Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY	Application number	Legal land description
☐ Approval ☑ Registration ☐ Authorization ☐ Amendment	RA25008	SE 24-44-27 W4M

APPLICATION DISCLOSURE

This information is collected under the authority of the *Agricultural Operation Practices Act* (AOPA), and is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. This information is public unless the NRCB grants a written request that certain sections remain private.

Any construction prior to obtaining an NRCB permit is an offence and is subject to enforcement action, including prosecution.

I, the applicant, or applicant's agent, have read and understand the statements above, and I acknowledge that the information provided in this application is true to the best of my knowledge.

22, July, 2025
Date of signing

[redacted]
Signature

Otto and Alice Nieuwland
Corporate name (if applicable)

Tyler Nieuwland
Print name

GENERAL INFORMATION REQUIREMENTS

Proposed facilities: list all proposed confined feeding operation facilities and their dimensions. Indicate whether any of the proposed facilities are additions to existing facilities. (attach additional pages if needed)

Proposed facilities	Dimensions (m) (length, width, and depth)
New barn	
- concrete silage pit pad*	120m x 200m
- feed kitchen *	42m x 65m
- office / utility room*	50m x 50m
- dairy barn	190m x 125m
- commodity shed *	40 m x 80m
Earthen manure storage	63 m x 63 m x 5 m deep

Existing facilities: list **ALL** existing confined feeding operation facilities and their dimensions

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
No existing facilities		

NRCB USE ONLY

* indicates ancillary facilities that do not contain livestock or manure

Part 2 — Technical Requirements

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If a new facility is replacing an old facility, please explain what will happen to the old facility and when. ☐ **N/A**

Construction completion date for proposed facilities _____

Additional information

Livestock numbers: Complete only if livestock numbers are different from what was identified in the Part 1 application. Note: if livestock numbers increase in your Part 2 application, a new Part 1 application must be submitted which may result in a loss of priority for minimum distance separation (MDS).

Livestock category and type (Available in the Schedule 2 of the Part 2 Matters Regulation)	**Permitted number**	**Proposed increase or decrease in number (if applicable)**	**Total**
From the part 1:			
Dairy cows (plus associated dries and replacements)	0	120	120

DECLARATION AND ACKNOWLEDGMENT OF APPLICANT CONCERNING *WATER ACT* LICENCE

issued by Alberta Environment and Protected Areas (EPA) for a confined feeding operation (CFO)

Date and sign one of the following four options

OPTION 1: Applying through the NRCB for both the AOPA permit and the *Water Act* licence

I **DO** want my water licence application coupled to my AOPA permit application.

Signed this ____day of _____, 20____.

Signature of Applicant or Agent

OPTION 2: Processing the AOPA permit and *Water Act* licence separately

1. I (we) acknowledge that the CFO will need a new water licence from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. I (we) request that the NRCB process the AOPA application **independently of** EPA's processing of the CFO's application for a water licence.
3. In making this request, I (we) recognize that, if this AOPA application is granted by the NRCB, the NRCB's decision will not be considered by EPA as improving or enhancing the CFO's eligibility for a water licence under the *Water Act*.
4. I (we) acknowledge that any construction or actions to populate the CFO with livestock pursuant to an AOPA permit in the absence of a *Water Act* licence will **not** be relevant to EPA's consideration of whether to grant the *Water Act* licence application.
5. I (we) acknowledge that any such construction or livestock populating will be at the CFO's sole risk if the *Water Act* licence application is denied or if the operation of the CFO is otherwise deemed to be in violation of the *Water Act*. This risk includes being required to depopulate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **AS RELEVANT:** I (we) acknowledge that the CFO is located in the South Saskatchewan River Basin and that, pursuant to the *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order* [Alta. Reg. 171/2007], this basin is currently closed to new surface water allocations.
7. **Provide:** Water licence application number(s) _____ [redacted] _____

Signed this 22 day of July, 2025.

Signature of Applicant or Agent

OPTION 3: Additional water licence not required

1. I (we) declare that the CFO will not need a new licence from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. **Provide**: Water license number(s) or water conveyance agreement details _____

Signed this ____ day of _____, 20___.

Signature of Applicant or Agent

OPTION 4: Uncertain if *Water Act* licence is needed; acknowledgement of risk (for existing CFOs only)

1. At this time, I (we) do not know whether a new water licence is needed from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. If a new *Water Act* licence is needed, I (we) request that the NRCB process the AOPA application **independently of** EPA's processing of the CFO's application for a water licence.
3. In making this request, I (we) recognize that, if this AOPA application is granted by the NRCB, the NRCB's decision will not be considered by EPA as improving or enhancing the CFO's eligibility for a water licence under the *Water Act*.
4. I (we) acknowledge that any construction or actions to populate the CFO with additional livestock pursuant to an AOPA permit in the absence of a *Water Act* licence will **not** be relevant to EPA's consideration of whether to grant my *Water Act* licence application, if a new water licence is needed.
5. I (we) acknowledge that any such construction or livestock increase will be at the CFO's sole risk if the *Water Act* licence application is denied or if the operation of the CFO is otherwise deemed to be in violation of the *Water Act*. This risk includes being required to depopulate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **AS RELEVANT:** I (we) acknowledge that the CFO is located in the South Saskatchewan River Basin and that, pursuant to the *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order*, [Alta. Reg. 171/2007], this basin is currently closed to new surface water allocations.
7. **Provide**: Water license number(s) or water conveyance agreement details _____

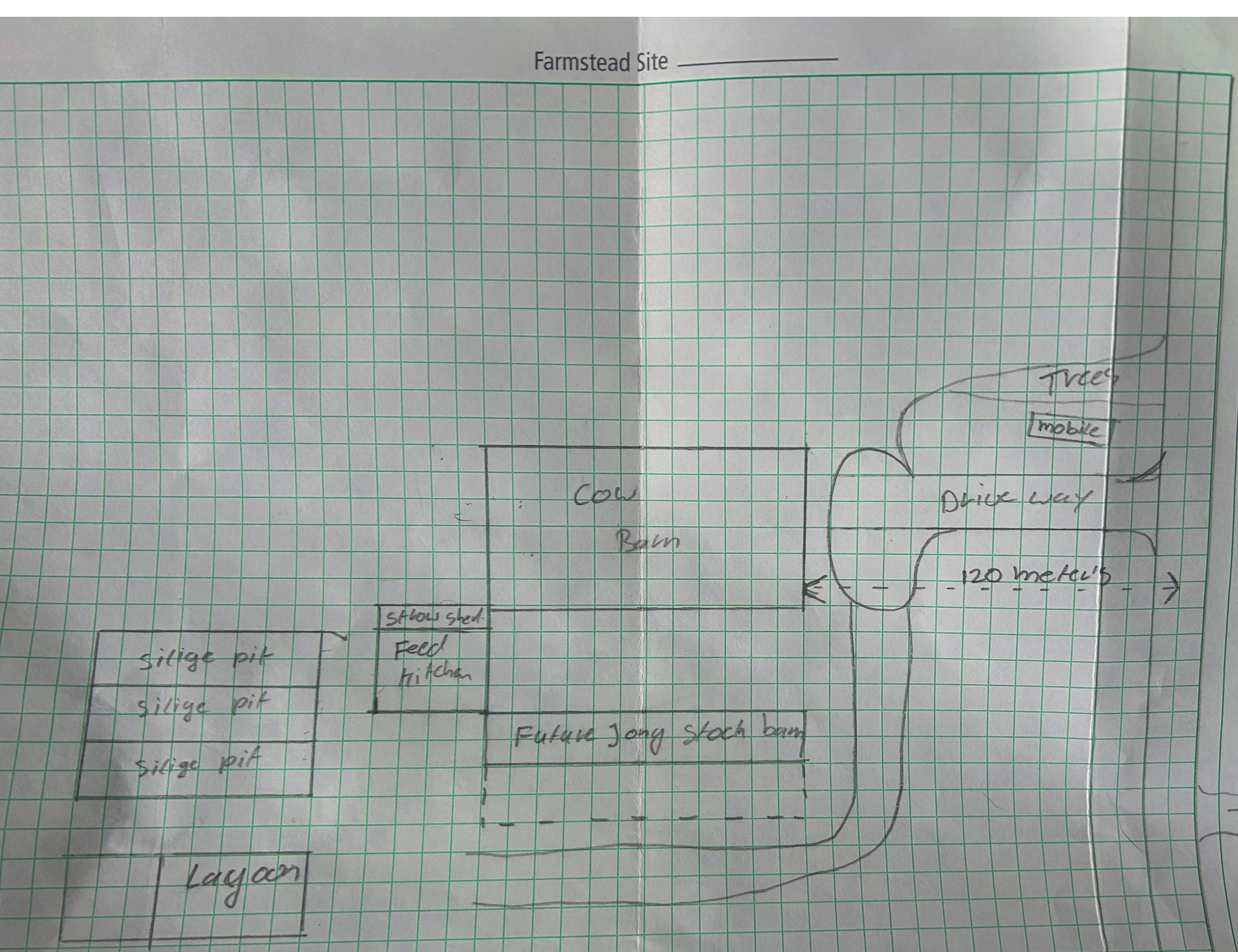
_____

Signed this _____ day of _____, 20____. _____

Signature of Applicant or Agent

Farmstead Site

Description of Farmstead



Terra Nova Fa

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

GENERAL ENVIRONMENTAL INFORMATION

(complete this section for the worst case of the existing facility which is the closest to water bodies or water wells and for each of the proposed facilities)

Facility description / name *(as indicated on site plan)*

Existing: _____ **Proposed 1:** New barn build

Proposed 2: _____ **Proposed 3:** _____

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☐ >1 m ☐ ≤ 1 m	☑ >1 m ☐ ≤ 1 m	☐ >1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☐ YES ☐ NO ☐ YES with exemption	
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	N/A	0			☐ YES ☐ NO ☐ YES with exemption	
	How many water wells are within 100 m of the manure storage facility or manure collection area?	N/A	0			☐ YES ☐ NO ☐ YES with exemption	
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	N/A	450m			☐ YES ☐ NO ☐ YES with exemption	
Groundwater information	What is the depth to the water table?	greater than	<7.5mbgs			☐ YES ☐ NO ☐ YES with exemption	
	What is the depth to the groundwater resource/aquifer you draw water from?		90ft			☐ YES ☐ NO ☐ YES with exemption	

Additional information (attach supporting information, e.g. borehole logs, records, etc. you consider relevant to your application)

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

DISTANCE OF ANY MANURE STORAGE FACILITY (EXISTING OR PROPOSED) TO NEIGHBOURING RESIDENCES

Neighbour name(s)	Legal land description	Distance (m)	NRCB USE ONLY				
			Zoning (LUB) category	MDS category (1-4)	Distance (m)	Waiver attached (if required)	Meets regulations
George Kocyba	SW 19-44-26	470					
Gail McKay	SE 24-44-27W4	750					
Gwen Patterson	SE 13-44-27W4	700					

LAND BASE FOR MANURE AND COMPOST APPLICATION (complete only if an increase in livestock or manure production will occur)

Name of land owner(s)*	Legal land description	Usable area** (ha)	Soil zone ***	NRCB USE ONLY	
				Usable area (ha)	Agreement attached (if required)
Otto and Alice Nieuwland	SE 24-44-27W4	145 acres			
O And A Nieuwland	SW-19-44-26 W4	135 acres			
O and A Nieuwland	SE-19-44-26 W4	125 acres			
O and A Nieuwland	NE 19 44-26 W4	70 acres			
			Total		

* If you are **not** the registered landowner, you must attach copies of land use agreements signed by all landowners.

