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	BA24013	NE 20-49-22 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.

March 20th 2025
Date of signing

[redacted]
Signature

ELSHADDAI DAIRIES INC.
Corporate name (if applicable)

DIETER GAGELMANS
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)
Dairy Barn addition	30Ft x 180 Ft
Calf Barn	40Ft x 160 Ft
Manure lagoon	80m x 80m x 4.5m

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

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
Milking Barn		
Dry Cow Barn		
Feedpens 1, 2, 3		

NRCB USE ONLY

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

Existing facilities continued	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
old Lagoon		
Manure storage Pad		

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

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

Construct new lagoon
Remove old lagoon

Construction completion date for proposed facilities End 2027

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**

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____. _____
Signature of Applicant or Agent

OPTION 3: Additional water licence not required

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

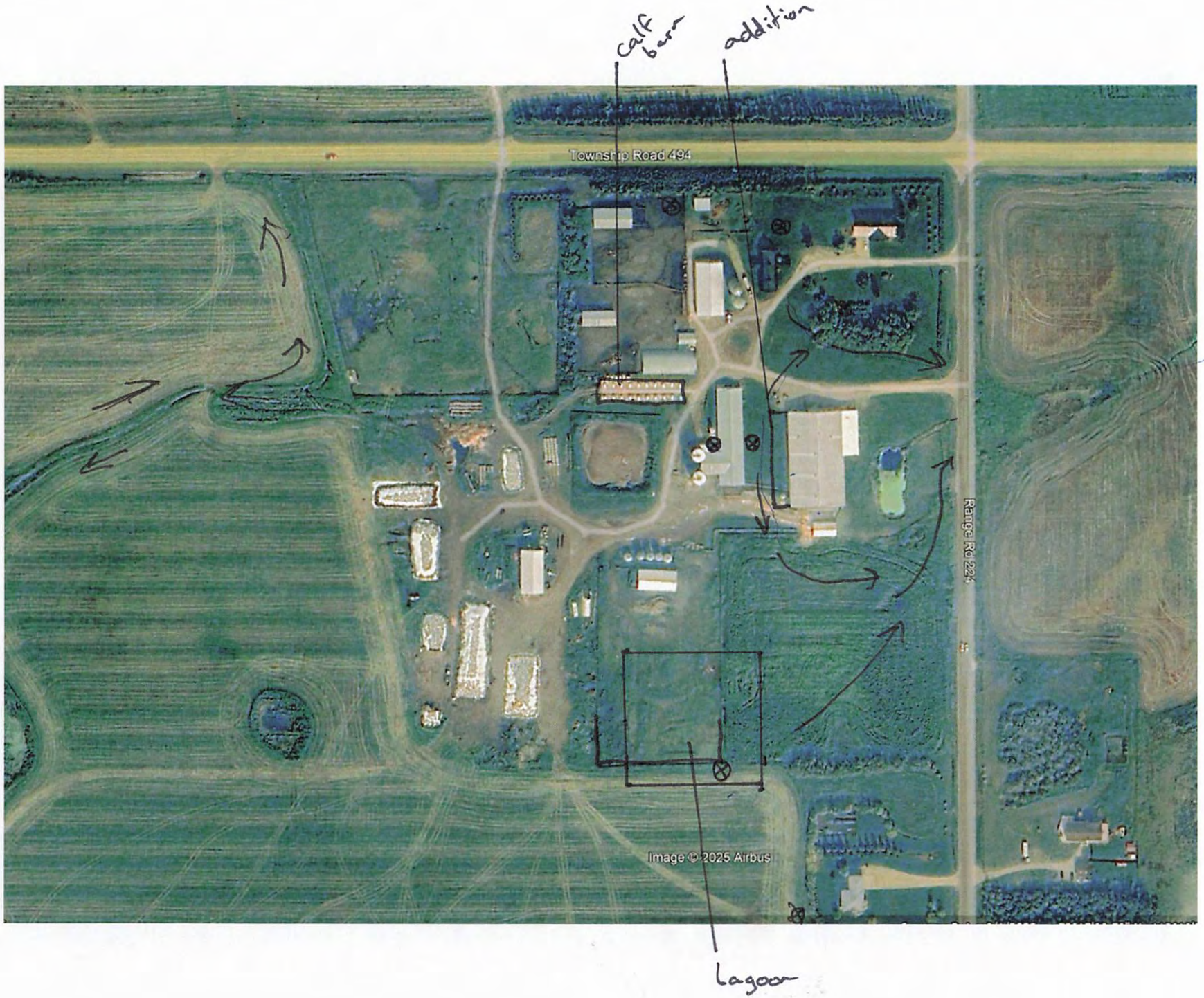
Signed this ____ day of _____, 20____. _____
Signature of Applicant or Agent

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

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

Signed this 20th day of March, 2025. [redacted]

Signature of Applicant or Agent


calf barn
addition
Township Road 494
Range Rd 224
Image © 2025 Airbus
lagoon

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: Dairy Barn **Proposed 1:** Lagoon

Proposed 2: Calf Barn **Proposed 3:** Addition

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☒ >1 m ☐ ≤ 1 m	☒ >1 m ☐ ≤ 1 m	☒ >1 m ☐ ≤ 1 m	☒ > 1 m ☐ ≤ 1 m	☐ YES ☐ NO ☐ YES with exemption	
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	0	0	0	0	☐ YES ☐ NO ☐ YES with exemption	
	How many water wells are within 100 m of the manure storage facility or manure collection area?	3	1	3	3	☐ YES ☐ NO ☐ YES with exemption	
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	300m	250m	150m	250m	☐ YES ☐ NO ☐ YES with exemption	
Groundwater information	What is the depth to the water table?		>6	>6	>6	☐ YES ☐ NO ☐ YES with exemption	
	What is the depth to the groundwater resource/aquifer you draw water from?	60Ft	60Ft	60Ft	60Ft	☐ YES ☐ NO ☐ YES with exemption	

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

Water Well Drilling Report

View in Imperial | 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.

GIC Well ID 1370463
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2014/08/18

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
VOLKMAN, GEOFF	RR 2	NEW SAREPTA	ALBERTA	CANADA	T0B 3M0

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	20	49	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.249950 Longitude -113.172170
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 762.00 m
How Elevation Obtained
Differential corrected handheld GPS 5-10m

Drilling Information

Method of Drilling
Combination

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
2.74		Till
5.49		Gray Clay
7.01		Silty Clay
7.92		Brown Clay
9.45		Yellow Sandy Clay
11.28		Gray Fractured Shale
12.19		Sandstone
13.72		Gray Shale
14.33		Green Shale
17.07		Gray Shale
17.37		Coal
18.59		Brown Soft Shale
19.20		Soft Sandstone
19.81		Light Brown Shale
20.73		Silty Sandstone
23.77		Gray Shale
24.08		Sandstone
27.43		Shale
27.74		Limestone
28.35	Yes	Sandstone
29.57		Shale
30.18	Yes	Coal
32.31		Shale
34.44	Yes	Sandstone
48.77		Shale
49.68		Brown Shale
50.90		Gray Shale
53.04		Sandstone
54.86		Shale
58.52	Yes	Sandstone
60.05		Shale
60.96		Coal

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 9.09 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
2011/06/02	9.09	12.09

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
65.53 m	65.53 m	2011/06/01	2011/06/02

Borehole

Diameter (cm)	From (m)	To (m)
20.00	0.00	21.34
15.24	21.34	22.86
13.02	22.86	65.53

Surface Casing (if applicable)
Plastic
Size OD : 15.24 cm
Wall Thickness : 0.991 cm
Bottom at : 22.56 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.544 cm
Top at : 19.81 m
Bottom at : 65.53 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
28.96	35.05	0.102		12.70
53.34	65.53	0.102		12.70

Perforated by Saw

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 m to 21.34 m
Amount 200.00 Pounds

Other Seals

Type	At (m)
Drive Shoe	21.34
Driven	22.56
K-Packer	35.05

Screen Type
Size OD : cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings Bottom Fittings

Pack
Type Grain Size

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MARK HOLLAND

Certification No
76129A

Company Name
HOLLAND WATER WELLS

Copy of Well report provided to owner
Yes

Date approval holder signed
2011/08/01

Water Well Drilling Report

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.

