# Application for Amendment

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

| **NRCB USE ONLY** | NRCB Application number | Date Stamp |
|---|---|---|
| ☒ Approval ☐ Registration ☐ Authorization<br>Amendment | RA23022A | NRCB APPLICATION<br>30 OCT 2024<br>RECEIVED |

## CONTACT INFORMATION

**Applicant Information**

| Name: | Corporate Name (if applicable) | |
|---|---|---|
| Mitchel Kroetsch | | |
| Address: (Street/P.O. Box) Box 132 | | |
| City/Town: Bawlf | Province: Alberta | Postal Code: T0B 0J0 |

**Agent consent** *(if applicable)*

I, Mitchel Kroetsch, hereby give consent for Envirowest Engineering
*(name of applicant)* *(name of agent and company)*

to act on my behalf or as my agent for this application.

Signed this 09 day of October, 2024. [redacted]

*Signature of Applicant*

## LOCATION OF DEVELOPMENT

| | |
|---|---|
| **Which permit do you wish to amend?** (List permit number and issuing agency.) | RA23022 |
| Legal Land Description(s) | (Qtr-Sec-Twp-Rg-W Mer)<br>NW-15-42-16 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 herein and acknowledge that the information provided in this application is true to the best of my knowledge.

| | |
|---|---|
| October 9, 2024 | [redacted] |
| Date of signing | Signature |
| Envirowest Engineering | Emily Low |
| Corporate name (if applicable) | Print name |

# Application for Amendment – contd.

## AMENDMENT INFORMATION REQUIREMENTS

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

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

An amendment to Catch Basin 1 and Catch Basin 2 are provided in the attached report as well as additional assessment details.

A summary is as follows:

Catch Basin 1 (south): 53m x 51m x 2.7 meters

Catch Basin 2 (north): 46 m x 40.5 m x 2.7 meters

Depth to water table was determined to be 3.69 m and 3.96 m, respectively.

# 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 | Application number | Legal land description |
|---|---|---|
| ☐ Approval ☐ Registration ☐ Authorization ☑ Amendment | RA23022A | NW 15-42-16 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.

| | |
|---|---|
| | Emily Jocelyn Low -- P. Eng. - APEGA<br>Digitally signed by Emily Jocelyn Low -- P. Eng. - APEGA<br>Date: 2024.10.17 14:46:18 -06'00' |
| Date of signing | Signature |
| Envirowest Engineering | |
| Corporate name (if applicable) | 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) |
|---|---|
| Feedlot pens and alleys AO Note: This was already permitted under RA23022 | 208 m x 502 m |
| Catch Basin 1 AO Note: Amended dimensions | 53 m x 51 m x 2.7 m |
| Catch Basin 2 AO Note: Amended dimensions | 46 m x 40.5 m x 2.7 m |
| | |
| | |

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

| Existing facilities | Dimensions (m) (length, width, and depth) | NRCB USE ONLY |
|---|---|---|
| N/A | | |
| | | |
| | | |

**NRCB USE ONLY**

# 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)

**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** Spring 2024

**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** |
|---|---|---|---|
| Feeders | | 2500 | 2500 |
| Finishers | | 2500 | 2500 |
| | | | |
| AO Note: No proposed change to previously permitted livestock numbers in RA23022 | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |

# 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)

**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*

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**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) In Process

Signed this ____ day of _____, 20____. Emily Jocelyn Low -- P. Eng. - APEGA Digitally signed by Emily Jocelyn Low -- P. Eng. - APEGA Date: 2024.10.17 14:46:33 -06'00'

*Signature of Applicant or Agent*

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**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*

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**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)

## 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:** _____ **Proposed 1:** Feedlot Pens + Catch Basin 1

**Proposed 2:** Catch Basin 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 | |
| Surface water information | How many springs are within 100 m of the manure storage facility or manure collection area? | | 0 | 0 | | ☐ YES ☐ NO ☐ YES with exemption | |
| | How many water wells are within 100 m of the manure storage facility or manure collection area? | | 0 | 0 | | ☐ 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) | | Existing dugout is within | 60 | | ☐ YES ☐ NO ☐ YES with exemption | |
| Groundwater information | What is the depth to the water table? | | 3.69 m | 3.96 m | | ☐ YES ☐ NO ☐ YES with exemption | |
| | What is the depth to the groundwater resource/aquifer you draw water from? | | 64-73 | 64-73 | | ☐ YES ☐ NO ☐ YES with exemption | |

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

There is an existing dugout within the west boundary of the proposed pen construction area. This dugout will be bermed to ensure it is not impacted.

# 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)

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

| | | | NRCB USE ONLY | | | | |
|---|---|---|---|---|---|---|---|
| **Neighbour name(s)** | **Legal land description** | **Distance (m)** | **Zoning (LUB) category** | **MDS category (1-4)** | **Distance (m)** | **Waiver attached (if required)** | **Meets regulations** |
| Hihnalta Farms Ltd. | NW-10-42-16-W4 | 1000 | | | | | |
| R & R Congdon | NW-22-42-16-W4 | 1200 | | | | | |
| F & K Hihn | NW-14-42-16-W4 | 1400 | | | | | |
| F & K Hihn | SW-14-42-16-W4 | 1400 | | | | | |
| K & C Van Slyke | NE-17-42-16-W4 | 1800 | | | | | |

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

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

# Part 2 — Technical Requirements

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

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

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

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

1. Solid Manure Storage Area
2. 

**Manure storage capacity**

| | Length (m) | Width (m) | Depth below ground level (m) | **NRCB USE ONLY** Estimated storage capacity ($m^3$) |
|---|---|---|---|---|
| 1. | 502 | 208 | 0.4 | |
| 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

The south portion of the solid manure storage area, Area 1 (as shown on Figure 2.0), will be contoured so as to direct impacted runoff to Catch Basin 1. Area 2 will be contoured so as to direct impacted runoff to Catch Basin 2. Redirection and the construction of berms around the Catch Basins will prevent unimpacted runoff from entering.

**Naturally occurring protective layer details**

| | | | |
|---|---|---|---|
| Thickness of naturally occurring protective layer | 2.3 - 3.0 (m) | Provide details (as required)<br>A minimum of 0.4 m thickness is required to provide a sufficient protective barrier. | |
| Soil texture | 53 % sand | 17 % silt | 29 % clay |
| Hydraulic conductivity - naturally occurring protective layer | Depth and type of soil tested<br>1.75 - 2.6 mbgs<br>Sandy Clay Loam | Hydraulic conductivity (cm/s)<br>2.163 x 10^-7 cm/s | Describe test standard used<br>Slug test using AQTESOLV Bouwer-Rice method for |

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

**NRCB USE ONLY**

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Report attached: ☐ YES ☐ NO

# Part 2 — Technical Requirements

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

## RUNOFF CONTROL CATCH BASIN: Synthetic liner

*(complete a copy of this section for **EACH** proposed manure storage facility with a synthetic liner)*

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

1. Catch Basin 1
2. Catch Basin 2

**Determination of minimum required catch basin volume**

Provide a plan and show how you calculated the area contributing to runoff for each catch basin

See attached Amended Envirowest Engineering Report (October 2024)

**Catch basin capacity**

| | Length (m) | Width (m) | 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) ($m^3$) |
| 1. | 53 | 51 | 2.7 | 2.7 | 3:1 | 3:1 | 4:1 | |
| 2. | 46 | 40.5 | 2.7 | 2.7 | 3:1 | 3:1 | 4:1 | |
| | | | | | | | TOTAL CAPACITY | |

**Synthetic liner details**

| | Thickness and type of liner material | Provide liner material details (as required) |
|---|---|---|
| Synthetic liner | 40 mil HDPE | |

**Catch Basin – Design and management requirements can be found in Technical Guideline Agdex 096-101**

**NRCB USE ONLY**

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

**Liner protection**

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

A liner thickness of 40 mil of HDPE will be used to protect from erosion on the bottom and inside walls. The exterior walls (where applicable) will be soil covered.

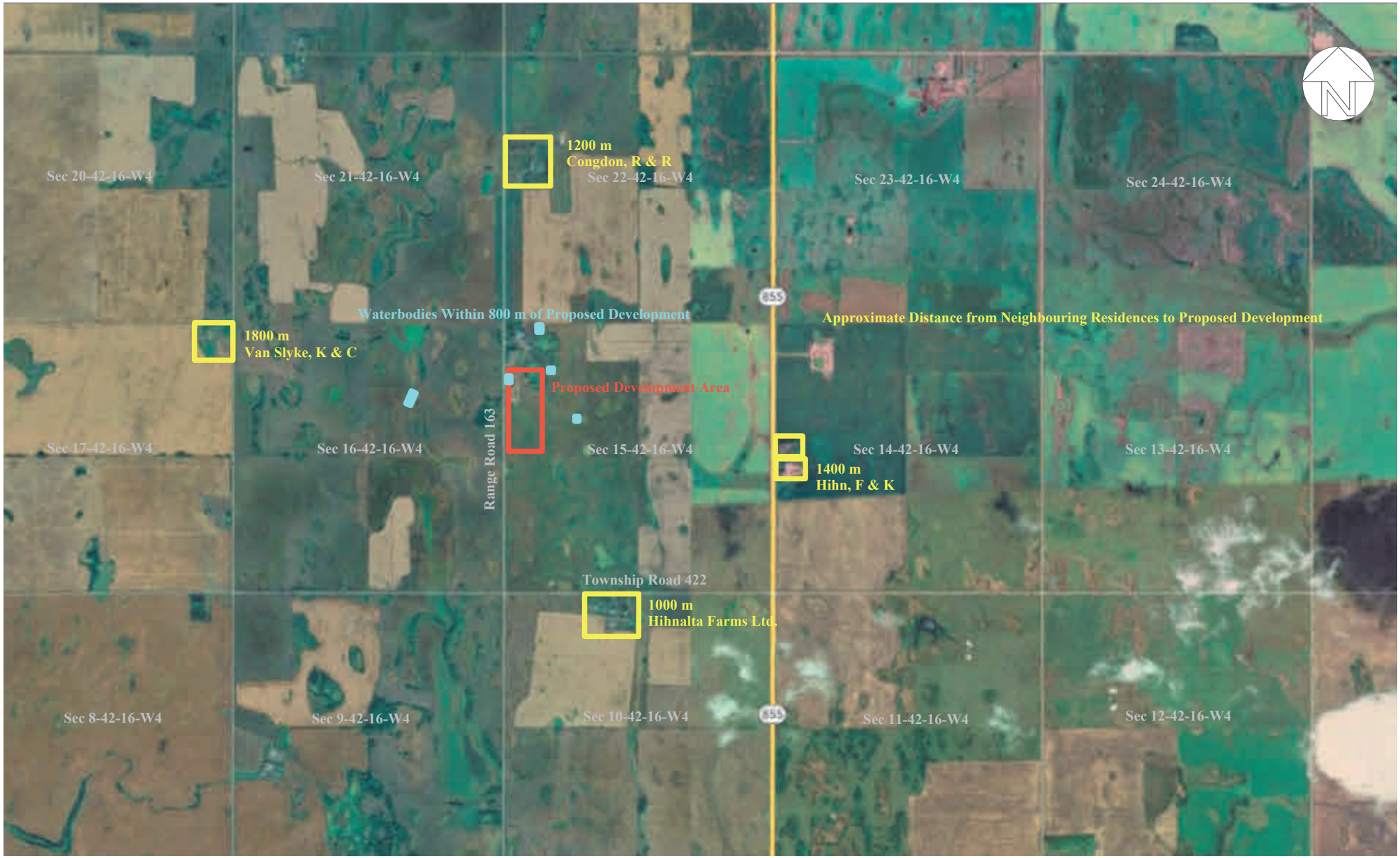
Describe how the physical integrity of the liner will be maintained from damage

