



NOTICE OF ALTERATION

TO: Director – Conservation and Climate, Environmental Approvals
FROM: Jason Bunn, P.Eng. – WSP Canada Inc.
SUBJECT: Maxwell Colony Lagoon Relocation – Client File No. 5876.00
DATE: January 7, 2022

INTRODUCTION

On behalf of our client Maxwell Colony Farms (MCF), we are providing an update in the form of a Notice of Alteration (NOA) to the previously submitted Environment Act Proposal (EAP) dated January 2016 for the construction of a new Colony wastewater treatment lagoon. Before being stayed, the project proceeded as far as the draft Environment Act Licence (EAL), which was issued on January 30, 2018.

The following formal correspondence was a part of the 2016 EAP review leading up to the issuance of the draft EAL:

- EAP Preliminary review letter request (dated March 9, 2016) from MCC
- Letter response (dated July 19, 2016) from WSP
- Memorandum (dated May 2, 2017) from Manitoba Water Quality Management Section
- Memorandum Response (dated August 8, 2017) from WSP

BACKGROUND

The EAP involved the development of a new lagoon adjacent to the existing, earthen manure storage pond south of Provincial Road No. 424. In the course of the EAP review, a number of issues and questions were raised by the Environmental Approvals Branch of Manitoba Conservation and Climate, in particular with regard to the effluent discharge route and proposed measures to deal with the residual phosphorus in the effluent from the lagoon.

During the approvals process, MCF managers realized that part of the proposed lagoon and related pipeline infrastructure would interfere with the existing underground pipelines for the application of manure from the manure storage pond. To resolve this conflict, MCF desires to move the lagoon to an alternate location north of the Provincial Road and nearer to the Colony farmsite.

In order to consider the alternate proposed site, it was necessary to undertake a soil investigation of the area. Also, the proposed eventual effluent discharge route from the alternative site is different than that of the earlier proposed site and will be discussed further below. Any changes to the information proposed in the January 2016 EAP and subsequent correspondence will be updated as part of this NOA.

PROJECT OWNERSHIP AND LOCATION

Land Ownership and Mineral Rights - Section 2.3.1 from EAP

MCF owns the lagoon development land which is now proposed in River Lots 105 to 108, Parish of St. Francois Xavier in the Rural Municipality of Cartier. The Status of Titles are included in Appendix A. The rights to the mines & minerals and sand & gravel for these river lots continue to be owned by the surface's current landowner, Maxwell Hutterian Mutual Corporation, as confirmed with Real Estate Services Branch (Appendix D).

Proposed Wastewater Treatment Lagoon Location - Section 2.3.2 from EAP

The proposed wastewater treatment lagoon is to be located to the southwest of the Colony farm site on the north side of Provincial Road 424 (R.M. of Cartier) in River Lots 106, 107 and 108, Parish of St. Francois Xavier, as shown in Figure 1. Approximate UTM coordinates for the site are 596450 m E, 5533700 m N.



Source: © 2021 Microsoft Corporation © 2021 Maxar © CNES (2021) Distribution Airbus DS

Figure 1: Maxwell Colony and Proposed Wastewater Lagoon Location Plan

Description of Existing Land Use - Section 2.3.3 from EAP

The land intended for lagoon development is currently agricultural land. Land designation and zoning are unchanged from the EAP (“RG”, Rural General Policy Area” and zoned “AG”, Agriculture General).

DESCRIPTION OF PROPOSED DEVELOPMENT

The current MCF population (110 people), design population serviced (220 people), organic loading (16.94 kg-BOD₅/d), hydraulic loading (275 litres per capita-day L/c/d), and the wastewater sources identified in the EAP remain unchanged.

PROPOSED DEVELOPMENT

Besides the change in location, the lagoon design has also been changed to include the addition of a wetland treatment cell for the purpose of natural reduction of excess phosphorus using wetland plants. Furthermore, two secondary cells are necessary to facilitate uninterrupted liquid transfer into the wetland cell during the allowable 138-day discharge period (June 16th – October 31st).

The proposed lagoon and wetland treatment cell will be constructed as illustrated in the NOA design drawings (Appendix B). A lagoon with a wetland cell requires a modified approach to sizing the cells as the typical lagoon design does not operationally suit the circumstances. At full design,

$$220 \text{ c} \times 275 \text{ L/c/d} \times 365 \text{ d} \div 1000 \text{ L/m}^3 = 22,083 \text{ m}^3$$

of domestic wastewater will be generated by MCF annually. This wastewater must be discharged within the course of the 138-day discharge period. Conservatively, the design of the proposed MCF lagoon and wetland cell accommodates a 128-day discharge which corresponds to 172.5 m³/d or approximately 2.0 L/s.

The primary and secondary cells were designed to allow for continuous discharge during the selected 128-day period without any cell exceeding their 1.5 m maximum operating depths. At full design, three discharges (from isolated secondary cells) will be required. These discharges will occur over approximately 55, 53 and 20 days at the rate of 172.5 m³/d. The design parameters for each of the proposed cells are documented in Table 1.

Table 1 MCF cell design parameters

Parameter	Primary Cell	Secondary Cell 1	Secondary Cell 2	Wetland Cell
Cell bottom [m]	61 x 116	60 x 112.5	60 x 112.5	100.0 x 157.8
Operating depth [m]	1.5			0.3
Freeboard height [m]	1.0			1.37
Interior / Exterior side slope	4 horizontal : 1 vertical			
Total volume [m ³]	12,193	11,663	11,663	8,950 ^{*1}
Storage volume [m ³]	6,096	9,583	9,583	n/a
Surface area [ha] (at max. depth)	0.924	0.886	0.886	1.64
Liner system	Insitu clay			

^{*1} includes cross ditch volumes

Whereas a primary cell is typically sized based on the organic loading, for a small wastewater treatment lagoon that includes a wetland cell, the governing factor is the ability of the cell to operate without exceeding the maximum depth while the lagoon system is continuously discharging during the summer. At full design, the MCF primary cell should not need to exceed an operating level of 1.3 m at any point during the year. The treatment capacity of the proposed primary cell is **51.7 kg-BOD₅/d**.

Whereas the storage of a lagoon is typically calculated utilizing half of the volume of the primary cell plus the active storage component of the secondary cells, again, for a small wastewater treatment lagoon that includes a wetland cell, the governing factor is the ability of the cell to operate without exceeding the maximum depth while the lagoon system is continuously discharging during the summer. Using the MCC established guideline of determining the storage capacity of the lagoon, the proposed MCF lagoon provides a storage capacity of **25,262 cu.m.**

Total phosphorus (TP) was used to size the wetland treatment cell since TP removal usually requires the largest wetland area for treatment compared to other pollutants (Kadlec 2002). Upon discharge from the wetland cell, the treated effluent must meet the Provincial discharge regulation of 1.0 mg/L of TP which was an inclusion in the draft licence previously issued by MCC for this project. To be conservative, an influent phosphorus loading of 6 mg/L was assumed. Using this value and the projected annual hydraulic loading of 22,083 m³, the design annual phosphorus loading is estimated to be 132.5 kg/yr. Based on an estimated phosphorus removal of 1 kg/day per hectare (of functional wetland area) during the selected 128-day summer discharge period, a tertiary wetland cell would need an approximate bottom area of 1.04 ha. Note that this estimate does not include the wetland area that is non-functional for phosphorus removal (i.e. cross-ditches). The MCF wetland cell provides **1.05 ha** of functional wetland area, thus meeting the minimum requirement.

TOPOGRAPHICAL SURVEY

We conducted a topographical survey of the new development area for the purpose of positioning the cells and meeting the 1:200 year flood elevation of 241.77 metres (793.20 feet) CGVD28, as provided by the Hydrologic Forecasting & Water Management Division of Manitoba Infrastructure. All cells meet the minimum top of dyke elevation.

GEOTECHNICAL INVESTIGATION

A new geotechnical investigation took place on November 19, 2020 on the proposed development area. The report is included in Appendix C. The subsurface profiles are similar to the previous investigation. The proposed lagoon will be constructed with a clay core.

EFFLUENT DISCHARGE ROUTE

Upon being discharged from the proposed wetland cell, the treated effluent will flow into the watercourse that connects with Hammercrest Creek, an oxbow, just to the west of the MCF site. Hammercrest Creek has a normally closed valved connection with the Assiniboine River. The purpose of this valve is for flood control. The existing lagoon discharges to Hammercrest Creek.

EXISTING LAGOON DECOMMISSIONING

The 2016 EAP (Section 4.8) documents the details involved in the decommissioning of the existing MCF lagoon. As mentioned in the Introduction Section, after a preliminary review of the EAP, MCC (then Manitoba Conservation and Water Stewardship) requested additional information in a March 9, 2016 letter. This information was required before MCC would proceed with the EAP review process. WSP, on behalf of MCF submitted a response to each of the requests (July 19, 2016 letter), one of which focussed on the sludge removal from the existing MCF lagoon. During email correspondence in July and August 2020, WSP confirmed that the collective information submitted

to date is sufficient for the inclusion of the existing lagoon decommissioning in the new EAL to be issued.

ENVIRONMENTAL IMPACTS

Odour Consideration - Section 5.1 from EAP

The relocated lagoon is situated approximately 580 metres away from the nearest residence, which is a dwelling within the Colony. The nearest residence beyond the Colony is more than 2.1 kilometres away (to the north).

Land Impact - Section 5.2 from EAP

The land now proposed for the relocated lagoon is cultivated agricultural land.

Surface Water - Section 5.3 from EAP

From the discharge point into the new wetland cell, the treated effluent will flow slowly through the wetland cell and be discharged into a manhole (sampling point) and be discharged into a watercourse and then flow into Hammercrest Creek to the west of the MCF site. With the tertiary polishing provided by the wetland cell, the discharge of 22,083 m³ (at full design) will occur over a 128-day period at an anticipated rate of approximately 2 L/s.

If required, perimeter ditching will be constructed to provide positive drainage for surface water around the lagoon. There are no known local field drains that will be interrupted by construction.

The proposed facility is in the Central La Salle Watershed (No. 23).

The water licensing branch of Manitoba Conservation and Climate was consulted to provide a list of water users on Hammercrest Creek. There are no licensed water users. (Appendix D).

Species Impact - Section 5.5 from EAP

A file search with the Wildlife, Fisheries and Resource Enforcement Branch of Manitoba Agriculture and Resource Development resulted in no occurrences found within the development site, which was expected because it is currently used for agriculture purposes. However, within a 2 kilometre radius from the development area one occurrence of an aquatic species was found:

- Mapleleaf Mussel (*Quadrula quadrula*), S1, ESEA: Endangered, SARA/COSEWIC: Threatened

Correspondence and general area records are included in Appendix D.

Fisheries - Section 5.6 from EAP

The watercourse that the wetland cell will discharge into is classified as type A habitat (complex habitat with indicator fish species present) according to Fisheries and Oceans Canada. Hammercrest Creek into which the treated effluent will flow is unclassified however it would be expected to be similar.

In order to protect any potential fish along the discharge route during the critical springtime spawning season, when effluent un-ionized ammonia tends to be high, the lagoon has been designed for a storage period that will permit the discharge to be made after June 15th in any year. This will allow for conversion of any potential toxic un-ionized ammonia into relatively benign nitrates and will minimize the potential of a discharge being made during the spawning period.

As noted from Fisheries and Oceans Canada, the deposit of deleterious substances into water frequented by fish is prohibited under the Fisheries Act. In addition, according to subsection 35(1) of the Fisheries Act, “no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.”

Heritage Resources - Section 5.8 from EAP

In a memorandum dated May 12, 2021 from the Historic Resources Branch (Appendix D), it was stated that the lagoon development has the potential to impact heritage resources and therefore a heritage resource impact assessment (HRIA) is required.

North Roots Research (NRR) was retained to conduct the HRIA on a 19.5 ha area in River lots 105-109 Parish of St. Francois Xavier in the Rural Municipality of Cartier for the development of the lagoon.

For the lagoon site, on October 2nd & 3rd (2021) NRR excavated 12 subsurface tests with depths reaching 30 to 100 cm below the surface. Although the HRIA resulted in the recovery of a few fragments of artifacts scattered across the entire area, NRR has recommended that the lagoon project be allowed to proceed. The HRIA entire report is attached in Appendix E.

MANAGEMENT PRACTICE

With the construction of a new wetland cell, the new wastewater treatment facility will provide tertiary treatment for the reduction of phosphorus to meet the licenced limit. The facility will be discharged during the allowable period from June 16th to October 31st.

Operation of the wastewater treatment lagoon system must comply with the specifications, limits, terms and conditions of the new Environment Act Licence. The new wastewater treatment facility is specifically designed to provide wastewater treatment and storage capacity for the proposed population of 220 people. The proposed lagoon is designed to treat wastewater up to an average loading of 51.74 kg-BOD₅/d and provide storage up to 25,262 m³ over a period of 227 days. The wetland cell will function to reduce total phosphorus levels in the wastewater below 1.0 mg/L. The facility will normally be continuously discharged (seasonally) during the allowable period from isolated secondary cells. It may be possible to discharge in alternate years in the beginning until population numbers and wastewater volume increase until annual discharges are required.

Wetland Operation During Commissioning Phase

The capacity of a treatment wetland to meet total phosphorus removal requirements is dependent on having mature plant coverage over the entire wetland cell footprint, except in the cross ditches. As wetland plants will be established either from seed or plant propagules, full treatment capacity will not be available until full growth is met. It is expected to take up to two summer growing seasons for wetland plants in the treatment wetland to increase their growth and coverage to full capacity. These two years are termed the commissioning phase. During commissioning, alternate operation practices for discharge are proposed.

During the first two years of treatment wetland operation (i.e., the commissioning phase), there is expected to be no need for discharge from the new facility. The total volume of the three proposed

lagoon cells is 35,519 m³. At the current population and design wastewater generation rate, it will take over three years to fill the cells. As such, once the wetland cell is to receive water to support the commissioning phase, it will initially come from Hammercrest Creek until there is sufficient water within the lagoon cells for this purpose. During early wetland plant growth, water depths above plant height can drown wetland plants. Therefore, during the commissioning period, the treatment wetland cell will receive water/wastewater only to support new plant growth. No discharge from the treatment wetland is expected to occur during this commissioning phase. Following the commissioning phase, once full growth and coverage by wetland plants can be demonstrated, as well as total phosphorus data that indicates the designed treatment wetland performance is being met, discharge under regular operation will commence.

Regular Wetland Operation

The planned seasonal continuous discharge from the wetland cell will be from June 16th through to October 31st. With two secondary cells, MCF has flexibility in the management of the liquid levels in the cells in preparation for the first discharge. A minimum of six weeks prior to June 16th, valves will be manipulated to isolate one of the secondary cells. The other non-isolated secondary cell will continue to receive the primary treated effluent. Following isolation, discharge into the treatment wetland shall occur. Testing shall be conducted according to the Environment Act Licence.

For the proposed facility, we anticipate the following effluent monitoring requirements in the EAL:

The Licencee shall, during each effluent discharge campaign, obtain grab samples of the treated wastewater at the outlets of the secondary cells being discharged at the commencement of each discharge campaign and once each month during the campaign with at least fifteen days between each monthly sampling event, and have the grab samples analyzed for:

- a) the organic content as indicated by the five-day carbonaceous biochemical oxygen demand and expressed as milligrams per litre;*
- b) the total suspended solids content expressed as milligrams per litre;*
- c) the fecal coliform content as indicated by the MPN index and expressed as MPN per 100 millilitres per sample; and*
- d) the unionized ammonia nitrogen content expressed as milligrams per litre.*

The Licencee shall, during each effluent discharge campaign, obtain grab samples of the treated wastewater at the outlet of the constructed wetland treatment cell:

- a) at the commencement of the discharge campaign;*
- b) during the first summer discharge period, once each week during the discharge campaign with at least four days between each weekly sampling event;*
- c) during subsequent summer discharge periods, once every two weeks during the discharge campaign;*
- d) have each grab sample analysed for total phosphorus content expressed as milligrams per litre; and*
- e) determine a thirty-day rolling average based on the results of the analyses of not fewer than three grab samples.*

Once the test results of the effluent meet or exceed all parameters that should be satisfied prior to discharge, the continuous discharge of the wetland cell will begin, no earlier than June 16th.

The wetland system is designed to release the treated effluent throughout the discharge period (June 16th – October 31st). To meet the Provincial regulations, a 30-day rolling average (consisting of a minimum of three grab samples) will be used for total phosphorus levels when the discharge occurs from the wetland cell. This means any data collected in the previous 30 days is used to calculate the average total phosphorus. After the first year summer discharge, samples should be taken every two weeks during discharge from June 16th to October 31st, or up to 10 samples per year plus 1 sample prior to releasing the treated effluent from the wetland cell. For all other parameters, monthly grab samples will be collected. Should any of the parameters exceed regulated levels, discharge from the wetland will cease to allow for additional treatment time.

The discharge of the wetland cell should be stopped at or before the November 1 deadline.

REFERENCES

Kadlec, R.H. 2002. *Creating and Using Wetlands for Wastewater and Stormwater Treatment*. Workshop at Oak Hammock Marsh, 2002.

APPENDICIES

- A Status of Titles
- B Design Drawings
- C Geotechnical Report
- D General Correspondence
- E HRIA Report



APPENDIX

A STATUS OF TITLES



STATUS OF TITLE

Title Number **1760274/1**
Title Status **Accepted**
Client File **Maxwell Colony 151-13571-00**

The Property Registry

A Service Provider for the Province of Manitoba



1. REGISTERED OWNERS, TENANCY AND LAND DESCRIPTION

MAXWELL HUTTERIAN MUTUAL CORPORATION

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

RLS 101 TO 112 PARISH OF ST FRANCOIS XAVIER
EXC OUT OF ALL LOTS, MAIN HIGHWAY PLANS 552 WLTO AND 4137 WLTO AND
PUBLIC ROAD PLAN 38973 WLTO AND
EXC OUT SAID RL 103, ROAD PLAN 2906 WLTO

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: **87-1429/1**
Instrument Status: **Accepted**

Registration Date: 1987-01-07
From/By: MANITOBA HYDRO ELECTRIC BOARD
To:

Amount:
Notes: AFF: PART RLS 101 AND 104
Description: No description

Instrument Type: **Mortgage**
Registration Number: **2013987/1**
Instrument Status: **Accepted**

Registration Date: 1996-05-01
From/By: MAXWELL HUTTERIAN MUTUAL CORPORATION
To: BANK OF MONTREAL

Amount: \$1,300,000.00
Notes: No notes
Description: No description

Instrument Type: **Mortgage**
Registration Number: **2212865/1**
Instrument Status: **Accepted**

Registration Date: 1997-12-01
From/By: MAXWELL HUTTERIAN MUTUAL CORPORATION
To: BANK OF MONTREAL

Amount: \$2,200,000.00
Notes: No notes
Description: No description

Instrument Type: **Caveat**
Registration Number: **2332018/1**
Instrument Status: **Accepted**

Registration Date: 1998-12-08
From/By: MTS COMMUNICATIONS INC.
To:

Amount:
Notes: AFF.; PART
Description: EASEMENT

Instrument Type: **Caveat**
Registration Number: **2543530/1**
Instrument Status: **Accepted**

Registration Date: 2000-11-01
From/By: CARTIER REGIONAL WATER CO-OP INC.
To:

Amount:
Notes: AFF: WTN LTS R/W PL 38937
Description: EASEMENT

Instrument Type: **Mortgage**
Registration Number: **2786335/1**
Instrument Status: **Accepted**

Registration Date: 2002-11-04
From/By: MAXWELL HUTTERIAN MUTUAL CORPORATION
To: BANK OF MONTREAL

Amount: \$4,000,000.00
Notes: No notes
Description: No description

Instrument Type: **Caveat**
Registration Number: **3296420/1**
Instrument Status: **Accepted**

Registration Date: 2006-05-30
From/By: MTS ALLSTREAM INC.
To:

Amount:
Notes: PART OF ALL LOTS
Description: EASEMENT AGREEMENT

Instrument Type: **Mortgage**
Registration Number: **4248706/1**
Instrument Status: **Accepted**

Registration Date: 2012-07-26
From/By: MAXWELL HUTTERIAN MUTUAL CORPORATION
To: BANK OF MONTREAL

Amount: \$8,000,000.00
Notes: No notes
Description: No description

Instrument Type: **Personal Property Security Notice**
Registration Number: **4248707/1**
Instrument Status: **Accepted**

Registration Date: 2012-07-26
From/By: BANK OF MONTREAL
To: JOHN R. BRAUN AS AGENT

Amount:
Notes: No notes
Description: EXPIRES ON 2022/07/11

Instrument Type: **Easement**
Registration Number: **4581237/1**
Instrument Status: **Accepted**

Registration Date: 2015-02-26
From/By: MAXWELL HUTTERIAN MUTUAL CORPORATION
To: CENTRA GAS MANITOBA INC.

Amount:
Notes: AFF: WTN LTS R/W PL 57267
Description: STATUTORY EASEMENT

3. ADDRESSES FOR SERVICE

MAXWELL HUTTERIAN MUTUAL CORP.
RR 1 BOX 210
CARTIER MB
R4M 1B8

4. TITLE NOTES

No title notes

5. LAND TITLES DISTRICT

Winnipeg

6. DUPLICATE TITLE INFORMATION

Duplicate not produced

7. FROM TITLE NUMBERS

B87404/1 Partial

8. REAL PROPERTY APPLICATION / CROWN GRANT NUMBERS

No real property application or grant information

9. ORIGINATING INSTRUMENTS

Instrument Type: **Request To Issue Title**
Registration Number: **2549192/1**

Registration Date: 2000-11-20
From/By: MAXWELL HUTTERIAN MUTUAL CORPORATION
To:
Amount:

10. LAND INDEX

RL 101 FX
EXC PLANS 552, 4137 AND 38973

RL 102 FX
EXC PLANS 552, 4137 AND 38973

RL 103 FX
EXC PLANS 552, 4137, 38973 AND 2906

RL 104 FX
EXC PLANS 552, 4137 AND 38973

RL 105 FX
EXC PLANS 552, 4137 AND 38973

RL 106 FX
EXC PLANS 552, 4137 AND 38973

RL 107 FX
EXC PLANS 552, 4137 AND 38973

RL 108 FX
EXC PLANS 552, 4137 AND 38973

RL 109 FX
EXC PLANS 552, 4137 AND 38973

RL 110 FX
EXC PLANS 552, 4137 AND 38973

RL 111 FX
EXC PLANS 552, 4137 AND 38973

RL 112 FX
EXC PLANS 552, 4137 AND 38973

CERTIFIED TRUE EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE
SYSTEM OF TITLE NUMBER 1760274/1

APPENDIX

B

DESIGN DRAWINGS





- GENERAL DRAWING NOTES:
1. LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE. NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.
 2. DESCRIPTION OF PROPERTY LIMITS, AND EXISTING AND/OR PROPOSED FEATURES RELATIVE TO THESE LIMITS AS SHOWN ON THIS DRAWING DO NOT REPRESENT A LEGAL SURVEY. WSP MAKES NO REPRESENTATION OR GUARANTEE THAT THE PROPERTY LIMIT INFORMATION IS ACCURATE. WSP ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS OR ACTIONS BASED ON THIS DRAWING.
 3. DRAWING IS IN METRIC. WHOLE NUMBERS INDICATE MILLIMETRES, AND DECIMALIZED NUMBERS INDICATE METRES.
 4. BENCHMARK - 239 722 DESCRIPTION - DACOTAH HELIX PIPE WITH BRASS CAP ALONG SOUTH SIDE OF TRANS-CANADA HWY, 8.7 KM SOUTHEAST OF JUNC WITH PROVINCIAL RD #248, AT SOUTHWEST CORNER OF JUNC WITH PROVINCIAL RD #332 ALONG EAST BOUNDARY OF SECTION 34-10-2, 28.0 m S OF CL OF EAST BOUND LANE OF HWY, 15.8 m WEST OF CL OF PROVINCIAL RD NO 332, IN LINE WITH ROW OF POWER POLES GOING SOUTH, 2.6 m N OF FIRST POWER POLE SOUTH OF HWY AND 1.5 m BELOW HWY LEVEL.

GEOTECHNICAL INVESTIGATION		
TEST HOLE ID [TH]	TOPSOIL DEPTH [mm]	APPROX. DEPTH TO END OF FISSURES [m]
1	100	1.2
2	300	1.5
3	150	1.5
4	100	2.1
5	150	2.0
6	200	1.8
7	100	1.7
8	200	1.7

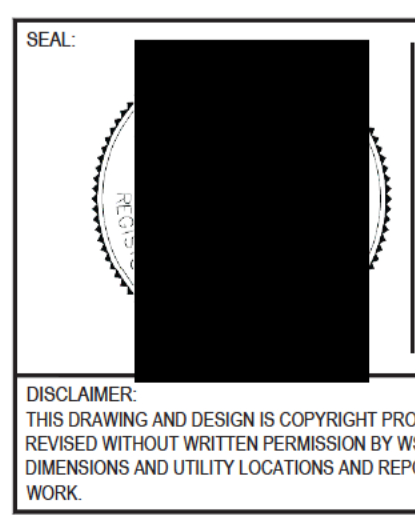
EXISTING	LEGEND-PLAN	PROPOSED
150 WM	WATER MAIN	150 WM
300 LDS	LAND DRAINAGE SEWER	300 LDS
250 WWS	WASTE WATER SEWER	250 WWS
250 FM	FORCEMAIN	250 FM
	EDGE OF ROAD / DYKE	
	DYKE TOE	
	APPROX. PROPERTY LINE	
	FENCE	
	TREE OR SHRUB LINE	
000.00	EXISTING MAJOR CONTOURS	
	EXISTING MINOR CONTOURS	
	FLOW DIRECTION	
	DITCH/SWALE	
	CULVERT	
59.367	GROUND ELEVATION	
00.00	ROAD ELEVATION	00.00
00.00	DYKE ELEVATION	00.00
00.00	DITCH ELEVATION	00.00
	SIGN / SURVEY BAR	
TH TP	TEST HOLE/TEST PIT	
	GUY WIRE / HYDRO POLE	
	CURB STOP / PLUG	
	VALVE / HYDRANT	
	MANHOLE / CLEANOUT	
	BOLLARD	
	WETLAND CATTAIL SEEDING AREA (1.05 ha)	
	CLAY CORE HYDRAULIC CONDUCTIVITY < 1x10 ⁻⁶ cm/s	
	RIP RAP	
	CONCRETE	

PRELIMINARY
NOT FOR CONSTRUCTION

© 2021 MICROSOFT CORPORATION © 2021 MAXAR © CNES (2021) DISTRIBUTION AIRBUS DS

C:\Users\jshibb\OneDrive\Desktop\151-1357-00 Maxwell Colony Farms\151-1357-00 Maxwell Colony Farms.dwg
 FILE: \\gpc\share\151-1357-00 Maxwell Colony Farms\151-1357-00 Maxwell Colony Farms.dwg
 PLOT FILE: 2022-01-07 2:14 PM

REV	DATE	DESCRIPTION	BY	REV	DATE	DESCRIPTION	BY
0	2022/01/07	ISSUED FOR APPROVALS	J.S.B.				



