

Preliminary Site Investigation and Recommendations

Four Winds Environmental Resource Management Facility

**Neegan Burnside Ltd.
307 Commerce Drive
Winnipeg MB R3P 1B3 CANADA**

**March 2018
300039698.2018**

Preliminary Site Investigation and Recommendations
March 2018

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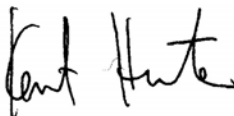
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Neegan Burnside Ltd.

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1.0 Introduction

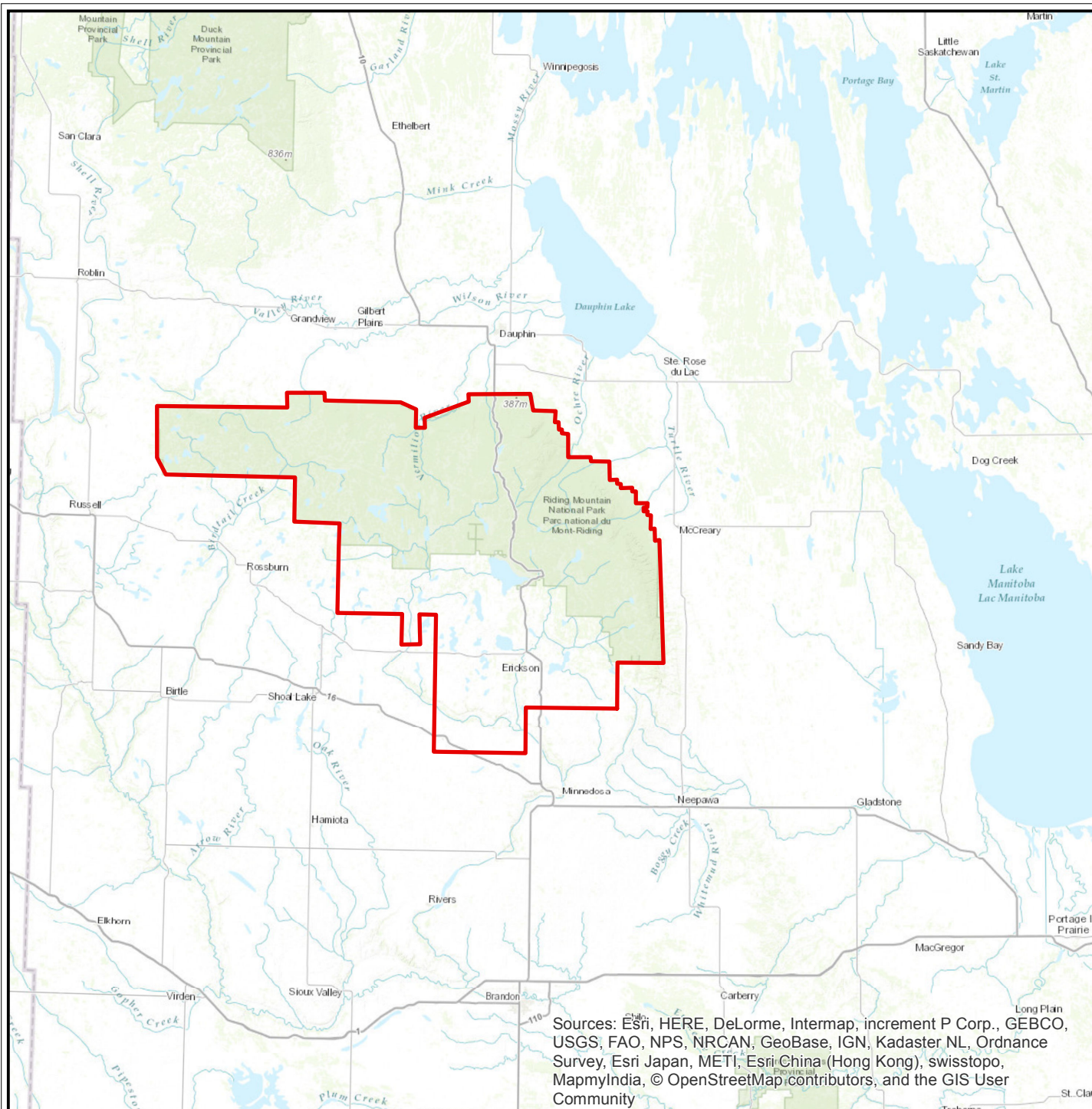
In fall 2016, Neegan Burnside Ltd. (Neegan Burnside) was retained to evaluate the optimum strategy for waste management for the communities of Keeseekoowenin First Nation, Rolling River First Nation, Rural Municipality (R.M.) Of Clanwilliam-Erickson, R.M. of Harrison Park and the Riding Mountain National Park (RMNP) herein referred to as the Partnership. The Study Location is shown on Figure 1-1 and Figure 1-2.

In March 2017, two main documents were provided by Neegan Burnside:

1. **Solid Waste Management Feasibility Study:** Feasibility Report South of Park RSWARFC¹ Project Team. This study is herein referred to as the Feasibility Study. The Project Team defined goals for the project which consisted of environmental protection, level of service, job creation, cost minimization and protection of roads. The report identified that a new landfill with a network of small transfer station was the best option in terms of meeting goals and objectives. In the report, the Study Area was mapped with respect to constraints, and general locations for landfills were selected. Constraints are further discussed in Section 1.1.1. The capital costs associated with a new landfill were approximately \$4,000,000.
2. **Technical Memorandum 3, Potential Site Locations:** This memorandum outlined three potential Sites; selected based on size, constraints, judgment to meet the requirements for a landfill for the communities. Sites were inspected on October 25, 2016 and December 7, 2016. It was recommended that the Sites be assessed to determine:
 - whether surface water is seasonal and significant;
 - soil type and suitability for landfilling;
 - depth to bedrock;
 - groundwater elevation; and
 - overall site conditions and suitability.

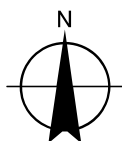
Since 2015, the partners have been participating in the Federation of Canadian Municipalities' (FCM) Community Infrastructure Partnership Project, which focuses on building positive relationship between First Nations and municipalities. On August 30, 2017 a Continued Cooperation agreement was signed by all partners to signify their commitment to continue working together on a regional solid waste initiative.

¹ The Regional Solid Waste and Recycling Facility (RSWARF) is now referred to as Four Winds Environmental Management Facility. The RSWARFC was the committee developing the RSWARF.



LEGEND

Study Area



0 5 10 20 30 40 50 60 70 80 90 100
Kilometers

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**PRELIMINARY SITE INVESTIGATION
AND RECOMMENDATIONS**

Figure Title:

STUDY LOCATION

Drawn

SK

Scale

1:1,250,000

Checked

KH

Date

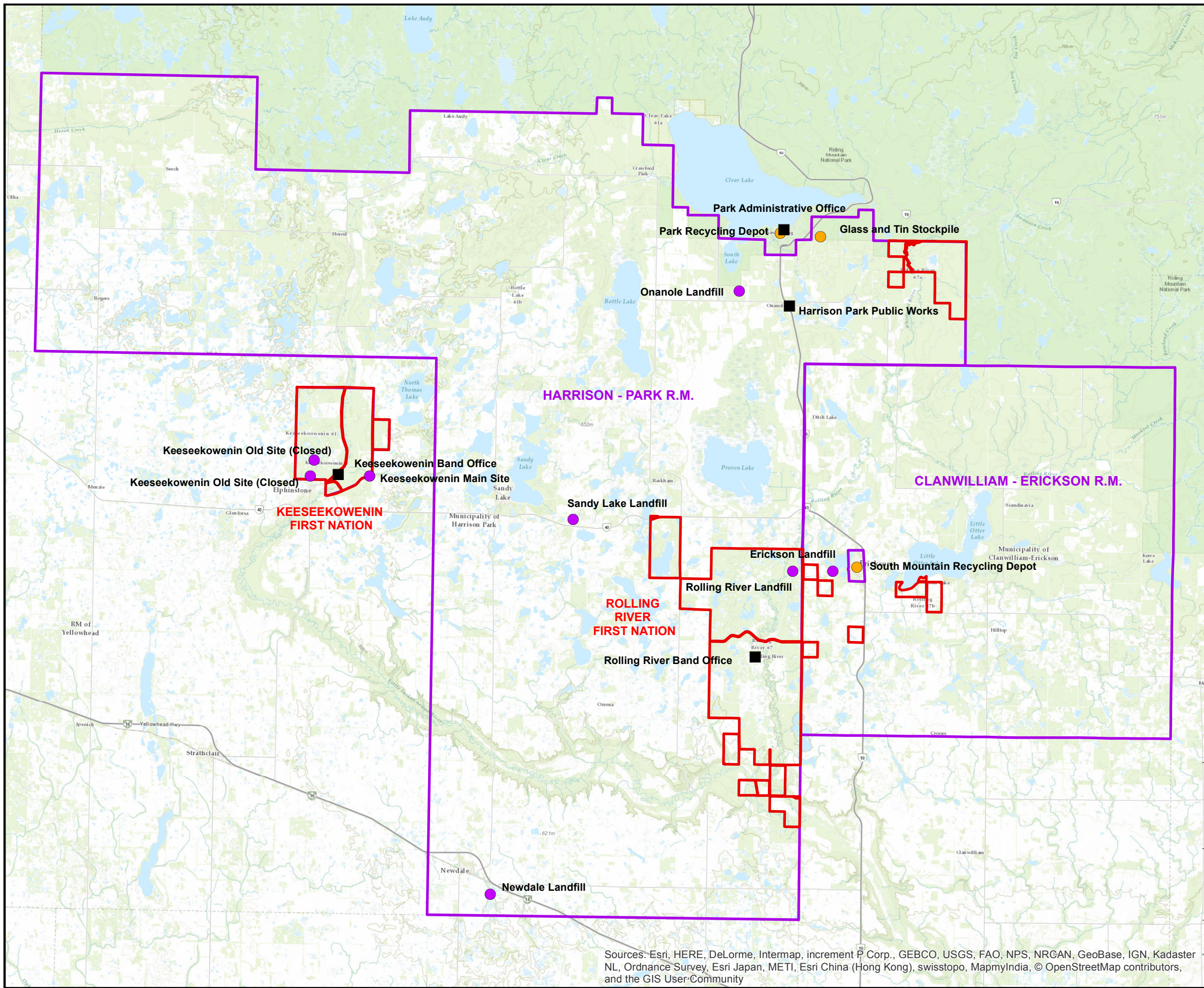
March 2018

Project No.

300039698

Figure No.

1-1

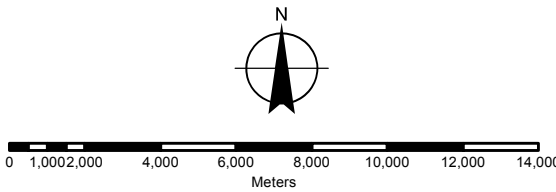


Legend

- <all other values>
- Depot
- Landfill
- Building
- ▭ Reserve Boundary
- ▭ Municipal Boundary

type

- Depot
- Landfill
- Building
- ▭ Reserve Boundary
- ▭ Municipal Boundary



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MANAGEMENT FACILITY
PRELIMINARY SITE INVESTIGATION
AND RECOMMENDATIONS

Figure Title
STUDY AREA

Drawn	Checked	Date	Figure No. 1-2
SK	KH	March 2018	
Scale		Project No.	
H 1:200,000		300039698	

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User-Community

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In the fall of 2017, Neegan Burnside was authorized to assess the Sites and to provide preliminary site information, to assist with site selection. Of the three Sites originally selected, only one landowner granted permission to investigate their Site. A fourth Site was subsequently selected in close proximity to one of the Sites. The two Sites investigated were:

Site 2: On Highway 250, between Sandy Lake and Newdale

- NW 4-17-20 W
- Latitude: 50°25'49.19"N
- Longitude: 100°10'49.05"W

Site 4A: East of Newdale

- SW 1-16-20
- Latitude: 50°19' 59.50"N
- Longitude: 100° 6' 33.35"W

The locations of the two Sites are shown on Figure 1-3.

1.1 Design Basis

1.1.1 Constraints

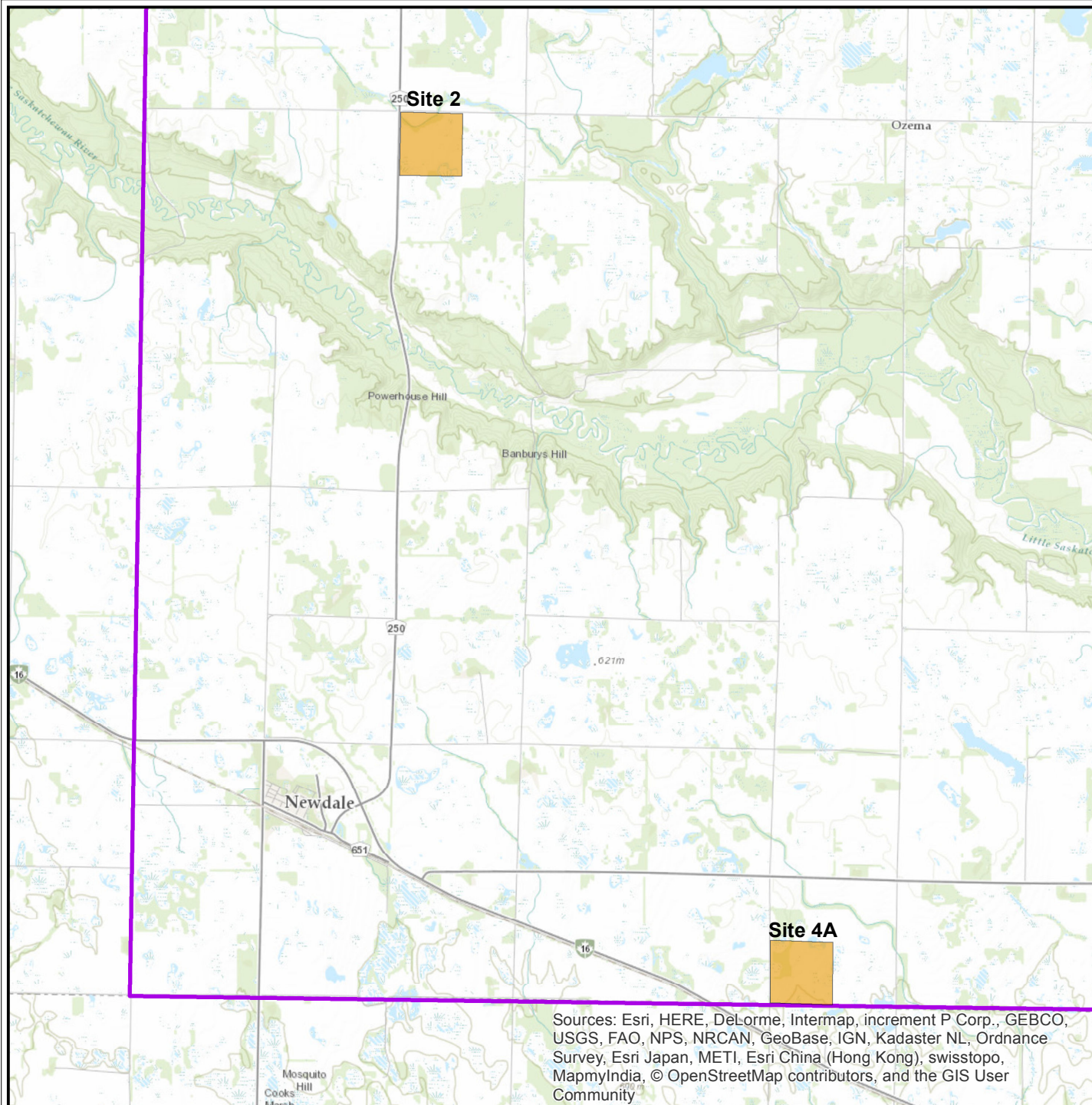
According to the Manitoba Environment Act, Regulation 37/2016:

The site of a landfill at the time it is established must be at least

- (a) 100 metres from any railway or public road, other than the access road to the landfill;*
- (b) 400 metres from the property boundary of any cemetery;*
- (c) 400 metres from any potable water well;*
- (d) 100 metres from a natural gas pipeline or an underground utility corridor;*
- (e) 400 metres from any building; and*
- (f) 1 kilometre from any surface water.*

Additional constraints which were also considered during the first assessment are as follows:

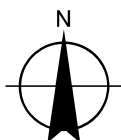
- (g) 15 km from an airport – As specified in the Transport Canada Sharing the Skies Study (2004).*



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

LEGEND

- Municipal Boundary
- Proposed Site



0 750 1,500 3,000 4,500 6,000
Meters

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*PRELIMINARY SITE INVESTIGATION
AND RECOMMENDATIONS*

Figure Title:

STUDY LOCATION

Drawn	Checked	Date	Figure No.
SK	KH	March 2018	1-3
Scale		Project No.	
1:75,000		300039698	

Preliminary Site Investigation and Recommendations
March 2018

In the Feasibility Study, we suggested that consideration be given to modification of the constraint criteria because many pockets being mapped as a water body are seasonal, shallow and likely not significant (referred to locally as potholes). If these depressions are included in the constraint mapping, it is extremely difficult to find three suitable Sites within the communities. We suggested that the surface water buffer be based on recognized lakes and streams as mapped by regulators. Through conversations with Sustainable Development, it was agreed that this modified constraint was reasonable (refer to the Feasibility Study, Appendix A-4).

