NRCB Natural Resources Conservation Board

#303, 4920 – 51 Street
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403-340-5241
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Enforcement Order No. EO 25-04

Made under section 39 of the
***AGRICULTURAL OPERATION PRACTICES ACT*, RSA 2000, c A-7 (AOPA)**

Date issued: August 1, 2025

Issued by: Fraser Grant, Inspector
Compliance and Enforcement Division
Natural Resources Conservation Board (NRCB), Red Deer Office

Issued to: Westcoast Holsteins Ltd. and
Ron Kooyman
Chilliwack, BC

Basis for Order: Risk to the environment

I, Fraser Grant, Inspector appointed by the Natural Resources Conservation Board, issue this enforcement order under section 39(1) of the *Agricultural Operation Practices Act* (AOPA) against:

Westcoast Holsteins Ltd. and Ron Kooyman

on the basis that they are creating an environmental risk at a dairy confined feeding operation (CFO). The facility posing an environmental risk is a two-stage earthen liquid manure storage (EMS). The EMS has three monitoring wells installed around the EMS as part of the leak detection monitoring requirements under NRCB Approval RA05006.

The CFO is located at NW 35-042-25 W4M, in Ponoka County, approximately four kilometers southeast of Ponoka, Alberta. The EMS was constructed before 2002, and before the NRCB took over CFO permitting. The land is owned by Westcoast Holsteins Ltd. (Westcoast Holsteins). The CFO is operated under the same corporation and currently overseen by Ron Kooyman.

Background and investigation

On December 1, 2023, I issued Compliance Directive CD 23-04 to Westcoast Holsteins Ltd. (Appendix A) regarding environmental risk associated with the two-stage EMS. CD 23-04 provides my reasoning as to why the environmental risk is present.

Directive CD 23-04 had two directive requirements:

1) By July 1, 2024, submit a detailed plan to the NRCB on how the EMS liner will meet AOPA requirements. The plan must include:
   i. The type of replacement liner to be installed (e.g., compacted clay, synthetic)
   ii. Timelines for the liner replacement

iii. How AOPA liner requirements will be met and verified in accordance with Section 9(3) and 9(6) of the Standards and Administration Regulation under AOPA

The plan will not be acceptable until the NRCB has reviewed and approved it.

2) By July 1, 2025, fully decommission the EMS according to Technical Guideline Agdex 096-90 Closure of Manure Storage Facilities and Manure Collection Areas if an NRCB permit for the EMS has not been obtained.

On July 5, 2024, Mr. Kooyman requested an extension to Directive 1 of CD 23-04 as they were waiting for engineer results to support their detailed plan on how an EMS liner would meet AOPA requirements. An extension was granted until August 5, 2024. On July 23, 2024, Darren Plesman (on-site manager at that time) submitted an engineer report provided by Envirowest Engineering outlining the intent of the installation of a synthetic liner that would meet AOPA requirements. The engineer report did not meet all the requirements under Directive 1 of CD 23-04. Mr. Plesman informed me that they would be submitting a NRCB Part 2 application on August 2, 2024, as I had informed him that this would address the information required to meet Directive 1 of CD 23-04. The Part 2 application was not received until September 9, 2024, and was deemed complete on September 10, 2024. On September 10, 2024, though late, the requirements under Directive 1 of CD 23-04 had been met.

On January 8, 2025, NRCB Approval Officer Sarah Neff, issued NRCB Authorization RA24019 granting permission to reline the existing double-cell EMS into a synthetically lined liquid manure storage (Appendix B). NRCB permit RA24019 imposed a construction deadline of July 1, 2025, this due date aligning with Directive 2 of CD 23-04. Ms. Neff delivered the permit in person to Mr. Kooyman and Mr. Plesman, I attended this meeting in case the operator had any questions related to the timelines. During our meeting Mr. Kooyman and Mr. Plesman expressed concerns about the NRCB's interpretation of the leak detection results discussed in CD 23-04 (Appendix A). I told Mr. Kooyman and Mr. Plesman that I could arrange a meeting with Scott (Sheila) Cunningham, NRCB Sci-Tech member assigned to the file, who had prepared the leak detection review report. I suggested that we could go over any questions that they had regarding our findings and interpretations in the 2022 Leak Detection Monitoring Review Report, issued on July 20, 2023, which led to Compliance Directive CD 23-04.

On January 17, 2025, I sent a follow-up email to Mr. Kooyman and Mr. Plesman, asking if there was a date that they would like to meet and if they had a chance to prepare any specific questions about the NRCB's interpretation. I did not receive a response. On March 4, 2025, I sent a follow-up email. I did not receive a response.

On May 13, 2025, I called Mr. Plesman, who informed me that he is no longer with Westcoast Holsteins Ltd. On May 15, 2025, I contacted Mr. Kooyman, who informed me that they have a new on-site manager. He also informed me that as a result of the quote that they had received for the synthetic liner associated with NRCB permit RA24019, it was unlikely they would be able to reline the EMS this year. Mr. Kooyman asked if it was still a possibility to re-install the leak detection wells.

As background, in June 2020, reinstallation of the leak detection wells and relining the EMS to meet AOPA requirements had been the two options presented by the

former chair of the NRCB monitoring review team (MRT) in response to a 2020 leak detection review report prepared by a former NRCB Sci-Tech member. During my correspondence with the Westcoast Holsteins on-site manager Jamison Ward (then-manager of the CFO), they had agreed to address one of the two options, later indicating they would proceed with relining the EMS.

In response to Mr. Kooyman's current request of installing new leak detection wells, I asked the NRCB Sci-Tech Manager, Greg Piorkowski (as Scott (Sheila) Cunningham was out of the office for several weeks) to review the request and the likelihood of new wells producing water or providing different results.

On May 23, 2025, myself, Compliance Manager, Kevin Seward, and Mr. Piorkowski discussed Mr. Kooyman's request and Mr. Piorkowski's review of the request. Given the historical leak detection results, borehole logs, the leak detection wells being reinstalled in 2018, and the bottom of the two-stage EMS being installed on top of the bedrock (sandstone) layer, without a liner that meets AOPA requirements, we determined that it is unlikely that new monitoring wells would change the results that have been observed (either dry wells or samples with elevated manure constituents). It was also unlikely that the environmental risk would be reduced.

On May 26, 2025, I informed Mr. Kooyman of our determination. Mr. Kooyman reiterated his concerns about the quote he had received for relining the EMS. I provided him with former NRCB permits for synthetic liners as well as some of the companies that were installing liners that meet AOPA requirements (this was previously sent on September 11, 2024). I recommended that he contact some companies and operators who have installed synthetic liners so that he could have a variety of quotes. At this time, it was evident to me that they would not meet the July 1, 2025 deadline under Directive 2 of CD 23-04. I discussed options with Mr. Kooyman, one being the possibility of requesting an extension of Directive 2 of CD 23-04, in which he would need to provide justification as to why an extension should be granted or the second option being I issue an enforcement order, which he would have the option to request a Board review of the direction I would give.

On June 5, 2025, I had a virtual meeting with Mr. Kooyman and Lee Gogal (CFO of Kooyman Group, Westcoast Holsteins Ltd. is a subsidiary company of the Kooyman Group). We discussed the history of the file and why CD 23-04 had been issued. I reminded them of the two options, one being an extension of CD 23-04 and the other being an enforcement order, with the possibility of requesting a Board review.

On June 25, 2025. I sent an email reminder to Mr. Kooyman and Mr. Gogal, reminding them of the approaching compliance date (July 1, 2025).

On June 27, 2025, Mr. Kooyman sent a text message, after work hours and while I was away on vacation, indicating that he would like to have a conversation. I did not access this message until July 1, 2025. On July 2, 2025, I contacted Mr. Kooyman and Mr. Gogal, who indicated that they had spoken to their engineer who was of the opinion that they could install new leak detection wells that might provide them with adequate water volume to collect the required leak detection samples. I informed Mr. Kooyman and Mr. Gogal that I would issue an enforcement order and that they would have the ability to request a Board review with their alternate solution of installing new leak detection wells.

Risk to the Environment

Section 39 of AOPA authorizes an NRCB inspector to issue an enforcement order if, in the inspector's opinion, a person is creating a risk to the environment or is contravening or has contravened AOPA or its regulations.

AOPA aims to reduce the potential for groundwater contamination and surface water runoff, and to lessen the nuisance impacts of CFOs on neighbours. The Standards and Administration Regulation (SAR) is one way that AOPA achieves its aims.

The SAR (effective June 23, 2025) requires that leak detection monitoring wells be installed if an approval officer considers that there is a risk to the environment.

> **18(1)** If an approval officer considers that there is a risk to the environment, the approval officer may require the owner or operator of a liquid manure storage facility to install and maintain a leakage detection system for the liquid manure storage facility consisting of at least one monitoring well up gradient of the facility and at least 2 monitoring wells down gradient from the facility of a type appropriate to determine whether there are leaks.
>
> **18(2)** As determined by an approval officer, the owner or operator of a liquid manure storage facility must monitor the monitoring wells installed under subsection (1) at regular intervals to detect contamination from the facility.

NRCB permit RA05006 has a condition requiring leak detection monitoring for the EMS using the pre-2002 monitoring wells. Condition 8 of Approval RA05006, reads:

> "a. Leakage detection well results must be submitted to the NRCB in report format until such time as the NRCB adjusts the monitoring frequency, test parameters and/or report contents. All reports (comprehensive and/or indicator) must include, but will not be limited to:
> • Background information – site description, soil logs, diagrams
> • Water level elevations
> • Elevation of liquid manure in the EMS at the time of water sampling
> • Dates when the EMS was emptied
> • Inspection of the surface well casing for its integrity
> • Explanation of the water sampling collection technique
> • Field and laboratory work
> • Discussion and explanation of the results including a trend analysis
> • Recommendations
>
> b. An Indicator report must be done by May 31, 2005 and every 24 months thereafter. The Indicators report must include laboratory analysis of the following parameters:
> • Electrical Conductivity, Chloride
> • Potassium, Total Dissolved Phosphorus (Orthophosphates)
> • Nitrogen Species: Nitrite and Nitrate Nitrogen, Total Kjieldahl Nitrogen"

Environmental Risk Screening

In a monitoring statement (Appendix C), issued on Oct 15, 2010, the NRCB changed the monitoring frequency to annually (instead of every 24 months). This was done as a result of an environmental risk screening completed in 2009 for the two-stage EMS. The environmental risk screening used the environmental risk screening tool (ERST). The result was a high potential risk to groundwater (it scored 97.2 points with the threshold for high risk starting at >90), this was a result of the geologic materials under the EMS. The EMS also posed a low potential risk to surface water.

In 2019, a former NRCB Approval Officer, issued NRCB Authorization RA19043 (later amended in RA19043A to remove a calf barn from the permit). In this permit, a re-assessment of environmental risk screening of the two-stage EMS was completed using a newer version of the ERST. The re-screening of the EMS determined a high potential risk to groundwater (it scored 91.2 points with the threshold for high risk starting at >90). The two-stage EMS also posed a low potential risk to surface water.

