Technical Document LA24025

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	LA24025	NE 6-11-21 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.

July 4- 24
Date of signing

[redacted]

Heva Dairy Ltd
Corporate name (if applicable)

Henry Vandenberg
Print name

GENERAL INFORMATION REQUIREMENTS

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

Proposed facilities	Dimensions (m) (length, width, and depth)
new lagoon	262'x110x Feet (79.5 m x 33.5 m x 6.7 m deep)

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

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
hiefer corral 30x48m		
hiefer pen 2	68x19	
feed lot	124x30	

NRCB USE ONLY

All facilities confirmed. Dimensions have not changed since the earliest available aerial was taken (April 2004).

Last updated September 11, 2023

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Existing facilities continued	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
Breeding pen with shelter	22 x 17	
Dry cow pen	29 x 19	
main barn	49 x 16 + 30 x 22	
Calving section	15 x 18	
lagoon	27 x 32 x 5m	to be decommissioned
Small calve shelter	36 x 15	
calve barn	9 x 28	

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

old lagoon filled in

Construction completion date for proposed facilities Nov 2025

Additional information

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

Livestock category and type (Available in the Schedule 2 of the Part 2 Matters Regulation)	**Permitted number**	**Proposed increase or decrease in number (if applicable)**	**Total**
This application is for the construction of an EMS only			

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) _____

Signed this ____ day of _____, 20____. _____
ent

Agreement # C1-21-11-06-80 MG Document on file

OPTION 3: Additional water licence not required

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

Signed this 21 day of May, 2024 [redacted]
Signature of Applicant or Agent

Last updated September 11, 2023

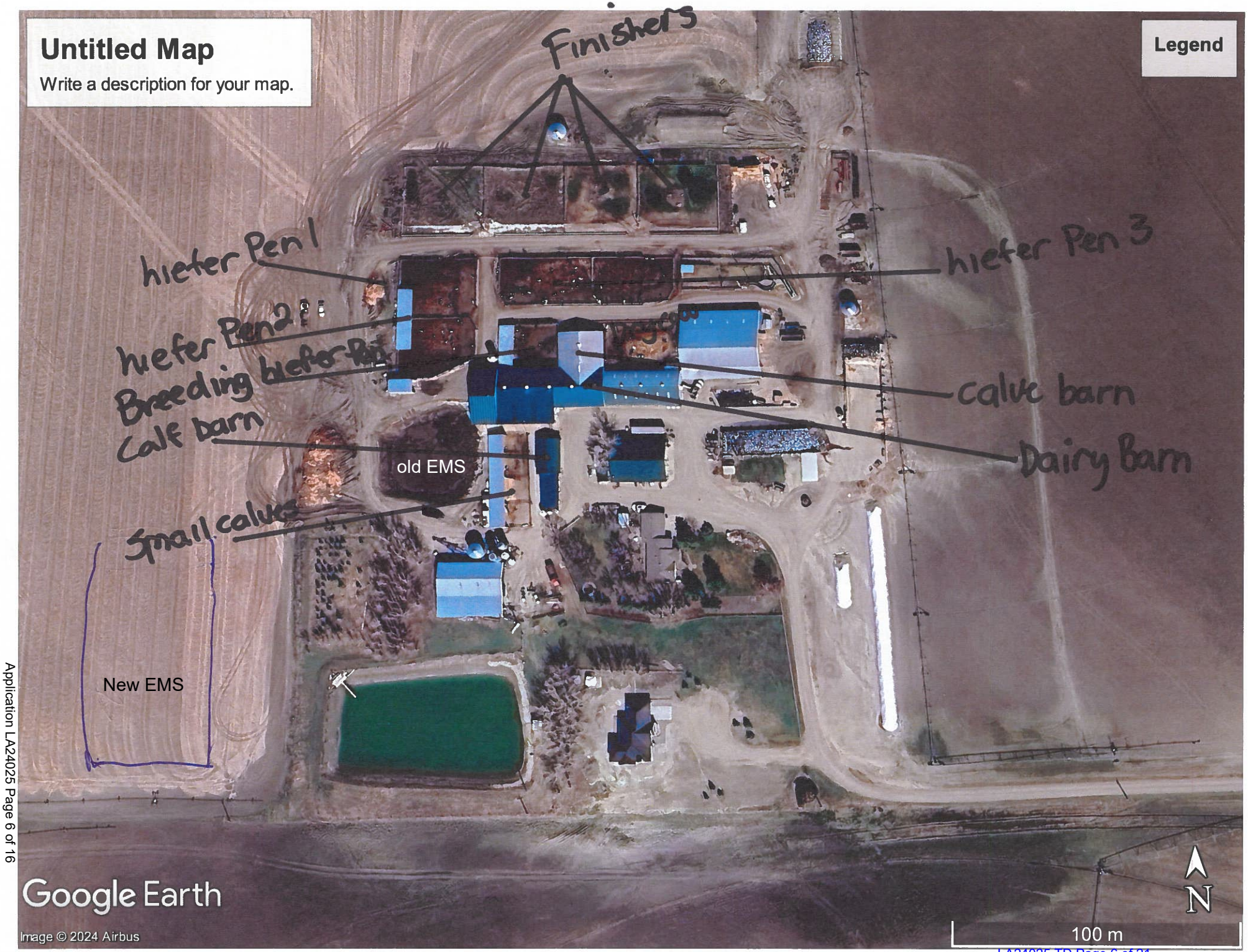
OPTION 4: Uncertain if *Water Act* licence is needed; acknowledgement of risk (for existing CFOs only)