Barriers will be placed around the catch basin to avoid any physical damage to the liner.

**NRCB USE ONLY**

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO




ENVIROWEST ENGINEERING

**Title:**

Detailed Site Layout Plan
Part II Technical Requirements
Mitchel Kroetsch
NW-15-042-16-W4M
Flagstaff County, Alberta

| | | |
|---|---|---|
| **Project No:** 2304-43021 | **Date:** March 12, 2024 | **Figure No.:** 1.0 |
| **Scale:** | **Prepared By:** L. Predy | |
| **Image Source:** Google Earth Pro (2022) | | |


ENVIROWEST ENGINEERING

**Title:**

Detailed Site Layout Plan
Part II Technical Requirements
Mitchel Kroetsch
NW-15-042-16-W4M
Flagstaff County, Alberta

| | | |
|---|---|---|
| **Project No:** 2304-43021 | **Date:** March 12, 2024 | **Figure No.:** 2.0 |
| **Scale:** | **Prepared By:** L. Predy | |
| **Image Source:** Google Earth Pro (2022) | | |

| Name of Landowners | Land Location | Acres | Soil Zone |
|---|---|---|---|
| Barbara and Colin Kroetsch | SW-3-43-16-W4 | 117 | Black |
| Barbara and Colin Kroetsch | SE-31-43-16-W4 | 110 | Black |
| Barbara and Colin Kroetsch | SW-31-43-16-W4 | 148 | Black |
| Barbara and Colin Kroetsch | NE-24-43-17-W4 | 130 | Black |
| Betty and Debbie Henderson | E½-29-41-16-W4 | 264 | Black |
| Betty and Debbie Henderson | SW-29-41-16-W4 | 150 | Black |
| Betty and Debbie Henderson | SE-30-41-16-W4 | 150 | Black |
| Lorraine J Henderson | NE-26-41-16-W4 | 155 | Black |
| Lorraine J Henderson | NE-27-41-16-W4 | 143 | Black |
| Lorraine J Henderson | SW-6-42-15-W4 | 147 | Black |

# LANDOWNER CONSENT

For the purpose of manure spreading

Date: JANUARY 7, 2024

I BARBARA KROETSCH COLIN KROETSCH (Name) of HEISLER (Town/City) Alberta

Do herby give consent for Mitchel Kroetsch to spread feedlot manure on the following lands:

| Legal Land Description | Acres Available |
|---|---|
| SW 3-43-16 w4 | 117 |
| SE 31-43-16 w4 | 110 |
| SW-31-43-16 w4 | 148 |
| NE-24-43-17 w4 | 130 |
| | |
| | |
| | |
| | |
| | |
| | |

This agreement shall remain in effect continuously for 10 (Number) years.

Land Owner BARBARA KROETSCH COLIN KROETSCH (Print name) [redacted] (Signature)

Feedlot Owner Mitchel Kroetsch (Print name) [redacted] (Signature)

# LANDOWNER CONSENT

For the purpose of manure spreading

Date: Feb 15/2024

I Betty & Debbie Henderson (Name) of FORESTBURG (Town/City) Alberta

Do herby give consent for Mitchel Kroetsch to spread feedlot manure on the following lands:

| Legal Land Description | Acres Available |
|---|---|
| E½ 29-41-16-4 | 264 |
| SW 29-41-16-4 | 150 |
| SE 30-41-16-4 | 150 |
| | |
| | |
| | |
| | |
| | |

This agreement shall remain in effect continuously for 10 (Number) years.

Land Owner DEBBIE HENDERSON BETTY HENDERSON (Print name) [redacted] (Signature)

Feedlot Owner Mitchel Kroetsch (Print name) [redacted] (Signature)

# LANDOWNER CONSENT

For the purpose of manure spreading

Date: January 10, 2024

I Lorraine J Henderson (Name) of Forestburg (Town/City) Alberta

Do herby give consent for Mitchel Kroetsch to spread feedlot manure on the following lands:

| Legal Land Description | Acres Available |
|---|---|
| NE 26 041 16 4 | 155 |
| NE 27 041 16 4 | 143 |
| | |
| SW 6 042 15 4 | 147 |
| | |
| | |
| | |
| | |
| | |
| | |

This agreement shall remain in effect continuously for 5 (Number) years.

Land Owner Lorraine Henderson (Print name) [redacted] (Signature)

Feedlot Owner Mitchel Kroetsch (Print name) [redacted] (Signature)

# 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 105363
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1982/09/01

## Well Identification and Location

Measurement in Metric

| Owner Name | Address | Town | Province | Country | Postal Code |
|---|---|---|---|---|---|
| KROETCH, COLIN | HEISLER | | | | |

| Location | 1/4 or LSD | SEC | TWP | RGE | W of MER | Lot | Block | Plan | Additional Description |
|---|---|---|---|---|---|---|---|---|---|
| | NW | 15 | 42 | 16 | 4 | | | | |

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619687 Longitude -112.229984
How Location Obtained
Map

Elevation m
How Elevation Obtained
Not Obtained

## Drilling Information

**Method of Drilling**
Rotary

**Proposed Well Use**
Domestic

**Type of Work**
New Well

## Formation Log

Measurement in Metric

| Depth from ground level (m) | Water Bearing | Lithology Description |
|---|---|---|
| 3.05 | | Brown Clay |
| 4.57 | | Coal |
| 41.15 | | Gray Shale |
| 41.76 | | Coal |
| 60.05 | | Gray Shale |
| 64.31 | | Blue Sand |

## Yield Test Summary

Measurement in Metric

Recommended Pump Rate 27.28 L/min

| Test Date | Water Removal Rate (L/min) | Static Water Level (m) |
|---|---|---|
| 1982/06/21 | 27.28 | 23.16 |

## Well Completion

Measurement in Metric

| Total Depth Drilled | Finished Well Depth | Start Date | End Date |
|---|---|---|---|
| 64.31 m | | 1982/06/18 | 1982/06/21 |

**Borehole**

| Diameter (cm) | From (m) | To (m) |
|---|---|---|
| 0.00 | 0.00 | 64.31 |

**Surface Casing (if applicable)**
Steel
Size OD : 11.43 cm
Wall Thickness : 0.396 cm
Bottom at : 61.26 m

**Well Casing/Liner**
Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Top at : 0.00 m
Bottom at : 0.00 m

**Perforations**

| From (m) | To (m) | Diameter or Slot Width (cm) | Slot Length (cm) | Hole or Slot Interval(cm) |
|---|---|---|---|---|
| | | | | |

Perforated by

**Annular Seal** Driven
Placed from 0.00 m to 61.26 m
Amount

Other Seals

| Type | At (m) |
|---|---|
| | |

**Screen Type** Stainless Steel
Size OD : 7.95 cm

| From (m) | To (m) | Slot Size (cm) |
|---|---|---|
| 61.57 | 64.31 | 0.018 |

Attachment Attached To Riser
Top Fittings Neoprene (Figure K)
Bottom Fittings Bail

**Pack**
Type Natural
Grain Size
Amount

## Contractor Certification

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

Certification No
1

Company Name
LOSNESS DRILLING (1975) 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 105363
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1982/09/01

GOWN ID

## Well Identification and Location

Measurement in Metric

| Owner Name | Address | Town | Province | Country | Postal Code |
|---|---|---|---|---|---|
| KROETCH, COLIN | HEISLER | | | | |

| Location | 1/4 or LSD | SEC | TWP | RGE | W of MER | Lot | Block | Plan | Additional Description |
|---|---|---|---|---|---|---|---|---|---|
| | NW | 15 | 42 | 16 | 4 | | | | |

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619687 Longitude -112.229984
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 27.28 L/min
Recommended Pump Intake Depth (From TOC) 59.74 m
Pump Installed Yes Depth m
Type SUB Make H.P. .5
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 |
|---|---|---|
| 1982/06/21 | 12:00 AM | 23.16 m |

Depth to water level

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

**Method of Water Removal**

Type Bailer & Pump
Removal Rate 27.28 L/min
Depth Withdrawn From 54.25 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
LOSNESS DRILLING (1975) 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.