On May 17, 2023, Scott (Sheila) Cunningham, prepared an internal file review summary for Westcoast Holsteins (Appendix D). The file review compared the two historical ERST results and determined that the high potential risk to groundwater should be scored as a 97.2. This is because the liner does not meet AOPA. The companion document for ERST v1.2 (2011) states “if the liner for the facility clearly does not meet the requirements of AOPA for a new facility of the same type (e.g. hole in the ground EMS, visually cracked concrete), then the liner score is 20 for that facility”.

Leak Detection Analysis

Historically, the leak detection wells have not produced enough groundwater to consistently collect a water sample to be analyzed. As a result, in 2018, three groundwater monitoring wells (MW-01, MW-02, and MW-03) around the two-stage EMS were installed to replace the pre-2002 monitoring wells.

The 2018 wells were completed between depths of 5.2 m and 5.8 m below ground surface. Soil stratigraphy was reported as alternating sand and sandy clay layers to the depth of completion. The depth of completion was a result of auger refusal as weathered sandstone was encountered. The file review description states “[T]he liquid manure in the EMS sits directly on the dry sandstone. There is no known liner or protective layer in the EMS. In at least 3 water wells on the same half section (see Appendix 1), the dry sandstone becomes wet at a certain depth. These 3 water wells are completed into the wet sandstone.”

The EMS was constructed before 2002, so the NRCB has limited details about its construction. The total depth of the EMS is reported to be approximately 6.0 m.

Analytical results have been obtained from the 2018 monitoring wells, only in 2020 (MW-03), 2021 (MW-01 and MW-03), and most recently, 2022 (MW-01, MW-02, and MW-03) (Appendix E). All other years since Approval RA05006 was issued reported the monitoring wells to be dry or have insufficient groundwater to obtain a groundwater sample. When groundwater samples were possible, the results have reported elevated chloride and nitrate-N, which are indicator parameters of manure constituents.

Based on my observations, my conversations with Kevin Seward (Compliance Manager), Greg Piorkowski (Sci-Tech Manager), Scott (Sheila) Cunningham (Environmental Specialist), and in

my opinion, Westcoast Holsteins is creating a risk to the environment by operating a two-stage EMS without a liner that meets AOPA requirements. This is supported by the elevated manure constituents reported in the 2020, 2021, and 2022 leak detection monitoring results and the dimensions and geological materials underlying the two-stage EMS in relation to the uppermost groundwater resource.

Conclusion

Under Section 39(1) of AOPA, if in the opinion of an inspector, a person is creating a risk to the environment, the inspector may issue an enforcement order:

> (d) directing the person to undertake any investigation, construction, alteration, repair or other measures specified in the enforcement order, within the time specified in the enforcement order;

An enforcement order is being issued because Westcoast Holsteins Ltd. and Ron Kooyman are creating a risk to the environment. They have failed to comply with Directive 2 of Compliance Directive CD 23-04, issued on December 1, 2023, as they have not decommissioned the EMS according to Technical Guideline Agdex 096-90 Closure of Manure Storage Facilities and Manure Collection Areas. The operator did obtain NRCB permit RA24019 for relining the two-stage EMS, but the permit's construction completion deadline of July 1, 2025 has passed without the EMS being relined.

ORDERS:

To mitigate any possible risks to the environment and potential nuisances to any affected neighbours, Westcoast Holsteins Ltd. and Ron Kooyman shall take all necessary and appropriate measures to comply with AOPA and its regulations. In particular, Westcoast Holsteins Ltd. and Ron Kooyman shall either:

1. By November 15, 2025, fully decommission the two-stage EMS, as a high-risk facility, according to Technical Guideline Agdex 096-90 Closure of Manure Storage Facilities and Manure Collection Areas;

OR

2. By November 15, 2025, actually reline the existing two-stage EMS, adhering to the requirements and conditions of an approved and active NRCB permit for a relined EMS;

OR

3. By November 15, 2025, construct a new EMS, adhering to the requirements and conditions of an approved and active NRCB permit for a new EMS.

Any of the deadline dates contained above may be extended in writing, but only by the NRCB, at the sole discretion of the NRCB.

Westcoast Holsteins Ltd. and Ron Kooyman shall allow the NRCB access at any reasonable hour, with or without advance notice, to the land and structures for the purpose of assessing compliance with the orders contained in this enforcement order.

All actions required above shall be in compliance with AOPA and its implementing regulations and shall not violate any other law. These requirements, including any deadlines, remain in effect until otherwise directed by the NRCB in writing.

The NRCB posts all enforcement orders on the NRCB public website.

CONSEQUENCES OF NOT COMPLYING WITH THIS ORDER

If any person to whom this enforcement order is directed fails to comply with any part of this enforcement order, the Natural Resources Conservation Board may apply to the Court of King's Bench for an Order of the Court directing those persons to comply with the enforcement order, under section 42 of the *Agricultural Operation Practices Act*.

When an enforcement order is issued to more than one person, all persons named in the Order are jointly responsible for carrying out the terms of the Order, under section 43 of the *Agricultural Operation Practices Act*.

NOTE: Under section 39(3), if a person to whom this enforcement order is directed complies with the Order, no prosecution may be commenced under the *Agricultural Operation Practices Act* for the offence with respect to the facts that gave rise to this enforcement order.

Fraser Grant
Senior Inspector, Compliance and Enforcement Division
Natural Resources Conservation Board

Cc: Ponoka County, Building & Development Department

Appendices:

A. Compliance Directive CD 23-04 Westcoast Holsteins Ltd. issued 01 Dec 23
B. Authorization RA24019 issued 08 Jan 25
C. Monitoring Statement RA05006 issued 15 Oct 10
D. RA05006 File Review dated 17 May 23
E. 2022 Leak Detection Monitoring Review Report dated 20 Jul 23

SERVICE OF ORDER:

Delivered to: Ron Kooyman	**Delivered to:**	**Delivered to:**
Method of Delivery: Via Email	**Method of Delivery:**	**Method of Delivery:**
Date of Delivery: August 1, 2025	**Date of Delivery:**	**Date of Delivery:**

INFORMATION: RIGHT TO REQUEST A REVIEW OF THIS ENFORCEMENT ORDER

Under section 41 of AOPA, you may request that the NRCB's board members (the "Board") "review and confirm, vary, amend or rescind'' this enforcement order. The Board has discretion whether to hold a review or not.

Please note that, under section 41(2), this enforcement order takes effect at the time prescribed in the order. This enforcement order will remain in effect unless the Board suspends the operation of this enforcement order.

Under section 13 of the AOPA Administrative Procedures Regulation, AR 106/2017, your request, must include:

a) a clear and concise statement of the facts relevant to your request
b) the grounds on which your request is made
c) a brief explanation of the harm that has resulted or will result from the enforcement order addressed in your request
d) a brief description of the remedy you seek; and
e) the name, address in Alberta and telephone number, and the fax number and email address, if any, of you or your representative (if you have one).

If you want the enforcement order suspended until the Board's review is completed, you must also be clear about this in your written request for review and provide your reasons for asking for a suspension of this enforcement order.

Under section 15(2) of the *AOPA Administrative Procedures Regulation*, a request for a review of the enforcement order must be filed with the Board within 10 working days of the date you received the enforcement order or by any later date specified in the order.

Because this enforcement order does not extend the 10 working day deadline in section 15(2) of the Regulation, the deadline for you to file a request for review by the Board is **4:30 p.m. on August 18, 2025**.

If you wish to have the Board review this order, please submit a written request to Laura Friend, Manager, Board Reviews by email at laura.friend@nrcb.ca. If you have any questions about requesting a review or about the review process, please call Ms. Friend at 403-297-8269.

NRCB Natural Resources Conservation Board

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Compliance Directive

***AGRICULTURAL OPERATION PRACTICES ACT*, RSA 2000, c A-7**

Directive #: **CD 23-04**

Date issued: December 1, 2023

Issued by: Fraser Grant, Inspector
Compliance and Enforcement Division
Natural Resources Conservation Board (NRCB), Red Deer Office

Issued to: Westcoast Holsteins Ltd.
Ron Kooyman
47749 Prairie Central Road
Chilliwack, BC V2P 6H3

Attention: Ron Kooyman

This directive relates to a risk to the environment at a dairy confined feeding operation (CFO). The facility posing an environmental risk is a two-stage liquid earthen manure storage (EMS). The EMS has three monitoring wells installed around the facility as part of the leak detection monitoring permit requirements. The CFO is located at NW-35-042-25 W4M, in Ponoka County, approximately four kilometers southeast of Ponoka, Alberta. The land is owned by Westcoast Holsteins Ltd (Westcoast Holsteins). The CFO is operated under the same corporation and currently overseen by Ron Kooyman.

Background and Investigation

The EMS was constructed pre-AOPA, accordingly, the NRCB has no engineering data on the EMS construction and no borehole logs available for the monitoring wells (up to 2005).

NRCB permit RA05006 has a condition requiring leak detection monitoring for the EMS using the pre-2002 monitoring wells. Condition #8 of Approval RA05006, reads:

> "a. Leakage detection well results must be submitted to the NRCB in report format until such time as the NRCB adjusts the monitoring frequency, test parameters and/or report contents. All reports (comprehensive and/or indicator) must include, but will not be limited to:
> • Background information – site description, soil logs, diagrams
> • Water level elevations

- Elevation of liquid manure in the EMS at the time of water sampling
- Dates when the EMS was emptied
- Inspection of the surface well casing for its integrity
- Explanation of the water sampling collection technique
- Field and laboratory work
- Discussion and explanation of the results including a trend analysis
- Recommendations

b. An Indicator report must be done by May 31, 2005 and every 24 months thereafter. The Indicators report must include laboratory analysis of the following parameters:
- Electrical Conductivity, Chloride
- Potassium, Total Dissolved Phosphorus (Orthophosphates)
- Nitrogen Species: Nitrite and Nitrate Nitrogen, Total Kjieldahl Nitrogen"

In the most recent monitoring statement (Appendix A), issued on Oct 15, 2010, the NRCB changed the monitoring frequency to annually (instead of every 24 months) as a result of the high potential for the EMS to impact the uppermost groundwater resource.

In 2018, three groundwater monitoring wells (MW-01, MW-02, and MW-03) around the two-cell EMS were installed to replace the pre-2002 monitoring wells.

The 2018 wells were completed between depths of 5.2 m and 5.8 m below ground surface. Soil stratigraphy was reported as alternating sand and sandy clay layers to the depth of completion. The depth of completion was a result of auger refusal as weathered sandstone was encountered.

Analytical has been obtained from the 2018 monitoring wells in 2020 (MW-03), 2021 (MW-01 and MW-03), and most recently, 2022 (MW-01, MW-02, and MW-03) (Appendix B). All remaining years since RA05006 was issued reported the monitoring wells to be dry or have insufficient groundwater to obtain a groundwater sample. Groundwater results collected from the monitoring wells report elevated chloride and nitrate-N, which are indicator parameters of manure constituents.

