


Application for Amendment

Application under the *Agricultural Operation Practices Act* to amend a permit for a confined feeding operation, manure collection area and/or manure storage facility(ies). ("Permit" means an NRCB-issued or grandfathered approval, registration, or authorization, including a grandfathered municipal development permit.)

NRCB USE ONLY		NRCB Application number	Date Stamp
<input type="checkbox"/> Approval	<input type="checkbox"/> Registration	<input checked="" type="checkbox"/> Authorization	NRCB APPLICATION 14 MAR 2025 RECEIVED
RA23025A			

CONTACT INFORMATION

Applicant Information			
Name: <u>Jake Vermeer</u>		Corporate Name (if applicable) <u>Vermeer's Dairy Ltd</u>	
Address: (Street/P.O. Box) <u>RR1 Ohaon</u>			
City/Town: <u>Ohaon</u>	Province: <u>AB</u>	Postal Code: <u>T0B 3P0</u>	
Agent consent (if applicable)			
I, <u>Jake Vermeer</u> , hereby give consent for <u>Vermeer's Dairy Ltd</u> (name of applicant) (name of agent and company)			
to act on my behalf or as my agent for this application.			
Signed this <u>11</u> day of <u>March</u> , 20 <u>25</u> .		 Signature of Applicant	

LOCATION OF DEVELOPMENT

Which permit do you wish to amend? (List permit number and issuing agency.)	<u>RA 23025</u>
Legal Land Description(s)	<u>SE 04 45 19 W4</u> (Qtr-Sec-Twp-Rg-W Mer)


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 herein and acknowledge that the information provided in this application is true to the best of my knowledge.

March 11, 2025
Date of signing
Vermeer's Dairy Ltd.
Corporate name (if applicable)


Signature
Jake Vermeer
Print name

Application for Amendment – contd.

AMENDMENT INFORMATION REQUIREMENTS

Instructions:

For each part of your permit that you would like amended, please detail what change you would like made and why, and how your proposed change will meet the AOPA requirements. You may attach additional pages to this form to provide this information.

Please note that an approval officer may require a page (or pages) of the Part 2 application forms to be completed as part of this application for amendment, depending on what changes are proposed.

The initial "Heifer Barn" permit was for a direct expansion
we have since concluded that a manure collection area
separating the expansion would better suit our needs.

* New expansion of heifer barn will be 15.24m West and
7.62 m North of existing heifer barn
↳ this new expansion will be 106.68m long and 22
wide.

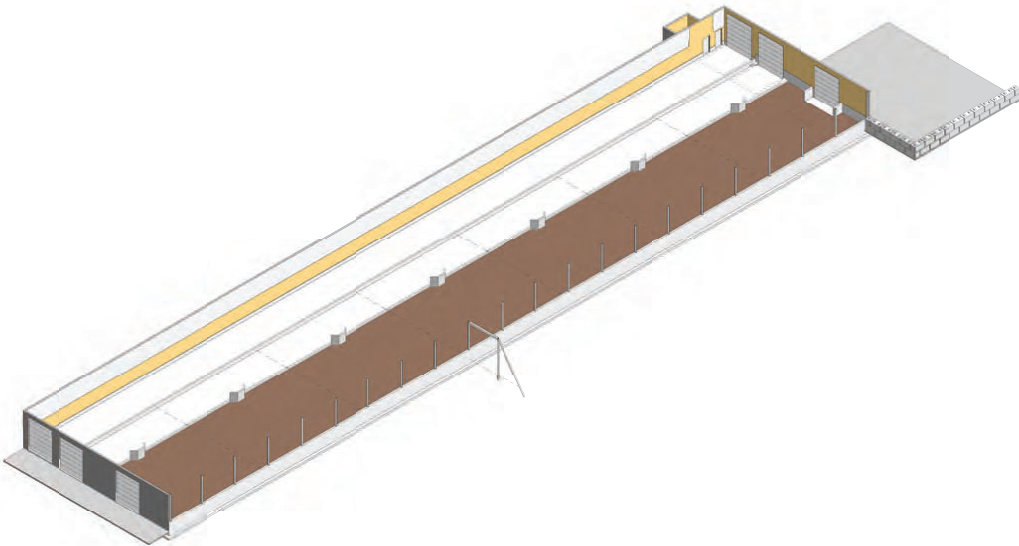
* New expansion will have the same concrete feed alley, conc
manure alley, BUT will have a clay lined pack area
106.68m by 12.19m

Clay should be on file as lagoon is NRCB approved
as a clay liner.

Approval officer's comments:

The application is to amend the previously issued authorization by relocating and changing the dimensions of the permitted, but not yet constructed, heifer shed addition. The shed will be located 15.2 m west and 7.6 m north from the previous permitted location. No changes to the proposed liner and naturally occurring protective layer

Vermeer Dairy



Camrose County, Alberta

Heifer Barn

SYMBOL LEGEND			
CONSTRUCTION REFERENCE		CONSTRUCTION TAG	
FINISH REFERENCE		EXTERIOR FINISH TAG	
GRID NUMBER		GRID BUBBLE	
DOOR REFERENCE		DOOR TAG	
ROOM NUMBER		ROOM TAG	
DESCRIPTION		ELEVATION DATUM	
ELEVATION		BUILDING SECTION CALLOUT	
SHEET NUMBER		ELEVATION CALLOUT	
DRAWING NUMBER		ELEVATION TAG	
WINDOW REFERENCE		WINDOW TAG	
ELEVATION		ELEVATION TAG	
DRAWING TITLE		DRAWING TAG	
DRAWING NUMBER		DRAWING TAG	
SHEET NUMBER		DRAWING TAG	

DRAWING INDEX		
Sheet Number	Sheet Name	Current Revision
A000	Index	A
A001	Site Plan	A
A002	Site Plan	A
A003	Site Plan	A
A004	Site Plan	A
A005	Site Plan	A
A006	Site Plan	A
A007	Site Plan	A
A008	Site Plan	A
A009	Site Plan	A
A010	Site Plan	A
A011	Site Plan	A
A012	Site Plan	A
A013	Site Plan	A
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A097	Site Plan	A
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A099	Site Plan	A
A100	Site Plan	A

Architect

Stamp

PRELIMINARY
NOT FOR CONSTRUCTION

aggregate
design studio ltd.
EAGLE BUILDERS

Vermeer Dairy
Heifer Barn
Camrose County, Alberta
08-04-4519 W4

Project No. A25085
Date: 3/7/2025 15:44:44
Drawn by: JC
Checked by: JC
Sheet Name:

Index
A000



- NOTES CONCERNING BUILDING LOCATION**
- ENGINEER IS TO BE ADVISED BEFORE START OF CONSTRUCTION OF ANY UNKNOWN FEATURES ON THIS OR THE ADJACENT SITE THAT MIGHT IMPACT ON THE PROJECT EITHER DURING CONSTRUCTION OR FUTURE USE.
 - THE "NORTH" ORIENTATION REFERS TO MAGNETIC NORTH, NOT TRUE NORTH.
 - ANY DIMENSIONS THAT SHOW THE LOCATION OF EXISTING FEATURES ARE APPROXIMATE ONLY AND ARE TO BE CONFIRMED BEFORE CONSTRUCTION START AS REQUIRED BY A CERTIFIED LAND SURVEYOR.
 - LANDSCAPING IS SUBJECT TO CHANGE.

