposition from construction activities directly affecting Netley Creek and downstream water bodies is considered low given the separation distance, and the presence of vegetation between the Project site in the receiving marshy area prior to Netley Creek. Additionally, as noted above, prior to construction, silt fences will be installed at the Project site to mitigate erosion and off-site deposition.

The proposed lagoon upgrade will provide long-term effluent improvements (i.e., 20 year design loading) at the Petersfield lagoon with the addition of two new properly sized primary cells. Effluent discharged into the existing receiving marshy area from the constructed wetland will meet Licence limits. Discharge of treated effluent will occur during the summer and fall spawning periods for fish. However, given the distance between the Project site and Netley Creek, and the presence of the intervening marshy receiving water body, the effects on fish from Project treated effluent are anticipated to be negligible.

d) Effects on Surface and Groundwater

The new cells will not be located within a vulnerable water body nutrient buffer zone. The existing discharge point to a receiving marshy area, system of existing ditches west of Netley Lake, down to Netley Creek approximately 2.8 km to the south, and ultimately flowing to Netley Lake will be used. The effluent will only be discharged according to licenced limits and timing restrictions. Erosion/deposition during construction activities at drainage locations will be mitigated by the installation of silt fencing and the vegetation along the discharge route prior to its discharge to Netley Creek. The potential for effect of the Project on surface water is anticipated to be negligible.

The new primary cells will be HDPE lined to provide groundwater protection at the site. As such, effects on groundwater from new lagoon construction are anticipated to be negligible.

e) Effects on Soils

During Project construction soils could be affected by compaction associated with equipment operating at the site. Any compaction of soils would be limited to the immediate cleared footprint for the Project and activities associated with the addition of a proposed road extension and turnaround. Project excavation at the site could result in some soil mixing. There is also the potential for soils to be contaminated due to accidental spills, leaks or releases of fuels, lubricants or other materials from construction equipment and activities at the Project site and from lagoon operation.

Disturbance of soils adjacent to the lagoon site and road turnaround will be minimized during construction by keeping heavy equipment operations limited to the Project site to the extent possible and using properly maintained equipment. As the Project site is primarily clay and silt with till at levels below excavation limits, there is some potential for minor compaction effects associated with lagoon construction. During excavation, topsoil will be stripped and stockpiled separately to avoid soil mixing with other subsurface materials. The upper soil deposits will be used to construct the new lagoon dikes at the site.

The potential adverse effects on soils from accidental spills would be limited to the period of construction, would be subject to remediation, and is considered negligible given the small amount of equipment and quantity of fuel, lubricants and materials that would be present at the Project site. An emergency spill kit to remediate accidental spills, leaks or releases will be maintained on the Project site during construction.

The new cells will be HDPE lined, with appropriate quality control measures implemented, to mitigate soils effects from lagoon operation on the Project site. The RM is currently undertaking a sludge reduction program. However, once the new cells are constructed, the existing primary cell can be desludged if required at a later date. Desludging of the existing cell would be

conducted in accordance with the applicable regulations in place at that time. As such, the potential effects from lagoon operation on soils in the area are anticipated to be negligible.

f) Vegetation Effects

There is potential for removal of vegetation species through construction work at the site. The proposed site for the new lagoon cells and road and turnaround is predominantly an existing grassed area that is already partially disturbed. Very minimal vegetation will be required at the Project site. Topsoil removed during lagoon excavation will be stockpiled separately for subsequent reuse in revegetating the lagoon berms. A request submitted to MBCDC for existing records of rare and protected wildlife species indicated no occurrences of such species in the Project area. As such, the effects on vegetation are anticipated to be negligible.

g) Forestry Related Effects

Existing grassed areas to the north and south of the existing lagoon site will be used for the new lagoon cells. No potential timber harvesting areas would be affected by the Project. A new road and turnaround is required for the new lagoon construction at the site. Existing roads will continue to provide access to the lagoon site. No Project related effects on forestry are anticipated.

h) Air Quality Effects

There is potential for emissions, including greenhouse gases (GHGs) and fugitive dust generation, from construction equipment and vehicles during construction works at the site. Localized increased volatile organic carbon (VOCs) levels could result from fuels used during construction. Fuel may be transported to the site to fuel equipment. Effects on air quality are expected to be low due to the short-term of construction (i.e., September to November) and the small construction workforce.

Nuisance odours can occur from lagoons that are not sized properly or are organically overloaded a short time in spring during the thawing period. However, the current expansion will be large enough to handle the organic loading which is the source of potential odors. Prevailing winds in southern Manitoba are principally northwest and southeast. A similar trend is likely at Petersfield, MB. Potential odours could be carried by variable winds and cause a nuisance to nearby residents. However, the closest residence/farmstead is located approximately 600 metres to the southwest of the site within a vegetation buffer. No prior odour complaints are known to have been registered with the RM of St. Andrews over lagoon operation.

Odour effects on air quality have been addressed through proper sizing of the two new primary cells to meet the 20 year design organic loading requirement of 56 kg/day. As such, nuisance odours as a result of organic overloading are expected to be low to negligible.

i) Noise Effects

There is some potential for noise effects in the immediate area during construction from the operation of construction equipment and vehicles. Noise effects could cause temporary disturbance to wildlife in the area. The nearest residence/farmstead is located to the southwest (approx. 600 metres) of the Project site within a vegetation buffer.

Construction noise effects are expected to be low and short-term in duration. Noise effects from maintenance vehicles (i.e., wastewater hauling trucks, grass mowers) operating at the site would only be intermittent in nature and limited in duration. As such, noise effects from the Project are anticipated to be negligible.

j) Heritage Resources

Heritage resources, and their associated artifacts and cultural data, are protected under *The Heritage Resources Act*. A desktop screening revealed three records within a 5 km radius of the Project site. All of the three recorded sites are along Netley Creek and are considered to be of low heritage resource potential (McLean 2016).The closest site is a surface collected bison bone, located approximately 2.9 km to the southwest of the Project site (McLean 2016).

The Heritage Resources Branch (HRB) was contacted to undertake a Heritage Screening for the proposed Project site. The HRB examined the applicable area proposed for development based on the Branch's records for areas of potential concern and identified no heritage concerns with the Project. In the event that heritage resources, or objects thought to be heritage resources, are exposed during construction, work at the site will cease until Historic Resources Branch authorities have been notified and the item investigated.

k) Socio-economic Effect

The proposed Project will create temporary construction employment and contribute to the local economy in the surrounding area through the purchase of goods and services during construction. The potential effects are considered positive but negligible.

In addition, it is expected that there will be an overall socio-economic benefit as a result of the improvement of treated effluent quality and elimination of organic overloading at the existing site. The proposed lagoon expansion will effectively address existing effluent quality issues related to septage hauling at the municipal lagoon and improve organic loading over a 20 year design period.

l) Visual Effects

The landscape will be altered by the construction of the new lagoon cells. Construction will occur in an area to the north and south of the existing lagoon cell in a predominantly grassed

area that is partially disturbed. The new lagoon cells will have a low profile earthen dike structure, approximately 1.4 metres above ground, with a fence approximately 2 metres high. The proposed lagoon expansion sites are located immediately adjacent to an existing lagoon approximately 45 metres to the east of an existing north-south municipal road. The nearest residence/farmstead to the Project site is located approximately 600 m to the southwest within a screened yardsite. Grass on the new earthen dikes will be mowed regularly during seasonal operation. The change in the visual viewscape would be incremental to existing facility effects at the site. As such, the Project's effect on area aesthetics is anticipated to be negligible.

3.4 ENVIRONMENTAL MANAGEMENT PRACTICES

Proposed environmental management practices will be undertaken in accordance with recommended "Operation and Maintenance of Sewage Lagoons" manual and Environment Act Licence, both as issued by Manitoba Conservation.

3.4.1 Operation

The RM of St. Andrews operates the existing wastewater lagoon and has a trained operator under the training program for a "Small System" sewage treatment facility. Normally, the lagoon would be discharged twice per year, between June 15 and October 31. The maximum water level in the cells is 1.5 m. The following procedure would be followed with respect to discharging the lagoon.

Step 1: Close the valves between the primary cells and secondary cell and wetland two weeks before sampling.

Step 2: Sample the secondary cell and wetland after the connecting valve between the primary cells and secondary cell has been closed for two weeks. Sample bottles and sample preservation and submission procedures can be obtained from accredited laboratories.

Step 3:

a) If the samples tested meet criteria, open the discharge valve from the secondary cell and wetland, and discharge the contents. Discharge would be completed within two weeks.

b) If the samples tested do not meet criteria, it is necessary to repeat the sampling until bacteriological criteria are met. Once met, discharge can take place.

Step 4: When the secondary cell is drained, the discharge valves would be closed.

Step 5: Open the valves between the primary cells and the secondary cell and control the water levels in the cells such that there is a minimum of 0.30 m.

3.4.2 Maintenance

Spring, Summer and Fall Maintenance

The majority of maintenance is carried out in the spring, summer and fall of each year as weather permits. Typical maintenance tasks include:

- Grass on the dykes of the lagoon should be cut on a regular basis. The grass should not exceed 0.3 meters in length. Deep rooted weeds should be removed to prevent deterioration of the dykes and liner system.
- Inspect fence and gate for damage and repair as required.
- Gate valves should be operated in spring, summer and fall to ensure they are in proper working order.
- If encountered, animals burrowing on the dykes of the lagoon should be removed and the holes filled. If assistance in animal control is required, contact Manitoba Conservation.
- Check for erosion on the dykes. If erosion is present, erosion repairs should be undertaken. This may include re-grading, grass planting or stone rip-rap.
- Regular road and turn around maintenance should be undertaken to ensure access to the site at all times. Culverts should be cleared of blockage.
- Ensure the discharge valve is closed when not draining.
- Inspect and maintain drainage.
- Monitor sewage dumping to allowable loads.

Winter Maintenance

- Monitor sewage dumping to allowable loads.

3.5 LAGOON DETAILS

The lagoon details are described and shown in the appended Study Drawing C-101.

3.6 MITIGATION OF SILT RUNOFF DURING CONSTRUCTION

Silt fences and/or straw wattles will be placed around the construction area as required to protect the adjacent lands from silt.

