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	LA19017	NW-01-008-21 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.

MAY 2 2019
Date of signing

Signature

SUNDOWN FEEDERS LTD
Corporate name (if applicable)

GIJSBERT VAN DE-LUTHUIZEN
Print name

GENERAL INFORMATION REQUIREMENTS

Proposed facilities. List all proposed confined feeding operation facilities and their measurements, including if it is an addition to a an existing facility (attach additional pages if needed)

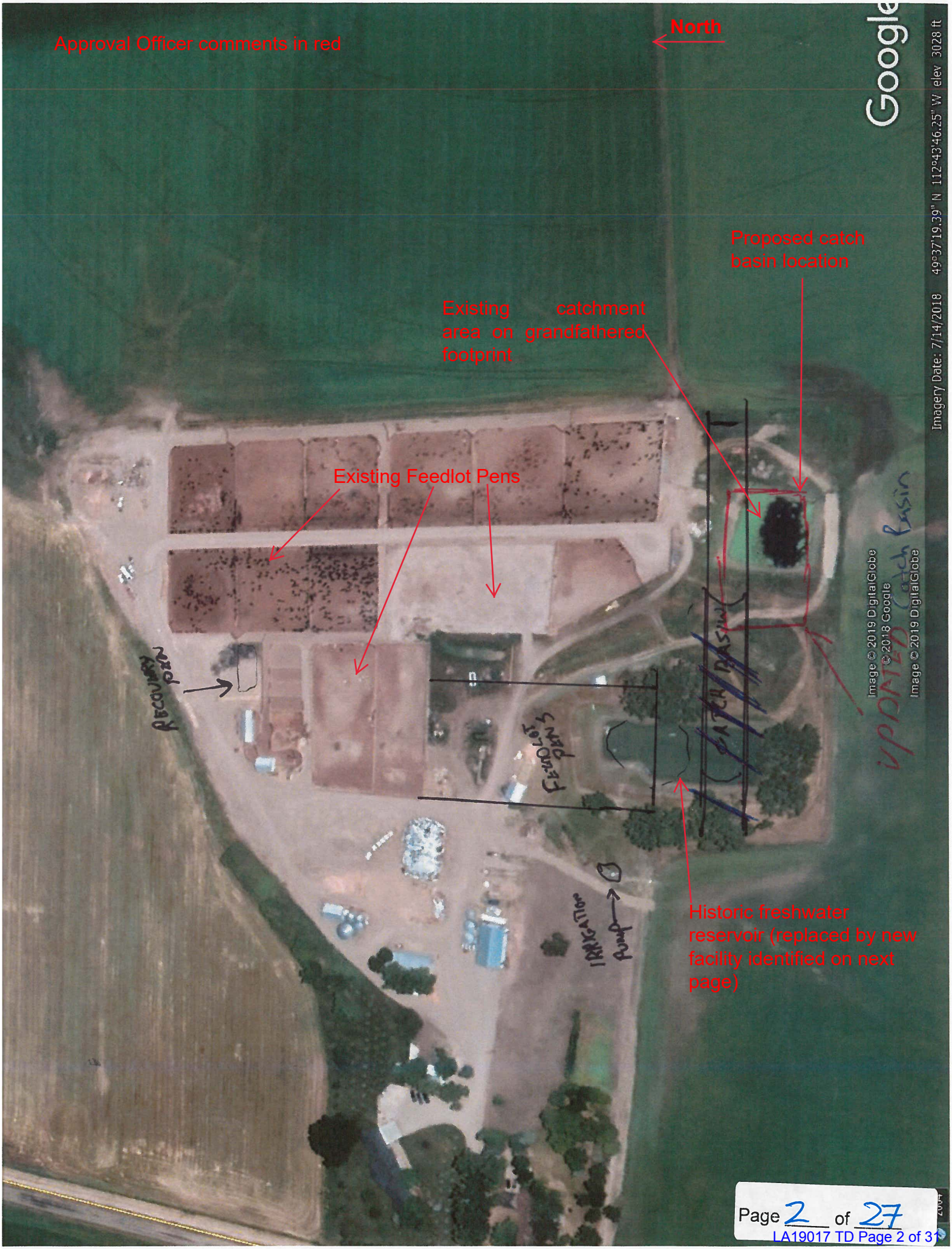
Proposed manure collection areas & manure storage facilities	Dimensions (m)
CATCH BASIN	55 x 50 x 2
FEEDLOT PENS	140 x 80
RECOVERY PEN	35 x 20

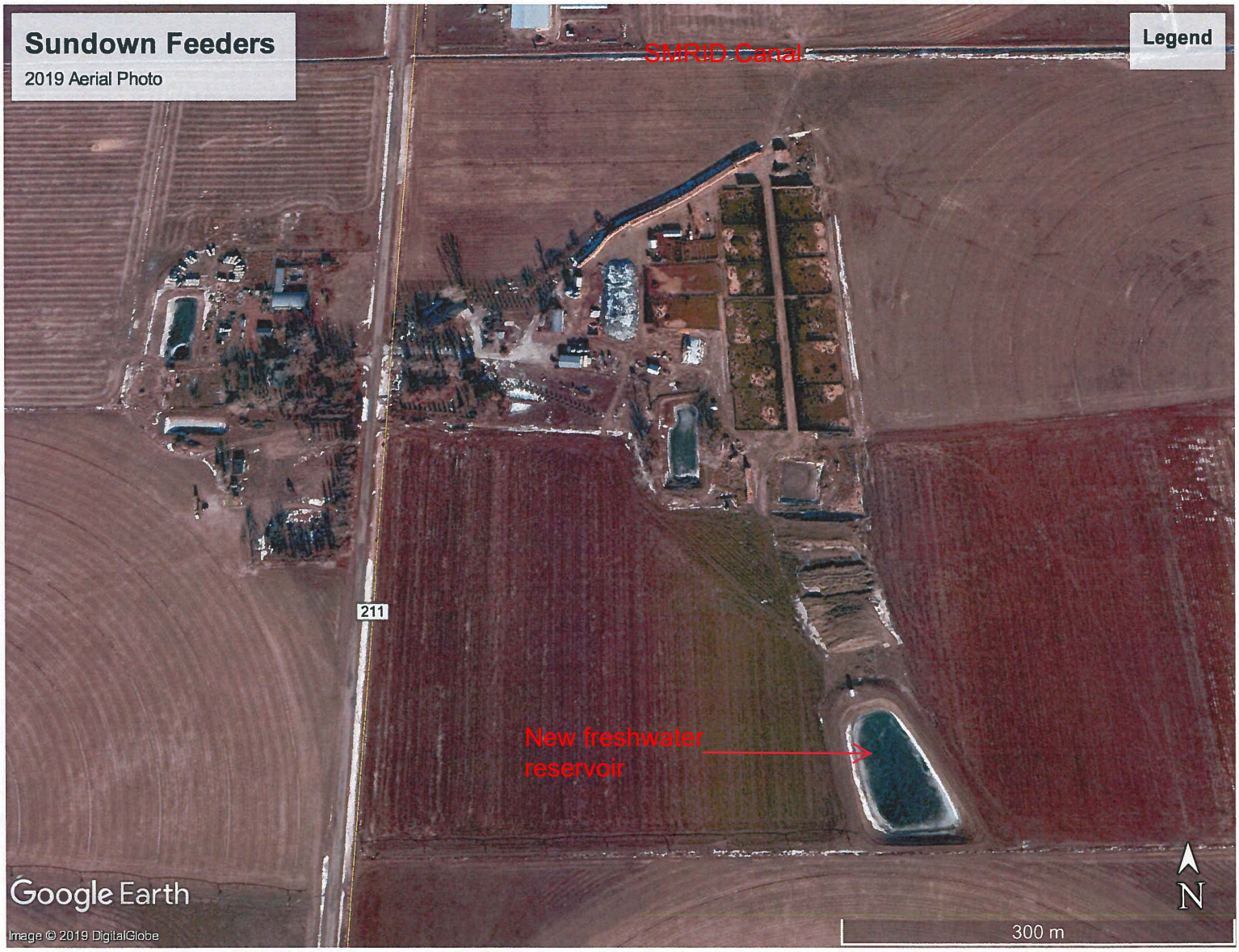
Existing facilities. List **ALL** existing confined feeding operation facilities and their measurements (use additional pages if needed)