BYLAW INFORMATION

EXISTING: AGRICULTURAL USE
USE: INTENSIVE LIVESTOCK OPERATIONS
SETBACKS:
FRONT YARD (SOUTH):
60.0m FROM A COUNTY ROAD (100m/h)
REAR YARD (NORTH):
60.0m FROM A COUNTY ROAD (100m/h)
SIDE YARD (EAST):
60.0m FROM A PROPERTY LINE
SIDE YARD (WEST):
60.0m FROM A PROPERTY LINE
SEE YARD DITCHES
60.0m FROM A PROPERTY LINE
60.0m FROM A PROPERTY LINE

SITE PLAN LEGEND	
PROPERTY LINE	---
SETBACK LINE	---
RIGHT OF WAY LINE	---
RIGHT OF WAY FUTURE	---
PROPOSED BUILDING	---
SERVICE ROAD	---
ENCE	---
MAIN DOOR	---
EXISTING DOOR	---
WATER FEED	---
WATER FEED	---

SITE SCHEDULE	
OWN SITE	100.0 m ² 1,043.34 m ²
ADDITION	333.4 m ² 3,352.32 m ²
GRAND TOTAL	433.4 m ² 4,395.66 m ²

SITE MATERIAL LEGEND	
ASPHALT	---
SIDEWALK	---
LIGHT DUTY ASPHALT	---
HEAVY DUTY ASPHALT	---
GRAVEL	---
LANDSCAPING	---
HARD LANDSCAPING	---
IRRIGATION	---

Architect:
Stamp:
PRELIMINARY
NOT FOR CONSTRUCTION
aggregate
design studio ltd.
EAGLE
BUILDERS

Vermeer Dairy
Heifer Barn
Camrose County, Alberta
08-04-45-19 W4
Project No: A25085
Date: 2/17/2025 15:48:48
Drawn by: JC
Checked by: JC
Sheet Name:

Site Plan
A102

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)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Naturally occurring protective layer

(complete a copy of this section for **EACH** barn, feedlot, and storage facility for solid manure, composting materials, or compost with a naturally occurring protective layer for the liner)

Facility description / name (as indicated on site plan)

1. Pack Pen (expansion to heifer shed)

2. ~~Scraper Alley~~ J.V.

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	NRCB USE ONLY Estimated storage capacity (m ³)
1.	30.48 95.1	11.176	at grade	6 month
2.	36.48 106.7	8.76 12.2 m	at grade	
TOTAL CAPACITY				

The expansion to the heifer shed will measure 106.7 m x 22 m. There will be an area with concrete (106.7 x 7.8 m, and the remainder will be naturally occurring protective layer (106.7 x 12.2 m)

☐ I plan to use a short-term solid manure storage (STMS) as part of my manure storage and handling plan for this CFO. (The AOPA requirements for STMS are set out in the NRCB [Short-Term Solid Manure Storage Requirements Fact Sheet](#).)

Surface water control systems

Describe the run-on and runoff control system

1. Scraper alley and pack area are under the roof
2. Manure push up pad will have lego blocks to prevent manure coming off the concrete and this area is only for loading manure into the trucks. Manure brought onto this pad is solid, mixed with bedding pack straw

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	4.5 (m)	Provide details (as required) See original permit from 2015	
Soil texture	42-48 % sand	29-32 % silt	20.8-26.4 % clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested 6m-9m	Hydraulic conductivity (cm/s) 3.72X10.7	Describe test standard used ASTMD8054

Additional information (attach copies of soil test reports)

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO

Condition required: ☒ YES ☐ NO

Report attached: ☒ YES ☐ NO

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)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Naturally occurring protective layer (cont.)

NRCB USE ONLY

Nine month manure storage volume requirements met: ☒ YES ☐ YES With STMS ☐ NO

Depth to water table: _____ 5.8 m _____ Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: _____ 30 m _____ Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

Surface water control systems

Requirements met: ☒ YES ☐ NO Details/comments:

A postconstruction inspection condition will be included in the authorization

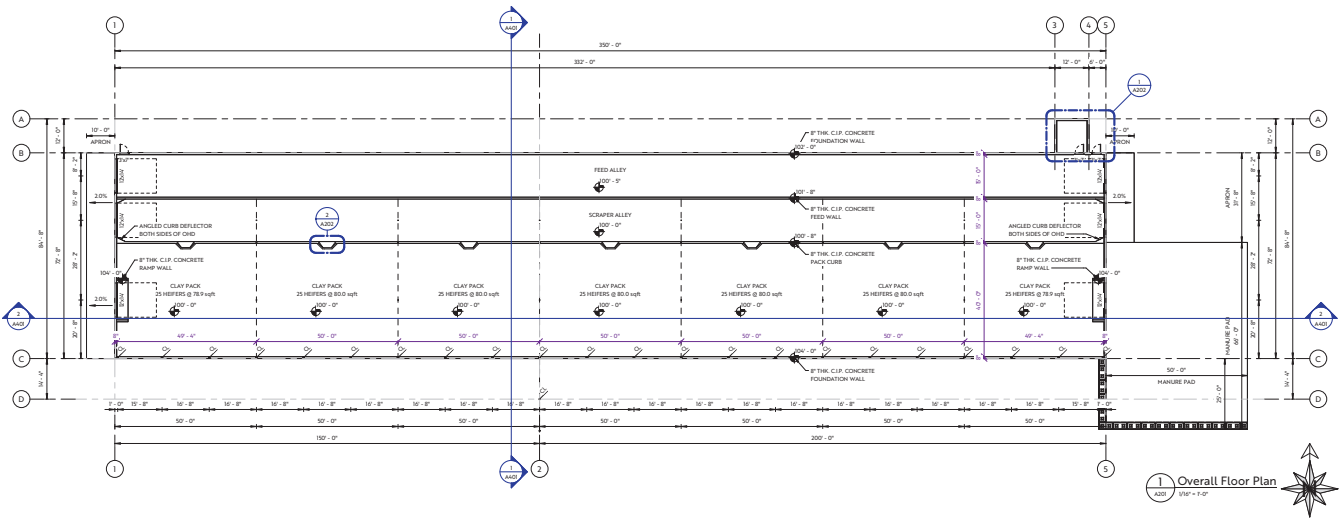
Naturally occurring protective layer details

