Rimrock Renewables Ltd. (Application No. 001-484778)

Environmental Protection and Enhancement Act
Supplemental Information Request #2 (dated March 23, 2023)

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Date Submitted:
2023-07-17

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1 Introduction

EXP Services Inc. (EXP) was retained by Rimrock Renewables Ltd. (Rimrock) to compile an Industrial Approval Application ("the Application") under the *Environmental Protection and Enhancement Act* (EPEA) for an approval to construct, operate and reclaim the proposed Rimrock Biodigester Facility (the Project). The Application was submitted to Alberta Environment and Protected Areas (AEPA) on June 9, 2022 (Application No. 001-484778).

On November 28, 2022, Rimrock received a Supplemental Information Request (SIR #1) from AEPA requesting supplemental information required to proceed with review of the Application. Rimrock's response was submitted to AEPA on February 13, 2023.

Subsequently, on March 23, 2023, Rimrock received an SIR #2 from AEPA requesting supplemental information required to continue technical review of the Application. Rimrock's responses to SIR #2 are presented in Sections 2 through 10 (SIR No. 1 – SIR No. 9) of this report, along with supporting information provided as Attachments A – L.

The following Sections 1.1 – 1.5 provide important information and key context for Rimrock's responses to SIR #2.

1.1 Project Setting

The proposed Project will be an "on-farm" biodigester facility which will be co-located with the Rimrock Cattle Company Ltd. Feedlot (see Figure 2-2, Attachment C and Facility Renderings, Attachment B). The feedlot will be the primary source of feedstock (livestock manure) for the facility, meaning the manure that is currently stored on the feedlot will be transferred approximately 200 m – 300 m to the biodigester facility where it will be anaerobically digested to capture odourous gases and produce renewable natural gas (RNG). Rimrock notes that the Rimrock Cattle Company Ltd. Feedlot is currently operating under a permit issued by the Natural Resources Conservation Board (NRCB) and that any AEPA decision regarding the proposed Project is independent of that permit.

Land surrounding the proposed Project site is predominantly agricultural. The Project site will be located within 10 km of four feedlots (including the immediately adjacent Rimrock Cattle Company Ltd. Feedlot and two within approximately 5 km) (see Figure 2-1, Attachment C). The Town of High River is located approximately 5.5 km to the east of the proposed Project. Industrially, Cargill's High River facility, a fully integrated beef processing facility including slaughter, fabrication, rendering and hide operations, is located approximately 9.5 km northeast of the Project and approximately 5.5 km northeast of the Town of High River. The High River wastewater treatment plant is located approximately 11 km northeast of the Project and approximately 6 km northeast of the Town of High River. The Foothills regional landfill is located approximately 7 km north of the Project; with Lafarge operations located approximately 3 km to the east (see Figure 2-1, Attachment C).

The proposed Project will be in an area with existing baseline regional odours. Historical and ongoing complaints in the region regarding odours are well documented, and the proposed Project location has known existing odours at baseline that can be attributed to proximity to feedlots.

1.1.1 Regional Air Quality and Odour Monitoring

In 2022, the Calgary Region Airshed Zone (CRAZ) and Town of High River announced a partnership in concert with AEPA to bring air quality monitoring to High River with one objective being the establishment of a baseline Air Quality

Index for the area (High River, 2023). The NRCB has also installed a CTair unit at the same location as the CRAZ sensor to measure additional air quality parameters specific to feedlots. The CTair unit will provide the NRCB with another tool to help monitor and address odours related to the Rimrock Cattle Company Ltd. feedlot west of High River (NRCB, 2023). As stated in Rimrock's response to SIR #1, Rimrock is open to cooperating and supporting a regional monitoring program through the province, county, or other organization.

References:

High River. 2023. *Air Quality Monitoring in High River.* Accessed June 2023 at:
https://highriver.ca/community/town-services/air-quality-monitoring

NRCB. 2023. *NRCB Installs Air Quality Monitoring Unit in High River to Help Assess Odours.* Accessed June 2023 at:
https://www.nrcb.ca/news/post/nrcb-installs-air-quality-monitoring-unit-in-high-river-to-help-assess-odours

1.2 Facility Design Changes

AEPA's SIR #2 preamble states that Rimrock is required to consider the most effective demonstrated technologies to minimize odour from the proposed facility. Rimrock has done this, as evidenced by the optimized facility design and odour abatement technologies described in this SIR #2 response.