View in Imperial **Export to Excel**

GOWN ID

GIC Well ID 1370463
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2014/08/18

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
VOLKMAN, GEOFF	RR 2	NEW SAREPTA	ALBERTA	CANADA	T0B 3M0

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	20	49	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.249950 Longitude -113.172170
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 762.00 m
How Elevation Obtained
Differential corrected handheld GPS 5-10m

Depth from ground level (m)	Water Bearing	Lithology Description
62.48	Yes	Sandstone
62.79	Yes	Coal
64.01		Shale
65.53		Sandstone

Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MARK HOLLAND

Certification No
76129A

Company Name
HOLLAND WATER WELLS

Copy of Well report provided to owner
Yes

Date approval holder signed
2011/08/01

Water Well Drilling Report

View in Imperial | Export to Excel

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GIC Well ID 1370463
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2014/08/18

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
VOLKMAN, GEOFF	RR 2	NEW SAREPTA	ALBERTA	CANADA	T0B 3M0

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	20	49	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.249950 Longitude -113.172170
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 762.00 m
How Elevation Obtained
Differential corrected handheld GPS 5-10m

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level 53.34 cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate 9.09 L/min
Recommended Pump Intake Depth (From TOC) 44.50 m
Pump Installed Yes
Type Submersible
Depth 44.50 m
Make GRUNDFOS
H.P. 0.5
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Gas
Depth m
Remedial Action Taken
Well Disinfected Upon Completion Yes
Geophysical Log Taken
Submitted to ESRD
Sample Collected for Potability
Submitted to ESRD
Additional Comments on Well

Yield Test

Taken From Top of Casing
Depth to water level

Measurement in Metric

Test Date	Start Time	Static Water Level
2011/06/02	3:00 PM	12.09 m

Method of Water Removal
Type Air
Removal Rate 9.09 L/min
Depth Withdrawn From 57.91 m

If water removal period was < 2 hours, explain why

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
12.09	0:00	57.91
	1:00	55.55
	2:00	55.04
	3:00	54.56
	4:00	54.03
	5:00	53.44
	6:00	52.78
	7:00	52.17
	8:00	51.54
	9:00	50.93
	10:00	50.27
	12:00	49.33
	14:00	48.34
	16:00	47.27
	20:00	45.26
	25:00	42.90
	30:00	40.59
	35:00	38.53
	40:00	36.52
	50:00	32.84
	60:00	29.54
	75:00	25.86
	90:00	23.32

Water Diverted for Drilling

Water Source	Amount Taken		Diversion Date & Time
TOWN OF NEW SAREPTA	9092.18	L	2011/06/01 6:00 AM

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MARK HOLLAND
Certification No
76129A
Company Name
HOLLAND WATER WELLS
Copy of Well report provided to owner
Yes
Date approval holder signed
2011/08/01

Water Well Drilling Report

View in Imperial | 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 271295
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1986/06/02

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
EL-SHADDAI DAIRIES	RR#2, NEW SAREPTA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	16	20	49	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.248708 Longitude -113.174896
How Location Obtained: Map

Elevation m
How Elevation Obtained: Not Obtained

Drilling Information

Method of Drilling: Rotary

Proposed Well Use: Domestic & Stock

Type of Work: New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
5.18		Clay
6.71		Sandstone
11.28		Crumbly Shale
12.80		Siltstone
20.42		Shale
20.73		Sandstone
22.86		Shale
29.26		Sandstone
29.57		Coal
32.92		Shale
33.53		Sandstone
35.66		Shale
37.49		Siltstone
39.62		Shale

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 0.00 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1986/05/05	18.18	7.01

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
39.62 m		1986/05/03	1986/05/05

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	39.62

Surface Casing (if applicable)
Steel
Size OD : 14.12 cm
Wall Thickness : 0.478 cm
Bottom at : 12.80 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.635 cm
Top at : 12.19 m
Bottom at : 39.62 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
33.53	39.62	0.076		5.08

Perforated by: Machine

Annular Seal Driven
Placed from 0.00 m to 12.19 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well: UNKNOWN NA DRILLER
Certification No: 1
Company Name: BAR K DRILLING LTD.
Copy of Well report provided to owner
Data approval holder signed

Water Well Drilling Report

View in Imperial | 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 271295
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1986/06/02

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
EL-SHADDAI DAIRIES	RR#2, NEW SAREPTA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	16	20	49	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.248708 Longitude -113.174896

How Location Obtained
Map

Elevation m

How Elevation Obtained
Not Obtained

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate 0.00 L/min
Recommended Pump Intake Depth (From TOC) 33.22 m
Pump Installed Yes Depth m
Type SUB Make H.P. 1/2
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS) Depth m
Gas Depth m
Remedial Action Taken
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to ESRD

Sample Collected for Potability Submitted to ESRD

Additional Comments on Well

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1986/05/05	12:00 AM	7.01 m

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)

Method of Water Removal

Type Pump
Removal Rate 18.18 L/min
Depth Withdrawn From 16.15 m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

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

Certification No
1

Company Name
BAR K DRILLING LTD.

Copy of Well report provided to owner Date approval holder signed

Water Well Drilling Report

View in Imperial | 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.

GIC Well ID 2089152
GoA Well Tag No. A0080
Drilling Company Well ID
Date Report Received 2019/06/14

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
EL-SHADDAI DAIRY INC.	49378 RANGE ROAD 224	LEDUC COUNTY	ALBERTA	CANADA	T0B 3M3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	20	49	22	4				GEOFF VOLKMAN

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.250078 Longitude -113.173607
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 694.00 m
How Elevation Obtained
Differential corrected handheld GPS 5-10m

Drilling Information

Method of Drilling
Rotary - Air

Proposed Well Use
Stock

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
0.61		Black Topsoil
9.75		Gray Clay
10.67		Gray Shale
11.28		Gray Fine Grained Sandstone
14.02		Brownish Gray Shale
17.07		Gray Medium Grained Sandstone
18.59		Coal
19.51		Gray Shale
25.91		Gray Fine Grained Sandstone
31.09	Yes	Gray Medium Grained Sandstone
32.00	Yes	Coal
39.93	Yes	Gray Shale & Coal
40.54		Gray Fine Grained Sandstone
48.77		Gray Shale

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 13.64 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
2019/06/04	18.18	19.07

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
48.77 m	48.77 m	2019/06/03	2019/06/04

Borehole

Diameter (cm)	From (m)	To (m)
22.86	0.00	1.83
15.56	1.83	48.77

Surface Casing (if applicable)
Steel
Size OD : 16.83 cm
Wall Thickness : 0.556 cm
Bottom at : 12.19 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.544 cm
Top at : 4.88 m
Bottom at : 47.55 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
32.92	41.45	0.051	7.62	7.62

Perforated by Machine

Annular Seal Bentonite Slurry
Placed from 0.00 m to 22.86 m
Amount 3.00 Gallons

Other Seals

Type	At (m)

Screen Type
Size OD : cm

From (m)	To (m)	Slot Size (cm)

Attachment Telescoped
Top Fittings Threaded
Bottom Fittings Plug

Pack
Type Artificial
Grain Size 10/20
Amount 22.00 Bags

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MICHAEL SCHMIDT

Certification No
90316A

Company Name
DARCY'S DRILLING SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2019/06/14

Water Well Drilling Report

View in Imperial | 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.

GIC Well ID 2089152
GoA Well Tag No. A0080
Drilling Company Well ID
Date Report Received 2019/06/14

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
EL-SHADDAI DAIRY INC.	49378 RANGE ROAD 224	LEDUC COUNTY	ALBERTA	CANADA	T0B 3M3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	20	49	22	4				GEOFF VOLKMAN

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.250078 Longitude -113.173607
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 694.00 m
How Elevation Obtained
Differential corrected handheld GPS 5-10m

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level 60.96 cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate 13.64 L/min
Recommended Pump Intake Depth (From TOC) 32.00 m
Pump Installed Yes
Type Submersible
Depth 32.00 m
Make GOULDS
H.P. 0.5
Model (Output Rating) 7G05

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Gas
Depth m
Remedial Action Taken
Well Disinfected Upon Completion Yes
Geophysical Log Taken
Submitted to ESRD
Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well
ADDIITONAL 2 PAILS OF COATED PELLETS IN ANNULAR SEAL

Yield Test

Taken From Top of Casing
Depth to water level
Measurement in Metric

Test Date	Start Time	Static Water Level
2019/06/04	4:00 PM	19.07 m

Method of Water Removal
Type Air
Removal Rate 18.18 L/min
Depth Withdrawn From 4.00 m