Traditional hunting areas, traditional plant harvesting or ceremonial grounds were not identified in this preliminary screening. This was discussed with First Nations communities and none of significance was identified.

1.1.2 Waste Generated

The total waste generated determines the landfill class, footprint size and life. Waste projections were provided in the Feasibility Study and are shown on the table below:

Table 1-1: Waste Projections

		Keeseekowenin	Rolling River	Clanwilliam -Erickson	Harrison Park	RMNP	TOTAL (tonnes)	Cumulative (tonnes)
		3.7%	6.0%	1.0%	1.0%	2.0%		
	2015	90	90	535	1822	675	3,212	3,212
	2016	93	95	540	1840	688	3,256	6,468
1	2017	96	100	545	1858	701	3,300	9,768
2	2018	99	106	550	1876	715	3,346	13,114
3	2019	102	112	555	1894	729	3,392	16,506
4	2020	105	118	560	1912	743	3,438	19,944
5	2021	108	125	565	1931	757	3,486	23,430
6	2022	111	132	570	1950	772	3,535	26,965
7	2023	115	139	575	1969	787	3,585	30,550
8	2024	119	147	580	1988	802	3,636	34,186
9	2025	123	155	585	2007	818	3,688	37,874
10	2026	127	164	590	2027	834	3,742	41,616
11	2027	131	173	595	2047	850	3,796	45,412
12	2028	135	183	600	2067	867	3,852	49,264
13	2029	139	193	606	2087	884	3,909	53,173
14	2030	144	204	612	2107	901	3,968	57,141
15	2031	149	216	618	2128	919	4,030	61,171
16	2032	154	228	624	2149	937	4,092	65,263
17	2033	159	241	630	2170	955	4,155	69,418
18	2034	164	255	636	2191	974	4,220	73,638
19	2035	170	270	642	2212	993	4,287	77,925

Preliminary Site Investigation and Recommendations
March 2018

		Keesee- kownenin	Rolling River	Clanwilliam -Erickson	Harrison Park	RMNP	TOTAL (tonnes)	Cumulative (tonnes)
20	2036	176	286	648	2234	1012	4,356	82,281
21	2037	182	303	654	2256	1032	4,427	86,708
22	2038	188	321	660	2278	1052	4,499	91,207
23	2039	194	340	666	2300	1073	4,573	95,780
24	2040	201	360	672	2323	1094	4,650	100,430
25	2041	208	381	678	2346	1115	4,728	105,158
26	2042	215	403	684	2369	1137	4,808	109,966
27	2043	222	427	690	2392	1159	4,890	114,856
28	2044	230	452	696	2415	1182	4,975	119,831
29	2045	238	479	702	2439	1205	5,063	124,894
30	2046	246	507	709	2463	1229	5,154	130,048

It should be noted that the communities use different methods to assess their annual waste generation (truck counts, weigh scale surveys and standard Municipal estimates). Furthermore, some communities recycle and divert a percentage of their wastes, while some do not. Better overall diversion will increase the life of the landfill site. For planning purposes, these estimates are believed to be conservative.

1.1.3 Footprint Sizing

Assuming a 450 kg/m³ final compaction rate (which is conservative) and a 2 m depth below grade, the final footprint of the landfill would be approximately 12 ha (with a 30 m buffer on all sides). Therefore, a minimum of 12 ha is needed for landfill capacity or a quarter-quarter section. For planning purposes, we are assuming a full quarter section to provide space for infrastructure, ponds, other facilities and future (beyond 30 years) expansion.

A conceptual site layout was developed in the Feasibility Study and is included as Figure 1-4.

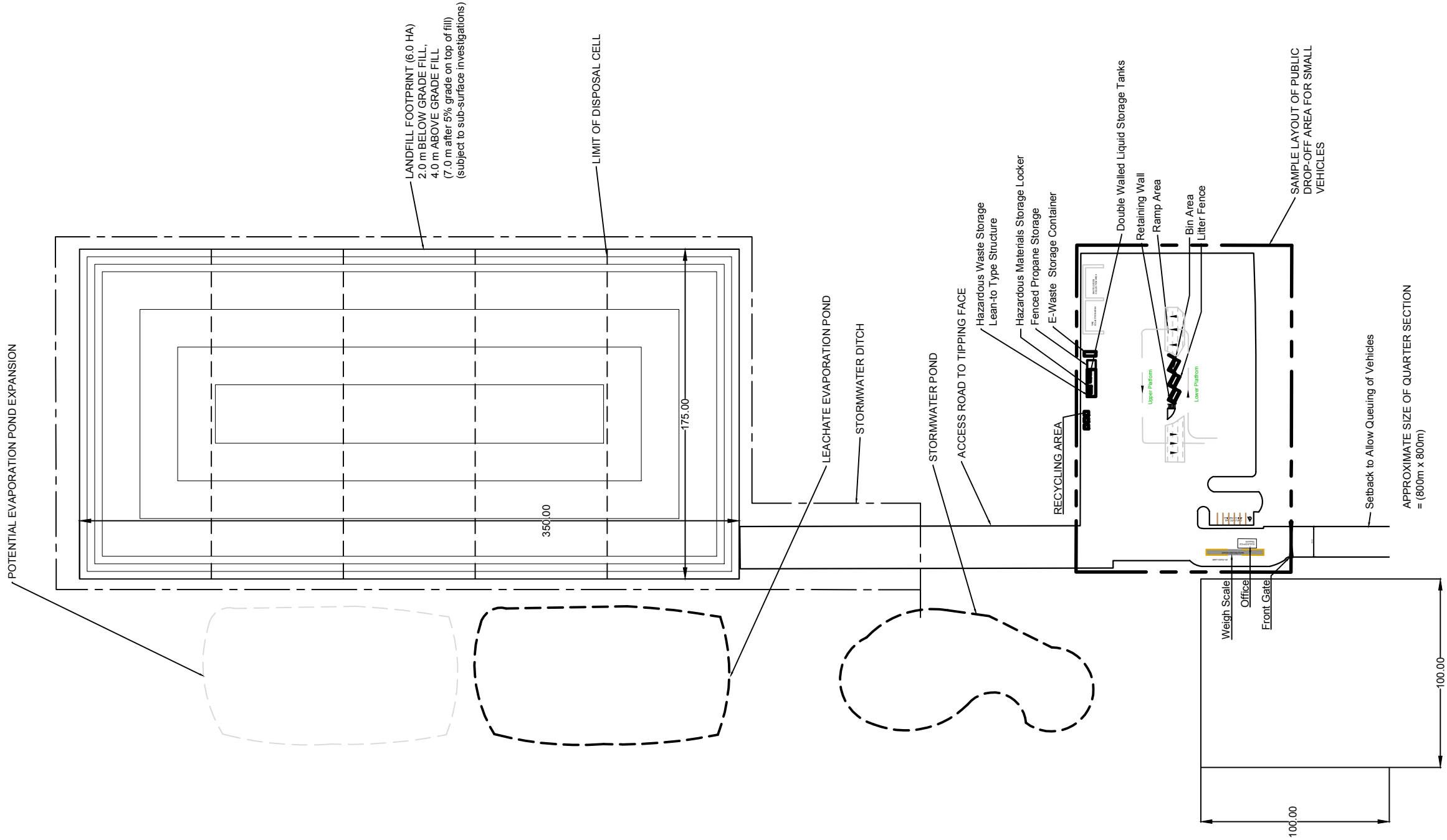


Figure Title

**PRELIMINARY SITE INVESTIGATION
AND RECOMMENDATIONS**

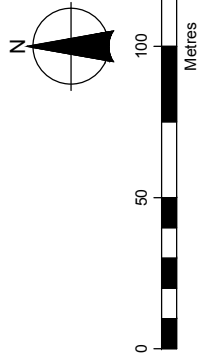
CONCEPTUAL DESIGN

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Scale		Project No.	
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2.0 Site Investigations

2.1 Background Information

Publicly available data and mapping were reviewed. These included surficial geology mapping and the provincial groundwater well database. A reconnaissance of the Sites was undertaken that entailed walking the Sites to observe wetlands, structures or other features that could impede permitting. A rough conceptual layout was reviewed and potential boreholes/monitoring well locations were identified by Neegan Burnside.

2.2 Surface Water

There are no major surface water features within 2 km of either Site. There are small water features on both Sites.

- At Site 2 there is a small creek passing through the northwest corner of the Site and a small pond at the southeast corner; and
- At Site 4A there are two small ponds, one in the northwest corner and one in the northeast corner.

2.3 Soil Investigation

Prior to drilling, underground utility locations were cleared. The boreholes were drilled on the Sites between December 12 and 14, 2017. The locations of the boreholes are shown on Figure 2-1 (Site 2) and Figure 2-2 (Site 4A). A total of four boreholes were drilled on each Site. Three boreholes were drilled to a depth of 12 m on each Site. This depth was selected based on the Manitoba Standards that require boreholes to a depth of 10 m below the proposed base of the active area. We had assumed a landfill base 2 m below ground.

In one of the boreholes at each Site, a 12 m well was installed. A shallow water table well was drilled beside it to create a “well nest” (two or more adjacent wells screened at different depths). At the remaining two boreholes on each Site, the 12 m boreholes were partially filled with bentonite pellets and shallow wells were installed in the top 6 to 8 m of the borehole. The three shallow wells were used to measure the depth of the water table below ground at three locations on each Site.

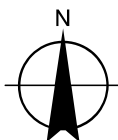
The numbering of the wells (i.e., MW2-12) means a monitoring well at borehole Location 2 that is approximately 12 m deep. MW2-4 is located at borehole Location 2 and is only 4 m deep.



LEGEND

- Potential Site 2
- Private Well (Manitoba Sustainable Development Database, 2017)
- ⊙ Borehole / Monitoring Well (Neegan Burnside, 2017)

0 100 200 400 600 800
Meters



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FOUR WINDS ENVIRONMENTAL MANAGEMENT
*PRELIMINARY SITE INVESTIGATION
AND RECOMMENDATIONS*

Figure Title:

SITE 2 MONITORING LOCATIONS

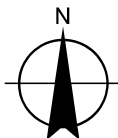
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SK	KH	March 2018	2-1
Scale H 1:15,000		Project No. 300039698	



LEGEND

- Potential Site 4A
- Private Well (Manitoba Sustainable Development Database, 2017)
- ⊙ Borehole / Monitoring Well (Neegan Burnside, 2017)

0 100 200 400 600 800
Meters



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*PRELIMINARY SITE INVESTIGATION
AND RECOMMENDATIONS*

Figure Title:

SITE 4A MONITORING LOCATIONS

Drawn	Checked	Date	Figure No.
SK	KH	March 2018	2-2
Scale 1:15,000		Project No. 300039698	

The soils observed in the boreholes were logged on-site by Neegan Burnside staff. A table of Monitoring Well Construction Details and the individual logs containing soil descriptions are included in Appendix A.

2.3.1 Regional Geology

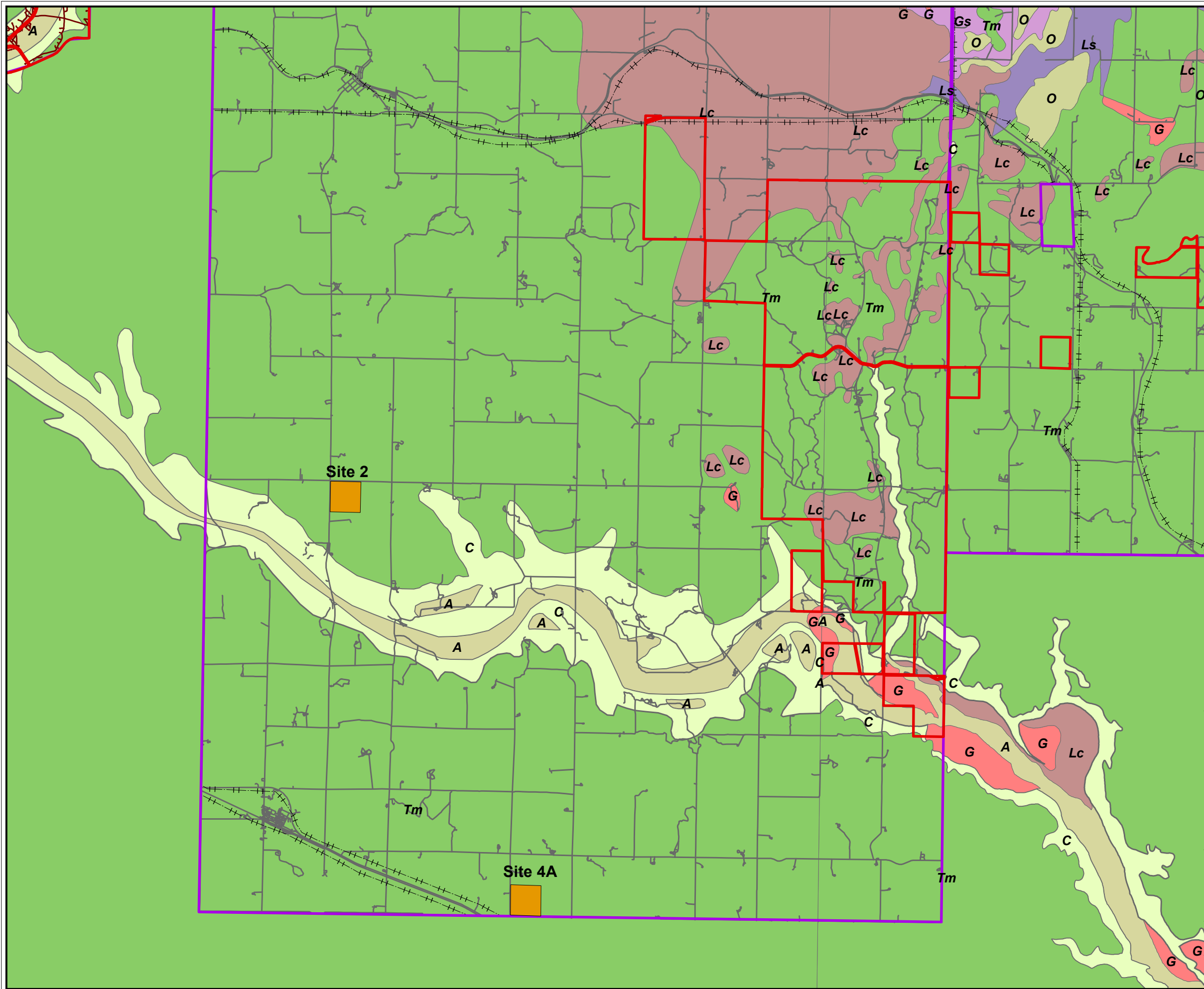
The surficial geology map for the area of the Sites is shown on Figure 2-3. The surface soils are mapped as Clay Diamicton – calcareous largely composed of Mesozoic rock. A diamicton soil (often referred to a glacial till), is an unsorted soil. It can consist of varying percentages of clay, silt, sand, gravel and stone. The soil was created during the ice age when thick continental sheets of ice transported masses of soil and rock from the Canadian north. The material was left in place when the ice melted (similar to debris remaining after a snow pile melts). The material is mixed and results in soils that consists of everything from fine clay to massive boulders.

Water well records were made available by the Manitoba Department of Sustainable Development. The locations of the wells reported in the area of the Sites are shown on Figure 2-1 and Figure 2-2. Copies of the records are included in Appendix B. Table 2-1 and Table 2-2 summarizes the soil descriptions and depths in wells near each Site.

Table 2-1: Summary of Water Well Records for Site 2

Soil Description	Depth (m)	Soil Description	Depth (m)
Well No. 72719		Well No. 39227	
Brown clay	0 – 6.1	Stony brown to grey till	0 – 20.7
Fine sand	6.1 – 9.1	Brown sand	20.7 – 21.0
Blue clay	9.1 – 32.0	Stony grey till	21.0 – 21.3
Sand	32.0 – 36.5	Coarse brown sand and gravel	21.3 – 32.0
Well screen	33.2 – 36.5	Grey shale till	32.0 – 35.0
		Grey sand and gravel	35.0 – 41.4
		Stony grey till	41.4 – 64.3
		Well screen	39.9 – 41.4

There were two wells reported near Site 2, one west of the Site and one to the north. Both wells were drilled as water supply wells. Most of the soil encountered is described as clay or till. However, layers of sand or sand and gravel were also reported. These layers varied from minor seams only 0.3 m thick to significant deposits that were 10.7 m thick.

