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	RA24045	NW 18-38-19 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.

Date of signing: February 2025

Signature: [redacted]

Corporate name (if applicable):

Print name: Gert Schrijver

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)
Dairy barn freestall addition	144 x 23
Parlour building (includes calf barn 45 m x 7 m)	72 ~~66~~ x 24
Sand separation building	15 x 15
AO Note: Applicant also proposing new earthen manure storage facility	167 m x 55 m x 3.5 m deep
AO Note: Applicant is also proposing pits in the parlour building and sand separation building	

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

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
dry cow barn	54 x 23	
freestall barn	120 x 20	

NRCB USE ONLY

All existing facilities have a deemed permit, see discussion in DS RA24045

Last updated September 11, 2023

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)

Existing facilities continued	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
young stock	50 x 15	
young stock	45 x 15	
Calf Barn	40 x 15	

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)

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

NO

AO Note: The applicant is proposing to decommission the existing EMS, after the new one is constructed

Construction completion date for proposed facilities end of 2027

Additional information

if permits will be done in Time
Construction will start early 2026

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 Part 1:			
Milking cows plus associated dries and replacements	200	200	400

Last updated September 11, 2023

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)

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) DAPP 019 815

Signed this 20 day of Febr., 20 25 [redacted]
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

Part 2 — Technical Requirements

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

NRCB Natural Resources Conservation Board

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: Existing dairy barn

Proposed 1: AO Note: New dairy barn, EMS, sand separator, calf barn

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	X ☐ YES ☐ NO ☐ YES with exemption	Not in flood plain
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	0	0	0		X ☐ YES ☐ NO ☐ YES with exemption	None observed on site visit
	How many water wells are within 100 m of the manure storage facility or manure collection area?	1	0	0		☐ YES ☐ NO X ☐ YES with exemption	One ww located within 100 m of proposed freestall addition, new EMS, and sand separator
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	685	685			X ☐ YES ☐ NO ☐ YES with exemption	299 m from proposed EMS to large slough north of CFO
Groundwater information	What is the depth to the water table?		8m			X ☐ YES ☐ NO ☐ YES with exemption	WT identified at 4 mbg; see TD RA24045
	What is the depth to the groundwater resource/aquifer you draw water from?		16m			X ☐ YES ☐ NO ☐ YES with exemption	UGR identified at 20.12 m in WW 296769

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

proposed 2 milkparlour/calfbarn 72 m

~~66~~ m x 24m

North NW 18-38-19 W4

sandseperator 15m x 15m

proposed 1 240 freestalls

144m x 23m

ENVIROWEST ENGINEERING

Title:

Borehole Locations
Site and Soil Assessment
Proposed Earthen Manure Storage Lagoon Expansion
NW¼-18-038-19-W4M
County of Stettler No. 6, Alberta

Project No: 2412-42124	**Date:** April 1, 2025	**Figure No.:** 1.0
Scale: 1:2700	**Prepared By:** E. Low	
Image Source: Google Earth Pro (February 22, 2024)		

Part 2 – Technical Requirements

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

NRCB Natural Resources Conservation Board

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
nemetz	SW 13 38 19	570	Agriculture	1	499 m	N/A	Yes
Unruh	SE 13 38 20	460	Agriculture	1	345 m	Yes	Yes with waiver
Volgemuth	SE 13 38 20	300	Agriculture	1	261 m	Yes	Yes with waiver

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)
NW/NE 18 38 19	mars dairy	70	black		
NW/NE 13 38 20	Gert/Sonja Schrijver	70	black		
SW 24 38 20	mars dairy	35	black		
NE 24 38 20	Gert/Sonja Schrijver	60	black		
SW/SE 25 38 20	mars dairy	90	black		
NW/SW 26-38-19	mars dairy	120	black	Total	445 ha

* 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 Manure Spreading Regulations)

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

Additional information (attach any additional information as required)

Part 2 — Technical Requirements

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

NRCB USE ONLY

MINIMUM DISTANCE SEPARATION

Methods used to determine distance (if applicable): Aerial photography

Margin of error (if applicable): +/- 2 m

Requirements (m): Category 1: 449 m Category 2: 599 m Category 3: 749 m Category 4: 1198 m

Technology factor: ☐ YES ☒ NO

Expansion factor: ☐ YES ☒ NO

MDS related concerns from directly affected parties or referral agencies: ☐ YES ☒ NO

LAND BASE FOR MANURE AND COMPOST APPLICATION

Land base required: 372 ha

Land base listed: 445 ha

Area not suitable: already accounted for

Available area 445 ha Requirement met: ☒ YES ☐ NO

Land spreading agreements required: ☐ YES ☒ NO

Manure management plan: ☐ YES ☒ NO If yes, plan is attached: ☐

PLANS

Submitted and attached construction plans: ☒ YES ☐ NO

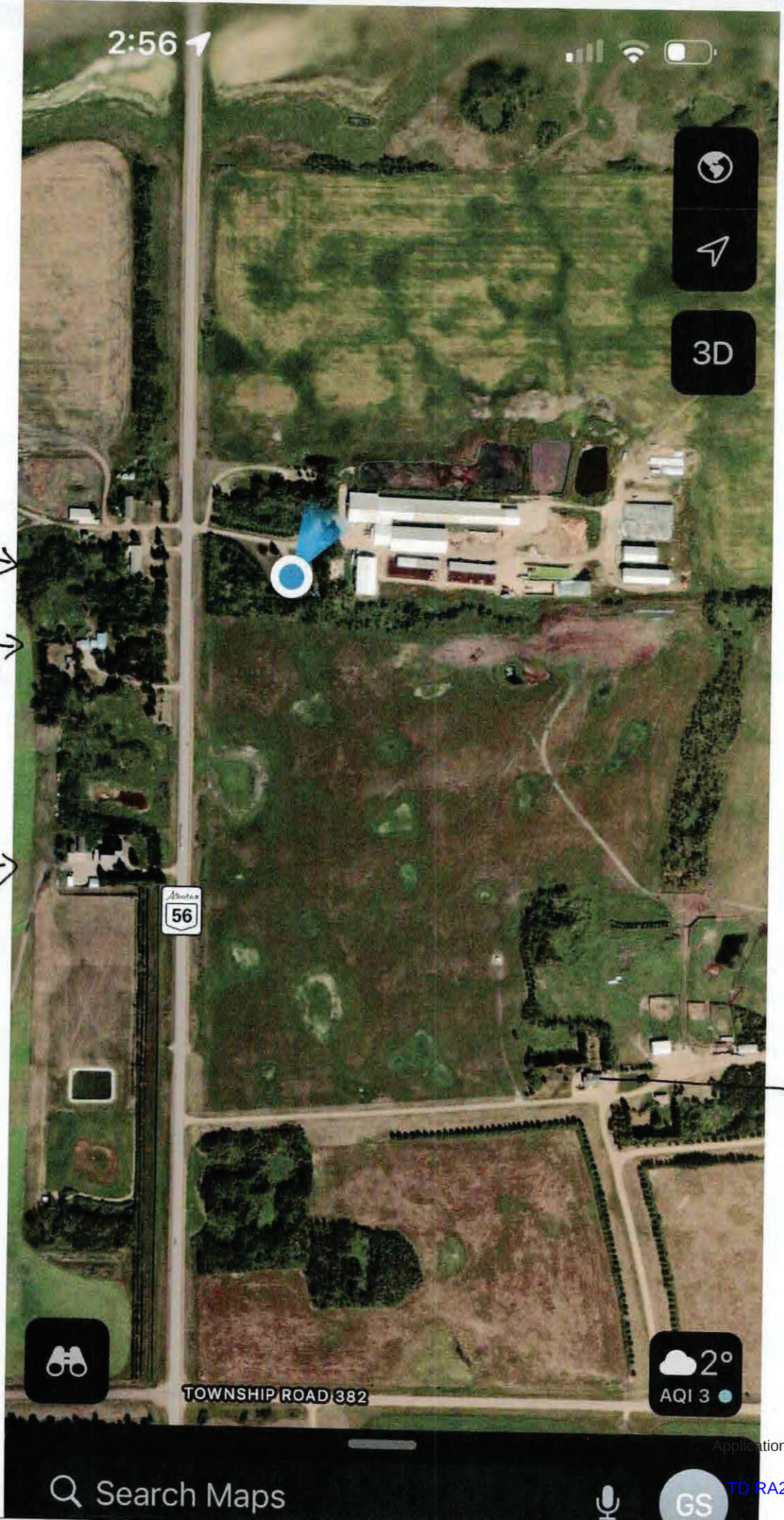
Submitted aerial photos: ☒ YES ☐ NO

Submitted photos: ☐ YES ☒ NO

GRANDFATHERING

Already completed: ☐ YES ☐ NO ☒ N/A

If already completed, see completed as part of RA24045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Minimum Distance Separation (MDS) Waiver (declaration)

Applicant information NRCB application number: RA 24045

Operator/operation name: Gert Schriver

Address [redacted] Postal Code: [redacted]

Legal land location of confined feeding operation: _____

I have requested the residence owner(s) named below to waive the required minimum distance separation (MDS) to their residence for the *Agricultural Operation Practices Act* (AOPA) permit application identified above. In making this request, I have provided the owner(s) with an opportunity to review my permit application and a copy of the Natural Resources Conservation Board (NRCB) Fact Sheet "Minimum Distance Separation (MDS) Waivers" available on the NRCB website at www.nrcb.ca. I have also explained:

- The MDS requirement set out in section 3 of the Standards and Administration Regulation of AOPA. I have advised the owner(s) that section 3(6)(a) of the Standards and Administration Regulation allows this requirement to be waived by the owners of residences, if they agree in writing to grant a waiver;
- That my proposed development does not meet the required MDS to the owner's residence; and,
- That this waiver applies only to this application as described. An increase in livestock capacity, annual manure production, level of odour production, change to the site plan or change to a facility that would increase the MDS would require a new waiver.