If water removal period was < 2 hours, explain why

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
	1:00	39.05
	2:00	37.18
	3:00	35.27
	4:00	33.38
	5:00	31.51
	6:00	29.85
	7:00	28.43
	8:00	27.15
	9:00	26.00
	10:00	24.97
	12:00	23.92
	14:00	23.26
	16:00	22.74
	18:00	22.35
	20:00	21.98
	25:00	21.29
	30:00	20.80
	35:00	20.46
	40:00	20.22

Water Diverted for Drilling

Water Source	Amount Taken		Diversion Date & Time
TOWN OF PONOKA	5455.31	L	2019/05/31 6:00 PM

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
MICHAEL SCHMIDT
Certification No
90316A
Company Name
DARCY'S DRILLING SERVICES LTD.
Copy of Well report provided to owner
Yes
Date approval holder signed
2019/06/14

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

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

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

	Neighbour name(s)	Legal land description	Distance (m)	NRCB USE ONLY: Zoning (LUB) category	MDS category (1-4)	Distance (m)	Waiver attached (if required)	Meets regulations
①	Janisse	NW 21 49 22 W4	212					
②	Mantei	SE 29 49 22 W4	170					
③	Van Sickle	SW 28 49 22 W4	240					

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

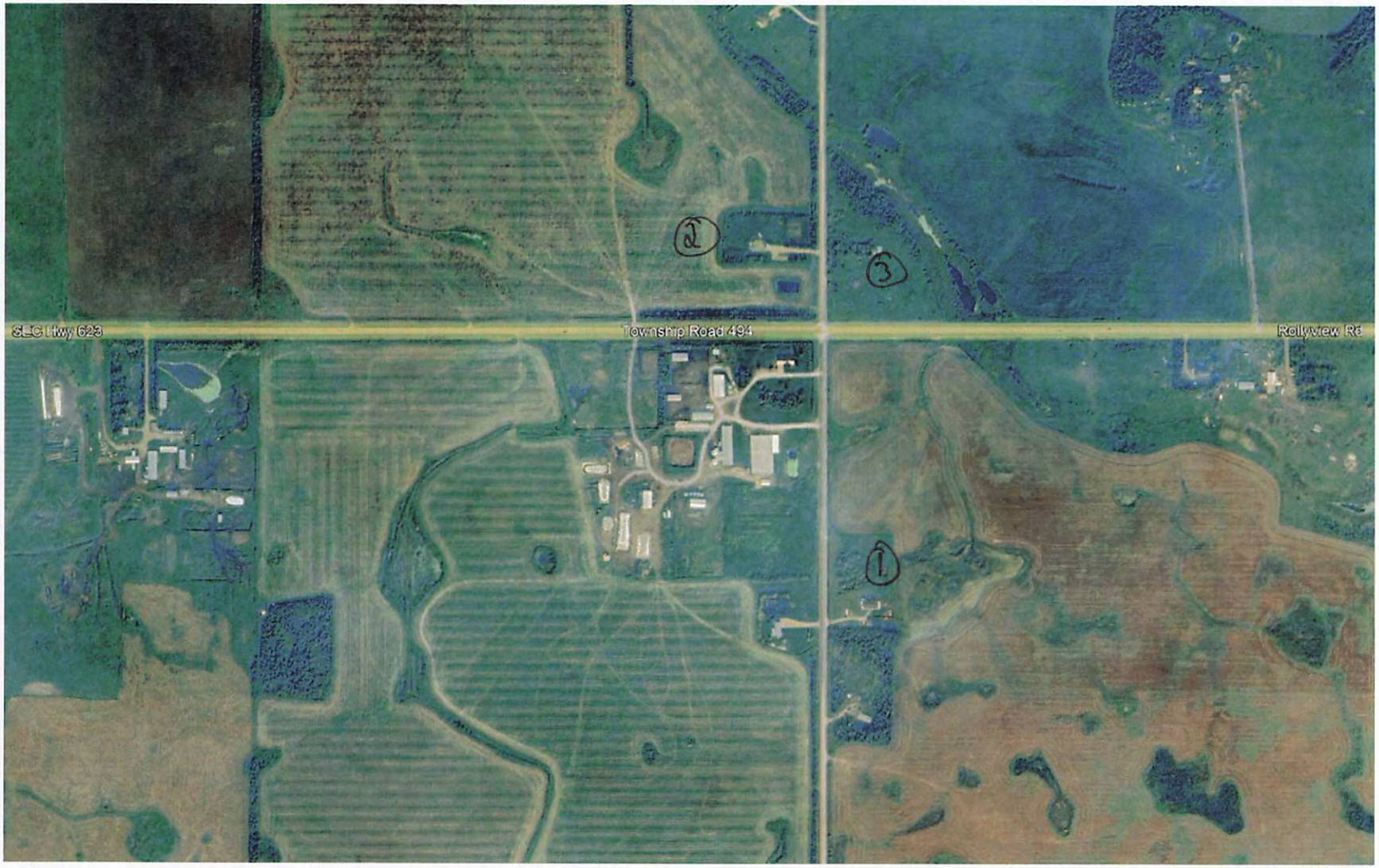
Name of land owner(s)*	Legal land description	Usable area** (ha)	Soil zone ***	NRCB USE ONLY: Usable area (ha)	Agreement attached (if required)
owned		405 Acre	Black		
Rental		135 Acre	Black		
			Total		

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

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

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

Additional information (attach any additional information as required)


SLC Hwy 623
Township Road 494
Rollyview Rd
2
3
1

Minimum Distance Separation (MDS) Waiver (declaration)

Applicant information NRCB application number: BA 24013

Operator/operation name: EL-SHADDAI DAIRIES INC.

Address: 49378 Range Road 224 Postal Code: T0B 3M3

Legal land location of confined feeding operation: NE 20 49 22 W 4

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

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

Following is a summary of the proposed development:

- The current scope of my confined feeding operation (CFO), including the type, number, and category of livestock, if any, is:
  DAIRY, 110
- My application for a new AOPA permit proposes the following changes to the existing livestock category, type and/or capacity at my CFO:
  DAIRY BARN ADDITION, INCREASE PERMIT TO 200 Head
  Add Lagoon 70m x 50m for Manure storage
- 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):
  - Add 2,1 Million ~~ft~~ of Gallons of manure storage.
  - Add dairy barn addition for milking cows

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

Permit Applicant: [redacted] Date: Sept 30, 2024
Signature

Residence owner(s) to initial: JPJ

Minimum Distance Separation (MDS) Waiver (declaration)

Residence owner(s) information

ALL Names on land title: SUSAN & JEFF JANISSE

Legal land location of residence(s): MER 4 RNG 22 TWP 49 SEC 21 QTR NW

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

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

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

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

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

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

Application number _____.

[redacted] [redacted]

ner(s) on title

JEFF JANISSE SUSAN JANISSE

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

Date: SEPT 30, 2024

Minimum Distance Separation (MDS) Waiver (declaration)

Applicant information NRCB application number: BA 24013

Operator/operation name: EL-SHADDAI DAIRIES INC

Address: 49378 Range Road 224 Postal Code: T0B 3M3

Legal land location of confined feeding operation: NE 20 49 22 W4

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

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

Following is a summary of the proposed development:

- The current scope of my confined feeding operation (CFO), including the type, number, and category of livestock, if any, is:

  Dairy, 110

- My application for a new AOPA permit proposes the following changes to the existing livestock category, type and/or capacity at my CFO:

  Dairy Barn Addition, Increase Permit to 200 Milking Animals, Add a manure lagoon sized 70x50 m

- 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):

  - add 2.1 Million Gallons of manure storage
  - add dairy barn addition for milking cows

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

Permit Applicant: [redacted] Date: March 12th, 2025

Residence owner(s) to initial: _____

Minimum Distance Separation (MDS) Waiver (declaration)

Residence owner(s) information

ALL Names on land title: Glenn Van Sickle

Legal land location of residence(s): SW 28 49 22 W4

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

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

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

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

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

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

Application number _____.

[redacted]

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

Glenn Van Sickle

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

Date: March 14/2025

Minimum Distance Separation (MDS) Waiver (declaration)

Applicant information NRCB application number: BA 24013

Operator/operation name: EL SHADDAI DAIRIES INC

Address: 49378 Range Road 224 Postal Code: T0B 3M3

Legal land location of confined feeding operation: NE 20 49 22 W4

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

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

Following is a summary of the proposed development:

- The current scope of my confined feeding operation (CFO), including the type, number, and category of livestock, if any, is:

  Dairy, 110

- My application for a new AOPA permit proposes the following changes to the existing livestock category, type and/or capacity at my CFO:

  Dairy Barn Addition, increase Permit to 200 milking animals and construction of a new Manure storage 70 x 50 m

- 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):

  - add 2,1 Million Gallons of manure storage
  - add dairy barn addition

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

Permit Applicant: [redacted] Date: March 12th, 2025

Residence owner(s) to initial: _____

Minimum Distance Separation (MDS) Waiver (declaration)

Residence owner(s) information

ALL Names on land title: ARNOLD MANTEI ; DANA MANTEI

Legal land location of residence(s): SE 29 49 22 W4

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

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

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

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

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

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

Application number BA 24013.