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

   _____

Signed this _____ day of _____, 20____. _____

Signature of Applicant or Agent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Dairy Barn
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Small calves
New EMS
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PC Dairy
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Ben Vandenberg
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100 m

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

GENERAL ENVIRONMENTAL INFORMATION

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

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

Existing: old lagoon **Proposed 1:** New lagoon

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

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☑ >1 m ☐ ≤ 1 m	☑ >1 m ☐ ≤ 1 m	☐ >1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☒ YES ☐ NO ☐ YES with exemption	not in flood plain
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	none	none			☒ YES ☐ NO ☐ YES with exemption	none observed during site visit or EPA database
	How many water wells are within 100 m of the manure storage facility or manure collection area?	none	none			☒ YES ☐ NO ☐ YES with exemption	none observed during site visit or EPA database
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	150m slough	150m slough			☒ YES ☐ NO ☐ YES with exemption	163 m to slough
Groundwater information	What is the depth to the water table?					☒ YES ☐ NO ☐ YES with exemption	2 m bgl (south of proposed EMS) below 6 m within footprint
	What is the depth to the groundwater resource/aquifer you draw water from?	48m	48m			☒ YES ☐ NO ☐ YES with exemption	confirmed not within 400 m of MSF

Additional information (attach supporting infor[illegible]s, etc. you consider relevant to your application)

ID 221690

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

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

			NRCB USE ONLY				
Neighbour name(s)	**Legal land description**	**Distance (m)**	**Zoning (LUB) category**	**MDS category (1-4)**	**Distance (m)**	**Waiver attached (if required)**	**Meets regulations**
VanderVeen		759	RG	1	800 m		yes
P+C Dairy		517	RG	1	517 m		yes
Ben Vandenberg		835	RG	1	762 m		yes
Steven Dunsburgen		547	RG	1	524 m		yes

RG=Rural General

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

				NRCB USE ONLY	
Name of land owner(s)*	**Legal land description**	**Usable area** (ha)**	**Soil zone *** **	**Usable area (ha)**	**Agreement attached (if required)**
			Total	NA	

* 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)

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NRCB USE ONLY

ENVIRONMENTAL RISK SCREENING INFORMATION

ERST for **proposed** facilities

see Decision Summary for details

Facility	Groundwater score	Surface water score	File number

ERST for **existing** facilities

Facility	Groundwater score	Surface water score	File number
Existing EMS	low	low	A24025
Existing feedlot pens	low	low	A24025

ERST related comments:

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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: Testholes (221 83, 221 85, 221 8) down to 100 m blg. o reported