GOWN ID

GIC Well ID 296831
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2001/08/16

## Well Identification and Location

Measurement in Metric

| Owner Name | Address | Town | Province | Country | Postal Code |
|---|---|---|---|---|---|
| KROCTCH, COLIN | HEISLER | | | | T0B 2A0 |

| Location | 1/4 or LSD | SEC | TWP | RGE | W of MER | Lot | Block | Plan | Additional Description |
|---|---|---|---|---|---|---|---|---|---|
| | 13 | 15 | 42 | 16 | 4 | | | | |

Measured from Boundary of
396.24 m from North
198.12 m from West

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619742 Longitude -112.233001
How Location Obtained: Map

Elevation m
How Elevation Obtained: Not Obtained

## Drilling Information

**Method of Drilling**
Rotary

**Proposed Well Use**
Domestic

**Type of Work**
New Well

## Formation Log

Measurement in Metric

| Depth from ground level (m) | Water Bearing | Lithology Description |
|---|---|---|
| 3.35 | | Brown Clay & Boulders |
| 17.07 | | Gray Clay |
| 22.56 | | Light Gray Shale |
| 41.15 | | Gray Shale |
| 43.59 | | Brown Shale & Coal |
| 61.87 | | Brown Shale |
| 71.32 | | Blue Sandstone |
| 72.54 | | Gray Shale |
| 73.15 | | Rocks |

## Yield Test Summary

Measurement in Metric

Recommended Pump Rate 45.46 L/min

| Test Date | Water Removal Rate (L/min) | Static Water Level (m) |
|---|---|---|
| 2001/07/20 | 68.19 | 26.46 |

## Well Completion

Measurement in Metric

| Total Depth Drilled | Finished Well Depth | Start Date | End Date |
|---|---|---|---|
| 73.15 m | | 2001/07/17 | 2001/07/20 |

**Borehole**

| Diameter (cm) | From (m) | To (m) |
|---|---|---|
| 0.00 | 0.00 | 73.15 |

**Surface Casing (if applicable)**
Plastic
Size OD : 12.70 cm
Wall Thickness : 0.953 cm
Bottom at : 68.28 m

**Well Casing/Liner**
Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Top at : 0.00 m
Bottom at : 0.00 m

**Perforations**

| From (m) | To (m) | Diameter or Slot Width (cm) | Slot Length (cm) | Hole or Slot Interval(cm) |
|---|---|---|---|---|
| | | | | |

Perforated by

**Annular Seal** Bentonite Chips/Tablets
Placed from 0.00 m to 64.01 m
Amount

Other Seals

| Type | At (m) |
|---|---|
| | |

**Screen Type** Stainless Steel
Size OD : 12.70 cm

| From (m) | To (m) | Slot Size (cm) |
|---|---|---|
| 68.28 | 71.32 | 0.038 |

Attachment Attached To Casing
Top Fittings Packer
Bottom Fittings Plug

**Pack**
Type Artificial
Grain Size 10-20
Amount 12.00 Bags

## Contractor Certification

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

Certification No
1

Company Name
LOSNESS DRILLING (1975) 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.

GOWN ID

GIC Well ID 296831
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2001/08/16

## Well Identification and Location

Measurement in Metric

| Owner Name | Address | Town | Province | Country | Postal Code |
|---|---|---|---|---|---|
| KROCTCH, COLIN | HEISLER | | | | T0B 2A0 |

| Location | 1/4 or LSD | SEC | TWP | RGE | W of MER | Lot | Block | Plan | Additional Description |
|---|---|---|---|---|---|---|---|---|---|
| | 13 | 15 | 42 | 16 | 4 | | | | |

Measured from Boundary of
396.24 m from North
198.12 m from West

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.619742 Longitude -112.233001
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 45.46 L/min
Recommended Pump Intake Depth (From TOC) 67.06 m
Pump Installed Yes Depth m
Type SUB Make GOULDS H.P. 1
Model (Output Rating)

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

Additional Comments on Well

DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 1.5'. HARDNESS 2 GRAINS, IRON .05 PPM, PH 7.8. WELL CHLORINATED. WATER HAULED FROM LOSNESS SHOP 4000 GALS IN 3 DAYS.

## Yield Test

Taken From Ground Level
Measurement in Metric

| Test Date | Start Time | Static Water Level |
|---|---|---|
| 2001/07/20 | 12:00 AM | 26.46 m |

**Method of Water Removal**

Type Pump
Removal Rate 68.19 L/min
Depth Withdrawn From 67.06 m

If water removal period was < 2 hours, explain why

Depth to water level

| Pumping (m) | Elapsed Time Minutes:Sec | Recovery (m) |
|---|---|---|
| 26.47 | 0:00 | 46.09 |
| 31.93 | 1:00 | 41.04 |
| 35.21 | 2:00 | 37.37 |
| 37.57 | 3:00 | 34.75 |
| 39.25 | 4:00 | 32.96 |
| 40.48 | 5:00 | 31.64 |
| 41.46 | 6:00 | 30.66 |
| 42.16 | 7:00 | 29.95 |
| 42.64 | 8:00 | 29.43 |
| 43.03 | 9:00 | 28.79 |
| 43.32 | 10:00 | 28.65 |
| 43.75 | 12:00 | 28.32 |
| 44.06 | 14:00 | 28.14 |
| 44.30 | 16:00 | 28.02 |
| 44.53 | 20:00 | 27.86 |
| 44.82 | 25:00 | 27.71 |
| 44.97 | 30:00 | 27.63 |
| 45.26 | 35:00 | 27.56 |
| 45.38 | 40:00 | 27.50 |
| 45.60 | 50:00 | 27.40 |
| 45.80 | 60:00 | 27.32 |
| 45.98 | 75:00 | 27.24 |
| 46.01 | 90:00 | 27.17 |
| 46.05 | 105:00 | 27.12 |
| 46.09 | 120:00 | 27.08 |

## 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
LOSNESS DRILLING (1975) LTD.

Copy of Well report provided to owner
Date approval holder signed

ENVIROWEST
ENGINEERING

# SITE AND SOIL ASSESSMENT

Mitchel Kroetsch
NW-15-42-16-W4M

Flagstaff County, Alberta

**Site and Soil Assessment - Amended**
NW-15-42-16-W4M
Flagstaff County, Alberta

Prepared For: Mitchel Kroetsch

Prepared By: Envirowest Engineering
Box 4248, Ponoka, AB, T4J 1R6
(403) 783-8229

Report Date: October 30, 2024

Project Number: 2304-43021

**Private and Confidential**

## Table of Contents



### List of Tables



### Appendices

## 1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Mitchel Kroetsch to conduct a Site and Soil Assessment for the proposed construction of a solid manure storage facility and two catch basins for a proposed 5000 head feedlot, composed of 2500 finishers and 2500 feeders.

The assessment was completed to determine conditions beneath the proposed construction areas and assess soil properties for construction of the proposed facilities. The operation, herein referred to as "the Site," is located on NW-15-42-16-W4M in Flagstaff County, as shown on Figure 1.0.

The assessment has been completed in accordance with the standards and regulations associated with the amended Agricultural Operation Practices Act (2022) and associated regulations which govern all new and modified confined feeding operations.

### Scope of Work

Five investigative boreholes were drilled using a truck-mounted rotary auger and completed to depths between 3.0 and 6.0 metres below ground surface (mbgs) on May 2, 2023. The boreholes were completed in the areas proposed for solid manure storage and a catch basin. One borehole was completed as a groundwater monitoring well to allow for in-situ hydraulic conductivity testing, which was completed on May 30, 2023.

Soil samples were collected from the strata beneath the proposed solid manure storage and catch basin locations and submitted to an accredited third-party laboratory for analysis of soil properties.

## 2.0 Assessment Results

The results of the soil analysis completed by a third-party accredited laboratory are presented in Table 1 below. The soil sample locations are presented on Figure 2.0. Borehole logs and well completion details can be found in Appendix B.

**Table 1: Soil Properties Results**

| Parameter | 23BH01-01 | 23BH03-01 | 23BH05-01 |
|---|---|---|---|
| **Sample Depth (m)** | 1.2 | 2.1 | 1.75 – 2.6 |
| **Particle Size (%clay)** | 33 | 34 | 29 |
| **Particle Size (%sand)** | 39 | 37 | 53 |
| **Particle Size (%silt)** | 27 | 28 | 17 |
| **Texture Class** | Clay Loam | Clay Loam | Sandy Clay Loam |
| **Hydraulic Conductivity (field)** | - | - | $2.16 \times 10^{-7}$ cm/s |

The monitoring well installed at borehole 23BH05 (23MW01) was sufficiently hydrated prior to completing the in-situ hydraulic conductivity testing. The in-situ hydraulic conductivity test was completed on May 30, 2023. The monitoring well was placed to assess the material below surface, and was screened from 2.1 to 3.0 meters below ground surface (mbgs) with bentonite filling the annulus below the screen from 3.0 to 4.5 mbgs.

The initial depth to water was measured in the well. A volume of water was then removed from the well and the change in depth measured over time to assess hydraulic conductivity of the clay strata. It is assumed (as per AGDEX 096-01) that all flow occurs under saturated conditions. The depth was measured every 30 seconds for 10 minutes and every 5 minutes for thirty minutes. The results of the test were analyzed as a slug test using AQTESOLV Bouwer-Rice method for unconfined wells. The results of the assessment were an in-situ hydraulic conductivity of $2.16 \times 10^{-7}$ cm/sec in monitoring well 23MW01.

A water table defined by saturated soils was not encountered during the assessment to a maximum depth of 6.0 mbgs. It was concluded based on the field assessment that a standard water table is not present (ie. not a perched water table) within the scope of construction, therefore delineation was not required.

On September 27, 2024 a piezometer was installed at the location of each catch basin using a track hoe and installed at minimum 1.0 meters below the initial proposed catch basin depth. A log for each piezometer (P-01, P-02) are included in the borehole logs and locations can be found on the attached figures. Depth to water table was measured on October 7, 2024.

## 3.0 Liner Assessments

### 3.1 Natural Barrier Assessment (Solid Manure Storage)

Based on the information obtained it was determined that the native clay within the proposed area of construction for solid manure storage was found to range in thickness from 2.3 to 3.0 meters, generally at surface. Along the south portion of Area 1 contains approximately 0.8 meters of overburden. The proposed solid manure storage area is approximately 208 m x 502 m, as shown on Figure 2.0. The layout and dimensions are shown on Figure 3.0.

Minimum Required Liner Depth for a natural barrier for solid manure storage:

$$\frac{2 \text{ m}}{1 \times 10^{-6} \text{ cm/sec}} = \frac{\mathbf{X} \text{ m}}{2.16 \times 10^{-7} \text{ cm/sec}}$$

$$\mathbf{X} = 0.4 \text{ m}$$

A minimum of **0.5** meters of native clay is required to be present to provide a sufficient protective barrier and structural stability through erosion such as use during operations and freeze/thaw cycles. It is found that there is sufficient protection across the proposed solid manure storage area.