**ENGINEERS
GEOLOGISTS
MANITOBA**
Certificate of Authorization
WSP Canada Inc.
No. 5750

ORIGINAL SCALE: 1:2500
 DESIGNED BY: J.S.B.
 ASSISTED BY: D.T.G.B.
 DRAWN BY: V.A.A.
 MODIFIED BY: V.A.A.
 APPROVED BY: J.S.B.
 DISCIPLINE: INFRASTRUCTURE
 DATE: 2021/11/01
 IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
 25mm

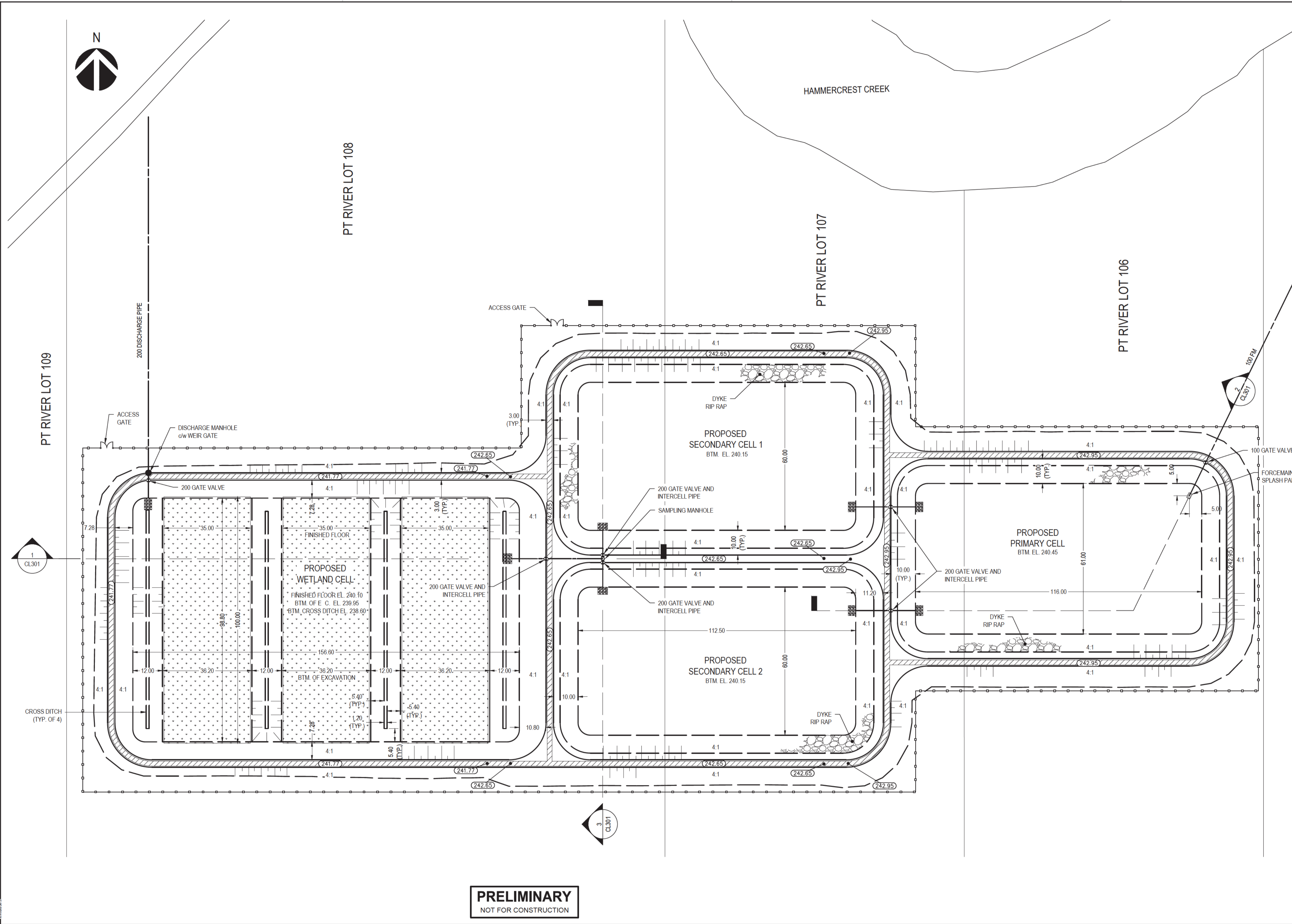
wsp
 WSP Canada Inc.
 1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8
 T 204-477-6950 | www.wsp.com

CLIENT: **MAXWELL COLONY FARMS**
 CLIENT REF. # -

TITLE: **OVERALL SITE PLAN**

PROJECT: **PROPOSED WASTEWATER TREATMENT LAGOON**
 DRAWING NUMBER: **CL101**
 REV: **0**

- GENERAL DRAWING NOTES:
1. LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE. NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.
 2. DESCRIPTION OF PROPERTY LIMITS, AND EXISTING AND/OR PROPOSED FEATURES RELATIVE TO THESE LIMITS AS SHOWN ON THIS DRAWING DO NOT REPRESENT A LEGAL SURVEY. WSP MAKES NO REPRESENTATION OR GUARANTEE THAT THE PROPERTY LIMIT INFORMATION IS ACCURATE. WSP ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS OR ACTIONS BASED ON THIS DRAWING.
 3. DRAWING IS IN METRIC. WHOLE NUMBERS INDICATE MILLIMETRES, AND DECIMALIZED NUMBERS INDICATE METRES.
 4. BENCHMARK - 239 722 DESCRIPTION - DACOTAH HELIX PIPE WITH BRASS CAP ALONG SOUTH SIDE OF TRANS-CANADA HWY, 8.7 KM SOUTHEAST OF JUNC. WITH PROVINCIAL RD #248, AT SOUTHWEST CORNER OF JUNC. WITH PROVINCIAL RD #332 ALONG EAST BOUNDARY OF SECTION 34-10-2, 28.0 m S OF CL OF EAST BOUND LANE OF HWY, 15.8 m WEST OF CL OF PROVINCIAL RD NO 332, IN LINE WITH ROW OF POWER POLES GOING SOUTH, 2.6 m N OF FIRST POWER POLE SOUTH OF HWY AND 1.5 m BELOW HWY LEVEL.

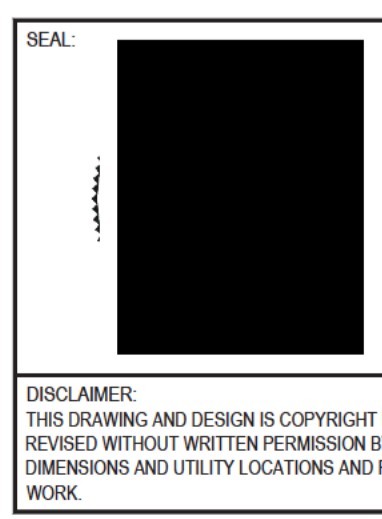


EXISTING	LEGEND-PLAN	PROPOSED
150 WM	WATER MAIN	150 WM
300 LDS	LAND DRAINAGE SEWER	300 LDS
250 WWS	WASTE WATER SEWER	250 WWS
250 FM	FORCEMAIN	250 FM
	EDGE OF ROAD / DYKE	
	DYKE TOE	
	APPROX. PROPERTY LINE	
	FENCE	
	TREE OR SHRUB LINE	
000.00	EXISTING MAJOR CONTOURS	
	EXISTING MINOR CONTOURS	
	FLOW DIRECTION	
	DITCH/SWALE	
	CULVERT	
59.367	GROUND ELEVATION	
00.00	ROAD ELEVATION	00.00
00.00	DYKE ELEVATION	00.00
00.00	DITCH ELEVATION	00.00
	SIGN / SURVEY BAR	
TH TP	TEST HOLE/TEST PIT	
EO	GUY WIRE / HYDRO POLE	
♂	CURB STOP / PLUG	
⊗	VALVE / HYDRANT	
○	MANHOLE / CLEANOUT	○
⊙	BOLLARD	⊙
	WETLAND CATTAIL SEEDING AREA (1.05 ha)	
	CLAY CORE HYDRAULIC CONDUCTIVITY < 1x10 ⁻⁶ cm/s	
	RIP RAP	
	CONCRETE	

PRELIMINARY
NOT FOR CONSTRUCTION

C:\Users\jacob.f...
 2022/11/07 2:14 PM
 FILE: \projects\20115113571-00_maxwell_colony_farms_eap_f\w\103-dwg\102_writing_dwg\104_civil\civil\main\102.dwg, 37.dwg

REV	DATE	DESCRIPTION	BY	REV	DATE	DESCRIPTION	BY
0	2022/11/07	ISSUED FOR APPROVALS	J.S.B.				



**ENGINEERS
GEOSCIENTISTS
MANITOBA**
Certificate of Authorization
WSP Canada Inc.
No. 5750

ORIGINAL SCALE: 1:1000
 DESIGNED BY: J.S.B.
 ASSISTED BY: D.T.G.B.
 DRAWN BY: V.A.A.
 MODIFIED BY: V.A.A.
 APPROVED BY: J.S.B.
 DISCIPLINE: INFRASTRUCTURE

DATE: 2021/11/01

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

wsp

WSP Canada Inc.
 1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8
 T 204-477-6650 | www.wsp.com

CLIENT: **MAXWELL COLONY FARMS**

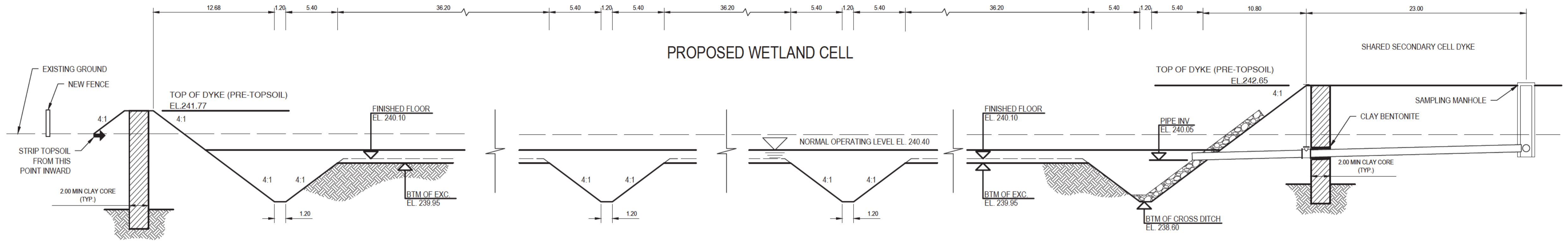
TITLE: **PROPOSED SITE PLAN**

PROJECT: **PROPOSED WASTEWATER TREATMENT LAGOON**

DRAWING NUMBER: **CL102**

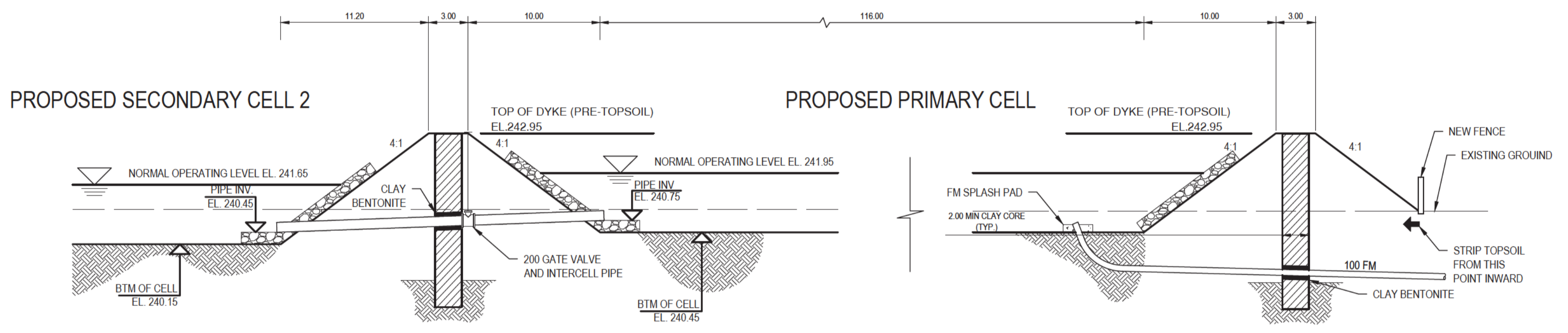
REV: **0**

- GENERAL DRAWING NOTES:
1. LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE. NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.
 2. DESCRIPTION OF PROPERTY LIMITS, AND EXISTING AND/OR PROPOSED FEATURES RELATIVE TO THESE LIMITS AS SHOWN ON THIS DRAWING DO NOT REPRESENT A LEGAL SURVEY. WSP MAKES NO REPRESENTATION OR GUARANTEE THAT THE PROPERTY LIMIT INFORMATION IS ACCURATE. WSP ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS OR ACTIONS BASED ON THIS DRAWING.
 3. DRAWING IS IN METRIC. WHOLE NUMBERS INDICATE MILLIMETRES, AND DECIMALIZED NUMBERS INDICATE METRES.
 4. BENCHMARK - 239.722 DESCRIPTION - DACOTAH HELIX PIPE WITH BRASS CAP ALONG SOUTH SIDE OF JUNC WITH PROVINCIAL RD #246, AT SOUTHWEST CORNER OF JUNC WITH PROVINCIAL RD #332 ALONG EAST BOUNDARY OF SECTION 34-10-2, 28.0 m S OF CL OF EAST BOUND LANE OF HWY, 15.8 m WEST OF CL OF PROVINCIAL RD NO 332, IN LINE WITH ROW OF POWER POLES GOING SOUTH, 2.6 m N OF FIRST POWER POLE SOUTH OF HWY AND 1.5 m BELOW HWY LEVEL.

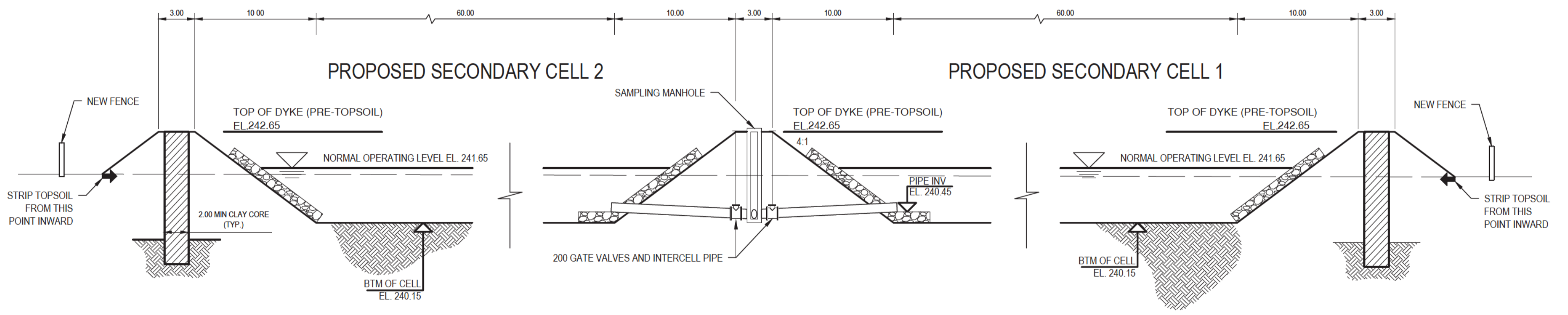


1 W/E PROPOSED WETLAND AND SHARED SECONDARY DYKE SECTION
CL102 SCALE: NTS

- CLAY CORE HYDRAULIC CONDUCTIVITY <math>< 1 \times 10^{-7}</math> cm/s
- IN SITU MATERIAL
- CLAY BENTONITE
- RIP RAP
- CONCRETE



2 PROPOSED PRIMARY AND SECONDARY CELL 2 SECTION
CL102 SCALE: NTS



3 S/N PROPOSED SECONDARY CELL SECTION
CL102 SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

C:\Users\jbs\Documents\1571-00 Maxwell Colony Farms\1571-00 Maxwell Colony Farms.dwg
 FILE: \\proj\hpc\2011571-00 Maxwell Colony Farms.dwg
 PLOT FILE: 2022/01/07 2:14 PM

REV	DATE	DESCRIPTION	BY	REV	DATE	DESCRIPTION	BY
0	2022/01/07	ISSUED FOR APPROVALS	J.S.B.				

SEAL:

**ENGINEERS
GEOLOGISTS
MANITOBA**

Certificate of Authorization
WSP Canada Inc.
No. 5750

DISCLAIMER: THIS DRAWING AND DESIGN IS COPYRIGHT PROTECTED WHICH SHALL NOT BE USED, REPRODUCED OR REVISED WITHOUT WRITTEN PERMISSION BY WSP. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND UTILITY LOCATIONS AND REPORT ALL ERRORS AND OMISSIONS PRIOR TO COMMENCING WORK.

ORIGINAL SCALE: NTS

DESIGNED BY: J.S.B.

ASSISTED BY: D.T.G.B.

DRAWN BY: V.A.A.

MODIFIED BY: V.A.A.

APPROVED BY: J.S.B.

DISCIPLINE: INFRASTRUCTURE

DATE: 2021/11/01

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

WSP Canada Inc.
1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8
T 204-477-6650 | www.wsp.com

CLIENT: MAXWELL COLONY FARMS

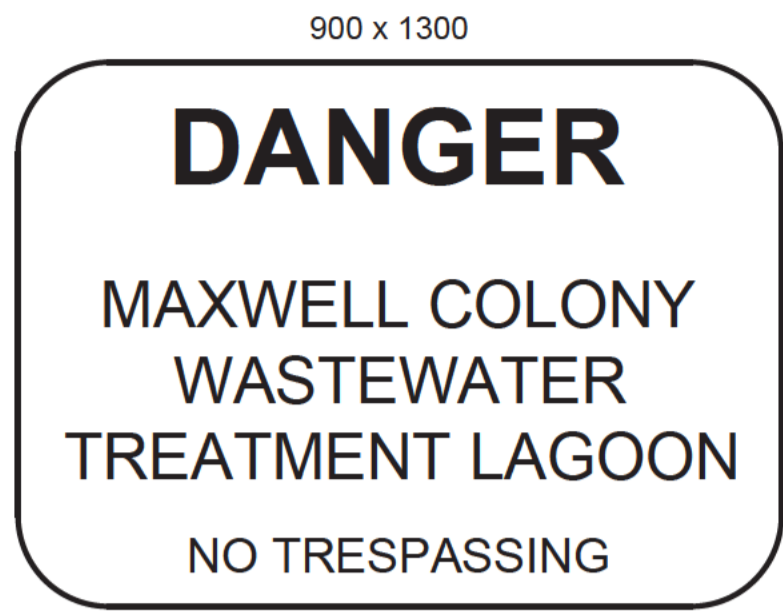
CLIENT REF. # -

TITLE: LAGOON SECTIONS

PROJECT: PROPOSED WASTEWATER TREATMENT LAGOON

DRAWING NUMBER: CL301

REV: 0



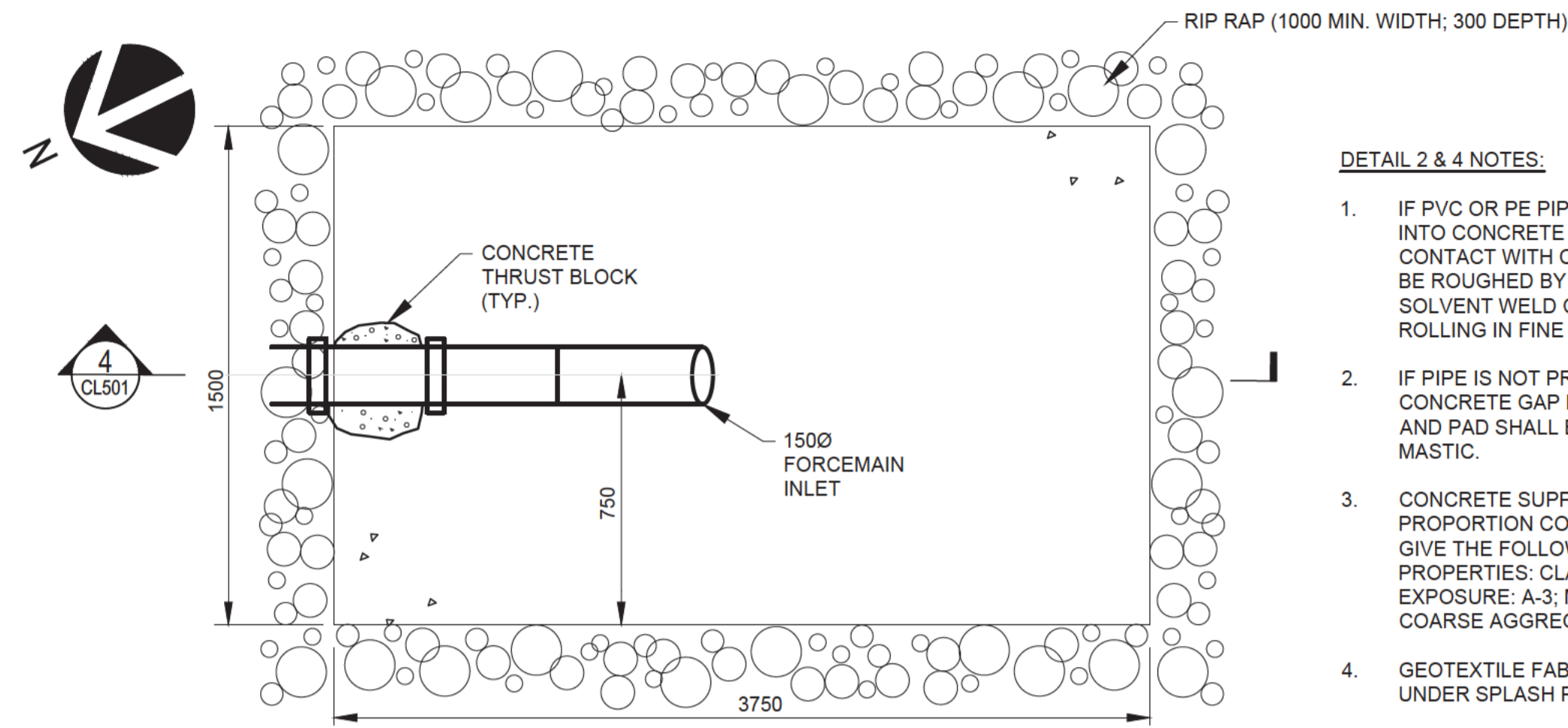
MAIN ENTRANCE SIGNAGE NOTES:
 1. MAIN ENTRANCE SIGNAGE TO BE ATTACHED AND INSTALLED WITH TWO 4X4 PRESSURE TREATED WOOD POSTS
 2. SIGN TO BE CONSTRUCTED OF ALUMINUM, AIR MASTER QUALITY OR APPROVED EQUAL.

1 MAIN ENTRANCE SIGNAGE DETAIL
 N.T.S.



PERIMETER FENCE SIGNAGE NOTES:
 1. PERIMETER SIGNAGE TO BE SECURED TO PERIMETER FENCE POSTS AND SHALL BE INSTALLED EVERY 50 METRES ALONG THE FENCE AND WHITE REFLECTIVE STRIPS SHALL BE SECURED TO THE TOP OF EVERY THIRD FENCE POST
 2. SIGNS TO BE CONSTRUCTED OF ALUMINUM, AIR MASTER QUALITY OR APPROVED EQUAL

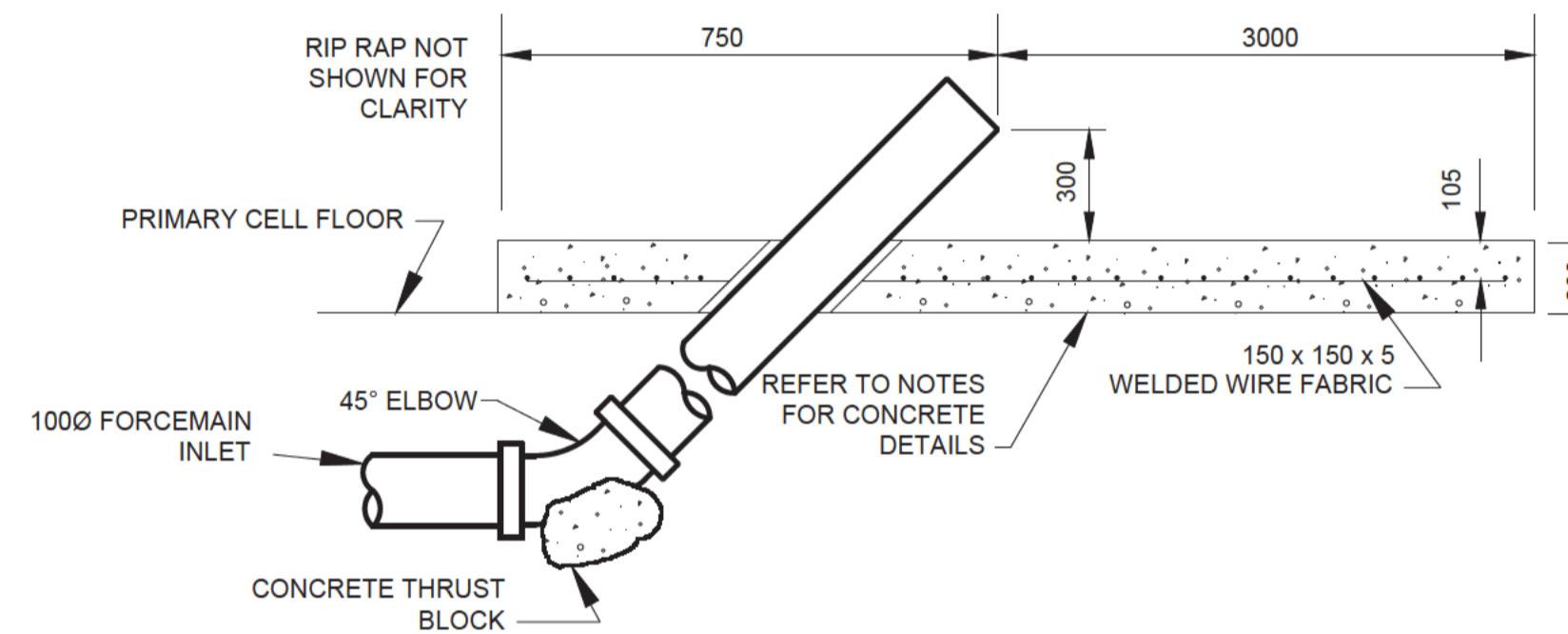
3 PERIMETER FENCE SIGNAGE DETAIL (TYP.)
 N.T.S.