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

Groundwater or surface water related comments:

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NRCB USE ONLY

MINIMUM DISTANCE SEPARATION

Methods used to determine distance (if applicable): _____

Margin of error (if applicable): _____

Requirements (m): Category 1:_____ Category 2:_____ Category 3:_____ Category 4:_____

Technology factor: ☐ YES ☐ NO

Expansion factor: ☐ YES ☐ NO

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

The MDS has not been determined. Just for the purpose to establish an MDS because the EMS is closer to the neighboring residence then the existing facilities (Operational Policy 2023-1), I treated this EMS similar to a stand alone MSF (Approval Policy, section 5.4, for dairy manure). The capacity of this facility is 5,009 m^3 at freeboard level. This would be able to contain 9 mth storage for the equivalent of a 185 dairy CFO an result in the MDS of 339 m (Category 1). This distance has been met to all neighboring residences.

LAND BASE FOR MANURE AND COMPOST APPLICATION

Land base required: _____

Land base listed: _____ A

Area not suitable: _____

Available area _____ 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 _____

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

July 11, 2024	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: July 11, 2024

Municipality: ethbridge County

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

Alberta Health Services: 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: ID ☐ N/A

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

Other: Atco as, Fortis Alberta ☐ N/A

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

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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. Lagoon
2. _____

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	NRCB USE ONLY Estimated storage capacity (m^3)
1.	262 Feet	110 Feet	5.2 m deep ~~total depth 6.7 m~~	
2.	79.8 m	33.5 m		
			AL CAPACITY	5009 m^3

slope of inside walls : 3:1
Depth below grade : 17'
Total depth : 22'

☐ I plan to use a short-term solid manure stor … orage and handling plan for this CFO. (The AOPA requirements for STMS are set out in the NRCB … quirements Fact Sheet.

Surface water control systems

Describe the run-on and runoff control system

Burm

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	3.02 (m)	Provide details (as required) See report	
Soil texture	14-24 % sand	22-30 % silt	52-64 % clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested	Hydraulic conductivity (cm/s) 2.02E-08	Describe test standard used falling head

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

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO
Condition required: ☒ YES ☐ NO
Report attached: ☒ YES ☐ NO

Liquid Manure Storage Volume Calculator

Construction Dimensions of Liquid Manure Storage

*** Only cells in blue can be changed.**

	Metric		Imperial Units
Size of Liquid Manure Storage			**Size of Liquid MS**
Total Length*[4]	79.8	m	262 ft
Total Width*[4]	33.5	m	110 ft
Total Depth*[4]	6.7	m	22 ft
Design Capacity Depth	*6.20*	m	20 ft
End Slope*[4]	3	run:rise	3 run:rise
Side Slope*[4]	3	run:rise	3 run:rise
Length of Bottom	39.6		
Width of Bottom	(6.7)		
Total Capacity @ top of Bank	**6,262**	**m^3**	**Total Capacity (@tob)** 221,146 ft^3 1,377,481 Imp. Gal.

Design Capacity of Liquid Manure Storage (freeboard level)			**Design Capacity (freeboard level)**
Length (design capacity depth)	76.8	m	252 ft
Width (design capacity depth)	30.5	m	100 ft
Total Depth	*6.7*	m	*22* ft
Design Capacity Depth	6.20	m	20 ft
End Slope	3	run:rise	3 run:rise
Side Slope	3	run:rise	3 run:rise
Design Capacity (freeboard level)	**5,009**	**m^3**	176,890 ft^3 1,101,821 Imp. Gal.
Surface Area of Liquid Manure	*2,342*	m^2	*25,213* ft^2

CFO Name [1]	**(Enter CFO Name Here)**
Land Location [1]	1-1-4-W5

Type of Livestock [2]

Free Stall: Lactating Cow Only

Annual manure production / hd	36.0 m^3/hd
9 month manure production / hd	27.00 m^3/hd