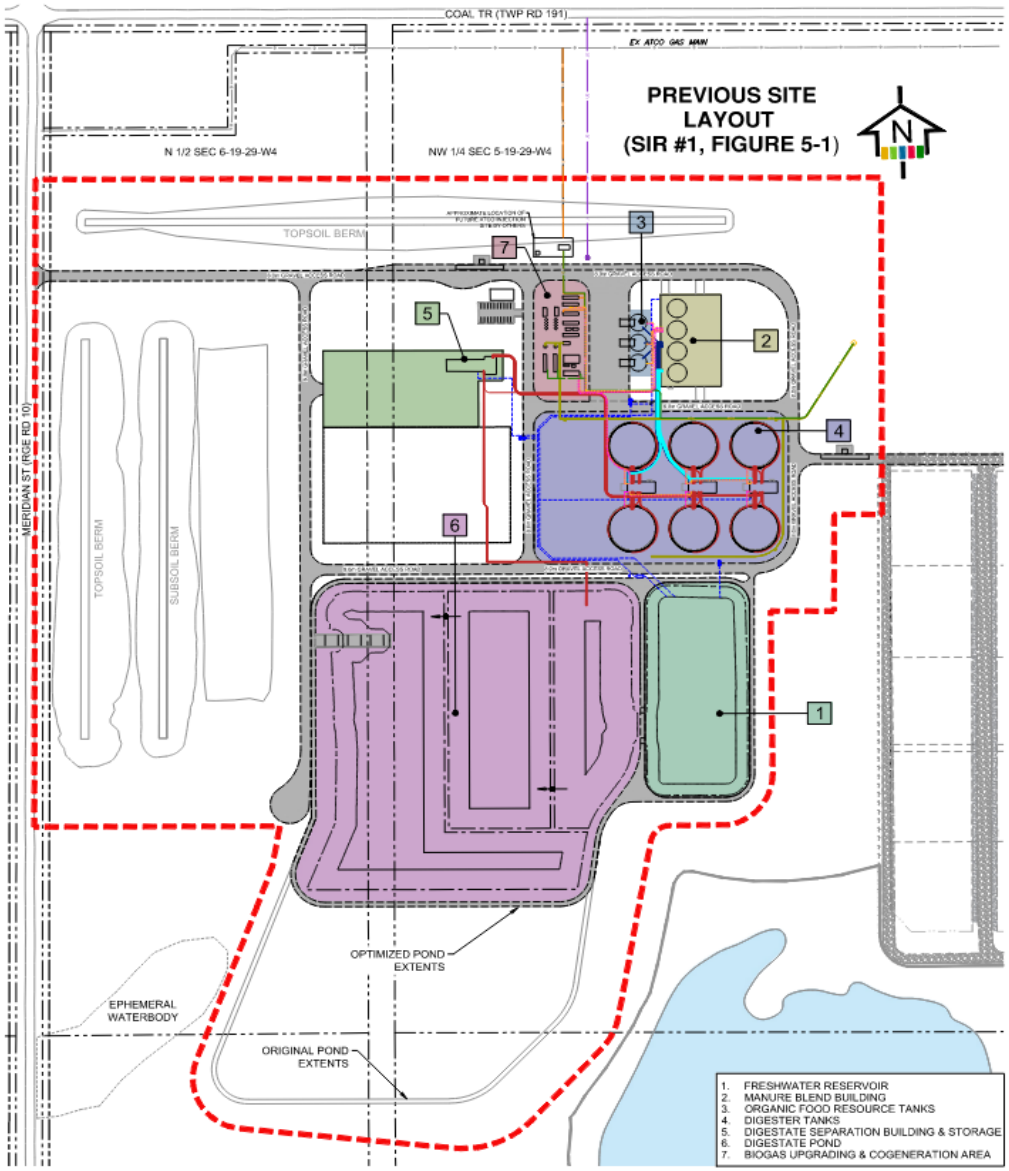
Importantly, as described in Section 1.4, the primary driver for the facility design changes described in this SIR #2 response has been feedback and concerns from Statement of Concern (SOC) filers, local landowners, and residents of Foothills County about odour conditions in the region and the potential impact of the Project on regional odours.

The proposed Project is designed as a series of highly integrated components that will need to work together to ensure efficient and cost-effective facility operation and construction, while minimizing potential environmental impacts, such as odour emissions. Therefore, consideration of the most effective technologies to minimize odours required a wholistic approach, which has resulted in notable improvements to the overall facility design.

Information on this optimized facility design (which is at a front-end engineering design [FEED] level) is provided below and is intended to be reviewed in concert with Rimrock's responses to SIR #2. An updated site layout and facility plot plan showing the integrated facility design changes are provided in Figure 5-1A and Figure 5-2 respectively (Attachment C). Conceptual facility renderings are provided as Attachment B. An updated overall facility Process Flow Diagram and mass balance for the Project, based on current assumptions, is provided in Attachment E. An updated Table 5-7 (Storage Tank Summary) and Table 5-8 (Summary of Material Staging Areas and Storage) from the Application are provided in Attachment G.

For comparative purposes the previous site layout (SIR #1 response Figure 5-1) and the revised optimized site layout (SIR #2 response Figure 5-1A) are shown below in Illustration 1-1. Table 1-1 provides a comparative description of the optimized design changes along with concordance with Rimrock's SIR #2 responses.

The optimized design has also resulted in a change in the Project footprint (see Figure 5-1A) with an area of approximately 41.4 ha, compared to the previous area of approximately 39.8 ha. The gravel access road in the northeast portion of the footprint has been shifted to the east to accommodate the solid digestate staging area.