** Available manure spreading area (excluding setback areas from residences, common bodies of water, water wells, etc. as identified in Agdex 096-5)

*** Brown, dark brown, black, grey wooded, or irrigated

Additional information (attach any additional information as required)

LIQUID MANURE STORAGE: Earthen manure storage (EMS): Compacted soil liner

*(complete a copy of this section for **EACH** proposed earthen liquid manure storage facility with a compacted soil liner)*

Facility description / name *(as indicated on site plan)*

1. New lagoon
2.

Manure storage capacity *(complete a separate row of this table for each cell of the EMS)*

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	Slope run:rise			NRCB USE ONLY	
					Inside end walls	Inside side walls	Outside walls	Calculated storage capacity (excl. 0.5 m freeboard) (m^3)	Filled in lower ¼? Y/N
1.	63m	63m	5m	5.5m	3:1	3:1	4:1		
2.									
							TOTAL CAPACITY		

Surface water control systems

Describe the run-on and runoff control system

Above grade dykes of 0.5m to prevent rainwater run off. The rest of the dyke will slope slighty outward to direct rainfall away from the facility.

Sealing

Describe sealing practices for piping, etc. that penetrates the liner

Bentonite sealer

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Liner protection

Describe how the inside walls, bottom and outside walls are protected from erosion

The walls will be seeded with grass

Describe how the physical integrity of the liner will be maintained from other damage

There will be a fence around the outside of the lagoon.

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

LIQUID MANURE STORAGE: Earthen manure storage (EMS): Compacted soil liner (cont.)

Compacted soil liner details

Thickness of compacted liner: 1 (m)		Provide compacted liner details (as required): Compacted clay liner	
Soil texture	37.6 % sand	60.2 % silt	and clay % clay
Atterberg limits	Plastic limit: 13.32	Liquid limit: 32.26	Plasticity index: 18.93
Hydraulic conductivity	Hydraulic conductivity (cm/s): 2.2×10^{-8} cm/s		
	Describe test standard used		

Additional information *(attach copies of soil test reports)*

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Report attached: ☐ YES ☐ NO

NRCB USE ONLY

Liquid manure storage volume calculator attached: ☐ YES ☐ NO

Depth to water table: _____ Requirements met: ☐ YES ☐ NO

Depth to uppermost groundwater resource: _____ Requirements met: ☐ YES ☐ NO

ERST completed: ☐ see ERST page for details

Surface water control systems

Requirements met: ☐ YES ☐ NO Details/comments:

Compacted soil liner details

Liner specification comments (e.g. compaction, moisture content, thickness):

Leakage detection system required: ☐ YES ☐ NO If yes, please explain why.

LIQUID MANURE COLLECTION AND/OR STORAGE: In-barn - Concrete liner

*(complete a copy of this section for **EACH** proposed in-barn liquid manure storage facility with a concrete liner)*

Facility description / name *(as indicated on site plan)*

1. Pit
2. Barn
3.

Manure storage capacity *(use one row in the table for **EACH** in-barn storage. Attach additional pages if you require more rows)*

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	**NRCB USE ONLY** Calculated storage capacity (m^3)
1.	3.6m	3.6 m	2.5m	2.5m	
2.	190 m	125m			
3.					
				TOTAL CAPACITY	

Concrete liner details

Scrape alleys or unslatted portions of barn floors (if applicable)	Concrete thickness: 5 in		Method of sulphate protection: Sulfate resistant concrete
	Concrete strength: 30 mpa		Concrete reinforcement size and spacing: rebar 15in spacing 10 ml rebar
In-barn manure pit floors	Concrete thickness: 8 in		Method of sulphate protection: Sulfate resistant concrete
	Concrete strength: 35mpa		Concrete reinforcement size and spacing: rebar 15in spacing 10 ml rebar
In-barn manure pit walls	Concrete thickness: 6in		Method of sulphate protection: Sulfate resistant concrete
	Concrete strength: 35 mpa	Horizontal reinforcement size and spacing: 15 in spacing 10 ml rebar	Vertical reinforcement size and spacing: 15in Spacing 10 ml rebar

LIQUID MANURE COLLECTION AND/OR STORAGE: In-barn - Concrete liner (cont.)

Describe how the joints at the junction of the pit walls, pit floors and any other joints will be sealed

water stop caulking and expanding caulking

Describe sealing practices for piping, etc. that penetrates the liner

expanding caulked joints, piping boots

Concrete requirements can be found in Technical Guideline Agdex 096-93
Guideline minimums:
Solid manure: 25MPa (D)
Solid manure (wet): 30MPa (C)
Liquid manure: 32MPa (B)
Category A is required to be engineered
Method of sulphate protection:
Type 50 or Type 10 with fly ash or equivalent

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Additional information

NRCB USE ONLY

Liquid manure storage volume calculator attached: ☐ YES ☐ NO

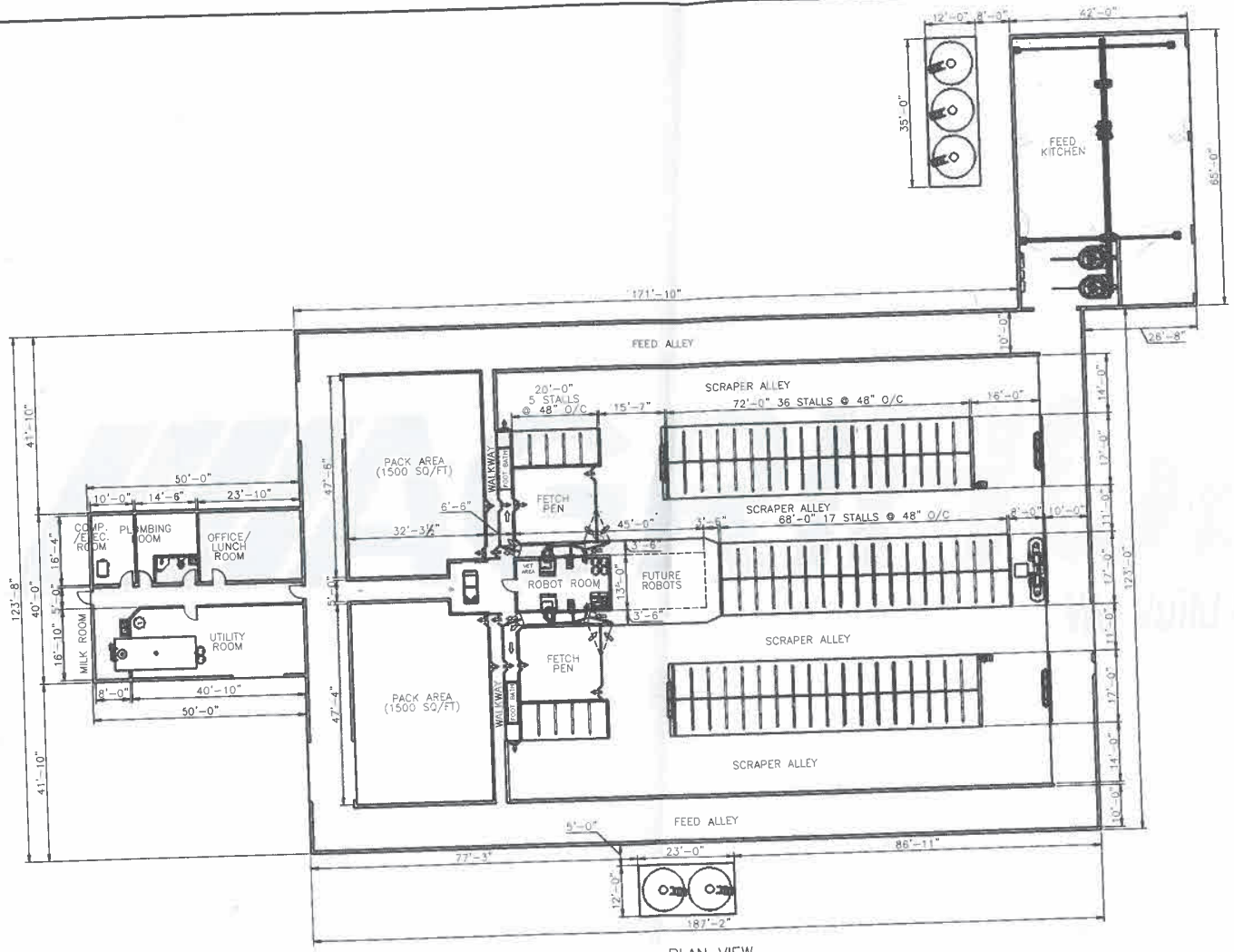
Depth to water table: _____ Requirements met: ☐ YES ☐ NO

Depth to uppermost groundwater resource: _____ Requirements met: ☐ YES ☐ NO

ERST completed: ☐ see ERST page for details

Concrete liner requirements

Leakage detection system required: ☐ YES ☐ NO If yes, please explain why



PLAN VIEW

ENGINEERING | STAMP

REVISION'S

REV	DATE	DESCRIPTION	BY	CHK	APPD
A	3/18/25	ISSUED FOR REVIEW	DJB	NW	
B	4/14/25	REVISED AS PER CLIENT/SALES CHANGES	DJB	NW	
C	4/17/25	REVISED AS PER SALES CHANGES	DJB	NW	

PENNER FARM SERVICES
64-27211 HWY. 12 LACOMBE, AB T4l 0E3
TOLL FREE: 1-866-339-0000 PH: 1-403-782-0675

CLIENT: TERRA NOVA ALBERTA

DRAWING TITLE: LELY ROBOT DAIRY BARN

SCALE	DATE	DRAWING NO
1:160	MAR/18/2025	A1
DWN: DJB	CHK: NW	REVISION: C
JOB NO.:	SHEET: 1 OF 1	

ENVIROWEST
ENGINEERING

SITE AND SOIL ASSESSMENT

Proposed Earthen Manure Storage Lagoon
SE¼-24-044-27-W4M

Ponoka County, Alberta

Site and Soil Assessment
Proposed Earthen Manure Storage Lagoon
SE-24-044-27-W4M
Ponoka County, Alberta

Prepared For: Tyler Nieuwland

Delivered via Email: [redacted]

Prepared By: Envirowest Engineering
Box 4248, Ponoka, AB, T4J 1R6
(403) 783-8229

Report Date: May 29, 2025

Project Number: 2502-43078

Private and Confidential

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List of Tables

Appendices

1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Tyler Nieuwland to conduct a Site and Soil Assessment for the proposed construction of an earthen manure storage (EMS) lagoon for the proposed construction of a dairy operation.

The assessment was completed to determine conditions beneath the proposed construction area and assess soil properties for construction of proposed facilities. The operation, herein referred to as "the Site," is located on SE-24-044-27-W4M in Ponoka County.

The assessment has been completed in accordance with the standards and regulations associated with the amended Agricultural Operation Practices Act and associated regulations which govern all new and modified confined feeding operations.

Scope of Work

Three investigative boreholes were drilled using a truck-mounted rotary auger and completed to a maximum depth of 9.0 m below ground surface (mbgs) on March 14, 2025. The boreholes were completed in the area proposed for a manure storage lagoon. The borehole locations are shown on Figure 1.0 (attached).

2.0 Assessment Results

The Site is in an area of rolling topography. The Site is currently utilized as cropland.

Three investigative boreholes were drilled using a truck-mounted rotary auger and completed to a maximum depth of 9.0 mbgs on March 14, 2025. The boreholes were drilled in the area proposed for an earthen manure storage lagoon and are shown on Figure 1.0 (attached).

