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	RA24023	SE 25-30-26 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.

June 4 2024
Date of signing

[redacted]
Signature

Beaver Valley Farms
Corporate name (if applicable)

CECIL Klassen
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)
Unauthorized pen	150' by 1000'
	45.7 m x 304.8 m

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

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
3 Feedlot pens (60m x 60m) each	(pens 10-13)	
25m x 15m handling facility.	(does not require a permit)	Facilities confirmed
Surface runoff interceptor.	(protective berm)	

NRCB USE ONLY

Last updated September 11, 2023

Part 2 — Technical Requirements

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

Existing facilities continued	**Dimensions (m) (length, width, and depth)**	**NRCB USE ONLY**
Feedlot pens 1-5	233 x 55	
Feedlot pens 6-9	106 x 90	All facilities confirmed
Catch basin (irregular shape)	6,679.3 cubic meters	
note: Facilities added by AO		

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

Construction completion date for proposed facilities N/A

Additional information

Decommision North Pen and rebuild the berm before August 1, 2024

*AO note: decommissioning of the north pen and re-building of protective berm is part of NRCB-issued Compliance Directive 24-01 issued May 10, 2024.

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**
Feeder Cattle	2650	0	2650
No proposed increase in animal numbers			

Last updated September 11, 2023

Part 2 – Technical Requirements

NRCB | Natural Resources Conservation Board

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

DECLARATION AND ACKNOWLEDGMENT OF APPLICANT CONCERNING *WATER ACT* LICENCE
issued by Alberta Environment and Protected Areas (EPA) for a confined feeding operation (CFO)
Date and sign one of the following four options

OPTION 1: Applying through the NRCB for both the AOPA permit and the *Water Act* licence

I **DO** want my water licence application coupled to my AOPA permit application.

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

OPTION 2: Processing the AOPA permit and *Water Act* licence separately

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

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

00163987-00-00

Signed this ____ day of June 4, 2024 [redacted]
Signature of Applicant or Agent

NRCB | Natural Resources Conservation Board

Part 2 – Technical Requirements

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

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

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

_____

Signed this ____ day of _____, 20____. _____

Signature of Applicant or Agent

Part 2 — Technical Requirements

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

NRCB Natural Resources Conservation Board

GENERAL ENVIRONMENTAL INFORMATION

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

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

Existing: Unauthorised Pens **Proposed 1:** _____

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

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☒ >1 m ☐ ≤ 1 m	☐ >1 m ☐ ≤ 1 m	☐ >1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☒ YES ☐ NO ☐ YES with exemption	Not located in a flood plain
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	0				☒ YES ☐ NO ☐ YES with exemption	None identified
	How many water wells are within 100 m of the manure storage facility or manure collection area?	1				☐ YES ☐ NO ☒ YES with exemption	One well ~11 m NE of unauthorized pen area
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	1/2 mile				☒ YES ☐ NO ☐ YES with exemption	Creek ~396 m east of unauthorized pen area
Groundwater information	What is the depth to the water table?	greater 10mT				☒ YES ☐ NO ☐ YES with exemption	>3 m
	What is the depth to the groundwater resource/aquifer you draw water from?	200 Ft				☒ YES ☐ NO ☐ YES with exemption	47.2 m using WWID 291618

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

N


Water well
Unauthorized pen now decommissioned
Protective berm
Catch basin area
Handling facility
Water well
Water well
Klassen
Unauthorized pen area
Runoff culvert runs underground toward catch basin
Township Rd 304
Image © 2024 Airbus
Google Earth

S

Part 2 — Technical Requirements

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

NRCB USE ONLY

WATER WELL AND SURFACE WATER INFORMATION

Well IDs: 1471175 291618 135287

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

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

Water wells ☐ N/A

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

Surface water ☒ N/A

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

Water Well Exemption Screening Tool ☐ N/A

Water Well ID	Preliminary Screening Score	Secondary Screening Score	Facility
135287	22 = continue to next section	8 = exemption more likely	Unauthorized pen

Groundwater or surface water related comments:

A condition will be included in the permit requiring groundwater monitoring for WW ID 135287 to address the proximity of the well to the west pen, as well as the lack of available information regarding well construction.

Part 2 — Technical Requirements

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

NRCB USE ONLY

ENVIRONMENTAL RISK SCREENING INFORMATION

ERST for **proposed** facilities

Facility	Groundwater score	Surface water score	File number
Unauthorized pen area	low	low	RA24023

ERST for **existing** facilities

Facility	Groundwater score	Surface water score	File number
Catch basin	low	low	RA24023

ERST related 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)

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
~~Sid Toews~~ Lindac Farms	SW-25-30-26-W4	1/3 mile	Agriculture	1	725		Yes for all
Kurt Leinweber	SW-30-30-26		Ag	1	490 m		
~~Brian Klassen~~	NW-19-30-26-W4	1/2 mile	Ag	1	645		
Ron Riemer		1 mile	Ag	1	670 m		

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)
			Total	N/A	

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

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

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

Additional information (attach any additional information as required)

Part 2 — Technical Requirements

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

NRCB USE ONLY

MINIMUM DISTANCE SEPARATION

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

Margin of error (if applicable): +/- 5 m

Requirements (m): Category 1: 436 Category 2: 582 Category 3: 727 Category 4: 1,163

Technology factor: ☐ YES ☒ NO

Expansion factor: ☐ YES ☒ NO

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

LAND BASE FOR MANURE AND COMPOST APPLICATION

Land base required: _____ N/A for authorization applications

Land base listed: _____

Area not suitable: _____

Available area _____ Requirement met: ☐ YES ☐ NO

Land spreading agreements required: ☐ YES ☐ NO

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

PLANS

Submitted and attached construction plans: ☐ YES ☒ NO

Submitted aerial photos: ☐ YES ☒ NO

Submitted photos: ☐ YES ☒ NO

GRANDFATHERING

Already completed: ☒ YES ☐ NO ☐ N/A

If already completed, see RA06036

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 - Naturally occurring protective layer

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

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

1. Unauthorized Pen
2. _____

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	NRCB USE ONLY Estimated storage capacity (m^3)
1.	1000 FT	150 FT	0	
2.	304.8 m x 45.7 m			
			TOTAL CAPACITY	sufficient 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

catch Basin

AO note: refer to Appendix A attached (pg 15) for evaluation of catch basin

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	_____(m)	Provide details (as required) See Engineering Report	
Soil texture	_____% sand	_____% silt	_____% clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested	Hydraulic conductivity (cm/s) 3.3x10-6 cm/sec	Describe test standard used

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

AO note: refer to Appendix A attached (pg 15) for evaluation of the naturally occurring layer

NRCB USE ONLY

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

Last updated February 26, 2021

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

NRCB USE ONLY

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

Depth to water table: >3 m Requirements met: ☒ YES ☐ NO

Depth to uppermost groundwater resource: 47.2 m Requirements met: ☒ YES ☐ NO

ERST completed: ☒ see ERST page for details

Surface water control systems

Requirements met: ☒ YES ☐ NO Details/comments:

Naturally occurring protective layer details

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

See drilling report and Appendix A, attached.

Part 2 — Technical Requirements

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

NRCB USE ONLY

ALL SIGNATURES IN FILE ☒ YES ☐ NO

DATES OF APPROVAL OFFICER SITE VISITS

June 4, 2024	
Sept 13, 2024	

CORRESPONDENCE WITH MUNICIPALITIES AND REFERRAL AGENCIES

Date deeming letters sent: July 11, 2024

Municipality: Kneehill County

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

Alberta Health Services: ☒ N/A

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

Alberta Environment and Parks: ☐ N/A

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

Alberta Transportation: ☐ N/A

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

Alberta Regulatory Services: ☒ N/A

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

Other: Harvest Hills Gas Co-op Ltd., Ember Resources Inc., and Trident Exploration Corp ☐ N/A

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

Other: _____ ☐ N/A

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

Sarah Neff
NRCB Approval Officer
Airdrie, AB
sarah.neff@nrcb.ca

RE: Cecil Klassen
Application RA24023
SE 25-030-26W4

October 8, 2024

Hi Sarah,

Thank you for your September 10 email request for assistance regarding application RA24023 with:

- Assessing the naturally occurring layer of the unauthorized feedlot pen, and whether the findings from the historic engineering report meet our current requirements
- Assessing runoff of the unauthorized feedlot pen, and whether the current catch basin area is large enough for this added volume

I reviewed:

- RA24023 Part 2 – Technical Requirements portion of the application
- RA06036 application and decision, including multiple engineering reports and other portions of the file in NRCB records
- Subsoil Investigations for Naturally Occurring Protective Layers (Technical Guideline Agdex 096-63, March 2023)
- Determining Equivalent Protective Layers and Constructed Liners (Technical Guideline Agdex 096-61, June 2022)

2024 analysis of the 2007 Soils Engineering report

Four test holes were drilled on January 4, 2007. Each well was completed as a monitoring well to facilitate water level measurement and in-situ hydraulic conductivity testing via slug tests. Hydraulic conductivity calculations using the AQTESOLV program and the Bouwer-Rice solution were included in the report. The results of the four hydraulic conductivity tests were geometrically averaged to provide a single hydraulic conductivity design value of $3.3x10^{-6}$ cm/sec for the site.

Review: The information in the 2007 Soils Engineering report above meets the requirements of Agdex 096-63 with one exception. The averaging of hydraulic conductivity results across a site is not listed in the guideline. The formula relied on in the guideline, Darci's Law, does include provisions and methods for averaging hydraulic conductivity results, one method being geometric averaging.

The three 2007 boreholes in the pens (west, centre and east) were drilled to depths of 8 to 10m below grade and were logged showing clay/silt from approximately 3 m below grade to bottom of hole. The report also reviews water well drilling reports (1964 and 1999 wells) and concludes that the till (clay/silt) unit extends to a depth of 44m. The report concludes that a till layer 44m thick with an average hydraulic conductivity of $3.3x10^{-6}$ cm/sec meets the regulation requirements of 2m thick at $1X10^{-6}$ cm/sec for the feedlot pens using an equivalent thickness calculation.

Review: The methodology for the 2007 equivalent thickness calculation matches the method listed in Agdex 096-61.

Approval officer handwritten notes (mine), dated March 6, 2007, calculated the minimum thickness required of a $3.3x10^{-6}$ cm/sec protective layer as 6.6m. The notes concluded that the 5 to 7m of clay/silt logged beneath each feedlot pen (and the 44m of till in the water well reports) were okay. In 2024, the same calculations and conclusion apply.

The closest borehole to the unauthorized feedlot pen was drilled in the proposed (and since then, constructed) west feedlot pen. Using an aerial photograph measurement, the approximate distance from the borehole location in the west feedlot pen to the south (most distant) edge of the unauthorized feedlot pen is approximately 230m.

Review: Figure 4 of Agdex 096-63 suggests a borehole be located within (or at) 100m of the exterior edges of feedlot pens. The same figure also shows that boreholes within large feedlot pens may be up to 200m from each other. While the distance from the west feedlot pen's borehole to the south edge of the unauthorized feedlot pen (at 230m) is clearly greater than the ***suggested*** *maximum distance (100m) from a pen edge, I do not have a position on whether the approval officer should require additional soils information (or take other regulatory action) for the south portion of the unauthorized feedlot pen.*

<u>2024 analysis of catch basin volume and contributing drainage area</u>

The storage volume in the existing catch basin is detailed in a June 11, 2007 letter from Sabatini Earth Technologies Inc. The volume of the catch basin was estimated to be 10262.8m^3 to the top of berm. The usable volume of the catch basin (when accounting for 0.5m of freeboard) was 6679.3m^3.

The same letter calculated a runoff volume of 3583.2m^3, smaller than the available storage volume. This was based on a catch basin drainage area of 74,650m^2 (surveyed), a runoff coefficient of 0.6 and a 80mm (0.08m) 24 hour, 1-in-30 year rainfall event for nearby Three Hills.