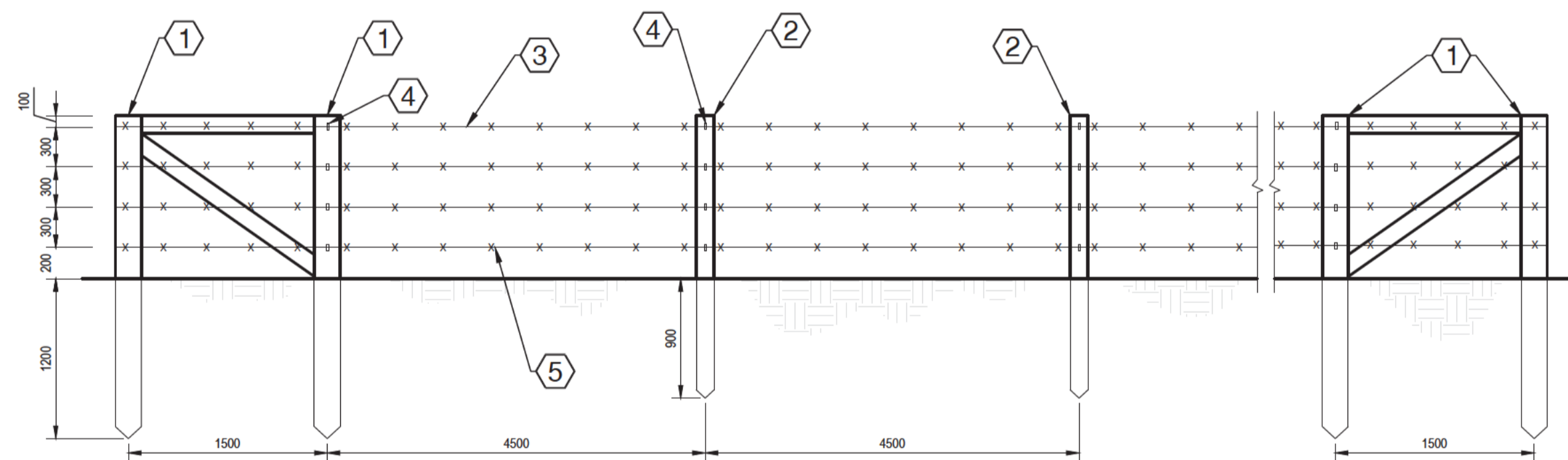
DETAIL 2 & 4 NOTES:

- IF PVC OR PE PIPE IS PRECAST INTO CONCRETE PIPE WALL IN CONTACT WITH CONCRETE SHALL BE ROUGHED BY APPLYING SOLVENT WELD CEMENT AND ROLLING IN FINE SAND.
- IF PIPE IS NOT PRECAST INTO CONCRETE GAP BETWEEN PIPE AND PAD SHALL BE FILLED WITH MASTIC.
- CONCRETE SUPPLIER TO PROPORTION CONCRETE MIX TO GIVE THE FOLLOWING PROPERTIES: CLASS OF EXPOSURE: A-3; MAXIMUM COARSE AGGREGATE: 20 mm
- GEOTEXTILE FABRIC REQUIRED UNDER SPLASH PAD AND RIP RAP

2 FORCEMAIN SPLASH PAD DETAIL
 N.T.S.



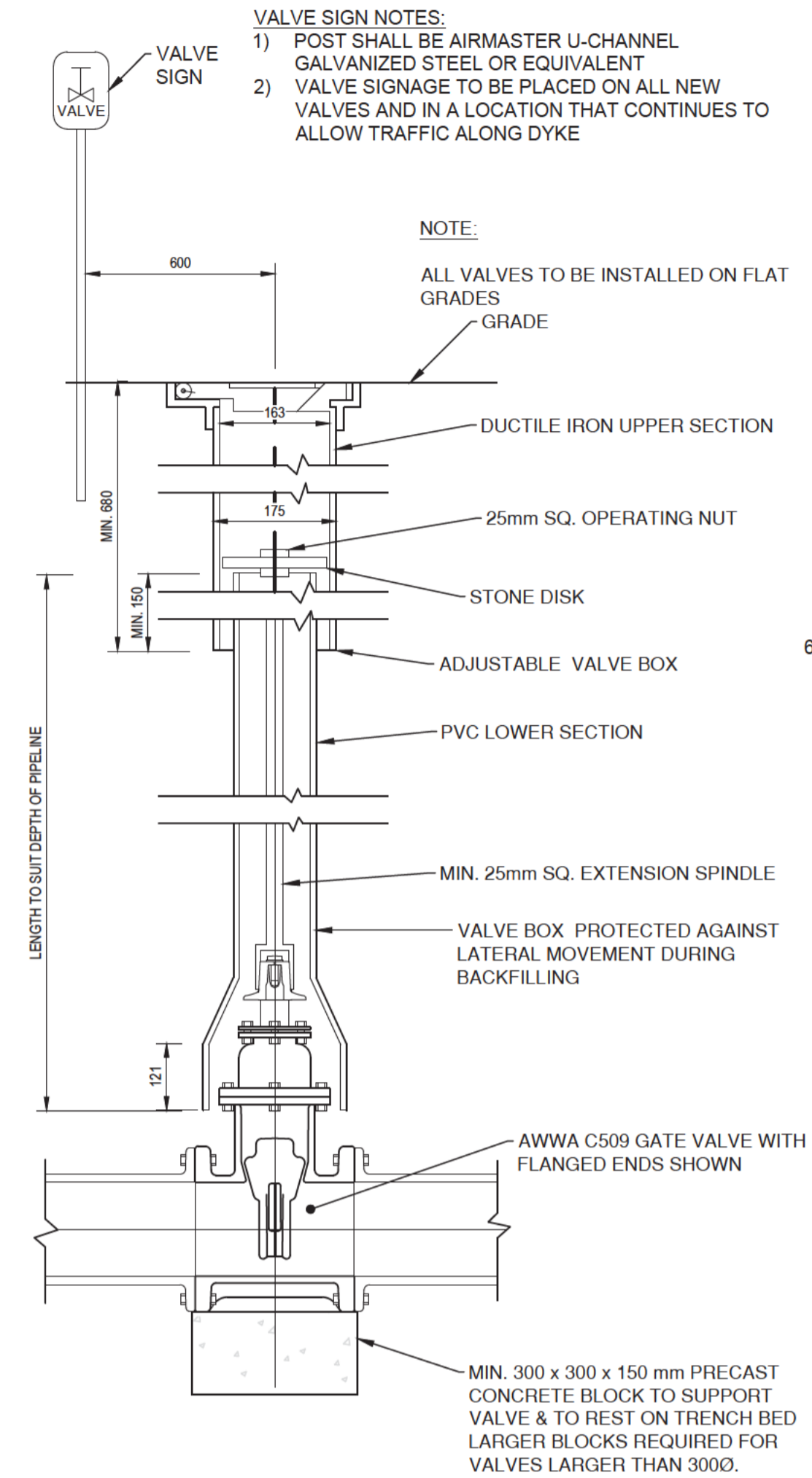
4 FORCEMAIN SPLASH PAD SECTION
 N.T.S.



NOTES:
 1. CORNER POSTS: 1750 TREATED WOOD POST, 2400 LONG
 2. REGULAR POSTS: 1250 TREATED WOOD POST, 2100 LONG
 3. 2 STRAND 20 GALVANIZED WIRE (TYP.)
 4. WIRE FENCE STAPLES (TYP.)
 5. 4 POINT BARBS (TYP.)

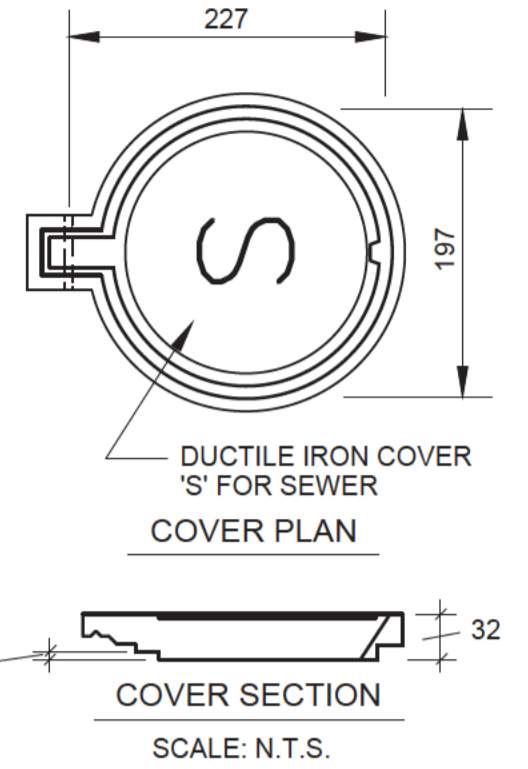
6 BARBED WIRE PERIMETER FENCE DETAIL
 N.T.S.

PRELIMINARY
 NOT FOR CONSTRUCTION

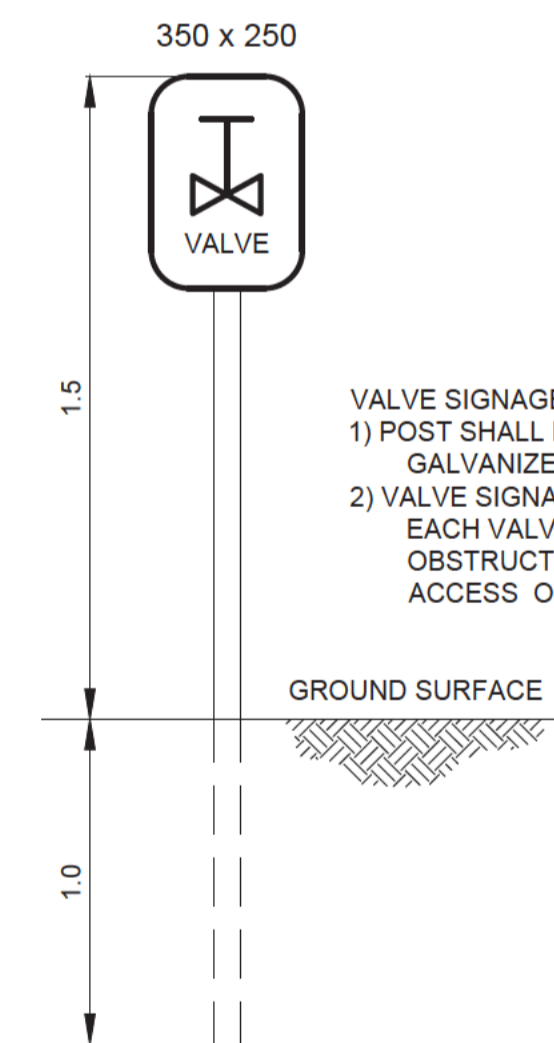


VALVE SIGN NOTES:
 1) POST SHALL BE AIRMASTER U-CHANNEL GALVANIZED STEEL OR EQUIVALENT
 2) VALVE SIGNAGE TO BE PLACED ON ALL NEW VALVES AND IN A LOCATION THAT CONTINUES TO ALLOW TRAFFIC ALONG DYKE

NOTE:
 ALL VALVES TO BE INSTALLED ON FLAT GRADES



5 GATE VALVE INSTALLATION
 N.T.S.



VALVE SIGNAGE NOTES:
 1) POST SHALL BE AIRMASTER U-CHANNEL GALVANIZED STEEL OR EQUIVALENT
 2) VALVE SIGNAGE SHALL BE LOCATED NEAR EACH VALVE, BUT NOT IN A LOCATION THAT OBSTRUCTS TOP OF DYKE VEHICLE ACCESS OR PENETRATES THE LINER

7 VALVE SIGNAGE DETAIL
 N.T.S.

C:\Users\jbs\OneDrive\Desktop\151-1357-00 Maxwell Colony Wastewater Lagoon.swp (1:100 - 4mp) (2022/11/07 - 2:14 PM) FILE: I:\projects\151-1357-00 Maxwell Colony Wastewater Lagoon.swp (1:100 - 4mp) (2022/11/07 - 2:14 PM)

REV	DATE	DESCRIPTION	BY	REV	DATE	DESCRIPTION	BY
0	2022/01/07	ISSUED FOR APPROVALS	J.S.B.				

SEAL:

**ENGINEERS
 GEOSCIENTISTS
 MANITOBA**
 Certificate of Authorization
 WSP Canada Inc.
 No. 5750

DISCLAIMER:
 THIS DRAWING AND DESIGN IS COPYRIGHT PROTECTED WHICH SHALL NOT BE USED, REPRODUCED OR REVISED WITHOUT WRITTEN PERMISSION BY WSP. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND UTILITY LOCATIONS AND REPORT ALL ERRORS AND OMISSIONS PRIOR TO COMMENCING WORK.

COPYRIGHT © 2022 WSP CANADA INC.

ORIGINAL SCALE: N.T.S.
 DESIGNED BY: J.S.B.
 ASSISTED BY: D.T.G.B.
 DRAWN BY: V.A.A.
 MODIFIED BY: V.A.A.
 APPROVED BY: J.S.B.
 DISCIPLINE: INFRASTRUCTURE

DATE: 2021/11/01

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

WSP Canada Inc.
 1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8
 T 204-477-6650 | www.wsp.com

CLIENT: MAXWELL COLONY FARMS

TITLE: MISCELLANEOUS DETAILS

PROJECT: PROPOSED WASTEWATER TREATMENT LAGOON

DRAWING NUMBER: CL501

REV: 0

APPENDIX

C

GEOTECHNICAL
REPORT

MAXWELL COLONY FARMS

MAXWELL COLONY LAGOON GEOTECHNICAL INVESTIGATION

OCTOBER 29, 2021

FINAL

WSP CANADA INC.
1600 BUFFALO PLACE
WINNIPEG, MANITOBA
R3T 6B8 CANADA

TEL: +1 204-477-6650
WSP.COM

WSP PROJECT NO. 151-13571-00

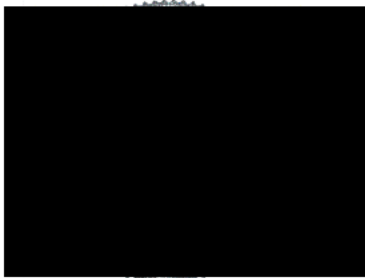


SIGNATURES

PREPARED BY

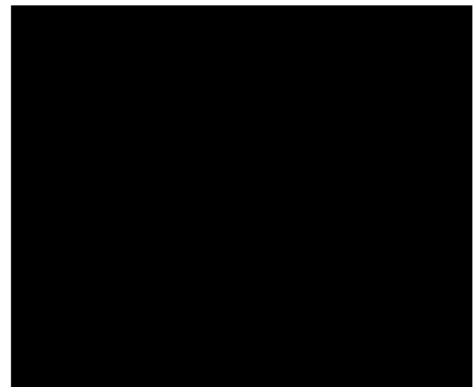
Brianna Landrie, E.I.T.
Junior Engineer

REVIEWED BY



2021-10-29

Dana Bredin, P.Eng.
Project Manager



PREPARED FOR:

Maxwell Colony Farms
10450 Assiniboine Road
Cartier, MB
R4K 1C3

WSP Canada Inc. (WSP) prepared this report solely for the use of the intended recipient, Maxwell Colony Farms, in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report.

The original of this digital file will be conserved by WSP for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP, its integrity cannot be assured. As such, WSP does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.



TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	SITE AND PROJECT DESCRIPTION	1
2.1	Published Geological Information	1
3	METHODOLOGY.....	2
3.1	Field Investigation	2
3.2	Laboratory Testing	2
4	SUBSURFACE CONDITIONS	3
4.1	Topsoil	3
4.2	Native Clay	3
4.3	Groundwater and Sloughing Observations.....	3
5	GEOTECHNICAL RECOMMENDATIONS	4
5.1	General.....	4
5.2	Geotechnical Considerations.....	4
6	CLOSURE.....	5

LIST OF TABLES

Table 1:	Test Hole Details.....	2
Table 2	Laboratory Test Results for Native Clay	3

APPENDICES

A	Terms of Reference
B	Site Plan and Testhole Logs
C	Laboratory Test Results
D	Hydraulic conductivity test results

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Maxwell Colony Farms to complete a geotechnical investigation for the proposed lagoon project. The scope of work for this geotechnical investigation included the following:

- Eight (8) geotechnical test holes
- Laboratory testing
- Geotechnical report

The objectives of this geotechnical investigation were to assess the subsoil conditions and to provide geotechnical recommendations/considerations for the development of a new wastewater treatment lagoon.

The following report summarizes the field and laboratory testing programs, outlines the subsurface soil conditions encountered at the test hole locations, provides geotechnical considerations and determines the suitability of the site for the proposed lagoon based on the encountered subsurface conditions during drilling.

The use of this report is subject to the Terms of Reference (Appendix A).

2 SITE AND PROJECT DESCRIPTION

The site is located southwest of the colony farm site and north of Provincial Road 424 within River Lots 106, 107, and 108 (Parish of St. Francois Xavier). Maxwell Colony is located within the RM of Cartier and is approximately 13 km northeast of Elie, Manitoba. The site has a near flat topography and is currently used as agricultural land. A conceptual site plan illustrating the location of the test holes and the preferred site selected for the proposed lagoon is provided in Appendix B.

The site is generally flat with drainage anticipated to be directed towards Hammercrest Creek (an oxbow) north of the site.

2.1 Published Geological Information

The site is located in an area known as the Red River Plain Sub-Area¹. The area is a clay basin, with local flood plains and river levees that occupy a flat depressional area that was covered by Glacial Lake Agassiz. The sediments are estimated to be up to 20 m thick and consist of lacustrine clay and alluvial deposits. The sediments overlay dolomite with thin interbedded shale bedrock from the Silurian period.

¹ Ehrlich, W.A., Poyser, E.A., Pratt, L.E. and Ellis, J.H. *Report of Reconnaissance Soil Survey of Winnipeg and Morris Map Sheet Areas*. Manitoba Department of Agriculture. Manitoba, 1953.

3 METHODOLOGY

3.1 Field Investigation

WSP supervised the drilling of eight (8) geotechnical test holes that were completed on November 19, 2020. The test holes were drilled using a track-mounted Mobile B48 drill rig equipped with 125 mm diameter solid stem augers owned and operated by Paddock Drilling Ltd. All test holes were backfilled to grade using a combination of auger cuttings and bentonite upon the completion of drilling. Test hole details are provided in Table 1. A site plan showing the test hole locations is provided in [Appendix B](#).

Table 1: Test Hole Details

Test Hole #	Completion Date	Depth (mbgs ^{*1})	Northing ^{*2}	Easting ^{*2}	Elevation at Grade (m)
TH01	Nov 19/20	4.6	5533737	596552	241.10
TH02			5533631	596552	241.00
TH03			5533679	596511	240.98
TH04			5533717	596467	240.97
TH05			5533641	596467	241.05
TH06			5533679	596406	241.06
TH07			5533631	596344	240.90
TH08			5533727	596345	241.02

^{*1} Meters below ground surface

^{*2} Coordinates are in NAD 83 Zone 14U

Disturbed soil samples were retrieved from the auger flighting at a continuous depth in all test holes. Also, three (3) undisturbed Shelby tube samples were collected at selected test holes. These samples were submitted to TREK Geotechnical Inc. for review, and one (1) of the submitted samples was selected for a hydraulic conductivity test. Collected samples were labelled with the project name and number, test hole number, date of sampling, the sample number, depth of the sample and submitted for laboratory testing.

3.2 Laboratory Testing

The following laboratory tests were completed on the soil samples collected on site:

- Moisture content tests for all samples (27)
- Three (3) Atterberg limits tests
- Three (3) grain size analysis tests (sieve and hydrometer)
- One (1) hydraulic conductivity test (flexible wall permeameter)

The laboratory test results are discussed in Section 4 and are attached in [Appendix C](#).

4 SUBSURFACE CONDITIONS

Overall, the soil profile encountered at the test hole locations generally consisted of topsoil followed by native clay to the depth explored. A description of the subsurface soil strata is provided in the following sub-sections.

4.1 Topsoil

Topsoil typically 100 to 300 mm thick was encountered at all test hole locations. The topsoil was generally described as black and contained clay.

4.2 Native Clay

Native clay was encountered immediately below the topsoil and extended to 4.6 mbgs. The clay was described as brown to grey-brown, moist, firm to stiff, highly plastic, silty, trace sand, trace gravel (<10 mm), trace sulphate inclusions, trace silt inclusions, and trace oxidation. Vertical fissures were observed in the native clay ranging from 1.2 to 2.1 mbgs, averaging 1.8 mbgs. Moisture contents completed on all selected samples ranged from 29% to 44%, with an average of 38%.

Atterberg limit and particle size analysis tests were conducted on select samples showing the native clay near the surface was highly plastic. The hydraulic conductivity of the in-situ clay obtained at 1.7 mbgs was 3.58×10^{-9} cm/s. The test results on selected clay samples are summarized in Table 2 below.

Table 2 Laboratory Test Results for Native Clay

Testhole#	Sample Depth (mbgs)	Atterberg Limits			Sieve and Hydrometer			
		Plastic Limit %	Liquid Limit %	Plasticity Symbol	Sand (%)	Gravel (%)	Silt (%)	Clay (%)
TH03	0.6	23	81	CH	2.30	0.30	18.2	79.2
TH03	1.8	21	80	CH	1.10	3.10	34.6	61.2
TH06	1.2	22	84	CH	0.8	0.0	22.3	76.9

Notes: CH – highly plastic clay

4.3 Groundwater and Sloughing Observations

Sloughing was observed in all test holes upon completion of drilling. No water seepage was observed upon completion of test hole drilling, however, groundwater levels are prone to fluctuations and may be affected by seasonal fluctuations, recent rainfall, surface drainage, and infiltration, etc.

Based on the well logs and groundwater availability maps, groundwater bearing formations or aquifers are formed in the clay layer. The depth of the aquifer based on the well logs in this area (River Lot 100, River Lot 102, River Lot 112 & River Lot 112) is approximately 3.7 mbgs. The yield usually is adequate to abundant for household and normal farm requirements (approximately 1.0 to 7.5 litres per second). Water quality in this aquifer ranges from very poor to poor potable water. Detailed well logs are attached in [Appendix B](#).

A review of the Groundwater Pollution Hazard Map for the Winnipeg Area revealed that the site is not within a groundwater pollution hazard area.

Based on the drainage map of the area, local groundwater flow at the site is north towards the Assiniboine River.

5 GEOTECHNICAL RECOMMENDATIONS

5.1 General

This section provides geotechnical recommendations and considerations based on WSP's interpretation of the field and laboratory testing information. The recommendations provided are intended as preliminary guidance for planning and design by qualified engineers and architects. Where comments are made on construction, they are provided to highlight aspects of construction that could affect the implementation of the project. Parties requiring information beyond the scope or purpose of this report must contact WSP or make their interpretation of the information provided.

Where the subsurface conditions encountered during construction are different from stated and/or assumed in this report, WSP should be provided with the opportunity to revise the geotechnical recommendations contained in this report.

5.2 Geotechnical Considerations

For lagoon construction, The Manitoba Conservation and Climate Information Bulletin – *Design Objectives For Wastewater Treatment Lagoons (October 2017)* stipulates that all soil materials designated as lagoon liner materials must have a permeability of less than 1×10^{-7} cm/s and be at least 1 metre in thickness. Based on the subsurface conditions encountered at the test hole locations, the native high plastic clay encountered on site is considered feasible for construction of a clay lined. The in-situ high plastic clay soils were found to have a hydraulic conductivity of 3.58×10^{-9} cm/s which meets Manitoba Conservation and Climate's Design Objectives. However, vertical fissures were observed in the native clay layer at an average depth of approximately 1.8 mbgs. For this reason, it is recommended that the proposed lagoon liner be constructed with a clay core within the proposed dykes that extends a minimum 300 mm below the vertical fissures encountered in the underlying high plastic clay.

Assuming dry conditions, the construction of the clay core shall involve excavating a trench a minimum of two metres wide around the perimeter dykes of the proposed lagoon cells and keying a minimum of 300 mm into the underlying high plastic clay layer to a depth of approximately 1.8 mbgs. *The depth of the clay core trench shall be reviewed by a qualified engineer prior to backfilling.* The trench shall be backfilled with high plastic clay material in 150 mm lifts compacted to 95% Standard Proctor Maximum Dry Density (SPMDD) within -1 and +2 percent of the optimum moisture content with a sheepsfoot roller. Any unsuitable material such as sand and silt should be removed and replaced with the recommended high plastic clay material. A minimum shrinkage factor of 20% should be used in calculating volumes of material to be used for the construction of the clay core.

Although not encountered during our investigation, seepage and caving conditions may occur during construction of the clay core. If encountered, dewatering should be conducted prior to placing and compacting clay material into the clay core trench.