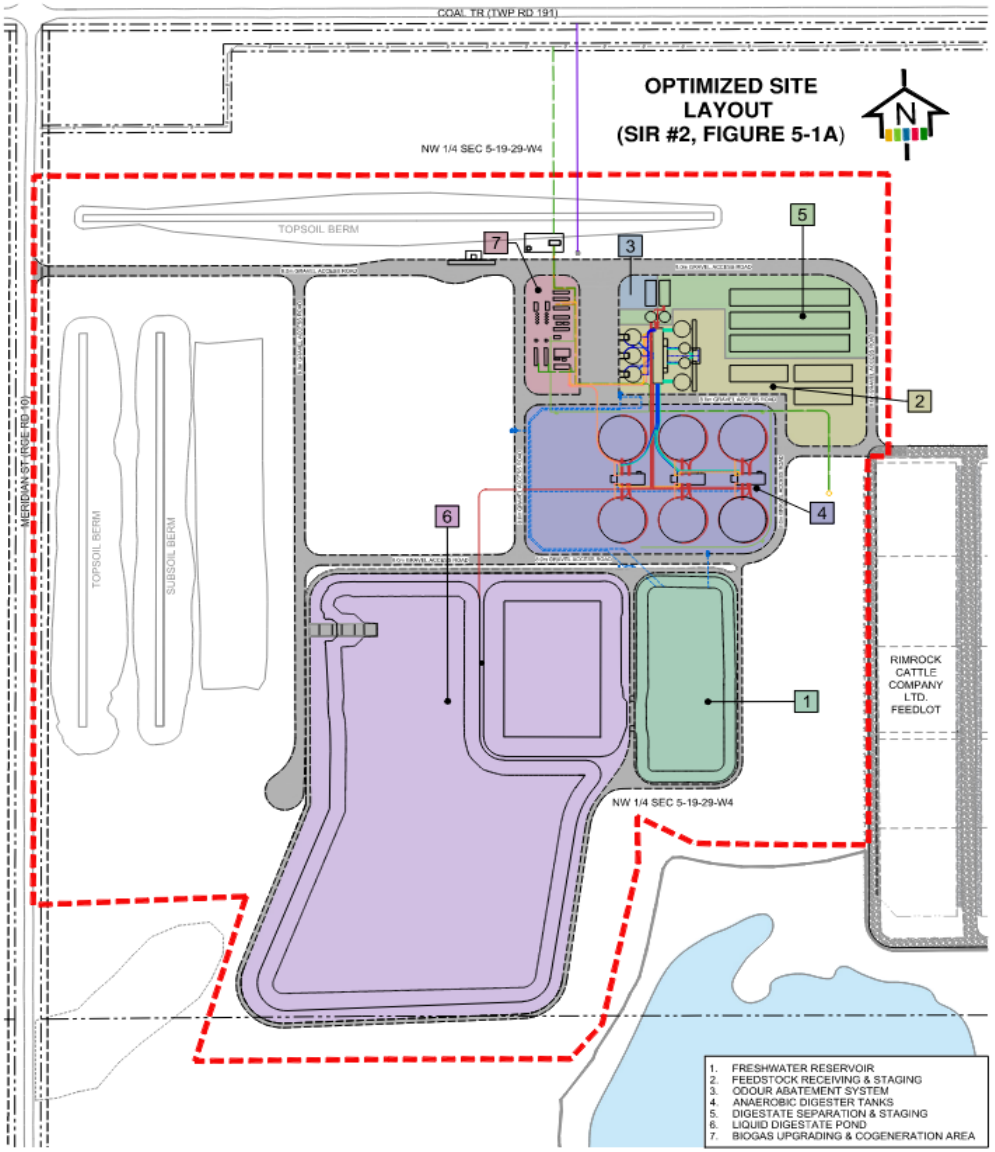


Illustration 1-1: Comparative View of Facility Design Changes

Table 1-1: Comparative Description of Facility Design Changes

Process Area (Figure 5-1A)	Updated Process Area Description	Concordance with SIR #2
1 – Freshwater Reservoir	No changes have been made to the design of the Freshwater Reservoir. Refer to Section 5.1 of the Application for details on this process area.	n/a
2 – Feedstock Receiving and Staging	**Previous (Application) design (Manure Blend Building):** • Approximate 30,000 sq ft. manure blend building containing 4 semi-open manure blend tanks used to hydrate, mix, and heat manure feedstock prior to being sent to anaerobic digester tanks. • End dump trucks transporting manure from the adjacent feedlot would drive into the manure blend building and unload manure directly into open blend tanks. • No odour abatement (filters) was proposed in the manure blend building. Although the manure blend building itself would have served to assist in containing odours from the blend tanks, building air would vent to the atmosphere through the required HVAC system. **Updated (optimized) design (Feedstock Receiving Area):** • The manure blend building has been replaced with a feedstock receiving hopper building, fully enclosed outdoor manure blend and digester feed tanks, and a feedstock pumphouse building (see Figure 5-2, Attachment C). • Raw (un-hydrated) manure will be trucked in from the adjacent feedlot and transferred into two recessed 220 m^3 metal feedstock receiving hoppers placed into concrete bays and enclosed with building structure and overhead doors (see Drawing 1, Attachment D). By enclosing the feedstock receiving hoppers, odours from receiving the raw manure will be collected from above the hopper through intakes and tied into an odour abatement system. • The metal receiving hoppers will be recessed below grade in concrete lined bays making it feasible for trucks to end dump directly, removing the need for double handling with a front-end loader. Each hopper will be outfitted with augers to feed raw manure into the blend tanks (see Drawing 1, Attachment D). The mechanical portion of the feedstock receiving hoppers will be housed indoors within the feedstock hopper building for maintenance purposes, particularly during winter conditions.	See SIR #2 response No. 1 for a full description of odour abatement for this process area

Process Area (Figure 5-1A)	Updated Process Area Description	Concordance with SIR #2
	• From the hoppers, the raw manure will be augured into the enclosed manure blends tanks. Hydration of the raw manure will occur partially in the manure blend tanks and then in the digester feed tanks where it will be fully hydrated, agitated, and heated into a slurry prior to being pumped to the anaerobic digester tanks (see Drawing 2, Attachment D). The headspace of the manure blend tanks, and digester feed tanks will be under negative pressure and vented to an odour abatement system. • A feedstock pumphouse building (located centrally within the feedstock receiving and staging area) will house fully enclosed mechanical equipment and instrumentation, as well as provide office space/control room for the overall facility (see Drawing 4, Attachment D). • For manure staging, a limited contingency volume of manure will need to be staged immediately adjacent to the solid digestate within the staging areas, this is discussed further in this SIR #2 response No. 3.	
2 – Feedstock Receiving and Staging (Organics Reception Tanks)	**Previous (Application) design:** • Organics reception tanks receive organic food resources from an enclosed truck with a hose connecting to the tank lids. • No additional odour abatement for the headspace of these tanks. **Updated (optimized) design:** • The headspace of the organics reception tanks will be tied into an odour abatement system (see Drawing 3, Attachment D). The dimensions of these tanks have changed slightly (refer to updated Table 5-7 from the Application, Appendix G). • No other changes to the process described in the first bullet above.	See SIR #2 response No. 1 for a full description of odour abatement for this process area
3 – (NEW) Odour Abatement System	**Previous (Application) design:** • No dedicated odour abatement system proposed. **Updated (optimized) design:** • All tanks involved in feedstock receiving and digestate separation (two manure blend tanks, two digester feed tanks, three organics reception tanks, one digestate nurse tank and one liquid digestate tank) will be enclosed, under negative pressure, and tied into an odour abatement system via sealed ducting. • A 2-stage BIOREM odour abatement system has been designed to achieve approximately 99% removal of NH_3 in Stage 1 (chemical scrubber) and 95% or	See SIR #2 response No. 1 for a full description of the odour abatement system