Review: The 2007 letter does not contain a map showing the location of the surveyed drainage area on a site plan of the feedlot. Therefore, you and I used the Alberta Water Wells website to measure the catch basin's drainage area. The drainage area edges were based on your observations of site drainage patterns during your site visit(s). The first area measured (64,460m^2) was based on the 2006 permitted area of the feedlot and the second area measured (17,811m^2) was based on the unauthorized feedlot pen applied for in application RA24023 (Appendix A). The entire second area was included because a culvert has been added to convey the runoff from the unauthorized feedlot pen directly to the catch basin. The total of these two areas is 82,271m^2.

A 24 hour, 1-in-30 year rainfall event for nearby Three Hills continues to be 80mm (0.08m) and this corresponds to a runoff coefficient of 0.6. Using a drainage area of 82,271m2, the runoff volume is calculated to be 3949.0m^3. This runoff volume is smaller than the usable volume of the catch basin of 6679.3m^3.

Based on these calculations, the existing catch basin is large enough for the added runoff volume from the unauthorized feedlot pen.

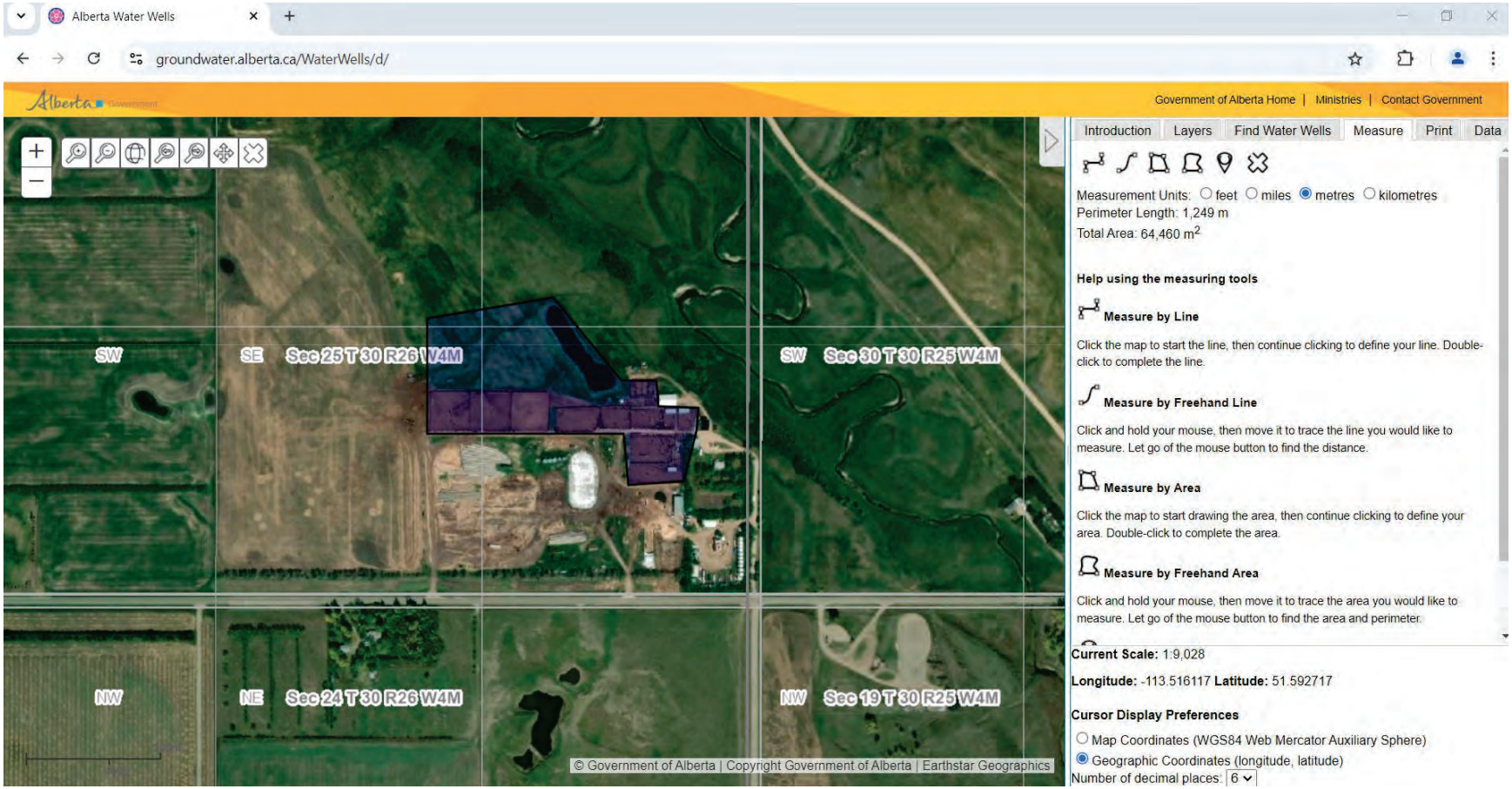
Closing

If you have any questions, please contact me.

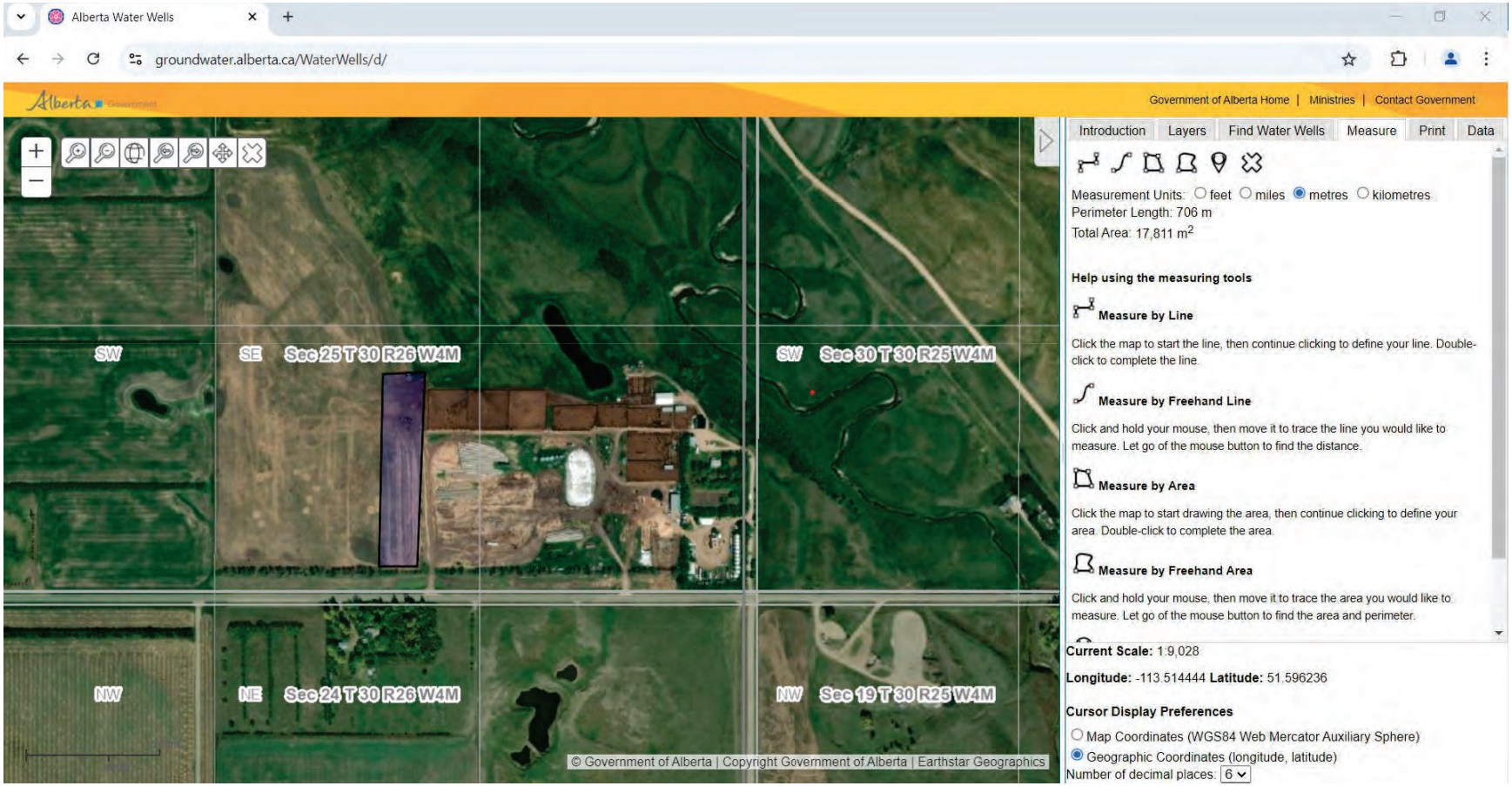
[redacted]

Scott (Sheila) Cunningham
NRCB Environmental Specialist
scott.cunningham@nrcb.ca

Appendix A


Alberta Water Wells
groundwater.alberta.ca/WaterWells/d/
Government of Alberta Home | Ministries | Contact Government
Introduction
Layers
Find Water Wells
Measure
Print
Data
Measurement Units: feet miles metres kilometres
Perimeter Length: 1,249 m
Total Area: 64,460 m2
Help using the measuring tools
Measure by Line
Click the map to start the line, then continue clicking to define your line. Double-click to complete the line.
Measure by Freehand Line
Click and hold your mouse, then move it to trace the line you would like to measure. Let go of the mouse button to find the distance.
Measure by Area
Click the map to start drawing the area, then continue clicking to define your area. Double-click to complete the area.
Measure by Freehand Area
Click and hold your mouse, then move it to trace the area you would like to measure. Let go of the mouse button to find the area and perimeter.
Current Scale: 1:9,028
Longitude: -113.516117 Latitude: 51.592717
Cursor Display Preferences
Map Coordinates (WGS84 Web Mercator Auxiliary Sphere)
Geographic Coordinates (longitude, latitude)
Number of decimal places: 6
SW
SE
Sec 25 T 30 R26 W4M
SW
Sec 30 T 30 R25 W4M
NW
NE
Sec 24 T 30 R26 W4M
NW
Sec 19 T 30 R25 W4M
© Government of Alberta | Copyright Government of Alberta | Earthstar Geographics

Appendix A


Alberta Water Wells
groundwater.alberta.ca/WaterWells/d/
Government of Alberta Home | Ministries | Contact Government
Introduction
Layers
Find Water Wells
Measure
Print
Data
Measurement Units: feet miles metres kilometres
Perimeter Length: 706 m
Total Area: 17,811 m2
Help using the measuring tools
Measure by Line
Click the map to start the line, then continue clicking to define your line. Double-click to complete the line.
Measure by Freehand Line
Click and hold your mouse, then move it to trace the line you would like to measure. Let go of the mouse button to find the distance.
Measure by Area
Click the map to start drawing the area, then continue clicking to define your area. Double-click to complete the area.
Measure by Freehand Area
Click and hold your mouse, then move it to trace the area you would like to measure. Let go of the mouse button to find the area and perimeter.
SW SE Sec 25 T 30 R26 W4M
SW Sec 30 T 30 R25 W4M
NW NE Sec 24 T 30 R26 W4M
NW Sec 19 T 30 R25 W4M
© Government of Alberta | Copyright Government of Alberta | Earthstar Geographics
Current Scale: 1:9,028
Longitude: -113.514444 Latitude: 51.596236
Cursor Display Preferences
Map Coordinates (WGS84 Web Mercator Auxiliary Sphere)
Geographic Coordinates (longitude, latitude)
Number of decimal places: 6

Subsurface Investigation
SE-25-30-26W4

Prepared For:
Cecil Klassen

Prepared By:
Sabatini Earth Technologies Inc.

February, 2007

SABATINI EARTH TECHNOLOGIES INC.