Potential liner construction material (noted in borehole logs as sandy clay) was typically found beneath dry silt clay/ sand and cobble.

Weathered bedrock was encountered at borehole 25BH01 at 8.90 mbgs. Boreholes were backfilled with the material removed by back spinning the solid stem auger and compacting to depth of the borehole.

The results of the soil analysis completed by a third-party laboratory are presented in Table 1 below. The soil sample locations are presented on Figure 1, and borehole logs are attached. The composite sample was obtained from boreholes 25BH02.

Table 1: Soil Properties Results

Parameter	25BH01-01	25BH01-02	25BH01-03	25BH01-04	25BH02-01	25BH03-01	25BH03-02	25BH03-03	Composite
Sample Depth (mbgs)	4.25	5.25	6.60	8.40	3.20 – 4.50	2.60	3.75	5.30	3.20 – 4.50
Particle Size (%sand)	2.9	33.5	34.2	33.9	34.9	29.6	30.7	30.6	37.6
Particle Size (%silt)	62.6	31.5	34.3	36.3	31.7	31.9	31.8	31.9	60.2
Particle Size (%clay)	34.5	31.4	28.6	28.4	29.5	36.8	37.4	36.9	
Texture Class	Silty Clay Loam	**Clay Loam**	**Clay Loam**	**Clay Loam**	**Clay Loam**	**Clay Loam**	**Clay Loam**	**Clay Loam**	**Clay Loam**
Plastic Limit (%)	-	-	-	-	-	-	-	-	13.32
Liquid Limit (%)	-	-	-	-	-	-	-	-	32.26
Plasticity Index (%)	-	-	-	-	-	-	-	-	18.93
Field Hydraulic Conductivity (cm/sec)									2.2×10^{-8}
Natural Moisture (%)									16.3

The soils were identified as clay loam. The suspected compacted liner material had an average clay content of 32.7%, ranging from 28.4 – 37.4%.

The composite soils were determined to be clay loam. The hydraulic conductivity was determined to be 2.2×10^{-9} cm/sec at 99% compaction. The maximum dry density was found to be 1,787 kg/m^3 with an optimum moisture content of 14.2%. Natural moisture of the sample was found to be 16.3%.

Conservatively a safety factor of 10 is to be applied to the hydraulic conductivity based on the NRCB Approvals Policy (2016-7), Section 8.7.2, stating "lab measurements of a sample of material taken from the field are not considered an accurate representation of the actual field hydraulic conductivity values. This is because of the potential variability of soils, differences in compaction methods and variances in compaction." Therefore, the field hydraulic conductivity of the composite material tested is determined to be 2.2×10^{-8} cm/sec.

A saturated water table was not encountered during the assessment to a maximum depth of 9.0 mbgs.

A piezometer was installed at borehole 25BH02, screened from 3.0 to 7.5 mbgs. Depth to water table was measured on May 21, 2025, and was found to be greater than the depth of the piezometer (7.5 mbgs).

3.0 Liner Assessments

3.1 Compacted Earthen Liner Assessment (Liquid Manure Storage)

Based on the information obtained it was determined that the native clay within the proposed area of construction was found to have a minimum thickness of 1.0 meters. The proposed liquid manure storage area is approximately 63 meters x 63 meters, as shown on Figure 1.0.

Minimum Required Liner Depth for EMS:

$$\frac{1\text{ m}}{1 \times 10^{-7}\text{ cm/sec}} = \frac{\mathbf{X}\text{ m}}{2.2 \times 10^{-8}\text{ cm/sec}}$$

$$\mathbf{X} = 0.22\text{ m}$$

A compacted liner thickness of 0.22 m is required, however a **1.0 m** liner is recommended due to freeze thaw cycles and erosion.

4.0 Conclusions

The following conclusions are based on the discussed scope of the construction.

The composite soils were determined to be appropriate for the construction of a compacted clay liner for a liquid manure storage facility.

5.0 Design and Construction Considerations

5.1 Earthen Lined Lagoon

Earthen Lagoon Storage Sizing

The new liquid EMS facility was designed for 220 head including dries and replacements for a minimum 9 months storage. The manure storage lagoon is recommended to have the following specifications:

- To provide the required capacity the new EMS should be 63 m in length x 63 m in width. The overall depth has been designed as 5.0 m. The overall capacity of the new EMS will be 11,895 cubic metres (2.6 million imperial gallons) which accounts for the required 0.5 m of freeboard, a storage capacity of 10,003 cubic metres. The sizing is based on an inside end and side wall slope of 3:1 (run/rise)
- The overall depth of 5.0 m will be achieved through a below grade depth of 4.5 m as measured from borehole 25BH02. The bottom of the liner will measure 5.5 meters below grade.
- The above-grade dykes will measure 0.5 m. The outside dyke walls should be completed to at slope of 4:1. The crest of the dyke should be sloped slightly outward to direct rainfall away from the storage facility
- The below-grade depth of the EMS must maintain a minimum of a 1.0 m separation above the water table at the time of construction (if encountered)
- Construction of the clay liner on the north wall should be completed in approximately 0.15 m lifts. Preferably, compaction of each lift will be undertaken with a padfoot roller, or the like. The equipment being used for soil compaction must fully penetrate each lift.
- Lifts should continue to be added until the recommended liner thickness is achieved. Particular attention should be paid to ensuring that the liner is integrally connected to the lower soil strata and that the soil around the inlet pipe is compacted to the same standard as the remainder of the liner
- Sand pockets that may be encountered during construction should be removed prior to liner installation
- If any significant amount of coarse grained material is encountered, the NRCB or the engineer should be contacted prior to proceeding
- Control of liner moisture content is critical during the construction process. Liner material should not be allowed to become saturated or to become dry. Should a lift surface become dry, the lift should be scarified prior to the placement of the next lift. Lifts which are above the required moisture content due to precipitation etc. should be removed or allowed to dry and re-compacted. The liner should not be allowed to freeze during construction

- Topsoil, frozen soil or rocks larger than 6 inches should not be included in the liner material
- Construction of the lagoon should be supervised by a professional engineer
- The freeboard depth of 0.5 m and outside dyke walls should be covered with 0.1-0.2 m of topsoil and seeded to prevent soil erosion.
- The inlet pipe to the EMS should be located in the bottom 1/4 of the lagoon. The annulus around the inlet pipe should be sealed with a bentonite sealer.

Earthen Manure Storage Construction

The following general construction procedures are recommended, though some modifications may be required based on actual site conditions encountered during construction:

- The topsoil and overburden should be stripped from the area for construction. The topsoil can be reused on the freeboard area after construction completion
- Sand and gravel seams, if encountered, should be excavated during construction and should be removed
- Construction of the lagoon should be supervised by a professional engineer

Following completion of the lagoon the operator should:

- Ensure that shrubs, trees, and deep-rooted plants are not allowed to grow within 10 meters of the facility

6.0 Closure

Envirowest Engineering is pleased to submit the report to Tyler Nieuland. The information and conclusions contained in this report are for their sole use. No other party is to rely upon the information contained within the report without the express written authorization of Envirowest Engineering.

Envirowest Engineering is not responsible for any damages that may be suffered as the result of any unauthorized use of, or reliance on, this report. Envirowest Engineering has performed the work and made the findings and conclusions set out in the report in a manner consistent with the level of care and skill normally exercised by members of the environmental engineer profession practicing under similar conditions at the time the work was performed. Envirowest Engineering accepts no responsibility for any deficiency, misstatement or inaccuracy in this report resulting from misinformation from any individuals or parties that provided information as part of this report.

We trust that this report meets your present needs. Please feel free to contact the undersigned with any questions or should you require additional information.

Respectfully submitted,

Prepared by:
Emily J. Low, P.Eng.
Envirowest Engineering

PERMIT TO PRACTICE
2206165 ALBERTA LTD.

RM SIGNATURE: _____

RM APEGA ID #: 110373

DATE: May 29, 2025

PERMIT NUMBER: P014810
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

2206165 Alberta Ltd. o/a Envirowest Engineering
Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice No. P14810

7.0 Qualifications of Assessors

Ms. Emily Low, B.Sc., P.Eng, is an Environmental Engineer with Envirowest Engineering and has approximately 15 years of environmental assessment, monitoring, and remediation experience in the agricultural, industrial, real estate and development, and oil and gas sectors. Ms. Low has a Bachelor of Science in Chemical Engineering from the University of Alberta and is a certified Professional Engineer in Alberta (Association of Professional Engineers and Geoscientists of Alberta).

Leah Predy, B.A., B.Sc., P.Ag., is a Professional Agrologist with Envirowest Engineering and has approximately 6 years of experience in the environmental field, both in field data collection and report preparation for environmental assessments, monitoring, and remediation, as well as agricultural projects. Prior to her employment with Envirowest Engineering, Leah had 5 years of experience managing rangelands and navigating legislation and regulations as a Rangeland Agrologist with the Government of Alberta. She is a Professional Agrologist in Alberta (Alberta Institute of Agrologists).

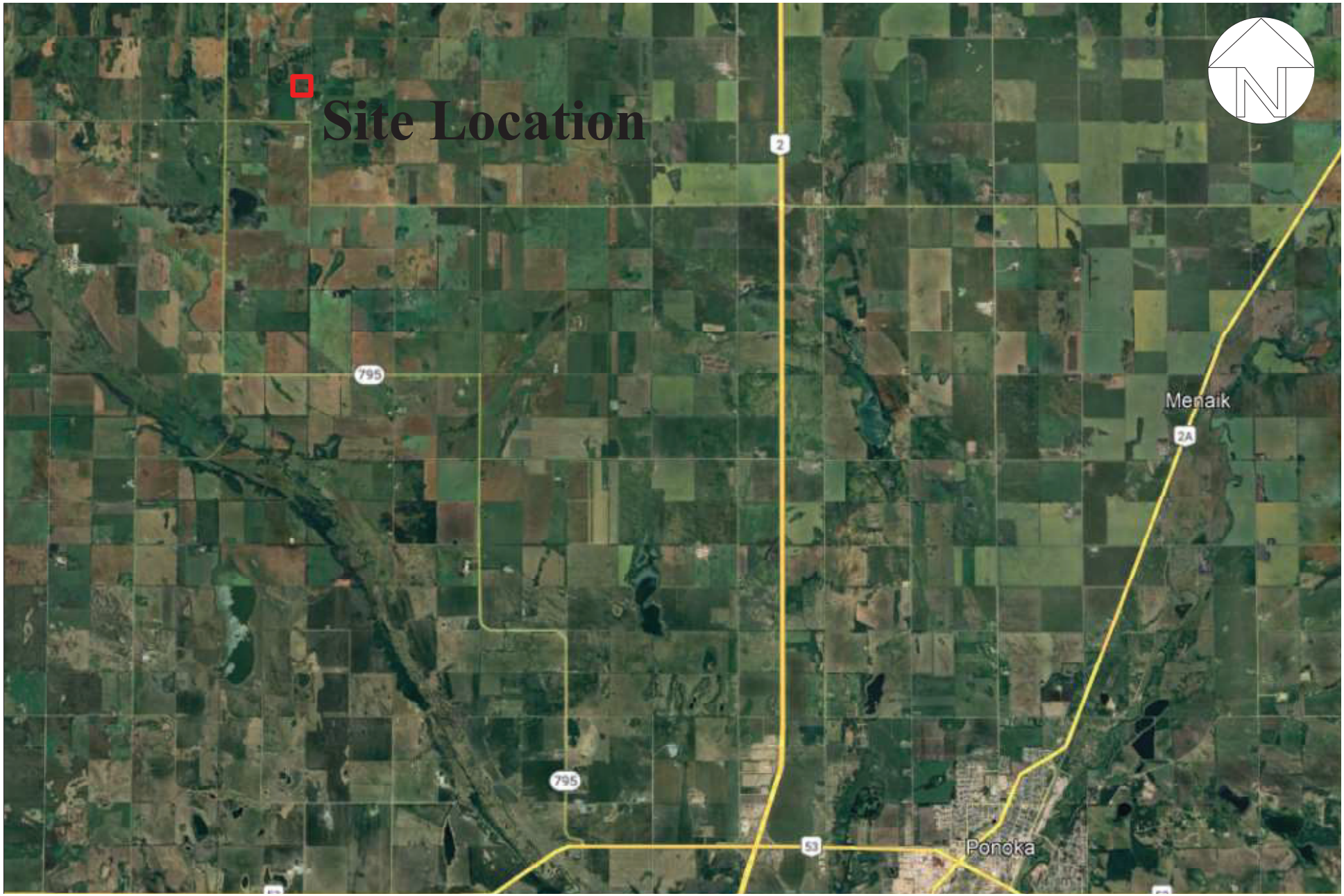
8.0 References

GOA (Government of Alberta). (January 2020). Agricultural Operation Practices Act and Regulations. Edmonton, AB: Author.