Following is a summary of the proposed development:

- The current scope of my confined feeding operation (CFO), including the type, number, and category of livestock, if any, is:
  Dairy farm 200 milkcows
- My application for a new AOPA permit proposes the following changes to the existing livestock category, type and/or capacity at my CFO:
  Dairy farm 400 milkcows
- The proposed new CFO facility(ies), or changes to the existing CFO facilities, including manure storage, manure storage volume and any other pertinent details, if any, are (attach a site layout plan if available):
  extend dairy barn 144m x 23m
  build new milkparlour 66x24

I the applicant understand that the waiver is not valid unless ALL registered owners of the residence sign this document.

Permit Applicant: [redacted] Date: febr 25 2025
Signature

Residence owner(s) to initial: BKW BFW

Minimum Distance Separation (MDS) Waiver (declaration)

Residence owner(s) information

ALL Names on land title: Brad K Wohlgemuth
Beverly F Wohlgemuth

Legal land location of residence(s): 4/20/38/13/SE/6759KS/B

Telephone number(s)[1]: [redacted] Email address(es)[1]: [redacted]

Address(es)[1] and Postal code(s)[1]: [redacted]

[1] ***Please note that personal contact information is for NRCB use ONLY and not publicly released***

I am/we are the legal landowner(s) of a residence(s) located at the above noted legal land location/address:

- I/we have read the NRCB Fact Sheet "Minimum Distance Separation (MDS) Waivers";
- I/we have discussed this application with the applicant and understand its potential impacts to our residence(s);
- I/we understand that the application **does not** meet the MDS requirement to my/our residence(s), under the *Agricultural Operation Practices Act* (AOPA);
- **I/we understand that this waiver is not valid unless signed by ALL parties identified on the land title as owners;**
- **I/we are not obligated to waive the MDS requirement to our residence(s);**
- I/we understand that if I/we choose to waive the MDS requirement, I/we can revoke the waiver, by providing written notice to the NRCB approval officer, as set out in the "Minimum Distance Separation (MDS) Waivers" Fact Sheet; and
- I/we understand that this waiver is a public document.

Having considered my/our rights, I/we hereby waive the MDS requirement to my/our residence, with respect to

Application number RA24045.

[redacted] [redacted]

Signatures of **all** residence owner(s) on title

Brad K Wohlgemuth, Beverly F Wohlgemuth

Printed names of **all** residence owner(s) on title

Date: Feb 26, 2025

Tim unruh

Minimum Distance Separation (MDS) Waiver (declaration)

Applicant information NRCB application number: RA24045

Operator/operation name: Gert Schrijver Mars dairy

Address: [redacted] steffler Postal Code: [redacted]

Legal land location of confined feeding operation: NW 18 38 1a W4

I have requested the residence owner(s) named below to waive the required minimum distance separation (MDS) to their residence for the *Agricultural Operation Practices Act* (AOPA) permit application identified above. In making this request, I have provided the owner(s) with an opportunity to review my permit application and a copy of the Natural Resources Conservation Board (NRCB) Fact Sheet "Minimum Distance Separation (MDS) Waivers" available on the NRCB website at www.nrcb.ca. I have also explained:

- The MDS requirement set out in section 3 of the Standards and Administration Regulation of AOPA. I have advised the owner(s) that section 3(6)(a) of the Standards and Administration Regulation allows this requirement to be waived by the owners of residences, if they agree in writing to grant a waiver;
- That my proposed development does not meet the required MDS to the owner's residence; and,
- That this waiver applies only to this application as described. An increase in livestock capacity, annual manure production, level of odour production, change to the site plan or change to a facility that would increase the MDS would require a new waiver.

Following is a summary of the proposed development:

- The current scope of my confined feeding operation (CFO), including the type, number, and category of livestock, if any, is:
  Dairy Farm 200 milkcows
- My application for a new AOPA permit proposes the following changes to the existing livestock category, type and/or capacity at my CFO:
  Dairy Farm 400 milkcows including dry cows and heifers
- The proposed new CFO facility(ies), or changes to the existing CFO facilities, including manure storage, manure storage volume and any other pertinent details, if any, are (attach a site layout plan if available):
  extend dairy barn with 14ym x 23m 240 Free
  build new milkparlour ~~manure~~ 66 x 24

I the applicant understand that the waiver is not valid unless ALL registered owners of the residence sign this document.

Permit Applicant: [redacted] Date: feb 25 2025

Signature

Residence owner(s) to initial: TV RU

Tim Unruh

Minimum Distance Separation (MDS) Waiver (declaration)

Residence owner(s) information

ALL Names on land title: TIM + RITA UNRUH

Legal land location of residence(s): [redacted]

Telephone number(s)[1]: [redacted] Email address(es)[1]: [redacted]

Address(es)[1] and Postal code(s)[1]: [redacted]

[1] ***Please note that personal contact information is for NRCB use ONLY and not publicly released***

I am/we are the legal landowner(s) of a residence(s) located at the above noted legal land location/address:

- I/we have read the NRCB Fact Sheet "Minimum Distance Separation (MDS) Waivers";
- I/we have discussed this application with the applicant and understand its potential impacts to our residence(s);
- I/we understand that the application **does not** meet the MDS requirement to my/our residence(s), under the *Agricultural Operation Practices Act* (AOPA);
- **I/we understand that this waiver is not valid unless signed by ALL parties identified on the land title as owners;**
- **I/we are not obligated to waive the MDS requirement to our residence(s);**
- I/we understand that if I/we choose to waive the MDS requirement, I/we can revoke the waiver, by providing written notice to the NRCB approval officer, as set out in the "Minimum Distance Separation (MDS) Waivers" Fact Sheet; and
- I/we understand that this waiver is a public document.

Having considered my/our rights, I/we hereby waive the MDS requirement to my/our residence, with respect to

Application number RA24045.

[redacted]

Signatures of **all** residence owner(s) on title

TIM UNRUH RITA UNRUH

Printed names of **all** residence owner(s) on title

Date: MARCH 5/25

bing maps

Notes

lagoon 685m To waterbody
300m To wolgemuth

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)

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. Freestall barn
2. parlour including calf room, and 2 pits
3. Sand seperator (and 2 pits)

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 (m³)
1.	144	23		/	Storage in sand separation pits
2.	72 ~~66~~	24		/	Storage in pits (731 cubic metres + 487 cubic metres)
3.	15	15			Pits (2 pits each 81 cubic metres)
				TOTAL CAPACITY	

Parlour will include pits 65 m x 4.5 m x 2.5 m deep, and 65 m x 3 m x 2.5 m deep
Sand separator will include 2 pits, each 6 m x 4.5 m x 3 m deep

Concrete liner details

Scrape alleys or unslatted portions of barn floors (if applicable)	Concrete thickness: 6 inch	Method of sulphate protection: Type 50	
	Concrete strength: 30 mpa	Concrete reinforcement size and spacing: 10mm rebar every 12 inch	
In-barn manure pit floors	Concrete thickness: 6 inch	Method of sulphate protection: Type 50	
	Concrete strength: 35 mpA	Concrete reinforcement size and spacing: 10mm every 12 inch	
In-barn manure pit walls	Concrete thickness: 6 inch	Method of sulphate protection: Type 50	
	Concrete strength: 35 mpA	Horizontal reinforcement size and spacing: 10mm rebar ever 12 inch	Vertical reinforcement size and spacing: 10mm rebar every 12 inch

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

Bentonite

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

Bentonite

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

Additional information

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

NRCB USE ONLY

Liquid manure storage volume calculator attached: ☒ YES ☐ NO

Depth to water table: 4 m — Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: 20.12 m — 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

A condition will be added requiring applicant to provide proof that concrete liner meets NRCB technical guidelines

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)

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. 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.	167	55	3,5	2	3.1	3.1	4.1	20,076 cubic metres	Yes
2.									
							TOTAL CAPACITY		

Surface water control systems

Describe the run-on and runoff control system

dykes above grade
slop of 4-1

Sealing

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

Bentonite

NRCB USE ONLY
Requirements met: ☒ YES ☐ NO

Liner protection

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

Vegetation

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

1 meter liner for protection

NRCB USE ONLY
Requirements met: ☒ YES ☐ NO

Last updated February 26, 2021

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): As per Site and Soil Assessment (Envirowest, 2025)	
Soil texture	29.7-42.9 % sand	26.8-28.8 % silt	30.3-32.7 % clay
Atterberg limits	Plastic limit: 14.52	Liquid limit: 45.98	Plasticity index: 31.46
Hydraulic conductivity	Hydraulic conductivity (cm/s): 2.15 x 10^-8 (field HC, after safety factor)		
	Describe test standard used: Flexible Wall Permeameter (ASTM D5084-10)		

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: 4 m — Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: 20.12 m — 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.

Last updated February 26, 2021

Earthen Manure Storage Volume Calculator

Dimensions of EMS	Metric		English Units	
Capacity of EMS			**Capacity of EMS**	
Length*	167.0		547.90	Feet
Width*	55.0	m	180.45	Feet
Total Depth*	3.5	m	11.48	Feet
Water Depth	3.00	m	9.84	Feet
End Slope*	3	run:rise	3	run:rise
Side Slope*	3	run:rise	3	run:rise
Length of Bottom	146.0			
Width of Bottom	34.0			
Total Capacity @ top of Bank	**24,504**	**m^3**	**865,333**	**ft^3**
			5,390,014	**Imp. Gal.**

* Only cells in blue can be changed.

