

NEWPCC Upgrade: Biosolids Facilities Early Works

Geotechnical Report
Land Drainage System – FINAL

WSTP

60705950

August 2025



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August 7, 2025

Project #
60705950

Subject: NEWPCC Upgrade: Biosolids Facilities Early Works – Geotechnical Report

Dear Ms. Obach:

AECOM Canada ULC is pleased to submit our Final Geotechnical Report for the Biosolids Early Works Land Drainage System. Note that this submittal is focused on the work related to the overall biosolids LDS system, including the pond and sewer trunk to John Black outfall.

Please contact German Leal at (431) 335-9734 should you have any questions.

Sincerely,
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Encl.

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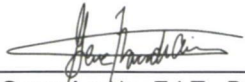
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Geotechnical Report
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Quality Information

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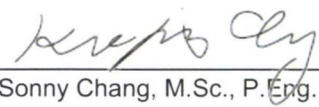
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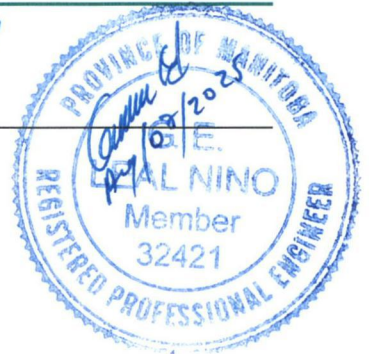


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Executive Summary

AECOM Canada ULC (AECOM) was retained as part of the NEWPCC Upgrade to provide geotechnical services to support the design and construction of the Biosolids Early Works Land Drainage Sewer (LDS) System proposed along the future extension of the Chief Peguis Trail (CPT) near the North End Water Pollution Control Centre (NEWPCC). The proposed Biosolids Early Works LDS includes the installation of the following infrastructure to provide service to the proposed Biosolids and Nutrient Removal Facilities (NRF) at NEWPCC:

1. A new LDS and stormwater pond connecting to Parcel B and the existing John Black Outfall.
 - **Twin (2) 1350 mm LDS pipe** (connecting Parcel B to the stormwater pond).
 - **Stormwater Pond.**
 - **900 mm LDS** along proposed CPT (future alignment).
 - i. **Note:** *part of the 900 mm LDS crosses a CPKC rail line and has a separate geotechnical report (AECOM, 2025).*
 - **1800 mm LDS** along and parallel to Main St.
 - **900 mm LDS** connecting to John Black Outfall.

As part of the NEWPCC Upgrade: Biosolids Facilities Early Works, AECOM was tasked with completing a geotechnical field investigation, which includes a laboratory testing program, and a summary of the findings of geotechnical investigation.

The geotechnical investigation program consisted of a subsurface exploration program (drilling, soil sampling and in-situ tests). A total of sixteen testholes were drilled along the alignment of the Biosolids Early Works LDS system.

The soils encountered during the investigation consisted of topsoil, fill (clay fill), silt, fat clay and silt till. Selected representative soil samples were tested to determine physical characteristics, evaluate the engineering properties, and aid with further characterization of the subsurface. Sloughing and groundwater was observed in most testholes.

AECOM anticipates that the Biosolids Early Works LDS and stormwater pond can be constructed successfully, provided that sloughing and groundwater control measures are implemented.

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1. Introduction

AECOM Canada ULC (“AECOM”) was retained to undertake a geotechnical investigation to evaluate the existing soil conditions and provide recommendations for proposed construction of the Biosolids Early Works LDS, as part of the NEWPCC Upgrade. The project site is located at 2230 Main Street at the North End Sewage Treatment Plant (NEWPCC) in Winnipeg, Manitoba.

Authorization to proceed with the geotechnical investigation was provided on December 21, 2023. The work that was performed as part of this geotechnical study included the following:

- Private utility locator to locate existing utilities.
- A geotechnical drilling and soil sampling program at the proposed site to identify the existing soil and groundwater conditions.
- Laboratory testing program to determine the engineering properties relevant to the foundation design. The testing program included moisture contents on all collected samples, Atterberg limits, particle size analysis, unconfined compressions test of intact soil and hydraulic conductivity test.
- The preparation of this geotechnical report outlines the existing condition, frost implications and explores foundation design recommendations.

Use of this report is subject to the Statement of Qualifications and Limitations provided at the beginning of this report.

2. Project Site

The project site is located at 2230 Main Street in Winnipeg, MB, at the North End Sewage Treatment Plant (NEWPCC), with an average elevation of 231.1 m above sea level (ASL), see **Appendix A** for the overall testhole plan. The terrain consists of grass and sparse trees throughout the site.

Testholes drilled on the east side of the CPKC Rail include TH23-01 to TH23-07 that follow the future Chief Peguis Trail (CPT) alignment, with TH23-06 and TH23-07 situated near Main St. On the west side of the CPKC Rail, testholes include TH23-08 to TH24-16, which are located in an open field with uneven surfaces. TH24-10 and TH24-11 are located on both sides of Ferrier St.

North of the future CPT is a residential neighbourhood, while on the south is the NEWPCC.

3. Proposed Construction

The project involves the design and construction of the Biosolids Early Works LDS found along the future alignment of the Chief Peguis Trail (CPT, Parcel B) and in Parcel C. The Biosolids Early Works LDS will consist of the following:

1. A new LDS and stormwater pond connecting to Parcel B and the existing John Black Outfall, which will consist of the following:
 - a. **Twin (2) 1350 mm LDS pipe:** Connects Parcel B to the stormwater pond.
 - b. **Stormwater pond:** The stormwater pond is a dry pond that temporarily holds and controls excess runoff water. The pond will have a 7H:1V side slopes. The bottom elevation of 226.50 mASL. Additionally, the pond will have a bottom area of approximately 0.85 hectares. The operating elevations include a 25 Year Storm Level of 227.96 mASL and a 100 Year Storm Level of 228.26 mASL.
 - c. **900 mm LDS:** Runs along proposed CPT (future alignment).
 - i. **Note:** *part of the 900 mm LDS crosses a CPKC rail line, and details are found in a separate report (AECOM, 2025).*
 - d. **1800 mm LDS:** Proposed along and parallel to Main St.
 - e. **900 mm LDS:** Proposed perpendicular to Main St. and connects to John Black Outfall.

Sixteen (16) testholes were drilled on the project site from October 30, 2023, to January 10, 2024. These testholes served various purposes as can be seen in the **Table 3-1**.

Table 3-1: Testholes Drilled

Testholes	Remarks
TH23-02	Drilled to a depth 10.7 m to support the design of the CPKC Crossing structure.
TH23-08	Drilled to refusal to support the design of the CPKC Crossing structure.
TH24-13 TH24-14 TH24-15 TH25-16	Drilled to a depth of 10.7 m to support the stormwater pond design.
TH23-01 TH23-07 TH24-10 TH24-11	Drilled to refusal to support the LDS design.
TH23-03 TH23-04 TH23-05 TH23-06 TH24-09 TH24-12	Drilled to a depth of 10.7 m to support the LDS design.

See **Appendix A** for the testhole location plan and **Appendix D** for the preliminary drawings.

4. Geotechnical Investigation

4.1 Drilling and Sampling Program

AECOM obtained underground service clearances from public utility companies (Click Before You Dig Manitoba). A utility locator identified and marked the private utilities. The subsurface drilling and sampling program was conducted from October 30, 2023, to January 10, 2024. Drilling services were provided by Paddock Drilling and Maple Leaf Drilling under the supervision of AECOM geotechnical field personnel. The proposed testholes are shown on the attached location plan provided in **Appendix A**. Sixteen (16) testholes were drilled on the project sites using a track mounted drill rig which was equipped with 125 mm solid stem augers. Testholes TH23-01 to TH24-16, except TH23-01, TH23-07, TH23-08, TH24-11, and TH24-13, were terminated at depths of 9.1 m to 11.3 m within the clay layer. Testholes TH23-01, TH23-07, TH23-08, TH24-11, and TH24-13 were drilled to auger refusal in dense till or suspected bedrock within the site area, at depths of 17.1 m to 21.3 m. Sloughing was observed in testholes TH23-01, TH23-04, TH23-05, TH23-07, TH23-08, TH24-10, TH24-11, TH24-13, and TH24-15, at a depth between of 2.1 m and 18.9 m.

Soil samples were obtained directly from the auger flights at depth intervals ranging from 0.3 to 1.5 m. SPT was conducted in testhole TH24-13 to assess the relative density of cohesionless soils. The soil samples were visually classified in the field and returned to our soil laboratory for additional examination and testing. Cohesive soil samples were tested using a pocket torvane to estimate the undrained shear strength.

Upon completion of drilling, the testholes were examined for evidence of sloughing and groundwater seepage, sealed with bentonite at the bottom, backfilled with auger cutting and bentonite to the surface. The excess auger cuttings were left on site. The detailed testhole records are provided in **Appendix B**, which include a summary sheet outlining the symbols and terms of the testhole record.

4.2 Laboratory Testing

A laboratory testing program was performed on soil samples obtained during the drilling program to determine the relevant engineering properties of the subsurface materials. The laboratory testing included soil index and advanced testing. The tests were conducted in general accordance with American Society for Testing Material (ASTM). The laboratory testing and referenced standards includes moisture contents (ASTM D2216), particle size analysis (ASTM D422), Atterberg limits tests (ASTM D4318), unconfined compressive strength for soil (ASTM D2166) and Hydraulic conductivity (ASTM D5084). In addition, pocket torvane readings were taken on auger grab samples. The results of the laboratory testing are shown on the testhole logs in **Appendix B** and in the laboratory test report in **Appendix C**.

4.3 Groundwater Levels Monitoring

During the geotechnical field investigation, four (5) standpipe piezometers (SP) consisting of 25 mm and 5 mm in diameter and 305 mm in length screening Casagrande tip were installed. The installation details of the standpipe piezometers are shown on the testhole logs in **Appendix B** and summarize in **Table 4-1**.

Table 4-1: Standpipe Piezometer Installed for GWL Reading

Testhole No.	SP depth (m)	Tip Elevation (m ASL)	USCS Soil Type
TH23-07 (SP07)	9.6	221.04	Clay (CH)
TH23-08 (SP08)	17.0	213.29	Till (ML)
TH24-10 (SP10)	1.8	229.17	Silt (ML)
TH24-11 (SP11)	21.3	208.99	Till (ML)
TH24-13 (SP13)	20.1	210.56	Till (ML)

5. Subsurface Conditions

Subsurface conditions observed during testhole drilling and field classification were documented by AECOM geotechnical personnel in accordance with the Unified Soil Classification System (USCS).

5.1 Stratigraphy

The conditions of the site have been based on the investigation results obtained during the field and laboratory investigation programs. The pertinent results from these investigations are outlined below.

Soils encountered during the investigation consisted of Fill (Clay fill), Silt, Fat clay, and Silt till. The description of the subsurface soil units encountered along the Biosolids Early Works LDS is provided in the following subsections. The detailed testhole records are provided in **Appendix B**, which include a summary sheet outlining the symbols and terms of the testhole record.

5.1.1 Topsoil

Topsoil was encountered at the ground surface in testholes TH23-02, TH23-07 and TH23-08. The thickness of the topsoil ranged from approximately 0.15 m to 0.3 m. The moisture content of the topsoil ranged from 29.2% to 55.5%.

5.1.2 Fill – Clay (CH)

Black fat clay (CH) fill material was encountered from TH23-01 to TH24-16, except TH23-02, with a thickness ranging from approximately 0.15 m to 2.75 m. The clay (CH) fill layer was generally observed to be moist, high plasticity, black in color, firm to stiff and have traces of sand, gravel, and silt. The moisture content of the clay fill (CH) fill ranged from 17.8% to 52.2%.

5.1.3 Silt (ML)

Silt (ML) was encountered directly below the clay fill or fat clay in testholes TH23-03, TH24-04, TH24-05, and TH24-09 to TH24-16. The silt (ML) ranged in thickness from 0.15 m to 1.68 m. The silt was observed to be tan, moist, of low plasticity, and soft. The moisture content of the silt (ML) ranged from 15.3% to 26.7%.

5.1.4 Lean Clay (CL)

Lean clay (CL) was encountered directly below the clay fill or fat clay in testholes TH23-01, TH23-02, TH23-06, TH23-07, and TH23-08. The lean clay (CL) ranged in thickness from approximately 0.31 m to 1.54 m. The lean clay was tan in colour, moist and had high contents of approximately 80% of silt. The moisture content of the lean clay (CL) ranged from 22.8% to 25.2%.

5.1.5 Fat Clay (CH)

Fat clay (CH) was encountered either directly below or on top of the silt (ML) layer in TH23-01 to TH24-16. The thickness of the fat clay (CH) above the lean clay (CL) and silt (ML) ranged from 0.61 m to 1.3 m, and are found in testholes TH23-01, TH23-02, TH23-03, TH23-07, TH23-08, TH24-13, TH24-14, and TH24-15. The fat clay (CH) below the lean clay (CL) and silt (ML) layer ranged from 12.9 m to 15.7 m and are found in all the testholes. The fat clay (CH) was grey, moist, of high plasticity. The fat clay (CH) layer began as stiff to firm and transitioned to soft with depth. The moisture content of the fat clay (CH) ranged from 26.6% to 73.8%.

5.1.6 Sandy Lean Clay (CL) TILL

Sandy lean clay (CL) till was encountered below the fat clay (CH) in TH23-01, TH23-07, TH23-08, TH24-10, TH24-11, and TH24-13. The sandy lean clay (CL) till ranged in thickness from approximately 0.92 m to 3.09 m and auger refusal was met in the sandy lean clay (CL) till at this range. The sandy lean clay (CL) till was tan in color. SPTs completed in TH24-13 within the sandy lean clay (CL) till showed uncorrected “N” values ranging from 20 to >50 per 300 mm of penetration, classifying the materials as very loose to very dense in relative density. The moisture content ranged from 10.2% to 54%. In the sandy lean clay (CL) till layer, it was common to find cobbles and boulders.

6. Groundwater and Sloughing Conditions

Groundwater seepage or soil conditions were observed in most testholes upon completion of drilling. Details of the depth and nature of the sloughing, seepage, and groundwater encountered are provided in the testhole records in **Appendix B** and presented in **Table 6-1**.

Table 6-1: Observed Groundwater Seepage and Sloughing Conditions

Testhole No.	Depth of Groundwater Seepage (m BGS)	Groundwater Depth Upon Completion of Drilling (m BGS)	Groundwater Elevation (m ASL)	Depth of Soil Sloughing (m BGS)
TH23-01	18.6	None ¹	227.5	15.2
TH23-02	1.5	7.5	222.93	1.5
TH23-03	3.1	7.0	224.15	3.1
TH23-04	3.1	5.5	224.96	8.2
TH23-05	6.4	None ¹	229.0	6.4
TH23-06	1.5	11.5	229.2	1.6
TH23-07	18.9	None ¹	228.0	15.2
TH23-08	2.0	None ¹	None ¹	13.7
TH24-09	None ¹	None ¹	229.0	0.8
TH24-10	2.1	None ¹	229.8	1.8 & 12.2
TH24-11	2.1	9.8	220.49	2.1
TH24-12	None ¹	None ¹	229.0	1.5
TH24-13	2.1	17.1	213.56	3.0
TH24-14	2.1	7.6	222.96	2.1
TH24-15	2.3	6.1	224.15	2.3
TH24-16	3.1	6.1	225.44	3.1

Note: ¹Was not observed.

6.1 Standpipe Piezometer Monitoring Results

Groundwater measurements were taken upon completion of the testhole drilling and utilizing the standpipes installed in testholes TH23-07 (SP23-07), TH23-08 (SP23-08), TH24-10 (SP24-10), TH24-11 (SP24-10) and TH24-13 (SP24-13) by AECOM. The readings recorded are summarized in **Table 6-2**.

Table 6-2: Groundwater Measurements

Standpipe	Groundwater Elevation (m ASL)				
	Stratum/Tip (m ASL)	10-Oct-24	23-Oct-24	28-Oct-24	17-Apr-25
SP23-07	Clay/221.04	- ²	- ²	- ²	228.530
SP23-08	Till/213.29	- ¹	228.680	228.677	- ¹
SP24-10	Silt/230.17	229.549	229.459	229.450	229.774
SP24-11	Till/208.99	225.594	225.573	225.575	226.134
SP24-13	Till/210.56	224.429	224.719	224.709	225.354

¹Reading was not taken due to water/snow covering the area making it inaccessible.

²Reading was not taken since the crossing design was not requested at the time.

A graphical summary of these readings is provided in **Figure 6-1** that shows the groundwater elevation over time.

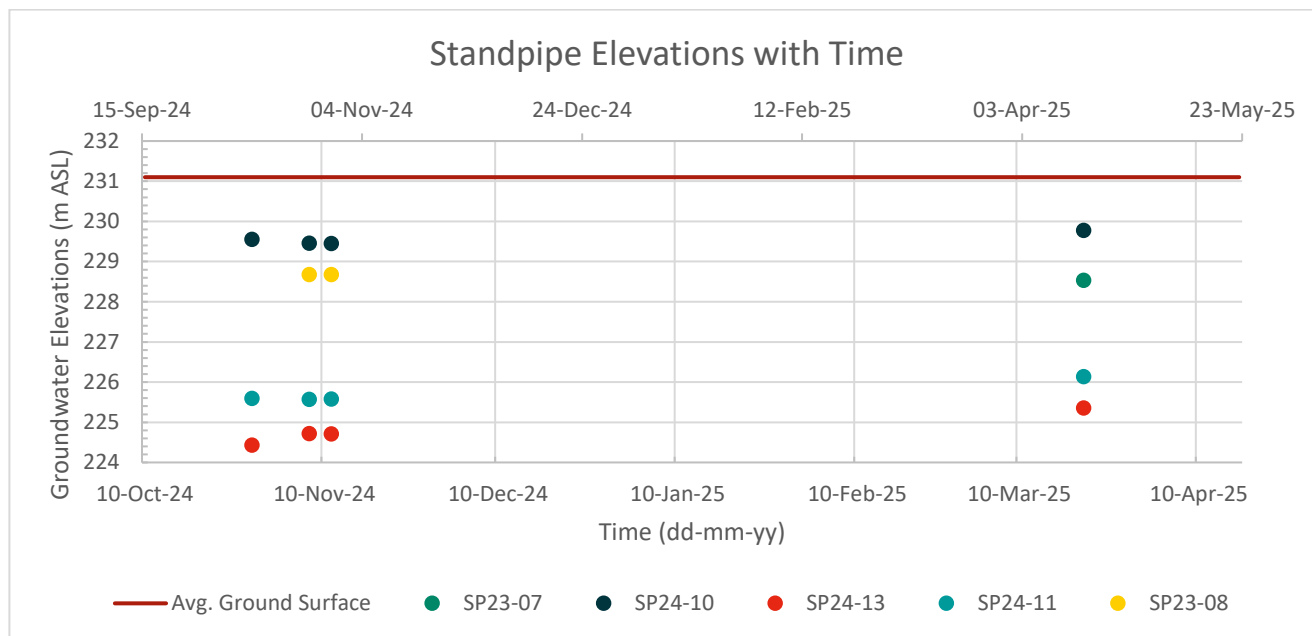


Figure 6-1: Graph of Groundwater Elevations Versus Time

Only short-term seepage and sloughing conditions were observed in the testholes. Groundwater levels will normally fluctuate during the year and will be dependent on precipitation, surface drainage, and regional groundwater regimes. Groundwater seepage and soil sloughing should be expected from the silt and are expected in trench excavations during construction.

7. Laboratory Testing Results

7.1 General

A variety of laboratory testing was performed on select samples collected from the field drilling program. Moisture content tests were conducted on soil samples recovered from the testholes with the moisture content (ASTM D2216) test results shown on the testhole records are provided in **Appendix C**. Select representative soil samples were also tested for particle size analysis (ASTM D422), Atterberg limits (ASTM D4318), unconfined compressive strength soil (ASTM D2166) and hydraulic conductivity (ASTM D5084).

7.2 Overburden Soils

Table 7-1: Grain Size Distribution (Hydrometer Analysis) Results

Testhole No.	Sample Depth (m)	USCS	Grain Size Distribution (%)			
			Gravel 75 to 4.75 mm	Sand <4.75 to 0.075 mm	Silt <0.075 to 0.002 mm	Clay <0.002 mm
TH23-01	1.52 - 1.98	CH	0	0.20	44.3	55.5
TH23-01	2.13 - 2.29	CL	0	2.90	82.9	14.2
TH23-01	10.67 - 11.13	CH	0.70	8.00	39.9	51.4
TH23-01	19.66 - 19.81	CL	11.2	33.2	45.3	10.4
TH23-02	0.61 - 0.76	CH	0	0.30	21.9	77.8
TH23-02	2.13 - 2.29	CL	0	7.60	79.8	12.6
TH23-02	5.94 - 6.1	CH	0	0.40	25.0	74.6
TH23-03	2.13 - 2.29	CH	0	1.50	52.5	46.0
TH23-05	1.52 - 2.13	CH	0.20	4.00	64.4	61.4
TH23-05	4.57 - 5.18	CH	0.20	4.50	51.1	44.2
TH23-06	2.13 - 2.29	CL	0	5.10	75.9	19.0
TH23-06	6.1 - 6.71	CH	0	0.60	31.2	68.2
TH23-07	0.61 - 0.76	CH	0	3.50	36.2	60.3
TH23-07	2.13 - 2.29	CH	0	0.40	31.4	68.2
TH23-07	2.9 - 3.05	CL	0.30	2.60	76.6	20.5
TH23-07	9.14 - 9.6	CH	0.40	6.8	31.6	61.2
TH23-07	19.66 - 19.81	CL	4.90	42.6	41.4	11.1
TH23-08	1.52 - 1.98	CH	0	5.30	45.6	49.1
TH23-08	2.13 - 2.29	CL	0	7.60	84.5	7.90
TH23-08	7.62 - 8.08	CH	0	1.50	38.4	60.2
TH23-08	8.99 - 9.14	CH	1.50	10.8	39.9	47.7
TH24-10	1.37 - 1.52	ML	0	6.50	74.5	19.0
TH24-10	6.10 - 6.55	ML	0.10	2.20	26.6	71.2
TH24-13	2.74 - 2.90	ML	0	1.20	90.9	7.90
TH24-13	9.14 - 9.60	CH	0	0.90	23.0	76.1
TH24-14	2.90 - 3.05	ML	0	3.10	87.4	9.50
TH24-14	4.57 - 5.03	CH	0	0.30	25.2	74.6
TH24-15	6.10 - 6.55	CH	0	0.20	18.8	80.9

Table 7-2: Atterberg Limits Test Data

Testhole No.	Sample Depth (m)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Activity
TH23-01	1.52 - 1.98	CH	72	23	49	0.88
TH23-01	2.13 - 2.29	CL	33	12	21	1.48
TH23-01	10.67 - 11.13	CH	75	23	52	1.01
TH23-01	19.66 - 19.81	CL	30	13	17	1.63
TH23-02	0.61 - 0.76	CH	93	27	66	0.85
TH23-02	2.13 - 2.29	CL	25	15	10	0.79
TH23-02	5.94 - 6.1	CH	91	25	66	0.88
TH23-03	2.13 - 2.29	CH	73	23	50	1.09
TH23-05	1.52 - 2.13	CH	85	25	60	0.98
TH23-05	4.57 - 5.18	CH	75	22	53	1.2
TH23-06	2.13 - 2.29	CL	38	13	24	1.26
TH23-06	6.1 - 6.71	CH	86	25	61	0.89
TH23-07	0.61 - 0.76	CH	84	26	59	0.98
TH23-07	2.13 - 2.29	CH	88	26	63	0.92
TH23-07	2.9 - 3.05	CL	35	12	23	1.12
TH23-07	9.14 - 9.6	CH	85	25	60	0.98
TH23-07	19.66 - 19.81	CL	28	13	15	1.35
TH23-08	1.52 - 1.98	CH	69	19	51	1.04
TH23-08	2.13 - 2.29	CL	23	12	11	1.39
TH23-08	7.62 - 8.08	CH	80	21	59	0.98
TH23-08	8.99 - 9.14	CH	73	17	56	1.17
TH24-10	1.37 - 1.52	ML	17	15	2	0.11
TH24-10	6.10 - 6.55	ML	90	23	66	0.93
TH24-13	2.74 - 2.90	ML	16	13	3	0.38
TH24-13	9.14 - 9.60	CH	93	24	69	0.91
TH24-14	2.90 - 3.05	ML	19	16	3	0.32
TH24-14	4.57 - 5.03	CH	95	26	69	0.92
TH24-15	6.10 - 6.55	CH	98	24	74	0.91

Table 7-3: Unconfined Compressive Strength Test (Soil)

Testhole No.	Sample Depth (m)	USCS	Moisture Content (%)	Bulk Unit Weight (kN/m ³)	Undrained Shear Strength (kPa)	Unconfined Compressive Strength (kPa)
TH23-01	1.52 - 1.98	CH	45	16.5	86.04	43.02
TH23-01	4.57 - 5.03	CH	36.6	18.2	99.19	49.59
TH23-01	7.62 - 8.08	CH	55.9	16.7	108.64	54.32
TH23-01	10.67 - 11.13	CH	47.3	18.2	63.34	31.67
TH23-01	13.72 - 14.17	CH	59.4	16.2	52.61	26.3
TH23-01	16.76 - 17.22	CH	64	17.6	45.26	22.63
TH23-05	1.52 - 2.13	CH	33.2	17.9	155.83	77.92
TH23-05	4.57 - 5.18	CH	29.5	36.4	154.45	77.22
TH23-05	7.62 - 8.23	CH	51.2	17.2	131.17	65.59
TH23-06	3.05 - 3.66	CH	40.5	16.8	74.76	37.38
TH23-06	6.1 - 6.71	CH	52.9	16.6	60.08	30.04
TH23-06	10.67 - 11.28	CH	51.4	17.1	89.73	44.86
TH23-07	6.1 - 6.55	CH	53.7	16.2	112.18	56.09
TH23-07	9.14 - 9.6	CH	50	17.8	63.27	31.63
TH23-07	12.19 - 12.65	CH	45	17.6	82.56	41.28
TH23-07	15.24 - 15.7	CH	48.1	16.9	78.73	39.36
TH23-07	18.29 - 18.75	CH	45.2	16.1	22.76	11.38
TH23-08	1.52 - 1.98	CH	35.6	19.4	46.46	23.23
TH23-08	4.57 - 5.03	CH	53.4	17	32.55	16.28
TH23-08	7.62 - 8.08	CH	46.2	17.2	66.46	33.23
TH24-10	6.1 - 6.55	CH	57.2	16.4	105.96	52.98
TH24-10	9.14 - 9.6	CH	47.5	16.8	21.72	10.86
TH24-13	3.05 - 3.51	CH	46.2	17.4	93.14	46.57
TH24-13	6.1 - 6.55	CH	52.5	16.6	23.2	11.6
TH24-13	9.14 - 9.6	CH	50.8	16.2	45.42	22.71
TH24-13	12.19 - 12.65	CH	49.7	18	44.36	22.18
TH24-13	15.24 - 15.7	CH	61	15.9	55.22	27.61
TH24-14	3.05 - 3.51	CH	43.3	17.6	68.93	34.46
TH24-14	6.1 - 6.55	CH	55.2	16.8	54.52	27.26
TH24-15	7.62 - 8.08	CH	44.4	16.7	35.72	17.86

Table 7-4: Hydraulic Conductivity Test (Soil)

Testhole No.	Sample Depth (m)	USCS	Hydraulic Conductivity, k_{20} (m/s)
TH23-01	4.57 - 5.18	CH	8.12293E-11
TH24-15	6.10 - 6.71	CH	7.12429E-11

8. Geotechnical Concerns

Based on our current understanding of the pipe layout and dry pond details, the results of our geotechnical investigation and the primary geotechnical concerns at the project site are:

- Potential soil sloughing and groundwater seepage from the shallow silt layers while performing open excavations (see Sections 9.1.1 and 9.5.7).
- Potential high porewater pressures creating lateral and uplift forces to shoring structures while performing excavations (see Section 9.2.1).
- The Factor of Safety (FS) due to artesian pressure at depth for the deepest part of the LDS pipe, located at an elevation of 222.953 mASL along Main Street (see Section 9.2.1).

9. Recommendations

The information included in this report is to be interpreted as information for the design team and contractor. No design determinations or decisions are made in this geotechnical section. The contractor is fully responsible for the interpretations, determination, calculations, and decisions made during the design and construction phases. This section shall only be considered as general information for the Biosolids Early Works LDS.

9.1 Anticipated Shallow Trench Soil Conditions

Since the proposed Biosolids Early Works LDS has pipes at various sizes and depths, the following section shows the anticipated trench at each section. Details of each section, including pipe elevations, are shown in the drawings as provided in the **Appendix D**.

All construction activities during trenching and installation of the Biosolids Early Works LDS shall adhere to the following City of Winnipeg Standard Construction Specifications and Standard Construction Details:

- CW 2030 - Excavation Bedding and Backfill
- CW 2130 - Gravity Sewers
- CW 2160 - Concrete Underground Structures and Works
- SD-001: Standard Pipe Bedding Classes
- SD-002: Standard Trench and Excavation Backfill Classes

9.1.1 Twin 1350 mm LDS Pipe (Connecting Parcel B and Stormwater Pond)

The proposed twin 1350 mm LDS is located between Parcel C and Parcel B, which connects Parcel B to the stormwater pond. At this section, testholes TH24-12, TH24-13 and TH24-14 are located within the alignment of the pipe. The invert elevation at which the pipe is located at 266.594 mASL to 226.521 mASL. **Table 9-1** provides the anticipated soil stratigraphy along the proposed twin 1350 mm LDS.

Table 9-1: Anticipated Stratigraphy along the LDS Pipe Path that Connects Parcel B and the Stormwater Pond

Proposed LDS Path	Approximate Elevation of LDS	Anticipated Soil Unit	Elevation of Soil Unit (m)
Top of Pipe	227.9 mASL	Fat Clay (CH) & Silt (ML)	TH24-12 Fat Clay below 228.6 mASL
Bottom of Pipe	226.6 mASL	Fat Clay (CH)	TH24-13 Fat Clay below 227.5 mASL TH24-14 Fat Clay below 227.5 mASL

As shown in **Table 9-1**, the proposed LDS pipe is expected to be within the silt and fat clay layer. The soil layer above the pipe transitions from fat clay to silt between TH24-12 and TH24-14. Sloughing may occur during the excavation on the silt layer. Contractor shall consider a mitigation plan for the sloughing within the silt layer.

9.1.2 900 mm LDS Pipe (along the Future CPT)

The proposed 900 mm LDS pipe is located along the future CPT, which extends from the Stormwater Pond to Main Street. Along this section, testholes TH24-02 to TH24-08 (except TH24-07) are located within the alignment of the

pipe. The invert elevation at which the pipe is located is from 266.408 mASL to 223.853 mASL. **Table 9-2** provides the anticipated soil stratigraphy along the proposed 900 mm LDS pipe.

Table 9-2: Anticipated Stratigraphy along the LDS Alignment of the Future CPT

Proposed LDS Path	Average Elevation of LDS	Anticipated Soil Unit	Elevation of Soil Unit (m)
Top of Pipe	226.66 mASL	Fat Clay (CH)	On Average, from TH24-02 to TH24-08, Fat Clay is found below 227.4 mASL
Bottom of Pipe	225.76 mASL	Fat Clay (CH)	

As shown in **Table 9-2**, it is anticipated that the proposed LDS pipe will be within fat clay layer.

9.1.3 1800 mm LDS Pipe (along Main St.)

The proposed 1800 mm LDS pipe is located along Main Street, which connects the 900 mm LDS pipe along the future CPT to another 900 mm LDS pipe which connects to the John Black outfall. Along this section, testholes TH24-07 and TH24-06 are located within the alignment of the pipe. The invert elevation at which the pipe is found is from 222.953 mASL to 222.922 mASL. **Table 9-3** provides the anticipated soil stratigraphy along the proposed 1800 mm LDS pipe.

Table 9-3: Anticipated Stratigraphy along the LDS Alignment along Main St.

Proposed LDS Path	Average Elevation of LDS	Anticipated Soil Unit	Elevation of Soil Unit (m)
Top of Pipe	224.75 mASL	Fat Clay (CH)	TH23-06 Fat Clay below 227.7 mASL
Bottom of Pipe	222.95 mASL	Fat Clay (CH)	TH23-07 Fat Clay below 227.3 mASL

As shown in **Table 9-3**, it is anticipated that the proposed LDS pipe will be within fat clay layer.

9.1.4 900 mm LDS (Connecting 1800 mm LDS with John Black Outfall)

The 900 mm LDS pipe is found along Main Street, which connects the 1800 mm LDS pipe with the John Black Outfall. At this section, testholes TH24-07 are found within the alignment of the pipe. The invert elevation at which the pipe is found at 222.922 mASL. **Table 9-4** provides the anticipated soil stratigraphy along the proposed 900 mm LDS pipe.

Table 9-4: Anticipated Stratigraphy along the LDS Alignment that Connect John Black Outfall to the Biosolids Early Works LDS

Proposed LDS Path	Average Elevation of LDS	Anticipated Soil Unit	Elevation of Soil Unit (m)
Top of Pipe	223.82 mASL	Fat Clay (CH)	TH23-07 Fat Clay below 227.3 mASL
Bottom of Pipe	222.92 mASL	Fat Clay (CH)	

As shown in **Table 9-4**, it is anticipated that the proposed LDS pipe will be within fat clay layer.

9.2 Excavation Base Stability

The analysis in this section is based on a braced excavation. Braced excavations are expected for the open-cut pipe installations. There are various bottom depths of the proposed LDS pipe along the alignment. The maximum elevation is at 222.42 mASL, which is along Main Street (TH23-06 and TH23-07). The soil above the base acts as a surcharge

on the soil below it. This surcharge load outside the trench may exceed the bearing capacity of the soil, resulting in bottom heaving. Factor of Safety (FS) against bottom heave has been calculated using the equation developed by Bjerrum and Eide. The equation was developed by calibrating their failure mechanisms using observation of bottom heave in clays. The equation used was:

$$(FS)_{heave} = N_c \left(\frac{(Su)_b}{\gamma H_o + q_s} \right)$$

Where:

- N_c is a bearing capacity coefficient using Figure 15.26a of Muni Budhu Soil Mechanics and Foundations. N_c depends on H_o/B and L/B (H_o is the bottom of the excavation, B is the width of the excavation and L is the length of the excavation).
- γ is the unit weight of fat clay. In this calculation, 17 kN/m^3 was used.
- $(Su)_b$ is the average undrained shear strength over the depth below the toe of the sheeting. In this calculation, 30 kPa was used.
- q_s is the surcharge on the surface. It has been assumed that no surcharge will be on the surface. Thus, $q_s = 0 \text{ kPa}$.

Basal heave is deemed satisfactory if $(FS)_{heave}$ is greater than 1.5. Using an average surface elevation of 231.10 mASL and a maximum excavation elevation of 222.42 mASL (accounting for the pipe wall thickness of 0.197 m and over excavation of 0.3 m for the pipe installation), and with a maximum trench width of 3 m, we estimate the FS of 1.51 to be satisfactory. The Contractor is responsible to confirm the trench details suited for their means and methods of installation, and to engage a professional engineer specialized in shoring design for the design of the temporary shoring system.

9.2.1 Buoyancy Uplift from Excess Groundwater Pressure Beneath an Impermeable Stratum

According to the Canadian Foundation Engineering Manual (CFEM 5e), when an excavation is dug into a clay deposit underlain by a pervious stratum under artesian pressure, pressure and seepage may result, leading to instability of the excavation. Basal heave analysis has been prepared for the design of the temporary excavation, excavation depth and piezometric condition within the underlying fat clay. The maximum elevation is 222.42 mASL, which is along Main Street (TH23-06 and TH23-07).

The basal heave analysis is based on the ratio of total stresses and uplift pore water pressure.

For this approach, the FS of the basal heave is expressed using the equation:

$$FS = \frac{H_c \gamma_c}{H_w \gamma_w}$$

Where:

γ_c = unit weight of fat clay = 17 kN/m^3

H_c = thickness of the fat clay between the bottom of the excavation to the top of the glacial till = 10.625 m

γ_w = unit weight of water = 9.81 kN/m^3

H_w = the total head in the glacial till layer = 16.73 m

According to the CFEM, heave due to artesian pressure at depth is deemed satisfactory if FS is greater than 1.1 (Fran, 2025). Using an average surface elevation of 231.10 mASL and a maximum excavation elevation of 222.42 mASL (accounting for the pipe wall thickness of 0.197 m and over excavation of 0.3 m for the pipe installation), we estimate the FS of 1.1 to be satisfactory. The Contractor may need to consider the development of a dewatering plan to manage artesian pressures. The Contractor is responsible for confirming their excavations details to suit their

means and methods and engage a professional engineer who specializes in braced excavation design prior to beginning construction.

9.3 Frost

9.3.1 Frost Penetration

The depths of frost penetration have been estimated for a range of annual air freezing identified in **Table 9-5**. The annual freezing index was inferred from Figure K-4 of the National Building Code of Canada (2020) Commentary document. The ten-year return annual freezing index was calculated using the mean annual freezing index and recommendations outlined in the Canadian Foundation Engineering Manual (CFEM 5e). The fifty-year return annual freezing index was taken from Figure K-5 of the National Building Code of Canada (2020) Commentary document.

Factors such as snow cover, vegetation at surface, soil type and groundwater conditions can all significantly impact the depth of frost penetration. The predominant soil type of the project site is fat clay.

Table 9-5: Frost Penetration Depth

Parameter	Period		
	Mean	10-Year Return	50-Year Return
Annual Air Freezing Index (°C-days)	1825	1875	2375
Estimated Frost Penetration (Fat Clay Subgrade) – gravel surface, no snow cover (m)	1.9	2.0	2.5
Estimated Frost Penetration (Fat Clay Subgrade) – grass with snow cover (m)	1.7	1.9	2.2

9.3.2 Frost Susceptibility

The qualitative frost susceptibility of a soil is typically assessed using guidelines developed by Casagrande (1932) based on the percentage by weight of the soil finer than 0.02 mm, and the Plasticity Index. The classification system has been adapted by the U.S. Army Corps of Engineers and the Canadian Foundation Engineering Manual (2023). Soils are classed as F1 through F4 in order of increasing frost susceptibility.

The soils (clay and silt) encountered during the geotechnical investigation fall mostly within the frost groups F3 and F4. The F3 group has high to very high susceptibility to frost and F4 has very high susceptibility. Frost susceptibility has been assigned to the encountered soil type and is summarized in **Table 9-6**.

Table 9-6: Frost Susceptibility

Soil Unit	USCS Soil Type	Frost Group	Percentage finer than 0.02 mm, by weight	PI	Frost Susceptibility
Clay/Clay fill	CL, CH	F3	-	>12	High to very high susceptibility
Silt	ML	F4	-	-	Very high susceptibility

Source: Canadian Foundation Engineering Manual (CFEM, 5e), Chapter 14 Frost Action.

9.4 Temporary Shoring

It is anticipated that temporary shoring will be used to facilitate excavation for the lower levels of the proposed Biosolids Early Works LDS. Comments regarding the design and temporary shoring system are therefore provided as follows. The design of the temporary shoring system should be carried out by a professional engineer specialized in shoring design.

It is anticipated that the maximum excavation depth for the lower level of the Biosolids Early Works LDS will be approximately 7.7 m BGS (222.922 m ASL). The depth of excavation is relatively deep; thus, shoring such as sheet pile walls and additional bracing may be required. The installation of the sheet pile walls will cause vibrations on adjacent structures, the contractor should document any pre-existing cracks or settlement of adjacent infrastructures to ensure no additional damage is incurred.

In consideration of the conditions encountered in the testholes, it is recommended that the design of a shoring system consider the parameters provided in **Table 9-7**. **Table 9-7** provides the recommended earth pressure coefficients, and angle of internal friction and bulk unit weight of the fill, clay, and silt for use in the calculation of lateral earth pressures. The friction angles provided in **Table 9-7** have been assumed based on the soil conditions encountered in the testholes and consideration of literature references for similar soils.

Table 9-7: Lateral Earth Pressure Design Parameters

USCS Soil Type	Soil Unit Weight (kN/m ³)	Angle of Internal Friction (°)	At Rest Lateral Earth Pressure Coefficient (K_o)
Fill (CH)	18	17	0.71
Clay (CH)	17	20	0.66
Silt (SP)	18	24	0.59

For the purpose of designing the shoring system, it is recommended that the groundwater elevation be taken as 229.9 m ASL as being the highest elevation of the groundwater level recorded in the SP installed in testhole TH24-10. It should be noted that groundwater levels observed may not be representative of stable groundwater conditions. Seasonal fluctuations due to precipitation, snow melting, drainage conditions on site and other factors may influence the groundwater levels recorded over time. Therefore, groundwater conditions at the time of construction may vary from the recorded groundwater depths above. Construction dewatering should be expected to isolate the work zone and facilitate construction in dry conditions; therefore, provisions for dewatering and groundwater control should be accounted for in the project schedule and cost.

Additionally, as previously mentioned in Section 9.2.1, the FS due to artesian pressure at depth for the deepest part of the LDS pipe, located at an elevation of 222.953 mASL along Main Street, is reported to be 1.1. While this meets the minimum satisfactory threshold as per CFEM guidelines (FS > 1.1), it is crucial to acknowledge that this value is at the lower limit of acceptability.

A perimeter ditch and associated pumping and an appropriate dewatering system should be provided to intercept surface runoff and groundwater from entering the excavation. The excavation shall abide by *The Manitoba Workplace Safety and Health Act and Regulations*.

The Instrumentation and Monitoring (I&M) plan must be carried out during the construction process and following construction to confirm that movements of the temporary shoring system are within a pre-determined acceptable range.

9.5 Stormwater Pond

9.5.1 2023-2024 Geotechnical Investigation

As discussed in Section 4, AECOM performed a geotechnical investigation in October 2023, December 2023 and January 2024. As part of the investigation, sixteen testholes were drilled, four (4) testholes were within vicinity of the Stormwater Pond, which included the testholes TH24-13, TH24-14, TH24-15 and TH24-16. The general soil stratigraphy encountered within the Stormwater Pond consisted of topsoil, silt, overlying low to high plasticity clay, and silt till. The detailed descriptions of the various soil units encountered were provided in Section 4.

9.5.2 Groundwater Conditions within Stormwater Pond

Groundwater conditions encountered within the footprint of the Stormwater Pond during the investigation are summarized in **Table 9-8**.

Table 9-8: Groundwater Observations during Investigations

Testhole ID	Groundwater Depth (mBGS)	Groundwater Elevation (mASL)	Date Measured
SP24-13	6.231	224.429	October 10, 2024
	5.941	224.719	October 23, 2024
	5.951	224.709	October 28, 2024
	5.306	225.354	April 17, 2025

The groundwater observations show that the groundwater elevation within the footprint of the stormwater pond could vary between 224.429 m and 225.353 m. The slope stability analyses will utilize a groundwater elevation of 225.4 m based on the highest water conditions recorded on April 17, 2025. It is also important to note that groundwater seepage from the silt layer was observed. The contractor should be prepared to manage this issue.

9.5.3 2025 Soil Design Parameters

The soil properties used in the slope stability analyses for the Stormwater Pond are summarized in **Table 9-9**, respectively. These parameters were estimated from strength parameters from laboratory test results, published literature, local and AECOM's previous experience in slope stability issues with highly plasticity clay.

Table 9-9: Soil Parameters used in the Slope Stability Analyses

Soil Unit	γ (kN/m ³)	c' (kPa)	ϕ' (°)
Clay Fill	18	3	17
Fat Clay (CH)	18	3	20
Silt (ML)	18	0	24
Clay Liner	18	7	19

Note: γ = soil unit weight
 c' = soil cohesion
 ϕ' = effective soil friction angle

9.5.4 Stormwater Pond Design

As previously mentioned, the stormwater pond is a dry pond that temporarily holds and controls excess runoff water. The stormwater pond will be constructed within the native fat clay. A silt layer along the slope of the pond will be excavated and backfilled with native fat clay. The pond design details are as follows:

- Stormwater Pond Details:
 - Pond base elevation = 226.5 m
 - Bottom Elevation of Compacted Clay Liner = 225.5 m
 - 25-Year Storm Level = 227.96 m
 - 100-Year Storm Level = 228.26 m; and
 - Groundwater Level = 225.4 m

To analyze the stability and design side slope configurations of the stormwater pond, one cross-section was utilized. The location of the cross-sections taken are shown in drawings within **Appendix D** (Consultant No.: C201), and summarized below:

- Cross-Section A: approximately 120 m in length with a slope of 7H:1V

9.5.5 Waste Disposal Cell Liner

According to the *2016 Standards for Landfills in Manitoba*, all clay-lined cells or leachate ponds must be designed to achieve a maximum hydraulic conductivity of 1×10^{-9} m/s. Additionally, the clay must have a minimum thickness of 1 m, measured perpendicular to the slope, unless otherwise approved by the Director. This requirement is detailed on page 24 of the standards, which outlines the criteria for compliance.

As shown in **Table 7-4** in Section 4.2, two hydraulic conductivity tests were conducted. The hydraulic conductivity was 8.45×10^{-11} and 7.41×10^{-11} m/sec at depths of approximately 4.57 m (elev. 226.33) and 6.71 (elev. 226.33), confirming compliance with the Standards for Landfills in Manitoba by remaining below the maximum hydraulic conductivity of 1×10^{-9} m/s. For detailed lab test results, refer to **Appendix C**.

9.5.6 Slope Stability Analyses

The slope stability analyses were conducted using the Slope/W module of GeoStudio software, employing the Morgenstern-Price method with circular slip surfaces and a minimum slip surface depth of 0.1 m. The analyses considered a 100-Year Storm Level of 228.26 m and a 25-Year Storm Level of 227.96 m.

Additionally, rapid drawdown (RDD) conditions were examined to demonstrate the loss of stabilizing effect of water on the upstream face, while hydraulic pressures within the embankment remain elevated. Consequently, the stability of the upstream face of the stormwater pond is significantly reduced. Various RDD conditions are shown in the following tables.

A factor of safety (FOS) is generally used in slope stability assessments. The FOS for earthworks against shearing failure will generally vary from 1.3 to 1.5; however, the selection of the FOS for an earthen structure depends on many factors such as the importance of the structure, potential failure consequences, uncertainties involved in the design loads and soil parameters, the additional cost associated with a higher FOS and the risk the owner is willing to accept in case of failure.

For this project, an FOS of 1.3 was utilized for short-term rapid drawdown, 25-Year Storm Level, and 100-Year Storm Level conditions. An FOS of 1.5 was used for normal long-term conditions, such as an empty stormwater pond.

We have selected FOS values based on our experience, review of published literature including US Army Corp of Engineers (EM1110-2-1902) and generally accepted geotechnical engineering practices.

The results of the slope stability analyses are provided in **Table 9-10** and **Table 9-11**, respectively. The figures and results are presented separately in **Appendix E**.

Table 9-10: Slope Stability Analyses Results for Cross-Section A (West to East)

Figure	Description	Factor of Safety
1	Empty Stormwater Pond	2.90
2	Stormwater Pond Operating at 25-Year Storm Level	2.52
3	Rapid Drawdown from 25-Year Storm Level to base	2.11
4	Stormwater Pond Operating at 100-Year Storm Level	2.58
5	Rapid Drawdown from 100-Year Storm Level to 25-Year Storm Level	2.43

Table 9-11: Slope Stability Analyses Results for Cross-Section A (East to West)

Figure	Description	Factor of Safety
6	Empty Stormwater Pond	2.95
7	Stormwater Pond Operating at 25-Year Storm Level	2.58
8	Rapid Drawdown from 25-Year Storm Level to base	2.12
9	Stormwater Pond Operating at 100-Year Storm Level	2.65
10	Rapid Drawdown from 100-Year Storm Level to 25-Year Storm Level	2.47

Based on the slope stability analyses, the proposed Stormwater Pond configuration satisfies all FOS against slope stability failures.

9.5.7 Stormwater Pond Construction Comments

Based on the Stormwater Pond base elevation of 226.5 m and a groundwater elevation of 225.4 m in SP24-13, approximately 2.8 m of clay will be excavated below the groundwater surface. The construction team must consider the following:

- The safety of the excavation will be affected by groundwater infiltration from the silt layer. The construction team must have a dewatering plan to be able to complete the excavation.
- Sloughing may occur during the excavation on the silt layer. Contractor shall consider a mitigation plan for the sloughing within the silt layer.
- The dewatering plan may include a perimeter ditch and a sump pump to collect and remove the groundwater.
- A thin silt layer is expected along the slopes of the Stormwater Pond. It is recommended to excavate a thickness of 1-m of this thin silt layer and use the excavated clay as a clay liner, compacted to 95% SPMDD and maximum lift thickness of 6 inches.

9.6 Seismic Considerations

As per the CFEM, the site classification for seismic site response is dependent on the average properties in the top 30 m of the soil profile. Based on a soil profile having more than 3 m of high plasticity clay and Article 4.1.8.4 of the National Building Code of Canada (NBCC) 2020, a Seismic Site Class E can be assigned to the site.

The 2020 NBCC Seismic Hazard Calculation for the site is provided in **Appendix F**. It includes values of spectral acceleration (for time periods of 0.05, 0.1, 0.2, 0.3, 0.5, 1.0, 2.0, 5.0 and 10.0 seconds), peak ground acceleration, and peak ground velocity for 2%, 5%, 10% and 40% probability of exceedance in 50 years.

9.7 Quality Assurance and Quality Control

During construction, it is recommended that the contractor provides an approved quality assurance and quality control program (QA/QC). This program should include but is not limited to periodic testing of granular gradation, L.A. abrasion loss, material proctors, field density test, bedding sand and compaction.

10. References

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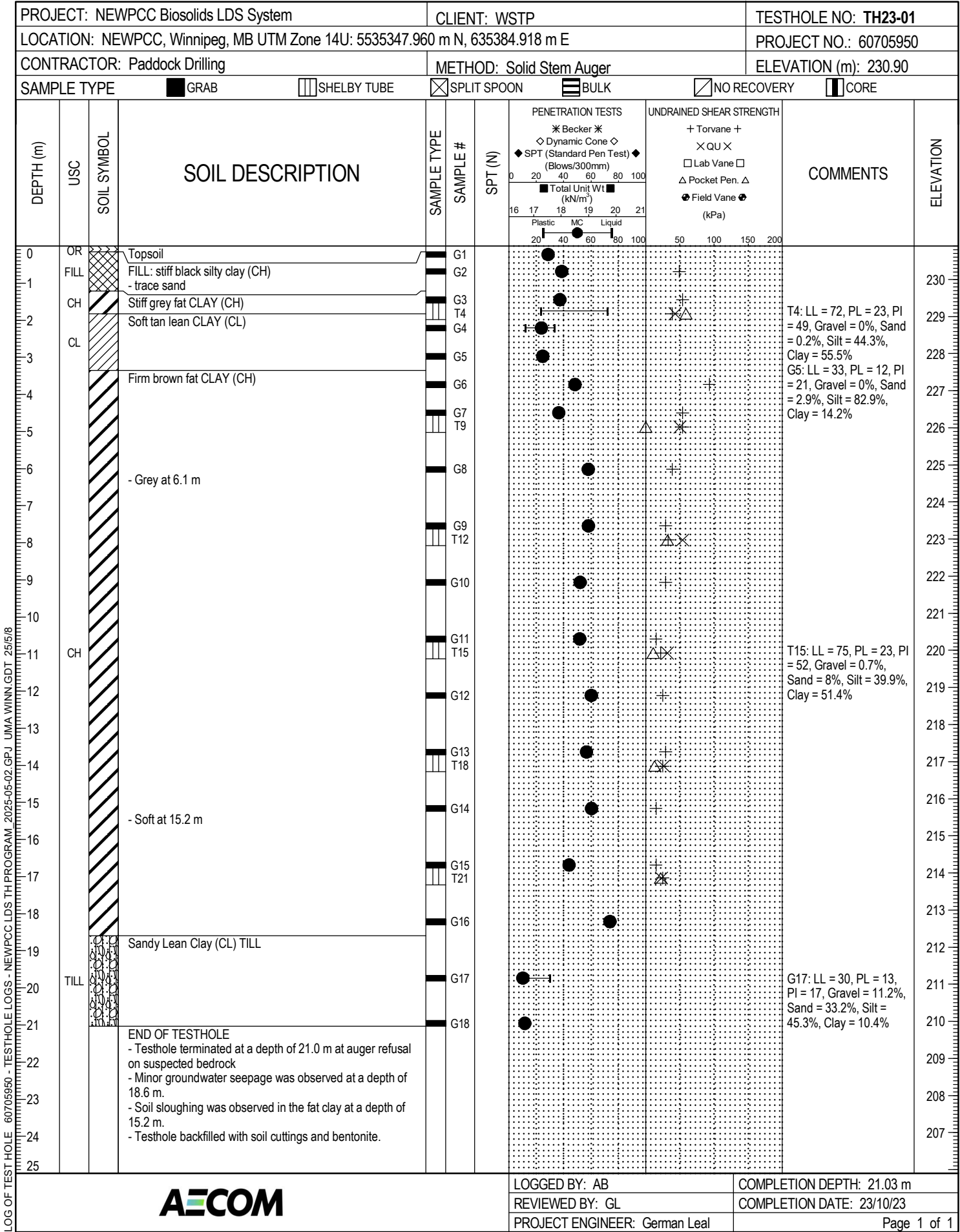
Appendix **A**

Testhole Location Plan

Appendix **B**

Testhole Logs





LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH23-02					
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535408.134 m N, 635419.979 m E												PROJECT NO.: 60705950					
CONTRACTOR: Paddock Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 230.43					
SAMPLE TYPE		☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE					
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION			SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS		ELEVATION		
									* Becker *		+ Torvane +						
									◇ Dynamic Cone ◇		X QU X						
									◆ SPT (Standard Pen Test) ◆		□ Lab Vane □						
									(Blows/300mm)		△ Pocket Pen. △						
									■ Total Unit Wt (kN/m³)		● Field Vane ●						
									16 17 18 19 20 21		(kPa)						
									Plastic MC Liquid								
									20 40 60 80 100		50 100 150 200						
0	OR		Topsoil				G1								230		
1	CH		Stiff brown fat CLAY (CH)				G2						G2: LL = 93, PL = 27, PI = 66, Gravel = 0%, Sand = 0.3%, Silt = 21.9%, Clay = 77.8%		229		
2	CL		Soft tan lean CLAY (CL)				G3								228		
3							G4						G4: LL = 25, PL = 15, PI = 10, Gravel = 0%, Sand = 7.6%, Silt = 79.8%, Clay = 12.6%		227		
4			Firm brown fat CLAY (CH)				G5								226		
5							G6								225		
6							G7								224		
7	CH		- Grey below 6.1 m				G8						G8: LL = 91, PL = 25, PI = 66, Gravel = 0%, Sand = 0.4%, Silt = 25%, Clay = 74.6%		223		
8							G9								222		
9							G10								221		
10							G11								220		
11			- Soft below 10.5 m												219		
12			END OF TESTHOLE												218		
13			- Testhole terminated at a depth of 10.7 m in fat CLAY												217		
14			- Minor groundwater seepage was observed at a depth of 1.5 m.												216		
15			- Groundwater level was observed at a depth of 7.5 m upon completion of drilling.												215		
16			- No soil sloughing was observed during or upon completion of drilling.												214		
17			- Testhole backfilled with soil cuttings and bentonite.												213		
18															212		
19															211		
20															210		
21															209		
22															208		
23															207		
24															206		
25															205		
									LOGGED BY: AB			COMPLETION DEPTH: 10.67 m					
									REVIEWED BY: GL			COMPLETION DATE: 23/10/23					
									PROJECT ENGINEER: German Leal			Page 1 of 1					

LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH23-03					
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535342.559 m N, 635590.652 m E												PROJECT NO.: 60705950					
CONTRACTOR: Maple Leaf Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 231.15					
SAMPLE TYPE		☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE					
DEPTH (m) USC SOIL SYMBOL SOIL DESCRIPTION SAMPLE TYPE SAMPLE # SPT (N) PENETRATION TESTS * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt ■ (kN/m³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100 UNDRAINED SHEAR STRENGTH + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200 COMMENTS ELEVATION																	
0			FILL: black silty clay (CH) - trace sand, trace gravel		G1								231				
1	FILL				G2								230				
2			Stiff brown fat CLAY (CH)		G3								229				
3	CH				G4					+			228				
4			Soft tan SILT (ML)		G5					+			227				
5	ML				G6								226				
6			Firm brown fat CLAY (CH)		G7					+			225				
7			- Grey below 6.1 m		G8								224				
8	CH				G9					+			223				
9					G10								222				
10					G11					+			221				
11			END OF TESTHOLE - Testhole terminated at a depth of 10.7 m in fat CLAY - Moderate groundwater seepage was observed at a depth of 3.1 m. - Groundwater level was observed at a depth of 7.0 m upon completion of drilling. - No soil sloughing was observed during or upon completion of drilling. - Testhole backfilled with soil cuttings and bentonite.										220				
12													219				
13													218				
14													217				
15													216				
16													215				
17													214				
18													213				
19													212				
20													211				
21													210				
22													209				
23													208				
24													207				
25																	
						LOGGED BY: AB						COMPLETION DEPTH: 10.67 m					
						REVIEWED BY: GL						COMPLETION DATE: 23/10/26					
						PROJECT ENGINEER: German Leal						Page 1 of 1					

LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH23-04								
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535271.903 m N, 635728.217 m E												PROJECT NO.: 60705950								
CONTRACTOR: Maple Leaf Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 230.46								
SAMPLE TYPE						☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE				
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION				SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS				UNDRAINED SHEAR STRENGTH				COMMENTS		ELEVATION
										* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt ■ (kN/m²) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100				+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200						
0			FILL: black silty clay (CH) - trace sand, trace gravel					G1		●				+						230
1	FILL							G2		●				+						229
2								G3		●				+						228
3	ML		Soft tan SILT (ML)					G4		●										227
4								G5		●										226
5								G6		●				+						225
6								G7		●				+						224
7	CH		Stiff brown fat CLAY (CH)					G8		●				+						223
8								G9		●				+						222
9								G10		●				+						221
10								G11		●				+						220
11			END OF TESTHOLE							●				+						219
12			- Testhole terminated at a depth of 10.7 m in fat CLAY																	218
13			- Moderate groundwater seepage was observed at a depth of 3.1 m.																	217
14			- Groundwater level was observed at a depth of 5.5 m upon completion of drilling.																	216
15			- Soil sloughing was observed in the silt at a depth of 3.0 m.																	215
16			- Testhole backfilled with soil cuttings and bentonite.																	214
17																				213
18																				212
19																				211
20																				210
21																				209
22																				208
23																				207
24																				206
25																				206

LOGGED BY: AB

REVIEWED BY: GL

PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 10.67 m

COMPLETION DATE: 23/10/26

Page 1 of 1

LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH23-05																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	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PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH23-06					
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535096.488 m N, 636111.133 m E												PROJECT NO.: 60705950					
CONTRACTOR: Paddock Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 230.75					
SAMPLE TYPE						☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE	
DEPTH (m) USC SOIL SYMBOL SOIL DESCRIPTION SAMPLE TYPE SAMPLE # SPT (N) PENETRATION TESTS * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100 UNDRAINED SHEAR STRENGTH + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200 COMMENTS ELEVATION																	
0	OR		Topsoil		G1												
1	FILL		FILL: black silty clay (CH) - trace gravel, trace sand		G2												230
2	CL		Soft tan lean CLAY (CL)		G3												229
3					G4												228
4			Firm brown fat CLAY (CH)		G5												227
5					T6												226
6					G6												225
7					G7												224
8					G8												223
9	CH		- Grey below 6.1 m		T10												222
10					G9												221
11					G10												220
12					G11												219
13					T14												218
14																	217
15																	216
16																	215
17																	214
18																	213
19																	212
20																	211
21																	210
22																	209
23																	208
24																	207
25																	206

AECOM

LOGGED BY: AB

REVIEWED BY: GL

PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 11.28 m

COMPLETION DATE: 23/10/24

Page 1 of 1

PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH23-07					
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535159.231 m N, 636174.406 m E						PROJECT NO.: 60705950											
CONTRACTOR: Paddock Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 230.64					
SAMPLE TYPE		GRAB		SHELBY TUBE		SPLIT SPOON		BULK		NO RECOVERY		CORE					
BACKFILL TYPE		BENTONITE		GRAVEL		SLOUGH		GROUT		CUTTINGS		SAND					
DEPTH (m) USC SOIL SYMBOL SLOTTED PIEZOMETER SOIL DESCRIPTION SAMPLE TYPE SAMPLE # SPT (N) PENETRATION TESTS * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100 UNDRAINED SHEAR STRENGTH + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200 COMMENTS ELEVATION																	
0	OR			Topsoil	G1												
1	FILL			FILL: brown silty clay (CH) - trace gravel, trace sand	G2										230		
2	CH			Stiff brown fat CLAY (CH)	G3										229		
3	CL			Soft tan lean CLAY (CL)	G4										228		
4				Firm brown fat CLAY (CH)	G5										227		
5					G6										226		
6					G7										225		
7				- Grey below 6.1 m	G8										224		
8					T10										223		
9					G9										222		
10					G10										221		
11	CH				T13										220		
12					G11										219		
13					G12										218		
14					T16										217		
15					G13										216		
16					G14										215		
17					T19										214		
18					G15										213		
19					G16										212		
20	TILL			Sandy lean clay (CL) TILL	T22										211		
21					G17										210		
22				END OF TESTHOLE - Testhole terminated at a depth of 20.7 m at auger refusal on suspected bedrock - Moderate groundwater seepage was observed at a depth of 18.9 m. - Soil sloughing was observed in the silt (TILL) at a depth of 15.2 m. - Standpipe piezometer installed to a depth of 9.6 m, in CLAY slotted between a depth of 9.6 m and 9.1 m, stick up 0.3 m. - Testhole backfilled with bentonite and soil cuttings to ground surface.	G18										209		
23															208		
24															207		
25															206		
26															205		

AECOM

LOGGED BY: AB

REVIEWED BY: GL

PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 20.73 m

COMPLETION DATE: 23/10/23

Page 1 of 1

PROJECT: NEWPCC Biosolids LDS System				CLIENT: WSTP				TESTHOLE NO: TH23-08																																																																																																																																																																																																																																																																																																																																																																																																			
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535448.050 m N, 635348.646 m E				PROJECT NO.: 60705950																																																																																																																																																																																																																																																																																																																																																																																																							
CONTRACTOR: Paddock Drilling				METHOD: Solid Stem Auger				ELEVATION (m): 230.29																																																																																																																																																																																																																																																																																																																																																																																																			
SAMPLE TYPE		GRAB		SHELBY TUBE		SPLIT SPOON		BULK		NO RECOVERY		CORE																																																																																																																																																																																																																																																																																																																																																																																															
BACKFILL TYPE		BENTONITE		GRAVEL		SLOUGH		GROUT		CUTTINGS		SAND																																																																																																																																																																																																																																																																																																																																																																																															
<table><thead><tr><th rowspan="2">DEPTH (m)</th><th rowspan="2">USC</th><th rowspan="2">SOIL SYMBOL</th><th rowspan="2">SLOTTED PIEZOMETER</th><th rowspan="2">SOIL DESCRIPTION</th><th rowspan="2">SAMPLE TYPE</th><th rowspan="2">SAMPLE #</th><th rowspan="2">SPT (N)</th><th colspan="2">PENETRATION TESTS</th><th colspan="2">UNDRAINED SHEAR STRENGTH</th><th rowspan="2">COMMENTS</th><th rowspan="2">ELEVATION</th></tr><tr><th></th><th></th><th></th><th></th></tr></thead><tbody><tr><td>0</td><td>OR</td><td></td><td></td><td>Topsoil</td><td></td><td>G1</td><td></td><td></td><td></td><td></td><td></td><td></td><td>230</td></tr><tr><td>1</td><td>FILL</td><td></td><td></td><td>FILL: brown silty clay (CH)</td><td></td><td>G2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>229</td></tr><tr><td></td><td></td><td></td><td></td><td>- trace gravel, trace sand</td><td></td><td>G3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2</td><td>CH</td><td></td><td></td><td>Stiff brown fat CLAY (CH)</td><td></td><td>T4</td><td></td><td></td><td></td><td></td><td></td><td></td><td>228</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>G5</td><td></td><td></td><td></td><td></td><td></td><td></td><td>227</td></tr><tr><td>3</td><td>CL</td><td></td><td></td><td>Soft tan lean CLAY (CL)</td><td></td><td>G6</td><td></td><td></td><td></td><td></td><td></td><td></td><td>226</td></tr><tr><td></td><td></td><td></td><td></td><td>Firm brown fat CLAY (CH)</td><td></td><td>G7</td><td></td><td></td><td></td><td></td><td></td><td></td><td>225</td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td>T8</td><td></td><td></td><td></td><td></td><td></td><td></td><td>224</td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td>G9</td><td></td><td></td><td></td><td></td><td></td><td></td><td>223</td></tr><tr><td>6</td><td></td><td></td><td></td><td>- Grey below 6.1 m</td><td></td><td>G10</td><td></td><td></td><td></td><td></td><td></td><td></td><td>222</td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td>T11</td><td></td><td></td><td></td><td></td><td></td><td></td><td>221</td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td>G12</td><td></td><td></td><td></td><td></td><td></td><td></td><td>220</td></tr><tr><td>9</td><td>CH</td><td></td><td></td><td></td><td></td><td>G13</td><td></td><td></td><td></td><td></td><td></td><td></td><td>219</td></tr><tr><td>10</td><td></td><td></td><td></td><td>- Soft below 10.5 m</td><td></td><td>T14</td><td></td><td></td><td></td><td></td><td></td><td></td><td>218</td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td>G15</td><td></td><td></td><td></td><td></td><td></td><td></td><td>217</td></tr><tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td>G16</td><td></td><td></td><td></td><td></td><td></td><td></td><td>216</td></tr><tr><td>13</td><td></td><td></td><td></td><td></td><td></td><td>G17</td><td></td><td></td><td></td><td></td><td></td><td></td><td>215</td></tr><tr><td>14</td><td></td><td></td><td></td><td></td><td></td><td>S18</td><td>200/152mm</td><td></td><td></td><td></td><td></td><td></td><td>214</td></tr><tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>213</td></tr><tr><td>16</td><td>TILL</td><td></td><td></td><td>Sandy Lean Clay (CL) TILL</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>212</td></tr><tr><td>17</td><td></td><td></td><td></td><td>END OF TESTHOLE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>211</td></tr><tr><td>18</td><td></td><td></td><td></td><td>- Testhole terminated at a depth of 17.1 m at auger refusal on very dense TILL</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>210</td></tr><tr><td>19</td><td></td><td></td><td></td><td>- Moderate groundwater seepage was observed at a depth of 2.0 m.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>209</td></tr><tr><td>20</td><td></td><td></td><td></td><td>- Soil sloughing was observed in fat CLAY at a depth of 13.7 m.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>208</td></tr><tr><td>21</td><td></td><td></td><td></td><td>- Standpipe piezometer installed to a depth of 17.0 m, in TILL slotted between a depth of 16.2 m and 16.8 m, stick up 0.3 m.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>207</td></tr><tr><td>22</td><td></td><td></td><td></td><td>- Testhole backfilled filter sand to a depth of 15.2 m. 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DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION																																																																																																																																																																																																																																																																																																																																																																																														
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								LOGGED BY: AB				COMPLETION DEPTH: 17.07 m																																																																																																																																																																																																																																																																																																																																																																																															
								REVIEWED BY: GL				COMPLETION DATE: 23/12/15																																																																																																																																																																																																																																																																																																																																																																																															
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LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System				CLIENT: WSTP				TESTHOLE NO: TH24-09				
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535567.989 m N, 635188.067 m E								PROJECT NO.: 60705950				
CONTRACTOR: Paddock Drilling				METHOD: Solid Stem Auger				ELEVATION (m): 230.66				
SAMPLE TYPE				☒ GRAB ☐ SHELBY TUBE ☒ SPLIT SPOON ☐ BULK ☒ NO RECOVERY ☐ CORE								
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m²) 16 17 18 19 20 21 Plastic MC Liquid		UNDRAINED SHEAR STRENGTH + Torvane + X QU X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200		COMMENTS	ELEVATION
0	FILL		FILL: black silty clay (CH) - trace sand, trace gravel		G1							
1	ML		Soft tan silt (ML)		G2							230
2					G3							229
3			Stiff brown fat CLAY (CH)		G4							228
4					G5							227
5					G6							226
6	CH				G7							225
7					G8							224
8					G9							223
9					G10							222
10												221
11			END OF TESTHOLE - Testhole terminated at a depth of 10.7 m in fat CLAY - No groundwater seepage or soil sloughing was observed during or upon completion of drilling. - Testhole backfilled with soil cuttings and bentonite to ground surface.									220
12												219
13												218
14												217
15												216
16												215
17												214
18												213
19												212
20												211
21												210
22												209
23												208
24												207
25												206

LOGGED BY: GA
REVIEWED BY: GL
PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 10.67 m
COMPLETION DATE: 24/1/8
Page 1 of 1

PROJECT: NEWPCC Biosolids LDS System				CLIENT: WSTP				TESTHOLE NO: TH24-10																																																																																																																																																																																																																																																																																																																																																																																								
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535662.806 m N, 635065.803 m E								PROJECT NO.: 60705950																																																																																																																																																																																																																																																																																																																																																																																								
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BACKFILL TYPE		BENTONITE		GRAVEL		SLOUGH		GROUT		CUTTINGS		SAND																																																																																																																																																																																																																																																																																																																																																																																				
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19%</td><td>230</td></tr><tr><td>1</td><td>ML</td><td></td><td></td><td>- trace sand, trace gravel</td><td></td><td>G2</td><td></td><td></td><td></td><td></td><td></td><td>229</td></tr><tr><td></td><td></td><td></td><td></td><td>Soft tan silt (ML)</td><td></td><td>G3</td><td></td><td></td><td></td><td></td><td></td><td>228</td></tr><tr><td>2</td><td></td><td></td><td></td><td>Stiff brown fat CLAY (CH)</td><td></td><td>G4</td><td></td><td></td><td></td><td></td><td></td><td rowspan="10">T7: LL = 90, PL = 23, PI = 66, Gravel = 0.1%, Sand = 2.2%, Silt = 26.6%, Clay = 71.2%</td><td>227</td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td>G5</td><td></td><td></td><td></td><td></td><td></td><td>226</td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td>G6</td><td></td><td></td><td></td><td></td><td></td><td>225</td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td>T7</td><td></td><td></td><td></td><td></td><td></td><td>224</td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td>G8</td><td></td><td></td><td></td><td></td><td></td><td>223</td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td>G9</td><td></td><td></td><td></td><td></td><td></td><td>222</td></tr><tr><td>8</td><td>CH</td><td></td><td></td><td></td><td></td><td>T10</td><td></td><td></td><td></td><td></td><td></td><td>221</td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td>G11</td><td></td><td></td><td></td><td></td><td></td><td>220</td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td>G12</td><td></td><td></td><td></td><td></td><td></td><td>219</td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td>G13</td><td></td><td></td><td></td><td></td><td></td><td>218</td></tr><tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td>G14</td><td></td><td></td><td></td><td></td><td></td><td>217</td></tr><tr><td>13</td><td></td><td></td><td></td><td></td><td></td><td>G15</td><td></td><td></td><td></td><td></td><td></td><td>216</td></tr><tr><td>14</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>215</td></tr><tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>214</td></tr><tr><td>16</td><td>TILL</td><td></td><td></td><td>Sandy 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71.2%	227	3						G5						226	4						G6						225	5						T7						224	6						G8						223	7						G9						222	8	CH					T10						221	9						G11						220	10						G12						219	11						G13						218	12						G14						217	13						G15						216	14												215	15												214	16	TILL			Sandy Lean Clay (CL) TILL								213	17												212	18				END OF TESTHOLE								211	19				- Testhole terminated at a depth of 17.4 m at auger refusal on very dense TILL								210	20				- Moderate groundwater seepage was observed at a depth of 2.1 m.								209	21				- Soil sloughing was observed in shallow silt layer at a depth of 1.8 m.								208	22				- Soil sloughing was observed in the fat clay layer at a depth of 12.2 m.								207	23				- No groundwater was observed during or upon completion of drilling.									24				- Standpipe piezometer installed to a depth of 1.8 m, in silt slotted between a depth of 0.8 m and 1.8 m, stick up 0.3 m.									25				- Testhole backfilled with soil cuttings and 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(CH)</td><td></td><td>G5</td><td></td><td></td><td></td><td></td><td></td><td></td><td>227</td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td>T6</td><td></td><td></td><td></td><td></td><td></td><td></td><td>226</td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td>G7</td><td></td><td></td><td></td><td></td><td></td><td></td><td>225</td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td>G8</td><td></td><td></td><td></td><td></td><td></td><td></td><td>224</td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td>G9</td><td></td><td></td><td></td><td></td><td></td><td></td><td>223</td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td>G10</td><td></td><td></td><td></td><td></td><td></td><td></td><td>222</td></tr><tr><td>10</td><td></td><td>CH</td><td></td><td></td><td></td><td>G11</td><td></td><td></td><td></td><td></td><td></td><td></td><td>221</td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td>G12</td><td></td><td></td><td></td><td></td><td></td><td></td><td>220</td></tr><tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td>G13</td><td></td><td></td><td></td><td></td><td></td><td></td><td>219</td></tr><tr><td>13</td><td></td><td></td><td></td><td></td><td></td><td>G14</td><td></td><td></td><td></td><td></td><td></td><td></td><td>218</td></tr><tr><td>14</td><td></td><td></td><td></td><td></td><td></td><td>G15</td><td></td><td></td><td></td><td></td><td></td><td></td><td>217</td></tr><tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td>G16</td><td></td><td></td><td></td><td></td><td></td><td></td><td>216</td></tr><tr><td>16</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>215</td></tr><tr><td>17</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>214</td></tr><tr><td>18</td><td></td><td></td><td></td><td>Sandy Lean Clay (CL) TILL</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>213</td></tr><tr><td>19</td><td></td><td>TILL</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>212</td></tr><tr><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>211</td></tr><tr><td>21</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>210</td></tr><tr><td>22</td><td></td><td></td><td></td><td>END OF TESTHOLE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>209</td></tr><tr><td>23</td><td></td><td></td><td></td><td>- Testhole terminated at a depth of 21.3 m at auger refusal on suspected bedrock.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>208</td></tr><tr><td>24</td><td></td><td></td><td></td><td>- Heavy groundwater seepage was observed at a depth of 2.1 m.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>207</td></tr><tr><td>25</td><td></td><td></td><td></td><td>- Soil sloughing was observed in shallow silt layer at a depth of 2.1 m.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>206</td></tr><tr><td>26</td><td></td><td></td><td></td><td>- Groundwater level was observed at a depth of 9.8 m upon completion of drilling.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>205</td></tr><tr><td>27</td><td></td><td></td><td></td><td>- Standpipe piezometer installed to a depth of 21.3 m, in TILL slotted between a depth of 21.3 m and 20.3 m, stick up 0.9 m.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>204</td></tr><tr><td>28</td><td></td><td></td><td></td><td>- Testhole backfilled with filter sand to a depth of 21.3 m, then with bentonite and cutting to the original ground surface.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>203</td></tr><tr><td>29</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>202</td></tr><tr><td>30</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>201</td></tr></tbody></table>												DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION													0		FILL		FILL: black, hard, clay (CH) - trace sand, trace gravel		G1							230	1						G2								2		ML		Soft tan silt (ML)		G3							229	3						G4							228	4				Firm brown fat CLAY (CH)		G5							227	5						T6							226	6						G7							225	7						G8							224	8						G9							223	9						G10							222	10		CH				G11							221	11						G12							220	12						G13							219	13						G14							218	14						G15							217	15						G16							216	16													215	17													214	18				Sandy Lean Clay (CL) TILL									213	19		TILL											212	20													211	21													210	22				END OF TESTHOLE									209	23				- Testhole terminated at a depth of 21.3 m at auger refusal on suspected bedrock.									208	24				- Heavy groundwater seepage was observed at a depth of 2.1 m.									207	25				- Soil sloughing was observed in shallow silt layer at a depth of 2.1 m.									206	26				- Groundwater level was observed at a depth of 9.8 m upon completion of drilling.									205	27				- Standpipe piezometer installed to a depth of 21.3 m, in TILL slotted between a depth of 21.3 m and 20.3 m, stick up 0.9 m.									204	28				- Testhole backfilled with filter sand to a depth of 21.3 m, then with bentonite and cutting to the original ground surface.									203	29													202	30													201
DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH										COMMENTS	ELEVATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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4				Firm brown fat CLAY (CH)		G5							227																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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26				- Groundwater level was observed at a depth of 9.8 m upon completion of drilling.									205																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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28				- Testhole backfilled with filter sand to a depth of 21.3 m, then with bentonite and cutting to the original ground surface.									203																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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LOGGED BY: GA REVIEWED BY: GL PROJECT ENGINEER: German Leal								COMPLETION DEPTH: 21.34 m																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System				CLIENT: WSTP				TESTHOLE NO: TH24-12					
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535418.820 m N, 635275.679 m E								PROJECT NO.: 60705950					
CONTRACTOR: Paddock Drilling				METHOD: Solid Stem Auger				ELEVATION (m): 230.49					
SAMPLE TYPE		☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE	
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION	
							* Becker *		+ Torvane +				
							◇ Dynamic Cone ◇		X QU X				
							◆ SPT (Standard Pen Test) ◆		□ Lab Vane □				
							(Blows/300mm)		△ Pocket Pen. △				
							■ Total Unit Wt ■		● Field Vane ●				
							(kN/m²)		(kPa)				
							16 17 18 19 20 21		50 100 150 200				
							Plastic MC Liquid						
							20 40 60 80 100						
0	FILL		FILL: black, silty clay (CH)		G1							230	
1			- trace gravel, trace sand		G2								
2	ML		Soft tan silt (ML)		G3							229	
2			Firm brown fat CLAY (CH)		G4								
3	CH				G5							228	
4					G6								227
5													226
6					G7								225
7													224
8					G8								223
9													222
10					G9								221
11													220
12					G10								219
13			END OF TESTHOLE									218	
14			- Testhole terminated at a depth of 10.7 m in fat CLAY									217	
15			- No groundwater seepage or soil sloughing was observed									216	
16			during or upon completion of drilling.									215	
17			- Testhole backfilled with soil cuttings and bentonite to									214	
18			ground surface.									213	
19												212	
20												211	
21												210	
22												209	
23												208	
24												207	
25												206	

LOGGED BY: GA

REVIEWED BY: GL

PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 10.67 m

COMPLETION DATE: 24/1/8

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PROJECT: NEWPCC Biosolids LDS System				CLIENT: WSTP				TESTHOLE NO: TH24-13																							
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535538.509 m N, 635315.755 m E								PROJECT NO.: 60705950																							
CONTRACTOR: Paddock Drilling				METHOD: Solid Stem Auger				ELEVATION (m): 230.66																							
SAMPLE TYPE		GRAB		SHELBY TUBE		SPLIT SPOON		BULK		NO RECOVERY		CORE																			
BACKFILL TYPE		BENTONITE		GRAVEL		SLOUGH		GROUT		CUTTINGS		SAND																			
<table><tr><th rowspan="2">DEPTH (m)</th><th rowspan="2">USC</th><th rowspan="2">SOIL SYMBOL</th><th rowspan="2">SLOTTED PIEZOMETER</th><th rowspan="2">SOIL DESCRIPTION</th><th rowspan="2">SAMPLE TYPE</th><th rowspan="2">SAMPLE #</th><th rowspan="2">SPT (N)</th><th colspan="2">PENETRATION TESTS</th><th colspan="2">UNDRAINED SHEAR STRENGTH</th><th rowspan="2">COMMENTS</th><th rowspan="2">ELEVATION</th></tr><tr><td colspan="2"> * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³) 020406080100 161718192021 PlasticMCLiquid 20406080100 </td><td colspan="2"> + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50100150200 </td></tr></table>														DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION	* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³) 020406080100 161718192021 PlasticMCLiquid 20406080100		+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50100150200	
DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION																		
								* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³) 020406080100 161718192021 PlasticMCLiquid 20406080100		+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50100150200																					
0	FILL			FILL: black silty clay (CH)		G1						G4: LL = 16, PL = 13, PI = 3, Gravel = 0%, Sand = 1.2%, Silt = 90.9%, Clay = 7.9%	230																		
1	CH			- trace gravel, trace sand		G2							229																		
2				Stiff brown fat CLAY (CH)		G3							228																		
3	ML			Soft tan silt (ML)		G4							227																		
4				Firm brown fat CLAY (CH)		T5							226																		
5						G6							225																		
6						G7							224																		
7						T8							223																		
8													222																		
9						T9							221																		
10													220																		
11	CH					T10						219																			
12												218																			
13						T11						217																			
14												216																			
15												215																			
16												214																			
17												213																			
18												212																			
19												211																			
20	TILL			Sandy Lean Clay (CL) TILL		S12	64					210																			
21				END OF TESTHOLE								209																			
22				- Testhole terminated at a depth of 20.4 m at auger refusal on very dense TILL.								208																			
23				- Heavy groundwater seepage was observed at a depth of 2.1 m.								207																			
24				- Soil sloughing was observed in shallow silt layer at a depth of 3.0 m.								206																			
25				- Groundwater level was observed at a depth of 17.1 m upon completion of drilling.								205																			
26				- Standpipe piezometer installed to a depth of 20.1 m, in TILL slotted between a depth of 18.6 m and 20.1 m, stick up 0.9 m.								204																			
27				- Testhole backfilled with filter sand to a depth of 18.6 m, then with bentonite and cuttings to the original ground surface.								203																			
28												202																			
29												201																			
30												201																			

AECOM

LOGGED BY: GA

REVIEWED BY: GL

PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 21.34 m

COMPLETION DATE: 24/1/9

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PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH24-14													
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535550.420 m N, 635346.968 m E												PROJECT NO.: 60705950													
CONTRACTOR: Paddock Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 230.56													
SAMPLE TYPE		☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE													
DEPTH (m) USC SOIL SYMBOL SOIL DESCRIPTION SAMPLE TYPE SAMPLE # SPT (N) PENETRATION TESTS * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt ■ (kN/m²) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100 UNDRAINED SHEAR STRENGTH + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200														COMMENTS		ELEVATION									
0														FILL		FILL: black silty clay (CH) - trace gravel, trace sand		G1						230	
1														CH		Stiff brown fat CLAY (CH)		G2						229	
2														ML		Soft tan silt (ML)		G3						228	
3																Firm brown fat CLAY (CH)		G4						227	
4																		G5						226	
5																		T6						225	
6																		G7						224	
7														CH		- Grey below 6.1 m		T8						223	
8																- Soft below 7.5 m		G9						222	
9																		T10						221	
10																		G11						220	
11																		G12						219	
12																								218	
13																								217	
14																								216	
15																								215	
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21																								209	
22																								208	
23																								207	
24																								206	
25																								205	

LOGGED BY: GA

REVIEWED BY: GL

PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 9.14 m

COMPLETION DATE: 24/1/9

AZCOM

Page 1 of 1

PROJECT: NEWPCC Biosolids LDS System						CLIENT: WSTP						TESTHOLE NO: TH24-15										
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535610.841 m N, 635408.041 m E												PROJECT NO.: 60705950										
CONTRACTOR: Paddock Drilling						METHOD: Solid Stem Auger						ELEVATION (m): 230.25										
SAMPLE TYPE						☒ GRAB		☐ SHELBY TUBE		☒ SPLIT SPOON		☐ BULK		☒ NO RECOVERY		☐ CORE						
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION					SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS					UNDRAINED SHEAR STRENGTH					COMMENTS	ELEVATION
											* Becker *					+ Torvane +						
											◇ Dynamic Cone ◇					X QU X						
											◆ SPT (Standard Pen Test) ◆					□ Lab Vane □						
												(Blows/300mm)					△ Pocket Pen. △					
												■ Total Unit Wt ■					● Field Vane ●					
												(kN/m²)					(kPa)					
												16 17 18 19 20 21					50 100 150 200					
												Plastic MC Liquid										
												20 40 60 80 100										
0			FILL: black, hard, silty clay (CH)						G1											230		
1			- trace sand, trace gravel						G2											229		
2			Stiff brown fat CLAY (CH)						G3											228		
3			Soft tan silt (ML)						G4											227		
4			Firm brown fat CLAY (CH)						G5											226		
5									G6											225		
6									G7											224		
7									T8											224		
8									G9											223		
9									T10											222		
10									G11											221		
11									T12											220		
12			END OF TESTHOLE																	219		
13			- Testhole terminated at a depth of 10.7 m in fat CLAY																	218		
14			- The soil was frozen to a depth of 0.6 m																	217		
15			- Moderate groundwater seepage was observed at a depth 2.3 m.																	216		
16			- Groundwater level was observed at a depth 6.1 m upon completion of drilling.																	215		
17			- Soil sloughing was observed in the silt at a depth of 2.3 m.																	214		
18			- Testhole backfilled with soil cuttings and bentonite to ground surface.																	213		
19																				212		
20																				211		
21																				210		
22																				209		
23																				208		
24																				207		
25																				206		

T8: LL = 98, PL = 24, PI = 74, Gravel = 0%, Sand = 0.2%, Silt = 18.8%, Clay = 80.9%

LOG OF TEST HOLE 60705950 - TESTHOLE LOGS - NEWPCC LDS TH PROGRAM 2025-05-02.GPJ UMA WINN.GDT 25/5/8

PROJECT: NEWPCC Biosolids LDS System				CLIENT: WSTP				TESTHOLE NO: TH24-16				
LOCATION: NEWPCC, Winnipeg, MB UTM Zone 14U: 5535619.933 m N, 635487.460 m E								PROJECT NO.: 60705950				
CONTRACTOR: Paddock Drilling				METHOD: Solid Stem Auger				ELEVATION (m): 231.54				
SAMPLE TYPE				☒ GRAB ☐ SHELBY TUBE ☒ SPLIT SPOON ☐ BULK ☒ NO RECOVERY ☐ CORE								
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS * Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³) 16 17 18 19 20 21 Plastic MC Liquid		UNDRAINED SHEAR STRENGTH + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200		COMMENTS	ELEVATION
0			FILL: black silty clay (CH) - some sand, trace gravel		G1							231
1					G2							
2					G3							230
3					G4							229
4			Soft tan silt (ML)		G5							228
5					G6							227
6			Stiff brown fat CLAY (CH)		G7							226
7					G8							225
8					G9							224
9					G10							223
10												222
11			END OF TESTHOLE - Testhole terminated at a depth of 10.7 m in fat CLAY - Moderate groundwater seepage was observed at a depth of 3.1 m. - Groundwater level was observed at a depth 6.1 m upon completion of drilling. - No soil sloughing was observed during or upon completion of drilling. - Testhole backfilled with soil cuttings and bentonite to ground surface.									221
12												220
13												219
14												218
15												217
16												216
17												215
18												214
19												213
20												212
21												211
22												210
23												209
24												208
25												207

LOGGED BY: GA
REVIEWED BY: GL
PROJECT ENGINEER: German Leal

COMPLETION DEPTH: 10.67 m
COMPLETION DATE: 24/1/8
Page 1 of 1

Appendix **C**

Lab Test Results



Memorandum

To	Gene Acurin	Page	1
CC			
Subject	NEWPCC – Biosolids Early Works		
From	German Leal		
Date	October 29, 2024	Project Number	60705950

Please find attached the following material test result(s) on sample(s) submitted to the Winnipeg Geotechnical Laboratory:

- One Hundred eighty-eight (188) Moisture Content Determination Test.
- Twenty-eight (28) Atterberg Limits (3 Points) Test.
- Twenty-eight (28) Grain Size Distribution (Hydrometer method) Test.
- Thirty-three (33) Unconfined Compressive Strength Tests.
- Two (2) Hydraulic Conductivity Tests.