GOA (Government of Alberta). (2017). Agricultural Operation Practices Act: Standards and Administration Regulation. Edmonton, AB: Author.

Appendix A

Figure



ENVIROWEST ENGINEERING

Title:

Site Location
Site and Soil Assessment
SE¼-24-044-27-W4M
Ponoka County, Alberta

Project No: 2502-43078	**Date:** May 29, 2025
Scale:	**Prepared By:** E.Low
Image Source: Google Earth Pro (August 25, 2023)	

Figure No.: 1.0

ENVIROWEST ENGINEERING

Title:

Site Location
Site and Soil Assessment
SE¼-Sec.24-Twp.044-Rge.27-W4M
Ponoka County, Alberta

Project No: 2502-43078	**Date:** May 29, 2025	**Figure No.:** 2.0
Scale:	**Prepared By:** E.Low	
Image Source: Google Earth Pro (August 24, 2024)		

Appendix B

Borehole Logs

ENVIROWEST ENGINEERING

LOG OF BORING 25BH01

Site and Soil Assessment
SE-24-044-27-W4M
Ponoka County, Alberta

Project Number: 2502-43078

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : March 14, 2025
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0 – 2.5				SILT CLAY, loose, very dry	
2.5 – 4.0				SAND, some clay, loose, dry	
4.0 – 5.0				SILTY CLAY, light brown, soft, damp	
5.0 – 8.8				SANDY CLAY, coal inclusions, brown, damp, medium plasticity grey very hard	
8.8 – 9.0				WEATHERED BEDROCK	

05-29-2025 Y:\Operations\Client Data\43078 Tyler Nieuwland\25BH01.bor

ENVIROWEST ENGINEERING

LOG OF BORING 25BH02

Site and Soil Assessment
SE-24-044-27-W4M
Ponoka County, Alberta

Project Number: 2502-43078

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : March 14, 2025
Logged By: : Emily Low P.Eng.

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Well: 25MW01 Elev.:	Water Level
0.0				SILT CLAY, cobble, loose, very dry		
0.3						
0.5						
0.8						
1.0						
1.3					Bentonite	
1.5					Solid	
1.8						
2.0						
2.3						
2.5						
2.8						
3.0						
3.3				SANDY CLAY, brown, medium plasticity, damp		
3.5						
3.8						
4.0						
4.3						
4.5						
4.8						
5.0					Sand	
5.3					Screen	
5.5						
5.8						
6.0						
6.3						
6.5						
6.8						
7.0						
7.3						
7.5						

05-29-2025 Y:\Operations\Client Data\43078 Tyler Nieuwland\25BH02.bor

ENVIROWEST ENGINEERING

LOG OF BORING 25BH03

Site and Soil Assessment
SE-24-044-27-W4M
Ponoka County, Alberta

Project Number: 2502-43078

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : March 14, 2025
Logged By: : Emily Low P.Eng.

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				SILT CLAY, loose, very dry	
0.3					
0.5					
0.8					
1.0					
1.3					
1.5					
1.8					
2.0					
2.3				SANDY CLAY, brown, medium plasticity, damp	
2.5					
2.8					
3.0					
3.3					
3.5					
3.8					
4.0					
4.3					
4.5					
4.8					
5.0					
5.3					
5.5					
5.8					
6.0					

05-29-2025 Y:\Operations\Client Data\43078 Tyler Nieuwland\25BH03.bor

Appendix C

Certificate of Analysis

Laboratory Hydrometer — Sample No.: W656

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 01-01 **Specification:** ASTM D 422

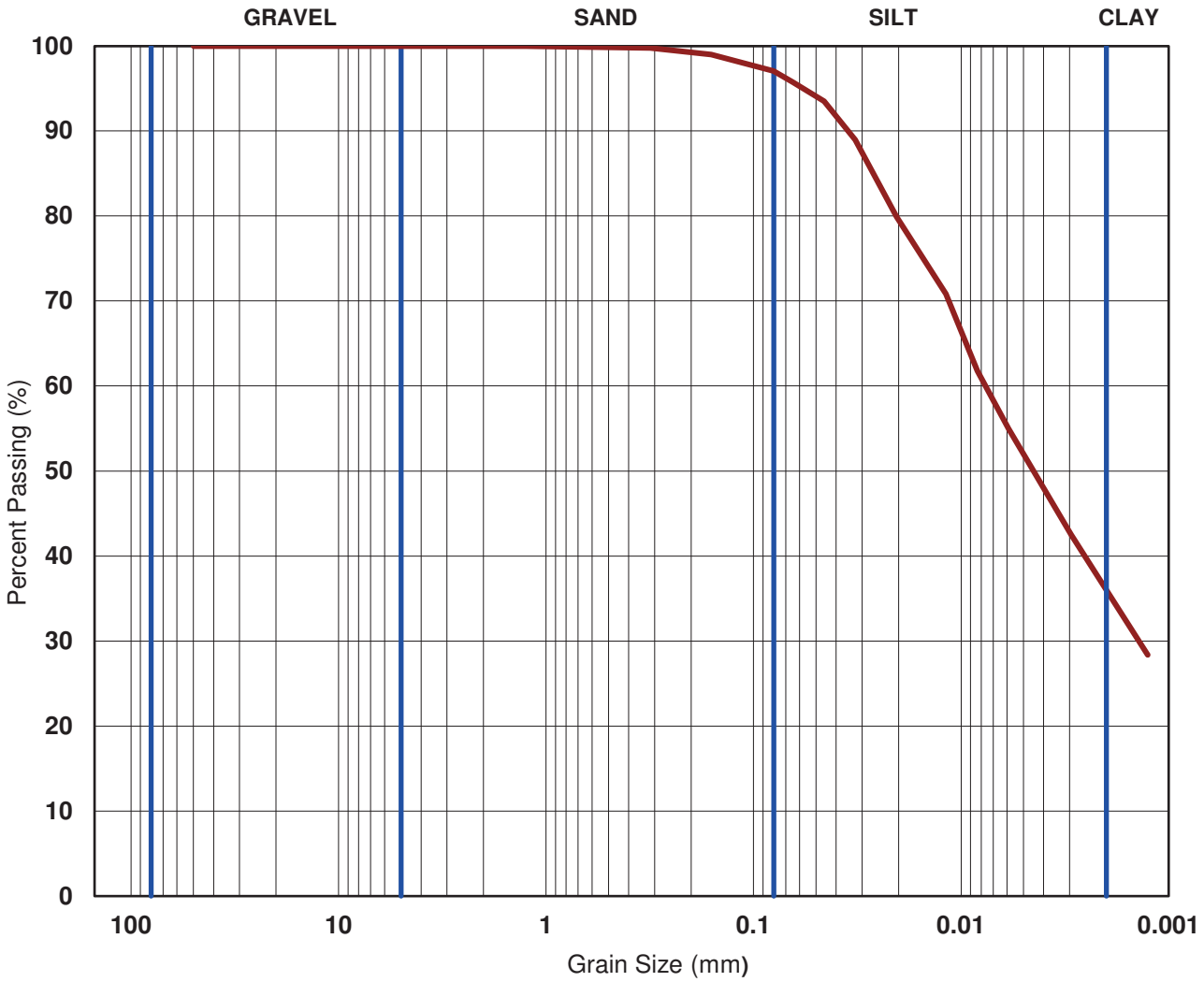
Description: Silt, clayey, trace sand

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.0** Sand = **2.9** Silt = **62.6** Clay = **34.5**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W657

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 01-02 **Specification:** ASTM D 422

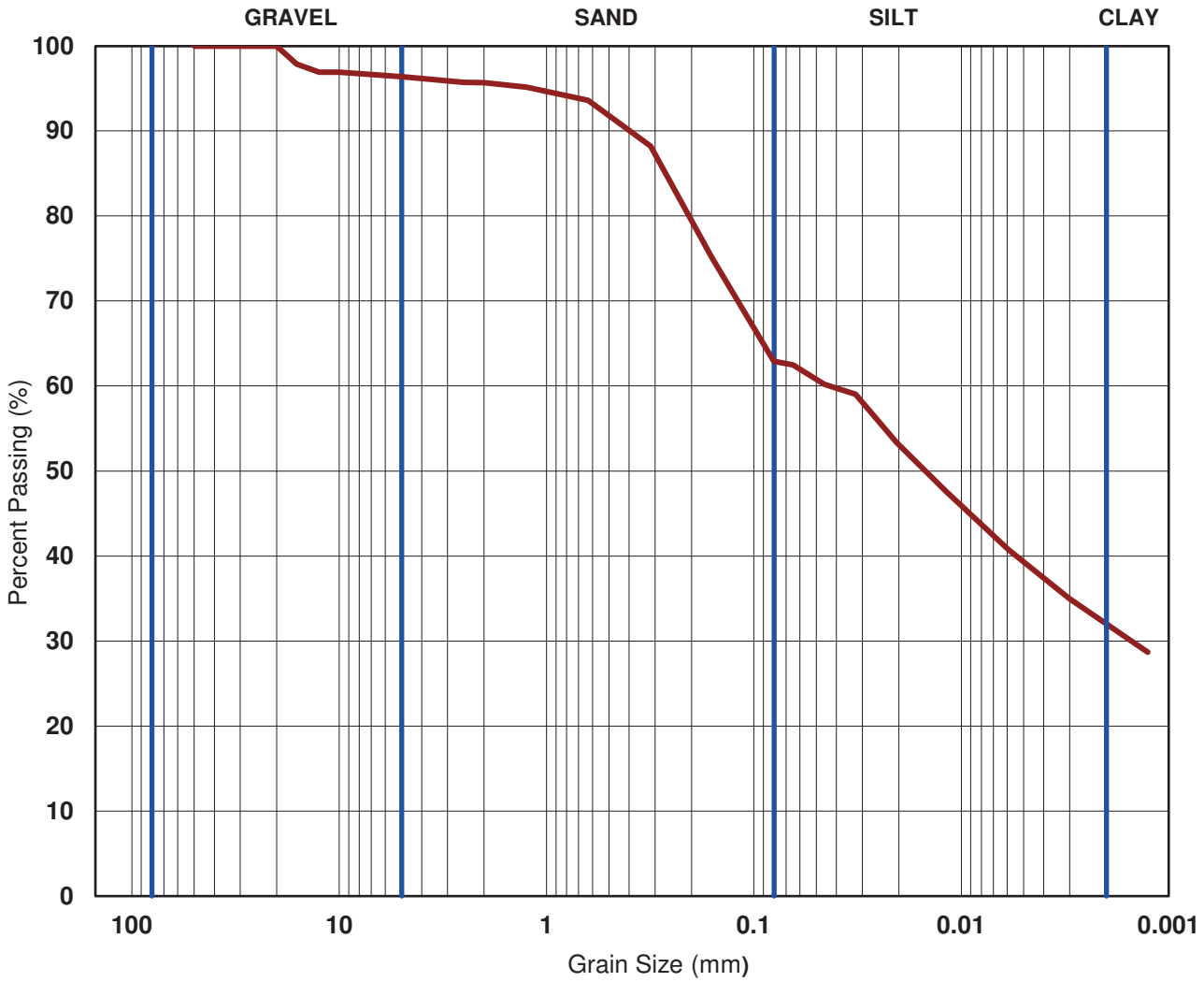
Description: Sand, silty, clayey, trace gravel