### 3.2 Natural Barrier Assessment (Catch Basins)

Based on the information obtained it was determined that the native clay within the proposed area of construction was found to range in thickness from 2.3 to 3.0 meters, generally at surface. The catch basin designs are shown on Figure 2.0.

Minimum Required Liner Thickness for Catch Basin:

$$\frac{5 \text{ m}}{1 \times 10^{-6} \text{ cm/sec}} = \frac{\mathbf{X} \text{ m}}{2.16 \times 10^{-7} \text{ cm/sec}}$$

$$\mathbf{X} = 1.1 \text{ m}$$

A minimum of 1.1 meters of native clay is required to provide a sufficient protective liner. It is found that there is sufficient protection across the assessed and at the proposed catch basin locations.

## 4.0 Conclusions

The following conclusions are based on the discussed scope of construction.

**Solid Manure Storage Area**

The native soils were determined to present properties that will provide sufficient protection for a solid manure storage area as a natural barrier. Contouring of the proposed solid manure storage area to direct surface water flow to the catch basins should be done with caution so as to not remove this protective barrier. This is discussed further in Section 5.0.

**Catch Basins**

The native soils in the area of the proposed catch basins were found to provide sufficient protection for use as a natural barrier however, it is not found to be feasible to construct a catch basin using a natural barrier. The minimum depth of clay within the area is 2.3 mbgs, the required liner depth is 1.1 meters with 0.5 meters of freeboard (1.6 meters). This allows for a catch basin volume depth of 0.7 meters. As it will be required to have culverts to facilitate redirection of impacted run off, it is recommended to use a synthetic liner for both catch basins.

## 5.0 Design and Construction Considerations

### 5.1 Solid Manure Storage

The south portion of Area 1 (solid manure storage) may be cut to be regraded, should this occur do not remove more than 1.7 meters of clay below the overburden (approximately 2.5 meters) (as measured from the south boundary of the pens). This is to maintain the minimum protective barrier as well as 0.5% slope towards the catch basin.

Regrading and fill of Area 2 should be completed to maintain 0.5% slope towards catch basin 2. This can be achieved through an overall slope or slope within the pens with redirection of runoff towards catch basin 2.

A Figure presenting the elevations and proposed site plan is attached.

## 5.2 Catch Basin Sizing – Catch Basin 1

**Surface Run-off Area**

The proposed area of contributing run-off for Catch Basin 1 (referred to as Area 1, as shown on Figure 2.0), is conservatively 64,896 $m^2$. The size of the catch basin is recommended to have a total storage capacity of 3,890 $m^3$, based on Killam precipitation data.

Area 1 is required to be contoured to direct 'impacted' runoff towards the catch basin. Unimpacted runoff should be prevented from entering the catch basin through berms or surface contouring.

The depth to water table was found to be 3.69 meters.

The storage capacity required for Catch Basin 1 is 3,890 $m^3$ and will have the following specifications:

- To provide the required capacity, the catch basin should be 53 m in length x 51 m in width. The overall depth has been designed as 2.7 m. The overall capacity of the catch basin will be 5,260 $m^3$, which accounts for the required 0.5 m of freeboard, and provides a storage capacity of 3,985 $m^3$. The sizing is based on an inside end and side wall slope of 3:1 (run/rise).
- The bottom of the liner must be not less than 1.0 m above the top of the shallow groundwater level at the time of construction.
- The overall depth of 2.7 m will be achieved through a below grade depth of 2.7 m. Above-grade dykes may be needed to redirect unimpacted surface flow. The outside dyke walls should be completed to a slope of 4:1. The crest of the dyke should be sloped slightly outward to direct rainfall away from the storage facility.

### 5.3 Catch Basin Sizing – Catch Basin 2

**Surface Run-off Area**

The proposed area of contributing run-off for Catch Basin 2 (referred to as Area 2, as shown on Figure 2.0), is conservatively 39,520 $m^2$. The size of the catch basin is recommended to have a total storage capacity of 2,461 $m^3$, based on Killam precipitation data.

Area 2 is required to be contoured to direct 'impacted' runoff towards the catch basin. Unimpacted runoff should be prevented from entering the catch basin through berms or redirection.

The depth to water table was found to be 3.96 meters.

The storage capacity required for Catch Basin 2 is 2,461 $m^3$ and will have the following specifications:

- To provide the required capacity, the catch basin should be 46 m in length x 40.5 m in width. The overall depth has been designed as 2.7 m. The overall capacity of the catch basin will be 3,375 $m^3$, which accounts for the required 0.5 m of freeboard, and provides a storage capacity of 2,506 $m^3$. The sizing is based on an inside end and side wall slope of 3:1 (run/rise).
- The bottom of the liner must be not less than 1.0 m above the shallow groundwater level at the time of construction.
- The overall depth of 2.7 m will be achieved through a below grade depth of 2.7 m. Above-grade dykes may be needed to redirect unimpacted surface flow. The outside dyke walls should be completed to a slope of 4:1. The crest of the dyke should be sloped slightly outward to direct rainfall away from the storage facility.

**Catch Basin Construction**

Two types of synthetic liner which are readily available in the market and are suitable for such an installation are polyvinyl chloride (PVC) and high density polyethylene (HDPE). Both materials are resistant to degradation from animal manures. The suitability of these materials in this application will be somewhat dependent on the intended operation of the facility. Operational practices for the catch basin will need to be considered to determine the potential for mechanical damage to the liner. Some suppliers also offer specially blended materials for such an installation. The use and suitability of these materials should be discussed directly with the supplier.

PVC is a flexible material which is more easily installed and repaired than liners constructed of polyethylene material. Seams in PVC liners can be completed in the field without special equipment. These liners require a soil covering, generally 30 cm thick, to protect them from degradation from ultraviolet light, cold temperatures and mechanical damage. This presence of such a soil cover can be troublesome on the sidewalls due to gravitational sloughing and liquid drawdown. Additional care is required during installation to avoid liner damage during construction of the backfill layer.

Liners constructed of HDPE are more rigid and more resistant to damage. Both seams completed in the field and repairs to the liner require the use of special equipment to "weld" the material. The material is not degraded by ultraviolet light and does not require a soil backfill.

Should damage occur to the liner after installation, repair can be time consuming and costly, particularly with respect to HDPE liners. The liner construction should consider areas of high risk (areas of manure removal and agitation) to reduce the potential for damage. There are various methods for securing these higher risk areas such as double liner installation or concrete filled geofabrics which allow equipment to enter and exit the lagoon with less risk of damage.

Liner material is available in a range of thicknesses from 20 mil to 100 mil (1 mil= 0.001 inches or 1 mm = 39 mils). The selection of liner thickness should consider material availability, cost, durability and operational procedures. Thicker liners are less prone to damage but are more costly.

Based on the liquid level fluctuation in the catch basin and the exposure to degradation, a HDPE liner is recommended as no soil covering is required. A thickness of 40 mil is suggested to reduce the potential for liner damage.

On site preparation is required for the installation of a synthetic liner. The sub-grade must be compacted and stable. It should be smooth and uniform, must be free of sharp fragments, stones, roots or other material which could damage the liner and should not have any rapid changes in elevation. Care is required during the installation of synthetic liners to ensure damage does not result from vehicular activity or improper installation. Supervision by the supplier is recommended.

Applicable material and workmanship warranties should be discussed prior to installation.

To improve the sub-grade preparation and to again reduce the risk of liner damage, a geotextile may be installed under the geomembrane liner. The placement of this textile over the sub-grade provides a clean working area for field seams, provides added puncture resistance when loads are applied, improves the geomembrane to soil interface and can allow for the lateral and upward escape of subsurface water and gases that rise up beneath the geomembrane during its service life.

Upward moving water is caused by high groundwater levels. Upward moving gases are caused by biodegradation of organic material in the subsurface soils and from rising water table levels which expel the air from the soil voids. Vapour “strips” can be placed to allow for trapped vapours to be released from beneath the liner.

Following installation of the liner, each seam and repair area should be tested to ensure a complete seal has been achieved. The supplier/installer should provide an installation report detailing the testing of the material, the seams and any required repairs.

## 6.0 Closure

Envirowest Engineering is pleased to submit the report to Mitchel Kroetsch. The information and conclusions contained in this report are for their sole use. No other party is to rely upon the information contained within the report without the express written authorization of Envirowest Engineering.

Envirowest Engineering is not responsible for any damages that may be suffered as the result of any unauthorized use of, or reliance on, this report. Envirowest Engineering has performed the work and made the findings and conclusions set out in the report in a manner consistent with the level of care and skill normally exercised by members of the environmental engineer profession practicing under similar conditions at the time the work was performed. Envirowest Engineering accepts no responsibility for any deficiency, misstatement or inaccuracy in this report resulting from misinformation from any individuals or parties that provided information as part of this report.

We trust that this report meets your present needs. Please feel free to contact the undersigned with any questions or should you require additional information.

Respectfully submitted,

October 30, 2024

**Prepared by:**
Emily J. Low, P.Eng.
Envirowest Engineering

**Reviewed by:**
Leah Predy, P.Ag.
Envirowest Engineering

**PERMIT TO PRACTICE**
**2206165 ALBERTA LTD.**

RM SIGNATURE: _____

RM APEGA ID #: 110373

DATE: October 30, 2024

**PERMIT NUMBER: P014810**
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

2206165 Alberta Ltd. o/a Envirowest Engineering
Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice No. P14810

## 7.0 Qualifications of Assessors

Ms. Emily Low, B.Sc., P.Eng, is an Environmental Engineer with Envirowest Engineering and has approximately 15 years of environmental assessment, monitoring, and remediation experience in the agricultural, industrial, real estate and development, and oil and gas sectors. Ms. Low has a Bachelor of Science in Chemical Engineering from the University of Alberta and is a certified Professional Engineer in Alberta (Association of Professional Engineers and Geoscientists of Alberta).

Leah Predy, B.A., B.Sc., P.Ag., is a Professional Agrologist with Envirowest Engineering and has approximately 5 years of experience in the environmental field, both in field data collection and report preparation for environmental assessments, monitoring, and remediation, as well as agricultural projects. Prior to her employment with Envirowest Engineering, Leah had five years of experience managing rangelands and navigating legislation and regulations as a Rangeland Agrologist with the Government of Alberta. She is a Professional Agrologist in Alberta (Alberta Institute of Agrologists).