If you have any questions, please contact the undersigned.

Prepared by:

**Boughton,
Lee**
Digitally signed by Boughton, Lee
DN: cn=Boughton, Lee,
ou=CAWPG1,
email=Lee.Boughton@aecom.com
Date: 2024.10.29 11:04:00 -05'00'

Lee Boughton
Laboratory Manager

Att.

Reviewed by:

**Leal,
German**
Digitally signed by Leal, German
DN: cn=Leal, German,
ou=CAWPG1,
email=German.Leal@aecom.com
Date: 2024.12.12 12:31:05 -06'00'

German Leal, M.Eng., P.Eng.
Discipline Lead, Geotechnical



AECOM Canada Ltd.
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Winnipeg, Manitoba
R3P 0Y7
Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: Winnipeg, Manitoba
Sample Depth: Varies
Sample Number: Varies

Supplier: AECOM
Specification: N/A
Field Technician: LBoughton
Sample Date: October 27, 2023
Lab Technician: LBoughton
Date Tested: November 1, 2023

Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH23-01	G1	0.15 - 0.30 m	28.6%
	G2	0.61 - 0.76 m	38.6%
	G3	1.37 - 1.52 m	37.2%
	G4	2.13 - 2.29 m	23.7%
	G5	2.90 - 3.05 m	24.7%
	G6	3.66 - 3.81 m	48.3%
	G7	4.42 - 4.57 m	36.4%
	G8	5.94 - 6.10 m	58.0%
	G9	7.47 - 7.62 m	58.1%
	G10	8.99 - 9.14 m	52.0%
	G11	10.52 - 10.67 m	51.7%
	G12	12.04 - 12.19 m	60.2%
	G13	13.56 - 13.72 m	56.7%
	G14	15.09 - 15.24 m	60.4%
	G15	16.61 - 16.76 m	44.0%
	G16	18.14 - 18.29 m	73.8%
	G17	19.66 - 19.81 m	10.2%
	G18	20.88 - 21.03 m	11.6%
TH23-02	G1	0.15 - 0.30 m	41.9%
	G2	0.61 - 0.76 m	32.1%
	G3	1.37 - 1.52 m	31.1%
	G4	2.13 - 2.29 m	23.6%
	G5	2.90 - 3.05 m	25.2%
	G6	3.66 - 3.81 m	52.5%
	G7	4.42 - 4.57 m	55.4%
	G8	5.94 - 6.10 m	61.7%
	G9	7.47 - 7.62 m	55.2%
	G10	8.99 - 9.14 m	47.2%
	G11	10.52 - 10.67 m	45.1%
TH23-03	G1	0.15 - 0.30 m	23.0%
	G2	0.61 - 0.76 m	34.7%
	G3	1.37 - 1.52 m	27.1%
	G4	2.13 - 2.29 m	32.5%
	G5	2.90 - 3.05 m	34.9%
	G6	3.66 - 3.81 m	26.6%
	G7	4.42 - 4.57 m	45.5%
	G8	5.94 - 6.10 m	58.6%
	G9	7.47 - 7.62 m	57.3%

Location	Sample	Depth (m)	Moisture Content (%)
	G10	8.99 - 9.14 m	53.3%
	G11	10.52 - 10.67 m	55.0%
TH23-04	G1	0.15 - 0.30 m	28.1%
	G2	0.61 - 0.76 m	28.5%
	G3	1.37 - 1.52 m	34.0%
	G4	2.13 - 2.29 m	24.9%
	G5	2.90 - 3.05 m	22.3%
	G6	3.66 - 3.81 m	44.9%
	G7	4.42 - 4.57 m	52.7%
	G8	5.94 - 6.10 m	58.0%
	G9	7.47 - 7.62 m	60.0%
	G10	8.99 - 9.14 m	52.5%
	G11	10.52 - 10.67 m	49.4%
TH23-05	G1	0.15 - 0.30 m	33.7%
	G2	0.61 - 0.76 m	22.2%
	G3	1.37 - 1.52 m	31.4%
	G4	2.13 - 2.29 m	23.8%
	G5	2.90 - 3.05 m	23.6%
	G6	3.66 - 3.81 m	54.6%
	G7	4.42 - 4.57 m	53.6%
	G8	5.94 - 6.10 m	52.4%
	G9	7.47 - 7.62 m	46.3%
	G10	8.99 - 9.14 m	43.2%
	G11	10.52 - 10.67 m	57.5%
TH23-06	G1	0.15 - 0.30 m	27.6%
	G2	0.61 - 0.76 m	24.2%
	G3	1.37 - 1.52 m	23.3%
	G4	2.13 - 2.29 m	23.8%
	G5	2.90 - 3.05 m	22.8%
	G6	3.66 - 3.81 m	47.8%
	G7	4.42 - 4.57 m	50.0%
	G8	5.94 - 6.10 m	51.2%
	G9	7.47 - 7.62 m	51.2%
	G10	8.99 - 9.14 m	47.4%
	G11	10.52 - 10.67 m	54.7%
TH23-07	G1	0.15 - 0.30 m	29.2%
	G2	0.61 - 0.76 m	23.6%
	G3	1.37 - 1.52 m	25.3%



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Winnipeg, Manitoba
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Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: Winnipeg, Manitoba
Sample Depth: Varies
Sample Number: Varies

Supplier: AECOM
Specification: N/A
Field Technician: LBoughton
Sample Date: October 27, 2023
Lab Technician: LBoughton
Date Tested: November 1, 2023

Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
	G4	2.13 - 2.29 m	33.3%
	G5	2.90 - 3.05 m	24.3%
	G6	3.66 - 3.81 m	53.3%
	G7	4.42 - 4.57 m	53.9%
	G8	5.94 - 6.10 m	51.1%
	G9	7.47 - 7.62 m	52.8%
	G10	8.99 - 9.14 m	52.2%
	G11	10.52 - 10.67 m	57.2%
	G12	12.04 - 12.19 m	51.9%
	G13	13.56 - 13.72 m	45.8%
	G14	15.09 - 15.24 m	52.1%
	G15	16.61 - 16.76 m	64.2%
	G16	18.14 - 18.29 m	57.6%
	G17	19.66 - 19.81 m	10.3%
	G18	20.57 - 20.73 m	11.4%



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Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: Winnipeg, Manitoba
Sample Depth: Varies
Sample Number: Varies

Supplier: AECOM
Specification: N/A
Field Technician: ABonifacio
Sample Date: December 15, 2023
Lab Technician: LBoughton
Date Tested: December 17, 2023

Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH23-08	G1	0.00 - 0.00 m	55.5%
	G2	0.00 - 0.00 m	42.4%
	G3	0.00 - 0.00 m	35.7%
	T4	0.00 - 0.00 m	-
	G5	0.00 - 0.00 m	24.6%
	G6	0.00 - 0.00 m	48.3%
	G7	0.00 - 0.00 m	54.2%
	T8	0.00 - 0.00 m	-
	G9	0.00 - 0.00 m	55.2%
	G10	0.00 - 0.00 m	50.2%
	T11	0.00 - 0.00 m	-
	G12	0.00 - 0.00 m	43.8%
	G13	0.00 - 0.00 m	46.7%
	T14	0.00 - 0.00 m	-
	G15	0.00 - 0.00 m	52.3%
	G16	0.00 - 0.00 m	53.4%
	G17	0.00 - 0.00 m	54.0%
	G18	0.00 - 0.00 m	34.2%



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Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: Winnipeg, Manitoba
Sample Depth: Varies
Sample Number: Varies

Supplier: AECOM
Field Technician: ABonifacio
Sample Date: January 12, 2024
Lab Technician: LBoughton
Date Tested: January 15, 2024

Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH24-09	G1	0.30 m	44.9%
	G2	0.76 m	33.5%
	G3	1.52 m	21.1%
	G4	1.98 m	24.2%
	G5	3.05 m	43.6%
	G6	4.57 m	38.2%
	G7	6.10 m	55.8%
	G8	7.62 m	45.2%
	G9	9.14 m	42.9%
	G10	10.67 m	45.1%
TH24-10	G1	0.30 m	40.3%
	G2	0.76 m	26.7%
	G3	1.52 m	26.2%
	G4	3.05 m	55.4%
	G5	4.57 m	51.7%
	G6	6.10 m	60.0%
	G8	7.62 m	48.0%
	G9	9.14 m	47.7%
	G11	10.67 m	47.4%
	G12	12.19 m	57.2%
TH24-11	G13	13.72 m	51.8%
	G14	15.24 m	62.3%
	G15	16.31 m	10.7%
	G1	0.30 m	52.2%
	G2	0.76 m	40.6%
	G3	1.52 m	26.6%
	G4	1.98 m	23.2%
	G5	3.05 m	37.4%
	G7	4.57 m	36.4%
	G8	6.10 m	50.2%
TH24-12	G9	7.62 m	46.5%
	G10	9.14 m	41.2%
	G11	10.67 m	26.7%
	G12	12.19 m	51.2%
	G13	13.72 m	43.8%
	G14	15.24 m	49.5%
	G15	18.29 m	25.6%
	G16	19.96 m	17.5%

Location	Sample	Depth (m)	Moisture Content (%)
TH24-12	G1	0.30 m	40.4%
	G2	0.76 m	36.7%
	G3	1.52 m	37.6%
	G4	1.98 m	22.4%
	G5	3.05 m	52.5%
	G6	4.57 m	52.2%
	G7	6.10 m	53.8%
	G8	7.62 m	46.2%
	G9	9.14 m	41.6%
	G10	10.67 m	46.9%
TH24-13	G1	0.30 m	44.3%
	G2	0.76 m	31.7%
	G3	1.52 m	15.3%
	G4	2.90 m	25.9%
	G6	4.57 m	50.8%
	G7	6.10 m	53.2%
	G12	20.27 m	10.7%
	G1	0.30 m	48.4%
	G2	0.76 m	42.4%
	G3	1.52 m	35.2%
TH24-14	G4	1.68 m	35.3%
	G5	3.05 m	24.1%
	G7	4.57 m	51.0%
	G9	6.10 m	44.3%
	G11	7.62 m	50.7%
	G12	9.14 m	54.5%
	G1	0.30 m	36.0%
	G2	0.76 m	35.3%
	G3	1.98 m	37.3%
	G4	3.05 m	22.2%
TH24-15	G5	3.20 m	46.4%
	G6	4.57 m	54.9%
	G7	6.10 m	58.0%
	G9	7.62 m	57.2%
	G11	9.14 m	46.7%
	G1	0.30 m	29.7%
	G2	0.76 m	17.8%
	G3	1.52 m	34.2%



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Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: Winnipeg, Manitoba
Sample Depth: Varies
Sample Number: Varies

Supplier: AECOM
Specification: N/A
Field Technician: ABonifacio
Sample Date: January 12, 2024
Lab Technician: LBoughton
Date Tested: January 15, 2024

Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH24-16	G4	3.05 m	30.5%
	G5	3.81 m	25.8%
	G6	4.57 m	39.6%
	G7	6.10 m	54.9%
	G8	7.62 m	56.1%
	G9	9.14 m	57.9%
	G10	10.67 m	52.4%



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Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-01

Sample Depth: 1.52 - 1.98 m

Sample Number: T4

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

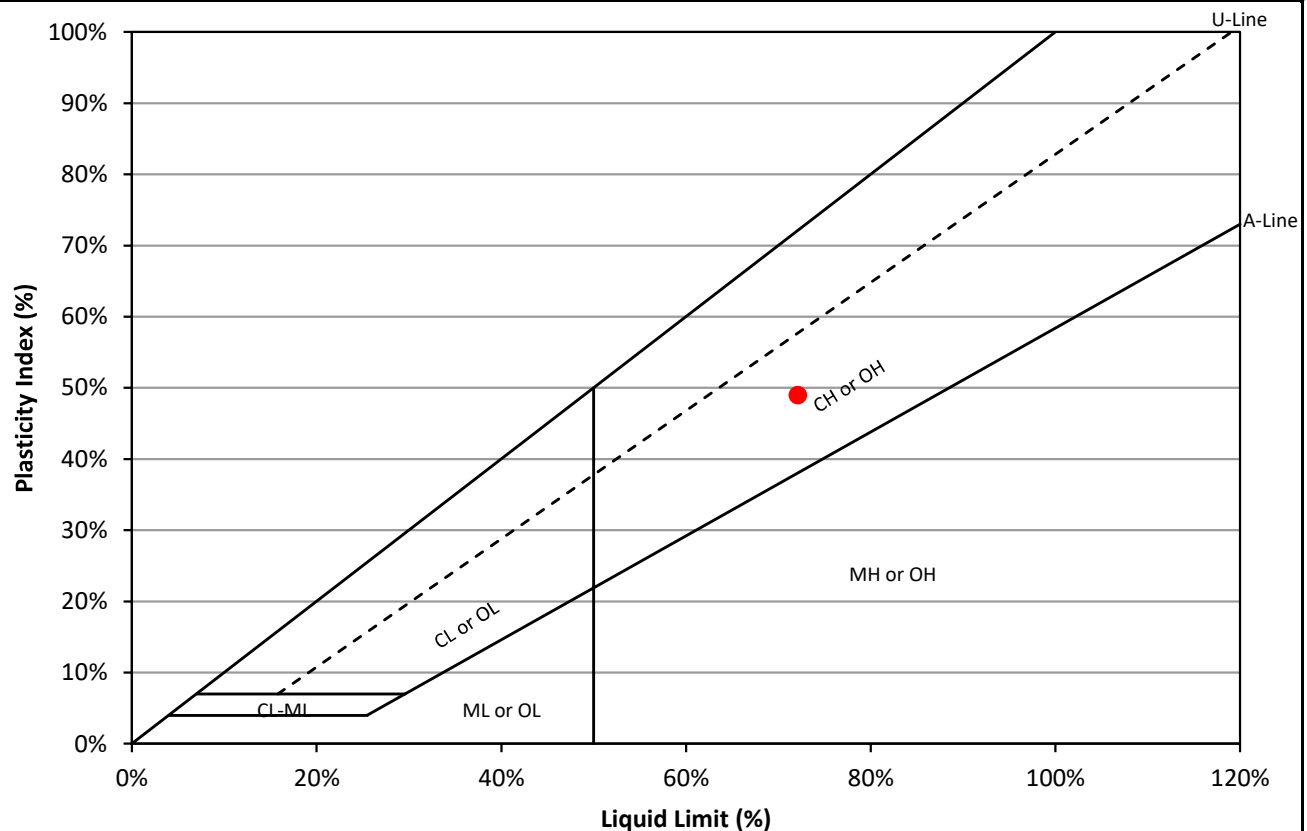
Lab Technician: JWiens

Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit				Plastic Limit		
Blows	28	23	19	Trial	1	2
Wet Sample (g)	8.1	11.3	9.8	Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	6.6	5.7	Dry Sample (g)	4.8	4.8
Water Content (%)	72.1%	71.6%	73.5%	Water Content (%)	22.5%	23.8%



Liquid Limit:	72	Plastic Limit:	23	Plasticity Index:	49
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-01

Sample Depth: 2.13 - 2.29 m

Sample Number: G5

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

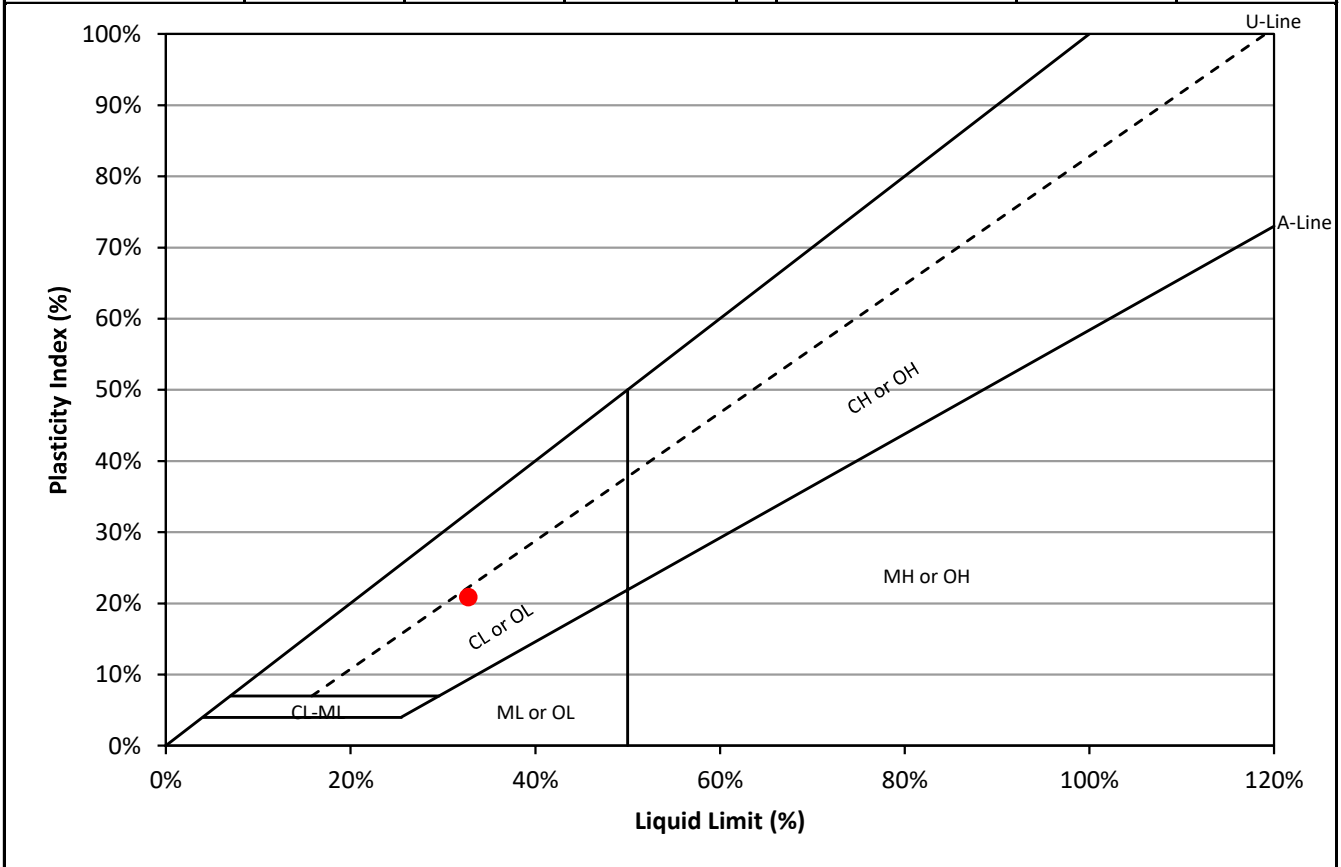
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	33	22	18
Wet Sample (g)	13.1	8.7	9.6
Dry Sample (g)	9.9	6.6	7.2
Water Content (%)	31.8%	33.4%	33.6%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	5.2	5.3
Water Content (%)	11.9%	11.8%



Liquid Limit:	33	Plastic Limit:	12	Plasticity Index:	21
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-01

Sample Depth: 10.67 - 11.13 m

Sample Number: T15

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: October 27, 2023

Lab Technician: JWiens

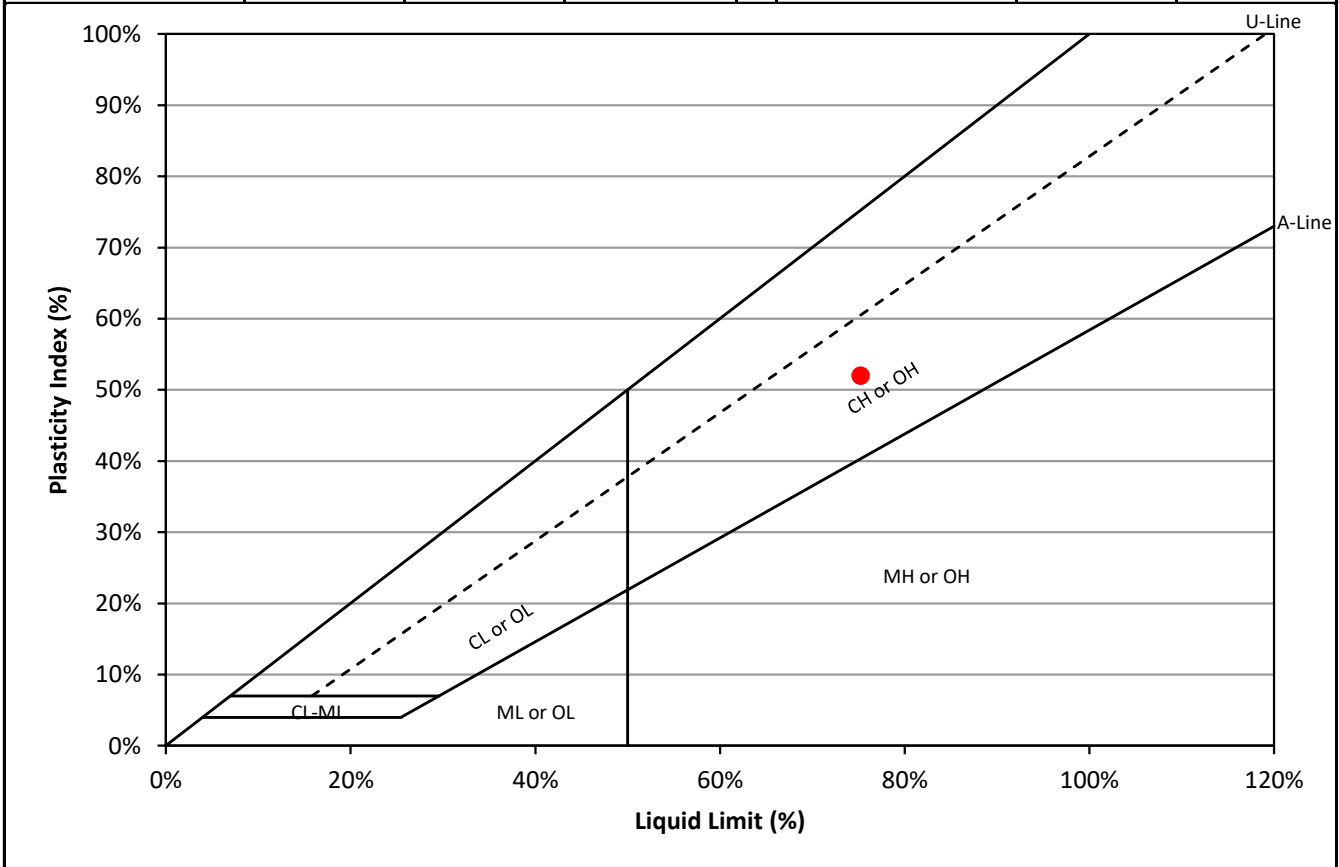
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	20	15
Wet Sample (g)	9.3	9.8	8.1
Dry Sample (g)	5.3	5.5	4.5
Water Content (%)	73.7%	77.4%	81.1%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.8	4.8
Water Content (%)	23.0%	23.5%



Liquid Limit:	75	Plastic Limit:	23	Plasticity Index:	52
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-01

Sample Depth: 19.66 - 19.81 m

Sample Number: G23

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

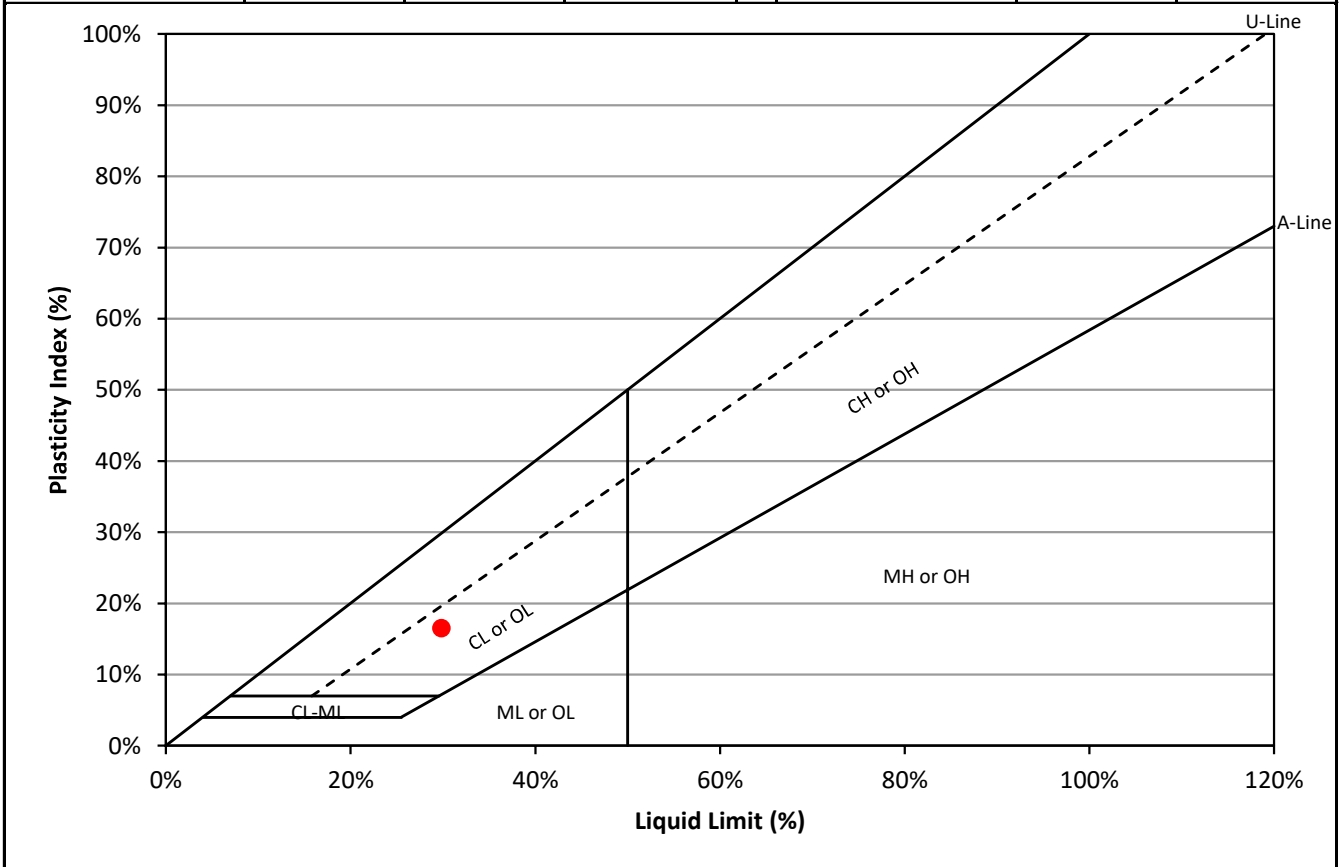
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	31	26	17
Wet Sample (g)	11.4	9.8	8.8
Dry Sample (g)	8.9	7.5	6.6
Water Content (%)	27.7%	30.2%	32.6%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	5.2	5.2
Water Content (%)	13.4%	13.3%



Liquid Limit:	30	Plastic Limit:	13	Plasticity Index:	17
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-02

Sample Depth: 0.61 - 0.76 m

Sample Number: G2

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

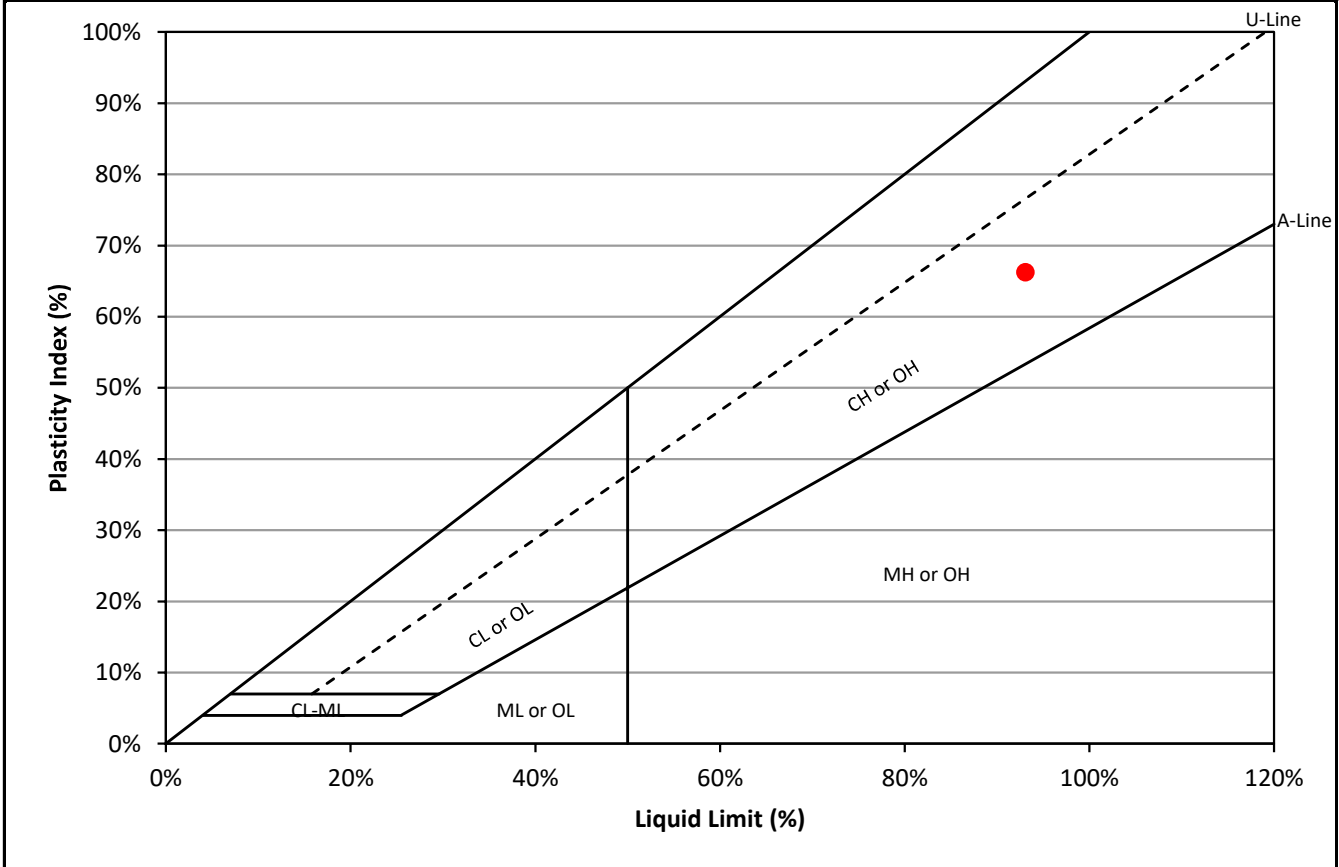
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	33	20	18
Wet Sample (g)	10.5	7.7	8.6
Dry Sample (g)	5.5	4.0	4.4
Water Content (%)	91.0%	94.4%	95.9%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.0	4.7
Dry Sample (g)	4.8	3.7
Water Content (%)	26.4%	27.2%



Liquid Limit:	93	Plastic Limit:	27	Plasticity Index:	66
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-02

Sample Depth: 2.13 - 2.29 m

Sample Number: G4

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

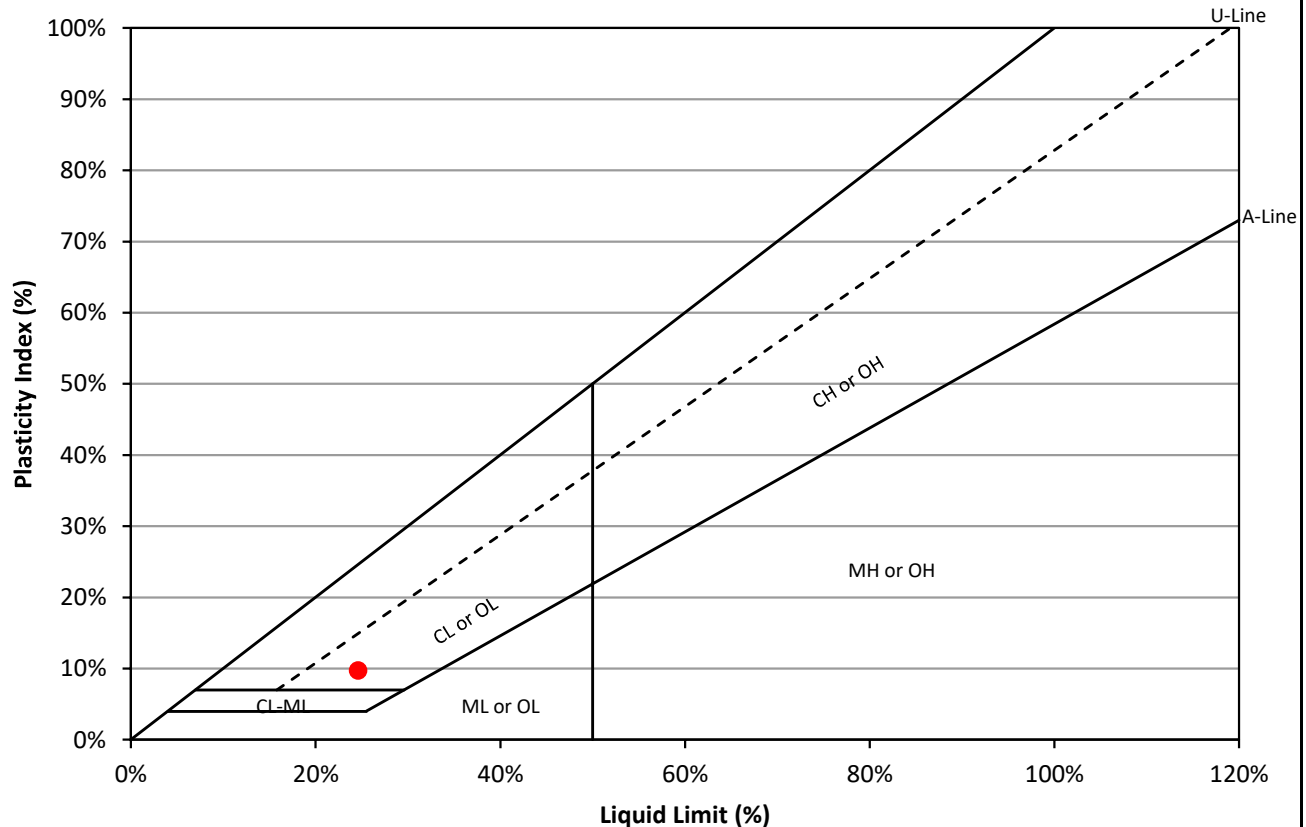
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

	Liquid Limit		
Blows	34	24	17
Wet Sample (g)	9.4	10.7	9.6
Dry Sample (g)	7.6	8.6	7.7
Water Content (%)	23.8%	24.9%	25.3%

	Plastic Limit	
Trial	1	2
Wet Sample (g)	6.2	9.0
Dry Sample (g)	5.4	7.9
Water Content (%)	14.7%	15.1%



Liquid Limit:

25

Plastic Limit:

15

Plasticity Index:

10

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-02

Sample Depth: 5.94 - 6.10 m

Sample Number: G8

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

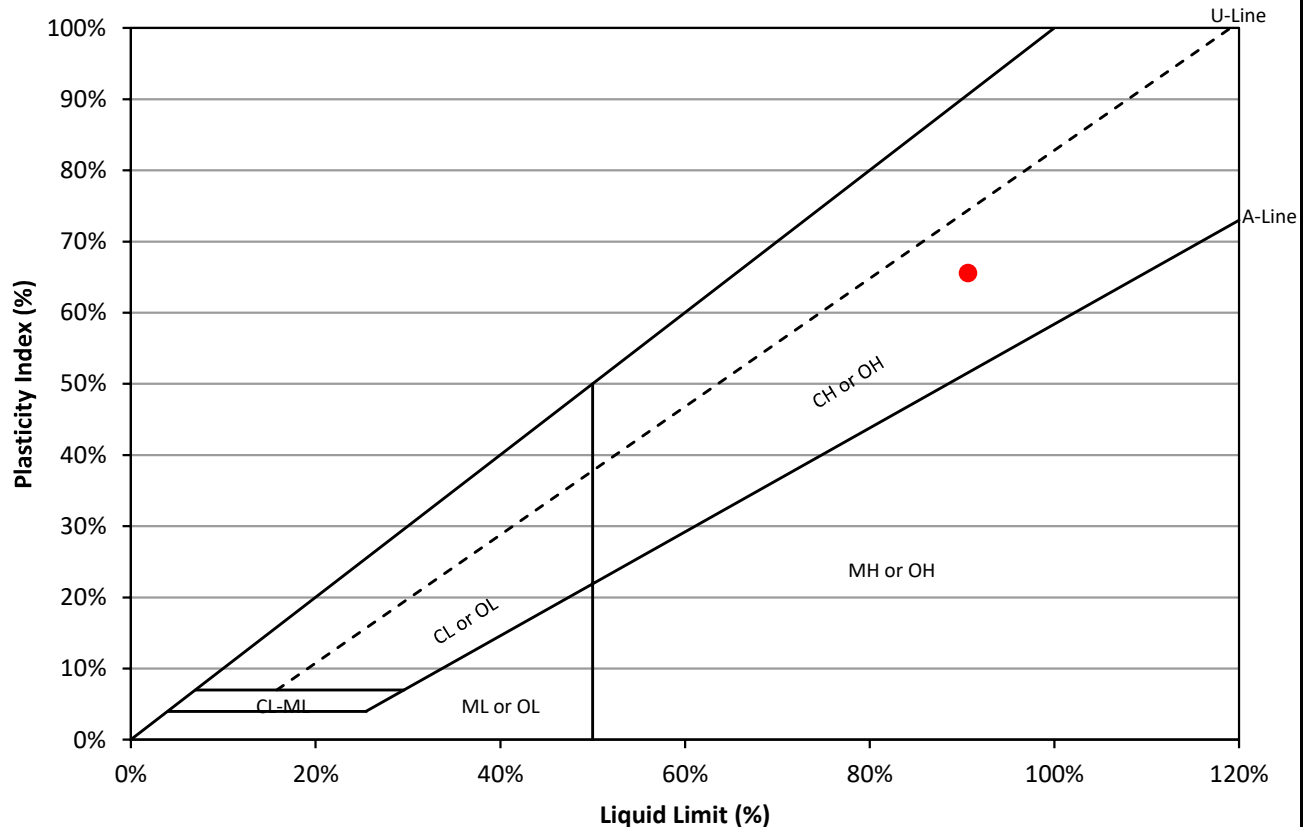
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	35	23	17
Wet Sample (g)	7.8	9.2	9.4
Dry Sample (g)	4.1	4.8	4.9
Water Content (%)	89.4%	90.8%	92.2%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	4.7
Water Content (%)	25.1%	25.1%



Liquid Limit:

91

Plastic Limit:

25

Plasticity Index):

66

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-03

Sample Depth: 2.13 - 2.29 m

Sample Number: G4

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

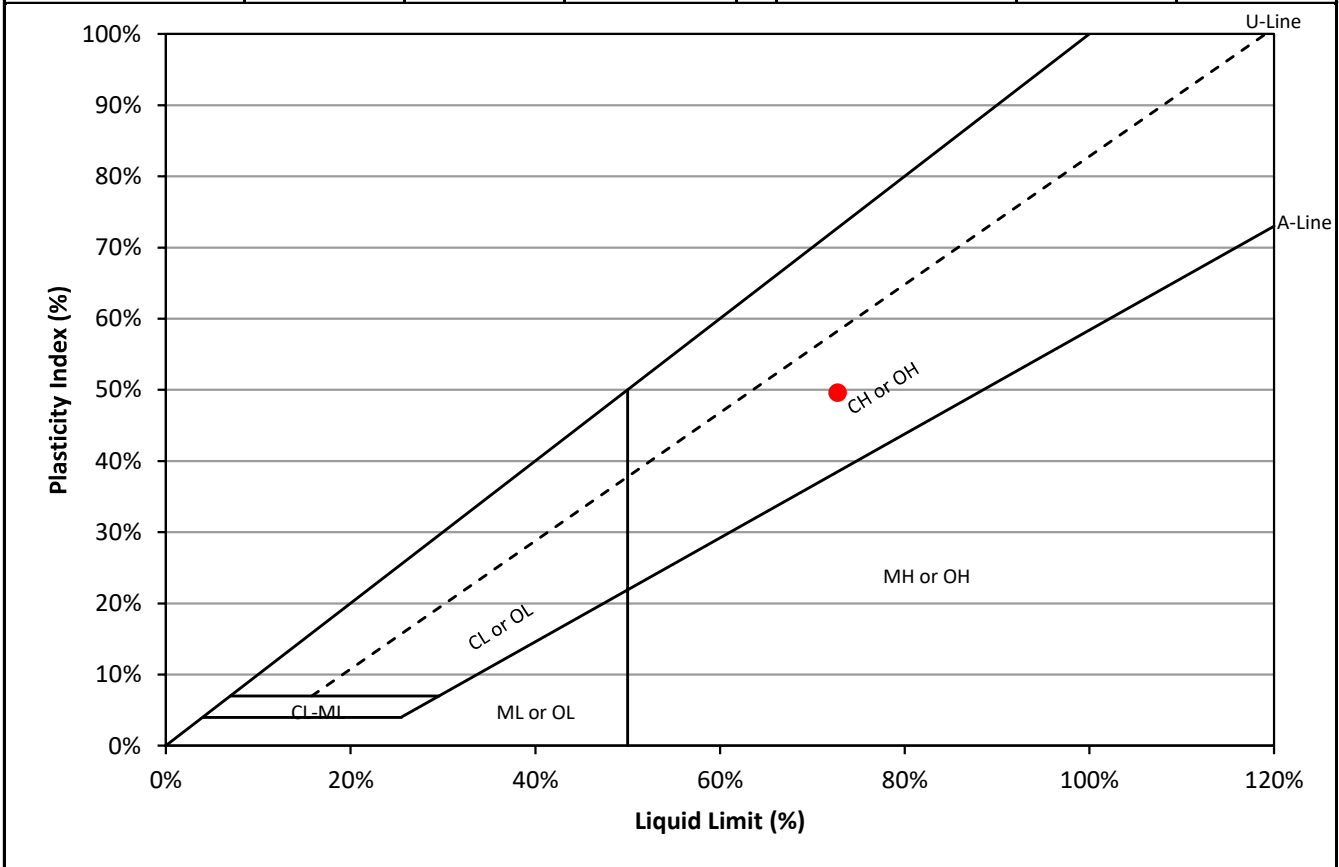
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	33	22	19
Wet Sample (g)	8.9	9.2	9.4
Dry Sample (g)	5.2	5.3	5.4
Water Content (%)	71.0%	73.6%	74.3%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.8	4.8
Water Content (%)	22.5%	23.8%



Liquid Limit:	73	Plastic Limit:	23	Plasticity Index:	50
---------------	-----------	----------------	-----------	-------------------	-----------

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-05

Sample Depth: 1.52 - 2.13 m

Sample Number: T4

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

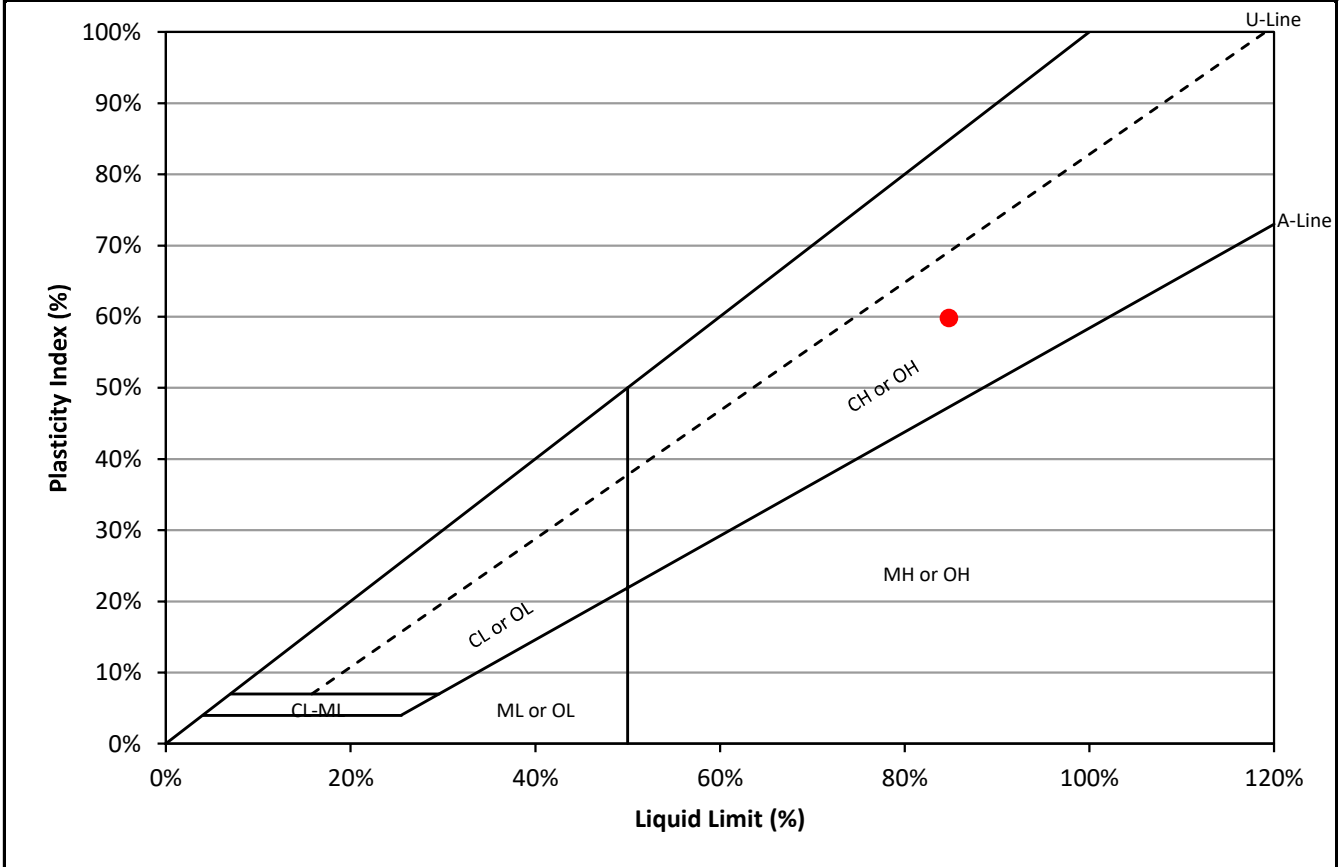
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	28	25	22
Wet Sample (g)	9.2	9.2	9.9
Dry Sample (g)	5.0	5.0	5.3
Water Content (%)	84.0%	84.5%	85.9%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	4.7
Water Content (%)	25.1%	24.8%



Liquid Limit:	85	Plastic Limit:	25	Plasticity Index:	60
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
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99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-05

Sample Depth: 4.57 - 5.18 m

Sample Number: T9

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

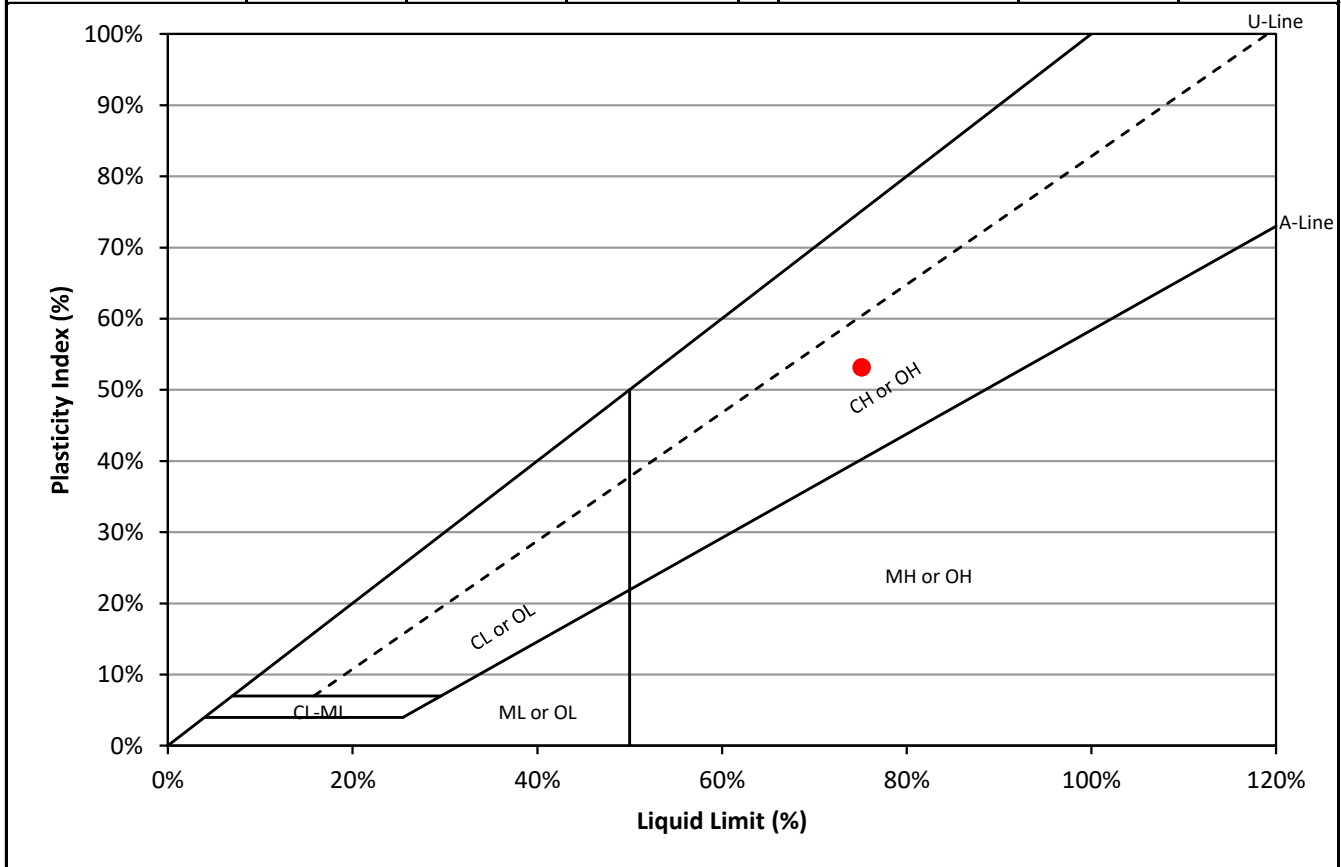
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	30	25	21
Wet Sample (g)	8.6	9.6	8.1
Dry Sample (g)	5.0	5.4	4.6
Water Content (%)	73.5%	75.7%	76.1%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.8	4.8
Water Content (%)	22.0%	22.0%



Liquid Limit:	75	Plastic Limit:	22	Plasticity Index:	53
---------------	----	----------------	----	-------------------	----

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: TH23-06
Sample Depth: 2.13 - 2.29 m
Sample Number: G4

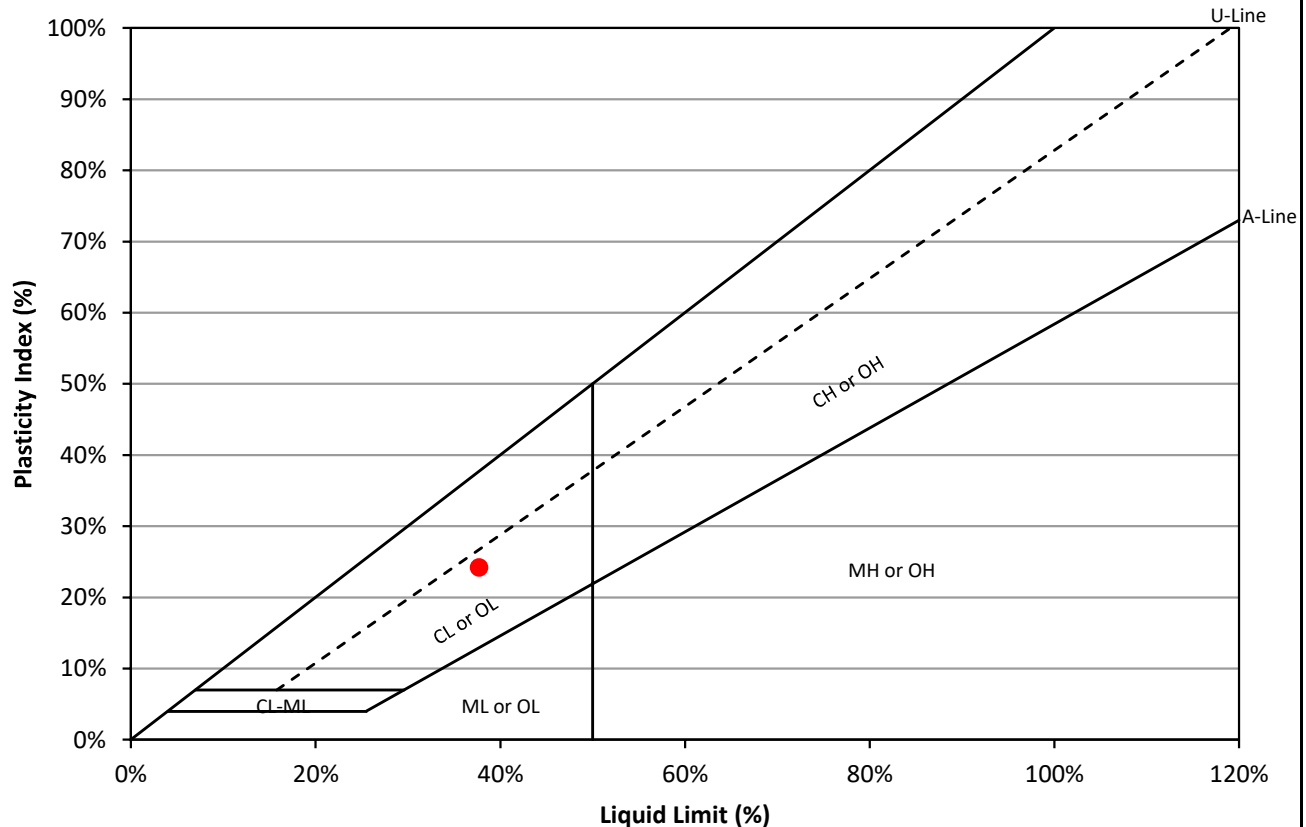
Supplier/Location: Winnipeg, MB
Field Technician: LBoughton
Sample Date: October 27, 2023
Lab Technician: JWiens
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	23	19
Wet Sample (g)	8.2	11.2	8.4
Dry Sample (g)	6.1	8.1	6.0
Water Content (%)	35.8%	38.9%	40.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	5.2	5.2
Water Content (%)	13.0%	14.0%



Liquid Limit:	38	Plastic Limit:	13	Plasticity Index:	24
---------------	-----------	----------------	-----------	-------------------	-----------

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-06

Sample Depth: 6.10 - 6.71 m

Sample Number: T10

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

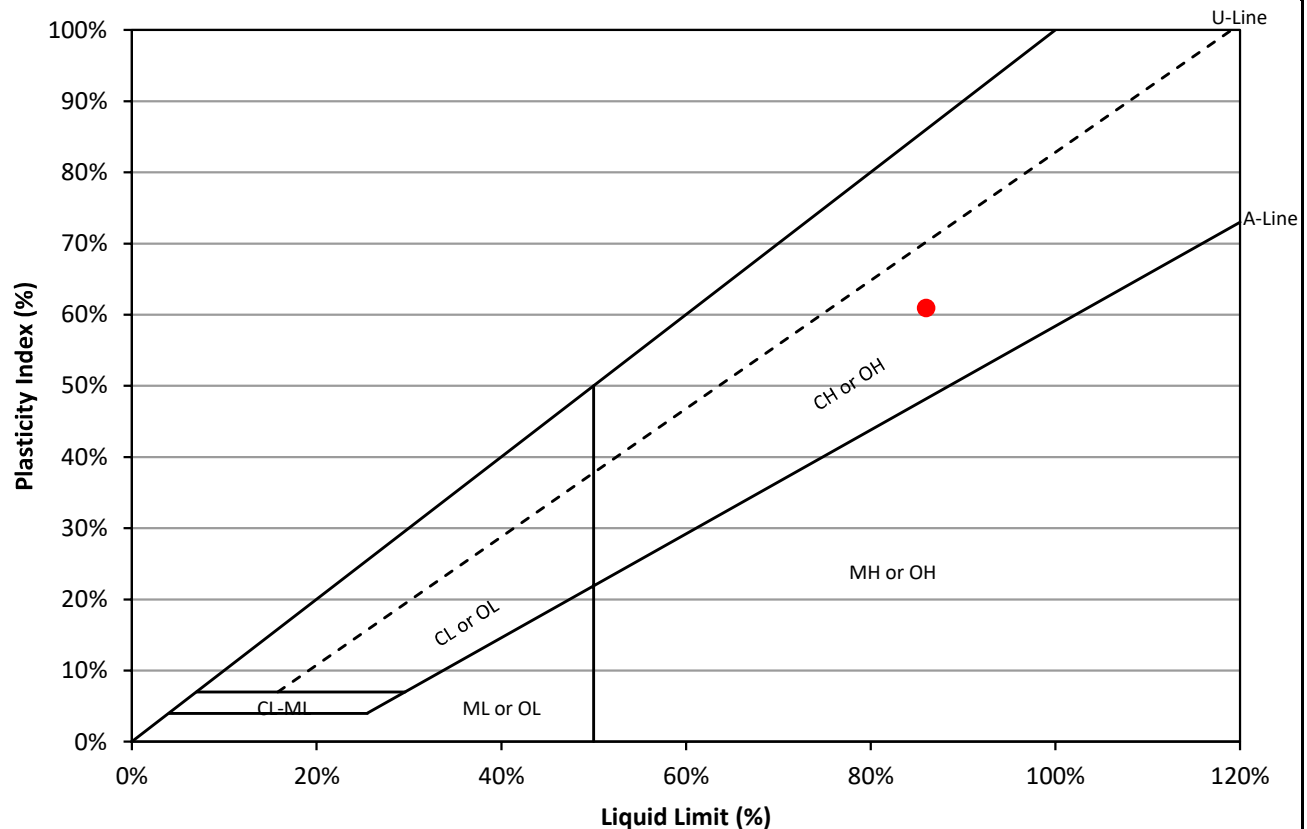
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

	Liquid Limit		
Blows	31	20	19
Wet Sample (g)	8.9	9.5	8.2
Dry Sample (g)	4.9	5.0	4.3
Water Content (%)	82.3%	88.8%	91.9%

	Plastic Limit	
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	4.7
Water Content (%)	25.1%	25.1%



Liquid Limit:

86

Plastic Limit:

25

Plasticity Index:

61

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-07

Sample Depth: 0.61 - 0.76 m

Sample Number: G2

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

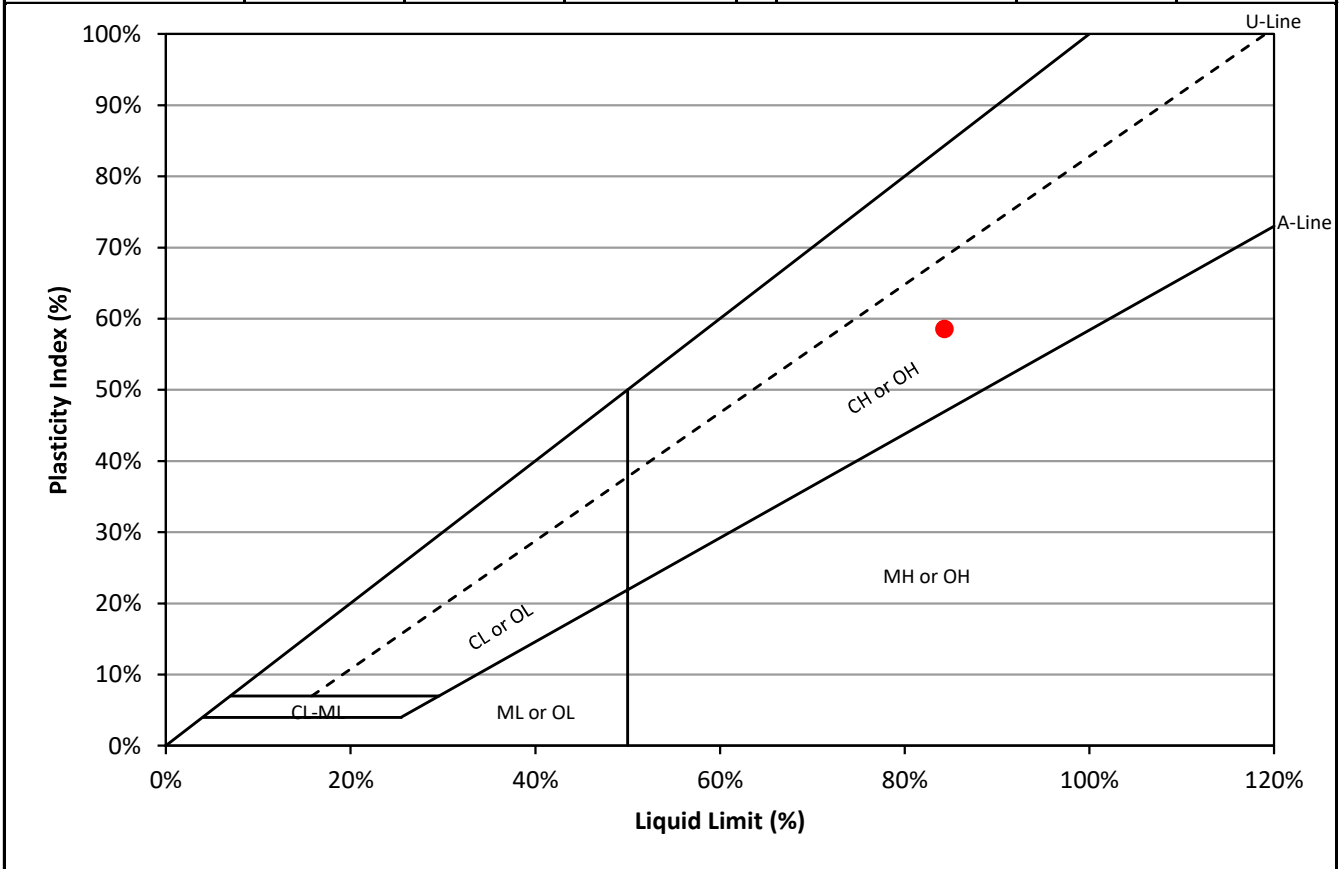
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	25	18
Wet Sample (g)	10.0	9.1	10.0
Dry Sample (g)	5.5	4.9	5.4
Water Content (%)	83.1%	84.8%	86.1%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	4.7
Water Content (%)	25.1%	26.4%



Liquid Limit:	84	Plastic Limit:	26	Plasticity Index:	59
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-07

Sample Depth: 2.13 - 2.29 m

Sample Number: G4

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

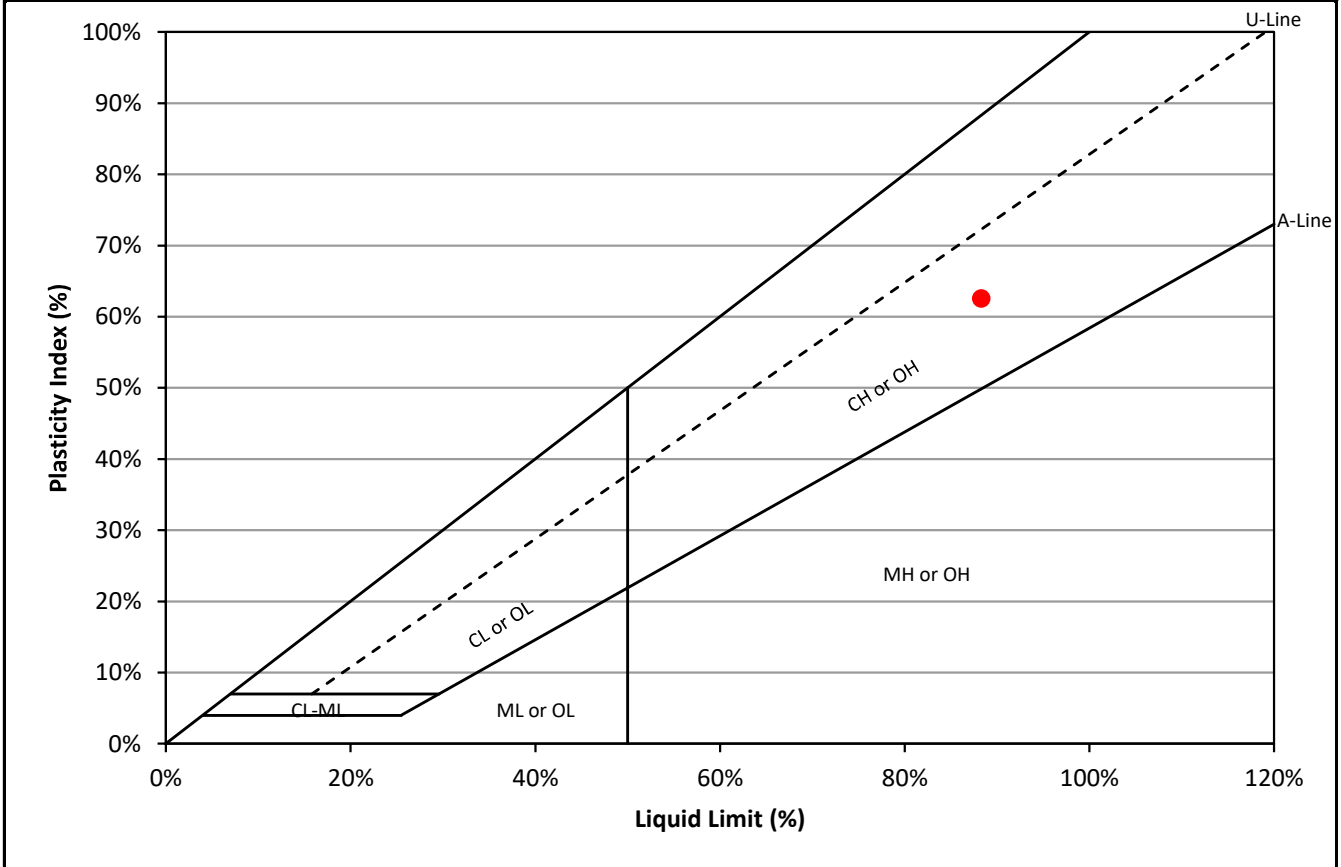
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	35	23	19
Wet Sample (g)	8.6	8.2	10.1
Dry Sample (g)	4.7	4.3	5.3
Water Content (%)	83.5%	89.5%	92.2%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	4.7
Water Content (%)	25.1%	26.4%