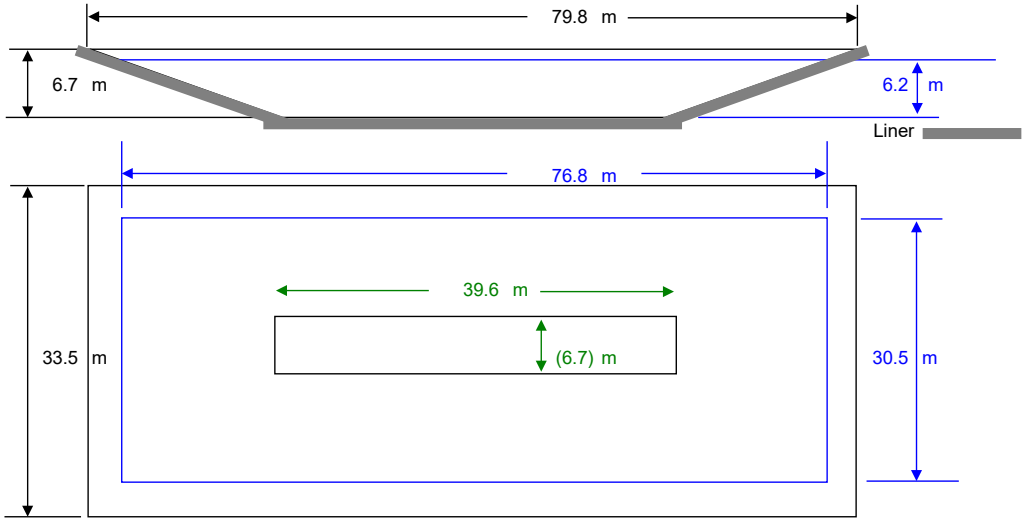
Number of Livestock [3] _____ head

Minimum Liquid Manure Storage Volume Required

\- m^3 ** - ft^3

\- Imp. Gal.

** Design capacity of liquid manure storage should be equal to, or greater than, minimum storage volume required.



Lines in Black - Overall liquid manure storage dimensions

Lines in Blue - Design capacity depth dimensions (excludes freeboard)

NTS - Not To Scale

JLECS

26 June 2024

J Lobbezoo Engineering & Consulting Services Ltd.
PO Box 96, Monarch, AB T0L1M0

JLECS File: P24033

HEVA Dairy
PO Box 597
Picture Butte, Alberta T0K1V0

Attention: Mr. Henry Vandenberg

Re: Geotechnical Review and Evaluation
NRCB Permitting of Proposed Manure Storage Lagoon
NE-06-011-21-W4M, near Picture Butte, Alberta

As requested, J Lobbezoo Engineering & Consulting Services Ltd. (JLECS) has carried out a geotechnical review and evaluation of the above-captioned site relative to the required protection of the groundwater resource, as required by the Agricultural Operation Practices Act, AB Reg. 267/2001 (hereinafter referred to as "AOPA"). This letter describes site soil conditions to support a permit application related to a proposed manure storage lagoon to be located near the west side of the farmyard area located within the southwest corner area of NE-06-011-21-W4M (refer to Figure 1, attached).

In order to demonstrate the suitability of the naturally existing soils for consideration as a naturally occurring protective layer to the groundwater, four boreholes were advanced at the site on June 3, 2024. The boreholes were advanced at the approximate locations denoted as HV1-24 to HV4-24 on Figure 1, attached.

The boreholes were advanced by a truck-mounted drill rig owned and operated by Chilako Drilling Services and extended to depths of 9.2 m to 12.2 m below the existing grade. The boreholes were logged by Larry Delong of Chilako Drilling Services.

In general, the natural mineral soils encountered in the boreholes consisted of a layer of medium plastic lacustrine clay (to approximately 6 m depth) which was underlain by stiff medium plastic clay till to the termination depth of the four boreholes. While soft and wet clay soils were noted at approximately 2 m depth in boreholes HV2-24 and HV3-24, no groundwater resource (as defined by the AOPA) was identified within the 12.2 m investigation depth at the proposed lagoon site.