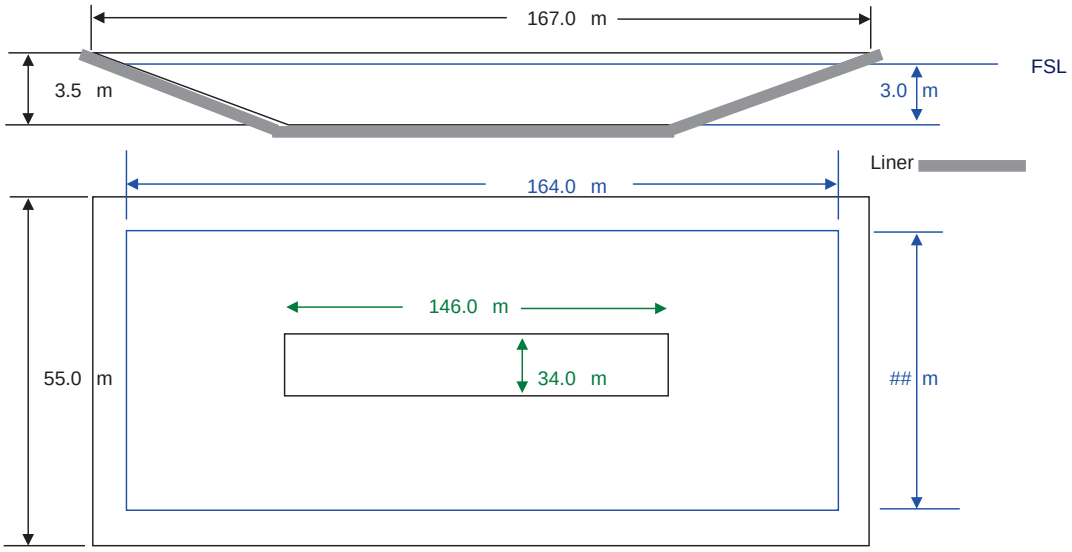
Volume of Liquid Manure at Specified Depth			Volume at Freeboard	
Length (liquid manure level)	164.0	m	538.06	Feet
Width (liquid manure level)	52.0	m	170.60	Feet
Depth	3.5	m	11.48	Feet
Water Depth	3.00	m	9.84	Feet
End Slope	3	run:rise	3	run:rise
Side Slope	3	run:rise	3	run:rise
Total Volume@ freeboard depth	**20,076**	**m^3**	**708,977**	**ft^3**
			4,416,101	**Imp. Gal.**
Surface Area of Liquid Manure	**8,528**	**m^2**	**91,795**	**ft^2**

Nine Month Storage Requirement	
12,780	**m^3**
451,321	**ft^3**
2,811,206	**Imp. Gal.**

<--- Use Sheet "1. Nine Month Storage Calc" to calculate this number

Twelve Month Storage Requirement	
17,040	**m^3**
601,762	**ft^3**
3,748,275	**Imp. Gal.**

<--- Use Sheet "1. Nine Month Storage Calc" to calculate this number



NTS - Not Drawn To Scale

NRCB USE ONLY **LIQUID MANURE STORAGE VOLUME CALCULATOR (if applicable)**	
Facility 1	
Name / description New EMS 2025	Capacity 20,076 cubic metres
Facility 2	
Name / description	Capacity
Facility 3	
Name / description	Capacity
Facility 4	
Name / description	Capacity
TOTAL CAPACITY	20, 076 cubic metres
REQUIRED 9 MONTH STORAGE CAPACITY	12,780 cubic metres
MEETS THE REQUIREMENTS FOR A MINIMUM OF 9 MONTHS STORAGE	☒ YES ☐ NO

Additional storage available in barn pits

Part 2 — Technical Requirements

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

NRCB USE ONLY

ENVIRONMENTAL RISK SCREENING INFORMATION

ERST for **proposed** facilities

Facility	Groundwater score	Surface water score	File number
New EMS 2025	Low	Low	RA24045
Sand separator			
New freestall barn 2025			
Calf barn			

ERST for **existing** facilities

Facility	Groundwater score	Surface water score	File number
Existing EMSs (2 cells*)	Low	Low	RA24045
Young stock pens	Low	Low	RA24045
Freestall barn	Low	Low	RA24045
Highest risk facilities scored; all others presumed lower risk			

ERST related comments:

* existing EMS (2 cells) is proposed to be decommissioned

Part 2 — Technical Requirements

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

NRCB USE ONLY

WATER WELL AND SURFACE WATER INFORMATION

Well IDs: 296769 2063037 (> 100 m from proposed CFO Facilities)

Surface water related concerns from directly affected parties or referral agencies: ☐ YES ☒ NO

Groundwater related concerns from directly affected parties or referral agencies: ☒ YES ☐ NO

Water wells ☐ N/A

If applicable, exemption for 100 m distance requirements applied: ☒ YES ☐ NO Condition required: ☐ YES ☒ NO

Surface water ☒ N/A

If applicable, exemption for 30 m distance requirements applied: ☐ YES ☐ NO Condition required: ☐ YES ☐ NO

Water Well Exemption Screening Tool ☐ N/A

Water Well ID	Preliminary Screening Score	Secondary Screening Score	Facility
296769	9; exemption more likely, do not complete next section		EMS/Freestall/Sand separation

Groundwater or surface water related comments:

Part 2 — Technical Requirements

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

NRCB USE ONLY

ALL SIGNATURES IN FILE ☒ YES ☐ NO

DATES OF APPROVAL OFFICER SITE VISITS

April 15, 2025	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: April 24, 2025

Municipality: County of Stettler

☒ letter sent ☒ response received ☒ written/email ☐ verbal ☐ no comments received

Alberta Health Services: ☒ N/A

☐ letter sent ☐ response received ☐ written/email ☐ verbal ☐ no comments received

Alberta Environment and Parks: ☐ N/A

☒ letter sent ☐ response received ☐ written/email ☐ verbal ☒ no comments received

Alberta Transportation: ☐ N/A

☒ letter sent ☒ response received ☒ written/email ☐ verbal ☐ no comments received

Alberta Regulatory Services: ☐ N/A

☒ letter sent ☒ response received ☒ written/email ☐ verbal ☐ no comments received

Other: Ember Resources Inc, Apex Utilities ☐ N/A

☒ letter sent ☐ response received ☐ written/email ☐ verbal ☒ no comments received

Other: _____ ☒ N/A

☐ letter sent ☐ response received ☐ written/email ☐ verbal ☐ no comments received

ENVIROWEST
ENGINEERING

SITE AND SOIL ASSESSMENT

Proposed Earthen Manure Storage Lagoon Expansion
NW¼-18-038-19-W4M

County of Stettler No. 6, Alberta

Site and Soil Assessment
Proposed Earthen Manure Storage Lagoon Expansion
NW¼-18-038-19-W4M
County of Stettler No. 6, Alberta

Prepared For: Gert Schrijver
Mars Dairy Ltd.

Delivered via Email: gert.schrijver@xplornet.ca

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

Report Date: March 3, 2025

Project Number: 2412-42124

Private and Confidential

Table of Contents

List of Tables

Appendices

1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Gert Schrijver of Mars Dairy Ltd. to conduct a Site and Soil Assessment for the proposed construction of an earthen manure storage (EMS) lagoon expansion.

The assessment was completed to determine conditions beneath the construction area and assess soil properties for construction of the expansion. The operation, herein referred to as “the Site,” is located on NW-18-038-19-W4M in County of Stettler No. 6.

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 December 9, 2024. The boreholes were completed in the area north, northeast and south of the expansion. The borehole locations are shown on Figure 1.0 (attached).

2.0 Assessment Results

The yard site is generally flat, sloping to the north, which transitions to gently rolling topography. The Site is currently an active dairy operation with a cultivated field to the north.

Three investigative boreholes were drilled using a truck-mounted rotary auger and completed to a maximum depth of 9.0 mbgs on December 9, 2024. The boreholes were drilled in the area north, northeast and south of the expansion and are shown on Figure 1.0 (attached).

Potential liner construction material (noted in borehole logs as sandy clay) was typically found beneath topsoil and intermittent clay/sand. Saturated sand seams were noted at 4.5 mbgs (as measured at 24BH03) and 2.0 mbgs (as measured at 24BH01). Bedrock was not encountered to a maximum depth of 9.0 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 all three boreholes (24BH01, 0.75-3.0mbgs; 24BH02, 1.5-3.0mbgs; 24BH03, 0-4.5 mbgs). Boreholes 24BH01 and 24BH02 are approximately 2.0 meters below borehole 24BH03.

Table 1: Soil Properties Results

Parameter	24BH01-01	24BH01-02	24BH01-03	24BH01-04	24BH01-05	24BH03-01	Composite
Sample Depth (mbgs)	**1.0**	3.5	**4.25**	5.5	7.0	**0.75**	**0-4.5**
Particle Size (%sand/gravel)	**42.9**	11.3	**29.7**	9.0	10.7	**38.5**	**39.4**
Particle Size (%silt)	**26.8**	43.6	**39.4**	56.4	50.7	**28.8**	**60.4**
Particle Size (%clay)	**30.3**	45.1	**30.9**	34.6	38.6	**32.7**	
Texture Class	**Clay Loam**	Silty Clay	**Clay Loam**	Silty Clay Loam	Silty Clay Loam	**Clay Loam**	**Clay Loam**
Plastic Limit (%)	-	-	-	-	-	-	**14.52**
Liquid Limit (%)	-	-	-	-	-	-	**45.98**
Plasticity Index (%)	-	-	-	-	-	-	**31.46**
Field Hydraulic Conductivity (cm/sec)	-	-	-	-	-	-	**2.148×10^{-8}**
Natural Moisture (%)	-	-	-	-	-	-	**16.5**

***Bold and Shaded – Suspected compacted liner material**

The soils were identified as clay loam. The suspected compacted liner material had an average clay content of 31.3%, ranging from 30.3 – 32.7%. The composite soils were determined to be clay loam. The hydraulic conductivity was determined to be 2.148×10^{-9} cm/sec at 99% compaction. The maximum dry density was found to be 1,849 kg/m^3 with an optimum moisture content of 13.8%. Natural moisture of the sample was found to be 16.5%.

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 2.148×10^{-8} cm/sec.

A saturated strata was noted in borehole 24BH01 at 2.0 mbgs and borehole 24BH03 at 4.5 mbgs. It should be noted that the current depth of lagoon is unknown.

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 1.5 meters. The proposed liquid manure storage expansion has already been constructed, as shown on Figure 1.0.

Minimum Required Liner Depth for EMS:

$$\frac{1\text{ m}}{1 \times 10^{-7}\text{ cm/sec}} = \frac{\mathbf{X}\text{ m}}{2.15 \times 10^{-8}\text{ cm/sec}}$$

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

A compacted liner thickness of 0.22 m is required, however a **1.0 m** liner is recommended.