3.7 DISTANCE FROM EXISTING STRUCTURES

The existing and proposed new lagoon cells are approximately 600 m from the nearest residence.

3.8 SLUDGE DISPOSAL PLAN

The Sludge Disposal Plan is as follows:

- Sludge in the primary cells would be monitored on an annual basis and removed when a significant accumulation occurs (300-400 mm). With respect to the two new primary cells, sludge likely won't require removal for perhaps 25 years. The RM is currently undertaking a chemical sludge reduction program on the existing primary cell.

- At removal time, the sludge would be dewatered on site, removed from site, and applied to agricultural land or an appropriate landfill in accordance with disposal methods approved by the Province of Manitoba. An EAP Licence would be required.

4.0 SCHEDULE

Construction of the proposed wastewater lagoon is tentatively scheduled to start upon receipt of funding and approvals. The completed lagoon upgrade would commence operation, upon approval by Manitoba Conservation.

5.0 FUNDING

This project will apply for funding from the Province of Manitoba.

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APPENDIX 1

Petersfield Truck Dump Wastewater Lagoon Expansion Study

Petersfield Truck Dump Wastewater Lagoon Expansion Study

Prepared for:
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Project No. 111215981

June 24, 2016

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1.0 INTRODUCTION

Stantec was retained by the Manitoba Water Services Board in January, 2016 to undertake the "Petersfield Truck Dump Wastewater Lagoon Expansion Study", as the basis for an Environmental Act Proposal Application for the addition of two new primary cells to the existing lagoon. The existing lagoon, located on Section 36, Township 15, Range 4E, has a primary cell, secondary cell, and a constructed wetland which borders on Netley marsh. The existing lagoon expansion areas are generally grass with marsh to the east. The lagoon is not near any centre of development and the nearest residence is a farm 600 m to the southwest.

Stantec had completed a Preliminary Assessment of the proposed lagoon expansion in November, 2015 for the RM of St. Andrews. At that time, assessments were made of the loadings and a one primary cell expansion option was considered. Test hole drilling was undertaken directly south of the existing lagoon. In order to increase the capacity for septage dumping, the RM of St. Andrews later decided to proceed with a two primary cell expansion, one cell south and one cell north of the existing lagoon. This current Study will assess the two cell expansion which will include additional test holes on the north side of the lagoon, and a topographic survey.

The existing two cell lagoon was constructed in 1996. It is lined with clay taken from adjacent borrow pits. The organic loading on the primary cell exceeds the allowable limits of 56 kg/day/ha and as a result the lagoon has been closed from time to time in order to allow treatment to meet discharge requirements. The RM provided operational data for wastewater truck dumping as detailed in Appendix A. The maximum loading year was 2013. The RM has decided not to exceed this loading for the next 20 years and therefore the 2013 loading will be the 20 year design loading. The RM will carefully monitor truck dumping to ensure that lagoon loading does not exceed the design capacity.

2.0 SCOPE OF WORK

The scope of work includes the following tasks:

- Liaison with MWSB and the RM of St. Andrews
- Test holes north of the lagoon
- Topographic survey north and south of the lagoon
- Confirm 20 year design period hydraulic and organic loading
- Desktop preliminary assessment of potential environmental issues
- Determine size of proposed two new primary cells
- Assess feasibility of using sporadic clay deposits for lagoon construction
- Assess the use of a synthetic liners such as 60 mil HDPE
- Assess construction and quantity issues related to "perching" the lagoon cells to match existing cell bottom and wetland elevations
- Assess interconnecting and discharge piping arrangements
- Assess expected high groundwater table to determine elevation of a synthetic liner
- Review existing discharge configurations from wetland
- Determine feasible alternatives
- Determine preliminary construction quantities
- Prepare preliminary opinion of cost estimates
- Prepare and submit a draft Study
- Review comments from MWSB and RM of St. Andrews
- Prepare and submit Final Study

3.0 EXISTING LAGOON AND WASTEWATER TRUCK DUMP DATA

The following assessment is based on the 2013 truck dump wastewater loading data which is the 20-year design loading year.

a) The existing primary cell has a full supply hydraulic operating level (FSL) surface area of 0.6 hectare.

b) The allowable hydraulic storage in the primary cell for winter storage is 3,025 m^3.

c) The secondary cell has an FSL area of 0.55 hectare.

d) The allowable hydraulic winter storage in the secondary cell is 5,625 m^3.

e) The winter hydraulic storage in the wetland is 8,094 m^3. Manitoba Conservation advised that, on a preliminary assessment, the wetland can be included in the storage calculations.

f) The total annual hydraulic loading from truck dumping was 22,644 m^3 which will be the design hydraulic loading.

g) The total truck loads were 2,059.

h) Of the 2,059 truckloads, 142 loads were septage.

i) The average daily summer hydraulic loading was 80 m^3.

j) The maximum daily summer hydraulic loading was 100 m^3.

k) The winter average daily hydraulic loading was 60 m^3.

4.0 GEOTECHNICAL INVESTIGATION

Maple Leaf Drilling undertook the drilling of 27 test holes on July 9 and 10, 2015 on the proposed lagoon expansion site directly south of the existing lagoon and wetland. The test hole log information, and test hole location plan, Figure 3.1, are in Appendix B.

A second test drilling was undertaken on January 28, 2016 on the north side of the lagoon. This test hole information is also in Appendix B.

In conclusion, the site soils are clay and silt with till at depths below excavation limits. Suitable clay for lagoon construction is very difficult and expensive to access. Stantec has the experience of having designed and provided construction resident and non-resident inspection on the original lagoon and wetland. The construction of clay lined new cells meeting the required 1 x 10^{-7} cm/sec hydraulic conductivity is considered high risk as suitable clay may be difficult to find and require more than expected excavation of unsuitable material to access.

The second option would be to construct lagoon cells using easily accessible silt lined with 60 mil HDPE.

5.0 TOPOGRAPHIC SURVEYS OF SITES

A topographic survey of both the south and north sites was done on February 26, 2016. The survey went as far east as the cattail lines which had ice at ground level which was considered to be the marsh water level.

The expansion site ground levels are approximately .5 m above ice level. Therefore, it is recommended to place the synthetic liner no lower than that level to prevent "bubbles" popping up in to the cell bottom. Assuming .15 m stripping, this allows a clay/silt cut of .65 m below ground which allow for a .3 m sand bedding below the liner. The elevation of the liner with respect to ground and surface water will be further assessed in the design phase.

6.0 LAGOON DESIGN HYDRAULIC AND ORGANIC LOADING

6.1 REQUIRED WINTER HYDRAULIC STORAGE

The required winter hydraulic storage is 230 days x 60 m^3/day = 13,800 m^3.

6.2 HYDRAULIC STORAGE

Manitoba Conservation and Water Stewardship, Environmental Assessment and Licensing Branch have advised that a well-managed wetland can be used in hydraulic storage calculations. Therefore, the calculated winter hydraulic storage including the wetland is as follows:

Primary Cell		3,025 m^3
Secondary Cell		5,625 m^3
Wetland		8,094 m^3
	Total	16,744 m^3

Therefore the existing lagoon system has adequate winter storage, and the additional storage created with the two new primary cells, estimated at 13,900 m^3, is surplus. The existing lagoon is hydraulically capable of handling domestic sewage of approximately 250 persons annually and 350 persons with expansion. However, the disposal of septage from septic tanks is the limiting factor due to its high organic loading.

6.3 MAXIMUM DAY ORGANIC LOADING

Domestic sewage organic loading is hydraulically based and has been set at 250 mg/L BOD_5 for domestic sewage. Septage, from septic tank solids compartments, is set at 7,000 mg/L BOD_5. The RM of St. Andrews has requested that the lagoon expansion allow for two full truck loads of septage per day.

The maximum day organic loading is:

1. Trucked sewage; 100,000 L (maximum day) @ 250 mg/L = 25 kg/day BOD_5
2. Trucked septage; 2 loads @ 11,000 l @ 7,000 mg/L = 154 kg/day BOD_5

Total Maximum Day Loading 179 kg/day BOD_5

6.4 REQUIRED PRIMARY CELL SIZE

The maximum allowable primary cell loading is 56 kg/day/hectare. Therefore, the minimum required primary cell size is 179 ÷56 = 3.2 hectares. Therefore, the existing 0.60 ha primary cell is inadequate for two truck load of septage per day and additional primary cell area is required.

The required additional primary cell size at full supply liquid level would be 3.2 – 0.6 = 2.6 hectares. The organic loading requirements would be met by constructing two new primary cells of 1.3 hectares each. Total phosphorus levels will be monitored and treatment provided if required.

7.0 LAGOON CELL EXPANSION OPTIONS AND COSTS

a) Option 1 – Two New 1.3 Hectare 60 mil HDPE Lined Primary Cells

Two new primary cells could be constructed using the shallow primarily silt soil and then lining with a 60 mil high density polyethylene liner. This method of construction minimizes time of construction, has low risk, and is economical.

Our preliminary opinion of capital cost is as follows. Cost subtotals are rounded to the nearest $5,000:

Preliminary Quantities and Opinion of Capital Cost Estimate for Two New 60 mil HDPE Lined Primary Cells

		Unit	Quantity	Unit Price	Amount
1	Topsoil Stripping, Stockpiling and Replacement	C.M.	15,000	$ 10	$ 150,000
2	Common Excavation	C.M.	15,500	$ 10	$ 155,000
3	Borrow Excavation	C.M.	15,000	$ 15	$ 225,000
4	60 mil HDPE Liner	S.M.	37,000	$ 12	$ 445,000
5	Sand Bedding/Cover	C.M.	22,000	$ 25	$ 550,000
6	Interconnecting Pipe Systems	L.S.	4	$ 40,000	$ 160,000
7	Gas Release Piping	L.S.	2	$ 25,000	$ 50,000
8	Decommission Existing Truck Dump	L.S.	1	$ 5,000	$ 5,000
9	Truck Dump Structure	L.S.	2	$ 40,000	$ 80,000
10	Granular Material for Roads	C.M.	200	$ 50	$ 10,000
11	Culverts	L.S.	2	$ 5,000	$ 10,000
12	Ditching	L.S.	1	$ 30,000	$ 30,000
13	Seeding	L.S.	1	$ 25,000	$ 25,000
14	Fence and Gate	L.S.	1	$ 40,000	$ 40,000
	Sub-Total Construction Cost				**$1,935,000**
	Engineering, Administration, and Construction Cost Contingency (35%)				**$ 675,000**
	TOTAL ESTIMATED OPINION OF CAPITAL COST (to nearest $10,000) (not including GST or land costs)				**$2,610,000**

b) Option 2 – Two New 1.3 Hectare Clay Lined Primary Cells

Two new clay primary cells could potentially be constructed which would allow the lagoon system to meet the overall hydraulic and organic loading requirements. However, suitable clay is very difficult to access. The average depth from ground level to clay is approximately 1.3 m. Above the clay is approximately 0.2 m of topsoil overburden and 1.1 m of silt. Therefore, in order to access the good clay, extensive and expensive excavation of unsuitable silt material is required.