Existing barns, manure collection areas & manure storage facility	Dimensions (m)	NRCB USE ONLY
EXCISTING FEEDLOT PENS 1	275 x 95	
PENS 2	75 x 65	
Existing runoff catchment area	40 m x 45 m*	

*AO comment: existing runoff catchment area has been altered since 2002. This alteration likely represents unauthorized construction under the AOPA and negates the grandfathered status of the catchment area liner. The applicant proposes constructing a new catch basin with an AOPA approved liner to accommodate all run-off generated from the site. A condition requiring decommissioning of the existing catch basin, including the portion which was expanded without an NRCB permit, will be included in Approval LA19017.

NRCB USE ONLY


Approval Officer comments in red
North
Proposed catch basin location
Existing catchment area on grandfathered footprint
Existing Feedlot Pens
Historic freshwater reservoir (replaced by new facility identified on next page)
Google
Imagery Date: 7/14/2018 49°37'19.39" N 112°43'46.25" W elev 3028 ft
Image © 2019 DigitalGlobe
© 2018 Google
Image © 2019 DigitalGlobe


Sundown Feeders
2019 Aerial Photo
Legend
SMRID Canal
211
New freshwater reservoir
Google Earth
Image © 2019 DigitalGlobe
N
300 m

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If a new facility is replacing an old facility, what will be done with the old facility and when? ☐ **N/A**

Proposed construction completion date: Nov. 30 2021

Additional information:

Livestock Numbers: (include all livestock)
Note: Livestock numbers in this table will be used when processing the application)

Livestock type/ category	Existing number	Change in number (if applicable)	Total
BEEF FEEDERS	2500	1000	3500

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DECLARATION AND ACKNOWLEDGMENT OF APPLICANT CONCERNING *WATER ACT* LICENCE

issued by Alberta Environment and Parks (AEP) for a confined feeding operation (CFO)

Date and sign (or check) 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 AEP 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** AEP'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 AEP 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 AEP'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 de-populate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **CHECK IF 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.

Signed this ____ day of _____, 20____. _____

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 AEP under the *Water Act* for the development or activity proposed in this AOPA application.

Signed this 22 day of JAN., 2019. _____

Signature of Applicant or Agent

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

1. At this time, I (we) do not know whether a new water licence is needed from AEP 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** AEP'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 AEP 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 AEP'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 de-populate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **CHECK IF 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.

Signed this ____ day of _____, 20____. _____

Signature of Applicant or Agent

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GENERAL WATER INFORMATION – EXISTING **Use the existing manure storage facility that is closest to a common body of water or water well**			**NRCB USE ONLY**	
			Comments	**Meets regulations**
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?	5 t (m)	☑ Estimated ☐ From records	Not located in a known flood plain	☒ YES ☐ NO ☐ YES with exemption
Springs, wells, and surface water information a. How many springs are within 100 m of manure storage facilities or manure collection areas?		0	No springs observed during site visit	☒ YES ☐ NO ☐ YES with exemption
b. How many water wells are within 100 m of the manure storage facilities or manure collection areas?		0	No water wells observed during site visit	☒ YES ☐ NO ☐ YES with exemption
c. What is the shortest distance from an manure collection or storage facility to a surface water body? (ie, lake, creek, slough, seasonal, etc.)		170	170 m to SMRID canal	☒ YES ☐ NO ☐ YES with exemption
Groundwater information a. What is the depth to bedrock?	82 (m)	☐ Estimated ☐ Measured ☑ Drilling reports	N/A	
c. What is the shallowest depth to the uppermost groundwater resource?	13.7 (m)	☐ Estimated ☐ Measured ☑ Drilling reports	Well ID118178 possible UGR at 13.7 m depth	☒ YES ☐ NO ☐ YES with exemption

Additional information: (attach borehole logs and records, as required)

WELL 118178

Part 2 — Technical Requirements

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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)

GENERAL WATER INFORMATION – PROPOSED **Use the proposed manure storage facility that is closest to a common body of water or water well**			**NRCB USE ONLY** **Comments**	**Meets regulations**
Proposed facility name FEEDLOT PENS				
Flood plain information What is the elevation of the floor of the lowest **proposed** manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	5 (m)	☑ Estimated ☐ From records	Not located in a known flood plain	☒ YES ☐ NO ☐ YES with exemption
Springs, wells, and surface water information a. How many springs are within 100 m of **proposed** manure storage facilities or manure collection areas?		0	No springs observed during site visit	☒ YES ☐ NO ☐ YES with exemption
b. How many water wells are within 100 m of **proposed** manure storage facilities or manure collection areas?		0	No water wells observed during site visit	☒ YES ☐ NO ☐ YES with exemption
c. What is the shortest distance from a **proposed** manure collection or storage facility to a surface water body? (ie, lake, creek, slough, seasonal, etc.)		322	200 m from SMRID canal	☒ YES ☐ NO ☐ YES with exemption
Groundwater information a. What is the depth to bedrock?	82 (m)	☐ Estimated ☐ Measured ☑ Drilling reports	N/A	
b. What is the depth to the water table?	1.5+* (m)	☐ Estimated ☐ Measured ☑ Drilling reports	1.5 m*	☒ YES ☐ NO ☐ YES with exemption
c. What is the shallowest depth to the uppermost groundwater resource?	13.7 (m)	☐ Estimated ☐ Measured ☑ Drilling reports	Well ID118178 possible UGR at 13.7 m depth**	☒ YES ☐ NO ☐ YES with exemption

Additional information: (attach borehole logs and records, as required)

* DRILLED POST HOLES SUMMER 2018

*Approval Officer Note: attached drilling log (for work completed in 2017) shows a shallow water table. Indications at the site were the historic freshwater storage had been leaking and leading to a saturated condition at the site. Following completion of the new freshwater storage, the historic facility is no longer being filled. The water table at the site receded relatively rapidly and standing water was not present in post holes drilled to 1.5 m depth in summer 2018. None the less, a condition will be contained in Approval LA19017 requiring the permit holder to contact the NRCB if the water table is encountered during construction.