## 8.0 References

GOA (Government of Alberta). (November 2022). Agricultural Operation Practices Act and Regulations. Edmonton, AB: Author.

GOA (Government of Alberta). (December 2020). Agricultural Operation Practices Act: Standards and Administration Regulation. Edmonton, AB: Author.

# Environmental Assessment Report – General Conditions

## 1.0 Use of Report

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Envirowest Engineering's (Envirowest's) client. Envirowest does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Envirowest's client (hereunder referred to as the "Client") or an approved agent of the Client. Any unauthorized use of or reliance on the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Envirowest. The Client agrees that it shall use the report for its own internal purposes and it shall not provide the report to another party other than an approved agent.

## 2.0 Limitation of Report

This report is based solely on the conditions that existed on site at the time of Envirowest's investigation. The Client, and any other parties using this report with the express written consent of the Client and Envirowest, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The Client, and any other party using this report with the express written consent of the Client and Envirowest, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The Client acknowledges that Envirowest is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the site, the decisions on which are the sole responsibility of the Client.

## 3.0 Information Provided to Envirowest by Others

During the performance of the work and the preparation of this report, Envirowest may have relied on information provided by persons other than the Client. While Envirowest endeavours to verify the accuracy of such information when instructed to do so by the Client, Envirowest accepts no responsibility for the accuracy or the reliability of such information that may affect the report.

## 4.0 Limitation of Liability

The Client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising from the presence of those materials. In consideration of these risks, and in consideration of Envirowest providing the services requested, the Client agrees that Envirowest's liability shall be limited as follows:

(1) With respect to any claims brought against Envirowest by the Client for damages of any kind whatsoever, including without limitation, incidental, consequential, exemplary or punitive, for any reason whatsoever arising out of the provision or failure to provide services hereunder the amount of such claim and the extent of Envirowest's liability shall be limited to the amount of fees paid by the Client to Envirowest under this Agreement.

(2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the Client agrees to indemnify, defend, and hold harmless Envirowest from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by Envirowest.

## 5.0 Disclosure of Information by Client

The Client agrees to fully cooperate with Envirowest with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client acknowledges that in order for Envirowest to properly provide the service, Envirowest requires and shall rely upon the full disclosure and accuracy of any and all such information.

## 6.0 Standard of Care

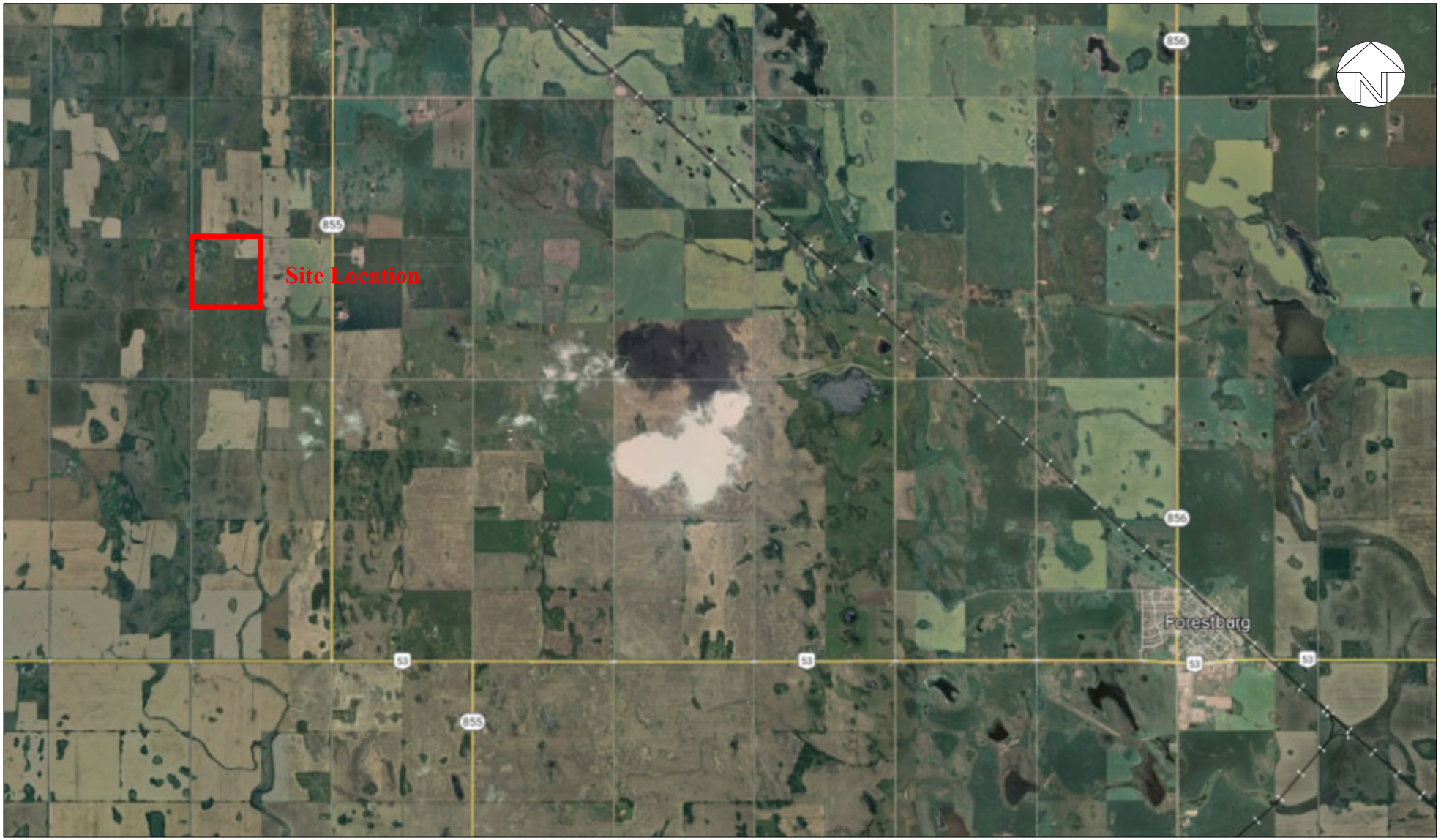
Services performed by Envirowest for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering and scientific judgment have been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

## 7.0 Ownership of Instruments of Service

The Client acknowledges that all reports, plans, and data generated by Envirwoest during the performance of the work and other documents prepared by Envirowest are considered its professional work product and shall remain the copyright property of Envirowest.