In June 2020, the NRCB Science and Technology (sci-tech) division reviewed the 2020 leak detection data obtained from that year and recommended that the file be presented to the NRCB monitoring review team (MRT). The MRT aids with data interpretation and recommends follow-up actions for files that are brought to their attention. Sci-tech recommendations, historic leak detection reports, and supporting documentation were provided to the chair of the MRT in June 2020. The chair of the MRT recognized the environmental concerns and recommended that a discussion should be had with the operator regarding relining or reconstructing the EMS so that an AOPA approved liner would be present. The MRT chair felt that a three-to-five-year timeline (2023 to 2025) would be appropriate for relining or reconstructing the EMS.

On July 22, 2020, Jamison Ward (then-manager of the CFO) provided an email to myself indicating that they would plan on either reinstalling the monitoring wells or look into options of relining or reconstructing the EMS. The anticipated timeline that Westcoast Holsteins provided was Spring 2021. In March 2021, an NRCB Approval Officer and I met with Mr. Ward to discuss Westcoast Holsteins' plans. Mr. Ward

indicated that they would like to either reline or reconstruct the EMS. Mr. Ward was provided application forms and he indicated that they would be putting together an application once they determined how they would like to proceed with the design of the EMS. Follow-ups with Mr. Ward in 2021 indicated that Westcoast Holsteins was developing a plan. In January and May 2022, the operator informed me that they still have not determined the plans for relining or reconstructing the EMS.

In April 2023, I contacted Mr. Ward and he told me that a design still has not been finalized. In June 2023, I met with the sci-tech individual now assigned to this file, as well as the managers of NRCB Compliance and Sci-tech. We agreed that a compliance directive should be issued at this time due to being in the midst of the three-to-five-year deadline (2023-2025) for mitigating the environmental risk of the EMS.

Risk to the environment from manure-contaminated groundwater

The *Agricultural Operation Practices Act* ("AOPA") aims to reduce the potential for groundwater and surface water contamination (or nutrient overloading of soils), and to lessen the nuisance impacts of CFOs on neighbours.

In my opinion, Westcoast Holsteins is creating a risk to the environment by allowing manure-contaminated constituents to impact groundwater quality. This impact is evident from historic EMS leak detection results.

Under Section 39(1) of AOPA, the NRCB may issue an enforcement order to a person if, in the NRCB's opinion, the person is, among other things, creating a risk to the environment. However, as this is the first enforcement action regarding risk to the environment at this site, and the operator has expressed cooperation in mitigating the risk, a compliance order is being issued at this time rather than an enforcement order.

DIRECTIVE:

Westcoast Holsteins Ltd. shall take all necessary and appropriate measures to mitigate risks to the environment. In particular, Westcoast Holsteins Ltd. shall:

1. By July 1, 2024, submit a detailed plan to the NRCB on how the EMS liner will meet AOPA requirements. The plan must include:

   i. The type of replacement liner to be installed (e.g., compacted clay, synthetic)

   ii. Timelines for the liner replacement

   iii. How AOPA liner requirements will be met and verified in accordance with Section 9(3) and 9(6) of the Standards and Administration Regulation under AOPA

   The plan will not be acceptable until the NRCB has reviewed and approved it.

2. By July 1, 2025, fully decommission the EMS according to Technical Guideline Agdex 096-90 *Closure of Manure Storage Facilities and Manure Collection Areas* if an NRCB permit for the EMS has not been obtained.

Any of the deadlines contained above may be extended in writing, but only by the NRCB, at the sole discretion of the NRCB.

All actions required above shall be in compliance with AOPA and its implementing regulations and shall not violate any other law. These requirements, including any deadlines, remain in effect until otherwise directed by the NRCB in writing.

The NRCB may access the land and structures for the purpose of assessing compliance with this directive.

If Westcoast Holsteins Ltd. fails to comply with this directive, the NRCB may take additional enforcement action.

Fraser Grant
Inspector, Compliance and Enforcement Division
Natural Resources Conservation Board

Cc: Ponoka County, Planning and Development
Sarah Neff, Approval Officer, NRCB

Appendices

A. Appendix A: RA05006 Monitoring Statement issued October 15, 2010
B. Appendix B: 2022 LDM Review Report prepared on July 20, 2023

In consideration of Decision Summary RA24019, Authorization RA24019 is issued to:

Name: Westcoast Holsteins Ltd. (the "permit holder")
Address: Box 15 Site 15 RR 4 Ponoka, AB T4J 4R4
Contact person: Darren Plesman

Permitted construction (based on the submitted site plan):

- Relining the existing double cell EMS into a synthetically lined liquid manure storage (LMS) – 106.7 m x 45.7 m x 6.1 m deep (each cell)

The permit holder shall comply with the requirements of the *Agricultural Operation Practices Act* (AOPA) and the regulations passed pursuant to that Act.

The permit holder shall adhere to the descriptions, the site plan, building plans, operating plan, engineering reports and other attached documents included with filed Application RA24019.

The permit holder shall contact the NRCB at least 10 working days in advance of the desired inspection date to schedule the inspection in condition 3.

The permit holder is responsible for all costs associated with monitoring, sampling, testing, recording, and reporting requirements (this includes post construction reports).

Construction conditions

Synthetically lined LMS

1. The permit holder shall provide the NRCB a written construction completion report for the relining of the existing double cell EMS into a synthetically lined LMS. The report must be stamped and signed by a "professional engineer," as defined in the Standards and Administration Regulation, and must include:
    - the final dimensions, side slopes and depth below grade of the LMS,
    - confirmation that the bottom of the liner was constructed no less than 1 metre above the water table,
    - confirmation of the water table level at the time of the liner installation; and
    - confirmation that the liner installed was a 60 mil HDPE enviro liner, and that the liner was installed in accordance with the liner manufacturer's requirements, including preparation of the bed on which the synthetic liner is placed and proper sealing at all seams

2. The permit holder shall immediately cease construction of the synthetically lined LMS and contact the NRCB if the water table is observed to be one meter or less from the bottom of the liner of the LMS.

3. The permit holder shall not place manure in the synthetically lined LMS until the facility has been inspected by NRCB personnel and confirmed by them, in writing, to have been constructed in accordance with the terms and conditions of this permit.

4. The permit holder shall complete construction of the synthetically lined LMS prior to July 1st, 2025. Upon request, this deadline may be extended by the NRCB in writing.

This authorization becomes effective immediately and needs to be read in conjunction with previously issued Approval RA05006 and Authorizations RA10058, RA10058A, RA19028, and RA19043A. The authorization conditions will remain in effect unless amended in writing by the NRCB.

January 8, 2025

[redacted]
Sarah Neff
Approval Officer

NRCB Natural Resources Conservation Board

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Regarding Approval RA05006
NW 35-42-25 W4

Statement of Groundwater Monitoring Requirements

The purpose of this statement is to revise the groundwater monitoring requirements in Approval RA05006. Condition # 8 of Approval RA05006, reads:

> "a. Leakage detection well results must be submitted to the NRCB in report format until such time as the NRCB adjusts the monitoring frequency, test parameters and/or report contents. All reports (comprehensive and/or indicator) must include, but will not be limited to:
> • Background information – site description, soil logs, diagrams
> • Water level elevations
> • Elevation of liquid manure in the EMS at the time of water sampling
> • Dates when the EMS was emptied
> • Inspection of the surface well casing for its integrity
> • Explanation of the water sampling collection technique
> • Field and laboratory work
> • Discussion and explanation of the results including a trend analysis
> • Recommendations
> b. An Indicator report must be done by May 31, 2005 and every 24 months thereafter. The Indicators report must include laboratory analysis of the following parameters:
> • Electrical Conductivity, Chloride
> • Potassium, Total Dissolved Phosphorus (Orthophosphates)
> • Nitrogen Species: Nitrite and Nitrate Nitrogen, Total Kjieldahl Nitrogen"

The NRCB has re-assessed the groundwater monitoring requirements, using results from an environmental risk screening conducted on October 1, 2009, for the two stage liquid earthen manure storage facility ("facility").

Based on the risk screening result, the NRCB has determined that the groundwater monitoring requirements for this facility should be revised as follows:

Monitoring Frequency

The monitoring wells are each to be sampled annually during May or June by a qualified professional, beginning in 2011.

Monitoring Well Test Parameters

Groundwater samples from the monitoring wells are to be tested for the Indicator samples identified in the most recent NRCB Technical Guideline "Leak Detection and CFO's".

Monitoring Wells to be used for Monitoring

The monitoring wells at the two stage liquid earthen manure storage identified as MW# NW (located N of the west EMS), MW# NE (located N of the east EMS) and MW# S (located S of east EMS) are to be monitored.

It is noted that these monitoring wells are 1 inch diameter wells, and this may require special techniques to be used in order to obtain the samples. No

borehole logs (subsoil lithology, well depth, slotted interval, etc.) are available for these monitoring wells, which may add to the challenges faced when interpreting monitoring results. If the current monitoring wells prove to be ineffective or if they are unable to be sampled, the NRCB may require the installation of replacement monitoring wells (with borehole logs and completion details) around the two stage liquid earthen manure storage.

Groundwater Monitoring Report

The groundwater monitoring report from a qualified professional is to be submitted to the Red Deer NRCB office prior to August 31 annually for the sampling that occurred the previous May or June, beginning in 2011. The report **must** include:

- Water level elevations for each of the monitoring wells
- Elevation of liquid manure in the EMS at the time of water sampling
- Dates when the EMS was emptied
- Information on the integrity of the surface well casing of each monitoring well
- Explanation of the water sampling collection technique
- Explanation of the field and laboratory work conducted
- Discussion and explanation of the monitoring well results, including a trend analysis
- Recommendations

The results of the risk screening exercise indicate this facility has a high potential to impact the uppermost groundwater resource. This facility was constructed prior to 2002 and there is no engineering information on its construction. There are no borehole logs available for the monitoring wells. Water well drilling reports for water wells in the vicinity indicate surficial soils of 3 to 13 feet of clay, underlain by sandstone to depths of 101 to 178 feet. Given the geologic materials under the facility, the potential risk that groundwater quality would be impacted by the facility is high and continued annual groundwater monitoring is required.

Note that the installation of new water wells in the area surrounding the CFO may impact the potential risk to groundwater quality at a facility and therefore may require monitoring requirements to be revised. To ensure that monitoring requirements are appropriate, CFO operators should inform the NRCB of any new water wells that are being developed or installed in the area surrounding their facility.

The integrity of all monitoring wells must be maintained. Any damaged or destroyed wells must be reported to the NRCB and may be required to be repaired or replaced.

These monitoring requirements become effective on the date of this statement and supersede any previously issued monitoring requirements at this facility.

October 15, 2010 Signed:

(Original Signed)

Scott Cunningham
Approval Officer

May 17, 2023

To: Fraser Grant, NRCB Inspector, fraser.grant@nrcb.ca
From: Scott (Sheila) Cunningham, NRCB Environmental Specialist, scott.cunningham@nrcb.ca

Re: RA05006 – Westcoast Holsteins – NW 35-042-25 W4

Sheila Cunningham assigned as Sci-tech for this file on April 4, 2023. Sci-tech's review of 2022 LDM results is currently overdue.

Below is a file review of the site geology, hydrogeology, environmental risk screenings and prior sci-tech documentation to inform next steps.

Summary

The 2018 borehole logs at the edges of the EMS all terminate (due to auger refusal) in weathered sandstone at depths below grade of 5.0 to 5.7m.