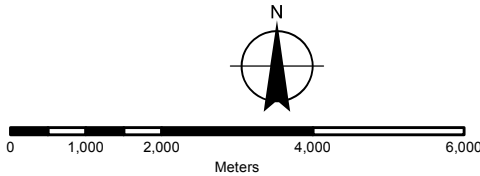


Legend

- Proposed Site
- Reserve Boundary
- Municipal Boundary
- Railway
- Roadway

Surficial Geology

- A: Alluvial Sediments - sand and gravel, sand, silt clay, organic detritus
- C: Colluvium - landslide debris, eroded slopes, mass-flow deposits
- G: Proximal Glaciofluvial Sediments - sand and gravel
- Gs: Distal Glaciofluvial Sediments - fine sand, minor gravel, silt and clay interbeds
- Lc: Offshore Glaciolacustrine Sediments - clay, silt, minor sand
- Ls: Marginal Glaciolacustrine Sediments - littoral sand and gravel
- O: Organic Deposits - peat, muck
- Tm: Clay Diamicton - calcareous, largely composed of Mesozoic rocks



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SOLID WASTE MANAGEMENT OPTIONS
FEASIBILITY STUDY

Figure Title
REGIONAL GEOLOGY

Drawn	Checked	Date
SK	KH	December 19, 2016
Scale	Project No.	
H 1:100,000	300039698	

Figure No.
2-3

Table 2-2: Summary of Water Well Records for Site 4A

Soil Description	Depth (m)	Soil Description	Depth (m)
Well No. 73436		Well No. 73437	
Coarse gravel	0 – 2.1	Silty sandy clay	0 – 3.0
Grey till	2.1 – 5.2	Light grey till	3.0 – 3.7
Gravel	5.2 – 5.5	Sand and gravel	3.7 – 4.3
Brown-grey till	5.5 – 6.1	Grey till	4.3 – 4.6
Gravel	6.1 – 8.8	Sand and gravel	4.6 – 6.4
Grey till	8.8 – 10.1	Grey till	6.4 – 9.1
Gravel	10.1 – 10.2		
Grey till	10.2 – 12.2		
Well No. 73438		Well No. 73417	
Silty sandy clay	0 – 1.2	Sand and gravel	0 – 2.1
Sand	1.2 – 1.5	Grey clay	2.1 – 3.0
Light grey clay	1.5 – 2.7	Grey till	3.0 – 9.1
Brown-grey till	2.7 – 4.6		
Grey till	4.6 – 5.2		
Sand and gravel	5.2 – 8.5		
Grey till	8.5 – 9.1		

There were four wells reported near Site 4A, all in a cluster northeast of the Site. These wells are small diameter test wells and are not as deep as the water wells. Similar to Site 2, the soil encountered is primarily clay and till. However, layers of sand and gravel were also reported. These layers varied from 0.1 to 3.3 m thick. Neegan Burnside also recommends additional assessment of existing private water wells in the vicinity of the selected Site.

The general area soils appear to be similar at both Sites. The soil is predominantly clay based fill containing seams of more permeable sand and gravel.

2.3.2 Site Geology

The soil descriptions for the boreholes drilled on the two Sites are included with the well logs in Appendix A. Representative soil samples were submitted to a laboratory for grain-size testing. The results are included in Appendix C.

The soils observed on Site 2 confirm the dominant clay based till mapped on the surficial geology mapping and encountered in the water wells. A 1.5 to 1.8 m deep veneer of silt with clay and sand was reported on the ground surface at all three drilling locations. This soil likely covers the Site.

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At locations MW2 and MW3, thin silt or sand seams were observed. These occurred at 1.5 m and 6.5 m in MW3-6 and at 2.4 m in MW2-12. There is not enough data to know if these are isolated lenses or continuous layers.

The soils observed on Site 4A are also predominantly clay based till. A 1.5 m deep veneer of clay, silt or clay was also reported on the ground surface at all three drilling locations. This soil likely covers the Site.

At locations MW1 and MW2, thin silt or sand seams were observed. These occurred at 1.8 m at MW1-8 and at 2.1 m and 3.7 m at MW2-10. There is not enough data to know if these are isolated lenses or continuous layers.

A summary of the grain-size test results are contained in Table 2-3 below.

Table 2-3: Summary of Grain-Size Distribution

Monitoring Well		Sample Depth (m)	Gravel	Sand	Silt and Clay	Soil Type
Site 2	MW2-12	1.5	1	31.5	67.5	Till
Site 2	MW2-12	3.0-4.5	7.5	30.9	61.6	Till
Site 2	MW3-6	3.0-4.5	3.2	31.7	65.1	Till
Site 4	MW1-8	6.0-7.5	4.2	34.2	61.6	Till
Site 2	MW3-6	0-1.5	0.6	26.9	72.5	Surface silt
Site 4	MW2-10	0.6-1.5	1.9	37.2	60.9	Surface silt
Site 4	MW2-10	3.7-4.3	0	17.2	82.8	Silt seam

The till is relatively consistent between boreholes and between Sites. It contains little gravel, and is sandy with 19 to 25 percent particles below 0.002 mm diameter.

The soils at the two Sites are basically the same and typical for the region.

2.3.3 Soil Permeability

Hydraulic conductivity testing was not part of the preliminary site investigations. However, some estimates can be made from the available information collected.

Based on the grain-size, the till falls within the ML classification in the Unified Soils Classification System. The estimated hydraulic conductivity (K) for ML soils is 10^{-5} to 10^{-6} cm/s. With the high silt/clay content, the K for this soil is likely closer to 10^{-6} cm/s. Other factors could change the insitu K, including soil density, chemistry and weathering and fractures.

2.3.4 Depth to Bedrock

Bedrock is greater than 12 m at both Sites. At Site 2, it may be greater than 64 m based on one of the well records in the area.

2.4 Groundwater Investigation

During the subsurface investigation, 50 mm diameter monitoring wells were installed in the boreholes. Water levels were measured in the wells prior to leaving the Site (December 15). However, due to the nature of the soils, the water was slow to enter the wells and the water levels had not recovered by that time. Two additional site visits were made to obtain water levels. These occurred on January 18, 2018 and February 13, 2018.

2.4.1 Water Table

The water levels measured in the monitoring wells are recorded in Table D-1, Appendix D. The water table elevations are also calculated and plotted on graphs on Figures D-2 and D-3. The graphs show the amount of change to the water level in each well over the two months after drilling.

The table below contains the depth to the water table in each well. At both Sites the depth varies between wells and the highest recorded water levels to date are similar (2.4 m at Site 2 and 2.45 m at Site 4A).

Table 2-4: Water Table Depth Below Ground Surface

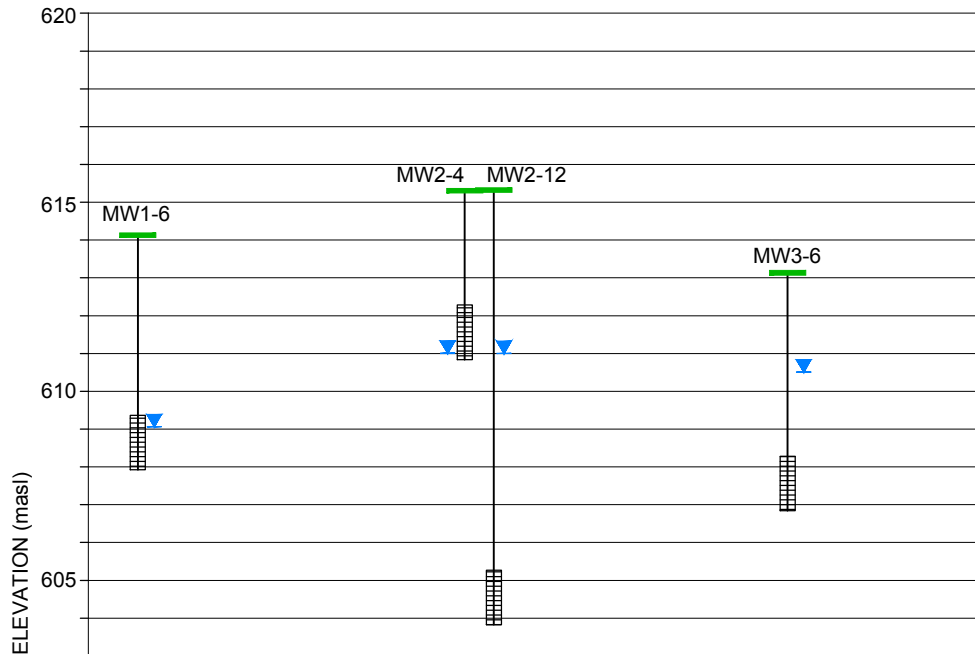
	Site 2				Site 4A			
Date	MW1-6	MW2-4	MW2-12	MW3-6	MW1-8	MW2-4	MW2-10	MW3-8
Dec 14	dry	dry	10.18	5.75	dry	dry	2.45	dry
Dec 15	6.39	4.51	9.39	5.39	7.66	4.50	2.46	dry
Jan 18	5.72	4.42	3.79	2.40	7.41	4.46	2.64	6.79
Feb 13	5.25	4.36	4.34	2.67	6.88	4.46	2.75	6.21

Note: Shading denotes highest measured water table level

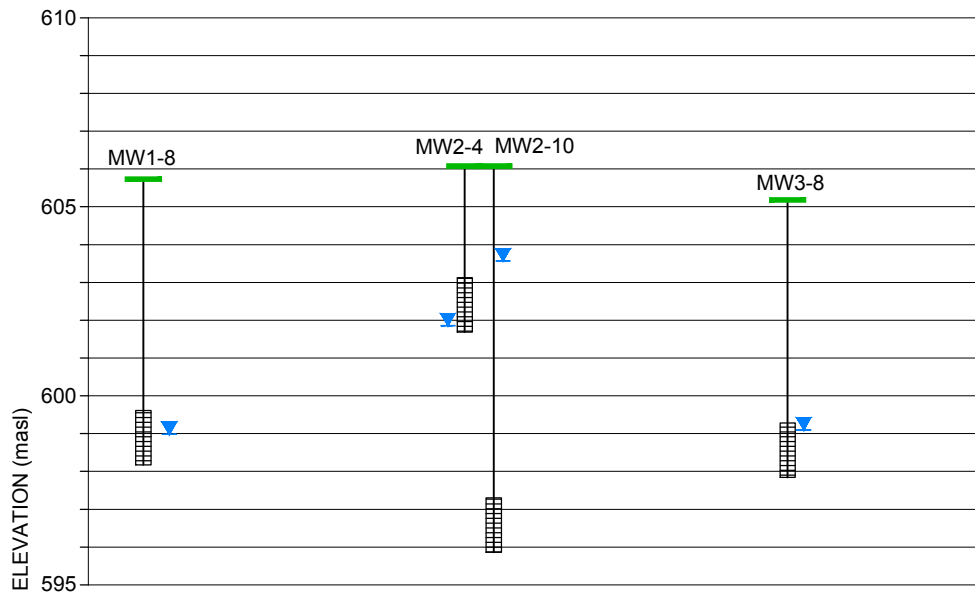
The hydrographs in Appendix D are preliminary as groundwater movement can be very slow and will change with wet and dry seasons. Measurements over several seasons are needed to fully understand the variations.

To date, the hydrographs show that the water levels over the two months (mid-December to mid-February) were either stable or rising slowly. The exceptions were MW-12 and MW3-6, both on Site 4A. The water levels in those wells rose rapidly and then declined. This pattern indicates that the wells may be screened in a soil with a slightly higher K value than the other wells. A conceptual section is included as Figure 2-4.

SITE 2



SITE 4A



NOTE: CONCEPTUAL DRAWING ONLY. WELLS NOT SHOWN WITH SCALED HORIZONTAL SPACING

LEGEND

- MW1-6 — WELL ID
 — GROUND
 — MEASURED WATER LEVEL (FEB. 13, 2018)
 — SCREEN

NEEGAN BURNSIDE

Client

FOUR WINDS ENVIRONMENTAL RESOURCE
 MANAGEMENT FACILITY
 PRELIMINARY SITE INVESTIGATION
 AND RECOMMENDATIONS

Figure Title

CONCEPTUAL SECTION

Drawn

SK

Checked

JR

Date

March 2018

Figure No.

2-4

Scale

V = 1:200

Project No.

300039698

2.4.2 Vertical Movement of Groundwater

A well nest, consisting of one deep well and one shallow well was installed at each Site. A comparison of water level elevations in a shallow/deep pair determines the direction of vertical movement of water in the ground. At Site 2, the water level in MW2-12 is higher than the water level in MW2-4 in January. This indicates an upward gradient or movement of water from deep to shallow. This is the pattern if groundwater is discharging to a surface water feature (i.e., groundwater springs in a creek bottom). However, the gradient at MW2 in February is neutral (neither upwards or downwards). The gradients can fluctuate with seasons.

At nest on Site 4A, the deep well MW2-10 is consistently higher than the shallow well MW2-4. This suggests an upward gradient. However, it is also possible that the shallow wells have still not fully recovered. The slow recovery is a sign of low permeability soils which is good for siting a landfill.

2.4.3 Presence of Aquifers

Water wells in the adjacent quarter sections are shown on Figures 2-1 and 2-2. These well locations were obtained from the Manitoba Sustainable Development well data base. The locations shown were provided in the database and were not field checked for this preliminary investigation. Therefore, the actual locations could vary.

Two wells near Site 2 and three wells in the cluster near Site 4A encountered geological formations that produced water. These aquifers were seams of sand and gravel bedded within the clay till. The table below summarizes the depth to the formations, the test pumping rates and the vertical drawdown of the water levels in the wells during the test pumping.

Table 2-5: Potential Depths of Aquifers

Well	Screen Depth (m)	Formation	Pumping Rate (L/min)	Drawdown (m)
Site 2				
72719	33.2 – 36.5	Sand	23	15.8
39227	39.6 – 41.4	Sand and gravel	68	8.2
Site 4A²				
73436	6.4 – 8.5	Gravel	20	Na
73437	5.2 – 7.6	Sand and gravel	29	4.6
73438	6.1 – 8.5	Sand and gravel	91	4.9
73417	NA			

² The well log indicates that these wells are in a ravine. Confirmation of the locations is recommended.

Preliminary Site Investigation and Recommendations
March 2018

This indicates that there is a possibility in the area of the Sites to obtain water supplies from significant sand and gravel layers within the till. However, the seams observed in the boreholes at the Sites were thin and contained silt or clay. These would not constitute aquifers.

3.0 Discussion

3.1 Criteria

Manitoba Regulations state that if a landfill receives less than 5,000 tonnes per year or 400 tonnes in 30-day period, the landfill is a Class II landfill³. In terms of approvals, the following is a brief summary of the differences between a Class I and Class II approval:

- Class I landfill requires a license, and a Class II requires a permit. A permit is generally less onerous than a license;
- Public consultation is not required for a Class II landfill (but is recommended);
- The Class I landfill application must be posted for 30 days, after which comments are considered as the license is compiled; and
- The Class I landfill design requirements are more prescriptive.

Both classes require that the site design be protective of the environment, and a hydrogeological assessment is completed.

3.2 Site Preferences

Both Sites are acceptable with respect to Constraint Mapping undertaken as part of the Feasibility Study (refer to Section 1.1.1). Therefore, we assessed the Sites to optimize the location.

Table 3-1: Site Comparison

	Site 2	Site 4A
Seasonal or significant surface water	A small creek transects the northern corner of the Site.	A small pond is located on the Site.
Soil type and suitability for landfilling	Low permeable silt clay till with thin seams of silt/sand/clay. Suitable for landfill construction.	Low permeable silt clay till with thin seams of silt/sand/clay. Suitable for landfill construction.
Depth to bedrock	Unknown, but exceeding 12 m. No preference.	Unknown, but exceeding 12 m. No preference.
Water table depth	Depth below grade is 2.4 to 5.3 m. Therefore, this Site is less preferred.	Depth below grade is 4.5 to 6.9 m. Therefore, this Site is more preferred.

³ The quantity is exceeded in year 29. The communities must apply for a Class I landfill license 2 years before exceeding 5000 tonnes per year. Due to the seasonality of the waste associated with the park, it is possible that the monthly threshold will be exceeded earlier.

Preliminary Site Investigation and Recommendations
March 2018

	Site 2	Site 4A
Overall site conditions and suitability	No structures nearby. Closer travel distance to centroid of waste.	There appears to be a house or structure located near the Site.

Note: Shading represents a preference.

Generally, both Sites are considered acceptable and it is recommended that the Partnership discusses the merits of both Sites before making any decisions.

3.3 Budgetary Estimates

The capital budget estimated for the landfill in the Feasibility Study is \$4,000,000. This included:

- projected volumetric requirements for a 30-year study period;
- general configuration of 2 m below grade and 7 m of fill above grade;
- a liner comprised of heavy duty plastic (HDPE) barrier at base of landfill;
- a leachate collection system would be installed over the liner with a gravel layer and subsurface piping network to an evaporative lagoon for leachate management;
- a stormwater pond and perimeter ditching for non-impacted effluent (rainwater) which is diverted away from the open cell;
- a weigh scale and office facilities; and
- a public drop off area at the Site.

This does not include construction of transfer stations.

No data has been collected as part of this preliminary investigation that indicates this estimate is not valid.

4.0 Next Steps

4.1 Enhanced Site Investigation

Once the Site is selected by the Partnership, the remaining hydrogeological data should be collected. The more complete the application and background data is, the quicker the review process. For a site this size, the Manitoba Standards for Landfills recommends the following:

- a total of nine boreholes; therefore, five additional boreholes should be advanced;
- hydraulic conductivity testing (to assess the need for a liner)⁴;
- baseline groundwater quality analysis; and
- site survey.

Neegan Burnside also recommends additional assessment of existing private water wells in the vicinity of the selected Site. This would involve the following:

- verification of location of existing wells (the Provincial registry is often not accurate); and
- determination of whether well is being used.

It is our expectation that the wells will remain in place to be used in the permitting process, and if possible, become part of the monitoring network. It should be noted that once the Site is selected, additional boreholes and monitoring wells will be needed for permitting and detailed design. Insitu hydraulic conductivity (K) testing and water quality testing were not been included in this program as it is not needed for preliminary site evaluation. However, K testing and water sampling at the monitoring wells will eventually be needed for permitting purposes.