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. At this time the expansion was constructed without an engineered liner. Based on the site assessment it is required that the lagoon be completed with a compacted clay liner using the material as outlined above.

The depth of the current lagoon was not measured at the time of the assessment. Based on the information obtained, the bottom of the liner must be 1.0 meters above the water table. It should be noted that it could not be ascertained if the coarse-grained saturated stratuma was hydrated with a naturally occurring groundwater table or from the current lagoon expansion. As the lagoon has been excavated prior to the assessment the conditions within the immediate footprint of the lagoon are unknown.

A previous groundwater assessment was completed by Envirowest Engineering Inc. (Envirowest, 2001) and measured relative depth to groundwater. As measured from grade at the east portion of the original lagoon, groundwater was measured in 2001 and ranged from 4.0 and 5.3 mbgs. These values cannot be utilized in the current design as they are not current, however they are relative to the saturated strata that was noted during field assessment. This would help indicate that the saturated strata is a naturally occurring water table.

5.0 Design and Construction Considerations

5.1 Earthen Lined Lagoon

Earthen Lagoon Storage Sizing

The liquid EMS facility expansion was constructed prior to the Site and Soil Assessment. The manure storage lagoon sizing was not considered during this assessment as initial construction was complete. However, the following construction considerations should be included during liner installation:

- The lagoon should maintain an inside end and side wall slope of 3:1 (run/rise)
- The outside dyke walls should be completed to a 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. This is conservatively determined to be at 4.0 mbgs as measured from borehole 24BH03
- Construction of the clay liner 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 Gert Schrijver of Mars Dairy Ltd. 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,

110373

March 3, 2025

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

Reviewed by:
Leah Predy, P.Ag.
Envirowest Engineering

PERMIT TO PRACTICE
2206165 ALBERTA LTD.
RM SIGNATURE: _____
RM APEGA ID #: 110373
DATE: March 3, 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 5 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 five 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:

Borehole Locations
Site and Soil Assessment
Proposed Earthen Manure Storage Lagoon Expansion
NW¼-18-038-19-W4M
County of Stettler No. 6, Alberta

Project No: 2412-42124	**Date:** Febaruary 28, 2025	**Figure No.:** 1.0
Scale: 1:2700	**Prepared By:** E. Low	
Image Source: Google Earth Pro (February 22, 2024)		

Appendix B

Borehole Logs

ENVIROWEST ENGINEERING

LOG OF BORING 24BH01

Site and Soil Assessment
NW-18-38-19-W4M
Stettler County No. 6, Alberta

Project Number: 2412-42124

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : Decmber 9, 2024
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 – 0.5				CLAY/SAND, damp, loose, reddish brown	
0.5 – 1.8				SANDY CLAY, firm, damp, brown/reddish brown	
1.8 – 3.0				SAND, saturated, brown	
3.0 – 4.0				SILTY CLAY, some sand, brown, damp	
4.0 – 6.3				SANDY CLAY, firm, reddish brown, damp	
6.3 – 9.0				SILTY CLAY LOAM, hard, damp, grey	

02-26-2025 Y:\Operations\Client Data\42124 Schrijver\2024 Lagoon Expansion\24BH01.bor

ENVIROWEST ENGINEERING

LOG OF BORING 24BH02

Site and Soil Assessment
NW-18-38-19-W4M
Stettler County No. 6, Alberta

Project Number: 2412-42124

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : Decmber 9, 2024
Logged By: : Emily Low P.Eng.
NOTES: : Elevation approximately 2.0 m below grade

Well:
Elev.:

Depth in Meters	Gastech Reading (ppm) 0 100 200 300 400 500	VOC Reading	GRAPHIC	DESCRIPTION	Water Level
0.0				CLAY/SAND, damp, loose, reddish brown	
1.3				SANDY CLAY, firm, damp, brown/reddish brown	
3.0				SILTY CLAY, some sand, brown, damp	
4.0				SANDY CLAY, firm, reddish brown, damp	
6.0					

02-26-2025 Y:\Operations\Client Data\42124 Schrijver\2024 Lagoon Expansion\24BH02.boi

ENVIROWEST ENGINEERING

LOG OF BORING 24BH03

Site and Soil Assessment
NW-18-38-19-W4M
Stettler County No. 6, Alberta

Project Number: 2412-42124

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : Decmber 9, 2024
Logged By: : Emily Low P.Eng.
NOTES: : Elevation approximately 2.0 m below grade

Well:
Elev.:

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

02-26-2025 Y:\Operations\Client Data\42124 Schrijver\2024 Lagoon Expansion\24BH03.boi

Appendix C

Certificate of Analysis

Laboratory Proctor — Sample No.: W641

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail

Location: Mars Dairy **Natural Moisture:** 16.5 %

Description: Clay and silt, sandy

Specfication: ASTM D 698 - Method A

Comments:

Proctor Results:

Test Number	1	2	3	4	5
Dry Density (Kg/m^3)	**1753**	**1807**	**1846**	**1805**	**#DIV/0!**
Moisture Content (%)	**10.2**	**11.7**	**14.4**	**16.0**	**#DIV/0!**

Oversize Correction (Calculated using assumed Specific Gravity of 2.40)

Oversize (%)	5	10	15	20	25
Density	**1875**	**1901**	**1927**	**1953**	**1979**

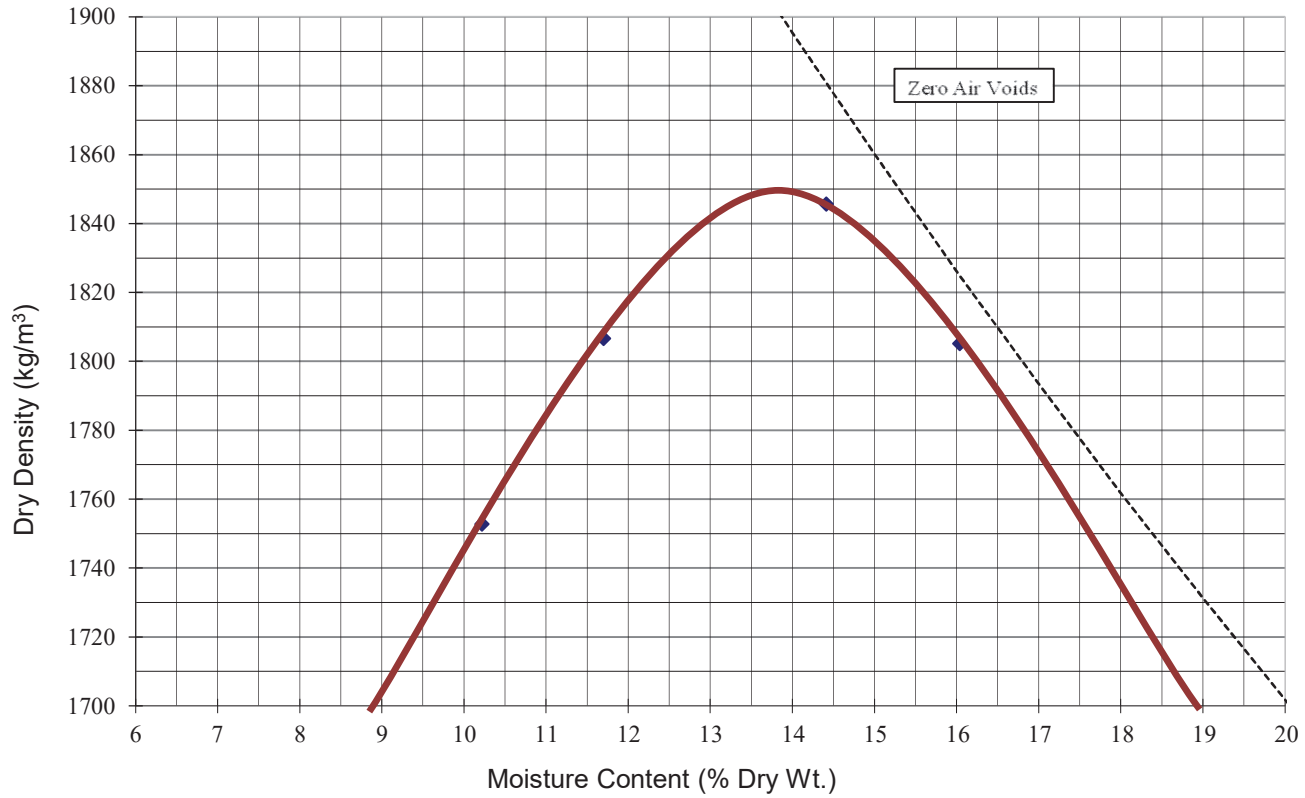
Optimum Results:

Moisture Content = **13.8** %

Dry Density = **1849** Kg/m^3

Corrected Density = **1850** Kg/m^3

Oversize Material = **0.2** %



Union Street Geotechnical

CLIENT: Envirowest Engineering **FILE No.:** USG2024

PROJECT: 2024 Materials Testing **DATE:** 17-Dec-24

LOCATION: Red Deer, Alberta **TECH:** D.J.W.