SABATINI EARTH TECHNOLOGIES INC.

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

12323 - 67th STREET
EDMONTON, ALBERTA T5B 1N1
TEL: (780) 438-0844
FAX: (780) 435-1812

February 16, 2007

File: 0612-5821

Cecil Klassen
Box 247
Linden, AB T0M 1J0

Dear Sir:

RE: Subsurface investigation for feedlot expansion - SE-25-30-26W4

Four test holes were drilled and monitoring wells installed to determine subsurface conditions as part of a feedlot expansion at the above mentioned site. The site is underlain by a thin gravel horizon followed by a silty till unit that extends over 40 m to bedrock.

The water table at depths of 3 - 4 m below the surface. Groundwater flow directions are towards the north-west in the direction of surface drainage towards Kneehills Creek. Hydraulic conductivity tests show a geometric average of 3.3×10^{-6} cm/s.

The depth to the water table, type of soil, and equivalent hydraulic conductivity meets requirements as outlined in Section 9 of the Agricultural Operations Practices Act and Regulation and the site is suitable for feedlot use.

Should you have any questions please do not hesitate to contact the undersigned.

Yours truly,
SABATINI EARTH TECHNOLOGIES INC.

APEGGA P5773

[redacted]

Ken Hugo, P.Geol.

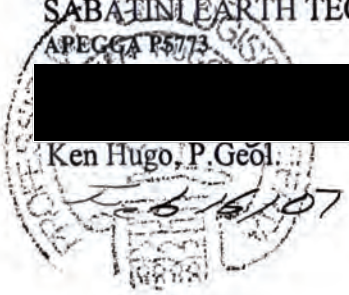


Table of Contents

A) Introduction

At the request of Cecil Klassen a subsurface investigation was conducted on a proposed feedlot expansion within the SE $^1/_4$ of Section 25 - Twp. 30 - Range 26W4. The purpose of the investigation was to determine whether the subsurface conditions (soil and groundwater) are suitable for a feedlot as defined in Section 9 in the Regulations Section of the Agricultural Operation Practices Act and Regulations.

The site is located within a relatively flat prairie environment overlooking Kneehills Creek (Plate 1). This creek is located within a glacial outwash channel approximately 40 m below the prairie benchland. A gravel pit was formerly in operation south of the site and thin gravels were noted on the surface as part of this investigation.

B) Details of Field Investigation

Four test holes were drilled on the site on January 4, 2007 utilizing an auger rig supplied by Mobile Augers of Calgary. One hole was drilled in each of the proposed cattle pens and a fourth well was installed within the proposed catch basin area. The location of the holes with respect to the feedlot is shown on Plate 2.

The test holes were completed as monitoring wells with the installation of 52 mm PVC pipe into each hole. The pipe had machine slots over the lower most 3 m. Clean sand was placed in the annulus between the well bore walls and the slotted portion of the pipe and bentonite chips was placed around the solid portion of the pipe.

The location of the wells was measured with a hand held GPS device and the well elevations were measured relative to each other with the use of a builders transit.

A return trip to the site was made on January 21, 2007 to measure water levels, conduct hydraulic conductivity (slug) tests and collect water samples for chemical analysis to establish background

water conditions. Slug tests were conducted with the aid of new disposable bailers and samples were also collected with the use of the bailers. The lab samples were collected into appropriate containers and delivered to Norwest Labs of Calgary for analysis of routine dissolved parameters.

Test hole logs showing nature of strata encountered, water levels and monitoring well design are shown on Plates 3 - 6.

C. Results

I Soil Strata - The area is immediately underlain by a sand and sandy gravel unit that appears to be an extension of the gravel deposit formerly mined south of the site. This gravel extends to a depth of approximately 2 m and is dry.

Underlying these gravels are a silty till unit that was found to the depth of investigation. This till is soft and medium plastic. Occasional sand and gravel lenses were found throughout the this till but are thought to be discontinuous.

The till units extends appears to extend to a depth of 44 m as indicated by the two water well drilling reports for the site (Plates 7 - 8). One well was drilled in 1964 and the second in 1999 and both show productive aquifers within bedrock units at depths greater than 45 m.

II Water Levels - Water levels from all 4 wells are as follows:

Well	Water Level - m btoc	Water Level - m below ground	Well Elevation - m	Groundwater Elevation - m
East Pen	4.77	3.90	97.59	92.82
Centre Pen	4.26	3.66	97.64	93.38
West Pen	5.20	4.20	100.00	94.80
Catch Basin	3.82	3.02	94.98	91.16

Water table depths are found from 3 - 4.2 m below ground with the shallowest water tables found (as expected) in the downhill wells. All water tables are within the clay tills and have at least 1 m of unsaturated clay tills above the water table.

Groundwater flow directions are shown on Plate 9. Groundwater flow directions are towards the north-east, similar to the topographic directions as shown on Plate 1. A hydraulic gradient of 0.023 m/m is calculated.

III Hydraulic Conductivity - Slug tests were conducted in all wells and the data was interpreted using the Bouwer-Rice solution utilizing the AQTESOLV program developed by HydroSoft Inc. Graphs showing the water displacement data and calculated hydraulic conductivity are shown on Plates 10 - 13. A summary of the results is as follows:

Well	Hydraulic Conductivity - cm/s
East Pen	2.3×10^{-5}
Centre Pen	3.5×10^{-6}
West Pen	6.3×10^{-6}
Catch Basin	2.3×10^{-7}

A relatively large range of hydraulic conductivities was found and this is likely related to the observed sand and gravel lenses within the clay till. Wells that received contribution to flow from these lenses have higher hydraulic conductivity than wells completed in silt till only. As was discussed these sand and gravel lenses are limited in extent and do not give a regional average.

A geometric average conductivity of 3.3×10^{-6} cm/s is calculated, which is a conservative estimate and will be used in future calculations.

Groundwater flow velocities can be calculated from the hydraulic gradient and the hydraulic

conductivity through Darcy's Law:

$$\text{Groundwater Velocity} = \frac{\text{Hydraulic conductivity} \times \text{hydraulic gradient}}{\text{Porosity}}$$

A groundwater velocity of less than 0.1 m per year is calculated illustrating the slow flow rates through these tills.

IV Water Chemistry - The report from Norwest Labs is shown on Plates 14 - 16. A summary of the results with a comparison to drinking water standards is as follows:

Parameter	East Pen	Centre Pen	West Pen	Catch Basin (Lagoon)	Drinking Water
Calcium	345	312	393	209	-
Magnesium	145	137	144	61.7	-
Sodium	543	209	272	162	500
Potassium	11	12	10	5.7	-
Iron	< 0.1	0.43	< 0.1	< 0.01	0.3
Manganese	0.88	2.30	0.28	1.22	0.05
Chloride	9.4	12.8	6.5	11.1	250
Nitrate	2.80	0.09	< 0.05	0.17	45
Sulfate	2100	1310	1640	728	500
Bicarbonate	401	438	417	424	-
Total Dissolved Solids	3350	2200	2660	1390	500
pH	7.92	8.00	7.88	7.92	6.5 - 8.5

Note: All results in mg/L except pH in pH units

The results show that the water is a sodium-calcium sulfate water typical of tills in southern Alberta.

No impacts by indicator parameters from feedlot operations (chloride, nitrates, total dissolved solids) is currently found, although the well in the east pen appears to contain the highest salinity.

The well in the catch basin area was completed as a permanent installation with a steel surface casing over the PVC pipe and a dedicated bailer installed in the well.

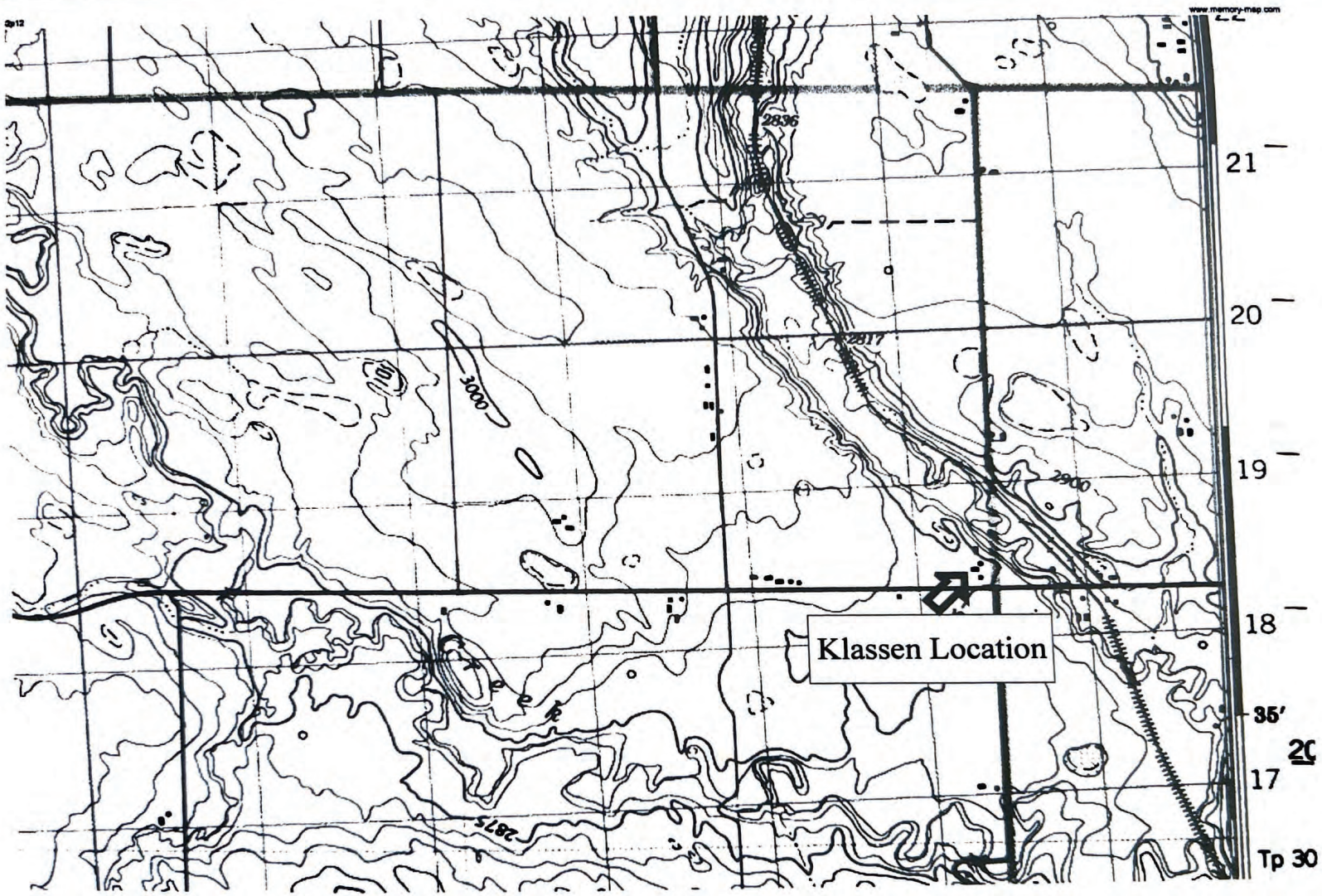
D. Conclusions

A till strata of 44 m thickness was found underlying the site with an average hydraulic conductivity of 3.3×10^{-6} cm/s. A liquid manure storage facility requires a liner of at least 10 m thick with a hydraulic conductivity of not more than 1×10^{-6} cm/s. This situation meets these criteria using an equivalent thickness calculation.

If the results from the catch basin well is used as a representative hydraulic conductivity, a lower hydraulic conductivity of 2.3×10^{-7} cm/s could be used which shows that the strata in the area meets the regulated values.

The strata within the feedlots needs a minium thickness of 2 m and maximum hydraulic conductivity of 1×10^{-6} cm/s. The till thickness (> 40 m) and average hydraulic conductivity (3.3×10^{-6} cm/s) meets an equivalent thickness for these location.