4.2 Layout of Transfer Stations

The concept involves a network of transfer stations throughout the communities. These were generally located at the existing landfill sites (landfills converted to transfer station). Partnering municipalities and First Nations will develop and manage their own transfer stations to feed into the central site. Discussions between neighbouring First Nations and Municipal governments need to take place as part of this process.

4.3 Municipal Conditional Use Permit

A Municipal Conditional Permit will be needed to develop the Site. The Partnership, in particular the R.M. of Harrison Park, will need to indicate the requirements for this permit.

⁴ It should be noted that estimates provided in the Feasibility Study assumed a liner would be required. This additional testing may reduce the overall costs.

4.4 Public Consultation

For a Class II landfill permit, public consultation is not required, but is recommended. This could comprise advertisements in the local paper, and a public meeting. It is likely that the public consultation requirements will be laid out through the Municipal Conditional Use Permit.

4.5 Permit to Operate

In order to obtain a permit to operation, the Partnership must submit the following:

- A completed application form (a sample application form is included as Appendix E);
- Supporting information prepared by a qualified professional that contains the assessment of geological and hydrological conditions specific to the landfill and its surrounding areas; and
- Design concepts.

A complete list of the requirements is included in Appendix F.

It should be noted that the Partnership should own the Site before they apply for the permit to operate.

The Director has the authority to request, and may require the Applicant to provide any additional information considered necessary to assess the application. The Director may also issue a permit that imposes terms and conditions considered necessary to protect human health and the environment, or refuse to issue a permit if it is evident that the facility will have a negative impact on human health or the environment. Refusals will be communicated to the proponent within 30 days of the decision, in writing, with reasons for the refusal.

Permit renewals are required every five years under the Regulation.

4.6 Other Considerations

Decommissioning of wells on private properties, which are no longer used will be needed. A geotechnical assessment may be needed if the Site requires a retaining wall or large structures.

5.0 Conclusions

Two sites have been shortlisted as potential Sites for the community landfill. A preliminary hydrogeological investigation has indicated that both Sites are suitable. Site 4A may have a slight advantage of lower water levels, but has a neighbouring house. The next steps involve the following:

- Enhanced Site Investigation;
- Layout and design of transfer stations;
- Municipal Conditional Use Permit;
- Public Consultation; and
- Submission of an Application for a Permit to Operate.

Appendix A

Borehole Logs

Table A-1	Monitoring Well Construction Details Four Winds Environmental Management
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<i>Monitoring Well</i>	<i>Date of Installation</i>	<i>Screened Stratigraphy</i>	<i>Top of PVC Pipe (m ags)</i>	<i>Depth Below Ground Surface</i>						
				<i>Borehole Depth (m)</i>	<i>Well Screen (m)</i>		<i>Sand Pack (m)</i>		<i>Annular Seal (m)</i>	
					<i>Top</i>	<i>Bottom</i>	<i>Top</i>	<i>Bottom</i>	<i>Top</i>	<i>Bottom</i>
Site 2 MW1-6	12-Dec-17	clay silt till	0.88	12.19	4.90	6.42	4.59	6.42	0.00	4.59
Site 2 MW2-4	12-Dec-17	clay silt till	0.85	4.57	3.06	4.58	2.75	4.58	0.00	2.75
Site 2 MW2-12	12-Dec-17	clay silt till	0.90	12.19	10.26	11.78	9.95	11.78	0.00	9.95
Site 2 MW3-6	13-Dec-17	clay silt till	0.86	12.19	4.93	6.45	4.62	6.45	0.00	4.62
Site 4A MW1-8	14-Dec-17	clay silt till	0.92	12.19	6.16	7.68	5.85	7.68	0.00	5.85
Site 4A MW2-4	13-Dec-17	silt seam	0.88	4.57	3.00	4.52	2.69	4.52	0.00	2.69
Site 4A MW2-10	13-Dec-17	clay silt till	0.88	12.19	9.10	10.62	8.79	10.62	0.00	8.79
Site 4A MW3-8	14-Dec-17	clay silt till	0.91	12.19	6.15	7.67	5.84	7.67	0.00	5.84

<i>Monitoring Well</i>	<i>Well Description</i>	<i>Elevation (metres above mean sea level)</i>								
		<i>Ground</i>	<i>Top of PVC Pipe</i>	<i>Bottom of Borehole</i>	<i>Well Screen</i>		<i>Sand Pack</i>		<i>Annular Seal</i>	
					<i>Top</i>	<i>Bottom</i>	<i>Top</i>	<i>Bottom</i>	<i>Top</i>	<i>Bottom</i>
Site 2 MW1-6	Water table	614.19	615.07	602.00	609.29	607.77	609.60	607.77	614.19	609.60
Site 2 MW2-4	Water table	615.28	616.12	610.71	612.22	610.70	612.53	610.70	615.28	612.53
Site 2 MW2-12	Intermediate	615.27	616.17	603.08	605.01	603.49	605.32	603.49	615.27	605.32
Site 2 MW3-6	Water table	612.95	613.81	600.76	608.02	606.50	608.33	606.50	612.95	608.33
Site 4A MW1-8	Water table	605.69	606.61	593.50	599.53	598.01	599.84	598.01	605.69	599.84
Site 4A MW2-4	Water table	606.04	606.91	601.47	603.04	601.52	603.35	601.52	606.04	603.35
Site 4A MW2-10	Intermediate	606.11	606.99	593.92	597.01	595.49	597.32	595.49	606.11	597.32
Site 4A MW3-8	Water table	605.03	605.94	592.84	598.88	597.36	599.19	597.36	605.03	599.19

Client: RSWART Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 614.19
Drilling Co.: Maple Leaf Drilling	Date Started: 12/12/2017	Static Water Level (m amsl): 5.25
Drilling Method: Geo Probe	Date Completed: 12/12/2017	Sand Pack (m amsl):

Depth Scale (ft) (m)	Stratigraphic Description	Strat. Plot	Elev. Depth (m)		SAMPLE			Depth Scale (ft) (m)
					Num.	Type	Int.	
	Surface Elevation (m): 614.19							
	Topsoil - dark brown, soft, dry, organic material		613.73 0.46		1	CS	25	
1.0	Silt - some clay, trace sand, trace gravel and cobble, light brown, soft, cohesive, non-plastic, trace oxidization, massive, moist		612.67 1.52		2	CS	90	1.0
5.0	Clay - some silt, trace sand, trace gravel and cobble, light-medium brown, trace oxidization, medium density, cohesive, low plasticity, massive, moist-wet (Till)		611.14 3.05		3	CS	100	5.0
2.0	Clay - some silt, trace sand, trace gravel and cobble, medium brown, trace oxidization, hard, cohesive, medium plasticity, massive, moist-wet (Till)		609.92 4.27		4	CS	100	2.0
10.0	Clay - some silt, trace sand, trace gravel and cobble, brownish grey, trace oxidization, hard, cohesive, medium plasticity, massive, saturated (Till)				5	CS	100	10.0
4.0					6	CS	100	4.0
15.0					7	CS	100	15.0
5.0					8	CS	100	5.0
20.0								20.0
6.0								6.0
7.0								7.0
25.0								25.0
8.0								8.0
30.0								30.0
9.0								9.0
35.0								35.0
11.0								11.0
12.0								12.0

Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**
 This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by R. J. Burnside & Associates Limited personnel before use by others.

LEGEND	MONITORING WELL DATA	SAMPLE TYPE	AC Auger Cutting	SS Split Spoon
Water found @ time of drilling	Pipe: 51 mm dia. PVC	CS Continuous	AR Air Rotary	WC Wash Cuttings
Static Water Level - 2/13/2018	Screen: 51 mm dia. PVC #10 slot	RC Rock Core		

Client: RSWARF Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 615.27
Drilling Co.: Maple Leaf Drilling	Date Started: 12/12/2017	Static Water Level (m amsl): 4.34
Drilling Method: Geo Probe	Date Completed: 12/12/2017	Sand Pack (m amsl):

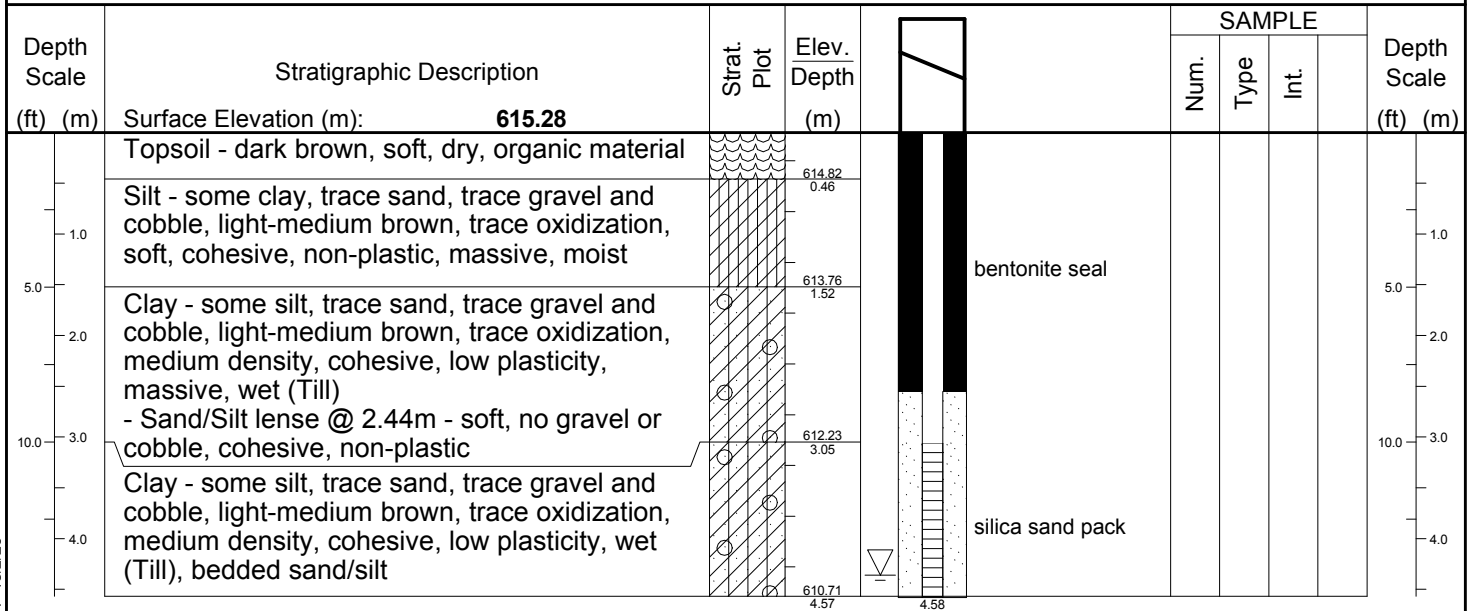
Depth Scale (ft) (m)	Stratigraphic Description	Strat. Plot	Elev. Depth (m)		SAMPLE			Depth Scale (ft) (m)
					Num.	Type	Int.	
	Surface Elevation (m): 615.27							
	Topsoil - dark brown, soft, dry, organic material		614.81 0.46		1	CS	50	
1.0	Silt - some clay, trace sand, trace gravel and cobble, light-medium brown, trace oxidization, soft, cohesive, non-plastic, massive, soft		613.75 1.52		2	CS	80	1.0
5.0	Clay - some silt, trace sand, trace gravel and cobble, light-medium brown, trace oxidization, medium density, cohesive, low plasticity, massive, wet (Till)		612.22 3.05		3	CS	95	5.0
2.0	- Sand/Silt lense @ 2.44m - soft, no gravel or cobble, cohesive, non-plastic		610.70 4.57		4	CS	100	2.0
10.0	Clay - some silt, trace sand, trace gravel and cobble, light-medium brown, trace oxidization, medium density, cohesive, low plasticity, wet (Till), bedded sand/silt				5	CS	100	10.0
3.0	Clay - some silt, trace sand, trace gravel and cobble, medium-dark brown, trace oxidization, hard, cohesive, low plasticity, massive, saturated (Till)				6	CS	100	3.0
4.0	- becoming brownish grey @ 7.32m				7	CS	100	4.0
15.0	- becoming medium plasticity @ 10.97m				8	CS	100	15.0
5.0								5.0
20.0								20.0
6.0								6.0
25.0								25.0
8.0								8.0
30.0								30.0
9.0								9.0
35.0								35.0
11.0								11.0
12.0								12.0

Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**









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LEGEND	MONITORING WELL DATA	SAMPLE TYPE	AC	Auger Cutting	SS	Split Spoon
▼ Water found @ time of drilling	Pipe: 51 mm dia. PVC	CS	Continuous	AR	Air Rotary	
▽ Static Water Level - 2/13/2018	Screen: 51 mm dia. PVC #10 slot	RC	Rock Core	WC	Wash Cuttings	

Client: RSWARF Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 615.28
Drilling Co.: Maple Leaf Drilling	Date Started: 12/12/2017	Static Water Level (m amsl): 4.36
Drilling Method: Geo Probe	Date Completed: 12/12/2017	Sand Pack (m amsl):



NEEGAN BURNSIDE LOGO COLOR 2010 P:\GINT\PROJECTS\300 JOBS\300039698 - FOUR WINDS\300039698 - FOUR WINDS.GPJ TEMPLATE.GDT 18/2/26

Prepared By: Matt Valeriote		Checked By: Joy Rutherford		Date Prepared: 1/1/2018	
This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by R. J. Burnside & Associates Limited personnel before use by others.					
LEGEND		MONITORING WELL DATA		SAMPLE TYPE	
 Water found @ time of drilling		Pipe: 51 mm dia. PVC		AC  Auger Cutting	
 Static Water Level - 2/13/2018		Screen: 51 mm dia. PVC #10 slot		CS  Continuous	
				RC  Rock Core	
				SS  Split Spoon	
				AR  Air Rotary	
				WC  Wash Cuttings	

LOG OF DRILLING OPERATIONS

NEEGAN BURNSIDE

Site 2 MW3-6

Page ___ of ___

Client: RSWART Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 612.95
Drilling Co.: Maple Leaf Drilling	Date Started: 12/13/2017	Static Water Level (m amsl): 2.67
Drilling Method: Geo Probe	Date Completed: 12/13/2017	Sand Pack (m amsl):

Depth Scale (ft) (m)	Stratigraphic Description	Strat. Plot	Elev. Depth (m)		SAMPLE			Depth Scale (ft) (m)
					Num.	Type	Int.	
	Surface Elevation (m): 612.95							
	Topsoil - dark brown, soft, dry, organic material		612.49 0.46		1	CS	30	
1.0	Sandy silt - some clay, light brownish grey, trace oxidization, soft, cohesive, non-plastic, massive, moist-wet							1.0
5.0	- 1.52 to 1.83 m - Sand, some silt, trace gravel, brown, noncohesive, non-plastic, wet		611.12 1.83		2	CS	80	5.0
2.0	Clay - some silt, trace sand, trace gravel, medium brownish grey, trace oxidization, medium density, cohesive, low plasticity, massive, wet (Till)		609.90 3.05		3	CS	100	10.0
3.0	Clay - some silt, trace sand, trace gravel, medium brownish grey, trace oxidization, hard, cohesive, low plasticity, massive, wet (Till)							3.0
4.0	Clay - some silt, trace sand, trace gravel, medium brownish grey, trace oxidization, hard, cohesive, low plasticity, massive, wet (Till)		608.38 4.57		4	CS	100	4.0
15.0	Clay - some silt, trace sand, trace gravel, medium brownish grey, trace oxidization, hard, cohesive, low plasticity, massive, wet-saturated (Till)							15.0
5.0	- Between 6.55 and 7.01 m - Silt, some sand, trace clay, trace gravel, light-medium brown, soft, trace oxidization, cohesive, non-plastic		604.72 8.23		5	CS	100	5.0
6.0	Clay - some silt, trace sand, trace gravel, medium-dark grey, trace oxidization, hard, cohesive, low plasticity, massive, saturated (Till)							6.0
7.0					6	CS	100	7.0
25.0								25.0
8.0					7	CS	100	8.0
9.0								9.0
10.0					8	CS	100	10.0
35.0								35.0
11.0								11.0
12.0			600.76 12.19					12.0

Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**

This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by R. J. Burnside & Associates Limited personnel before use by others.