Liquid Limit:	88	Plastic Limit:	26	Plasticity Index:	63
---------------	-----------	----------------	-----------	-------------------	-----------

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-07

Sample Depth: 2.90 - 3.05 m

Sample Number: G5

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

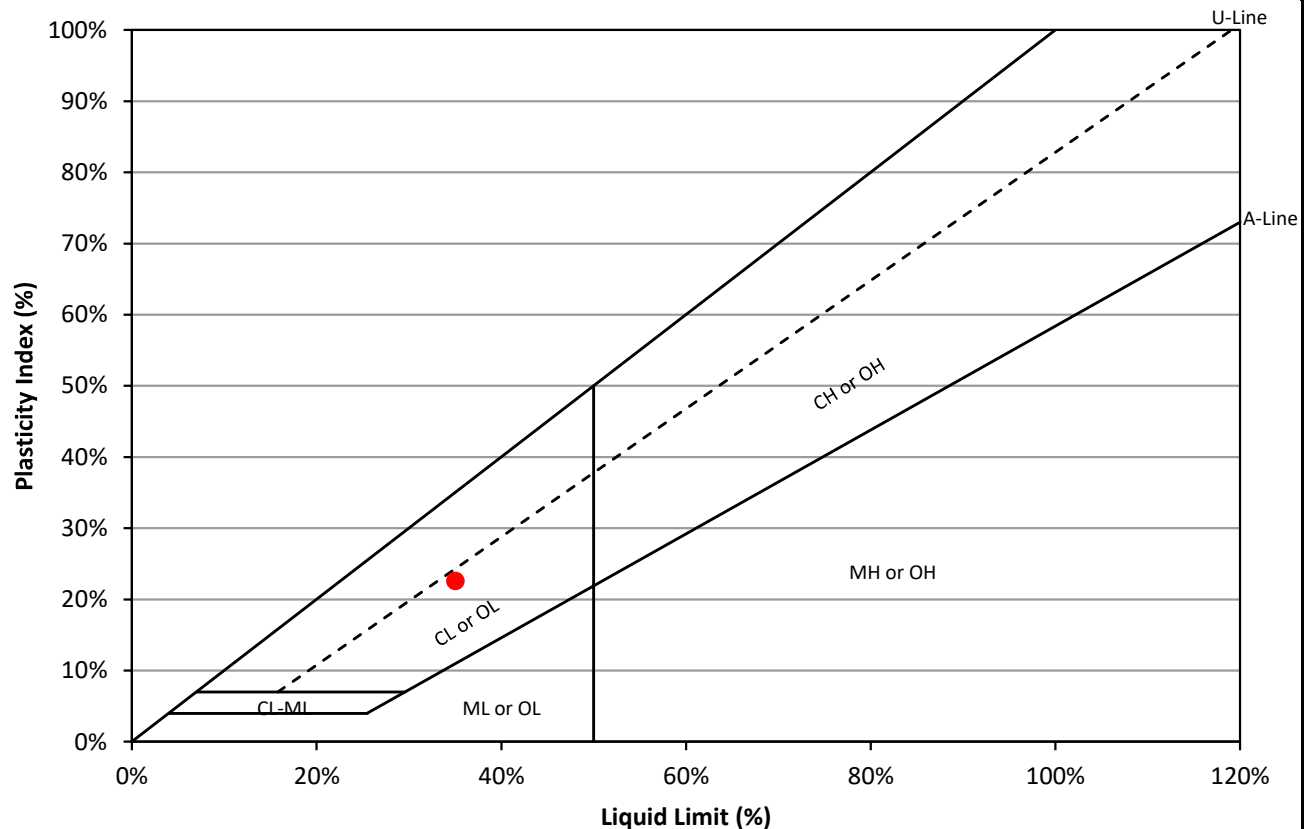
Lab Technician: JWiens

Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit				Plastic Limit		
Blows	33	23	18	Trial	1	2
Wet Sample (g)	8.8	8.2	8.0	Wet Sample (g)	5.9	5.9
Dry Sample (g)	6.6	6.0	5.9	Dry Sample (g)	5.2	5.3
Water Content (%)	33.8%	35.3%	36.5%	Water Content (%)	12.6%	12.2%



Liquid Limit:	35	Plastic Limit:	12	Plasticity Index:	23
---------------	-----------	----------------	-----------	-------------------	-----------

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-07

Sample Depth: 9.14 - 9.60 m

Sample Number: T13

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: October 27, 2023

Lab Technician: JWiens

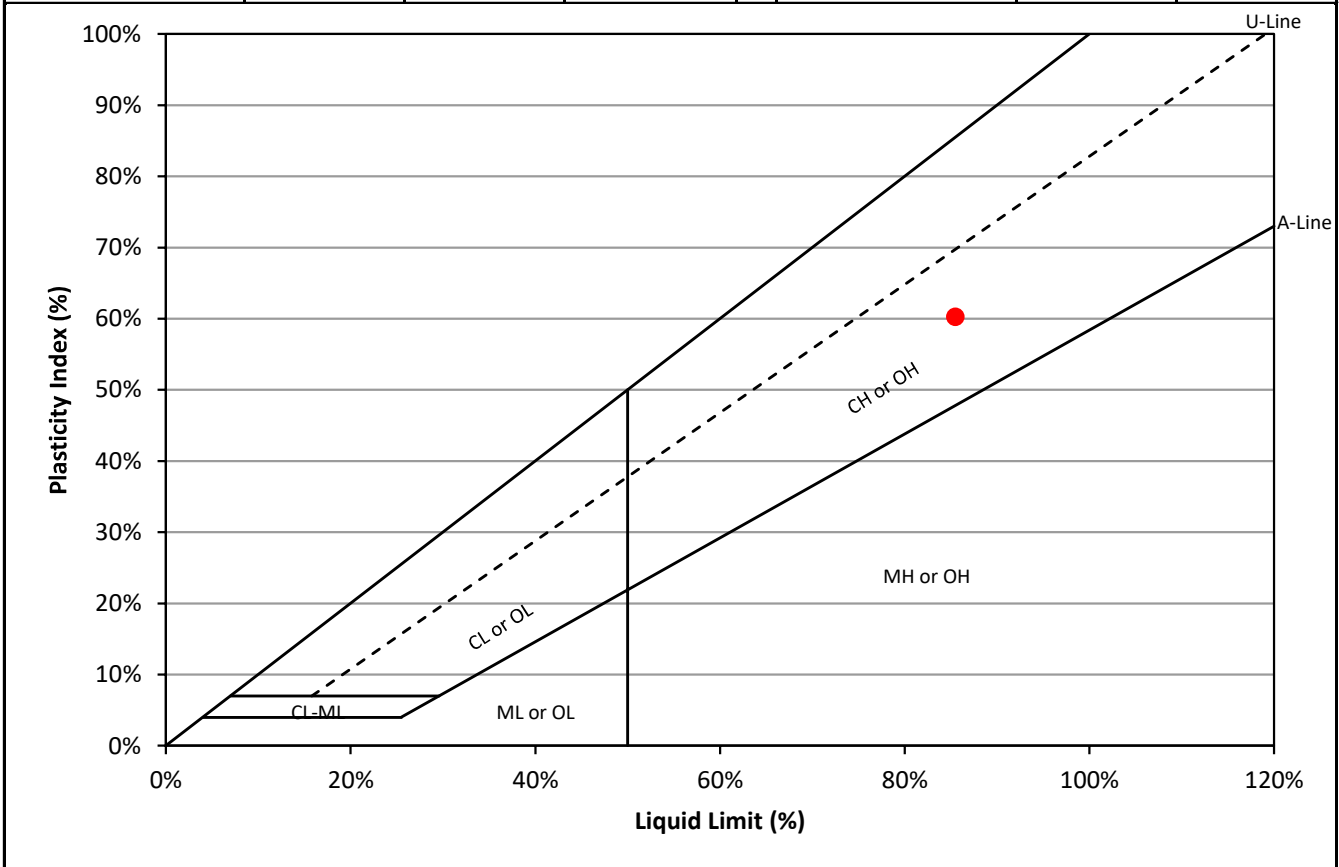
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	34	24	20
Wet Sample (g)	9.8	8.2	8.8
Dry Sample (g)	5.3	4.4	4.7
Water Content (%)	84.7%	85.5%	86.2%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	4.7	4.7
Water Content (%)	25.1%	25.3%



Liquid Limit:	85	Plastic Limit:	25	Plasticity Index:	60
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-07

Sample Depth: 19.66 - 19.81 m

Sample Number: G23

Supplier/Location: Winnipeg, MB

Field Technician: LBoughton

Sample Date: October 27, 2023

Lab Technician: JWiens

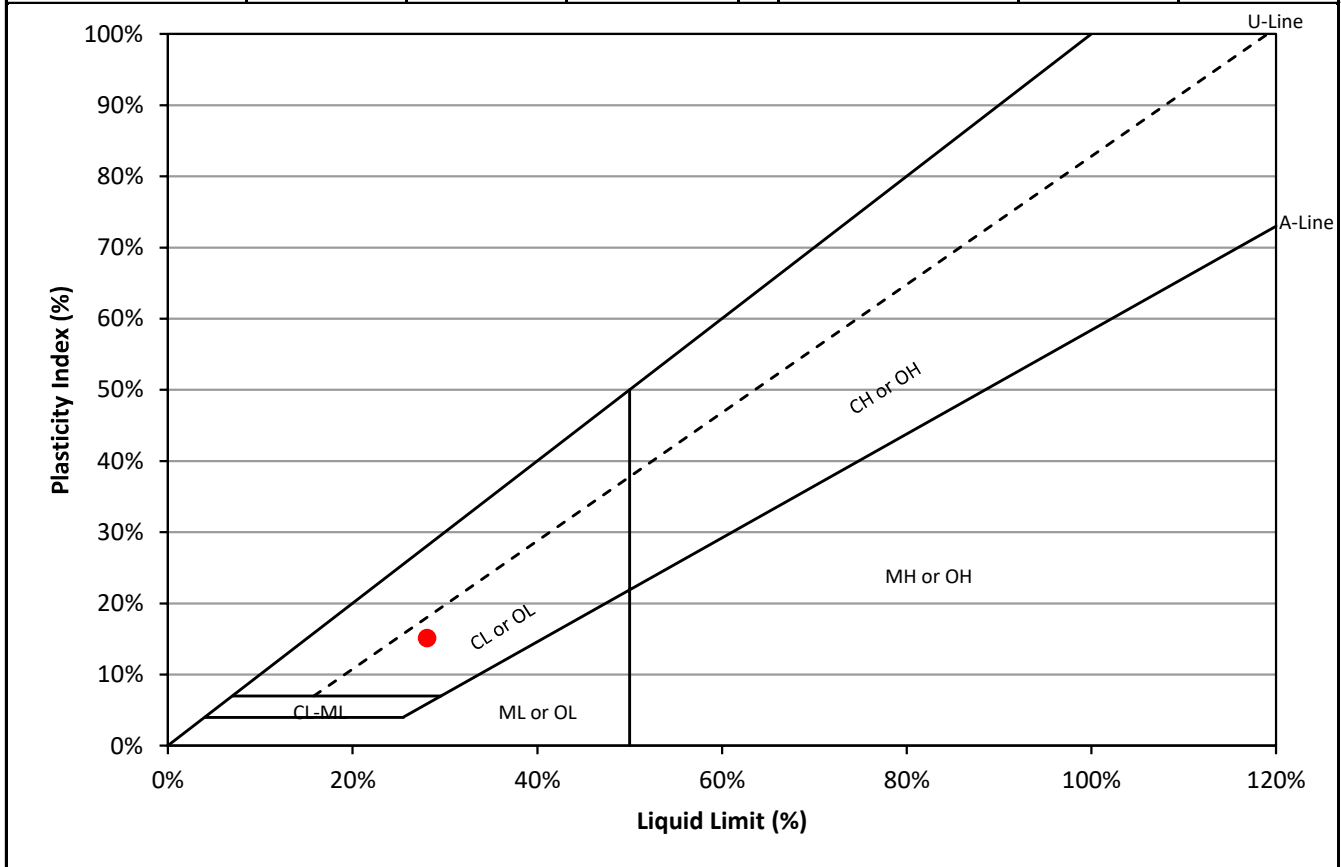
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	31	26	17
Wet Sample (g)	11.4	9.8	8.8
Dry Sample (g)	9.0	7.6	6.7
Water Content (%)	26.3%	28.5%	30.3%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.9	5.9
Dry Sample (g)	5.2	5.2
Water Content (%)	13.0%	12.9%



Liquid Limit:	28	Plastic Limit:	13	Plasticity Index:	15
---------------	-----------	----------------	-----------	-------------------	-----------

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-08

Sample Depth: 1.52 - 1.98 m

Sample Number: T4

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: December 15, 2023

Lab Technician: JWiens

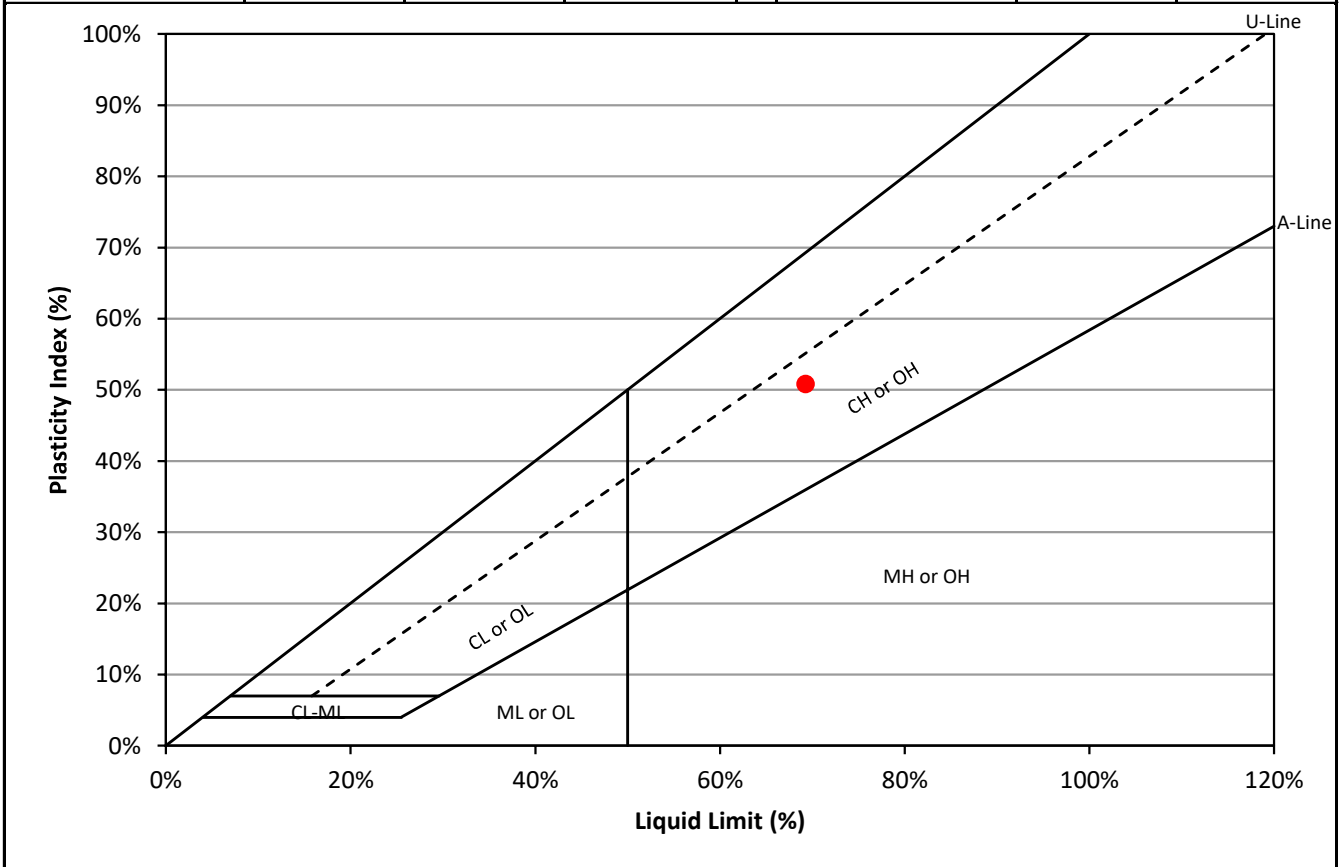
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	32	25	18
Wet Sample (g)	8.1	10.6	9.3
Dry Sample (g)	4.8	6.3	5.4
Water Content (%)	67.5%	68.4%	72.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.2	6.2
Dry Sample (g)	5.2	5.3
Water Content (%)	18.5%	18.4%



Liquid Limit (%):	69	Plastic Limit (%):	18	Plasticity Index (%):	51
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-08

Sample Depth: 2.13 - 2.29 m

Sample Number: G5

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: December 15, 2023

Lab Technician: JWiens

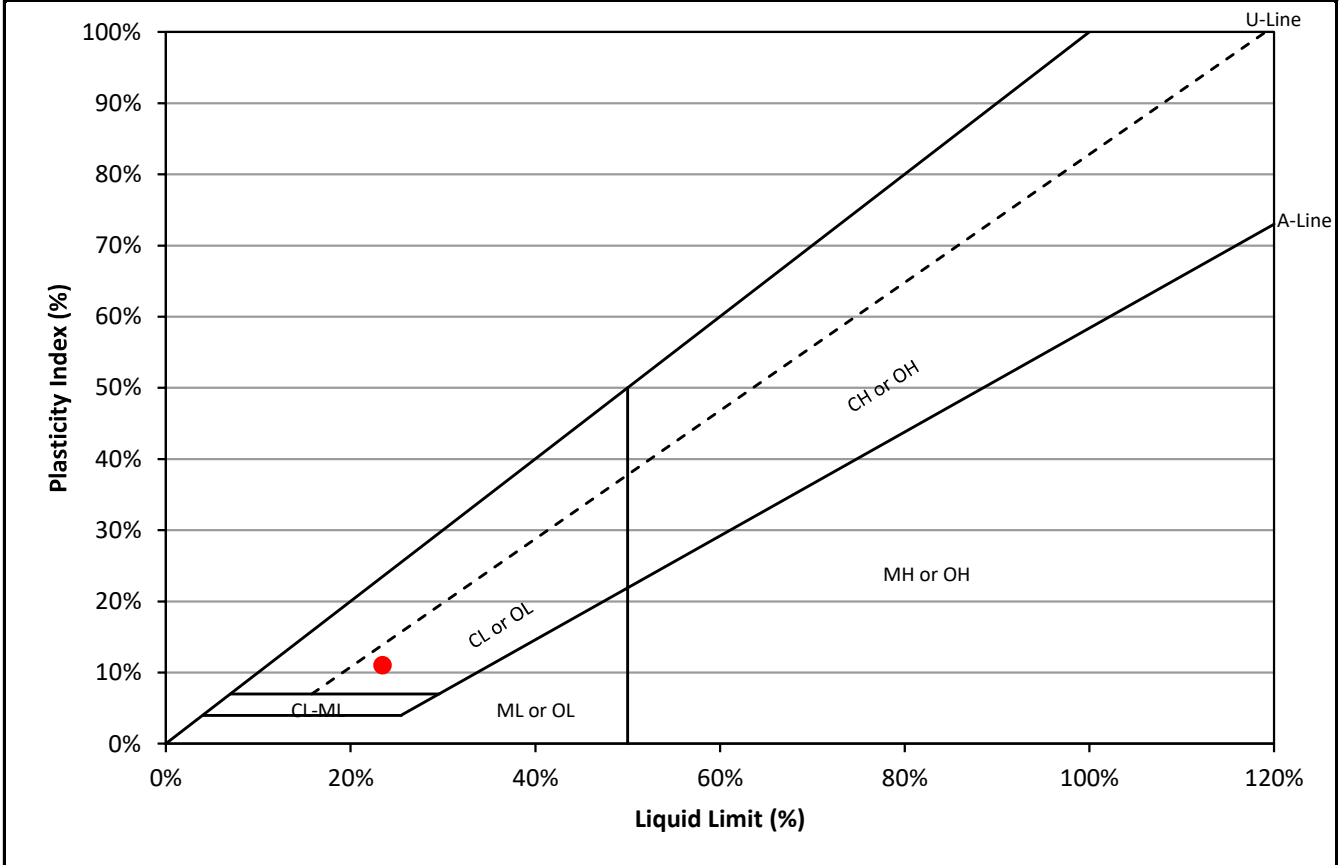
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	24	19
Wet Sample (g)	15.4	11.5	9.7
Dry Sample (g)	12.6	9.3	7.8
Water Content (%)	22.9%	23.4%	24.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.1	6.2
Dry Sample (g)	5.4	5.5
Water Content (%)	12.3%	12.5%



Liquid Limit:	23	Plastic Limit:	12	Plasticity Index:	11
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-08

Sample Depth: 7.62 - 8.08 m

Sample Number: T11

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: December 15, 2023

Lab Technician: JWiens

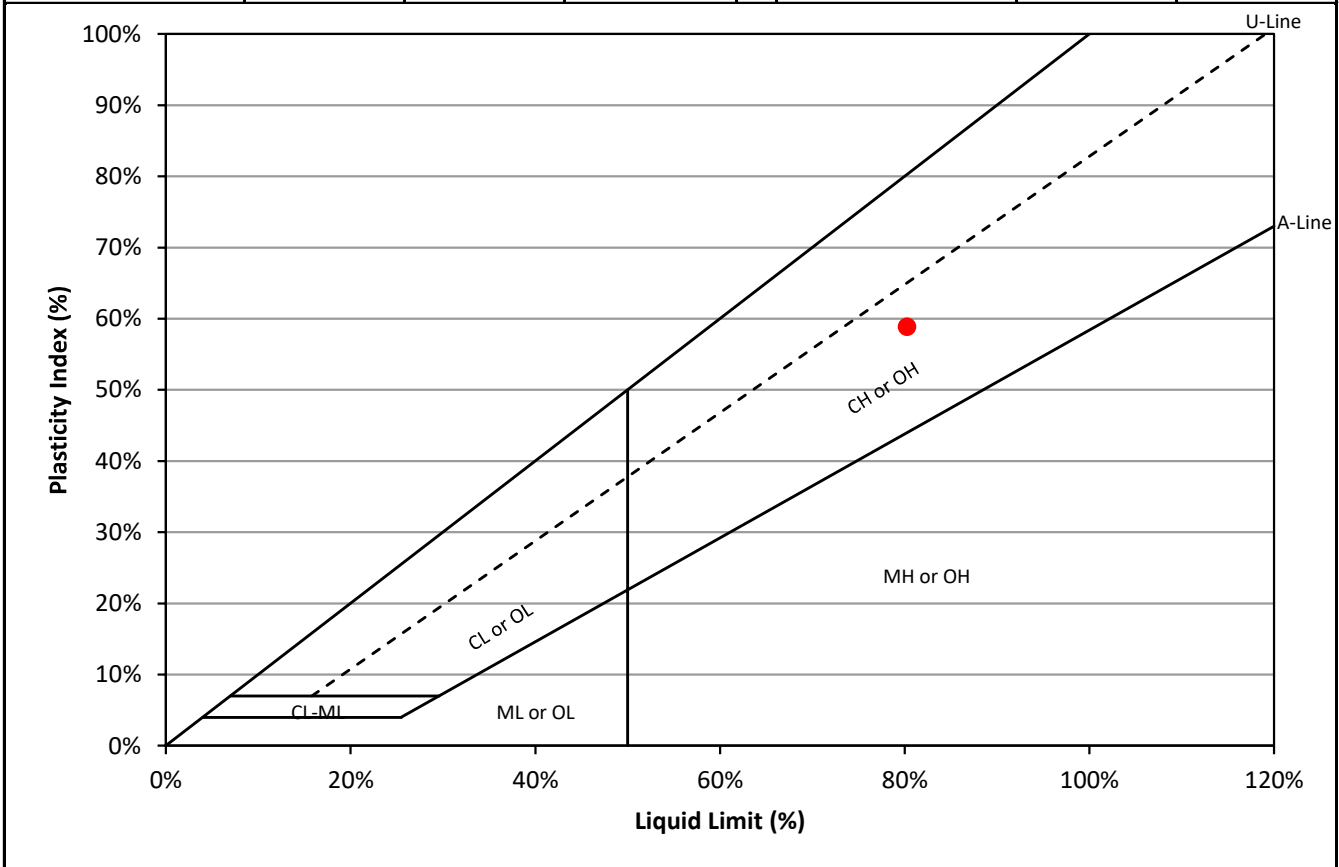
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	31	25	20
Wet Sample (g)	11.0	12.0	9.7
Dry Sample (g)	6.2	6.6	5.3
Water Content (%)	76.4%	81.9%	82.6%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.1	6.2
Dry Sample (g)	5.1	5.1
Water Content (%)	21.5%	21.2%



Liquid Limit (%):	80	Plastic Limit (%):	21	Plasticity Index (%):	59
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
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99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH23-08

Sample Depth: 8.99 - 9.14 m

Sample Number: G12

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: December 15, 2023

Lab Technician: JWiens

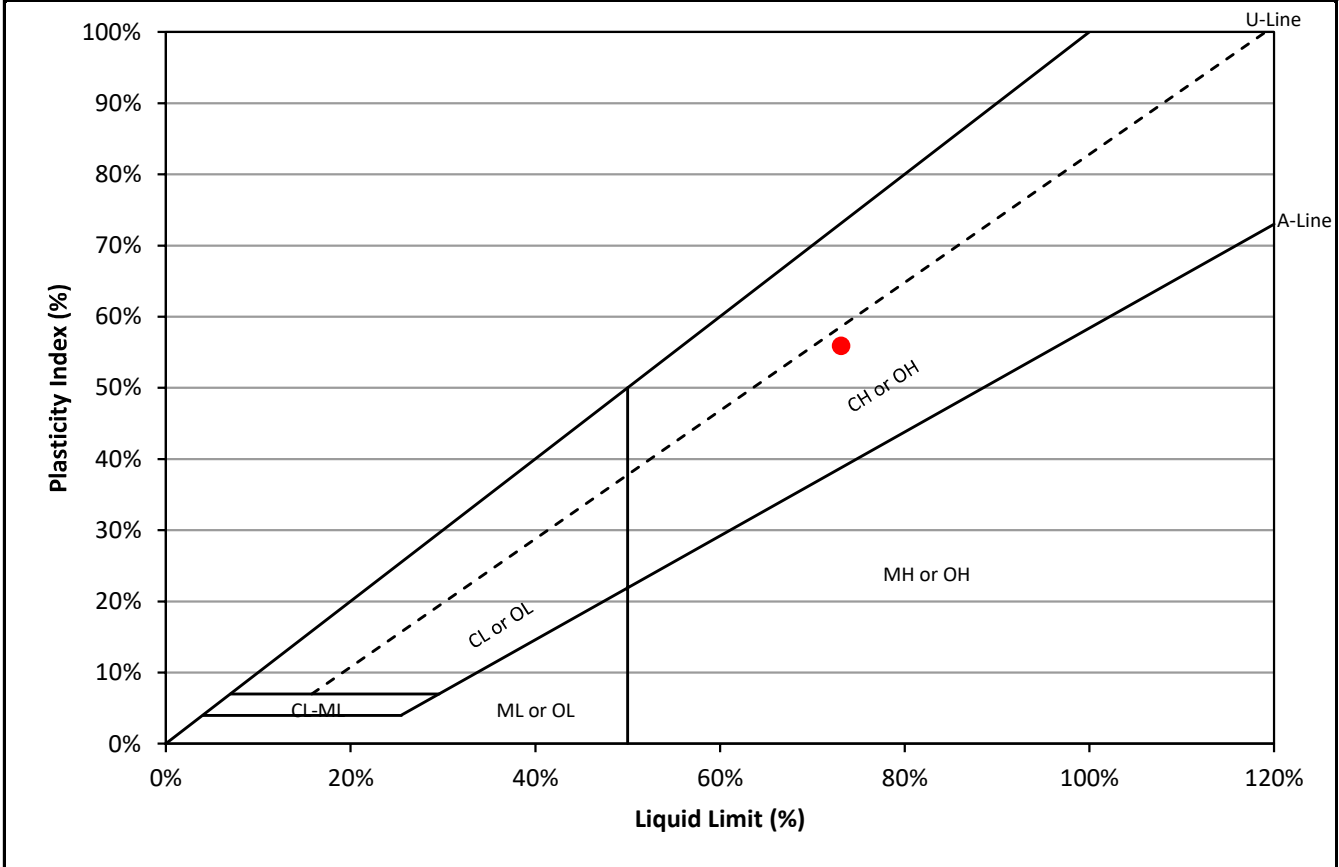
Date Tested: January 16, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	33	23	17
Wet Sample (g)	8.5	8.9	13.0
Dry Sample (g)	5.0	5.1	7.4
Water Content (%)	71.4%	73.4%	75.8%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.0	6.1
Dry Sample (g)	5.2	5.2
Water Content (%)	16.9%	17.5%



Liquid Limit (%):	73	Plastic Limit (%):	17	Plasticity Index (%):	56
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-10

Sample Depth: 1.37 - 1.52 m

Sample Number: G3

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

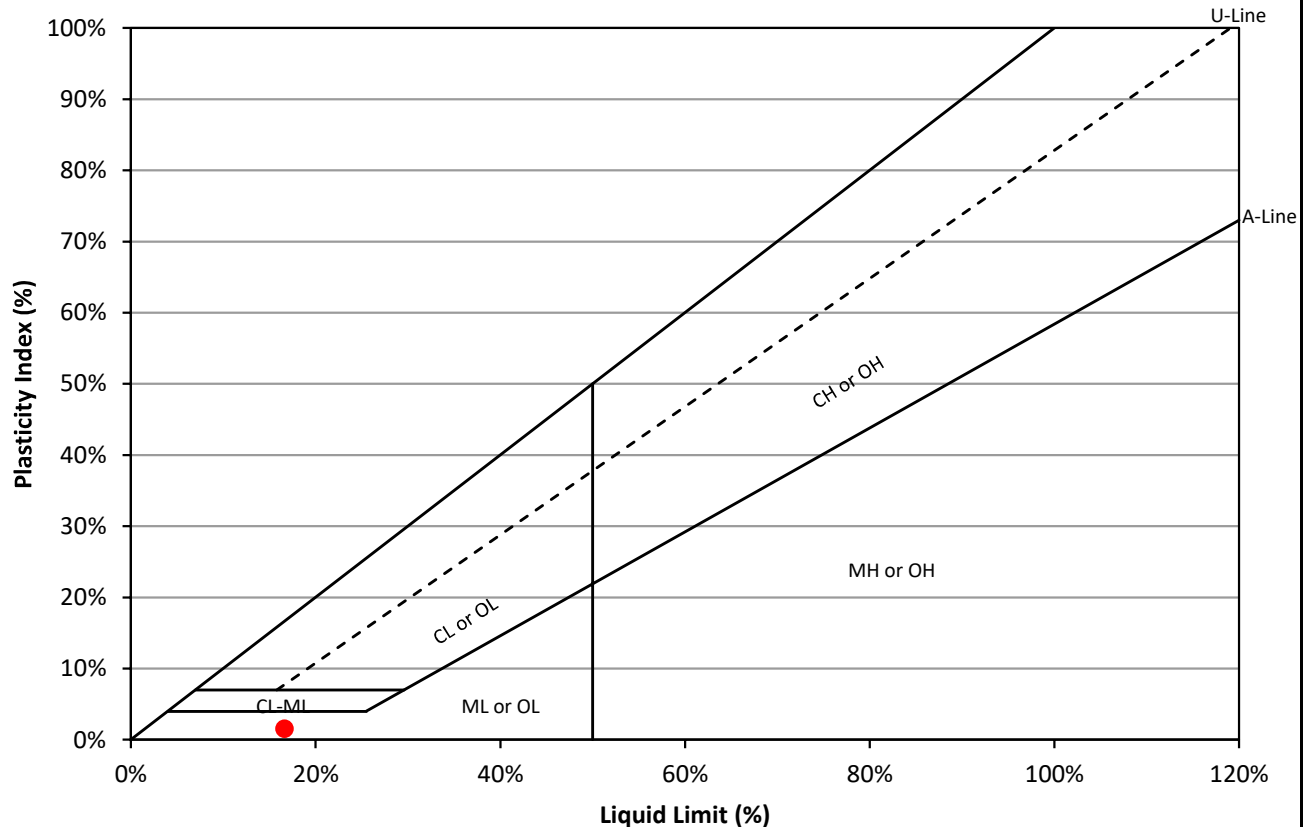
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	20	25	30
Wet Sample (g)	9.5	9.5	9.5
Dry Sample (g)	8.0	8.1	8.2
Water Content (%)	18.2%	16.7%	15.3%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.4	6.1
Dry Sample (g)	5.5	5.3
Water Content (%)	15.0%	15.1%



Liquid Limit:

17

Plastic Limit:

15

Plasticity Index:

2

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-10

Sample Depth: 6.10 - 6.71 m

Sample Number: T7

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

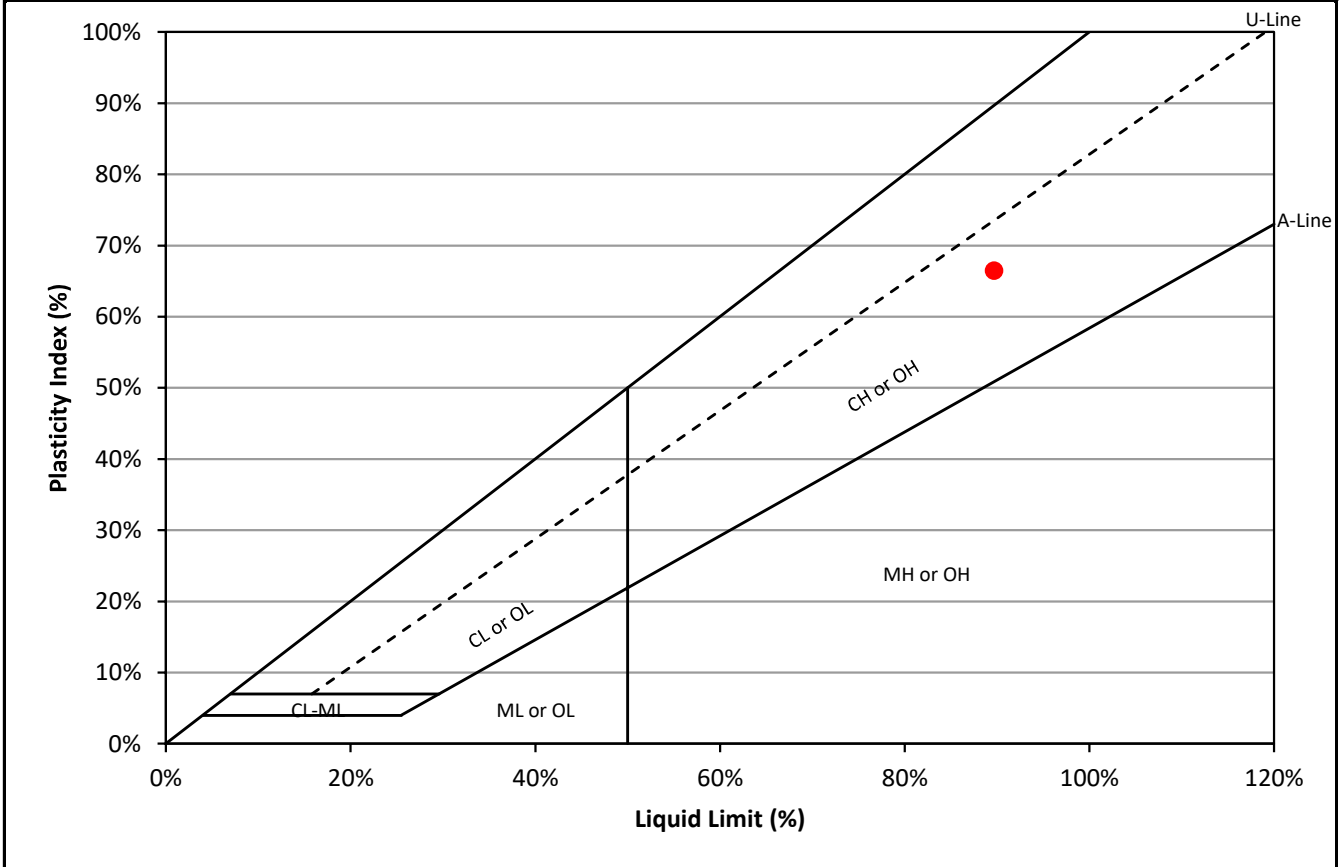
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	27	20	18
Wet Sample (g)	11.7	12.3	11.7
Dry Sample (g)	6.2	6.4	6.0
Water Content (%)	88.9%	91.7%	94.9%

Plastic Limit		
Trial	1	2
Wet Sample (g)	4.8	4.9
Dry Sample (g)	3.9	4.0
Water Content (%)	23.3%	23.0%



Liquid Limit:	90	Plastic Limit:	23	Plasticity Index:	66
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-13

Sample Depth: 2.74 - 2.90 m

Sample Number: G4

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

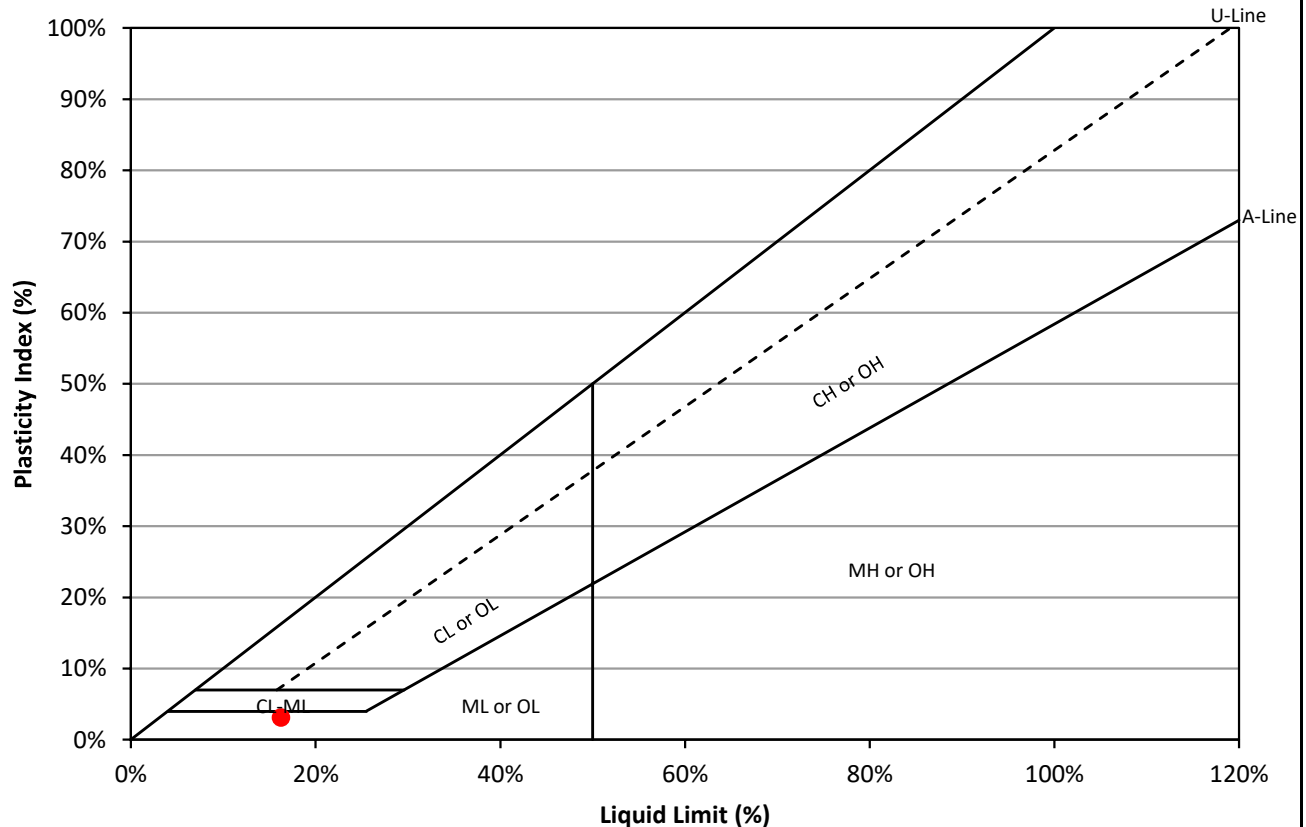
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	19	26	30
Wet Sample (g)	11.4	11.4	11.4
Dry Sample (g)	9.7	9.8	9.8
Water Content (%)	16.9%	16.2%	15.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	5.8	5.9
Dry Sample (g)	5.1	5.3
Water Content (%)	13.3%	12.8%



Liquid Limit:

16

Plastic Limit:

13

Plasticity Index:

3

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-13

Sample Depth: 9.14 - 9.75 m

Sample Number: T9

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

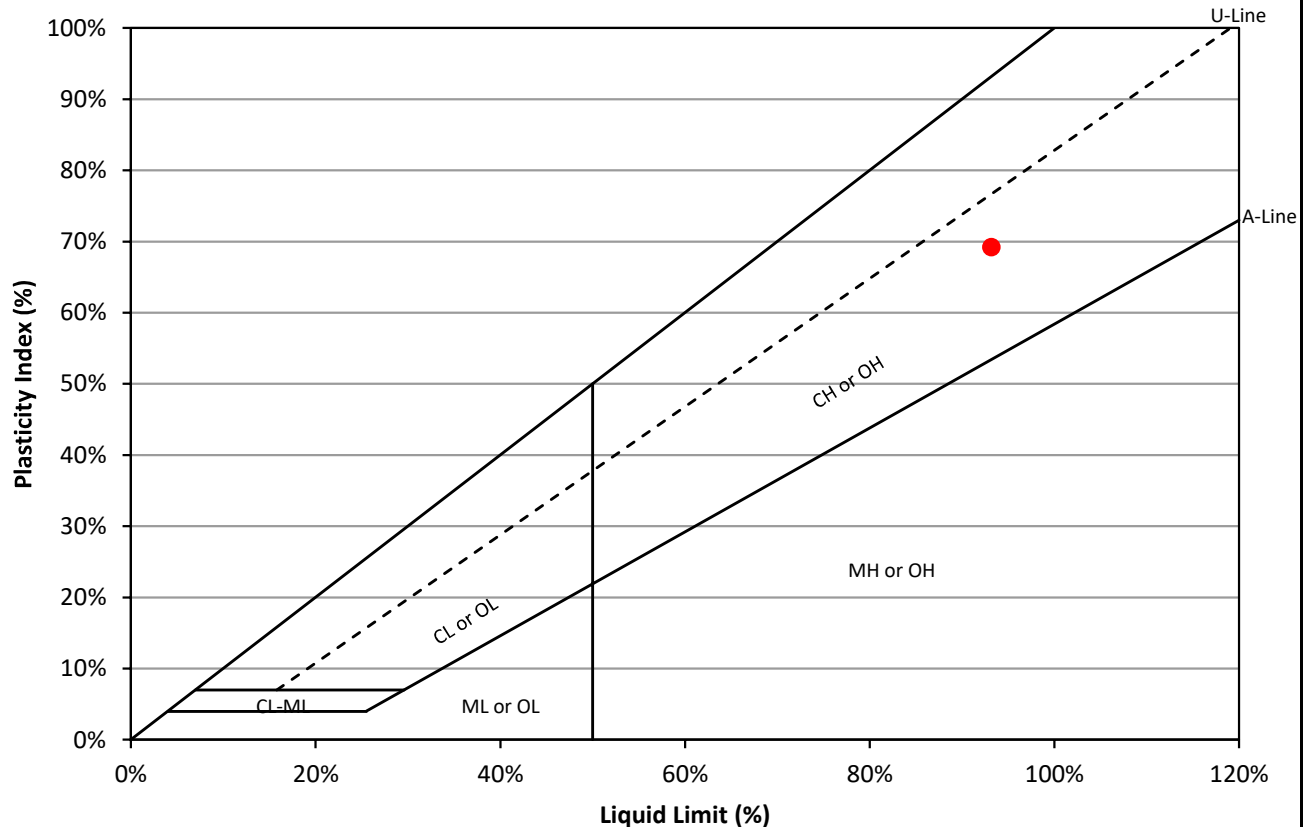
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	25	20	16
Wet Sample (g)	8.6	10.2	11.9
Dry Sample (g)	4.5	5.3	6.0
Water Content (%)	93.5%	94.6%	97.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	4.8	4.9
Dry Sample (g)	3.8	4.0
Water Content (%)	23.5%	24.4%



Liquid Limit:

93

Plastic Limit:

24

Plasticity Index:

69

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-14

Sample Depth: 2.90 - 3.05 m

Sample Number: G5

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

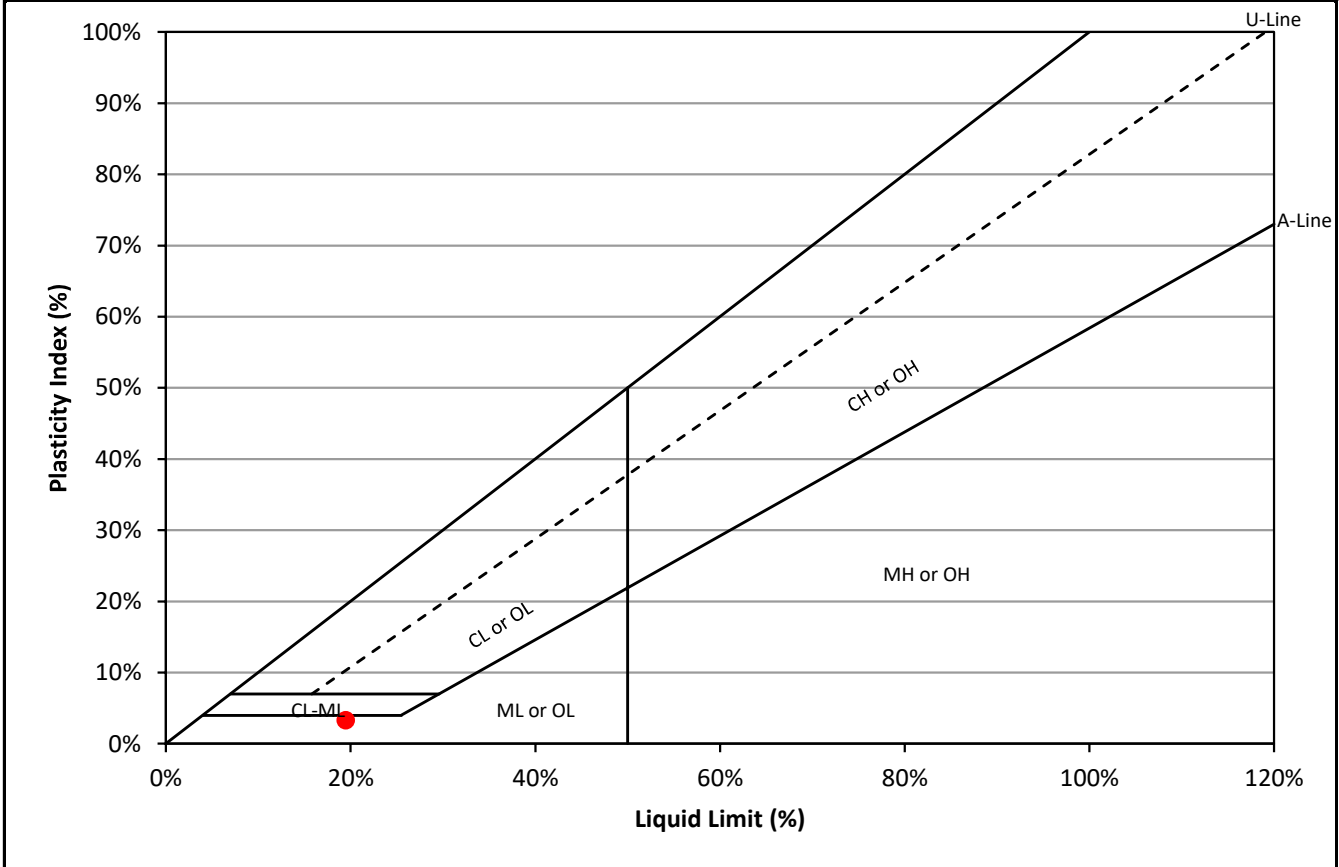
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

	Liquid Limit		
Blows	32	20	15
Wet Sample (g)	8.0	10.1	11.7
Dry Sample (g)	6.7	8.4	9.6
Water Content (%)	18.4%	20.4%	21.7%

	Plastic Limit	
Trial	1	2
Wet Sample (g)	5.8	5.8
Dry Sample (g)	5.0	5.0
Water Content (%)	16.3%	16.0%



Liquid Limit:	19	Plastic Limit:	16	Plasticity Index:	3
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-14

Sample Depth: 4.57 - 5.18 m

Sample Number: T8

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

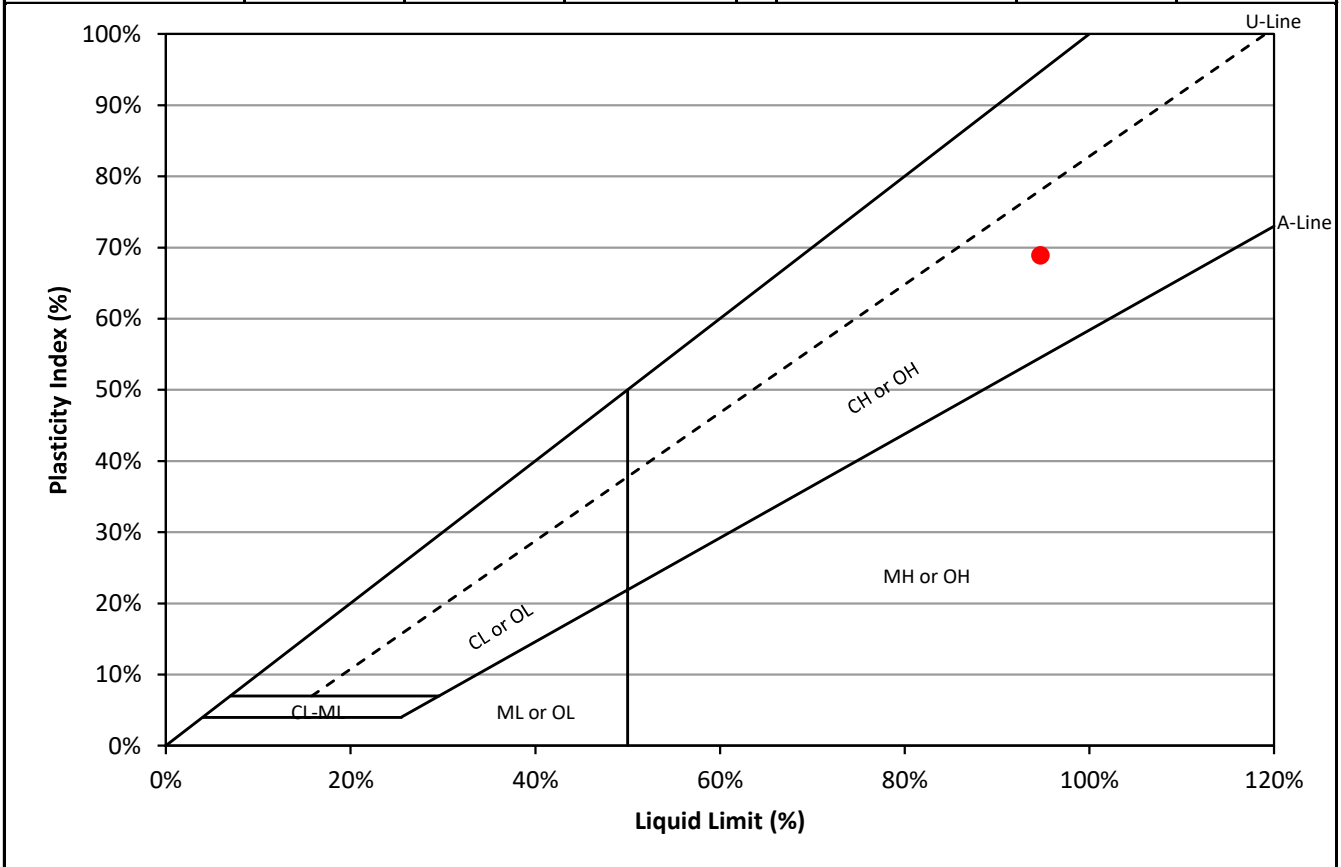
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	32	27	19
Wet Sample (g)	9.4	11.6	10.8
Dry Sample (g)	4.9	6.0	5.4
Water Content (%)	90.4%	94.8%	98.2%

Plastic Limit		
Trial	1	2
Wet Sample (g)	4.2	4.6
Dry Sample (g)	3.4	3.7
Water Content (%)	25.7%	25.8%



Liquid Limit:	95	Plastic Limit:	26	Plasticity Index:	69
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Sample Location: TH24-15

Sample Depth: 6.10 - 6.71 m

Sample Number: T8

Supplier/Location: Winnipeg, MB

Field Technician: ABonifacio

Sample Date: January 12, 2024

Lab Technician: LBoughton

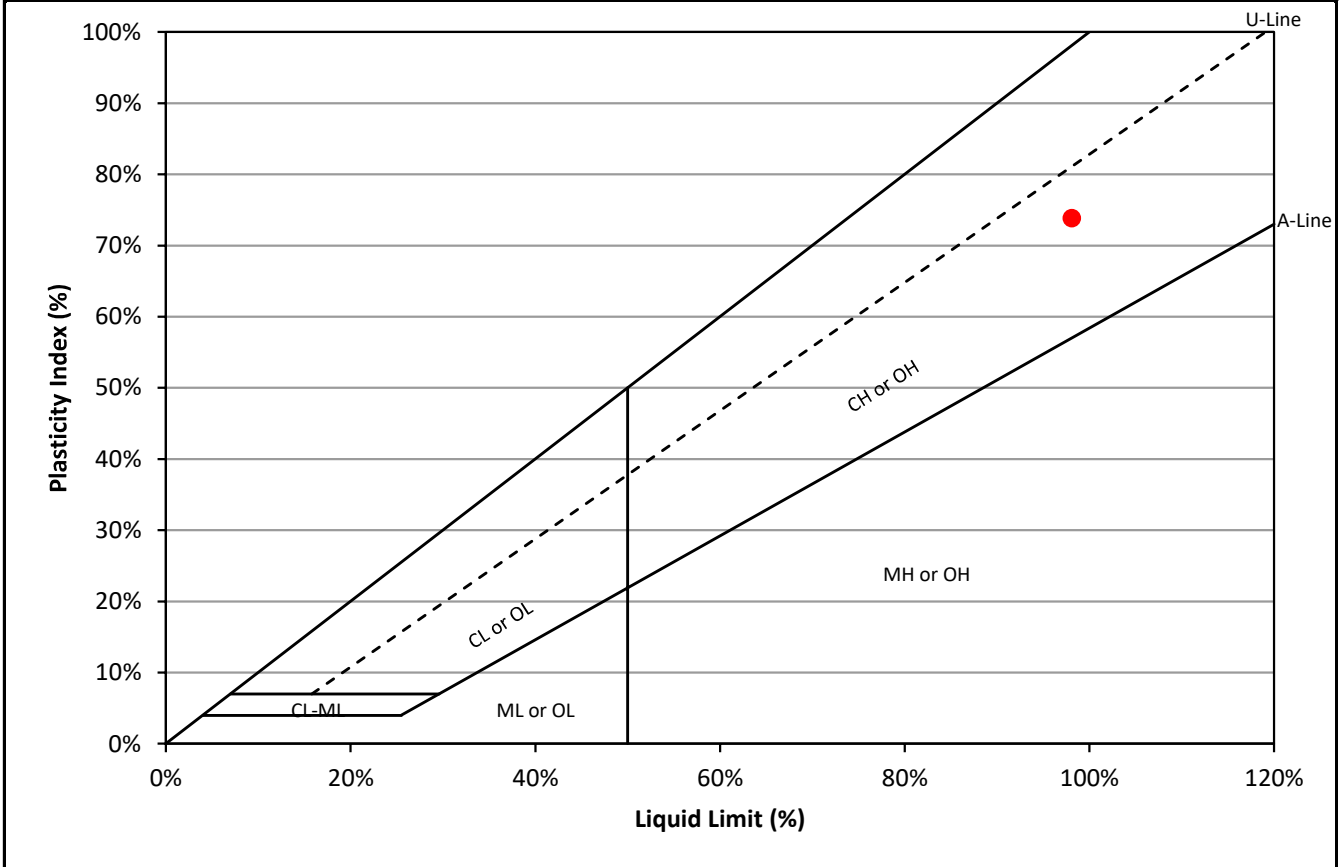
Date Tested: February 21, 2024

Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	30	25	20
Wet Sample (g)	11.8	10.4	11.6
Dry Sample (g)	6.1	5.2	5.8
Water Content (%)	95.4%	98.1%	101.3%

Plastic Limit		
Trial	1	2
Wet Sample (g)	4.6	5.0
Dry Sample (g)	3.7	4.0
Water Content (%)	24.4%	24.1%



Liquid Limit:	98	Plastic Limit:	24	Plasticity Index:	74
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Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



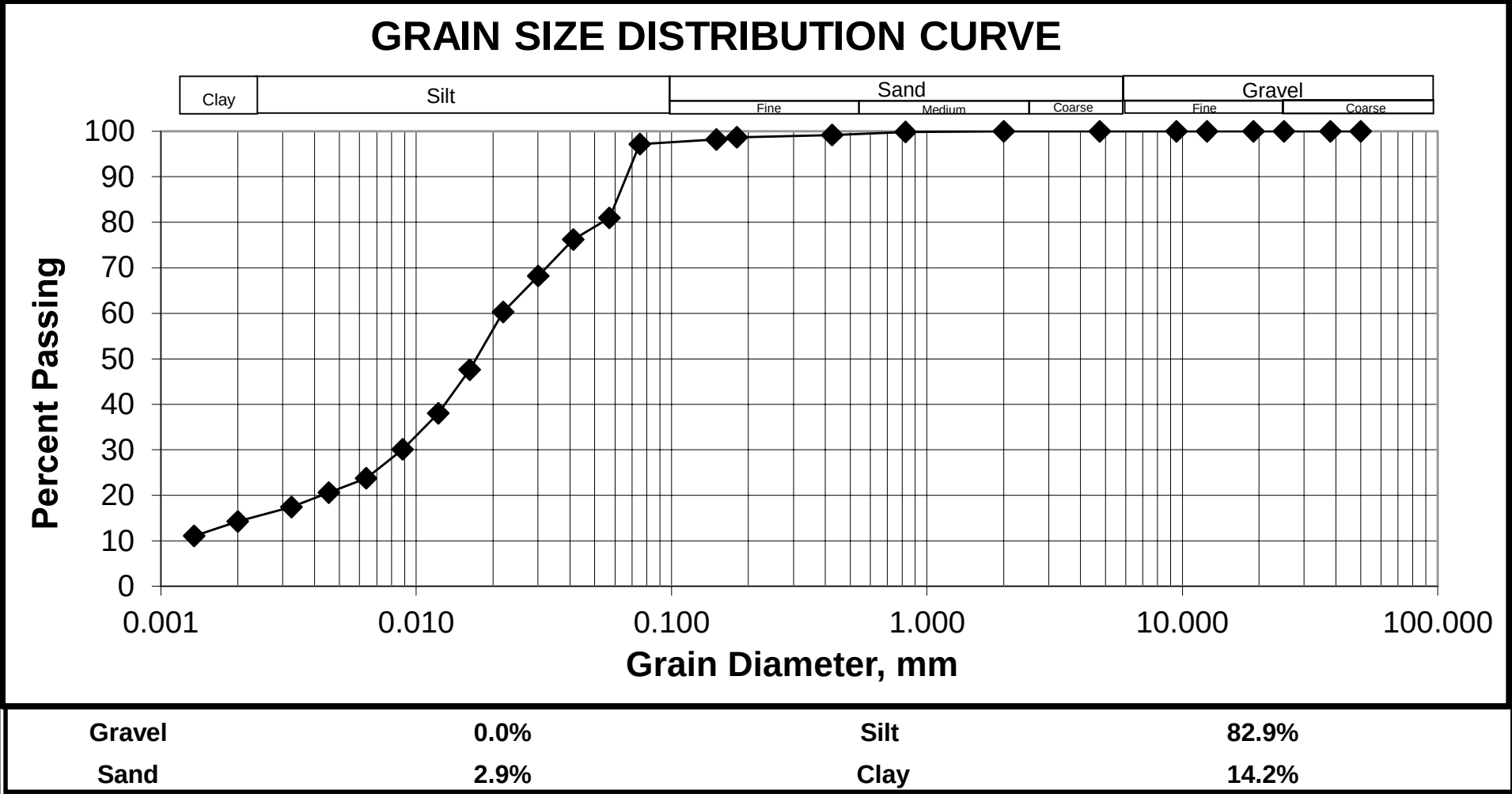
WINNIPEG GEOTECHNICAL LABORATORY
99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-01
Sample No.: G5
Depth: 2.90 - 3.05 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	97.1
38.0	100.0	2.00	100.0	0.0571	80.9
25.0	100.0	0.825	99.8	0.0412	76.2
19.0	100.0	0.425	99.2	0.0301	68.2
12.5	100.0	0.18	98.6	0.0219	60.3
9.5	100.0	0.15	98.2	0.0162	47.6
4.75	100.0	0.075	97.1	0.0122	38.1
				0.0089	30.1
				0.0064	23.8
				0.0046	20.6
				0.0032	17.4
				0.0020	14.2
				0.0013	11.1



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



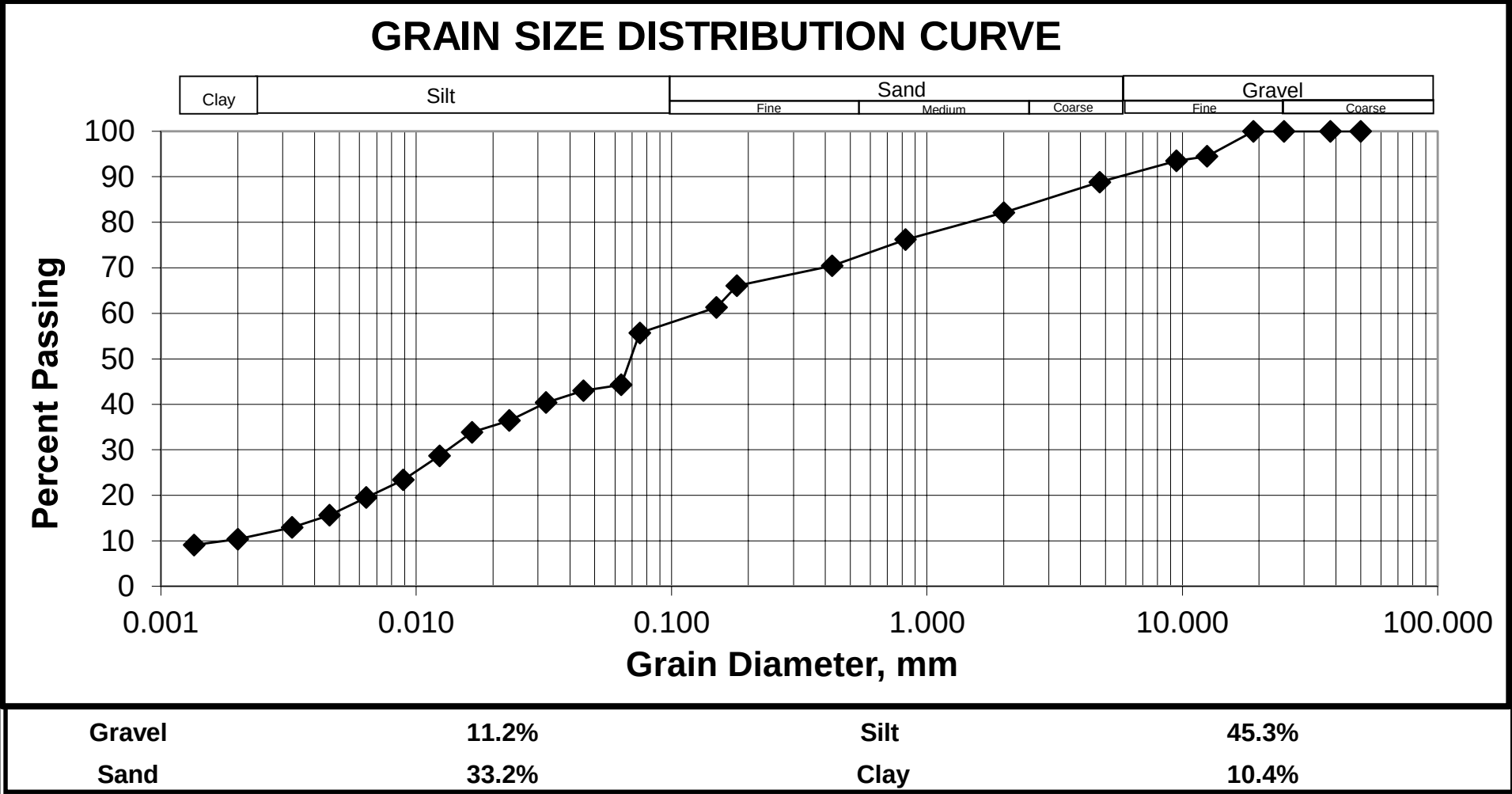
WINNIPEG GEOTECHNICAL LABORATORY
99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-01
Sample No.: G23
Depth: 19.66 - 19.81 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	88.8	0.0750	55.6
38.0	100.0	2.00	82.1	0.0634	44.3
25.0	100.0	0.825	76.2	0.0451	43.0
19.0	100.0	0.425	70.4	0.0322	40.4
12.5	94.5	0.18	66.0	0.0232	36.5
9.5	93.5	0.15	61.3	0.0166	33.9
4.75	88.8	0.075	55.6	0.0123	28.6
				0.0089	23.4
				0.0064	19.5
				0.0046	15.6
				0.0033	13.0
				0.0020	10.4
				0.0013	9.1



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



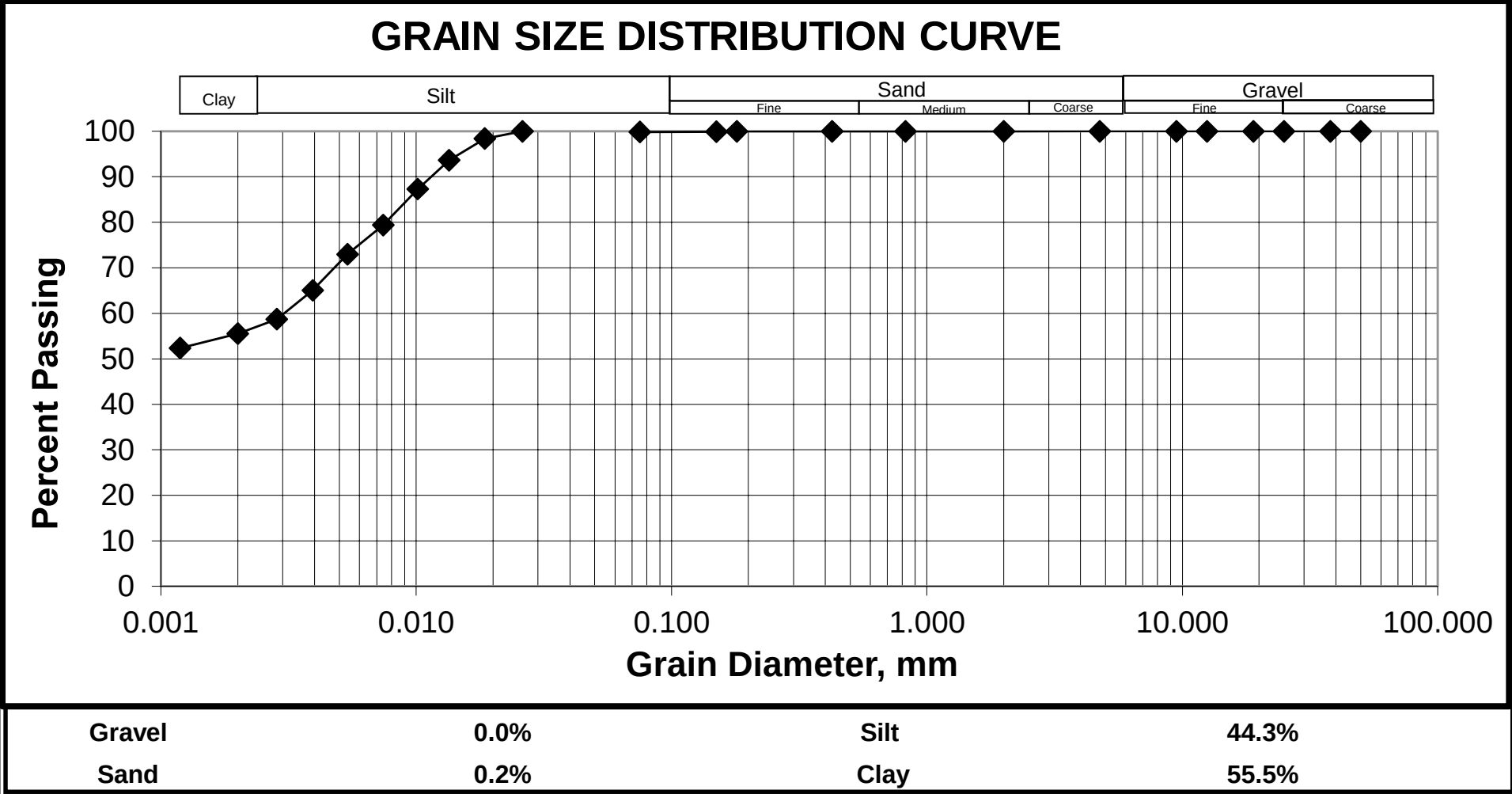
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99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-01
Sample No.: T4
Depth: 1.52 - 1.98 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.8
38.0	100.0	2.00	100.0	0.0512	103.2
25.0	100.0	0.825	100.0	0.0365	101.6
19.0	100.0	0.425	100.0	0.0260	100.0
12.5	100.0	0.18	99.9	0.0186	98.4
9.5	100.0	0.15	99.9	0.0134	93.6
4.75	100.0	0.075	99.8	0.0101	87.3
				0.0074	79.3
				0.0054	73.0
				0.0039	65.0
				0.0028	58.7
				0.0020	55.5
				0.0012	52.3



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



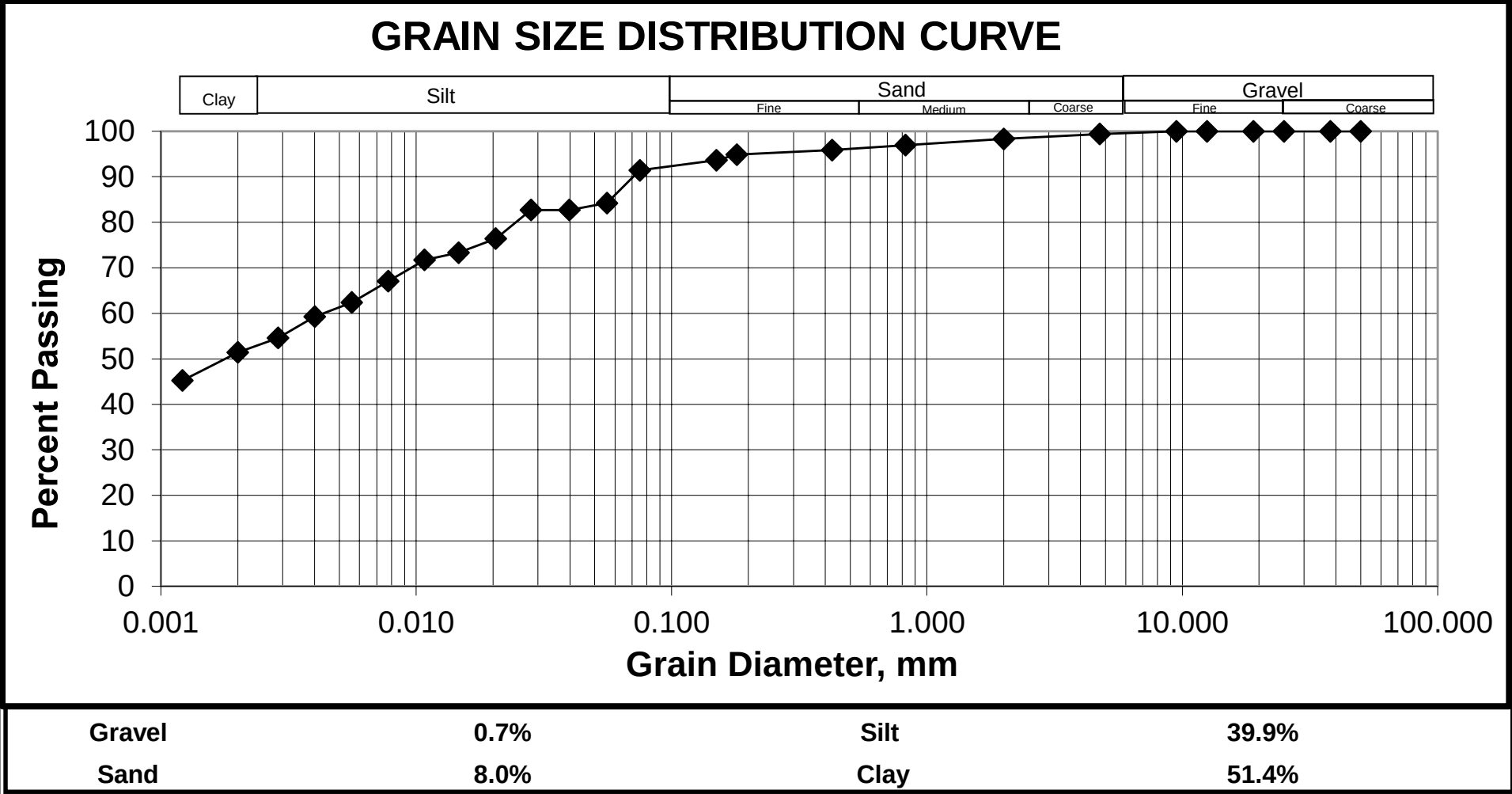
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tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-01
Sample No.: T15
Depth: 10.67 - 11.13 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.4	0.0750	91.4
38.0	100.0	2.00	98.3	0.0559	84.2
25.0	100.0	0.825	96.9	0.0398	82.7
19.0	100.0	0.425	95.8	0.0281	82.7
12.5	100.0	0.18	94.8	0.0205	76.4
9.5	100.0	0.15	93.6	0.0147	73.3
4.75	99.4	0.075	91.4	0.0108	71.7
				0.0078	67.1
				0.0056	62.4
				0.0040	59.3
				0.0029	54.6
				0.0020	51.4
				0.0012	45.2