Layer specification comments (e.g. sand lenses; layering uniform or irregular; number and location of boreholes):

CONSTRUCTION LEGEND

- NEW FRAMED WALL
- NEW PRECAST WALL
- EXISTING WALL
- DEMOLISHED WALL
- NEW DOOR
- EXISTING DOOR

Architect: _____
Stamp: _____
PRELIMINARY
NOT FOR CONSTRUCTION

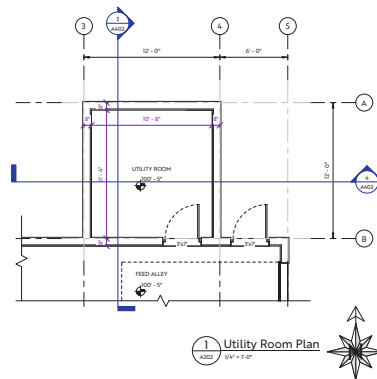
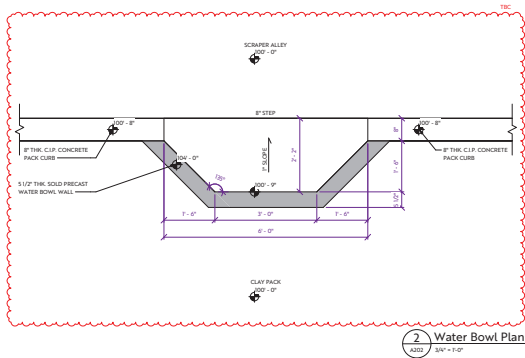


Vermeer Dairy
Heifer Barn
Camrose County, Alberta
08-04-4519 W4

PROJECT NO.	A201
DATE	3/7/2025 15:49 AM
DRAWN BY	JC
CHECKED BY	JC
SHEET NAME	

PROJECT NO.	A201
DATE	3/7/2025 15:49 AM
DRAWN BY	JC
CHECKED BY	JC
SHEET NAME	

Floor Plan
Overall
A201



Architect:

Stamp:

PRELIMINARY
NOT FOR CONSTRUCTION

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EAGLE BUILDERS

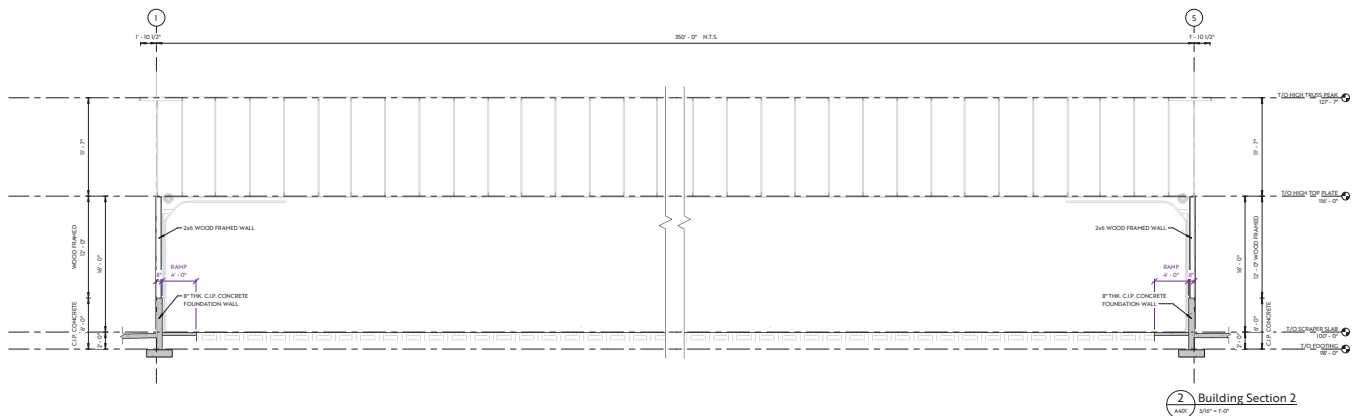
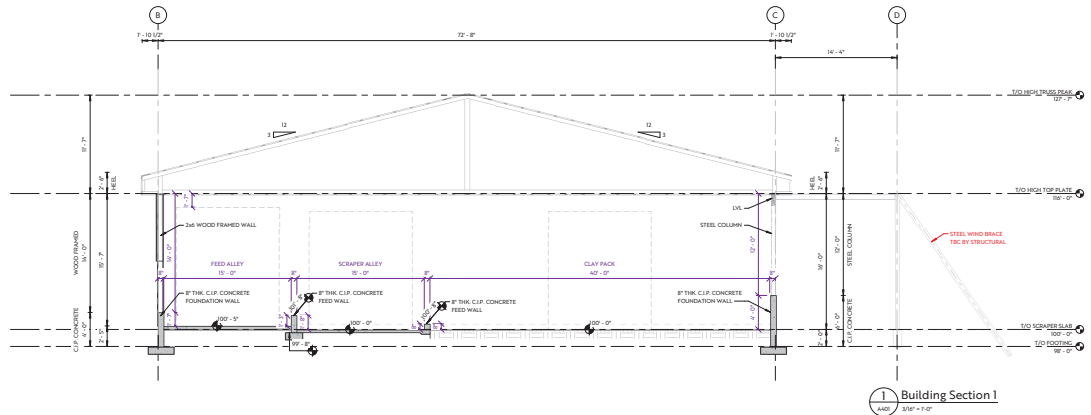
Vermeer Dairy
Heifer Barn
Camrose County, Alberta
08-04-4519 W4

Project No.	A25085
Date	3/7/2025 15:43:09 AM
Drawn by	JC
Checked by	JC
Sheet Name	

Floor Plan
Enlarged

A202

DO NOT SCALE DRAWING. VERIFY ALL DIMENSIONS, LOCATIONS AND UTILITIES PRIOR TO COMMENCEMENT OF WORK. ADJUST ANY DISCREPANCIES OR OMISSIONS TO THE ARCHITECT'S INTENT. ALL WORK SHALL COMPLY WITH THE MOST RECENT EDITION OF THE APPLICABLE BUILDING CODE AND ANY OTHER GOVERNING AUTHORITY. THE FOLLOWING DRAWING AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE WRITTEN CONSENT OF THE CONSULTANT.