# Appendix A

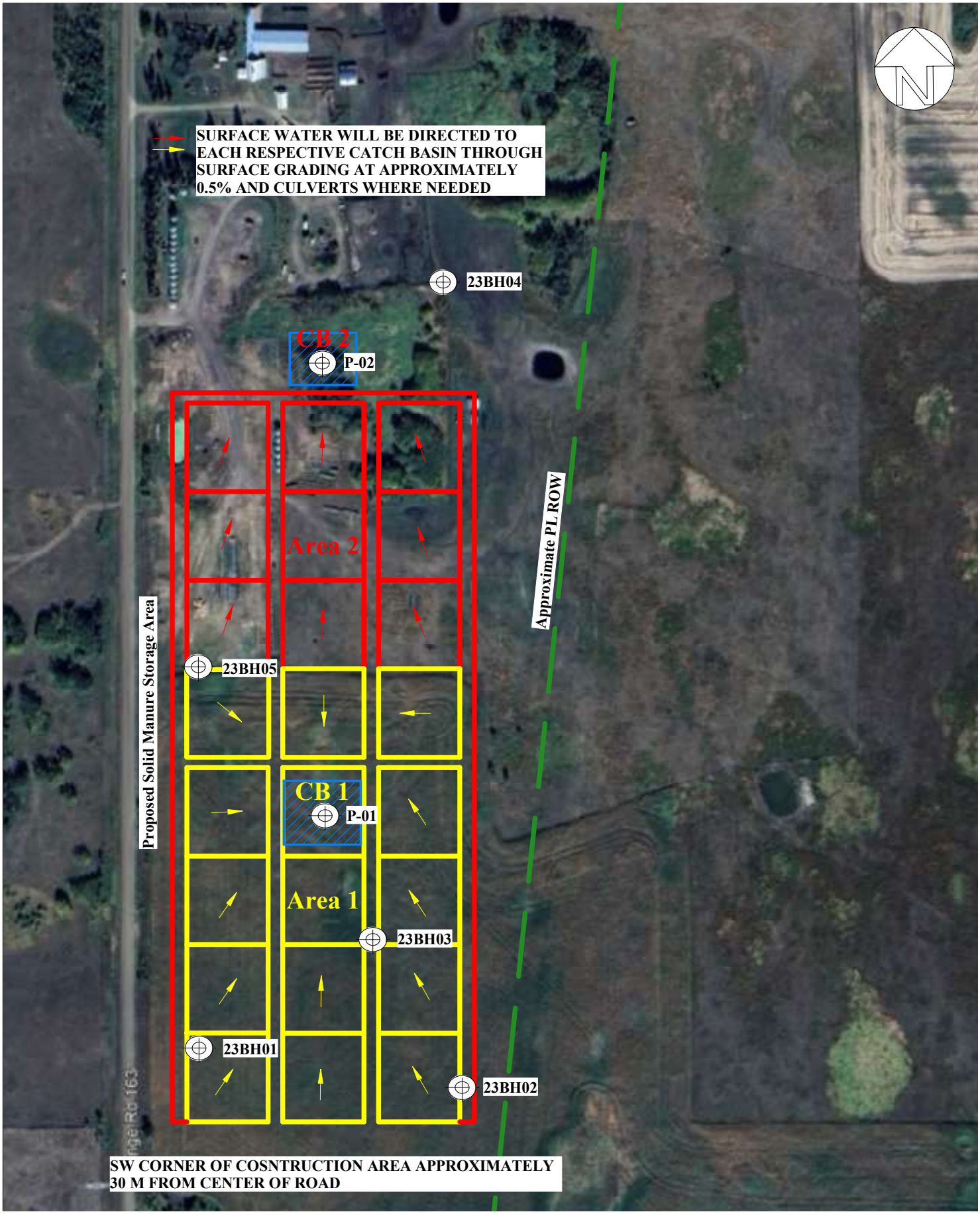
## Figures




ENVIROWEST ENGINEERING

**Title:** Location of Subject Site
Site and Soil Assessment
NW-15-42-16-W4M
Flagstaff County, Alberta

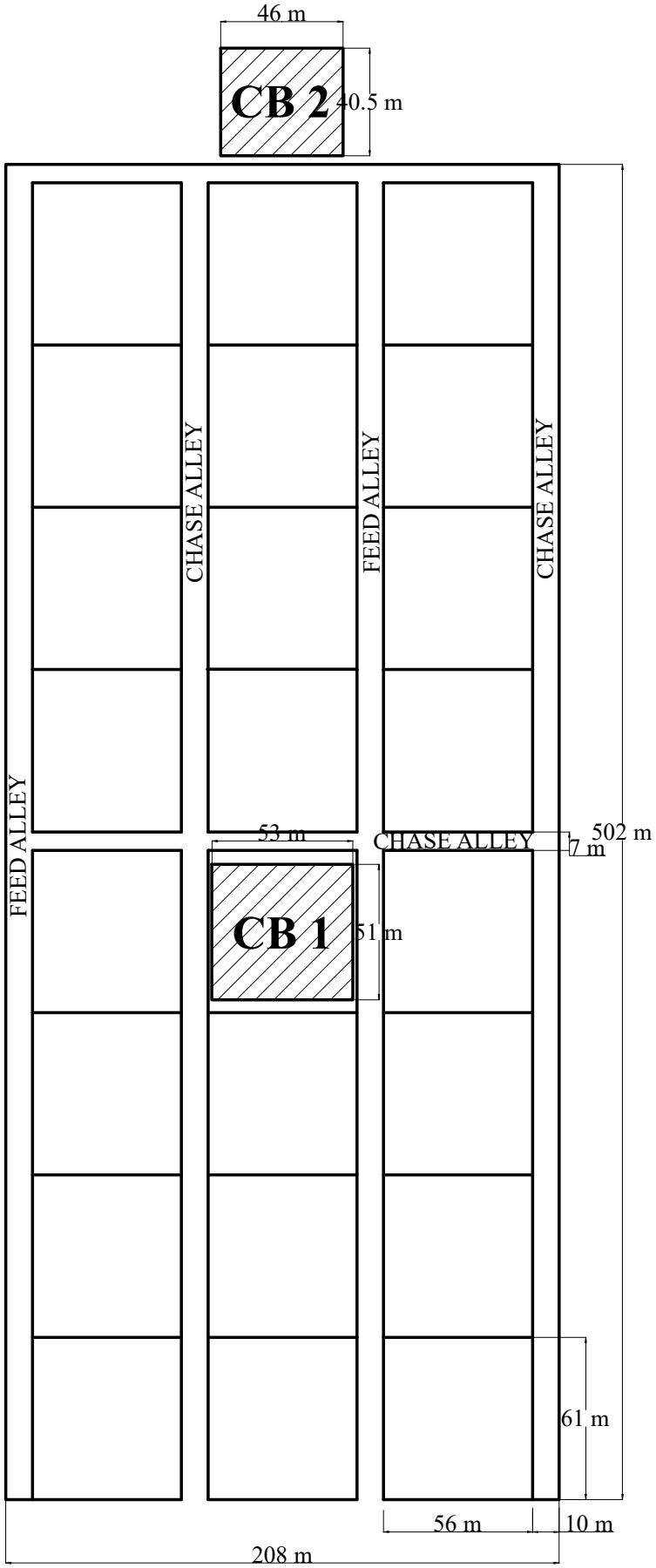
| | |
|---|---|
| **Project No:** 2304-43021 | **Date:** January 3, 2024 |
| **Prepared by:** L. Predy | **Drawing No:** 1.0 |




ENVIROWEST ENGINEERING

**Title:** Borehole Locations and Proposed Surface Water Flow
Site and Soil Assessment
NW-15-42-16 W4M
Flagstaff County, Alberta

| | | |
|---|---|---|
| **Project No:** 2304-43021 | **Date:** October 17, 2024 | **Figure No.:** 2.0 |
| **Scale:** 1:3500 | **Prepared By:** E. Low | |
| **Image Source:** Google Earth Pro (2022) | | |



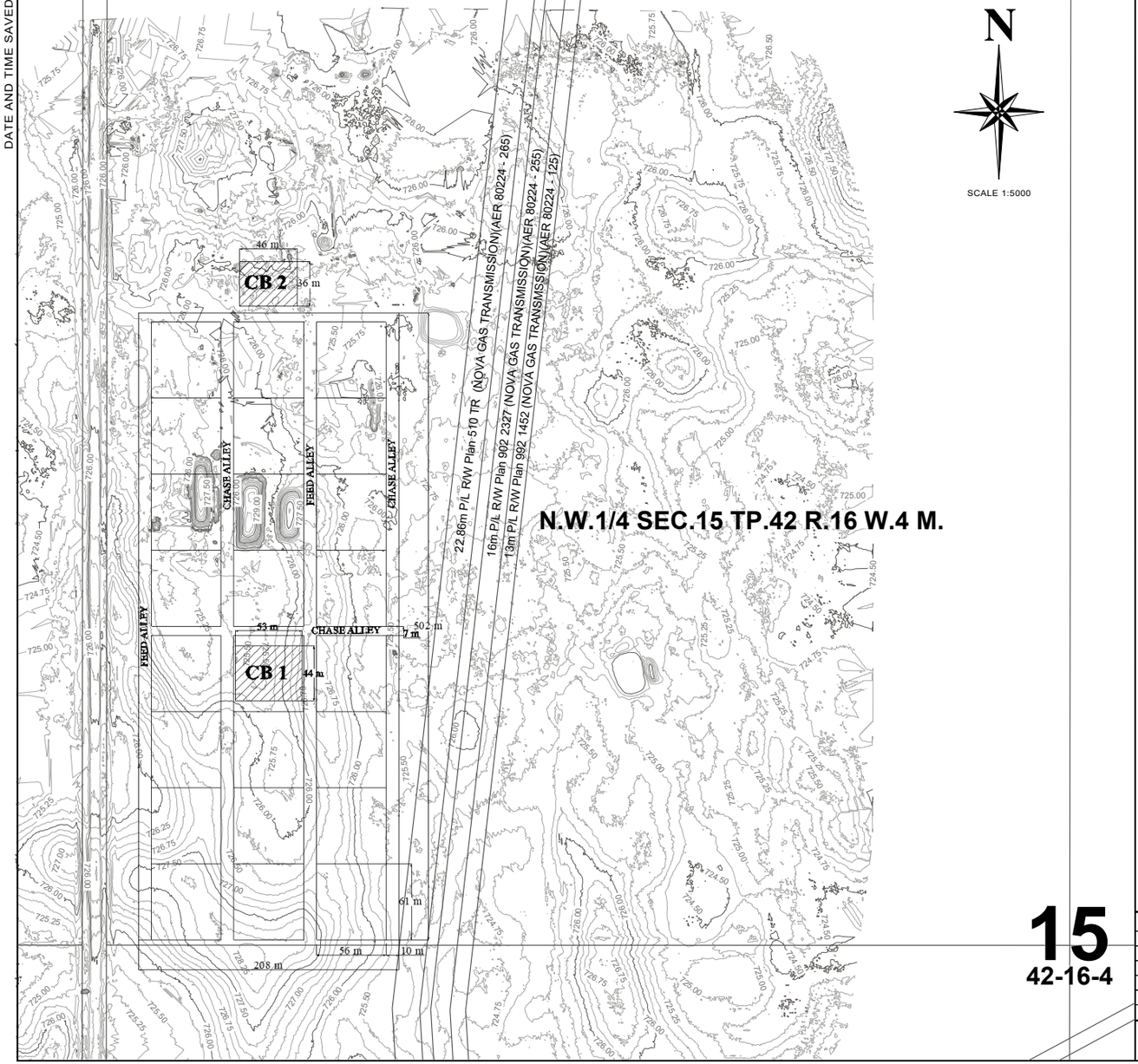

ENVIROWEST ENGINEERING

**Title:**

Site Plan
Site and Soil Assessment
NW-15-42-16 W4M
Flagstaff County, Alberta

| | | |
|---|---|---|
| **Project No:** 2304-43021 | **Date:** October 9, 2024 | **Figure No.:** 3.0 |
| **Scale:** | **Prepared By:** E. Low | |
| **Image Source:** | | |

DATE AND TIME SAVED 2023/11/09 3:45pm




15
42-16-4

ENVIROWEST ENGINEERING

# *PLAN showing DETAIL of CONTOUR MAP*

*WITHIN NW SEC. 15 TWP. 042 RGE. 16 W4M*

NOTE:
CONTOURS WERE DERIVED FROM A DIGITAL SURFACE MODEL CREATED THROUGH PHOTOGRAMMETRY. IN AREAS OF HIGH VEGETATION, TREES OR BUILDINGS, SURFACE MODEL DATA HAS BEEN REMOVED AND RECREATED BY INTERPOLATING VALUES BASED ON SURROUNDING ELEVATIONS.

NOTE:
THE RIGHT OF WAYS WERE TAKEN FROM CADASTRAL MAPPING AND SHOULD BE USED FOR REFERENCE ONLY.

CAUTION:
NO UNDERGROUND AND ABOVE GROUND FACILITIES HAVE BEEN LOCATED AND SHOWN.

SCALE 1:5000

0 62.5 125 250 metres

NOTE:
LAST FIELD UPDATE WAS DONE ON OCTOBER 27, 2023

| NO. | DATE | REVISION/ISSUED | REFERENCE DRAWINGS | DRAWING NO. |
|---|---|---|---|---|
| 1 | 2023/10/27 | INITIAL SURVEY | | |

McElhanney

PROJECT NW-15-042-16 W4M
AREA FORESTBURG
CLASS L
FILE NO. EE0001FB

COMMENTS:

UPDATING:

PLEASE MARK ANY CHANGES/ERRORS/OMISSIONS ON THE DRAWING. BRIEFLY DESCRIBE IN THE SPACE PROVIDED THE NATURE OF THE CHANGE. PLEASE EMAIL THE ENTIRE DRAWING TO McELHANNEY AT reddeer@mcelhanney.com. YOUR COOPERATION IS APPRECIATED AND WILL ENSURE A SAFER WORKPLACE.