Project Name:	2024 Materials Testing	Depth:	
Project Number:	USG2024	Testing Company:	Union Street Geo.
Client:	Envirowest Engineering	Field Technician:	E.L.
Testhole:		Sample Date:	9 Dec., 2025
Location:	Mars Dairy	Lab Technician:	B.B.
Sample Number:	W641	Date Tested:	22 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

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:	2024 Materials Testing	Depth:	
Project Number:	USG2024	Testing Company:	Union Street Geo.
Client:	Envirowest Engineering	Field Technician:	E.L.
Testhole:		Sample Date:	9 Dec., 2025
Location:	Mars Dairy	Lab Technician:	BB
Sample Number:	W641	Date Tested:	22 Jan., 2025

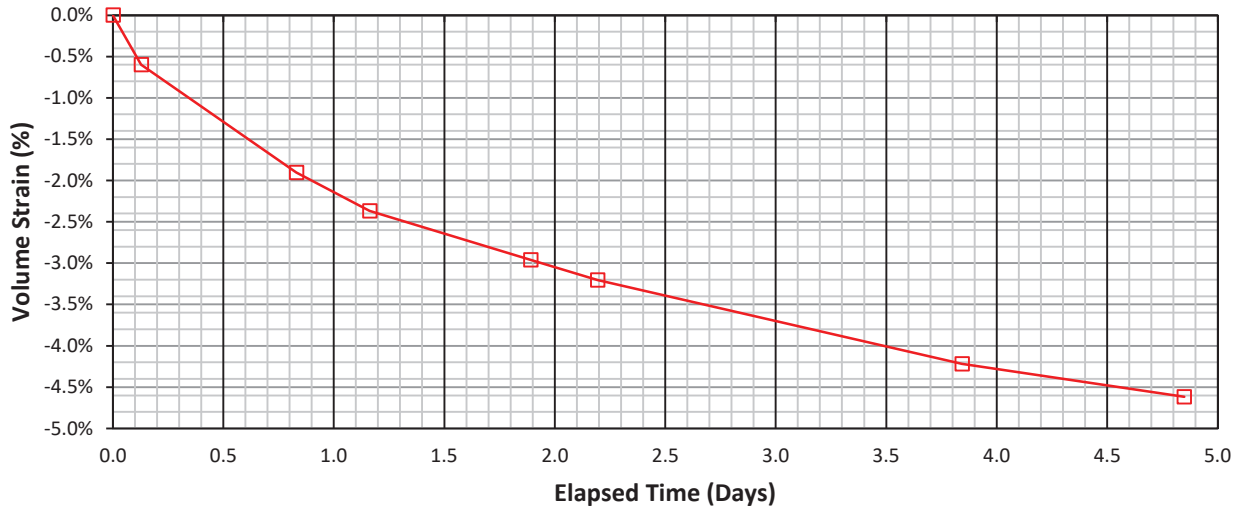
Flexible Wall Permeameter (ASTM D5084-10)

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

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 (^{o}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:	2024 Materials Testing	Depth:	
Project Number:	USG2024	Testing Company:	Union Street Geo.
Client:	Envirowest	Field Technician:	E.L.
Testhole:		Sample Date:	9 Dec., 2025
Location:	Mars Dairy	Lab Technician:	B.B.
Sample Number:	W641	Date Tested:	22 Jan., 2025

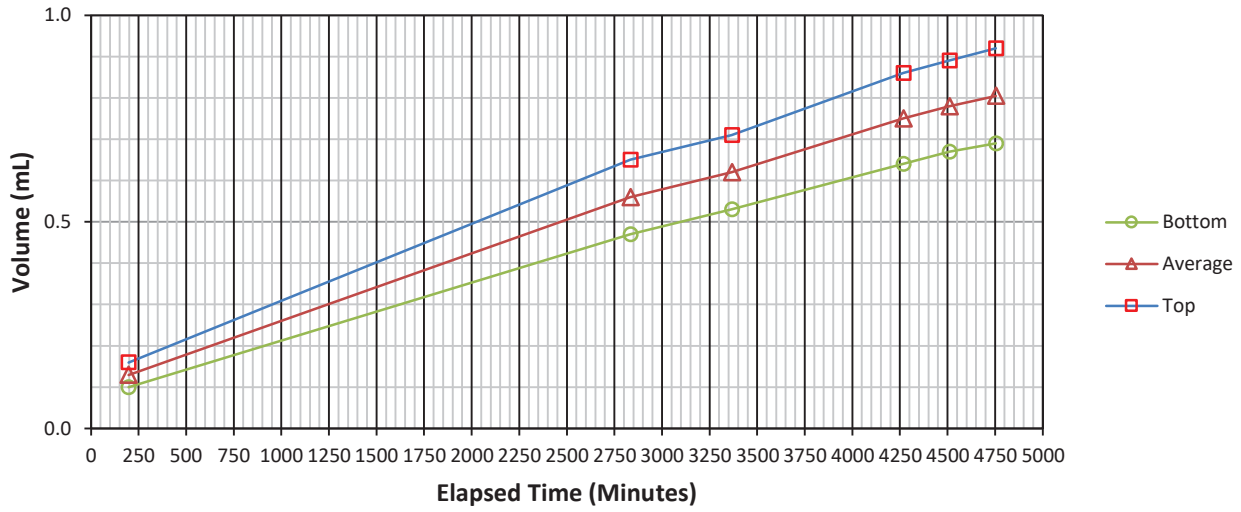
Flexible Wall Permeameter (ASTM D5084-10)

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

Permeation Data

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:	2024 Materials Testing	Depth:	
Project Number:	USG2024	Testing Company:	Union Street Geo.
Client:	Envirowest Engineering	Field Technician:	E.L.
Testhole:		Sample Date:	9 Dec., 2025
Location:	Mars Dairy	Lab Technician:	B.B.
Sample Number:	W641	Date Tested:	22 Jan., 2025

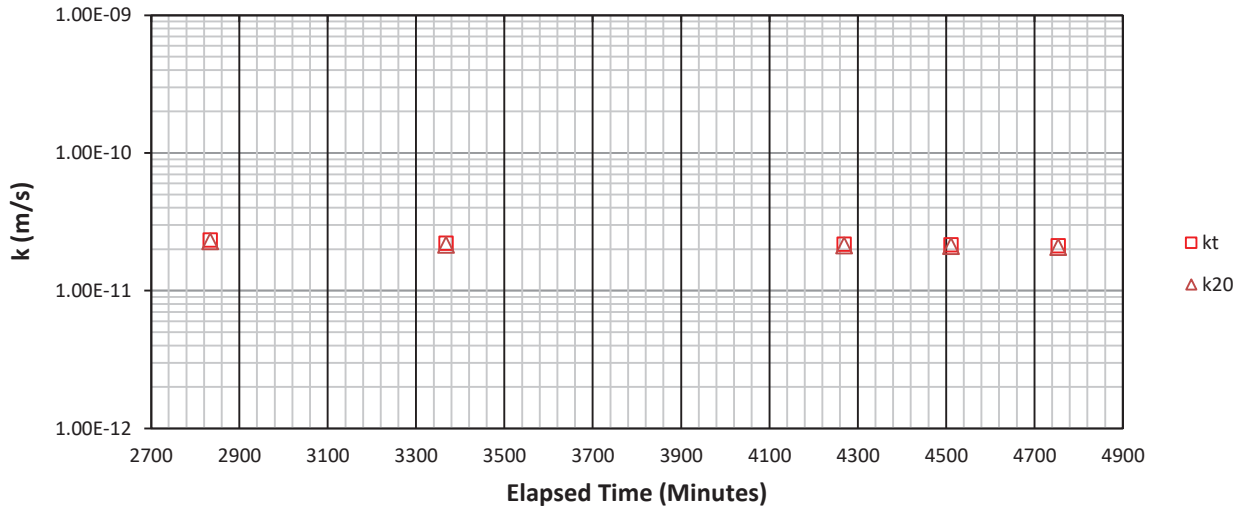
Flexible Wall Permeameter (ASTM D5084-10)

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



Laboratory Hydrometer — Sample No.: W642

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail / Bag

Location: Mars Dairy - Sample 01-01 **Specification:** ASTM D 422

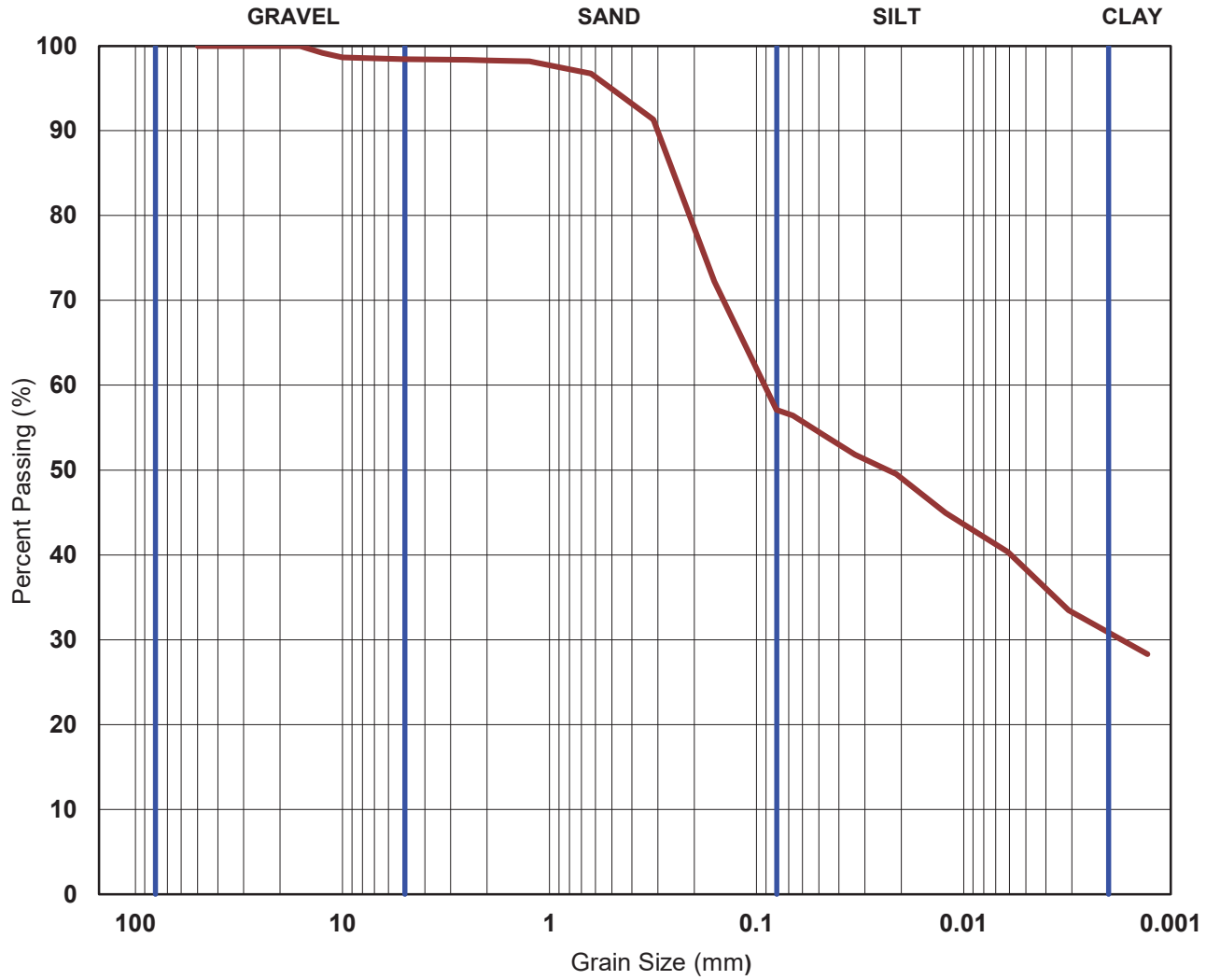
Description: Sand, clayey, silty, trace gravel