Process Area (Figure 5-1A)	Updated Process Area Description	Concordance with SIR #2
	greater removal rate of H_2S, reduced sulfur compounds including methyl mercaptan and VOCs in Stage 2 (dry scrubber).	
4 – Anerobic Digester Tanks	No changes have been made to the design of the anaerobic digester tanks. Rimrock notes that odour abatement is inherent in the existing anaerobic digestion design. The anaerobic digester tanks are designed to be airtight, fully enclosed systems. Additionally, while updated mass balance (Attachment E) estimates 200 ppm H_2S from the anaerobic digesters to the biogas upgrading system, this is a "maximum" value used for the mass balance/design calculations only (to ensure a robust factor of safety in the selection of materials and mechanical equipment). Operationally H_2S concentrations are expected to be between 55-65 ppm. Refer to Section 5.1 of the Application and Rimrock's response to SIR #1 (Section 3.4), for details on this process area.	See Section 1.3 of this SIR #2 response regarding anaerobic digestion and the Project's predicted net reduction in cumulative regional odourous air emissions
5 – Digestate Separation and Staging	**Previous (Application) design:** • Digestate separation building located on the west side of facility site beside the solid digestate storage area. • The digestate separation building was attached to two tanks, the digestate nurse tank and the liquid digestate tank which temporarily stored the digestate pre- and post-separation, respectively. **Updated (optimized) design:** • The digestate separation building and associated digestate nurse tank and liquid digestate tank, and staging bays have been moved to be co-located with feedstock receiving in the northeast area of the facility. This relocation allows for the enclosed digestate nurse tank and liquid digestate tank (Drawings 6 and 7, Attachment D) to be fully tied into an odour abatement system. • The openings where solid digestate drops below the screw press (i.e., the solid digestate staging areas) must remain permanently open, compromising the ability to put the entire digestate separation building under negative pressure. Hood vents and ducting above the screw presses will pull process air that is created during digestate separation and route it directly to odour abatement system (see Drawing 5, Attachment D). • Moving the digestate separation to the northeast has also allowed for digestate heat recovery further reducing the facility's environmental footprint by repurposing thermal energy and reducing the temperature of the liquid digestate entering the pond.	See SIR #2 responses No. 1 and 3 a) for a full description of odour abatement for this process area

Process Area (Figure 5-1A)	Updated Process Area Description	Concordance with SIR #2
	• Relocating the digestate staging area to the northeast of the facility also places it further away from residential receptors and immediately adjacent to the feedlot, where a significant portion of solid digestate is proposed to be transported throughout the year (resulting in shortened hauling distances). • The capacity of the solid digestate staging area has been greatly reduced (i.e., proposed to be limited to approximately 22% of the annual solid digestate production), with the remaining 78% transported to the adjacent feedlot.	
6 - Liquid Digestate Pond	**Previous (SIR #1 response) design:** • Proposed reconfiguration to a three-cell design, consisting of an anaerobic cell, facultative cell and a maturation storage cell (each designed for biological oxygen demand removal efficiency). **Updated (optimized) design:** • The liquid digestate pond design has been optimized to a two-celled pond configuration with mechanical aeration. Mechanical aeration in the polishing cell (Cell 1) will remove greater than 95% of H_2S through oxidation/stripping. Cell 2 will be used for storage of the fully stabilized liquid digestate after aeration occurs.	See SIR #2 response No. 4 for a full description of the liquid digestate pond and aeration system
7 - Biogas Upgrading and Cogeneration Area	No changes have been made to the design of the biogas upgrading system, including the two microgeneration sized cogeneration units. The biogas collected from the anaerobic digester tanks will be transferred to the biogas upgrading system through a fully enclosed system where it will be sent through a wet chemical scrubber to remove ammonia (NH_3) and activated carbon filters that will trap volatile organic compounds (VOCs), and hydrogen sulfide (H_2S) as part of upgrading. The location of the flare has been shifted to south of the existing private internal access road with appropriate setbacks from the road and the anaerobic digester tanks (see in Figure 5-2, Attachment C). This was required to accommodate the relocation of the solid digestate staging area and provides additional distance between the flare and local residences. No odours will be generated from the microgeneration sized cogeneration units. Refer to Section 5.1 of the Application for details on this process area.	See Section 1.3 of this SIR #2 response regarding biogas upgrading and the Project's predicted net reduction in cumulative regional odourous air emissions

1.3 Net Cumulative Reduction in Regional Odours

The purpose of the proposed Project is to capture greenhouse gases (GHGs), including odorous gases, from livestock manure and organic food resources and convert them into a usable renewable energy resource, renewable natural gas (RNG).

As demonstrated in the Air Quality Assessment (AQA) prepared for the Project (Attachment I), the Project is predicted to result in a notable net reduction of odourous air emissions in the region (approximately 44% hydrogen sulphide [H_2S] and approximately 47% ammonia [NH_3])[1] compared to current conditions (see Illustrations 1-2 and 1-3, refer to cumulative case).

This net positive influence in the cumulative case is due to Rimrock's proposed significant capital investment in anaerobic biodigester tanks, screw presses and biogas upgrading system for the Project, combined with a significant reduction of manure stored at the adjacent feedlot, since the manure will be used as feedstock for the biodigester facility operations. Given the purpose of the Project, these components (anaerobic biodigester tanks, screw presses and biogas upgrading system) are and have always been at the core of the facility design process.