McElhanney
4728-78A Street Close, Red Deer, AB T4P 2J2
(T) 403-346-7555

# Appendix B

# Borehole Logs

ENVIROWEST ENGINEERING

# LOG OF BORING 23BH01



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Well:
Elev.:

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION | Water Level |
|---|---|---|---|---|---|
| 0.0 | | | | SAND, trace clay, light brown, dry | |
| 0.3 | | | | | |
| 0.5 | | | | | |
| 0.8 | | | | SANDY CLAY, olive brown, compact, damp | |
| 1.0 | | | | | |
| 1.3 | | | | | |
| 1.5 | | | | | |
| 1.8 | | | | | |
| 2.0 | | | | | |
| 2.3 | | | | | |
| 2.5 | | | | | |
| 2.8 | | | | | |
| 3.0 | | | | | |
| 3.3 | | | | dark brown | |
| 3.5 | | | | SAND, grey , compact | |
| 3.8 | | | | | |
| 4.0 | | | | | |
| 4.3 | | | | | |
| 4.5 | | | | | |

10-17-2024 C:\Users\elow\OneDrive\Desktop\Temporary Drive\Kroetsch Site and Soil Assessment\23BH01.bor

ENVIROWEST ENGINEERING

# LOG OF BORING 23BH02



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Well:
Elev.:

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION | Water Level |
|---|---|---|---|---|---|
| 0.0 – 0.8 | | | | SAND, trace clay, light brown, dry | |
| 0.8 – 3.3 | | | | SANDY CLAY, olive brown, compact, damp | |
| 3.3 – 6.0 | | | | SAND, grey, damp | |

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ENVIROWEST ENGINEERING

# LOG OF BORING 23BH03



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Well:
Elev.:

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION | Water Level |
|---|---|---|---|---|---|
| 0.0 – 2.8 | | | | SANDY CLAY, olive brown, compact, damp | |
| 2.8 – 4.5 | | | | SAND, grey, damp | |

0.0 0.3 0.5 0.8 1.0 1.3 1.5 1.8 2.0 2.3 2.5 2.8 3.0 3.3 3.5 3.8 4.0 4.3 4.5

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ENVIROWEST ENGINEERING

# LOG OF BORING 23BH04



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

Well:
Elev.:

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION | Water Level |
|---|---|---|---|---|---|
| 0.0 | | | | SANDY CLAY, olive brown, compact, damp | |
| 0.3 | | | | | |
| 0.5 | | | | | |
| 0.8 | | | | | |
| 1.0 | | | | | |
| 1.3 | | | | | |
| 1.5 | | | | | |
| 1.8 | | | | | |
| 2.0 | | | | | |
| 2.3 | | | | SAND, grey, damp | |
| 2.5 | | | | | |
| 2.8 | | | | | |
| 3.0 | | | | | |

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ENVIROWEST ENGINEERING

# LOG OF BORING 23BH05



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : May 2, 2023
Logged By: : Emily Low, P.Eng.

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION | Well: 23MW01 Elev.: | Water Level |
|---|---|---|---|---|---|---|
| 0.0 | | | | SANDY CLAY, olive brown, compact, damp | Bentonite | |
| 0.3 | | | | | Solid | |
| 0.5 | | | | | | |
| 0.8 | | | | | | |
| 1.0 | | | | | | |
| 1.3 | | | | | | |
| 1.5 | | | | | | |
| 1.8 | | | | | | |
| 2.0 | | | | | | |
| 2.3 | | | | | Sand | |
| 2.5 | | | | | Screen | |
| 2.8 | | | | | | |
| 3.0 | | | | | | |
| 3.3 | | | | | Bentonite | |
| 3.5 | | | | | | |
| 3.8 | | | | | | |
| 4.0 | | | | | | |
| 4.3 | | | | | | |
| 4.5 | | | | | | |

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ENVIROWEST ENGINEERING

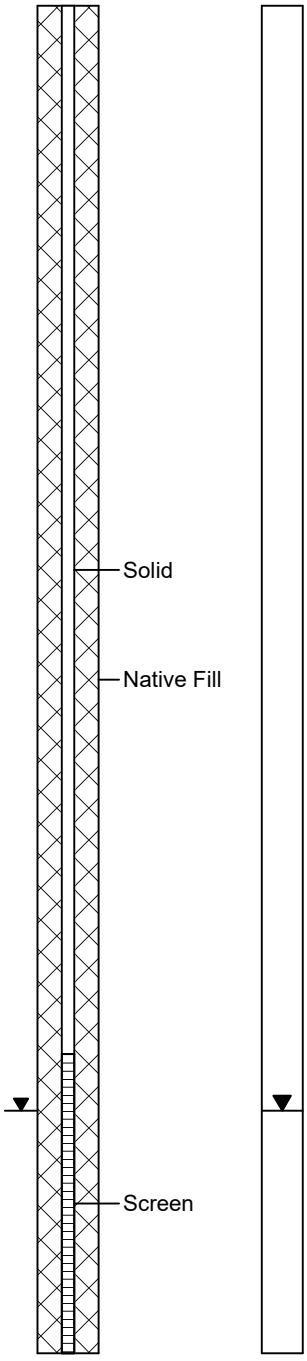
# LOG OF BORING P-01



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : September 27, 2024
Logged By: : Emily Low, P.Eng.

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0.0 | | | | SANDY CLAY, olive brown, compact, damp |
| 0.3 | | | | |
| 0.5 | | | | |
| 0.8 | | | | |
| 1.0 | | | | |
| 1.3 | | | | |
| 1.5 | | | | |
| 1.8 | | | | |
| 2.0 | | | | |
| 2.3 | | | | |
| 2.5 | | | | |
| 2.8 | | | | |
| 3.0 | | | | |
| 3.3 | | | | |
| 3.5 | | | | |
| 3.8 | | | | |
| 4.0 | | | | |
| 4.3 | | | | |
| 4.5 | | | | |

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ENVIROWEST ENGINEERING

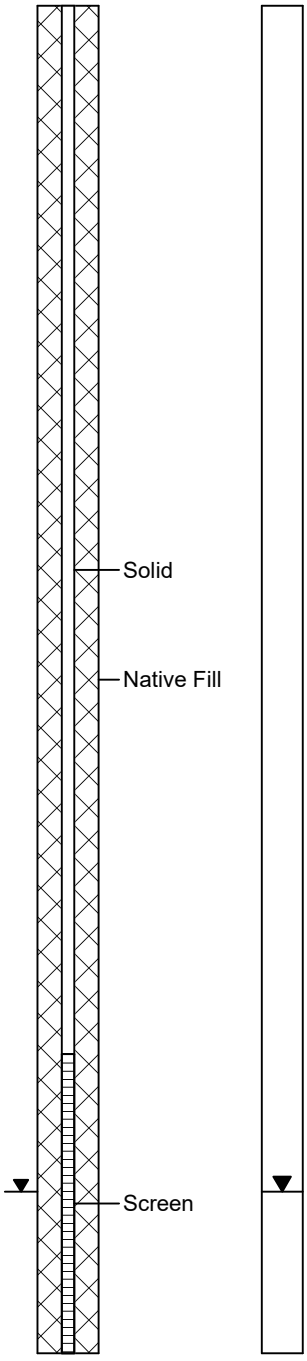
# LOG OF BORING P-02



Site and Soil Assessment
NW-15-42-16-W4
Flagstaff County, Alberta
Project Number: 2304-43021

Driller: : Evergreen Drilling
Drilling Method: : Truck Mounted Auger
Drill Date : September 27, 2024
Logged By: : Emily Low, P.Eng.

| Depth in Meters | Gastech Reading (ppm) 0 200 400 600 800 1000 | VOC Reading | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0.0 | | | | SANDY CLAY, olive brown, compact, damp |
| 0.3 | | | | |
| 0.5 | | | | |
| 0.8 | | | | |
| 1.0 | | | | |
| 1.3 | | | | |
| 1.5 | | | | |
| 1.8 | | | | |
| 2.0 | | | | |
| 2.3 | | | | |
| 2.5 | | | | |
| 2.8 | | | | |
| 3.0 | | | | |
| 3.3 | | | | |
| 3.5 | | | | |
| 3.8 | | | | |
| 4.0 | | | | |
| 4.3 | | | | |
| 4.5 | | | | |

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# Appendix C

## Certificates of Analysis

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

**CLIENT NAME: ENVIROWEST**
**BOX 4248, 5118-50th STREET**
**PONOKA, AB T4J1R6**
**(403) 783-8229**
**ATTENTION TO: Emily Low**
**PROJECT: 43021**
**AGAT WORK ORDER: 23R060845**
**SOIL ANALYSIS REVIEWED BY: Thomas Yoo, Report Writer**
**DATE REPORTED: Aug 26, 2023**
**PAGES (INCLUDING COVER): 6**
**VERSION*: 1**

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*Notes

*Disclaimer:*

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

# Certificate of Analysis

**AGAT WORK ORDER: 23R060845**

**PROJECT: 43021**

**CLIENT NAME: ENVIROWEST**

**ATTENTION TO: Emily Low**

**SAMPLING SITE:**

**SAMPLED BY:**

## Particle Size - Texture

**DATE RECEIVED: 2023-08-22**

**DATE REPORTED: 2023-08-26**

| | | SAMPLE DESCRIPTION: | | 23BH03-01 | 22BH01-01 | 22BH05-01 |
|---|---|---|---|---|---|---|
| | | SAMPLE TYPE: | | Soil | Soil | Soil |
| | | DATE SAMPLED: | | 2023-05-02 | 2023-05-02 | 2023-05-02 |
| Parameter | Unit | G / S | RDL | 5233994 | 5233995 | 5233996 |
| Particle Size Distribution (Sand) | % | | 2 | 37 | 39 | 53 |
| Particle Size Distribution (Silt) | % | | 2 | 28 | 27 | 17 |
| Particle Size Distribution (Clay) | % | | 2 | 34 | 33 | 29 |
| Soil Texture | | | | Clay Loam | Clay Loam | Sandy Clay Loam |

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard

**5233994-5233996** Soil Texture is a calculated parameter. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
% Silt is a calculated parameter. The calculated value is determined by subtracting the percent sand and clay values from 100 percent.