During construction of the proposed cells, the following steps should be followed:

- The entire area of the proposed lagoon should be stripped of vegetation, topsoil and organic material. The depth of the topsoil ranges from 100 mm to 300 mm.
- The proposed embankment material for the dykes should be compacted to 95% SPMD within -1 and +2 percent of the optimum moisture content with a sheepsfoot roller. A shrinkage factor of approximately 20% should be used in calculating volumes of embankment material to be used.
- Unsuitable material can be used as backfill on the outside shoulders of the dykes.
- Both the inside and outside slopes of the proposed lagoon dykes are to be constructed at minimum 4H:1V.
- The top of the dykes are to be constructed at a minimum 3.0 m wide to accommodate for vehicles travelling on the dykes.
- Rip rap, or an approved alternative, shall be used as erosion control of the interior lagoon dykes. A well-developed and maintained grass cover above the rip rap should add integrity to the dykes.

6 CLOSURE

This report has been prepared for the sole benefit of Maxwell Colony Farms and is not intended for use by others. This report may not be reproduced without the prior written consent of WSP. Contractors undertaking the work must draw their own interpretations of the factual information provided in this report as they affect the construction costs, procedures, and scheduling.

As test holes are a localized representation of the total study area, subsurface conditions may vary between and/or beyond the test hole locations. If conditions encountered at the site vary significantly from that reported herein, WSP should be notified immediately so that our interpretation and recommendations can be reviewed and revised, if necessary.

APPENDIX

A

TERMS OF REFERENCE



TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY WSP CANADA INC.

1. STANDARD OF CARE

WSP Canada Inc. (“WSP”) prepared and issued this geotechnical report (the “Report”) for its client (the “Client”) in accordance with generally-accepted engineering consulting practices for the geotechnical discipline. No other warranty, expressed or implied, is made. Unless specifically stated in the Report, the Report does not address environmental issues.

The terms of reference for geotechnical reports issued by WSP (the “Terms of Reference”) contained in the present document provide additional information and caution related to standard of care and the use of the Report. The Client should read and familiarize itself with these Terms of Reference.

2. COMPLETENESS OF THE REPORT

All documents, records, drawings, correspondence, data, files and deliverables, whether hard copy, electronic or otherwise, generated as part of the services for the Client are inherent components of the Report and, collectively, form the instruments of professional services (the “Instruments of Professional Services”). The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, the communications between WSP and the Client, and to any other reports, writings, proposals or documents prepared by WSP for the Client relative to the specific site described in the Report, all of which constitute the Report.

TO PROPERLY UNDERSTAND THE INFORMATION, OBSERVATIONS, FINDINGS, SUGGESTIONS, RECOMMENDATIONS AND OPINIONS CONTAINED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WSP CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT AND ITS VARIOUS COMPONENTS.

3. BASIS OF THE REPORT

WSP prepared the Report for the Client for the specific site, development, building, design or building assessment objectives and purpose that the Client described to WSP. The applicability and reliability of any of the information, observations, findings, suggestions, recommendations and opinions contained in the Report are only valid to the extent that there was no material alteration to or variation from any of the said descriptions provided by the Client to WSP unless the Client specifically requested WSP to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information, observations, findings, suggestions, recommendations and opinions contained in the Report, or any component forming the Report, are for the sole use and benefit of the Client and the team of consultants selected by the Client for the specific project that the Report was provided. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION OR COMPONENT WITHOUT THE WRITTEN CONSENT OF WSP. WSP will consent to any reasonable request by the Client to approve the use of this Report by other parties designated by the Client as the “Approved Users”. As a condition for the consent of WSP to approve the use of the Report by an Approved User, the Client must provide a copy of these Terms of Reference to that Approved User and the Client must obtain written confirmation from that Approved User that the Approved User will comply with these Terms of Reference, such written confirmation to be provided separately by each Approved User prior to beginning use of the Report. The Client will provide WSP with a copy of the written confirmation from an Approved User when it becomes available to the Client, and in any case, within two weeks of the Client receiving such written confirmation.

The Report and all its components remain the copyright property of WSP and WSP authorises only the Client and the Approved Users to make copies of the Report, but only in such quantities as are reasonably necessary for the use of the Report by the Client and the Approved Users. The Client and the Approved Users may not give, lend, sell or otherwise disseminate or make the Report, or any portion thereof, available to any party without the written permission of WSP. Any use which a third party makes of the Report, or any portion of the Report, is the sole responsibility of such third parties. WSP accepts no responsibility for damages suffered by any third party resulting from the use of the Report. The Client and the Approved Users acknowledge and agree to indemnify and hold harmless WSP, its officers, directors, employees, agents, representatives or sub-consultants, or any or all of them, against any claim of any nature whatsoever brought against WSP by any third parties, whether in contract or in tort, arising or related to the use of contents of the Report.

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY WSP CANADA INC. (continued)

5. INTERPRETATION OF THE REPORT

- a. Nature and Exactness of Descriptions:** The classification and identification of soils, rocks and geological units, as well as engineering assessments and estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1 above. The classification and identification of these items are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations or assessments utilizing the standards of Paragraph 1 involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to changes over time and the parties making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or when the Client has special considerations or requirements, the Client must disclose them to WSP so that additional or special investigations may be undertaken, which would not otherwise be within the scope of investigations made by WSP or the purposes of the Report.
- b. Reliance on information:** The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site investigation and field review and on the basis of information provided to WSP. WSP has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, WSP cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.
- c. Additional Involvement by WSP:** To avoid misunderstandings, WSP should be retained to assist other professionals to explain relevant engineering findings and to review the geotechnical aspects of the plans, drawings and specifications of other professionals relative to the engineering issues pertaining to the geotechnical consulting services provided by WSP. To ensure compliance and consistency with the applicable building codes, legislation, regulations, guidelines and generally-accepted practices, WSP should also be retained to provide field review services during the performance of any related work. Where applicable, it is understood that such field review services must meet or exceed the minimum necessary requirements to ascertain that the work being carried out is in general conformity with the recommendations made by WSP. Any reduction from the level of services recommended by WSP will result in WSP providing qualified opinions regarding adequacy of the work.

6. ALTERNATE REPORT FORMAT

When WSP submits both electronic and hard copy versions of the Instruments of Professional Services, the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding upon WSP. The hard copy versions submitted by WSP shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions; furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed and sealed versions of the Instruments of Professional Services maintained or retained, or both, by WSP shall be deemed to be the overall originals for the Project.

The Client agrees that the electronic file and hard copy versions of Instruments of Professional Services shall not, under any circumstances, no matter who owns or uses them, be altered by any party except WSP. The Client warrants that the Instruments of Professional Services will be used only and exactly as submitted by WSP.

The Client recognizes and agrees that WSP prepared and submitted electronic files using specific software or hardware systems, or both. WSP makes no representation about the compatibility of these files with the current or future software and hardware systems of the Client, the Approved Users or any other party. The Client further agrees that WSP is under no obligation, unless otherwise expressly specified, to provide the Client, the Approved Users and any other party, or any or all of them, with specific software and hardware systems that are compatible with any electronic submitted by WSP. The Client further agrees that should the Client, an Approved User or a third party require WSP to provide specific software or hardware systems, or both, compatible with the electronic files prepared and submitted by WSP, for any reason whatsoever included but not restricted to an order from a court, then the Client will pay WSP for all reasonable costs related to the provision of the specific software or hardware systems, or both. The Client further agrees to indemnify and hold harmless WSP, its officers, directors, employees, agents, representative or sub-consultant, or any or all of them, against any claim or any nature whatsoever brought against WSP, whether in contract or in tort, arising or related to the provision or use of any specific software or hardware provided by WSP.

APPENDIX

B

SITE PLAN, TESTHOLE LOGS,
WELL LOGS





© 2021 MICROSOFT CORPORATION © 2021 MAXAR © CNES (2021) DISTRIBUTION AIRBUS DS

L:\Projects\2015151-1371-00 Maxwell Colony Farms EAP (R.W.)\3 - DWG\302 Working Dwg\304 Civil\CA\151-1371-00 Aerial-ssad.dwg Oct 29, 2021 12:07pm BT (AbaoV)
AS-REPORT VERSION 10



1600 Buffalo Place, Winnipeg, Manitoba, R3T 6B8
T 204-477-6650 | www.wsp.com

PROJECT NO: 151-1371-00

SCALE:
NTS

DATE:
2021-10-29

DESIGNED BY:
J.S.B.

DRAWN BY:
V.A.A.

PROJECT:

MAXWELL COLONY FARMS

TITLE:

SITE PLAN R1

DRAWING:

CL801



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

TH1

PAGE 1 OF 1

CLIENT Maxwell Colony

PROJECT NAME Maxwell Colony Lagoon

PROJECT NUMBER 151-13571-00

PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier

DATE STARTED 11/19/20 COMPLETED 11/19/20

GROUND ELEVATION 241.1 m HOLE SIZE 125 mm

DRILLING CONTRACTOR Paddock Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD S/S Auger

AT TIME OF DRILLING ---

LOGGED BY Dana Bredin CHECKED BY Brianna Landrie

AT END OF DRILLING ---

NOTES 596552 m E, 5533727 m N

AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲			
										PL	MC	LL	
										20	40	60	80
										20	40	60	80
										PP	qu (kPa)	Torvane	*
										100	200	300	400
		241.00		TOPSOIL - grey, clayey									
				CLAY - Grey, moist firm to stiff, trace sand, fine grained gravel - Fissured to 1.2 m - Mottled grey-brown below 1.2 m - Trace oxidation below 1.8 m - Firm to soft below 2.4 m - Trace sulfates below 3.0 m - Brown below 3.7 m	GB S-01				41				
1					GB S-02				35				
2					GB S-03				37				
3					GB S-04				39				
4					GB S-05				40				
					GB S-06				42				
		236.50											

- Test hole drilled to 4.6 m below grade
- No seepage or water observed
- Sloughing observed at 3.7 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony

PROJECT NAME Maxwell Colony Lagoon

PROJECT NUMBER 151-13571-00

PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier

DATE STARTED 11/19/20 COMPLETED 11/19/20

GROUND ELEVATION 241 m HOLE SIZE 125 mm

DRILLING CONTRACTOR Paddock Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD S/S Auger

AT TIME OF DRILLING --

LOGGED BY Dana Bredin CHECKED BY Brianna Landrie

AT END OF DRILLING --

NOTES 596552 m E, 5533631 m N

AFTER DRILLING --

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
										20	40
		240.70		TOPSOIL - Black, clayey							
1				CLAY - Grey-black, stiff, dry - Grey, moist, silt inclusions below 0.8 m - Mottled grey-brown, trace sand, trace gravel below 1.5 m - Firm below 2.3 m - Trace sulfates, trace oxidation below 3.4 m - Brown, soft below 4.3 m							
2											
3											
4											
		236.40									

- Test hole drilled to 4.6 m below grade
 - No seepage or water encountered upon completion of drilling
 - Sloughing observed at 3.0 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony

PROJECT NAME Maxwell Colony Lagoon

PROJECT NUMBER 151-13571-00

PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier

DATE STARTED 11/19/20 COMPLETED 11/19/20

GROUND ELEVATION 240.98 m HOLE SIZE 125 mm

DRILLING CONTRACTOR Paddock Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD S/S Auger

AT TIME OF DRILLING --

LOGGED BY Dana Bredin CHECKED BY Brianna Landrie

AT END OF DRILLING --

NOTES 596511 m E, 5533679 m N

AFTER DRILLING --

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
										20	40
		240.83		TOPSOIL							
				CLAY - Grey-black mixed, stiff, moist, trace sand, trace fine grained gravel, trace silt inclusions - Mottled brown-grey below 1.2 m - Fissured to 1.5 m - Stiff to firm below 1.5 m - Trace oxidations 1.8 m - Brown, trace sulfates below 2.4 m - Soft below 3.0 m							
1					ST ST-1				37		
2					ST ST-2				38		
3											
4											
		236.38									

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21

- Test hole drilled to 4.6 m below grade
- No seepage or water observed upon completion of drilling
- Sloughing observed at 2.7 m below grade



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony
PROJECT NUMBER 151-13571-00
DATE STARTED 11/19/20 COMPLETED 11/19/20
DRILLING CONTRACTOR Paddock Drilling Ltd.
DRILLING METHOD S/S Auger
LOGGED BY Dana Bredin CHECKED BY Brianna Landrie
NOTES 596467 m E, 5533717 m N

PROJECT NAME Maxwell Colony Lagoon
PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier
GROUND ELEVATION 240.97 m HOLE SIZE 125 mm
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
										20	40 60 80
		240.87		TOPSOIL CLAY - Grey-black, dry, crumbly - Grey, stiff, moist, trace silt inclusions, trace sand, trace fine grained gravel below 0.7 m - Trace sulfates below 1.2 m - Mottled grey-brown below 1.5 m - Fissured to 2.1 m - Firm to soft below 2.7 m							
1											
2											
3											
4											
		236.37									

- Test hole drilled to 4.6 m below grade
- No seepage or water observed upon completion of drilling
- Sloughing observed at 2.7 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony
PROJECT NUMBER 151-13571-00
DATE STARTED 11/19/20 COMPLETED 11/19/20
DRILLING CONTRACTOR Paddock Drilling Ltd.
DRILLING METHOD S/S Auger
LOGGED BY Dana Bredin CHECKED BY Brianna Landrie
NOTES 596467 m E, 5533641 m N

PROJECT NAME Maxwell Colony Lagoon
PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier
GROUND ELEVATION 241.05 m HOLE SIZE 125 mm
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲		
										20	40	60
		240.90		TOPSOIL								
				CLAY - Black-grey, stiff, dry - Grey, moist, trace silt inclusions, trace sand, trace fine grained gravel below 0.6 m - Mottled brown-grey below 1.2 m - Fissured to 2.0 m - Firm below 2.3 m - Brown below 3.0 m - Soft below 4.3 m								
1					GB S-07				35			
					GB S-08				35			
2					GB S-09				38			
					GB S-10				41			
3					GB S-11				44			
					GB S-12				41			
4												
		236.45										

- Test hole drilled to 4.6 m below grade
- No seepage or water observed upon completion of drilling
- Sloughing observed at 2.1 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony
PROJECT NUMBER 151-13571-00
DATE STARTED 11/19/20 COMPLETED 11/19/20
DRILLING CONTRACTOR Paddock Drilling Ltd.
DRILLING METHOD S/S Auger
LOGGED BY Dana Bredin CHECKED BY Brianna Landrie
NOTES 596406 m E, 5533679 m N

PROJECT NAME Maxwell Colony Lagoon
PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier
GROUND ELEVATION 241.06 m HOLE SIZE 125 mm
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
										PL	MC
		240.86		TOPSOIL							
				CLAY - Black-brown mixed, stiff, dry - Grey, moist, stiff below, trace silt inclusions, trace sand, trace fine grained gravel below 0.8 m - Mottled grey-brown below 1.4 m - Fissured to 1.8 m - Brown, firm to soft below 2.4 m - Soft below 4.3 m	GB S-13				29		
1					GB S-14				36		
2					GB S-15				40		
3					GB S-16				43		
4					GB S-17				43		
					GB S-18				41		
		236.46									

- Test hole drilled to 4.6 m below grade
- No seepage or water observed upon completion of drilling
- Sloughing observed at 2.1 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony
PROJECT NUMBER 151-13571-00
DATE STARTED 11/19/20 COMPLETED 11/19/20
DRILLING CONTRACTOR Paddock Drilling Ltd.
DRILLING METHOD S/S Auger
LOGGED BY Dana Bredin CHECKED BY Brianna Landrie
NOTES 596344 m E, 5533631 m N

PROJECT NAME Maxwell Colony Lagoon
PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier
GROUND ELEVATION 240.9 m HOLE SIZE 125 mm
GROUND WATER LEVELS:
AT TIME OF DRILLING --
AT END OF DRILLING --
AFTER DRILLING --

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲			
										PL	MC	LL	
										20	40	60	80
										20	40	60	80
										PP	qu (kPa)	Torvane	*
										100	200	300	400
		240.80		TOPSOIL									
				CLAY - Black-brown mixed, crumbly, dry, silty - Grey, stiff, moist below 0.6 m - Mottled grey-brown, trace silt inclusions below 0.9 m - Fissured to 1.8 m - Trace oxidation, trace sand below 2.3 m - Trace gravel below 3.0 m - Trace sulfates below 3.4 m - Soft below 3.7 m - Brown below 4.0 m									
1													
2					ST ST-3				34				
3													
4													
		236.30											

- Test hole drilled to 4.6 m below grade
- No seepage or water observed upon completion of drilling
- Sloughing observed at 2.7 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21



WSP
1600 Buffalo Place
Winnipeg, Manitoba
Telephone: 204-477-6650

CLIENT Maxwell Colony
PROJECT NUMBER 151-13571-00
DATE STARTED 11/19/20 COMPLETED 11/19/20
DRILLING CONTRACTOR Paddock Drilling Ltd.
DRILLING METHOD S/S Auger
LOGGED BY Dana Bredin CHECKED BY Brianna Landrie
NOTES 596345 m E, 5533727 m N

PROJECT NAME Maxwell Colony Lagoon
PROJECT LOCATION RL 106-108 Parish of St. Francois Xavier
GROUND ELEVATION 241.02 m HOLE SIZE 125 mm
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	TORVANE (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
										20	40 60 80
		240.82		TOPSOIL							
				CLAY - Black-brown mixed, silty, crumbly, dry - Grey, stiff, moist below 0.8 m - Mottled grey-brown below 1.1 m - Fissured to 1.7 m - Firm, trace sand, trace fine grained gravel, trace oxidation below 2.3 m - Soft below 3.8 m - brown below 4.0 m	GB S-19				29		
1					GB S-20				36		
2					GB S-21				39		
3					GB S-22				37		
4					GB S-23				40		
					GB S-24				44		
		236.42									

- Test hole drilled to 4.6 m below grade
- No seepage or water encountered upon completion of drilling
- Sloughing observed at 2.7 m below grade

GENERAL BH PLOTS - WSP MAXWELL COLONY LAGOON LOGS.GPJ G NT STD CANADA GDT 5/20/21

LOCATION: RIVER LOT 0100 IN PARISH OF St. Fr-Xavier

Owner: MAXWELL COLONY

Driller: Paddock Drilling Ltd.

Well Name:

Well Use: PRODUCTION

Water Use: Livestock

Date Completed: 2003 Nov 05

WELL LOG

From (ft.)	To (ft.)	Log
0	1.0	TOPSOIL
1.0	13.0	SANDY CLAY
13.0	17.0	MEDIUM FINE BROWN SAND
17.0	21.0	MEDIUM GREY SAND, CLEAN
21.0	23.0	DIRTY GREY SAND
23.0	26.5	VERY CLEAN COARSE SAND AND GRAVEL, WELL ROUNDED
26.5	30.0	STIFF CLAY TILL WITH BOULDERS

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	13.5	CASING	30.00	30.00		WIRE WOUND	FIBERGLASS
13.5	28.5	PERFORATIONS	30.00			0.040 SAW CUT	
11.0	28.5	GRAVEL PACK					WASHED SAND
9.0	11.0	CASING GROUT					BENTONITE
5.0	9.0	GRAVEL PACK					WASHED SAND
0	5.0	GRAVEL PACK					BACKFILL

Top of Casing: 1.5 ft. above ground

PUMPING TEST

Date: 2003 Nov 05

Rate: 100.000 Imp. gallons/minute

Water level before pumping: 12.0 ft. below ground

Pumping level at end of test: 21.5 ft. below ground

Test duration: ??? hours, ?? minutes

Water temperature: ?? degrees F

REMARKS

PUMP TEST IS RECOVERY

LOCATION: RIVER LOT 102 IN PARISH OF St. Fr-Xavier

Owner: MAXWELL COLONY

Driller: Friesen Drillers Ltd.

Well Name:

Well Use: PRODUCTION

Water Use: Livestock

Date Completed: 1985 Jul 19

WELL LOG

From (ft.)	To (ft.)	Log
0	23.0	CLAY
23.0	52.0	TILL
52.0	164.9	LIMESTONE

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	56.0	casing	5.00		INSERT	PVC	
56.0	164.9	open hole	4.00				

Top of Casing: 2.0 ft. below ground

PUMPING TEST

Date: 1985 Jul 19

Pumping Rate: 12.0 Imp. gallons/minute

Water level before pumping: 12.0 ft. below ground

Pumping level at end of test: 28.0 ft. below ground

Test duration: hours, 30 minutes

Water temperature: ?? degrees F

LOCATION: RIVER LOT 112 IN PARISH OF St. Fr-Xavier

Owner: WRB

Driller: Friesen Drillers Ltd.

Well Name: A-2

Well Use: OBSERVATION

Water Use:

Date Completed: 1977 Sep 28

WELL LOG

From (ft.)	To (ft.)	Log
0	22.0	CLAY
22.0	50.0	CLAYEY TILL
50.0	71.0	GRAVEL
71.0	117.9	BUFF LIMESTONE WITH SHALE LAYERS, SALTY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	72.0	casing	4.00				
72.0	117.9	open hole					
0	60.0	casing				grout	

Top of Casing: ft. below ground

No pump test data for this well.

REMARKS

SARP, 130M.E.OF MAXWELL#1 (MJ-18).

LOCATION: RIVER LOT 112 IN PARISH OF St. Fr-Xavier

Owner: WRB

Driller: Friesen Drillers Ltd.

Well Name: A-3

Well Use: TEST WELL

Water Use:

Date Completed: 1977 Sep 28

WELL LOG

From (ft.)	To (ft.)	Log
0	22.0	CLAY
22.0	50.0	CLAYEY TILL
50.0	70.0	GRAVEL, SALTY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	70.0	open hole					

Top of Casing: ft. below ground
No pump test data for this well.

REMARKS

SARP, BESIDE TH.A-2

APPENDIX

C

LABORATORY TEST RESULTS





Quality Engineering | Valued Relationships

November 25, 2020

Our File No. 1000-43-15

Dana Bredin
WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB
R3T 6B8

RE Lab Testing Results for Maxwell Colony Lagoon – L20-374

Attached are laboratory testing results for the above noted project. This report contains moisture content determinations, particle size distribution (hydrometer method), and Atterberg Limits test results.

Hydraulic Conductivity results will be submitted upon completion.

If you have any questions or require additional information or clarifications, please contact Angela at 204.792.8458.

Kind Regards,

TREK Geotechnical

Review Control:

<i>Prepared By:</i> AD	<i>Reviewed By:</i> AFK	<i>Checked By:</i> NJF
------------------------	-------------------------	------------------------



www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-10

Project No. 1000-043-15
Client WSP Canada
Project Maxwell Colony Lagoon

Sample Date 19-Nov-20
Test Date 20-Nov-20
Technician AD

Test Hole	TH-01	TH-01	TH-01	TH-01	TH-01	TH-01
Depth (m)	0.6	1.2	1.8	2.4	3.0	3.7
Sample #	S-01	S-02	S-03	S-04	S-05	S-06
Tare ID	E79	AB13	AC38	P03	F44	C10
Mass of tare	8.8	6.8	7.0	8.6	8.4	8.6
Mass wet + tare	236.6	209.4	241.2	310.2	226.4	202.0
Mass dry + tare	170.0	156.8	177.8	225.4	163.6	145.2
Mass water	66.6	52.6	63.4	84.8	62.8	56.8
Mass dry soil	161.2	150.0	170.8	216.8	155.2	136.6
Moisture %	41.3%	35.1%	37.1%	39.1%	40.5%	41.6%

Test Hole	TH-05	TH-05	TH-05	TH-05	TH-05	TH-05
Depth (m)	0.6	1.2	1.8	2.4	3.0	3.7
Sample #	S-07	S-08	S-09	S-10	S-11	S-12
Tare ID	W81	H16	Z101	AC10	D29	Z10
Mass of tare	8.8	8.4	8.6	6.6	8.2	8.4
Mass wet + tare	260.0	213.4	212.2	169.9	256.6	199.0
Mass dry + tare	195.4	160.8	156.0	122.4	180.2	143.8
Mass water	64.6	52.6	56.2	47.5	76.4	55.2
Mass dry soil	186.6	152.4	147.4	115.8	172.0	135.4
Moisture %	34.6%	34.5%	38.1%	41.0%	44.4%	40.8%

Test Hole	TH-07	TH-07	TH-07	TH-07	TH-07	TH-07
Depth (m)	0.6	1.2	1.8	2.4	3.0	3.7
Sample #	S-13	S-14	S-15	S-16	S-17	S-18
Tare ID	F37	AB19	AB30	Z31	E121	K7
Mass of tare	8.4	6.6	6.8	8.6	8.6	8.6
Mass wet + tare	170.6	207.4	253.2	249.0	230.2	179.4
Mass dry + tare	133.8	154.6	183.0	176.4	163.8	130.2
Mass water	36.8	52.8	70.2	72.6	66.4	49.2
Mass dry soil	125.4	148.0	176.2	167.8	155.2	121.6
Moisture %	29.3%	35.7%	39.8%	43.3%	42.8%	40.5%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-10**

Project No. 1000-043-15
Client WSP Canada
Project Maxwell Colony Lagoon

Sample Date 19-Nov-20
Test Date 20-Nov-20
Technician AD

Test Hole	TH-08	TH-08	TH-08	TH-08	TH-08	TH-08
Depth (m)	0.6	1.2	1.8	2.4	3.0	3.7
Sample #	S-19	S-20	S-21	S-22	S-23	S-24
Tare ID	E99	AA10	K10	F108	AB38	K9
Mass of tare	8.6	6.6	8.4	8.2	6.6	8.4
Mass wet + tare	169.4	233.4	174.6	210.0	162.2	172.8
Mass dry + tare	133.2	174.0	127.6	156.0	117.4	122.6
Mass water	36.2	59.4	47.0	54.0	44.8	50.2
Mass dry soil	124.6	167.4	119.2	147.8	110.8	114.2
Moisture %	29.1%	35.5%	39.4%	36.5%	40.4%	44.0%

Test Hole	TH-03	TH-03	Th-06			
Depth (m)	0.6 - 1.2	1.8 - 2.4	1.2 - 1.8			
Sample #	ST-1	ST-2	ST-3			
Tare ID	N07	F42	F95			
Mass of tare	8.6	8.4	8.2			
Mass wet + tare	464.2	509.2	322.5			
Mass dry + tare	340.2	370.8	242.4			
Mass water	124.0	138.4	80.1			
Mass dry soil	331.6	362.4	234.2			
Moisture %	37.4%	38.2%	34.2%			