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **3.6** Sand = **33.5** Silt = **31.5** Clay = **31.4**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W658

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 01-03 **Specification:** ASTM D 422

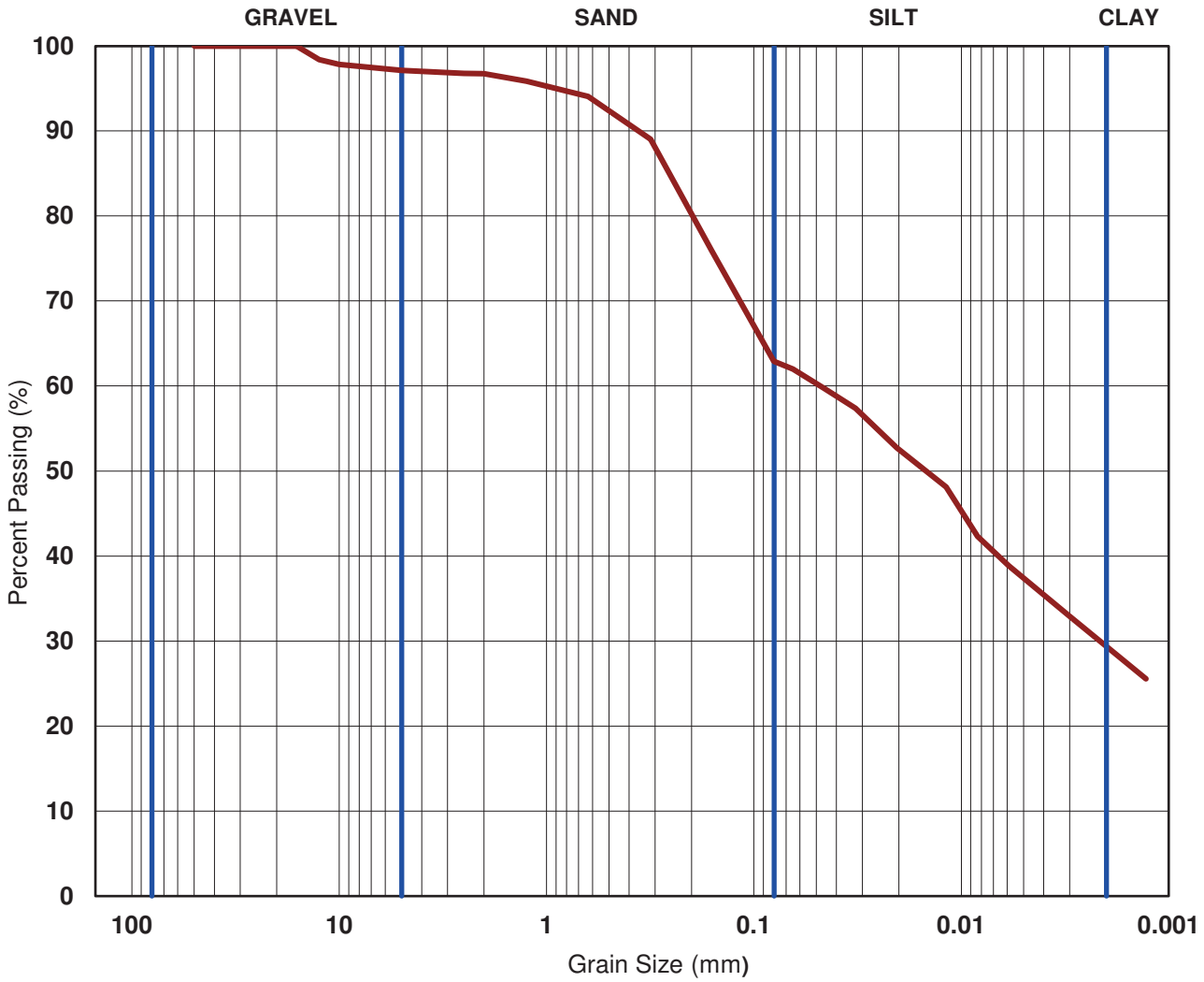
Description: Silt, sandy, clayey, trace gravel

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **2.9** Sand = **34.2** Silt = **34.3** Clay = **28.6**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W659

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 01-04 **Specification:** ASTM D 422

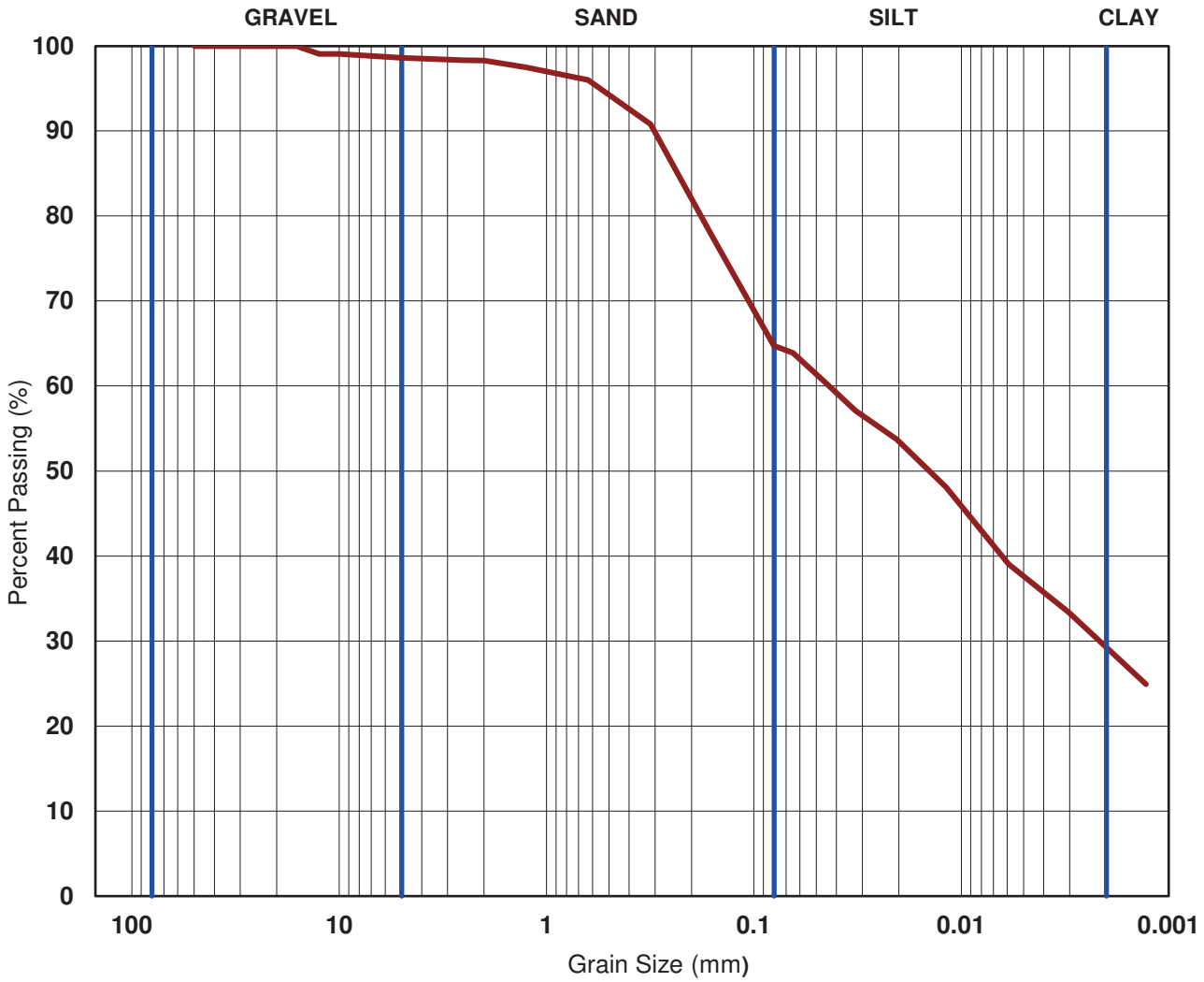
Description: Silt, sandy, clayey, trace gravel

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **1.4** Sand = **33.9** Silt = **36.3** Clay = **28.4**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W660

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 02-01 **Specification:** ASTM D 422

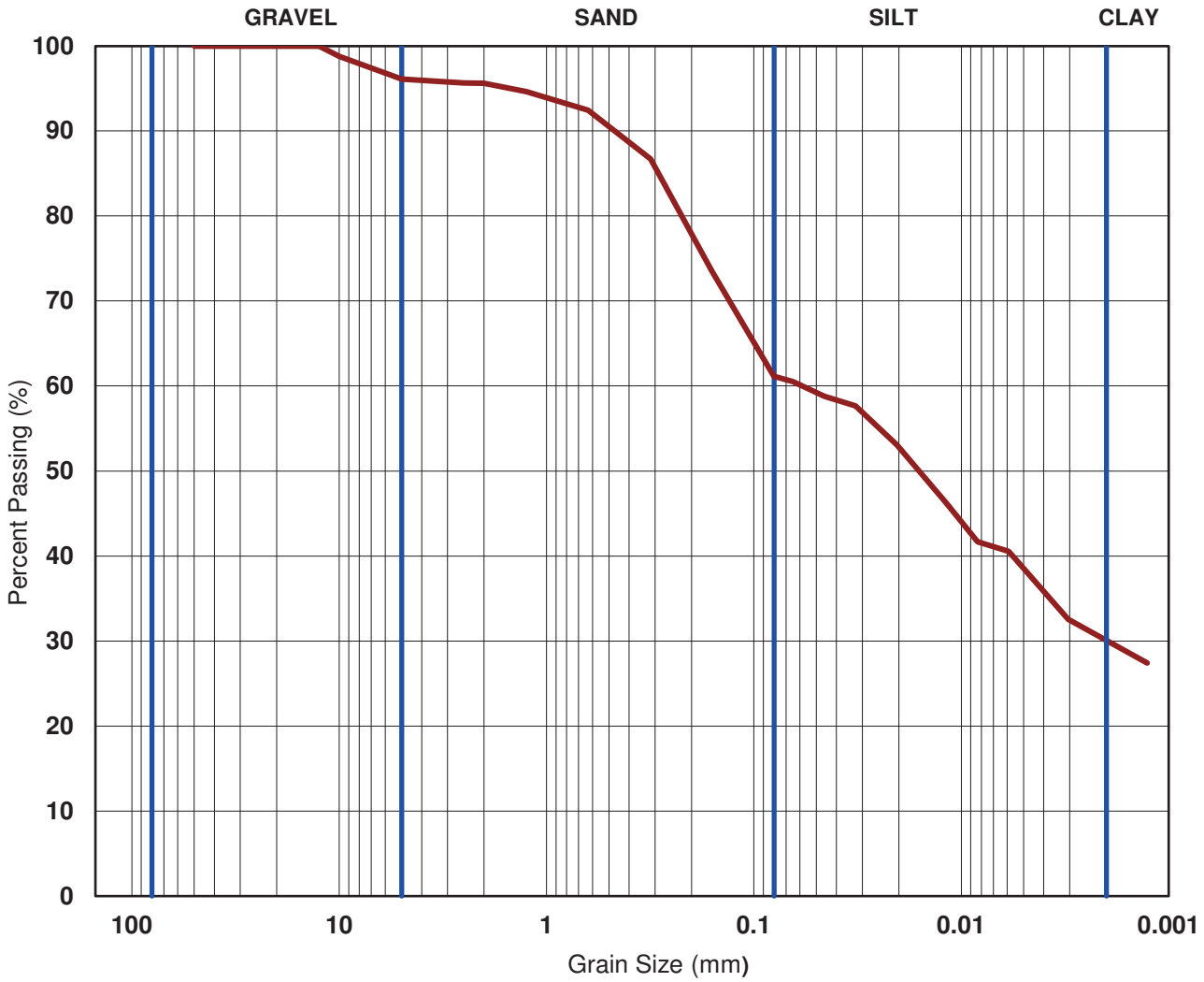
Description: Sand, silty, clayey, trace gravel