[redacted] [redacted]

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

ARNOLD MANTEI DANA MANTEI

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

Date: MARCH 12, 2025

Manure Spreading Agreement

This agreement is between EL-SHADDAI DAIRIES INC., manure producer, and Ross Hugo manure receiver.

Length of agreement: This agreement is valid for a time period of 3 years (minimum of one year)

Legal land location	Soil type[1]	Acres suitable for manure spreading[2]
SE 26-49-22 W4	Black	110 Acres

[1] Soil type choices: Dark brown and brown, Grey wooded, Black, Irrigated.

[2] Land within required setbacks from water bodies, water wells, residences, etc. is not to be included.

Other comments:

Manure producer (Confined Feeding Operation) Legal Land Location NE 26-49-22 W4

Date of signing	Signature	Print name	Corporate name(if appl)
MAY 01/25	[redacted]	PIETER GIGELMANS	EL-SHADDAI DAIRIES INC

Manure Receiver – Landowner(s)[3]

Date of signing	Signature	Print name	Corporate name(if appl)
MAY 01/25	[redacted]	Ross Hugo	

[3] All registered owners of land, or authorized signing authorities must sign.

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

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

Facility description / name *(as indicated on site plan)* **1.** Calf Barn

2. _____

Manure storage capacity

	Length (m)	Width (m)	Depth below grade to the bottom of the liner (m)	**NRCB USE ONLY** Estimated storage capacity (m^3)
1.	49	12	0	
2.				
			TOTAL CAPACITY	

☐ 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

Under Roof, Water Directed around Barn

Liner protection

Describe how the physical integrity of the liner will be maintained

Monitor for ~~[illegible]~~ cracks

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

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

Concrete liner details

Concrete thickness	Method of sulphate protection:
5inches	T50
Concrete strength	**Concrete reinforcement size and spacing**
32 MPA	12 inch

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

NRCB USE ONLY

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

Additional information *(attach as required)*

NRCB USE ONLY

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

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

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

ERST completed: ☐ see ERST page for details

Surface water control systems

Requirements met: ☐ YES ☐ NO Details/comments:

Concrete liner details

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

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

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

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

At grade one gutter in the Barn

1. Addition
2.
3.

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

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	**NRCB USE ONLY** Calculated storage capacity (m^3)
1.	55	9 m	1 m	1 m	
2.					
3.					
				TOTAL CAPACITY	

Concrete liner details

Scrape alleys or unslatted portions of barn floors (if applicable)	Concrete thickness: 6 inch		Method of sulphate protection: T50
	Concrete strength: >2 mpa		Concrete reinforcement size and spacing: 12" o/c
In-barn manure pit floors	Concrete thickness		Method of sulphate protection
	Concrete strength		Concrete reinforcement size and spacing
In-barn manure pit walls	Concrete thickness		Method of sulphate protection
	Concrete strength	Horizontal reinforcement size and spacing	Vertical reinforcement size and spacing

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

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

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

1. lagoon
2. _____

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

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	Slope run:rise			NRCB USE ONLY	
					Inside end walls	Inside side walls	Outside walls	Calculated storage capacity (excl. 0.5 m freeboard) (m^3)	Filled in lower ¼? Y/N
1.	80	80	4,5	4	5	5	3		
2.									
							TOTAL CAPACITY		

Surface water control systems

Describe the run-on and runoff control system

Berm Around To Direct Water

Sealing

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

Concrete Collar

NRCB USE ONLY
Requirements met: ☐ YES ☐ NO

Liner protection

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

splash pad under Pipe

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

Monitor for erosion, Maintain as needed

NRCB USE ONLY
Requirements met: ☐ YES ☐ NO

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

Compacted soil liner details

Thickness of compacted liner: 1 (m)		Provide compacted liner details (as required): See Attached	
Soil texture	____% sand	____% silt	____% clay
Atterberg limits	Plastic limit: 26 %	Liquid limit:	Plasticity index:
Hydraulic conductivity	Hydraulic conductivity (cm/s): 1×10^{-8}		
	Describe test standard used: IN SITU		

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

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Report attached: ☐ YES ☐ NO

NRCB USE ONLY

Liquid manure storage volume calculator attached: ☐ YES ☐ NO

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

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

ERST completed: ☐ see ERST page for details

Surface water control systems

Requirements met: ☐ YES ☐ NO Details/comments:

Compacted soil liner details

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

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

SABATINI EARTH TECHNOLOGIES INC.

203, 6919 - 32nd AVENUE N.W.
CALGARY, ALBERTA T3B 0K6
TEL: (403) 247-1813
FAX: (403) 247-1814

9315 - 35th AVENUE N.W.
EDMONTON, ALBERTA T6E 5R5
TEL: (780) 436-0944
FAX: (780) 435-1812

El-Shaddai Dairies Inc.
RR2
New Sarepta, Alberta
T0B 3M0

Our File: E0205-845
June 3, 2002

Attention: **Mr. Geoff Volkman**

Dear Sirs:

Re: Geotechnical Investigation
Proposed Liquid Manure Storage Facility
El-Shaddai Dairies Farm
NE1/4-20-49-22-W4M
Leduc County, Alberta

1.0 INTRODUCTION

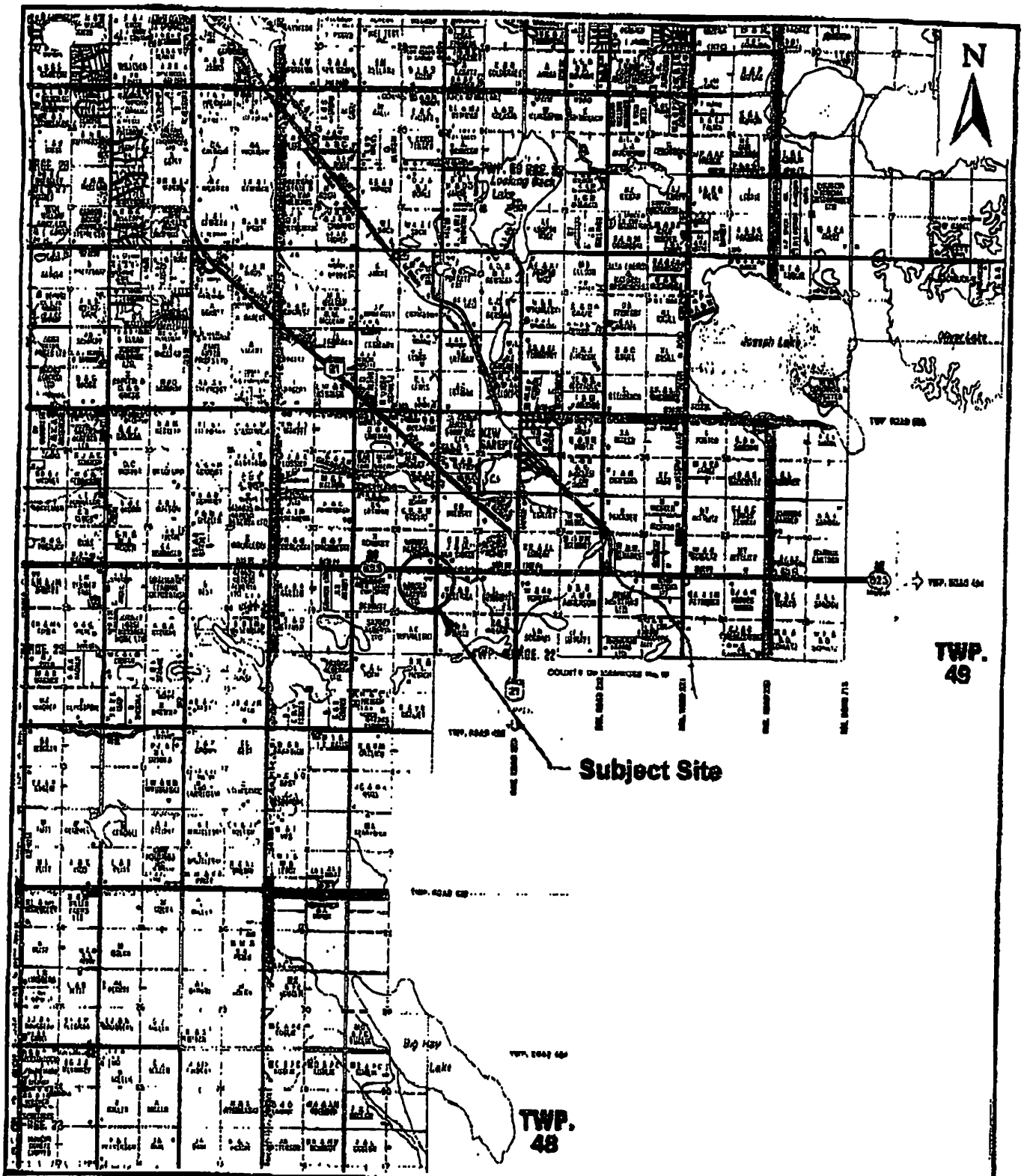
Sabatini Earth Technologies Inc. (SETI) was retained by El-Shaddai Dairies Inc. to carry out a geotechnical investigation for the above referenced project. The purpose of the investigation was to obtain subsurface information in order to provide recommendations for the design and construction of the proposed liquid manure storage facility. The scope of work was limited to field drilling, testing and evaluation of results within and around the proposed liquid manure pit.