Our preliminary opinion of capital cost is as follows. Cost subtotals are rounded to the nearest $5,000.

Preliminary Quantities and Opinion of Capital Cost Estimate for Two New Clay Lined Primary Cells

		Unit	Quantity	Unit Price	Amount
1	Topsoil Stripping, Stockpiling and Replacement	C.M.	20,000	$ 10	$ 200,000
2	Clay Borrow	C.M.	40,000	$ 10	$ 400,000
3	Common Excavation	C.M.	110,000	$ 10	$1,100,000
4	Interconnecting Pipe Systems	L.S.	4	$ 35,000	$ 140,000
5	Compact Lagoon Floor	L.S.	1	$ 10,000	$ 10,000
6	Decommission Existing Truck Dump	L.S.	1	$ 5,000	$ 5,000
7	New Truck Dump Structure	L.S.	2	$ 40,000	$ 80,000
8	Granular Material for Roads	C.M.	200	$ 50	$ 10,000
9	Culverts	L.S.	2	$ 5,000	$ 10,000
10	Ditching	L.S.	1	$ 30,000	$ 30,000
11	Seeding	L.S.	1	$ 25,000	$ 25,000
12	Fence and Gate	L.S.	1	$ 40,000	$ 40,000
13	Post Construction Testing	L.S.	1	$ 10,000	$ 10,000
	Sub-Total Construction Cost				**$2,060,000**
	Engineering, Administration, and Construction Cost Contingency (35%)				**$ 720,000**
	TOTAL ESTIMATED OPINION OF CAPITAL COST (to the nearest $10,000) (not including GST or land costs)				**$2,780,000**

c) Opinion of Capital Cost Estimate Summary

Option 1 – Two New 60 mil HDPE Lined Primary Cells (Low Risk Construction)	$2,610,000
Option 2 – Two New Clay Lined Primary Cells (High Risk Construction)	$2,780,000

8.0 CONCLUSIONS

a) In order to meet Manitoba Conservation requirements, two new 1.3 hectare primary cells are required for two truck loads of septage per day. The RM would need to control dumping to limit septage dumping. Control of septage dumping is the key to controlling the organic loading on the lagoon.

b) There are two options for this new primary cell construction:

1. Option 1 - 60 mil HDPE lined cells – Estimated Opinion of Capital Cost $2,610,000
2. Option 2 - Clay lined cells – Estimated Opinion of Capital Cost $2,780,000

c) The clay lined cell Option 2 requires very extensive unsuitable material excation to get down to suitable clay. There is high risk in this method as the lower clay may be discontinuous necessitating more extensive silt removal. Depending upon the year, there may also be water issues in deep borrow excavations. Due to the high risk, and higher cost, we do not recommend this option.

d) The 60 mil HDPE lined Option 1 is low risk and has the lower cost. The upper silt soil deposits can be used to construct the dikes.

e) The combination of two new primary cells, the existing primary cell, the existing secondary cell, and the existing wetland, provides large winter hydraulic storage surplus.

f) Aeration was assessed as an option and the RM decided not to pursue aeration due to the estimated capital cost and maintenance requirements.

g) The existing truck dump would be removed once the new primary cell truck dumps become operational and are approved.

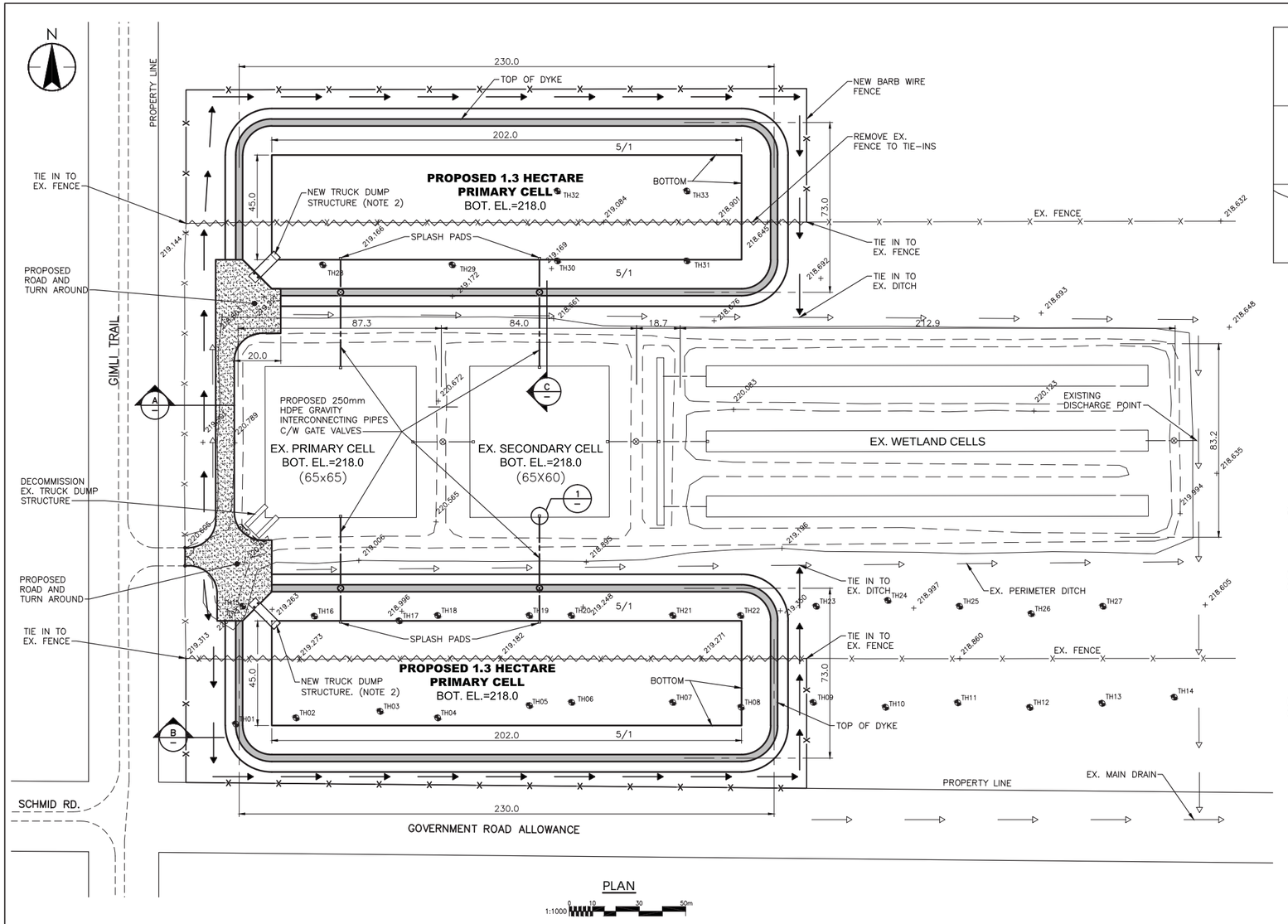
h) The treated effluent discharging procedure would be to close off the primary cells from the secondary cells and wetland, hold for two weeks or until it is acceptable to discharge, test/retest, then discharge the secondary cell and wetland, maintaining a minimum .3 m deep liquid residual in all cells. This procedure would be undertaken in the spring and fall.

i) The RM is currently undertaking a biological sludge decomposition program on the existing primary cell. The sludge decomposition will be measured by the RM upon completion. Further sludge removal is likely not necessary upon completion of the two new primary cells.

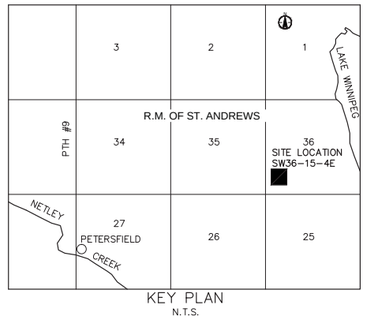
9.0 RECOMMENDATIONS

a) We recommend the construction of Option 1 with two new 1.3 hectare 60 mil HDPE lined primary cells at an opinion of estimated capital cost of $2,610,000 including construction, engineering, administration, licencing, and construction contingency. The expansion details are shown on Drawing No. C-101.

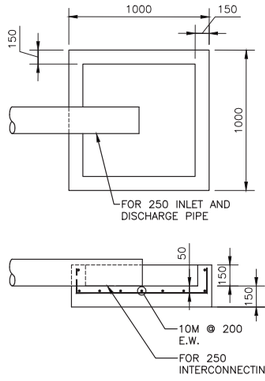
b) The RM will carefully control the dumping of septage into the primary cells.



PLAN
1:1000 0 10 30 50m

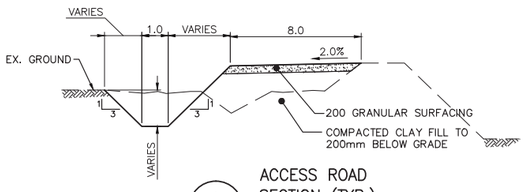


KEY PLAN
N.T.S.