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



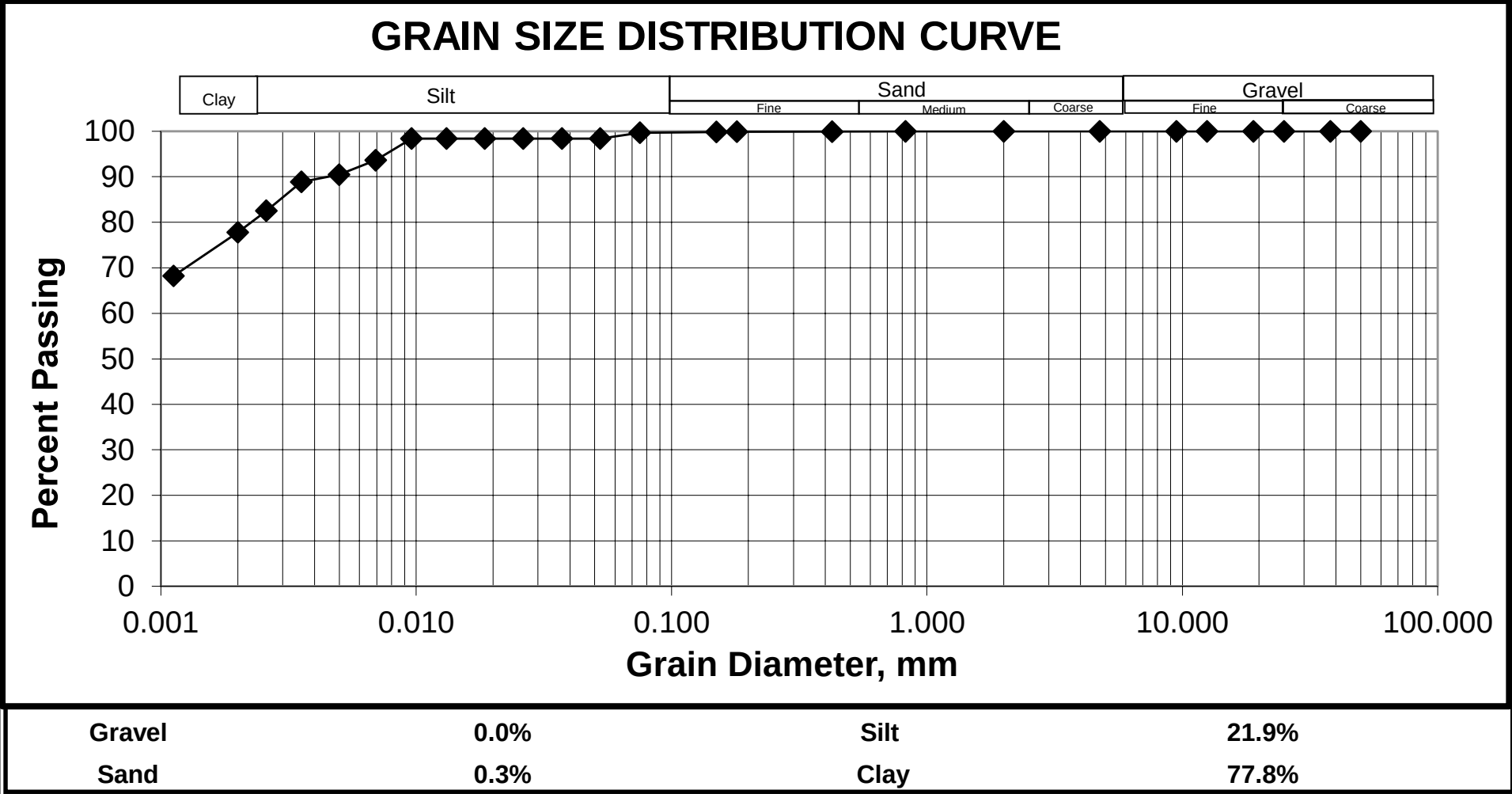
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19 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
Tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-02
Sample No.: G2
Depth: 0.61 - 0.76 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.7
38.0	100.0	2.00	100.0	0.0525	98.4
25.0	100.0	0.825	100.0	0.0371	98.4
19.0	100.0	0.425	99.9	0.0263	98.4
12.5	100.0	0.18	99.9	0.0186	98.4
9.5	100.0	0.15	99.8	0.0131	98.4
4.75	100.0	0.075	99.7	0.0096	98.4
				0.0069	93.6
				0.0050	90.5
				0.0036	88.9
				0.0026	82.5
				0.0020	77.8
				0.0011	68.2



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



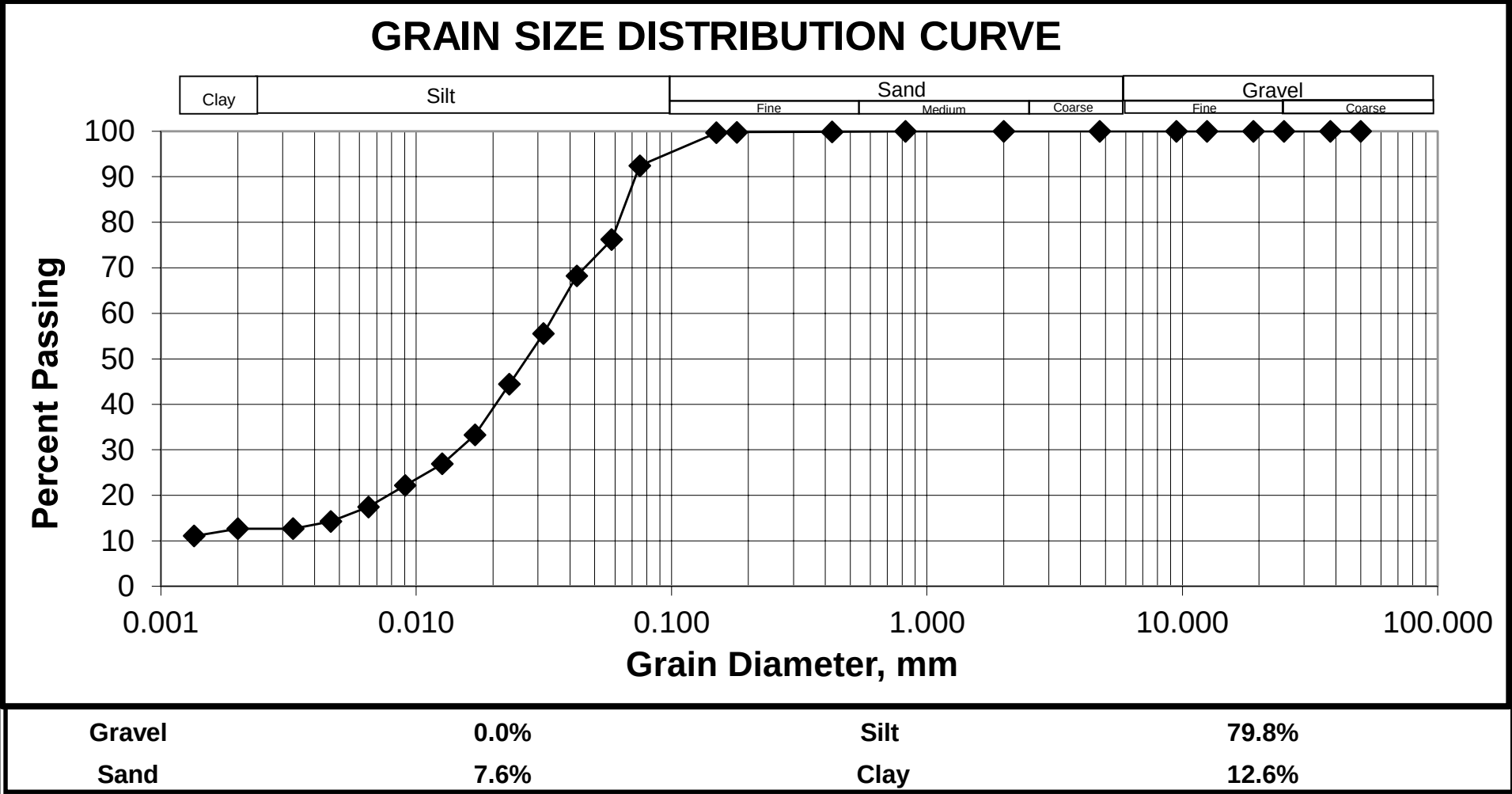
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99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-02
Sample No.: G4
Depth: 2.13 - 2.29 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	92.4
38.0	100.0	2.00	100.0	0.0582	76.2
25.0	100.0	0.825	100.0	0.0425	68.2
19.0	100.0	0.425	99.9	0.0315	55.5
12.5	100.0	0.18	99.8	0.0232	44.4
9.5	100.0	0.15	99.7	0.0170	33.3
4.75	100.0	0.075	92.4	0.0126	26.9
				0.0091	22.2
				0.0065	17.4
				0.0046	14.2
				0.0033	12.6
				0.0020	12.6
				0.0013	11.1



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



WINNIPEG GEOTECHNICAL LABORATORY

99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada

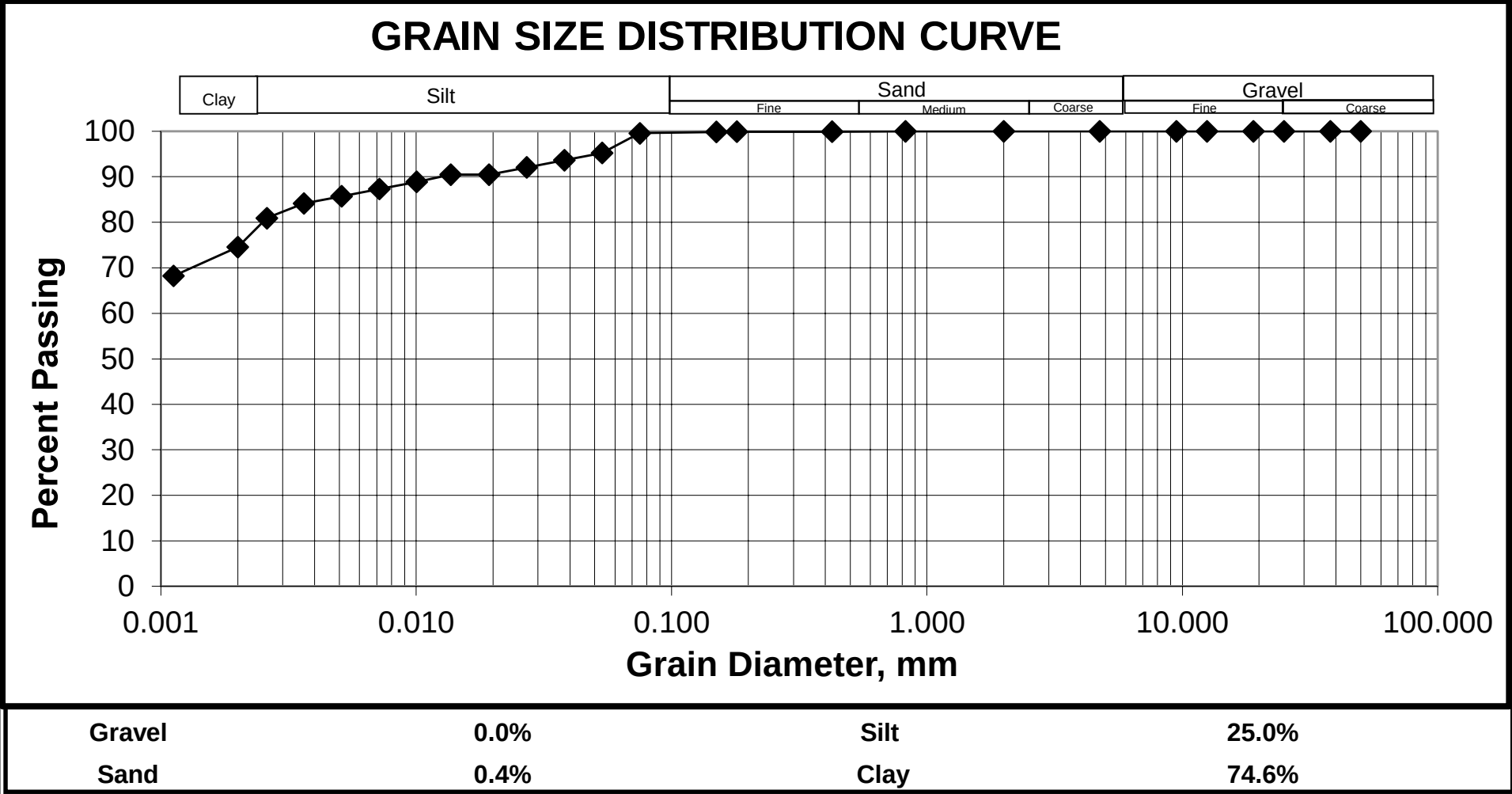
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-02
Sample No.: G8
Depth: 5.94 - 6.10 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.6
38.0	100.0	2.00	100.0	0.0534	95.2
25.0	100.0	0.825	99.9	0.0380	93.6
19.0	100.0	0.425	99.9	0.0271	92.0
12.5	100.0	0.18	99.9	0.0193	90.4
9.5	100.0	0.15	99.8	0.0137	90.4
4.75	100.0	0.075	99.6	0.0100	88.9
				0.0072	87.3
				0.0051	85.7
				0.0036	84.1
				0.0026	80.9
				0.0020	74.6
				0.0011	68.2



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



WINNIPEG GEOTECHNICAL LABORATORY

99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada

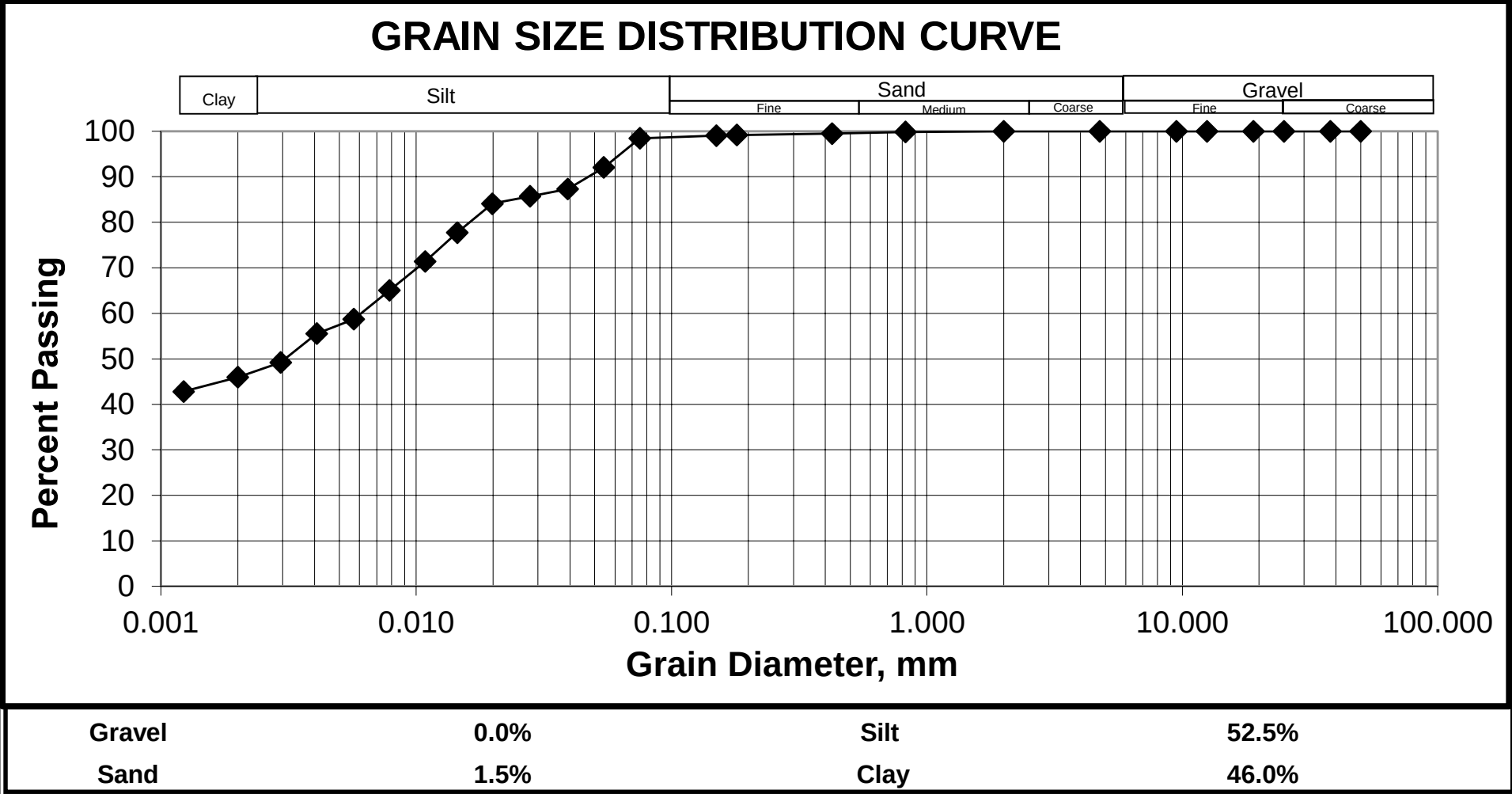
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-03
Sample No.: G4
Depth: 2.13 - 2.29 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	98.5
38.0	100.0	2.00	100.0	0.0542	92.0
25.0	100.0	0.825	99.8	0.0392	87.3
19.0	100.0	0.425	99.4	0.0279	85.7
12.5	100.0	0.18	99.2	0.0199	84.1
9.5	100.0	0.15	99.0	0.0145	77.7
4.75	100.0	0.075	98.5	0.0108	71.4
				0.0079	65.0
				0.0057	58.7
				0.0041	55.5
				0.0029	49.2
				0.0020	46.0
				0.0012	42.8



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



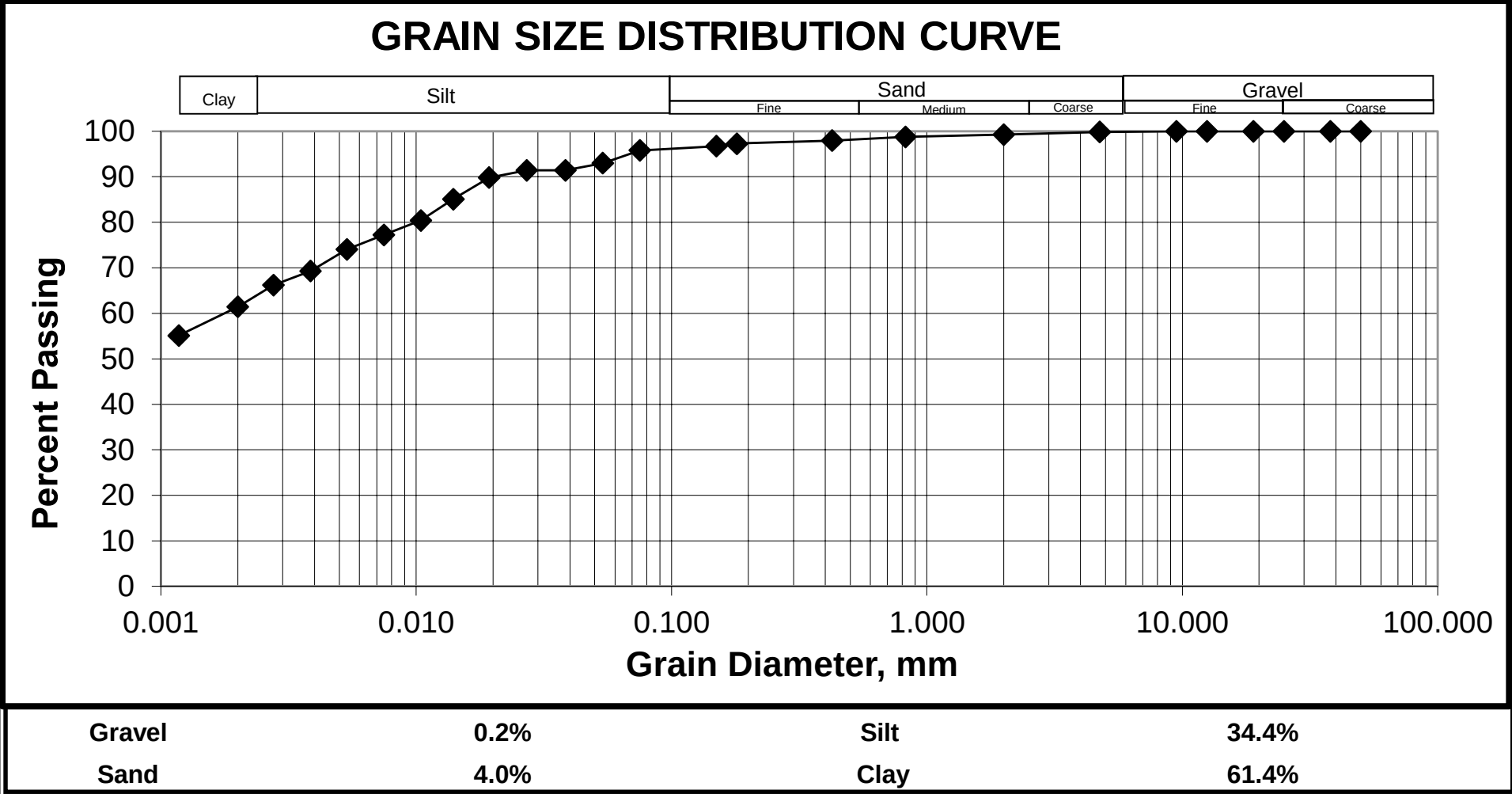
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99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-05
Sample No.: T4
Depth: 1.52 - 2.13 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.8	0.0750	95.8
38.0	100.0	2.00	99.3	0.0538	92.9
25.0	100.0	0.825	98.7	0.0383	91.4
19.0	100.0	0.425	97.9	0.0271	91.4
12.5	100.0	0.18	97.3	0.0193	89.8
9.5	100.0	0.15	96.7	0.0140	85.1
4.75	99.8	0.075	95.8	0.0104	80.3
				0.0075	77.2
				0.0054	74.0
				0.0039	69.3
				0.0028	66.1
				0.0020	61.4
				0.0012	55.1



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
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GRAIN SIZE DISTRIBUTION
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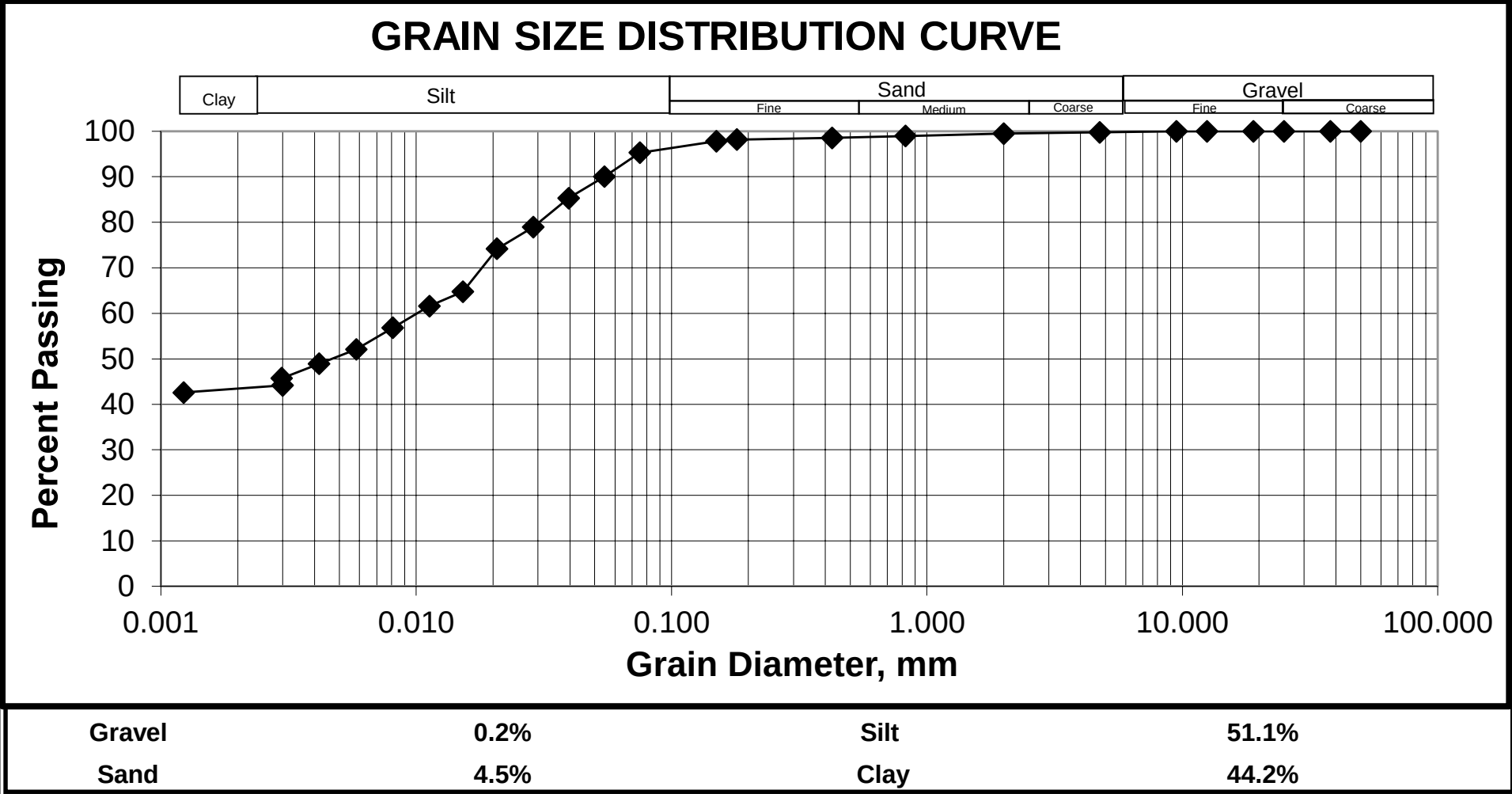
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tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-05
Sample No.: T9
Depth: 4.57 - 5.18 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.8	0.0750	95.3
38.0	100.0	2.00	99.5	0.0546	90.0
25.0	100.0	0.825	98.9	0.0395	85.3
19.0	100.0	0.425	98.5	0.0287	78.9
12.5	100.0	0.18	98.2	0.0207	74.2
9.5	100.0	0.15	97.8	0.0152	64.7
4.75	99.8	0.075	95.3	0.0113	61.6
				0.0081	56.8
				0.0058	52.1
				0.0042	48.9
				0.0030	45.8
				0.0030	44.2
				0.0012	42.6



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GRAIN SIZE DISTRIBUTION
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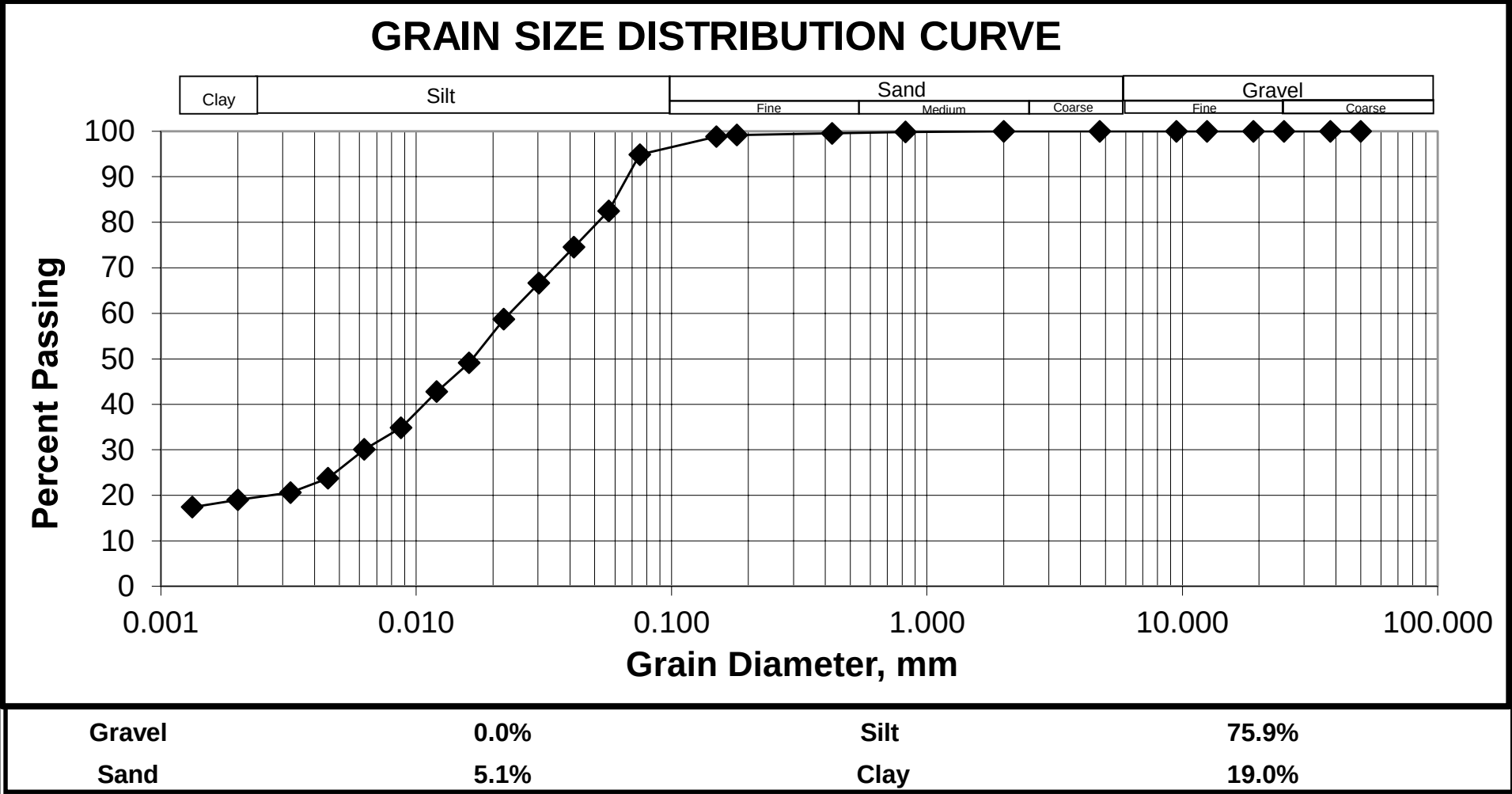
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-06
Sample No.: G4
Depth: 2.13 - 2.29 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	94.9
38.0	100.0	2.00	99.9	0.0567	82.5
25.0	100.0	0.825	99.8	0.0415	74.5
19.0	100.0	0.425	99.5	0.0303	66.6
12.5	100.0	0.18	99.2	0.0220	58.7
9.5	100.0	0.15	98.8	0.0161	49.1
4.75	100.0	0.075	94.9	0.0120	42.8
				0.0087	34.9
				0.0063	30.1
				0.0045	23.7
				0.0032	20.6
				0.0020	19.0
				0.0013	17.4



Reviewed by: Lee Boughton
Laboratory Manager

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GRAIN SIZE DISTRIBUTION
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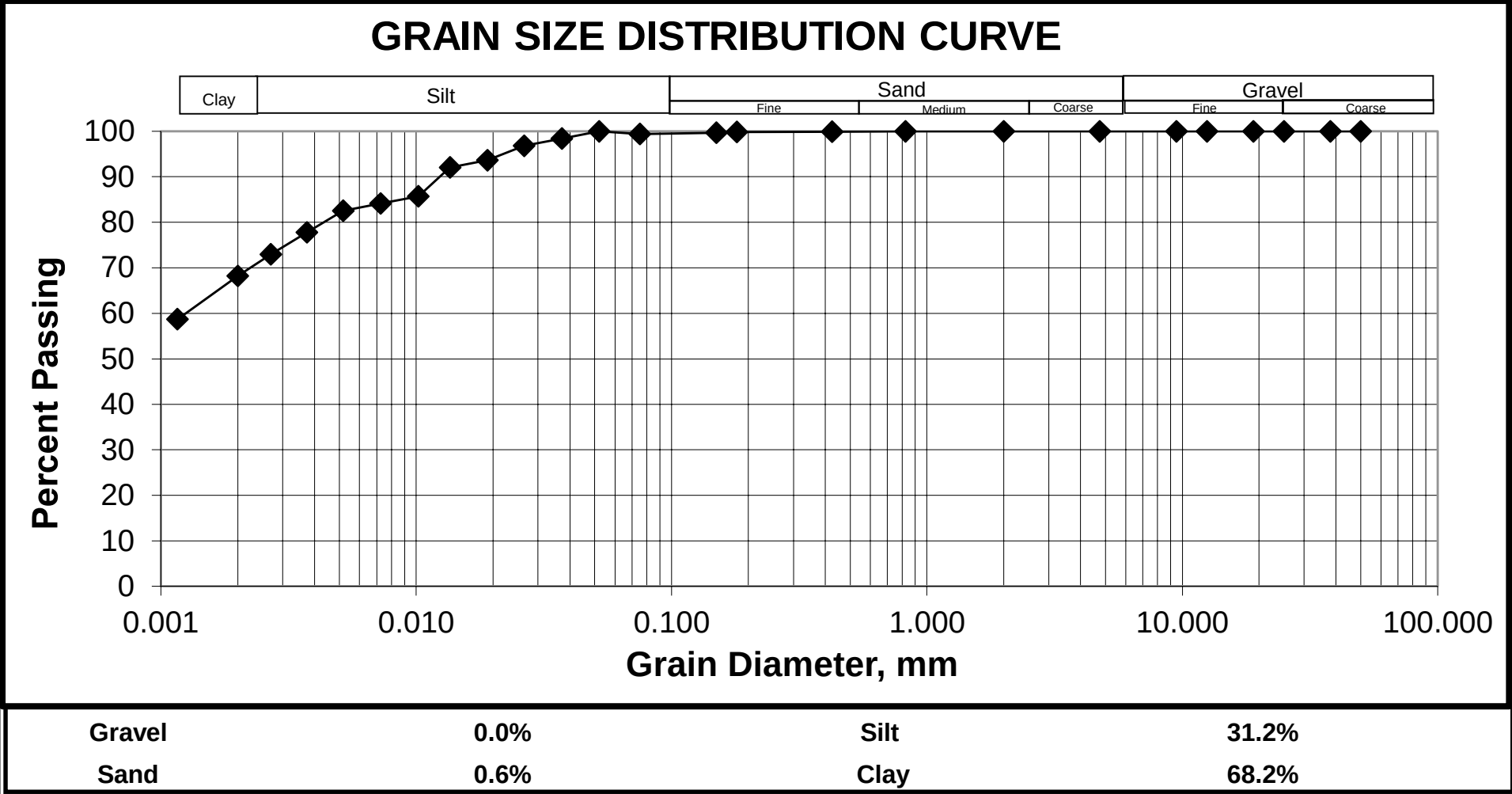
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-06
Sample No.: T10
Depth: 6.10 - 6.71 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.4
38.0	100.0	2.00	100.0	0.0521	100.0
25.0	100.0	0.825	99.9	0.0371	98.4
19.0	100.0	0.425	99.9	0.0265	96.8
12.5	100.0	0.18	99.8	0.0190	93.6
9.5	100.0	0.15	99.6	0.0136	92.0
4.75	100.0	0.075	99.4	0.0102	85.7
				0.0073	84.1
				0.0052	82.5
				0.0037	77.7
				0.0027	73.0
				0.0020	68.2
				0.0012	58.7



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Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
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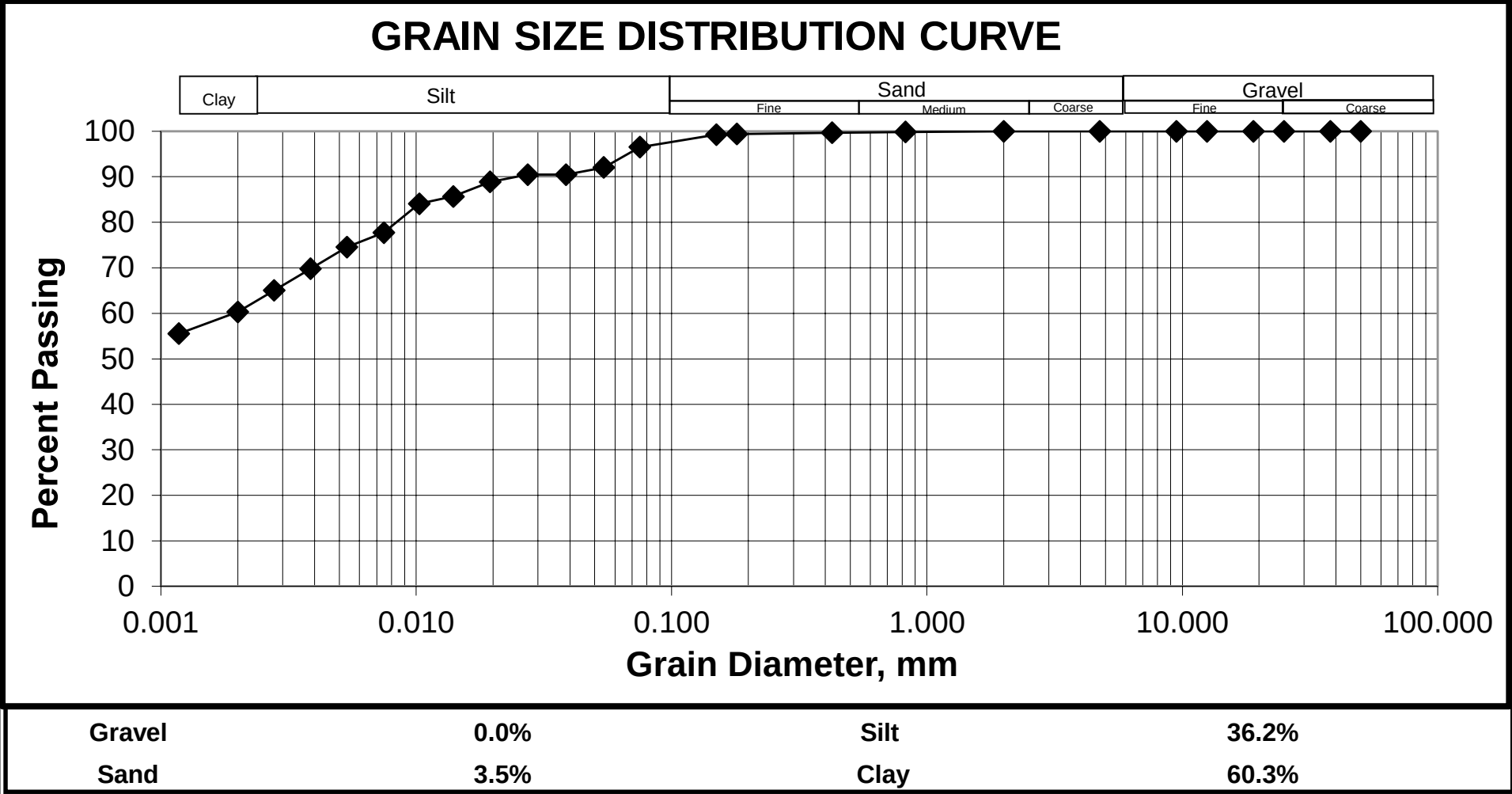
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-07
Sample No.: G2
Depth: 0.61 - 0.76 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	96.5
38.0	100.0	2.00	100.0	0.0542	92.0
25.0	100.0	0.825	99.8	0.0386	90.4
19.0	100.0	0.425	99.6	0.0273	90.4
12.5	100.0	0.18	99.4	0.0195	88.8
9.5	100.0	0.15	99.2	0.0140	85.7
4.75	100.0	0.075	96.5	0.0103	84.1
				0.0075	77.7
				0.0054	74.6
				0.0039	69.8
				0.0028	65.0
				0.0020	60.3
				0.0012	55.5



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Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
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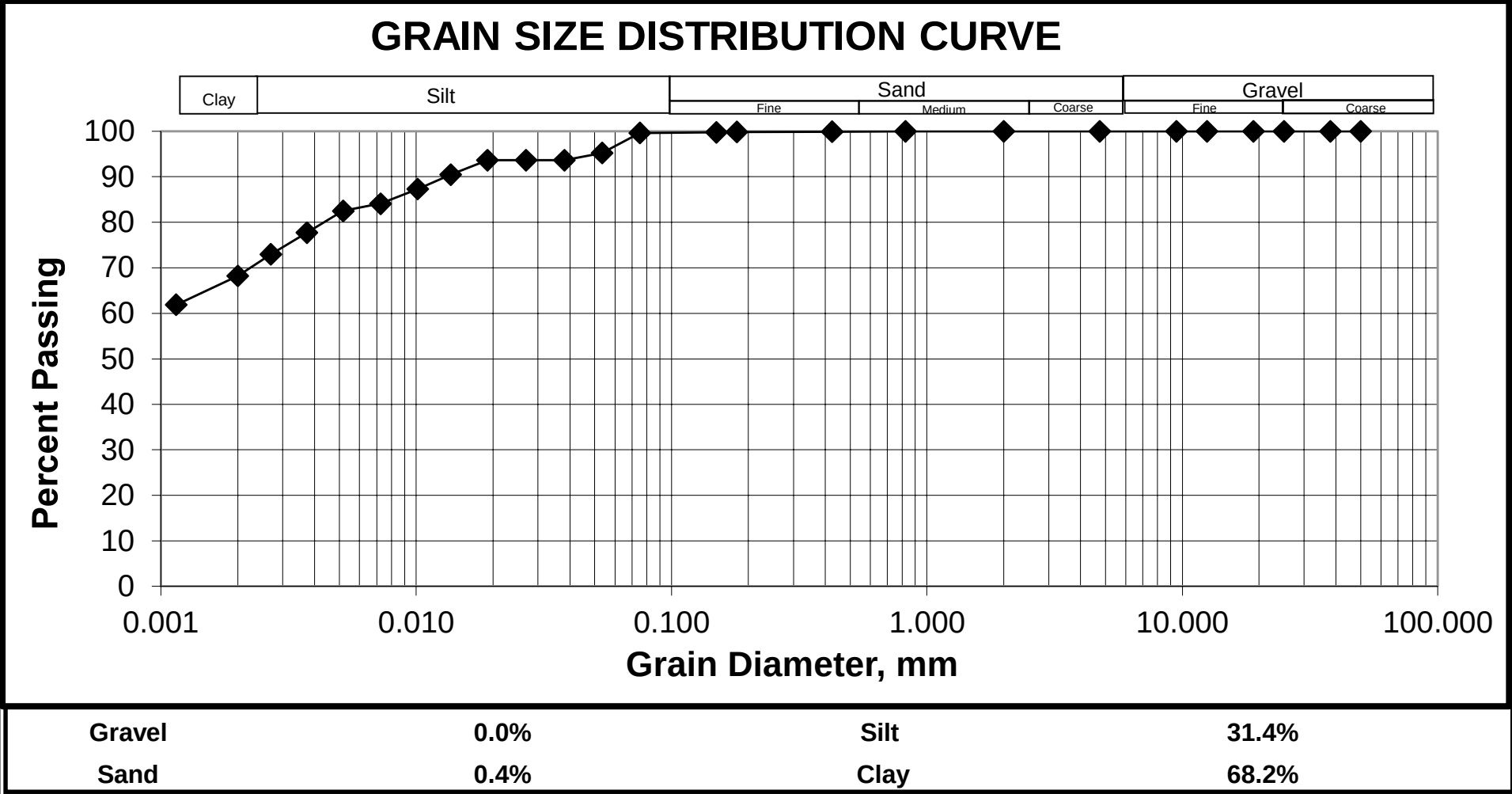
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-07
Sample No.: G4
Depth: 2.13 - 2.29 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.6
38.0	100.0	2.00	100.0	0.0534	95.2
25.0	100.0	0.825	100.0	0.0380	93.6
19.0	100.0	0.425	99.9	0.0269	93.6
12.5	100.0	0.18	99.8	0.0190	93.6
9.5	100.0	0.15	99.7	0.0137	90.4
4.75	100.0	0.075	99.6	0.0101	87.3
				0.0073	84.1
				0.0052	82.5
				0.0037	77.7
				0.0027	73.0
				0.0020	68.2
				0.0011	61.9



GRAIN SIZE DISTRIBUTION
(AASHTO T88)



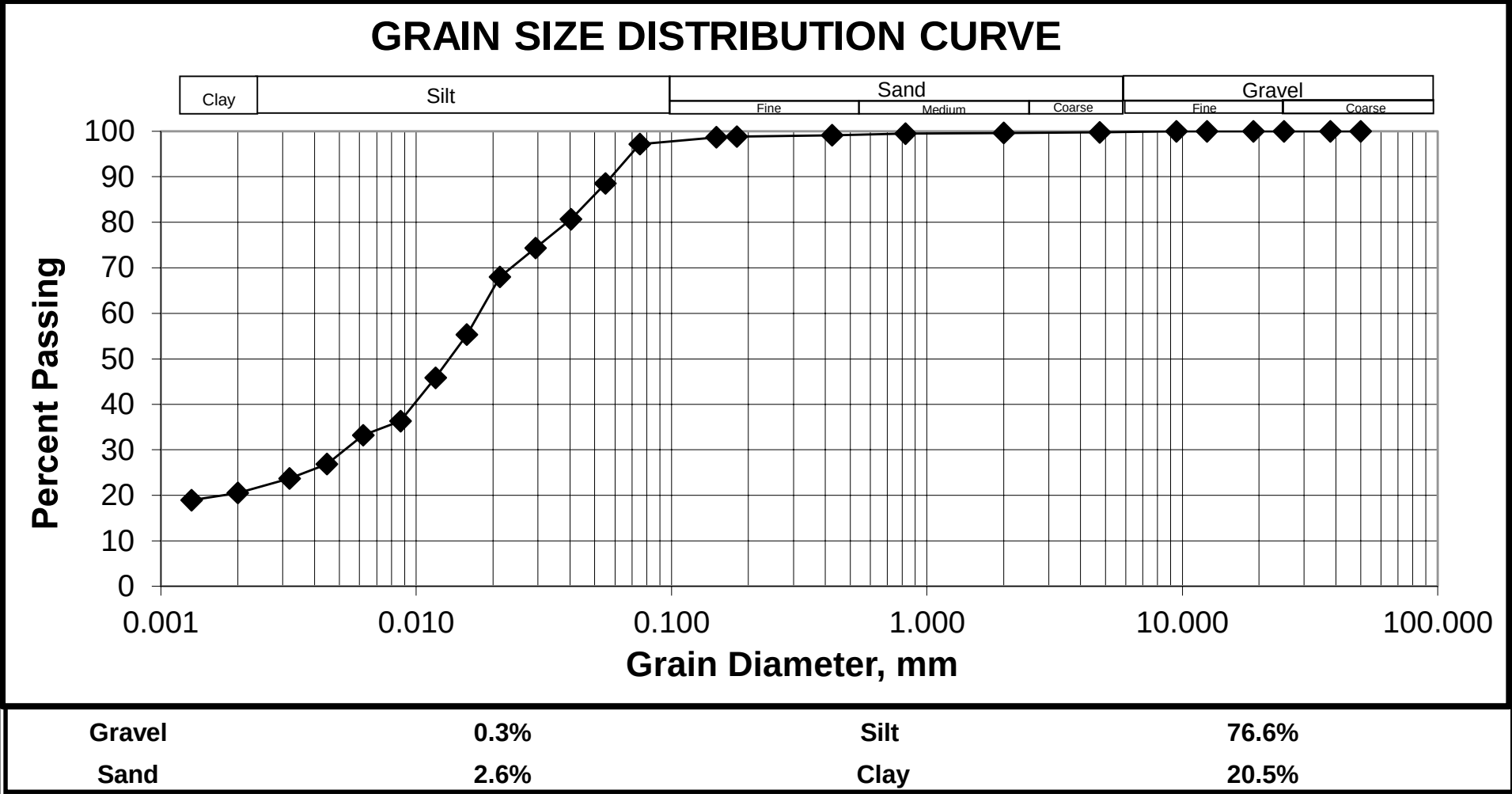
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-07
Sample No.: G5
Depth: 2.90 - 3.05 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.7	0.0750	97.1
38.0	100.0	2.00	99.6	0.0550	88.5
25.0	100.0	0.825	99.4	0.0403	80.6
19.0	100.0	0.425	99.1	0.0293	74.3
12.5	100.0	0.18	98.8	0.0213	68.0
9.5	100.0	0.15	98.6	0.0158	55.3
4.75	99.7	0.075	97.1	0.0119	45.8
				0.0087	36.3
				0.0062	33.2
				0.0045	26.8
				0.0032	23.7
				0.0020	20.5
				0.0013	18.9



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
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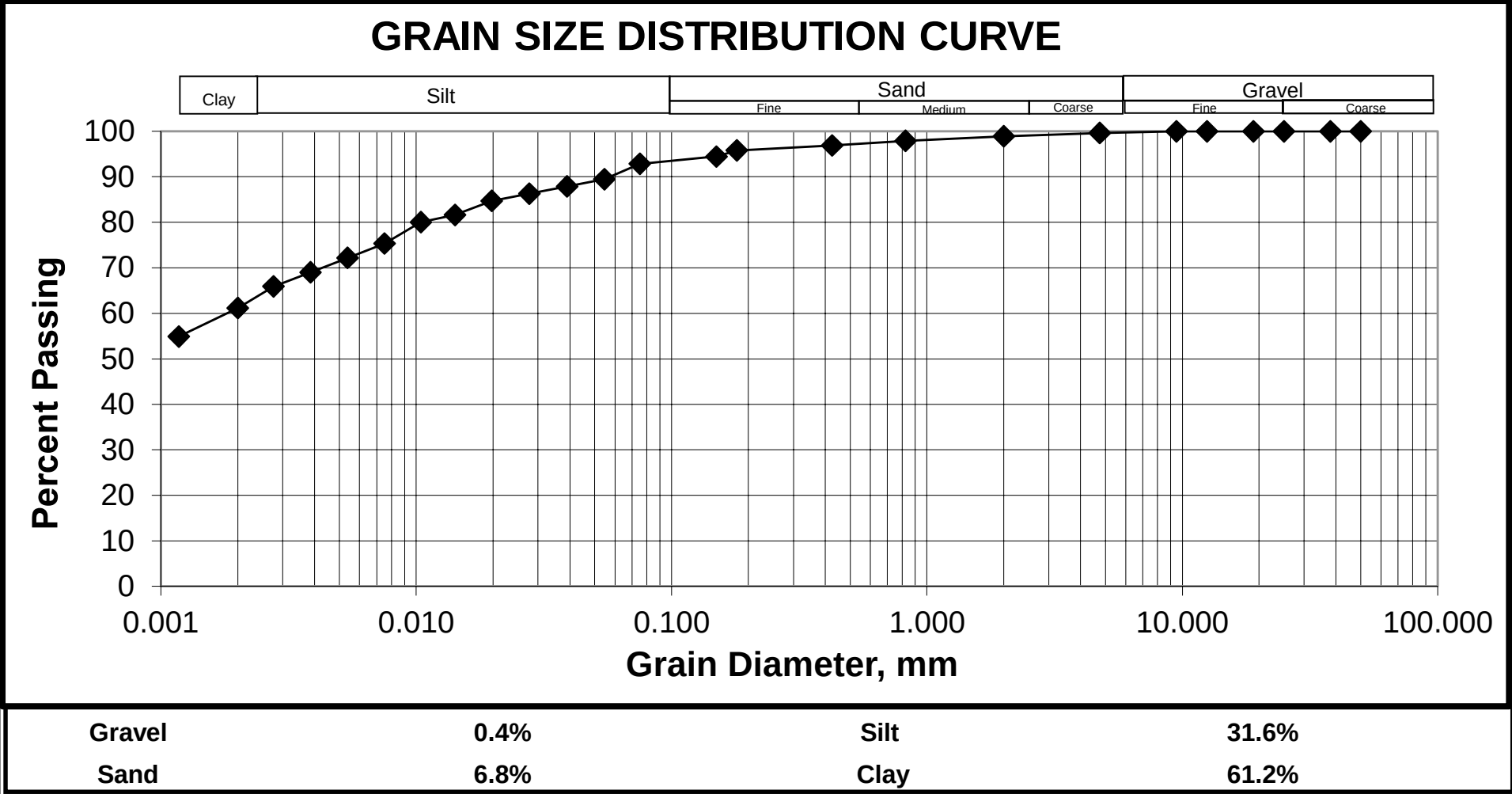
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-07
Sample No.: T13
Depth: 9.14 - 9.60 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.6	0.0750	92.8
38.0	100.0	2.00	98.9	0.0546	89.4
25.0	100.0	0.825	97.9	0.0389	87.9
19.0	100.0	0.425	96.9	0.0277	86.3
12.5	100.0	0.18	95.8	0.0197	84.7
9.5	100.0	0.15	94.5	0.0142	81.6
4.75	99.6	0.075	92.8	0.0104	80.0
				0.0075	75.3
				0.0054	72.2
				0.0039	69.0
				0.0028	65.9
				0.0020	61.2
				0.0012	54.9



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



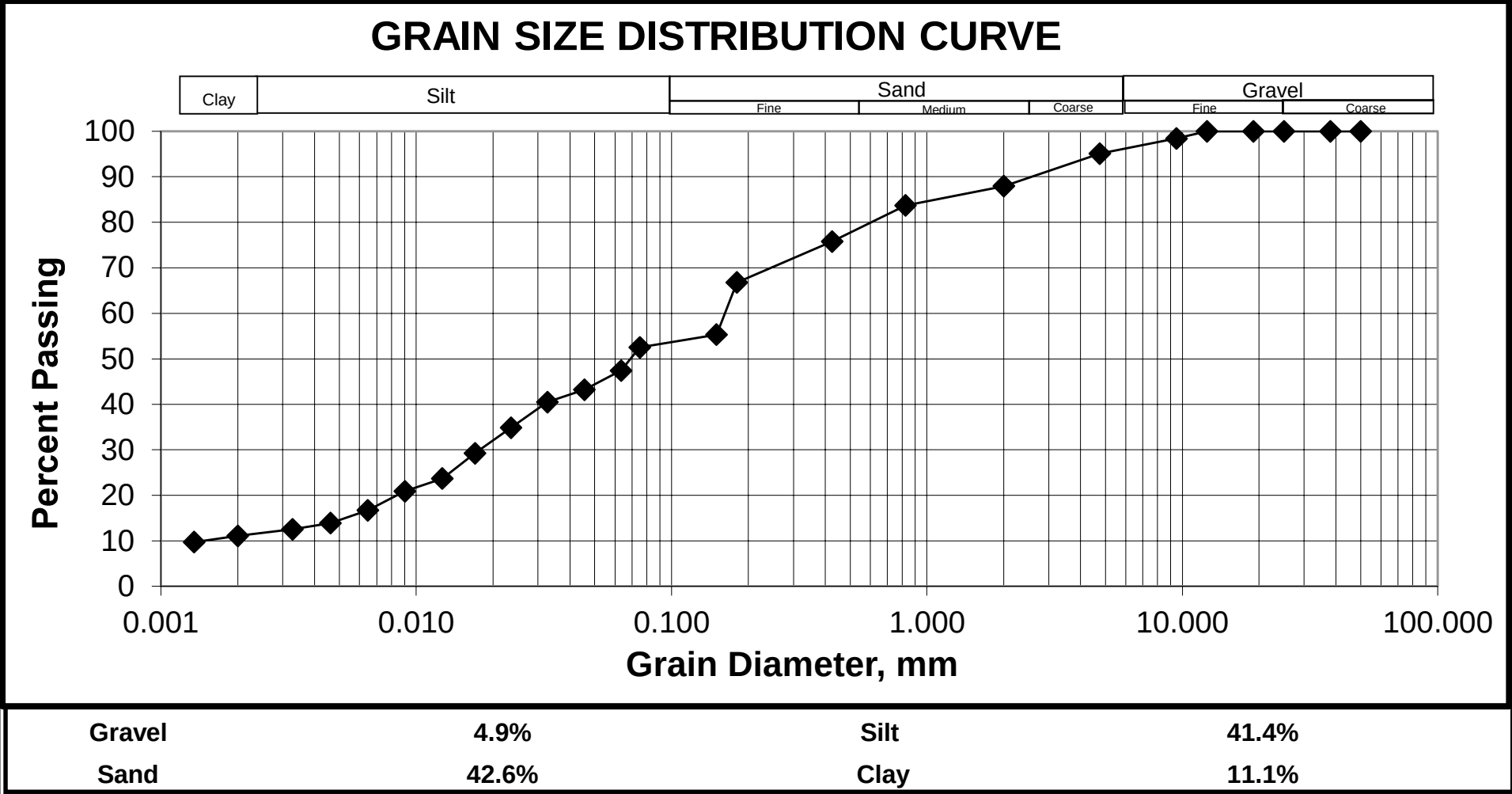
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-07
Sample No.: G23
Depth: 19.66 - 19.81 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	95.1	0.0750	52.5
38.0	100.0	2.00	87.9	0.0634	47.4
25.0	100.0	0.825	83.7	0.0456	43.2
19.0	100.0	0.425	75.7	0.0326	40.4
12.5	100.0	0.18	66.8	0.0235	34.9
9.5	98.4	0.15	55.3	0.0170	29.3
4.75	95.1	0.075	52.5	0.0126	23.7
				0.0090	20.9
				0.0065	16.7
				0.0046	13.9
				0.0033	12.5
				0.0020	11.1
				0.0013	9.7



GRAIN SIZE DISTRIBUTION
(AASHTO T88)



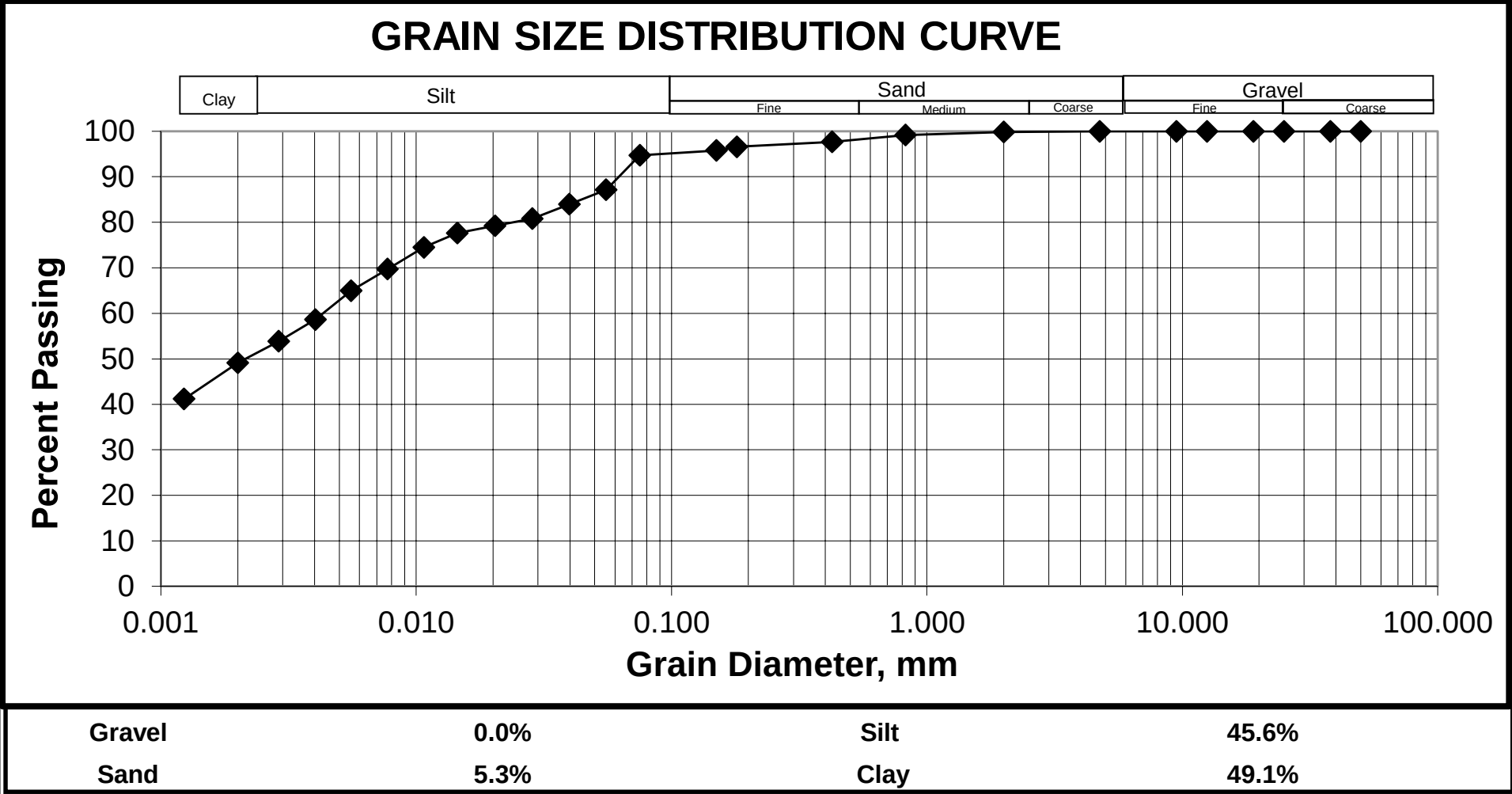
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH23-08
Sample No.: T4
Depth: 1.52 - 1.98 m
Date Sampled: 27-Oct-23
Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	94.7
38.0	100.0	2.00	99.8	0.0555	87.1
25.0	100.0	0.825	99.1	0.0398	84.0
19.0	100.0	0.425	97.7	0.0285	80.8
12.5	100.0	0.18	96.6	0.0203	79.2
9.5	100.0	0.15	95.8	0.0145	77.6
4.75	100.0	0.075	94.7	0.0107	74.5
				0.0077	69.7
				0.0056	64.9
				0.0040	58.6
				0.0029	53.8
				0.0020	49.1
				0.0012	41.2



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION (AASHTO T88)



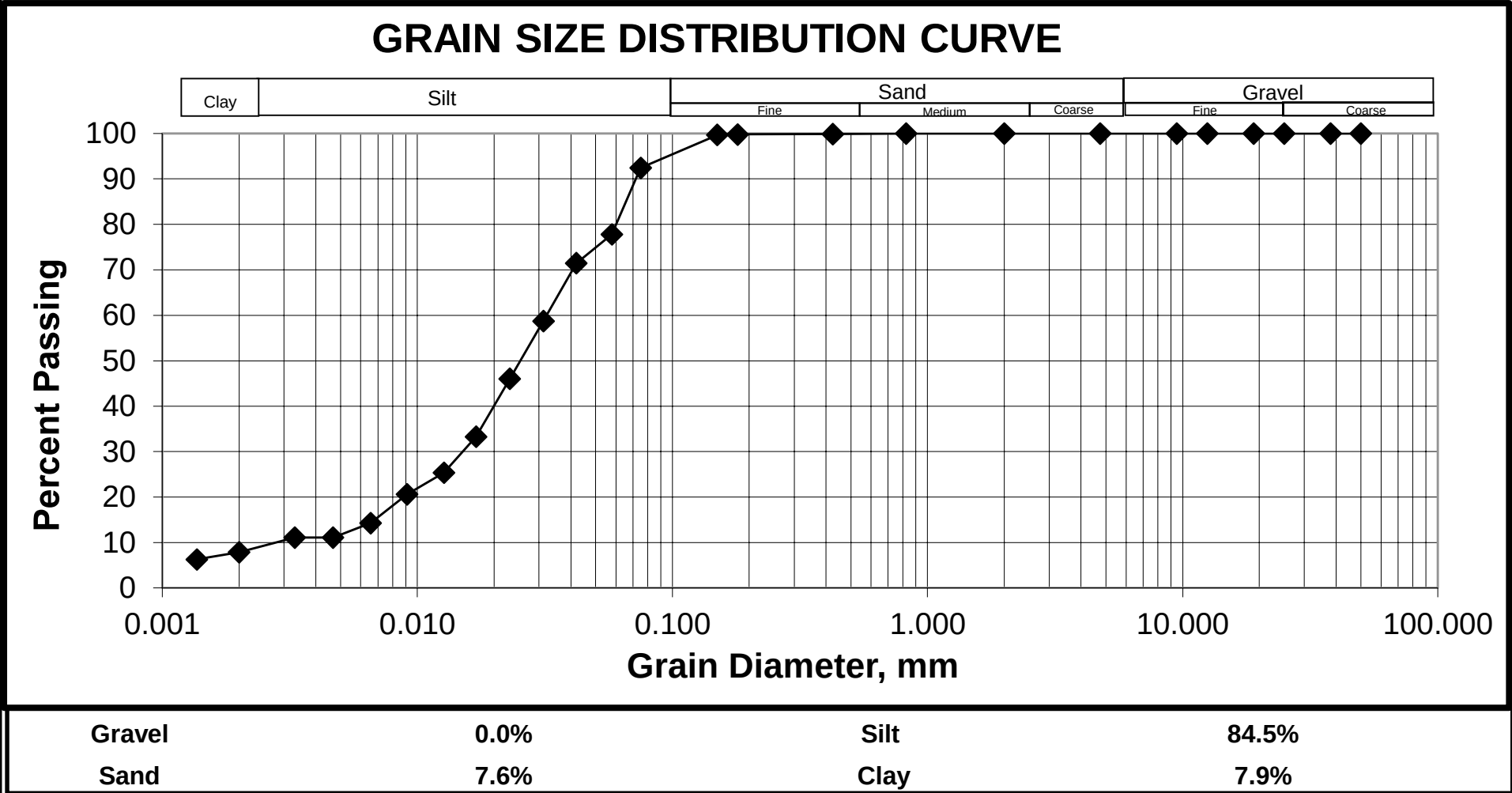
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Job No.:	60705950
Client:	WSTP
Project :	NEWPCC Biosolids Early Works
Date Tested:	21-Nov-23
Tested By:	LBoughton

Hole No.:	TH23-08
Sample No.:	G5
Depth:	2.13 - 2.29 m
Date Sampled:	27-Oct-23
Sampled By:	LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	92.4
38.0	100.0	2.00	100.0	0.0578	77.8
25.0	100.0	0.825	100.0	0.0420	71.4
19.0	100.0	0.425	99.9	0.0312	58.7
12.5	100.0	0.18	99.8	0.0230	46.0
9.5	100.0	0.15	99.7	0.0170	33.3
4.75	100.0	0.075	92.4	0.0127	25.3
				0.0091	20.6
				0.0066	14.2
				0.0047	11.1
				0.0033	11.1
				0.0020	7.9
				0.0014	6.3



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
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WINNIPEG GEOTECHNICAL LABORATORY

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Job No.: 60705950

Client: WSTP

Project : NEWPCC Biosolids Early Works

Date Tested: 21-Nov-23

Tested By: LBoughton

Hole No.: TH23-08

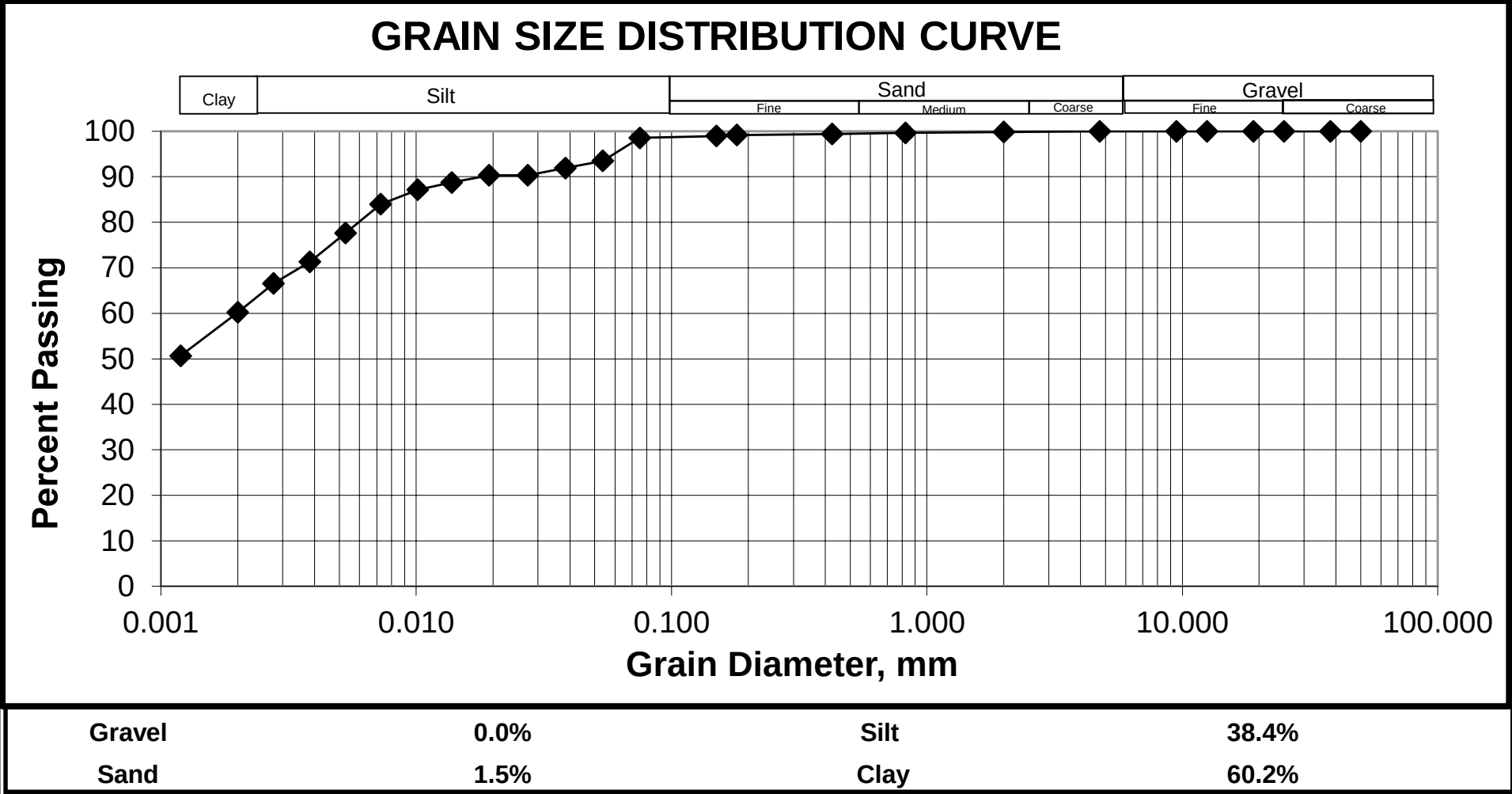
Sample No.: T11

Depth: 7.62 - 8.08 m

Date Sampled: 27-Oct-23

Sampled By: LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	98.5
38.0	100.0	2.00	99.8	0.0538	93.5
25.0	100.0	0.825	99.6	0.0383	91.9
19.0	100.0	0.425	99.4	0.0273	90.3
12.5	100.0	0.18	99.2	0.0193	90.3
9.5	100.0	0.15	98.9	0.0138	88.7
4.75	100.0	0.075	98.5	0.0101	87.1
				0.0073	83.9
				0.0053	77.6
				0.0038	71.3
				0.0028	66.5
				0.0020	60.2
				0.0012	50.7



Reviewed by: Lee Boughton
Laboratory Manager

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GRAIN SIZE DISTRIBUTION (AASHTO T88)



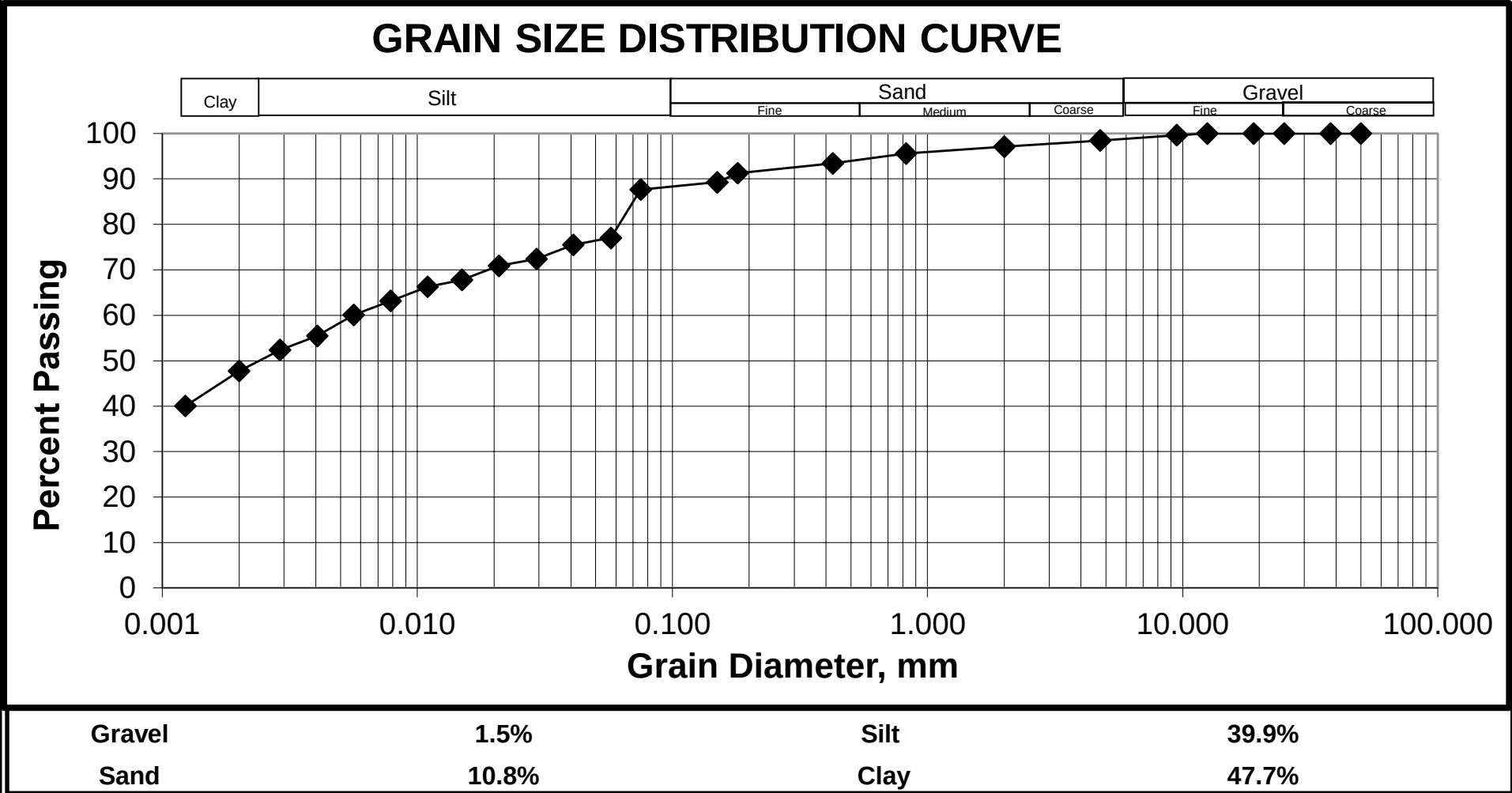
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Job No.:	60705950
Client:	WSTP
Project :	NEWPCC Biosolids Early Works
Date Tested:	21-Nov-23
Tested By:	LBoughton

Hole No.:	TH23-08
Sample No.:	G12
Depth:	8.99 - 9.14 m
Date Sampled:	27-Oct-23
Sampled By:	LBoughton

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	98.5	0.0750	87.7
38.0	100.0	2.00	97.1	0.0575	77.0
25.0	100.0	0.825	95.6	0.0409	75.5
19.0	100.0	0.425	93.4	0.0293	72.4
12.5	100.0	0.18	91.3	0.0209	70.9
9.5	99.6	0.15	89.3	0.0149	67.8
4.75	98.5	0.075	87.7	0.0110	66.2
				0.0079	63.1
				0.0056	60.1
				0.0040	55.4
				0.0029	52.4
				0.0020	47.7
				0.0012	40.0



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GRAIN SIZE DISTRIBUTION
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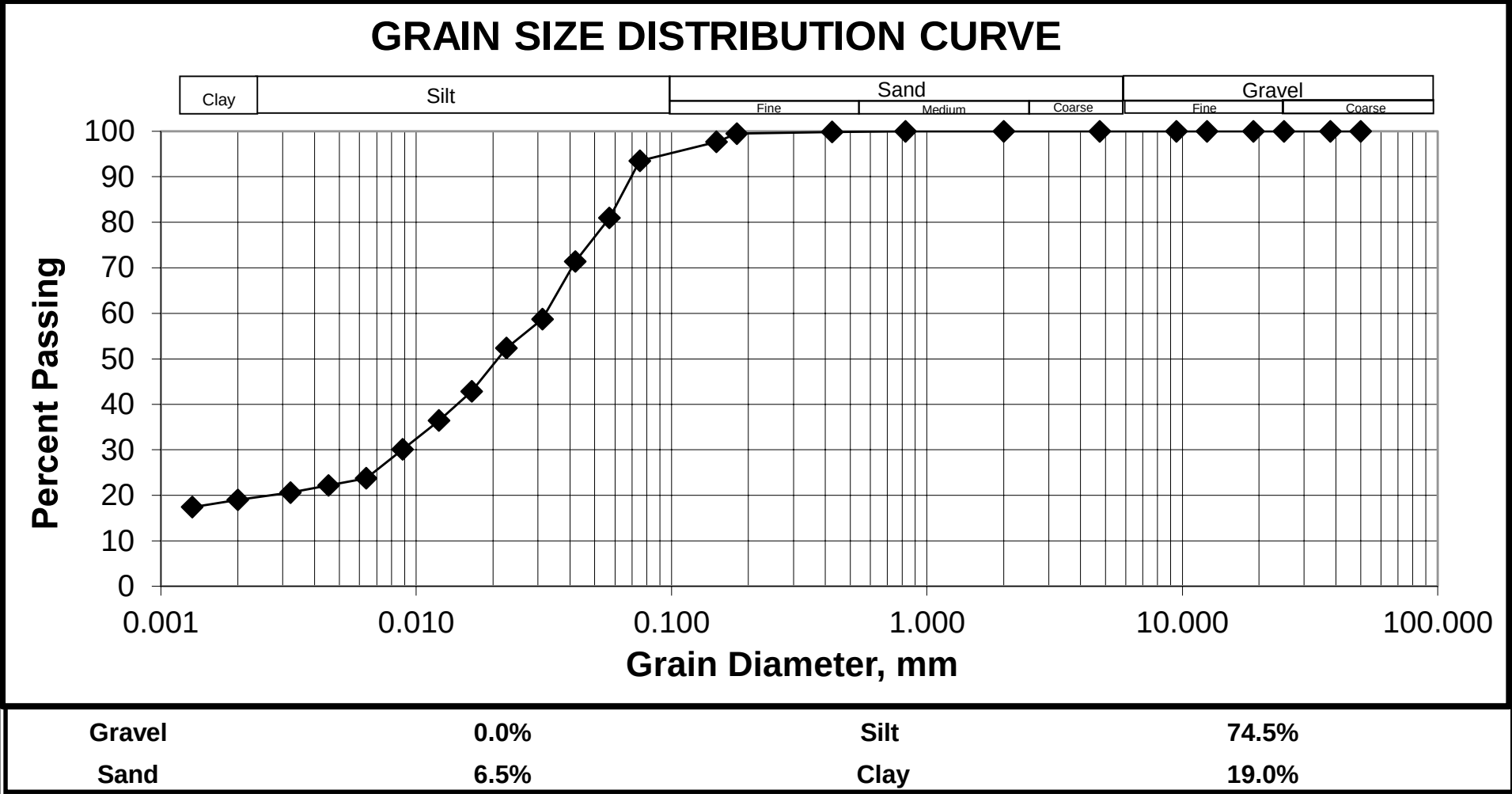
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 29-Jan-24
Tested By: LBoughton