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **3.9** Sand = **34.9** Silt = **31.7** Clay = **29.5**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W661

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 03-01 **Specification:** ASTM D 422

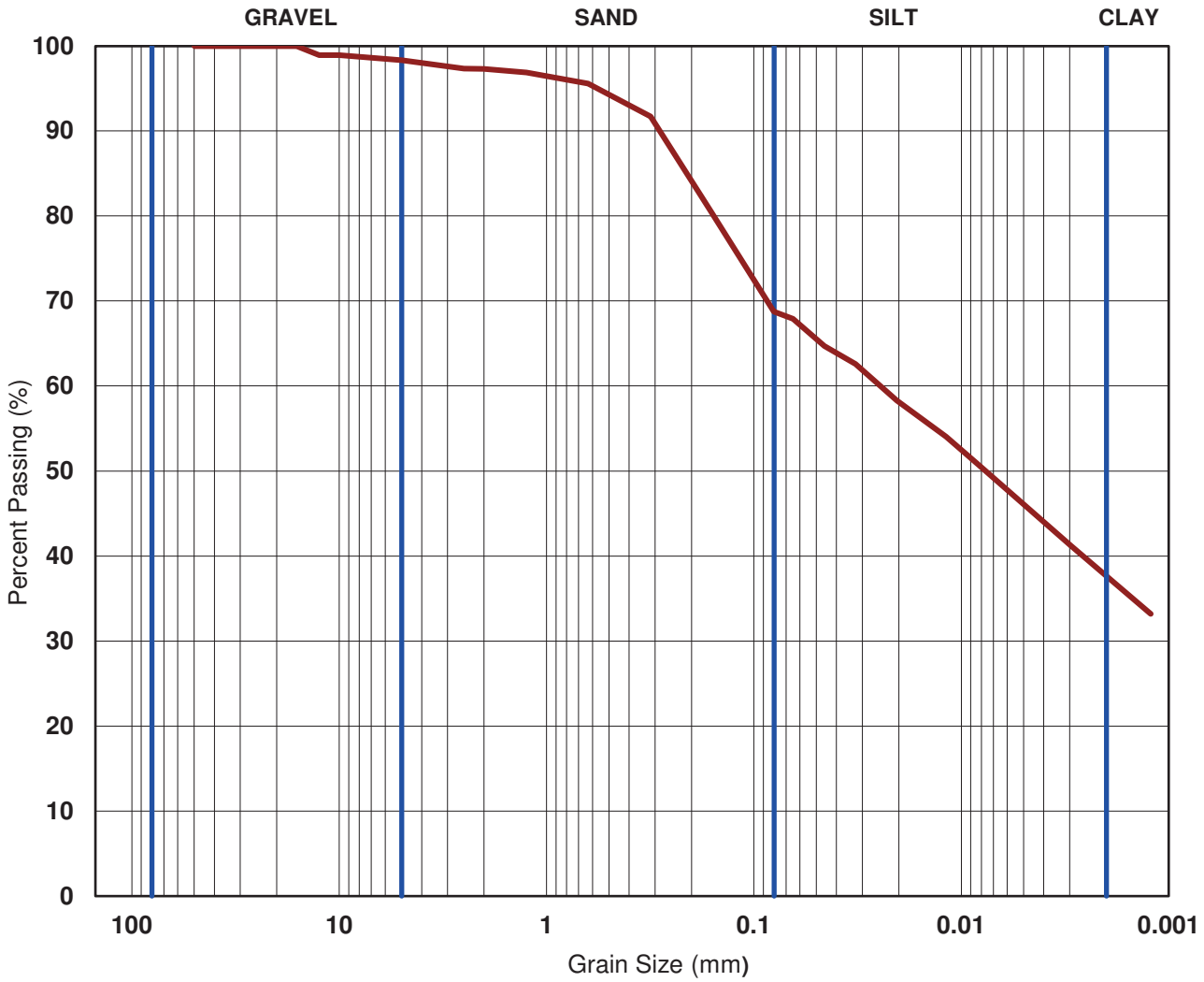
Description: Clay, silty, sandy, trace gravel

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **1.7** Sand = **29.6** Silt = **31.9** Clay = **36.8**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W662

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 03-02 **Specification:** ASTM D 422

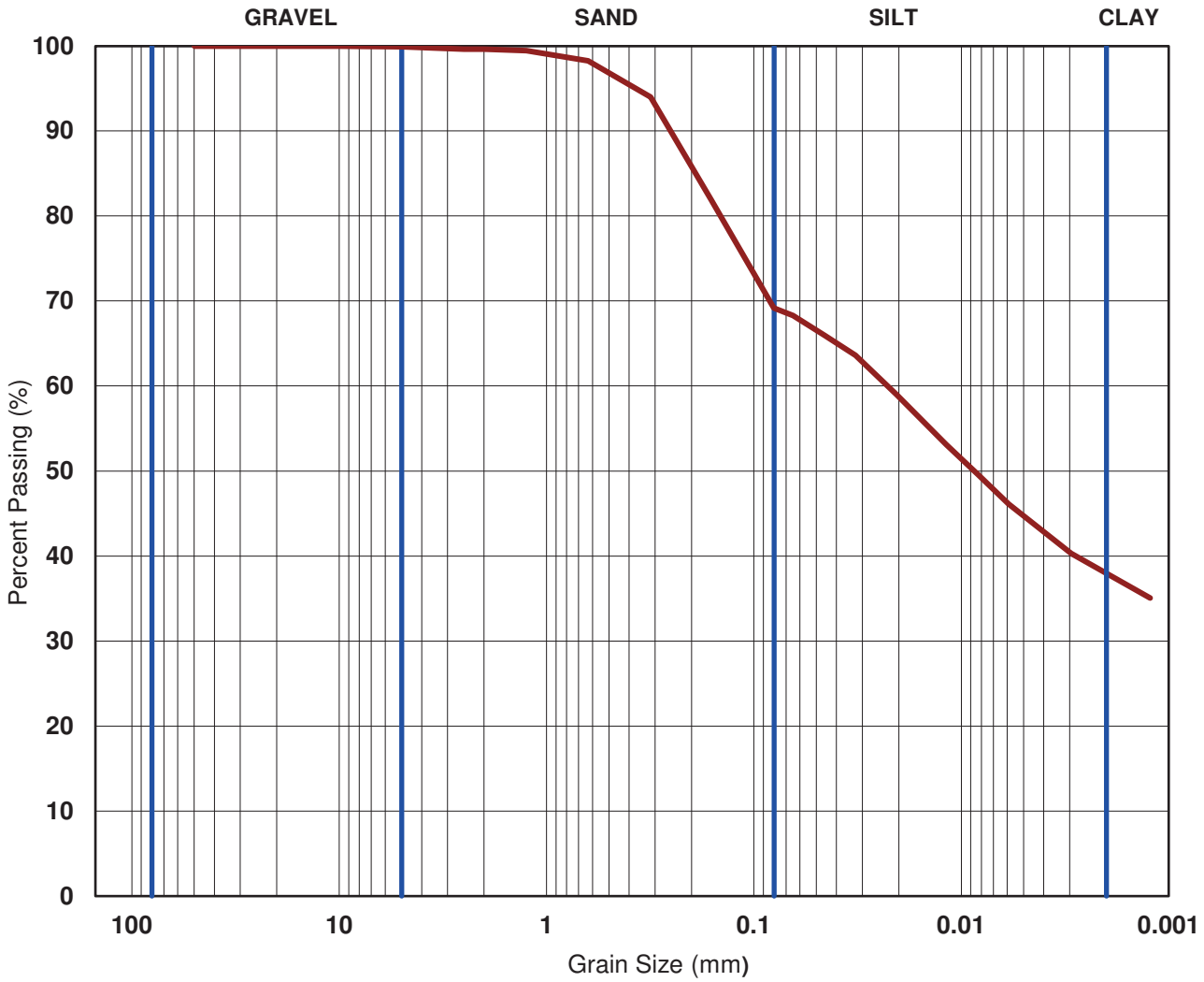
Description: Clay, silty, sandy, gravel inclusions

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.1** Sand = **30.7** Silt = **31.8** Clay = **37.4**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W663

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland, Sample 03-03 **Specification:** ASTM D 422