A sample of soil collected from the screened zone of borehole HV1-24 as well as samples from the same depth at the other boreholes were all subjected to grain size analyses, which was carried out by Down to Earth Laboratories in Lethbridge, Alberta. The results indicate a soil texture breakdown of:

Table 1: Soil Texture Analyses

Borehole/Depth	% Sand	% Silt	% Clay
HV1-24 / 6.5 – 8.5 m *(clay till)*	14	22	64
HV2-24 / 6.5 – 8 m *(clay till)*	24	30	46
HV3-24 / 6.5 – 8 m *(clay till)*	22	26	52
HV4-24 / 7.5 – 8.5 m *(clay till)*	18	26	56

JLECS

To measure the *in situ* permeability of the subsurface soils, a 50 mm diameter PVC monitoring well was constructed in borehole HV1-24. The test well was screened from 6.0 m to 9.2 m depth. Well saturation of the 50 mm diameter monitoring well was carried out by filling the monitoring well to the top for several consecutive days. After several days of testing, a 24-hour water drop of 0.69 m was determined.

To calculate the permeability of the screened portion of the clay till strata at the test well location, a modified falling head test (as outlined in the USBR Engineering Geology Field Manual Volume 2 [2001]) was used. The input variables and output data are outlined on the attached In Situ Permeability Test report. The results of the permeability testing indicate an *in situ* hydraulic conductivity, k_s, of 2.2×10^{-8} cm/s at BH24-01.

Using the measured permeability of the clay stratum, the 3.2 m of clay screened at HV1-24 is estimated to represent the equivalent of over 100 m of naturally occurring materials having a hydraulic conductivity of 1×10^{-6} cm/s (the reference standard in AOPA). This represents natural material protection in excess of the minimum requirements outlined by the AOPA for lagoons (minimum 10 m, Section 9.5-a).

Conclusion

Based on the results of the current investigation, permeability testing, and our understanding of the site and proposed development at the site, it is JLECS's opinion that the naturally occurring materials at the site satisfy the AOPA requirements for permitting the proposed manure storage lagoon at this location.

It is noted that, depending upon the final location and size of the lagoon, some soft soils may be encountered in the upper 2 m at the site. These soft soils may require subexcavation, and bank reconstruction using recompacted clay at a moisture content within about three percent of optimum (as determined by standard Proctor testing).

We trust that this report satisfies your present requirements. Should you have any questions, please contact the undersigned at your convenience.

Yours truly,

J Lobbezoo Engineering & Consulting Services Ltd.

PROFESSIONAL ENGINEER ALBERTA
JOHN P. LOBBEZOO
D 110450
27 June 2024

John Lobbezoo, P.Eng.
Principal Geotechnical Engineer

PERMIT TO PRACTICE
J LOBBEZOO ENGINEERING & CONSULTING SERVICES LTD.
RM SIGNATURE:
RM APEGA ID #: 110450
DATE: 27 June 2024
PERMIT NUMBER: P016456
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Attachments
Figure 1 Borehole Locations
In Situ Permeability Test Calculations
Soil Profile and Parent Material Description, Chilako Drilling Services