Hole No.: TH24-10
Sample No.: G3
Depth: 1.37 - 1.52 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	93.5
38.0	100.0	2.00	100.0	0.0571	80.9
25.0	100.0	0.825	100.0	0.0420	71.4
19.0	100.0	0.425	99.8	0.0312	58.7
12.5	100.0	0.18	99.4	0.0226	52.3
9.5	100.0	0.15	97.7	0.0165	42.8
4.75	100.0	0.075	93.5	0.0123	36.5
				0.0089	30.1
				0.0064	23.8
				0.0045	22.2
				0.0032	20.6
				0.0020	19.0
				0.0013	17.4



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



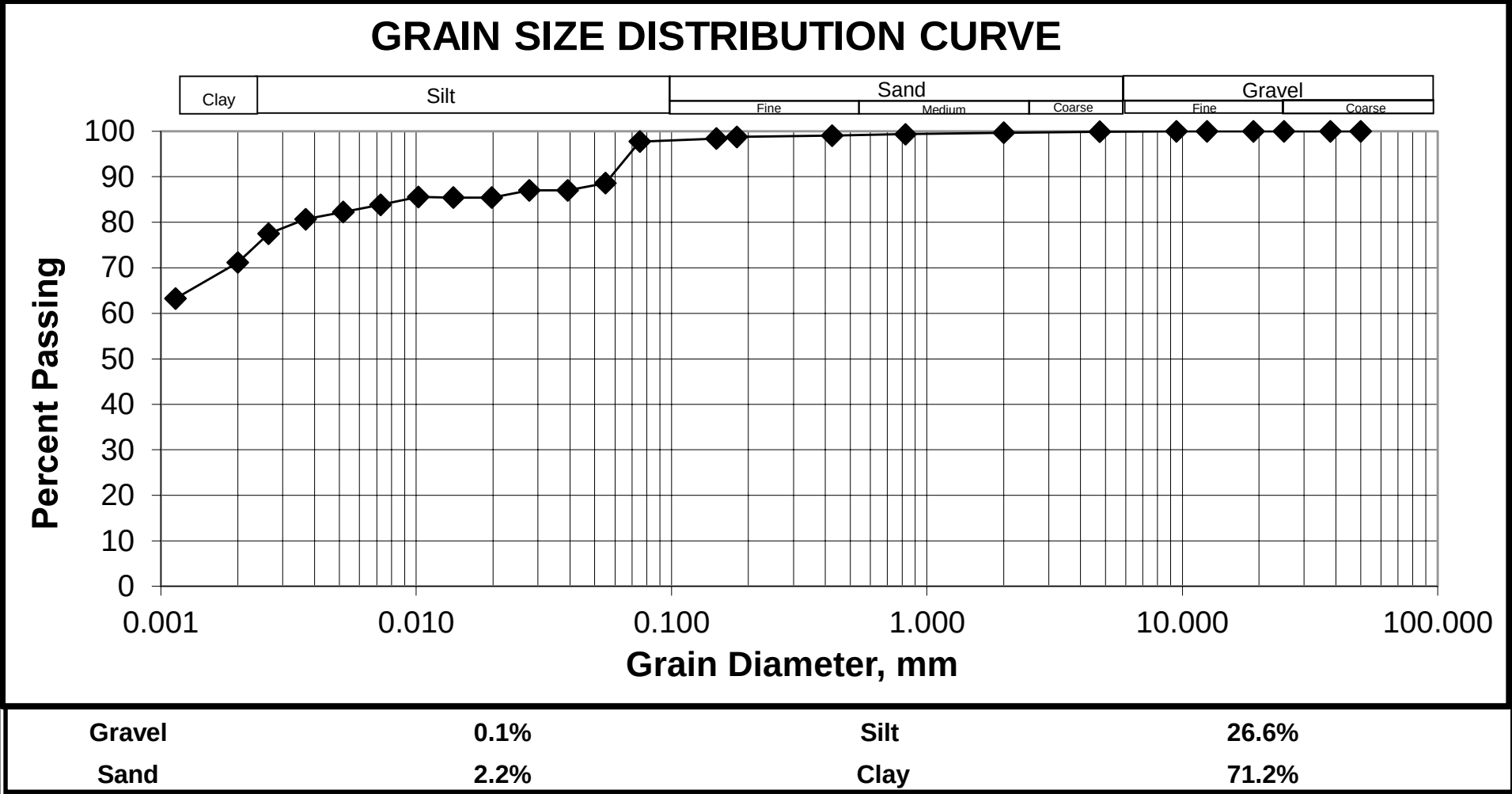
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19 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada
Tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 29-Jan-24
Tested By: LBoughton

Hole No.: TH24-10
Sample No.: T7
Depth: 6.10 - 6.71 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.9	0.0750	97.7
38.0	100.0	2.00	99.6	0.0550	88.6
25.0	100.0	0.825	99.4	0.0392	87.0
19.0	100.0	0.425	99.0	0.0277	87.0
12.5	100.0	0.18	98.7	0.0197	85.4
9.5	100.0	0.15	98.4	0.0140	85.4
4.75	99.9	0.075	97.7	0.0102	85.5
				0.0073	83.8
				0.0052	82.2
				0.0037	80.7
				0.0026	77.5
				0.0020	71.2
				0.0011	63.2



Reviewed by: Lee Boughton
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Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



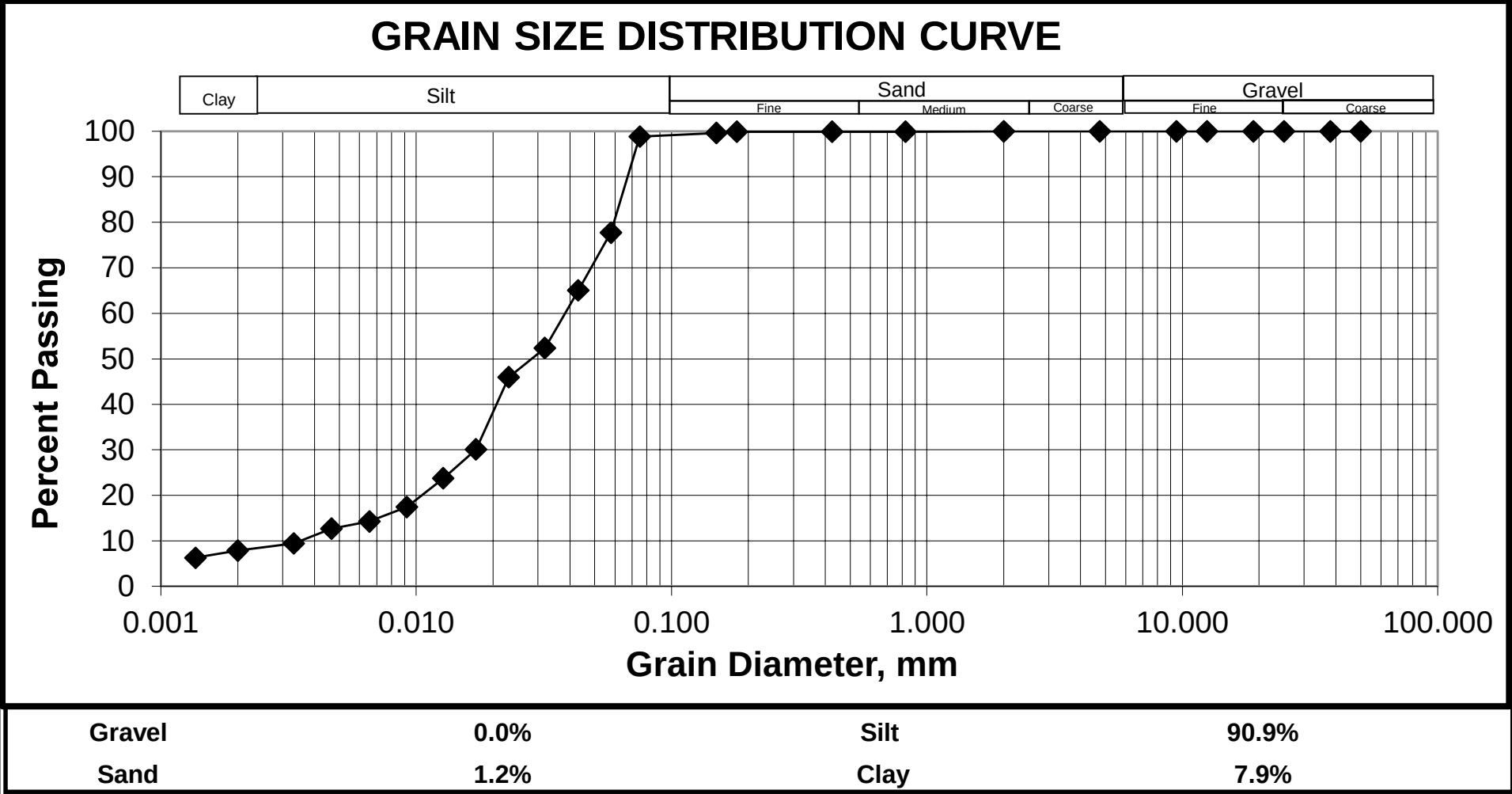
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Tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 29-Jan-24
Tested By: LBoughton

Hole No.: TH24-13
Sample No.: G4
Depth: 2.74 - 2.90 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	98.8
38.0	100.0	2.00	100.0	0.0578	77.7
25.0	100.0	0.825	99.9	0.0431	65.0
19.0	100.0	0.425	99.9	0.0319	52.3
12.5	100.0	0.18	99.9	0.0230	46.0
9.5	100.0	0.15	99.6	0.0171	30.1
4.75	100.0	0.075	98.8	0.0128	23.7
				0.0092	17.4
				0.0066	14.2
				0.0047	12.6
				0.0033	9.5
				0.0020	7.9
				0.0014	6.3



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
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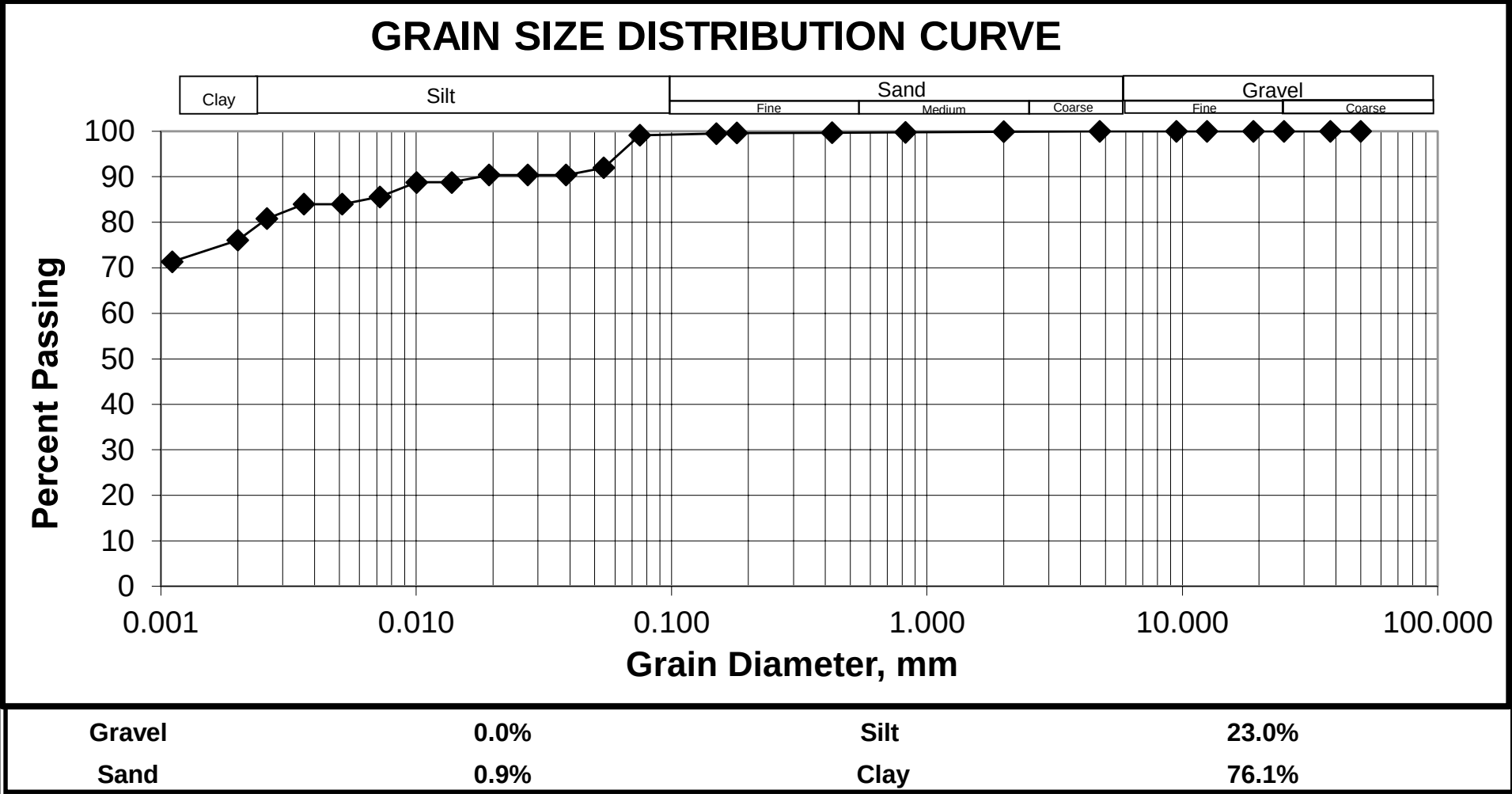
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 29-Jan-24
Tested By: LBoughton

Hole No.: TH24-13
Sample No.: T9
Depth: 9.14 - 9.75 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.1
38.0	100.0	2.00	99.9	0.0542	91.9
25.0	100.0	0.825	99.8	0.0386	90.4
19.0	100.0	0.425	99.7	0.0273	90.4
12.5	100.0	0.18	99.6	0.0193	90.4
9.5	100.0	0.15	99.5	0.0138	88.8
4.75	100.0	0.075	99.1	0.0100	88.8
				0.0072	85.6
				0.0051	84.0
				0.0036	84.0
				0.0026	80.8
				0.0020	76.1
				0.0011	71.3



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
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GRAIN SIZE DISTRIBUTION
(AASHTO T88)



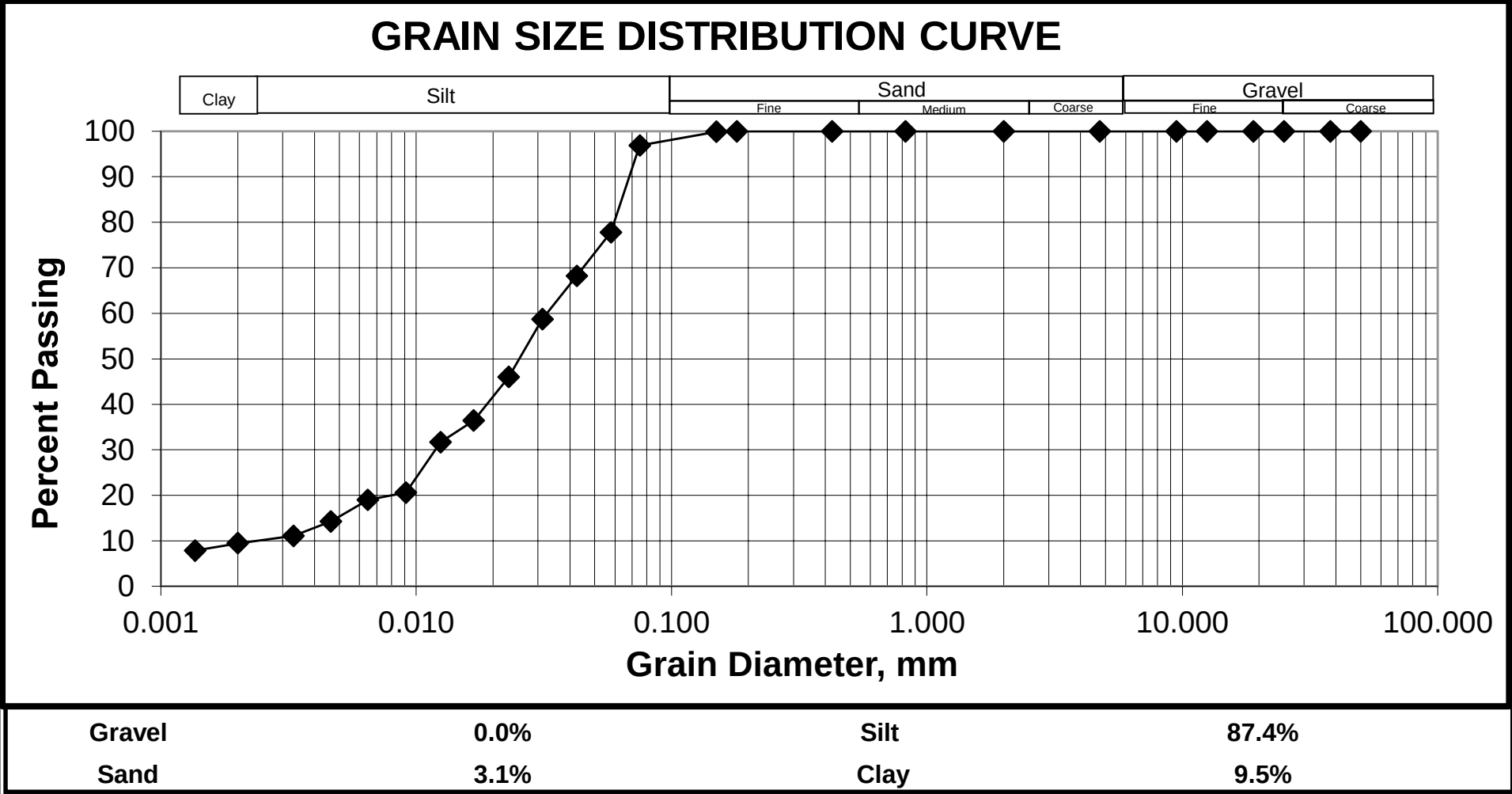
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 29-Jan-24
Tested By: LBoughton

Hole No.: TH24-14
Sample No.: G5
Depth: 2.90 - 3.05 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	96.9
38.0	100.0	2.00	100.0	0.0578	77.7
25.0	100.0	0.825	100.0	0.0425	68.2
19.0	100.0	0.425	100.0	0.0312	58.7
12.5	100.0	0.18	99.9	0.0230	46.0
9.5	100.0	0.15	99.9	0.0168	36.5
4.75	100.0	0.075	96.9	0.0125	31.7
				0.0091	20.6
				0.0065	19.0
				0.0046	14.2
				0.0033	11.1
				0.0020	9.5
				0.0014	7.9



Reviewed by: Lee Boughton
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Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

GRAIN SIZE DISTRIBUTION
(AASHTO T88)



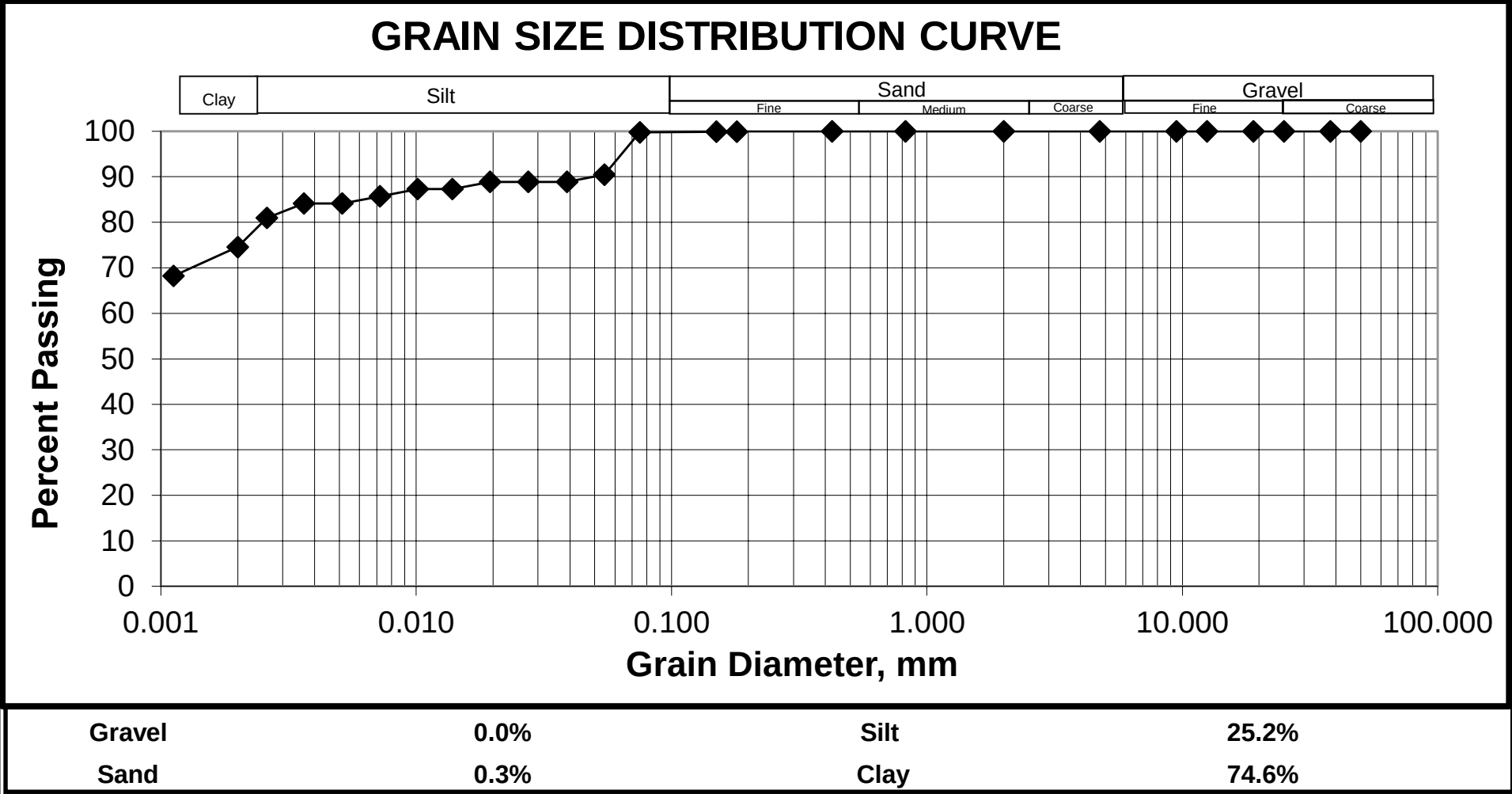
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Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 29-Jan-24
Tested By: LBoughton

Hole No.: TH24-14
Sample No.: T8
Depth: 4.57 - 5.18 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.7
38.0	100.0	2.00	100.0	0.0546	90.5
25.0	100.0	0.825	100.0	0.0389	88.9
19.0	100.0	0.425	99.9	0.0275	88.9
12.5	100.0	0.18	99.9	0.0195	88.9
9.5	100.0	0.15	99.9	0.0139	87.3
4.75	100.0	0.075	99.7	0.0101	87.3
				0.0072	85.7
				0.0051	84.1
				0.0036	84.1
				0.0026	80.9
				0.0020	74.6
				0.0011	68.2



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Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
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GRAIN SIZE DISTRIBUTION
(AASHTO T88)



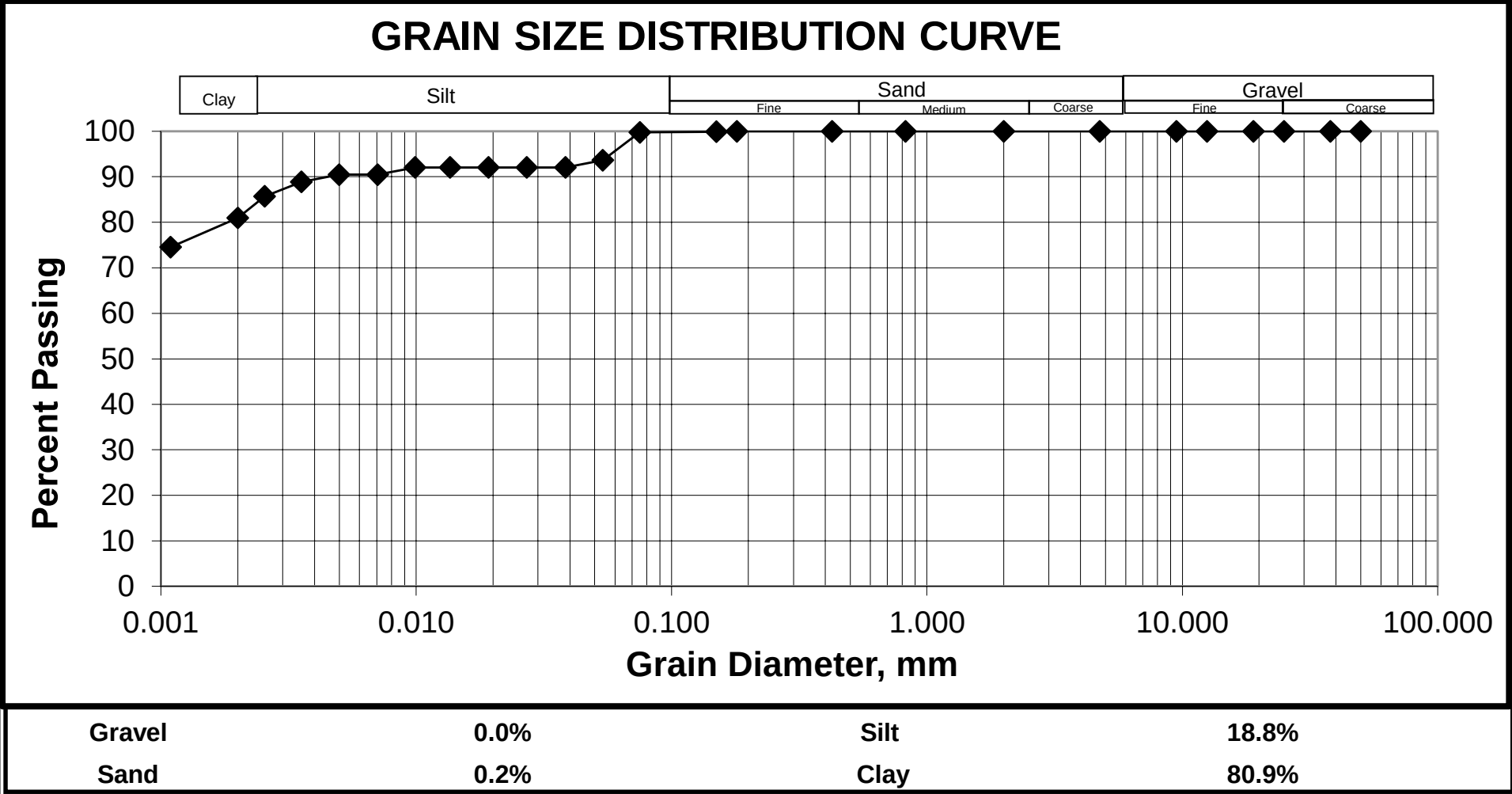
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Tel (204) 477-5381 fax (431) 800-1210



Job No.: 60705950
Client: WSTP
Project : NEWPCC Biosolids Early Works
Date Tested: 21-Nov-23
Tested By: LBoughton

Hole No.: TH24-15
Sample No.: T8
Depth: 6.10 - 6.71 m
Date Sampled: 12-Jan-24
Sampled By: ABonifacio

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	99.8
38.0	100.0	2.00	100.0	0.0538	93.6
25.0	100.0	0.825	100.0	0.0383	92.0
19.0	100.0	0.425	100.0	0.0271	92.0
12.5	100.0	0.18	99.9	0.0192	92.0
9.5	100.0	0.15	99.9	0.0136	92.0
4.75	100.0	0.075	99.8	0.0099	92.0
				0.0071	90.5
				0.0050	90.5
				0.0036	88.9
				0.0025	85.7
				0.0020	80.9
				0.0011	74.6



Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Supplier/Location: Winnipeg, MB
Sample Depth (m): 1.52 - 1.98 m
Sample Location: TH23-01
Sample Number: T4

Date Sampled: October 27, 2023
Sampled By: LBoughton
Date Received: November 7, 2023
Submitted By: LBoughton
Date Tested: November 9, 2023
Tested By: LBoughton

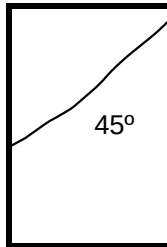
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - brown, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.26
Average Length (cm):	15.00
Length/Diameter Ratio:	2.07
Moisture content (%):	45.0
Bulk Density (g/cm ³):	1.681
Bulk Unit Weight (kN/m ³):	16.5
Bulk Unit Weight (pcf):	105.0
Dry Unit Weight (kN/m ³):	11.38

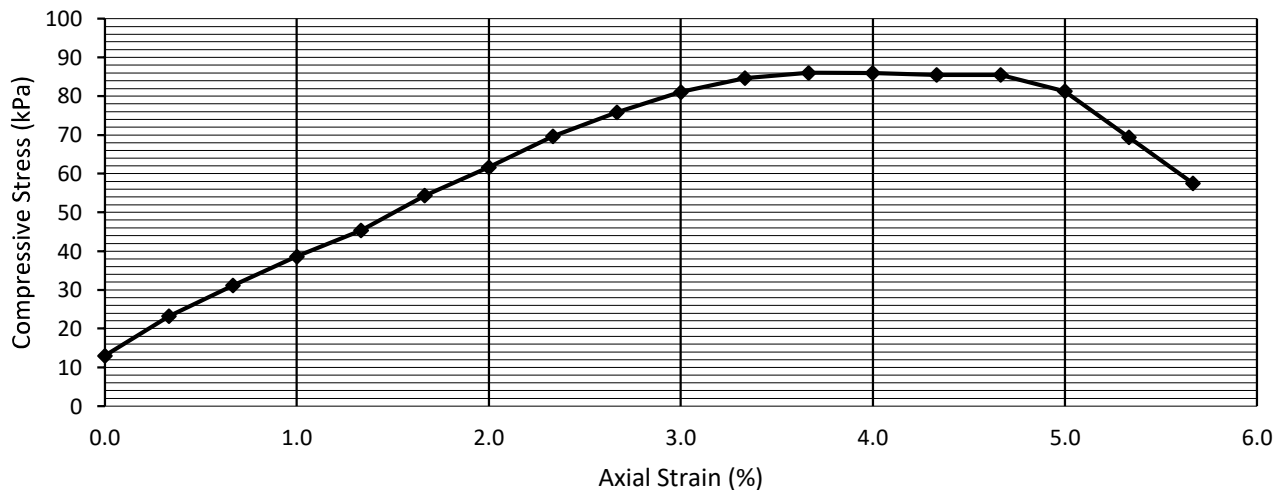
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	39.2
Pocket Pen.	Undrained Shear Strength (kPa)	59.1

UCS	Unconfined compressive strength (kPa)	86.04	Undrained Shear Strength (kPa)	43.02
	Unconfined compressive strength (ksf)	1.797	Undrained Shear Strength (ksf)	0.898
	Avg. Rate of Strain to Failure (%/min):	2.00	Strain at Failure (%):	3.67

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

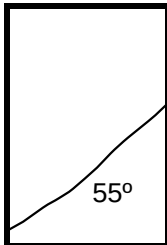


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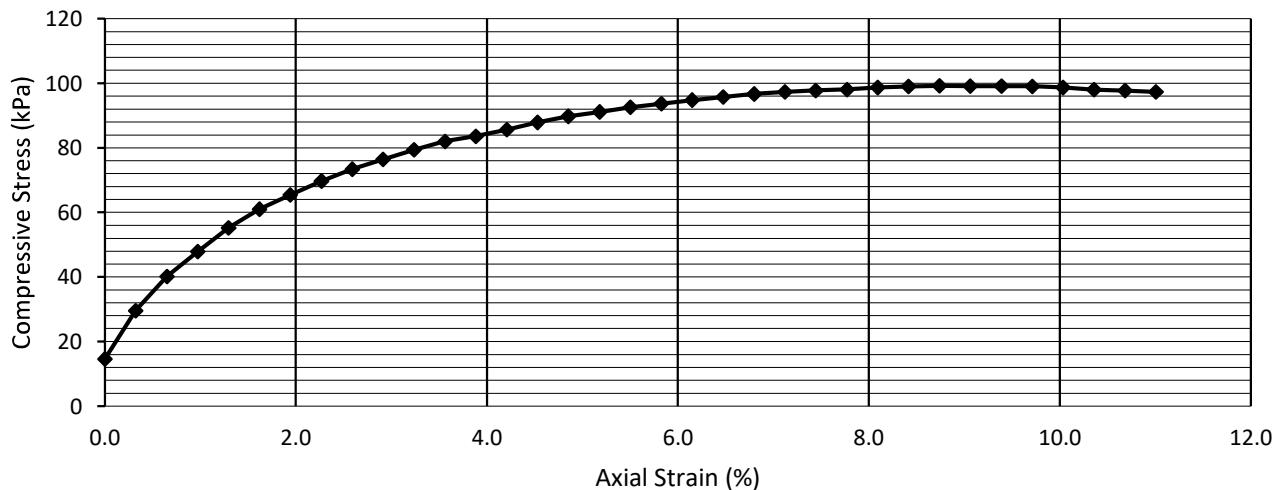
Project Name:	NEWPCC Biosolids Early Works	Date Sampled:	October 27, 2023
Project Number:	60705950	Sampled By:	LBoughton
Client:	WSTP	Date Received:	November 7, 2023
Supplier/Location:	Winnipeg, MB	Submitted By:	LBoughton
Sample Depth (m):	4.57 - 5.03 m	Date Tested:	November 9, 2023
Sample Location:	TH23-01	Tested By:	LBoughton
Sample Number:	T9		

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description:		CLAY - brown, stiff, moist, silty, high plasticity, homogeneous			
Average Diameter (cm):		7.25		FAILURE SKETCH 	
Average Length (cm):		15.45			
Length/Diameter Ratio:		2.13			
Moisture content (%):		36.6			
Bulk Density (g/cm³):		1.854			
Bulk Unit Weight (kN/m³):		18.2			
Bulk Unit Weight (pcf):		115.7			
Dry Unit Weight (kN/m³):		13.31			
Torvane	Undrained Shear Strength (kPa)	53.9			
Pocket Pen.	Undrained Shear Strength (kPa)	0.0			
UCS	Unconfined compressive strength (kPa)	99.19	Undrained Shear Strength (kPa)	49.59	
	Unconfined compressive strength (ksf)	2.072	Undrained Shear Strength (ksf)	1.036	
	Avg. Rate of Strain to Failure (%/min):	1.94	Strain at Failure (%):	8.74	

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 7.62 - 8.08 m

Sample Location: TH23-01

Sample Number: T12

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

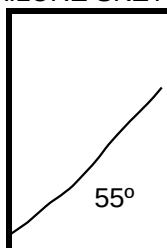
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.25
Average Length (cm):	14.02
Length/Diameter Ratio:	1.93
Moisture content (%):	55.9
Bulk Density (g/cm ³):	1.702
Bulk Unit Weight (kN/m ³):	16.7
Bulk Unit Weight (pcf):	106.2
Dry Unit Weight (kN/m ³):	10.70

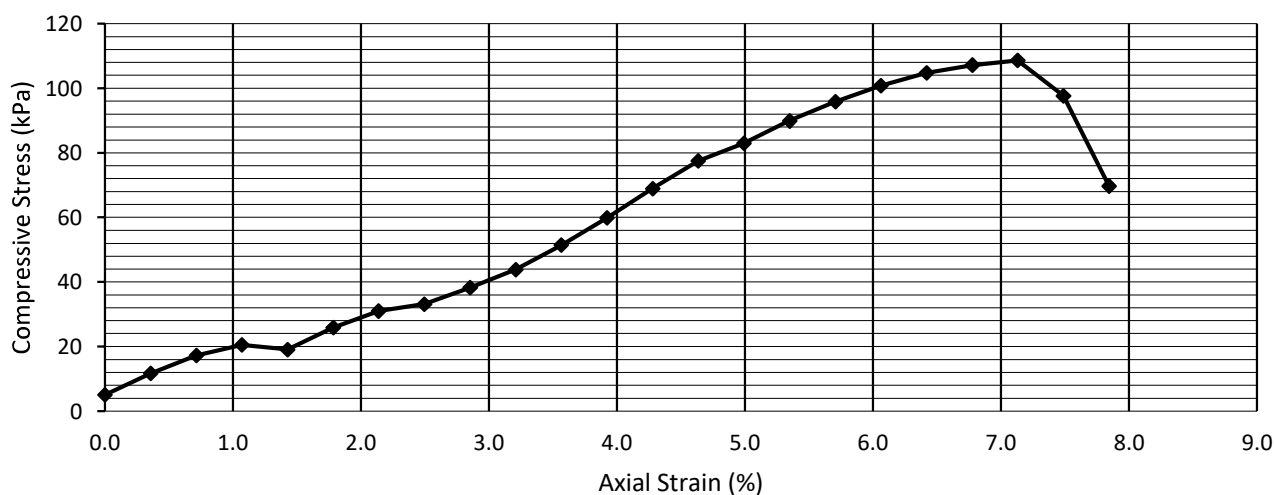
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	33.3
Pocket Pen.	Undrained Shear Strength (kPa)	31.9

UCS	Unconfined compressive strength (kPa)	108.64	Undrained Shear Strength (kPa)	54.32
	Unconfined compressive strength (ksf)	2.269	Undrained Shear Strength (ksf)	1.135
	Avg. Rate of Strain to Failure (%/min):	2.14	Strain at Failure (%):	7.13

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 10.67 - 11.13 m

Sample Location: TH23-01

Sample Number: T15

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

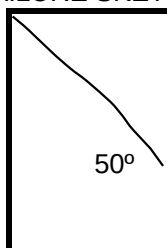
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, soft, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.21
Average Length (cm):	14.80
Length/Diameter Ratio:	2.05
Moisture content (%):	47.3
Bulk Density (g/cm ³):	1.857
Bulk Unit Weight (kN/m ³):	18.2
Bulk Unit Weight (pcf):	116.0
Dry Unit Weight (kN/m ³):	12.37

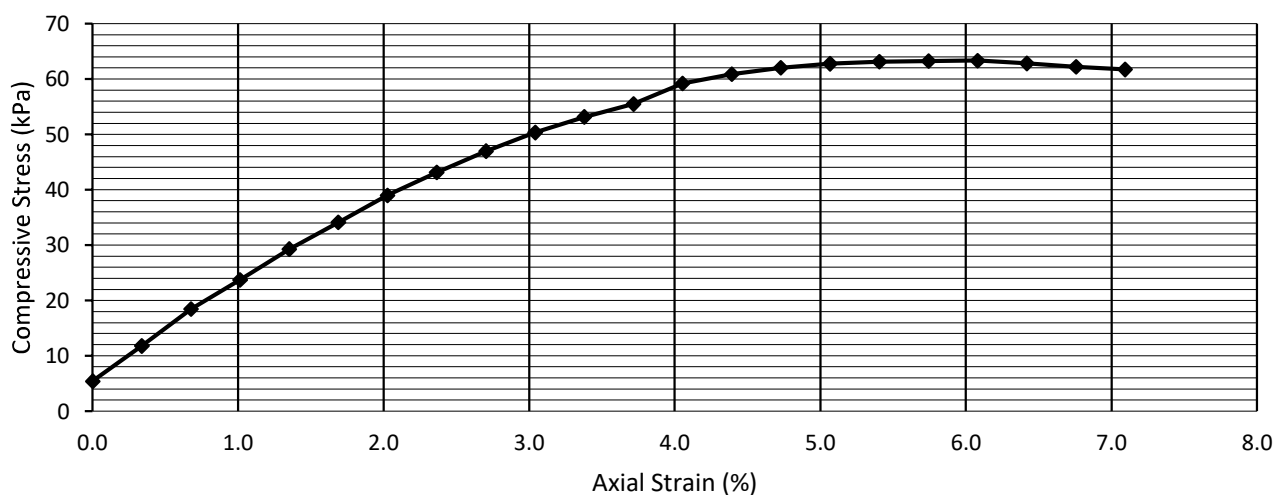
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	21.6
Pocket Pen.	Undrained Shear Strength (kPa)	11.2

UCS	Unconfined compressive strength (kPa)	63.34	Undrained Shear Strength (kPa)	31.67
	Unconfined compressive strength (ksf)	1.323	Undrained Shear Strength (ksf)	0.661
	Avg. Rate of Strain to Failure (%/min):	2.03	Strain at Failure (%):	5.74

Unconfined Compressive Strength



Comments:

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Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 13.72 - 14.17 m

Sample Location: TH23-01

Sample Number: T18

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, soft, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.26
Average Length (cm):	13.46
Length/Diameter Ratio:	1.85
Moisture content (%):	59.4
Bulk Density (g/cm ³):	1.649
Bulk Unit Weight (kN/m ³):	16.2
Bulk Unit Weight (pcf):	102.9
Dry Unit Weight (kN/m ³):	10.14

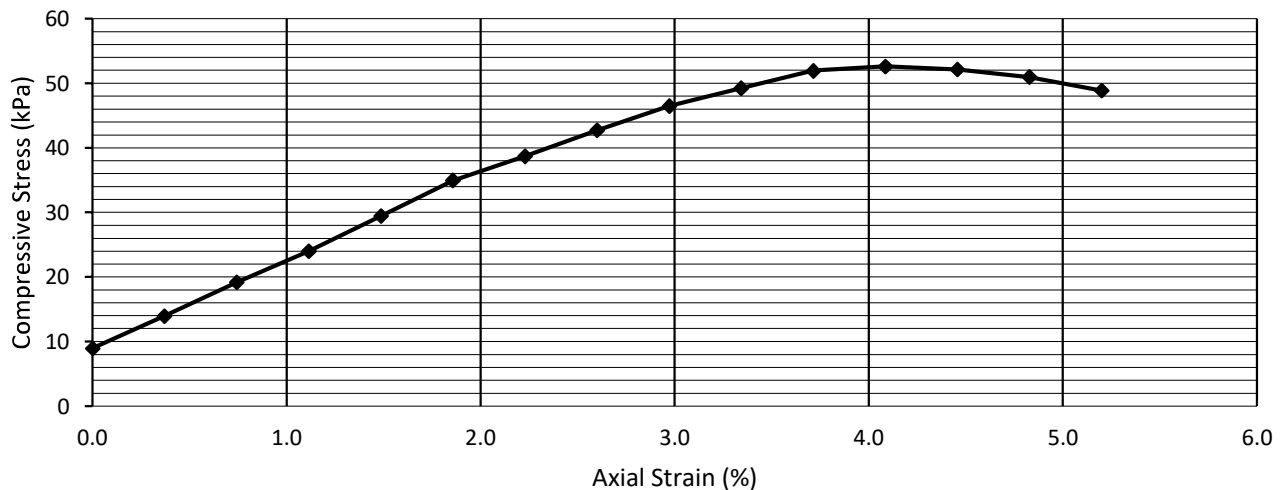
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	24.5
Pocket Pen.	Undrained Shear Strength (kPa)	19.2

UCS	Unconfined compressive strength (kPa)	52.61	Undrained Shear Strength (kPa)	26.30
	Unconfined compressive strength (ksf)	1.099	Undrained Shear Strength (ksf)	0.549
	Avg. Rate of Strain to Failure (%/min):	2.23	Strain at Failure (%):	4.09

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

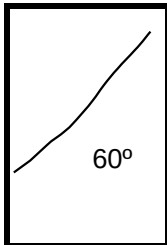


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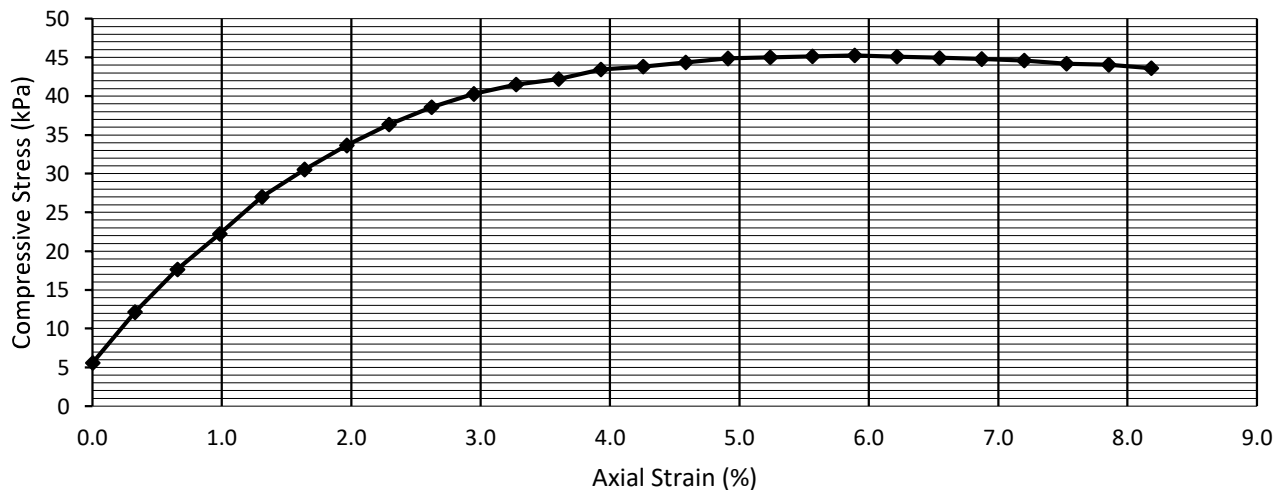
Project Name:	NEWPCC Biosolids Early Works	Date Sampled:	October 27, 2023
Project Number:	60705950	Sampled By:	LBoughton
Client:	WSTP	Date Received:	November 7, 2023
Supplier/Location:	Winnipeg, MB	Submitted By:	LBoughton
Sample Depth (m):	16.76 - 17.22 m	Date Tested:	November 9, 2023
Sample Location:	TH23-01	Tested By:	LBoughton
Sample Number:	T21		

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description:		CLAY - grey, soft, moist, silty, high plasticity, homogeneous			
Average Diameter (cm):		7.29		FAILURE SKETCH 	
Average Length (cm):		15.28			
Length/Diameter Ratio:		2.09			
Moisture content (%):		64.0			
Bulk Density (g/cm³):		1.799			
Bulk Unit Weight (kN/m³):		17.6			
Bulk Unit Weight (pcf):		112.3			
Dry Unit Weight (kN/m³):		10.76			
Torvane	Undrained Shear Strength (kPa)	24.5			
Pocket Pen.	Undrained Shear Strength (kPa)	22.3			
UCS	Unconfined compressive strength (kPa)	45.26	Undrained Shear Strength (kPa)	22.63	
	Unconfined compressive strength (ksf)	0.945	Undrained Shear Strength (ksf)	0.473	
	Avg. Rate of Strain to Failure (%/min):	1.96	Strain at Failure (%):	5.89	

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name:	NEWPCC Biosolids Early Works	Date Sampled:	October 27, 2023
Project Number:	60705950	Sampled By:	LBoughton
Client:	WSTP	Date Received:	November 7, 2023
Supplier/Location:	Winnipeg, MB	Submitted By:	LBoughton
Sample Depth (m):	1.52 - 2.13 m	Date Tested:	November 9, 2023
Sample Location:	TH23-05	Tested By:	LBoughton
Sample Number:	T4		

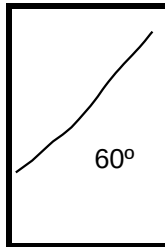
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description:	CLAY - black/brown, stiff, moist, silty, trace organics, trace gravel, trace sand, high plasticity
-------------------	--

Average Diameter (cm):	7.17
Average Length (cm):	10.03
Length/Diameter Ratio:	1.40
Moisture content (%):	33.2
Bulk Density (g/cm ³):	1.824
Bulk Unit Weight (kN/m ³):	17.9
Bulk Unit Weight (pcf):	113.9
Dry Unit Weight (kN/m ³):	13.44

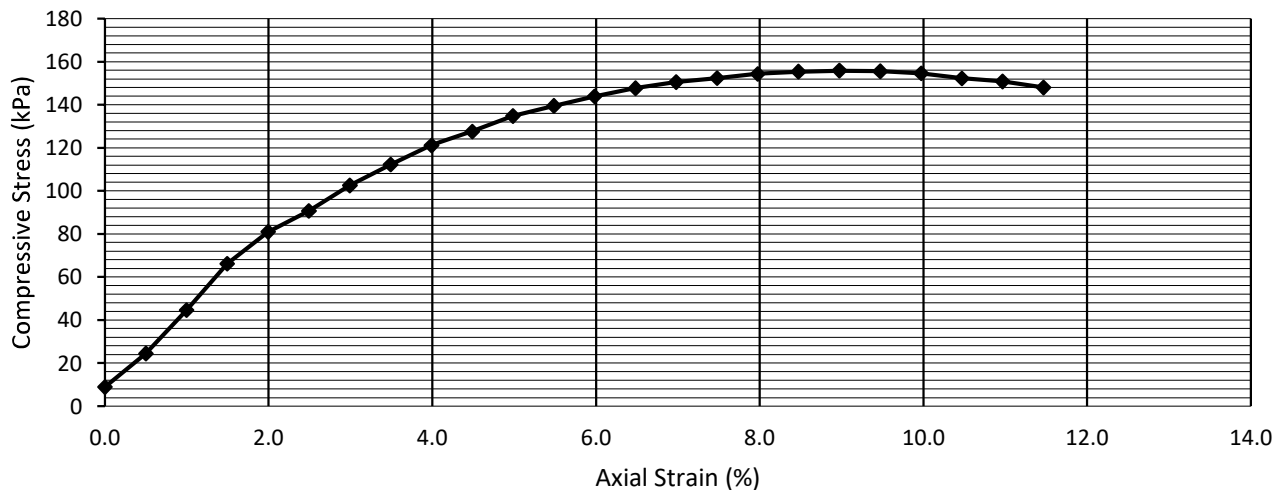
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	78.5
Pocket Pen.	Undrained Shear Strength (kPa)	99.0

UCS	Unconfined compressive strength (kPa)	155.83	Undrained Shear Strength (kPa)	77.92
	Unconfined compressive strength (ksf)	3.255	Undrained Shear Strength (ksf)	1.627
	Avg. Rate of Strain to Failure (%/min):	2.99	Strain at Failure (%):	8.97

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 4.57 - 5.18 m

Sample Location: TH23-05

Sample Number: T9

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - brown, stiff, moist, silty, high plasticity, homogeneous

Average Diameter (cm): 5.09

Average Length (cm): 14.37

Length/Diameter Ratio: 2.82

Moisture content (%): 29.5

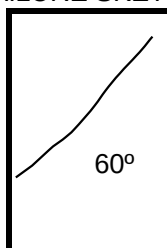
Bulk Density (g/cm³): 3.709

Bulk Unit Weight (kN/m³): 36.4

Bulk Unit Weight (pcf): 231.5

Dry Unit Weight (kN/m³): 28.09

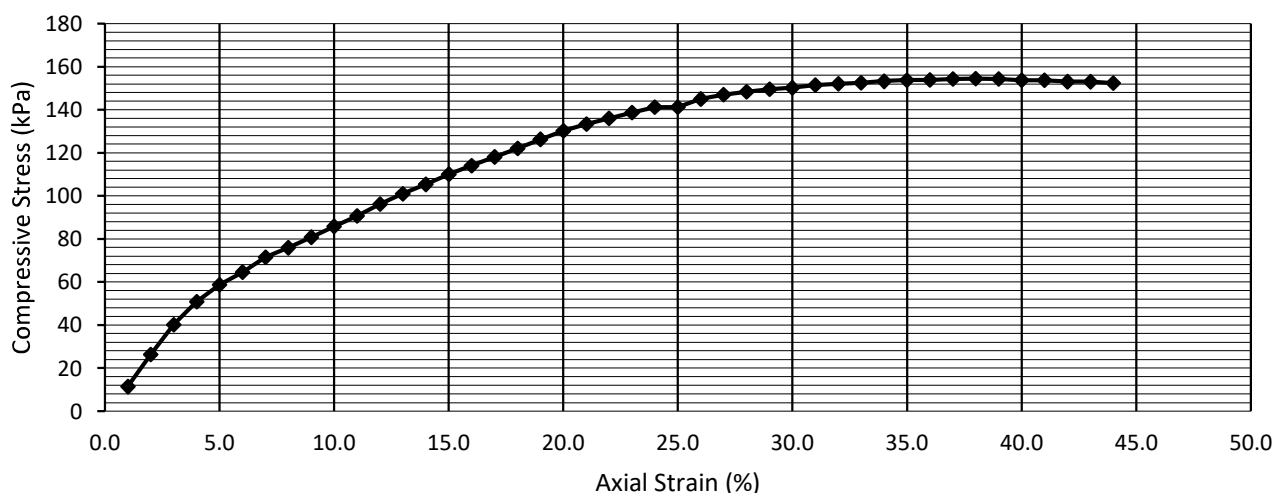
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	34.3
Pocket Pen.	Undrained Shear Strength (kPa)	41.5

UCS	Unconfined compressive strength (kPa)	154.45	Undrained Shear Strength (kPa)	77.22
	Unconfined compressive strength (ksf)	3.226	Undrained Shear Strength (ksf)	1.613
	Avg. Rate of Strain to Failure (%/min):	2.09	Strain at Failure (%):	12.87

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 7.62 - 8.23 m

Sample Location: TH23-05

Sample Number: T12

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

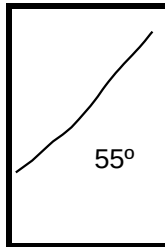
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.24
Average Length (cm):	14.99
Length/Diameter Ratio:	2.07
Moisture content (%):	51.2
Bulk Density (g/cm ³):	1.756
Bulk Unit Weight (kN/m ³):	17.2
Bulk Unit Weight (pcf):	109.6
Dry Unit Weight (kN/m ³):	11.39

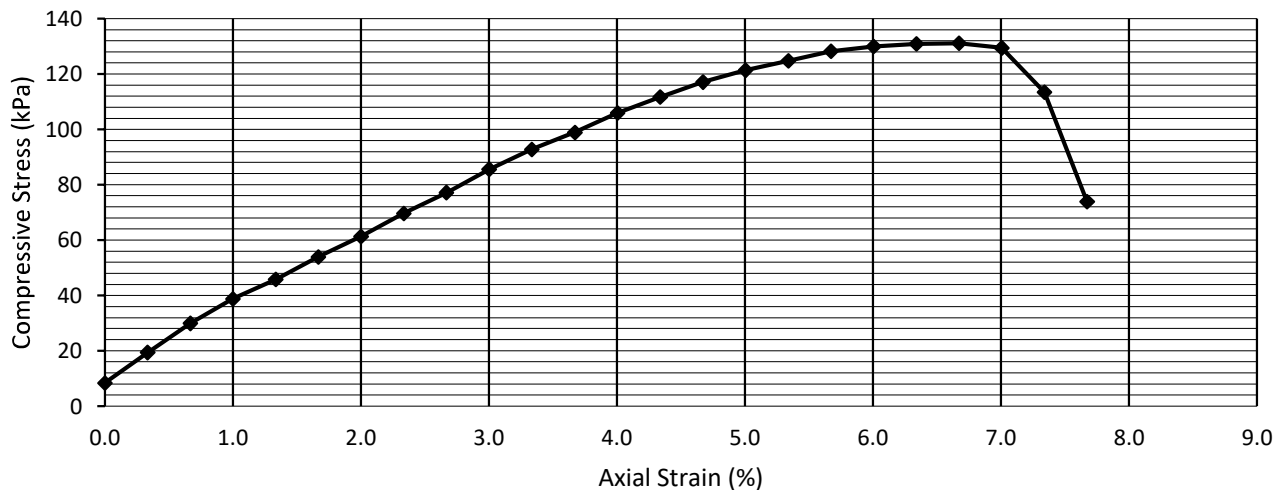
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	39.2
Pocket Pen.	Undrained Shear Strength (kPa)	47.9

UCS	Unconfined compressive strength (kPa)	131.17	Undrained Shear Strength (kPa)	65.59
	Unconfined compressive strength (ksf)	2.740	Undrained Shear Strength (ksf)	1.370
	Avg. Rate of Strain to Failure (%/min):	2.00	Strain at Failure (%):	6.67

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 3.05 - 3.66 m

Sample Location: TH23-06

Sample Number: T6

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

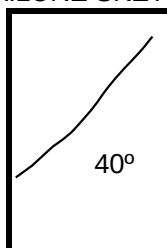
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - brown, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.26
Average Length (cm):	14.43
Length/Diameter Ratio:	1.99
Moisture content (%):	40.5
Bulk Density (g/cm ³):	1.718
Bulk Unit Weight (kN/m ³):	16.8
Bulk Unit Weight (pcf):	107.2
Dry Unit Weight (kN/m ³):	11.99

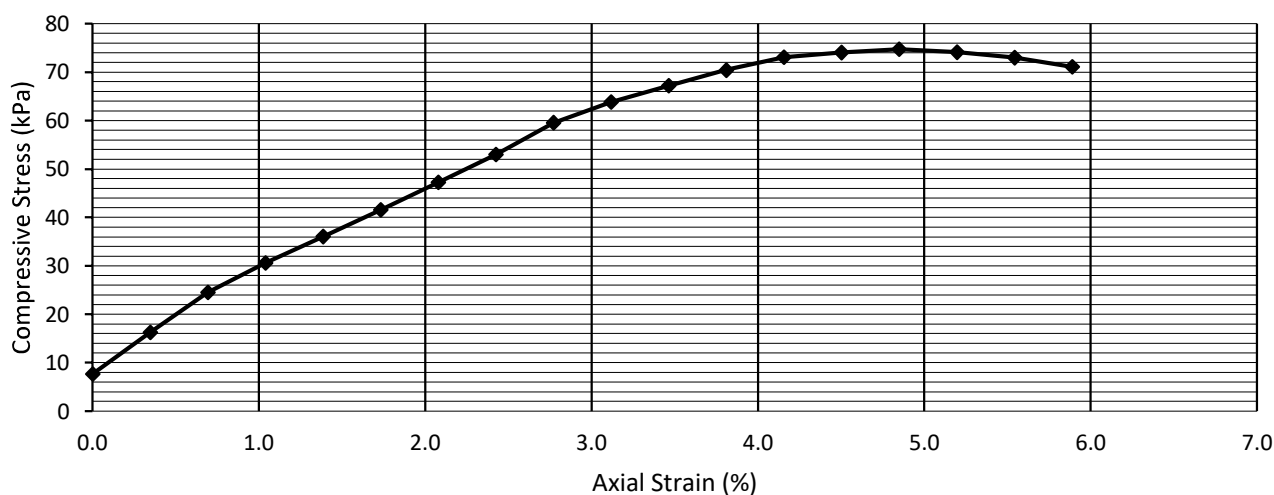
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	29.4
Pocket Pen.	Undrained Shear Strength (kPa)	70.2

UCS	Unconfined compressive strength (kPa)	74.76	Undrained Shear Strength (kPa)	37.38
	Unconfined compressive strength (ksf)	1.561	Undrained Shear Strength (ksf)	0.781
	Avg. Rate of Strain to Failure (%/min):	2.08	Strain at Failure (%):	4.85

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
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Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 6.10 - 6.71 m

Sample Location: TH23-06

Sample Number: T10

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

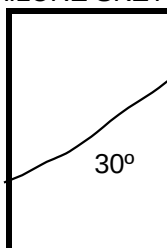
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - brown, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.13
Average Length (cm):	15.35
Length/Diameter Ratio:	2.15
Moisture content (%):	52.9
Bulk Density (g/cm ³):	1.696
Bulk Unit Weight (kN/m ³):	16.6
Bulk Unit Weight (pcf):	105.9
Dry Unit Weight (kN/m ³):	10.88

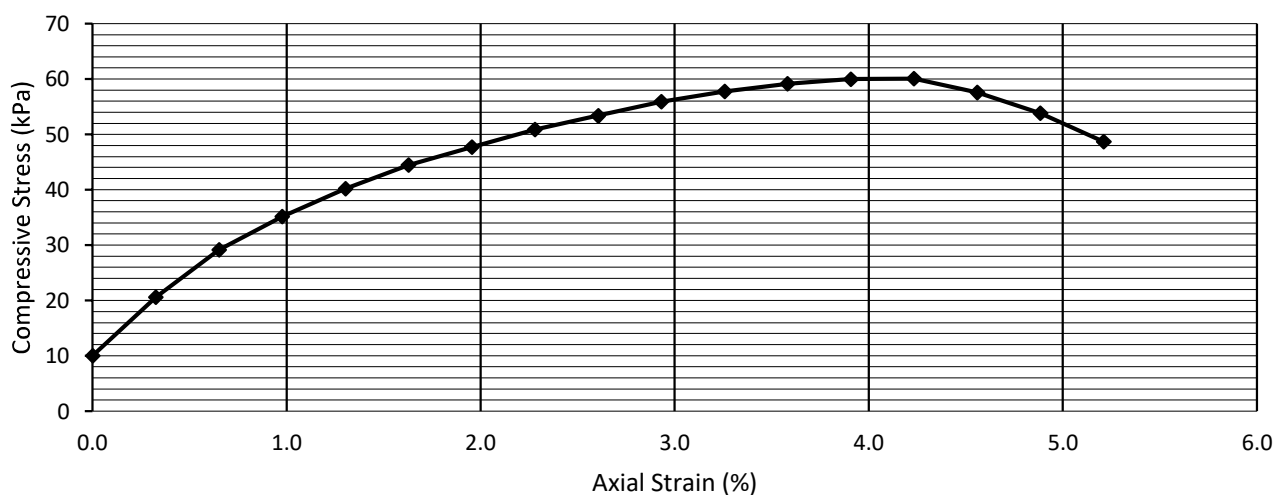
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	24.5
Pocket Pen.	Undrained Shear Strength (kPa)	64.6

UCS	Unconfined compressive strength (kPa)	60.08	Undrained Shear Strength (kPa)	30.04
	Unconfined compressive strength (ksf)	1.255	Undrained Shear Strength (ksf)	0.627
	Avg. Rate of Strain to Failure (%/min):	1.95	Strain at Failure (%):	4.23

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

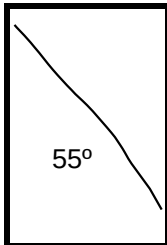


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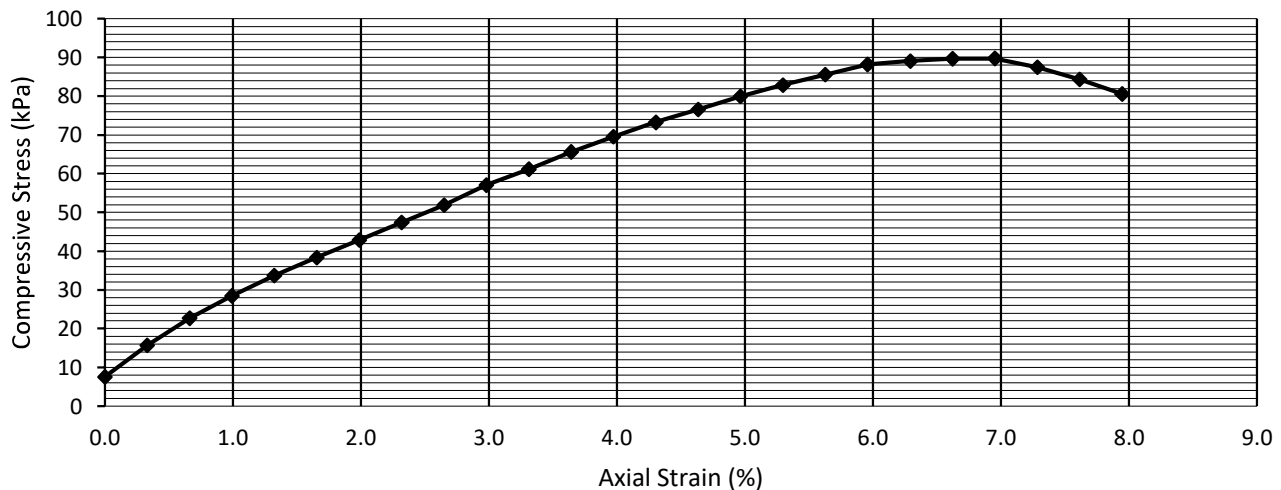
Project Name:	NEWPCC Biosolids Early Works	Date Sampled:	October 27, 2023
Project Number:	60705950	Sampled By:	LBoughton
Client:	WSTP	Date Received:	November 7, 2023
Supplier/Location:	Winnipeg, MB	Submitted By:	LBoughton
Sample Depth (m):	10.67 - 11.28 m	Date Tested:	November 9, 2023
Sample Location:	TH23-06	Tested By:	LBoughton
Sample Number:	T14		

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description:		CLAY - grey, firm, moist, silty, high plasticity, homogeneous			
Average Diameter (cm):		7.16		FAILURE SKETCH 	
Average Length (cm):		15.10			
Length/Diameter Ratio:		2.11			
Moisture content (%):		51.4			
Bulk Density (g/cm³):		1.746			
Bulk Unit Weight (kN/m³):		17.1			
Bulk Unit Weight (pcf):		109.0			
Dry Unit Weight (kN/m³):		11.31			
Torvane	Undrained Shear Strength (kPa)	34.3			
Pocket Pen.	Undrained Shear Strength (kPa)	38.3			
UCS	Unconfined compressive strength (kPa)	89.73	Undrained Shear Strength (kPa)	44.86	
	Unconfined compressive strength (ksf)	1.874	Undrained Shear Strength (ksf)	0.937	
	Avg. Rate of Strain to Failure (%/min):	1.99	Strain at Failure (%):	6.29	

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 3.05 - 3.51 m

Sample Location: TH23-07

Sample Number: T6

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: SILT - tan, very loose, moist, trace sand, low plasticity,

Average Diameter (cm):

Average Length (cm):

Length/Diameter Ratio:

Moisture content (%): 22.4

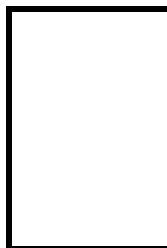
Bulk Density (g/cm³):

Bulk Unit Weight (kN/m³):

Bulk Unit Weight (pcf):

Dry Unit Weight (kN/m³):

FAILURE SKETCH

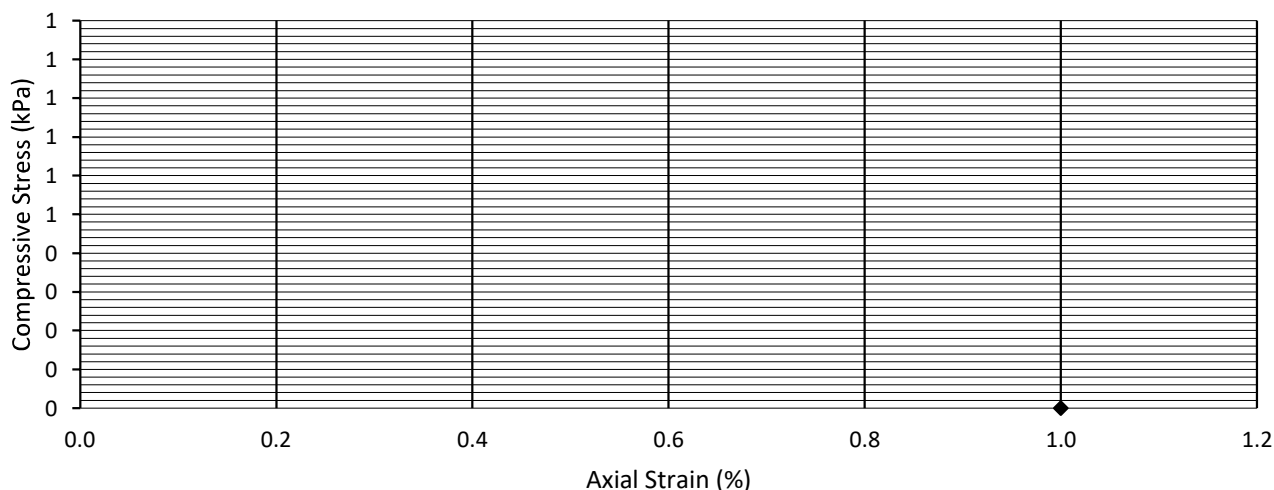


Torvane Undrained Shear Strength (kPa)

Pocket Pen. Undrained Shear Strength (kPa)

UCS	Unconfined compressive strength (kPa)		Undrained Shear Strength (kPa)	
	Unconfined compressive strength (ksf)		Undrained Shear Strength (ksf)	
	Avg. Rate of Strain to Failure (%/min):		Strain at Failure (%):	

Unconfined Compressive Strength



Comments:

No recovery of native soil. Filled with silt from sloughing.