The EMS depth is indicated as 6.1m in the ERST's site information documents. There is no information available on the construction of the EMS for a liner that protects groundwater.

There are several water wells on the NW35 and SW35. Water well ids 2063029, 94171, and 285473 (Appendix 1) on NW35 and SW35 indicate that sandstone starts at 2.0m to 4.0m below ground level. Bottom of sandstone (also bottom of hole) ranges from 32.61m to 54.25m. In these same wells, lower portion(s) of this sandstone are water bearing and are the zone where the water well is completed. Static water levels in these wells (at time of drilling) range from 24.69m to 29.87m below ground level.

Description

The liquid manure in the EMS sits directly on the dry sandstone. There is no known liner or protective layer in the EMS. In at least 3 water wells on the same half section (see Appendix 1), the dry sandstone becomes wet at a certain depth. These 3 water wells are completed into the wet sandstone.

Graphic

Based the locations and depths listed above, a cross section graphic has been created for the site (Figure 1).

Assumptions made:
Surrounding ground elevation at site is constant at 850m.
Borehole auger refusal at 6m depth, which is the top of the sandstone (elevation of 850 – 6 = 844m)
EMS depth at 6m (elevation of 850 – 6 = 844m)
Dry sandstone bottom/top of water bearing is 27m, average of static water level range of 24.69m to 29.87m. (elevation of 850 – 27 = 823m)
Wet sandstone bottom is 43m, average of bottom of sandstone range of 32.61m to 54.25m (elevation of 850m – 43 = 807m).

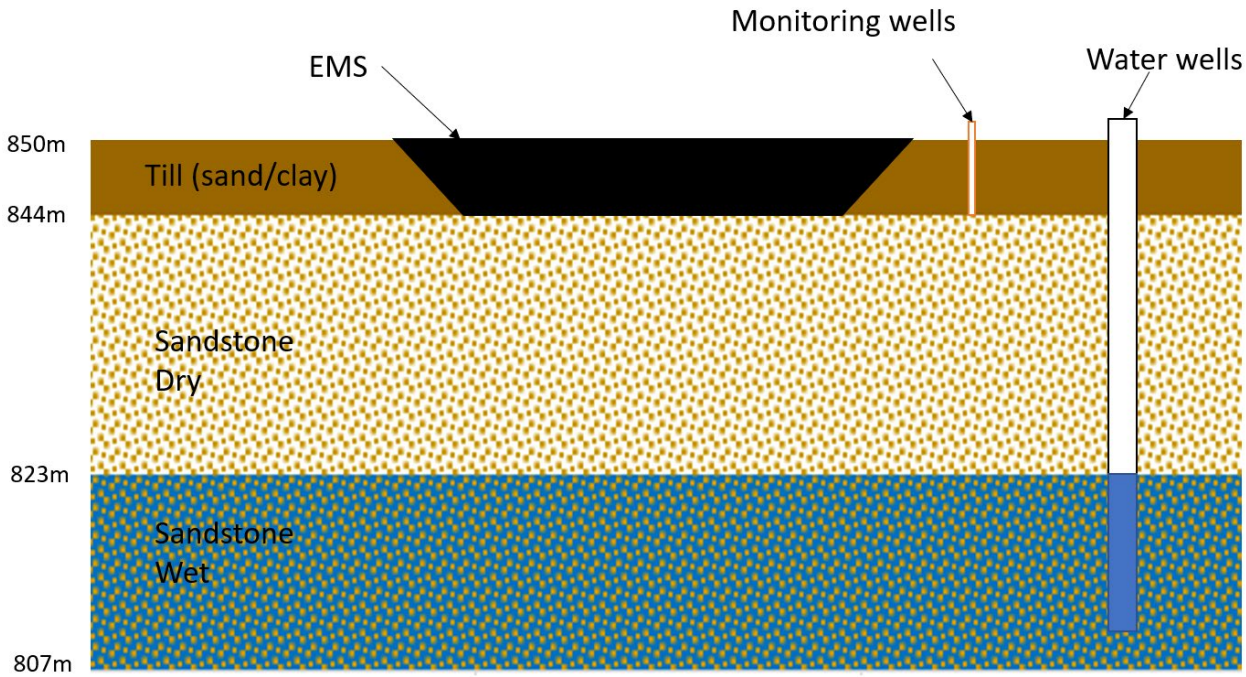


Figure 1. Cross section of the EMS at NW 35-042-25 W4.

Background

2005 – April 14 – RA05006 issued, requiring monitoring of the pre-2002 EMSs. Condition 8 requires monitoring every 2 years.

2009 – October 1 – ERST for pre-2002 EMSs scored as high risk to groundwater, numeric score of 97.2. High is >90.

2010 – October 15 – Groundwater monitoring statement issued. Annual sampling required. Reasons listed for the high risk are:

- Built prior to 2002 and no engineering information on its construction
- No borehole logs for the monitoring wells
- Nearby water well drillers reports show 3 to 13 feet of clay, underlain by sandstone to depths of 101 to 178 feet.

2018 – July 30 – three monitoring wells re-installed around EMSs by Envirowest. Auger refusal in weathered sandstone ranged from 5.0 to 5.8m below ground. Logs were topsoil, underlain by sand, underlain by sandy clay, underlain by sand, underlain by weathered sandstone (auger refusal). Reported in Envirowest, 2020 LDM results.

2019 – Sept 26 – RA19028 TD, pdf7, and RA19028 DS pdf3, list GW risk of existing two cell EMS as Moderate, scored on RA19028. (July 12, 2019 ERST in CFO2 shows 91.2, High for GW risk)

2019 – December 11 – RA19043 TD, pdf 7, and RA19043 DS pdf 3, list GW risk of existing two cell EMS as High (91.2),scored on RA19043, and acknowledges a calculation error on RA19028 that resulted in a moderate score. No additional action than continuing condition from Approval RA05006 and continuing water well monitoring.

2020 – June 12 – "… there is a past and current leak based on the data available… It is recommended to complete confirmatory sampling and assess the lagoon walls once emptied." Envirowest, 2020 LDM results, page 5.

2020 – June 17 – Scitech completed review report and recommendations. The recommendation from Envirowest to assess the lagoon walls once emptied was not mentioned by Scitech.

2020 – June 18 – Email to Mike from Fraser – file summary, with two options.

2021 – July 28 – 2021 LDM results from Amber. They state "moderate" risk to GW (page 1).

2023 – April 20 – Compared ERSTs for Two cell EMS from 2019 and 2009.

2019 – GW score is 91.2, Liner scored as 15 – don't know if AOPA met

2009 – GW score is 97.2, liner scored as 20 – does not meet AOPA

Reviewed ERST v1.2 companion document, page 16, under the heading "Liner type", states: "if the liner for the facility clearly does not meet the requirements of AOPA for a new facility of the same type (e.g. hole in the ground EMS, visually cracked concrete), then the liner score is 20 for that facility."

The file indicates the EMS is a hole in the ground and has no construction specs. Therefore, the correct GW scoring for the EMS would remain 97.2, High.

Appendix 1

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 2063029
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2009/09/30

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HARBRIDGE, LEWIS	RR 1 SITE 1 BOX 11	PONOKA	ALBERTA	CA	T4J 1R1

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	5	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.658867 Longitude -113.505767
How Location Obtained
Hand held autonomous GPS 20-30m

Elevation 840.00 m
How Elevation Obtained
Hand held autonomous GPS 20-30m

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
3.66		Brown Clay
32.92		Brown Fine Grained Sandstone
42.67		Gray Fine Grained Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 45.46 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
2009/09/16	45.46	27.61

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
42.67 m	42.67 m	2009/09/16	2009/09/16

Borehole

Diameter (cm)	From (m)	To (m)
22.23	0.00	6.10
15.24	6.10	7.62
13.02	7.62	42.67

Surface Casing (if applicable)
Plastic
Size OD : 15.24 cm
Wall Thickness : 0.991 cm
Bottom at : 7.62 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.544 cm
Top at : 6.10 m
Bottom at : 42.67 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
36.58	42.67	0.635		20.32

Perforated by Saw

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 m to 6.10 m
Amount

Other Seals

Type	At (m)
Driven	7.62

Screen Type
Size OD : cm

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

Attachment
Top Fittings Bottom Fittings

Pack
Type Unknown Grain Size
Amount Unknown

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
WILLIAM M BROWN

Certification No
VA4906

Company Name
BILL'S WATERWELL SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2009/09/17

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 2063029
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2009/09/30

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HARBRIDGE, LEWIS	RR 1 SITE 1 BOX 11	PONOKA	ALBERTA	CA	T4J 1R1

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	5	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.658867 Longitude -113.505767
How Location Obtained
Hand held autonomous GPS 20-30m

Elevation 840.00 m
How Elevation Obtained
Hand held autonomous GPS 20-30m

Additional Information

Measurement in Metric

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

Recommended Pump Rate 45.46 L/min
Recommended Pump Intake Depth (From TOC) 36.58 m
Pump Installed
Type
Depth m
Make
H.P.
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

12' - 108' ALSO WITH GRAY 22 HARD LAYERS, SEAL ALSO CUTTINGS,

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
2009/09/16	3:00 PM	27.61 m

Method of Water Removal

Type Air
Removal Rate 45.46 L/min
Depth Withdrawn From 42.67 m

If water removal period was < 2 hours, explain why

MEASUREMENTS FROM +5'

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
27.61	0:00	42.67
	1:00	35.23
	2:00	32.21
	3:00	30.58
	4:00	29.87
	5:00	29.57
	6:00	29.44
	7:00	29.36
	8:00	29.34
	9:00	29.31
	10:00	29.31

Water Diverted for Drilling

Water Source	Amount Taken		Diversion Date & Time
WELL @ SW-4-40-23-4	5455.31	L	2009/09/15 4:00 PM

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
WILLIAM M BROWN

Certification No
VA4906

Company Name
BILL'S WATERWELL SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2009/09/17

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 94171
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HOWELL, D.	PONOKA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.665846 Longitude -113.504252
How Location Obtained
Map

Elevation 847.34 m
How Elevation Obtained
Survey-Air

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
2.13		Sand
3.66		Clay
32.61		Soft Sandstone & Rocks

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 0.00 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1964/04/25	18.18	24.69

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
32.61 m			1964/04/25

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	32.61

Surface Casing (if applicable)

Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Bottom at : 0.00 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

Placed from 0.00 m to 0.00 m
Amount
Other Seals

Type	At (m)

Screen Type

Size OD : 0.00 cm

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

Attachment
Top Fittings
Bottom Fittings

Pack

Type
Grain Size
Amount

Contractor Certification

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

Certification No
1

Company Name
DICKAU HOWARD F

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 94171
GoA Well Tag No.
Drilling Company Well ID
Date Report Received
GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HOWELL, D.	PONOKA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.665846 Longitude -113.504252
How Location Obtained: Map

Elevation 847.34 m
How Elevation Obtained: Survey-Air

Additional Information

Measurement in Metric

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

Recommended Pump Rate: 0.00 L/min
Recommended Pump Intake Depth (From TOC): 0.00 m
Pump Installed:
Depth: m
Type:
Make:
H.P.:
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 HARD & CLEAR WATER.