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

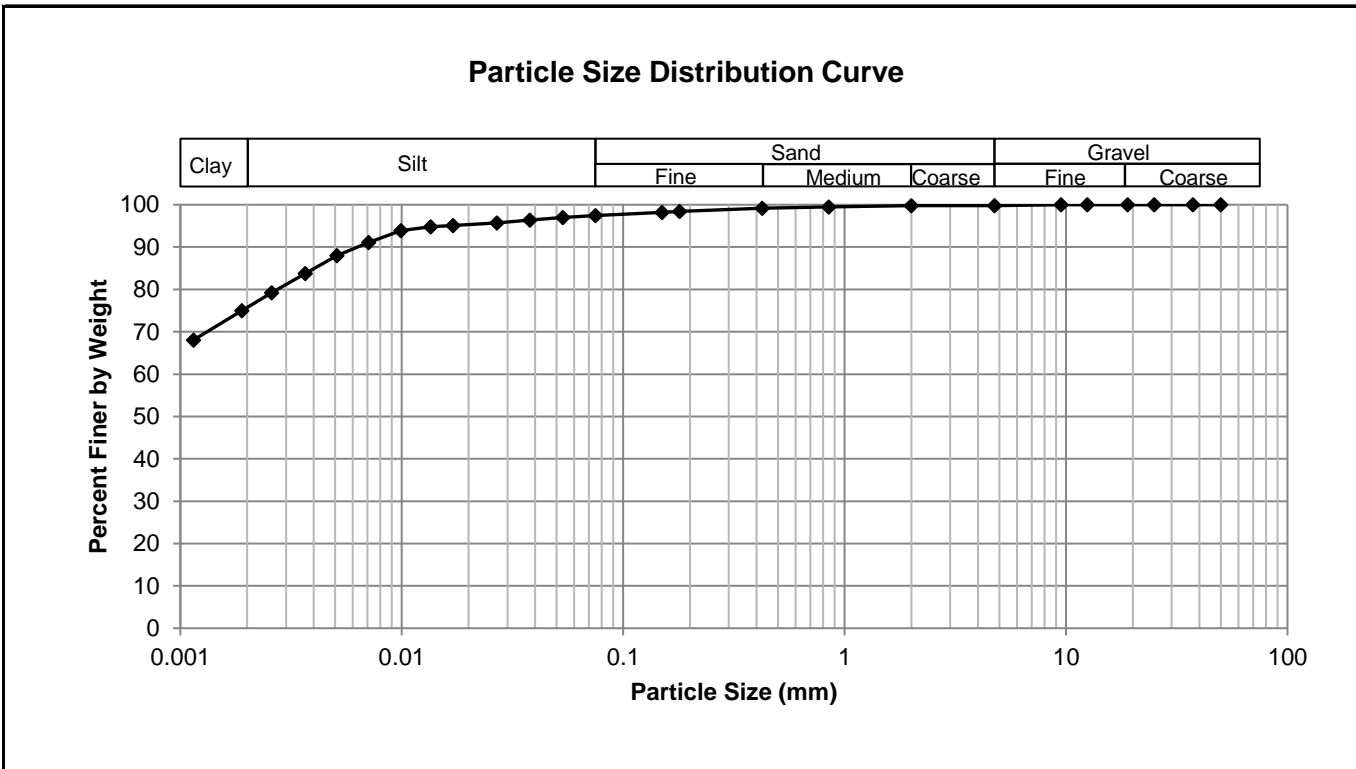
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-15
Client WSP Canada
Project Maxwell Colony Lagoon



Test Hole TH-03
Sample # ST-1
Depth (m) 0.6 - 1.2
Sample Date 19-Nov-20
Test Date 23-Nov-20
Technician AD

Gravel	0.2%
Sand	2.3%
Silt	21.8%
Clay	75.6%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	99.76	0.0750	97.43
37.5	100.00	2.00	99.76	0.0534	96.97
25.0	100.00	0.850	99.48	0.0379	96.35
19.0	100.00	0.425	99.19	0.0269	95.73
12.5	100.00	0.180	98.39	0.0171	95.10
9.50	100.00	0.150	98.18	0.0135	94.79
4.75	99.76	0.075	97.43	0.0099	93.85
				0.0071	91.11
				0.0051	87.99
				0.0037	83.76
				0.0026	79.21
				0.0019	74.97
				0.0011	68.08



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

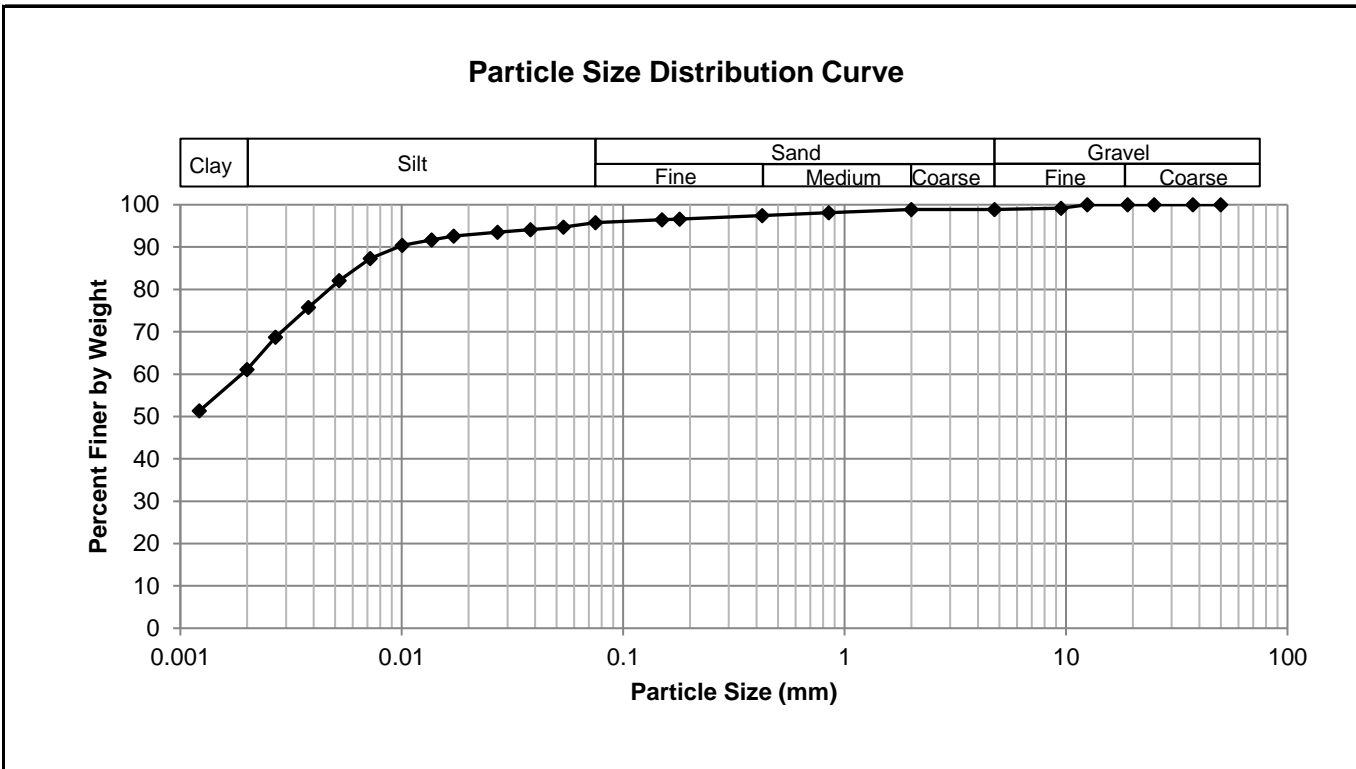
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-15
Client WSP Canada
Project Maxwell Colony Lagoon



Test Hole TH-03
Sample # ST-2
Depth (m) 1.8 - 2.4
Sample Date 19-Nov-20
Test Date 23-Nov-20
Technician AD

Gravel	1.1%
Sand	3.1%
Silt	34.6%
Clay	61.1%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	98.89	0.0750	95.76
37.5	100.00	2.00	98.89	0.0538	94.76
25.0	100.00	0.850	98.14	0.0382	94.14
19.0	100.00	0.425	97.48	0.0271	93.52
12.5	100.00	0.180	96.63	0.0172	92.59
9.50	99.19	0.150	96.44	0.0137	91.66
4.75	98.89	0.075	95.76	0.0100	90.43
				0.0072	87.34
				0.0052	82.14
				0.0038	75.75
				0.0027	68.75
				0.0020	61.13
				0.0012	51.35



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

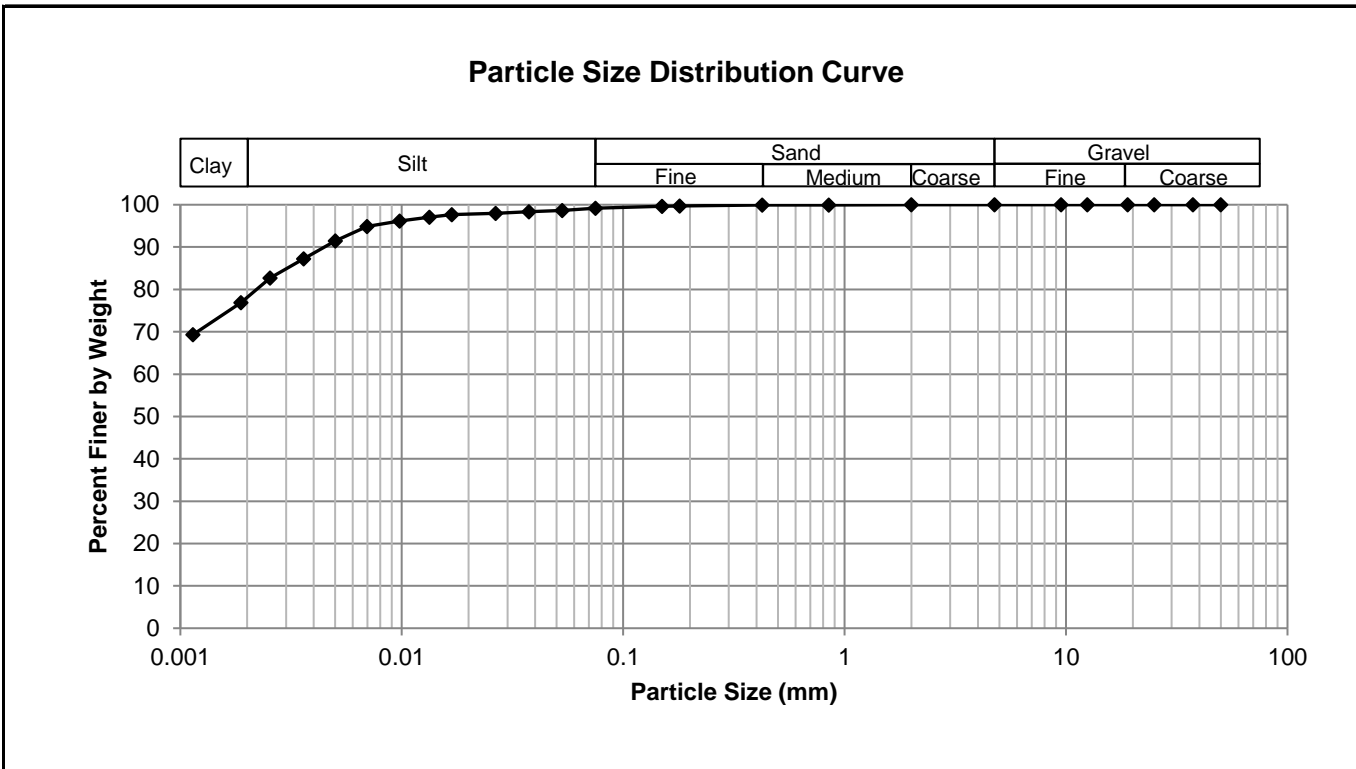
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-15
Client WSP Canada
Project Maxwell Colony Lagoon



Test Hole TH-06
Sample # ST-3
Depth (m) 1.2 - 1.8
Sample Date 19-Nov-20
Test Date 23-Nov-20
Technician AD

Gravel	0.0%
Sand	0.8%
Silt	21.3%
Clay	77.9%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	99.18
37.5	100.00	2.00	100.00	0.0530	98.63
25.0	100.00	0.850	99.94	0.0375	98.32
19.0	100.00	0.425	99.94	0.0266	98.01
12.5	100.00	0.180	99.74	0.0168	97.69
9.50	100.00	0.150	99.66	0.0134	97.07
4.75	100.00	0.075	99.18	0.0098	96.13
				0.0070	94.88
				0.0050	91.51
				0.0036	87.26
				0.0025	82.70
				0.0019	76.89
				0.0011	69.35



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

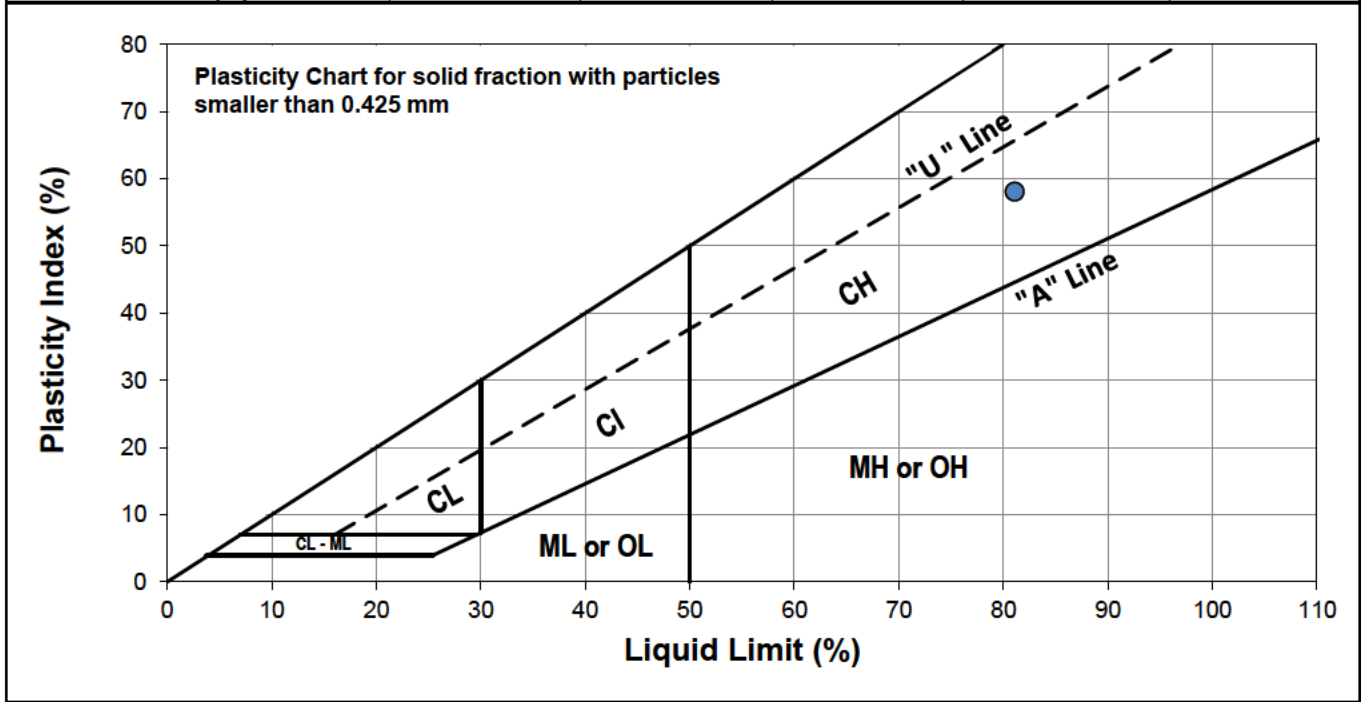
Project No.	1000-043-15
Client	WSP Canada
Project	Maxwell Colony Lagoon
Test Hole	TH-03
Sample #	ST-1
Depth (m)	0.6 - 1.2
Sample Date	19-Nov-20
Test Date	24-Nov-20
Technician	AD



Liquid Limit	81
Plastic Limit	23
Plasticity Index	58

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	16	20	26
Mass Wet Soil + Tare (g)	27.303	25.106	25.900
Mass Dry Soil + Tare (g)	21.250	20.152	20.648
Mass Tare (g)	14.115	14.162	14.153
Mass Water (g)	6.053	4.954	5.252
Mass Dry Soil (g)	7.135	5.990	6.495
Moisture Content (%)	84.835	82.705	80.862



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.243	13.996			
Mass Wet Soil + Tare (g)	20.264	20.174			
Mass Dry Soil + Tare (g)	19.135	19.020			
Mass Water (g)	1.129	1.154			
Mass Dry Soil (g)	4.892	5.024			
Moisture Content (%)	23.078	22.970			



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

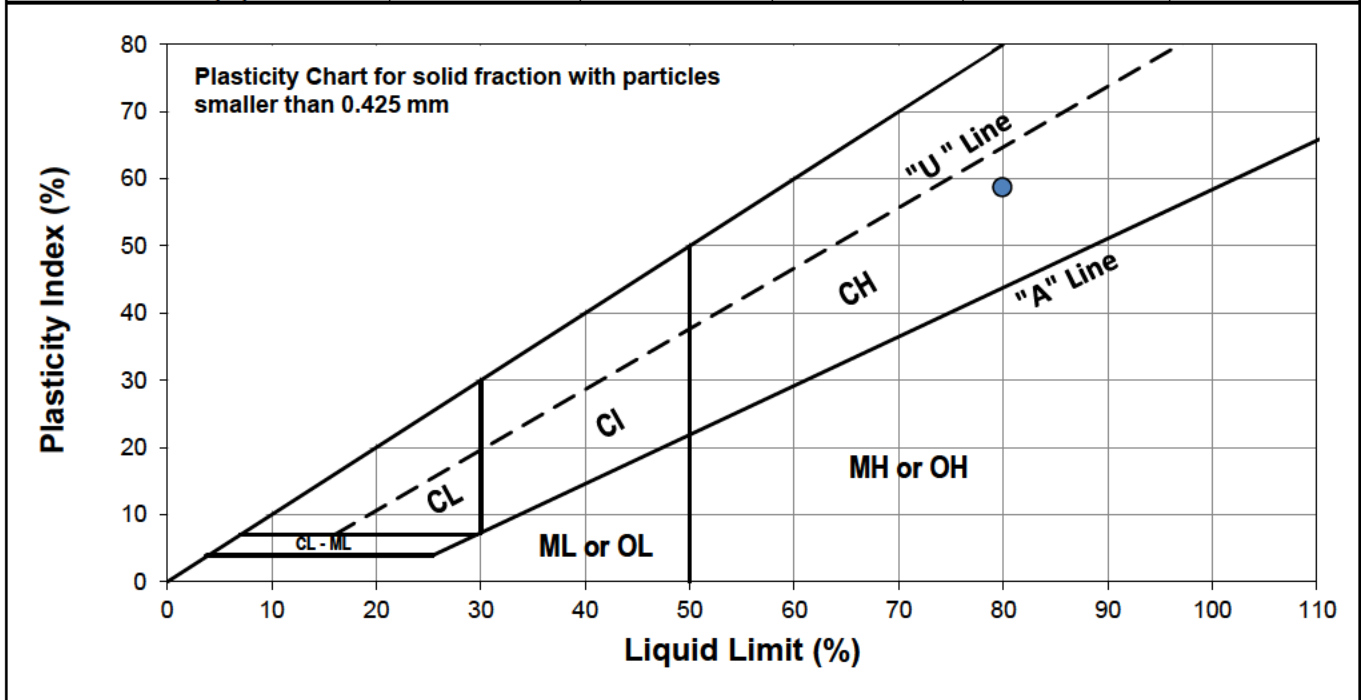
Project No.	1000-043-15
Client	WSP Canada
Project	Maxwell Colony Lagoon
Test Hole	TH-03
Sample #	ST-2
Depth (m)	1.8 - 2.4
Sample Date	19-Nov-20
Test Date	24-Nov-20
Technician	AD



Liquid Limit	80
Plastic Limit	21
Plasticity Index	59

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	20	32
Mass Wet Soil + Tare (g)	25.182	25.470	25.789
Mass Dry Soil + Tare (g)	20.122	20.304	20.646
Mass Tare (g)	14.050	13.957	14.074
Mass Water (g)	5.060	5.166	5.143
Mass Dry Soil (g)	6.072	6.347	6.572
Moisture Content (%)	83.333	81.393	78.256



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.198	14.028			
Mass Wet Soil + Tare (g)	20.528	20.020			
Mass Dry Soil + Tare (g)	19.428	18.966			
Mass Water (g)	1.100	1.054			
Mass Dry Soil (g)	5.230	4.938			
Moisture Content (%)	21.033	21.345			



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

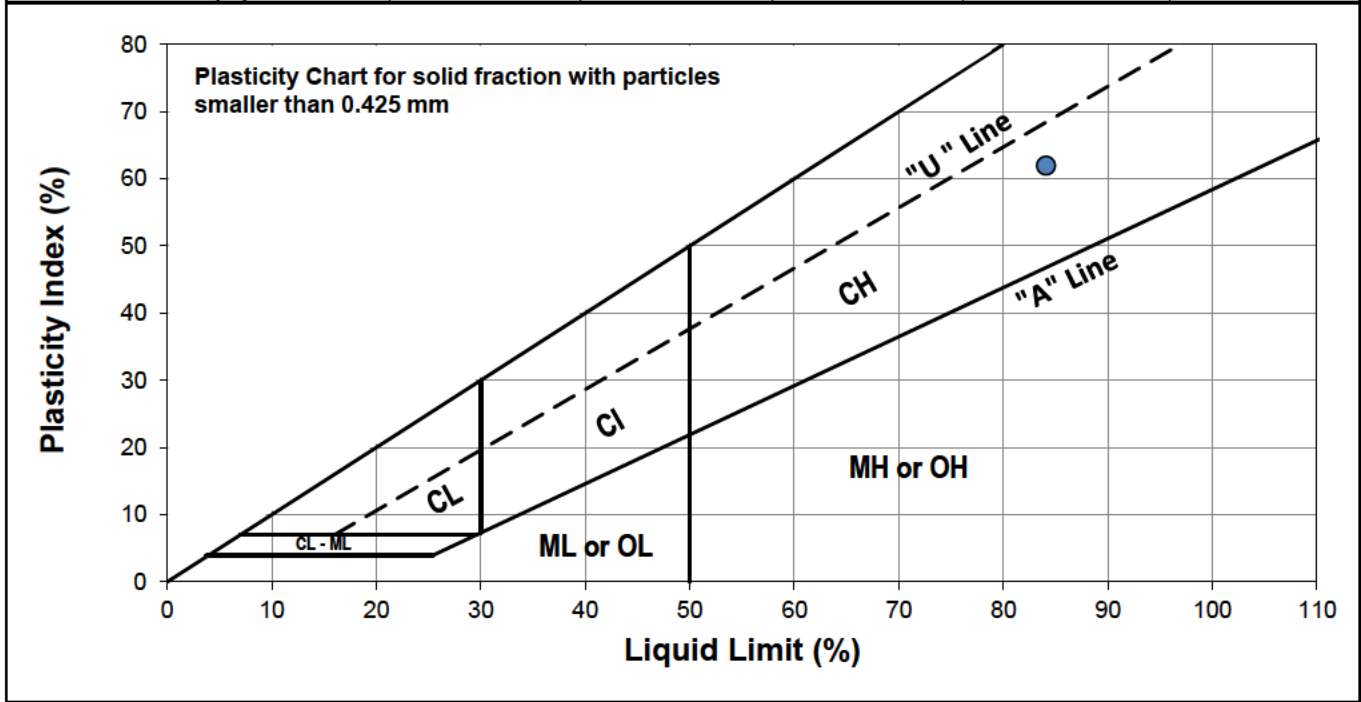
Project No.	1000-043-15
Client	WSP Canada
Project	Maxwell Colony Lagoon
Test Hole	TH-06
Sample #	ST-3
Depth (m)	1.2 - 1.8
Sample Date	19-Nov-20
Test Date	24-Nov-20
Technician	AD



Liquid Limit	84
Plastic Limit	22
Plasticity Index	62

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	21	32
Mass Wet Soil + Tare (g)	26.226	27.358	25.959
Mass Dry Soil + Tare (g)	20.515	21.240	20.622
Mass Tare (g)	13.966	14.053	14.162
Mass Water (g)	5.711	6.118	5.337
Mass Dry Soil (g)	6.549	7.187	6.460
Moisture Content (%)	87.204	85.126	82.616



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.011	13.926			
Mass Wet Soil + Tare (g)	20.409	20.610			
Mass Dry Soil + Tare (g)	19.252	19.394			
Mass Water (g)	1.157	1.216			
Mass Dry Soil (g)	5.241	5.468			
Moisture Content (%)	22.076	22.238			



Photo 1: Extruded Shelby Tube at Test Hole TH-03_ST-1



Photo 2: Extruded Shelby Tube at Test Hole TH-03_ST-2



Photo 3: Extruded Shelby Tube at Test Hole TH-06_ST-3

APPENDIX

D

HYDRAULIC CONDUCTIVITY TEST RESULTS





Quality Engineering | Valued Relationships

December 17, 2020

Our File No. 1000-43-15

Dana Bredin
WSP Canada Inc.
1600 Buffalo Place
Winnipeg, MB
R3T 6B8

RE Lab Testing Results for Maxwell Colony Lagoon – L20-374

Please see the attached Hydraulic Conductivity report. Three Shelby tube samples were obtained at the Maxwell Colony Lagoon on November 19, 2020. This report contains the hydraulic conductivity test results for ST-03 sample using a flexible wall permeameter following ASTM D5080-16.

The test report for the sample are attached showing the calculated hydraulic conductivity values corrected to 20°C are as follows:

Sample #ST-03 3.58E-11 m/s (3.58 x 10⁻⁹ cm/s)

The services undertaken by TREK on this assignment constitutes testing services only and engineering evaluation or interpretation has not been undertaken, but is available upon request.

If you have any questions or require additional information or clarifications, please contact Angela at 204.792.8458.