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 6.10 - 6.55 m

Sample Location: TH23-07

Sample Number: T10

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - brown, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm): 7.23

Average Length (cm): 14.81

Length/Diameter Ratio: 2.05

Moisture content (%): 53.7

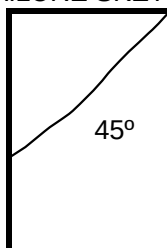
Bulk Density (g/cm³): 1.654

Bulk Unit Weight (kN/m³): 16.2

Bulk Unit Weight (pcf): 103.3

Dry Unit Weight (kN/m³): 10.56

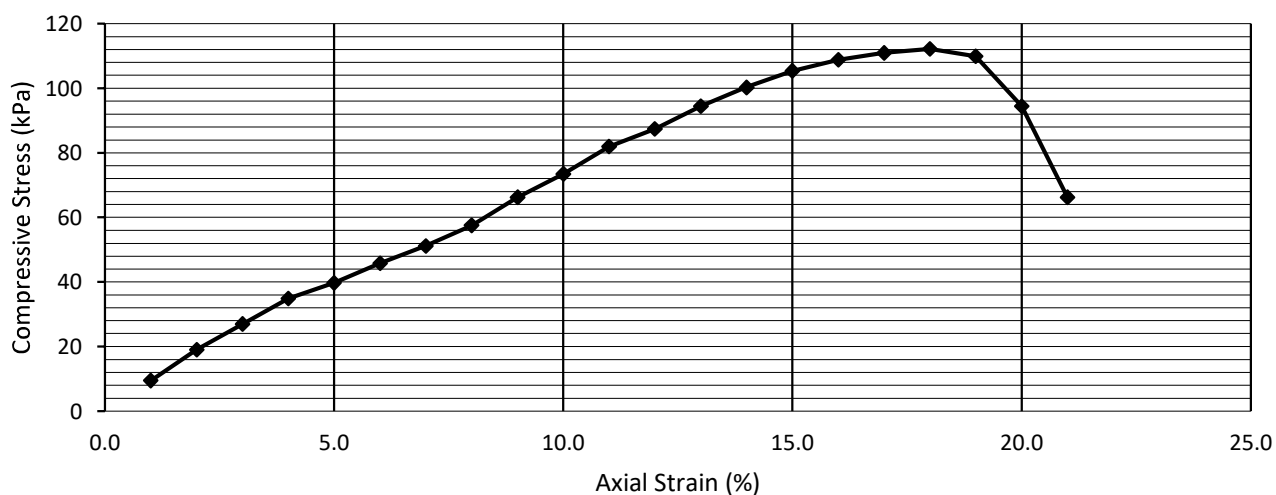
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	34.3
Pocket Pen.	Undrained Shear Strength (kPa)	79.8

UCS	Unconfined compressive strength (kPa)	112.18	Undrained Shear Strength (kPa)	56.09
	Unconfined compressive strength (ksf)	2.343	Undrained Shear Strength (ksf)	1.171
	Avg. Rate of Strain to Failure (%/min):	2.03	Strain at Failure (%):	5.74

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 9.14 - 9.60 m

Sample Location: TH23-07

Sample Number: T13

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

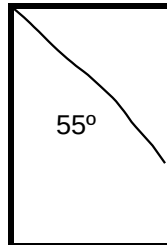
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.23
Average Length (cm):	15.44
Length/Diameter Ratio:	2.13
Moisture content (%):	50.0
Bulk Density (g/cm ³):	1.814
Bulk Unit Weight (kN/m ³):	17.8
Bulk Unit Weight (pcf):	113.2
Dry Unit Weight (kN/m ³):	11.86

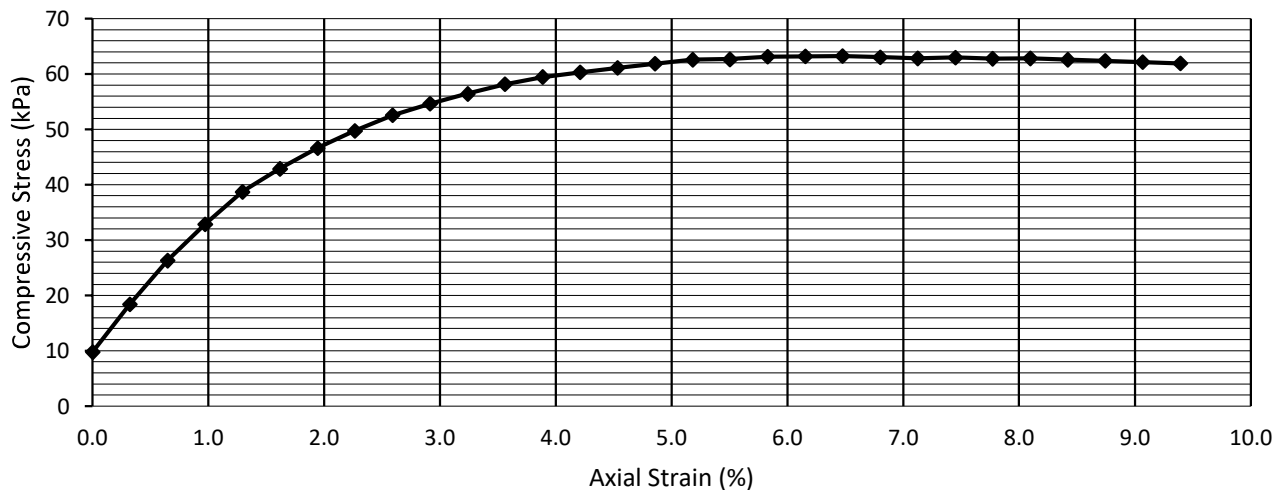
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	29.4
Pocket Pen.	Undrained Shear Strength (kPa)	43.1

UCS	Unconfined compressive strength (kPa)	63.27	Undrained Shear Strength (kPa)	31.63
	Unconfined compressive strength (ksf)	1.321	Undrained Shear Strength (ksf)	0.661
	Avg. Rate of Strain to Failure (%/min):	1.94	Strain at Failure (%):	6.48

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 12.19 - 12.65 m

Sample Location: TH23-07

Sample Number: T16

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

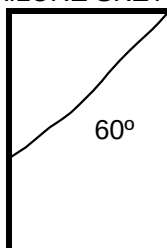
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.24
Average Length (cm):	15.32
Length/Diameter Ratio:	2.12
Moisture content (%):	45.0
Bulk Density (g/cm ³):	1.799
Bulk Unit Weight (kN/m ³):	17.6
Bulk Unit Weight (pcf):	112.3
Dry Unit Weight (kN/m ³):	12.17

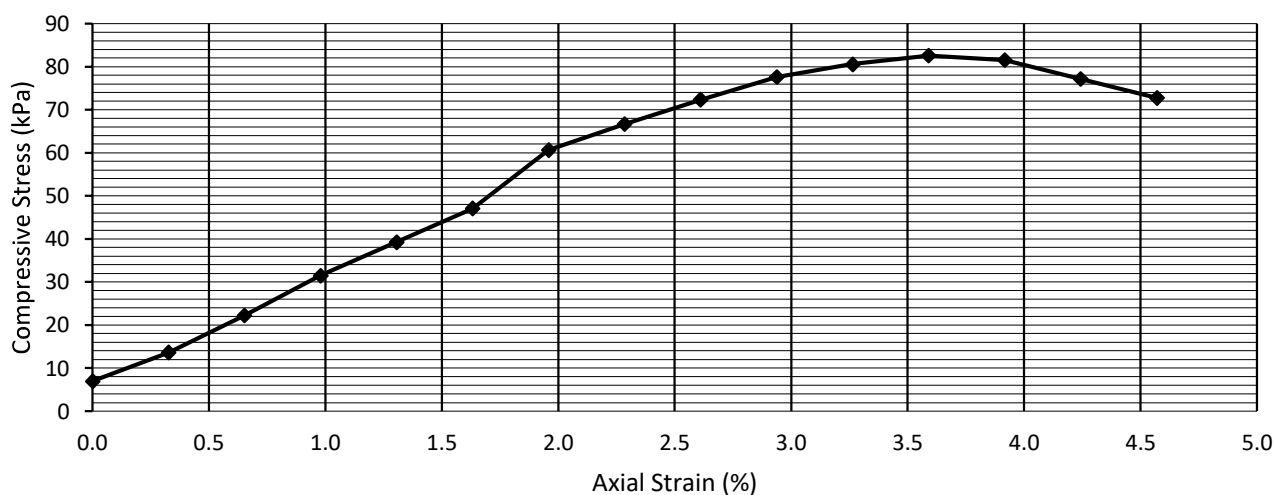
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	34.3
Pocket Pen.	Undrained Shear Strength (kPa)	49.5

UCS	Unconfined compressive strength (kPa)	82.56	Undrained Shear Strength (kPa)	41.28
	Unconfined compressive strength (ksf)	1.724	Undrained Shear Strength (ksf)	0.862
	Avg. Rate of Strain to Failure (%/min):	1.96	Strain at Failure (%):	3.59

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 15.24 - 15.70 m

Sample Location: TH23-07

Sample Number: T19

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

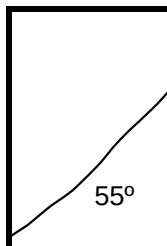
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.22
Average Length (cm):	14.16
Length/Diameter Ratio:	1.96
Moisture content (%):	48.1
Bulk Density (g/cm ³):	1.719
Bulk Unit Weight (kN/m ³):	16.9
Bulk Unit Weight (pcf):	107.3
Dry Unit Weight (kN/m ³):	11.39

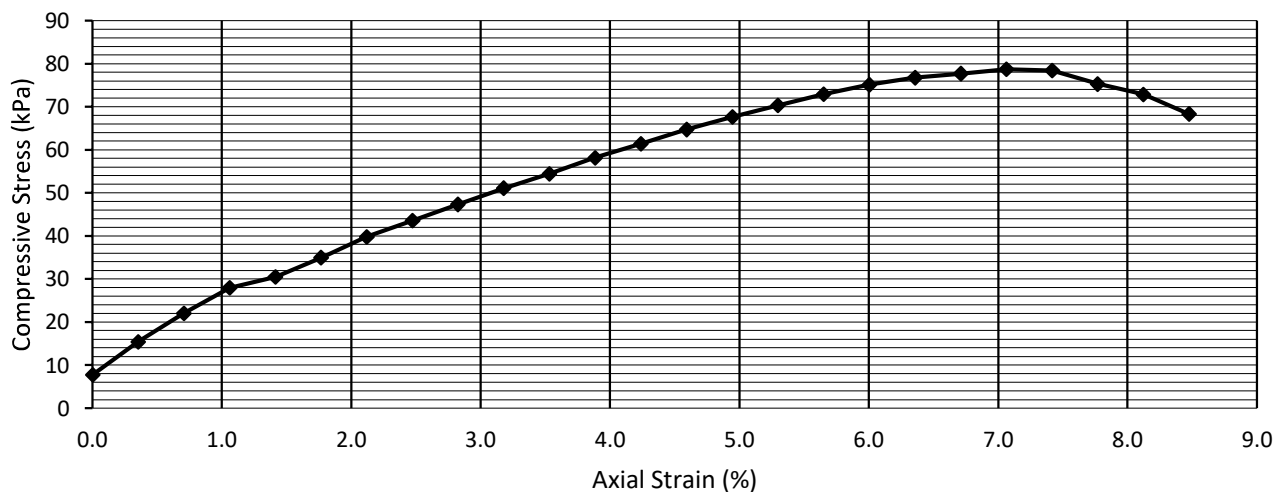
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	19.6
Pocket Pen.	Undrained Shear Strength (kPa)	31.9

UCS	Unconfined compressive strength (kPa)	78.73	Undrained Shear Strength (kPa)	39.36
	Unconfined compressive strength (ksf)	1.644	Undrained Shear Strength (ksf)	0.822
	Avg. Rate of Strain to Failure (%/min):	2.12	Strain at Failure (%):	7.06

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 18.29 - 18.75 m

Sample Location: TH23-07

Sample Number: T22

Date Sampled: October 27, 2023

Sampled By: LBoughton

Date Received: November 7, 2023

Submitted By: LBoughton

Date Tested: November 9, 2023

Tested By: LBoughton

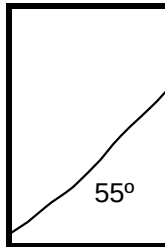
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, high plasticity, homogeneous

Average Diameter (cm):	7.26
Average Length (cm):	14.50
Length/Diameter Ratio:	2.00
Moisture content (%):	45.2
Bulk Density (g/cm ³):	1.644
Bulk Unit Weight (kN/m ³):	16.1
Bulk Unit Weight (pcf):	102.7
Dry Unit Weight (kN/m ³):	11.11

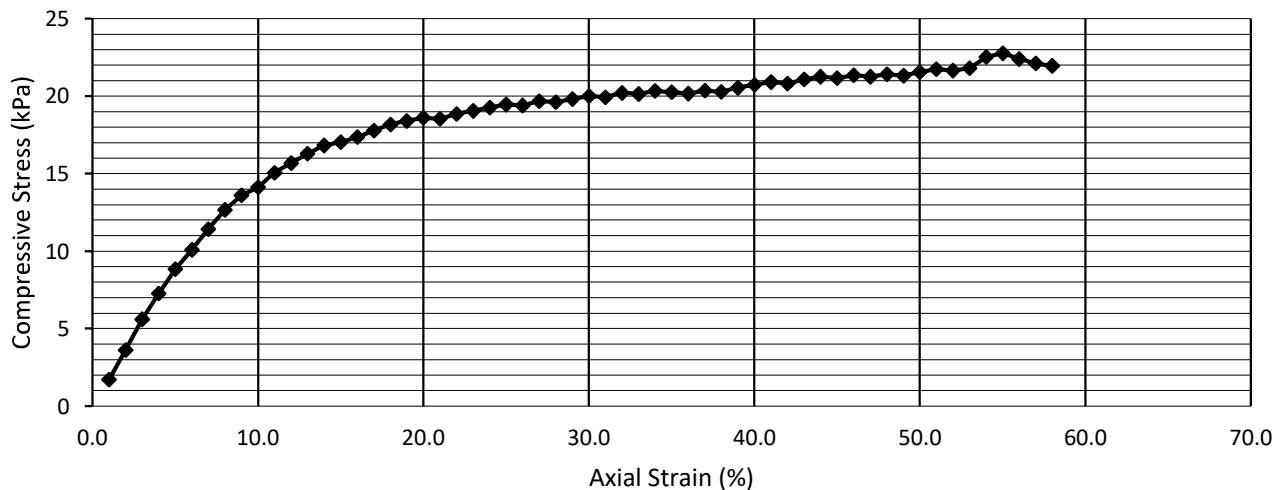
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	19.6
Pocket Pen.	Undrained Shear Strength (kPa)	23.9

UCS	Unconfined compressive strength (kPa)	22.76	Undrained Shear Strength (kPa)	11.38
	Unconfined compressive strength (ksf)	0.475	Undrained Shear Strength (ksf)	0.238
	Avg. Rate of Strain to Failure (%/min):	2.07	Strain at Failure (%):	20.34

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 1.52 - 1.98 m

Sample Location: TH23-08

Sample Number: T4

Date Sampled: December 15, 2023

Sampled By: LBoughton

Date Received: December 8, 2023

Submitted By: LBoughton

Date Tested: January 8, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY/SILT - brown, firm, moist, trace sand, high plasticity, homogeneous

Average Diameter (cm): 7.16

Average Length (cm): 11.86

Length/Diameter Ratio: 1.66

Moisture content (%): 35.6

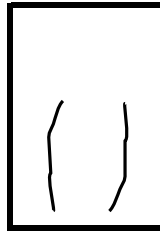
Bulk Density (g/cm³): 1.980

Bulk Unit Weight (kN/m³): 19.4

Bulk Unit Weight (pcf): 123.6

Dry Unit Weight (kN/m³): 14.32

FAILURE SKETCH



Torvane Undrained Shear Strength (kPa)

Pocket Pen. Undrained Shear Strength (kPa)

UCS

Unconfined compressive strength (kPa)

46.46

Undrained Shear Strength (kPa)

23.23

Unconfined compressive strength (ksf)

0.970

Undrained Shear Strength (ksf)

0.485

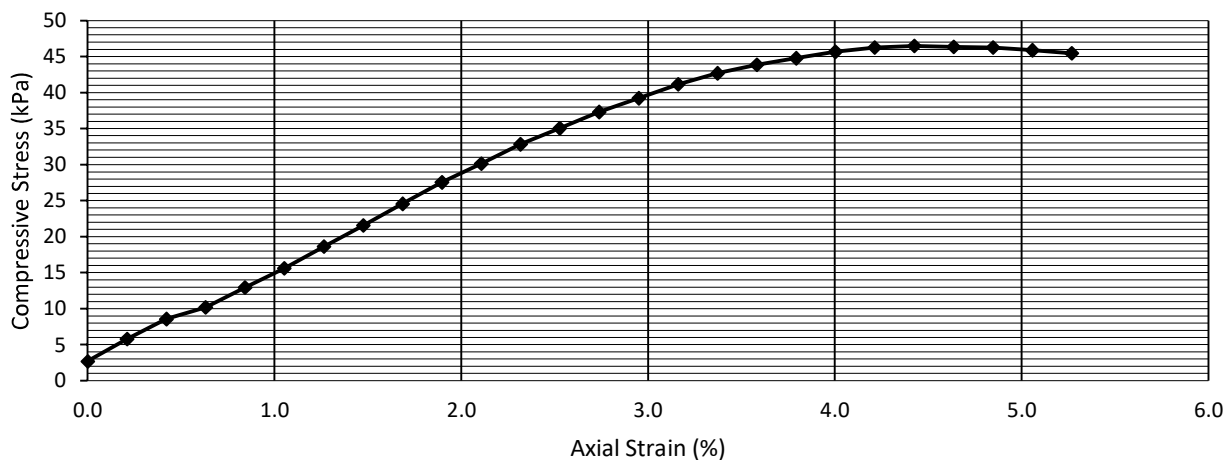
Avg. Rate of Strain to Failure (%/min):

1.26

Strain at Failure (%):

4.43

Unconfined Compressive Strength



Comments:

sample collected appears to be from sloughing and not representative of native soil to perform Torvane or Pocket Pen

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

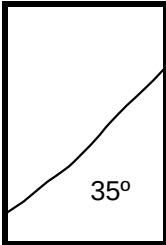


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Phone: 204 477 5381

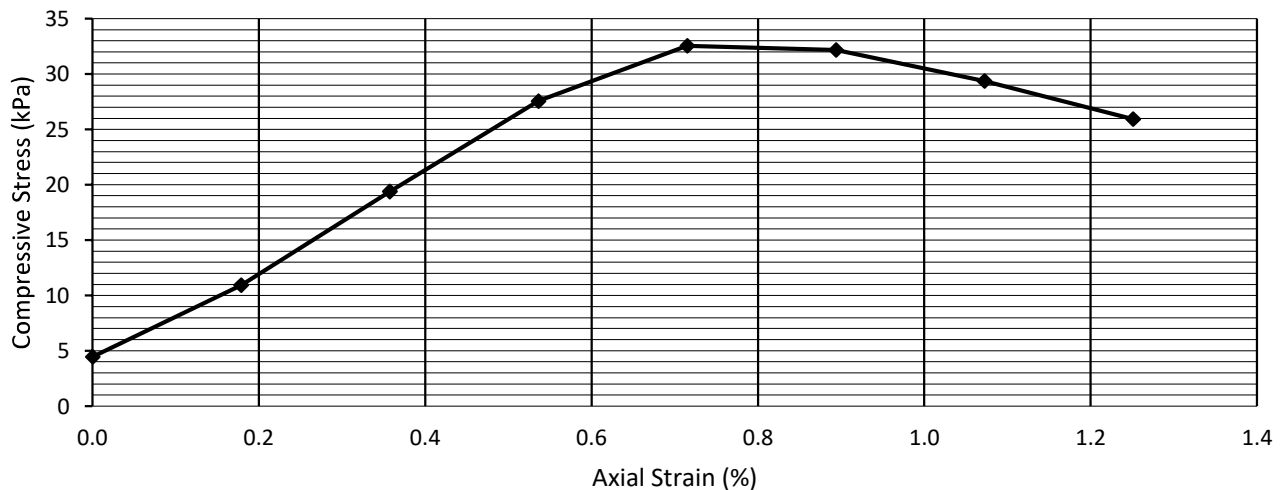
Project Name:	NEWPCC Biosolids Early Works	Date Sampled:	December 15, 2023
Project Number:	60705950	Sampled By:	LBoughton
Client:	WSTP	Date Received:	December 8, 2023
Supplier/Location:	Winnipeg, MB	Submitted By:	LBoughton
Sample Depth (m):	4.57 - 5.03 m	Date Tested:	January 8, 2024
Sample Location:	TH23-08	Tested By:	LBoughton
Sample Number:	T8		

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description:	CLAY - brown, stiff, moist, silty, high plasticity, homogeneous		
Average Diameter (cm):	7.16	FAILURE SKETCH 	
Average Length (cm):	13.99		
Length/Diameter Ratio:	1.95		
Moisture content (%):	53.4		
Bulk Density (g/cm³):	1.732		
Bulk Unit Weight (kN/m³):	17.0		
Bulk Unit Weight (pcf):	108.1		
Dry Unit Weight (kN/m³):	11.07		
Torvane	Undrained Shear Strength (kPa)	53.9	
Pocket Pen.	Undrained Shear Strength (kPa)	59.1	
UCS	Unconfined compressive strength (kPa)	32.55	Undrained Shear Strength (kPa) 16.28
	Unconfined compressive strength (ksf)	0.680	Undrained Shear Strength (ksf) 0.340
	Avg. Rate of Strain to Failure (%/min):	1.07	Strain at Failure (%): 0.72

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 7.62 - 8.08 m

Sample Location: TH23-08

Sample Number: T11

Date Sampled: December 15, 2023

Sampled By: LBoughton

Date Received: December 8, 2023

Submitted By: LBoughton

Date Tested: January 8, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, stiff, moist, silty, high plasticity, homogeneous

Average Diameter (cm): 7.17

Average Length (cm): 14.34

Length/Diameter Ratio: 2.00

Moisture content (%): 46.2

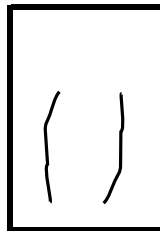
Bulk Density (g/cm³): 1.759

Bulk Unit Weight (kN/m³): 17.3

Bulk Unit Weight (pcf): 109.8

Dry Unit Weight (kN/m³): 11.80

FAILURE SKETCH



Torvane Undrained Shear Strength (kPa)

Pocket Pen. Undrained Shear Strength (kPa)

UCS

Unconfined compressive strength (kPa)

66.46

Undrained Shear Strength (kPa)

33.23

Unconfined compressive strength (ksf)

1.388

Undrained Shear Strength (ksf)

0.694

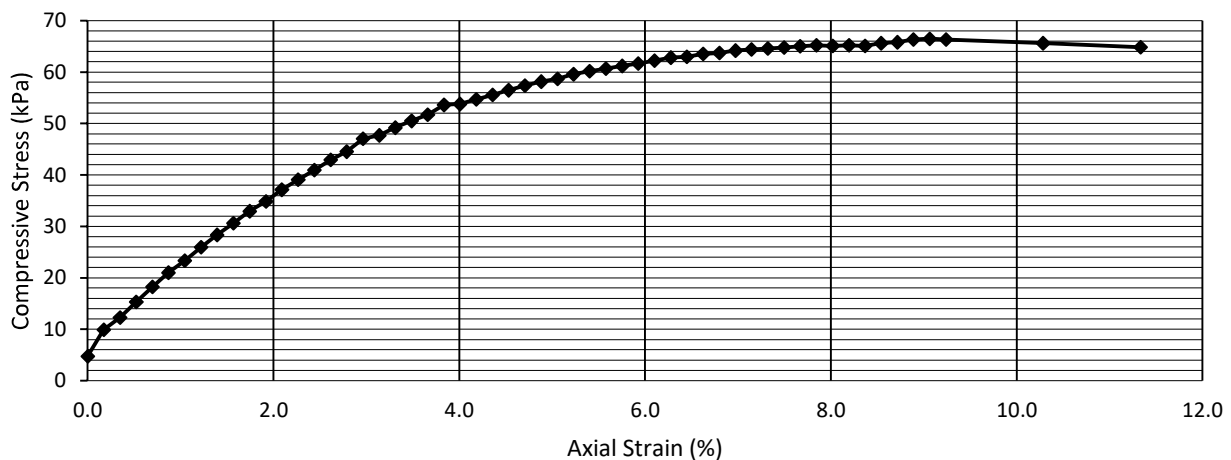
Avg. Rate of Strain to Failure (%/min):

1.05

Strain at Failure (%):

9.06

Unconfined Compressive Strength



Comments:

Not enough sample to perform torvane or pocket pen

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



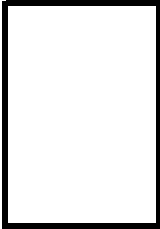
AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name:	NEWPCC Biosolids Early Works		
Project Number:	60705950	Date Sampled:	December 15, 2023
Client:	WSTP	Sampled By:	LBoughton
Supplier/Location:	Winnipeg, MB	Date Received:	December 8, 2023
Sample Depth (m):	10.67 - 11.13 m	Submitted By:	LBoughton
Sample Location:	TH23-08	Date Tested:	January 8, 2024
Sample Number:	T14	Tested By:	LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

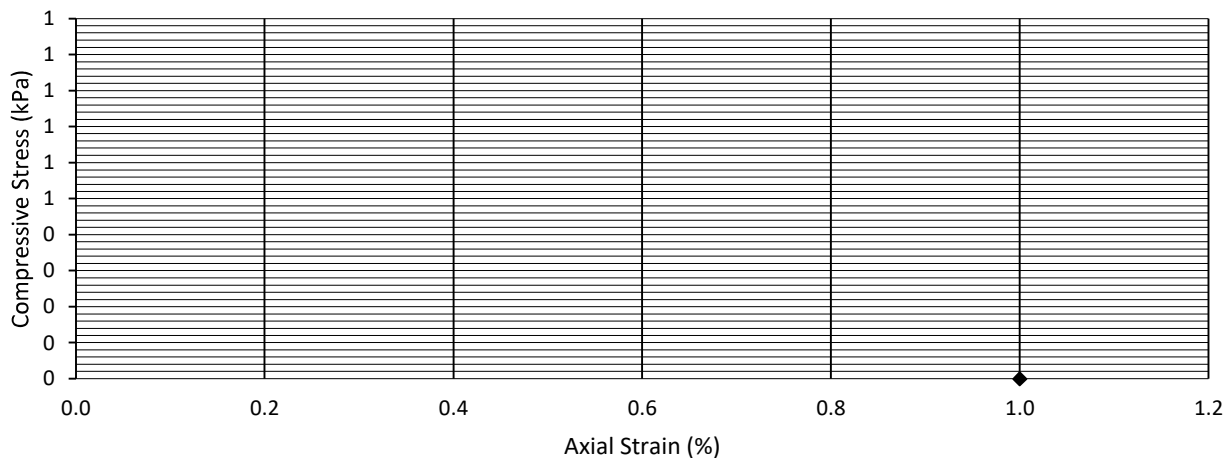
Soil Description:	CLAY - grey, soft, moist to wet, silty, high plasticity, homogeneous		
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Average Diameter (cm):		FAILURE SKETCH 
Average Length (cm):		
Length/Diameter Ratio:		
Moisture content (%):	38.2	
Bulk Density (g/cm³):		
Bulk Unit Weight (kN/m³):		
Bulk Unit Weight (pcf):		
Dry Unit Weight (kN/m³):		

Torvane	Undrained Shear Strength (kPa)	
Pocket Pen.	Undrained Shear Strength (kPa)	

UCS	Unconfined compressive strength (kPa)		Undrained Shear Strength (kPa)	
	Unconfined compressive strength (ksf)		Undrained Shear Strength (ksf)	
	Avg. Rate of Strain to Failure (%/min):		Strain at Failure (%):	

Unconfined Compressive Strength



Comments:
Not enough sample collected to perform testing

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 6.10 - 6.71 m

Sample Location: TH24-10

Sample Number: T7

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, stiff, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm): 7.28

Average Length (cm): 14.45

Length/Diameter Ratio: 1.98

Moisture content (%): 57.2

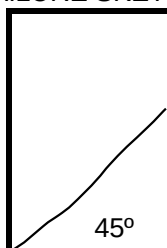
Bulk Density (g/cm³): 1.672

Bulk Unit Weight (kN/m³): 16.4

Bulk Unit Weight (pcf): 104.4

Dry Unit Weight (kN/m³): 10.43

FAILURE SKETCH

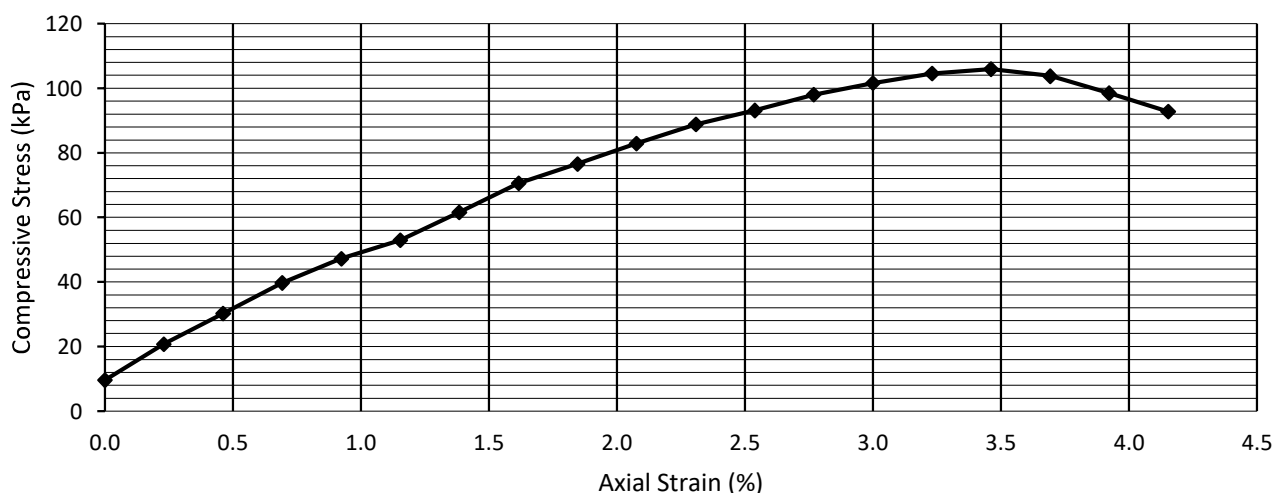


Torvane Undrained Shear Strength (kPa) 62.8

Pocket Pen. Undrained Shear Strength (kPa) 49.5

UCS	Unconfined compressive strength (kPa)	105.96	Undrained Shear Strength (kPa)	52.98
	Unconfined compressive strength (ksf)	2.213	Undrained Shear Strength (ksf)	1.106
	Avg. Rate of Strain to Failure (%/min):	1.38	Strain at Failure (%):	3.46

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 9.14 - 9.75 m

Sample Location: TH24-10

Sample Number: T10

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

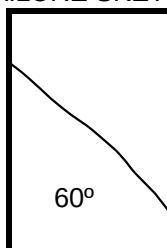
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, very soft, moist, silty, trace gravel, trace sand, high plasticity, homogeneous

Average Diameter (cm):	7.16
Average Length (cm):	15.36
Length/Diameter Ratio:	2.14
Moisture content (%):	47.5
Bulk Density (g/cm ³):	1.711
Bulk Unit Weight (kN/m ³):	16.8
Bulk Unit Weight (pcf):	106.8
Dry Unit Weight (kN/m ³):	11.38

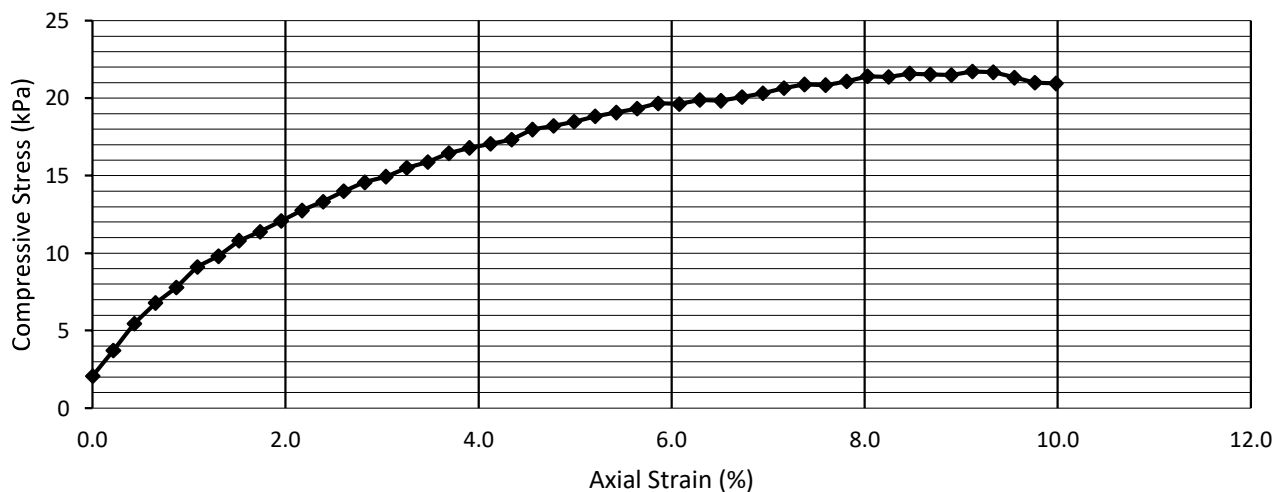
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	14.7
Pocket Pen.	Undrained Shear Strength (kPa)	9.6

UCS	Unconfined compressive strength (kPa)	21.72	Undrained Shear Strength (kPa)	10.86
	Unconfined compressive strength (ksf)	0.454	Undrained Shear Strength (ksf)	0.227
	Avg. Rate of Strain to Failure (%/min):	1.30	Strain at Failure (%):	9.11

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 3.05 - 3.66 m

Sample Location: TH24-11

Sample Number: T6

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY/SILT - brown/tan, very soft, moist, trace sand, high plasticity, homogeneous

Average Diameter (cm):

Average Length (cm):

Length/Diameter Ratio:

Moisture content (%): 28.2

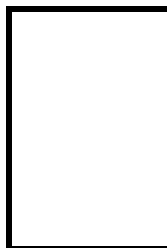
Bulk Density (g/cm³):

Bulk Unit Weight (kN/m³):

Bulk Unit Weight (pcf):

Dry Unit Weight (kN/m³):

FAILURE SKETCH

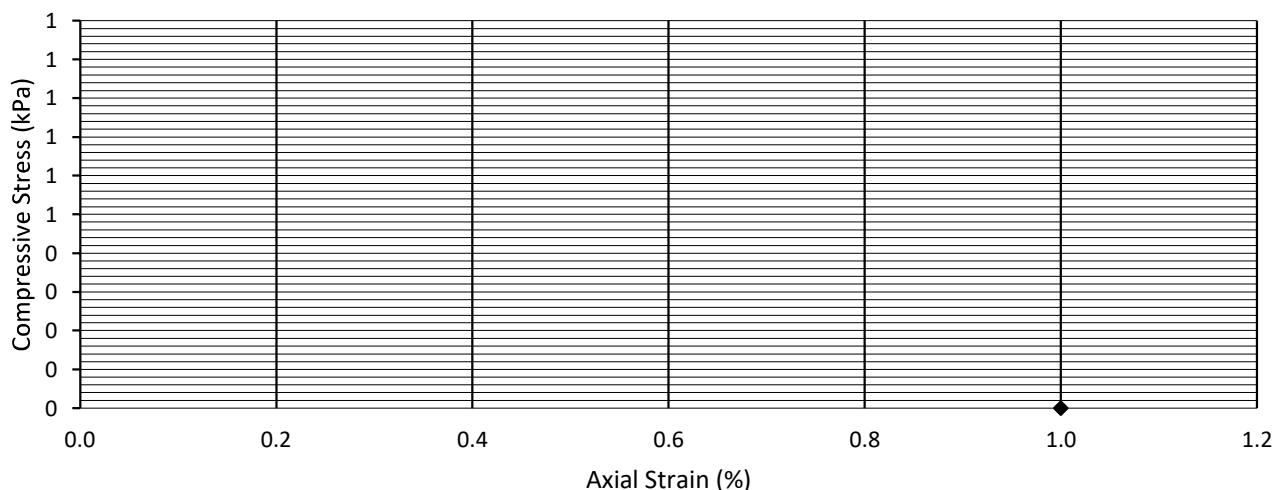


Torvane Undrained Shear Strength (kPa)

Pocket Pen. Undrained Shear Strength (kPa)

UCS	Unconfined compressive strength (kPa)		Undrained Shear Strength (kPa)	
	Unconfined compressive strength (ksf)		Undrained Shear Strength (ksf)	
	Avg. Rate of Strain to Failure (%/min):		Strain at Failure (%):	

Unconfined Compressive Strength



Comments:

sample collected appears to be from sloughing and not representative of native soil

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 3.05 - 3.66 m

Sample Location: TH24-13

Sample Number: T5

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm): 7.18

Average Length (cm): 14.83

Length/Diameter Ratio: 2.06

Moisture content (%): 46.2

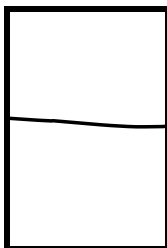
Bulk Density (g/cm³): 1.775

Bulk Unit Weight (kN/m³): 17.4

Bulk Unit Weight (pcf): 110.8

Dry Unit Weight (kN/m³): 11.91

FAILURE SKETCH

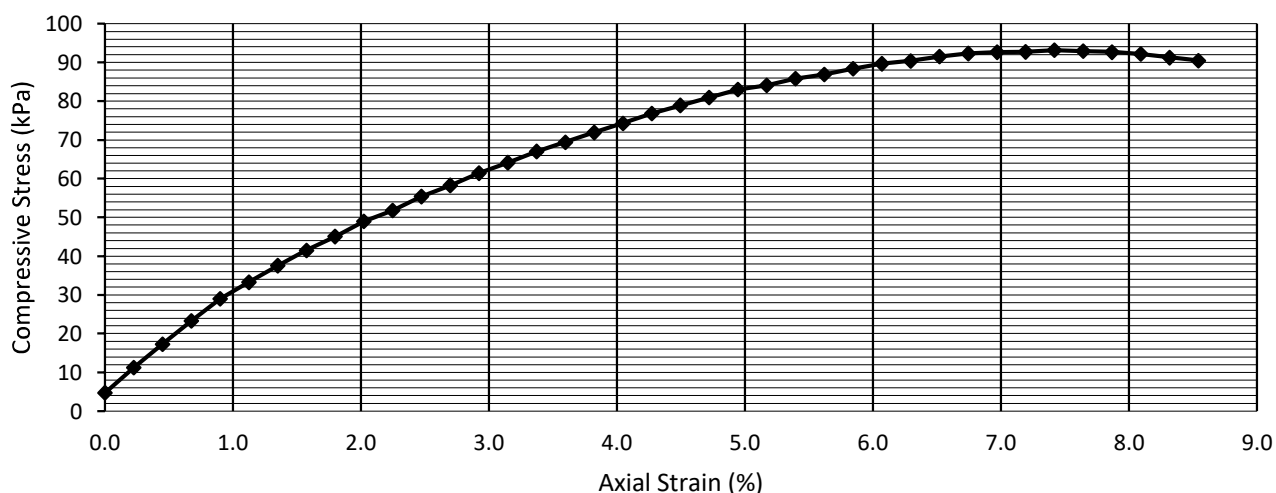


Torvane Undrained Shear Strength (kPa) 39.2

Pocket Pen. Undrained Shear Strength (kPa) 62.2

UCS	Unconfined compressive strength (kPa)	93.14	Undrained Shear Strength (kPa)	46.57
	Unconfined compressive strength (ksf)	1.945	Undrained Shear Strength (ksf)	0.973
	Avg. Rate of Strain to Failure (%/min):	1.35	Strain at Failure (%):	7.42

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 6.10 - 6.71 m

Sample Location: TH24-13

Sample Number: T8

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

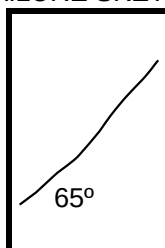
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, very soft, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm):	7.15
Average Length (cm):	14.96
Length/Diameter Ratio:	2.09
Moisture content (%):	52.5
Bulk Density (g/cm ³):	1.694
Bulk Unit Weight (kN/m ³):	16.6
Bulk Unit Weight (pcf):	105.7
Dry Unit Weight (kN/m ³):	10.89

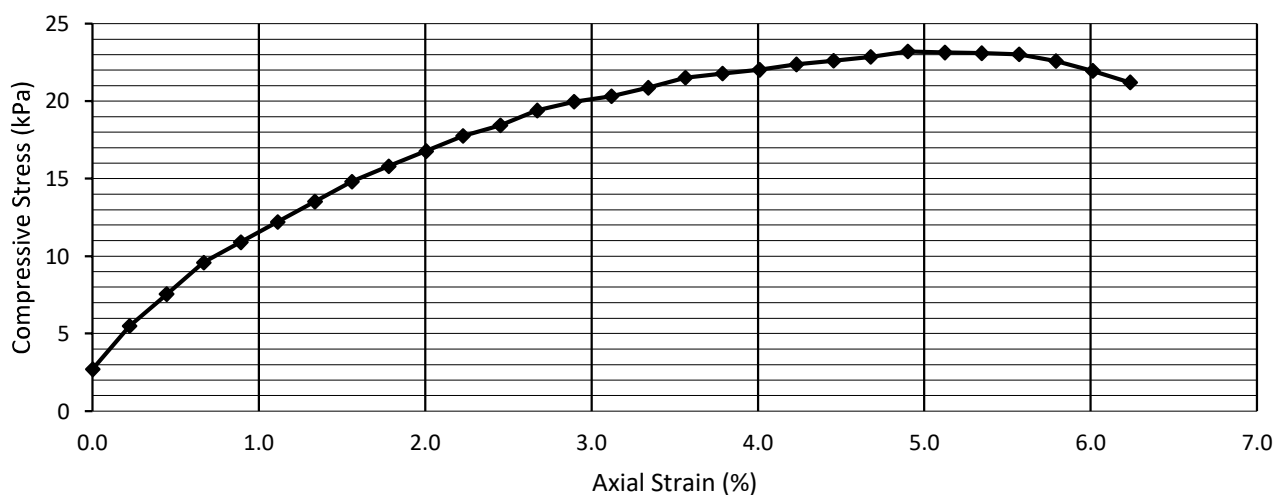
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	24.5
Pocket Pen.	Undrained Shear Strength (kPa)	12.0

UCS	Unconfined compressive strength (kPa)	23.20	Undrained Shear Strength (kPa)	11.60
	Unconfined compressive strength (ksf)	0.485	Undrained Shear Strength (ksf)	0.242
	Avg. Rate of Strain to Failure (%/min):	1.34	Strain at Failure (%):	4.90

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 9.14 - 9.75 m

Sample Location: TH24-13

Sample Number: T9

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, soft, moist, silty, trace gravel, trace sand, high plasticity, homogeneous

Average Diameter (cm): 7.19

Average Length (cm): 14.72

Length/Diameter Ratio: 2.05

Moisture content (%): 50.8

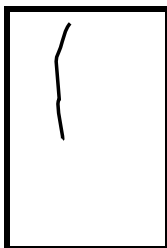
Bulk Density (g/cm³): 1.655

Bulk Unit Weight (kN/m³): 16.2

Bulk Unit Weight (pcf): 103.3

Dry Unit Weight (kN/m³): 10.76

FAILURE SKETCH

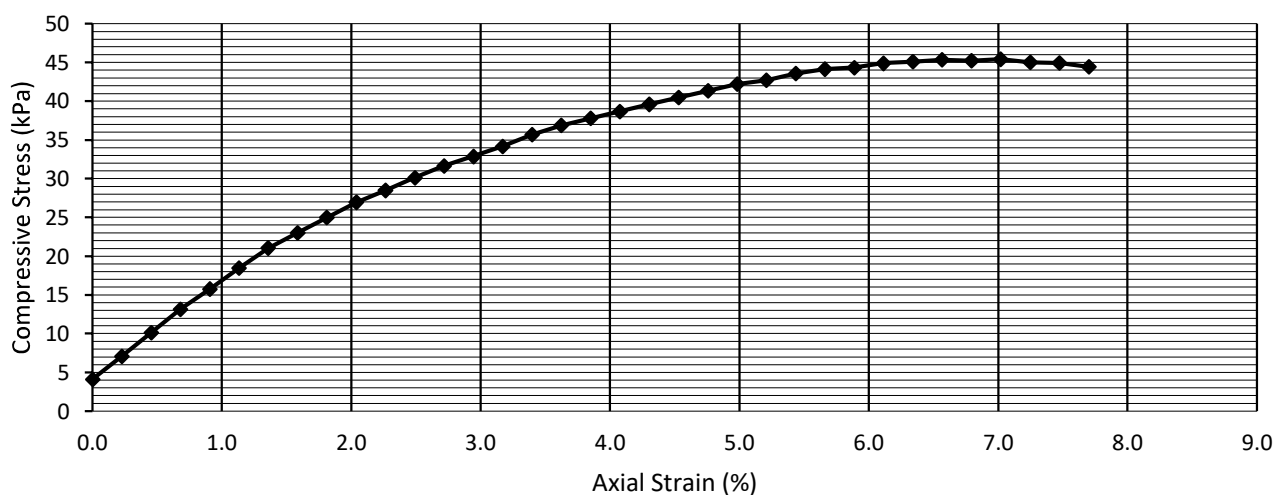


Torvane Undrained Shear Strength (kPa) 24.5

Pocket Pen. Undrained Shear Strength (kPa)

UCS	Unconfined compressive strength (kPa)	45.42	Undrained Shear Strength (kPa)	22.71
	Unconfined compressive strength (ksf)	0.949	Undrained Shear Strength (ksf)	0.474
	Avg. Rate of Strain to Failure (%/min):	1.36	Strain at Failure (%):	7.02

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 12.19 - 12.80 m

Sample Location: TH24-13

Sample Number: T10

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, soft, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm): 7.24

Average Length (cm): 15.05

Length/Diameter Ratio: 2.08

Moisture content (%): 49.7

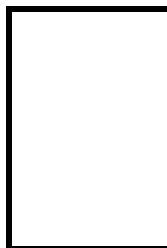
Bulk Density (g/cm³): 1.830

Bulk Unit Weight (kN/m³): 17.9

Bulk Unit Weight (pcf): 114.3

Dry Unit Weight (kN/m³): 11.99

FAILURE SKETCH

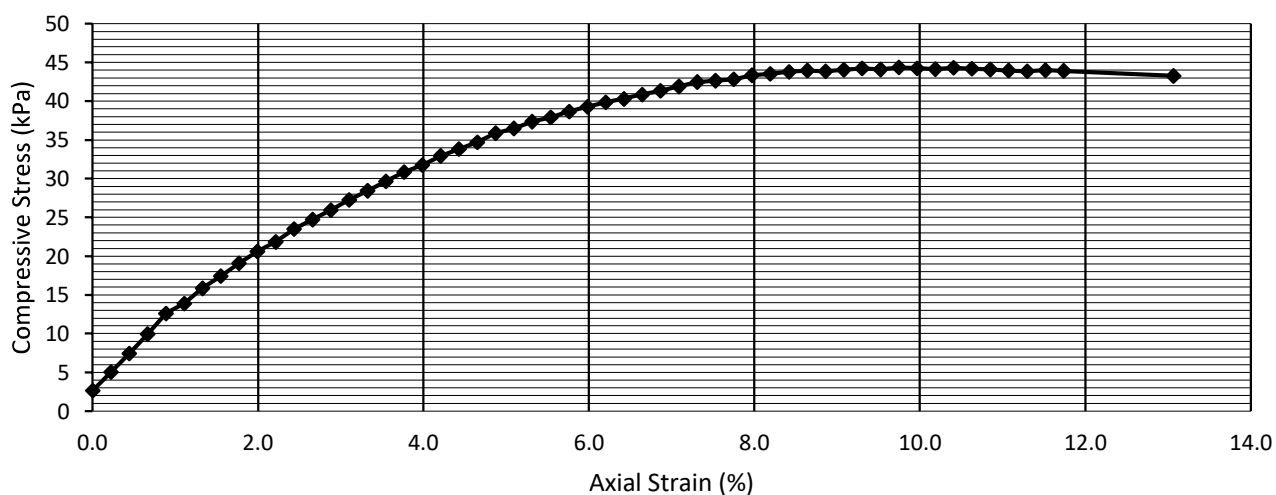


Torvane Undrained Shear Strength (kPa) 24.5

Pocket Pen. Undrained Shear Strength (kPa) 23.9

UCS	Unconfined compressive strength (kPa)	44.36	Undrained Shear Strength (kPa)	22.18
	Unconfined compressive strength (ksf)	0.926	Undrained Shear Strength (ksf)	0.463
	Avg. Rate of Strain to Failure (%/min):	1.33	Strain at Failure (%):	9.74

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works

Project Number: 60705950

Client: WSTP

Supplier/Location: Winnipeg, MB

Sample Depth (m): 9.14 - 9.75 m

Sample Location: TH24-13

Sample Number: T11

Date Sampled: January 12, 2024

Sampled By: ABonifacio

Date Received: January 12, 2024

Submitted By: ABonifacio

Date Tested: January 28, 2024

Tested By: LBoughton

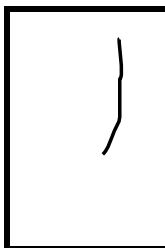
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, soft, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm):	7.21
Average Length (cm):	14.35
Length/Diameter Ratio:	1.99
Moisture content (%):	61.0
Bulk Density (g/cm ³):	1.625
Bulk Unit Weight (kN/m ³):	15.9
Bulk Unit Weight (pcf):	101.5
Dry Unit Weight (kN/m ³):	9.90

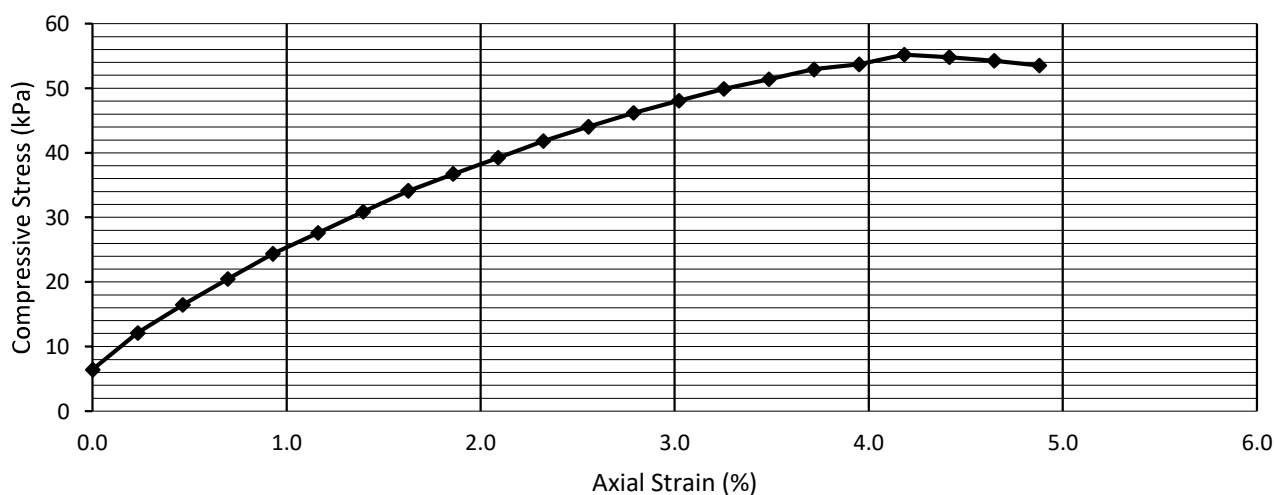
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	24.5
Pocket Pen.	Undrained Shear Strength (kPa)	17.6

UCS	Unconfined compressive strength (kPa)	55.22	Undrained Shear Strength (kPa)	27.61
	Unconfined compressive strength (ksf)	1.153	Undrained Shear Strength (ksf)	0.577
	Avg. Rate of Strain to Failure (%/min):	1.39	Strain at Failure (%):	4.18

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead

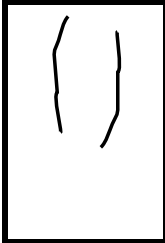


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Phone: 204 477 5381

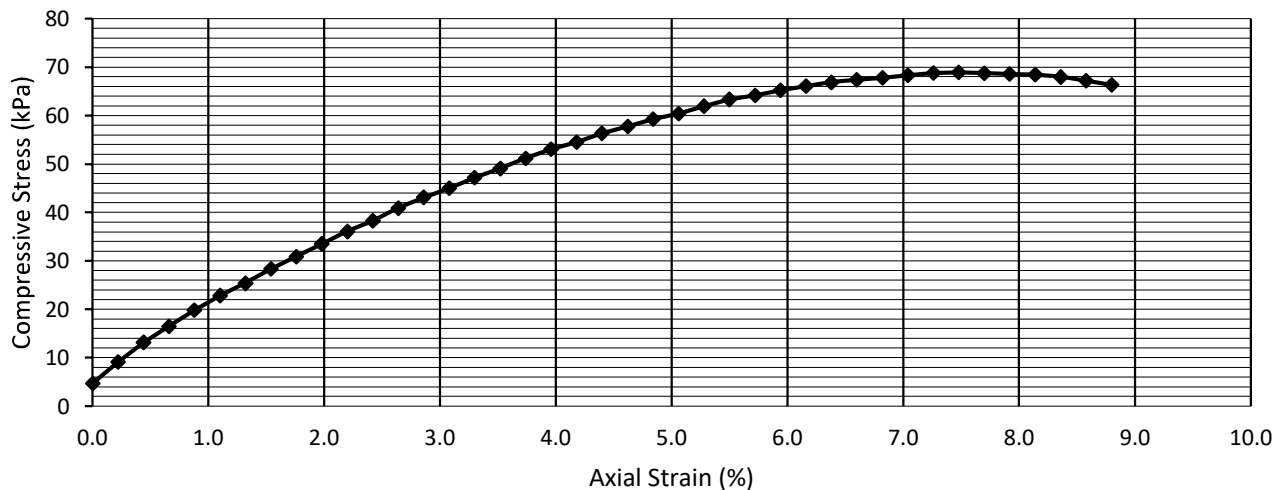
Project Name:	NEWPCC Biosolids Early Works	Date Sampled:	January 12, 2024
Project Number:	60705950	Sampled By:	ABonifacio
Client:	WSTP	Date Received:	January 12, 2024
Supplier/Location:	Winnipeg, MB	Submitted By:	ABonifacio
Sample Depth (m):	3.05 - 3.66 m	Date Tested:	January 28, 2024
Sample Location:	TH24-14	Tested By:	LBoughton
Sample Number:	T6		

Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description:		CLAY/SILT - brown, firm, moist, trace sand, high plasticity, homogeneous			
Average Diameter (cm):		7.20		FAILURE SKETCH  	
Average Length (cm):		15.15			
Length/Diameter Ratio:		2.11			
Moisture content (%):		43.3			
Bulk Density (g/cm³):		1.792			
Bulk Unit Weight (kN/m³):		17.6			
Bulk Unit Weight (pcf):		111.8			
Dry Unit Weight (kN/m³):		12.26			
Torvane	Undrained Shear Strength (kPa)		44.1		
Pocket Pen.	Undrained Shear Strength (kPa)		55.9		
UCS	Unconfined compressive strength (kPa)		68.93	Undrained Shear Strength (kPa)	34.46
	Unconfined compressive strength (ksf)		1.440	Undrained Shear Strength (ksf)	0.720
	Avg. Rate of Strain to Failure (%/min):		1.32	Strain at Failure (%):	7.48

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Supplier/Location: Winnipeg, MB
Sample Depth (m): 6.10 - 6.71 m
Sample Location: TH24-14
Sample Number: T10

Date Sampled: January 12, 2024
Sampled By: ABonifacio
Date Received: January 12, 2024
Submitted By: ABonifacio
Date Tested: January 28, 2024
Tested By: LBoughton

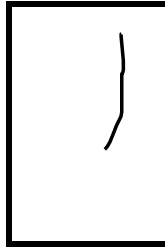
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - grey, firm, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm):	7.11
Average Length (cm):	14.86
Length/Diameter Ratio:	2.09
Moisture content (%):	55.2
Bulk Density (g/cm ³):	1.715
Bulk Unit Weight (kN/m ³):	16.8
Bulk Unit Weight (pcf):	107.1
Dry Unit Weight (kN/m ³):	10.84

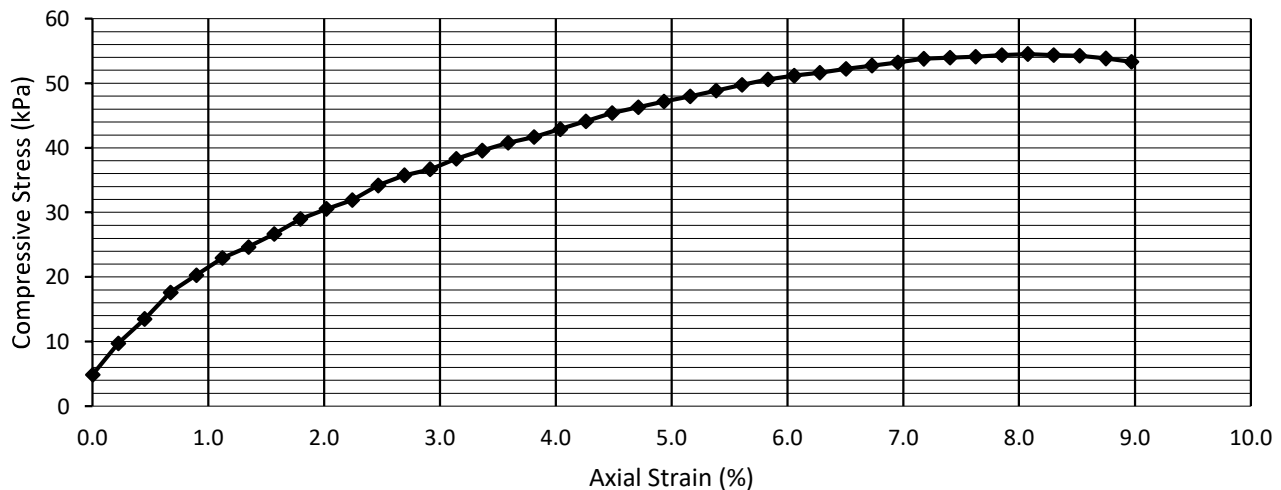
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	34.3
Pocket Pen.	Undrained Shear Strength (kPa)	23.9

UCS	Unconfined compressive strength (kPa)	54.52	Undrained Shear Strength (kPa)	27.26
	Unconfined compressive strength (ksf)	1.139	Undrained Shear Strength (ksf)	0.569
	Avg. Rate of Strain to Failure (%/min):	1.35	Strain at Failure (%):	8.07

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive, Winnipeg, MB R3P 0Y7
Phone: 204 477 5381

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Supplier/Location: Winnipeg, MB
Sample Depth (m): 7.62 - 8.23 m
Sample Location: TH24-15
Sample Number: T10

Date Sampled: January 12, 2024
Sampled By: ABonifacio
Date Received: January 12, 2024
Submitted By: ABonifacio
Date Tested: January 28, 2024
Tested By: LBoughton

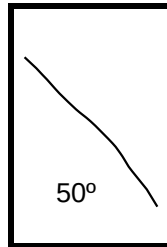
Unconfined Compressive Strength (ASTM D2166)

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, using strain-controlled application of the axial load.

Soil Description: CLAY - brown, soft, moist, silty, trace sand, high plasticity, homogeneous

Average Diameter (cm):	7.12
Average Length (cm):	14.88
Length/Diameter Ratio:	2.09
Moisture content (%):	44.1
Bulk Density (g/cm ³):	1.698
Bulk Unit Weight (kN/m ³):	16.6
Bulk Unit Weight (pcf):	106.0
Dry Unit Weight (kN/m ³):	11.55

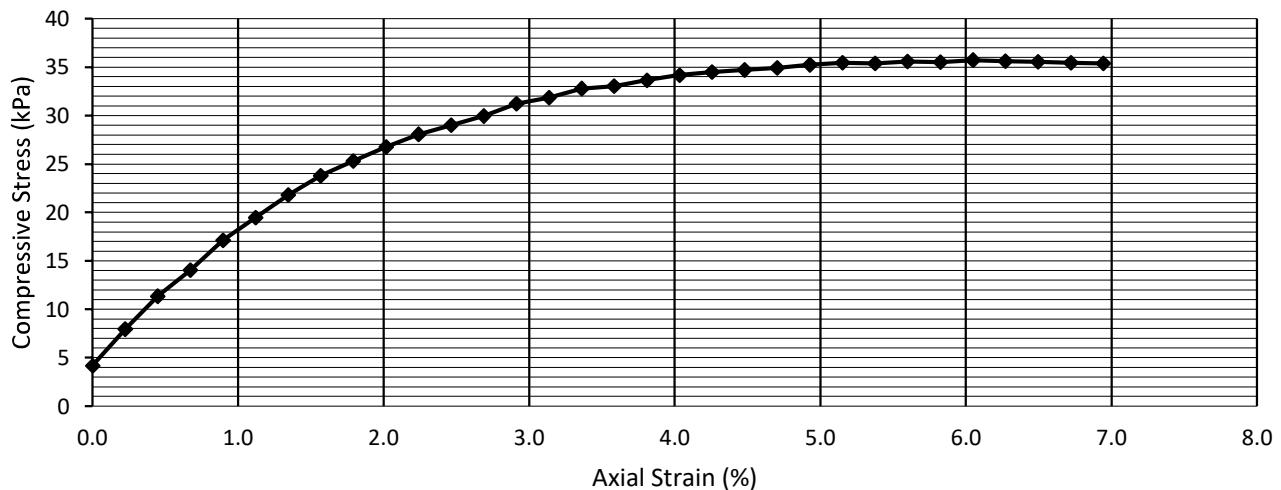
FAILURE SKETCH



Torvane	Undrained Shear Strength (kPa)	24.5
Pocket Pen.	Undrained Shear Strength (kPa)	12.0

UCS	Unconfined compressive strength (kPa)	35.72	Undrained Shear Strength (kPa)	17.86
	Unconfined compressive strength (ksf)	0.746	Undrained Shear Strength (ksf)	0.373
	Avg. Rate of Strain to Failure (%/min):	1.34	Strain at Failure (%):	6.05

Unconfined Compressive Strength



Comments:

Reviewed by: Lee Boughton
Laboratory Manager

Approved by: German Leal, M.Eng., P.Eng.
Geotechnical Discipline Lead



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Winnipeg Geotechnical Laboratory
99 Commerce Drive
Winnipeg, Manitoba
R3P 0Y7
Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: TH23-01
Sample Depth: 4.57 - 5.18 m
Sample Number: T8

Supplier: AECOM
Specification: N/A
Field Technician: ABonifacio
Sample Date: January 12, 2024
Lab Technician: LBoughton
Date Tested: January 23, 2024

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Material and Test Description

Material Description:

CLAY - silty, grey, moist, firm, high plasticity

Test Type:	Constant Head	Remoulding Details	
Mould Size:	Flexible Wall	Max Dry Density (kg/m ³):	N/A
Sample Source:	Shelby Tube Sample	Proctor ID:	N/A
Fluid Used:	Deaired Water	Percent Max (%):	N/A
Fluid Reservoir:	Burrettes	Target Dry Density (kg/m ³):	N/A

Initial Sample Characteristics

Water Content		Sample Size					
Wet + Tare (g):	779.6	Trial	1	2	3	4	Average
Dry + Tare (g):	516.9	Diameter (mm):	72.01	72.18	71.85	71.54	71.9
Tare (g):	8.3	Length (mm):	56.52	56.38	56.32	56.48	56.4
Water Content (%):	51.7%	Weight (g)	381.3				
Area (cm ²):	40.6	Specific Gravity (Note 2):		3.84			
Volume (cm ³):	229.1	Void Ratio:		2.50			
Wet Density (kg/m ³):	1,664.6	Saturation:		79.4%			
Dry Density (kg/m ³):	1,097.6	Porosity:		71.4%			

Final Sample Characteristics

Water Content			Sample Size					
Wet + Tare (g):	396.1		Trial	1	2	3	4	Average
Dry + Tare (g):	215.8		Diameter (mm):	72.1	72.2	72.3	72.1	72.2
Tare (g):	8.1		Length (mm):	57.4	57.2	57.3	57.3	57.3
Water Content (%):	86.8%		Weight (g)	388.2				
Area (cm ²):	40.9	Specific Gravity (Note 1):		3.84				
Volume (cm ³):	234.4	Void Ratio:		3.33				
Wet Density (kg/m ³):	1,655.9	Saturation:		100.0%				
Dry Density (kg/m ³):	886.4	Porosity:		76.9%				

Note 1: Specific gravity for final sample characteristics calculation adjusted to result in 100.0% saturation.

Note 2: Specific gravity for initial sample characteristics calculation set equal to that of the final.



AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive
Winnipeg, Manitoba
R3P 0Y7
Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: TH23-01
Sample Depth: 4.57 - 5.18 m
Sample Number: T8

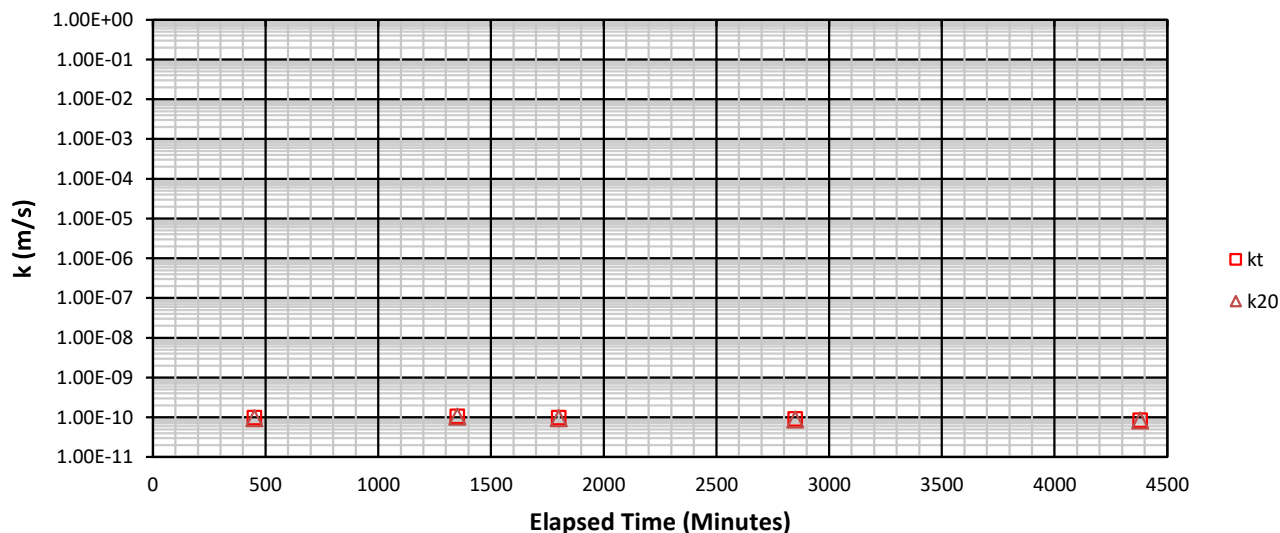
Supplier: AECOM
Specification: N/A
Field Technician: ABonifacio
Sample Date: January 12, 2024
Lab Technician: LBoughton
Date Tested: January 23, 2024

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Permeation Data

Head Difference (m):		2.8	Area of Sample (m ²)		4.075E-03
Length of Sample (m):		5.686E-02	Gradient, i		4.944E+01
Hydraulic Conductivity, "k" (m/s):		8.453E-11	Hydraulic Conductivity, "k ₂₀ " (m/s):		8.12293E-11
Elapsed Time (Minutes)	Average Volume Change (mL)	Average Temperature (°C)	k _t (m/s)	R _T	k ₂₀ (m/s)
450	0.61	21.2	9.847E-11	0.972	9.571E-11
1350	1.79	21.1	1.066E-10	0.974	1.038E-10
1800	2.23	22.1	9.915E-11	0.952	9.439E-11
2850	3.25	21.5	9.159E-11	0.965	8.838E-11
4380	4.64	21.2	8.551E-11	0.973	8.320E-11
5670	5.75	22.5	8.211E-11	0.943	7.743E-11
7170	6.97	21.6	7.890E-11	0.962	7.590E-11
8730	8.24	24.4	7.677E-11	0.903	6.933E-11
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-





AECOM Canada Ltd.
Winnipeg Geotechnical Laboratory
99 Commerce Drive
Winnipeg, Manitoba
R3P 0Y7
Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: TH24-15
Sample Depth: 6.10 - 6.71 m
Sample Number: T8

Supplier: AECOM
Specification: N/A
Field Technician: ABonifacio
Sample Date: January 12, 2024
Lab Technician: LBoughton
Date Tested: January 23, 2024

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Material and Test Description

Material Description:

CLAY - silty, grey, moist, firm, high plasticity

Test Type:	Constant Head	Remoulding Details	
Mould Size:	Flexible Wall	Max Dry Density (kg/m ³):	N/A
Sample Source:	Shelby Tube Sample	Proctor ID:	N/A
Fluid Used:	Deaired Water	Percent Max (%):	N/A
Fluid Reservoir:	Burettes	Target Dry Density (kg/m ³):	N/A

Initial Sample Characteristics

Water Content		Sample Size					
Wet + Tare (g):	779.2	Trial	1	2	3	4	Average
Dry + Tare (g):	502.3	Diameter (mm):	71.36	71.6	72.05	72.05	71.8
Tare (g):	8.6	Length (mm):	49.8	50.6	50.38	50.02	50.2
Water Content (%):	56.1%	Weight (g)	330.5				
Area (cm ²):	40.4	Specific Gravity (Note 2):			2.11		
Volume (cm ³):	203.1	Void Ratio:			1.02		
Wet Density (kg/m ³):	1,627.6	Saturation:			115.6%		
Dry Density (kg/m ³):	1,042.8	Porosity:			50.6%		

Final Sample Characteristics

Water Content		Sample Size					
Wet + Tare (g):	342.8	Trial	1	2	3	4	Average
Dry + Tare (g):	255.8	Diameter (mm):	71.9	72.1	71.9	72	72.0
Tare (g):	8.2	Length (mm):	50.3	50.1	50.2	50.2	50.2
Water Content (%):	35.1%	Weight (g)	334.4				
Area (cm ²):	40.7	Specific Gravity (Note 1):			2.11		
Volume (cm ³):	204.2	Void Ratio:			0.74		
Wet Density (kg/m ³):	1,637.2	Saturation:			100.0%		
Dry Density (kg/m ³):	1,211.5	Porosity:			42.6%		

Note 1: Specific gravity for final sample characteristics calculation adjusted to result in 100.0% saturation.

Note 2: Specific gravity for initial sample characteristics calculation set equal to that of the final.



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Phone: 204 477 5381 Fax: 204 284 2040

Project Name: NEWPCC Biosolids Early Works
Project Number: 60705950
Client: WSTP
Sample Location: TH24-15
Sample Depth: 6.10 - 6.71 m
Sample Number: T8

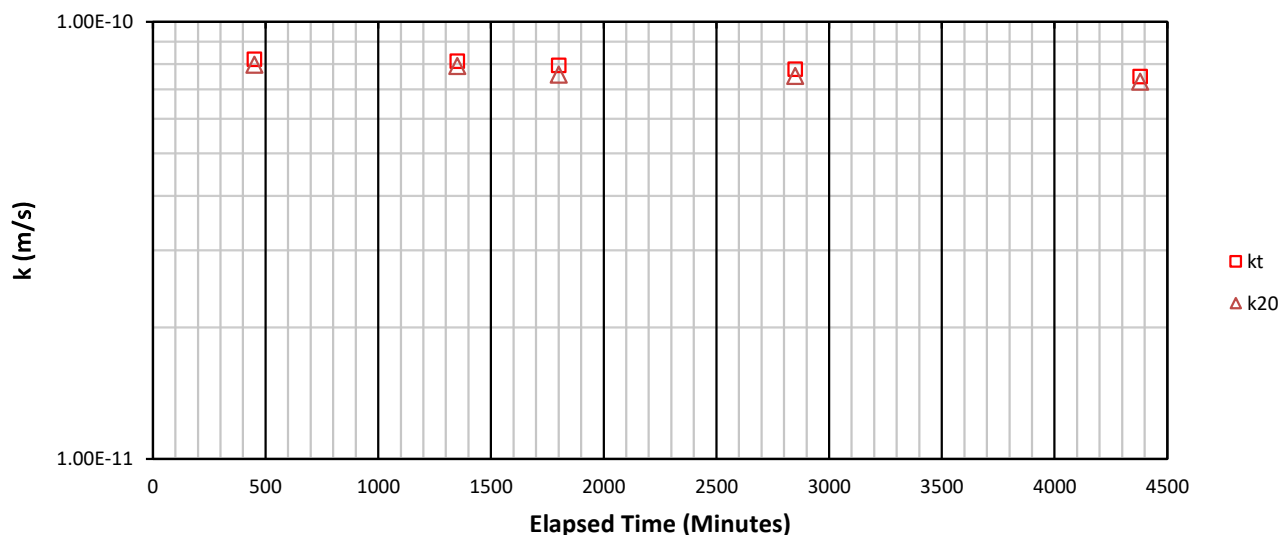
Supplier: AECOM
Specification: N/A
Field Technician: ABonifacio
Sample Date: January 12, 2024
Lab Technician: LBoughton
Date Tested: January 23, 2024

Flexible Wall Permeameter (ASTM D5084-10)

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Permeation Data

Head Difference (m):		2.8	Area of Sample (m ²)		4.057E-03
Length of Sample (m):		5.020E-02	Gradient, i		5.600E+01
Hydraulic Conductivity, "k" (m/s):		7.413E-11	Hydraulic Conductivity, "k ₂₀ " (m/s):		7.12429E-11
Elapsed Time (Minutes)	Average Volume Change (mL)	Average Temperature (°C)	k _t (m/s)	R _T	k ₂₀ (m/s)
450	0.62	21.2	8.209E-11	0.972	7.979E-11
1350	1.61	21.1	8.129E-11	0.974	7.918E-11
1800	2.07	22.1	7.947E-11	0.952	7.566E-11
2850	3.15	21.5	7.786E-11	0.965	7.513E-11
4380	4.61	21.2	7.495E-11	0.973	7.293E-11
5670	5.80	22.5	7.322E-11	0.943	6.905E-11
7170	7.04	21.6	7.050E-11	0.962	6.782E-11
8730	8.38	24.4	6.913E-11	0.903	6.242E-11
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
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-	-	-	-	-	-

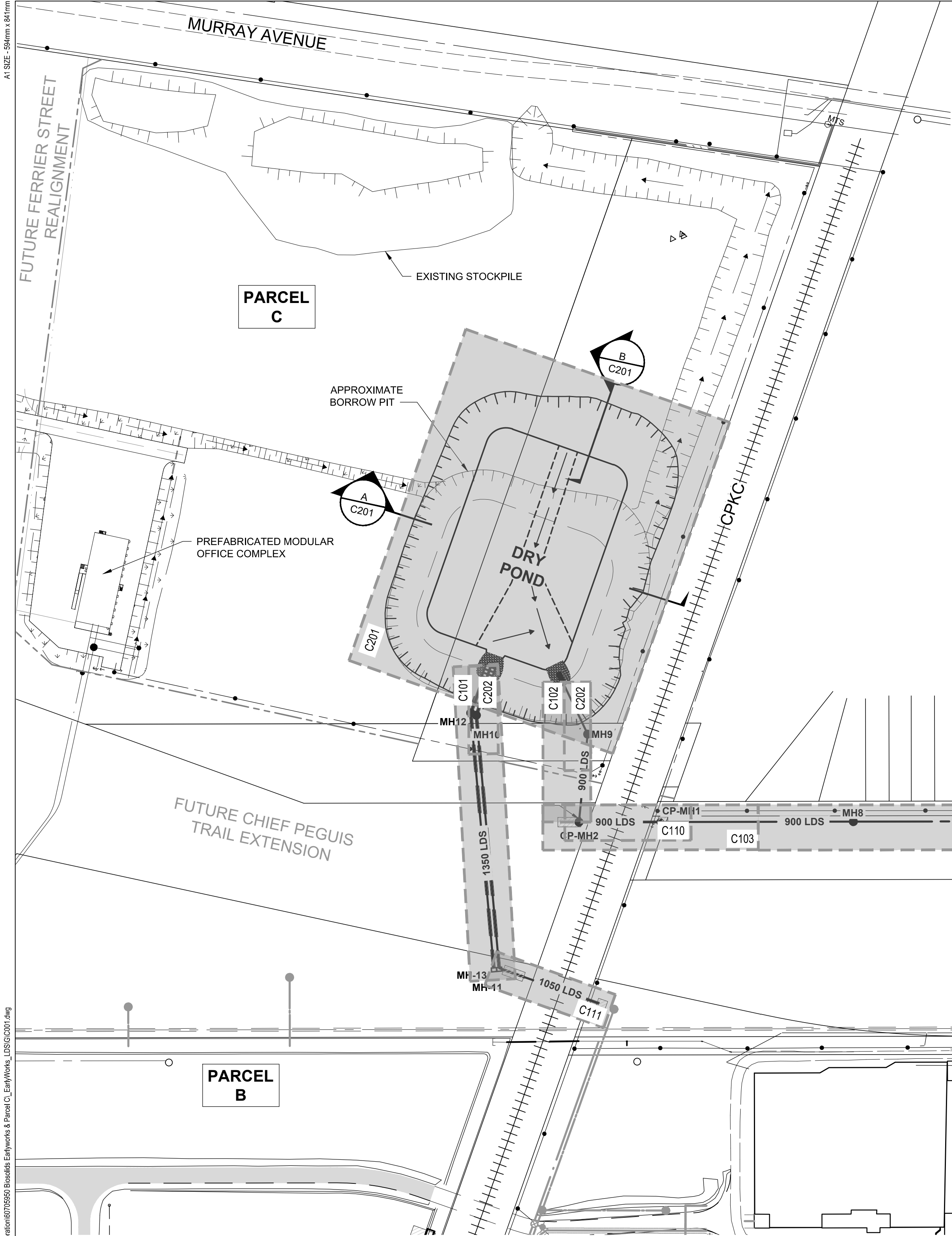


Appendix **D**

Drawings



LAST SAVE: 2025/07/20 15:53 AM
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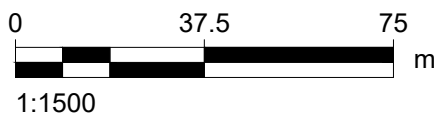


DRAWING INDEX

	CITY SHEET NUMBER	CONSULTANT SHEET NUMBER	DESCRIPTION
GENERAL			
1	X	G001	COVER PAGE
2	X	C001	DRAWING INDEX & SHEET LOCATION PLAN
3	X	C002	LAYDOWN AREA & CONSTRUCTION SITE
LAND DRAINAGE			
4	X	C101	LDS-POND INLET
5	X	C102	LDS-POND OUTLET
6	X	C103	LDS-CPK CROSSING & FOLEY AVE
7	X	C104	LDS-FOLEY AVE
8	X	C105	LDS-FOLEY AVE
9	X	C106	LDS-FOLEY AVE
10	X	C107	LDS-FOLEY AVE
11	X	C108	LDS-FOLEY AVE
12	X	C109	LDS-MAIN STREET
13	X	C110	LDS-CPKC CROSSING-WINNIPEG BEACH SUBDIVISION - MILE 3.84
14	X	C111	LDS-CPKC CROSSING-WINNIPEG BEACH SUBDIVISION - MILE 3.78
POND			
15	X	C201	POND CROSS SECTIONS
16	X	C202	POND DETAILS
STANDARD DETAILS			
17	X	C501	POND STANDARD DETAILS
18	X	C502	LAND DRAINAGE STANDARD DETAILS

- GENERAL NOTES:
- ALL WORK AND MATERIALS TO BE IN ACCORDANCE WITH THE CITY OF WINNIPEG STANDARD CONSTRUCTION SPECIFICATIONS.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING SURFACE AND UNDERGROUND STRUCTURES THAT AFFECT THE WORK OR MAY BE DAMAGED DURING CONSTRUCTION.
 - ALL EXISTING SURFACE AND UNDERGROUND STRUCTURES MAY NOT BE SHOWN ON THE DRAWINGS.
 - THE CONTRACTOR TO USE SOFT EXCAVATION METHODS (HYDROVAC OR HAND DIGGING) TO CONFIRM EXISTING PIPES AT CONNECTION AND CROSSING LOCATIONS PRIOR TO THE START OF CONSTRUCTION.
 - MEASUREMENTS AND LOCATION OF THE EXISTING UNDERGROUND STRUCTURES SHOWN ON THE DRAWINGS ARE NOT GUARANTEED TO BE ACCURATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
 - PRIOR TO CONSTRUCTION, CONTRACTOR TO CONFIRM ELEVATIONS OF EXISTING PIPELINES AND EXISTING UTILITIES.
 - MINIMUM PIPE DEPTH OF COVER 2.5m EXCEPT WHEN SHOWN OTHERWISE.
 - MAINTAIN A MINIMUM CLEARANCE OF 0.3m ABOVE AND 0.5m BELOW, BETWEEN EXISTING AND NEW PIPES AND UTILITIES.
 - INSTALL NEW LDS BY TRENCHLESS METHODS BENEATH ALL EXISTING AND PROPOSED PAVEMENTS. UTILIZE CLASS 3 BACKFILL IN ALL SHAFTS AND UNDER OR WITHIN 1.0m OF EXISTING OR PROPOSED PAVEMENTS. BACKFILL IN BOULEVARDS SHALL BE CLASS 4.
 - ALL PIPES IN OPEN TRENCH TO BE INSTALLED WITH CLASS B SAND BEDDING.
 - ALL ELEVATIONS AND MEASUREMENTS INDICATED ARE IN METERS UNLESS OTHERWISE STATED.
 - ALL PIPE DIAMETERS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
 - THE CONTRACTOR SHALL ENSURE THAT LOCAL DRAINAGE PATTERNS ARE NOT ALTERED BY THE CONSTRUCTION.
 - RESTORE ALL SURFACES TO A CONDITION EQUAL TO OR BETTER THAN ORIGINAL CONDITION.
FOR ALL NON-PAVEMENT RESTORATION AREAS, RESTORE DISTURBED AREAS WITH TOPSOIL AND SOD, AS PER SPECIFICATION.