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1964/04/25	12:00 AM	24.69 m

Depth to water level

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

Method of Water Removal

Type: Pump
Removal Rate: 18.18 L/min
Depth Withdrawn From: 0.00 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
DICKAU HOWARD F

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

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

View in Imperial | Export to Excel

GOWN ID

GIC Well ID 285473
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1996/08/23

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
WOODSPAN DEV LTD	2 8337 YOUNG RED, CHILLIWACK B.C.				V2P 4N8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	35	42	25	4				MIDDLE OF DRIVEWAY WEST OF POWER TRANSFORMER

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.656806 Longitude -113.501274
How Location Obtained

Elevation m
How Elevation Obtained

Drilling Information

Method of Drilling
Rotary

Type of Work
New Well

Proposed Well Use
Stock

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
3.96		Brown Till & Clay
28.65		Brown Fine Grained Sandstone
54.25		Gray Medium Grained Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 90.92 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1996/04/18	136.38	29.87

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
54.25 m		1996/04/18	1996/04/18

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	54.25

Surface Casing (if applicable)
Steel
Size OD : 14.12 cm
Wall Thickness : 0.478 cm
Bottom at : 30.48 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.602 cm
Top at : 29.87 m
Bottom at : 54.25 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
46.63	54.25	0.635		30.48

Perforated by Saw

Annular Seal Cuttings
Placed from 0.00 m to 30.48 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

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

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

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

Certification No
1

Company Name
SCHMIDT DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

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

GOWN ID

GIC Well ID 285473
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1996/08/23

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
WOODSPAN DEV LTD	2 8337 YOUNG RED, CHILLIWACK B.C.				V2P 4N8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	35	42	25	4				MIDDLE OF DRIVEWAY WEST OF POWER TRANSFORMER

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.656806 Longitude -113.501274
How Location Obtained

Elevation m
How Elevation 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 90.92 L/min
Recommended Pump Intake Depth (From TOC) 42.67 m
Pump Installed Yes Depth m
Type SUB Make H.P. 1.5
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: .5 M.

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1996/04/18	12:00 AM	29.87 m

Method of Water Removal

Type Air
Removal Rate 136.38 L/min
Depth Withdrawn From 53.95 m

If water removal period was < 2 hours, explain why

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
	0:00	54.00
	1:00	40.55
	2:00	34.25
	3:00	31.70
	4:00	30.88
	6:00	30.38
	8:00	30.24
	10:00	30.09
	14:00	30.02
	16:00	29.98

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
SCHMIDT DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

NATURAL RESOURCES CONSERVATION BOARD

2022 Leak Detection Monitoring Review Report
Westcoast Holsteins Ltd.
Authorization RA05006
NW 35-42-25 W4M

July 20, 2023

Prepared by:

Scott Cunningham

Scott (Sheila) Cunningham,
P.Eng., P.Ag.

Introduction

Westcoast Holsteins Ltd., located at NW 35-42-25 W4M (the Site) within Ponoka County, is a dairy confined feeding operation. Annual leak detection monitoring is required for the liquid earthen manure storage facility "EMS" or "facility" (as per Approval RA05006). The Site consists of an EMS (two cell) and other facilities associated with the operation (e.g. barns etc.). The EMS is located to the north of the dairy barns (Figure 1).

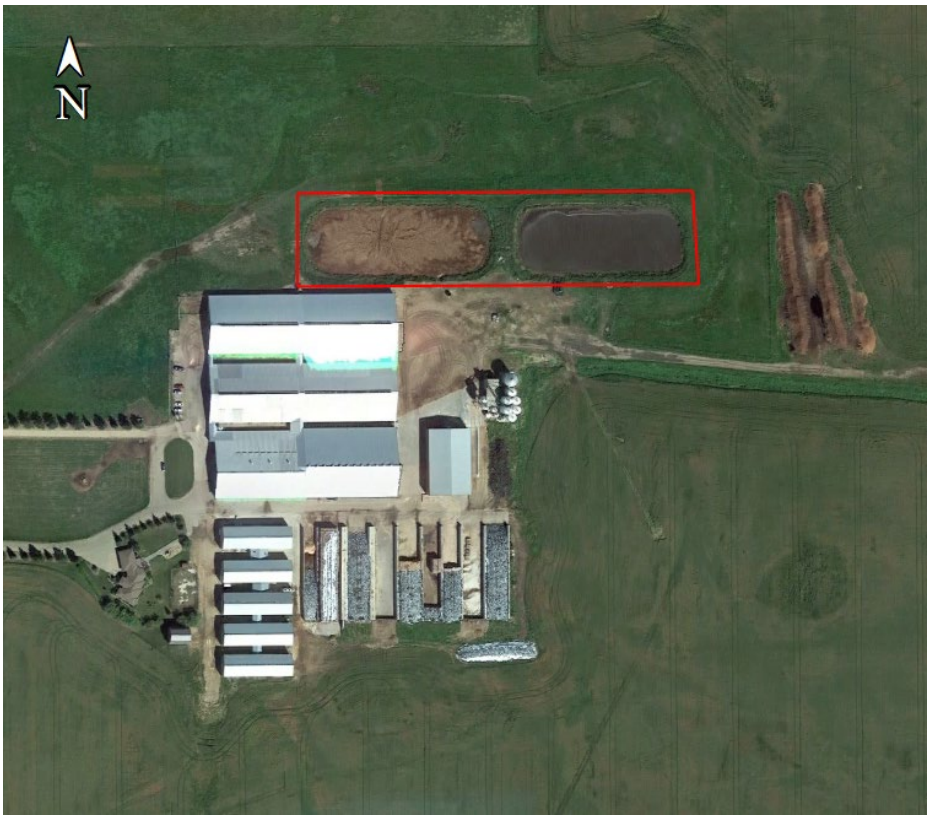


Figure 1. EMS at Westcoast Holsteins Ltd. The EMS is identified in the red box.[1]

Previous Investigations

A leak detection monitoring system consisting of three groundwater monitoring wells was installed at the Site, with the monitoring wells requiring annual monitoring; groundwater monitoring wells were replaced in 2018 (Figure 2). The primary purpose of the leak detection monitoring system is to monitor the EMS.

Samples from monitoring well 18MW03 were obtained for chemical analysis in 2014, 2020 and 2021. A sample was obtained from monitoring well 18MW01 in 2021. Monitoring wells at Site have otherwise been reported as 'dry' at the time of sampling events.

Previous investigations conducted at the Site include: 2019 and 2020 electromagnetic

[1]Google Earth image (2015)

(EM) surveys (EM31 and EM38) of the Site and relative elevation measurements of the monitoring wells. Hydraulic conductivity testing has not been completed at Site.

Figure 2. Monitoring well locations surrounding the EMS at the Site[2].

All previous results indicate elevated concentrations of chloride and nitrate-N compared to what may be typically expected for natural shallow groundwater in this area (Appendix A).

File Review

Because of a April 2023 change in the Sci-tech staff member responsible for reviewing this file, a file review was completed. The file review included site geology, hydrogeology, environmental risk screening tool (ERST) ratings, and previous sci-tech documentation.

Summary
The 2018 borehole logs at the edges of the EMS all terminate (due to auger refusal) in weathered sandstone at depths below grade of 5.0 to 5.7m.

The EMS depth is indicated as 6.1m in the ERST's site information documents. There is no information available on the EMS construction regarding a liner that protects groundwater.

There are several water wells on the NW35 and SW35. Water well ids 2063029, 94171, and 285473 (Appendix B) on NW35 and SW35 indicate that sandstone starts at 2.0m to 4.0m below ground level. Bottom of sandstone (also bottom of hole) ranges from 32.61m to 54.25m. In

[2]Google Earth Image (2015)

these same wells, lower portion(s) of this sandstone are water bearing and are the zone where the water well is completed. Static water levels in these wells (at time of drilling) range from 24.69m to 29.87m below ground level.

Description

The liquid manure in the EMS appears to sit directly on the dry sandstone. There is no known liner or protective layer in the EMS. In at least 3 water wells on the same half section (see Appendix B), the dry sandstone becomes wet at a certain depth. These 3 water wells are completed into and source their water from the wet sandstone.

Graphic

Based the locations and depths listed above, and the assumptions below, a cross section graphic has been created for the site (Figure 3).

Assumptions:

Surrounding ground elevation at site is constant at 850m.

Borehole auger refusal at 6m depth, which is the top of the sandstone (elevation of 850 – 6 = 844m)

EMS depth at 6m (elevation of 850 – 6 = 844m)

Dry sandstone bottom/top of water bearing is 27m, average of static water level range of 24.69m to 29.87m. (elevation of 850 – 27 = 823m)

Wet sandstone bottom is 43m, average of bottom of sandstone range of 32.61m to 54.25m (elevation of 850m – 43 = 807m).

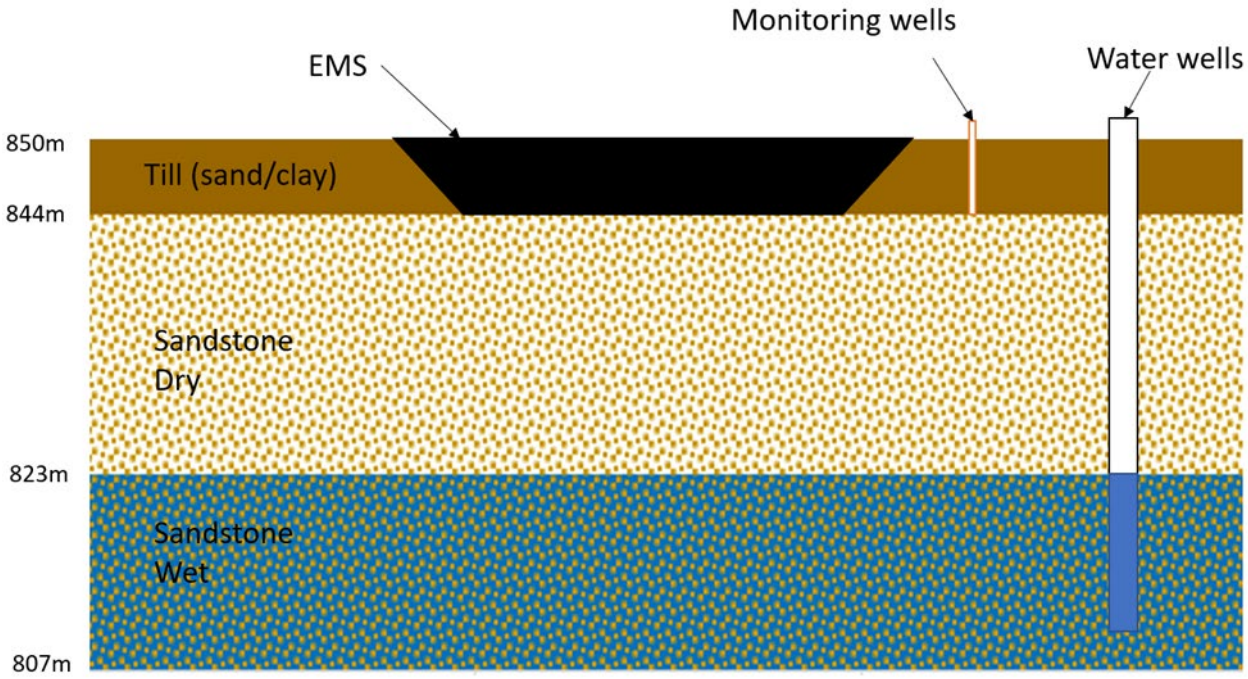


Figure 3. Cross section of the EMS at NW 35-042-25 W4.