Architect:

Stamp:

PRELIMINARY
NOT FOR CONSTRUCTION

aggregate
design studio ltd.
EAGLE BUILDERS

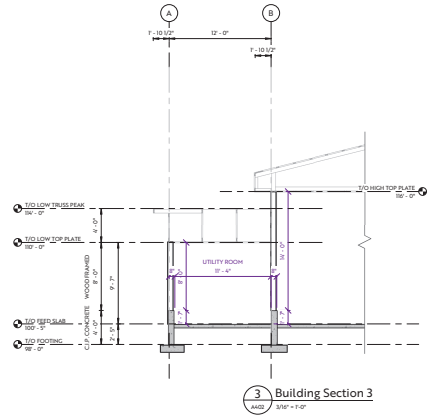
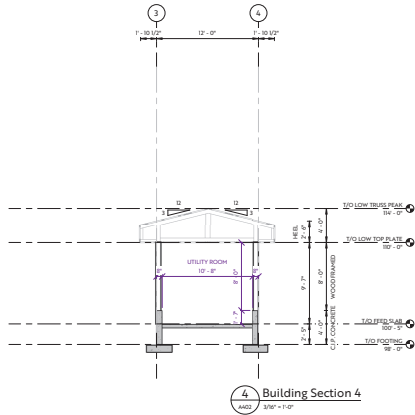
Vermeer Dairy
Heifer Barn
Camrose County, Alberta
08-04-4519 W4

DATE	11/11/2020
BY	JC
CHECKED	JC
DATE	11/11/2020

Project No: A25085
Date: 3/7/2020 15:43:40 AM
Drawn by: JC
Checked by: JC
Sheet Name:

Building
Sections

A401



Architect

Stamp

PRELIMINARY
NOT FOR CONSTRUCTION

aggregate
design studio ltd.
EAGLE BUILDERS

Vermeer Dairy
Heifer Barn
Camrose County, Alberta
08-04-45'10" W4

DATE	11/11/2023
BY	JC
REVISION	11/11/2023
BY	JC

Project No.	A25085
Date	2/17/2023 15:43:43
Drawn by	JC
Checked by	JC
Sheet Name	

Building
Sections

A402

DO NOT SCALE DRAWING. VERIFY ALL DIMENSIONS, LOCATIONS AND ELEVATIONS TO CORNER POINTS OF WORK. VERIFY ANY DISCREPANCIES OR CHANGES TO THE ARCHITECT'S PRELIMINARY ALL INFORMATION CORRELATES WITH THE MOST RECENT EDITION OF THE APPLICABLE BUILDING CODE AND ANY OTHER CODES, STANDARDS, THESE DRAWINGS ARE PRELIMINARY AND SHALL NOT BE USED FOR CONSTRUCTION WITHOUT THE WRITTEN CONSENT OF THE CONSULTANT.

In-Situ Test Record

Client Name: VermeerClient Number: 42495Test Date: Sept 17/07

Initial Depth to Water: _____

Stand Pipe Height: 0.84m

Time	Depth (mbgs)	Time	Depth (mbgs)
30s	7.22 6.38	11	7.16 6.32
60s	7.22 6.38	12	7.15 6.31
1.5	7.21 6.37	13	7.15 6.31
2.0	7.205 6.365	14	7.14 6.30
2.5	7.20 6.36	15	7.13 6.29
3.0	7.19 6.35	20	7.11 6.27
3.5	7.19 6.35	25	7.10 6.26
4.0	7.18 6.34	30	7.09 6.25
4.5	7.18 6.34	35	7.07 6.23
5.0	7.18 6.34	40	7.06 6.22
6	7.175 6.335		
7	7.17 6.33		
8	7.17 6.33		
9	7.165 6.325		
10	7.16 6.32		

AQTESOLV for Windows

Data Set: Z:\42495 Vermeer Dairy\Slug test.aqt

Date: 11/02/07

Time: 16:21:41

PROJECT INFORMATION

Company: Envirowest Eng

Client: Vermeer

Project: 42495

Test Date: Sept 17/2007

Test Well: MW-02

AQUIFER DATA

Saturated Thickness: 4.29 m

Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: : MW-02

X Location: 0. m

Y Location: 0. m

Initial Displacement: 6.38 m

Static Water Column Height: 4.29 m

Casing Radius: 0.025 m

Wellbore Radius: 0.075 m

Well Skin Radius: 0.075 m

Screen Length: 3. m

Total Well Penetration Depth: 9. m

No. of Observations: 25

Observation Data			
Time (min)	Displacement (m)	Time (min)	Displacement (m)
0.5	6.38	9.	6.325
1.	6.38	10.	6.32
1.5	6.37	11.	6.32
2.	6.365	12.	6.31
2.5	6.36	13.	6.31
3.	6.35	14.	6.3
3.5	6.35	15.	6.29
4.	6.34	20.	6.27
4.5	6.34	25.	6.26
5.	6.34	30.	6.25
6.	6.335	35.	6.23
7.	6.33	40.	6.22
8.	6.33		

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

11/02/07

AQTESOLV for Windows

Shape Factor: 3.482

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.717E-7	cm/sec
y0	6.364	m



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

October 17, 2007



NRCB
#303, 4920 51st Street
Red Deer, Alberta
T4N 6K8
Attention: Scott Cunningham, P.Eng
Approval Officer

**RE: Vermeer Dairy Ltd.
Soil Assessment and EMS Design Report**

Dear Scott,

Enclosed is a copy of the assessment and design report for Vermeer Dairy Ltd. The assessment was conducted on the proposed construction site a SE 4-45-19-W4M in Camrose County.

Please feel free to call if you have any questions.

Yours truly,



Shauna D. Low, P.Eng
Envirowest Engineering Inc.

**Site Assessment and Manure Storage Design
SE 1/4, Sec. 4, Twp. 45, Rng. 19 W4M
Camrose County, Alberta**



Professional Environmental Engineering Services



Envirowest Engineering Inc.

Professional Environmental Engineering Services

**Site Assessment and
Manure Storage Lagoon Design and Construction
SE 1/4, Sec. 4, Twp. 45, Rng. 19, W4M
Camrose County, Alberta**

Prepared for: Vermeer Dairy Ltd.

Prepared by: Envirowest Engineering Inc.
P.O. Box 4248, Ponoka, Alberta
(403) 783-8229

Report Prepared: October 17, 2007

Project Number: 0708-42495

Private and Confidential



Table of Contents

	Page
1.0 Executive Summary	1
2.0 Introduction and Scope of Work	2
3.0 Site Description	3
4.0 Standards and Guidelines	4
5.0 Site Assessment Methodology	5
6.0 Site Assessment Results	6
7.0 Design and Construction Considerations	8
8.0 Closure	11

Appendices

- A. Site Location and Site Photographs**
- B. Site Map**
- C. Borehole Logs**
- D. Certificates of Analysis**



1.0 Executive Summary

Envirowest Engineering Inc. was retained by Vermeer Dairy Ltd. to complete an assessment of the soil properties for the proposed construction of a new dairy barn and the associated EMS facility. The proposed operation is for a 450 head dairy located at the SE 4-45-19-W4M in Camrose County. The soils in the areas proposed for construction of the EMS facilities and the under barn collection pits were tested as part of this assessment.