SITE PLAN



150 WM	WATERMAIN	150 WM		CURB STOP		[230.850]	GRADE	(231.000)
HYDRANT	REDUCER					230.50	CONTOUR ELEVATION	
VALVE	COUPLING						SWALE	
300 LDS	LAND DRAINAGE SEWER	300 LDS		HYDRO				
250 WWS	WASTE WATER SEWER	250 WWS		MTS				
MANHOLE				GAS				
CATCH BASIN				GRAVEL				
CURB INLET				GRASS				
SUBDRAIN				LIP CURB				
COMMUNITY MAILBOX				MODIFIED BARRIER CURB				
SURVEY BAR				RAMP CURB				
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW

WARNING

- IF POWER EQUIPMENT OR EXPLOSIVES ARE TO BE USED FOR EXCAVATION ON THIS PROJECT THE CONTRACTOR MUST:
- NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.
 - TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.
- SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

**ENGINEERS
GEOSCIENTISTS
MANITOBA**

Certificate of Authorization
AECOM Canada ULC
No. 4671

				AECOM		ENGINEER'S SEAL	
				DESIGNED BY: NJD	CHECKED BY: MPG		
				DRAWN BY: LMB	APPROVED BY: KWF		
				SCALE: 1:1500	RELEASED FOR CONSTRUCTION BY:		
				DATE: 2025-02-21	DATE:		
				CONSULTANT NO.:	C001		
A	ISSUED FOR REVIEW	2025-06-12	NJD	MPG			
NO.	REVISIONS	DATE	DESIGN	CHECK			

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
OVERALL SITE PLAN

CITY DRAWING NUMBER	SHEET 001	REV. A	SIZE A1
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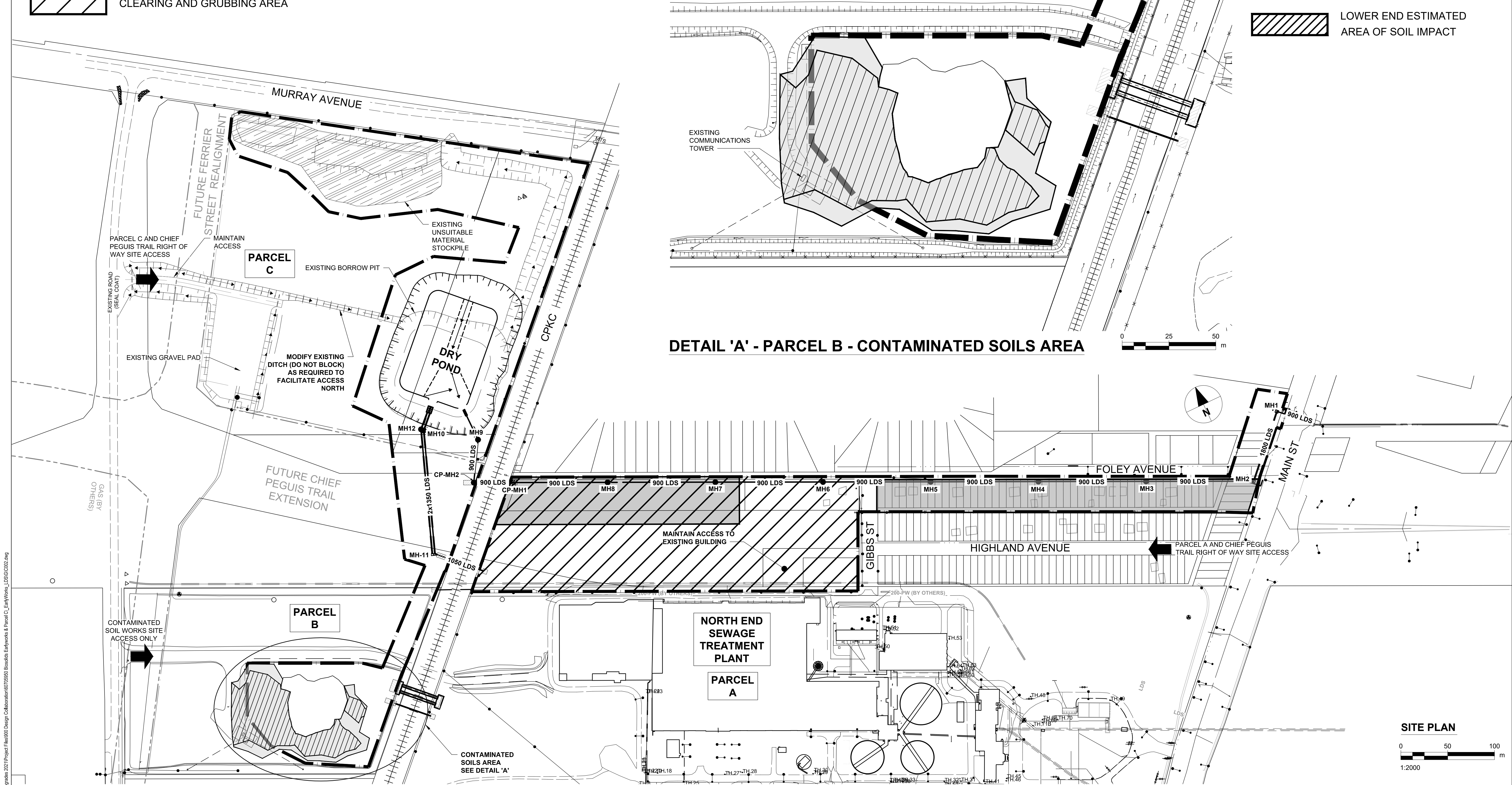
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SITE PLAN LEGEND:

- LIMITS OF CONSTRUCTION SITE
- LAYDOWN AREA
- CLEARING AND GRUBBING AREA

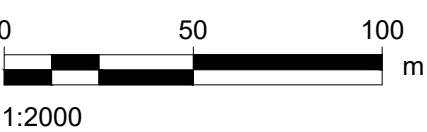
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- LIMITS OF CONSTRUCTION SITE
- UPPER END ESTIMATED AREA OF SOIL IMPACT
- LOWER END ESTIMATED AREA OF SOIL IMPACT



DETAIL 'A' - PARCEL B - CONTAMINATED SOILS AREA

SITE PLAN



FOR INDEX SEE C001

TENDER NO. 116-2025

150 WM	WATERMAIN	150 WM		CURB STOP		230.850	GRADE	231.000
HYDRANT		REDUCER				230.50	CONTOUR ELEVATION	
VALVE		COUPLING					SWALE	
300 LDS	LAND DRAINAGE SEWER	300 LDS		HYDRO				
250 WWS	WASTE WATER SEWER	250 WWS		MTS				
MANHOLE				GAS				
CATCH BASIN				GRAVEL				
CURB INLET				GRASS				
SUBDRAIN				LIP CURB				
COMMUNITY MAILBOX				MODIFIED BARRIER CURB				
SURVEY BAR				RAMP CURB				
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW

WARNING

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SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

ENGINEERS
GEOSCIENTISTS
MANITOBA
Certificate of Authorization
AECOM Canada ULC
No. 4671

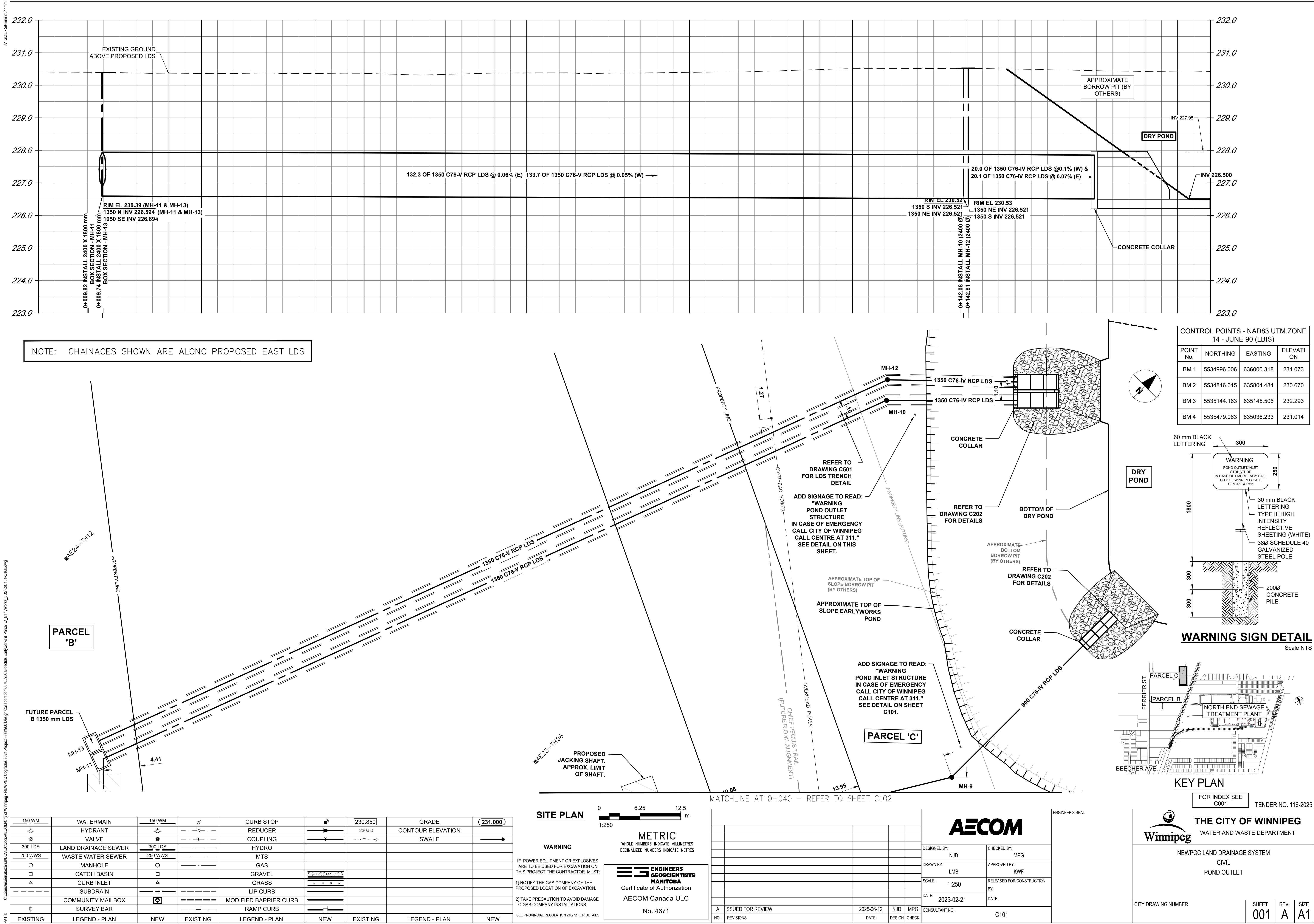
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NO.	REVISIONS	DATE	DESIGN CHECK

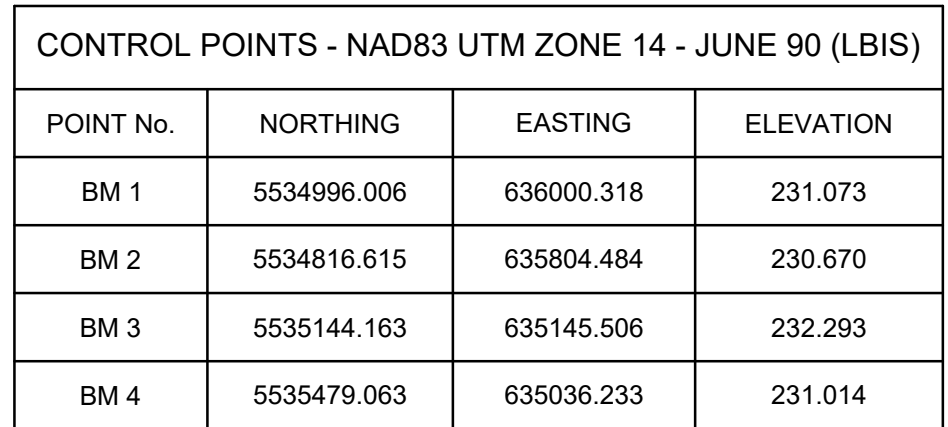
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
LAYDOWN AREA & CONSTRUCTION SITE

CITY DRAWING NUMBER	SHEET	REV.	SIZE
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TENDER NO. 116-2025

150 WM	WATERMAIN	150 WM	♂	CURB STOP	♂	230.850	GRADE	231.000
⊖	HYDRANT	⊖	⊖	REDUCER	→	230.50	CONTOUR ELEVATION	→
⊗	VALVE	⊗	⊖	COUPLING	→		SWALE	→
300 LDS	LAND DRAINAGE SEWER	300 LDS	⊖	HYDRO	→			
250 WWS	WASTE WATER SEWER	250 WWS	⊖	MTS	→			
○	MANHOLE	○	⊖	GAS	→			
□	CATCH BASIN	□	⊖	GRAVEL	→			
△	CURB INLET	△	⊖	GRASS	→			
— — — —	SUBDRAIN	— — — —	⊖	LIP CURB	→			
	COMMUNITY MAILBOX	Ⓜ	⊖	MODIFIED BARRIER CURB	→			
⊕	SURVEY BAR	⊕	⊖	RAMP CURB	→			
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW

1:250

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A	ISSUED FOR REVIEW	2025-06-12	NJD	MPG
NO.	REVISIONS	DATE	DESIGN	CHECK

DESIGNED BY: NJD	CHECKED BY: MPG
DRAWN BY: LMB	APPROVED BY: KWF
SCALE: 1:250	RELEASED FOR CONSTRUCTION BY:
DATE: 2025-02-21	DATE:
CONSULTANT NO.: C102	

ENGINEER'S SEAL



NEWPCC LAND DRAINAGE SYSTEM
CIVIL
POND INLET

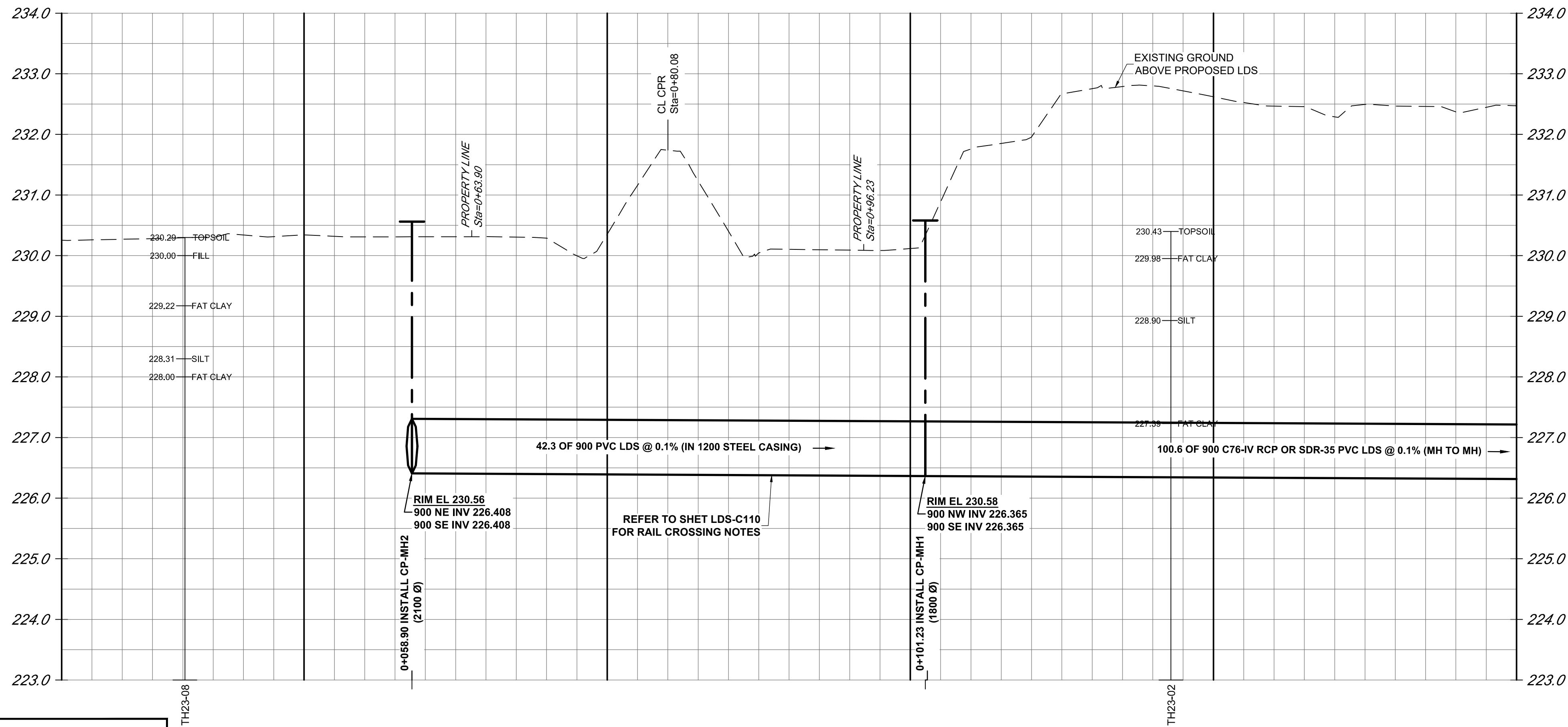
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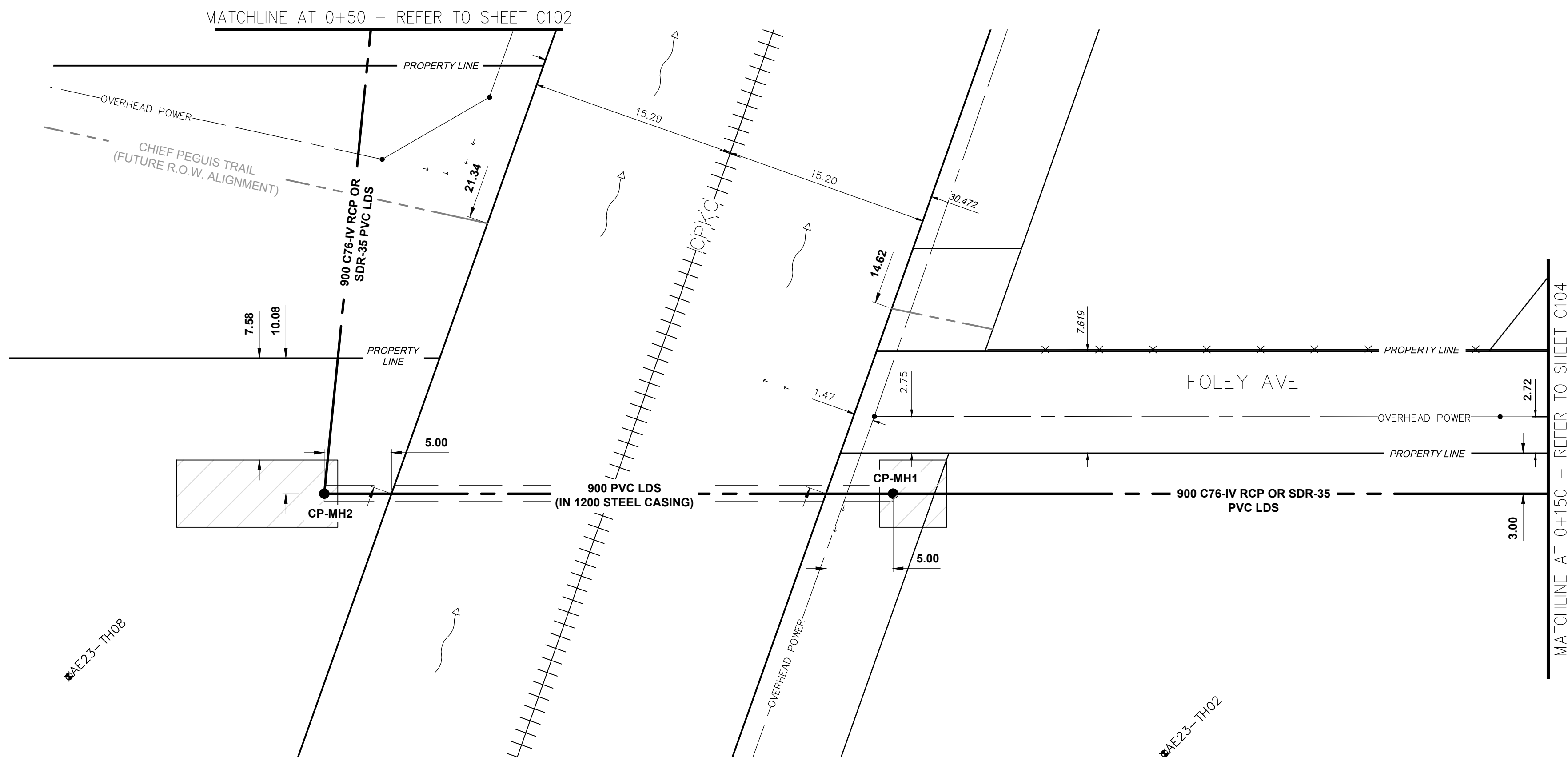
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	SIZE
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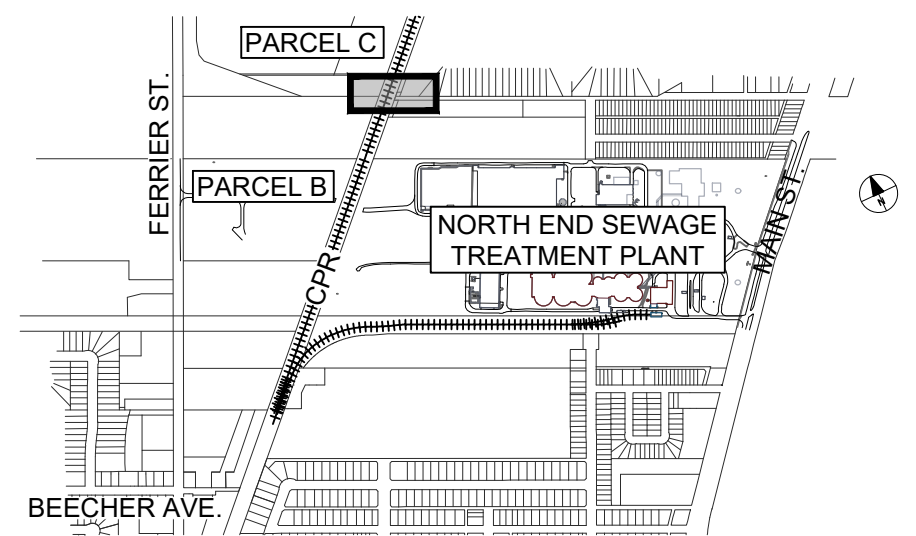
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NOTE: CHAINAGES SHOWN ARE ALONG
S P OF FOLEY AVENUE



CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)			
POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

FOR INDEX SEE
C001

TENDER NO. 116-2025

150 WM	WATERMAIN	150 WM	3"	CURB STOP	230.850	GRADE	231.000
HYDRANT	REDUCER					CONTOUR ELEVATION	
VALVE	COUPLING					SWALE	
300 LDS	LAND DRAINAGE SEWER	300 LDS		HYDRO			
250 WWS	WASTE WATER SEWER	250 WWS		MTS			
MANHOLE				GAS			
CATCH BASIN				GRAVEL			
CURB INLET				GRASS			
SUBDRAIN				LIP CURB			
COMMUNITY MAILBOX				MODIFIED BARRIER CURB			
SURVEY BAR				RAMP CURB			
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN

SITE PLAN

1:250

WARNING

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PROPOSED LOCATION OF EXCAVATION.
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GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

0 6.25 12.5 m
1:250

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

**ENGINEERS
GEOSCIENTISTS
MANITOBA**
Certificate of Authorization
AECOM Canada ULC
No. 4671

AECOM

DESIGNED BY: NJD
DRAWN BY: LMB
SCALE: 1:250
DATE: 2025-02-21

CHECKED BY: MPG
APPROVED BY: KWF
RELEASED FOR CONSTRUCTION BY:
DATE:

CONSULTANT NO.: C103

A ISSUED FOR REVIEW
NO. REVISIONS

2025-06-12
DATE

NJD
DESIGN

MPG
CHECK

ENGINEER'S SEAL

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
CPR CROSSING & FOLEY AVE - STA. 0+030 TO 0+150

CITY DRAWING NUMBER

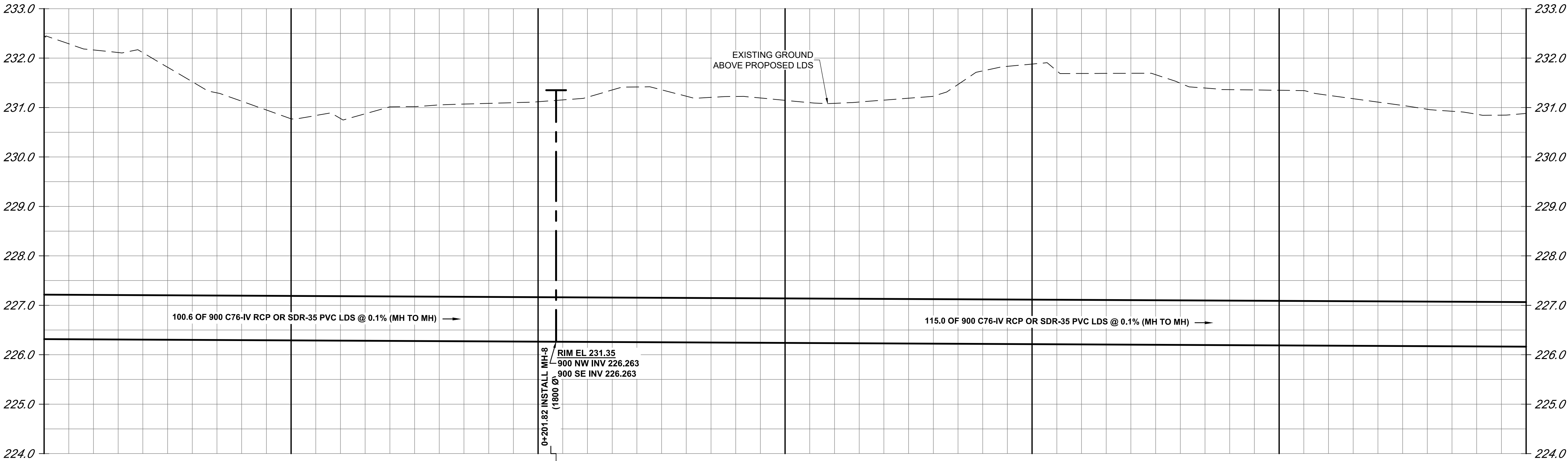
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REV.
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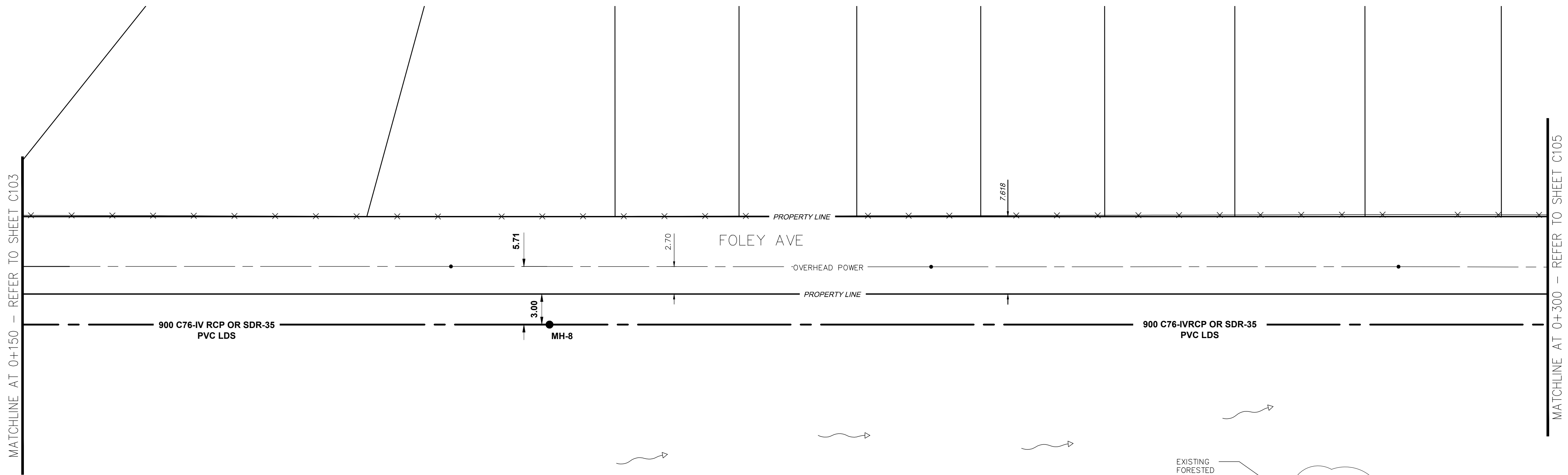
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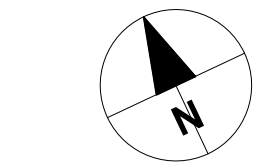
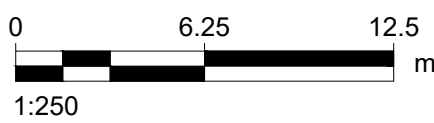
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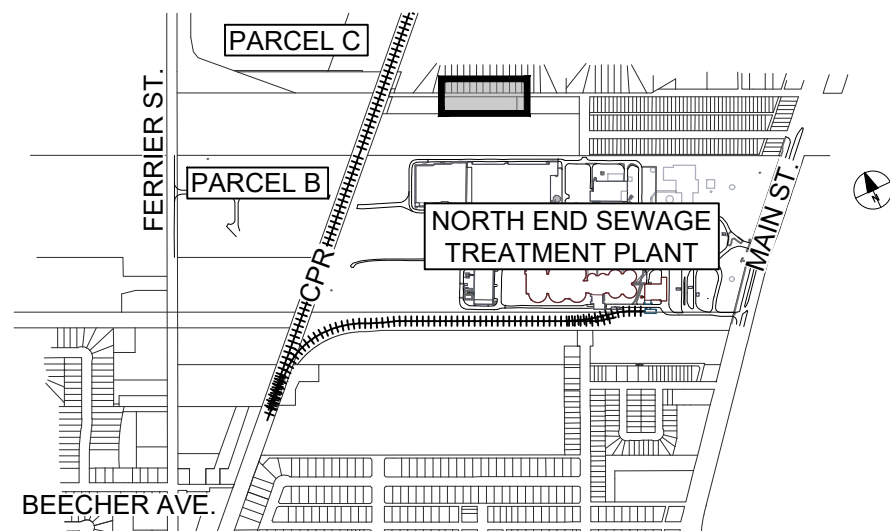
NOTE: CHAINAGES SHOWN ARE ALONG
S  OF FOLEY AVENUE



SITE PLAN
1:250



CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)			
POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

FOR INDEX SEE
C001

TENDER NO. 116-2025

150 WM	WATERMAIN	150 WM	Ø	CURB STOP	230.850	GRADE	231.000
	HYDRANT				230.50	CONTOUR ELEVATION	
	VALVE					SWALE	
	LAND DRAINAGE SEWER						
	WASTE WATER SEWER						
	MANHOLE						
	CATCH BASIN						
	CURB INLET						
	SUBDRAIN						
	COMMUNITY MAILBOX						
	SURVEY BAR						
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN

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METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

 **ENGINEERS
GEOSCIENTISTS
MANITOBA**
Certificate of Authorization
AECOM Canada ULC
No. 4671

A			
NO.	ISSUED FOR REVIEW	2025-02-25	NJD MPG
	REVISIONS	DATE	DESIGN CHECK

AECOM

DESIGNED BY: NJD	CHECKED BY: MPG
DRAWN BY: LMB	APPROVED BY: KWF
SCALE: 1:250	RELEASED FOR CONSTRUCTION BY: DATE:
DATE: 2025-02-21	DATE:
CONSULTANT NO.:	C104

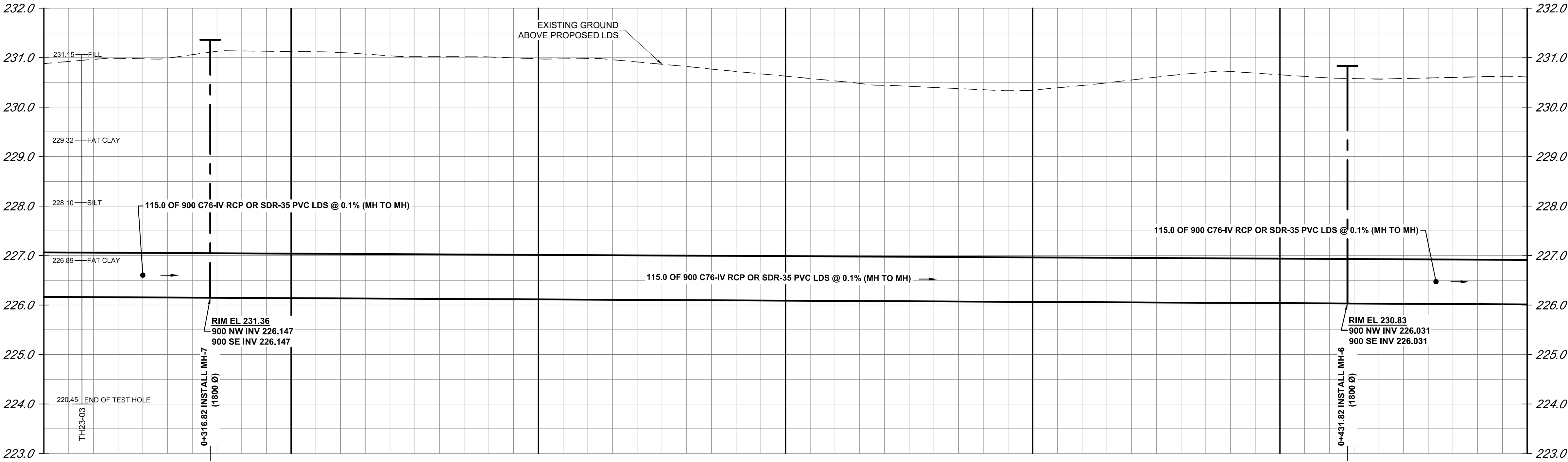
ENGINEER'S SEAL

 **THE CITY OF WINNIPEG**
WATER AND WASTE DEPARTMENT

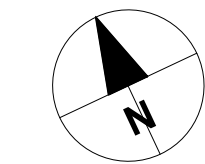
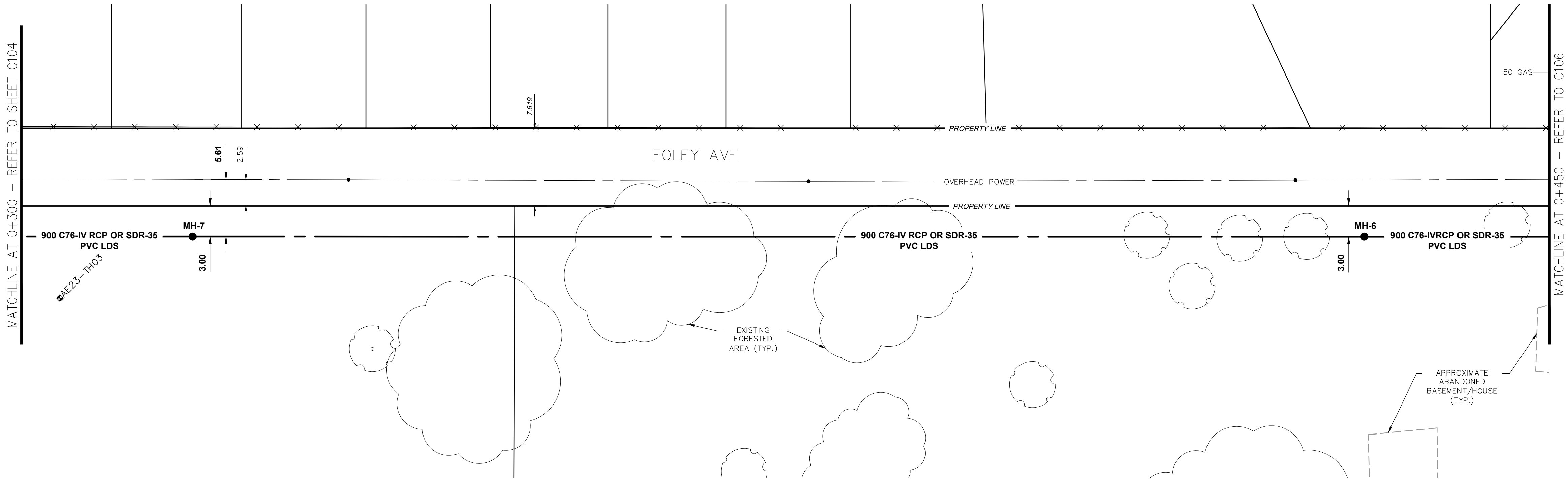
NEWPCC LAND DRAINAGE SYSTEM
CIVIL
FOLEY AVE - STA. 0+150 to 0+300

CITY DRAWING NUMBER	SHEET 001	REV. A	SIZE A1
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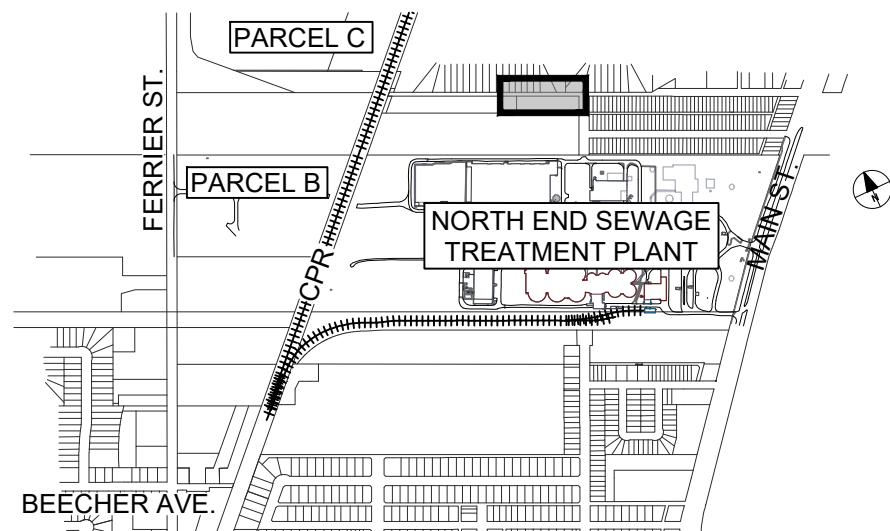
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NOTE: CHAINAGES SHOWN ARE ALONG
S R L OF FOLEY AVENUE

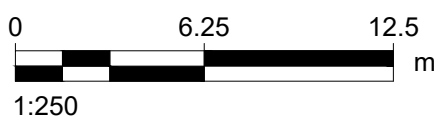


CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)			
POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

SITE PLAN
1:250



150 WM	WATERMAIN	150 WM	Ø	CURB STOP	230.850	GRADE	231.000
○	HYDRANT	○	---	REDUCER	230.50	CONTOUR ELEVATION	
⊗	VALVE	⊗	---	COUPLING		SWALE	→
300 LDS	LAND DRAINAGE SEWER	300 LDS	---	HYDRO			
250 WWS	WASTE WATER SEWER	250 WWS	---	MTS			
○	MANHOLE	○	---	GAS			
□	CATCH BASIN	□	---	GRAVEL			
△	CURB INLET	△	---	GRASS			
---	SUBDRAIN	---	---	LIP CURB			
⊕	COMMUNITY MAILBOX	⊕	---	MODIFIED BARRIER CURB			
⊕	SURVEY BAR	⊕	---	RAMP CURB			
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN

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METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

**ENGINEERS
GEOSCIENTISTS
MANITOBA**
Certificate of Authorization
AECOM Canada ULC
No. 4671

A			
ISSUED FOR REVIEW	2025-06-12	NJD	KWF
NO.	REVISIONS	DATE	DESIGN CHECK

AECOM

DESIGNED BY: NJD
DRAWN BY: LMB
SCALE: 1:250
DATE: 2025-02-21
CONSULTANT NO.: C105

CHECKED BY: MPG
APPROVED BY: KWF
RELEASED FOR CONSTRUCTION BY:
DATE:

ENGINEER'S SEAL

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
FOLEY AVE - STA. 0+300 TO 0+450

CITY DRAWING NUMBER

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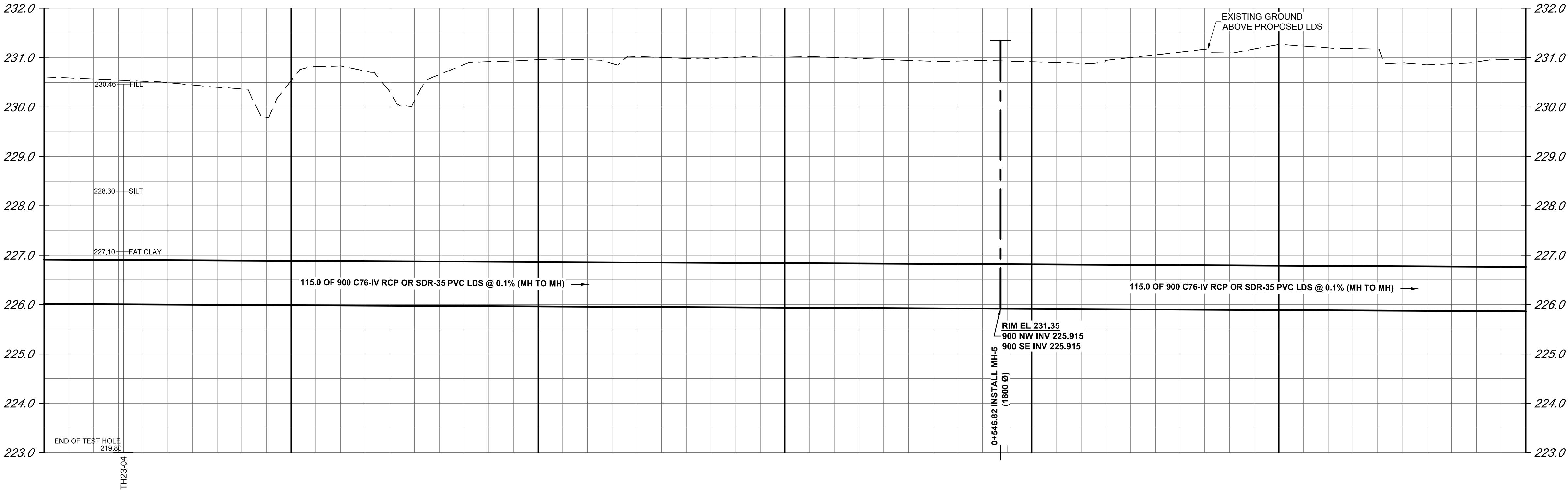
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SIZE
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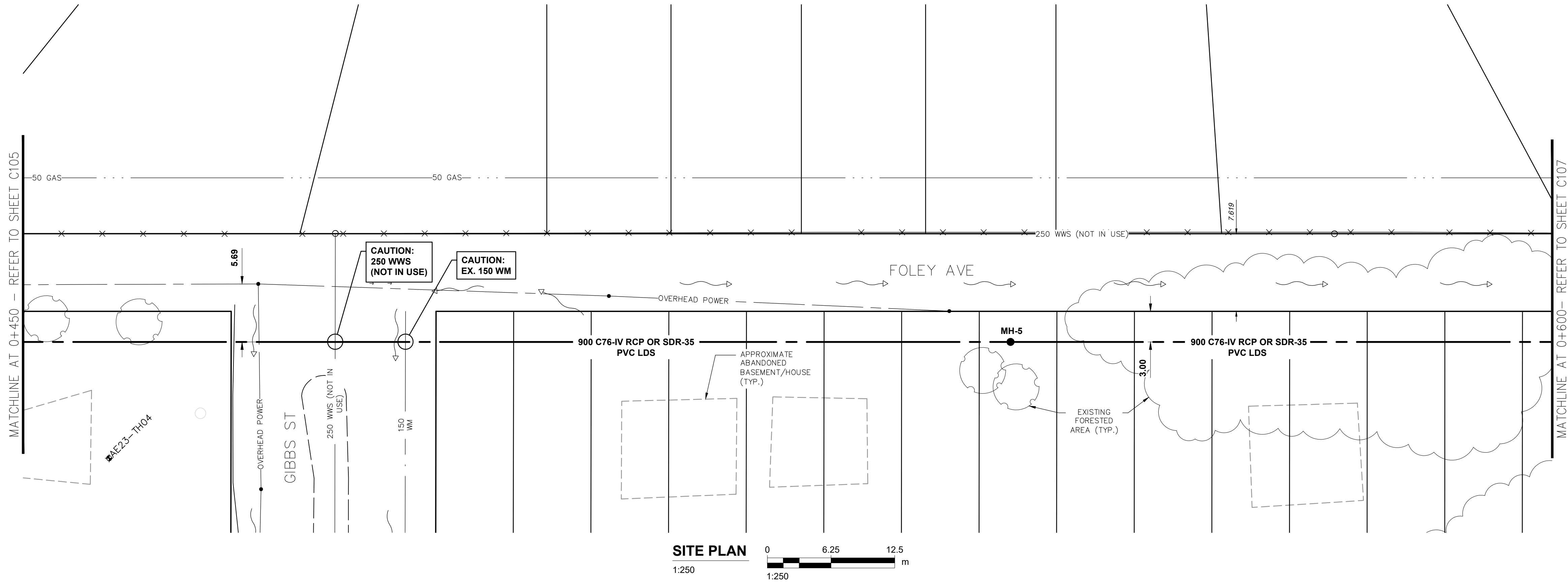
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C001

TENDER NO. 116-2025

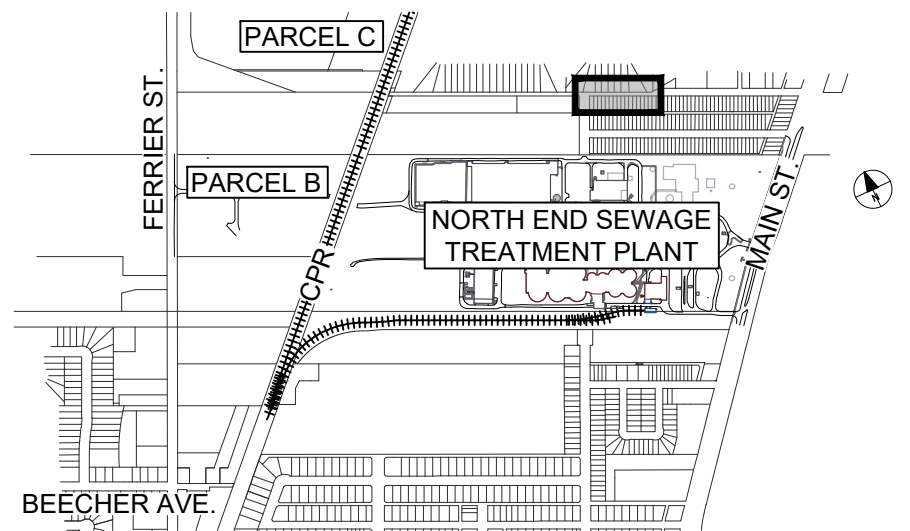
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NOTE: CHAINAGES SHOWN ARE ALONG
S E OF FOLEY AVENUE



CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)			
POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

FOR INDEX SEE
C001

TENDER NO. 116-2025

150 WM	WATERMAIN	150 WM	Ø	CURB STOP	230.850	GRADE	231.000
○	HYDRANT	○	— — — — —	REDUCER	230.50	CONTOUR ELEVATION	→
⊗	VALVE	⊗	— — — — —	COUPLING		SWALE	
300 LDS	LAND DRAINAGE SEWER	300 LDS	— — — — —	HYDRO			
250 WWS	WASTE WATER SEWER	250 WWS	— — — — —	MTS			
○	MANHOLE	○	— — — — —	GAS			
□	CATCH BASIN	□	— — — — —	GRAVEL			
△	CURB INLET	△	— — — — —	GRASS			
— — — — —	SUBDRAIN	— — — — —	— — — — —	LIP CURB			
⊕	COMMUNITY MAILBOX	⊕	— — — — —	MODIFIED BARRIER CURB			
⊕	SURVEY BAR	⊕	— — — — —	RAMP CURB			
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN

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WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

ENGINEERS
GEOSCIENTISTS
MANITOBA
Certificate of Authorization
AECOM Canada ULC
No. 4671

AECOM			
DESIGNED BY:	NJD	CHECKED BY:	MPG
DRAWN BY:	LMB	APPROVED BY:	KWF
SCALE:	1:250	RELEASED FOR CONSTRUCTION BY:	
DATE:	2025-02-21	DATE:	
CONSULTANT NO.:	C106		
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NO.	REVISIONS	DATE	DESIGN CHECK

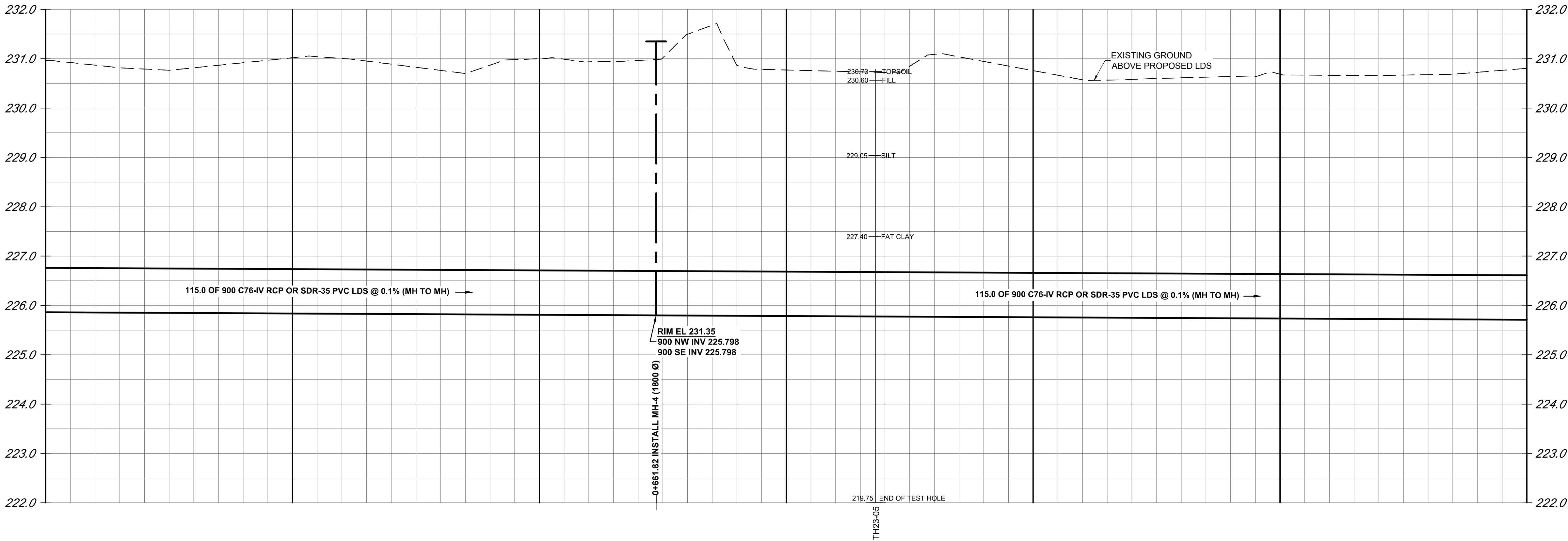
ENGINEER'S SEAL

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

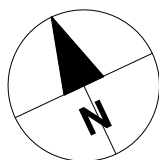
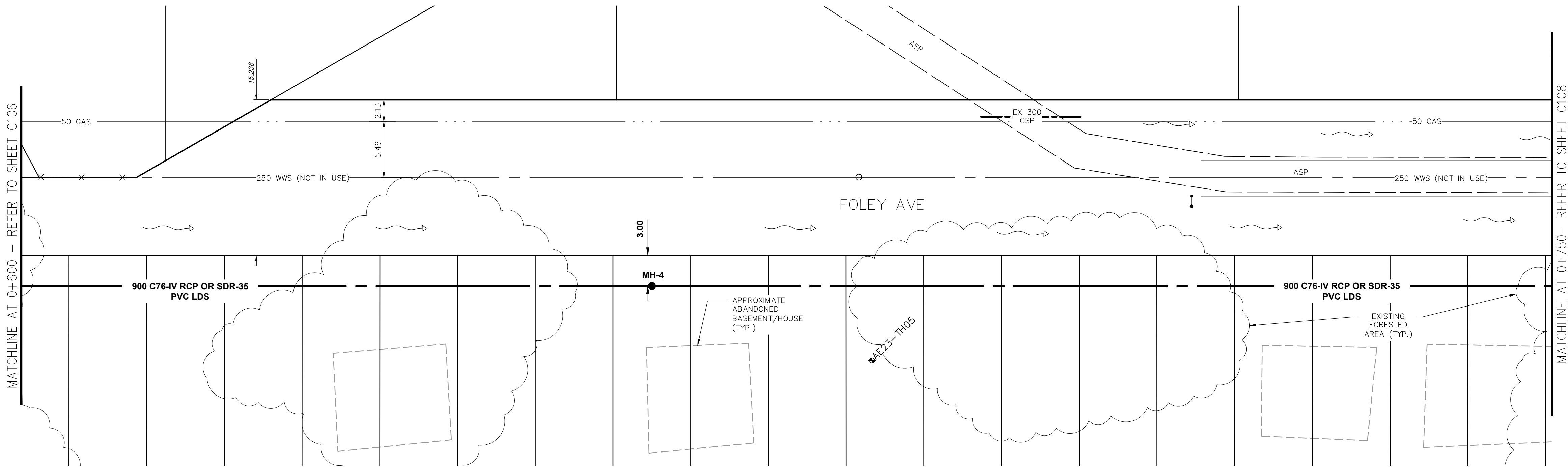
NEWPCC LAND DRAINAGE SYSTEM
CIVIL
FOLEY AVE - STA. 0+450 to 0+600

CITY DRAWING NUMBER	SHEET	REV.	SIZE
	001	A	A1

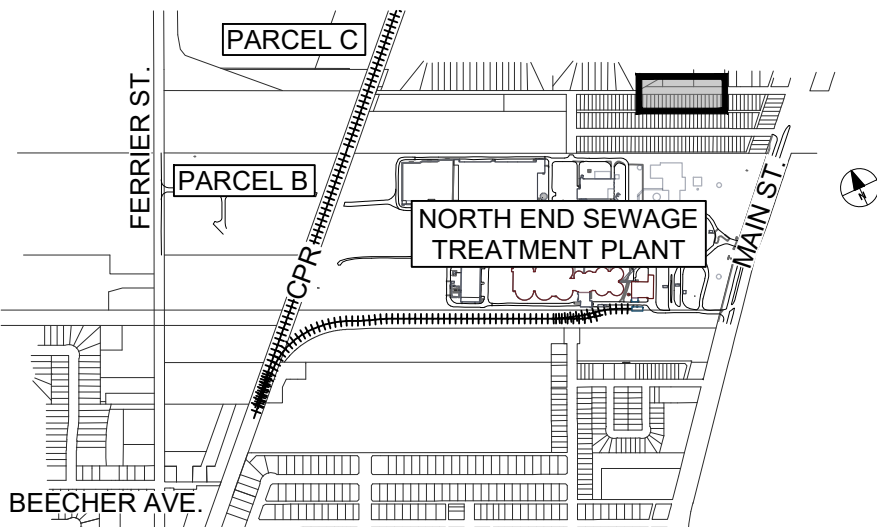
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NOTE: CHAINAGES SHOWN ARE ALONG
S P OF FOLEY AVENUE



CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)			
POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

FOR INDEX SEE
C001 TENDER NO. 116-2025

150 WM	WATERMAIN	150 WM	Ø	CURB STOP	230.850	GRADE	231.000
○	HYDRANT	○	— — — — —	REDUCER	230.50	CONTOUR ELEVATION	→
⊗	VALVE	⊗	— — — — —	COUPLING		SWALE	
300 LDS	LAND DRAINAGE SEWER	300 LDS		HYDRO			
250 WWS	WASTE WATER SEWER	250 WWS		MTS			
○	MANHOLE	○		GAS			
□	CATCH BASIN	□		GRAVEL			
△	CURB INLET	△		GRASS			
— — — — —	SUBDRAIN	— — — — —		LIP CURB			
⊕	COMMUNITY MAILBOX	⊕		MODIFIED BARRIER CURB			
+	SURVEY BAR	+		RAMP CURB			
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN

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MANITOBA**
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AECOM Canada ULC
No. 4671

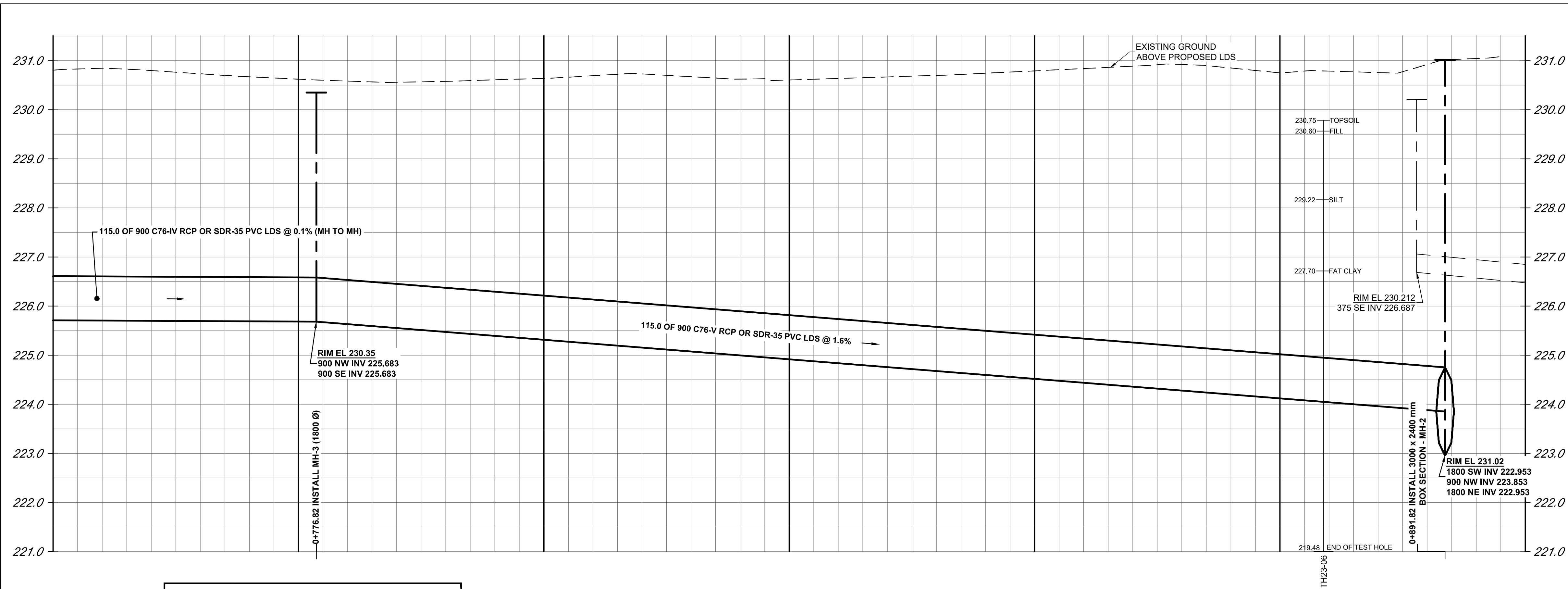
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DRAWN BY:	LMB	APPROVED BY:	KWF
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DATE:	2025-02-21	DATE:	
CONSULTANT NO.:	C107		
A	ISSUED FOR REVIEW	2025-06-12	NJD MPG
NO.	REVISIONS	DATE	DESIGN CHECK

ENGINEER'S SEAL

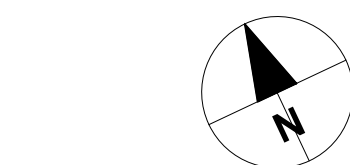
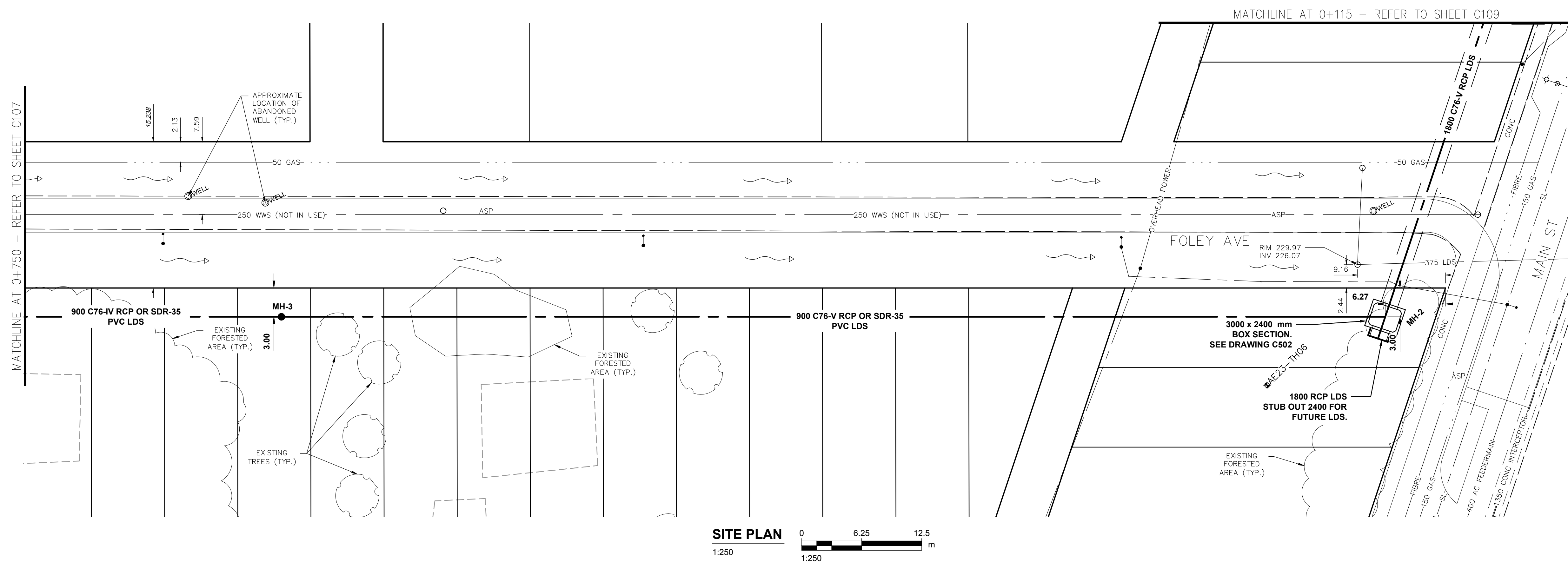
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
FOLEY AVE - STA. 0+600 to 0+750

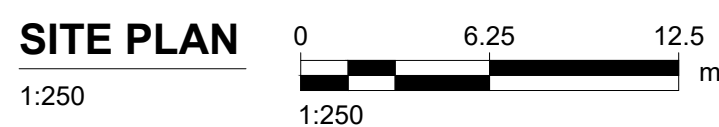
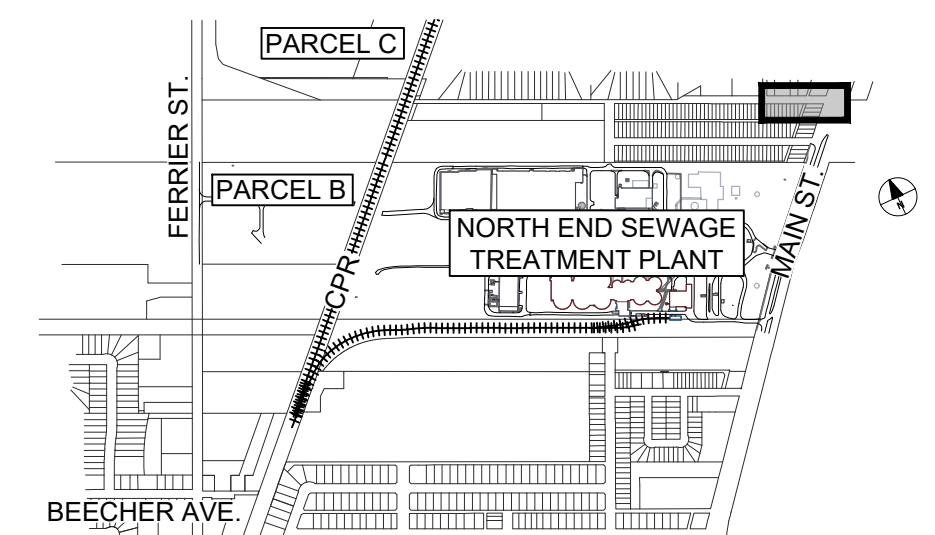
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	001	A	A1



NOTE: CHAINAGES SHOWN ARE ALONG
S R OF FOLEY AVENUE



CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)			
POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



150 WM	WATERMAIN	150 WM		CURB STOP		230.850	GRADE	231.000
	HYDRANT			REDUCER		230.50	CONTOUR ELEVATION	
	VALVE			COUPLING			SWALE	
300 LDS	LAND DRAINAGE SEWER	300 LDS		HYDRO				
250 WWS	WASTE WATER SEWER	250 WWS		MTS				
	MANHOLE			GAS				
	CATCH BASIN			GRAVEL				
	CURB INLET			GRASS				
	SUBDRAIN			LIP CURB				
	COMMUNITY MAILBOX			MODIFIED BARRIER CURB				
	SURVEY PLAN			RAMP CURB				
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW

WARNING

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SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES


**ENGINEERS
GEOSCIENTISTS
MANITOBA**

AECOM Canada ULC

No. 4671

					
A	ISSUED FOR REVIEW	2025-06-12	NJD	MPG	
NO.	REVISIONS	DATE	DESIGN	CHECK	

ENGINEER'S SEAL

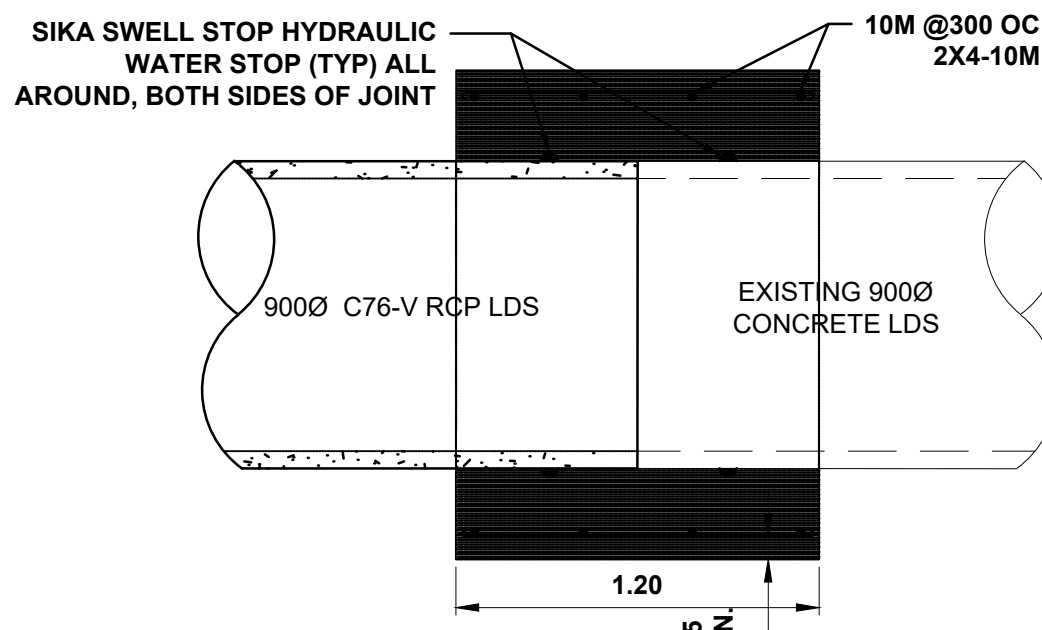
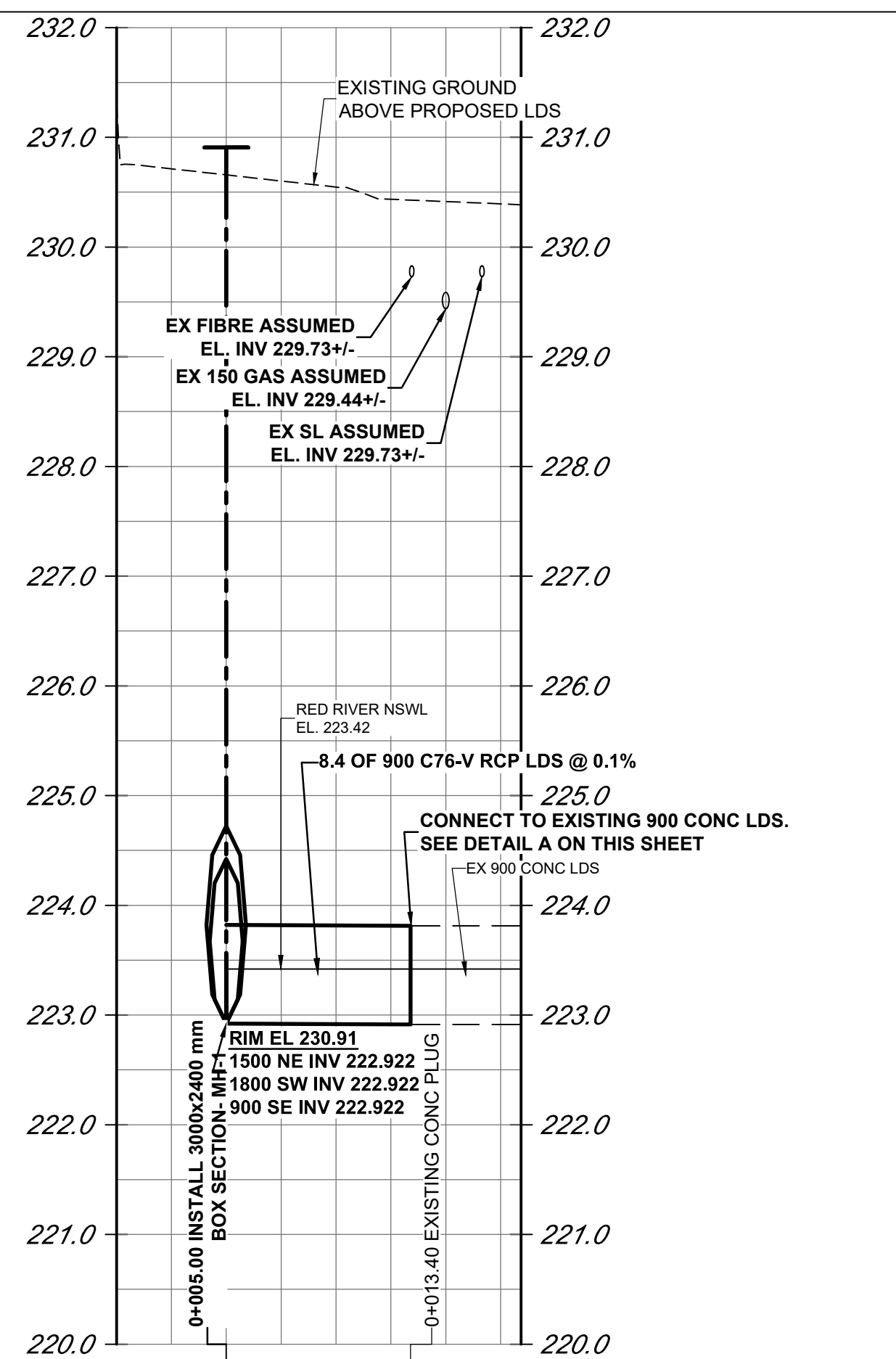
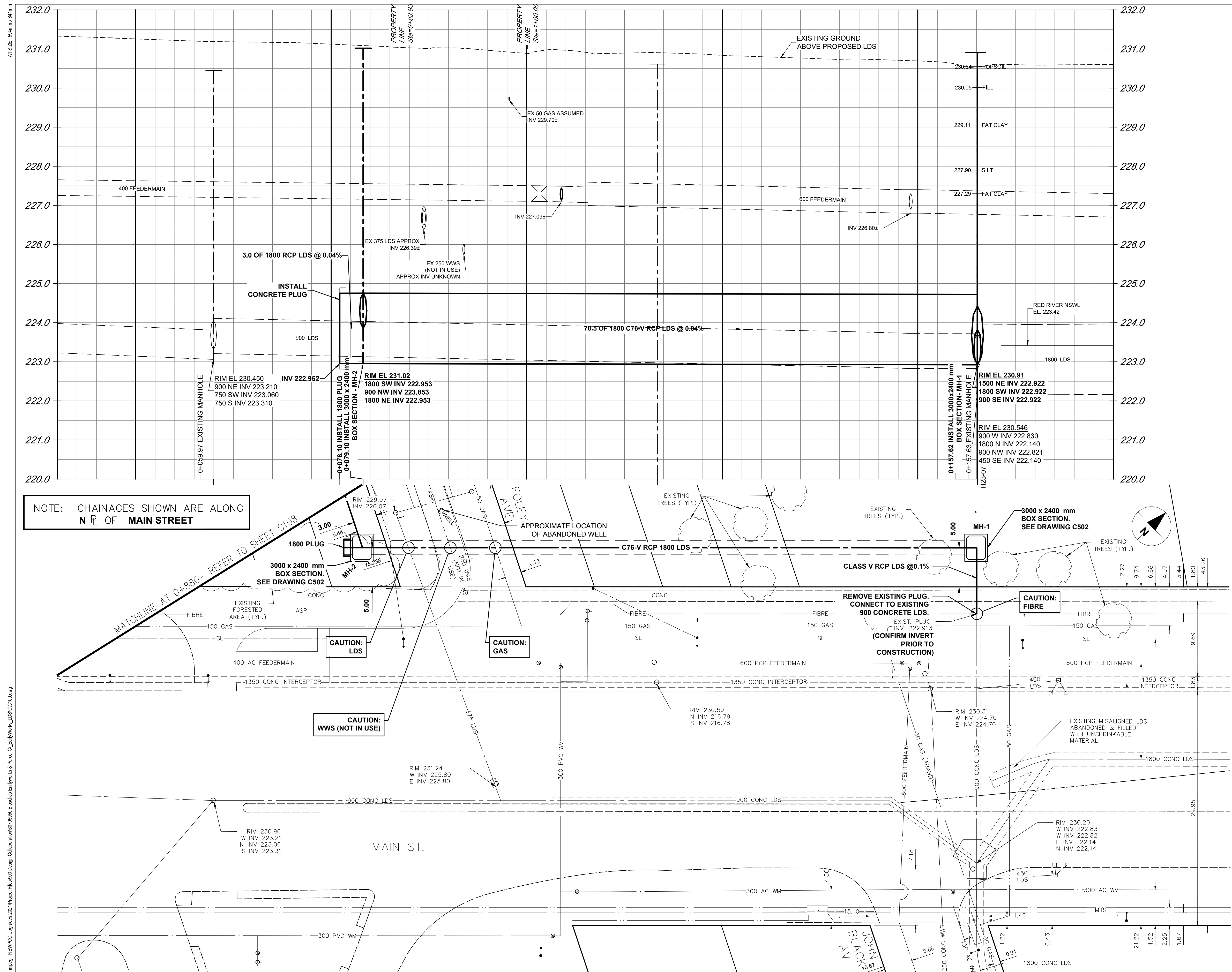
 **THE CITY OF WINNIPEG**
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
FOLEY AVE - STA. 0+750 to 0+900

CITY DRAWING NUMBER	SHEET 001	REV. A	SIZE A1
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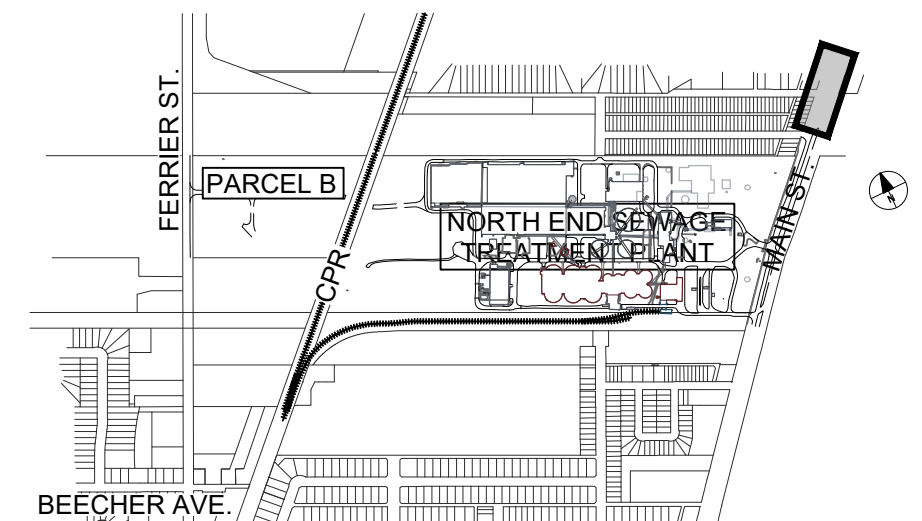
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A | DETAIL-CONCRETE COLLAR

CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)

POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

TENDER NO. 116-2025

	WATERMAIN			CURB STOP			GRADE	
	HYDRANT			REDUCER			CONTOUR ELEVATION	
	VALVE			COUPLING			SWALE	
	LAND DRAINAGE SEWER			HYDRO				
	WASTE WATER SEWER			MTS				
	MANHOLE			GAS				
	CATCH BASIN			GRAVEL				
	CURB INLET			GRASS				
	SUBDRAIN			LIP CURB				
	COMMUNITY MAILBOX			MODIFIED BARRIER CURB				
	SURVEY BAR			RAMP CURB				
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW

SITE PLAN



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SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

METRIC

WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES



AECOM Canada ULC

No. 4671

A	ISSUED FOR REVIEW	2025-06-12	NJD	KWF
NO.	REVISIONS	DATE	DESIGN	CHECK



DESIGNED BY: NJD	CHECKED BY: MPG
DRAWN BY: LMB	APPROVED BY: KWF
SCALE: 1:250	RELEASED FOR CONSTRUCTION BY:
DATE: 2025-02-21	DATE:
CONSULTANT NO.: C109	