**closest well with litholigy information

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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)

GENERAL WATER INFORMATION – PROPOSED **Use the proposed manure storage facility that is closest to a common body of water or water well**			**NRCB USE ONLY** **Comments**	**Meets regulations**
Proposed facility name CATCH BASIN				
Flood plain information What is the elevation of the floor of the lowest **proposed** manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	5 (m)	☑ Estimated ☐ From records	Not located in a known flood plain	☒ YES ☐ NO ☐ YES with exemption
Springs, wells, and surface water information a. How many springs are within 100 m of **proposed** manure storage facilities or manure collection areas?		0	No springs observed during site visit	☒ YES ☐ NO ☐ YES with exemption
b. How many water wells are within 100 m of **proposed** manure storage facilities or manure collection areas?		0	No water wells observed during site visit	☒ YES ☐ NO ☐ YES with exemption
c. What is the shortest distance from a **proposed** manure collection or storage facility to a surface water body? (ie, lake, creek, slough, seasonal, etc.)		460	470 m to SMRID canal	☒ YES ☐ NO ☐ YES with exemption
Groundwater information a. What is the depth to bedrock?	8.2 (m)	☐ Estimated ☐ Measured ☑ Drilling reports	N/A	
b. What is the depth to the water table?	1.5+ (m)	☐ Estimated ☐ Measured ☑ Drilling reports	1.5 m*	☒ YES ☐ NO ☐ YES with exemption
c. What is the shallowest depth to the uppermost groundwater resource?	13.7 (m)	☐ Estimated ☐ Measured ☑ Drilling reports	Well ID118178 possible UGR at 13.7 m depth**	☒ YES ☐ NO ☐ YES with exemption

Additional information: (attach borehole logs and records, as required)

*Approval Officer Note: attached drilling log (for work completed in 2017) shows a shallow water table. Indications at the site were the historic freshwater storage had been leaking and leading to a saturated condition at the site. Following completion of the new freshwater storage, the historic facility is no longer being filled. The water table at the site receded relatively rapidly and standing water was not present in post holes drilled to 1.5 m depth in summer 2018. None the less, a condition will be contained in Approval LA19017 requiring the permit holder to contact the NRCB if the water table is encountered during construction.

**closest well with lithology information

Water Well Drilling Report

View in Metric | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

GIC Well ID 118178
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1973/07/24

Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Country	Postal Code
MURRAY, JOHN	P.O. BOX 186 LETHBRIDGE				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	36	7	21	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.606910 Longitude -112.717560
How Location Obtained
Map

Elevation 3025.00 ft
How Elevation Obtained
Estimated

Drilling Information

Method of Drilling
Cable Tool

Type of Work
New Well

Proposed Well Use
Domestic & Stock

Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
40.00		Clay
45.00	Yes	Water Bearing Clay & Sand
140.00		Glacial Drift
150.00		Sand & Gravel
232.00		Glacial Drift
270.00		Shale

Yield Test Summary

Measurement in Imperial

Recommended Pump Rate 0.00 igpm

Test Date	Water Removal Rate (igpm)	Static Water Level (ft)
1973/05/28	8.00	153.00

Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
270.00 ft			1973/05/28

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	270.00

Surface Casing (if applicable)
Steel
Size OD : 5.56 in
Wall Thickness : 0.000 in
Bottom at : 231.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter or Slot Width(in)	Slot Length (in)	Hole or Slot Interval(in)

Perforated by

Annular Seal Driven
Placed from 0.00 ft to 0.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type
Size OD : 0.00 in

From (ft)	To (ft)	Slot Size (in)

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Company Name
MAUGHAN, JOSEPH R.

Certification No
1

Copy of Well report provided to owner

Date approval holder signed

Technical Document

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

WELL INFORMATION:

Well IDs: ID118178 (nearest well with lithology information, likely located approximately 1 mile south of the CFO)

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

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

Water Wells

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

Surface Water

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

ERST for **proposed** facilities

Facility	Groundwater score	Surface water score	File Number
Proposed feedlot pens	Low	Low	LA19017
Proposed catch basin	Low	Low	LA19017

ERST for **existing** facilities

Facility	Groundwater score	Surface water score	File Number
Existing catchment area	Low	Low	LA19017
Existing feedlot pens	Low	Low	LA19017

Groundwater or surface water related comments, see next page

Groundwater or surface water related comments:

Nearest surface water body is a SMRID canal. This canal flows westward into Six Mile Coulee and then the Oldman River. Surface water run-off at the CFO currently gathers in a grandfathered catchment area. The liner of this catchment area has been compromised by past activity at the CFO and Sundown Feeders has applied to replace the facility with a new catch basin complete with AOPA approved compacted liner.

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LAND BASE FOR MANURE AND COMPOST APPLICATION (for approvals and registrations only)

Name of landowner(s)*	Legal Land Description	Area ** (usable hectares)	Soil Zone	NRCB USE ONLY Area unsuitable:
Sundown Farmers	NW 1-8-21 W4		1 RR	116 acres irrigated, 15 acres DB*
	NE 1-8-21 W4		1 RR	110 acres irrigated
	SW-13-8-21-W4		1 RR	118 acres irrigated
				344 acres irrigated, 15 acres DB
	TOTAL	395		*dark brown

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

** Available manure spreading area (do not include required setback areas from residences, common bodies of water, water wells, etc.) (to convert from acres to hectares divide acres by 2.47)

Additional information: (attach copies of all signed land use agreements)

NRCB USE ONLY

Land base required: 345.9 acres irrigated

Land base listed: 395 acres

Area not suitable: 34 acres

Available area: 344 acres irrigated, 15 acres DB*

*DB is dark brown soil (non irrigated). AOPA requires approximately double the non irrigated dark brown soil area over irrigated. The 15 acres of DB is therefore more than adequate to make up for the 2 acre shortfall in irrigated area.

Requirement Met: ☒ YES ☐ NO

Land spreading agreements required: ☐ YES ☒ NO If yes, Agreements in file: ☐ Agreements attached: ☐

Manure Management Plan: ☐ YES ☒ NO Plan attached: ☐ Plan in file: ☐


211
210
4
Image © 2019 DigitalGlobe
© 2016 Google
Image © 2019 DigitalGlobe
Google
Imagery Date: 7/14/2018 49°37'15.66" N 112°43'31.76" W elev 3025 ft