Four investigative boreholes were drilled using a truck mounted rotary auger. The boreholes were completed to depths of between 6.0 and 10.5 meters. Representative soil samples were collected and submitted for laboratory analysis. The analysis included particle size (% sand, % clay, % silt), moisture and Atterberg Limits. Two groundwater monitoring wells were installed to determine depth to groundwater. One additional well was installed to determine in-situ hydraulic conductivity.

The laboratory results indicated that the soil in the area to be utilized for the EMS was silty to sandy clay in the upper 10.5 meters. The soil was relatively consistent across the site. The in-situ hydraulic conductivity was found to be 3.72×10^{-7} cm/sec. The native soil is of suitable characteristics to meet or exceed the AOPA standards for a naturally occurring protective layer with not less than 10 meters of material with an hydraulic conductivity of not more than 1×10^{-6} cm/sec.

The area is not considered to be prone to flooding. The proposed storage area is more than 30 meters from a common body of water. Standards and regulations for the construction, maintenance and use of facilities for confined feeding operations are set out in the amended "Agricultural Operation Practices Act" (AOPA) and are summarized in this report.



2.0 Introduction and Scope of Work

Envirowest Engineering Inc. was retained by Vermeer Dairy Ltd. to conduct an assessment for the proposed construction of a new dairy operation. The proposed construction consists of a barn, an earthen manure storage facility and ancillary structures. The proposed operation is a 450 head dairy. The operation is located at SE 4-45-19 W4M in Camrose County.

Representative soil samples were collected at the site to allow for the assessment of applicable soil properties. The samples were collected by completing investigative boreholes using a truck mounted rotary auger. Soil samples were collected from selected boreholes and reserved for laboratory analysis. The soil samples were analyzed for particle size (% sand, % clay, % silt), moisture and Atterberg Limits. Two monitoring wells were installed at the site to determine depth to water table. An additional well was installed to determine in-situ hydraulic conductivity. The site assessment occurred on September 14, 2006. In-situ testing was conducted on September 17, 2007.

The assessment has been completed in accordance with the standards and regulations associated with the "Agricultural Operation Practices Act" (AOPA) which came into force January 1, 2002 and amended in June 2004 and October 2006.

This report will summarize the findings of the soil assessment.



3.0 Site Description

The subject site is located approximately 16 km east of New Norway, Alberta. The quarter section is currently developed with a residence, grain storage facilities and ancillary structures.

The topography of the property and surrounding area is generally level to gently undulating. The proposed EMS is to be located west of a low lying treed area populated with willows and other native species. A slough area is located immediately to the north of the proposed construction site. The elevation increases gently to the west from the EMS site and to the east from the center of the EMS site. Surface runoff in the area of the EMS will generally collect in the slough. The area surrounding both the barn and EMS sites is currently in cropland. The nearest major surface water feature is Driedmeat Lake approximately 3 km to the west of the site. The county map indicates a seasonal drainage channel flowing across the quarter section to the east of the site.

The upper most bedrock is the Horseshoe Canyon formation which consists of grey, feldspathic, clayey sandstone; grey bentonitic mudstone and carbonaceous shale; concretionary ironstone beds; scattered coal and bentonitic beds of variable thickness with minor limestone beds. The formation is mainly non marine.

The quaternary geology for the general area is indicated to be stagnation moraine with till of uneven thickness; local water sorted material up to 30 meters thick. The topography is undulating with local relief less than 3 meters.

The site is located in an area where groundwater resources are reported to be between 5 and 25 gpm. Three well logs were available for the quarter. None of the logs provided detailed soil lithology. A new well has been completed to the east of the proposed construction site. The driller logs for this well were not yet available for review.



4.0 Standards and Guidelines

The amended “Agricultural Operation Practices Act” and associated regulations governs all new and modified confined feeding operations. The soil assessment for the earthen manure lagoons were reviewed with respect to the following standards and guidelines.

- a manure storage facility and a manure collection area must have either a protective layer or a liner that meets the requirements of the regulations between the facility or area and the uppermost groundwater resource below the site
- the bottom of a liner of a manure storage facility and of a manure collection area must be not less than 1 meter above the water table of the site at the time of construction
- the bottom of a liner or the base of the protective layer must be not less than 1 meter above the top of the groundwater resource
- if the liner of a liquid manure storage facility is made of compacted soil or manufactured materials it must provide equal or greater protection than that provided by 1 meter in depth with a hydraulic conductivity of not more than 1×10^{-7} cm/sec
- a natural protective layer must provide the equivalent protection to 10 meters of material with a hydraulic conductivity of 10^{-6} cm/sec
- the owner or operator of a confined feeding operation must construct manure storage facilities that are sufficient to store all the manure produced by the operation over a period of at least 9 consecutive months
- an open liquid manure storage facility must have a freeboard of not less than 0.5 meters when the facility is full

Other portions of the regulations may also be found to apply to the site.



5.0 Site Assessment Methodology

Four investigative boreholes were drilled using a truck mounted rotary auger and completed to depths of between 6.0 and 10.5 meters. The boreholes were completed in the areas proposed for construction of the barn and earthen manure storage facility. Two of the boreholes were completed as groundwater monitoring wells to determine depth to groundwater. One of the boreholes was completed to determine in-situ hydraulic conductivity. Borehole drilling and soil sampling was completed during a site visit on September 14, 2007. Groundwater levels were measured and in-situ testing was completed on September 17, 2007.

Samples from boreholes 2, 3 and 4 were selected for laboratory analysis. The samples were collected from depths of between 2.2 and 7.7 meters. The analysis included particle size distribution, moisture and Atterberg Limits.

The soil from the site was assessed based on the requirements specified in the "Agricultural Operation Practices Act" and associated regulations. One of the critical aspects of meeting these requirements is the assessment of native soil properties to facilitate manure storage facility construction. It is recommended that the earthen manure storage lagoons be constructed in such a way and of appropriate material to provide the equivalent protection of 10 meters of non-compacted native material with an hydraulic conductivity of 1×10^{-6} cm/sec. It is also important to construct such storage facilities in an area where the water table is at least 1 meter below the bottom of the facility and in an area not prone to flooding. Depth to groundwater will be confirmed prior to start of construction.