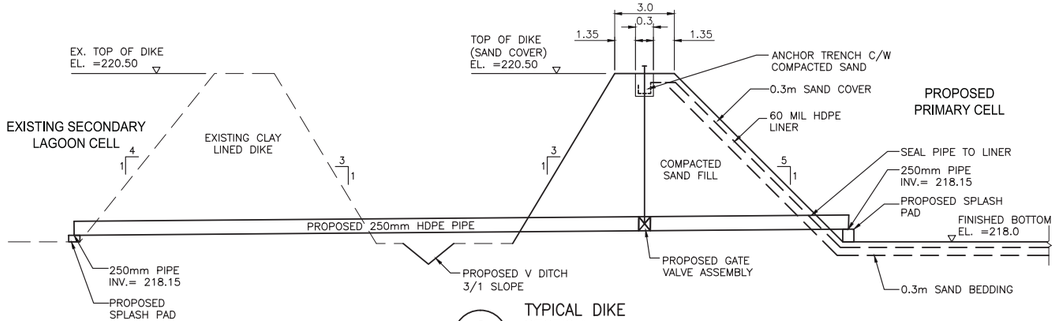
1 — SPLASH PAD DETAILS
N.T.S.

NOTE: CONCRETE TO BE SULPHATE RESISTANT, 30 MPa



A — ACCESS ROAD SECTION (TYP.)
N.T.S.

B — TYPICAL SECTION
N.T.S.



C — TYPICAL DIKE SECTION
N.T.S.

Stantec

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Winnipeg MB Canada R3B 2B9
Tel. 204.489.5900 Fax. 204.453.9012
www.stantec.com

Legend

EXISTING	LEGEND-PLAN	PROPOSED
	DITCH	
⊗	GATE VALVE	⊗
	CULVERT	
	FENCE	
	INTERCONNECTING PIPE	
	TEST HOLE	
x 218.605	ELEVATION	
	ROADWAY	

Notes

1. FOUR STRAND BARB WIRE FENCE AND GATE WILL BE AS PER MANITOBA WATER SERVICES BOARD STANDARD CONSTRUCTION SPECIFICATIONS, SECTION 027110
2. TRUCK DUMP TO BE "SEPTIC WASATE DUMP STATION" DRAWING AS DETAILED IN SECTION 025940 OF THE WATER SERVICES BOARD STANDARD CONSTRUCTION SPECIFICATIONS, SECTION 027110 EXCEPT WITH 5/1 SLOPE

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

5				
4				
3				
2				
1				
Revision		By	Appd.	YY.MM.DD
E				
D				
C				
B				
A				
Issued		By	Appd.	YY.MM.DD
File Name: 15980c-101	K.R.	T.L.S.	T.L.S.	16.07.04
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

APEGM Certificate of Authorization
Stantec Consulting Ltd.
No. 1301

PROVINCE OF MANITOBA
T.L. STRATTON
MEMBER 4381
REGISTERED PROFESSIONAL ENGINEER

Client/Project
R.M. OF ST. ANDREWS

PROPOSED PETERSFIELD TRUCK DUMP
WASTEWATER LAGOON EXPANSION STUDY - 2016
St. Andrews, MB Canada

Title
SITE PLAN AND DETAILS

Project No.	Scale	
111215980	AS NOTED	
Drawing No.	Sheet	Revision
C-101	1 of 1	0

APPENDIX A
Annual Truck Dumping Data

Comparative Report for Annual Lagoon Intake

2013	13-Jan	13-Feb	13-Mar	13-Apr	13-May	13-Jun	13-Jul	13-Aug	13-Sep	13-Oct	13-Nov	13-Dec	GRAND TOTALS
Total Loads	91	94	108	105	162	233	169	231	218	281	182	185	**2,059**
Loads per day	3	3	3	4	5	8	5	7	7	9	6	7	**67**
Loads per week	18	24	27	26	41	58	42	58	55	70	46	53	**43**
Total Gallons	229,600	251,700	294,000	260,250	381,575	527,100	475,800	534,430	479,230	632,440	468,000	442,550	**4,976,675**
Gallons per day	7,406	8,989	9,484	8,675	12,309	17,570	15,348	17,240	15,974	20,401	15,097	15,983	**164,476**
Gallons per week	45,920	62,925	73,500	65,063	95,394	131,775	118,950	133,608	119,808	158,110	117,000	123,300	**1,245,353**
Total Septic Field (gl)	18,125	34,000	10,550	21,100	43,000	46,400	39,100	65,200	115,850	176,650	80,400	35,250	**685,625**
Total Holding Tank (gl)	211,400	219,650	283,300	238,900	337,250	477,550	434,250	466,000	363,850	451,550	386,400	407,000	**4,277,100**
Total Other (portables) (gl)	75	1,050	150	250	1,325	3,150	2,450	3,230	5,030	4,240	1,200	300	**22,450**

2014	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	GRAND TOTALS
Total Loads	141	138	132	144	217	206	191	165	225	260	183	115	**2,117**
Loads per day	4.55	4.93	4.26	4.80	7.00	6.87	6.16	5.32	7.50	8.39	6.10	3.71	**70**
Loads per week	31	35	33	36	54	52	48	41	56	65	46	29	**44**
Total Gallons	317,300	338,050	351,800	425,750	416,265	425,370	441,425	309,825	496,425	551,700	399,745	312,825	**4,786,480**
Gallons per day	10,235	12,073	11,348	15,205	13,428	15,192	14,240	11,065	16,014	19,704	12,895	11,172.32	**162,571**
Gallons per week	70,511	84,513	87,950	106,438	104,066	106,343	110,356	77,456	124,106	137,925	99,936	78,206	**1,187,806**
Total Septic Field (gl)	11,650	14,450	41,675	62,150	99,750	88,875	92,350	22,050	94,950	175,900	98,720	12,350	**814,870**
Total Holding Tank (gl)	305,350	323,300	310,125	362,500	314,325	334,575	346,900	284,200	398,800	374,550	300,850	300,000	**3,955,475**
Total Other (portables) (gl)	300	300	2,150	1,100	2,190	1,920	2,175	3,575	2,675	1,250	175	475	**18,285**

Comparative Report for Annual Lagoon Intake

2013	13-Jan	13-Feb	13-Mar	13-Apr	13-May	13-Jun	13-Jul	13-Aug	13-Sep	13-Oct	13-Nov	13-Dec	GRAND TOTALS
Total Loads	91	94	108	105	162	233	169	231	218	281	182	185	**2,059**
Loads per day	3	3	3	4	5	8	5	7	7	9	6	7	**67**
Loads per week	18	24	27	26	41	58	42	58	55	70	46	53	**43**
Total Gallons	229,600	251,700	294,000	260,250	381,575	527,100	475,800	534,430	479,230	632,440	468,000	442,550	**4,976,675**
Gallons per day	7,406	8,989	9,484	8,675	12,309	17,570	15,348	17,240	15,974	20,401	15,097	15,983	**164,476**
Gallons per week	45,920	62,925	73,500	65,063	95,394	131,775	118,950	133,608	119,808	158,110	117,000	123,300	**1,245,353**
Total Septic Field (gl)	18,125	34,000	10,550	21,100	43,000	46,400	39,100	65,200	115,850	176,650	80,400	35,250	**685,625**
Total Holding Tank (gl)	211,400	219,650	283,300	238,900	337,250	477,550	434,250	466,000	363,850	451,550	386,400	407,000	**4,277,100**
Total Other (portables) (gl)	75	1,050	150	250	1,325	3,150	2,450	3,230	5,030	4,240	1,200	300	**22,450**

2014	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	GRAND TOTALS
Total Loads	141	138	132	144	217	206	191	165	225	260	183	115	**2,117**
Loads per day	4.55	4.93	4.26	4.80	7.00	6.87	6.16	5.32	7.50	8.39	6.10	3.71	**70**
Loads per week	31	35	33	36	54	52	48	41	56	65	46	29	**44**
Total Gallons	317,300	338,050	351,800	425,750	416,265	425,370	441,425	309,825	496,425	551,700	399,745	312,825	**4,786,480**
Gallons per day	10,235	12,073	11,348	15,205	13,428	15,192	14,240	11,065	16,014	19,704	12,895	11,172.32	**162,571**
Gallons per week	70,511	84,513	87,950	106,438	104,066	106,343	110,356	77,456	124,106	137,925	99,936	78,206	**1,187,806**
Total Septic Field (gl)	11,650	14,450	41,675	62,150	99,750	88,875	92,350	22,050	94,950	175,900	98,720	12,350	**814,870**
Total Holding Tank (gl)	305,350	323,300	310,125	362,500	314,325	334,575	346,900	284,200	398,800	374,550	300,850	300,000	**3,955,475**
Total Other (portables) (gl)	300	300	2,150	1,100	2,190	1,920	2,175	3,575	2,675	1,250	175	475	**18,285**

APPENDIX B
Geotechnical Data

See Drawing C-101
for Hole Locations

JULY 2015
Test Holes

RECORD OF SOIL PROFILE

Stantec

TH No.: TH1 | Logged by: Nestor | Drill Date: 9 July 2018

Client: | Project: Petersfield Lagoon Expansion | Start Time: | End Time:

Drill Contractor: Maple Leaf | Drill Rig:: MP5 Acker | Drilling Method: 125 mm solid Stem Auger

Location: Petersfield, MB | GPS Coordinates: N 6477492 E 557566 | Elevation: m | Sheet of

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil		AC	5				
					7.5				
3"	4'	Silt	tan, soft, moist, LP		10				
4'	12.5	clay	brown, stiff, moist, HP						
			trace silt below 4'-5.5'						
			firm below 10'						
12.5	20	Silt Fill	tan, soft, moist, LP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing

- None
- ~~Yes~~ --> Source (soil type): Silt till
  --> Source (depth): 12.5
- Yes --> Source (soil type):
  --> Source (depth):
- Yes --> Source (soil type):
  --> Source (depth):

~~Groundwater Seepage~~

- ~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage:

Final Groundwater depth:

Auger Refusal

- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth:

Sample Types

AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests

SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments:

RECORD OF SOIL PROFILE

Stantec

TH No.: TH2 Logged by: Nestor Drill Date: 9 July 2015

Client: # 111215980 Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: MPS Acker Drilling Method: 125 mm solid Stem auger