Name	0
Address	0
Legal Land	
Location	0

Landbase Requirements (hectares) based on 2006 AOPA requirements

Category of Livestock	Type of Livestock	Number of Animals	Dark Brown & Brown (ha)	Grey Wooded (ha)	Black (ha)	Irrigated (ha)
Beef	Cows/Finishers (900+ lbs)	0	0	0	0	0
	Feeders (450 - 900 lbs)	3500	280	234.5	175	140
	Feeder Calves (<550 lbs)	0	-	-	-	-
	Other	0				
Dairy (*count lactating cows only)	*Free Stall – Lactating Cows with all associated dries, heifers, and calves	0	0	0	0	0
	*Free Stall – Lactating cows with Dry Cows only	0	-	-	-	-
	Free Stall – Lactating Cows only	0	-	-	-	-
	Tie Stall – Lactating cows only	0	-	-	0	0
	Loose Housing – Lactating cows only	0	-	-	-	-
	Dry Cow (Solid manure)	0	-	-	-	-
	Dry Cow (Liquid manure)	0	-	-	-	-
	Replacements – Bred Heifers (Breeding to Calving)	0	-	-	-	-
	Replacements - Growing Heifers (350 lbs to breeding)	0	-	-	-	-
	Calves (< 350 lbs)	0	-	-	-	-
	Other	0				
Swine Liquid (*count sows only)	Farrow to finish *	0	-	0	-	-
	Farrow to wean *	0	-	-	-	-
	Farrow only *	0	-	-	-	-
	Feeders/Boars	0	-	0	0	0
	Growers/Roasters	0	-	-	-	-
	Weaners	0	-	-	-	-
	Other	0				
Swine Solid (*Count sows only)	Farrow to finish *	0	-	-	-	-
	Farrow to wean *	0	-	-	-	-
	Farrow only *	0	-	-	-	-
	Feeders/Boars	0	-	-	-	-
	Growers/Roasters	0	-	-	-	-
	Weaners	0	-	-	-	-
		0				
Poultry	Chicken - Breeders - Solid	0	-	-	-	-
	Chicken - Layers - Liquid (includes associated pullets)	0	-	0	0	0
	Chicken - Layers - (Belt Cage)	0	-	-	-	-
	Chicken - Layers - (Deep Pit)	0	-	-	-	-
	Chicken - Pullets/Broilers	0	-	0	0	0
	Turkey - Toms/Breeders	0	0	0	0	0
	Turkey - Hens (light)	0	-	-	-	-
	Turkey - Broilers	0	-	-	-	-
	Ducks	0	0	0	0	0
	Geese	0	0	0	0	0
	Other	0				
Horses	PMU	0	0	0	0	0
	Feeders > 750 lbs	0	-	0	-	-
	Foals < 750 lbs	0	-	-	-	-
	Mules	0	-	-	-	-
	Donkeys	0	-	-	-	-
	Other	0				
Sheep	Ewes/Rams	0	-	0	0	0
	Ewes with lambs	0	-	-	-	-
	Lambs	0	-	-	-	-
	Feeders	0	-	-	-	-
	Other	0				
Goats	Meat/Milk (per Ewe)	0	0	0	0	0
	Nannies/Billies	0	-	-	-	-
	Feeders	0	-	-	-	-
	Other	0				
Bison	Bison	0	0	0	0	0
	Other	0				
Cervid	Elk	0	0	0	0	0
	Deer	0	0	0	0	0
	Other	0				
Wild Boar	Feeders	0	-	0	0	0
	Sow (farrowing)	0	-	-	-	-
	Other	0				
	Total Hectares		280.0	234.5	175.0	140.0
	Total Acres		691.9	579.4	432.4	345.9

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

Name	Legal Land Description	Distance (m)	Zoning (LUB) Category	MDS Cat (1-4)	Distance (m)	Meets Regulations
DAVE CARLSON *	N½ NE¼ 2-8-21W4	330	Ag	1	330 m	Yes with waiver
NEIGHBOUR #2	SW 12-8-21 W4	435	Ag	1	431 m	Yes
Mr. Sakamoto*	NE 01-08-21 W4		Ag	1	1130 m	Yes

*Mr. Sakamoto submitted an SOC with concerns about MDS. Required MDS to his residence would be 372 m (measured from nearest CFO facility to edge of residence).

Methods used/margins of error to determine distance:

Additional information:

* WAIVER ATTACHED

NRCB USE ONLY

Methods used to determine distance (if applicable): measurement from aerial photo

Margin of error (if applicable): _____

Requirements: Category 1: 372 m Category 2: 496 m Category 3: 620 m Category 4: 992 m

Technology factor: ☐ YES ☒ NO

Expansion factor: ☒ YES ☐ NO

Waivers required: ☒ YES ☐ NO # _____

Waivers attached: ☒ Waivers in file: ☒

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

Comments:

Declaration of Permit Applicant Regarding MDS Waiver

NRCB application number _____

Applicant information

Operator/operation name: Sundown Feeders Ltd.

Address: 4-80063 Rge Rd Lethbridge County

Postal code: T1K8G7

Legal land location of proposed confined feeding operation (CFO development): NW-1-8-21-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 NRCB publication "Minimum Distance Separation (MDS) Waivers." 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, 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:

  beef backgrounding 2500 hd capacity

- My application for a new AOPA permit proposes the following changes to the existing livestock capacity at my CFO:

  3500 hd capacity

- 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):

  according to requirements

Permit applicant: _____ Date: APR/9 2018
Signature

Residence owner(s) to initial: _____

Minimum Distance Separation (MDS) Waiver

Residence owner information

Names(s) on title: DAVID & ALLISON CARLSON

Address: 50064 RANGE ROAD 211

Postal code: T1K 8G7

Legal land location: N½ NE¼ 28 21 W4

I am/we are the legal landowner(s) of a residence located at the above noted address. I/we have read the NRCB publication "Minimum Distance Separation (MDS) Waivers" and the above declaration of the applicant, and discussed the nature of application number 1000 with the applicant. I/we understand that:

- The application **does not** meet the MDS requirement to my/our residence, under the *Agricultural Operation Practices Act* (AOPA);
- **I/we are not obligated to waive the MDS requirement to our residence**;
- If I/we choose to waive the MDS requirement, I/we can cancel the waiver, by providing written notice of the cancellation to the Natural Resources Conservation Board (NRCB), at any time prior to the permit decision being issued by the NRCB;
- 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_____.

Signatures of all landowners on title

DAVID E.M. CARLSON

Printed names of all landowners on title

Date: APRIL 9 2018

FOR NRCB USE ONLY:
Residence owner contact information
(Please note that telephone numbers and email addresses are not publicly released)