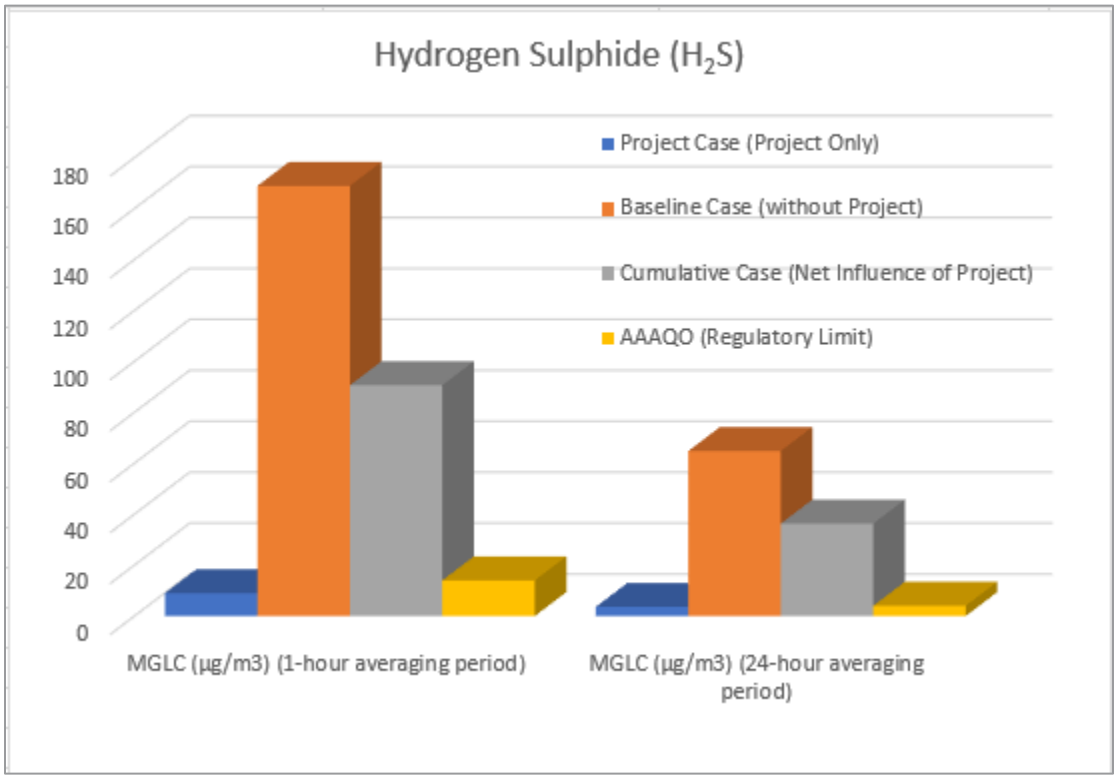


Illustration 1-2: Net Reduction in Cumulative Odour Emissions (H_2S)

[1] Source for percentages and Illustrations 1-2 and 1-3: Table 2 and Table 3 of the AQA (Attachment I).

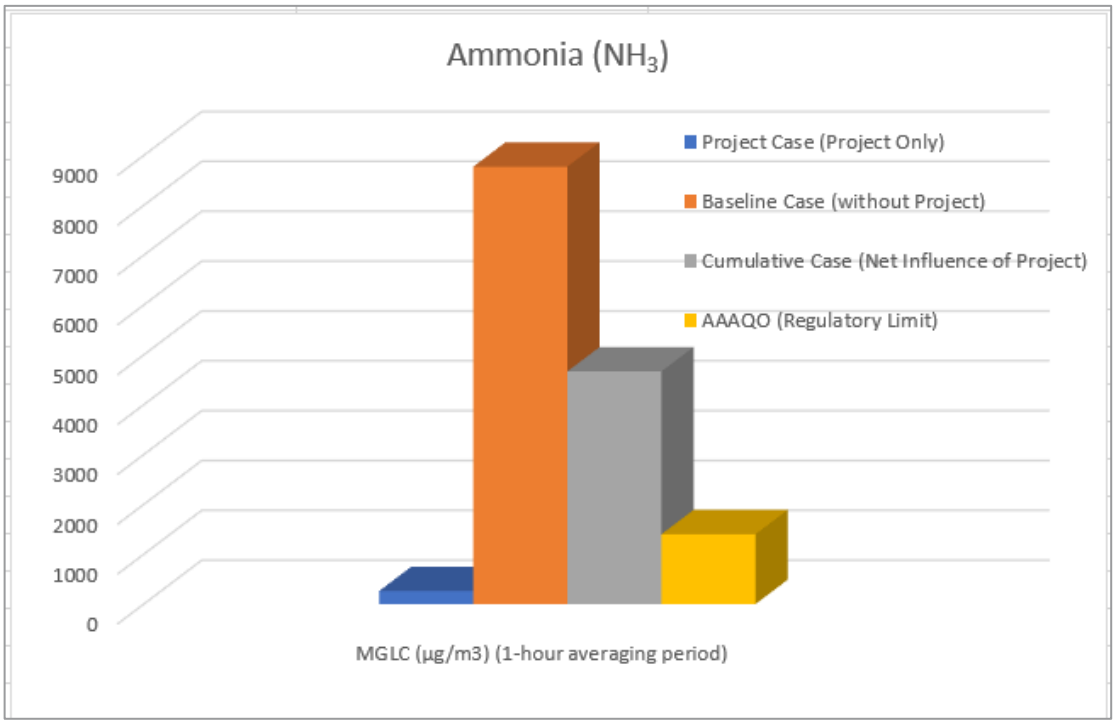


Illustration 1-3: Net Reduction in Cumulative Odour Emissions (NH_3)

In addition, Rimrock has continued to focus on opportunities to reduce potential odours from the Project itself and has proposed additional significant design and abatement measures, as described in this SIR #2 response. The Project will comply with the Alberta Ambient Air Quality Objectives (AAAQO) (AEPA, 2019) for the Project itself, as demonstrated in the AQA (Attachment I) and shown in Illustrations 1-2 and 1-3 (refer to project case).