6.0 Site Assessment Results

The results of the laboratory analysis are contained in Table 1.

Table 1: Soil Analysis Results

Parameter/ Sample Location	42495 BH-2	42495 BH-2	42495 BH-3	42495 BH-3	42495 BH-4
Sample Depth (m)	5.2	7.7	5.0	7.7	2.2
Particle Size (%sand)	44.0	46.0	42.0	48.0	44.4
Particle Size (%silt)	29.6	30.0	32.0	31.2	30.2
Particle Size (%clay)	26.4	24.0	26.0	20.8	25.4
Texture Class	Loam	Loam	Loam	Loam	Loam
Moisture (%)	16.3	16.5	17.8	16.4	
Liquid Limit	29	33	34	30	
Plastic Limit	17	16	19	16	
Plasticity Index	13	16	15	16.4	

Boreholes 1,2 and 3 were completed in the area for the EMS. Borehole 4 was completed in the area of the barn underfloor collection pit. Borehole locations are indicated on a map contained in the appendices.

The soils across the investigation area were loam with a clay content ranging from 20.8 to 26.4%.

Borehole 1 was completed to a depth of 10.5 meters. The soils are noted primarily as silty and sandy clay with sand lenses occurring at 3.7 meters, 7.4 meters and 9.4 meters. The lenses at 7.4 and 9.4 were found to be saturated. The depth to water table in the well was recorded on September 17 as 5.76 meters below surface.

Borehole 2 was drilled to a depth of 9 meters and was completed to allow for testing of in-situ hydraulic conductivity. The strata tested was from 6 to 9 meters in depth and included a wet sand lense at 6.5 meters. Samples were collected at depths of 5.2 and 7.7 meters to determine the quality and consistency of material underlying the proposed construction site.



Borehole 3 was completed to a depth of 9 meters. Consistent with the remainder of the site, the soils were noted primarily as silty and sandy clay tills. A sand lense was encountered at 5.3 meters and at 7.2 meters. The sand lense at 7.2 meters was noted as saturated. The 6 meters deep monitoring well was dry when tested on September 17, 2007. Samples were tested from depths of 5.0 meters and 7.7 meters.

Borehole 4 was completed to a depth of 6 meters in the area of the barn pit. The soils were noted as silty clay. A samples from a depth of 2.2 meters was tested for soil properties.

Bedrock was not intersected to the depths of the boreholes.

Groundwater monitoring wells were installed at boreholes 1 and 3. The monitoring wells were constructed of 25 mm PVC piping. The bottom 3 meters of the well were slotted. The well annulus was filled with native material. The well were completed above grade.

The monitoring well at BH-2, MW-02, was completed to allow for in-situ hydraulic conductivity testing. The well was constructed of 50mm PVC piping with the bottom 3 meters slotted. The well annulus was filled with clean filter sand to a depth above the slotted material. The remainder of the annulus was filled with bentonite. The in-situ slug testing was conducted utilizing ASTM standard procedure D4044-96 for Instantaneous Change in Head (Slug) Test for Determining Hydraulic Properties. The levels in MW-02 were recorded every 30 seconds for the first 5 minutes, every minute for an additional 10 minutes then every 5 minutes thereafter. The analytical procedure consisted of analyzing the water level in the well according to Bouwer and Rice (Bouwer, H., and Rice, R.C. " A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells"). The hydraulic conductivity of the native soils in this area were found to be 3.72×10^{-7} cm/sec.



7.0 Design and Construction Considerations

Based on the findings of the soil assessment the soils tested are suitable for use as a naturally occurring protective layer. The hydraulic conductivity was found to be 3.72×10^{-7} cm/sec (in-situ).

Darcy's Law determines the specific discharge or unit seepage for a unit cross-sectional area of a EMS.

$$Q = k (H+d)/d A$$

Where:

- Q: total seepage through area A
- k: coefficient of permeability
- (H+d)/d: hydraulic gradient
- H: vertical distance measured between the top of the liner and required volume of the waste storage
- d: thickness of the soil liner
- A: cross sectional area of flow

The unit seepage or specific discharge ,v, is Q/A and therefore

$d = k \times H/v - k$ where v is the specific discharge required by regulation

$$d = k \times H/v - k$$

$$d = \frac{3.72 \times 10^{-7} \text{ cm/s} \times 4.5 \text{ m}}{1 \times 10^{-6} \text{ cm/s} - 3.72 \times 10^{-7} \text{ cm/s}}$$

$$d = 2.49 \text{ m}$$

Alternatively, a direct depth equivalency can be determined as follows:

$$K(\text{in situ}) = 3.72 \times 10^{-7} \text{ cm/sec}$$

AOPA requirement is 10 meters @ 10^{-6} cm/sec

$$\frac{10 \text{ meters}}{10^{-6} \text{ cm/s}} = \frac{\text{required thickness (m)}}{3.72 \times 10^{-7} \text{ cm/s}}$$

Required thickness= 3.72 meters



At a sizing depth of 4.5 meters, in excess of 4.5 meters of suitable liner material is available to provide a natural protective layer beneath maximum invert depth of the EMS and the a groundwater resource. This exceeds the maximum required depth of 3.72 meters.

Lagoon Sizing

The annual volume of liquid manure produced by the proposed operation will be 16 200 cubic meters (3.57 million gallons) based on lactating animals. Vermeer Dairy Ltd. has chosen to provide for the annual volume of manure production instead of the nine months as required by AOPA.

- The EMS facility is to be constructed in the area of boreholes 1, 2 and 3. Based on the site conditions encountered in this area, the facility has been designed with a below grade depth of 4.5 meters. Therefore, the overall sizing of the EMS will be 90 meters in length and 70 meters in width. The overall capacity of the EMS would be 19 700 cubic meters (4.3 million gallons) which includes 0.5 meters for freeboard. The capacity for manure storage would be 16 700 cubic meters (3.7 million gallons). This will provide storage capacity for 12 consecutive months. The sizing is based on an inside end and side wall slope of 3:1 (run/rise).
- With a protective layer, the bottom of the manure storage facility must be not less than 1 meter above the water table or the groundwater resource at the time of construction. Water table at the site was found to be at a minimum depth of 5.76 meters. With the maximum invert depth of 4.5 meters, a separation of more than 1 meter is provided. The depth to water table should be confirmed at the time of construction.
- It is recommended that the area around the EMS be completed to ensure that no surface runoff enters the EMS.
- The 0.5 meter freeboard depth should be covered with 10 to 20 cm of topsoil and seeded to prevent soil erosion.
- The inlet pipe to the lagoon should be located in the bottom 1/4 of the lagoon. There should be a concrete pad located at the base of the pipe to mitigate possible soil erosion. The area around the inlet pipe should be sealed with bentonite.