2.0 PROJECT DESCRIPTION

The El-Shaddai Dairies farm is located within the NE 1/4 of Sect. 20, Twp. 49, Rge. 22, W4M, in Leduc County, Alberta (refer to Figure 1, following). The site is located about 1.6 kilometers west of Highway 21 and is bounded on the east by Range Road 224. It is understood that the proposed storage facility will be located southeast of the existing dairy barn. It is further understood that the facility will be clay lined and will be approximately 46 meters wide, 46 meters long and 5 to 6 meters deep. There is a small slough located east of the existing barn, adjacent to Range Road 224 and an existing manure pit located immediately west of the existing barn.

2.1 Site Drainage and Topography

The site is gently sloped towards the southeast at an inclination of approximately 2 to 3 percent. The site topography is generally undulating with elevation differences of approximately 3 to 4 meters. The overall surface drainage is towards the east direction.



SABATINI EARTH TECHNOLOGIES INC.
9315 - 35 Avenue NW, Edmonton, Alberta

PROPOSED LIQUID MANURE STORAGE FACILITY
NE ¼ - 20 - 49 - 22 - W4M
Leduc County , Alberta
County Plan Showing Subject Site

Job No: E0205-845	Date: June 3, 2002	Figure: 1

2.2 Quaternary Deposits

According to published surficial geology reports[1], the terrain in the area is broadly classified as a stagnation moraine till deposit of uneven thickness The terrain generally consists of local water-sorted material up to 30 meters thick. The topography is generally described as undulating to hummocky, reflecting variations in till thickness. Locally, the ground surface topography is moderately to weakly developed, with irregularly shaped and poorly defined knobs and kettles. The ground relief is typically between 3 to 10 meters.

2.3 Geology

According to Cerici[2], bedrock in the area is represented by the Horseshoe Canyon Formation of the upper Cretaceous Edmonton group, which comprises of deltaic and fluvial deposits of interbedded sandstone, siltstone and shale. Typically, these sediments include fine grained bentonitic sandstones, silty bentonitic shales, coal seams and carbonaceous shales. The underlying structure is relatively simple, with the strata dipping to the southwest at approximately 5 m/km. The thickness of the Horseshoe Formation is in the order of 200 meters.

2.4 Hydrogeology

The Horshoe Canyon Formation contains water bearing intervals or horizons of potable quality and is therefore a local domestic water supply resource. The water supply potential of this unit is highly variable due to its pronounced lateral and vertical changes in lithology. The best water supply potential is offered by sandstone and coal lenses. Where present, these have a potential yield of 6.5 to 32.7 m^3/day. The regional groundwater flow direction for the Horseshoe Canyon Formation in the study area is from SSE to NNW towards the North Saskatchewan River.

According to Cerici, there does not appear to be any significant aquifers in the quaternary deposits in the study area.

3.0 METHODOLOGY

Five boreholes were drilled at the site on May 20, 2002 to depths ranging from 7.5 to 10.5 metres using a truck-mounted B-56 auger rig. The approximate borehole locations are shown in Plate 8, Appendix A. Boreholes 02-1 and 02-2 were drilled within the proposed manure pit and Boreholes 02-3, 02-4 and 02-5 will be used as perimeter monitoring wells. A 50 mm diameter

[1] Shetsen, I. 1990. Quaternary Geology, Central Alberta, Alberta Research Council, Map Scale 1:500,000

[2] Cerici, W. 1970. Hydrogeology of the Southwest Segment, Edmonton, Alberta, pp.14 (plus Map NTS 83H-SW, Scale 1:250000)

monitoring well was installed in each of the three boreholes around the perimeter of the proposed pit at depths ranging from 6 to 9 meters to allow for the long-term monitoring of groundwater levels. The various soil strata encountered in the boreholes were logged as drilling proceeded and disturbed soil samples were obtained for laboratory testing. Borehole logs can be referred to in Plates 3 to 7 in Appendix A. The soils were classified using the Modified Unified Soils Classification System and described in accordance with the explanation sheets presented in Plates 1 and 2, Appendix A

The ground surface elevation at each borehole was surveyed on June 3, 2002 and was referred to as local assumed datum. The benchmark used was the southeast corner of the exterior concrete apron along the southern limits of the existing barn. An elevation of 100.00 meters was assigned to this benchmark.

4.0 SUBSOIL AND GROUNDWATER CONDITIONS

The soil profile encountered in the boreholes generally consisted of a thin layer of topsoil over clay followed by bedrock that extended beyond the termination depth of the boreholes. A layer of clay till, which extended below the termination depth of the borehole, was encountered below the clay layer in Borehole 02-3 In addition, the bedrock was absent at the investigative depth in Borehole 02-3.

The thickness of the clay layer ranged from 4.9 to 8.9 meters. The clay was noted to be generally silty, firm to very stiff consistency, moist to damp, high plasticity, dark brown in color, with numerous slickensided surfaces and frequent $CaCO_3$ mottling. In situ moisture contents in the clay layer ranged from 16 to 49 percent with values above 30 percent noted below depths of about 4.0 meters in Boreholes 02-1 and 02-2. Pocket penetrometer (PP) readings taken on intact auger samples of clay revealed approximate unconfined strengths, Q_u, ranging from 80 to greater than 450 kPa with the lower values observed at depths between 5 to 8 metres. It is noted that the silt content in the clay generally increased with increasing depth and was noted to be firm in consistency.

Sandstone bedrock was encountered in all but one borehole at depths ranging from 5.4 to 8.4 meters below the ground surface. The bedrock was noted to be generally silty, highly weathered, very dense soil and grey in color In situ moisture contents of the sandstone bedrock ranged from 20 to 27 percent. Pocket penetrometer (PP) readings taken on intact auger samples of the sandstone bedrock revealed approximate unconfined strengths, Q_u, ranging from 140 to greater than 450 kPa.

Three Atterberg limit tests were performed on clay samples obtained from Boreholes 02-1 and 02-2. The tests yielded Liquid limits of 66 to 71 percent and Plastic limits of 25 to 28 percent. These results thus confirm the high plasticity of the clay. A composite sample of clay was compacted in a steel mold at approximately 95 percent of the standard Proctor maximum dry density, which yielded a coefficient of permeability of approximately 1×10^{-8} cm/sec. Based on this result, the permeability of the clay in a compacted condition is considered to be relatively low.

Groundwater seepage was monitored during drilling and the ground water table was monitored 1 to 4 hours and 14 days after drilling. The stabilized water level results (14 days later) are summarized on Table 1. below.

Based on the above data, the elevations of the groundwater range from 90.1 to 94.0 meters. Two groundwater regimes appear to be located on the site. Shallow groundwater is present in the clay deposit northwest of the proposed pit (Borehole 02-3) at an elevation of about 94.0 meters. A deeper partially confined aquifer is present in the sandstone bedrock in the other boreholes at elevations between 90.5 and 91.0 meters. The general direction of the deeper partially confined aquifer is determined to be in an apparent south-easterly direction. However, the data collected to date is inconclusive and flows may be influenced by the presence of nearby obstructions and other pathways not identified by the five boreholes drilled at the site.