Current Investigation

Samples from all three monitoring wells were collected on July 13, 2022. The depth to groundwater was recorded prior to sample collection and groundwater samples were collected using bailers. Samples were analyzed for indicator parameters (Appendix C). The condition of the EMS was reported to be at approximately 75% capacity. Summary of current and historical monitoring data for monitoring wells, when sampled, are in Appendix A, attached.

The topography immediately near the EMS suggests the shallow, horizontal groundwater flow direction near the EMS to be towards the north.

The local topography (within 1.6 km) of the EMS is dominated by the headwaters of both Chain Lakes and the Battle River, located approximately 1.6 km east of the EMS and at approximately 30m lower elevation.

Monitoring Results Discussion

Chloride values in 2022 range from 381 mg/L to 841 mg/L, all higher than the aesthetic objective of 250 mg/L in the Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada 2022)[3]. In addition, these chloride values are above what would normally be expected in shallow groundwater with the geology in this area.

Nitrate – N values in 2022 range from 61.4 mg/L to 348 mg/L, all higher than the GCDWQ maximum acceptable concentration (MAC) of 10 mg/L. In addition, these nitrate – N values are above what would normally be expected in shallow groundwater with the geology in this area.

Analytical data from all sampling events are indicative of possible impact from manure constituents (e.g. elevated concentrations of chloride, nitrate-N) on shallow groundwater.

[3] Health Canada (2022). Guidelines for Canadian Drinking Water Quality – Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

Appendix A. Leak Detection Monitoring Results

Parameters (mg/L unless otherwise stated)	MW-01		MW-02	MW-03			
	2021	2022	2022	2014	2020	2021	2022
Groundwater depth from surface (m)	5.21	2.59	4.46	---	6.21*	5.49	3.79
Chloride	519	381	540	296	974	939	841
Nitrate-N	85.8	61.4	164	9.04	211	340	348
Nitrite-N	<0.02	<0.01	<0.01	0.11	0.25	<0.05	<0.01
Ammonia-N	---	0.39	0.63	---	0.14	---	0.89
Total kjeldahl nitrogen	6.9	---	---	---	---	21	---
Phosphate	---	---	---	<0.10	---	---	---
Dissolved phosphorus	<0.05	0.145	0.030	---	0.07	<0.05	0.053
Calcium	420	292	518	241	---	642	678
Magnesium	149	89.0	129	85.3	---	214	221
Sodium	172	61.3	93.6	60.5	---	417	487
Potassium	12	11.2	4.3	14.5	9.4	7.2	6.0
Iron	<0.05	<0.1	<0.1	0.02	---	<0.05	<0.1
Sulphate	130	55.2	98.6	58	---	423	384
Hydroxide	<5	<5	<5	<0.5	---	<5	<5
Carbonate	<6	<5	<5	<1.5	---	<6	<5
Bicarbonate	1070	472	649	776	---	796	886
P-Alkalinity	<5	<5	<5	<2	---	<5	<5
Total alkalinity	878	387	532	636	---	653	726
Total dissolved solids	1930	1390	2430	1183	---	3030	4590
pH (-)	7.0	6.44	6.34	7.6	6.9	6.7	6.81
Conductivity (µS/cm)	3600	2430	4040	2000	5930	6050	6880

*measured from top of casing

Appendix B. Water well drilling report ids 2063029, 94171, and 285473

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 2063029
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2009/09/30

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HARBRIDGE, LEWIS	RR 1 SITE 1 BOX 11	PONOKA	ALBERTA	CA	T4J 1R1

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	5	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.658867 Longitude -113.505767
How Location Obtained
Hand held autonomous GPS 20-30m

Elevation 840.00 m
How Elevation Obtained
Hand held autonomous GPS 20-30m

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
3.66		Brown Clay
32.92		Brown Fine Grained Sandstone
42.67		Gray Fine Grained Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 45.46 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
2009/09/16	45.46	27.61

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
42.67 m	42.67 m	2009/09/16	2009/09/16

Borehole

Diameter (cm)	From (m)	To (m)
22.23	0.00	6.10
15.24	6.10	7.62
13.02	7.62	42.67

Surface Casing (if applicable)
Plastic
Size OD : 15.24 cm
Wall Thickness : 0.991 cm
Bottom at : 7.62 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.544 cm
Top at : 6.10 m
Bottom at : 42.67 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
36.58	42.67	0.635		20.32

Perforated by Saw

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 m to 6.10 m
Amount

Other Seals

Type	At (m)
Driven	7.62

Screen Type
Size OD : cm

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

Attachment
Top Fittings
Bottom Fittings

Pack
Type Unknown
Grain Size
Amount Unknown

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
WILLIAM M BROWN

Certification No
VA4906

Company Name
BILL'S WATERWELL SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2009/09/17

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 2063029
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 2009/09/30

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HARBRIDGE, LEWIS	RR 1 SITE 1 BOX 11	PONOKA	ALBERTA	CA	T4J 1R1

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	5	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.658867 Longitude -113.505767
How Location Obtained
Hand held autonomous GPS 20-30m

Elevation 840.00 m
How Elevation Obtained
Hand held autonomous GPS 20-30m

Additional Information

Measurement in Metric

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

Recommended Pump Rate 45.46 L/min
Recommended Pump Intake Depth (From TOC) 36.58 m
Pump Installed
Type
Depth m
Make
H.P.
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

12' - 108' ALSO WITH GRAY 22 HARD LAYERS, SEAL ALSO CUTTINGS,

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
2009/09/16	3:00 PM	27.61 m

Method of Water Removal

Type Air
Removal Rate 45.46 L/min
Depth Withdrawn From 42.67 m

If water removal period was < 2 hours, explain why

MEASUREMENTS FROM +5'

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
27.61	0:00	42.67
	1:00	35.23
	2:00	32.21
	3:00	30.58
	4:00	29.87
	5:00	29.57
	6:00	29.44
	7:00	29.36
	8:00	29.34
	9:00	29.31
	10:00	29.31

Water Diverted for Drilling

Water Source	Amount Taken		Diversion Date & Time
WELL @ SW-4-40-23-4	5455.31	L	2009/09/15 4:00 PM

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
WILLIAM M BROWN

Certification No
VA4906

Company Name
BILL'S WATERWELL SERVICES LTD.

Copy of Well report provided to owner
Yes

Date approval holder signed
2009/09/17

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 94171
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HOWELL, D.	PONOKA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.665846 Longitude -113.504252
How Location Obtained
Map

Elevation 847.34 m
How Elevation Obtained
Survey-Air

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Domestic

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
2.13		Sand
3.66		Clay
32.61		Soft Sandstone & Rocks

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 0.00 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1964/04/25	18.18	24.69

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
32.61 m			1964/04/25

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	32.61

Surface Casing (if applicable)

Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Bottom at : 0.00 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

Placed from 0.00 m to 0.00 m
Amount
Other Seals

Type	At (m)

Screen Type

Size OD : 0.00 cm

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

Attachment
Top Fittings
Bottom Fittings

Pack

Type
Grain Size
Amount

Contractor Certification

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

Certification No
1

Company Name
DICKAU HOWARD F

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 94171
GoA Well Tag No.
Drilling Company Well ID
Date Report Received
GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
HOWELL, D.	PONOKA				

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	13	35	42	25	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.665846 Longitude -113.504252
How Location Obtained: Map

Elevation 847.34 m
How Elevation Obtained: Survey-Air

Additional Information

Measurement in Metric

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

Recommended Pump Rate: 0.00 L/min
Recommended Pump Intake Depth (From TOC): 0.00 m
Pump Installed: Depth: m
Type: Make: H.P.:
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
DRILLER REPORTS HARD & CLEAR WATER.

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1964/04/25	12:00 AM	24.69 m

Depth to water level

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

Method of Water Removal
Type: Pump
Removal Rate: 18.18 L/min
Depth Withdrawn From: 0.00 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
DICKAU HOWARD F

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

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

View in Imperial | Export to Excel

GOWN ID

GIC Well ID 285473
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1996/08/23

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
WOODSPAN DEV LTD	2 8337 YOUNG RED, CHILLIWACK B.C.				V2P 4N8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	35	42	25	4				MIDDLE OF DRIVEWAY WEST OF POWER TRANSFORMER

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.656806 Longitude -113.501274
How Location Obtained

Elevation m
How Elevation Obtained

Drilling Information

Method of Drilling
Rotary

Proposed Well Use
Stock

Type of Work
New Well

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
3.96		Brown Till & Clay
28.65		Brown Fine Grained Sandstone
54.25		Gray Medium Grained Sandstone

Yield Test Summary

Measurement in Metric

Recommended Pump Rate 90.92 L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)
1996/04/18	136.38	29.87

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
54.25 m		1996/04/18	1996/04/18

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	54.25

Surface Casing (if applicable)
Steel
Size OD : 14.12 cm
Wall Thickness : 0.478 cm
Bottom at : 30.48 m

Well Casing/Liner
Plastic
Size OD : 11.43 cm
Wall Thickness : 0.602 cm
Top at : 29.87 m
Bottom at : 54.25 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
46.63	54.25	0.635		30.48

Perforated by Saw

Annular Seal Cuttings
Placed from 0.00 m to 30.48 m
Amount

Other Seals

Type	At (m)

Screen Type
Size OD : 0.00 cm

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

Attachment
Top Fittings
Bottom Fittings

Pack
Type
Grain Size
Amount

Contractor Certification

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

Certification No
1

Company Name
SCHMIDT DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

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

GOWN ID

GIC Well ID 285473
GoA Well Tag No.
Drilling Company Well ID
Date Report Received 1996/08/23

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
WOODSPAN DEV LTD	2 8337 YOUNG RED, CHILLIWACK B.C.				V2P 4N8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SW	35	42	25	4				MIDDLE OF DRIVEWAY WEST OF POWER TRANSFORMER

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 52.656806 Longitude -113.501274
How Location Obtained

Elevation m
How Elevation 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 90.92 L/min
Recommended Pump Intake Depth (From TOC) 42.67 m
Pump Installed Yes Depth m
Type SUB Make H.P. 1.5
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: .5 M.

Yield Test

Taken From Ground Level
Measurement in Metric

Test Date	Start Time	Static Water Level
1996/04/18	12:00 AM	29.87 m

Method of Water Removal

Type Air
Removal Rate 136.38 L/min
Depth Withdrawn From 53.95 m

If water removal period was < 2 hours, explain why

Depth to water level

Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)
	0:00	54.00
	1:00	40.55
	2:00	34.25
	3:00	31.70
	4:00	30.88
	6:00	30.38
	8:00	30.24
	10:00	30.09
	14:00	30.02
	16:00	29.98

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
SCHMIDT DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

Appendix C. 2022 Leakage Detection Monitoring Results

EMS Leak Detection Program

Registration RA05006
NW¼-35-042-25-W4M

Ponoka County, Alberta

EMS Leak Detection Program
Registration RA05006
NW¼-35-042-25-W4M
Ponoka County, Alberta

Prepared For: Jamison Ward
Westcoast Holsteins Ltd.