The depth to water table is also sufficient with the water table at least 1 m into the confining unit and at least 3 m below the surface.

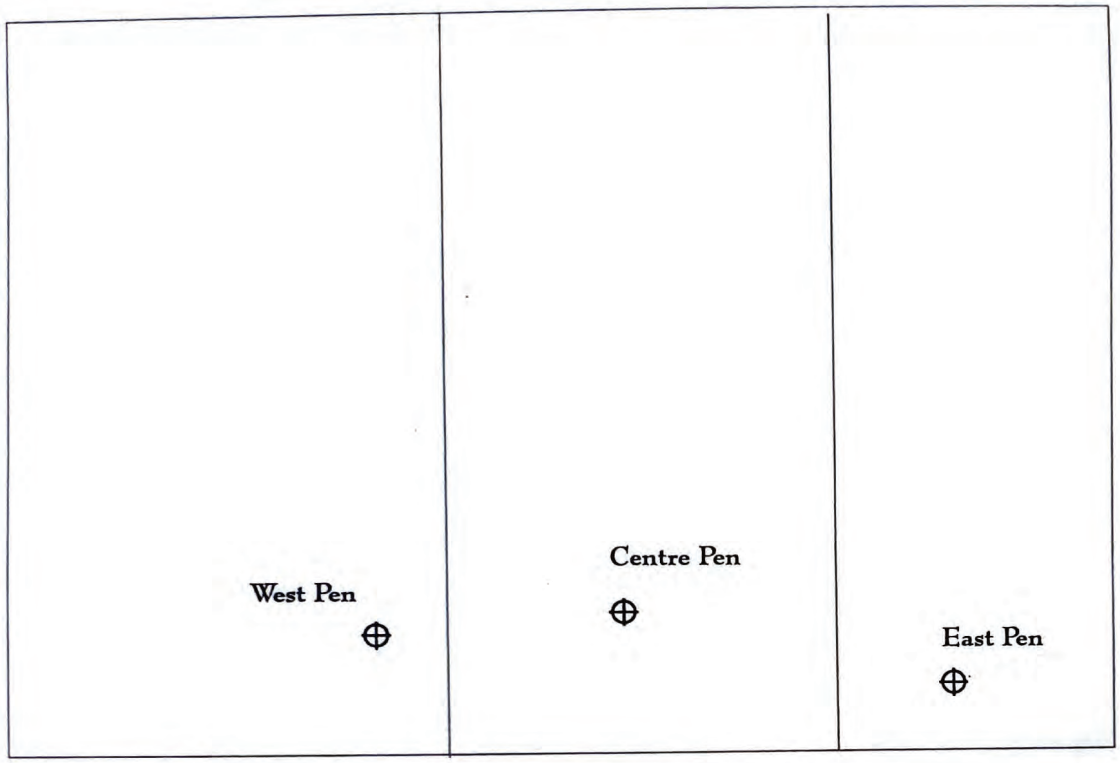


SABATINI EARTH TECHNOLOGIES INC.

Cecile Klassen

Topographic Map showing Klassen location in SE-25-30-26W4

Date: Feb 16, 07	Job No: 0612-5821	Plate No: 1



Catch Basin

LEGEND

MONITORING WELL LOCATIONS

0 50

SCALE (M)

SABATINI EARTH TECHNOLOGIES INC.

Cecile Klassen

Klassen Feedlot
Site map showing well locations

Date: Feb 16 / 07	Job No: 0612-5821	**Plate No: 2**

Boring/Well Construction Log

Project Cecile Klassen
Location East Pen
Drill Method Solid Stem Auger
Sample Method Auger Flights
Borehole Diameter 0.15 metres
Casing Elevation 97.59 m
Latitude 51o 35.388'

Project No. 0612-5281
Logged By KJH
Drill Co. Mobile Auger
Rig Type Marl 10
Driller Evan M.
Ground elevation 96.72 m
Longitude 113o 31.557'

Boring/Well TH 07-1
Date Drilled Jan 4 / 07
Water Level read on Jan 21/07
Boring Depth 10 m
Well Depth 10 m
Water Table Elev.: 92.39

Depth (m)	Hydraulic Conductivity	Water Level	Graphic Log	Sample Type	Lithological Description of Material	Well Diagram
1	K=2.2x10-5 cm/sec	4.77 m btoc Jan 21 07		Routine Water	**Silt / Fine Sand** - light brown, dry, some plant roots - occasional gravels at top, becoming mostly sand / silt below 2 m	Bentonite Chips Solid Pipe Sil o Sand 010 Screen
2						
3						
4					**Clay / Silt** - some coal fragments - soft, damp, low plastic, dark brown - wet below 6 m	
5						
6					- becoming grey below 4 m - more clayey with depth	
7						
8						
9						
10					End of Test Hole at 10 m Monitoring Well installed to 10 m	
11						
12						

Plate 3

ABATINI EARTH TECHNOLOGIES INC.

Boring/Well Construction Log

Project: Cecile Klassen
Location: Centre Pen
Drill Method: Solid Stem Auger
Sample Method: Auger Flights
Borehole Diameter: 0.15 metres
Casing Elevation: 97.64
Latitude: 51o 35.586'

Project No.: 0612-5281
Logged By: KJH
Drill Co.: Mobile Auger
Rig Type: Marl 10
Driller: Evan M.
Ground elevation: 97.04
Longitude: 113o 31.606'

Boring/Well: **TH 07-2**
Date Drilled: Jan 4 / 07
Water Level read on: Jan 21/07
Boring Depth: 8.25 m
Well Depth: 8.25m
Water Table Elev.: 93.38 m

Depth (m)	Hydraulic Conductivity	Water Level	Graphic Log	Sample Type	Lithological Description of Material
0				Routine Water	**Topsoil** - brown, sandy, under pasture grass
1					**Sand / Gravel** - light brown - fine sand with large gravels
2					**Sand / Silt** - light brown, dry - some medium brown layers and plant fragments
3		▼			**Clay / Silt** - dark brown - some coal fragments - soft on top, damp - occasional sand lenses
4	K =3.5x10-6 cm/s				
5		4.26 m btoc Jan 21 07			
6					- becoming grey and wet below 6 m
7					- gravel lens from 7.5 - 7.7. M
8					End of Test Hole at 8.25 m Monitoring Well installed to 8.25 m
9					
10					
11					
12					

Well Diagram

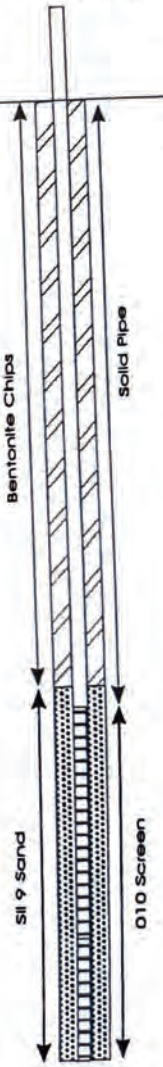


Plate 4

ABATINI EARTH TECHNOLOGIES INC.

Boring/Well Construction Log

Project: Cecile Klassen
Location: West Pen
Drill Method: Solid Stem Auger
Sample Method: Auger Flights
Borehole Diameter: 0.15 metres
Casing Elevation: 100.00
Latitude: 51o 35.587'

Project No.: 0612-5281
Logged By: KJH
Drill Co.: Mobile Auger
Rig Type: Marl 10
Driller: Evan M.
Ground elevation: 99.00
Longitude: 113o 31.649'

Boring/Well: TH 07-3
Date Drilled: Jan 4 / 07
Water Level read on: Jan 21/07
Boring Depth: 8.25 m
Well Depth: 8.25m
Water Table Elev.: 94.80 m

Depth (m)	Hydraulic Conductivity	Water Level	Graphic Log	Sample Type	Lithological Description of Material
0					**Topsoil** - brown, sandy, under pasture grass
1					**Sand** - light brown, dry - occasional large gravels
2					
3					
4		5.20 m btoc Jan 21 07			**Clay / Silt** - light brown - some coal fragments - damp, soft, medium plastic
5	K = 6.3x10-6 cm/sec			Routine Water	- becoming wet below 5 m - some 0.1 m thick silt lenses throughout
6					
7					
8					End of Test Hole at 8.25 m Monitoring Well installed to 8.25 m
9					
10					
11					
12					

Well Diagram

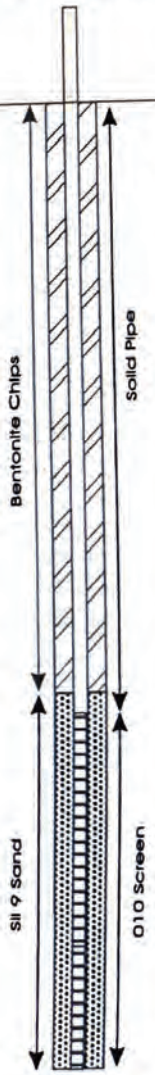


Plate 5

KABATINI EARTH TECHNOLOGIES INC.

Boring/Well Construction Log

Project Cecile Klassen
Location Lagoon Well
Drill Method Solid Stem Auger
Sample Method Auger Flights
Borehole Diameter 0.15 metres
Casing Elevation 94.98
Latitude 51o 35.587'

Project No. 0612-5281
Logged By KJH
Drill Co. Mobile Auger
Rig Type Marl 10
Driller Evan M.
Ground elevation 94.18
Longitude 113o 31.649'

Boring/Well TH 07-4
Date Drilled Jan 4 / 07
Water Level read on Jan 21/07
Boring Depth 5.25 m
Well Depth 5.25m
Water Table Elev.: 91.16

Depth (m)	Hydraulic Conductivity	Water Level	Graphic Log	Sample Type	Lithological Description of Material
0				Routine Water	**Topsoil** - brown, sandy, under pasture grass
1					**Sand** - light brown, dry - well sorted, soft
2					
3		3.82 m btoc Jan 21 07			**Clay / Silt** - dark brown, damp - some gravels and coal fragments - firm, medium plastic - becoming grey and moist below 4 m
4	K = 2.3 x10-7 cm/sec				
5					End of Test Hole at 5.25 m Monitoring Well installed to 5.25 m
6					
7					
8					
9					
10					
11					
12					

Well Diagram

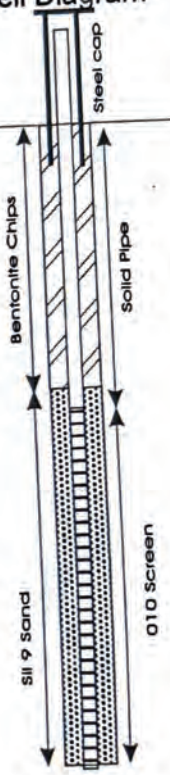


Plate 6

ALBERTA ENVIRONMENTAL PROTECTION

WATER WELL DRILLING REPORT

THIS DATA MAY NOT BE FULLY CHECKED; THE PROVINCE DISCLAIMS ALL RESPONSIBILITY FOR ITS ACCURACY:

WELL I.D. 291618

CONTRACTOR:

NAME: LOUSANA WATER WELLS LTD.