The following general construction procedures are recommended. Some modification may be required based on actual site conditions encountered during construction.

- The area for lagoon construction will be located in the area of boreholes 1, 2 and 3. The topsoil should be stripped from the area for construction. The topsoil can be reused on the freeboard area after lagoon completion.
- The facility design at this time is for a below grade depth of 4.5 meters. This allows for at least a 4.5 meter protective layer which exceeds the AOPA requirements.
- Construction of the lagoon should be supervised by a professional engineer.
- Following completion of the lagoon the operator should:
 - ensure that the facility is secure from unauthorized access
 - ensure that shrubs, trees and deep rooted plants are not allowed to grow on or near the walls of the facility



8.0 Closure

Envirowest Engineering Inc. is pleased to submit the report on the soil assessment to Vermeer Dairy Ltd.. The information and conclusions contained in this report are for his sole use and such parties as may be normally involved in the approval or construction process for such a facility. No other party is expected to rely upon the information contained within the report without the express written authorization of Envirowest Engineering Inc..

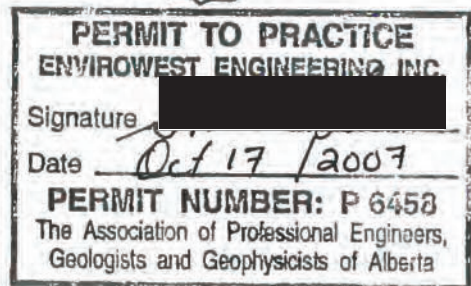
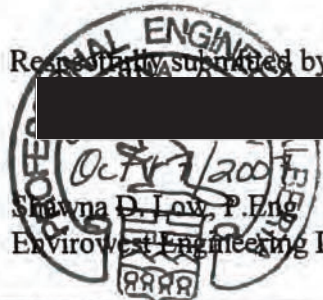
The review has been conducted in accordance with generally accepted environmental engineering practices. No other warranty is expressed or implied.

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 by,

[Redacted Signature]

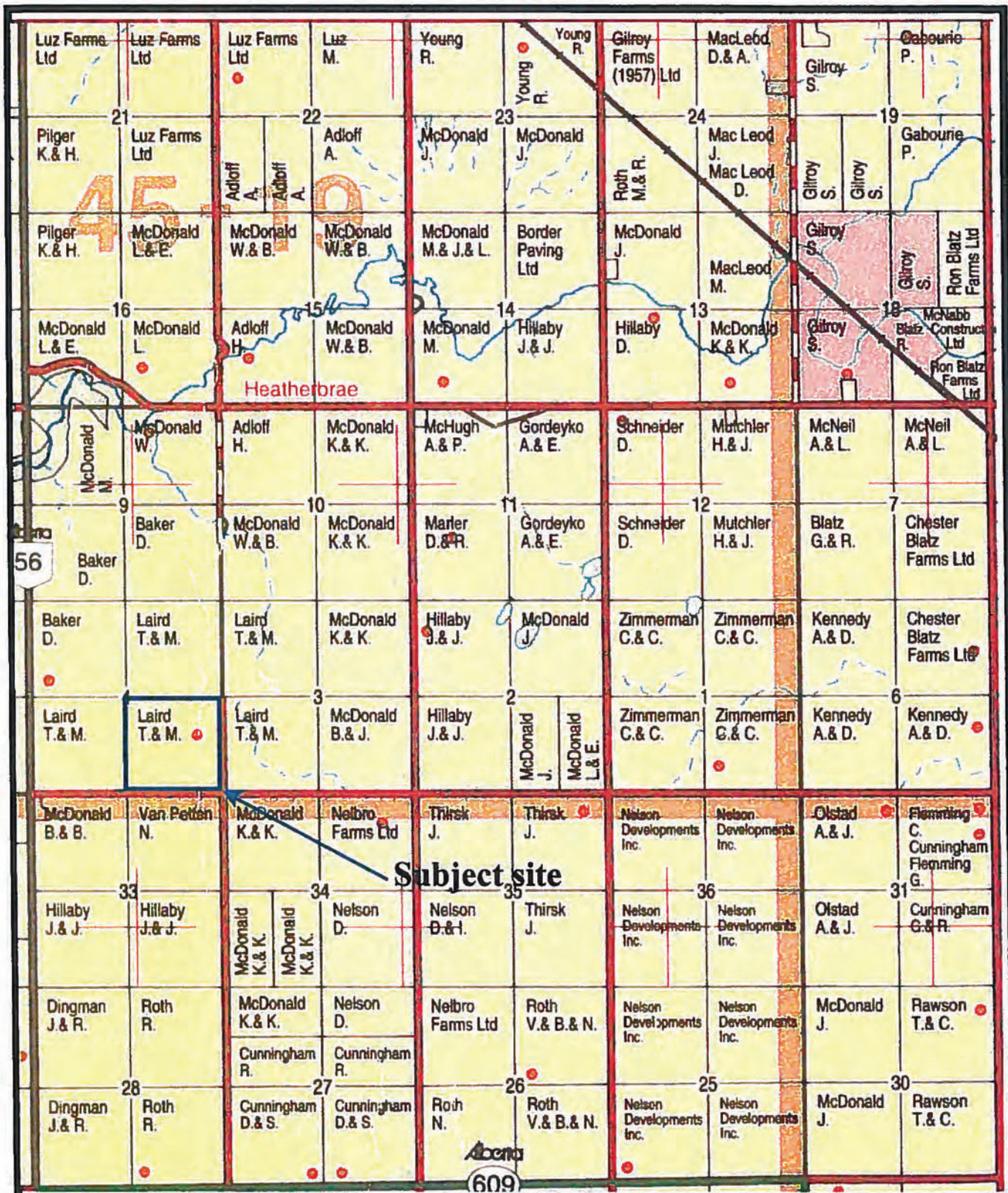
Shawna D. Low, P.Eng.
Envirowest Engineering Inc.