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **1.6** Sand = **41.3** Silt = **26.8** Clay = **30.3**



Union Street Geotechnical

CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	2024 Materials Testing	**DATE:**	17-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W643

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail / Bag

Location: Mars Dairy - Sample 01-02 **Specification:** ASTM D 422

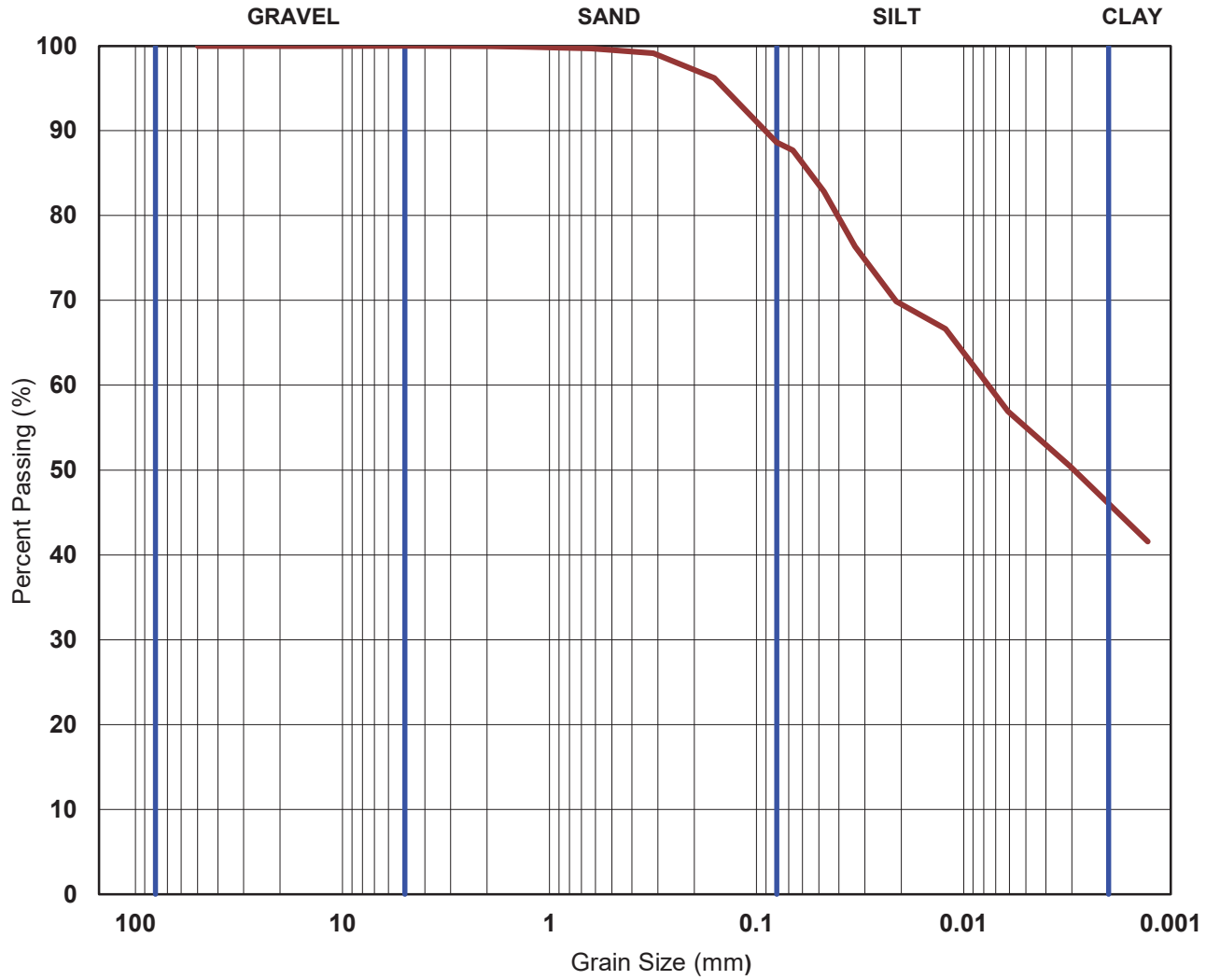
Description: Silt and clay, some sand

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.0** Sand = **11.3** Silt = **43.6** Clay = **45.1**



Union Street Geotechnical

CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	2024 Materials Testing	**DATE:**	17-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W644

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail / Bag

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

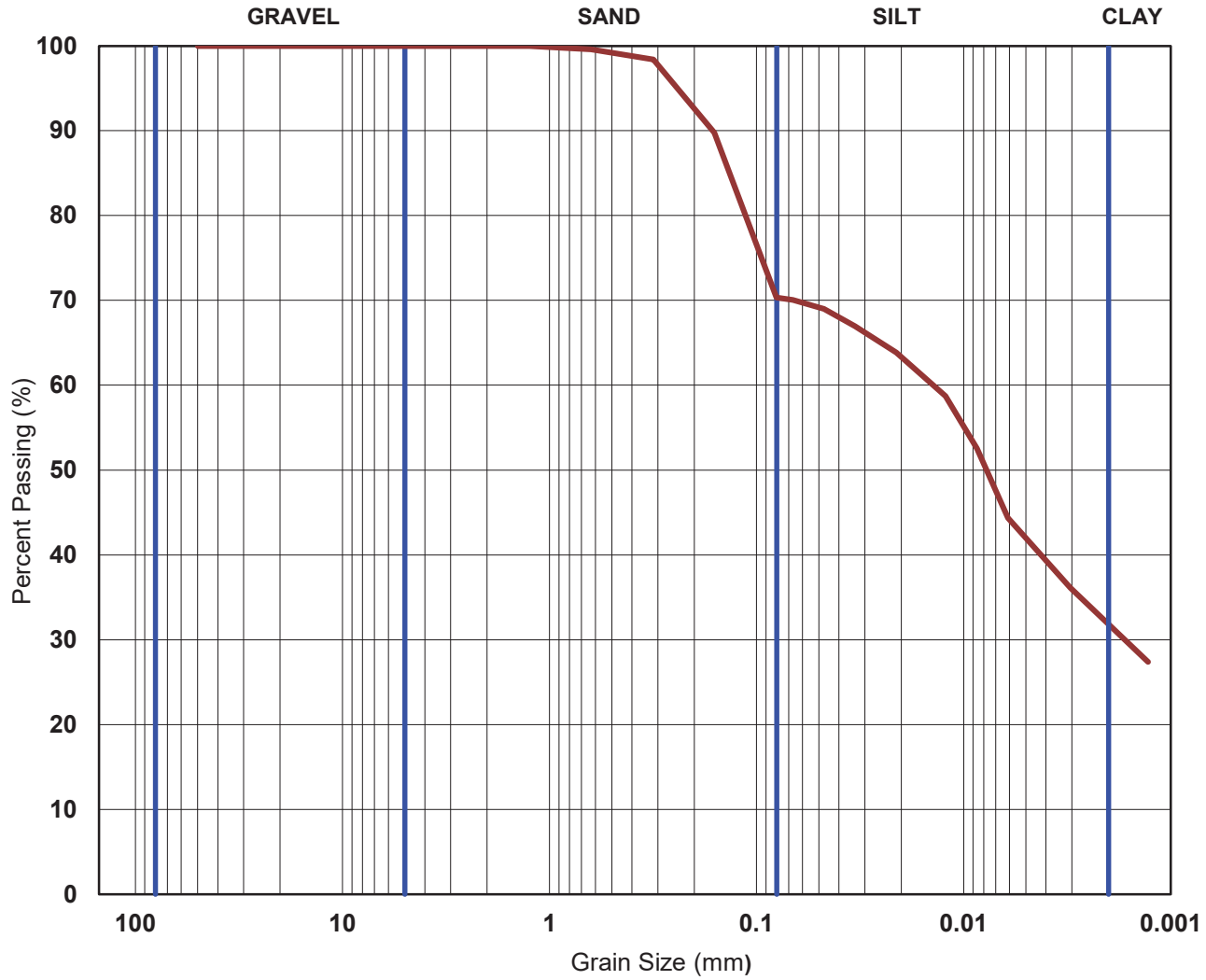
Description: Silt, clayey, sandy

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.0** Sand = **29.7** Silt = **39.4** Clay = **30.9**



Union Street Geotechnical

CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	2024 Materials Testing	**DATE:**	17-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W645