ADDRESS: Box 12
Lousana, Alberta T0M-1K0

LICENCE NO.: 0587 JOURNEYMAN NO.3890AD

WELL OWNER:

NAME: KLASSEN, CECIL

ADDRESS: LINDEN
P.O. Box 247

POSTAL CODE: T0M 1J0

WELL LOCATION: IC#:

¼ OR LSD	SEC	TWP	RGE	W. MER
SE	25	030	26	W4

LOCATION VERIFICATION METHOD: MAP
LOCATION IN QUARTER:

LOT: BLOCK: PLAN:
WELL ELEV: Feet How obtain: NOT OBTAIN

LITHO:

Depth (Feet):	Lithology:
Ground to:	
9	Brown Sand & Gravel
34	Brown Sandy Clay & Rocks
147	Gray Sandy Clay & Sand
154	Gray Fractured Shale
179	Gray Hard Sandstone Stringers
180	Coal

DRILLING METHOD: ROTARY

TYPE OF WORK: NEW WELL

FLOWING WELL: No **RATE:**
GAS PRESENT: No **OIL PRESENT:** No
DATE OF ABANDONMENT:
MATERIAL USED:
PROPOSED USE: DOMESTIC & STOCK

WELL COMPLETION DATA:

WELL FINISH: CASING/PERFORATED LINER
TOTAL HOLE DEPTH: 180 Feet

CASING TYPE: PLASTIC
SIZE OD: 5.50 Inch WALL THICKNESS: 0.390 Inch
BOTTOM AT: 153 Feet

PERFORATED CASING/LINER:
TYPE: PLASTIC
SIZE OD: 4.50 Inch
WALL THICKNESS: 0.235 Inch
TOP AT: 150 Feet BOTTOM AT: 180 Feet
PERFORATED FROM: 155 Feet TO: 180 Feet
Feet TO: Feet
Feet TO: Feet

SIZE OF PERFORATIONS: 0.250 Inch X 8.000 Inch
HOW PERFORATED: SAW

SEAL TYPE: DRIVEN
INTERVAL TOP: 0 Feet TO: 153 Feet

GEOPHYSICAL LOG TAKEN:
RETAINED ON FILE:

SCREEN:
MATERIAL:
SIZE ID (CLEAR): Inch SLOT SIZE: Inch
INTERVAL TOP: Feet TO: Feet
Feet TO: Feet

INSTALLATION METHOD:
TOP FITTINGS:
BOTTOM FITTINGS:
PACK TYPE:
GRAIN SIZE: AMOUNT:

PITLESS ADAPTER TYPE:
DROP PIPE TYPE: LENGTH: Feet
DIAMETER: Inch
ADDITIONAL PUMP INFORMATION:

PRODUCTION TEST:
TEST DATE: June 24, 1999 STARTTIME: 11:00

Elapsed Time in Min:Sec	Depth to Water Level During Pumping (Feet)	Depth to Water Level During Recovery (Feet)
0:00	(Static) 85.15	
1:00		90.14
2:00		88.56
3:00		87.45
4:00		86.83
6:00		86.07
8:00		85.61
10:00		85.22

WATER REMOVAL RATE DURING TEST: 50 Gal/Min
TEST DURATION: 2 Hours 0 Minutes
TESTING METHOD: AIR
DEPTH OF PUMP/DRILL STEM: 180 Feet
WATER LEVEL AT END OF TEST: 90.14 Feet
NON-PUMPING(STATIC) WATER LEVEL: 85.2 FEET
TOTAL DRAWDOWN: 5 Feet

RECOMMENDED PUMPING RATE: 10 Gal/Min
RECOMMENDED PUMP INTAKE AT: 120 Feet
TYPE OF PUMP INSTALLED:
MODEL: H.P.:

STARTED: June 17, 1999
COMPLETED: June 18, 1999
RECEIVED: July 5, 1999

COMMENTS: DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 1'.
(Maximum of 9 lines printed)

ADDITIONAL TEST AND/OR PUMP DATA:

CHEMISTRIES TAKEN/ HELD: DOCUMENTS HELD: 1

WELL OWNER'S ANTICIPATED WATER REQUIREMENTS PER DAY: 2,500 Gallons

Plate 7

PRINTED: February 14, 2007 14:34:40 **KEYED:** September 26, 1999 GIC4 UM

ALBERTA ENVIRONMENTAL PROTECTION

WATER WELL DRILLING REPORT

THIS DATA MAY NOT BE FULLY CHECKED; THE PROVINCE DISCLAIMS ALL RESPONSIBILITY FOR ITS ACCURACY:

WELL I.D. 135287

CONTRACTOR:

NAME: FORRESTER ROY

ADDRESS:

LICENCE NO.: JOURNEYMAN NO.:

WELL OWNER:

NAME: KLASSEN, ALBERT

ADDRESS: LINDEN

POSTAL CODE:

WELL LOCATION: IC#: 01

~ OR LSD	SEC	TWP	RGE	W. MER
SE	25	030	26	W4

LOCATION VERIFICATION METHOD: MAP
LOCATION IN QUARTER:

LOT: BLOCK: PLAN:
WELL ELEV: 2875. Feet How obtain: ESTIMATED

LITHO:

Depth (Feet):	Lithology:
Ground to:	
11	Clay & Boulders
122	Silty Sand
139	Gray Sandy Clay
147	Silty Sand
148	Coarse Grained Sand
154	Sandy Shale
161	Sandstone
169	Shale & Coal
178	Sandstone
180	Shale

DRILLING METHOD: CABLE TOOL

TYPE OF WORK: NEW WELL

FLOWING WELL: **RATE:**
GAS PRESENT: No OIL PRESENT: No
DATE OF ABANDONMENT:
MATERIAL USED:
PROPOSED USE: DOMESTIC

WELL COMPLETION DATA:

WELL FINISH: CASING/PERFORATED LINER
TOTAL HOLE DEPTH: 180 Feet

CASING TYPE: UNKNOWN
SIZE OD: 7.00 Inch WALL THICKNESS: Inch
BOTTOM AT: 152 Feet

PERFORATED CASING/LINER:
TYPE: UNKNOWN
SIZE OD: 5.38 Inch
WALL THICKNESS: Inch
TOP AT: 0 Feet BOTTOM AT: 180 Feet
PERFORATED FROM: Feet TO: Feet
Feet TO: Feet
Feet TO: Feet

SIZE OF PERFORATIONS: Inch X Inch
HOW PERFORATED: UNKNOWN

SEAL TYPE: DRIVEN
INTERVAL TOP: 0 Feet TO: Feet

GEOPHYSICAL LOG TAKEN:
RETAINED ON FILE:

SCREEN:
MATERIAL:
SIZE ID (CLEAR): Inch SLOT SIZE: Inch
INTERVAL TOP: Feet TO: Feet
Feet TO: Feet

INSTALLATION METHOD:
TOP FITTINGS:
BOTTOM FITTINGS:
PACK TYPE:
GRAIN SIZE: AMOUNT:

PITLESS ADAPTER TYPE:
DROP PIPE TYPE: LENGTH: Feet
DIAMETER: Inch
ADDITIONAL PUMP INFORMATION:

PRODUCTION TEST:
TEST DATE: December 3, 1964 STARTTIME: 11:00

Elapsed Time in Min:Sec	Depth to Water Level During Pumping	Depth to Water Level During Recovery

WATER REMOVAL RATE DURING TEST: 20 Gal/Min
TEST DURATION: 0 Hours 30 Minutes
TESTING METHOD: BAILER
DEPTH OF PUMP/DRILL STEM: Feet
WATER LEVEL AT END OF TEST: 120 Feet
NON-PUMPING(STATIC) WATER LEVEL: 79.0 FEET
TOTAL DRAWDOWN: Feet

RECOMMENDED PUMPING RATE: Gal/Min
RECOMMENDED PUMP INTAKE AT: Feet
TYPE OF PUMP INSTALLED:
MODEL: H.P.:

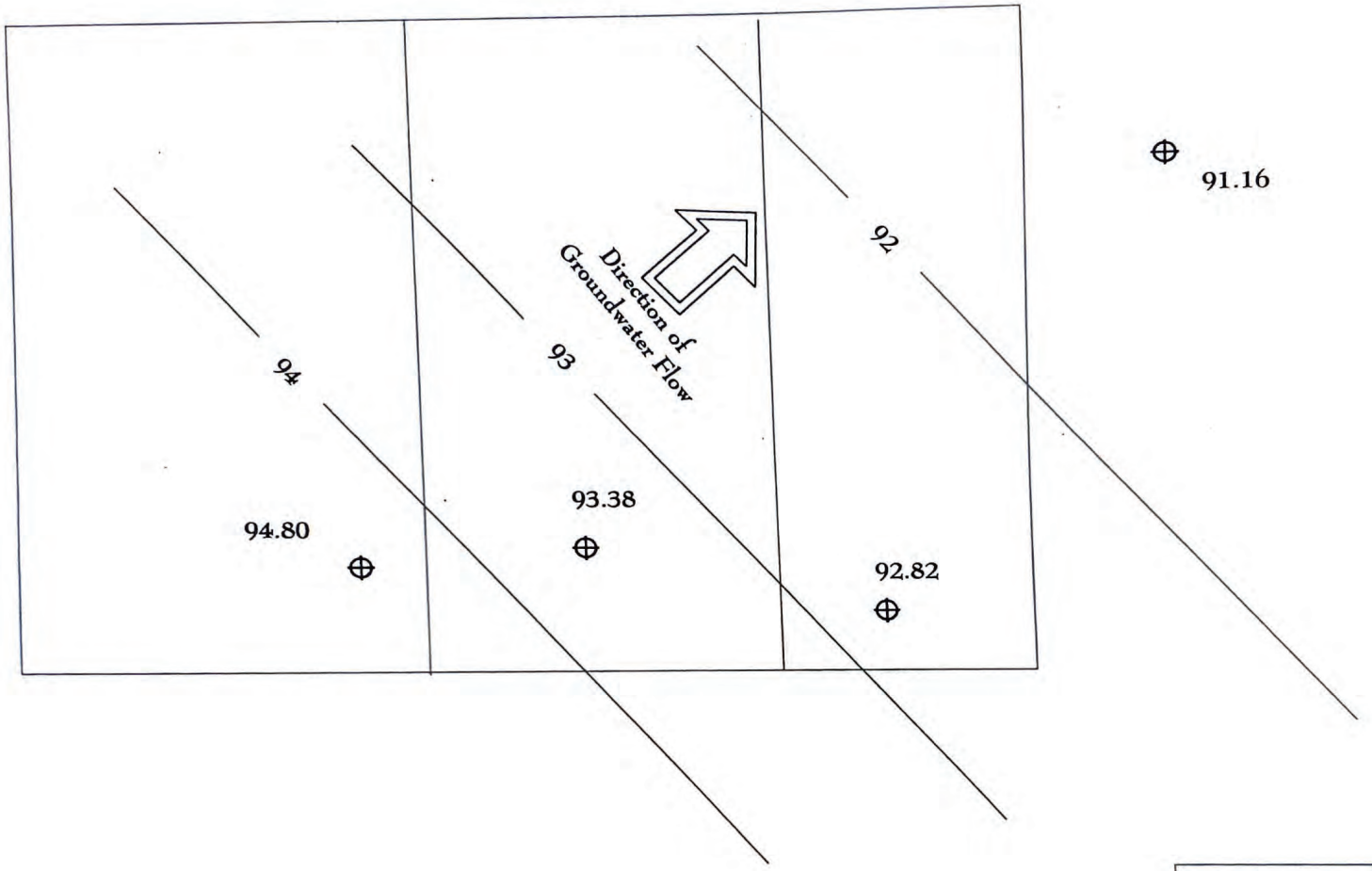
STARTED:
COMPLETED: December 3, 1964
RECEIVED:

COMMENTS: DRILLER REPORTS CLEAR, SOFT WATER
(Maximum of 9 lines printed)

ADDITIONAL TEST AND/OR PUMP DATA:
CHEMISTRIES TAKEN: HELD: 2 DOCUMENTS HELD: 3
WELL OWNER'S ANTICIPATED WATER REQUIREMENTS PER DAY:

PRINTED: February 14, 2007 14:34:39 **KEYED:** December 6, 1993 GIC4

Plate 8
DB



LEGEND
⊕ MONITORING WELL LOCATIONS

0 50

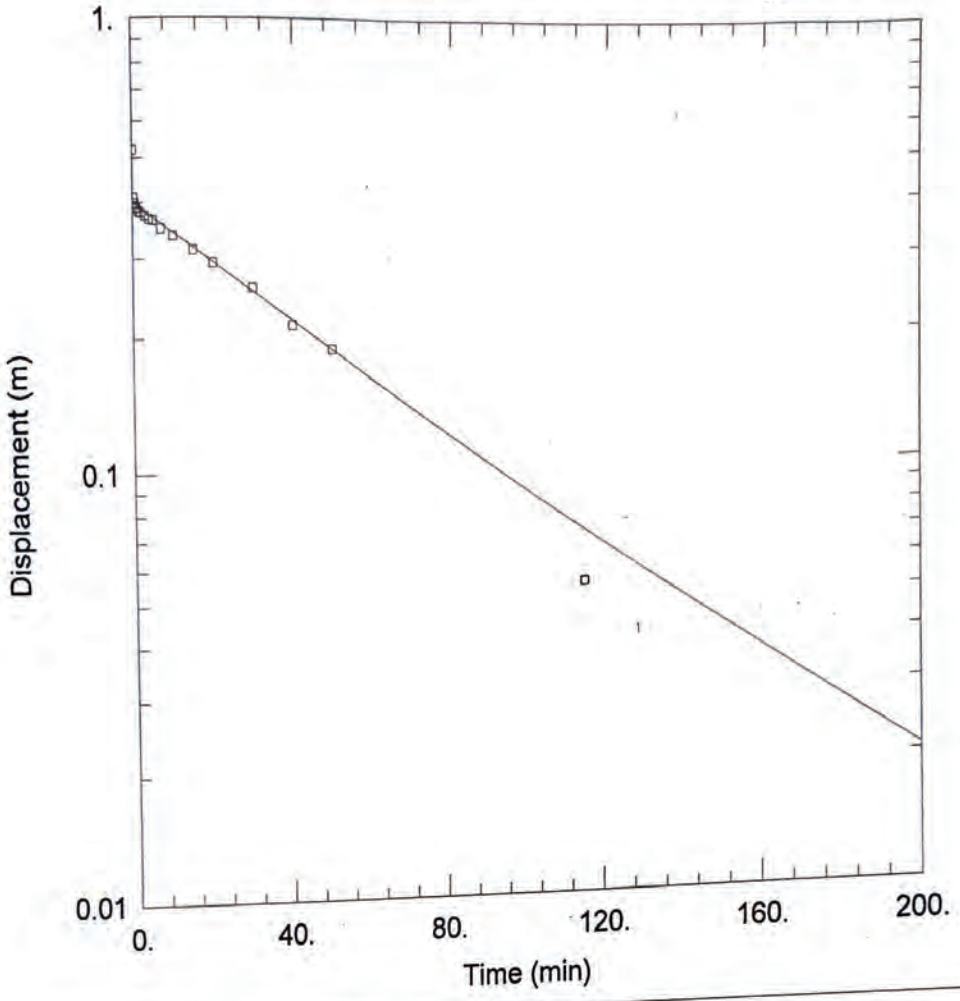
SCALE (M)

SABATINI EARTH TECHNOLOGIES INC.

Cecile Klassen

Klassen Feedlot
Map showing water table elevations and direction of groundwater flow

Date: Feb 16 / 07	Job No: 0612-5821	**Plate No: 9**



KLASSEN FEEDLOT

Data Set: Z:\A-Job Folders\Reports\5821 Cecile Klassen SE-25-30-26W4\centre pen.aqt
Date: 02/14/07 Time: 14:19:13

PROJECT INFORMATION

Company: Sabatini Earth Technologies
Client: Cecile Klassen
Project: 0505-5045
Location: SE-25-30-26W4
Test Well: Centre Pen Well
Test Date: Jan 22 / 07

WELL DATA (Centre Pen)

Initial Displacement: 0.52 m
Total Well Penetration Depth: 5. m
Casing Radius: 0.026 m

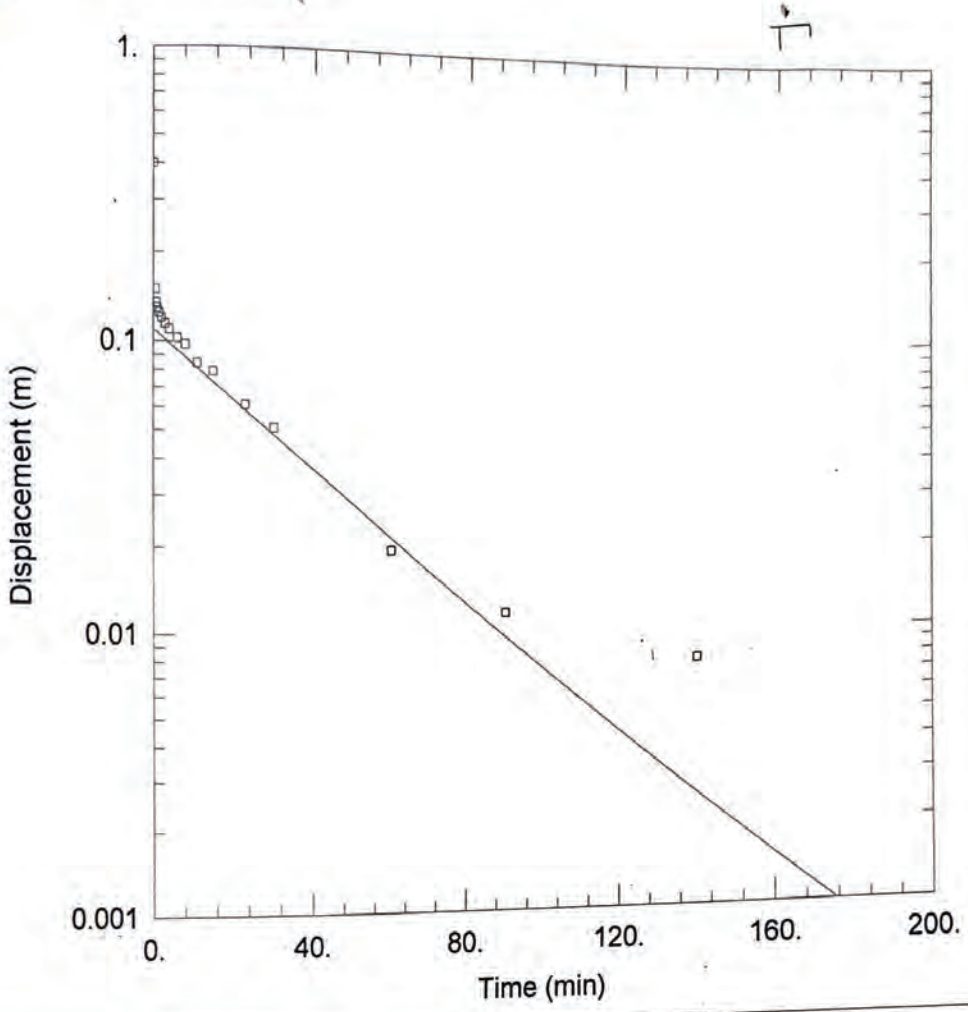
Static Water Column Height: 6.2 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
K = 3.543E-6 cm/sec

Solution Method: Bouwer-Rice
y0 = 0.399 m

Plate 10



KLASSEN FEEDLOT

Data Set: Z:\A-Job Folders\Reports\5821 Cecile Klassen SE-25-30-26W4\west pen.aqt
Date: 02/14/07 Time: 14:31:15

PROJECT INFORMATION

Company: Sabatini Earth Technologies
Client: Cecile Klassen
Project: 0505-5045
Location: SE-25-30-26W4
Test Well: West Pen Well
Test Date: Jan 22 / 07

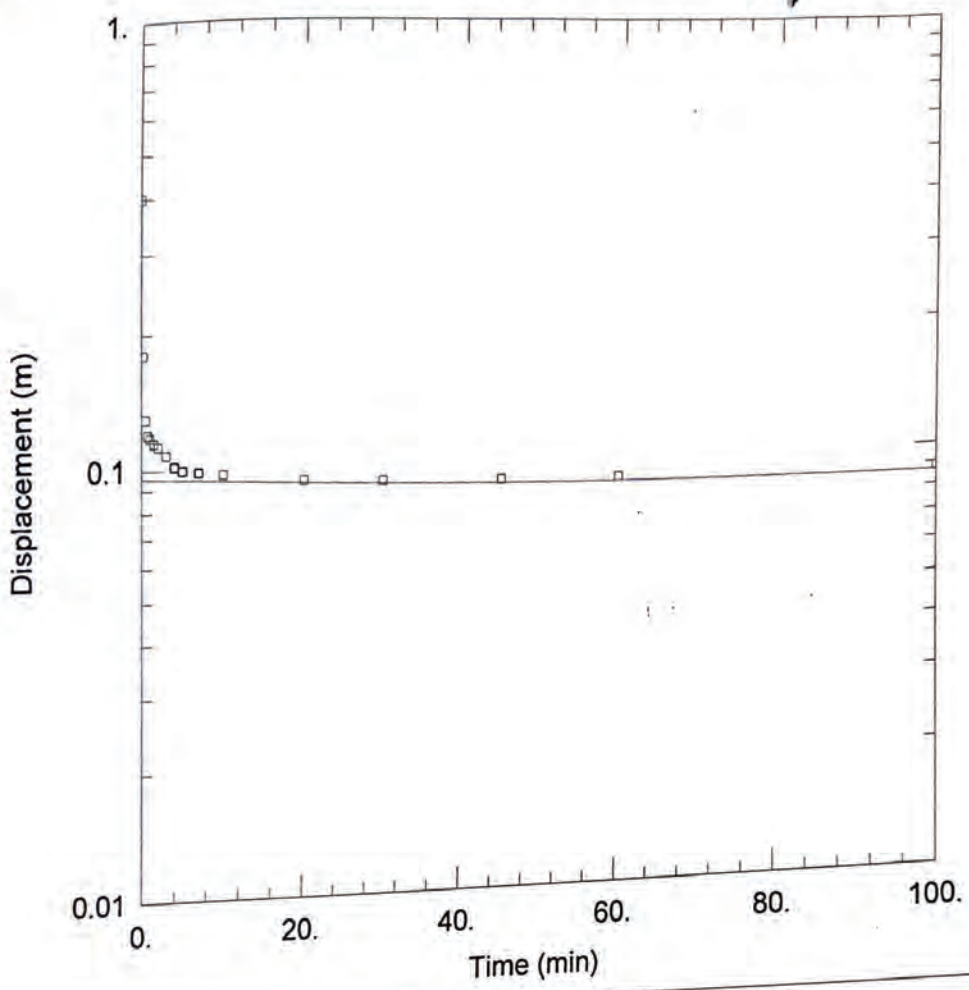
WELL DATA (West Pen)

Initial Displacement: 0.4 m
Total Well Penetration Depth: 4.75 m
Casing Radius: 0.026 m
Static Water Column Height: 6.2 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
K = 6.343E-6 cm/sec
Solution Method: Bouwer-Rice
y0 = 0.11 m

Plate 11



KLASSEN FEEDLOT

Data Set: Z:\A-Job Folders\Reports\5821 Cecile Klassen SE-25-30-26W4\lagoon well.aqt
Time: 14:30:52
Date: 02/14/07

PROJECT INFORMATION

Company: Sabatini Earth Technologies
Client: Cecile Klassen
Project: 0505-5045
Location: SE-25-30-26W4
Test Well: Lagoon Well
Test Date: Jan 22 / 07