Telephone: **Email:**

Name
Address
Legal Land
Location

MDS Spreadsheet based on 2006 AOPA Regulations

Category of Livestock	Type of Livestock	Factor A	Technology Factor	MU	LSU Factor	Number of Animals	LSU
Beef	Cows/Finishers (900+ lbs)	0.700	0.700	0.910	0.446		-
	Feeders (450 - 900 lbs)	0.700	0.700	0.500	0.245	3,500	857.5
	Feeder Calves (<550 lbs)	0.700	0.700	0.275	0.135		-
	Other						-
Dairy (*count lactating cows only)	*Free Stall – Lactating Cows with all associated dries, heifers, and calves	0.800	1.100	2.000	1.760		-
	*Free Stall – Lactating cows with Dry Cows only	0.800	1.100	1.640	1.443		-
	Free Stall – Lactating Cows only	0.800	1.100	1.400	1.232		-
	Tie Stall – Lactating cows only	0.800	1.000	1.400	1.120		-
	Loose Housing – Lactating cows only	0.800	1.000	1.400	1.120		-
	Dry Cow (Solid manure)	0.800	0.700	1.000	0.560		-
	Dry Cow (Liquid manure)						
	Replacements – Bred Heifers (Breeding to Calving)	0.800	0.700	0.875	0.490		-
	Replacements - Growing Heifers (350 lbs to breeding)	0.800	0.700	0.525	0.294		-
	Calves (< 350 lbs)	0.800	0.700	0.200	0.112		-
	Other						-
Swine Liquid (*count sows only)	Farrow to finish *	2.000	1.100	1.780	3.916		-
	Farrow to wean *	2.000	1.100	0.670	1.474		-
	Farrow only *	2.000	1.100	0.530	1.166		-
	Feeders/Boars	2.000	1.100	0.200	0.440		-
	Growers/Roasters	2.000	1.100	0.118	0.260		-
	Weaners	2.000	1.100	0.055	0.121		-
	Other						-
Swine Solid (*Count sows only)	Farrow to finish *	2.000	0.800	1.780	2.848		-
	Farrow to wean *	2.000	0.800	0.670	1.072		-
	Farrow only *	2.000	0.800	0.530	0.848		-
	Feeders/Boars	2.000	0.800	0.200	0.320		-
	Growers/Roasters	2.000	0.800	0.118	0.189		-
	Weaners	2.000	0.800	0.055	0.088		-
							-
Poultry	Chicken - Breeders - Solid	1.000	0.700	0.010	0.007		-
	Chicken - Layers - Liquid (includes associated pullets)	2.000	1.100	0.008	0.018		-
	Chicken - Layers - (Belt Cage)	2.000	0.700	0.008	0.011		-
	Chicken - Layers - (Deep Pit)	2.000	0.700	0.008	0.011		-
	Chicken - Pullets/Broilers	1.000	0.700	0.002	0.001		-
	Turkey - Toms/Breeders	1.000	0.700	0.020	0.014		-
	Turkey - Hens (light)	1.000	0.700	0.013	0.009		-
	Turkey - Broilers	1.000	0.700	0.010	0.007		-
	Ducks	1.000	0.700	0.010	0.007		-
	Geese	1.000	0.700	0.020	0.014		-
	Other						-
Horses	PMU	0.650	0.700	1.000	0.455		-
	Feeders > 750 lbs	0.650	0.700	1.000	0.455		-
	Foals < 750 lbs	0.650	0.700	0.300	0.137		-
	Mules	0.600	0.700	1.000	0.420		-
	Donkeys	0.600	0.700	0.670	0.281		-
	Other						-
Sheep	Ewes/Rams	0.600	0.700	0.200	0.084		-
	Ewes with lambs	0.600	0.700	0.250	0.105		-
	Lambs	0.600	0.700	0.050	0.021		-
	Feeders	0.600	0.700	0.100	0.042		-
	Other						-
Goats	Meat/Milk (per Ewe)	0.700	0.700	0.170	0.083		-
	Nannies/Billies	0.700	0.700	0.140	0.069		-
	Feeders	0.700	0.700	0.077	0.038		-
	Other						-
Bison	Bison	0.600	0.700	1.000	0.420		-
	Other						-
Cervid	Elk	0.600	0.700	0.600	0.252		-
	Deer	0.600	0.700	0.200	0.084		-
	Other						-
Wild Boar	Feeders	2.000	0.800	0.140	0.224		-
	Sow (farrowing)	2.000	0.800	0.371	0.594		-
	Other						-
					Total		857.5

For New Operations

Dispersion Factor: 1

Category	Odour Objective	Distance Feet	Distance Metres
1	41.04	1,584	483
2	54.72	2,112	644
3	68.4	2,640	805
4	109.44	4,225	1,288

For Expanding Operations

Dispersion Factor: 1
Expansion Factor: 0.77

Category	Odour Objective	Distance Feet	Distance Metres
1	41.04	1,220	372
2	54.72	1,626	496
3	68.40	2,033	620
4	109.44	3,253	992

Technical Document

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

ALL SIGNATURES IN FILE: ☒ Yes ☐ No

DATES OF APPROVAL OFFICER SITE VISITS:

April 3, 2019	
May 2, 2019	
March 29, 2018	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES:

Date deeming letters sent May 7, 2019

Municipality: Lethbridge County

☒ Letter sent ☒ Response received ☒ written/email ☐ verbal ☐ no comments received

Alberta Health Services:

☒ 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: St. Mary River Irrigation District

☒ Letter sent ☒ Response received ☒ written/email ☐ verbal ☐ no comments received

Other: _____

☐ Letter sent ☐ Response received ☐ written/email ☐ verbal ☐ no comments received

PLANS

Submitted and attached construction plans ☒YES ☐NO

Submitted aerial photos ☒YES ☐NO

Submitted photos ☐YES ☒NO

GRANDFATHERING:

On this application: ☒ Yes ☐ No

Comments:

On a previous application/decision: ☐ Yes ☒ No If yes, list application/decision number _____

Comments:

Sundown Feeders holds municipal permit #94-08 which was issued on March 8, 1994. This permit allowed for the remodeling and operation of a 2,500 head feedlot. See further discussion on the grandfathered status of the CFO and deemed capacity in Appendix D of Decision Summary LA19017.

DEEMING CAPACITY: ☒Yes ☐No

Comments:

Municipal permit #94-08 stated the capacity of the feedlot as 2,500 head. See further discussion on the grandfathered status of the CFO and deemed capacity in Appendix D of Decision Summary LA19017.

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)

SOLID MANURE, COMPOST & COMPOSTING MATERIALS: Barns, feedlots & storage facilities - Compacted soil liner

*(complete a copy of this section for **EACH** barn, feedlot and storage facility for solid manure, composting materials or compost with a compacted soil liner)*

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

1. FEEDLOT PEN

2. RECOVERY PEN

Manure storage capacity

	Length (m)	Width (m)	Estimated storage capacity (m^3)	Depth below grade to the bottom of the liner (m)
1.	140	80	1 YR	0
2.	35	20	1 YR	0

NRCB USE ONLY

Depth to water table: 1.5 m* Requirements met: ☒ YES ☐ NO

Depth to UGR: 13.7 m Requirements met: ☒ YES ☐ NO

ERST completed: ☒ YES ☐ NO

Groundwater risk level: Low Surface Water risk level: Low

*due to past variability in water table depth at the site, a condition has been included requiring Sundown Feeders to contact the NRCB if the water table is encountered during construction.

UGR: Uppermost Groundwater Resource as defined under AOPA's *Standards and Administration Regulation*.

Surface water control systems

☐ Under roof: Surface water will be controlled by the walls and roof of the building and by the finished landscaping.

☑ Outdoor: Describe the run-on and runoff control system proposed for feedlots and outdoor manure storage facilities:

ALL SURFACE WATER DIRECTED TO CATCH BASIN

NRCB USE ONLY

Requirements met: ☒ YES ☐ NO Details/comments:

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)

SOLID MANURE, COMPOST & COMPOSTING MATERIALS: Barns, feedlots & storage facilities - Compacted soil liner (cont.)

Compacted soil liner details

a. Thickness of compacted liner (m)	Provide details:		
1/2 M	CLAY TEST PROVIDED		
b. Soil texture	_____% sand	_____% silt	_____% clay
c. Atterberg limits	Plastic limit	Liquid limit	Plasticity index
	_____	_____	_____
d. Hydraulic conductivity	Hydraulic conductivity (cm/s)		
	Describe test standard used		

Liner protection

Describe how the physical integrity of the liner will be maintained	Provide details:

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

NRCB USE ONLY

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

Samples of clay stockpile are attached below. A permit condition requiring written confirmation that the liners are constructed in accordance with AOPA requirements has been included in Approval LA19017.

Protective liner requirements met: ☒ YES ☐ NO Condition required: ☒ YES ☐ NO

Comments:

A permit condition requiring written confirmation that the liners are constructed in accordance with AOPA requirements has been included in Approval LA19017.

Hydraulic conductivity after adjustment: 8.9×10^{-8} cm/sec Condition required: ☒ YES ☐ NO

Comments on testing method/origin of material:

A permit condition requiring written confirmation that the liners are constructed in accordance with AOPA requirements has been included in Approval LA19017.