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail / Bag

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

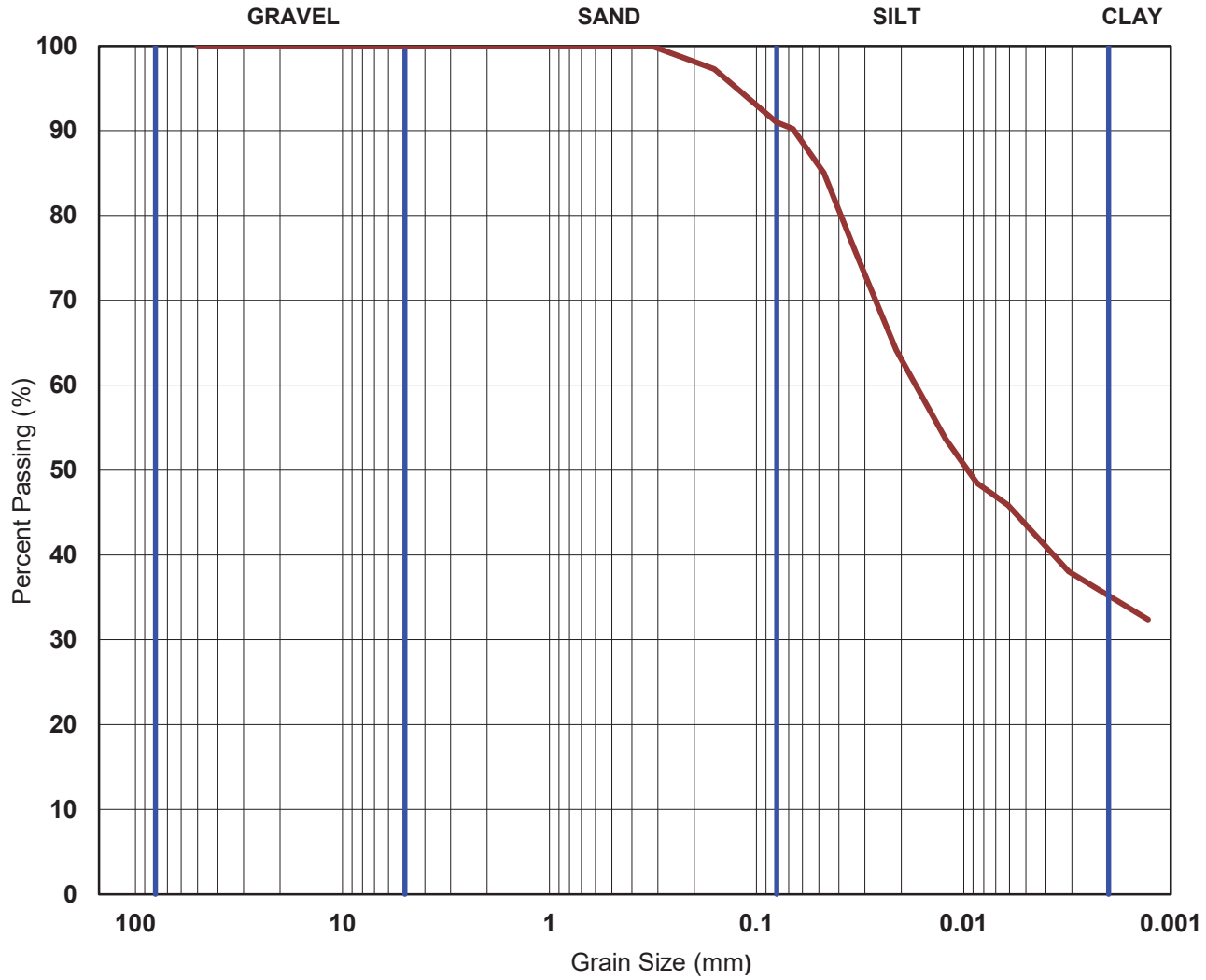
Description: Silt, clayey, trace sand

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.0** Sand = **9.0** Silt = **56.4** Clay = **34.6**



Union Street Geotechnical

CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	2024 Materials Testing	**DATE:**	19-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W646

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail / Bag

Location: Mars Dairy, Sample 01-05 **Specification:** ASTM D 422

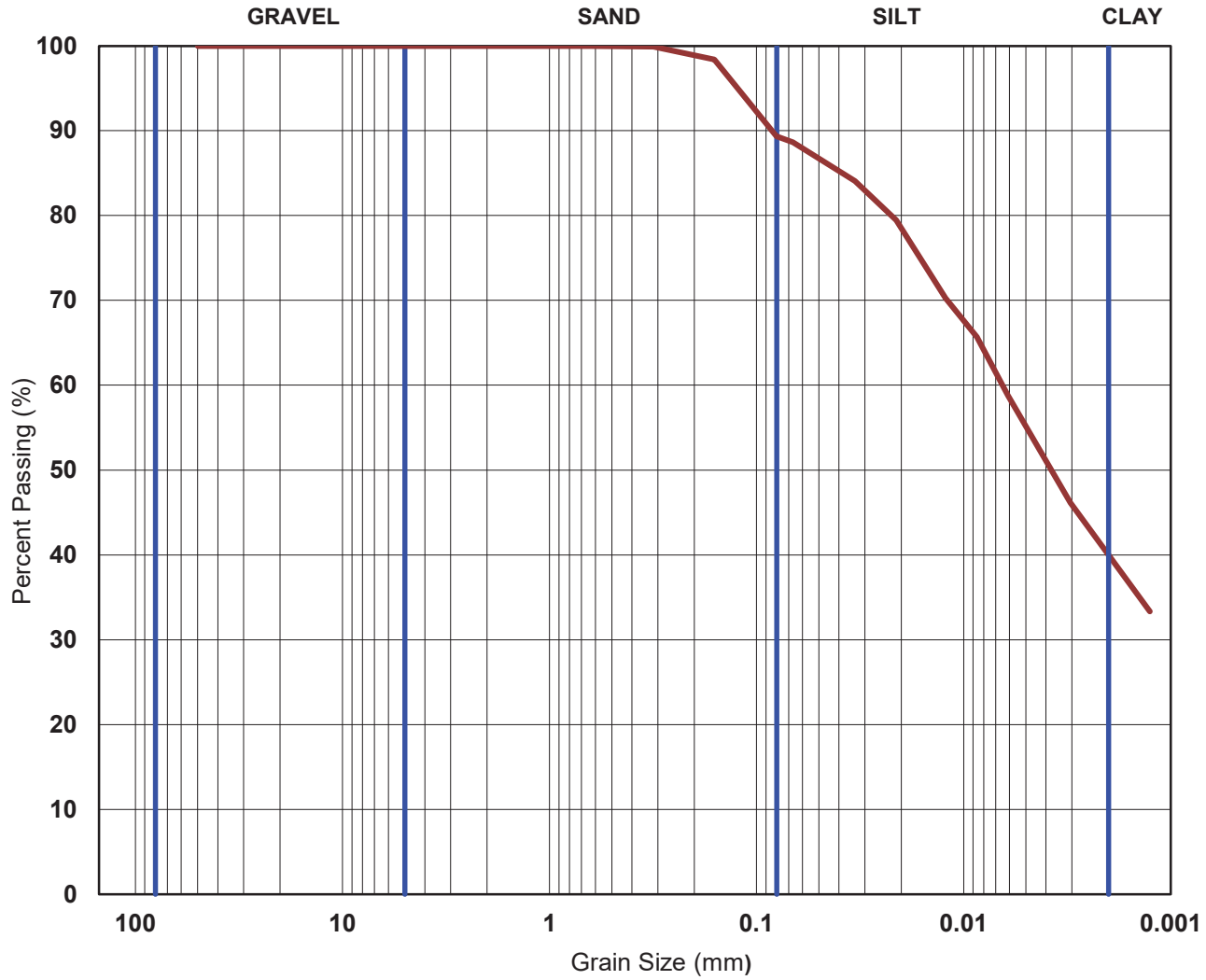
Description: Silt and clay, some sand

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.0** Sand = **10.7** Silt = **50.7** Clay = **38.6**



Union Street Geotechnical

CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	2024 Materials Testing	**DATE:**	19-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

Laboratory Hydrometer — Sample No.: W647

Sample Information

Date: 09-Dec-24 **By:** E.L. **of:** Envirowest Eng. **Type:** Pail / Bag

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

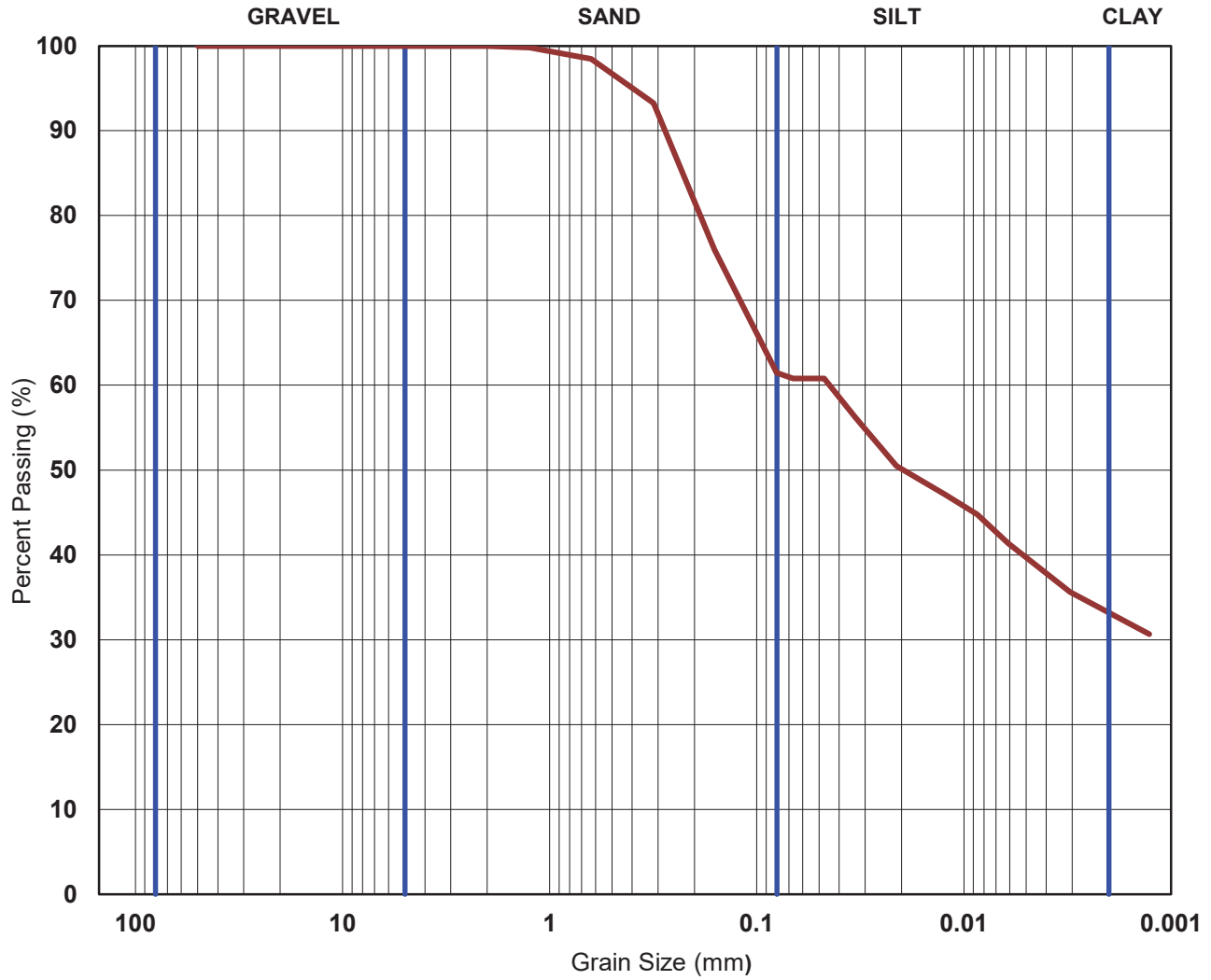
Description: Sand, clayey, silty

Specifications: Laboratory Specifications as per ASTM D 422.