Rimrock notes that, while the Project will reduce cumulative H_2S and NH_3 emissions, the cumulative case is predicted to exceed the AAAQO due to existing baseline feedlot sources (as noted in the AQA) and it is anticipated that the cumulative case may continue to exceed the AAAQO during facility operations. This means that any air quality monitoring that is conducted at the Project fenceline during facility operations is likely to show exceedances, regardless of the Project's investment in odour abatement technologies, and would not be representative of Project contributions to air quality.

References:

Alberta Environment and Protected Areas (AEPA). January 2019. *Alberta Ambient Air Quality Objectives and Guidelines Summary*. Government of Alberta. Accessed May 2023. https://open.alberta.ca/publications/9781460134856.

1.4 The Influence of Public Engagement and Feedback

Since the filing of Rimrock's Application in June 2022, Rimrock has continued to focus on opportunities to minimize potential residual odours that may result from the proposed Project. A primary driver for this has been feedback and concerns from local landowners and residents of Foothills County about odour conditions in the region and the potential impact of the Project on regional odours.

In January 2023, Rimrock held two key virtual public presentations about the proposed Rimrock Biodigester Facility, including a description of design updates that had been made since the Application to address potential odours, largely based on public feedback since filing of the Application.

- On January 12, 2023, Rimrock hosted a webinar presentation about the proposed Rimrock Biodigester Facility to all landowners and occupants/residents within 2,000 m of the Rimrock Biodigester Facility Boundary, and

- On January 25, 2023, Rimrock provided a webinar presentation as part of a Foothills County Public Meeting about the proposed Rimrock Biodigester Facility. The meeting was hosted by Foothills County, the NRCB and AEPA. The webinar was open to anyone in the public that was interested in attending.

Feedback and concerns from local landowners and residents of Foothills County to both Rimrock and AEPA has influenced the ongoing assessment and selection of odour abatement technologies for the Project, including Rimrock's approach to responding to SIR #2. Rimrock will be sending out information packages (via email and/or mail) regarding the design changes and odour abatement technologies described in this SIR #2 response to all Statement of Concern (SOC) filers, as well as landowners and occupants/residents within 2,000 m of the facility boundary, after filing this response, and will be responding to any questions or concerns raised.

1.5 BATEA

In keeping with the AEPA SIR #2 Preamble and the *Industrial Release Limits Policy*, Rimrock has employed the principles of best available technology economically achievable (BATEA) in considering additional odour abatement technologies for the Project. The BATEA evaluation took into account factors such as technological feasibility, cost-effectiveness, and overall environmental impact when identifying the best available technology for this specific facility. In undertaking BATEA Rimrock has, in conjunction with industry experts:

- Identified demonstrated technologies,

- Screened demonstrated technologies considering facility operational requirements and conditions, and the unique Project setting, and

- Completed an environmental and economic evaluation of the remaining viable options for the Project.

The BATEA evaluation is provided as Attachment A; it details the technical screening, environmental, and economic evaluation of best available technologies. The following SIR #2 responses provide the requested details on the odour abatement technologies that were selected as a result of the BATEA evaluation. Please note that rationale for why certain pollution abatement technologies were selected, instead of other options, is detailed is the BATEA evaluation (Attachment A) rather than in the body of this report, as such Attachment A should be reviewed in conjunction with the relevant responses.

2 SIR No. 1

Request: *Design plan and specifications of the pollution abatement equipment to collect and treat air from:*

a) The manure blend building;
b) The digestate separation building;
c) The solid digestate staging areas;
d) The anaerobic cell in the liquid digestate pond; and
e) The head space of the organic food resource tanks.

Response:

As detailed in Section 1.2 (Table 1-1), Rimrock has implemented notable facility design changes and odour abatement technologies in response to SIR #2. Relevant to the above lettered bullets a) through e):

a) The previous manure blend building has been replaced by a feedstock receiving area comprised of a feedstock receiving hopper building, fully enclosed outdoor manure blend and digester feed tanks, and a feedstock pumphouse building. The feedstock receiving hoppers, feedstock pumphouse building, headspace of the manure blend tanks, and digester feed tanks will be tied to an odour abatement system, which is discussed further below. For manure staging, a limited contingency volume of manure will be staged immediately adjacent to the solid digestate within the solid digestate staging area (see SIR No. 3a).

b) The digestate separation building and associated digestate nurse tank, liquid digestate tank and staging bays have been moved to be co-located with feedstock receiving in the northeast area of the facility. This relocation allows for the screw presses and tanks to be fully tied into an odour abatement system; further details are provided below.

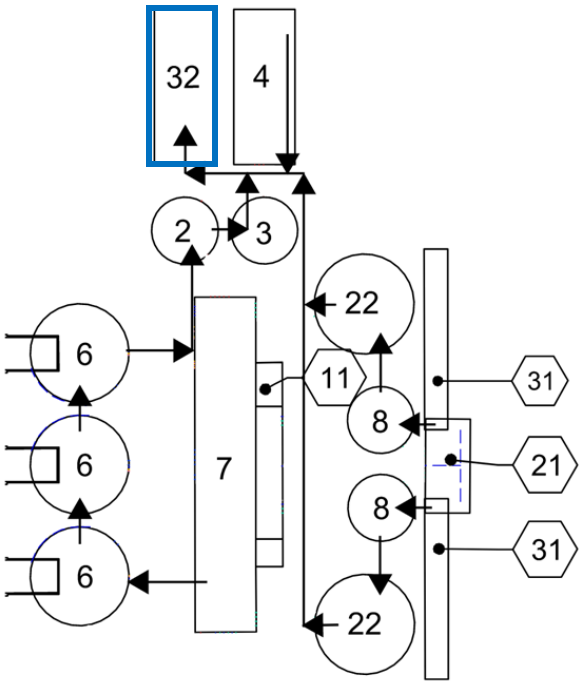
c) The solid digestate staging bays have been relocated to the northeast area of the facility along with the digestate separation building; however, are discussed further in SIR No. 3a along with solid digestate staging area.

d) The liquid digestate pond design has been optimized to a two-celled pond configuration with mechanical aeration in the polishing cell that will remove greater than 95% of H_2S through oxidation/stripping. Cell 2 will be used for liquid digestate storage. The aeration system is described in detail in SIR No. 4.

e) The headspace of the organic reception tanks will be tied into an odour abatement system, which is discussed further below.