Kind Regards,

TREK Geotechnical

Review Control:

<i>Prepared By:</i> AD	<i>Reviewed By:</i> AFK	<i>Checked By:</i> NJF
------------------------	-------------------------	------------------------



Project No. 1000-043.15
Client WSP Canada
Project Maxwell Colony Lagoon

Test Hole TH-06
Trek Sample # ST3
Depth (m) 1.7-1.8
Sample Date 19-Nov-20
Test Date November 20, 2020 to December 16, 2020
Technician Angela Fidler-Kliewer

Specimen Details

Visual Classification Clay, silty, trace gravel (< 10 mm diam.), trace sulphate inclusions (<10 mm dia.), trace silt inclusions (<20 mm), brown, stiff, moist, high plasticity, vertical fissures.

Comments The specific gravity of the soil was assumed to be 2.75.

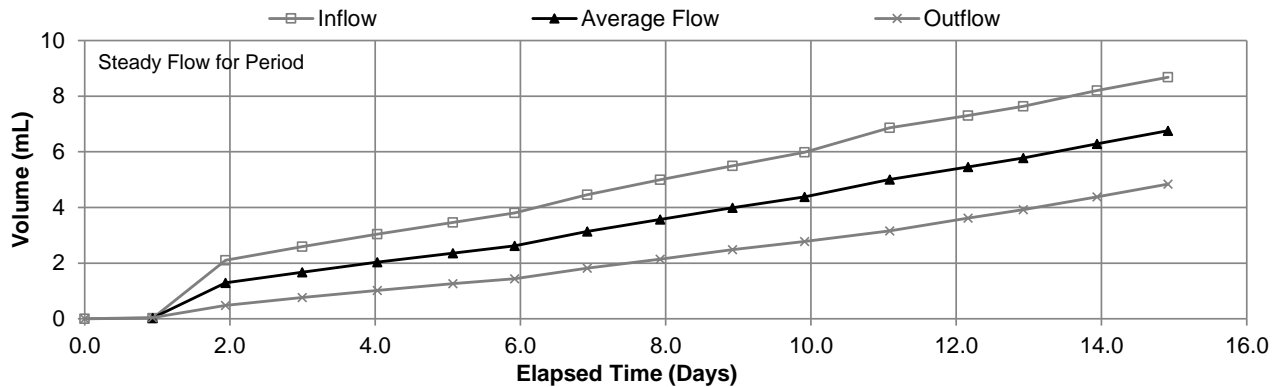
Index Testing

Liquid Limit 84
Plastic Limit 22
Plasticity Index 62
Clay Content (%) 78

Test Details

Permeant Distilled, de-aired water
Method Constant Head
Cell Pressure 127.8 kPa
Influent Pressure 110.7 kPa
Effluent Pressure 84.9 kPa
Gradient 29.31

Permeation Graph



Steady Flow Permeation Data

Time Increment (Days)	Elapsed Time (Days)	Flow (Q)		Inflow / Outflow Ratio	Average Flow (mL)	Temperature Correction	Corrected Hydraulic Conductivity, k_{20} (m/s)
		Influent (mL)	Effluent (mL)				
1.08	12.16	7.30	3.62	0.96	0.45	1.03	3.23E-11
0.76	12.92	7.64	3.92	1.13	0.32	1.06	3.35E-11
1.02	13.94	8.20	4.38	1.22	0.51	1.05	3.99E-11
0.98	14.92	8.68	4.84	1.04	0.47	1.04	3.76E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) 3.58E-11 (3.58x10⁻⁹ cm/s)

Consolidation Data

	Average Height (m)	Average Diameter (m)	Moisture Content (%)	Dry Density (kN/m ³)	Degree of Saturation (%)	Cell Pressure	Back Pressure
Initial	0.0961	0.0719	35.9	13.4	97.8	119.4	84.5
Final	0.0975	0.0723	37.6	13.3	100.1	119.4	84.5

APPENDIX

D

GENERAL
CORRESPONDENCE

Bunn, Jason

From: McCartney, Erin (CEN) <Erin.McCartney@gov.mb.ca>
Sent: May 6, 2021 9:31 AM
To: Bunn, Jason
Cc: CA - WinnipegFiling
Subject: RE: Mineral Rights - Maxwell Colony [WSP# 151-13571-00]

Good Morning, please be advised that according to our records as of this date:

- RL 105 Parish of St. Francois Xavier was transferred in 1884 along with the Mines, Minerals, Sand and Gravel.
- RL 106 Parish of St. Francois Xavier was transferred in 1877 along with the Mines, Minerals, Sand and Gravel.
- RL 107 Parish of St. Francois Xavier was transferred in 1885 along with the Mines, Minerals, Sand and Gravel.
- RL 109 Parish of St. Francois Xavier was transferred in 1885 along with the Mines, Minerals, Sand and Gravel.

Title 1760274/1 is silent as to mines, minerals, sand and gravel so it reverts back to the original Grant from the Crown (as per Section 58 of *The Real Property Act*). We can confirm that the mines, minerals, sand and gravel continue to be owned by the surface's current landowner, **Maxwell Hutterian Mutual Corporation**, for the lands described in Box 1 of said title.

If I can be of further assistance to you may I please hear from you.

Erin McCartney

Crown Lands Registrar, Real Estate Services Branch

Asset Management – Central Capital

Manitoba Central Services

308 - 25 Tupper Street North

Portage la Prairie, MB, R1N 3K1

Direct Line: 204-239-3805

Manitoba Toll Free: 1-866-210-9589

Fax: 204-239-3560

RESInfo@gov.mb.ca

CONFIDENTIAL NOTICE: This e-mail message (including any attachments) is confidential and may also be privileged, and all rights to privilege are expressly claimed and not waived. Any use, distribution, copying or disclosure of this message and any attachments, in whole or in part, by anyone other than the intended recipient is strictly prohibited. If you have received this message in error, please notify the sender and delete all copies. Thank you.

From: Bunn, Jason <Jason.Bunn@wsp.com>
Sent: May-05-21 10:26 AM
To: McCartney, Erin (CEN) <Erin.McCartney@gov.mb.ca>
Cc: CA - WinnipegFiling <Winnipeg.Filing@wsp.com>
Subject: FW: Mineral Rights - Maxwell Colony [WSP# 151-13571-00]

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION: ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Good morning Erin,

Back in 2015 I had submitted a request on the Mines and Minerals & Sand and Gravel for a lagoon development in River Lot 108, Parish of St. Francois Xavier, R.M. of Cartier (see correspondence below). The proposed development location has been updated to River Lots 105 to 109, north of PR 424 (also referred to as Road 241). Please provide me with any information that you would have on the mineral rights ownership for these River Lots. I have attached the Status of Titles for your reference.

Kind regards,

Jason Bunn, P.Eng.
Engineer, Wastewater Infrastructure



From: Little, Karen (CLPA) [<mailto:Karen.Little@gov.mb.ca>]
Sent: December 11, 2015 9:34 AM
To: Bunn, Jason <Jason.Bunn@wspgroup.com>
Cc: 'Alf Poetker' <apoetker@shaw.ca>; CA - WinnipegFiling <Winnipeg.Filing@wspgroup.com>
Subject: RE: Mineral Rights - Maxwell Colony [WSP# 151-13571-00]

Good morning Jason – according to The Crown Land Registry, this date, the Dominion of Canada granted:

- the Westerly 6 chains in width of RL 108 Parish of St. Francoise Xavier in 1878 to Michel Allard along with the mines & minerals and sand & gravel. The Crown kept no under-rights.
- the Easterly 6 chains in width of RL 108 Parish of St. Francois Xavier in 1885 to John S Morrison along with the mines & minerals and sand & gravel. The Crown kept no under-rights.

To determine current ownership of the under-rights you will need to do title searches at the Winnipeg Land Titles Office. Under-rights may have reverted back to the Crown by way of tax sale, which we are not aware of. <Karen>

Best wishes for the holidays,

Karen Little
Supervisor of Crown Lands Registry

Crown Lands and Property Agency
308 - 25 Tupper Street North
Portage la Prairie MB R1N 3K1
P 204-239-3805 F 204-239-3560
Toll Free 1-866-210-9589
karen.little@gov.mb.ca



An Agency of the Manitoba Government

The information contained in this e-mail and all attachments is confidential and is for the sole use of its intended recipient. It may not be disclosed to or used by anyone other than the addressee. If received in error, please contact the sender by return e-mail and delete this e-mail and all attachments from your system.

Le présent courrier électronique (courriel) et les documents qui y sont attachés peuvent contenir de l'information confidentielle; ils s'adressent exclusivement au destinataire mentionné ci-dessus et nulle autre personne ne doit en prendre connaissance ni les utiliser ou les divulguer. Si vous recevez le présent courriel par erreur, veuillez en aviser l'émetteur immédiatement par courrier électronique et le détruire avec les documents qui y sont attachés.

From: Bunn, Jason [<mailto:Jason.Bunn@wspgroup.com>]
Sent: December-10-15 9:33 AM
To: Little, Karen (CLPA)
Cc: Alf Poetker; CA - WinnipegFiling
Subject: Mineral Rights - Maxwell Colony [WSP# 151-13571-00]

Hi Karen,

We are preparing an EAP for Maxwell Colony for the construction of a new domestic lagoon in RL 108, Parish of St. Francois Xavier, R.M. of Cartier; proposed location south of PR 424 (also referred to as Road 241) and adjacent to the existing earthen manure storage; current land use is as agricultural cropland. Could you please provide me with information as to the mineral rights (Mines and Minerals and Sand and Gravel) for this River Lot? We would greatly appreciate receiving this information by December 23/15.

Kind regards,



Jason Bunn, P.Eng.
Environmental Engineer

WSP Canada Inc.
1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8
T 204 477 6650 ext#307 | F 204 474 2864 | E jason.bunn@wspgroup.com
www.wspgroup.com

You are receiving this communication because you are listed as a current WSP contact. Should you have any questions regarding WSP's electronic communications policy, please consult our Anti-Spam Commitment www.wspgroup.com/cas/. For any concern or if you believe you should not be receiving this message, please forward this message to cascompliance@wspgroup.com so that we can promptly address your request. This message is intended only for the addressee and may contain information which is privileged, confidential, proprietary, or exempt from disclosure under applicable law. If you are not the intended recipient, you are strictly prohibited from disclosing, distributing, copying, or in any way using this message. If you have received this communication in error, please notify the sender and delete any copies you may have received. WSP's Land Surveying entities in AB and BC are WSP Surveys (AB) Limited Partnership and WSP Surveys (BC) Limited Partnership.

Vous recevez cette communication car vous faites partis des contacts de WSP. Si vous avez des questions concernant la politique de communications électroniques de WSP, veuillez consulter notre Engagement anti-pourriel www.wspgroup.com/lcap. Pour toute question ou si vous croyez que vous ne devriez pas recevoir ce message, prière de le transférer au conformitelcap@wspgroup.com afin que nous puissions rapidement traiter votre demande. Ce message est destiné uniquement au destinataire et il peut contenir des informations privilégiées, confidentielles ou non divulguables en vertu de la loi. Si vous n'êtes pas le destinataire du présent message, il vous est strictement interdit de le divulguer, de le distribuer, de le copier ou de l'utiliser de quelque façon que ce soit. Si vous avez reçu la présente communication par erreur, veuillez en aviser l'expéditeur et supprimer le message.

NOTICE: This communication and any attachments ("this message") may contain information which is privileged, confidential, proprietary or otherwise subject to restricted disclosure under applicable law. This message is for the sole use of the intended recipient(s). Any unauthorized use, disclosure, viewing, copying, alteration, dissemination or distribution of, or reliance on, this message is strictly prohibited. If you have received this message in error, or you are not an authorized or intended recipient, please notify the sender immediately by replying to this message, delete this message and all copies from your e-mail system and destroy any printed copies. You are receiving this communication because you are listed as a current WSP contact. Should you have any questions regarding WSP's electronic communications policy, please consult our Anti-Spam Commitment at www.wsp.com/cas/. For any concern or if you believe you should not be receiving this message, please forward this message to cascompliance@wsp.com so that we can promptly address your request. Note that not all messages sent by WSP qualify as commercial electronic messages.

Bunn, Jason

From: Butterfield, Tamara (CC) <Tamara.Butterfield@gov.mb.ca>
Sent: May 5, 2021 2:34 PM
To: Bunn, Jason
Cc: CA - WinnipegFiling
Subject: RE: Licensed water users - Maxwell Colony [WSP# 151-13571-00]

Hi Jason,

According to our database, there are no licensed water users on the Hammercrest Creek.

Please note, that we do not licence projects where the water use falls below the domestic exemption category (< 25 000 Litres/day). Therefore, we would not have any records of domestic users in the area of interest.

Please note, you can use our Licensing Map Viewer Portal as well: [Water Licensing Portal \(gov.mb.ca\)](#)

Let me know if you need anything further.

Thanks,

Tamara

Cell 204-918-6273

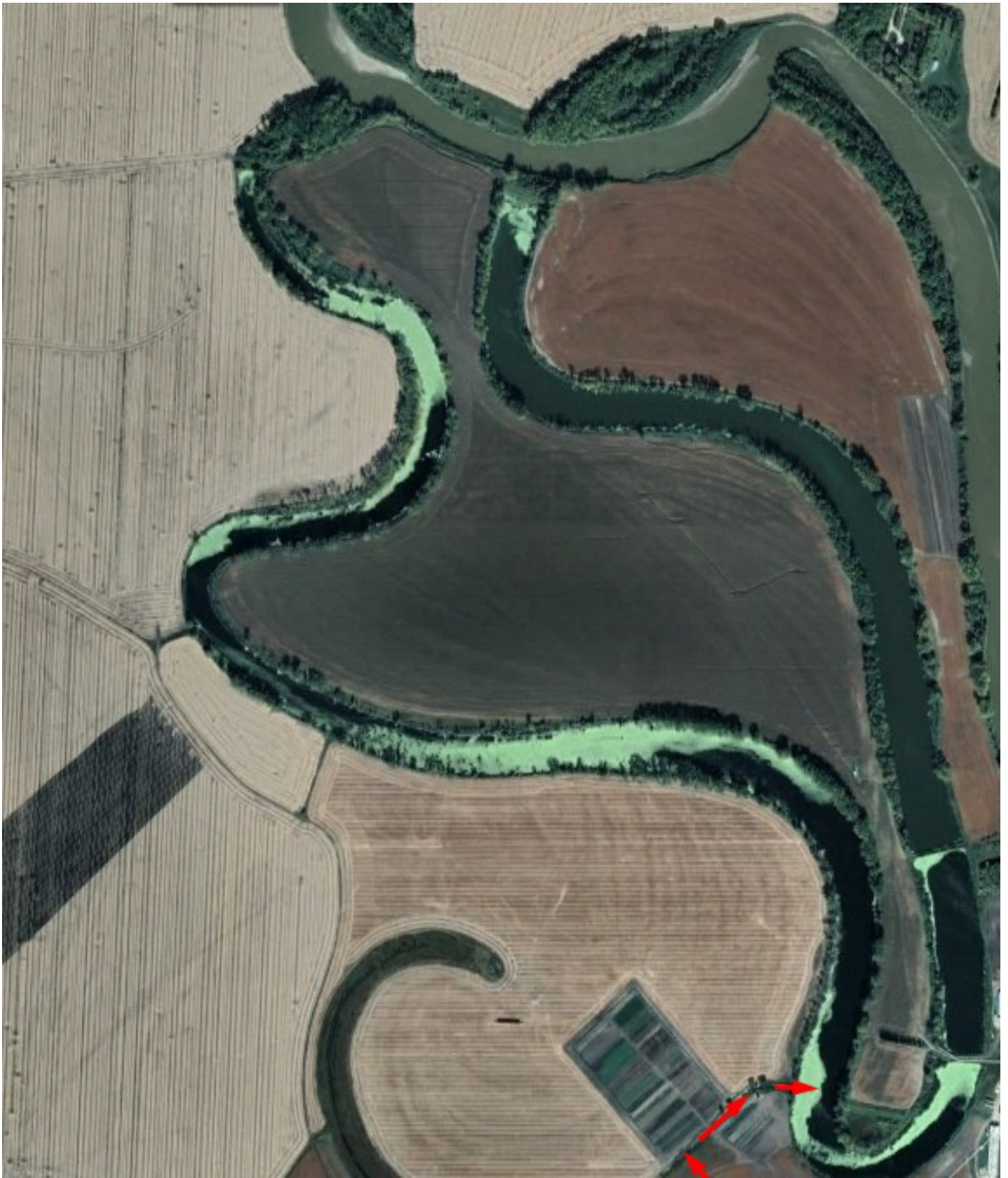
From: Bunn, Jason <Jason.Bunn@wsp.com>
Sent: May 5, 2021 10:26 AM
To: Butterfield, Tamara (CC) <Tamara.Butterfield@gov.mb.ca>
Cc: CA - WinnipegFiling <Winnipeg.Filing@wsp.com>
Subject: RE: Licensed water users - Maxwell Colony [WSP# 151-13571-00]

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION: ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Tamara,

Back in 2015 I had submitted a licensed water users request for a lagoon development in River Lot 108, Parish of St. Francois Xavier, R.M. of Cartier (see correspondence below). The proposed development location has been updated to River Lots 105-109, north of PR 424 (also referred to as Road 241). The discharge route will be into the watercourse that flows into Hammercrest Creek (see image below), which is actually an oxbow with a normally closed valve into the Assiniboine River. This purpose of this valve is for flood control. Are there any licensed water users on Hammercrest Creek?



Kind regards,

Jason Bunn, P.Eng.
Engineer, Wastewater Infrastructure



From: Matthews, Rob (CWS) [<mailto:Rob.Matthews@gov.mb.ca>]
Sent: December 10, 2015 11:26 AM
To: Bunn, Jason <Jason.Bunn@wspgroup.com>
Cc: Alf Poetker <apoetker@shaw.ca>; CA - WinnipegFiling <Winnipeg.Filing@wspgroup.com>
Subject: RE: Licensed water users - Maxwell Colony [WSP# 151-13571-00]

Jason,

There are no licensed water users on this section of the Barrickman Drain.

Another thing to keep in mind is that the only licensed water use in such situations would be for non-municipal purposes.

Most likely if someone was taking water from such a drain, either under licence or unlicensed (domestic use exemption), it would be for livestock watering.

There are examples of people taking loads of water out of a drain during the spring runoff period and then storing it in a reservoir for irrigation purposes later in the year.

But that having been said, irrigation is not that common on the Lake Agassiz clay soils.

Rob

From: Bunn, Jason [<mailto:Jason.Bunn@wspgroup.com>]
Sent: December-10-15 9:29 AM
To: Matthews, Rob (CWS)
Cc: Alf Poetker; CA - WinnipegFiling
Subject: Licensed water users - Maxwell Colony [WSP# 151-13571-00]

Hi Rob,

We are preparing an EAP for Maxwell Colony for the construction of a new domestic lagoon in RL 108, Parish of St. Francois Xavier, R.M. of Cartier; proposed location south of PR 424 (also referred to as Road 241) and adjacent to the existing earthen manure storage; current land use is as agricultural cropland. The discharge is proposed to the south of the lagoon and into the Barrickman Drain in RL 108. Please provide the licensed water users for this Drain (if any) from RL 108 down to its convergence with the Assiniboine River (See attached map). We would appreciate receiving your response by December 23/15.

Kind regards,



Jason Bunn, P.Eng.
Environmental Engineer

WSP Canada Inc.
1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8
T 204 477 6650 ext#307 | F 204 474 2864 | E jason.bunn@wspgroup.com



Mon 2021-05-31 2:46 PM

Murray, Colin (ARD) <Colin.Murray@gov.mb.ca>

DR J Bunn 20210505 Maxwell colony lagoon WSP151-13571-00

To Bunn, Jason



Hi Jason

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's (CDC) rare species database for your area of interest. This includes the primary location outlined by river lots RL-0105to9-FX north of Hwy424; and a two kilometer radius buffer from the edge of the location boundary. I'm also including an ESRI Shapefile representing the river lots using in the request and the 2km radius buffer.

The search resulted in the following occurrences:

1. Within the footprint or primary location(s):

No listed or tracked species occurrences found at this time.

2. Within 2km of the footprint boundary:

SCINAME	COMNAME	S_RANK	ESEA	SARA	COSEWIC	FIRSTOBS	LASTOBS	EO_RANK	REPACC
Quadrula quadrula	Mapleleaf Mussel	S1	Endangered	Threatened	Threatened	1991-10-10	1995-09-17	E - Verified extant (viability not assessed)	Medium

3. General area records

SCINAME	COMNAME	S_RANK	ESEA	SARA	COSEWIC	FIRSTOBS	LASTOBS	EO_RANK	REPACC	
Dolichonyx oryzivorus	Bobolink	S3S4B			Threatened	Threatened	2011-05-29	2015-06-01	A - Excellent estimated viability	Medium
Chaetura pelagica	Chimney Swift	S2B	Threatened		Threatened	Threatened	Jul-10	2019	E - Verified extant (viability not assessed)	Very High
Strix varia	Barred Owl	S3S4							E - Verified extant (viability not assessed)	Medium
Contopus virens	Eastern Wood-pewee	S3B			Special Concern	Special Concern	2011-06-07	2011-06-07		High
Verbena bracteata	Bracted Vervain	S3					1948-10-02	1948-10-02	H - Historical	
Ambystoma mavortium	Western Tiger Salamander	S4S5			Special Concern	Special Concern	1983-03-01	2014-10-19	E - Verified extant (viability not assessed)	Low

Further information on this ranking system can be found on our website at: <http://www.natureserve.org/conservation-tools/conservation-status-assessment>.

These designations can be found at:

<http://web2.gov.mb.ca/laws/statutes/ccsm/e111e.php>,

<https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html> and

<http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>.

Manitoba's recommended setback distances can be found at: https://www.gov.mb.ca/sd/pubs/conservation-data-centre/mbcdc_bird_setbacks.pdf.

The information provided in this letter is based on existing data known to the Manitoba CDC of the Wildlife and Fisheries Branch at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. **An absence of data does not confirm the absence of any rare or endangered species.** Many areas of the province have never been thoroughly surveyed, however, and the absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. The information should, therefore, not be regarded as a final statement on the occurrence of any species of concern nor should it substitute for on-site surveys for species or environmental assessments. Also, because our Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request.

Please contact the Manitoba CDC for an update on this natural heritage information if more than six months passes before it is utilised.

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

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

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

If you have any questions or require further information contact me directly at (204) 945-7760.

Colin

Reference screen clip:



Colin Murray
Information Manager- Manitoba Conservation Data Centre
Wildlife, Fisheries, and Resource Enforcement Branch
Manitoba Agriculture and Resource Development
200 Saulteaux Crescent, Winnipeg, MB R3J3W3
Colin.Murray@gov.mb.ca
T: 204-945-7760 F: 204-945-3077
Visit our website: <https://www.manitoba.ca/fish-wildlife/cdc/index.html>
Follow us on Twitter: twitter.com/MBGovAg
View our videos on YouTube: youtube.com/ManitobaAgriculture

From: Bunn, Jason <Jason.Bunn@wsp.com>
Sent: May 5, 2021 10:27 AM
To: Murray, Colin (ARD) <Colin.Murray@gov.mb.ca>
Cc: CA - WinnipegFiling <Winnipeg.Filing@wsp.com>
Subject: [Caution: Suspicious Email] [WARNING: UNSCANNABLE EXTRACTION FAILED]FW: Species search - Maxwell Colony [WSP# 151-13571-00]

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.
ATTENTION: ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Good morning Colin,

Back in 2015 I had submitted a request on a listing for rare species for a lagoon development in River Lot 108, Parish of St. Francois Xavier, R.M. of Cartier (see correspondence below). The proposed development location has been updated to River Lots 105-109, north of PR 424 (also referred to as Road 241). The current land use is agricultural cropland. Please provide an updated listing of rare species for the identified area (see attached kmz file for location). It would be great if we received your information by May 12.

Kind regards,

Jason Bunn, P.Eng.
Engineer, Wastewater Infrastructure



DATE: 2021-05-12

TO: **Jason BUNN**
Engineer, Wastewater Infrastructure
WSP
1600 Buffalo Place
Winnipeg, Manitoba
R3T 6B8

FROM: **Reid GRAHAM**
Impact Assessment Archaeologist
Archaeological Assessment Services Unit
Historic Resources Branch
Main Floor – 213 Notre Dame Avenue
Winnipeg, MB
R3B 1N3
T: (204) 945-2118
F: (204) 948-2384
e: Reid.Graham@gov.mb.ca

SUBJECT: **WSP #151-13571-00**
HRB File #: AAS-21-16971

Concerns.

Further to your e-mail regarding the above noted heritage screening, the Archaeological Assessment Services Unit (AASU) has examined the location in conjunction with Branch records for areas of potential concern. There are concerns with the current proposed plan to impact unknown heritage resource sites. The proposed lagoon is situated near the banks of the Assiniboine River, along the relict channel of Hammercrest Creek. There are numerous known archaeological sites located along this feature, including Precontact Indigenous settlements, bison kill sites, and human burials. Additionally, 1870's historical maps of the parish lots show cart trails and existing buildings near the proposed development location. These factors, to name a few, suggest that any future planned development within the area has the potential to impact heritage resources.

Under Section 12(2) of *The Heritage Resources Act*, if the Minister of Sport, Culture and Heritage has reason to believe that heritage resources or human remains are known, or thought likely to be present, on lands that are to be developed, then the owner/developer is required to conduct at his/her own expense, a heritage resource impact assessment (HRIA) and mitigation, if necessary, prior to the project's start.

The developer must contract a qualified archaeological consultant to conduct a Heritage Resources Impact assessment (HRIA) of the proposed development location, in order to identify and assess any heritage resources that may be negatively impacted by development. If desirable, the Branch will work with the developer/land owners and its consultant to draw up terms of reference for this project.

If you have any further questions or comments, please feel free to contact the Branch as above.