It should be noted that the groundwater levels are subject to wide variations from season to season and year to year, depending on a number of factors such as precipitation, surface drainage and the hydrogeology of the area. For the subject site, the recommended groundwater table elevation for design purposes should be taken as elevation 91.0 meters in the area of the proposed liquid manure pit.

Table 1
Summary of Groundwater Information

Borehole	Ground Surface Elevation (m)	Depth To Groundwater (m)	Groundwater Elevation (m)
02-1	97.56	6.60	90.96
02-2	97.31	6.38	90.93
02-3	*100.06	6.02	94.04
02-4	*96.38	5.67	90.71
02-5	*97.46	6.99	90.47

* Top of the PVC pipes

5.0 RECOMMENDATIONS

5.1 NRCB Agricultural Operations Practices Act

According to the Natural Resources Conservation Board (NRCB) Act on Agricultural Operations

Practices[1]:

- The owner or operator of a manure storage facility or manure collection area must include a liner in its construction that lies below the bottom of the facility and above the uppermost aquifer of the site.

- If the liner of a manure storage facility or a manure collection area is manufactured, whether of natural or synthetic materials, the bottom of the liner must be no less than one metre above the water table of the site at the time of construction.

- If the liner of a liquid manure storage facility is made of non-compacted naturally occurring material, it must have not less than 10 meters of naturally occurring material with a hydraulic conductivity of not more than 1×10^{-6} centimeters per second.

- The horizontal and vertical ratio of the slope of the inside wall of an earthen liquid manure storage facility must not be less than 3:1 and must be consistent with the requirements of the design of the liner and the equipment used in the facility.

- The horizontal to vertical ratio of the slope of the outside wall of an earthen liquid manure storage facility must not be less than 4:1.

5.2 Geotechnical Evaluation

The soil conditions encountered at the site are considered to be generally poor mainly because of the weak soil conditions at depths between 4 to 8 meters within the clay soils. In addition, where the moisture content of the clay is above 30 percent, severe equipment wheel rutting is expected during construction near the bottom of the pit. Relative to the groundwater table, the depth is about 6.5 meters below the existing grade in the region of the proposed pit. The groundwater table design elevation that is seasonally adjusted should be taken as elevation 91.0 meters and the bottom of the pit should therefore be constructed approximately 1.0 metre above this elevation. Following the removal of all organic materials such as topsoil and organic clay, the existing clay may be used for the construction of the proposed pit provided that it is dried to moisture levels near its plastic limit and properly compacted. Based on the laboratory tests, the high plastic clay is considered suitable for liner construction provided drying of the clay is carried out.

All deleterious materials including topsoil, vegetation or softened materials should be removed from the proposed pit and berm areas and stockpiled for reuse. In fill areas (portions of the pit

[1] Agricultural Operations Practices Act Regulations, Natural Resources Conservation Board, 2001.

and the berm), the exposed subgrade should be scarified to a depth of 150 mm, and re-compacted to a minimum of 95 percent of the standard Proctor maximum dry density (SPMDD) at a moisture content slightly in excess of the Optimum Moisture Content (OMC). Excavation and subgrade preparation should be undertaken under close engineering supervision. Any soft areas and or sand/silt zones exposed on the excavated face should be removed completely and replaced with suitable compacted material as described in the following paragraph.

The fill material can consist of high plastic clay. The fill should be free from stones greater than 75 mm in diameter, sand, silt organic material, frozen lumps and other deleterious materials. The fill should be placed at moisture contents within the range of +/- 1 percent of OMC and compacted to at least 95 percent of SPMDD. The fill should be placed in lifts such that the maximum thickness of any lift, after compaction does not exceed 150 mm. The outside cut and fill slopes should not exceed 4H:1V side slopes for slope stability considerations.

Close quality control of fill is recommended during construction. Regular in-situ density and moisture content tests should be performed on each lift during the manure pit base and berm construction. Uniformity of compaction is of utmost importance.

Based on the laboratory test results, the high plastic clay is considered suitable for clay liner. During the manure pit excavation work, the clay, excluding sand/silt zones, should be selectively stockpiled and dried for reuse as liner material. The stockpile area should be stripped prior to the commencement of the work to avoid topsoil/organic materials contamination of the liner material. Construction of the liner material in the bottom of the pit should start at no less than 1.0 metre above the groundwater table or at about elevation 91.0 metres and the material should be placed in equal layers to give an overall compacted thickness of 1000 mm at the base of the pit and 1000 mm on the side slopes (measured perpendicular to the slope). If there is a significant delay between the pit excavation/berm construction and placement of the liner, the entire pit bottom and side slopes should be first re-scarified to a depth of 150 mm, and re-compacted to at least 95 percent of SPMDD. Each layer of liner fill should be compacted to a minimum of 95 percent of SPMDD, at placement water contents within 1 percent of OMC. Regular in-situ density and moisture content tests should be performed on each lift. Liner construction should not be undertaken during freezing weather. The permeability of compacted clay liners will deteriorate over time due to weathering action above the water level and freezing ice lens action below the liquid level. A periodic maintenance to scarify and recompact the soil liner should be established in order to maintain the design condition.

An alternative to a clay liner is a synthetic liner, which should be a PVC liner. It is recommended that PVC liners be a minimum of 20 mils thick to reduce the number of punctures during installation. The synthetic liner must be installed in accordance with the supplier/manufacturers specifications. For a synthetic liner, it is recommended that the base of the proposed pit also be situated at least 1.5 metre above the groundwater table to minimize construction problems such as wheel rutting, and the potential for bottom heave during periods when the catch basin is empty.

Interior pit slopes should be no steeper than 3 (horizontal) to 1 (vertical). The exterior slopes should be no less than 4 (horizontal) to 1 (vertical). The pit dyke crest should be at least 3 meters wide to allow vehicle access. A minimum freeboard of 0.5 metres is recommended.

Groundwater levels should be monitored in the existing monitoring wells prior to the start of construction to confirm the levels measured at the time of the field investigation. Monitoring of the existing perimeter wells should be carried out prior to and after completion of construction to allow for monitoring of groundwater quality.

6.0 CONCLUSIONS

Based on the above data, it is concluded that:

- The on-site soils within the top 5 to 8 metres are clayey in nature and can be used as low permeability materials required to develop and construct the open liquid manure pit.
- The guidelines as indicated in Agricultural Operations Practice Act, 2001, must be followed for the proposed liquid manure pit.
- Subject to the limitations given in this report, it is our opinion that the proposed liquid manure pit would be feasible in terms of water table position and groundwater table supply protection.

We trust the foregoing satisfies your requirements at this time. Should you have any questions, or require further geotechnical input in the design/construction of the proposed facility, please feel free to call our office at (780) 438-0844.

Yours very truly:
Sabatini Earth Technologies Inc.

[redacted]

June 3, 2002

Merle Haggstrom, B.Sc., P.Eng.
Senior Engineer, Edmonton Office

PERMIT TO PRACTICE
Sabatini Earth Technologies Inc.
Signature [redacted]
Date June 3, 2002
PERMIT NUMBER: P-5773
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Distribution: (4) addressee

Attachments: Appendix A

Explanation of Field and Laboratory Test Data

The following pages are an explanation of the terms and symbols used in the Test Hole Log.

Soil Profile and Description

Soil types are described by the Modified Unified Soil Classification System.
(See Plate 2 for terms and symbols)

Soils classified by particle size fall in the following ranges:

BOULDERS	- greater than 200 mm	SAND	- 0.08 mm to 5 mm
COBBLES	- 75 mm to 200 mm	SILT	- 0.002 mm to 0.08 mm
GRAVEL	- 5 mm to 75 mm	CLAY	- finer than 0.002 mm

Additional graphic symbols include:

——→	seepage
▽	water level surface

Soil Sample Type

[ ]	Standard Penetration Sample (D)
[ ]	Undisturbed Sample (Shelby) (U)
[B]	Bag Sample

Penetration Resistance

Field test indication number of blows (N) of a 140 pound hammer dropping 30 inches (76 cm) required todrive a 2 inch (5 cm) O.D. open end sampler a distance of 1 foot (30 cm) from 0.5 to 1.5 feet (15 to 45 cm) into the undisturbed soil. This test is outlined in A.S.T.M., D1586.