Location: Petersfield, MB GPS Coordinates: 647517 E, 5575664 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
	2'11	top soil/ Org. Clay		AC	5'				
				ST	5'	7.5'	(1.5 ft recovery)		
3'1"	2.5'	silt	tan, soft, moist, LP	AC	7.5				
				AC	10				
2.5	14'	clay	brown, firm, moist, HP	AC	12.5				
5'			silt varve below 2.5 to 5'						
14'	20'	Silt Till	tan, soft, moist, LP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): Silt till
  --> Source (depth): 16'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH3 | Logged by: Nestor | Drill Date: 9 July 2015

Client: 111215980 | Project: Petersfield Lagoon Expansion | Start Time ____ End Time: ____

Drill Contractor: Maple Leaf | Drill Rig:: MPS Acker | Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB | GPS Coordinates: N 647545 E 557566 N, Elevation: ____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil		AC	7.5				
					10				
3"	5'	Silt	firm, soft, moist, LP		12.5				
					15				
5'	16'	clay	brown, firm, moist, HP						
16'	20'	Silt till	firm, soft, moist, LP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): silt till
  --> Source (depth): 19'
- Yes --> Source (soil type): ____
  --> Source (depth): ____
- Yes --> Source (soil type): ____
  --> Source (depth): ____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: 16'
Final Groundwater depth: 18.5

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: I did not recover the 5.5' depth on clay they toss it away we measured the water 6" then after 2 hours, soil sloughs @ 7' and the water is 4' below grade

RECORD OF SOIL PROFILE

Stantec

TH No.: TH4 | Logged by: Nestor | Drill Date: 9 July 2015

Client: | Project: Peterfield Lagoon Expansion | Start Time: | End Time:

Drill Contractor: Maple Leaf | Drill Rig:: MP5 Acker | Drilling Method: 125 mm solid stem auger

Location: Peterfield, MB | GPS Coordinates: N 6475764 E 557566 | N, Elevation: m | Sheet of

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples: Type	Soil Samples: Depth from	Soil Samples: Depth to	Field Tests: Test	Field Tests: Depth	Field Tests: Test Result
0	3"	top soil		AC	5				
					7.5				
3"	1.5	clay	black, firm, moist, MP		10				
			some organic		12.5				
					15				
1.5	3	silt	tan, soft, moist, LP						
3'	14	clay	brown, firm, moist, HP						
14	~~20~~	clayey silt fill	brown ~~tan~~, soft, moist, MP trace fine to coarse sand trace fine gravel						
~~16~~	~~20~~	~~silt fill~~	~~tan, soft, moist~~						

Soil Sloughing
- None
- ✓ Yes --> Source (soil type): silt fill
  --> Source (depth): 17'
- Yes --> Source (soil type):
  --> Source (depth):
- Yes --> Source (soil type):
  --> Source (depth):

Groundwater Seepage
- ✓ None
- Minor
- Moderate
- Heavy

Depth of Seepage:
Final Groundwater depth:

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth:

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments:

RECORD OF SOIL PROFILE

Stantec

TH No.: TH5 Logged by: Nestor Drill Date: 9 July 2015

Client: 111215980 Project: Peterfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: maple Leaf Drill Rig:: MPS Acker Drilling Method: 125 mm solid Stem auger

Location: Peterfield, MB GPS Coordinates: 647605 E, 5575665N, Elevation: _____m Sheet ___of___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples: Type	Soil Samples: Depth from	Soil Samples: Depth to	Field Tests: Test	Field Tests: Depth	Field Tests: Test Result
0	3"	topsoil		AC	3.5				
					7.5				
3"	4'	clay	brown, firm, moist, HP		10				
4'	6'	silt	brn, soft, moist, LP						
6'	17	clay	brown, firm, moist, HP						
17	20	clayey silt fill	brn, soft, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- ~~Yes~~ --> Source (soil type): clayey silt fill
  --> Source (depth): 16'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- ~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH6 | Logged by: Nestor | Drill Date: 9 July 2015

Client: 111215980 | Project: Petersfield Lagoon Expansion | Start Time ____ End Time: ____

Drill Contractor: maple leaf | Drill Rig:: MPS Acker | Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB | GPS Coordinates: N 647634 E 5575669 | Elevation: ____ m | Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	6"	top soil		AC	5				
					10				
6"	4'	silt	firm, soft, moist, LP		15				
4'	15.5'	clay	firm, firm, moist, HP						
15.5'	20	clayey silt fill	brown, soft, moist, NP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt fill
  --> Source (depth): 15'
- Yes --> Source (soil type): ____
  --> Source (depth): ____
- Yes --> Source (soil type): ____
  --> Source (depth): ____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: ____
Final Groundwater depth: ____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: ____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 7 | Logged by: Nestor | Drill Date: 9 July 2015

Client: 111215980 | Project: Peterfield Lagoon Expansion | Start Time _____ End Time: _____

Drill Contractor: maple leaf | Drill Rig:: MP 5 Acker | Drilling Method: 125 mm solid stem auger

Location: Peterfield, MB | GPS Coordinates: N 647664 E, 557567 | Elevation: _____ m | Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples: Type	Soil Samples: Depth from	Soil Samples: Depth to	Field Tests: Test	Field Tests: Depth	Field Tests: Test Result
0	3"	topsoil		AC	5"				
				AC	10				
3"	1.5'	clay	black, firm, moist, MP	ST	10	12.5'			
			some organic						(full recovery)
1.5	2.5'	silt	tan, soft, moist, LP						
2.5'	13.5'	clay	brown, stiff, moist, HP						
			firm below 7.5'						
13.5	15	clayey silt till	brown ~~tan~~, soft, moist, ~~MP~~ MP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
- ✓ None
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- ~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 8 | Logged by: Nestor | Drill Date: 9 July 2015

Client: | Project: Petersfield Lagoon Expansion | Start Time ____ End Time: ____

Drill Contractor: Maple Leaf 111215980 | Drill Rig:: MP 5 Acker | Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB | GPS Coordinates: N 6470792 E 557570 | Elevation: ____ m | Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples: Type	Soil Samples: Depth from	Soil Samples: Depth to	Field Tests: Test	Field Tests: Depth	Field Tests: Test Result
0	3"	topsoil							
3"	1.5	clay	black, firm, moist, MH						
			some organic material						
1.5	4	silt	brn, soft, moist, LP						
4	12'	clay	brown, stiff, moist, HP						
			varve with trace silt						
12'	15'	silt till	brn, soft, moist, LP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
~~None~~
- Yes --> Source (soil type): ____ --> Source (depth): ____
- Yes --> Source (soil type): ____ --> Source (depth): ____
- Yes --> Source (soil type): ____ --> Source (depth): ____

~~Groundwater~~ Seepage
~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage: ____
Final Groundwater depth: ____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: ____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH9 Logged by: Nestor Drill Date: 9 July 2015

Client: Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

111215980

Drill Contractor: Maple Leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: N 6477718 E 575670 Elevation: _____m Sheet ___of__

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil		AC	5				
					10				
3"	2'	silt	tan, soft, moist, LP		14				
2'	5.5	clay	brown, stiff, moist, HP						
5.5	6.5	silt	tan, soft, moist, LP						
6.5	13 ~~14.5~~	clay	brown, stiff, moist, HP						
~~15~~		clayey	brown						
13	15	silt till	tan, soft, moist, MP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
~~None~~
- ~~Yes~~ --> Source (soil type): Silt
  --> Source (depth): 13'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- ~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 10 Logged by: Nestor Drill Date: 9 July 2015

Client: 111215980 Project: Peterfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: maple leaf Drill Rig:: _____ Drilling Method: _____

Location: Peterfield, MB GPS Coordinates: 647745 E, 5575671 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil		AC	5				
					10				
3"	2'	clay	brown, firm, moist, HP		15				
			trace organic						
2'	3	silt	tan, soft, moist, LP						
3	8'	clay	brown, stiff, moist, HP						
8'	8.5	clayey silt	tan, firm, moist, MP						
8.5	14.5	clay	brown, firm, moist, HP						
14.5	15	clayey silt till	brown tan, soft, moist, MP trace fine to coarse sand and fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt
  --> Source (depth): 12
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 11 Logged by: Nestor Drill Date: 9 July 2015

Client: 111215980 Project: Peterfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: _____ Drilling Method: _____

Location: Peterfield, MB GPS Coordinates: 14 647776E, 55 75673N, Elevation: _____m Sheet ___of___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil		AC	5				
					10				
3"	3'	clay	black, firm, moist, MP		15				
			some organic						
3	4	silt	tan, soft, moist, LP						
			trace clay						
4	15.5	clay	brown, stiff, moist, HP						
15.5	20	silt till	tan, soft, moist, LP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing

~~None~~

- Yes --> Source (soil type): _____ --> Source (depth): _____
- Yes --> Source (soil type): _____ --> Source (depth): _____
- Yes --> Source (soil type): _____ --> Source (depth): _____

Groundwater Seepage

~~None~~

- Minor
- Moderate
- Heavy

Depth of Seepage: _____

Final Groundwater depth: _____

Auger Refusal

- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types

AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests

SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH12 Logged by: Nestor Drill Date: 9 July 2015

Client: 111215980 Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: maple leaf Drill Rig:: _____ Drilling Method: _____

Location: Peterfield, MB GPS Coordinates: N 6478021 E 557567 Elevation: _____m Sheet ___of___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil		AC	5				
				AC	10				
3"	15.5	clay	black, firm, moist, MP trace silt from below 1' to 2' some organic ~~below 2'~~	ST	10	12.5'			
				AC	15				
			brown below 3' stiff						
			firm below 13'						
15.5	20	clayey silt till	brown ~~from~~, soft, moist, MP						
			~~trace from~~ to coarse sand						
			trace fine gravel						

Soil Sloughing
- None
- ~~Yes~~ --> Source (soil type): clayey silt till
  --> Source (depth): 18'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- ~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 13 Logged by: Nestor Drill Date: 9 July 2015

Client: Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: 1112159880 maple leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647833 E, 5575677 N, Elevation :_____m Sheet ___of__

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil		AC	5				
					10				
3"	1'	clay	black, firm, moist, HP		15				
			some organic						
1	2.5	silt	tan, soft, moist, LP						
2.5	15.5	clay	brown, stiff, moist, HP						
			brown						
15.5	20	clayey silt till	tan, soft, moist, MP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): Silt
  --> Source (depth): 13'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH14 Logged by: Nestor Drill Date: 9 July 2015