Appendix A

Site Location and Site Photographs



**Envirowest
Engineering Inc.**

Professional Environmental Engineering
Services

Location of Subject Site

Scale: nts

Date: 07/10/17

Figure: A1



Photo #1: Proposed EMS site, looking east



Photo #2: Subject site



Appendix B

Site Map



**Envirowest
Engineering Inc.**

Professional Environmental Engineering
Services

Borehole Locations (Map by DJS Drafting)

Scale: nts

Date: 07/10/17

Figure:



Appendix C

Borehole Logs

Envirowest Engineering Inc.
Professional Engineering Services

LOG OF BORING BH-01

(Page 1 of 1)

Vermeer Dairy Ltd.
Site Assessment
Project No. : 0709-42495

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : 07/09/14
Logged By: : S. Low, P.Eng

Depth
in
Meters

0

1

USCS

GRAPHIC

DESCRIPTION

Well: MW-01
Elev.:

Water Level

0
.25
.5
.75
1
1.25
1.5
1.75
2
2.25
2.5
2.75
3
3.25
3.5
3.75
4
4.25
4.5
4.75
5
5.25
5.5
5.75
6
6.25
6.5
6.75
7
7.25
7.5
7.75
8
8.25
8.5
8.75
9
9.25
9.5
9.75
10
10.25
10.5

SW

SM

SW

TOPSOIL, scant

SAND, yellow brown

SILTY SAND, olive brown

CLAYEY SILT, olive brown

SILTY CLAY, till, olive brown, plastic, coal
inclusions, minor stones

moist sand lense

SANDY CLAY, olive brown, till, coal
inclusions

SAND, olive brown, wet, lense

SANDY CLAY, grey, till

wet sand lense

Cover

Grout

Native fill

Screened

Envirowest Engineering Inc.
Professional Engineering Services

LOG OF BORING BH-02

(Page 1 of 1)

Vermeer Dairy Ltd.
Site Assessment
Project No. : 0709-42495

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : 07/09/14
Logged By: : S. Low, P.Eng

Depth
in
Meters

0

1

USCS

GRAPHIC

DESCRIPTION

Well: MW-02
Elev.:

Water Level

Cover

Grout

Sand Pack

Screened

TOPSOIL, black, organic

SC

CLAYEY SAND, grey

SC

CLAYEY SAND, olive brown, dark orange
pockets

SILTY CLAY, till, olive brown, orange pockets

SW

SAND, olive brown, wet, lense

SANDY CLAY, olive brown, till

SANDY CLAY, grey, till

Envirowest Engineering Inc.
Professional Engineering Services

LOG OF BORING BH-03

(Page 1 of 1)

Vermeer Dairy Ltd.
Site Assessment
Project No. : 0709-42495

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : 07/09/14
Logged By: : S. Low, P.Eng

Depth
in
Meters

0

1

USCS

GRAPHIC

DESCRIPTION

Well: MW-03
Elev.:

Water Level

Cover

Native fill

Screened

SC

SW

SW

TOPSOIL, black, organic
CLAYEY SAND, olive brown, orange pockets

SILTY CLAY, olive brown, till

SAND, olive brown, lense
SILTY CLAY, till, olive brown,
SANDY CLAY, grey, till coal pockets

SAND, olive brown, wet, lense
SANDY CLAY, grey, till



Envirowest Engineering Inc.
Professional Engineering Services

LOG OF BORING BH-04

(Page 1 of 1)

Vermeer Dairy Ltd.
Site Assessment
Project No. : 0709-42495

Driller: : Ever Green Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : 07/09/14
Logged By: : S. Low, P.Eng

Depth in Meters	USCS	GRAPHIC	DESCRIPTION	Well: Elev.:	Water Level
0			TOPSOIL, black,		
.25	SC		CLAYEY SAND, olive brown		
.5			SILTY CLAY, olive brown		
.75					
1					
1.25					
1.5					
1.75					
2					
2.25					
2.5					
2.75					
3					
3.25					
3.5					
3.75					
4					
4.25					
4.5					
4.75					
5					
5.25					
5.5					
5.75					
6					

10-17-2007 C:\Documents and Settings\Mary Ann\My Documents\Client Data\42495 Vermeer Dairy\BH-1.bor



Appendix D

Certificates of Analysis

Analytical Report

Bill To: Envirowest Engineering Ltd.
 Report To: Envirowest Engineering Ltd.
 Box 4248
 5118 - 50th Street
 Ponoka, AB, Canada
 T4J 1R6
 Attn: Shawna Low
 Sampled By: Shawna Low
 Company: Envirowest

Project:
 ID: 42495
 Name: Vermeer
 Location:
 LSD: SE 4-45-19 W4M
 P.O.:
 Acct code:

Lot ID: **574651**
 Control Number: E 276836
 Date Received: Sep 20, 2007
 Date Reported: Sep 27, 2007
 Report Number: 1049712

		Reference Number	574651-1	574651-2	574651-3	Detection Limit
		Sample Date	Sep 14, 2007	Sep 14, 2007	Sep 14, 2007	
		Sample Location				
		Sample Description	BH2 / 42495-2-2 / 5.2 / m	BH2 / 42495-2-4 / 7.7 / m	BH3 / 42495-3-1 / 5.0 / m	
		Matrix	Soil	Soil	Soil	
Analyte		Units	Results	Results	Results	
Physical and Aggregate Properties						
Liquid Limit			29	33	34	
Plastic Limit			17	16	19	
Plasticity Index			13	16	15	
Moisture	Wet Weight	%	16.3	16.5	17.8	0.1
Texture			Loam	Loam	Loam	
Sand	Soil Texture	% by weight	44.0	46.0	42.0	
Silt	Soil Texture	% by weight	29.6	30.0	32.0	
Clay	Soil Texture	% by weight	26.4	24.0	26.0	

Analytical Report

Bill To: Envirowest Engineering Ltd.
 Report To: Envirowest Engineering Ltd.
 Box 4248
 5118 - 50th Street
 Ponoka, AB, Canada
 T4J 1R6
 Attn: Shawna Low
 Sampled By: Shawna Low
 Company: Envirowest

Project:
 ID: 42495
 Name: Vermeer
 Location:
 LSD: SE 4-45-19 W4M
 P.O.:
 Acct code:

Lot ID: **574651**
 Control Number: E 276836
 Date Received: Sep 20, 2007
 Date Reported: Sep 27, 2007
 Report Number: 1049712

		Reference Number	574651-4	574651-5		
		Sample Date	Sep 14, 2007	Sep 14, 2007		
		Sample Location				
		Sample Description	BH3 / 42495-3-2 /	BH4 / 42495-4 / 2.2 /		
			7.7 / m	m		
		Matrix	Soil	Soil		
Analyte		Units	Results	Results	Results	Detection Limit
Physical and Aggregate Properties						
Liquid Limit			30			
Plastic Limit			16			
Plasticity Index			14			
Moisture	Wet Weight	%	16.4			0.1
Texture			Loam	Loam		
Sand	Soil Texture	% by weight	48.0	44.4		
Silt	Soil Texture	% by weight	31.2	30.2		
Clay	Soil Texture	% by weight	20.8	25.4		

Approved by:

Anthony Neumann, MSc
 Laboratory Operations Manager