Comments:

Sieve Results:

By Type (%): Gravel = **0.0** Sand = **38.5** Silt = **28.8** Clay = **32.7**



Union Street Geotechnical

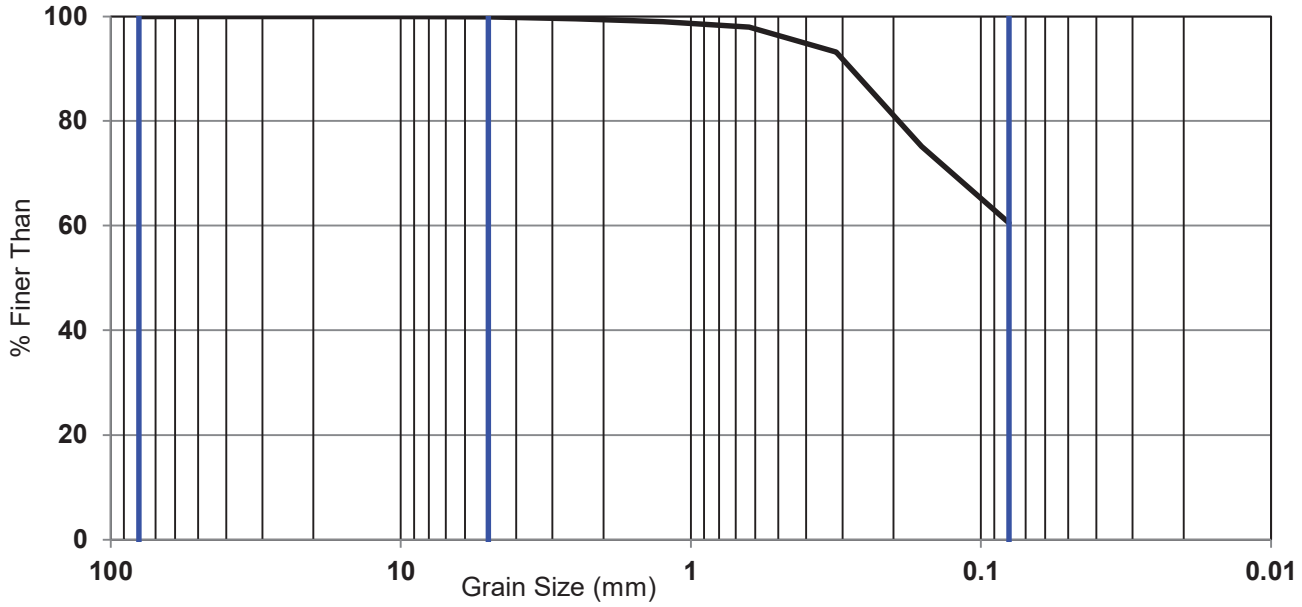
CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	2024 Materials Testing	**DATE:**	19-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

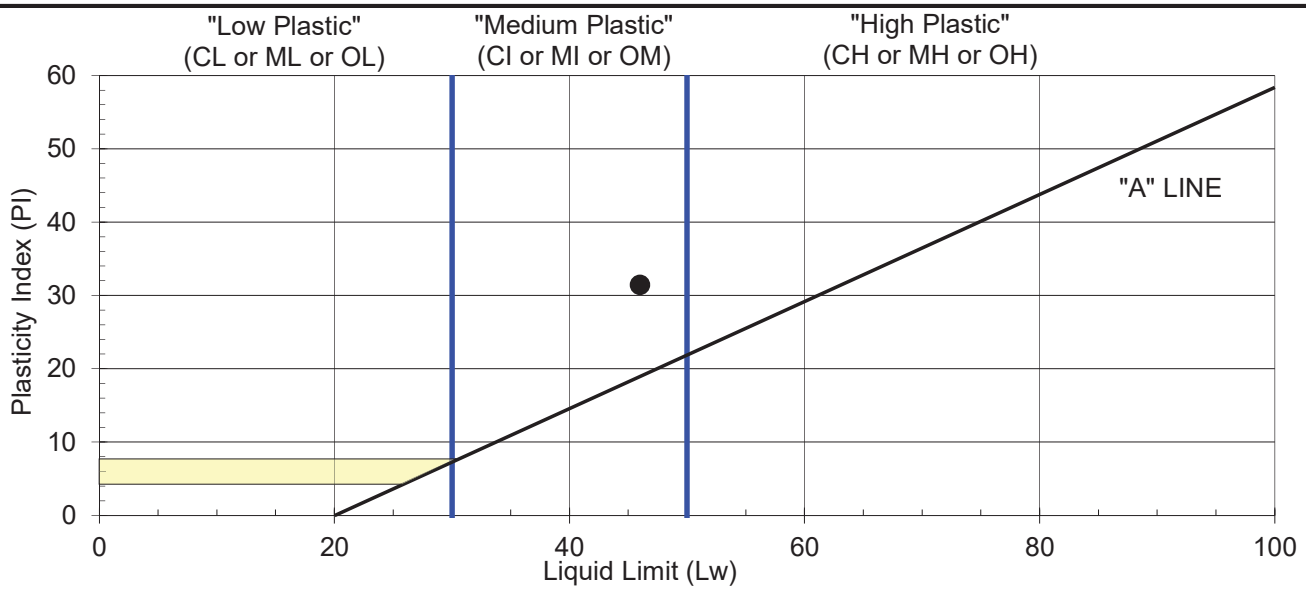
Lab Unified Soils Classification — Sample No.: W648

Sample Information

Classification:	**Particle Size:**	Gravel =	0.1%	**Borehole No.:**	-
Sand, silty, clayey		Sand =	39.4%	**Sample No.:**	-
		Silt & Clay =	60.5%	**Depth (m):**	-

Particle Size Analysis - Washed Sieve





Plastic Limit:	14.52%	**Group Index:**	15.6
Liquid Limit:	45.98%	**Soil Type:**	Inorganic
Plasticity Index:	31.46%	**Classification:**	CI : Sandy Medium Plastic Clay

Union Street Geotechnical

CLIENT:	Envirowest Engineering	**FILE No.:**	USG2024
PROJECT:	Geotech. Inv.	**DATE:**	16-Dec-24
LOCATION:	Red Deer, Alberta	**TECH:**	G.S.

ENVIROWEST ENGINEERING

P.O. Box 4248
Ponoka, AB.
T4J 1R6
Telephone: 403-783-8229
Facsimile: 403-783-5222

April 1, 2025

Gert Schrijver
Mars Dairy Ltd.
Delivered via Email: gert.schrijver@xplornet.car

Re: Site and Soil Assessment – Additional Information
Proposed Earthen Manure Storage Lagoon Expansion
NW¼-18-038-19-W4M
County of Stettler No. 6, Alberta

Dear Gert,

As per your request to provide additional information in regard to the above noted Site and Soil Assessment, the following information is supplemental to the original assessment.

Assessment Results

Saturated sand seams were noted at 4.5 mbgs (as measured at 24BH03) and 2.0 mbgs (as measured at 24BH01). It is noted that 24BH03 is approximately 2.0 meters above 24BH01, the water table is conservatively measured at 4.0 mbgs (as measured at 24BH03 which is equivalent to 2.0 mbgs as measured at 24BH01).

Design and Construction Considerations - Earthen Lined Lagoon

Earthen Lagoon Storage Sizing

The manure storage lagoon is recommended to have the following specifications:

1. To provide the required capacity the new EMS should be 167 m in length x 55 m in width. The overall depth has been designed as 3.5 m. The storage capacity of the EMS will be 20,076 cubic metres. The sizing is based on an inside end and side wall slope of 3:1 (run/rise)
2. The overall depth of 3.5 m will be achieved through a below grade depth of 2.0 m as measured from borehole 24BH03.The bottom of the liner will measure 3.0 meters below grade.
3. The above-grade dykes will measure 1.5 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

4. 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

Closure

Envirowest Engineering is pleased to submit the report to Gert Schrijver of Mars Dairy. 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,

Emily J. Low, P.Eng
Envirowest Engineering

PERMIT TO PRACTICE
2206165 ALBERTA LTD.
RM SIGNATURE: _____
RM APEGA ID #: 110373
DATE: April 1, 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

Attachment: Figure 1.0 – Proposed Design

ENVIROWEST ENGINEERING

Title:

Borehole Locations
Site and Soil Assessment
Proposed Earthen Manure Storage Lagoon Expansion
NW¼-18-038-19-W4M
County of Stettler No. 6, Alberta

Project No: 2412-42124	**Date:** April 1, 2025	**Figure No.:** 1.0
Scale: 1:2700	**Prepared By:** E. Low	
Image Source: Google Earth Pro (February 22, 2024)		