Client: Project: Peter Field Lagoon Expansion Start Time _____ End Time: _____

1112159 80

Drill Contractor: maple leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: E 647859 E, 5575678 N, Elevation :_____m Sheet ___of___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil		AC	5				
					10				
3"	1.5	clay	black, firm, moist, MP		15				
			some organic						
1.5	3.5	silt	tan, soft, moist, LP						
3.5	16.5	clay	brown, stiff, moist, HP						
			firm below 12'						
16.5	20	silt fill	tan, soft, moist, LP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing

- None
- ~~Yes~~ --> Source (soil type): silt fill
  --> Source (depth): 18
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage

- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____

Final Groundwater depth: _____

Auger Refusal

- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types

AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests

SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 15 Logged by: Nestor Drill Date: 10 July 2015

Client: Manitoba Hydro Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: MP 5 Acker Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB GPS Coordinates: 647496 E, 5575699 N. Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	**Torvane** Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	**SPT** Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil							
3"	1.5	clay	black, firm, moist, MP some organic						
1.5	4.5	SILT	tan, soft, moist, LP						
4.5	17	clay	brown, firm, moist, HP						
17	18	clayey silt Till	brown, soft, moist, MP						
18	20	silt till	tan, soft, moist, LP trace fine to coarse and trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): Silt till
  --> Source (depth): 18'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH16 Logged by: Nestor Drill Date: 10 July 2015

Client: Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: MPS Aeker Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB GPS Coordinates: 647522 E, 5575699 N, Elevation :_____m Sheet ___of___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	**Torvane** Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	**SPT** Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples: Type	Soil Samples: Depth from	Soil Samples: Depth to	Field Tests: Test	Field Tests: Depth	Field Tests: Test Result
0	3"	top soil							
3"	4'	Silty clay	brown, firm, moist, MP						
4	5.5	silt	tan, soft, moist, LP						
5.5	14	clay	brown, firm, moist, HP						
14	15	~~clayey~~ silt till	brown, firm, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
None
- Yes --> Source (soil type):_____
  --> Source (depth): _____
- Yes --> Source (soil type):_____
  --> Source (depth): _____
- Yes --> Source (soil type):_____
  --> Source (depth): _____

Groundwater Seepage
None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 17 Logged by: Nestor Drill Date: 10 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: MP5 Akker Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB GPS Coordinates: 647552 E, 5575697 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	2'	clay	black, firm, moist, MP some organic						
2	3	silty clay	brown, firm, moist, MP						
3	4.5	silt	fm, soft, moist, LP						
4.5	16	clay	brown, stiff, moist, HP firm below 12.5'						
16	20	clayey silt till	brown, firm, moist, MP trace fine to coarse sand fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 18'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH18 Logged by: Nestor Drill Date: 10 July 2015

Client: Project: Petersfield Lagoon Expansion Start Time ____ End Time: ____

Drill Contractor: maple leaf Drill Rig:: MP5 Acker Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB GPS Coordinates: 647577 E, 5575723 N, Elevation: ____m Sheet ___of__

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	1.5	clay	black, firm, moist, MP some organic						
1.5	2	silty clay	brown, firm, moist, MP						
2	4	silt	firm, soft, moist, LP						
4	14	clay	brown, stiff, moist, MP firm below 11'						
14	15	clayey silt till	brown, soft, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 14'
- Yes --> Source (soil type): ____
  --> Source (depth): ____
- Yes --> Source (soil type): ____
  --> Source (depth): ____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: ____
Final Groundwater depth: ____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: ____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 19 Logged by: Nestor Drill Date: 10 July 15

Client: Project: Petersfield lagoon Expansion Start Time ____ End Time: ____

Drill Contractor: Maple Leaf Drill Rig:: MP5 Acker Drilling Method: 125 mm solid stem auger

Location: Petersfield, MB GPS Coordinates: 647608 E, 5575704 N, Elevation: ____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	4.5	clay	brown, firm, moist, HP						
4.5	6.5	silty clay	brown, firm, moist, HP						
6.5	16	clay	brown, stiff, moist, HP firm below 12'						
16	20	clayey silt fill	brown, soft, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- ~~Yes~~ --> Source (soil type): clayey silt fill
  --> Source (depth): 16
- Yes --> Source (soil type): ____
  --> Source (depth): ____
- Yes --> Source (soil type): ____
  --> Source (depth): ____

Groundwater Seepage
- None
- ~~Minor~~
- Moderate
- ~~Heavy~~

Depth of Seepage: ____
Final Groundwater depth: ____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: first reading for the water 16' below grade
final reading 1' below grade, that why i call it moderate to heavy

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 20 Logged by: Nestor Drill Date: 10 July 2015

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: MPS Acker Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647635 E, 5575705 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	3.5	silty clay	brown, firm, moist, MP						
3.5	14	clay	brown, stiff, moist, MP firm below 12'						
14	15	clayey silt till	brown, firm, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 14'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH21 Logged by: Nestor Drill Date: 10 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig: MPS Acker Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647668 E, 5575707 N, Elevation: _____m Sheet ___of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	1.5	clay	black, firm, moist, MP some organic						
1.5	4.5	silt	tan, soft, moist, LP trace clay						
4.5	11.5	clay	brown, stiff, moist, HP						
11.5	15	silt till	tan, soft, moist, LP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- ~~Yes~~ --> Source (soil type): silt till
  --> Source (depth): 11.5'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

~~Groundwater~~ Seepage
- ~~None~~
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH22 Logged by: Nestor Drill Date: 10 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: MPS Acker Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647693 E, 5575708 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	1	clay	black, firm, moist, MP some organic						
1	3	silty clay	brown, firm, moist, MP						
3	12.5	clay	brown, stiff, moist, MP firm below 10'						
12.5	15	clayey silt till	brown, firm, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing

- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 13'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage

- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____

Final Groundwater depth: _____

Auger Refusal

- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types

AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests

SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 23 Logged by: Nestor Drill Date: 10 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647718 E, 5575710 N, Elevation: _____m Sheet ___of __

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	1	clay	black, firm, moist, MP some organic						
1	2	silty clay	brown, firm, moist, MP						
2	12.5	clay	brown, stiff, moist, HP firm below 10'						
12.5	15	silt till	tan, soft, moist, LP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): silt till
  --> Source (depth): 14'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 24 Logged by: Nestor Drill Date: 20 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647744 E, 5575712 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	1	clay	black, firm, moist, MP some organic						
1	2.5	silt	tan, soft, moist, LP						
2.5	11.5	clay	brown, stiff, moist, HP						
11.5	15	clayey silt till	brown, stiff, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 14'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH25 Logged by: Nestor Drill Date: 10 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647775 E, 5575712 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	topsoil							
3"	3'	silty clay	brown, firm, moist, MP						
3'	14	clay	brown, stiff, moist, HP						
14	15	clayey silt till	brown, firm, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 13'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: _____

RECORD OF SOIL PROFILE

Stantec

TH No.: TH 26 Logged by: Nestor Drill Date: 10 July 15

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: Maple Leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647804 E, 5575712 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	3"	top soil							
3"	1.5	clay	black, firm, moist, MP						
			some organic						
1.5	4	silt	tan, soft, moist, LP						
4	17	clay	brown, stiff, moist, HP						
			firm to soft below 11'						
17	20	clayey silt till	brown, soft, moist, MP						
			trace fine to coarse sand						
			trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt till
  --> Source (depth): 17.5'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater Depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: _____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: first reading open 17.5 water depth 17' from ground
final reading open 17.5 water depth 14' from ground

RECORD OF SOIL PROFILE

Stantec

TH No.: TH27 Logged by: Nestor Drill Date: 10 July 2015

Client: _____ Project: Petersfield Lagoon Expansion Start Time _____ End Time: _____

Drill Contractor: maple leaf Drill Rig:: _____ Drilling Method: _____

Location: Petersfield, MB GPS Coordinates: 647831 E, 5575716 N, Elevation: _____ m Sheet ___ of ___

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples: Type	Soil Samples: Depth from	Soil Samples: Depth to	Field Tests: Test	Field Tests: Depth	Field Tests: Test Result
0	3"	top soil							
3"	4'	silt	tan, soft, moist, LP						
4	16	clay	brown, stiff, moist, HP						
16	20	clayey silt fill	brown, soft, moist, MP trace fine to coarse sand trace fine gravel						

Soil Sloughing
- None
- Yes --> Source (soil type): clayey silt fill
  --> Source (depth): 4'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- ~~Moderate~~
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: ____

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: first reading 3.5' ~~from~~ ground
final reading 0.5' from ground

JANUARY 2016
Test Holes

RECORD OF SOIL PROFILE

Stantec

TH No.: 1 Logged by: LARRY PRESADO Drill Date: JANUARY 28, 2016

Client: MWSB Project: PETERSFIELD TRUCK DUMP LAGOON Start Time _____ End Time: _____

Drill Contractor: MAPLE LEAF Drill Rig:: Acker Renegade Drilling Method: 125 mm ø SSA

Location: PETERSFIELD, MB GPS Coordinates: 14U 647486 E, 5575835 N, Elevation: — m Sheet 1 of 1

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	1'	Topsoil	black	AC		1'			
1'	2'	Silt	tan, frozen, moist, LP	"		1.5'			
			clayey	"		2.5'			
2'	5.5'	Silty	brown, frozen (stiff), moist	"		5'			
		Clay	medium to high plasticity	"		7.5'			
5.5'	15'	Clay	brown, stiff, moist, high	"		10'			
			plasticity	"		12.5'			
			trace silt	"		15'			

Soil Sloughing
- (None)
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- (None)
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: 15' terminated

Sample Types
(AC) - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: Frozen up to 3.5'
Testhole was backfilled with auger cuttings

RECORD OF SOIL PROFILE

Stantec

TH No.: 2 Logged by: LARRY PRESADO Drill Date: JANUARY 28, 2016

Client: MWSB Project: PETERSFIELD TRUCK DUMP LAGOON Start Time _____ End Time: _____

Drill Contractor: MAPLE LEAF Drill Rig:: Acker Renegade Drilling Method: 125 mm ø SSA

Location: PETERSFIELD, MB GPS Coordinates: 647553 E, 5575841 N, Elevation: _____ m Sheet 1 of 1

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	6"	Topsoil	black, frozen	AC		1'			
6"	7'	Silty	tan, frozen (firm) moist	"		2.5'			
		Clay	medium to high plasticity	"		5'			
7'	15'	Clay	brown, stiff, moist,	"		7.5'			
			high plasticity	"		10'			
			trace silt	"		12.5'			
				"		15'			

Soil Sloughing
- None
- Yes --> Source (soil type): ~~clay, silt~~ silty clay
  --> Source (depth): 4-7'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: 4'
Final Groundwater depth: 4'

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: 15'

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: Frozen up to 3'
TH was backfilled with auger cuttings
Testhole was opened 4' below existing grade.