Analysis performed at AGAT Calgary (unless marked by *)

Certified By: [redacted]

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

# Quality Assurance

**CLIENT NAME: ENVIROWEST**

**AGAT WORK ORDER: 23R060845**

**PROJECT: 43021**

**ATTENTION TO: Emily Low**

**SAMPLING SITE:**

**SAMPLED BY:**

## Soil Analysis

| RPT Date: Aug 26, 2023 | | | DUPLICATE | | | | REFERENCE MATERIAL | | | METHOD BLANK SPIKE | | | MATRIX SPIKE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | Batch | Sample Id | Dup #1 | Dup #2 | RPD | Method Blank | Measured Value | Acceptable Limits | | Recovery | Acceptable Limits | | Recovery | Acceptable Limits | |
| | | | | | | | | Lower | Upper | | Lower | Upper | | Lower | Upper |
| **Particle Size - Texture** | | | | | | | | | | | | | | | |
| Particle Size Distribution (Sand) | 5235130 | | 25 | 25 | 0.2% | < 2 | 108% | 80% | 120% | | | | | | |
| Particle Size Distribution (Silt) | 5235130 | | 39 | 39 | 0.0% | < 2 | 93% | 80% | 120% | | | | | | |
| Particle Size Distribution (Clay) | 5235130 | | 35 | 35 | 0.1% | < 2 | 95% | 80% | 120% | | | | | | |

Comments: Duplicate NA: results are less than 5X the RDL and RDP will not be calculated.

Certified By: [redacted]

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

# Method Summary

**CLIENT NAME: ENVIROWEST**

**AGAT WORK ORDER: 23R060845**

**PROJECT: 43021**

**ATTENTION TO: Emily Low**

**SAMPLING SITE:**

**SAMPLED BY:**

| PARAMETER | AGAT S.O.P | LITERATURE REFERENCE | ANALYTICAL TECHNIQUE |
|---|---|---|---|
| **Soil Analysis** | | | |
| Particle Size Distribution (Sand) | SOIL 0520; SOIL 0110; SOIL 0120 | JONES 2001 | HYDROMETER |
| Particle Size Distribution (Silt) | SOIL 0520; SOIL 0110; SOIL 0120 | JONES 2001 | HYDROMETER |
| Particle Size Distribution (Clay) | SOIL 0520; SOIL 0110; SOIL 0120 | JONES 2001 | HYDROMETER |

22-AUG '23 PM 3:45

# AGAT Laboratories

2910 12 Street NE
Calgary, Alberta T2E 7P7
P: 403-735-2005 • F: 403-735-2771
webearth.agatlabs.com

**Laboratory Use Only**
Arrival Temperature: N/A
Cooler Quantity: 1
Custody Seal Intact: ☐ Yes ☐ No ☑ N/A
AGAT Job Number: 23R060845

## Chain of Custody Record

Emergency Support Services Hotline 1-855-AGAT 245 (1-855-242-8245)

### Report Information

Company: Enviro-west Engineering
Contact: Emily Law
Address:
Phone: 403-783-8279

### Project Information

Client Project #: 43021
Site Location:
Sample By:
AGAT Quote #:
If a quotation number is not provided, client will be billed at standard rates. See terms and conditions of quote for full details.

### Invoice To

Same as Report to ☑
Company:
Contact:
Email:
Address
Phone:
PO/CC #:

### Report Information

1. Name: Emily Law
   Email: elaw@enviro-westengineering.ca
2. Name:
   Email:
3. Name:
   Email:

### Turnaround Time Required (TAT)

**Regular TAT** ☑ 5 to 7 Business Days

**Rush TAT**
☐ <24 Hours (200%)
☐ Next Business Day (100%)
☐ 2 Business Days (50%)
☐ 3 Business Days(25%)

Date Required:

### Requirements (Selection may impact detection limits)

**CCME**
☐ Agricultural
☐ Industrial
☐ Residential/Park
☐ Commercial
☐ FWAL

**AB Tier 1**
☐ Agricultural
☐ Industrial
☐ Residential/Park
☐ Commercial
☐ Natural Area

**Alberta Surface Water**
☐ Chronic
☐ Acute
☐ SK Notice of Site Cond.
☐ Drinking Water
☐ Other:

Is this part of the Alberta SRP program? ☐ YES ☐ NO (If yes, please fill below)
Application Number:
Grant Amount:
Well/Facility/Location ID:
UWI:

| LABORATORY USE (LAB ID #) | SAMPLE IDENTIFICATION | DEPTH | DATE/TIME SAMPLED | SAMPLE MATRIX | COMMENTS | # OF CONTAINERS: VIALS / JARS | # OF CONTAINERS: BAGS | # OF CONTAINERS: BOTTLES | Field Filtered (Y/N) | Preserved (Y/N) | Detailed Salinity: ☐ AB ☐ SK ☐ BC ☐ D50 | ☐ CCME/AB : BTEX/F1-F4 ☐ CCME/AB : BTEX/F1-F2 | ☐ BC: BTEXS/VPH/EPH ☐ BC: LEPH/HEPH | SK: BTEX/TVH/C11-C22, C23-C60 | Soil Metals: ☐ HWS-B ☐ SP-B ☐ Hg ☐ Cr6+ | Water Metals: ☐ Dissolved ☐ Total ☐ Hg ☐ Cr6+ | Routine Water Chemistry | Landfill: ☐ AB Class 2 ☐ BC ☐ SK | Coliforms: ☐ Total ☐ Fecal ☐ E.coli | Particle Size: ☐ Sieve (75µm) ☒ Texture | | | Hold For 30 Days No Analysis (Additional Fee) | Long Term Storage - 6 Months | Long Term Storage - 1 Year | Hazardous (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23BH03-01 | | May 2/23 | Soil | | | 1 | | | | | | | | | | | | | X | | | | | | | |
| 2 | 23BH01-01 | | ↓ | ↓ | | | 1 | | | | | | | | | | | | | X | | | | | | | |
| 3 | 23BH5-01 | | | | | | 1 | | | | | | | | | | | | | X | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Samples Relinquished By (Print Name and Sign): | Date/Time | Samples Received By (Print Name and Sign): | Date/Time |
|---|---|---|---|
| Emily Law [redacted] | Aug 22/23 | [redacted] | Aug 22/23 11:30 |
| Samples Relinquished By (Print Name and Sign): | Date/Time | Samples Received By (Print Name and Sign): | Date/Time |
| Samples Relinquished By (Print Name and Sign): | Date/Time | Samples Received By (Print [redacted] | Date/Time 8/22/23 |

Pink Copy - Client
Yellow Copy - AGAT
White Copy- AGAT



N°: AB 180803

# AGAT Laboratories

# SAMPLE INTEGRITY RECEIPT FORM

## RECEIVING BASICS - Shipping

Company/Consultant: Enviroweb

Courier: Jenor Prepaid Collect

Waybill#

Branch: EDM GP FN FM (RD) VAN LYD FSJ EST SASK Other:

If multiple sites were submitted at once: (Yes) ~~No~~ L.C. [redacted]

Custody Seal Intact: Yes No ~~NA~~

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 1 small

## TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes No

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Color , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry:

Hydrocarbons: Earliest Expiry

## SAMPLE INTEGRITY - Shipping

**Hazardous Samples:** YES (NO) Precaution Taken:

**Legal Samples:** Yes (No)

**International Samples:** Yes (No)

**Tape Sealed:** (Yes) No

**Coolant Used:** Icepack Bagged Ice Free Ice Free Water (None)

**Temperature** (Bottles/Jars only) N/A if only (Soil Bags) Received

**FROZEN (Please Circle if samples received Frozen)**

1 (Bottle/Jar) NA +___+___=____°C 2(Bottle/Jar)___+___+___=____°C

3 (Bottle/Jar)___+___+___=____°C 4 (Bottle/Jar)___+___+___=____°C

5 (Bottle/Jar)___+___+___=____°C 6 (Bottle/Jar)___+___+___=____°C

7 (Bottle/Jar)___+___+___=____°C 8 (Bottle/Jar)___+___+___=____°C

9 (Bottle/Jar)___+___+___=____°C 10 (Bottle/Jar)___+___+___=____°C

(If more than 10 coolers are received use another sheet of paper and attach)

## LOGISTICS USE ONLY

**Workorder No:** 23R060845

**Samples Damaged:** Yes No If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments:

* Subcontracted Analysis (See CPM)

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Data Set: Z:\Operations\Client Data\43021 Mitchel Kroetsch\SlugTest.aqt
Date: 08/21/23
Time: 10:37:44

## PROJECT INFORMATION

Company: Envirowest Engineering
Client: Kroetsch
Project: 2304-43021
Test Date: May 30, 2023
Test Well: 23MW01(23BH05)

## AQUIFER DATA

Saturated Thickness: 2.7 m
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

### Test Well: New Well

X Location: 0. m
Y Location: 0. m

Initial Displacement: 0.445 m
Static Water Column Height: 1.2 m
Casing Radius: 0.0255 m
Well Radius: 0.075 m
Well Skin Radius: 0.075 m
Screen Length: 1.2 m
Total Well Penetration Depth: 2.4 m

No. of Observations: 25

Observation Data

| Time (min) | Displacement (m) | Time (min) | Displacement (m) |
|---|---|---|---|
| 0. | 0.445 | 6.5 | 0.445 |
| 0.5 | 0.445 | 7. | 0.445 |
| 1. | 0.445 | 7.5 | 0.445 |
| 1.5 | 0.445 | 8. | 0.445 |
| 2. | 0.445 | 8.5 | 0.445 |
| 2.5 | 0.445 | 9. | 0.445 |
| 3. | 0.445 | 9.5 | 0.445 |
| 3.5 | 0.445 | 10. | 0.445 |
| 4. | 0.445 | 15. | 0.445 |
| 4.5 | 0.445 | 20. | 0.445 |
| 5. | 0.445 | 25. | 0.445 |
| 5.5 | 0.445 | 30. | 0.445 |
| 6. | 0.445 | | |

## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.119

## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 2.163E-7 | cm/sec |
| y0 | 0.4448 | m |

T = K*b = 5.841E-5 cm²/sec