Miscellaneous Tests

In this column are summarized results of all the laboratory test as indicated by the following symbols:

HVR	Hydrocarbon Vapour Readings, ppm or % LEL
* MA	Mechanical grain size analysis
G	Specific gravity
k	Coefficient of permeability
PP	Pocket penetrometer strength kg/cm^2
* q	Triaxial compression test
* C	Consolidation test
Qu	Unconfined compressive strength kg/cm^2
SO_4	Soluble sulphate concentration
γ	Bulk unit weight
γ_d	Dry unit weight

* Tests normally summarized on separate data sheets.

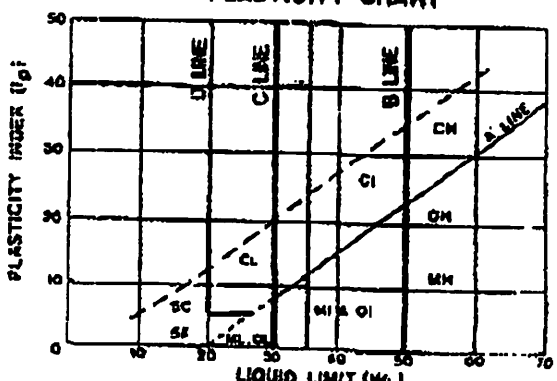
SABATINI EARTH TECHNOLOGIES INC. PLATE No. 1

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

MAJOR DIVISION			GROUP SYMBOL	GRAPH SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE-GRAINED SOILS (MORE THAN HALF OF MATERIAL LARGER THAN 200 SIEVE)	GRAVELS (MORE THAN HALF OF COARSE FRACTION LARGER THAN NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW		RED	WELL GRADED GRAVELS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ & $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			GP		RED	POORLY GRADED GRAVELS, AND GRAVEL SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (WITH SOME FINES)	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12% — ATTERBERG LIMITS BELOW "A" LINE P.I. LESS THAN 4
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	CONTENT OF FINES EXCEEDS 12% — ATTERBERG LIMITS ABOVE "A" LINE P.I. MORE THAN 7
	SANDS (MORE THAN HALF OF COARSE FRACTION SMALLER THAN NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)	SW		RED	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			SP		RED	POORLY GRADED SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME FINES)	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12% — ATTERBERG LIMITS BELOW "A" LINE P.I. LESS THAN 4
			SC		YELLOW	CLAYEY SANDS, SAND-SILT CLAY MIXTURES	CONTENT OF FINES EXCEEDS 12% — ATTERBERG LIMITS ABOVE "A" LINE P.I. MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF OF MATERIAL PASSES NO. 200 SIEVE)	SILTS (BELOW "A" LINE OR ORGANIC CONTENT)	$W_L < 50\%$	ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS ROCK FLOUR, SILTY SANDS OR SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (see below)
		$W_L > 50\%$	MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS (ABOVE "A" LINE OR PREDOMINANTLY ORGANIC CONTENT)	$W_L < 30\%$	CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	
		$30\% < W_L < 50\%$	CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		$W_L > 50\%$	CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SILTS & CLAYS (BELOW "A" LINE ON CHART)	$W_L < 50\%$	OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINE CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", E.G. SF IS A MIXTURE OF SAND WITH SILT OR CLAY
		$W_L > 50\%$	OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	
HIGHLY ORGANIC SOILS			PT		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE

BEDROCK SYMBOLS

PLASTICITY CHART



SABATINI EARTH TECHNOLOGIES INC.

PLATE No. 2

SABATINI EARTH TECHNOLOGIES INC.

CLIENT: El - Shaddai Dairies Inc.
PROJECT: Proposed Liquid Manure Storage Facility
LOCATION: NE1/4-20-49-22-W4M, Leduc County, Alberta
JOB No.: E0205-846
DATE: May 20, 2002
TECH: MH
TEST BORING 02-1

DRILL TYPE: 8-56 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS
MOISTURE CONTENT %
10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM: Local
SURFACE ELEVATION: 97.66 m

TEST RESULTS

DEPTH (ft)	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT N	MISCELLANEOUS TESTS	SOIL PROFILE & DESCRIPTION
						TOPSOIL, silty, clayey, black, 30 cm thick
3	1				PP = 350 kPa	CLAY, silty, high plasticity, very stiff, damp to moist, frequent slickensided surfaces, dark brown
					PP = 280 kPa	
					PP = 300 kPa	-- frequent CaCO3 mottling
8	2				PP = 260 kPa	
10	3				PP = 260 kPa	
	4				PP = 130 kPa	
15					PP = 120 kPa	
	5				PP= 110 kPa	-- stiff consistency, siltier with depth, dark brownish-grey
20	6				PP = 120 kPa	-- moist, siltier with depth
						-- occasional gravel pieces
	7				PP = 100 kPa	-- free water, "severe" borehole sloughing
25					PP = 100 kPa	
	8				PP = 100 kPa	
						BEDROCK(Sandstone), silty, highly weathered bedrock, very dense soil, grey in colour
30	9				PP = 450+ kPa	
					PP = 450+ kPa	
	10					End of borehole at 10.5 m Slough = 8.1 m, 0 hrs Water = 8.0 m, 0 hrs Water = 8.4 m, 4 hrs later Borehole covered with sheet of plywood
35					PP = 450+ kPa	

MOISTURE CONTENT
LIQUID LIMIT
PLASTIC LIMIT
GEO
Qu UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT
SO4 SULPHATE CONTENT
WATER TABLE
N PENETRATION RESISTANCE
STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE
PLATE No 3

SABATINI EARTH TECHNOLOGIES INC.

CLIENT: El - Shaddai Dairies Inc.
PROJECT: Proposed Liquid Manure Storage Facility
LOCATION: NE1/4-20-49-22-W4M, Leduc County, Alberta
JOB No.: E0205-946
DATE: May 20, 2002
TECH: MH
TEST BORING 02-2

DRILL TYPE: B-56 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS
MOISTURE CONTENT %
10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM: Local
SURFACE ELEVATION: 97.31 m

DEPTH (ft)	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT N	TEST RESULTS
					MISCELLANEOUS TESTS
					TOPSOIL, silty, some clay, damp, black in colour
					CLAY, silty, high plasticity, very stiff to hard, damp, dark brown — PP = 450 kPa
3	1				PP = 450+ kPa
					-- frequent CaCO3 mottling — PP = 350 kPa
6	2				PP = 280 kPa
10	3				PP = 190 kPa
					PP = 170 kPa
15	4				-- firm consistency, silty with depth, medium plasticity, dark grey — PP = 150 kPa, K = 10^-8 cm/sec
	5		6		PP= 100 kPa
20	6				PP = 110 kPa
					-- occasional gravel pieces, firm consistency, "severe" borehole sloughing
	7				BEDROCK(Sandstone), silty, fine grained, highly weathered bedrock, very dense soil, grey — PP = 450+ kPa
26	8				PP = 450+ kPa
					PP = 450+ kPa
30	9				-- occasional clay shale stringers, dark brown — PP = 450+ kPa
	10				PP = 450+ kPa
35					End of borehole at 10.5 m Slough = 9.0 m, 0 hrs Water = 6.4 m, 0 hrs Water = 6.4 m, 3.5 hrs later Borehole covered with sheet of plywood — PP = 450+ kPa

MOISTURE CONTENT
LIQUID LIMIT
PLASTIC LIMIT
Qu UNCONFINED COMPRESSION
γd DRY UNIT WEIGHT
SO4 SULPHATE CONTENT
WATER TABLE
N PENETRATION RESISTANCE
STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE
PLATE No. 4

SABATINI EARTH TECHNOLOGIES INC.

CLIENT: El - Shaddai Dairies Inc.
PROJECT: Proposed Liquid Manure Storage Facility
LOCATION: NE1/4-20-49-22-W4M, Leduc County, Alberta
JOB No.: E0205-846
DATE: May 20, 2002
TECH: MH
TEST BORING 02-3

DRILL TYPE: B-58 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS
MOISTURE CONTENT %
10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM: Local

SURFACE ELEVATION: 98.01 m

TOPSOIL silty, some clay, damp, black

CLAY, silty, high plasticity, very stiff, damp, frequent slickensided surfaces, dark brown

-- frequent $CaCO_3$ mottling, moister with depth, dark brown

-- occasional gravel pieces

-- silter with depth, moist, dark grey

CLAY TILL, silty, sandy, very stiff, occasional sand lenses, dark grey

-- sand layer from 9.6 to 9.9 metres, free water

End of borehole at 10.5 m
Slough = 8.1 m, 0 hrs Water = 7.9 m, 0 hrs Water = 7.5 m, 2 hrs later
Monitoring Well installed to Depth of 9.0 m
Borehole backfilled

TEST RESULTS

DEPTH (m)	DEPTH IN FEET	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT N	MECHANICAL TESTS
1	3				PP = 450+ kPa
					PP = 450 kPa
					PP = 400 kPa
2	6				PP = 330 kPa
3	10				PP = 310 kPa
4	13				PP = 220 kPa
5	15				PP = 210 kPa
6	18				PP= 140 kPa
					PP = 140 kPa
7	23				PP = 140 kPa
8	25				PP = 150 kPa
9	30				PP = 120 kPa
10	33				PP = 230 kPa
					PP = 240 kPa
	35				PP = 230 kPa

MOISTURE CONTENT
LIQUID LIMIT
PLASTIC LIMIT
Qu UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT
SO_4 SULPHATE CONTENT
WATER TABLE
N PENETRATION RESISTANCE
STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE
PLATE No. 5

SABATINI EARTH TECHNOLOGIES INC.