Pertinent to bullets a), b) and e), the co-location of the solid digestate separation processes with the feedstock receiving area, combined with the redesigned feedstock hopper system, has allowed for the selection of an integrated odour abatement system that will collect and treat air from both of these process areas (see Figure 5-1A, Attachment C). This integrated odour abatement system is described in detail below, as a response to this SIR No. 1 request.

All tanks involved in feedstock receiving and digestate separation (two manure blend tanks, two digester feed tanks, three organics reception tanks, one digestate nurse tank and one liquid digestate tank) will be enclosed, under negative pressure, and tied into an odour abatement system via sealed ducting. Illustration 2-1 provides an overview of the air flow lines (ducting) that tie these tanks to the odour abatement system.



Legend*:

2 - Digestate nurse tank
3 - Liquid digestate tank
4 - Digestate separation building
6 - Organics reception tanks
7 - Feedstock pumphouse building
8 – Manure blend tanks
11 – Office
21 – Feedstock receiving building
22 – Digester feed tanks
31 – Feedstock receiving hoppers
32 – Odour abatement system

*Note: numbering aligns with Facility Plot Plan (Figure 5-2) and Odour Abatement Process Flow Diagram (Attachment F).

Illustration 2-1: Odour Abatement Process Air Flow Lines

An Odour Abatement Process Flow Diagram (PFD) is provided as Attachment F, illustrating the airflow and flow rates of ambient air through process buildings and these tanks to the odour abatement system.

Regarding buildings, as shown in the Odour Abatement System PFD, warm air from the feedstock hopper building and feedstock pumphouse building will be drawn through the headspace of specific tanks using negative pressure, maintaining warm air in the headspace. The feedstock hopper building and feedstock pumphouse building are equipped with ambient air intakes (example provided in Illustration 2-2 below, see Drawing 4, Attachment D for additional detail [south elevation, view of south-side of building]). Pulling heated air from these buildings (including the feedstock pumphouse building which will not have odours) allows for energy savings. This is notable because the odour abatement system requires an intake air temperature of 5°C – 40°C for the scrubbers to be effective, and the air moving through the process will be waste heat during the winter months, providing heat without requiring an additional heat exchanger.

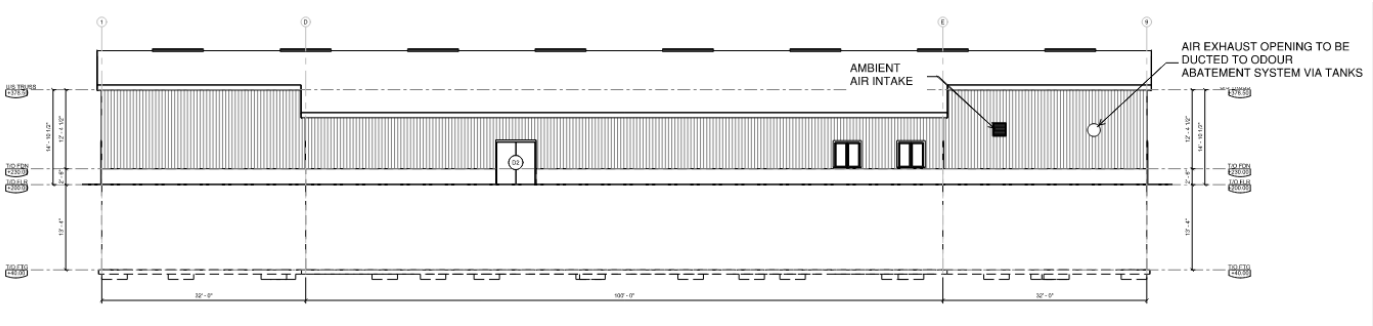


Illustration 2-2: Feedstock Pumphouse Building with Air Intake and Air Exhaust Opening

All air intakes and air exhaust openings from buildings, the feedstock receiving hopper, and tanks will be sealed when not being vented to the odour abatement system. A combination of backdraft dampers and actuated dampers will be used to control the air flow and ensure the air is directed to the treatment system.

For the digestate separation building, the openings where solid digestate drops below the screw press into the solid digestate staging bays must remain permanently open, compromising the ability to put the building under negative pressure. However, hood vents and ducting above the screw presses will pull process air that is created during digestate separation and route it directly to the odour abatement system (see Illustration 2-3 and Drawing 5, Attachment D [upper floor plan] for additional detail).