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)

RUNOFF CONTROL CATCH BASIN: Compacted soil liner

*(complete a copy of this section for **EACH** runoff control catch basin with a compacted soil liner)*

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

1. CATCH BASIN
2. _____
3. _____

Determination of minimum required catch basin volume

Show your calculations for determining the minimum required catch basin volume	Provide calculation assumptions:

Catch basin capacity

	Length (m)	Width (m)	Depth (m)	Slope run:rise			Estimated storage capacity (excl. freeboard) (m^3)	Depth below grade of the bottom of the liner(m)
				Inside end walls	Inside side walls	Outside walls		
1.	55	50	2	3	3		3038	2
2.								
3.								
						TOTAL CAPACITY		

NRCB USE ONLY

Catch basin calculator (calculation attached). Total volume @ freeboard: 3,038 m^3 Requirements met: ☒ YES ☐ NO

Depth to water table: 1.5 m* Requirements met: ☒ YES ☐ NO

Depth to UGR: 8.7 m from catch basin floor Requirements met: ☒ YES ☐ NO

ERST completed: ☒ YES ☐ NO

Groundwater risk level: Low Surface Water risk level: Low

*due to past variability in water table depth at the site, a condition has been included requiring Sundown Feeders to contact the NRCB if the water table is encountered during construction.

UGR: Uppermost Groundwater Resource as defined under AOPA's *Standards and Administration Regulation*.

RUNOFF CONTROL CATCH BASIN: Compacted soil liner (cont.)

Compacted soil liner details

a. Compacted soil liner	Thickness of liner 1 (m)	Provide details: Build Liner clay test provided	
b. Soil texture	_____% sand	_____% silt	_____% clay
c. Atterberg limits	Plastic limit _____	Liquid limit _____	Plasticity index _____
d. Hydraulic conductivity	Hydraulic conductivity (cm/s)		
	Describe test standard used		

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

NRCB USE ONLY

Liner specification comments (e.g. compaction required, moisture content, thickness):
Samples of clay stockpile are attached below. A permit condition requiring written confirmation that the liners are constructed in accordance with AOPA requiorements has been included in Approval LA19017.

Protective liner requirements met? ☒ YES ☐ NO Condition required: ☒ YES ☐ NO

Comments:

A permit condition requiring written confirmation that the liners are constructed in accordance with AOPA requirements has been included in Approval LA19017.

Hydraulic conductivity after adjustment: 8.9 x 10-8 cm/sec

Comments on testing method/origin of material:

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

Comments:

Catch Basin Dimensions Calculator

Construction Dimensions of Catch Basin

Size of Catch Basin	Metric		English Units: Capacity of Catch Basin	
Length*$_4$	55.0	m	180.45	Feet
Width*$_4$	50.0	m	164.04	Feet
Total Depth*$_4$	2.0	m	6.56	Feet
Water Depth	1.50	m	4.92	Feet
End Slope*$_4$	3	run:rise	3	run:rise
Side Slope*$_4$	3	run:rise	3	run:rise
Length of Bottom	43.0			
Width of Bottom	38.0			
Total Capacity @ top of Bank	**4,336**	**m^3**	**153,124**	**ft^3**
			953,786	**Imp. Gal.**

* Only cells in blue can be changed.

Name$_1$	Test		
Land Location$_1$			
Area$_2$	Length (m)	Width (m)	Area (m^2)
1	270	190	51,300
2			0
3			0
4			0
5			0
		Total Area	51,300

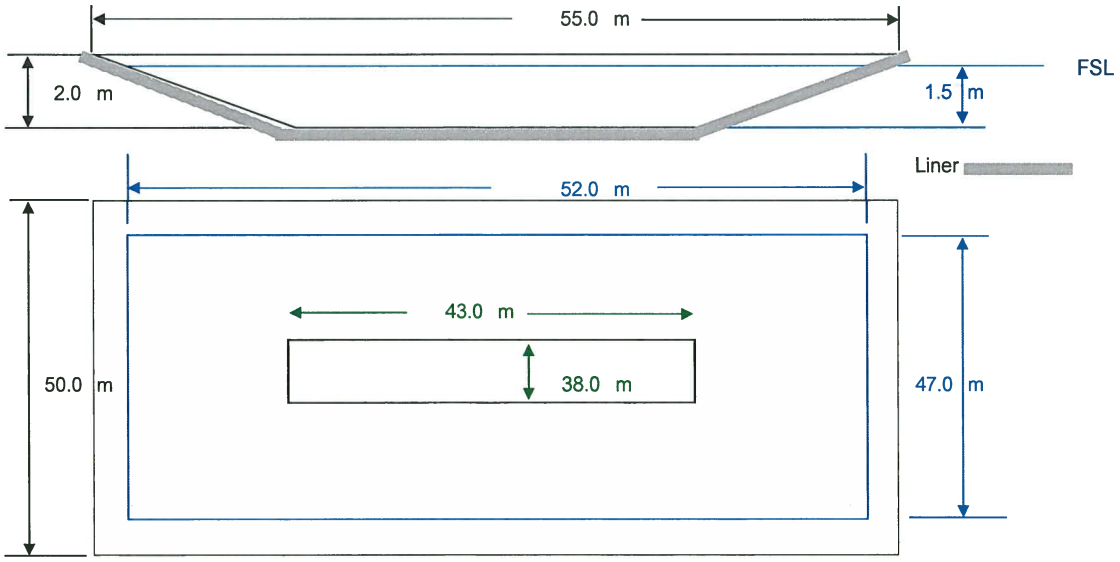
Select Town$_3$
Lethbridge 90
Design Rainfall 90 mm

Storage Volume of Catch Basin at Design Capacity (without freeboard)			Volume at Freeboard	
Length (Top of liquid level)	52.0	m	170.60	Feet
Width (Top of liquid level)	47.0	m	154.20	Feet
Depth	2.0	m	6.56	Feet
Water Depth	1.50	m	4.92	Feet
End Slope	3	run:rise	3	run:rise
Side Slope	3	run:rise	3	run:rise
Total Volume@ freeboard depth	**3,038**	**m^3**	**107,295**	**ft^3**
			668,321	**Imp. Gal.**
Surface Area of Liquid Manure	**2,444**	**m^2**	**26,307**	**ft^2**

Catch Basin Design Volume

3,001 m^3 **105,981 ft^3**
660,138 Imp. Gal.

** Storage volume should be same or slightly greater than design storage volume.



Lines in Black - Catch basin dimension
Lines in Blue - full level

NTS - Not Drawn To Scale

Moisture - Density Relationship Report

469 - 40 Street South
Lethbridge AB T1J 4M1
Tel: 1-403-327-7474
Fax: 1-403-327-7682