LEGEND

▼ Water found @ time of drilling
 ▽ Static Water Level - 2/13/2018

MONITORING WELL DATA

Pipe: **51 mm dia. PVC**
 Screen: **51 mm dia. PVC #10 slot**

SAMPLE TYPE

AC  Auger Cutting
 CS  Continuous
 RC  Rock Core
 SS  Split Spoon
 AR  Air Rotary
 WC  Wash Cuttings

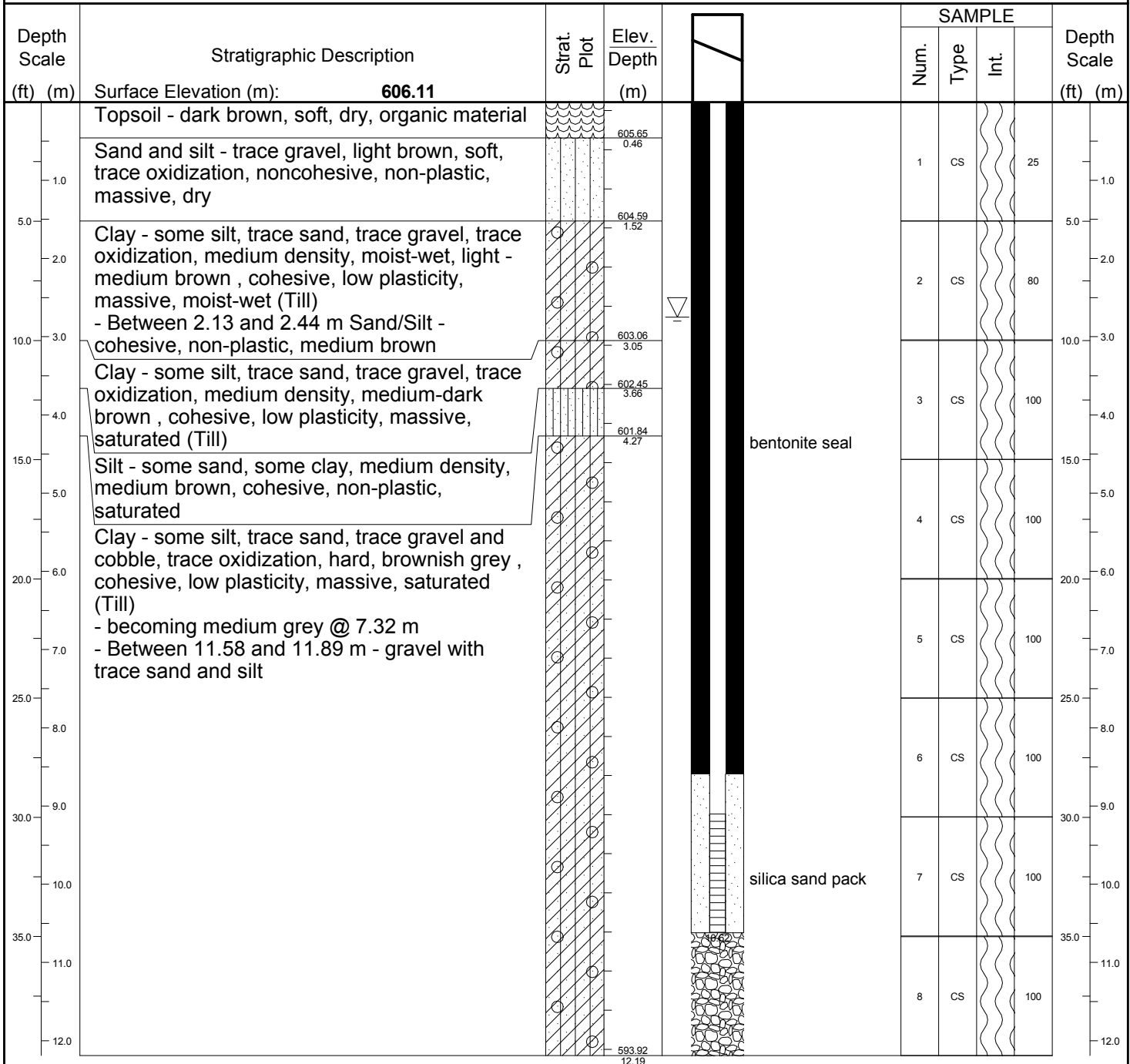
Client: RSWART Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 605.69
Drilling Co.: Maple Leaf Drilling	Date Started: 12/14/2017	Static Water Level (m amsl): 6.88
Drilling Method: Geo Probe	Date Completed: 12/14/2017	Sand Pack (m amsl):

Depth Scale (ft) (m)	Stratigraphic Description	Strat. Plot	Elev. Depth (m)		SAMPLE			Depth Scale (ft) (m)
					Num.	Type	Int.	
	Surface Elevation (m): 605.69							
	Topsoil - dark brown, soft, dry, organic material		605.23 0.46		1	CS	50	
1.0	Clay - some silt, trace sand, medium brown, medium density, trace oxidization, trace gravel, cohesive, non-plastic, massive, moist		604.17 1.52		2	CS	80	1.0
5.0	Clay - some silt, trace sand, medium brown, medium density, trace oxidization, trace gravel, cohesive, low plasticity, massive, moist-wet (Till)		602.64 3.05		3	CS	95	5.0
2.0	- Sand Lense 1.83 - 2.13m - coarse sand				4	CS	100	2.0
10.0	Clay - some silt, trace sand, medium brown - brownish grey with depth, hard, trace oxidization, trace gravel and cobble, cohesive, low plasticity, massive, wet-saturated with depth (Till)		599.59 6.10		5	CS	100	10.0
3.0					6	CS	100	3.0
15.0	Clay - some silt, trace sand, medium brown - brownish grey with depth, hard, trace oxidization, trace gravel and cobble, cohesive, low plasticity, massive, saturated (Till)		597.16 8.53		7	CS	100	15.0
5.0	- becoming medium grey @ 7.92 m				8	CS	100	5.0
20.0			593.50 12.19					20.0
25.0								25.0
8.0								8.0
30.0								30.0
9.0								9.0
10.0								10.0
35.0								35.0
11.0								11.0
12.0								12.0

Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**
 This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by R. J. Burnside & Associates Limited personnel before use by others.









LEGEND	MONITORING WELL DATA	SAMPLE TYPE
▼ Water found @ time of drilling	Pipe: 51 mm dia. PVC	AC Auger Cutting
▽ Static Water Level - 2/13/2018	Screen: 51 mm dia. PVC #10 slot	CS Continuous
		RC Rock Core
		SS Split Spoon
		AR Air Rotary
		WC Wash Cuttings

Client: RSWARF Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 606.11
Drilling Co.: Maple Leaf Drilling	Date Started: 12/13/2017	Static Water Level (m amsl): 2.75
Drilling Method: Geo Probe	Date Completed: 12/13/2017	Sand Pack (m amsl):

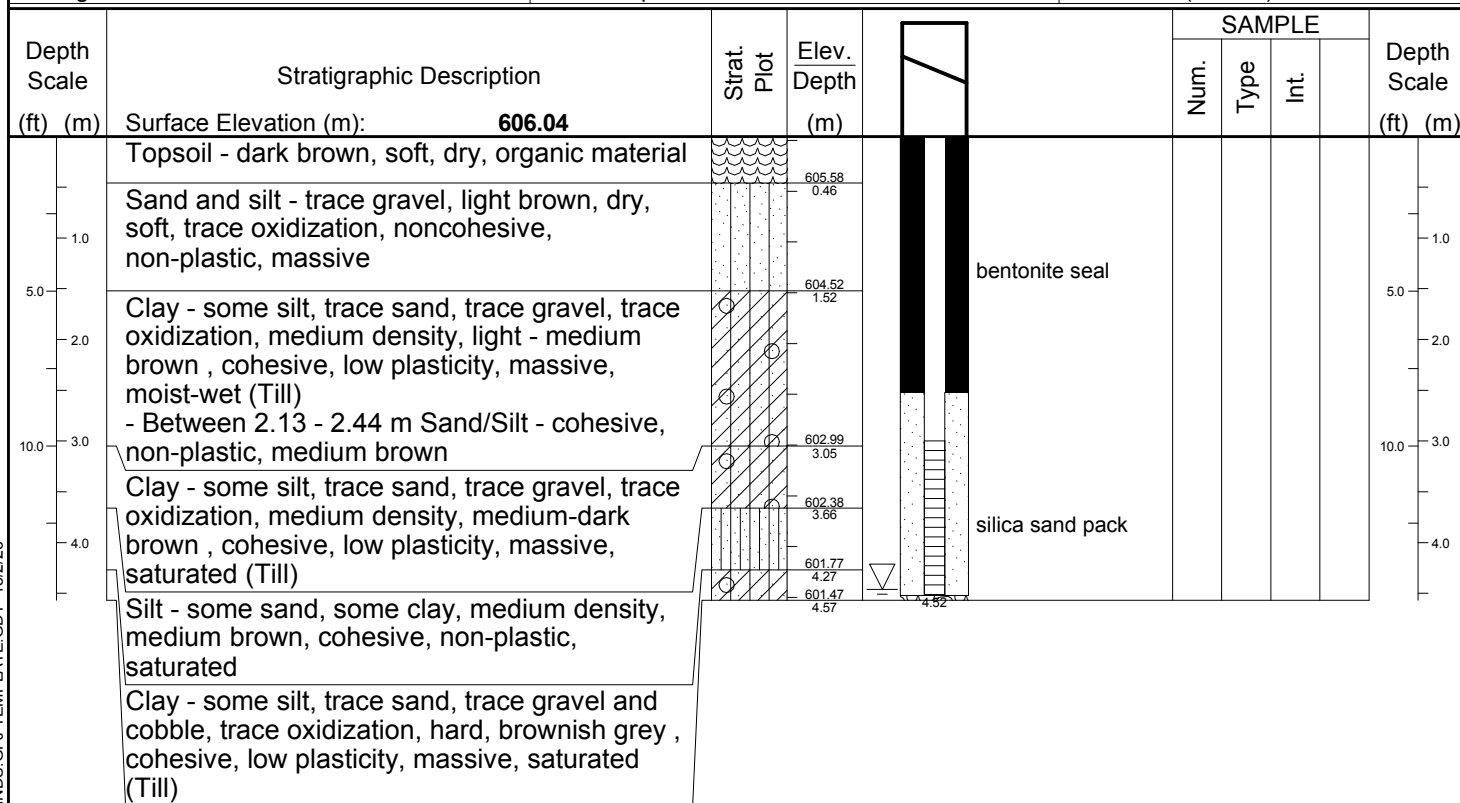


Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**

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LEGEND	MONITORING WELL DATA	SAMPLE TYPE	AC  Auger Cutting	SS  Split Spoon
 Water found @ time of drilling	Pipe: 51 mm dia. PVC	CS  Continuous	AR  Air Rotary	
 Static Water Level - 2/13/2018	Screen: 51 mm dia. PVC #10 slot	RC  Rock Core	WC  Wash Cuttings	

Client: RSWARF Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 606.04
Drilling Co.: Maple Leaf Drilling	Date Started: 12/13/2017	Static Water Level (m amsl): 4.46
Drilling Method: Geo Probe	Date Completed: 12/13/2017	Sand Pack (m amsl):



Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**

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LEGEND

- ▼ Water found @ time of drilling
- ▽ Static Water Level - 2/13/2018

MONITORING WELL DATA

Pipe: **51 mm dia. PVC**
Screen: **51 mm dia. PVC #10 slot**









SAMPLE TYPE

- | | | | | | |
|----|--|---------------|----|--|---------------|
| AC | | Auger Cutting | SS | | Split Spoon |
| CS | | Continuous | AR | | Air Rotary |
| RC | | Rock Core | WC | | Wash Cuttings |

Client: RSWART Waste Management	Project Name: Four Winds Env. Res. Mngmt.	Logged by: Matt Valeriote
Project No.: 300039698	Location: Newdale, Manitoba	Ground (m amsl): 605.03
Drilling Co.: Maple Leaf Drilling	Date Started: 12/14/2017	Static Water Level (m amsl): 6.21
Drilling Method: Geo Probe	Date Completed: 12/14/2017	Sand Pack (m amsl):

Depth Scale (ft) (m)	Stratigraphic Description	Strat. Plot	Elev. Depth (m)		SAMPLE			Depth Scale (ft) (m)
					Num.	Type	Int.	
	Surface Elevation (m): 605.03							
	Topsoil - dark brown, soft, dry, organic material		604.57 0.46		1	CS	40	
1.0	Clay - some silt, trace sand, medium brown, soft-medium density, trace oxidization, trace gravel, cohesive, non-plastic, massive, moist		603.51 1.52		2	CS	100	1.0
5.0	Clay - some silt, trace sand, medium brown, medium density, trace oxidization, trace gravel and cobble, cohesive, nonplastic, massive, moist-wet (Till)		601.98 3.05		3	CS	100	5.0
2.0	Clay - some silt, trace sand, medium brown, medium density, trace oxidization, trace gravel, cohesive, low plasticity, massive, wet-saturated (Till)		600.46 4.57		4	CS	100	2.0
10.0	Clay - some silt, trace sand, medium brown - brownish grey with depth, hard, trace oxidization, trace gravel and cobble, cohesive, low plasticity, massive, wet-saturated (Till)		597.71 7.32		5	CS	100	10.0
4.0	Clay - some silt, trace sand, medium grey, hard, trace oxidization, trace gravel, cohesive, low plasticity, massive, saturated (Till)		592.84 12.19		6	CS	100	4.0
15.0					7	CS	100	15.0
5.0					8	CS	100	5.0
20.0								20.0
7.0								7.0
25.0								25.0
8.0								8.0
30.0								30.0
9.0								9.0
35.0								35.0
11.0								11.0
12.0								12.0

Prepared By: **Matt Valeriote** Checked By: **Joy Rutherford** Date Prepared: **1/1/2018**
 This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by R. J. Burnside & Associates Limited personnel before use by others.

LEGEND	MONITORING WELL DATA	SAMPLE TYPE	AC  Auger Cutting	SS  Split Spoon
 Water found @ time of drilling	Pipe: 51 mm dia. PVC	CS  Continuous	AR  Air Rotary	
 Static Water Level - 2/13/2018	Screen: 51 mm dia. PVC #10 slot	RC  Rock Core	WC  Wash Cuttings	

Site 2 WWR

Location: 5-17-20W

Well_PID: 72719
 Owner: J LEFRANC
 Driller: A & S Well Drilling
 Well Name:
 Well Use: PRODUCTION
 Water Use: Livestock
 UTMX: 415079.06
 UTMY: 5586556.65
 Accuracy XY: UNKNOWN
 UTMZ:
 Accuracy Z:
 Date Completed: 1991 Oct 01

WELL LOG

From (ft.)	To (ft.)	Log
0	20.0	BROWN CLAY
20.0	30.0	FINE SAND
30.0	104.9	BLUE CLAY
104.9	119.9	SAND

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	108.9	casing	5.00			INSERT	PVC
108.9	119.9	perforations				WIRE WOUND	S. S.
0	0	gravel pack					

Top of Casing: 1.000 ft. above ground

PUMPING TEST

Date: 1991 Oct 01
 Pumping Rate: 5.000 Imp. gallons/minute
 Water level before pumping: 8.0 ft. below ground
 Pumping level at end of test: 60.0 ft. below ground
 Test duration: 3 hours, minutes
 Water temperature: ?? degrees F

 -

Location: SW-9-17-20W

Well_PID: 39227
 Owner: E REZSTYSHANUK
 Driller: M & M Drilling Rivers Ltd.
 Well Name:
 Well Use: PRODUCTION
 Water Use: Domestic,Livestock
 UTMX: 416295.741
 UTMY: 5587787.39
 Accuracy XY: UNKNOWN
 UTMZ:
 Accuracy Z:
 Date Completed: 1980 Jun 19

Site 2 WWR

WELL LOG

From (ft.)	To (ft.)	Log
0	28.0	STONY BROWN TILL
28.0	68.0	STONY GREY TILL
68.0	69.0	BROWN SAND
69.0	70.0	STONY GREY TILL
70.0	104.9	COARSE BROWN SAND AND GRAVEL
104.9	114.9	GREY SHALE TILL
114.9	135.9	GREY SAND AND GRAVEL
135.9	210.9	STONY GREY TILL

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	129.9	casing	5.00				PLASTIC
129.9	135.9	perforations	5.00		0.018	WIRE WOUND	S. S.
0	0	gravel pack					

Top of casing: 1.000 ft. below ground

PUMPING TEST

Date:	1980 Jun 19
Pumping Rate:	15.000 Imp. gallons/minute
Water level before pumping:	51.0 ft. below ground
Pumping level at end of test:	77.9 ft. below ground
Test duration:	2 hours, minutes
Water temperature:	?? degrees F

Site 4A WWR

Location: NE1-16-20W

Well_PID: 73436
 Owner: RM OF HARRISON/MWSB
 Driller: M & M Drilling Rivers Ltd.
 Well Name: TH #1
 Well Use: TEST WELL
 Water Use:
 UTMX: 421881.951
 UTMY: 5577015.42
 Accuracy XY: UNKNOWN
 UTMZ:
 Accuracy Z:
 Date Completed: 1991 Jun 11

WELL LOG

From (ft.)	To (ft.)	Log
0	2.0	SOIL
2.0	7.0	COARSE GRAVEL
7.0	17.0	GREY TILL
17.0	18.0	GRAVEL
18.0	20.0	BROWN-GREY TILL
20.0	29.0	GRAVEL
29.0	33.0	GREY TILL
33.0	33.5	GRAVEL
33.5	40.0	GREY TILL

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	21.0	casing	2.00			T & C	BLACK IRON
21.0	28.0	perforations	2.00			SL. PIPE	BLACK IRON

Top of Casing: 0 ft. below ground

PUMPING TEST

Date: 1991 Jun 11
 Pumping Rate: 4.301 Imp. gallons/minute
 Water level before pumping: 5.0 ft. below ground
 Pumping level at end of test: ?? ft. below ground
 Test duration: 1 hours, 5 minutes
 Water temperature: ?? degrees F

REMARKS

HARRISON SOUTH COMMUNITY WELL PROJECT, 4 M NE OF OLD LARGE DIAMETER
 WELL IN RAVINE, EC=800, H=32 GPG, FE=0.7 MG/L

Location: NE1-16-20W

Well_PID: 73437
 Owner: RM OF HARRISON/MWSB
 Driller: M & M Drilling Rivers Ltd.
 Well Name: TH #2
 Well Use: TEST WELL
 Water Use:

Site 4A WWR

UTMX: 421881.951
 UTMY: 5577015.42
 Accuracy XY: UNKNOWN
 UTMZ:
 Accuracy Z:
 Date Completed: 1991 Jun 11

WELL LOG

From (ft.)	To (ft.)	Log
0	2.0	SOIL
2.0	10.0	SILTY SANDY CLAY
10.0	12.0	LIGHT GREY TILL
12.0	14.0	SAND AND GRAVEL
14.0	15.0	GREY TILL
15.0	21.0	SAND AND GRAVEL, COARSE
21.0	30.0	GREY TILL

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	17.0	casing	2.00			T & C	BLACK IRON
17.0	25.0	perforations	2.00			SL. PIPE	BLACK IRON

Top of Casing: 0 ft. below ground

PUMPING TEST

Date: 1991 Jun 11
 Pumping Rate: 6.398 Imp. gallons/minute
 Water level before pumping: 3.0 ft. below ground
 Pumping level at end of test: 18.0 ft. below ground
 Test duration: 1 hours, minutes
 Water temperature: ?? degrees F

REMARKS

HARRISON SOUTH COMMUNITY WELL PROJECT, 18 M S OF OLD WELL, EC=750,
 H=28 GPG, FE=0, RECOVERY T=526 IGPD/FT

Location: NE1-16-20W

Well_PID: 73438
 Owner: RM OF HARRISON/MWSB
 Driller: M & M Drilling Rivers Ltd.
 Well Name: TH #3
 Well Use: TEST WELL
 Water Use:

TW
 UTMX: 421881.951
 UTMY: 5577015.42
 Accuracy XY: UNKNOWN
 UTMZ:
 Accuracy Z:
 Date Completed: 1991 Jun 11

WELL LOG

Site 4A WWR

From (ft.)	To (ft.)	Log
0	2.0	SOIL
2.0	4.0	SILTY SANDY CLAY, LIGHT GREY
4.0	5.0	SAND
5.0	9.0	LIGHT GREY CLAY
9.0	15.0	BROWN-GREY TILL
15.0	17.0	GREY TILL
17.0	28.0	SAND AND GRAVEL
28.0	30.0	GREY TILL

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	20.0	casing	2.00			T & C	BLACK IRON
20.0	28.0	perforations	2.00			SL. PIPE	BLACK IRON

Top of casing: 0 ft. below ground

PUMPING TEST

Date: 1991 Jun 11
Pumping Rate: 19.987 Imp. gallons/minute
Water level before pumping: 6.0 ft. below ground
Pumping level at end of test: 22.0 ft. below ground
Test duration: 1 hours, minutes
Water temperature: ?? degrees F

REMARKS

HARRISON SOUTH COMMUNITY WELL PROJECT, 23 M S OF TH #2, EC=850, H=38
GPG FE=0, MN=NO COLOUR, RECOVERY T=1390 IGPD/FT

Location: NE1-16-20W

Well_PID: 73417
Owner: RM OF HARRISON/MWSB
Driller: M & M Drilling Rivers Ltd.
Well Name: TH #4
Well Use: TEST WELL
Water Use:
UTMX: 421881.951
UTMY: 5577015.42
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1991 Jun 11

WELL LOG

From (ft.)	To (ft.)	Log
0	3.0	SOIL
3.0	7.0	SAND AND GRAVEL, COARSE
7.0	10.0	GREY CLAY
10.0	30.0	GREY TILL

No construction data for this well.

Site 4A WWR

Top of Casing: 0 ft. below ground

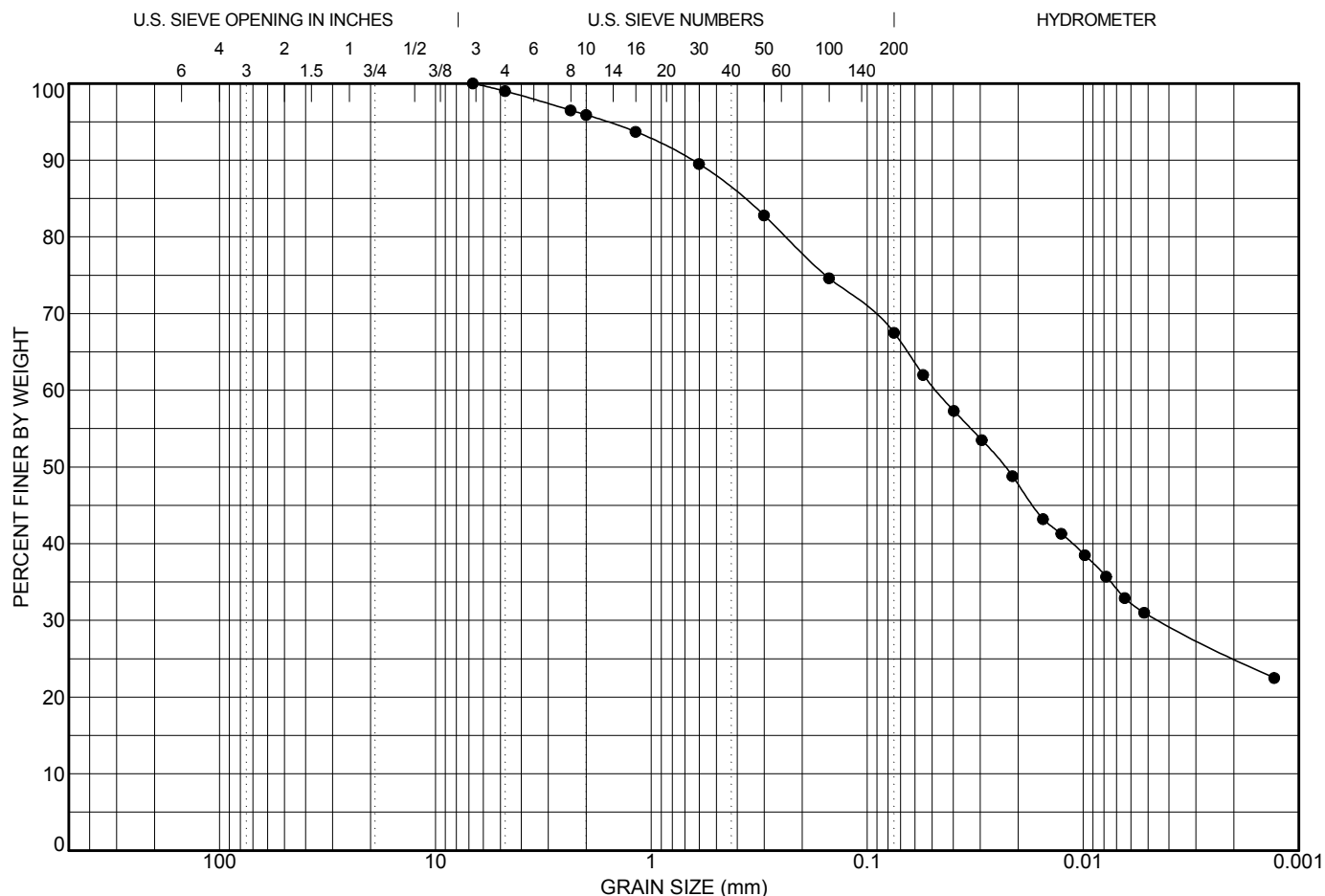
No pump test data for this well.

REMARKS

HARRISON SOUTH COMMUNITY WELL PROJECT, 17 M W OF RD ALLOW + APPROACH

Appendix C

Grain Size Analysis



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					6.7	0.048	0.004		1.0	31.5		67.5

Date: Feb. 05 / 2018
Client: Neegan Burnside Ltd.
Contractor:
Source: S2-2
Sampled From: Sample 1 (5ft)
Sample No.: 1
Date Sampled:
Sampled By: Client
Lab No.: 2700
Date Tested: Jan. 25 / 2018
Type of Material: Sandy Clayey Silt trace Gravel

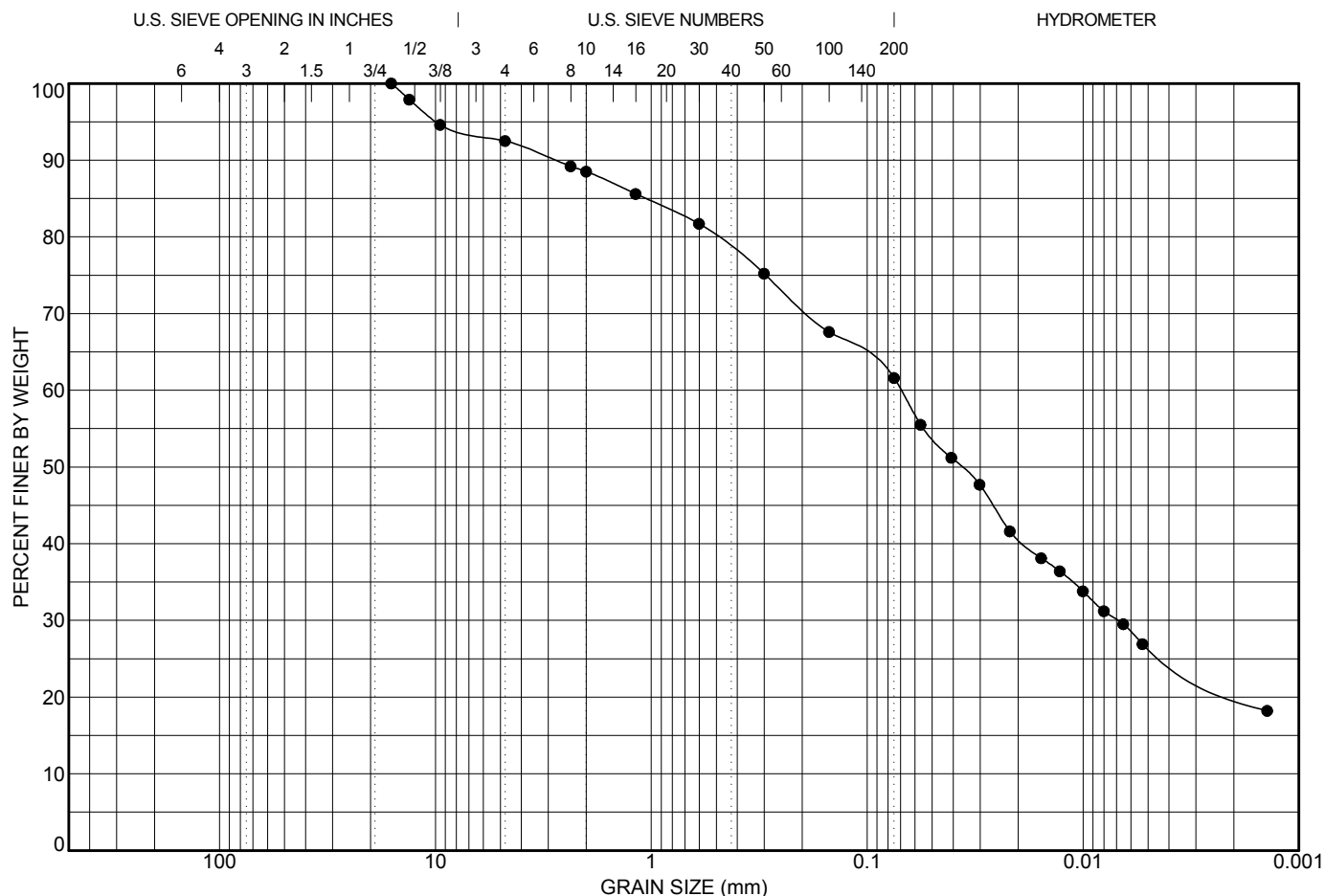
Sieve Size (mm)	Percent Passing	No Specifications



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 Fax: 519-742-7739
 e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

Project: Four Winds Waste Management Study
Location: Site 2 MW2-12 1.5 m
File No.: M181040
Enclosure No.: 1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					16	0.07	0.007		7.5	30.9	61.6	

Date: Feb. 05 / 2018
Client: Neegan Burnside Ltd.
Contractor:
Source: S2-2
Sampled From: Sample 3 (15-20ft)
Sample No.: 2
Date Sampled:
Sampled By: Client
Lab No.: 2701
Date Tested: Jan. 25 / 2018
Type of Material: Sandy Silt some Clay trace Gravel

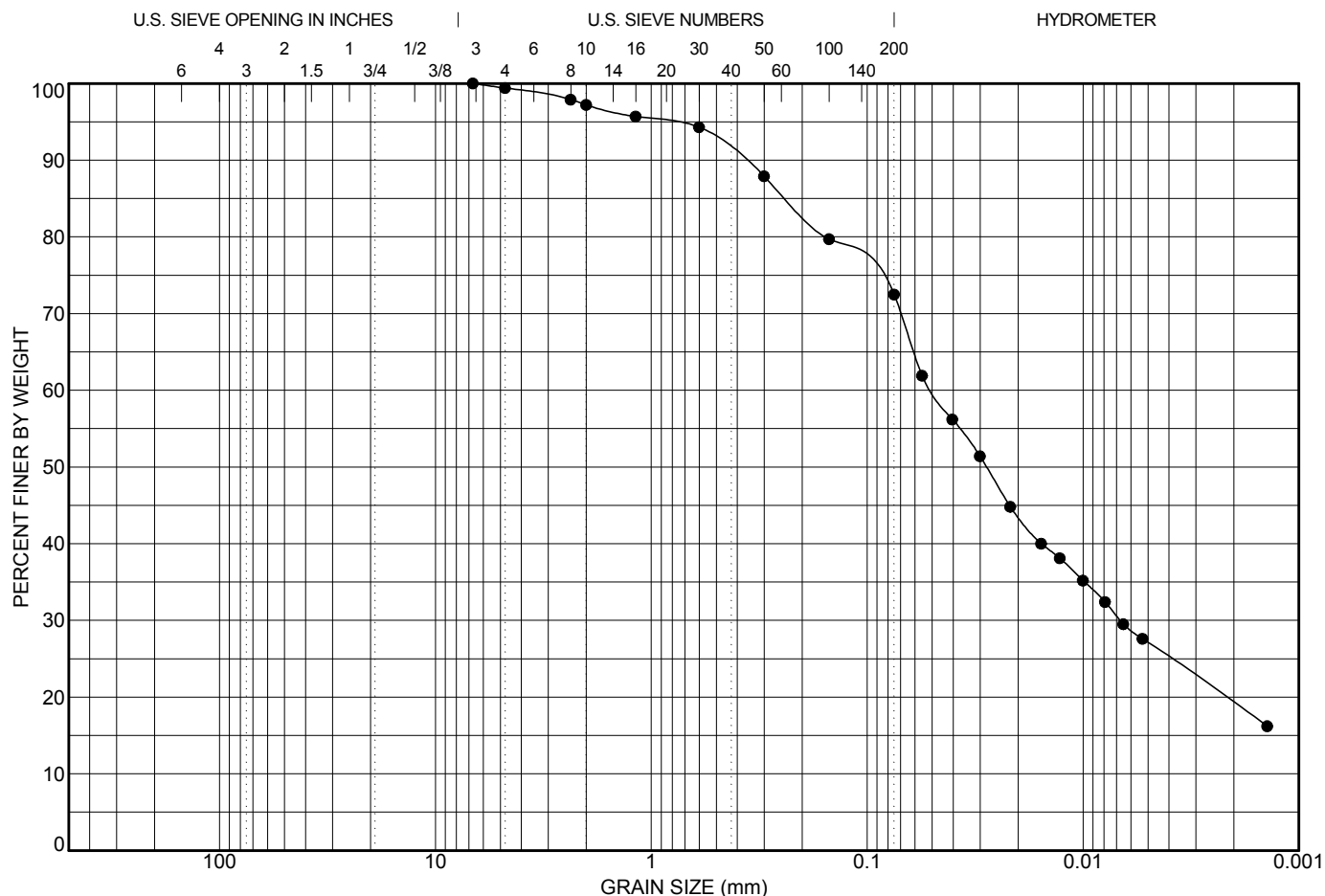
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Four Winds Waste Management Study
Location: Site 2 MW2-12 3.0 - 4.5 m
File No.: M181040
Enclosure No.: 2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					6.7	0.05	0.007		0.6	26.9	72.5	

Date: Feb. 05 / 2018
Client: Neegan Burnside Ltd.
Contractor:
Source: S2-4
Sampled From: Sample 1 (0-5ft)
Sample No.: 3
Date Sampled:
Sampled By: Client
Lab No.: 2702
Date Tested: Jan. 25 / 2018
Type of Material: Sandy Silt some Clay