RECORD OF SOIL PROFILE

Stantec

TH No.: 3 Logged by: LARRY PRESADO Drill Date: JANUARY 28, 2016

Client: MWSB Project: PETERSFIELD TRUCK DUMP LAGOON Start Time _____ End Time: _____

Drill Contractor: MAPLE LEAF Drill Rig:: Acker Renegade Drilling Method: 125 mm ø SSA

Location: PETERSFIELD, MB GPS Coordinates: 647603 E, 5575842 N, Elevation: — m Sheet 1 of 1

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	14"	Topsoil	black, frozen	AC		1'			
14"	6'	Silty	brown, frozen (stiff), moist	"		2.5'			
		Clay	high plasticity	"		5'			
6'	15'	Clay	brown, stiff, moist,	"		7.5'			
			high plasticity	"		10'			
			silty from 6.5' to 7.5'	"		12.5'			
			trace silt	"		15			

Soil Sloughing
- (None)
- Yes —> Source (soil type): _____
  —> Source (depth): _____
- Yes —> Source (soil type): _____
  —> Source (depth): _____
- Yes —> Source (soil type): _____
  —> Source (depth): _____

Groundwater Seepage
- (None)
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: 15'
Terminated

Sample Types
(AC) - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: frozen up to 2.5'
Testhole was backfilled with auger cuttings only

RECORD OF SOIL PROFILE

Stantec

TH No.: 4 Logged by: LARRY PRESADO Drill Date: JANUARY 28, 2016

Client: MWSB Project: PETERSFIELD TRUCK DUMP LAGOON Start Time _____ End Time: _____

Drill Contractor: MAPLE LEAF Drill Rig:: Acker Renegade Drilling Method: 125 mm ø SSA

Location: PETERSFIELD, MB GPS Coordinates: 14U 647648 E. 5575842N. Elevation: ✓ m Sheet 1 of 1

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	10"	Topsoil	black, frozen	AC		1'			
10"	4.5'	Silty Clay	tan (frozen) firm to stiff, medium to high plasticity	"		2.5'			
				"		5'			
4.5'	15'	Clay	brown/greyish, stiff, moist, high plasticity trace silt	"		7.5'			
				"		10'			
				"		12.5'			
				"		15'			

Soil Sloughing
- None
- Yes --> Source (soil type): _____ --> Source (depth): _____
- Yes --> Source (soil type): _____ --> Source (depth): _____
- Yes --> Source (soil type): _____ --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: 15'
Terminated

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: Frozen up to 2.5'.
Testhole was backfilled with auger cuttings

RECORD OF SOIL PROFILE

Stantec

TH No.: 5 Logged by: LARRY PRESADO Drill Date: JANUARY 28, 2016

Client: MWSB Project: PETERSFIELD TRUCK DUMP LAGOON Start Time _____ End Time: _____

Drill Contractor: MAPLE LEAF Drill Rig:: Acker Renegade Drilling Method: 125 mm ø SSA

Location: PETERSFIELD, MB GPS Coordinates: 14N 647582 E, 5575859 N, Elevation: ___ m Sheet 1 of 1

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	10"	Topsoil	black	AC		1'			
10"	6'	Clayey SILT	tan, frozen, moist, med to low plasticity	"		2.5'			
				"		5'			
6'	20'	Clay	brown, stiff, moist, high plasticity	"		7.5'			
				"		10'			
			trace silt	"		12.5'			
			firm below 14'	"		15'			
			some silt till inclusion below 16'	"		20			
			Some Coarse Sand & trace fine gravel below 16'						

Soil Sloughing
(None)
- Yes --> Source (soil type): Clayey Silt
  --> Source (depth): 4'-6'
- Yes --> Source (soil type): _____
  --> Source (depth): _____
- Yes --> Source (soil type): _____
  --> Source (depth): _____

Groundwater Seepage
- None
- Minor
- (Moderate)
- Heavy

Depth of Seepage: 4'-6'
Final Groundwater depth: ~~18.5'~~

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

~~Refusal Depth:~~ 20'
Terminated

Sample Types
(AC) - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: If sloughing, use hollow stems

Comments: Frozen up to 4.5'. TH open up to 18.5' ~~from~~ below existing grade
TH Backfilled w/ auger cuttings.

RECORD OF SOIL PROFILE

Stantec

TH No.: 6 Logged by: LARRY PRESADO Drill Date: JANUARY 28, 2016

Client: MWSB Project: PETERSFIELD TRUCK DUMP LAGOON Start Time _____ End Time: _____

Drill Contractor: MAPLE LEAF Drill Rig:: Acker Renegade Drilling Method: 125 mm ø SSA

Location: PETERSFIELD, MB GPS Coordinates: 14U 647628 E, 5575861 N, Elevation: — m Sheet 1 of 1

Typical Soil Classifications: Clay / Clay Fill / Silt / Sand / Gravel / Glacial Till / Granular Base or Fill / Topsoil / Peat or Organics / Bedrock

Colour	Consistency	Compactness	Water Content	Plasticity	Particle Size	Quantity
Black Grey Brown Tan	Torvane Hard >200 kPa Very Stiff 100-200 kPa Stiff 50-100 kPa Firm 25-50 kPa Soft 12-25 kPa Very Soft <12 kPa	SPT Very loose 0-4 Loose 4-10 Compact 10-30 Dense 30-50 Very Dense >50	Dry Moist Saturated	Non Plastic (NP) Low Plasticity (LP) Int. Plasticity (IP) High Plasticity (HP)	Fine Sand 0.075 - 0.425 mm Medium Sand 0.425 - 2.0 mm Coarse Sand 2.0 - 4.75 mm Fine Gravel 4.75 - 19 mm Coarse Gravel 19 - 75 mm Cobbles 75 - 300 mm Boulders >300 mm	Trace 0-10% Some 10-20% Adjective 20-35% (silty/clayey/sandy) And 35-50%

Depth from	Depth to	Soil Type	Soil Description	Soil Samples Type	Soil Samples Depth from	Soil Samples Depth to	Field Tests Test	Field Tests Depth	Field Tests Test Result
0	4"	Topsoil	black, frozen	AC		1'			
4"	6'	Clayey	trace, frozen, (firm → soft)	"		2.5'			
		SILT	moist, med to low plasticity	"		5'			
6'	20'	Clay	brown, stiff, moist-	"		7.5			
			high plasticity	"		10			
			trace to some silt till	"		12.5'			
			inclusions below 17.5'	"		15'			
			some coarse sand, trace	"		20'			
			fine gravel below						
			17.5'						

Soil Sloughing
- None
- Yes → Source (soil type): _____ → Source (depth): _____
- Yes → Source (soil type): _____ → Source (depth): _____
- Yes → Source (soil type): _____ → Source (depth): _____

Groundwater Seepage
- None
- Minor
- Moderate
- Heavy

Depth of Seepage: _____
Final Groundwater depth: _____

Auger Refusal
- Bedrock
- Dense Till
- Boulders
- Other

Refusal Depth: 20'
Terminated

Sample Types
AC - Auger Cutting
ST - Shelby Tube
SS - Split Spoon
C - Core
JS - Water Sample for Sulphate Content

Field Tests
SPT - Standard Penetration Test
PP - Pocket Penetrometer
TV - Torvane
Note: record correction factor for torvane tests
Note: if sloughing, use hollow stems

Comments: Frozen up to 2'.
Testhole was backfilled w auger cuttings

APPENDIX 2

Certificate of Title

STATUS OF TITLE

Title Number **1603055/1**
Title Status **Accepted**
Client File LDIAZ

The Property Registry
A Service Provider for the Province of Manitoba

1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION

RURAL MUNICIPALITY OF ST. ANDREWS

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

SW 1/4 36-15-4 EPM
EXC ALL MINES AND MINERALS SET FORTH IN THE CROWN LANDS ACT

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:	**Caveat**
Registration Number:	**2315311/1**
Instrument Status:	**Accepted**
Registration Date:	1998-10-21
From/By:	HER MAJESTY THE QUEEN (MANITOBA)
To:	AS AGENT: HARLEY S. JONASSON
Amount:	
Notes:	No notes
Description:	AGREEMENT OF SALE (RE: FLOOD COMPENSATION ETC.)

3. ADDRESSES FOR SERVICE

RURAL MUNICIPALITY OF
ST. ANDREWS
GENERAL DELIVERY
CLANDEBOYE MB
R0C 0P0

4. TITLE NOTES

No title notes

5. LAND TITLES DISTRICT

Winnipeg

6. DUPLICATE TITLE INFORMATION

Duplicate not produced

7. FROM TITLE NUMBERS

B67799/1 Partial

8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS

No real property application or grant information

9. ORIGINATING INSTRUMENTS

Instrument Type:	**Transfer Of Land**
Registration Number:	**2315310/1**
Registration Date:	1998-10-21
From/By:	HER MAJESTY THE QUEEN (MANITOBA)
To:	RURAL MUNICIPALITY OF ST. ANDREWS
Consideration:	$33,300.00

10. LAND INDEX

SW 36-15-4E
EX RES

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM OF TITLE NUMBER 1603055/1

APPENDIX 3

Application for Wastewater Treatment Facility Classification

Application for Wastewater Treatment Facility Classification

also available online at http://www.manitoba.ca/certification

Please print clearly or type and follow the instructions on the application form.
NOTE: If using Adobe Reader text can be inserted into form and tab between fields.