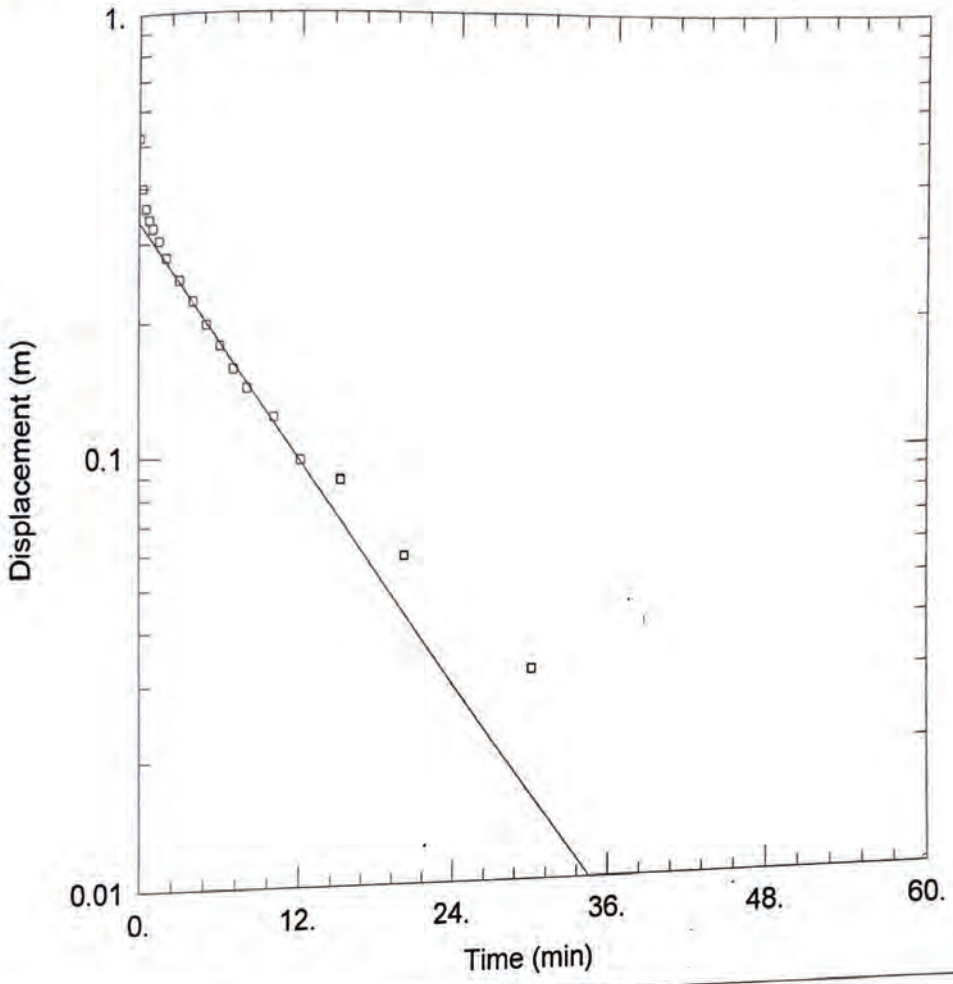
WELL DATA (Lagoon Well)

Initial Displacement: 0.4 m
Total Well Penetration Depth: 2.8 m
Casing Radius: 0.026 m
Static Water Column Height: 6.2 m
Screen Length: 2.8 m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
K = 2.323E-7 cm/sec
Solution Method: Bouwer-Rice
y0 = 0.09576 m

Plate 12



KLASSEN FEEDLOT

Data Set: Z:\A-Job Folders\Reports\5821 Cecile Klassen SE-25-30-26W4\east pen.aqt
Time: 14:13:10
Date: 02/14/07

PROJECT INFORMATION

Company: Sabatini Earth Technologies
Client: Cecile Klassen
Project: 0505-5045
Location: SE-25-30-26W4
Test Well: East Pen Well
Test Date: Jan 22 / 07

WELL DATA (East Pen Wel)

Initial Displacement: 0.52 m
Total Well Penetration Depth: 5.75 m
Casing Radius: 0.026 m
Static Water Column Height: 6.2 m
Screen Length: 3. m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.264E-5 cm/sec
y0 = 0.3356 m

Plate 13

NORWEST LABS

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Sabatini Earth Technologies Inc.
Report to: Sabatini Earth Technologies Inc.
6919 - 32 Avenue N. W.
Calgary, AB, Canada
T3B 0K6
Attn: Ken Hugo
Sampled By: Ken Hugo
Company: SETI

Project ID:
Name: Klassen
Location:
LSD: SE-25-30-26 W4M
P.O.:
Acct. Code:

NWL Lot ID: 520739
Control Number: 301249
Date Received: Jan 23, 2007
Date Reported: Jan 26, 2007
Report Number: 960422

		NWL Number	520739-1	520739-2	520739-3	
		Sample Description	East Pen	Centre Pen	West Pen	
		Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Routine Water						
pH			7.92	8.00	7.88	
Temperature of observed pH		°C	21.8	22.0	22.2	
Electrical Conductivity		µS/cm at 25 C	3830	2550	3010	1
Calcium	Dissolved	mg/L	345	312	393	0.2
Magnesium	Dissolved	mg/L	145	137	144	0.1
Sodium	Dissolved	mg/L	543	209	272	0.4
Potassium	Dissolved	mg/L	11	12	10	0.4
Iron	Dissolved	mg/L	<0.1	0.43	<0.1	0.01
Manganese	Dissolved	mg/L	0.88	2.30	0.28	0.005
Chloride	Dissolved	mg/L	9.4	12.8	6.5	0.4
Nitrate - N		mg/L	2.80	0.09	<0.05	0.01
Nitrite - N		mg/L	0.12	0.04	<0.02	0.005
Nitrate and Nitrite - N		mg/L	2.92	0.1	<0.07	0.02
Sulfate (SO4)	Dissolved	mg/L	2100	1310	1640	0.9
Hydroxide		mg/L	<5	<5	<5	5
Carbonate		mg/L	<6	<6	<6	6
Bicarbonate		mg/L	401	438	417	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	329	359	342	5
Total Dissolved Solids	Calculated	mg/L	3350	2200	2660	1
Hardness	Dissolved as CaCO3	mg/L	1460	1340	1570	
Ionic Balance	Dissolved	%	104	105	106	

Plate 13

NORWEST LABS

Analytical Report

Norwest Labs
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Edmonton, AB. T6B 3J4
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Fax: (780) 438-0396

Bill to: Sabatini Earth Technologies Inc.
Report to: Sabatini Earth Technologies Inc.
6919 - 32 Avenue N. W.
Calgary, AB, Canada
T3B 0K6
Attn: Ken Hugo
Sampled By: Ken Hugo
Company: SETI

Project ID:
Name: Klassen
Location:
LSD: SE-25-30-26 W4M
P.O.:
Acct. Code:

NWL Lot ID: 520739
Control Number: 301249
Date Received: Jan 23, 2007
Date Reported: Jan 26, 2007
Report Number: 960422

		NWL Number	520739-4			
		Sample Description	Lagoon			
		Matrix	Water			
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Routine Water						
pH			7.92			
Temperature of observed pH		°C	22.8			1
Electrical Conductivity		µS/cm at 25 C	1830			0.2
Calcium	Dissolved	mg/L	209			0.1
Magnesium	Dissolved	mg/L	61.7			0.4
Sodium	Dissolved	mg/L	162			0.4
Potassium	Dissolved	mg/L	5.7			0.01
Iron	Dissolved	mg/L	<0.01			0.005
Manganese	Dissolved	mg/L	1.22			0.4
Chloride	Dissolved	mg/L	11.1			0.01
Nitrate - N		mg/L	0.17			0.005
Nitrite - N		mg/L	0.018			0.02
Nitrate and Nitrite - N		mg/L	0.19			0.9
Sulfate (SO4)	Dissolved	mg/L	728			5
Hydroxide		mg/L	<5			6
Carbonate		mg/L	<6			5
Bicarbonate		mg/L	424			5
P-Alkalinity	as CaCO3	mg/L	<5			5
T-Alkalinity	as CaCO3	mg/L	348			1
Total Dissolved Solids	Calculated	mg/L	1390			
Hardness	Dissolved as CaCO3	mg/L	776			
Ionic Balance	Dissolved	%	102			

Approved by: [redacted]
Darren Crichton, BSc, PChem
Operations Chemist

Plate 15

NORWEST LABS

Methodology and Notes

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Sabatini Earth Technologies Inc.
Report to: Sabatini Earth Technologies Inc.
6919 - 32 Avenue N. W.
Calgary, AB, Canada
T3B 0K6
Attn: Ken Hugo
Sampled By: Ken Hugo
Company: SETI

Project ID:
Name: Klassen
Location:
LSD: SE-25-30-26 W4M
P.O.:
Acct. Code:

NWL Lot ID: 520739
Control Number: 301249
Date Received: Jan 23, 2007
Date Reported: Jan 26, 2007
Report Number: 960422

Method of Analysis:

MethodName	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Conductivity - Laboratory Method, 2510 B	25-Jan-07	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	* Electrometric Method, 4500-H+ B	25-Jan-07	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	* Titration Method, 2320 B	25-Jan-07	Norwest Labs Edmonton
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	25-Jan-07	Norwest Labs Edmonton
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl- E	24-Jan-07	Norwest Labs Edmonton
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B		

* Norwest method(s) is based on reference method

References:
APHA — Standard Methods for the Examination of Water and Wastewater

Comments:

Plate 16

SABATINI EARTH TECHNOLOGIES INC.

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

12323 - 67th STREET
EDMONTON, ALBERTA T5B 1N1
TEL: (780) 438-0844
FAX: (780) 435-1812

Aug 1, 2007

File: 0612-5821

Cecil Klassen
Box 247
Linden, AB
T0M 1J0

RE: Catch Basin Analysis
SE-25-30-26-W4M

Dear Mr. Klassen:

A catch basin analysis was undertaken on the above-mentioned site, which is located west of Linden, Alberta. A topographical survey of the study area was performed to determine the catch basin area, the current capacity of the subject site, and the volume of water likely to accumulate in a 1-in-30 year rain event typical of the area. This analysis was performed as outlined in Alberta Standards and Administration Regulation 267/2001 under the Agricultural Operation Practices Act.

The analysis concludes that a berm of 1 m in height should be added to the east and southeast portion of the lagoon to obtain the necessary storage volumes.

Catch Basin Analysis

Details of Field Investigation

The investigation was initiated on May 17, 2007, when the area was surveyed. The main reference point used on the site was a water monitoring well to the east of the proposed manure pond, which was assigned an arbitrary elevation of 100.00 m. Each data point collected was referenced to this point for the purpose of contouring.

Volume Calculations

The elevation and location data was entered into the Surfer program to produce elevation contours. This program was used to calculate the volume of the existing depression at the subject site with the allowance of a 0.5 m freeboard. The existing depression is detailed in plate 1, and was determined to have the capacity to contain liquid at the elevation of 99.24 m; therefore the volume of this depression was calculated to the elevation of 98.74 m to allow for the freeboard. The volume that could be contained therein is estimated to be 3313.42 m^3. This calculation was performed by Surfer and is provided following plate 1.

The catch basin area was calculated to be 74,650 m^2. At the prescribed 0.6 runoff coefficient and using the 1-in-30 year rain event of 80 mm listed under Schedule 2 of the Alberta Standards and Administration Regulation 267/2001 for the nearby town of Three Hills, the runoff volume is calculated as follows:

Runoff Volume = 74650 m^2 x 0.6 x 0.08 m = 3583.2 m^3

This approximated runoff volume exceeds the existing volume capacity of the depression at the subject site, indicating that the site requires a berm or an excavation to meet the containment volume required by the regulations.

The runoff volume calculated above remains viable only if there is sufficient storage volume to contain the remaining precipitation that would be assumed to infiltrate into the soil. The unaccounted infiltration volume is calculated as such:

Infiltration Volume = 74650 m^2 x 0.4 x 0.08 m = 2388.8 m^3

As noted in the subsurface investigation report, a sand and sandy gravel unit that extends to a depth of approximately 2 m and is dry underlies the area of study. Using this data we can approximate the storage volume within the gravels using the following formula:

Storage Volume = Area x Depth x Porosity x [1 – S(ω)]
=74650 m^2 x 2 m x 0.25 x [1-(0.15)]
= 31726 m^3

This indicates that there is storage volume in the area sufficient to contain the infiltration volume that would result in a 1-in-30 year rain event. It would appear, as you have reported, that little runoff during rainfall events would migrate to the pond, as the surface infiltration capacity would be quite high. This should provide an additional safety factor for overflow during large storm events.