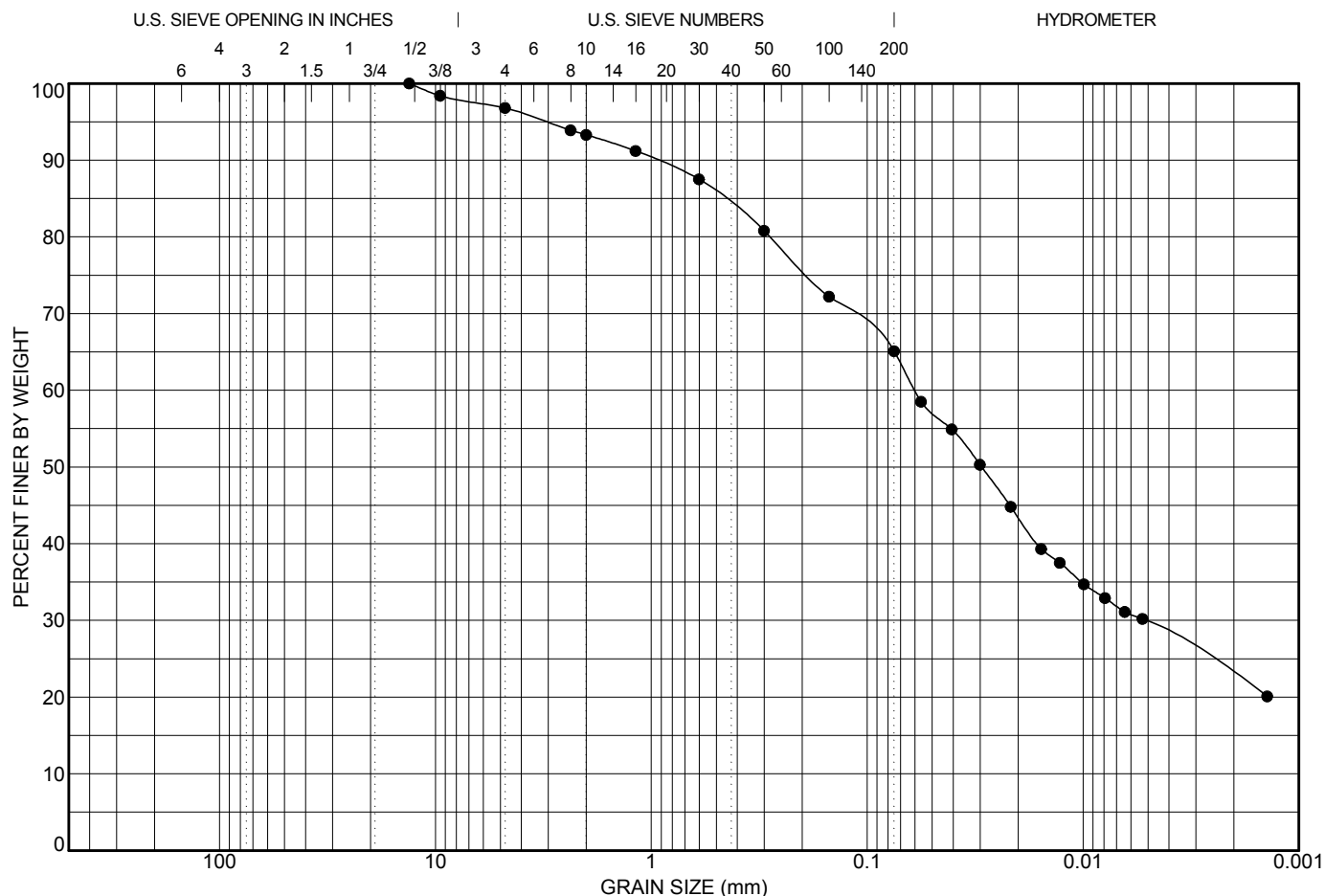
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Four Winds Waste Management Study
Location: Site 2 MW3-6 0 - 1.5 m
File No.: M181040
Enclosure No.: 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					13.2	0.06	0.005		3.2	31.7	65.1	

Date: Feb. 05 / 2018
Client: Neegan Burnside Ltd.
Contractor:
Source: S2-4
Sampled From: Sample 4 (10-15ft)
Sample No.: 4
Date Sampled:
Sampled By: Client
Lab No.: 2703
Date Tested: Jan. 25 / 2018
Type of Material: Sandy Clayey Silt some Gravel

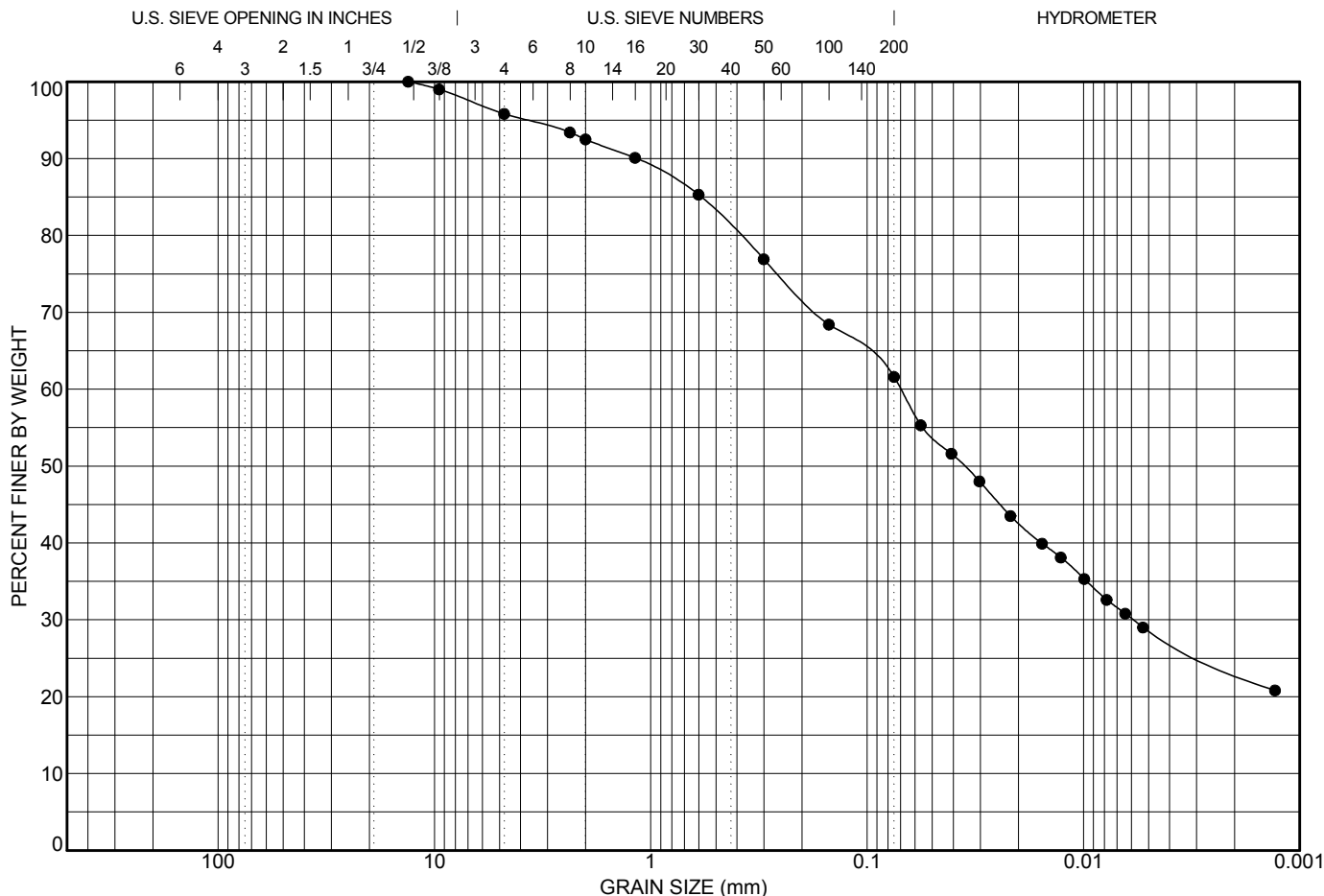
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Four Winds Waste Management Study
Location: Site 2 MW3-6 3.0 - 4.5 m
File No.: M181040
Enclosure No.: 4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					13.2	0.07	0.006		4.2	34.2	61.6	

Date: Feb. 05 / 2018
Client: Neegan Burnside Ltd.
Contractor:
Source: S4-1
Sampled From: Sample 1 (20-24ft)
Sample No.: 5
Date Sampled:
Sampled By: Client
Lab No.: 2704
Date Tested: Jan. 25 / 2018
Type of Material: Sandy Clayey Silt trace Gravel

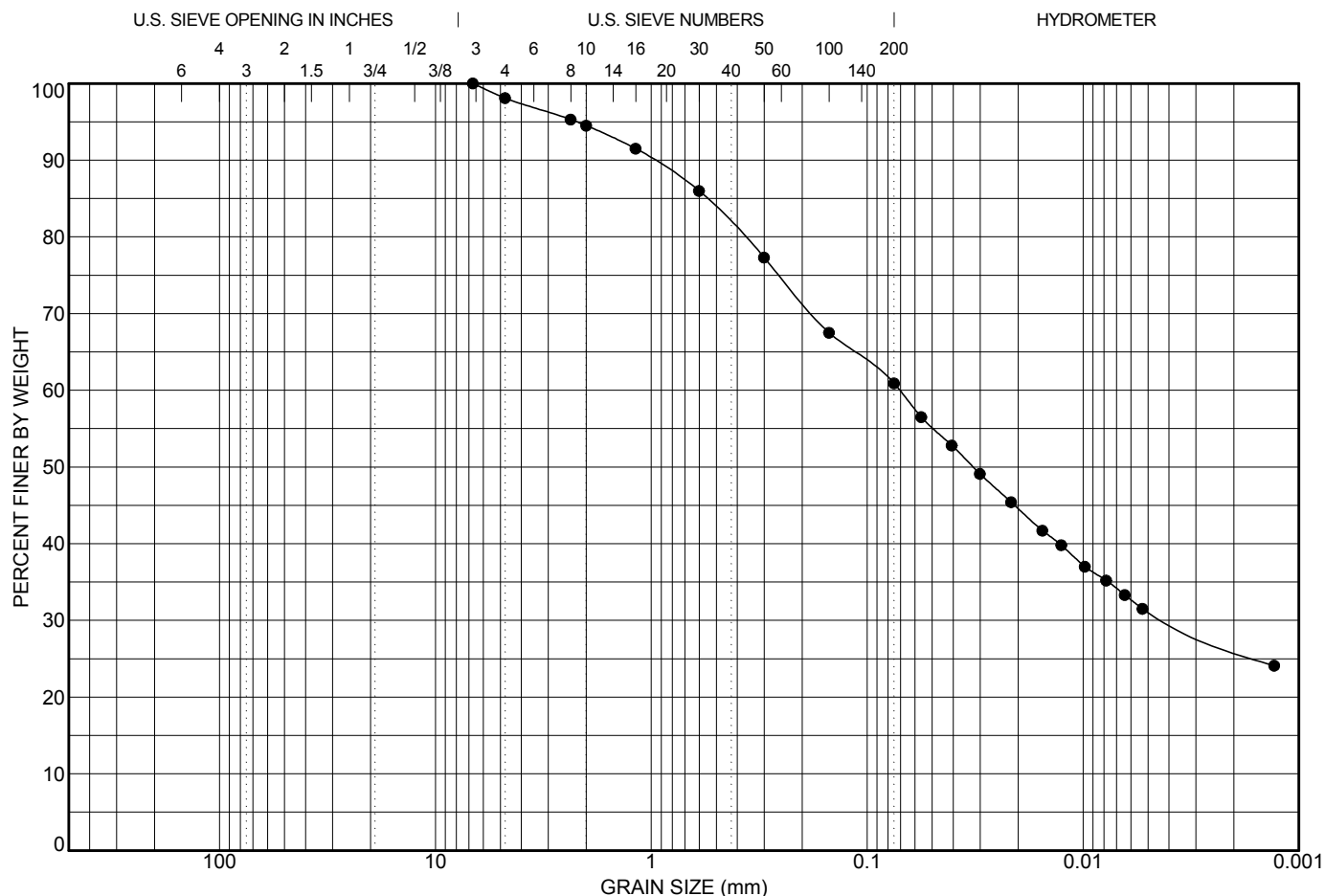
Sieve Size (mm)	Percent Passing	No Specifications



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 e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

Project: Four Winds Waste Management Study
Location: Site 4A MW1-8 6.0 - 7.5 m
File No.: M181040
Enclosure No.: 5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					6.7	0.071	0.004		1.9	37.2		60.9

Date: Feb. 05 / 2018
Client: Neegan Burnside Ltd.
Contractor:
Source: S4-4
Sampled From: Sample 1 (2-5ft)
Sample No.: 6
Date Sampled:
Sampled By: Client
Lab No.: 2705
Date Tested: Jan. 25 / 2018
Type of Material: Clayey Sand and Silt trace Gravel

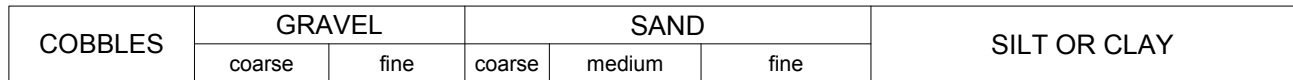
Sieve Size (mm)	Percent Passing	No Specifications



**CHUNG & VANDER DOELEN
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 Kitchener, Ontario N2H 5E1
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GRAIN SIZE DISTRIBUTION

Project: Four Winds Waste Management Study
Location: Site 4A MW2-10 0.6 - 1.5 m
File No.: M181040
Enclosure No.: 6



Date:	Feb. 05 / 2018	Sieve Size (mm)	Percent Passing	No Specifications
Client:	Neegan Burnside Ltd.			
Contractor:				
Source:	S4-4			
Sampled From:	Sample 3 (12-14ft)			
Sample No.:	7			
Date Sampled:				
Sampled By:	Client			
Lab No.:	2706			
Date Tested:	Jan. 25 / 2018			
Type of Material:	Silt some Sand and Clay			



GRAIN SIZE DISTRIBUTION

Location: **Site 4A** **MW2-10** **3.7 - 4.3 m**

File No.: M181040

Enclosure No.: 7

Appendix D

Groundwater Levels and Hydrographs

Table D-1	Static Groundwater Elevations Four Winds Environmental Management							
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	SITE 2				Site 4A			
Elevations	MW1-6	MW2-4	MW2-12	MW3-6	MW1-8	MW2-4	MW2-10	MW3-8
Top of Pipe	615.07	616.12	616.17	613.81	606.61	606.91	606.99	605.94
Ground	614.19	615.28	615.27	612.95	605.69	606.04	606.11	605.03
Top of Screen	609.29	612.22	605.01	608.02	599.53	603.04	597.01	598.88
Bottom of Screen	607.77	610.70	603.49	606.50	598.01	601.52	595.49	597.36
	Groundwater Elevations (m above mean sea level) or (m above local datum)							
14-Dec-17	dry	dry	605.09	607.21	dry	dry	603.66	dry
15-Dec-17	607.80	610.76	605.87	607.56	598.03	601.53	603.65	dry
18-Jan-18	608.47	610.85	611.48	610.55	598.28	601.57	603.46	598.24
13-Feb-18	608.94	610.92	610.93	610.28	598.81	601.58	603.36	598.82
	Water Levels Below Measuring Point							
14-Dec-17	dry	dry	11.08	6.60	dry	dry	3.33	dry
15-Dec-17	7.27	5.36	10.30	6.25	8.58	5.38	3.34	dry
18-Jan-18	6.6	5.27	4.69	3.255	8.33	5.34	3.525	7.7
13-Feb-18	6.13	5.2	5.245	3.53	7.8	5.335	3.63	7.12
	Water Levels Below Ground							
14-Dec-17	dry	dry	10.18	5.75	dry	dry	2.45	dry
15-Dec-17	6.39	4.51	9.39	5.39	7.66	4.50	2.46	dry
18-Jan-18	5.72	4.42	3.79	2.40	7.41	4.46	2.64	6.79
13-Feb-18	5.25	4.36	4.34	2.67	6.88	4.46	2.75	6.21