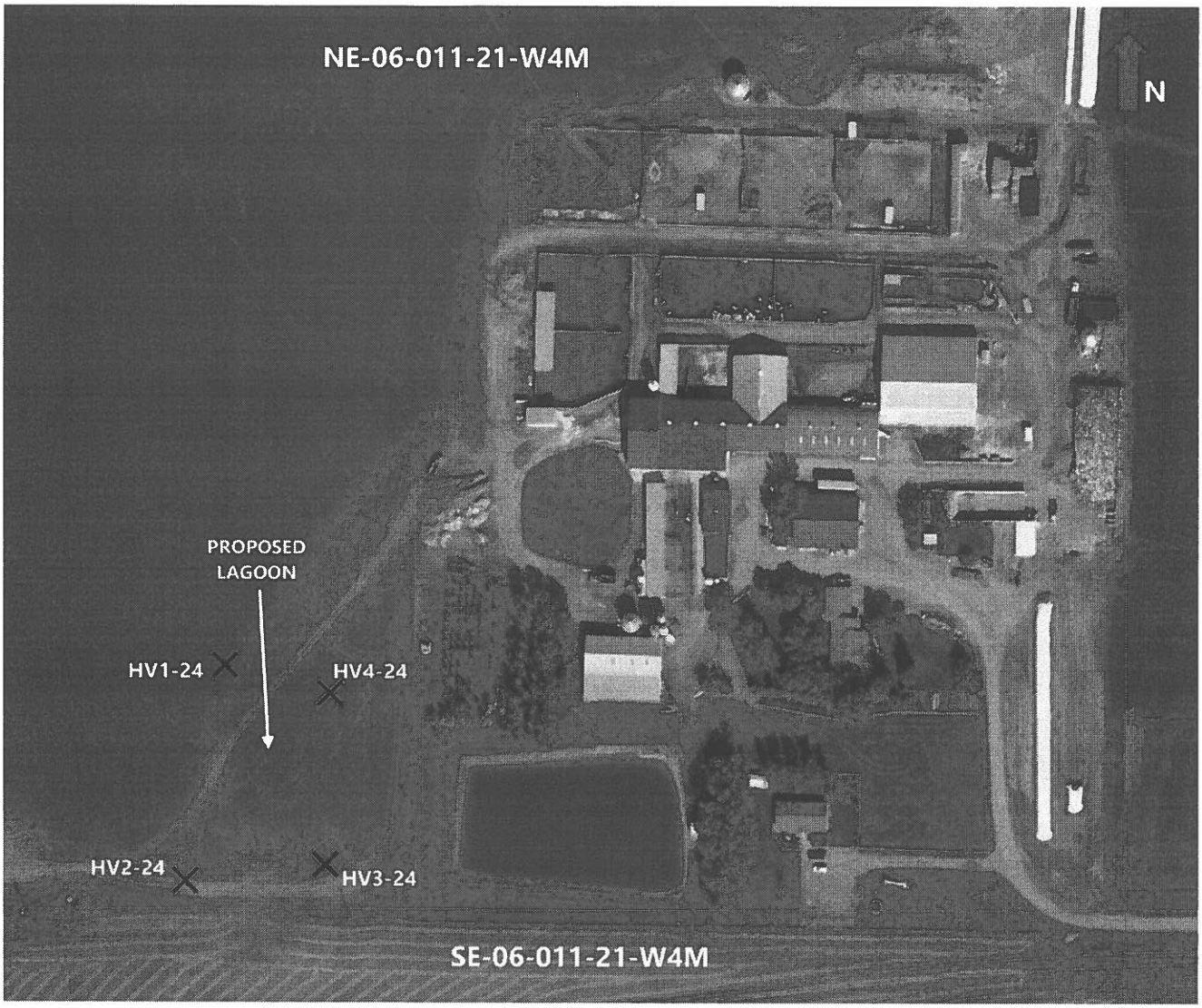


Image Credit: Government of Alberta

Figure 1: Borehole Locations **Proposed Liquid Manure Storage Lagoon**

HV1-24

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

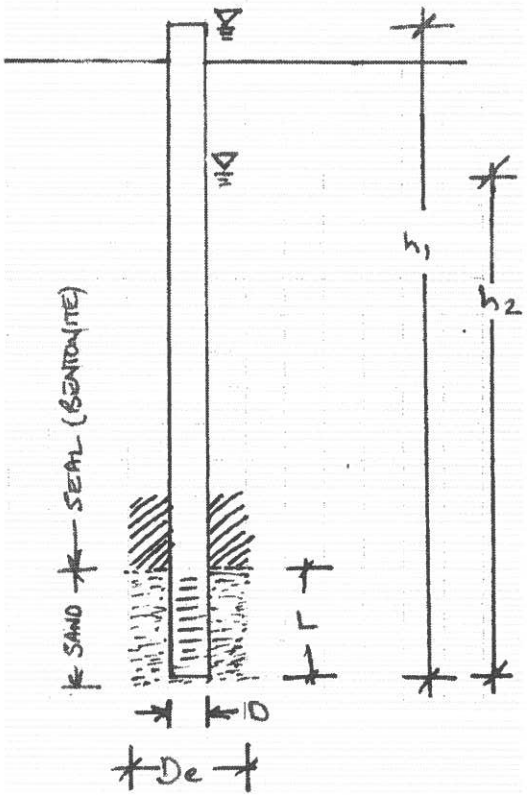
taken from USBR Engineering Geology Field Manual Volume 2 (2001)