Berm Calculations

A second Surfer analysis was performed using adjusted elevation data that incorporated a berm surrounding the subject site at the elevation of 100 m (level with the monitoring well). As indicated in plate 2, the site is mostly contained at this elevation, and a berm added to the south and southeast of the depression would contain the site at this level.

The volume of the simulated bermed site was calculated using the elevation of 99.5 m to allow for the freeboard and the volume that could be contained therein is estimated to be 10262.8 m^3. The contour is detailed in plate 2, followed by the calculations performed by Surfer regarding the adjusted volume. This scenario allows for 6679.6 m^3 of manure to be stored.

Conclusion

Based on the calculations produced using the elevation contours produced by Surfer, the existing depression does not have the capacity to contain the volume of water that would accumulate in the depression in a 1-in-30 year rain event. If the site were bermed to a level even with the groundwater monitoring well to the west of the pond, this depression would then be able to contain 10262.8 m^3 of liquid below the required freeboard, allowing 6679.6 m^3 of manure to be stored in the depression without danger of an overflow in a 1-in-30 year rain event.

Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Yours truly,
Sabatini Earth Technologies Inc.
APEGGA Permit to Practice: P5773

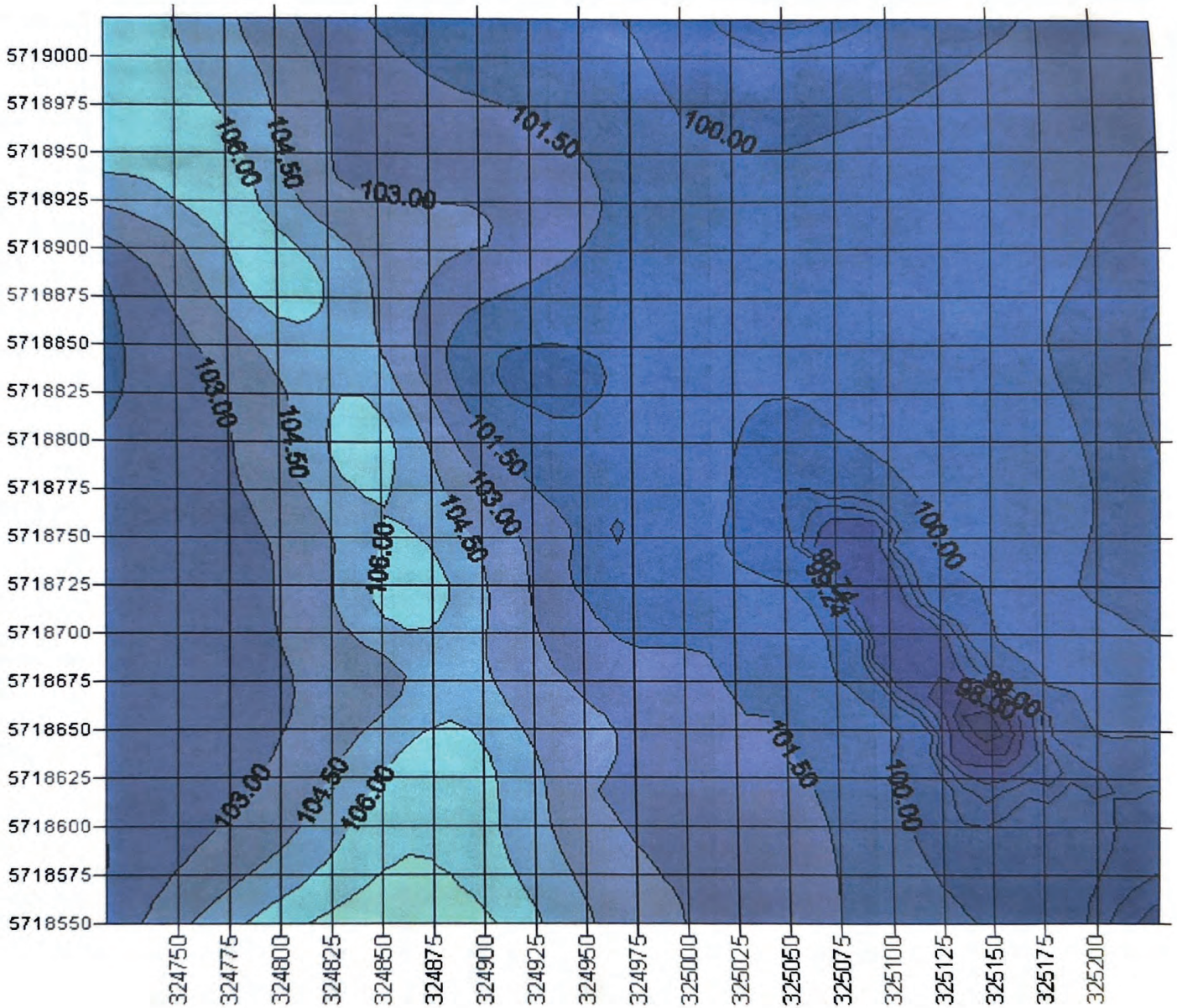
[redacted]

David Vaughan, B. A. Sc.
Environmental Scientist

PROFESSIONAL ENGINEER ALBERTA
ERICA GOTH

[redacted]

Erica Goth, P. Eng
Environmental Engineer
Aug 1, 2007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104.50
103.00
106.00
100.00
99.00
98.00
104.50
100.00
103.00
104.50
106.00

LASTREV-VOLUME

VOLUME COMPUTATIONS

UPPER SURFACE
Level Surface defined by Z = 98.74

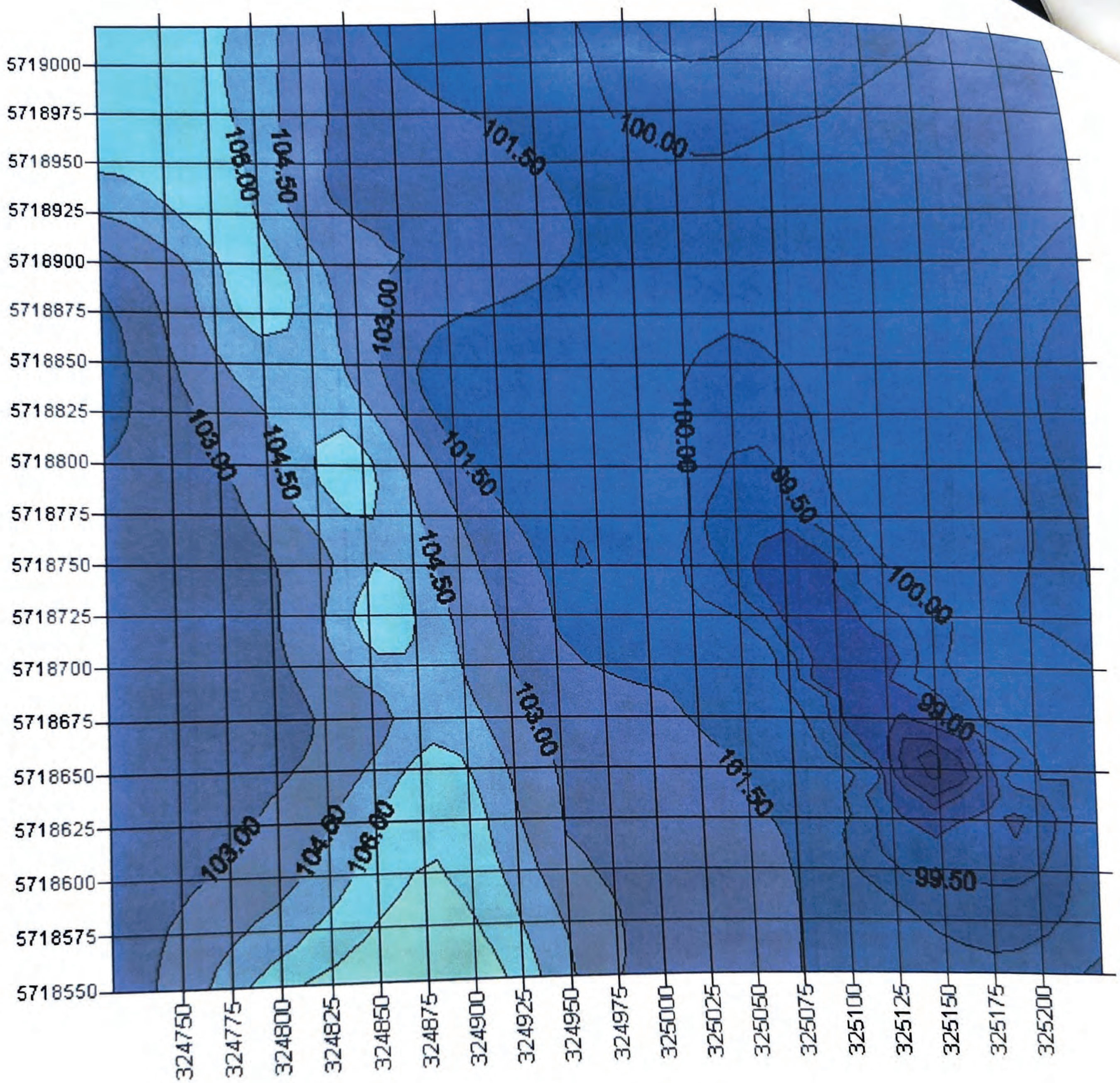
LOWER SURFACE
Grid File: Z:/A-JOB FOLDERS/REPORTS/5501-6000/5821 CECILE KLASSEN SE-25-30-26W4/CATCH BASIN/LASTREVISION.GRD
Grid size as read: 50 cols by 49 rows
Delta X: 10.5102
Delta Y: 9.79167
X-Range: 324715 to 325230
Y-Range: 5.71855E+006 to 5.71902E+006
Z-Range: 95.5 to 108.971

VOLUMES
Approximated Volume by
Trapezoidal Rule: -765779
Simpson's Rule: -765911
Simpson's 3/8 Rule: -765988

CUT & FILL VOLUMES
Positive Volume [Cut]: 3313.42
Negative Volume [Fill]: 769121
Cut minus Fill: -765807

AREAS
Positive Planar Area (Upper above Lower): 5009.47
Negative Planar Area (Lower above Upper): 237041
Blanked Planar Area: 0
Total Planar Area: 242050

Positive Surface Area (Upper above Lower): 5042.35
Negative Surface Area (Lower above Upper): 237243



Cecile Klassen

VOLUME COMPUTATIONS ADDEDBERM-VOLUME

UPPER SURFACE
Level Surface defined by Z = 99.5

LOWER SURFACE
Grid File: Z:/A-JOB FOLDERS/REPORTS/5501-6000/5821 CECILE KLASSEN SE-25-30-26W4/CATCH BASIN/ADDEDBERM.GRD
Grid size as read: 38 cols by 50 rows
Delta X: 13.9189
Delta Y: 9.59184
X-Range: 324715 to 325230
Y-Range: 5.71855E+006 to 5.71902E+006
Z-Range: 95.5008 to 109.41

VOLUMES
Approximated Volume by
Trapezoidal Rule: -590173
Simpson's Rule: -590283
Simpson's 3/8 Rule: -590329

CUT & FILL VOLUMES
Positive Volume [Cut]: 10262.8
Negative Volume [Fill]: 600473
Cut minus Fill: -590210

AREAS
Positive Planar Area
(Upper above Lower): 17246.4
Negative Planar Area
(Lower above Upper): 224804
Blanked Planar Area: 0
Total Planar Area: 242050

Positive Surface Area
(Upper above Lower): 17287.2
Negative Surface Area
(Lower above Upper): 224997