CLIENT: El - Shaddai Dairies Inc.
PROJECT: Proposed Liquid Manure Storage Facility
LOCATION: NE1/4-20-48-22-W4M, Leduc County, Alberta
JOB No.: E0205-845
DATE: May 20, 2002
TECH: MH
TEST BORING 02-4

DRILL TYPE: B-56 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS
MOISTURE CONTENT %
10 20 30 40 50 60

DEPTH (m) | DEPTH (ft)

SOIL PROFILE & DESCRIPTION

DATUM: Local
SURFACE ELEVATION: 95.44 m

TOPSOIL, some peat, moist, black, 60 cm thick

CLAY, high plasticity, silty, damp, very stiff to hard, dark brown

-- free water, siltier with depth

-- firm consistency, silty, sandy, dark greyish-brown

BEDROCK(Sandstone), silty, fine grained, highly weathered bedrock, very dense soil, grey in colour

End of borehole at 7.5 m
Slough = 5.0 m, 0 hrs
Water = 5.0 m, 0 hrs
Monitoring Well installed to Depth of 6.0 m
Water = 4.7 m, 2 hrs later
Borehole backfilled

TEST RESULTS

SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT 'N'	MISCELLANEOUS TESTS
			PP = 160 kPa
			PP = 220 kPa
			PP = 230 kPa
			PP = 220 kPa
			PP = 220 kPa
			PP = 110 kPa
			PP = 90 kPa
			PP= 110 kPa
			PP = 430 kPa
			PP = 450+ kPa
			PP = 450+ kPa

MOISTURE CONTENT ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △
Qu UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT
SO$_4$ SULPHATE CONTENT
WATER TABLE
N PENETRATION RESISTANCE
STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE
PLATE No. 6

SABATINI EARTH TECHNOLOGIES INC.

CLIENT: El - Shaddai Dairies Inc.
PROJECT: Proposed Liquid Manure Storage Facility
LOCATION: NE1/4-20-48-22-W4M, Leduc County, Alberta
JOB No.: E0205-845
DATE: May 20, 2002
TECH: MH
TEST BORING 02-5

DRILL TYPE: B-66 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS
MOISTURE CONTENT %
10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM: Local

SURFACE ELEVATION: 98.52 m

TOPSOIL, silty, some clay, moist, black, 20 cm thick

CLAY, silty, high plasticity, very stiff, damp, frequent slickensided surfaces, dark brown

– very silty, firm consistency, sandy

BEDROCK(Sandstone), silty, highly weathered bedrock, very dense soil, grey in colour

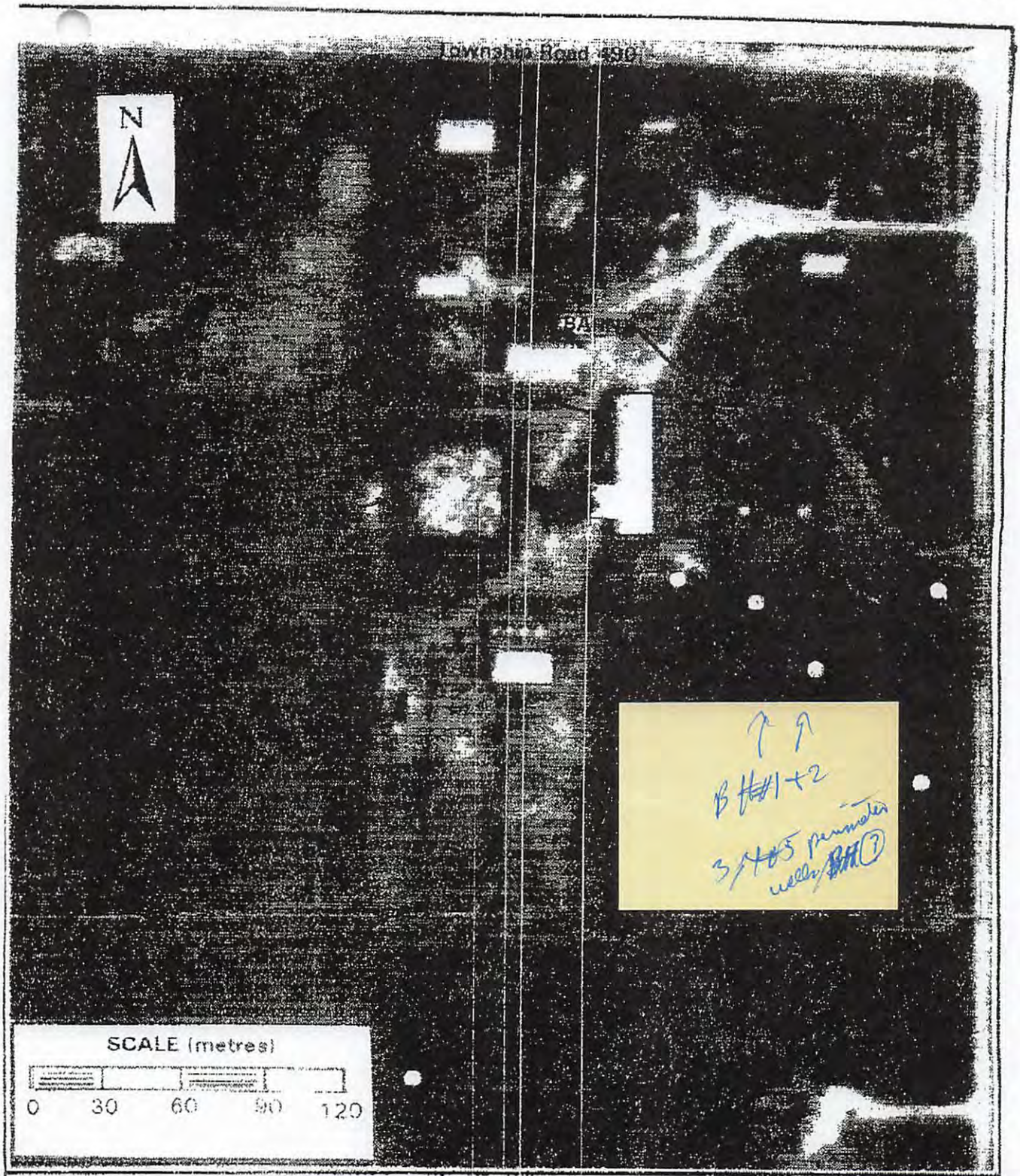
End of borehole at 9.0 m
Slough = 8.9 m, hrs
Water = 8.9 m, hrs
Monitoring Well installed to Depth of 9.0 m
Water = 9.0 m, 1 hr later
Borehole backfilled

TEST RESULTS

SOIL SYMBOL	SAMPLE TYPE	SLOW COUNT #	MISCELLANEOUS TESTS
			PP = 420 kPa
			PP = 400 kPa
			PP = 320 kPa
			PP = 250 kPa
			PP = 240 kPa
			PP = 140 kPa
			PP = 140 kPa
			PP= 90 kPa
			PP = 80 kPa
			PP = 90 kPa
			PP = 400 kPa
			PP = 450+ kPa
			PP = 450+ kPa

MOISTURE CONTENT ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △
Qu UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT
SO4 SULPHATE CONTENT
▽ WATER TABLE
N PENETRATION RESISTANCE
STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE

PLATE No. 7



SABATINI EARTH TECHNOLOGIES INC.
9915 - 78 Avenue NW, Edmonton, Alberta

PROPOSED LIQUID MANURE STORAGE FACILITY
NE ¼ - 20 - 49 - 22 - W4M
Leduc County Alberta
Site Plan Showing Borehole Locations

Job No: E0205-845	Date: June 3, 2002	Plate: 8