TO: **Sundown Feeders**
4-80063 Range Road 211
Lethbridge, AB T1K 8G7

ATTENTION: **Mr. Gus Van Velthuizen**

Wood File: **BX30583**

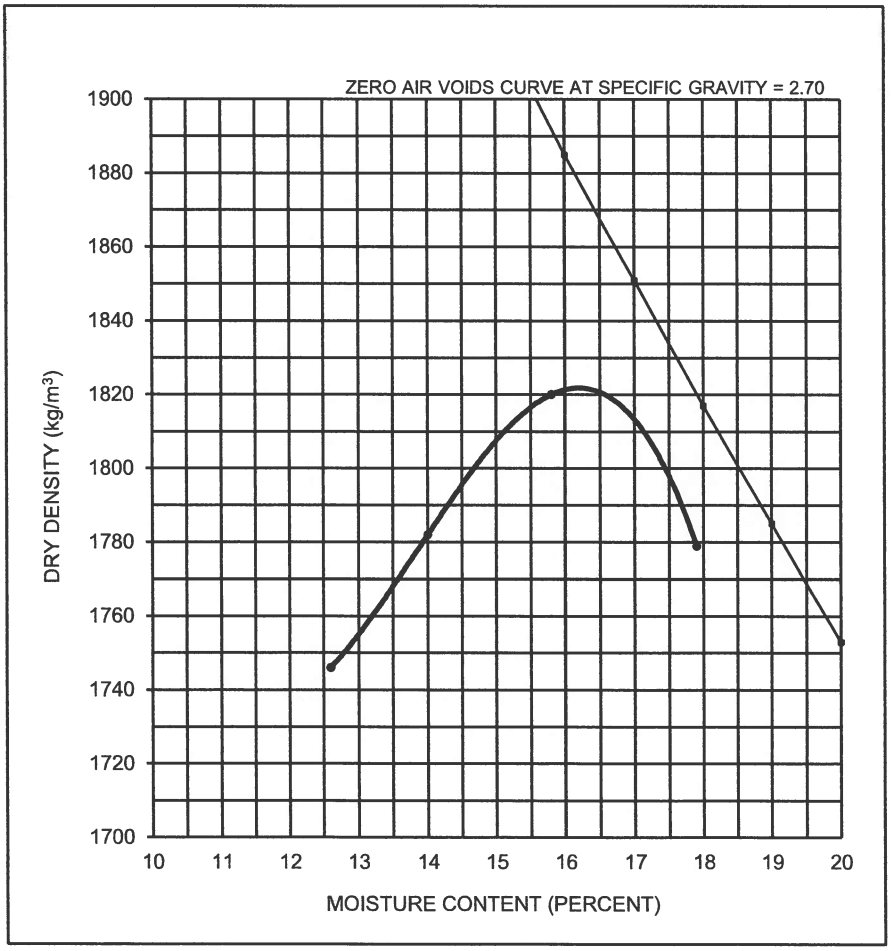
PROJECT: Geotechnical Consulting Services (NRCB Permeability testing) – NW-1-8-21-W4

COMPACTION STANDARD [X] ASTM D698 [ ] ASTM D1557 [ ] ASTM D558 **METHOD:** C

DRY DENSITY kg/m³	1746	1782	1820	1779			
MOISTURE CONTENT (%)	12.6	14.0	15.8	17.9			

MAXIMUM DRY DENSITY: 1822 kg/m³
OPTIMUM MOISTURE CONTENT: 16.2 %

SOURCE: Onsite Stockpile



DATE SAMPLED: 5-Mar-19
SAMPLED BY: Client
DATE RECEIVED: 5-Mar-19
SAMPLE NO.: 1

RAMMER TYPE
[ ] AUTO
[X] MANUAL

PREPARATION
[X] MOIST
[ ] DRY

PERCENT RETAINED
[E - 5] 4.75 mm SCREEN
[ ] 9.50 mm SCREEN
[ ] 19.0 mm SCREEN

SOIL DESCRIPTION:
Clay

Wood Environment & Infrastructure Solutions
A Division of Wood Canada Ltd.

Per: _____
J.Lobbezoo, P.Eng.

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

PERMEABILITY TEST

wood.

CLIENT :	Sundown Feeders		
PROJECT :	Proposed Pens (Compacted Clay Base)		
JOB No. :	BX30583		
LOCATION :		SAMPLE:	Clay
BOREHOLE:	--	DEPTH :	--
DATE :	12-Mar-19	TECHNICIAN :	DR

SAMPLE DATA

Sample Description :	Clay, medium plastic, silty, trace fine sand		
Sample Diameter (mm) :	101.4	Cross Section Area (cm²)	
Initial Sample Length (mm) :	116.2	Initial Volume (cm³)	
Final Sample Length (mm)		Final Volume(cm³)	
		Change in Volume (cm³)	

MOISTURE DETERMINATION	Before	After	DENSITY DETERMINATION	Before	After
Tare No. :	1		Mould No.	1	
Wt. Sample (wet + tare) (g)	234.9		Wt. Sample (wet + mould) (g)	4061.1	
Wt. Sample (dry + tare) (g)	202.7		Wt. Mould (g)	2098.8	
Wt. Tare (g)	9.8		Wt. Sample (wet) (g)	1962.3	
Wt. Water (g)	32.2		Volume Mould (cm³)	936.000	
Wt. Sample (dry) (g)	192.9		Wet Density (kg/m³)	2096	
Moisture Content (%)	16.7%		Dry Density (kg/m³)	1797	

PERMEABILITY TEST DATA

				Elapsed Time (sec)			Permeability (cm/s)	
Date	Temp	h1	h2	Time	Elapsed Time		Initial	Average
March 15, 2019	23	26.00		8:30 AM				
March 16, 2019	23		24.00	8:00 AM	86400		1.38E-07	
March 16, 2019	23	26.00		8:00 AM				
March 17, 2019	23		24.10	9:30 AM	86400		1.31E-07	
March 17, 2019	23	26.00		9:30 AM				
March 18, 2019	23		24.60	8:00 AM	86400		9.57E-08	
March 18, 2019	23	26.00		8:00 AM				
March 19, 2019	23		25.75	8:00 AM	86400		1.67E-08	5.62E-08
March 19, 2019	23	26.00		8:00 AM				
March 20, 2019	23		25.90	8:00 AM	86400		6.67E-09	3.14E-08
March 20, 2019	23	26.00		8:00 AM				
March 21, 2019	23		25.95	8:00 AM	86400		3.33E-09	1.74E-08
March 21, 2019	23	26.00		8:00 AM				
March 22, 2019	23		25.95	8:00 AM	86400		3.33E-09	1.04E-08
						Average Permeabilty, k:	**8.90E-09**	**cm/sec**

REMARKS:

Proctor = 1822 kg/m3 @16.2%

FORM : BX30583 Permeability 01
DATE: 28/03/2019

J.Lobbezoo, P.Eng.

Moisture - Density Relationship Report

469 - 40 Street South
Lethbridge AB T1J 4M1
Tel: 1-403-327-7474
Fax: 1-403-327-7682