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

Report Date: August 4, 2022

Project Number: 2207-42875

Private and Confidential

Table of Contents

Appendices

A. Site Location
B. Site Plan
C. Certificate of Analysis

1.0 Introduction and Scope of Work

Envirowest Engineering (Envirowest) was retained by Jamison Ward of Westcoast Holsteins Ltd. to sample and monitor groundwater as part of a leak detection program for an earthen manure storage (EMS) facility. The lagoon is associated with a 724 head dairy operation located in Ponoka County on NW-35-042-25-W4M.

The groundwater monitoring leak detection program has been undertaken in accordance with Registration RA05006 issued by the NRCB in April 2005.

2.0 Site Description

The subject site is located approximately 3.5 kilometers east of Ponoka, Alberta. The site is an established operation for a 724 head dairy. The existing two-stage liquid EMS is located north and northeast of the barns. Lagoons were estimated to be approximately 3/4 full at the time of the inspection. Monitoring wells were all in adequate condition at the time of the inspection.

The topography of the site and surrounding area is level. Surface runoff flows away from the EMS towards surrounding cropland.

The uppermost bedrock formation is the Paskapoo Formation which consists of grey to greenish grey, thick bedded calcareous, cherty sandstone; grey and green siltstone and mudstone; minor conglomerate, thin limestone, coal and tuff beds, and is non marine in nature (Prior, 2013).

The quaternary geology of the site is that of a draped moraine, which consists of till of even thickness with minor amounts of water-sorted material and local bedrock exposures. The topography is flat to undulating, reflecting the topography of the underlying bedrock (Shetsen, 1990).

3.0 Leak Detection Monitoring Program Methodology

A site map with approximate well locations is attached. There are three groundwater monitoring wells surrounding the manure storage lagoons, as shown on Figure 2.0. Envirowest drilled three boreholes with a truck-mounted rotary auger on July 30, 2018. The boreholes were completed between depths of 5.2 and 5.8 meters below ground surface (mbgs) and each borehole was completed as a groundwater monitoring well.

When assessing groundwater quality, a sample of water is collected from each well. The samples are gathered in individual dedicated point source bailers and stored in laboratory supplied plastic bottles. Groundwater samples to be analyzed for some nitrogen species are preserved with H_2SO_4. The groundwater level in each well is determined prior to sample collection. The samples are then subjected to laboratory analysis. The analysis included pH, electrical conductivity, dissolved potassium, dissolved phosphorus, chloride, nitrate as nitrogen (nitrate-N), nitrite as nitrogen (nitrite-N), and ammonia as nitrogen (ammonia-N).

Nitrate, nitrite, and chloride concentrations are components of animal manure and are considered to be good indicators of leakage from a manure storage lagoon. These components move more easily through the soil than do other manure constituents such as phosphates. Ammonia is changed over time to nitrates and nitrites through a nitrification process. These latter components would be indicators of a past leak or contaminant source or may occur at greater distances from the lagoon.

4.0 Groundwater Analysis Results

Depth to groundwater was measured for each monitoring well, and samples were taken from all three wells on July 13, 2022. The results of the laboratory analysis are contained in Table 1. The previous sampling event completed by Envirowest in 2020 yielded results solely from monitoring well 18MW03, as the other two wells had insufficient water for a sample at the time. The data from 2020 is also included in Table 1.

Table 1:
Groundwater Analysis Results

Parameter	18MW01	18MW02	18MW03	
Date	**July 13, 2022**	**July 13, 2022**	**May 28, 2020**	**July 13, 2022**
Level (mbgs)	2.59	4.46	6.21[1]	3.79
Field Temperature (°C)	9.2	10.3	-	8.1
Field Electrical Conductivity (uS/cm)	2990	4440	-	6000
Field pH	8.03	7.42	-	7.38
pH (at 15°C)	6.44	6.34	6.9	6.81
Electrical Conductivity (uS/cm)	2430	4040	5930	6880
Chloride (mg/L)	381	540	974.2	841
Dissolved Potassium (mg/L)	11.2	4.3	9.4	6.0
Dissolved Phosphorus (mg/L)	0.145	0.030	0.065	0.053
Nitrate-N (mg/L)	61.4	164	210.8	348
Nitrite-N (mg/L)	<0.01	<0.01	0.245	<0.01
Total Ammonia-N (mg/L)	0.39	0.63	0.14	0.89
Ammonia-N (unionized) (mg/L)	0.00030	0.00038	<0.01	0.00158
Ammonium-N (mg/L)*	0.39	0.63	0.13	0.89

[1] Measured from top of casing
*Calculated as Ammonium-N (mg/L) = Total Ammonia-N (mg/L) – unionized Ammonia-N (mg/L)

Groundwater monitoring results for 18MW03 indicate that chloride, dissolved potassium, dissolved phosphorus, and nitrite-N have decreased since the previous sampling event. Electrical conductivity, nitrate-N, total ammonia-N, ammonia-N, and ammonium-N have increased.

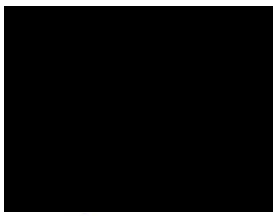
5.0 Closure

Envirowest Engineering is pleased to submit the report to Jamison Ward of Westcoast Holsteins Ltd. 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,



August 4, 2022

Prepared by:
Leah Predy P.Ag.
Envirowest Engineering

Reviewed by:
Emily J. Low, P.Eng.
Envirowest Engineering

PERMIT TO PRACTICE
2206165 ALBERTA LTD.
RM SIGNATURE: _____
RM APEGA ID #: 110373
DATE: August 4, 2022
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

6.0 Qualifications of Assessors

Ms. Emily Low, B.Sc., P.Eng, is an Environmental Engineer with Envirowest Engineering and has approximately 10 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) and Ontario (Professional Engineers of Ontario).

Leah Predy, B.A., B.Sc., P.Ag., is a Professional Agrologist with Envirowest Engineering and has approximately 3 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).

7.0 References

Prior, G.J., Hathway, B., Glombick, P.M., Pana, D.I., Banks, C.J., Hay, D.C., Weiss, J.A. (2013). Bedrock Geology of Alberta (Map 600). Edmonton, AB: Alberta Research Council, Natural Resources Division, Terrain Sciences Department.

Shetsen, I. (1990). Quaternary Geology, Central Alberta. Edmonton, AB: Alberta Research Council, Natural Resources Division, Terrain Sciences Department.

Appendix A

Site Location

ENVIROWEST ENGINEERING

Title: Site Location
Site and Soil Assessment
NW¼-Sec.35-Twp.42-Rge.25-W4M
Ponoka County, Alberta

Project No: 2004-42875

Date: June 9, 2020

Prepared by: L. Predy

Figure No.: 1.0

Appendix B

Site Plan

ENVIROWEST ENGINEERING

Title:
Monitoring Well Locations
Site and Soil Assessment
NW¼-Sec.35-Twp.042-Rge.25-W4M
Ponoka County, Alberta

Project No: 2004-42875	**Date:** June 9, 2020
Scale: 1:1600	**Prepared By:** L. Predy

Figure: **2.0**

Appendix C

Certificate 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: 42875

AGAT WORK ORDER: 22R921434

WATER ANALYSIS REVIEWED BY: Loan Nguyen, Senior Analyst

DATE REPORTED: Jul 27, 2022

PAGES (INCLUDING COVER): 10

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.*

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

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Certificate of Analysis

AGAT WORK ORDER: 22R921434

PROJECT: 42875

CLIENT NAME: ENVIROWEST

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

Water Analysis - Ammonia Unionized (No Field Data)

DATE RECEIVED: 2022-07-13

DATE REPORTED: 2022-07-27

		SAMPLE DESCRIPTION:		18MW01		18MW02	18MW03
		SAMPLE TYPE:		Water		Water	Water
		DATE SAMPLED:		2022-07-13		2022-07-13	2022-07-13
Parameter	Unit	G / S	RDL	4101196	RDL	4101260	4101261
Ammonia, Total (as N)	mg/L		0.02	0.39	0.08	0.63	0.89
pH (15 C)	pH Units		0.02	6.44	0.02	6.34	6.81
Ammonia, Unionized (as N) @ 15 C	mg/L			0.00030		0.00038	0.00158

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

4101196-4101261 Ammonia, Unionized is a calculated parameter. The calculated parameter is non-accredited. The calculation is from “Wastewater Systems Effluent Regulations”, SOR/2012-139, Minister of Justice, Sept 2012.

Analysis performed at AGAT Calgary (unless marked by *)

Certified By: [redacted]

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 22R921434

PROJECT: 42875

CLIENT NAME: ENVIROWEST

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

Water Analysis - Total Dissolved Phosphorus

DATE RECEIVED: 2022-07-13

DATE REPORTED: 2022-07-27

		SAMPLE DESCRIPTION:		18MW01	18MW02	18MW03
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2022-07-13	2022-07-13	2022-07-13
Parameter	Unit	G / S	RDL	4101196	4101260	4101261
Total Dissolved Phosphorus	mg/L		0.005	0.145	0.030	0.053

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

Analysis performed at AGAT Calgary (unless marked by *)

Certified By:

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 22R921434
PROJECT: 42875

CLIENT NAME: ENVIROWEST
SAMPLING SITE:

ATTENTION TO: Emily Low
SAMPLED BY:

Water Package - Routine Chemistry Water Analysis

DATE RECEIVED: 2022-07-13

DATE REPORTED: 2022-07-27

		SAMPLE DESCRIPTION:		18MW01	18MW02		18MW03
		SAMPLE TYPE:		Water	Water		Water
		DATE SAMPLED:		2022-07-13	2022-07-13		2022-07-13
Parameter	Unit	G / S	RDL	4101196	4101260	RDL	4101261
pH	pH Units	7.0-10.5	N/A	6.99	6.92	N/A	7.41
p - Alkalinity (as CaCO3)	mg/L		5	<5	<5	5	<5
T - Alkalinity (as CaCO3)	mg/L		5	387	532	5	726
Bicarbonate	mg/L		5	472	649	5	886
Carbonate	mg/L		5	<5	<5	5	<5
Hydroxide	mg/L		5	<5	<5	5	<5
Electrical Conductivity	uS/cm		5	2430	4040	5	6880
Chloride	mg/L	(250)	1.0	381	540	1.5	841
Fluoride	mg/L	1.5	0.01	0.11	0.29	0.03	0.32
Nitrate	mg/L	45	0.5	272	725	5	1540
Nitrate-N	mg/L	10	0.02	61.4	164	0.02	348
Nitrite	mg/L	3	0.05	<0.05	<0.05	0.10	<0.10
Nitrite-N	mg/L	1	0.01	<0.01	<0.01	0.01	<0.01
Nitrate+Nitrite - Nitrogen	mg/L		0.02	61.4	164	0.02	348
Sulfate	mg/L	(500)	1.0	55.2	98.6	1.0	384
Dissolved Calcium	mg/L		0.3	292	518	0.3	678
Dissolved Magnesium	mg/L		0.2	89.0	129	0.2	221
Dissolved Sodium	mg/L	(200)	0.6	61.3	93.6	0.6	487
Dissolved Potassium	mg/L		0.6	11.2	4.3	0.6	6.0
Dissolved Iron	mg/L	(0.3)	0.1	<0.1	<0.1	0.1	<0.1
Dissolved Manganese	mg/L	0.12 (0.02)	0.005	1.76	3.16	0.005	1.46
Sodium Adsorption Ratio				0.81	0.95		4.15
Calculated TDS	mg/L		0.6	1390	2430	0.6	4590
Hardness	mg CaCO3/L		0.5	1100	1820	0.5	2600
Ion Balance	%		1	104	103	1	103
Lab Filtration Performed				COMPLETE	COMPLETE		COMPLETE