Manitoba Historic Resources Branch
Archaeological Assessment Services

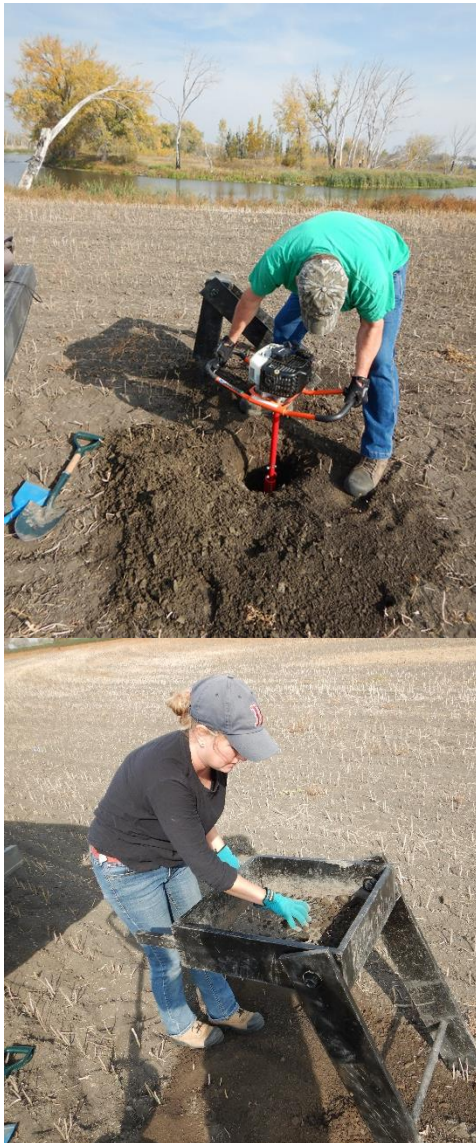
APPENDIX

E

HRIA REPORT



HERITAGE RESOURCE IMPACT ASSESSMENT PROPOSED MAXWELL COLONY WASTEWATER TREATMENT LAGOON RIVER LOTS 105-109 PARISH OF ST. FRANCOIS XAVIER, R.M. OF CARTIER, MB



Heritage Permit A78-21

AAS-21-16971

Prepared For:

WSP

1600 Buffalo Place

Winnipeg, MB R3T 6B8

Prepared by:

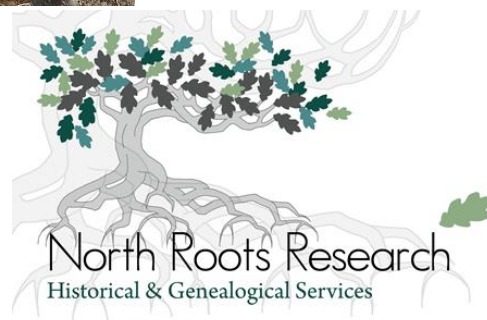
NORTH ROOTS RESEARCH

15080 31W

Stanley, Manitoba

R6T 0B4

November 4, 2021





15080 31 W
Stanley, Manitoba, R6T 0B4
Phone 204.997.3626 |
lbobbie@northrootsresearch.ca | www.northrootsresearch.ca

Jason Bunn, P.Eng.
Engineer, Wastewater Infrastructure
1600 Buffalo Place
Winnipeg, Manitoba
R3T 6B8

November 4, 2021

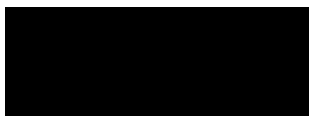
**Reference: Heritage Resource Impact Assessment of Proposed Wastewater Lagoon
Maxwell Hutterite Colony [A78-21]**

Dear Jason,

Please find enclosed the requested copy of the HRIA report regarding the above referenced project. Limited heritage resources were discovered during the HRIA investigation of the wastewater lagoon footprint in River Lots 105-109. Therefore, our recommendation is that there are no further heritage concerns with the Project and that the proposed development be granted heritage clearance.

The Historic Resources Branch has the authority to issue heritage clearance or make recommendations based on the findings in this report.

Sincerely,



Lisa C. Bobbie
Archaeologist/Owner
North Roots Research

Distribution List:

Manitoba Historic Resources Branch: 1 hard copy; 1 pdf copy
WSP: 1 pdf copy



EXECUTIVE SUMMARY

Maxwell Hutterian Mutual Corporation (Maxwell Colony) desires to construct a new wastewater treatment lagoon within River Lots 105 to 109, in the Parish of St. Francois Xavier, R.M. of Cartier. WSP Canada Inc. (WSP) has been retained by the Colony to provide the engineering design and to obtain the required approvals from Manitoba Conservation and Climate for this new lagoon. The new four-cell earthen wastewater lagoon, measuring approximately 190 metres x 480 metres, is planned to be located within a 7.0 hectare (17.3 acre) parcel of land situated south of an oxbow of the Assiniboine River, and southwest of the Colony's farm site.

The development was screened by the Historic Resources Branch (AAS-21-16971) as having potential for the presence of heritage resources due to its proximity to several large meanders and relict channels of the Assiniboine River. Numerous archaeological sites are known to be situated along the margins of this ancient waterway. Additionally, historical mapping indicates the project area overlaps with historic buildings and a major cart trail. Therefore, a Heritage Resource Impact Assessment (HRIA) is required to ensure heritage resources will not be impacted through construction and development under Section 12(2) of *The Heritage Resources Act* (1986).

North Roots Research was contracted by WSP to conduct an HRIA of the lagoon project area. The archaeological assessment occurred on October 2-3, 2021 under Heritage Permit A78-21. The assessment consisted of a systematic pedestrian survey and subsurface testing program across a larger 19.5 ha study area that conservatively includes 12.5 ha of the area surrounding the proposed lagoon. During the HRIA field investigations only a small number of widely scattered historic artifacts were discovered. Two of the artifacts date to the period prior to 1900 A.D. and were relatively close to each other and Hammercrest Creek. These finds have been registered with the Province as DILj-014 "Maxwell Colony Site". Subsurface testing did not locate any additional artifacts or evidence of buried cultural soil horizons. The very heavy and compacted clay soils impeded the subsurface testing.

While the HRIA identified the presence of heritage resources in the project area, the scattered nature of the artifacts and limited number of finds demonstrates a high degree of impact through agricultural practices over the last 100 years. **Therefore, it is recommendation that there are no further heritage concerns with the subject property and that the development should receive heritage clearance to proceed.**

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 PROJECT OVERVIEW	1
2.0 BACKGROUND.....	3
2.1 ENVIRONMENT.....	3
2.2 CULTURAL AND HISTORICAL BACKGROUND.....	5
3.0 HERITAGE RESOURCE IMPACT ASSESSMENT	8
3.1 BACKGROUND.....	8
3.2 FIELD INVESTIGATION.....	9
3.3 ANALYSIS AND RESULTS	14
4.0 CONCLUSIONS AND RECOMMENDATIONS.....	16
5.0 REFERENCES CITED.....	17

LIST OF FIGURES

FIGURE 1: SKETCH MAP OF PROPOSED MAXWELL COLONY WASTEWATER TREATMENT LAGOON.....	2
FIGURE 2. PROJECT LOCATION WITHIN THE WINNIPEG ECODISTRICT (849), LAKE MANITOBA PLAIN ECOREGION (162), AND PRAIRIE ECOZONE.	4
FIGURE 3. PLAN OF RIVER LOTS IN THE PARISH OF ST. FRANCOIS XAVIER 1873 (HUDSON BAY COMPANY ARCHIVES).....	7
FIGURE 4. FLAT, OPEN AGRICULTURAL FIELD – NORTHEAST ASPECT	10
FIGURE 5. GROUND SURFACE VISIBILITY OF FIELD	10
FIGURE 6. RELICT CHANNEL ON WEST SIDE OF PROPOSED LAGOON – NORTH ASPECT.....	11
FIGURE 7. RIBBONS OF CLAY IN AUGER TEST AG-09	11
FIGURE 8. AUGER TEST HOLE AG-02 – NORTH ASPECT	12
FIGURE 9. MACHINE CUT NAIL	15
FIGURE 10. CERAMIC SHERDS	15
FIGURE 11. “BLOB-TOP” BOTTLE FINISH.....	15

LIST OF TABLES

TABLE 1: LISTING OF KNOWN ARCHAEOLOGICAL SITES WITHIN 4 KM RADIUS OF THE STUDY AREA	8
---	---

LIST OF MAPS

MAP 1. ARCHAEOLOGICAL INVESTIGATION OF PROPOSED WASTEWATER TREATMENT LAGOON IN RIVER LOTS 105-10913

APPENDICES

APPENDIX A HERITAGE PERMIT A78-21
APPENDIX B SHOVEL TEST FORMS

Project Personnel

Project Manager & Archaeological Field Investigator

Lisa C. Bobbie, M.A.

Field Assistant

Derek R. Bobbie, B.Sc, BaCE

Report Preparation

Lisa C. Bobbie, M.A.

GIS Mapping

Lisa C. Bobbie, M.A.

1.0 INTRODUCTION

WSP Canada Inc. (WSP), on behalf of Maxwell Hutterian Mutual Corporation (Maxwell Colony), has been retained by the Colony to provide the engineering design and to obtain the required approvals from Manitoba Conservation and Climate for this new lagoon. The new four-cell earthen wastewater lagoon, measuring approximately 190 metres x 480 metres, is planned to be located within a 7.0 hectare (17.3 acre) parcel of land situated south of an oxbow of the Assiniboine River, and south of the Colony's farm site. The proponent submitted an Environment Act Proposal (EAP) in 2016 (Public Registry File: 5876) and are currently working on a notice of alteration for the lagoon development.

The lagoon development was screened by the Historic Resources Branch (AAS-21-16971) as having potential for the presence of heritage resources due to its proximity to several large meanders and relict channels of the Assiniboine River. Numerous archaeological sites are known to be situated along the margins of this ancient waterway. Additionally, historical mapping indicates the project area overlaps with historic buildings and a major cart trail. Therefore, a Heritage Resource Impact Assessment (HRIA) is required to ensure heritage resources will not be impacted through construction and development under Section 12(2) of *The Heritage Resources Act* (1986).

North Roots Research was contracted by WSP on behalf of Maxwell Colony Farms to conduct an HRIA of the proposed wastewater treatment lagoon area with the objective to determine if heritage resources are present within the development area and to assess the potential for impact or damage to such heritage resources during development activities.

1.1 PROJECT OVERVIEW

The study area is situated in the northern portions of River Lots 105-109 and immediately south of Hammercrest Creek, and southeast of an relict oxbow of the Assiniboine River. Access to the property is off Provincial Road 424 (also known as Road 241). The property is nine kilometres northeast of the Town of Elie and 10 kilometres northwest of the Town of St. Francois Xavier, MB.

The lagoon project area is situated within an open agricultural field. A thin strip of treeline separates the field from Hammercrest Creek. A dirt roadway crosses through the field leading to the Colony's vegetable garden. The Maxwell Colony itself, is located over 500 metres to the northeast along the south bank of the Assiniboine River. The lagoon's extent will measure approximately 190 metres x 480 metres within the 7.0 ha parcel of land. The proposed lagoon will consist of four cells consisting of a primary cell, two secondary cells and a wetland cell. The four-cell, earthen wastewater lagoon will be built into the in situ high plasticity clay.

Figure 1: Sketch Map of Proposed Maxwell Colony Wastewater Treatment Lagoon



2.0 BACKGROUND

2.1 ENVIRONMENT

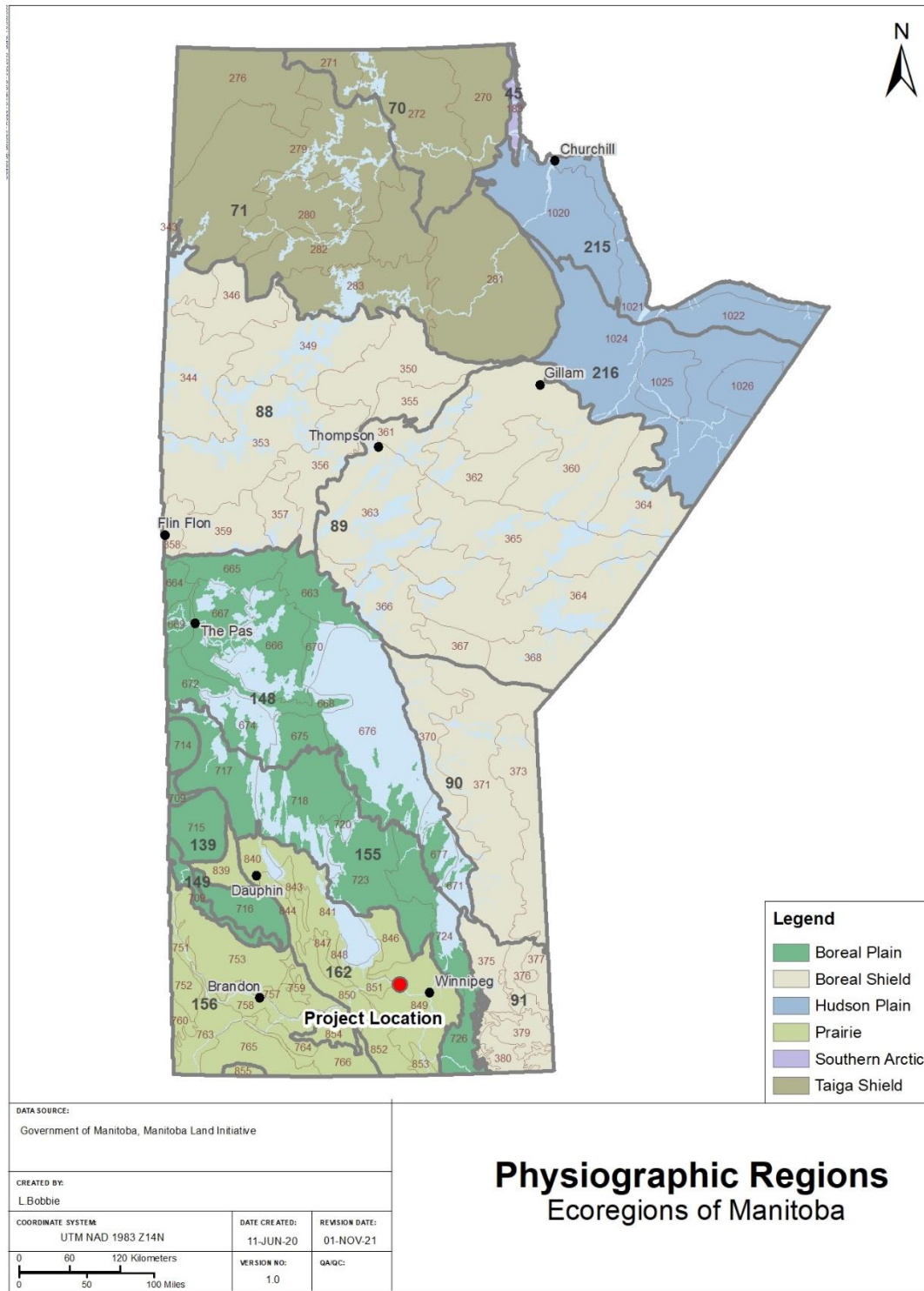
The Parish of St. Francois Xavier is located in southern Manitoba, off Provincial Trunk Highway (PTH) 1, approximately 15 km west of the City of Winnipeg (Figure 2). The natural environment is part of the Winnipeg Ecodistrict (849) of the Lake Manitoba Plain ecoregion (162). The Lake Manitoba Plain Ecoregion is described by Smith et al. (1998:244) as stretching “northwestward from the International Boundary to Lake Dauphin in southern Manitoba. The Manitoba Escarpment marks its western boundary. Before settlement, this ecoregion was a mosaic of trembling aspen/oak groves and rough fescue grasslands”.

The Winnipeg Ecodistrict lies in the central lowland of the Red River Plain. It is a smooth level to very gently sloping, clayey glaciolacustrine plain with a mean elevation of 236 masl¹. The climate is characterized by short, warm summers and long, cold winters with a mean annual temperature of 2.4°C with an average growing season of 183 days.

The soils in the Winnipeg Ecodistrict are predominantly imperfectly to poorly drained Gleysolic Humic Vertisols and Vertic Black Chernozems soils developed on calcareous, clayey glaciolacustrine sediments. The native vegetation originally consisted of tall prairie grass and meadow prairie grass which has largely been supplanted by cultivated fields and the development of an extensive network of drainage ditches. Tree cover was never very extensive and today is now mostly limited to fringes along stream channels. Tree species consist of bur oak and trembling aspen with an undergrowth of snow berry, hazelnut, saskatoon, high bush cranberry and red-osier dogwood. On the alluvial floodplain and lower river terraces white elm, basswood, cottonwood, Manitoba Maple and green ash are found with an undergrowth of willow, ferns and associated herbaceous plants. Wildlife includes white-tailed deer, coyote, red fox, rabbits, ground squirrel, striped skunk, and waterfowl (Smith et al 1998:244-245; 260-261).

¹ Masl – ‘Metres above sea level’

Figure 2. Project Location within the Winnipeg Ecodistrict (849), Lake Manitoba Plain Ecoregion (162), and Prairie Ecozone.



Physiographic Regions
 Ecoregions of Manitoba

2.2 CULTURAL AND HISTORICAL BACKGROUND

The ancient land use and occupation would have begun after deglaciation and the final draining of Glacial Lake Agassiz around 7,700 years ago (Nielson et al 1996). Boyd (2007) suggests for the Assiniboine delta that occupation would have occurred quite quickly as the lake shore regressed. The proposed development area lies within Treaty 1 land, signed in 1871 at Lower Fort Garry, which historically included the Ojibway (Saulteaux), Cree, the Assiniboine and the Sioux and is the homeland of the Métis Nation. A brief cultural chronology is presented below and is divided into the Precontact Period (10,500 – 300 yra²) and Contact Period (300-100 yra). Today, the geographically closest First Nations are Dakota Tipi and Dakota Plains.

Precontact Period

The first human inhabitants may have arrived in southcentral Manitoba during the Paleo Period (10,500-8,000 yra). The base of a lanceolate projectile point from this period was recovered near St. Norbert which may indicate an occupation by nomadic bison hunters as early as 8,000 years ago (Priess, Bradford, Ebell and Nieuwhof 1986:24). These peoples were nomadic hunter-gatherers who tracked and hunted megafauna, such as the mammoth, using large lanceolate spear points. Cultural materials from this period are rare, and in Manitoba, are typically only found in the southwestern corner of the Province.

As the climate warmed during the Altithermal period, the once coniferous forest transitioned to grasslands and herds of bison migrated northwards. Several cultures depended upon the bison for their subsistence and expanded their spheres northward into southwestern Manitoba (Buchner 1990). This era, known as the Intensive Diversification Period (8,000 – 2,000 yra), represents a time of technological innovation with the use of atlatl darts and side-notched projectile points. These cultures exploited a more diversified resource base including hunting, fishing and foraging. Extensive trade networks developed with agricultural village cultures to the south along the Missouri River. West coast marine shell artifacts have been found in Plains archaeological sites (Green 1998:34). High-quality raw materials for tools and weapons included Knife River Flint from North Dakota and native copper from the Lake Superior region which were imported and traded into Manitoba during ancient times.

The next cultural phase which followed is known as the Woodland Period (2000 -300 yra) and is marked by the introduction of ceramics, the bow and arrow, bison pound structures and burial mounds (Syms 1977). These cultural groups had a broadly-based forest economy that included hunting a variety of large and small animals, fishing and gathering wild plant foods (Priess et al 1986). The Mound Builder culture, noted for their large and complex earthworks in southern Manitoba, flourished between 900 and 1,400 A.D. and are assigned to the Late Woodland Period, specifically the Blackduck and the Devil's Lake-Sousford complexes (Rempel 1994).

Protocontact and Contact Period

The first Euro-Canadian explorer to reach southern Manitoba was Pierre Gaultier de La Vérendrye in 1738. La Vérendrye set up a series of posts along major waterways in Manitoba including Fort Rouge at the Forks, Forts La Reine, Bourbon, Dauphin and Paskoyac which provided a steady flow of furs to the East. Maps

² YRA – 'years ago'

from this period identify the Cree and Assiniboine as occupying southern Manitoba. Ancient Indigenous trade and travel routes became well known cart trails in the historic period used by explorers, fur traders, missionaries, bison hunters, and settlers. Exploration routes and Red River Cart trails expanded out from Fort Garry (now the City of Winnipeg). As the railways pushed into the west, these cart trails fell into disuse.

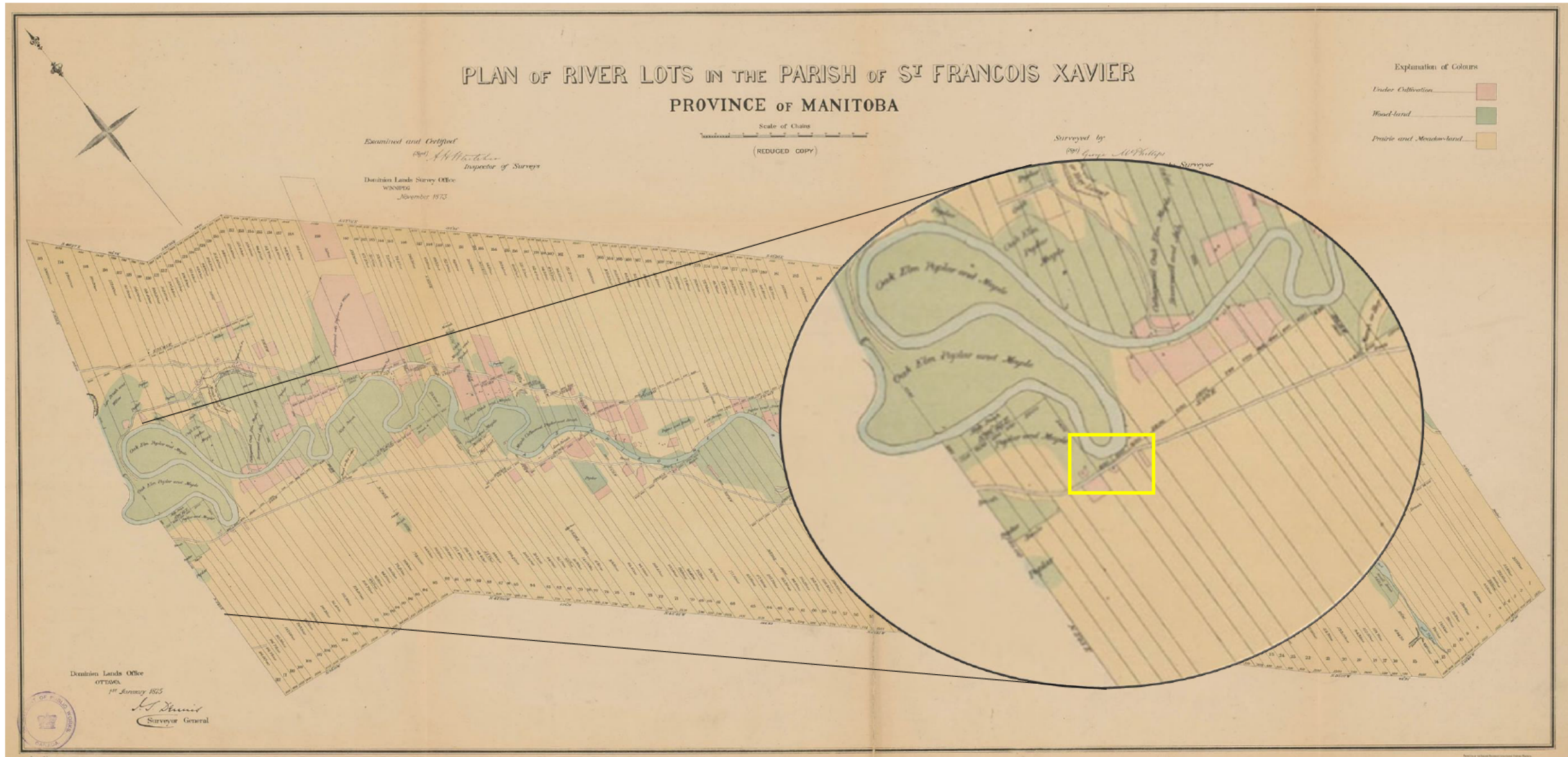
One of the earliest settlements beyond Upper Fort Garry was Grantown (today known as St. Francois Xavier) where Cuthbert Grant, an influential political and military leader of the Métis population, established his people in 1824. The lands around St. François were excellent for farming and provided the Métis with a sufficient wood supply. The area became a manufacturing centre for Red River Carts due to the abundance of oak (Barkwell et al 2010) and was a staging point for the Métis annual bison hunt. The Métis farms were anchored on the rivers along seigneurial river lots, while the location of other settlers was constrained by the survey grid of the Dominion Land Survey (DLS) system.

The original 1873 Plan of River Lots in the Parish of St. Francois Xavier was obtained from the Hudson Bay Company Archives (HBCA). The plan shows a major trail crossing through River Lots 105-109. The plan also shows cultivated fields, forests of poplar and maple. Small black dots located within the River Lots symbolizes the location of buildings. A building is shown on River Lot 105 where the Colony is currently situated and also in River Lot 107 south of the trail (Figure 3).

Sprague and Frye's genealogy (1983) assign River Lot 105 in the Parish of St. Francois Xavier to James Richard and his wife Hannah Willstedd and their family. This is possibly the J. Richards who was a mail carrier in the Pigeon Lake area starting in 1881. Pigeon Lake is a former channel of the Assiniboine River situated on River Lots 122-129, north of the Assiniboine. The name derives from the large number of passenger pigeons which abounded there. The Hudson Bay Company store issued free gunpowder to anyone who would shoot the pigeons (St. Francois Xavier Historical Committee 1980:346). The settlement had a post office, church and store. The HBC post, known as Lane's Post was also situated on the north side of the Assiniboine River on River Lot 139. A ferry was situated between lots 141 and 142 to connect the people living on the south side of the river with the main settlement and trail.

The Maxwell Colony was established in 1918 by members of the Maxwell Colony from South Dakota. It was part of a larger group of Hutterite people that migrated from the Dakotas in that year and established an initial total of six colonies in this region. The property where the Maxwell Colony is situated today was once owned by the Hammerquist family who came from Sweden in the early 1900s and established a farm on the south side of the Assiniboine River (St. Francois Xavier Historical Committee 1980:198). It may be possible that the name Hammercrest Creek was derived from this early settler family surname.

Figure 3. Plan of River Lots in the Parish of St. Francois Xavier 1873 (Hudson Bay Company Archives).