TO: **Sundown Feeders**
4-80063 Range Road 211
Lethbridge, AB T1K 8G7

ATTENTION: **Mr. Gus Van Velthuizen**

Wood File: **BX30583**

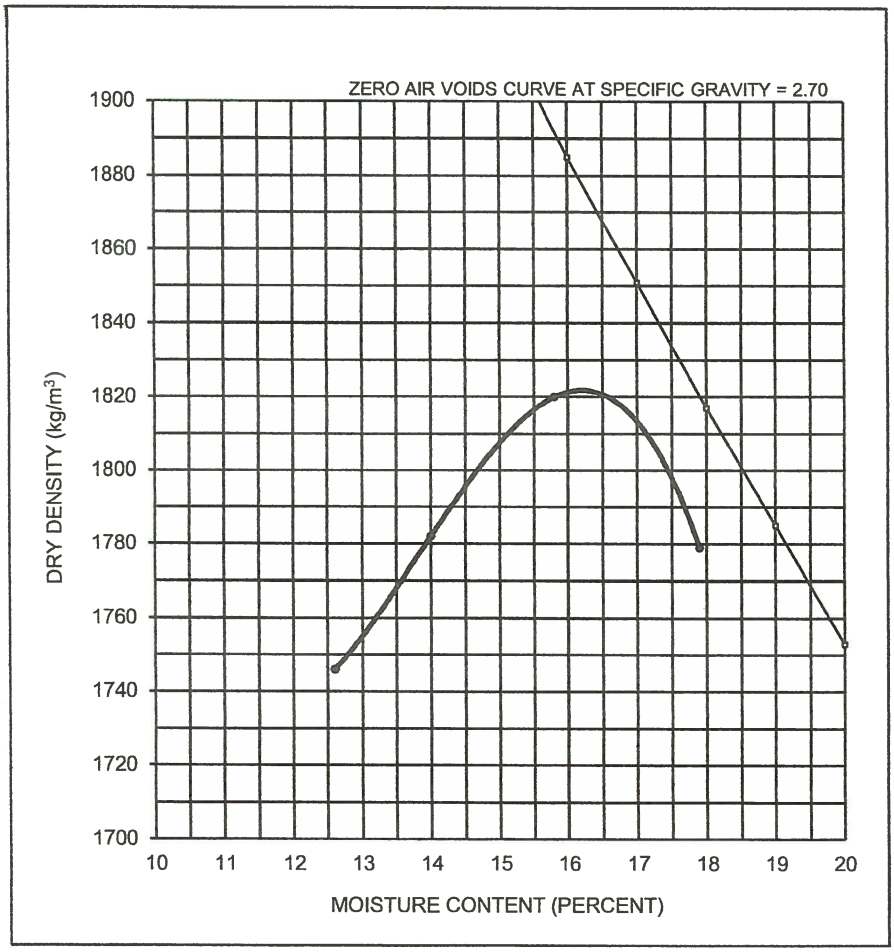
PROJECT: Geotechnical Consulting Services (NRCB Permeability testing) – NW-1-8-21-W4

COMPACTION STANDARD [X] ASTM D698 [ ] ASTM D1557 [ ] ASTM D558 **METHOD:** C

DRY DENSITY kg/m³	1746	1782	1820	1779			
MOISTURE CONTENT (%)	12.6	14.0	15.8	17.9			

MAXIMUM DRY DENSITY: 1822 kg/m³
OPTIMUM MOISTURE CONTENT: 16.2 %

SOURCE: Onsite Stockpile



DATE SAMPLED: 5-Mar-19
SAMPLED BY: Client
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SAMPLE NO.: 1

RAMMER TYPE
[ ] AUTO
[X] MANUAL

PREPARATION
[X] MOIST
[ ] DRY

PERCENT RETAINED
[E - 5] 4.75 mm SCREEN
[ ] 9.50 mm SCREEN
[ ] 19.0 mm SCREEN

SOIL DESCRIPTION:
Clay

Wood Environment & Infrastructure Solutions
A Division of Wood Canada Ltd.

Per: _____
J.Lobbezoo, P.Eng.

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

PERMEABILITY TEST

wood.

CLIENT :	Sundown Feeders		
PROJECT :	Proposed Pens (Compacted Clay Base)		
JOB No. :	BX30583		
LOCATION :		SAMPLE:	Clay
BOREHOLE:	--	DEPTH :	--
DATE :	12-Mar-19	TECHNICIAN :	DR

SAMPLE DATA

Sample Description :	Clay, medium plastic, silty, trace fine sand		
Sample Diameter (mm) :	101.4	Cross Section Area (cm²)	
Initial Sample Length (mm) :	116.2	Initial Volume (cm³)	
Final Sample Length (mm)		Final Volume(cm³)	
		Change in Volume (cm³)	

MOISTURE DETERMINATION	Before	After
Tare No. :	1	
Wt. Sample (wet + tare) (g)	234.9	
Wt. Sample (dry + tare) (g)	202.7	
Wt. Tare (g)	9.8	
Wt. Water (g)	32.2	
Wt. Sample (dry) (g)	192.9	
Moisture Content (%)	16.7%	

DENSITY DETERMINATION	Before	After
Mould No.	1	
Wt. Sample (wet + mould) (g)	4061.1	
Wt. Mould (g)	2098.8	
Wt. Sample (wet) (g)	1962.3	
Volume Mould (cm³)	936.000	
Wet Density (kg/m³)	2096	
Dry Density (kg/m³)	1797	

PERMEABILITY TEST DATA

				Elapsed Time (sec)			Permeability (cm/s)	
Date	Temp	h1	h2	Time	Elapsed Time		Initial	Average
March 15, 2019	23	26.00		8:30 AM				
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March 17, 2019	23		24.10	9:30 AM	86400		1.31E-07	
March 17, 2019	23	26.00		9:30 AM				
March 18, 2019	23		24.60	8:00 AM	86400		9.57E-08	
March 18, 2019	23	26.00		8:00 AM				
March 19, 2019	23		25.75	8:00 AM	86400		1.67E-08	5.62E-08
March 19, 2019	23	26.00		8:00 AM				
March 20, 2019	23		25.90	8:00 AM	86400		6.67E-09	3.14E-08
March 20, 2019	23	26.00		8:00 AM				
March 21, 2019	23		25.95	8:00 AM	86400		3.33E-09	1.74E-08
March 21, 2019	23	26.00		8:00 AM				
March 22, 2019	23		25.95	8:00 AM	86400		3.33E-09	1.04E-08
					Average Permeabilty, k:		**8.90E-09**	**cm/sec**

REMARKS:

Proctor = 1822 kg/m3 @16.2%

FORM : BX30583 Permeability 01
DATE: 28/03/2019

J.Lobbezoo, P.Eng.

CHILAKO DRILLING SERVICES LTD

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

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: NW1-8-21W4, Sundown Feeders Date: 20-Apr-18

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
SD1-18	0374950	0-0.15	CL	Sat	Topsoil		Seepage plus spring runoff
	5497957	0.15-0.6	CL	M	Lac		Soft
		0.6-1.8	FSCL	Sat	Lac		Soft
		1.8-4.6	CL	M	Till		Stiff, med plastic, brown, trace sand
		4.6-7.0	CL-C	M	Till		Stiff, med plastic, brown, trace sand, oxidized
		7.0-9.2	C	M	Till		Stiff, med plastic, grey, basel till
							Slough @ 1.2m
SD2-18	0375090	0-0.15	FSL	VM	Lac		
	5497953	0.15-1.6	FSL	Sat	Lac		V. soft, free water
		1.6-3.7	FSCL	Sat	Lac		V. soft, free water
		3.7-6.5	CL	M	Till		Stiff, med plastic, brown
		6.5-9.2	CL-C	M	Till		Stiff, med plastic, dark brown
SD3-18	0375030	0-0.7	CL	M			
	5498006	0.7-3.6	FSCL	Sat			Soft-firm
		3.6-4.0	SiC	M			Stiff, med-high plastic, yellow brown
		4.0-7.5	CL-C	M			Stiff, med plastic, brown
							Free water @ 1.1m
SD4-18	0375035	0-0.7	CL	M	Lac		
	5498048	0.7-3.0	FSCL-FSL	Sat	Lac		Soft, water @ 1.0m
SD5-18	0375010	0-1.1	CL	M	Lac		
	5498022	1.1-2.5	FSL-FSCL	Sat	Lac		Water @ 1.0m
		2.5-3.0	FSL-FSCL	Sat	Till		
SD6-18	0375000	0-0.7	CL	M	Lac		
	5598048	0.7-3.0	FSL-FSCL	Sat	Lac		Water @ 1.2m


SD6-18
SD4-18
SD5-18
SD3-18
SD1-18
SD2-18
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