Certified By: [redacted]

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 22R921434
PROJECT: 42875

CLIENT NAME: ENVIROWEST
SAMPLING SITE:

ATTENTION TO: Emily Low
SAMPLED BY:

Water Package - Routine Chemistry Water Analysis

DATE RECEIVED: 2022-07-13

DATE REPORTED: 2022-07-27

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to 2020 Canadian Drinking Water Quality MAC (AO)
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

4101196-4101261 < - Values refer to Report Detection Limits.
SAR is a calculated parameter. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.
Ion Balance is a calculated parameter. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
Hardness is a calculated parameter. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
Calculated TDS is a calculated parameter. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
Note: Result(NO3) was verified by repeat analysis

Analysis performed at AGAT Calgary (unless marked by *)

Certified By: [redacted]

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FAX (403)735-2771
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: ENVIROWEST

AGAT WORK ORDER: 22R921434

PROJECT: 42875

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jul 27, 2022			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
Water Package - Routine Chemistry Water Analysis															
pH	4101196	4101196	6.99	7.14	2.1%	N/A	102%	90%	110%						
p - Alkalinity (as CaCO3)	4101196	4101196	<5	<5	NA	< 5	NA	80%	120%						
T - Alkalinity (as CaCO3)	4101196	4101196	387	386	0.2%	< 5	91%	80%	120%						
Bicarbonate	4101196	4101196	472	471	0.2%	< 5									
Carbonate	4101196	4101196	<5	<5	NA	< 5									
Hydroxide	4101196	4101196	<5	<5	NA	< 5									
Electrical Conductivity	4101196	4101196	2430	2430	0.0%	< 5	100%	90%	110%						
Chloride	4101257		17.2	17.6	2.2%	< 1.0	93%	70%	130%	87%	80%	120%	93%	70%	130%
Fluoride	4101257		0.28	0.28	NA	< 0.01	94%	70%	130%	92%	80%	120%	100%	70%	130%
Nitrate	4101257		<0.5	<0.5	NA	< 0.5	96%	70%	130%	93%	80%	120%	98%	70%	130%
Nitrite	4101257		<0.20	<0.20	NA	< 0.05	96%	70%	130%	92%	80%	120%	95%	70%	130%
Sulfate	4101257		357	365	2.1%	< 1.0	93%	70%	130%	91%	80%	120%	NA	70%	130%
Dissolved Calcium	4085067		97.3	96.0	1.3%	< 0.3	104%	70%	130%	119%	80%	120%	NA	70%	130%
Dissolved Magnesium	4085067		23.4	23.1	1.0%	< 0.2	103%	70%	130%	101%	80%	120%	NA	70%	130%
Dissolved Sodium	4085067		15.2	15.0	1.2%	< 0.6	116%	70%	130%	101%	80%	120%	NA	70%	130%
Dissolved Potassium	4085067		2.8	2.7	NA	< 0.6	98%	70%	130%	97%	80%	120%	99%	70%	130%
Dissolved Iron	4085067		0.1	0.1	NA	< 0.1	105%	70%	130%	110%	80%	120%	105%	70%	130%
Dissolved Manganese	4085067		0.472	0.467	1.1%	< 0.005	104%	70%	130%	108%	80%	120%	NA	70%	130%

Comments: Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.
Duplicate NA: results are less than 5X the RDL and RDP will not be calculated.

pH has been analyzed past the recommended holding time of 15 minutes from sampling (field measurement ideal if more accurate data required)

Nitrate and Nitrite: The regulatory hold time for the analysis of nitrate and/or nitrite in water is 72 hours.

Water Analysis - Ammonia Unionized (No Field Data)															
Ammonia, Total (as N)	4000616		0.13	0.14	1.5%	< 0.02	98%	70%	130%	101%	80%	120%	97%	70%	130%

Comments: Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.
Duplicate NA: results are less than 5X the RDL and RDP will not be calculated.

Water Analysis - Total Dissolved Phosphorus															
Total Dissolved Phosphorus	4101196	4101196	0.145	0.140	3.5%	< 0.005	109%	70%	130%	97%	80%	120%	98%	70%	130%

Comments: Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.
Duplicate NA: results are less than 5X the RDL and RDP will not be calculated.

Certified By: [redacted]

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FAX (403)735-2771
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Method Summary

CLIENT NAME: ENVIROWEST

AGAT WORK ORDER: 22R921434

PROJECT: 42875

ATTENTION TO: Emily Low

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Ammonia, Total (as N)	INST 0340	SM 4500-NH3 G	CONTINUOUS FLOW ANALYZER
pH (15 C)	INST 0101, INST 0104	SM 4500 H+	PH METER
Ammonia, Unionized (as N) @ 15 C		Wastewater Systems, Canada, 2012	CALCULATION
Total Dissolved Phosphorus	INST 0530	SM 4500P-F	SPECTROPHOTOMETER
pH	INST 0101, INST 0104	SM 4500 H+	PH METER
p - Alkalinity (as CaCO3)	INST-0100, INST-0101	SM 2320 B	TITRATION
T - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
Bicarbonate	INST 0101	SM 2320 B	PC TITRATE
Carbonate	INST 0101	SM 2320 B	PC TITRATE
Hydroxide	INST 0101	SM 2320 B	PC TITRATE
Electrical Conductivity	INST 0101, INST 0120	SM 2510 B	CONDUCTIVITY METER
Chloride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate-N	INST 0150	SM 4110 B	CALCULATION
Nitrite	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrite-N	INST 0150	SM 4110 B	CALCULATION
Nitrate+Nitrite - Nitrogen	INST 0150	SM 4110 B	CALCULATION
Sulfate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Dissolved Calcium	INST 0140	SM 3120B – R	ICP/OES
Dissolved Magnesium	INST 0140	SM 3120B – R	ICP/OES
Dissolved Sodium	INST 0140	SM 3120B – R	ICP/OES
Dissolved Potassium	INST 0140	SM 3120B – R	ICP/OES
Dissolved Iron	INST 0140	SM 3120B – R	ICP/OES
Dissolved Manganese	INST 0140	SM 3120B – R	ICP/OES
Sodium Adsorption Ratio		CARTER & GREGORICH 2007	CALCULATION
Calculated TDS		SM 1030E	CALCULATION
Hardness		SM 2340 B	CALCULATION
Ion Balance		SM 1030E	CALCULATION
Lab Filtration Performed			N/A

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories
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Calgary, Alberta T2E 7P7
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webearth.agatlabs.com

Laboratory Use Only
Arrival Temperature: 12°C
Cooler Quantity: 1
Custody Seal Intact: ☐ Yes ☐ No ☒ N/A
AGAT Job Number: Z2R921934

Chain of Custody Record

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

Report Information
Company: Enviroweast Engineering
Contact: Emily Low
Address:
Phone: 403-783-8229

Project Information
Client Project #: 42875
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 Low
Email: elow@enviroweastengineering.ca
2. Name:
Email:
3. Name:
Email:

Requirements *(Selection may impact detection limits)*

CCME	AB Tier 1	Alberta Surface Water
☐ Agricultural	☐ Agricultural	☐ Chronic
☐ Industrial	☐ Industrial	☐ Acute
☐ Residential/Park	☐ Residential/Park	☐ SK Notice of Site Cond.
☐ Commercial	☐ Commercial	☐ Drinking Water
☐ FWAL	☐ Natural Area	☐ 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:

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:

LABORATORY USE (LAB ID #)	SAMPLE IDENTIFICATION	DEPTH	DATE/TIME SAMPLED	SAMPLE MATRIX	COMMENTS	# OF CONTAINERS: VIALS / JARS	# OF CONTAINERS: BAGS	# OF CONTAINERS: BOTTLES
1	18MW01		July 13/22	H_2O				4
2	18MW02		↓	↓				4
3	18MW03		↓	↓				4
4								
5								
6								
7								
8								
9								
10								

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 ☐ Cr^{6+}	Water Metals: ☐ Dissolved ☐ Total ☐ Hg ☐ Cr^{6+}	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)
												X X Indicator Package					

Samples Relinquished By (Print Name): Emily Low [redacted]
Date/Time: July 13/22/12:00
Samples Relinquished By (Print Name):
Date/Time:
Samples Relinquished By (Print Name and Sign):
Date/Time:
Date/Time: July 13/22 12:15PM
Date/Time: 7/13/22
Date/Time:

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

Page 1 of 1
N°: AB 168160

Document ID: DIV-50-1507.007
Date Revised: Oct 14, 2021

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: Envirowest

Courier: _____ Prepaid Collect

Waybill# _____

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

If multiple sites were submitted at once: Yes (No)

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr Reg Other_____

Cooler Quantity: 1

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: 7/15/22.

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) 4 + 4 + 8 = 12 °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: 22R921434

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)

Date issued: March 11, 2020
Document ID: SR-9505.004

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM – BRANCH RECEIPT

Sending From Branch: Environest

EDM ☐ GP ☐ FN ☐ FM ☐ RD ☑ VAN ☐ LYD ☐ FSJ ☐ EST ☐ SASK ☐ Other: _____

Company/Consultant: _____

TAT: <24hr ☐ 24-48hr ☐ 48-72hr ☐ Reg ☑ Other _____ Cooler Quantity: _____

TIME SENSITIVE ISSUES:

Earliest Date Sampled: _____ ALREADY EXCEEDED? YES ☐ NO ☐

Microbiology: Test: _____ Expiry: _____

Hydrocarbons: Test: _____ Expiry: _____

Are samples received >5 days after sampling: YES ☐ NO ☐

(TEMPERATURE MUST BE MAINTAINED IF RECEIVED <10 DEGREES C)

3 temperatures of samples* and average of each cooler (taken on jars only): NA (only bags on coolers)

(1) 15.9 + 14.1 + ___ = 14.6 °C (2) ___ + ___ + ___ = ___ °C (3) ___ + ___ + ___ = ___ °C (4) ___ + ___ + ___ = ___ °C

Additional integrity issues (note here and on COC next to the sample ID):

_____

SAMPLE INTEGRITY ISSUES:

Legal Samples: YES ☐ NO ☐ Custody Tape Sealed: YES ☐ NO ☐

International Samples: YES ☐ NO ☐

Coolant Used: Icepack ☐ Bagged Ice ☐ Free Ice ☐ Free Water ☐ NONE ☐

Additional Comments: _____