3.0 HERITAGE RESOURCE IMPACT ASSESSMENT

3.1 BACKGROUND

The purpose of the HRIA is to locate and document the presence and context of heritage resources within a project area and determine a site’s heritage significance and whether a site should be mitigated or avoided. Heritage sites or archaeological sites within the Province of Manitoba are protected under the *Heritage Resources Act* of 1986 (Government of Manitoba). Archaeological sites are resources which consist of objects, structures, or groups of objects that are abandoned in antiquity and are found in buried, submerged or surficial contexts. All registered archaeological sites in Canada are designated with a Borden Number, which is an alphanumeric code representing the location of the site and order in which it was discovered. Borden Number Blocks are measured in degrees and minutes Latitude and Longitude.

The archaeological assessment began with a review of existing archaeological sites in the general region. There are four registered archaeological sites within 4 km of the proposed development, consisting of two Precontact sites, one multi-component precontact/historic site and one historic-period site. A summary of these sites can be found in Table 1.

Table 1: Listing of Known Archaeological Sites within 4 km Radius of the Study Area

Borden Number	Name	Site Type	Period	Description
DILj-10	Not Available	A. Campsite	Precontact, Late Woodland	Fabric impressed body sherd
DILj-9	Not Available	I. Isolated Find	Precontact	
DILj-1	Lane’s Post	M. Fur Trade Post	1851-1900	Site originally consisted of several trade post structures. Bottle glass, HBC ceramics, cut nails
DILj-6	Not Available	A. Campsite J. Farmstead	Settlement period historic and Late period Precontact	Appears to be large site with distinct settlement period occupations. Several buildings, overlaying a wider distribution of pre-contact materials. Flakes, fragment of a catlinite pipe; wrought nails and hardware, cut nails, glass, porcelain, metal wire-looped buttons

3.2 FIELD INVESTIGATION

The HRIA investigation of the lagoon study area occurred on October 2-3, 2021 under Heritage Permit A78-21. The objective of the archaeological assessment is to assess the property to determine the presence and location of artifacts or features. Investigation methods employed a combination of pedestrian survey and judgmental subsurface testing (Map 1). Hand-held GPS units (Garmin 78S) recorded pedestrian survey tracks and subsurface test locations. Subsurface tests were excavated using a gas-powered auger with a 10-inch drill bit. The excavated soil was then screened through a 6mm mesh sieve. Information was recorded noting stratigraphy, size and location and the data was then transferred to an Excel spreadsheet (Appendix B). Other relevant information was recorded in field notebooks and photo-documented using a Nikon Coolpix W300 GPS camera.

The harvested canola field had been harrowed and partially cultivated at the time of the survey which allowed for excellent ground surface visibility (Figure 4 & 5). The agricultural field is flat, level terrain with no elevations or landforms of note. A dirt road runs through the north portion of the field and extends westward towards the Colony's vegetable garden and south towards the highway. The road has been packed down from regular vehicle use. The northern portion of the study area is within 20 metres of Hammercrest Creek. The vegetation consisted of a thin fringe of grasses and immature cottonwood and maple trees along the creek edge. The west side of project is bounded by a relict channel, measuring approximately 1 metre in depth and a width of 3 metres. The channel is vegetated with grasses, sedges and bullrushes and it appeared that the channel sides have been modified to allow for drainage (Figure 6). The Colony's vegetable garden is located to the northwest of the project's boundary.

The two-person crew conducted systematic pedestrian survey with transects spaced 5-15 metres apart throughout the entire study area. A limited number of historic period artifacts were noted widely spread across the property. Artifacts consisted of fragments of bottle glass, sherds of refined white earthenware, and one machine cut nail. The locations of surface artifacts were geo-located with hand-held GPS units and a representative sample was collected (>70%).

Large amounts of animal bones were scattered across the entire field consisting mainly of pig and bird bones, with lesser amounts of large mammal bones (cow, deer). The bones have been attributed to the spreading of compost materials using a byproduct of the Colony's poultry and swine production and as such were not mapped and were not collected.

The subsurface testing program was conducted across the study area with intensive testing closer to the Creek and relict channel. A total of 12 auger tests were excavated, with bore hole diameter on average 30 cm wide and excavated to depths between 30 to 100 cm below ground surface to locate *in-situ*³ artifacts or buried cultural soil horizons. The soil profile encountered in the shovel tests consisted of an extremely hard-packed, dry grey clay which transitioned to a beige leached, denuded soil. The ground was so compacted that the soils came out as ribbons of clay (Figure 7). Tests were halted when the auger could not penetrate further into the subsoils. Modern agricultural practices combined with the low rainfall during the past season had created a highly compacted soil. All subsurface tests were negative and there was no evidence of buried cultural soil horizons.

³³ In-situ – meaning in the place of original deposition

Figure 4. Flat, open agricultural field – Northeast aspect



Figure 5. Ground surface visibility of field



Figure 6. Relict Channel on west side of Proposed Lagoon - North aspect



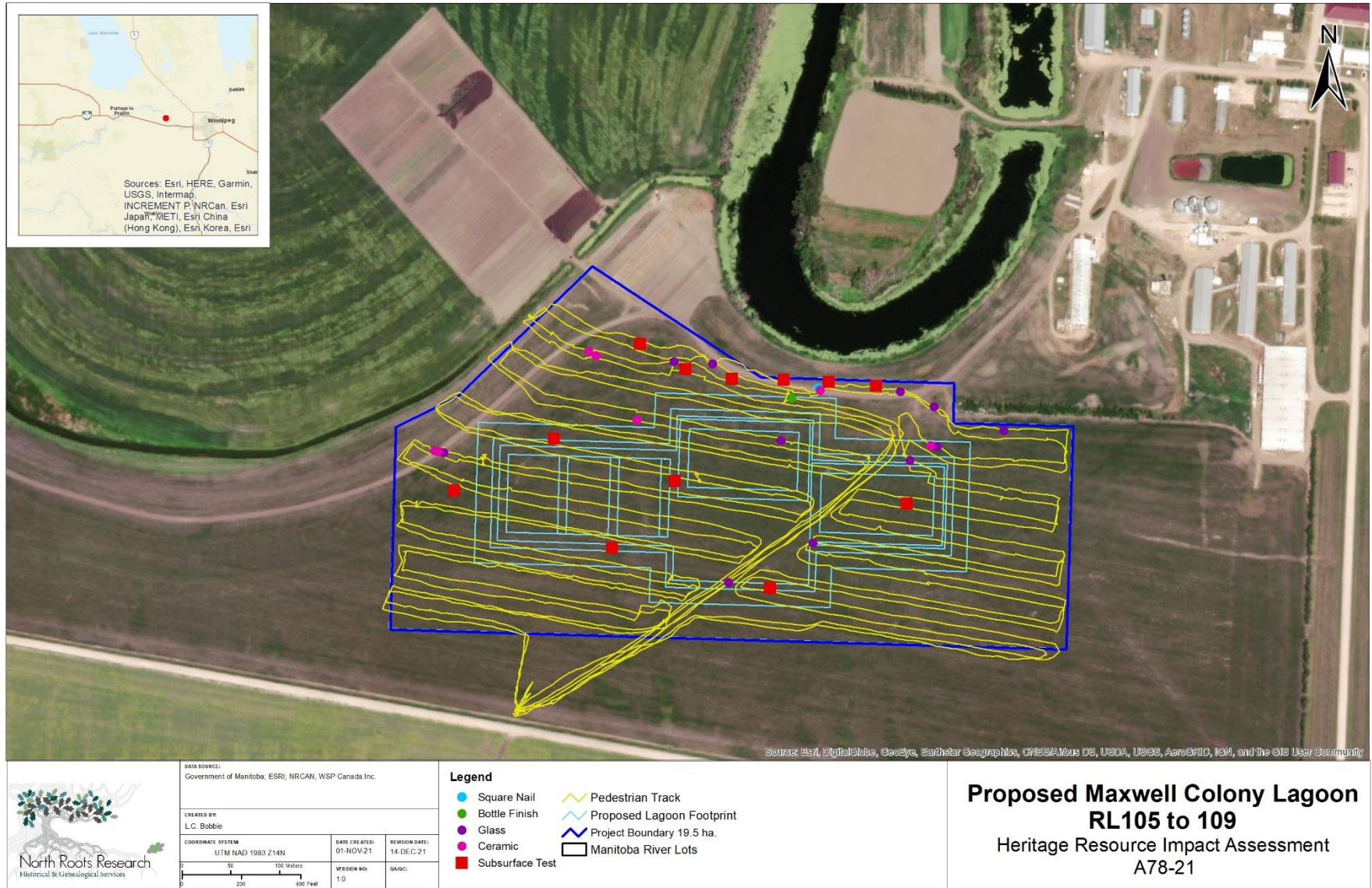
Figure 7. Ribbons of clay in auger test AG-09



Figure 8. Auger Test Hole AG-02 - North aspect



Map 1. Archaeological Investigation of Proposed Wastewater Treatment Lagoon in River Lots 105-109



3.3 ANALYSIS AND RESULTS

A total of 14 artifacts were collected from within the 19.5 ha study area. These finds were catalogued and are presented in Appendix C. An analysis of the finds was conducted to determine the date range of the materials which could be correlated to the occupation of the property. A summary of key finds is presented below and categorized into material types.

Metal

A single machine cut and machine -headed square nail was recovered 30 metres from Hammercrest Creek (Figure 9). Cut nails were made by machines that cut iron plate into rectangular strips (Fontana et al. 1962:52). The rise of the modern wire nail began circa 1900 A.D. and replaced square machine cut nails.

Ceramics

Seven ceramic fragments were collected. Two consisted of plain white refined white earthenware (RWE), three had flow blue interiors and one fragment had a design with green banding (Figure 10). A single piece of stoneware ware with a salt glaze was also recovered. The ceramic pieces did not contain a makers mark or motif which could be dated and these types of ceramics occurred over a long timespan from the 19th into the 20th century. The ceramic that have green banding appear to more modern than the flow blue RWE.

Glass

A total of six pieces of glass were recovered during the investigation. Clear glass bottle fragments, including a partial bottle base with embossed lettering were collected. The embossed letters were only partial containing "CO.3" on the top line and "..A" on the bottom line.

A piece of aquamarine glass and a bottle finish were also recovered. Aquamarine glass was very common color in all types of American made bottles that date prior to the 1930s but became uncommon after the 1920s when colorless glass largely replaced aquamarine glass (Lindsay 2021). The bottle finish consisted of a blob-top soda bottle style (Figure 11). This style was primarily used for soda/mineral water, and to a lesser degree beer and ale, appear to have originated in the early 1840s and was quite popular by 1850 (Markota 1994). This style dominated the soda bottle market up through the early to mid-1870s but appears to have largely fallen out of favor by the late 1880s (Lindsey 2021). The bottle finish was collected in the northern boundary of the study area in proximity to Hammercrest Creek and within 30 metres of the square machine-cut nail.

The results of the artifact analysis could only provide a general date range for the materials. Dates range as early as the 1880s extending through the 1930s and likely beyond. The few pieces that date prior to the 20th century (square nail and blob-top finish) could relate to the nearby historic cart trail, while others have a broad and likely more recent deposition. The finds have been registered with the Province as DILj-014 'Maxwell Colony' site.

Figure 9. Machine cut nail



Figure 10. Ceramic Sherds

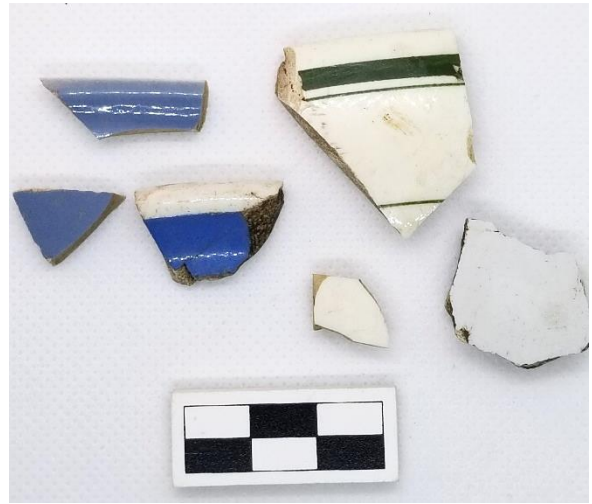


Figure 11. "Blob-top" Bottle Finish



4.0 CONCLUSIONS AND RECOMMENDATIONS

The HRIA of the proposed wastewater treatment lagoon in River Lots 105-109 in the Parish of St. Francois Xavier, conducted for WSP Canada Inc. occurred on October 2 and 3, 2021 under Heritage Permit A78-21. The assessment of the 19.5 ha parcel of land consisted of pedestrian survey and judgmental shovel testing across the property.

The HRIA resulted in the recovery of a small number of artifacts scattered across the cultivated field, including two Late Historic period (1870-1930 A.D.) artifacts in proximity to each other and to Hammercrest Creek. All finds have been registered with the Province as DILj-014 'Maxwell Colony' site.

Subsurface testing occurred over the extent of the study area and in proximity to Hammercrest Creek and the relict channel. Testing was limited by the extremely hard-packed soils, the paucity of areas containing heritage potential, and poor artifact returns from the surface collection. The heritage value of the materials collected from the field has been compromised due to the degree of impact from decades of cultivation and landscaping of the property over the last hundred years of settlement to allow for better drainage and increased productivity of the land. The combination of these factors reduces the heritage potential for intact heritage resources.

Based on the results of the HRIA, the recommendation is made that there are no further heritage concerns with the subject property and that the development should receive heritage clearance to proceed. However, there is always the potential for heritage resources to be discovered during construction phases of the development. If this is the case, then the HRB must immediately be notified. If human remains are discovered, the RCMP and the HRB must be contacted.

5.0 REFERENCES CITED

Barkwell, L, L. Dorion and D. Prefontaine

- 2016 The Métis Homeland: Its Settlements and Communities. Louis Riel Institute. Online document accessed July 12, 2020
<http://www.Métismuseum.ca/media/document.php/11956.Métis%20Settlements%20and%20Communities%20Aug.%202016%20Catalogued.pdf>

Boyd, M.

- 2007 Early postglacial history of the southeastern Assiniboine Delta, glacial Lake Agassiz basin. *Journal of Paleolimnology* 37:313–329.

Buchner, A.P.

- 1990 Glacial Lake Agassiz. In *Manitoba History*, accessed online Manitoba Historical Society, May 18, 2019 http://www.mhs.mb.ca/docs/mb_history/19/lakeagassiz.shtml

Fontana, Bernard L., Cameron Greenleaf, Charles Ferguson, Robert Wright and Doris Frederick

- 1962 'Johnny Ward's Ranch'. *The Kiva* Vol.28(1-2):1-115.

Green, D.

- 1998 *A re-evaluation of the Oxbow Dam Site (DhMn-1): Middle Holocene cultural continuity on the northern plains*. Thesis University of Saskatchewan.

Government of Manitoba

- 1986 *The Heritage Resources Act*. C.C.S.M c H39.1, Enacted May 12, 1986. Government of Manitoba, Queen's Printer, Winnipeg Manitoba. <http://web2.gov.mb.ca/laws/statutes/ccsm/h039-1e.php?ccsm=h39.1>

Hall, F.

- 1969 *Carlton Trail – First Western Highway*. Manitoba Historical Society, Manitoba Pageant, Spring 1969 Vol 13(3). Online document accessed July 9, 2020
<http://www.mhs.mb.ca/docs/pageant/14/carltontrail.shtml>

Hudson Bay Company Archives

- 1873 "Plan of River Lots in the Parish of St. Francois Xavier " HBC Land Department Maps. RG1/87/ St 25A; Location Code MD 2- CAD 5 DR15 folio. 1.

Lindsay, B.

- 2020a Bottle Finishes & Closures – Part II: Types or Styles of Finishes Page 1.
<https://sha.org/bottle/finishstyles.htm#Prescription>

Markota, Peck and Audie Markota

- 1994 *Western Blob Top Soda and Mineral Water Bottles – Second Edition*. Privately published (revised version of the original 1971 and 1972 printings).

St. Francois-Xavier Municipality Historical Committee

1980 *Our First Hundred Years : History of St. François-Xavier Municipality.* St. François-Xavier Municipality, Derksen Printers, Steinbach, Manitoba.

Priess, P.J., P. W. Nieuwhof, S.B. Ebell

1986 *Archaeological Investigation of the Junction of the Red and Assiniboine Rivers, 1984.* Parks Canada Research Bulletin No. 241. https://www.theforks.com/uploads/bibliographies/1986-Junction_Rivers_RB-241_Priess.pdf

Rempel, J.

1980 *Building with Wood and Other Aspects of Nineteenth-Century Building in Central Canada.* University of Toronto Press, Toronto.

Sprague, D.N. and R.P. Frye

1983 *The Genealogy of the First Metis Nation: The Development and Dispersal of the Red River Settlement 1820-1900.* Pemmican Publications, Winnipeg, MB.

Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Ellers, W.R. Fraser and G.W. Lelyk

1998 *Terrestrial ecozones, ecoregions and ecodistricts of Manitoba: an ecological stratification of Manitoba's natural landscapes.* Research Branch Technical Bulletin 98-9E. Land Resource Unit, Brandon Research Centre. Research Branch, Agriculture and Agri-Food Canada, Winnipeg, MB. Accessed online May 12, 2019
http://sis.agr.gc.ca/cansis/publications/ecostrat/provDescriptions/mbteee/mbteee_report.pdf

Syms, L.

1977 *Cultural Ecology and Ecological Dynamics of the Ceramic Period in Southwestern Manitoba.* Plains Anthropologist Memoir 12.

**APPENDIX A:
Manitoba Heritage Permit A78-21**

The Heritage Resources Act (Subsection 14(2) and Sections 52 and 53)

Heritage Permit No. A78-21



Pursuant to Section/Subsection: 53 of The Heritage Resources Act:

Name: Lisa C. Bobbie
Northern Roots Research

Address: Box 2516
Morden MB R6M 1C2

Attention: Lisa C. Bobbie

(hereinafter referred to as "the Permittee"),

is hereby granted permission to:

Conduct a heritage resource impact assessment (HRIA) for the Maxwell Colony Lagoon, within River Lots 105-109 in the Parish of St Francois Xavier

during the period:

September 24th to December 1st, 2021


This permit is issued subject to the following conditions:

- (1) That the information provided in the application for this permit dated the **August 12th, 2021** is true in substance and in fact;
- (2) That the permittee shall comply with all of the provisions of *The Heritage Resources Act* and any regulations or orders thereunder; PLEASE NOTE ATTACHMENT RE: CUSTODY AND OWNERSHIP OF HERITAGE OBJECTS;
- (3) That the Permittee shall provide to the Minister a written report or reports with respect to the Permittee's activities pursuant to this permit, the form and content of which shall be satisfactory to the Minister and which shall be provided on the following dates: **March 31st, 2021**
- (4) That this permit is not transferable;
- (5) This permit may be revoked by the Minister where, in the opinion of the Minister, there has been a breach of any of the terms or conditions herein or of any provision of *The Heritage Resources Act* or any regulations, thereunder;

(6) Special conditions:

- a. The permittee must obtain permission from any landowner, lessee or regulatory authority as applicable, concerning access to any property to be examined;
- b. Neither the Government of Manitoba nor the party issuing this permit shall be liable for any damages resulting from any activities carried out pursuant to this permit, and the Permittee specifically agrees, in consideration for receiving this permit, to indemnify and hold harmless the Minister and the Government of Manitoba, the Minister and any employees and officials of the Government, against any and all actions, liens, demands, loss, liability, cost, damage and expense including, without limitations, reasonable legal fees, which the Government, Minister or any employee or official of the Government may suffer or incur by reasons of any of the activities pursuant to or related to this permit.
- c. The permittee has, along with this permit, received enclosure:
Provisions Regarding Found Human Remains Under THE HERITAGE RESOURCES ACT, And Manitoba's Policy Respecting the Reporting, Exhumation and Reburial of Found Human Remains (1987).

Dated at the City of Winnipeg, in Manitoba, this 24th day of September, 2021


Minister of Sport, Culture and Heritage

**Manitoba Sport, Culture and Heritage
Historic Resources Branch**

**APPENDIX B:
Shovel Test Forms**

Shovel Test ID	Result (Neg / Pos)	Zone	Easting	Northing	Date	Elev (m)	Extent (cm)	Extent (cm)	Depth (cm)	Ground cover	Dominant Tree Cover	Secondary Tree Cover	Disturbance	Soil OH	Depth (cm)	Soil A	Depth (cm)	Comments
AG-01	N	14	596526	5533790	03-Oct-21	237	30	30	100	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey clay, extremely hardpacked, dry	0-100+			No discernable changes, slightly more moist 50cm+
AG-02	N	14	596478	5533794	03-Oct-21	243	30	30	95	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey clay, extremely hardpacked, dry	0-70	Grey clay, moist, dense	70-95	
AG-03	N	14	596431	5533796	03-Oct-21	245	30	30	70	Cultivated field	Cottonwood	MB maple	Cultivation	Grey clay, silty, extremely hardpacked, dry	0-70	Rock hardpan	70+	
AG-04	N	14	596378	5533797	03-Oct-21	244	30	30	45	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey silty clay, extremely hard, dry	0-45+			Ground like concrete, auger couldn't break through
AG-05	N	14	596330	5533807	03-Oct-21	243	30	30	43	Cultivated field	Cottonwood	MB maple	Cultivation	Black organic clay, extremely hard, dry	0-10	Beige mottled clay, extremely hard	10-43	
AG-06	N	14	596284	5533833	03-Oct-21	243	30	30	59	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey organic silty clay, very hard, dry	0-21	Beige silty clay, extremely hard	21-59	
AG-07	N	14	596195	5533736	03-Oct-21	244	30	30	54	Cultivated field	Cottonwood	MB maple	cultivation	Dark grey organic silty clay, very hard, dry	0-21	Brown grey silty clay, extremely hard	21-54	
AG-08	N	14	596319	5533692	03-Oct-21	245	30	30	35	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey silty organic clay, very hard, dry	0-15	Brown grey silty clay, extremely hard	15-35	
AG-09	N	14	596558	5533669	03-Oct-21	244	30	30	59	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey silty organic clay, very hard, dry	0-22	Grey clay extremely hard	22-59	
AG-10	N	14	596417	5533582	03-Oct-21	243	30	30	30	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey clay, extremely hardpacked, dry	0-30			
AG-11	N	14	596255	5533623	03-Oct-21	244	30	30	35	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey clay, extremely hardpacked, dry	0-35			
AG-12	N	14	596092	5533682	03-Oct-21	245	30	30	40	Cultivated field	Cottonwood	MB maple	Cultivation	Dark grey clay, extremely hardpacked, dry	0-12	Beige silty clay, extremely hard	12-40	

**APPENDIX C:
Artifact Catalogue**

Artifact Catalogue

Site	CatNo	Zone	UTMX_83	UTMY_83	DBS	Cult_Affil	Category	Subcat	Object Name	ObjectType	Object Portion	Material	Condition	Colour	Marks	Quant	Wgt_g
DILj-014	H001	14	596467	5533788	Surface	1850-1900 A.D.	Architectural	Nail	Machine cut	Square	Complete	Iron	Good	Ferrous	1 1/2 to 2 1/2 inch	1	1.47
DILj-014	H002	14	596439	5533777	Surface	1850-1900 A.D.	Kitchen	Container	Bottle	Blob-top finish	Finish	Glass	Good	Aquamarine		1	1.46
DILj-014	H003	14	596358	5533812	Surface	Late Historic	Kitchen	Container	Bottle		Body	Glass	Good	Aquamarine		1	0.25
DILj-014	H004	14	596280	5533755	Surface	Late Historic	Kitchen	Hollowware	Bowl		Body	RWE	Good	White		2	0.51
DILj-014	H005	14	596582	5533729	Surface	Late Historic	Kitchen	Hollowware	Bowl		Rim	RWE	Good	Flow blue		3	0.56
DILj-014	H006	14	596077	5533723	Surface	Late Historic	Kitchen	Hollowware	Bowl		Rim	RWE	Good	Green Bands		1	0.82
DILj-014	H007	14	596239	5533821	Surface	Late Historic	Kitchen	Container	Crockery		Body	Stoneware	Good	Beige		1	0.71
DILj-014	H008	14	596318	5533815	Surface	Late Historic	Kitchen	Container	Bottle		Base	Glass	Good	Clear	"Co.3 and ..A"	1	0.63
DILj-014	H009	14	596428	5533734	Surface	Late Historic	Kitchen	Container	Bottle		Base	Glass	Good	Clear		3	13.61

GPS Locations of Surface Artifacts

BRICK2	49.94898199	-97.65854199	5533819.85914018	596239.28177945
BRK	49.94902398	-97.65864903	5533824.39025289	596231.51932204
BTL FINISH	49.94855996	-97.65575602	5533776.52500246	596439.98920852
GLASS11	49.94816903	-97.65591997	5533732.85058066	596429.00801271
GLASS2	49.94686598	-97.65670502	5533586.96837459	596375.28837018
GLASS3	49.94811396	-97.66074903	5533720.51719414	596082.67688821
GLS BTM	49.94891401	-97.65743298	5533813.72825518	596318.97717480
GLS111	49.94845603	-97.65372198	5533767.59269514	596586.11911550
GLS20	49.94860003	-97.65420101	5533782.98439055	596551.46576890
GLS23	49.94808898	-97.65368401	5533726.83441520	596589.57721490
GLS33	49.94721500	-97.65549199	5533627.33484847	596461.61716244
GLS81	49.94796300	-97.65408198	5533712.31461946	596561.27821750
GLS91	49.94822502	-97.65272797	5533743.19323286	596657.89201684
NAIL	49.94864697	-97.65536902	5533786.69673679	596467.57829982
RWE16	49.94812704	-97.66082397	5533721.87473650	596077.27503236
RWE17	49.94809804	-97.65377998	5533727.71699312	596582.67394366
RWE18	49.94813198	-97.66087803	5533722.35514651	596073.38665150
RWE19	49.94838000	-97.65797697	5533753.65781193	596281.01653186
RWE23	49.94862802	-97.65534497	5533784.62168253	596469.34192305
TEALGLS	49.94888702	-97.65688104	5533811.43808881	596358.62758781