This application is pursuant to the Water and Wastewater Facility Operators Regulation issued under The Environment Act.

Name of Facility:	Petersfield Truck Dump Wastewater Lagoon
Name of Facility Owner: (Municipality/Commission/ Company/Individual/etc)	RM of St. Andrews
Civic Address of Facility:	SW Sec 36 TWP 15 RGE 4E, RM of St. Andrews
Mailing Address of Owner:	500 Railway Avenue, Box 130, Clandeboye, MB

Postal Code: R0C 0P0	Telephone: (204) 738-2264
Contact Person: Andrew Weremy	Position: CAO

Cell or Pager:	Fax: (204) 738-2500	Email: andrew@rmofstandrews.com

Is this a REAPPLICATION? (•) Yes ( ) No

Please complete the following. The information provided will be used to classify the wastewater treatment facility under the Water and Wastewater Facility Operators Regulation. In some cases actual numbers or answers must be supplied, but in most cases it will only be necessary to check the appropriate criteria.

Forward the completed form to:

Director
Environmental Assessment & Licensing Branch
Manitoba Conservation
160 – 123 Main Street
Winnipeg MB R3C 1A5

Please direct questions to:

Certification Program Coordinator
Phone: (204) 945-7065
Fax: (204) 945-5229

FOR MANITOBA CONSERVATION USE ONLY

Operation ID # _____

Stakeholder ID # _____

Approval ID # _____

EO/DWO _____

Application for Wastewater Treatment Facility Classification

SYSTEM *(choose all that apply)*			
1.	New or proposed Facility seeking classification	☐	
	Proposed start of operations (month / year)		
	Existing Facility seeking classification (in operation prior to December 31, 2005)	☑	
	Facility has been in operation since ~~(approximate month/year)~~ October 1996		
2.	The facility **WILL** employ mechanical treatment processes	○	
	The facility **WILL NOT** employ mechanical treatment processes	◉	

SIZE *(refer to Supplemental Information for point designation) (2 point minimum to 20 point maximum)*				
1.	Maximum population or part served, peak day	# 250 people		1-10
2.	Design flow average day **Estimated** or **Actual** (Circle volume option & units) ○ ◉ **OR** Peak month's flow average day **Estimated** or **Actual** ○ ○	80 ○ m^3/day ○ gal/day _____ ○ m^3/day ○ gal/day		1-10

VARIATION IN RAW WASTE[1] *(choose all that apply) (0 point minimum to 6 point maximum)*			
1.	Variations do not exceed those normally or typically expected	☐	0
2.	Recurring deviations or excessive variations of 100-200% in strength	☐	2
	Recurring deviations or excessive variations of 100-200% in flow	☐	
	Recurring deviations or excessive variations of 100-200% in strength and flow	☐	
3.	Recurring deviations or excessive variations of more than 200% in strength	☐	4
	Recurring deviations or excessive variations of more than 200% in flow	☐	
	Recurring deviations or excessive variations of more than 200% in strength and flow	☐	
4.	Raw wastes subject to toxic waste discharges	☐	6
5.	Septage or truck-hauled waste discharge is accepted at the facility.	☑	0 - 4
	Estimated number of loads per day in peak haul times	25	

Application for Wastewater Treatment Facility Classification

PRELIMINARY TREATMENT *(choose all that apply)*			
1.	Facility pumping of main flow	☐	3
2.	Screening or comminution	☐	3
3.	Grit removal	☐	3
4.	Equalization	☐	1

PRIMARY TREATMENT *(choose all that apply)*			
1.	Clarifiers	☐	5
2.	Anaerobic treatment with biogas flare	☐	10
3.	Anaerobic treatment with biogas utilization facility	☐	15

SECONDARY TREATMENT *(choose all that apply)*			
1.	Fixed-film reactor	☐	10
2.	Activated sludge	☐	15
3.	Stabilization ponds without aeration (ie: sewage lagoon)	☐	5
4.	Stabilization ponds with aeration	☐	8

TERTIARY TREATMENT *(choose all that apply)*			
1.	Polishing ponds for advanced waste treatment	☐	2
2.	Chemical / physical advanced waste treatment without secondary treatment	☐	15
3.	Chemical / physical advanced waste treatment following secondary treatment	☐	10
4.	Biological or chemical / biological advanced waste treatment	☐	12
5.	Nitrification by designed extended aeration only	☐	5
6.	Ion exchange for advanced waste treatment	☐	10
7.	Reverse osmosis, electrodialysis and other membrane filtration techniques	☐	10
8.	Advanced waste treatment chemical recovery, carbon regeneration	☐	4

Application for Wastewater Treatment Facility Classification

9.	Media filtration	☐	5

ADDITIONAL TREATMENT PROCESSES *(choose all that apply)*			
1.	Chemical addition: *(Please list chemicals used, 2 pts per chemical to max. of 6)*	☐	0 - 6
2.	Dissolved air floatation (other than for sludge thickening)	☐	8
3.	Intermittent sand filter	☐	2
4.	Recirculating intermittent sand filter	☐	3
5.	Microscreens	☐	5
6.	Generation of oxygen	☐	5

SOLIDS HANDLING *(choose all that apply)*			
1.	Storage (other than for stabilization)	☐	2
2.	Stabilization by storage (including any storage afterwards)	☐	4
3.	Gravity thickening	☐	2
4.	Mechanical dewatering	☐	8
5.	Anaerobic digestion of solids	☐	10
6.	Utilization of digester gas for heating or cogeneration	☐	5
7.	Aerobic digestion of solids	☐	6
8.	Air-drying of sludge	☐	2
9.	Solids reduction (including incineration and wet oxidation)	☐	12
10.	Disposal in landfill	☐	2
11.	Solids composting	☐	10
12.	Land application of biosolids by contractor	☐	2
13.	Land application of biosolids by facility personnel	☐	10

Application for Wastewater Treatment Facility Classification

DISINFECTION *(choose all that apply) (0 point minimum to 10 point maximum)*			
1.	Chlorination	☐	5
	Ultraviolet irradiation	☐	
2.	Ozonization	☐	10

EFFLUENT DISCHARGE *(choose all that apply) (0 point minimum to 10 point maximum)*			
1.	Discharge to surface water (constructed wetland and then to Netley Marsh)	✔	0
2.	Mechanical post-aeration	☐	2
3.	Direct recycling and reuse	☐	6
4.	Land treatment and surface or subsurface disposal		4

INSTRUMENTATION *(choose one) (0 point minimum to 6 point maximum)*			
1.	SCADA or similar instrumentation systems are used to provide:		
	• Data with no process operation	○	0
	• Data with limited process operation	○	2
	• Data with moderate process operation	○	4
	• Data with extensive or total process operation	○	6

LABORATORY CONTROL[2] *(choose all that apply) (0 point minimum to 15 point maximum)*			
1.	Bacteriological / Biological *(0 point minimum to 5 point maximum)*		
	• Lab work done outside the facility	✔	0
	• Membrane filter procedures	☐	3
	• Use of fermentation tubes or any dilution method of fecal coliform determination	☐	5
2.	Chemical / Physical *(0 point minimum to 10 point maximum)*		
	• Lab work done outside the facility	✔	0

Application for Wastewater Treatment Facility Classification

	• Push button or visual methods for simple tests such as pH or settleable solids *(List tests)*	☐	3
	• Additional procedures such as DO, COD, BOD, gas analysis, titration, solids content or volatile content *(List tests)*	☐	5
	• More advanced determinations such as specific constituents, nutrients, total oils or phenols *(List tests)*	☐	7
	• Highly sophisticated instrumentation such as atomic absorption or gas chromatograph *(List tests)*	☐	10

APPLICANT VERIFICATION	
I HEREBY DECLARE THAT ALL INFORMATION IN THIS APPLICATION IS TRUE.	
Name of Applicant[3]: (Print) Tim Stratton, P.Eng., of Stantec Consulting on behalf of the RM of St. Andrews	
Title: Project Manager	
Telephone: (204) 478-8997	Fax: (204) 453-9012
Email: tim.stratton@stantec.com	
Signature of Authorized Representative:	Date:

[1]The key concepts are frequency or intensity of deviation, or excessive variation from normal or typical fluctuations. The deviations in strength, toxicity, ratio of infiltration to inflow, or shock loads.

[2] The key concept is to credit laboratory analyses done on-site by facility personnel under the direction of an operator-in-charge with points from 0-15.

[3] Applicant must be an authorized representative of the owner/operating authority (i.e. manager, P. Eng., or overall responsible operator).

Print Application Form

Wastewater Treatment Form Supplemental Information

This is supplemental information for completing the Application for Wastewater Treatment Facility Classification Form only.

For exact definitions and text refer to Manitoba Regulation 77/2003, Water and Wastewater Facility Operators Regulation and amendment M.R. 162/2005, under The Environment Act (C.C.S.M. c E125).

A copy of the regulation is available by following the link for Manitoba Regulations at: http://www.gov.mb.ca/conservation/envapprovals/publs/index.html

Facilities are classified as follows:

Small system class
A wastewater treatment facility that otherwise meets the criteria of a class 1 wastewater treatment facility shall be classified in the small system class if

a) it treats wastewater from a population of no more than 500; and
b) no mechanical treatment processes are employed at the facility.

Classes 1 to 4
Wastewater treatment facilities shall be classified in classes 1 to 4 in accordance with the following table, on the basis of the number of classification points assessed under the classification point system set out in the Water and Wastewater Facility Operators Regulation.

Range of Classification Points	Classification
0 to 30	Class 1
31 to 55	Class 2
56 to 75	Class 3
76 or more	Class 4

Size

Points for size: (2 point minimum to 20 point maximum)

Maximum population or part served, peak day (1 point minimum to 10 point maximum). Points are assigned at 1 point per 10,000 population or part.

Design flow average day or peak month's flow average day, whichever is larger (1 point minimum to 10 point maximum). Points are assigned at 1 point per 4.5 megalitres per day or part.

Authorized Representative

Signatures for the Applicant Verification section must be an individual recognized by the Owner of the facility as able to sign official documentation (i.e. P.Eng., Manager, CAO, etc).