SITE 2 Groundwater Hydrograph

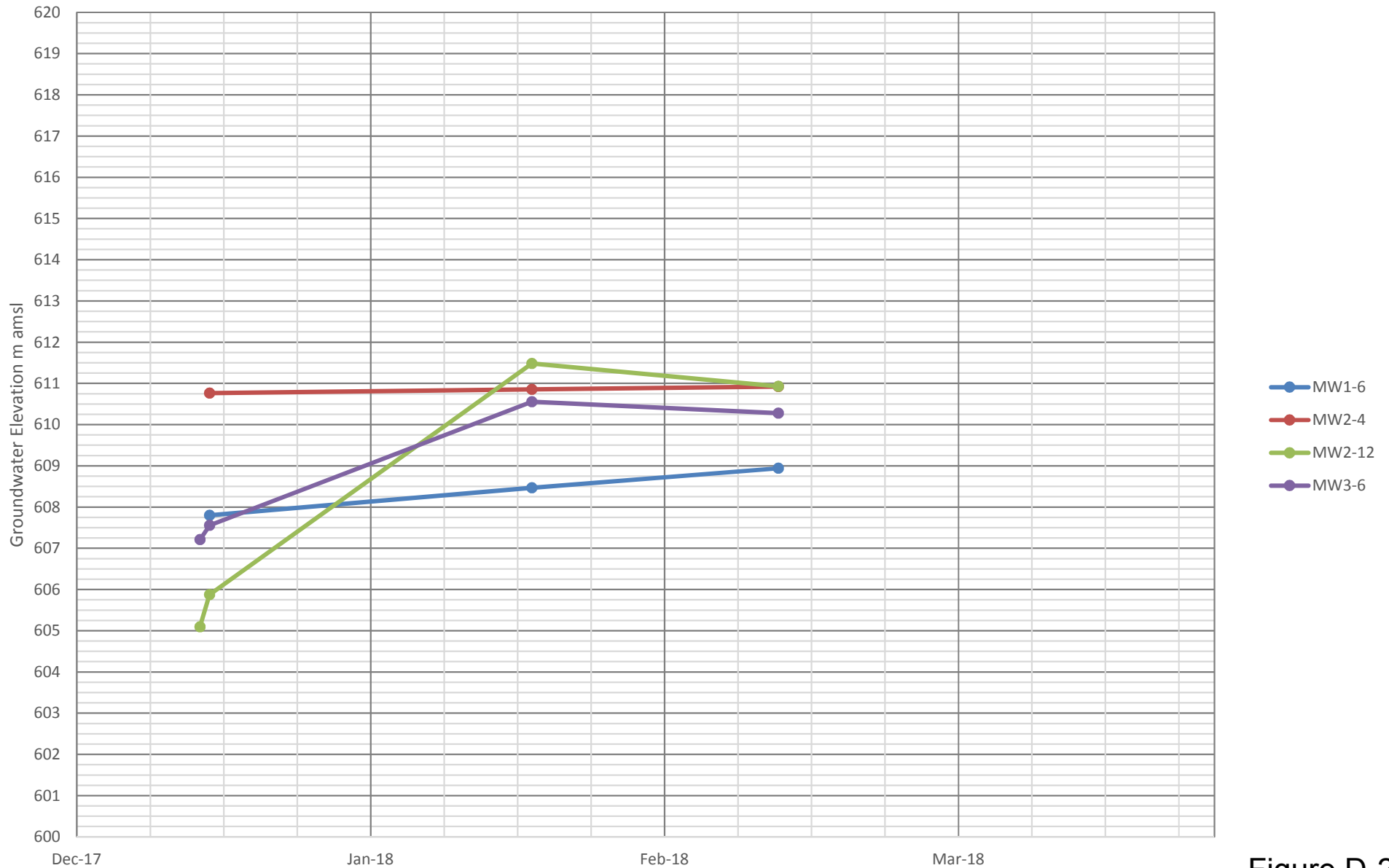


Figure D-2

SITE 4A Groundwater Hydrograph

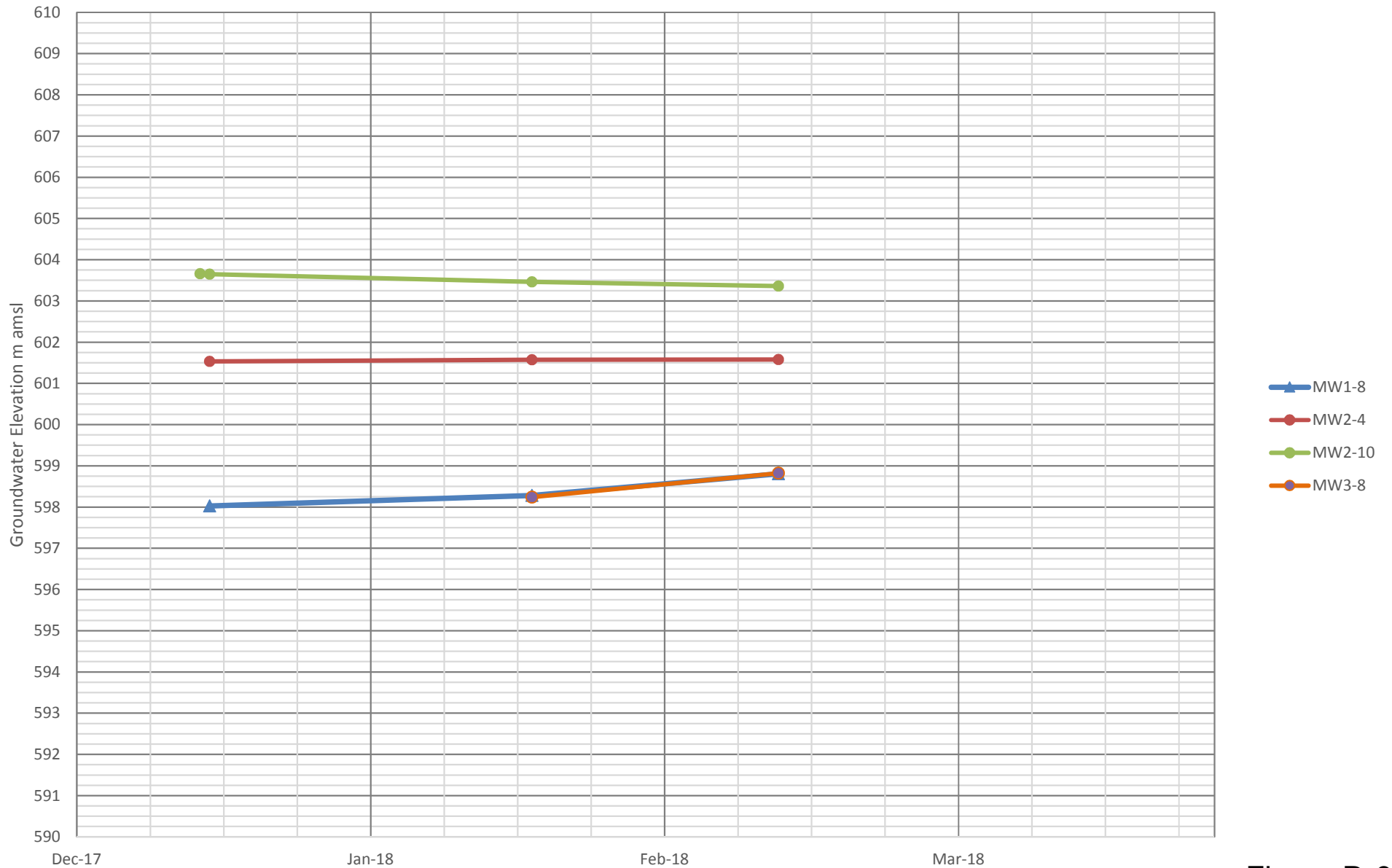


Figure D-3

Appendix E

Sample Landfill Permit Form

Application for a Waste Management Facility Permit

Part A: General Information

Facility Information			
Name of Operation			
Location of Operation (S/T/R or River Lot/Parish)		Rural Municipality/City	
Owner (legal name)			
Mailing Address			Postal Code
Contact Person and Title	Business	Fax	Cell
Email			

Consultant (if applicable)			
Name of Consultant			
Mailing Address			Postal Code
Contact Person and Title	Business	Fax	Cell
Email			

Purpose of Application				
<input type="checkbox"/> Class 2 WDG	<input type="checkbox"/> Transfer Station	<input type="checkbox"/> Compost Facility	<input type="checkbox"/> Material Recovery Facility	<input type="checkbox"/> Remote Seasonal Facility
Explain				

Construction Information
Proposed construction period

Part B: Operation Information

Siting Information (setback distance in metres)			
Railway and public road	Cemetery	Natural gas pipeline or underground utility corridor	Building (offsite)
Potable water well	Surface Water	Nearest spring, well or sinkhole	Wetland
Critical habitat areas	Nearest Airport	Distance to nearest City/Town/Village	Depth to Groundwater table
Depth to potable water	Depth to bedrock	Located on steep slope (>12%) or bedrock outcrop? Y <input type="checkbox"/> N <input type="checkbox"/>	Construction located within 100 year flood plain elevation Y <input type="checkbox"/> N <input type="checkbox"/>

Operation Description
Description of the service area, including total population, communities and industries, to be served by the facility and any type of special or non-household waste to be accepted.
<p>Proposed Operating Period: <input type="checkbox"/> Year-round <input type="checkbox"/> Seasonal</p> <p><i>Explain:</i></p>
<p>Waste Handling Method: <input type="checkbox"/> Below grade cell <input type="checkbox"/> Above grade cell <input type="checkbox"/> Bins</p> <p><input type="checkbox"/> Concrete pad <input type="checkbox"/> Other (explain)</p>

Expected Volume of Waste	
Municipal	_____ m ³ OR _____ kg
Industrial/Commercial	_____ m ³ OR _____ kg
Agricultural	_____ m ³ OR _____ kg
Estimated Tonnage/Year _____	

Part C: Operation Activities

Activities		
Composting <input type="checkbox"/> leaf and yard waste <input type="checkbox"/> commercial <input type="checkbox"/> kitchen and household <input type="checkbox"/> institutional <input type="checkbox"/> pet waste <input type="checkbox"/> industrial <input type="checkbox"/> other (<i>explain</i>)	Landfill gas management method Y <input type="checkbox"/> N <input type="checkbox"/> (<i>Explain</i>)	
Burning requested <input type="checkbox"/> cage <input type="checkbox"/> bermed area <input type="checkbox"/> below grade <input type="checkbox"/> not applicable <input type="checkbox"/> other (<i>explain</i>)	Leachate pond onsite Y <input type="checkbox"/> N <input type="checkbox"/> If yes, indicate collection method:	Monitoring wells onsite Y <input type="checkbox"/> N <input type="checkbox"/> If yes, indicate how many: Date last sampled:

Types of Waste or Waste Reduction And Prevention (WRAP) material to be received and separated		
Hazardous Waste <input type="checkbox"/> batteries <input type="checkbox"/> waste oil <input type="checkbox"/> used oil filters <input type="checkbox"/> used oil containers <input type="checkbox"/> antifreeze <input type="checkbox"/> solvents / paints <input type="checkbox"/> pesticide containers <input type="checkbox"/> propane cylinders <input type="checkbox"/> other (<i>explain</i>) Hazardous Waste Licence Number:	Wood and Paper Products <input type="checkbox"/> combustibles <input type="checkbox"/> cardboard <input type="checkbox"/> packaging and printed paper <input type="checkbox"/> wood (<i>clean or treated</i>)	WRAP and other waste <input type="checkbox"/> electronic waste <input type="checkbox"/> tires <input type="checkbox"/> glass <input type="checkbox"/> metals <input type="checkbox"/> white goods <input type="checkbox"/> asphalt shingles <input type="checkbox"/> plastics <input type="checkbox"/> recyclables <input type="checkbox"/> compostables
<input type="checkbox"/> Other waste accepted (<i>explain</i>)		
Description of the methods of collection, management, processing, handling, storage, disposal, composting or transport of waste .		
Description of any activities to be undertaken at the facility respecting the collection and handling of recyclable materials .		
If waste is being transported to another location, list the final disposal site of the waste (<i>if known</i>).		

The following information must be submitted along with the completed permit application (pages 1 to 3) as per the instructions on page 5:

- ☐ A study completed by a person with qualifications satisfactory to the director at Manitoba Sustainable Development that demonstrates the suitability of the proposed site for the waste management facility *(for landfills and compost facilities only)*
- ☐ A map showing:
 - a. existing zoning and land ownership of the area
 - b. external access roads and haul routes to the site
 - c. location of any buildings, surface water or water supply wells situated within two kilometres of the proposed site
- ☐ A diagram (site plan) showing the:
 - a. proposed site boundaries and the internal layout
 - b. dimensions and surface water management design,
 - c. location of any access road, active area, burn area, storage area, disposal facility, recyclable material collection area, compost processing, or curing area, operator and equipment facility, fence and drainage ditch
- ☐ A copy of the written authorization from the municipality or community where the facility will be located when operated by anyone other than a municipality, community, or regional waste management authority *(excluded for remote seasonal waste facilities)*
- ☐ Proof that the applicant is the owner/legal tenure (i.e. crown land permit) on which the facility is located
- ☐ Engineering plans and specifications for the waste disposal ground
- ☐ A design plan for all other waste management facilities including:
 - a. proposed active area design along with leachate collection and disposal method
 - b. design slopes and grades of berms
 - c. WDG area cut & fill depths
 - d. leachate pond design
 - e. details and design information for composting pad *(if applicable)*
 - f. landfill gas collection and management plan *(if applicable)*
 - g. background water chemistry
 - h. soil test results
 - i. bore hole logs

Facility Specific Information (as applicable)
<input type="checkbox"/> Class 2 or 3 Waste Disposal Ground – complete and attach Part D
<input type="checkbox"/> Material Recovery Facility – complete and attach Part E
<input type="checkbox"/> Composting facility – complete and attach Part F
<input type="checkbox"/> Transfer Station – complete and attach Part G

Declaration of Applicant

I _____ declare that:
(print name)

1. The information contained on this application, attached schedules, attached plans and specifications, and other attached documentation is to true to the best of my knowledge.
2. If the owner is a corporation or partnership, I have authority to bind the corporation or partnership.

Date

Signature of applicant

Submission Instructions:

Please submit one electronic copy and mail two printed copies of the completed application form and applicable attachments to:

Manitoba Sustainable Development

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

Telephone: 204-945-8321

Fax: 204-945-5229

Email: solidwaste@gov.mb.ca

Part D:

Additional information for Class 2 or 3 Waste Disposal Grounds

- ☐ In addition to the information and documents required in the application, the following must be submitted:
- a) a statement of need and a business plan, or a regional impact statement, including social, economic, and infrastructure impacts, to demonstrate the facility will meet the needs of the region for the proposed lifetime
 - b) a description of the cover material to be used
 - c) a description of geographic and other features to limit animal and insect access to the facility
 - d) information respecting the equipment (ex: compactor) to be present at the facility for operation
 - e) where applicable, descriptions of the proposed:
 - i) cell liners
 - ii) any subsurface drainage systems
 - iii) leachate collection and treatment systems,
 - iv) cell construction requirements
 - v) quality assurance and quality control procedures for the cell liner materials and liner system installation

Part E:

Additional information for Material Recovery Facilities

- ☐ In addition to the information and documents required in the application, the following must be submitted:
- a) a list of equipment at the facility
 - b) the hours of operation
 - c) the tonnage of material to be processed
 - d) the proposed retention time onsite for materials and waste
 - e) the storage capacity at the facility (inside and outside)
 - f) air emission controls or activities undertaken at the facility to reduce contaminants and maintain indoor air quality
 - g) a summary of any other activities undertaken to limit or reduce the impact of the site

Part F:

Additional information for Composting Facilities

- ☐ In addition to the information and documents required in the application, the following must be submitted:
- a) the types of organic waste and bulking agents to be used in the composting process
 - b) a description of the composting method and processes to include but not be limited to: curing; blending; and storage
 - c) a flow diagram showing the compost operating steps
 - d) a copy of the design calculations supporting the size of the composting and curing area
 - e) a description of the equipment to be used, including specifications and capacities
 - f) design details of the composition and permeability of the operating surface to be used for receiving, processing, producing, and curing compost
 - g) details of the odour, animal, and insect control systems
 - h) details of the storm water run-on and run-off management system, including dimensions and capacities
 - i) moisture control methods including information regarding the water source to be used, if necessary
 - j) procedures for managing unauthorized materials
 - k) proposed end use of the compost

Part G:

Additional information for Transfer Stations

- ☐ In addition to the information and documents required in the application, please include a description of the management of materials and types of containers to be used.

Appendix F

Permit Requirements

APPENDIX F: REQUIREMENTS FOR A PERMIT

Application Requirements

1(1) Subject to subsections (2) and (3), an application for a permit in respect of a waste management facility must include the following:

- (a) the legal description of the area to be used for the facility;
- (b) a description of the service area, including the population, communities and industries, to be served by the facility;
- (c) the months during which the facility will be open each year;
- (d) a description of the types of waste to be received at the facility, the capacity of the facility for each type of waste and the methods of collection, management, processing, handling, storage, disposal, recycling, composting or transport of waste;
- (e) a description of any activities to be undertaken at the facility in respect of designated material under The Waste Reduction and Prevention Act;
- (f) a description of any activities to be undertaken at the facility respecting the collection and handling of recyclable material;
- (g) if waste is to be transported to another location, the final disposal site of the waste, if known;
- (h) unless the director grants an exemption, a study completed by a person with qualifications satisfactory to the director that demonstrates the suitability of the proposed site for the waste management facility;
- (i) a map showing the existing zoning and land ownership of the area, the external access roads and haul routes to the site and the location of any buildings, surface water or water supply wells situated within two kilometres of the proposed site;
- (j) a diagram showing the proposed site boundaries and the internal layout, dimensions and surface water management design, including the location of any access road, active area, storage area, disposal facility, recyclable material collection area, compost processing or curing area, operator and equipment facility, fence and drainage ditch;
- (k) if the proposed facility is to be operated by anyone other than a municipality, community or regional waste management authority, a copy of the written consent of the municipality or community where the facility will be located;
- (l) one electronic copy and two printed copies of engineering plans and specifications in respect of a Class 1, Class 2 or Class 3 waste disposal ground;

(m) one electronic copy and two printed copies of a design plan for all other waste management facilities;

(n) proof that the applicant is the owner or lessor of the land on which the facility is located.

1(2) Clauses (1)(h) and (k) do not apply to an application respecting a remote seasonal waste facility.

1(3) Clause (1)(h) does not apply to an application respecting a transfer station or a material recovery facility.

Additional Information for Class 2 or 3 Waste Disposal Grounds

2 In addition to the information and documents required under section 1, an application for a permit for a Class 2 or Class 3 waste disposal ground must include the following:

(a) a statement of need and a business plan, or a regional impact assessment, including social, economic and infrastructure impacts, to demonstrate that the development of the facility will meet the needs of the region for the proposed lifetime of the facility;

(b) a description of the cover material to be used;

(c) a description of geographic and other features to limit animal and insect access to the facility;

(d) information respecting the equipment to be present on the facility site for the facility operation;

(e) where applicable, descriptions of the proposed;

(i) cell liners;

(ii) any subsurface drainage systems;

(iii) leachate collection and treatment systems;

(iv) cell construction requirements; and

(v) quality assurance and quality control procedures for the cell liner materials and liner system installation.