HV1-24 - HEVA Dairy

JLECS File: P24033

INPUT VARIABLES	Terms	Value	Definition
	D	0.0520	diameter of standpipe (m)
	De	0.1500	diameter of borehole (m)
	L	3.20	length of sand section (m)
	h1	9.80	initial height of water above base of hole (m)
	h2	9.11	final height of water above base of hole (m)
	t	24.0	time of test (h)

k_s =	2.2E-08 cm/sec



CHILAKO DRILLING SERVICES LTD

Box 942 Coaldale, Alberta, T1M 1M8
(403) 345-3710

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: NE6-11-21W4, HEVA Dairy (Henry Vandenber Date: 03-Jun-24

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
HV1-24	0366538	0-0.15	SiCL	M	Topsoil		
	5527078	0.15-1.2	SiCL	M	Lac		Firm, med plastic, olive brown
		1.2-3.1	CL	M	Lac		Stiff, med plastic, brown
		3.1-4.5	CL-SiCL	M	Lac		Stiff, med-high plastic, olive brown, weakly varved
		4.5-5.0	CL-C	M	Lac		Stiff, high plastic, olive brown, oxidized
		5.0-9.2	CL-C	M	Till	6.5-8.5	Stiff, med plastic, brown, oxidized
							No free water
							50mm H.C. Well installed to 9.2m BGS
							Screen: 9.2-6.2m
							Sand: 9.2-6.0m
							Bentonite: 6.0-0.0m
							Stickup: 0.6m
							Hole Diameter: 0.15m
HV2-24	0366520	0-0.15	SiCL	M	Topsoil		
	5527028	0.15-0.35	SiCL	M	Lac		
		0.35-0.9	SiCL	VM-Sat	Lac		V. Soft, med plastic, olive brown, no free water
		0.9-2.6	CL	M	Lac		Stiff, med plastic, brown
		2.6-3.1	CL-C	M	Lac		Stiff, med plastic, brown
		3.1-5.4	SiC	M	Lac		Stiff, med-high plastic, yellow brown, varved
		5.4-12.2	CL-C	M	Till	6.5-8.0	Stiff, med plastic, brown, oxidized
							No free water, no slough
HV3-24	0366562	0-0.15	CL-SiCL	M	Topsoil		
	5527022	0.15-1.1	CL	VM	Lac		
	Near dugout	1.1-1.4	SiCL	M	Lac		
		1.4-2.3	SiCL	Sat	Lac	1.4-2.0	V. Soft, med plastic, olive brown
		2.3-2.9	SiCL	M	Lac		Stiff, med plastic, yellow brown
		2.9-7.6	SiC	M	Lac		Stiff, med-high plastic, yellow brown, varved
		7.6-9.2	CL-C	M	Till		Stiff, med plastic, brown, oxidized
							Slough and free water @ 2.0m
HV4-24	0366564	0-0.15	SiCL	M	Topsoil		
	5527071	0.15-1.0	SiCL	M	Lac		
		1.0-1.4	SiCL	VM	Lac		Stiff, med plastic, brown, small sat. sand lenses
		1.4-1.8	CL	M	Lac		Stiff, med plastic, brown
		1.8-4.4	SiC	M	Lac		Stiff, med-high plastic, yellow brown, varved
		4.4-6.1	C	M	Lac		Stiff, med plastic, dark brown, varved with SiC
		6.1-7.5	C	M	Lac		Stiff, med plastic, brown, oxidized
		7-5.9.2	C	M	Till		Stiff, med-high plastic, gray, basel till

Legend:

L	Loam
C	Clay
S	Sand
Gr.	Gravel
Si	Silt
F	Fine (sand)
VF	Very Fine (sand)

Eg. VFSCL = Very Fine Sandy Clay Loam