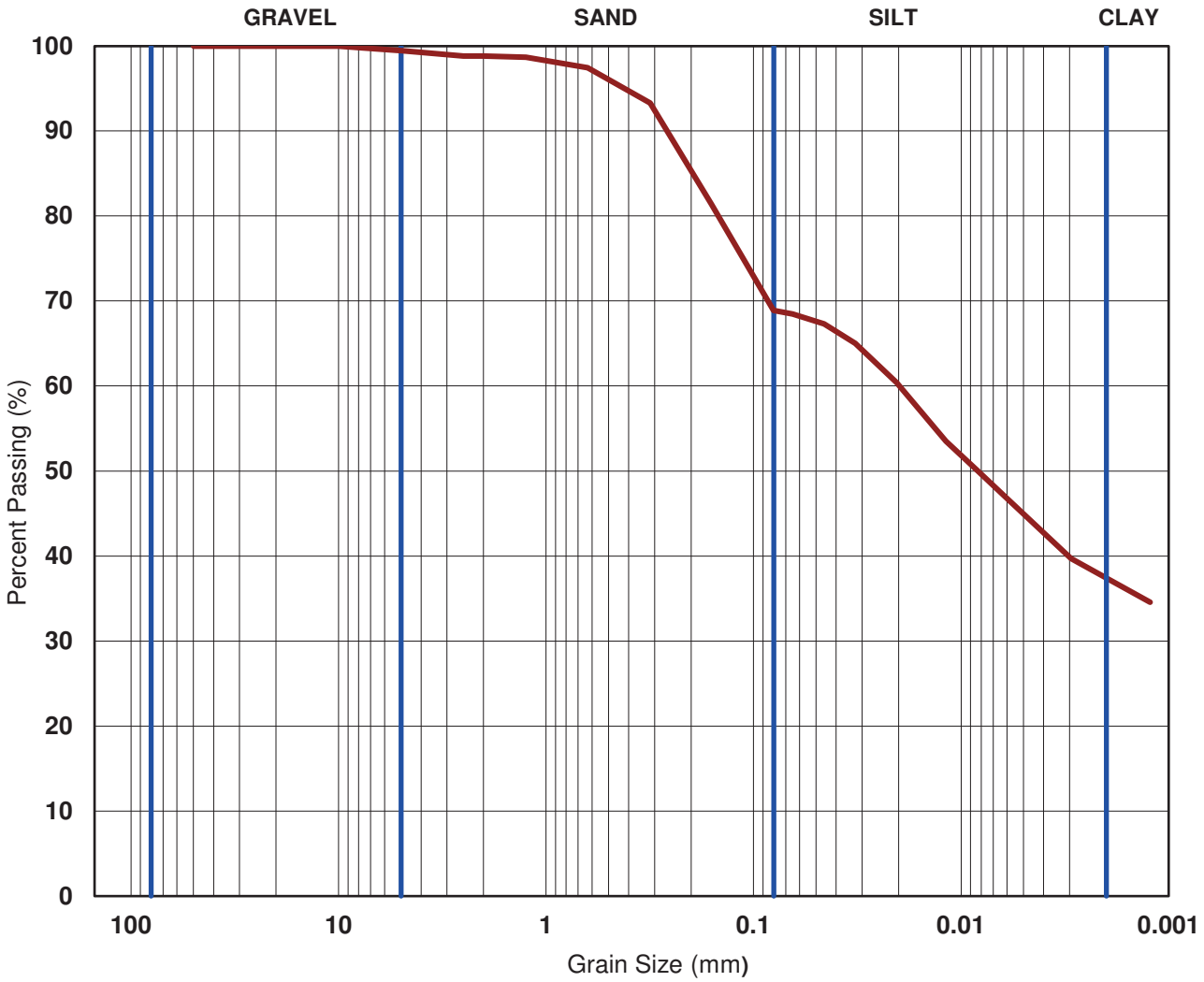
Description: Clay, silty, sandy, gravel inclusions

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.6** Sand = **30.6** Silt = **31.9** Clay = **36.9**



Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	2025 Materials Testing	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Proctor — Sample No.: W664

Sample Information

Date: 14-Mar-25 **By:** Emily **of:** Envirowest **Type:** Bag

Location: Nieuwland **Natural Moisture:** 16.3 %

Description: Clay till

Specfication: ASTM D 698 - Method A

Comments:

Proctor Results:

Test Number	1	2	3	4	5
Dry Density (Kg/m^3)	**1770**	**1786**	**1760**	**1688**	**#DIV/0!**
Moisture Content (%)	**12.2**	**14.1**	**16.7**	**20.1**	**#DIV/0!**

Oversize Correction (Calculated using assumed Specific Gravity of 2.40)

Oversize (%)	5	10	15	20	25
Density	**1816**	**1845**	**1874**	**1903**	**1932**

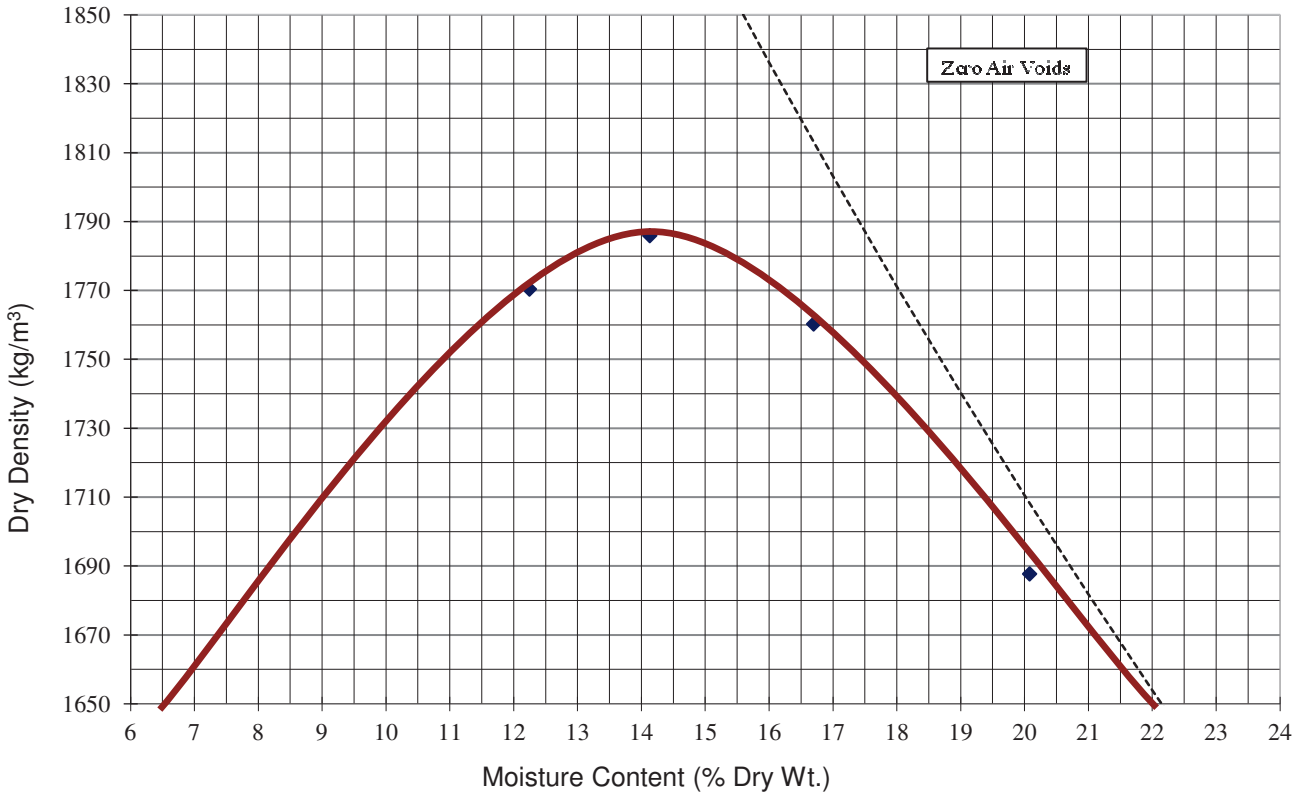
Optimum Results:

Moisture Content = **14.2** %

Dry Density = **1787** Kg/m^3

Corrected Density = **1798** Kg/m^3

Oversize Material = **1.9** %



Union Street Geotechnical

CLIENT: Envirowest **FILE No.:** USG2058

PROJECT: 2025 Materials Testing **DATE:** 31-Mar-25

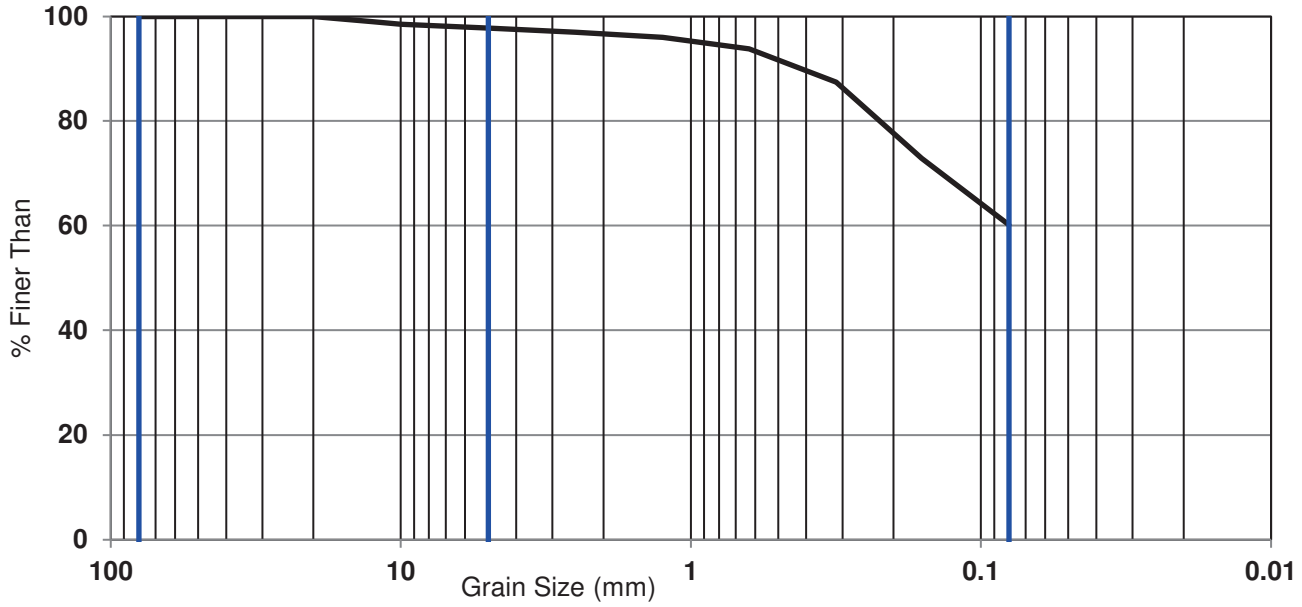
LOCATION: Red Deer, Alberta **TECH:** G.S.

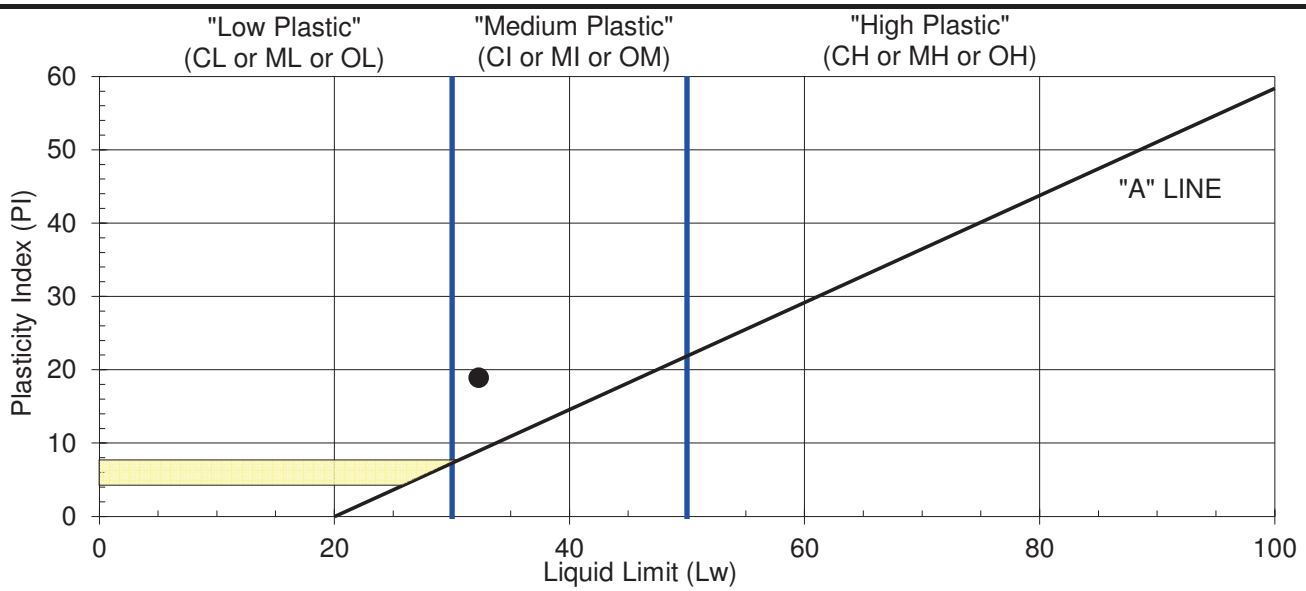
Lab Unified Soils Classification — Sample No.: W664