ENGINEER'S SEA



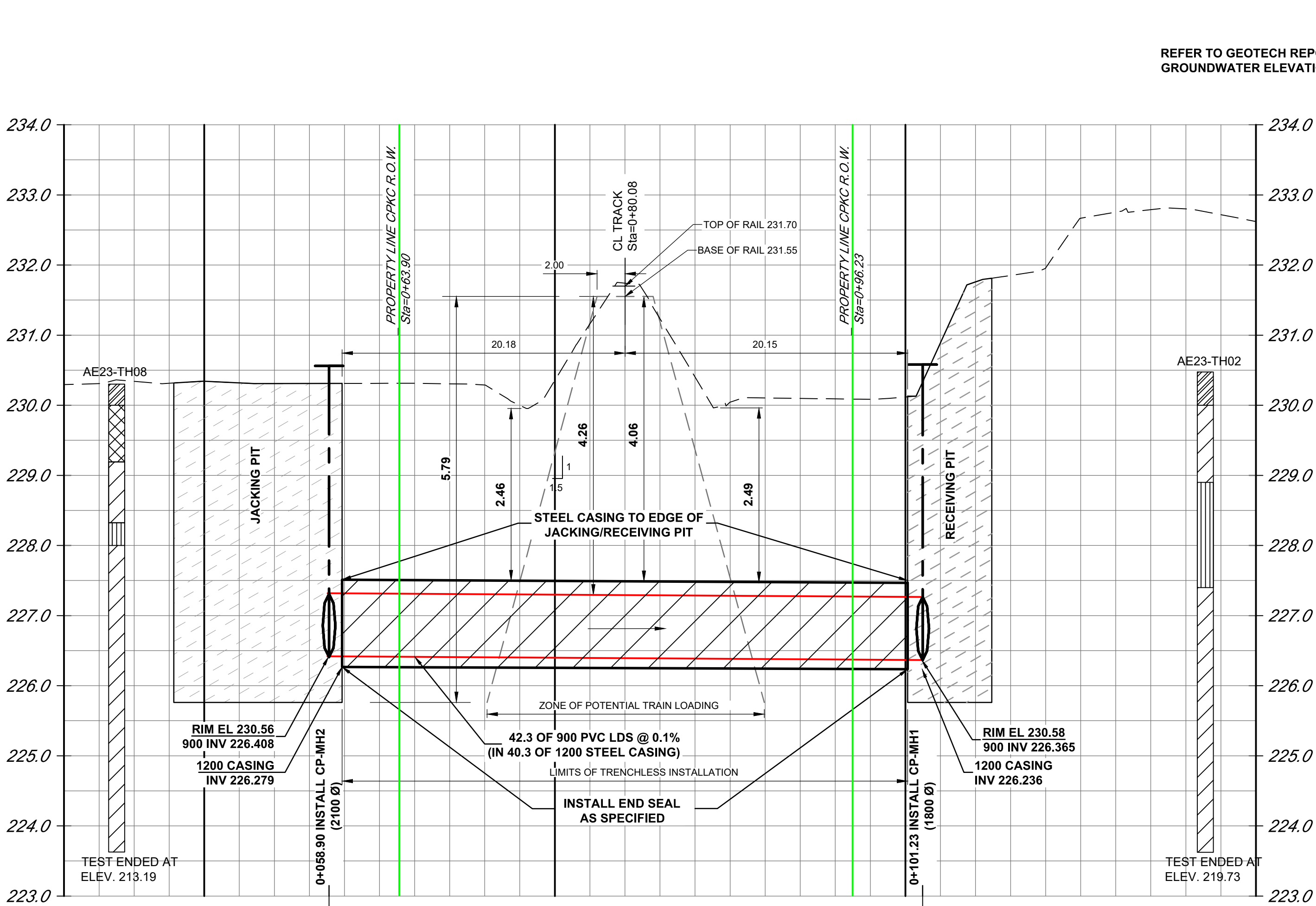
THE CITY OF WINNIPEG

WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
MAIN STREET

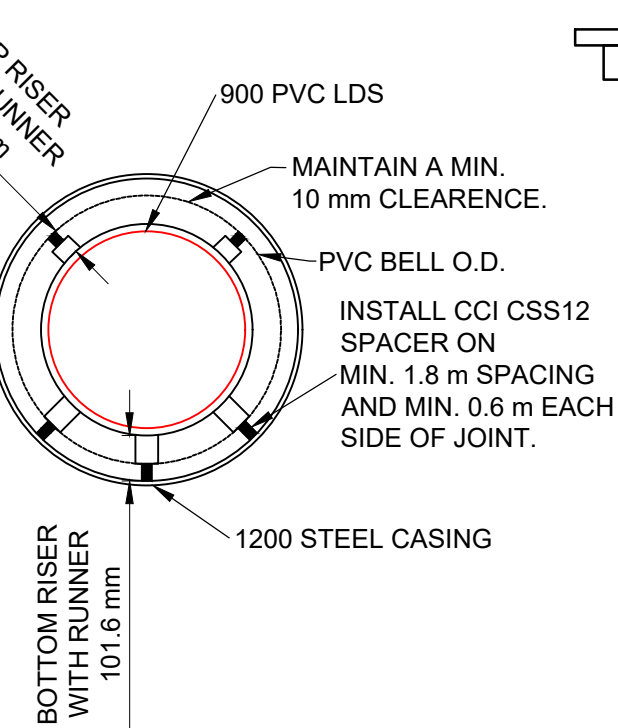
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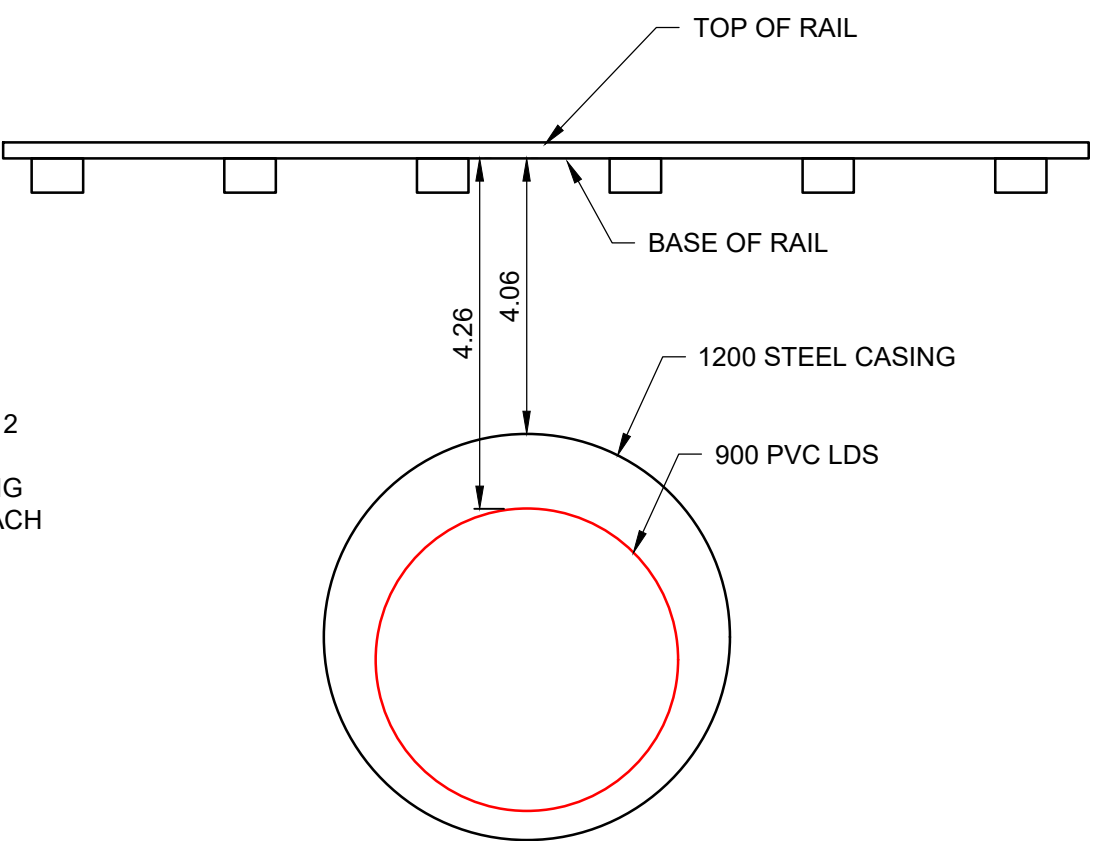


BOREHOLE LEGEND:

	TOPSOIL
	FILL
	LEAN CLAY
	FAT CLAY



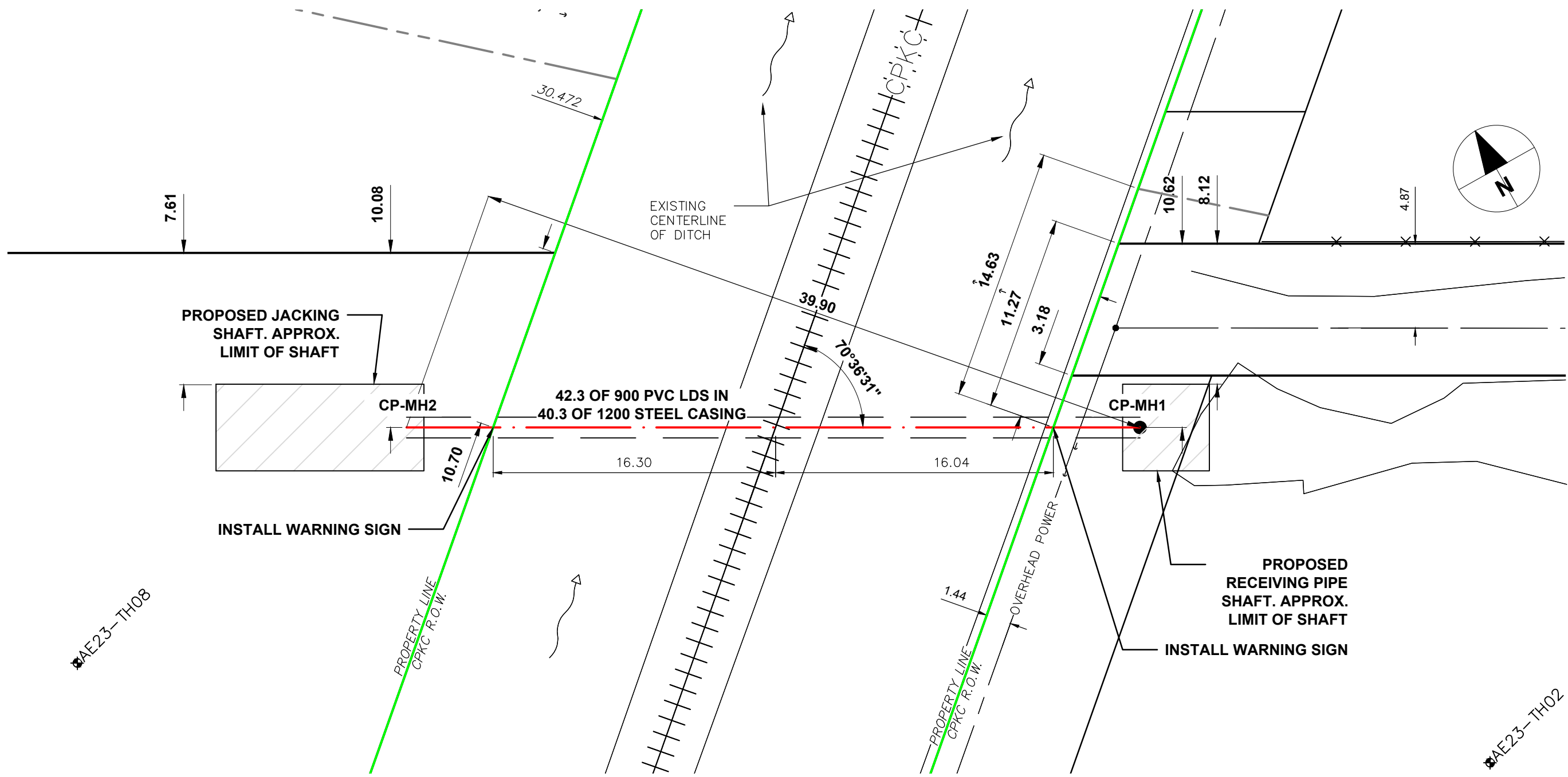
CASING PIPE DETAIL
Scale NTS



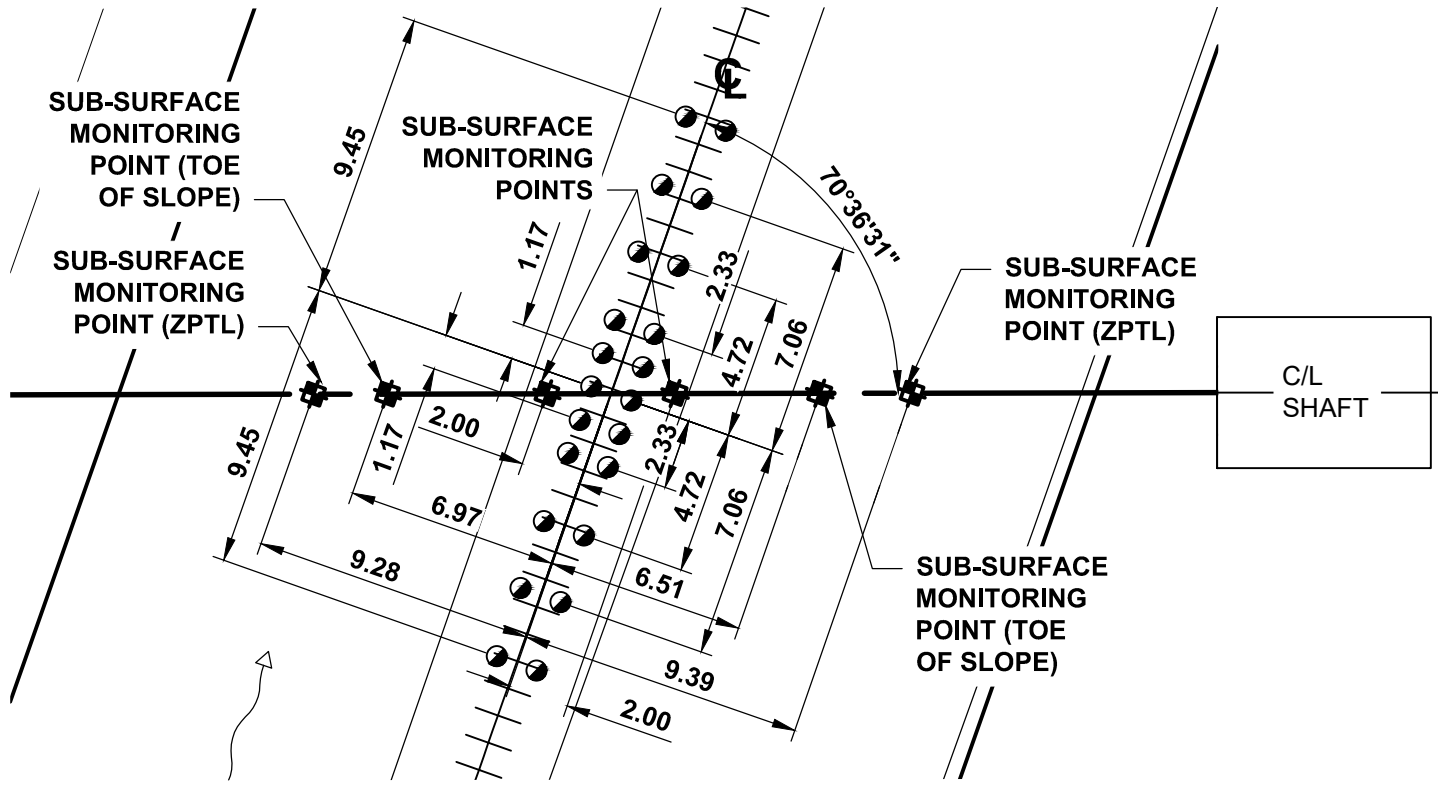
SECTION ALONG TRACK
Scale NTS

RAIL CROSSING NOTES:		
RAILWAY MILEAGE AND SUBDIVISION :		MILE 3.84, CP WINNIPEG BEACH SUBDIVISION
MUNICIPAL DESCRIPTION OF ADJACENT PROPERTIES:		NORTH END WATER POLLUTION CONTROL CENTRE
NAME OF PIPELINE OWNER:		CITY OF WINNIPEG, WATER AND WASTE DEPARTMENT 204-986-2626
CONTENTS TO BE HANDLED:		LAND DRAINAGE
MAXIMUM OPERATING PRESSURE:		N/A
MAXIMUM SURGE AND TEST PRESSURE:		N/A
MAXIMUM OPERATING TEMPERATURE		- °C
MINIMUM OPERATING TEMPERATURE		- °C
PIPING MATERIALS		CARRIER
NOMINAL DIAMETER		914 mm
OUTSIDE DIAMETER		972 mm
CASING		1184 mm
		1219 mm
MATERIAL		PVC
SPECIFICATION AND GRADE		DR35
WALL THICKNESS		27 mm
STEEL		MIN. YIELD STRENGTH 241 MPa
		17.4 mm MIN.
TYPE OF JOINT		RUBBER GASKET
		BELL AND SPIGOT
		N/A
		N/A
COATING		
LOCATION OF SHUT OFF VALVES		N/A
METHOD OF INSTALLATION		TRENCHLESS - GUIDED AUGER BORE OR GUIDED PIPE RAMMING WITH NO SOIL REMOVAL AHEAD OF PIPE
VENTS:		NA
NUMBER:		N/A
HEIGHT ABOVE GROUND:		N/A
SEALS:		NO
BOTH ENDS		
TYPE:		CONC. MANHOLE FOR FUTURE CONNECTION
BURY:		BASE OF RAIL TO TOP OF PIPE CASING
		4.06 m
		NA
		ROADWAY DITCHES
		2.46 m (NW) 2.49 m (NE)
		BASE OF RAIL TO BOTTOM OF JACKING/RECEIVING PITS
		5.79 m
EXTENT OF CASING MEASURED PERPENDICULAR TO CENTERLINE OF TRACK		40.33 m
ANGLE OF PIPE / TRACK CROSSING		70.36°
DIRECTION OF FLOW		WEST TO EAST
CENTERLINE OF TRACK TO FACE OF JACKING/RECEIVING PITS		20.18 m (N) 20.15 m (S)
TYPE, SIZE, AND SPACING OF INSULATORS OR SUPPORTS		CCI CSS12 SPACERS 1.8 m O.C., 69.8 mm TOP RISER WITH RUNNER, 101.6 mm BOTTOM RISER WITH RUNNER
CATHODIC PROTECTION		N/A
GEOTECHNICAL BOREHOLES		REFER TO SOILS REPORT
SOIL TYPE		REFER TO SOILS REPORT
BASE OF RAIL TO GROUND WATER		REFER TO SOILS REPORT
INSTALLATION AND MAINTENANCE SHALL BE IN ACCORDANCE WITH TC-E10 AND THE LATEST EDITION OF APPLICABLE CSA STANDARD Z662		

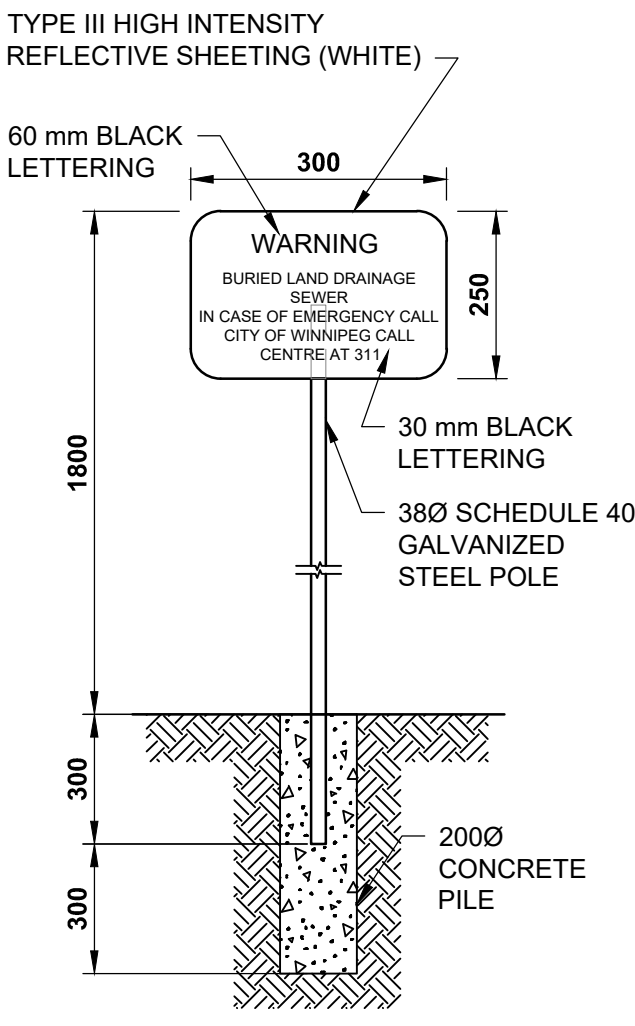
GEOTECHNICAL ENGINEER EVALUATION HAS BEEN COMPLETED AND THE GEOTECHNICAL ENGINEER HAS DETERMINED THAT BASED ON THE SOIL CONDITIONS, THERE WILL BE NO ADVERSE EFFECTS TO CPKC OPERATION AND PROPERTY.



SUB-SURFACE MONITORING POINTS (2) TO BE INSTALLED TO 1 m ABOVE CASING OBVERT IN ACCORDANCE WITH CP GEOTECHNICAL PROTOCOL FIGURE B



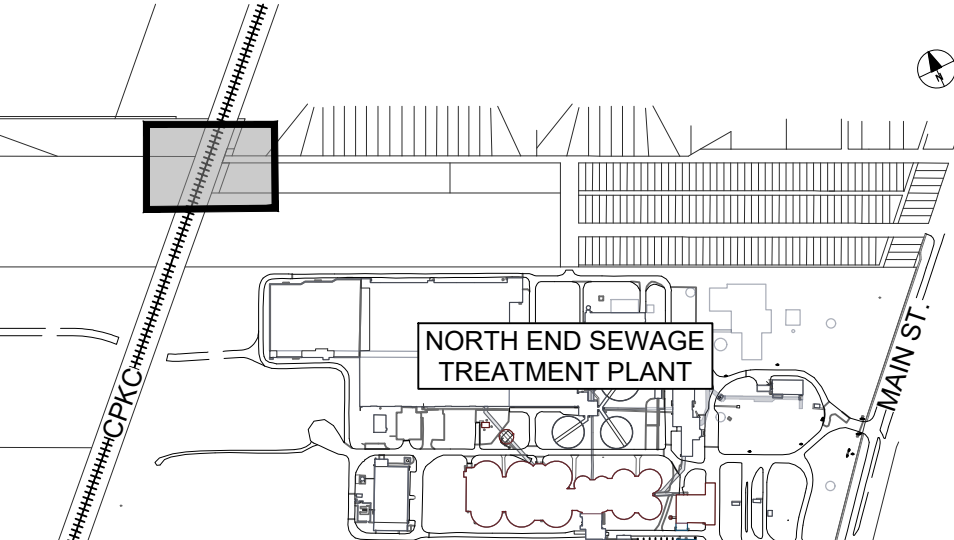
SUB-SURFACE/TRACK MONITORING PLAN
Scale 1:250



WARNING SIGN DETAIL
Scale NTS

900 PVC LDS PIPE ENDS TABLE		
NORTHING	EASTING	CASING
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5535434.25	635409.93	S. END 900 LDS

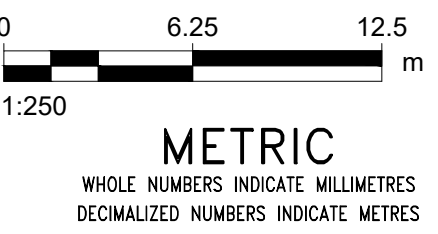
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BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



KEY PLAN

150 WM	WATERMAIN	150 WM	150 WM	CURB STOP	POLE	POLE	POLE
	HYDRANT			REDUCER	ANCHOR	ANCHOR	ANCHOR
	VALVE			COUPLING	GRADE	GRADE	GRADE
	LAND DRAINAGE SEWER			HYDRO	CONTOUR ELEVATION	CONTOUR ELEVATION	CONTOUR ELEVATION
	WASTE WATER SEWER			MTS	SWALE	SWALE	SWALE
	MANHOLE			GAS	POTABLE WATER	POTABLE WATER	POTABLE WATER
	CATCH BASIN			ASPHALT	FOUL AIR	FOUL AIR	FOUL AIR
	CURB INLET			CONCRETE	FLUSHING WATER	FLUSHING WATER	FLUSHING WATER
	SUBDRAIN			LIP CURB	SCUM PIPING	SCUM PIPING	SCUM PIPING
	FENCE			MODIFIED BARRIER CURB	HYDRONIC WATER	HYDRONIC WATER	HYDRONIC WATER
	SURVEY BAR			RAMP CURB	PROCESS DRAIN	PROCESS DRAIN	PROCESS DRAIN
	LEGEND - PLAN			LEGEND - PLAN	LEGEND - PLAN	LEGEND - PLAN	LEGEND - PLAN

SITE PLAN
1:250



METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

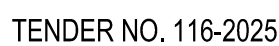
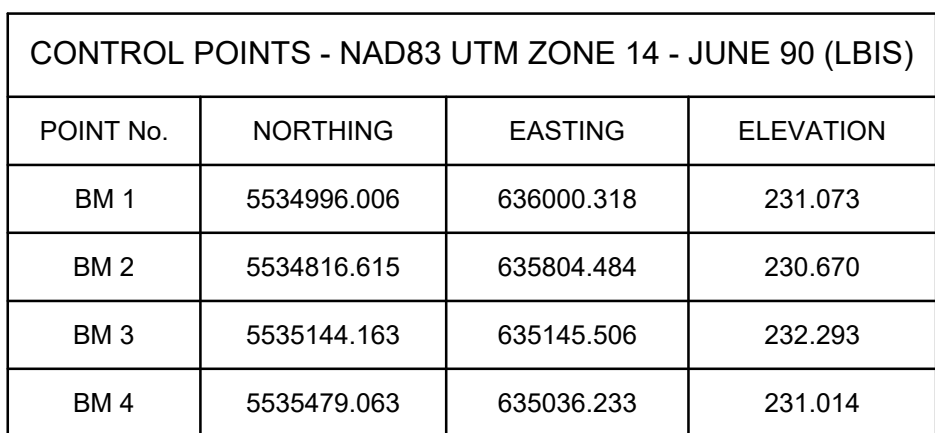
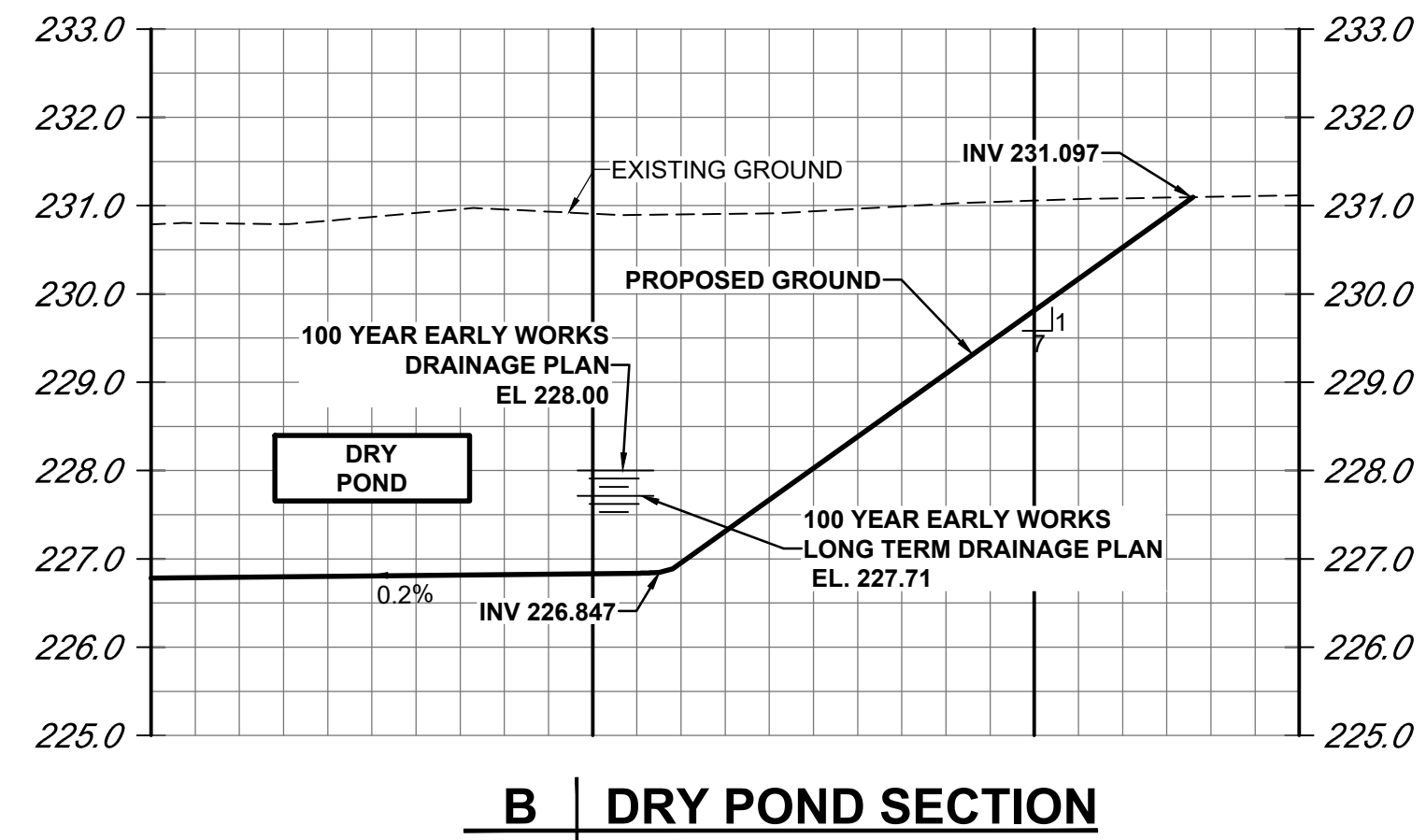
ENGINEERS
GEOSCIENTISTS
MANITOBA
Certificate of Authorization
AECOM Canada ULC
No. 4671

WARNING
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2) TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.
SEE PROVINCIAL REGULATION 21072 FOR DETAILS

- TRACK MONITORING
- MONITOR RAIL TRACK IN ACCORDANCE WITH TRACK MONITORING PLAN, SEE SPECIFICATIONS.
 - REPORT MONITORING THRESHOLDS: CRITICAL / REVIEW THRESHOLD: ≥ 22 mm
ALERT / WARNING THRESHOLD: > 11 mm
 - SETTLEMENT MONITORING OF THE RAIL TRACK SHALL COMMENCE A MINIMUM OF 2 DAYS PRIOR TO CONSTRUCTION/EXCAVATION IN ORDER TO ESTABLISH BASELINE COORDINATES AND ELEVATIONS.
 - MONITORING POINTS SHOULD BE SURVEYED AT LEAST TWICE PER DAY DURING THE DURATION OF CONSTRUCTION AND AT LEAST 3 DAYS AFTER THE COMPLETION OF CONSTRUCTION.
 - SURVEY RESULTS SHALL BE SUBMITTED DAILY TO GEOTECHNICAL ENGINEER FOR REVIEW.

DESIGNED BY: NJD				CHECKED BY: MG			
DRAWN BY: JP				APPROVED BY: KWF			
SCALE: 1:250				RELEASED FOR CONSTRUCTION BY:			
DATE: 2025-02-21				DATE:			
CONSULTANT NO.:				C110			
C	RE-ISSUED FOR CPKC APPROVAL	2025-07-17	NJD	MG			
B	ISSUED FOR REVIEW	2025-06-12	NJD	MG			
A	ISSUED FOR CPKC APPROVAL	2025-02-21	NJD	MG			
NO.	REVISIONS	DATE	DESIGN	CHECK			

ENGINEER'S SEAL			
THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT			
NEWPCC LAND DRAINAGE SYSTEM CIVIL LDS - CPKC CROSSING WINNIPEG BEACH SUBDIVISION - MILE 3.84			
CITY DRAWING NUMBER	SHEET 001	REV. C	SIZE A1



SITE PLAN

1:1000

0 6.25 12.5
m

1:250

WARNING

FOR EQUIPMENT OR EXPLOSIVES
USE THE LOCATION FOR EXCAVATION ON
THE EFFECT THE CONTRACTOR MUST:

THE GAS COMPANY OF THE
LOCATION OF EXCAVATION.

PRECAUTION TO AVOID DAMAGE
COMPANY INSTALLATIONS.

CRA REGULATION 21072 FOR DETAILS

METRIC

WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

**ENGINEERS
GEOSCIENTISTS
MANITOBA**

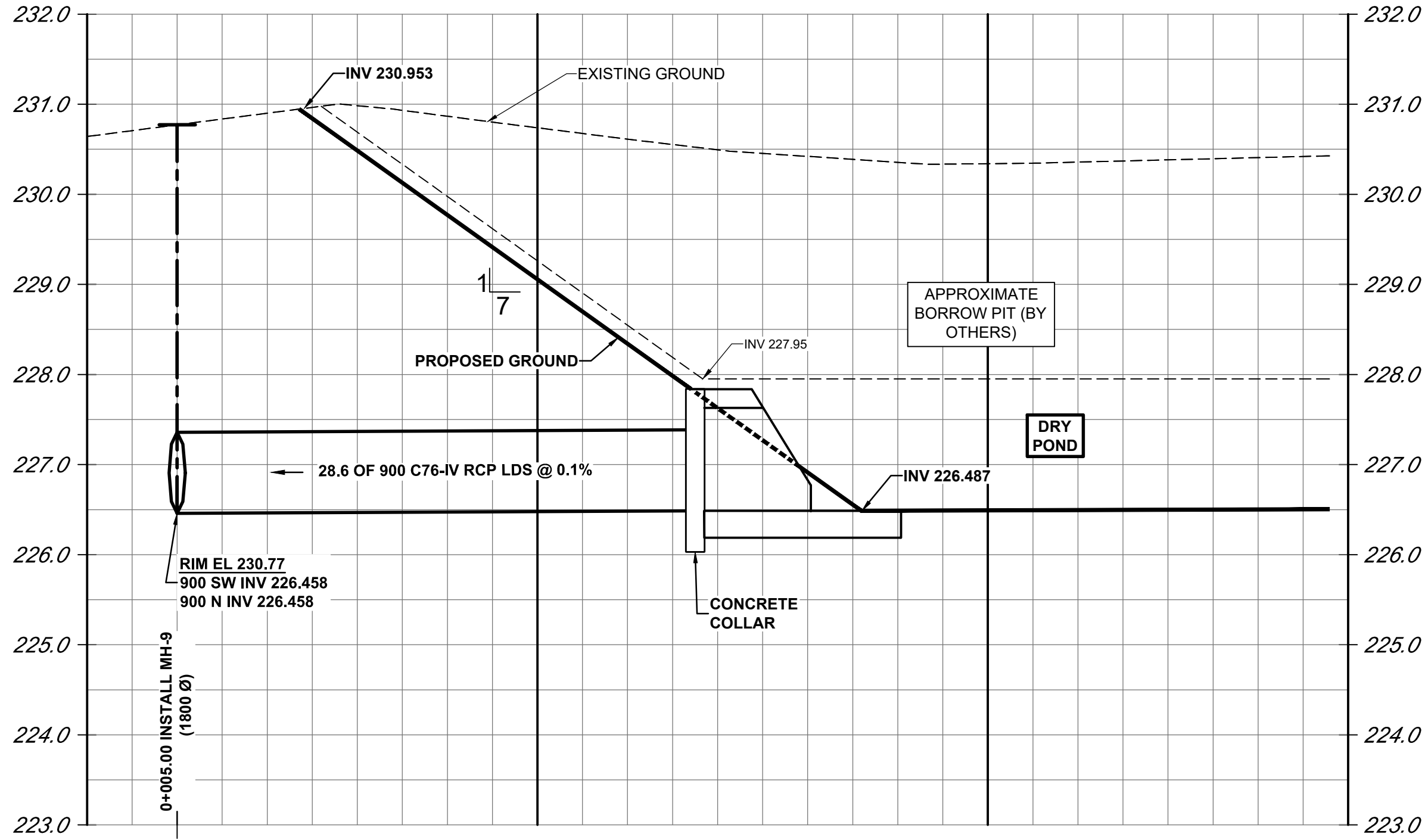
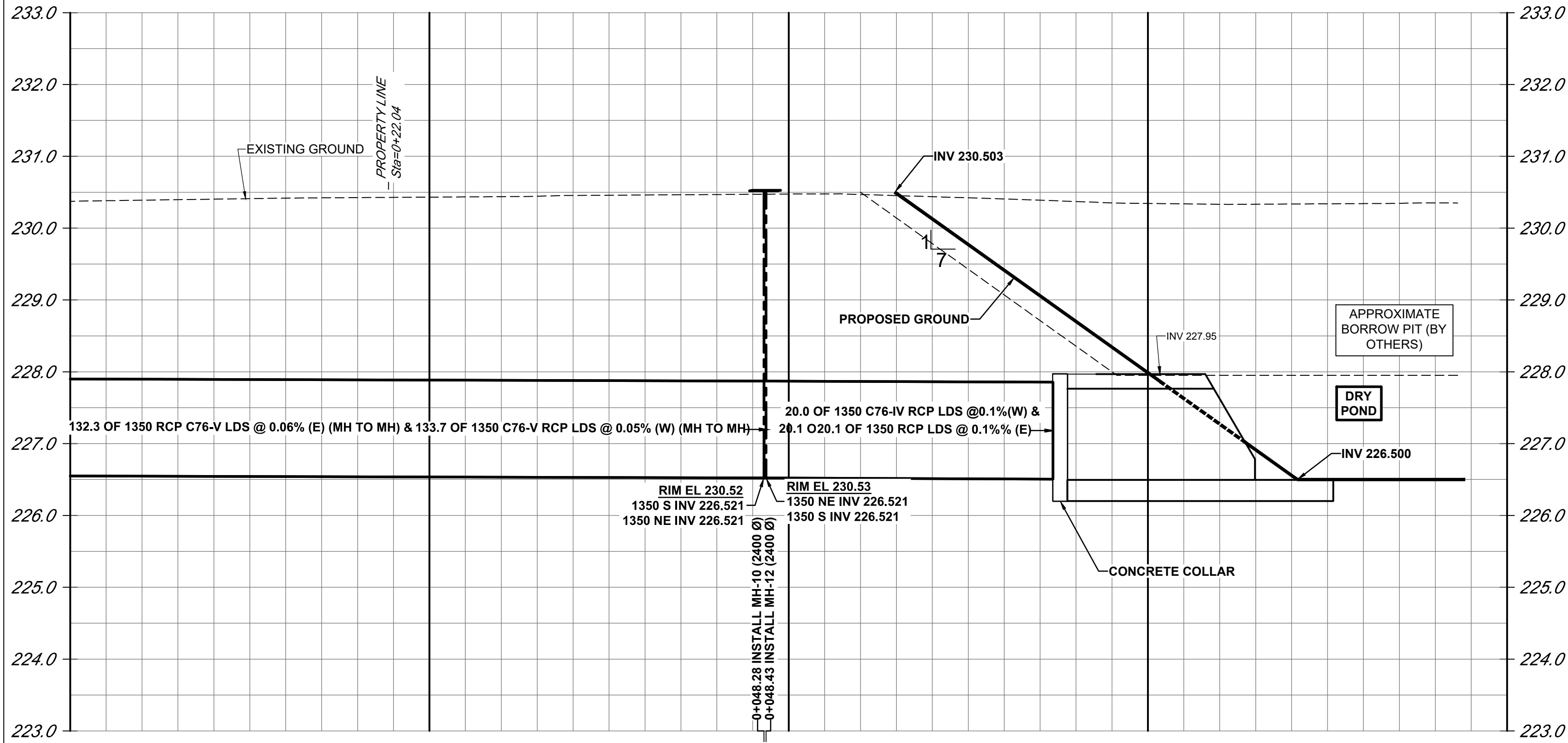
Certificate of Authorization

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No. 4671

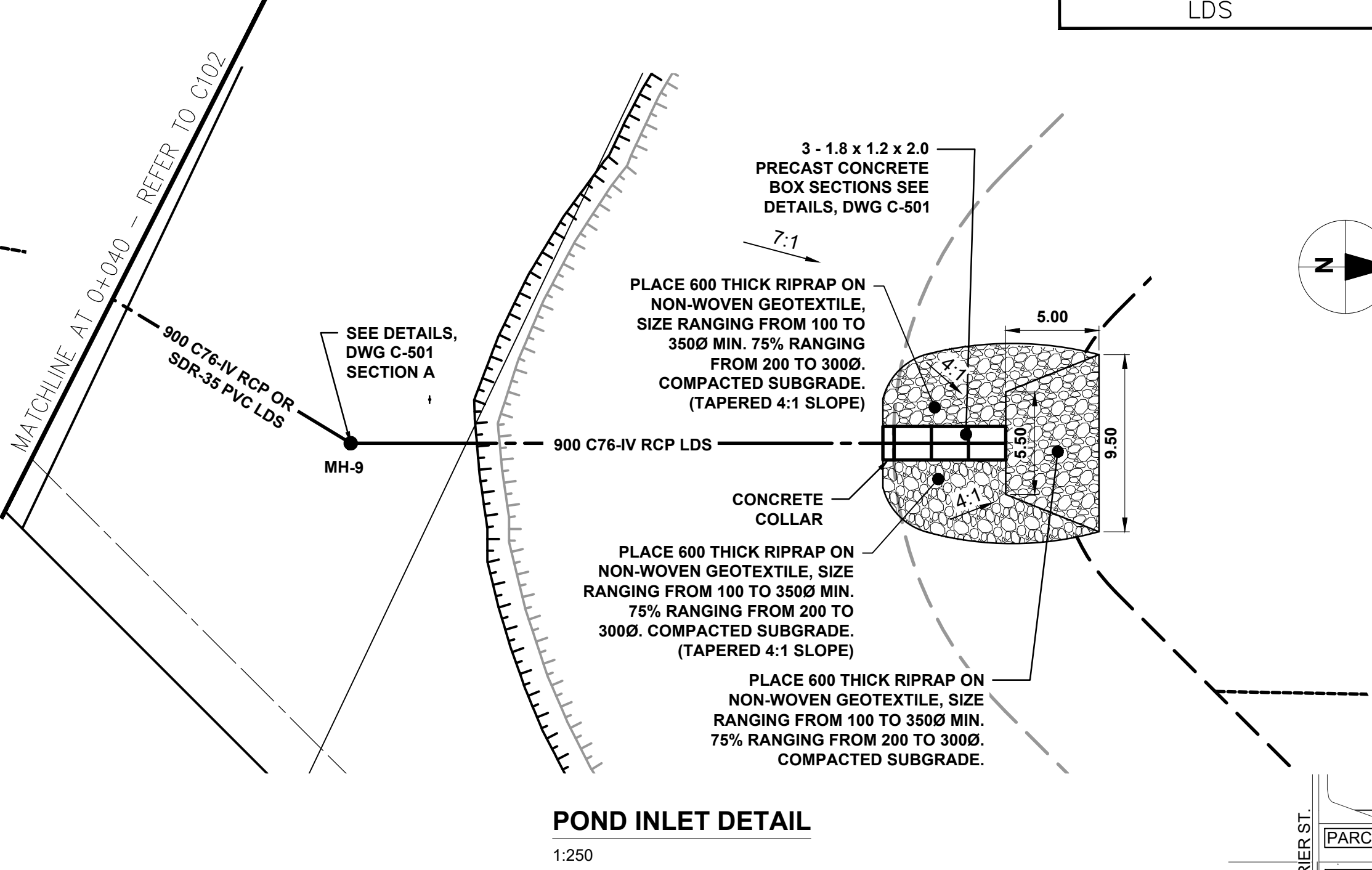
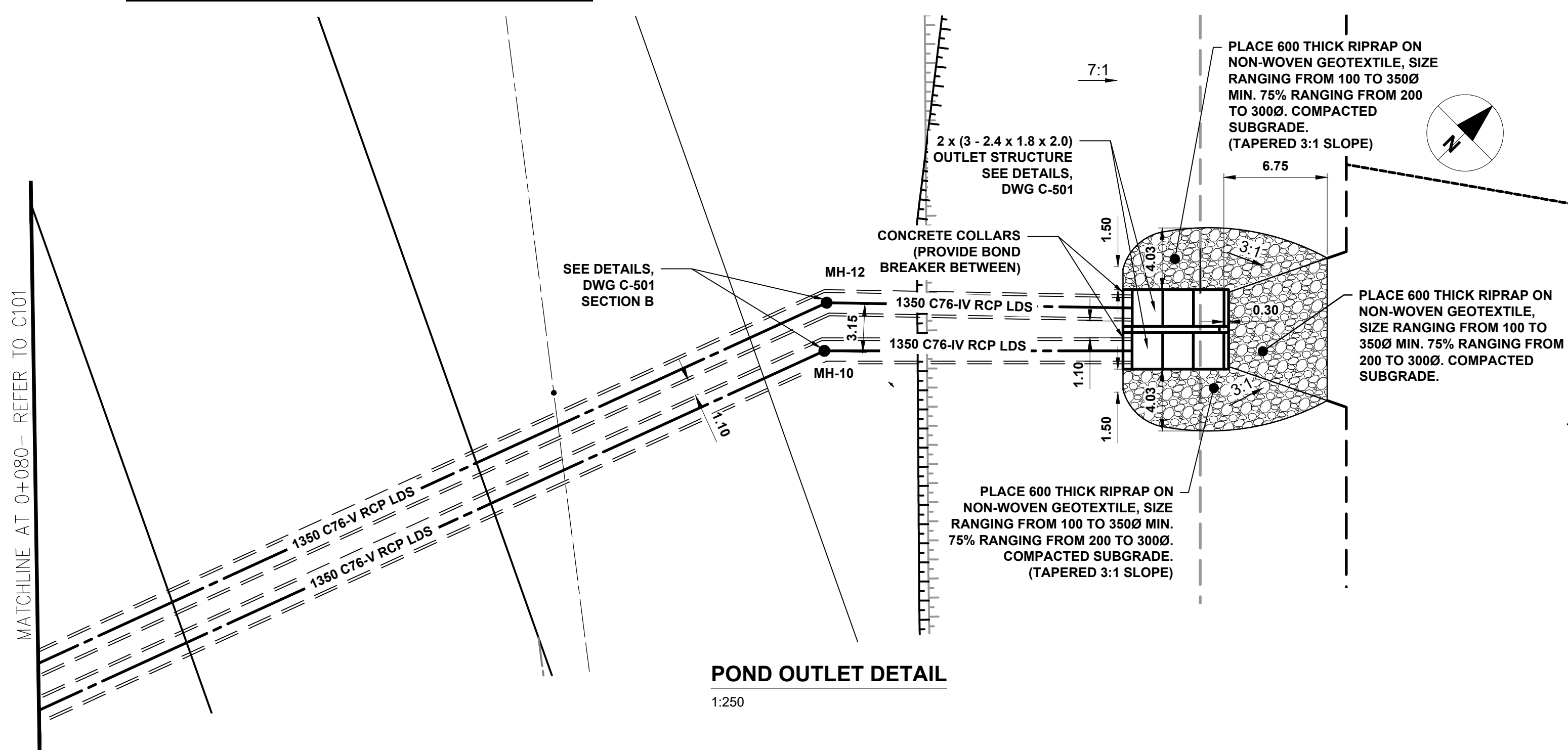
ENGINEER'S SEAL	 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT		
	NEWPCC LAND DRAINAGE SYSTEM CIVIL POND CROSS SECTIONS		
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			SIZE A1

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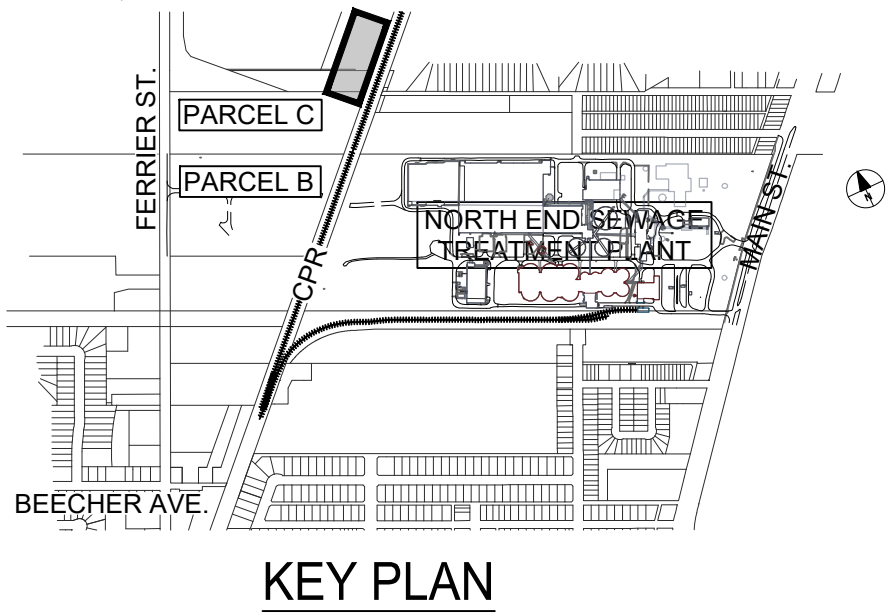
NOTE: CHAINAGES SHOWN ARE ALONG EAST LDS

NOTE: CHAINAGES SHOWN ARE ALONG LDS



CONTROL POINTS - NAD83 UTM ZONE 14 - JUNE 90 (LBIS)

POINT No.	NORTHING	EASTING	ELEVATION
BM 1	5534996.006	636000.318	231.073
BM 2	5534816.615	635804.484	230.670
BM 3	5535144.163	635145.506	232.293
BM 4	5535479.063	635036.233	231.014



150 WM	WATERMAIN	150 WM	REDUCER	POLE		
HYDRANT	COUPLING	ANCHOR				
VALVE	HYDRO	GRADE				
300 LDS	LAND DRAINAGE SEWER	300 LDS	MTS	CONTOUR ELEVATION		
250 WWS	WASTE WATER SEWER	250 WWS	GAS	SWALE		
MANHOLE	ASPHALT	POTABLE WATER				
CATCH BASIN	CONCRETE	FOUL AIR				
CURB INLET	LIP CURB	FLUSHING WATER				
SUBDRAIN	MODIFIED BARRIER CURB	SCUM PIPING				
FENCE	RAMP CURB	HYDRONIC WATER				
SURVEY BAR	LIGHT	PROCESS DRAIN				
CURB STOP	TRAFFIC SIGNAL POLE					
EXISTING	LEGEND - PLAN	NEW	EXISTING	LEGEND - PLAN	NEW	EXISTING

WARNING

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0 6.25 12.5
1:250 m

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

**ENGINEERS
GEOSCIENTISTS
MANITOBA**
Certificate of Authorization
AECOM Canada ULC
No. 4671

AECOM			
DESIGNED BY:	NJD	CHECKED BY:	MPG
DRAWN BY:	LMB	APPROVED BY:	KWF
SCALE:	1:250	RELEASED FOR CONSTRUCTION BY:	
DATE:	2025-02-21	DATE:	
CONSULTANT NO.:	C202		
A	ISSUED FOR TENDER	2025-06-12	NJD MPG
NO.	REVISIONS	DATE	DESIGN CHECK

ENGINEER'S SEAL

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

NEWPCC LAND DRAINAGE SYSTEM
CIVIL
POND DETAILS

CITY DRAWING NUMBER

SHEET 001
REV. A
SIZE A1

TENDER NO. 116-2025

Appendix **E**

Slope Stability Analysis



Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

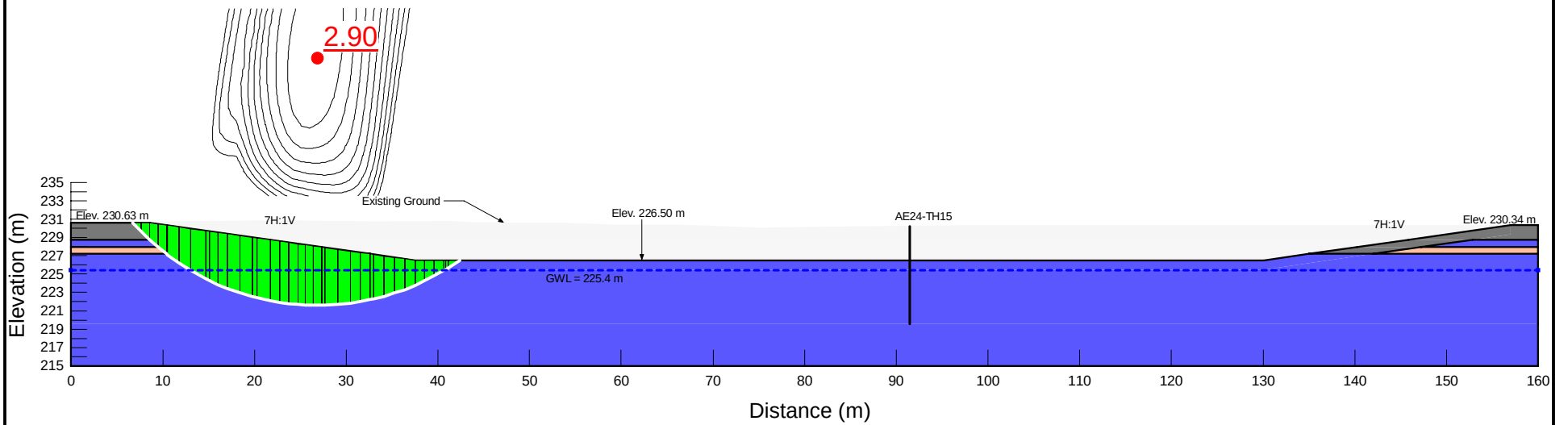


Figure 1: Empty Stormwater Pond

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

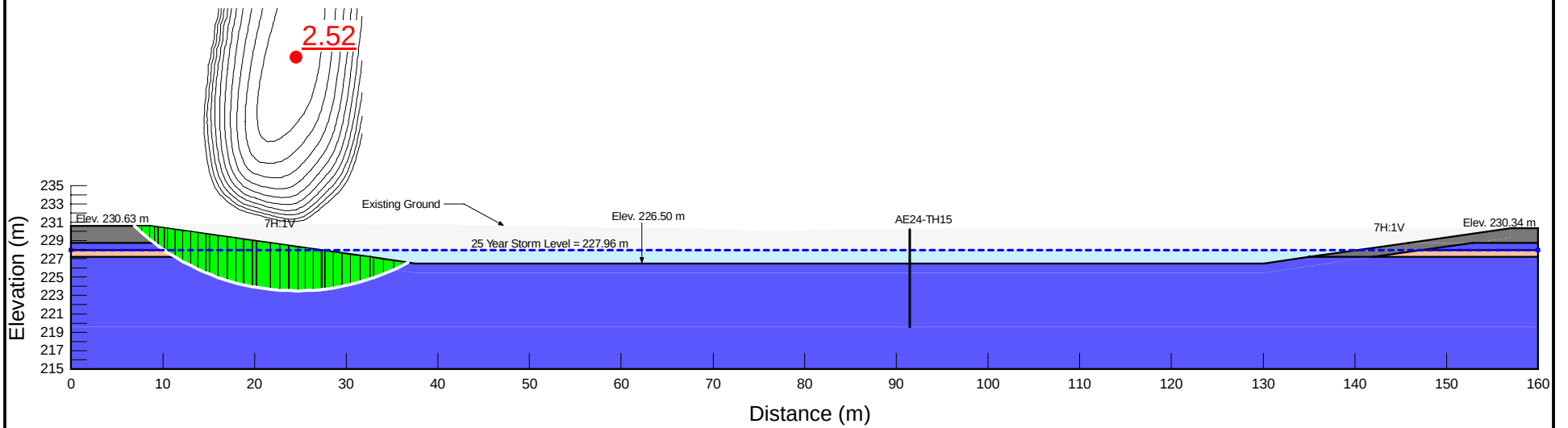


Figure 2: Stormwater Pond Operating at 25-Year Storm Level

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

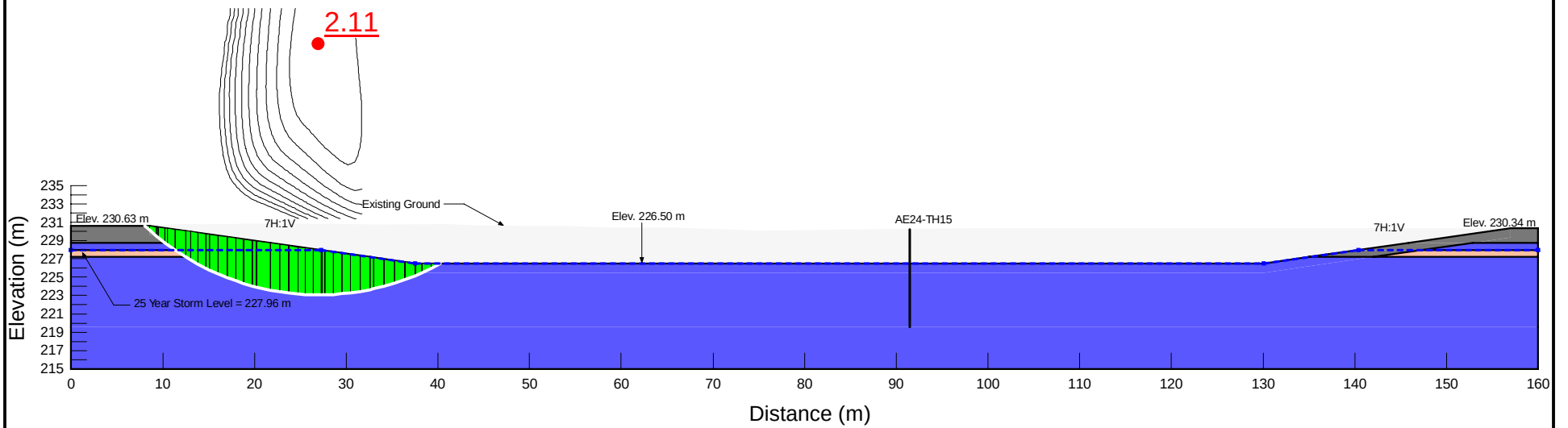


Figure 3: RDD from 25-Year Storm Level to Pond Base

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

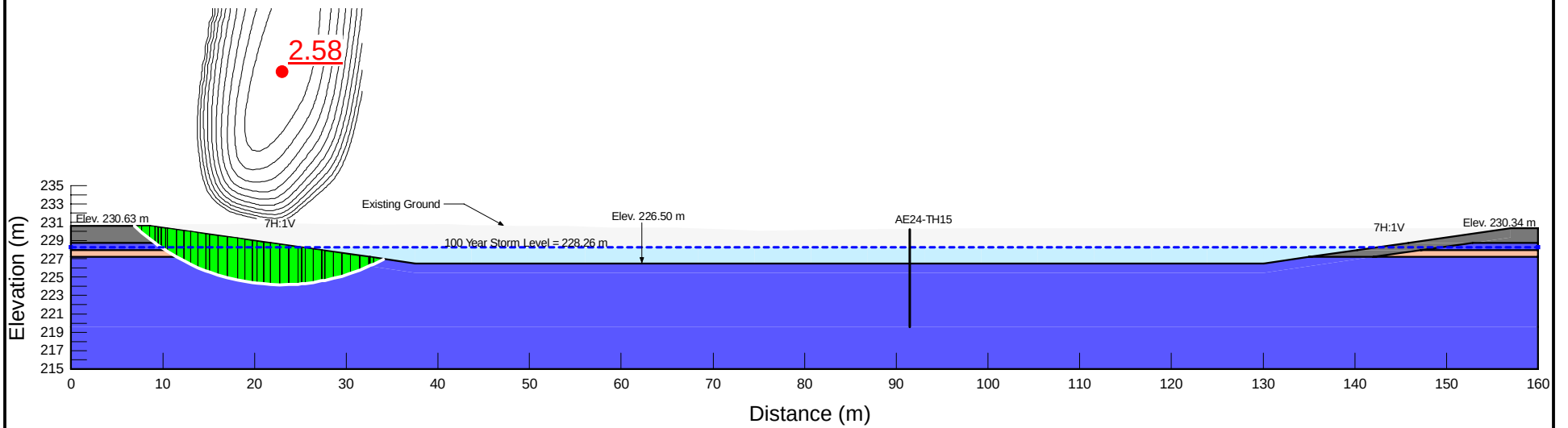


Figure 4: Stormwater Pond Operating at 100-Year Storm Level

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

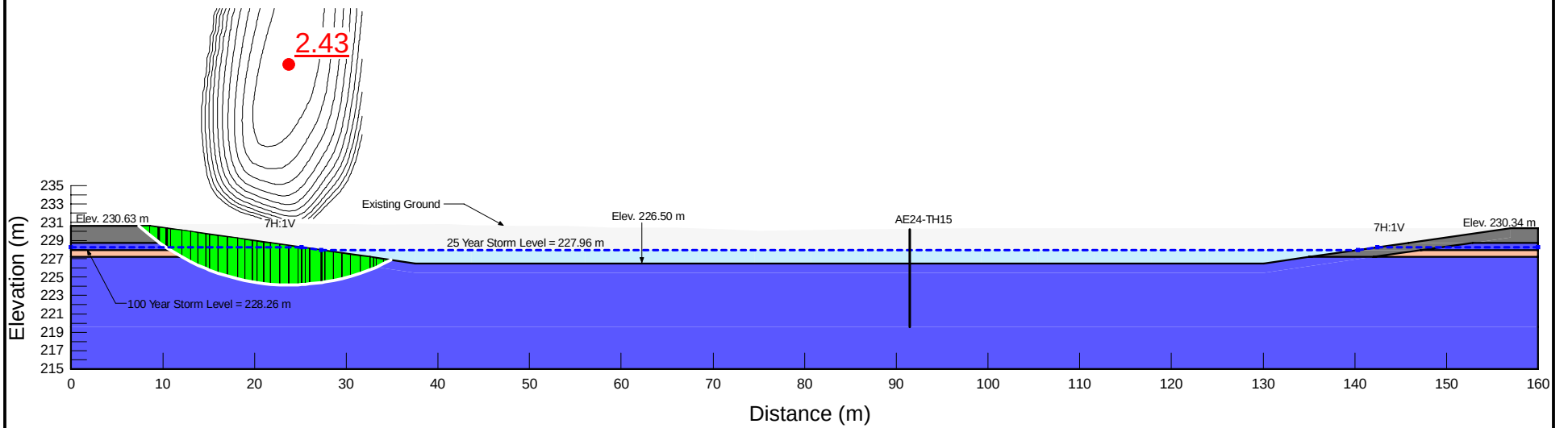


Figure 5: RDD from 100-Year to 25-Year Storm Level

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

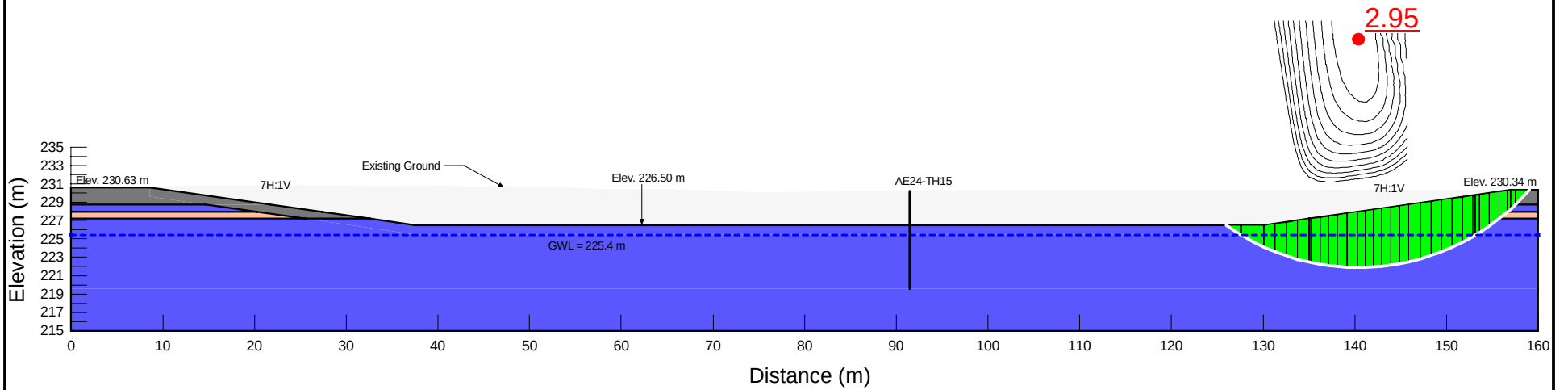


Figure 6: Empty Stormwater Pond

Project: Biosolids Early Works LDS

Date: 06/02/2025

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

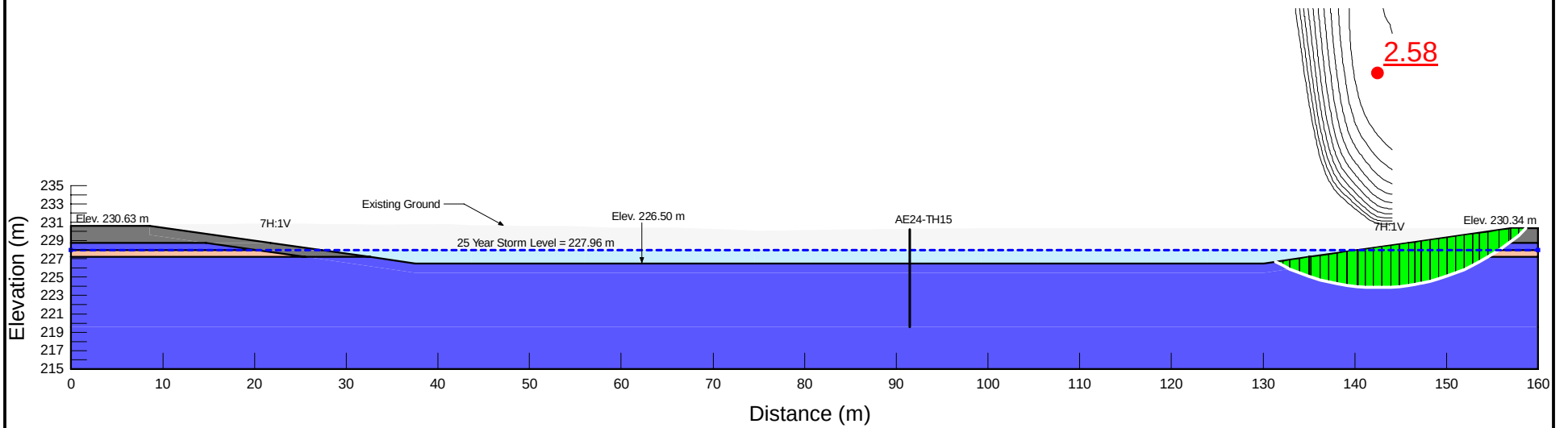


Figure 7: Stormwater Pond Operating at 25-Year Storm Level

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
Blue	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
Grey	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
Orange	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

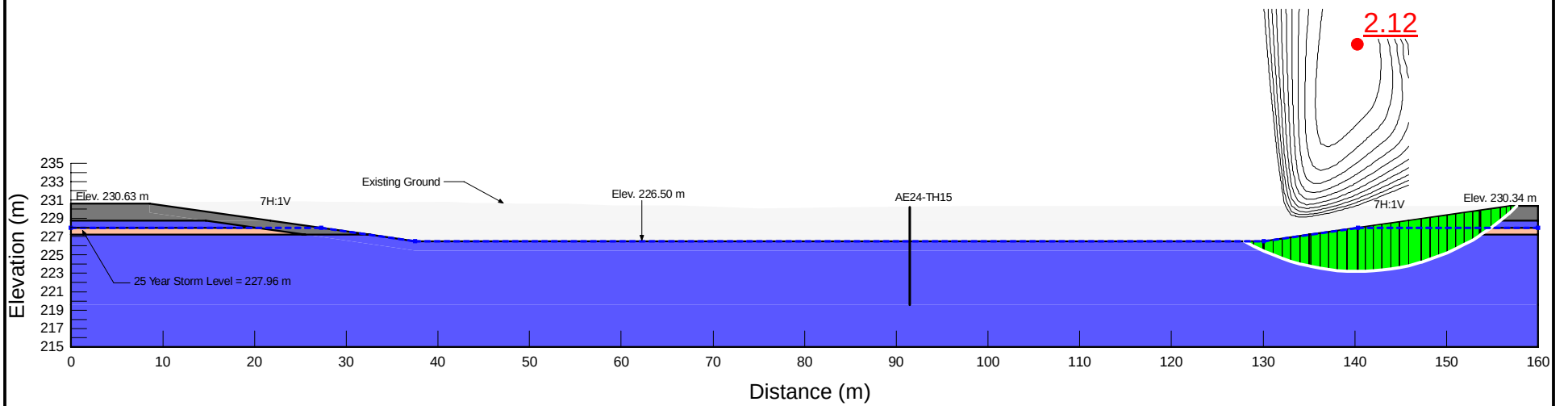


Figure 8: RDD from 25-Year Storm Level to Pond Base

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

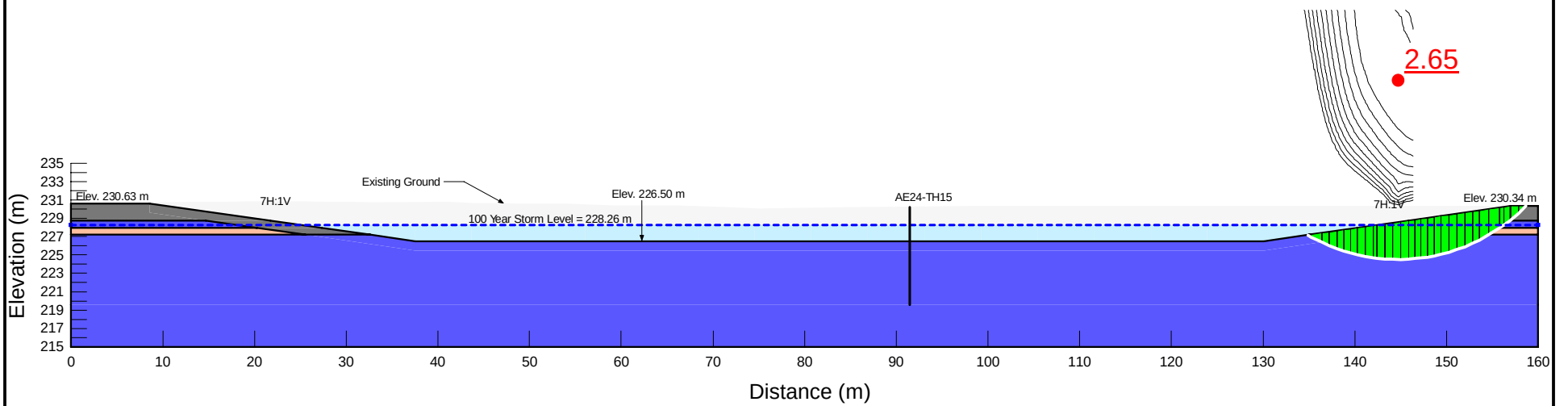


Figure 9: Stormwater Pond Operating at 100-Year Storm Level

Project: Biosolids Early Works LDS

Date: 06/02/2025

AECOM

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Fat Clay (CH)	Mohr-Coulomb	18	3	20	0	1
■	Fill (Clay)	Mohr-Coulomb	18	3	17	0	1
■	Silt (ML)	Mohr-Coulomb	18	0	24	0	1

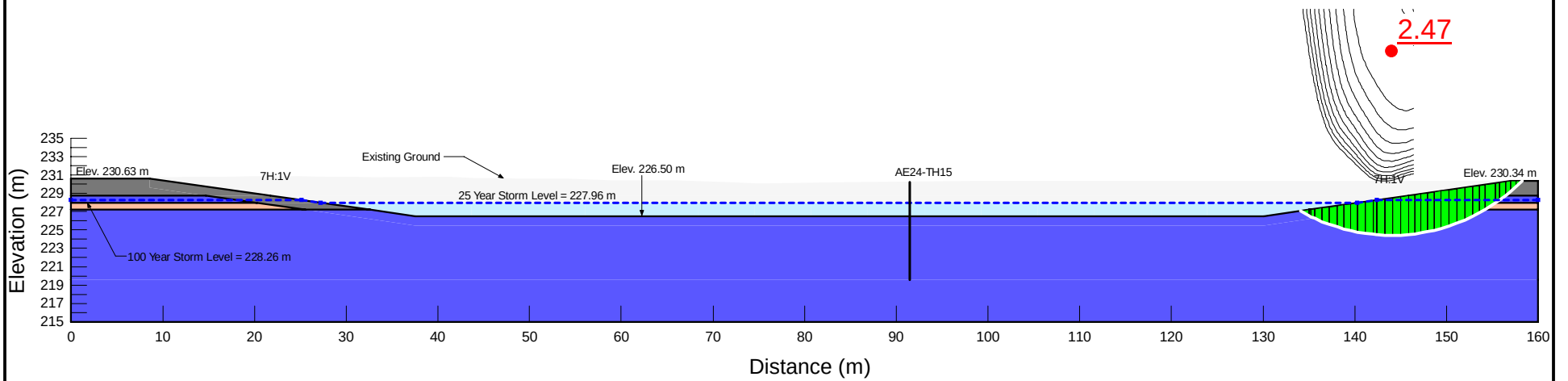


Figure 10: RDD from 100-Year to 25-Year Storm Level

Project: Biosolids Early Works LDS

Date: 06/02/2025

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Appendix **F**

Seismic Hazard Values





Government
of Canada

Gouvernement
du Canada

Canada.ca › [Natural Resources Canada](#) › [Earthquakes Canada](#)

2020 National Building Code of Canada Seismic Hazard Tool

i This application provides seismic values for the design of buildings in Canada under Part 4 of the National Building Code of Canada (NBC) 2020 as prescribed in Article 1.1.3.1. of Division B of the NBC 2020.

Seismic Hazard Values

User requested values

Code edition	NBC 2020
Site designation X_s	X_E
Latitude (°)	49.952
Longitude (°)	-97.107

Please select one of the tabs below.

NBC 2020

Additional Values

Plots

API

Background Information

The 5%-damped spectral acceleration ($S_a(T,X)$, where T is the period, in s, and X is the site designation) and peak ground acceleration ($PGA(X)$) values are given in units of acceleration due to gravity (g , 9.81 m/s^2). Peak

ground velocity. (PGV(X)) values are given in m/s. Probability is expressed in terms of percent exceedance in 50 years. Further information on the calculation of seismic hazard is provided under the *Background Information* tab.

The 2%-in-50-year seismic hazard values are provided in accordance with Article 4.1.8.4. of the NBC 2020. The 5%- and 10%-in-50-year values are provided for additional performance checks in accordance with Article 4.1.8.23. of the NBC 2020.

See the *Additional Values* tab for additional seismic hazard values, including values for other site designations, periods, and probabilities not defined in the NBC 2020.

NBC 2020 - 2%/50 years (0.000404 per annum) probability

$S_a(0.2, X_E)$	$S_a(0.5, X_E)$	$S_a(1.0, X_E)$	$S_a(2.0, X_E)$	$S_a(5.0, X_E)$	$S_a(10.0, X_E)$	PGA(X_E)	PGV(X_E)
0.113	0.107	0.055	0.0216	0.00434	0.00126	0.0679	0.0544

The log-log interpolated 2%/50 year $S_a(4.0, X_E)$ value is : **0.0064**

▼ Tables for 5% and 10% in 50 year values

NBC 2020 - 5%/50 years (0.001 per annum) probability

$S_a(0.2, X_E)$	$S_a(0.5, X_E)$	$S_a(1.0, X_E)$	$S_a(2.0, X_E)$	$S_a(5.0, X_E)$	$S_a(10.0, X_E)$	PGA(X_E)	PGV(X_E)
0.0591	0.0565	0.028	0.0104	0.00193	0.000552	0.0339	0.027

The log-log interpolated 5%/50 year $S_a(4.0, X_E)$ value is : **0.0029**

NBC 2020 - 10%/50 years (0.0021 per annum) probability

$S_a(0.2, X_E)$	$S_a(0.5, X_E)$	$S_a(1.0, X_E)$	$S_a(2.0, X_E)$	$S_a(5.0, X_E)$	$S_a(10.0, X_E)$	PGA(X_E)	PGV(X_E)
-----------------	-----------------	-----------------	-----------------	-----------------	------------------	--------------	--------------

$S_a(0.2, X_E)$	$S_a(0.5, X_E)$	$S_a(1.0, X_E)$	$S_a(2.0, X_E)$	$S_a(5.0, X_E)$	$S_a(10.0, X_E)$	PGA(X_E)	PGV(X_E)
0.0334	0.0317	0.0149	0.00517	0.000881	0.000242	0.0184	0.0142

The log-log interpolated 10%/50 year $S_a(4.0, X_E)$ value is : **0.0014**

Download CSV

← Go back to the [seismic hazard calculator form](#)

Date modified: 2021-04-06

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