Sample Information

Classification: Sand, clayey, silty, trace gravel	**Particle Size:** Gravel = 2.3%	**Borehole No.:** -	
	Sand = 37.6%	**Sample No.:** -	
	Silt & Clay = 60.2%	**Depth (m):** -	

Particle Size Analysis - Washed Sieve





Plastic Limit:	13.32%	**Group Index:**	8.1
Liquid Limit:	32.26%	**Soil Type:**	Inorganic
Plasticity Index:	18.93%	**Classification:**	CI : Sandy Medium Plastic Clay

Union Street Geotechnical

CLIENT:	Envirowest	**FILE No.:**	USG2058
PROJECT:	Geotech. Inv.	**DATE:**	27-Mar-25
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Project Name:	2025 Materials Testing	Depth:	
Project Number:	USG2058	Testing Company:	Union Street Geo.
Client:	Envirowest Engineering	Field Technician:	E.L.
Testhole:		Sample Date:	14 Mar., 2025
Location:		Lab Technician:	B.B.
Sample Number:	W664	Date Tested:	31 Mar., 2025

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 and silt, sandy

Test Type:	Constant Head
Mould Size:	Flexible Wall
Sample Source:	Re-moulded
Fluid Used:	Deaired Water
Fluid Reservoir:	Burrettes

Remoulding Details	
Max Dry Density (kg/m^3):	-
Proctor ID:	-
Percent Max (%):	-
Target Dry Density (kg/m^3):	-

Initial Sample Characteristics

Water Content	
Wet + Tare (g):	550.3
Dry + Tare (g):	471.4
Tare (g):	11.4
Water Content (%):	17.2%

Sample Size					
Trial	1	2	3	4	Average
Diameter (mm):	73.9	74.6	74.4	74	74.2
Length (mm):	75.8	75.9	76.2	76.1	76.0
Weight (g)	687.2				

Area (cm^2):	43.3
Volume (cm^3):	328.9
Wet Density (kg/m^3):	2090
Dry Density (kg/m^3):	1784

Specific Gravity (Note 2):	2.59
Void Ratio:	0.45
Saturation:	97.9%
Porosity:	31.2%

Final Sample Characteristics

Water Content	
Wet + Tare (g):	705.2
Dry + Tare (g):	597.7
Tare (g):	10.4
Water Content (%):	18.3%

Sample Size					
Trial	1	2	3	4	Average
Diameter (mm):	74.6	74.7	74.4	74.8	74.6
Length (mm):	76.4	76.5	76.4	76.2	76.4
Weight (g)	695.2				

Area (cm^2):	43.7
Volume (cm^3):	334.0
Wet Density (kg/m^3):	2081
Dry Density (kg/m^3):	1759

Specific Gravity (Note 1):	2.59
Void Ratio:	0.47
Saturation:	100.0%
Porosity:	32.2%

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.

Project Name:	2025 Materials Testing	Depth:	
Project Number:	USG2058	Testing Company:	Union Street Geo.
Client:	Envirowest Engineering	Field Technician:	E.L.
Testhole:		Sample Date:	14 Mar., 2025
Location:		Lab Technician:	BB
Sample Number:	W664	Date Tested:	31 Mar., 2025

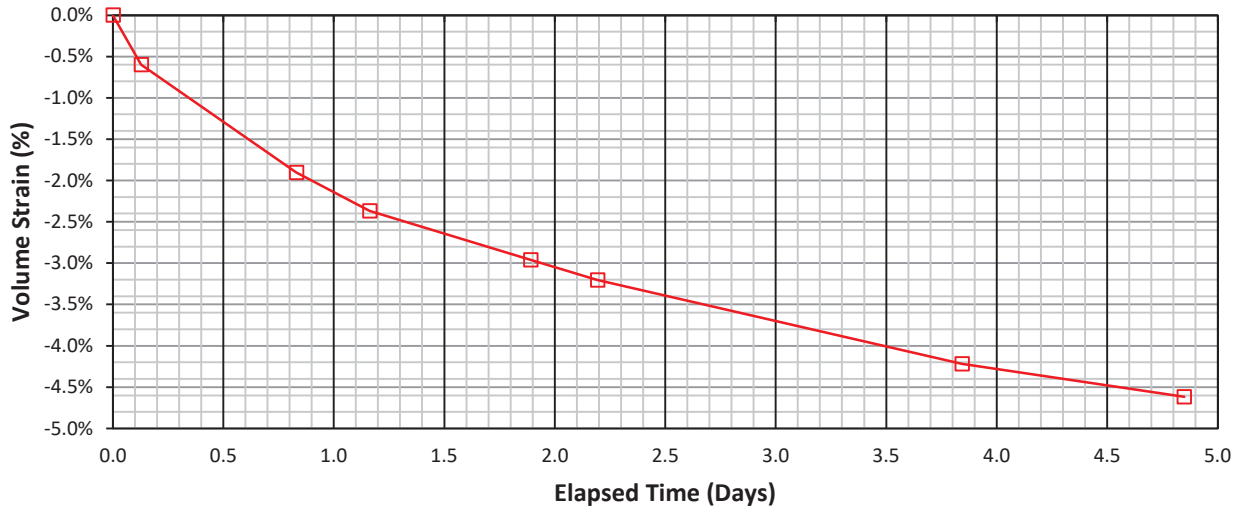
Flexible Wall Permeameter (ASTM D5084-10)

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

Saturation Data

Cell Pressure (kPa):	160.0	Top Pressure (kPa):	130.0
Bottom Pressure (kPa):	130.0	Pressure Difference (kPa):	-

Date & Time	Elapsed Time (Days)	Room Temp (°C)	Top Burret (mL)	Bottom Burret (mL)	Cell (mL)	Total Vol. Change (mL)	Volume Strain (%)
1/22/25 11:40	0.00	21.0	7.3	4.3	14.0	0	0.00%
1/22/25 14:45	0.13	21.0	6.4	4.5	16.6	-1.97	-0.60%
1/23/25 7:35	0.83	21.0	3.9	5.2	22.7	-6.26	-1.90%
1/23/25 15:34	1.16	21.0	3.1	5.4	24.8	-7.78	-2.37%
1/24/25 9:01	1.89	21.0	2.1	5.7	27.5	-9.74	-2.96%
1/24/25 16:17	2.19	21.0	2.0	5.8	28.3	-10.54	-3.21%
1/26/25 7:52	3.84	21.0	2.4	6.4	30.7	-13.87	-4.22%
1/27/25 8:01	4.85	21.0	2.5	6.6	31.7	-15.18	-4.62%
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-



Project Name:	2025 Materials Testing	Depth:	
Project Number:	USG2058	Testing Company:	Union Street Geo.
Client:	Envirowest	Field Technician:	E.L.
Testhole:		Sample Date:	14 Mar., 2025
Location:		Lab Technician:	B.B.
Sample Number:	W664	Date Tested:	31 Mar., 2025

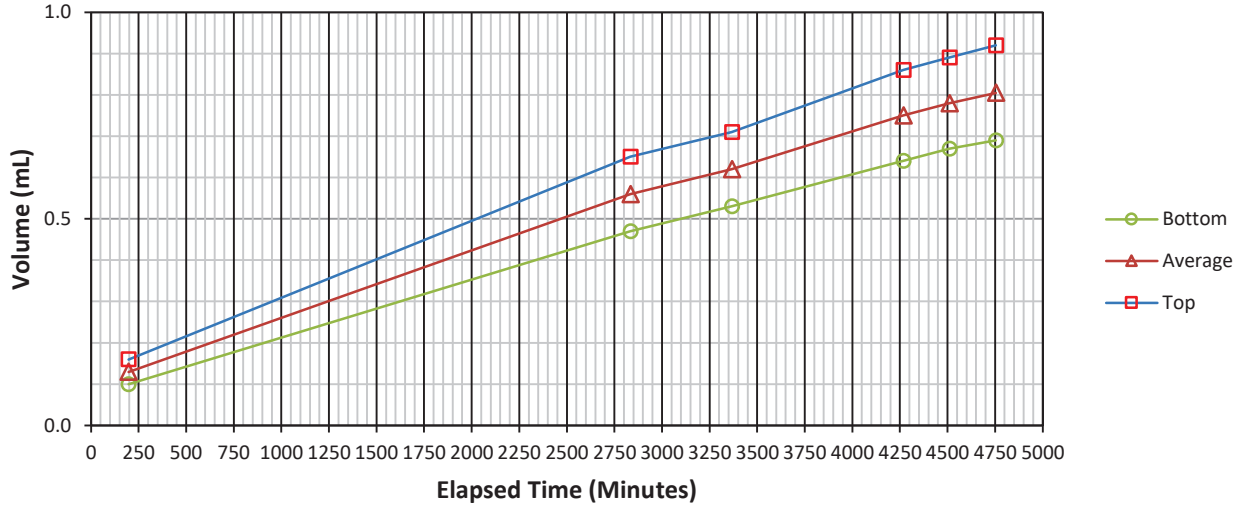
Flexible Wall Permeameter (ASTM D5084-10)

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

Permeation Data

Cell Pressure (kPa):	160.0	Top Pressure (kPa):	120.0
Bottom Pressure (kPa):	140.0	Pressure Difference (kPa):	20.0

Date & Time	Elapsed Time (Minutes)	Room Temp (°C)	Top Burret (mL)	Bottom Burret (mL)	Top Vol. Change (mL)	Bottom Vol. Change (mL)	Average Vol. Change (mL)
1/27/25 8:25	0	21.0	9.77	0.10	0.00	0.00	0.00
1/27/25 11:41	196	21.0	9.61	0.20	0.16	0.10	0.13
1/29/25 7:38	2833	21.0	9.12	0.57	0.65	0.47	0.56
1/29/25 16:32	3367	21.0	9.06	0.63	0.71	0.53	0.62
1/30/25 7:33	4268	21.0	8.91	0.74	0.86	0.64	0.75
1/30/25 11:35	4510	21.0	8.88	0.77	0.89	0.67	0.78
1/30/25 15:38	4753	21.0	8.85	0.79	0.92	0.69	0.81
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-



Project Name:	2025 Materials Testing	Depth:	
Project Number:	USG2058	Testing Company:	Union Street Geo.
Client:	Envirowest Engineering	Field Technician:	E.L.
Testhole:		Sample Date:	14 Mar., 2025
Location:		Lab Technician:	B.B.
Sample Number:	W664	Date Tested:	31 Jan., 2025

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):	2.0	Area of Sample (m^2)	4.350E-03
Length of Sample (m):	7.619E-02	Gradient, i	2.676E+01

Elapsed Time (Minutes)	Average Volume Change (mL)	Average Temperature (^oC)	k_t (m/s)	R_T	k_{20} (m/s)
2833	0.56	21.0	2.334E-11	0.976	2.278E-11
3367	0.62	21.0	2.212E-11	0.976	2.159E-11
4268	0.75	21.0	2.180E-11	0.976	2.127E-11
4510	0.78	21.0	2.157E-11	0.976	2.105E-11
4753	0.81	21.0	2.120E-11	0.976	2.070E-11
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	AVERAGE	2.201E-11		2.148E-11