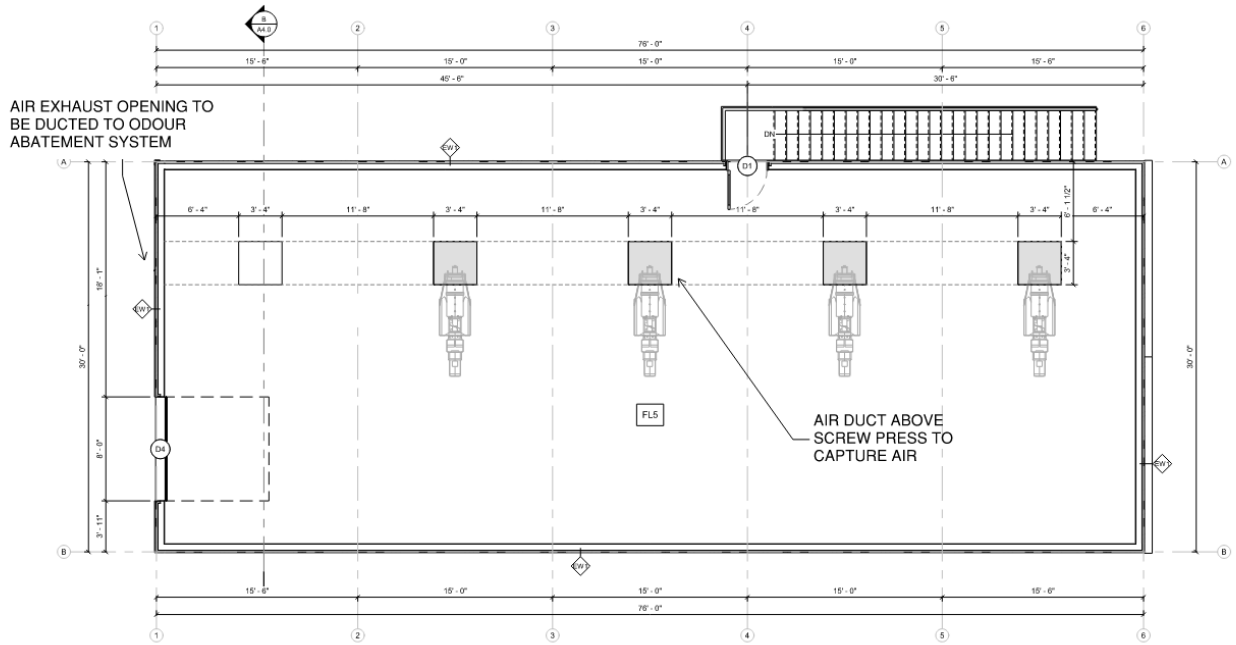


Illustration 2-3: Digestate Separation Building with Air Duct Above Screw Press and Air Exhaust Opening

BIOREM Odour Abatement System

The proposed odour abatement system is shown as #32 in Illustration 2-1 and #32 on the Plot Plan (Figure 5-2, Attachment C).

Rimrock has selected a BIOREM odour abatement system which consists of two stages:

- Stage 1: MytilusCS 5-1 (or equivalent) chemical scrubber to remove ammonia (NH_3).
- Stage 2: Mark V Dual Life 11-2 (or equivalent) activated carbon dry scrubber to remove hydrogen sulfide (H_2S), reduced sulfur compounds (RSCs), and volatile organic compounds (VOCs).

The selected BIOREM odour abatement system is best available technology and has been designed to treat the collected gas and remove H_2S, NH_3, RSCs including methyl mercaptans (MM), and VOCs (see BIOREM Technical Proposal, Attachment H). The odour abatement system was selected based on its system flow rate capacity and has been designed for a maximum flow rate of 15,600 m^3/h; a nominal flow rate of 13,386 m^3/hr is anticipated for the Project (see Attachment F, Odour Abatement System Process Flow Diagram and BIOREM Technical Proposal, Attachment H).

The BIOREM odour abatement system has been designed to achieve approximately 99% removal of NH_3 in Stage 1 (chemical scrubber) and 95% or greater removal rate of H_2S, RSCs including methyl mercaptan and VOCs in Stage 2 (dry scrubber). The odour abatement system performance ranges provide additional capacity buffer of up to 227% for H_2S and 1869% for NH_3 (see BIOREM Technical Proposal, Attachment H).

The odour abatement system will be operated and maintained as per the “Controls and Maintenance” protocols listed in the BIOREM Technical Proposal (see Attachment H). For example, the chemical scrubber uses a pH sensor to dose sulfuric acid. It will be calibrated every three months. H_2S readings at the ports on the activated carbon unit will be used to monitor when the media needs to be changed.

3 SIR No. 2

Request: *An updated air quality modelling report that reflects the construction and operation of the above pollution abatement equipment.*

Response:

An updated air quality modelling report (Air Quality Assessment) that reflects the construction and operation of the proposed pollution abatement equipment and odour mitigation described in Rimrock's response to SIR #2 is provided as Attachment I.

4 SIR No. 3

Request: *Design plan and specifications of the cover systems or other pollution abatement technologies selected for:*

a) The solid digestate storage area; and

b) The anaerobic cell in the liquid digestate pond.

Response:

a) The solid digestate staging area is not expected to be a significant source of odourous emissions. Solid digestate has lower odour compared to raw manure. During the anaerobic digestion process, the organic materials in the feedstock undergo decomposition by microorganisms in an oxygen-free environment. This process breaks down the organic matter and reduces the concentration of volatile compounds responsible for odours. The composition of solid digestate can vary depending on the variability of the feedstock used in the anaerobic digestion process. However, in general, solid digestate contains nutrients (primarily nitrogen (N), phosphorus (P), potassium (K)), as well as limited moisture, and may include residual microorganisms from the aerobic digestion process which contribute to soil health and nutrient cycling when digestate is applied as a fertilizer.

It is important to note the primary purpose of separating digestate into solid and liquid fractions is for odour mitigation in both the staged solid and liquid digestate.

By separating the solid fraction from the liquid fraction, the moisture content in the solid digestate is significantly reduced, limiting the conditions favorable for microbial activity and odour generation. The solid digestate composition in the staging area (after solids-liquids separation) is detailed in the updated facility mass balance (Attachment E) and summarized in Table 4-1.

Table 4-1: Solid Digestate Composition

Parameter	Units	Value
Percent total solids (TS)	% wt	30.0
Percent volatile solids	% wt (of TS)	90.4
Percent total nitrogen	% wt	0.6
Percentage ammonia nitrogen of total	% wt	60.0
Percentage organic nitrogen of total	% wt	40.0
Percent phosphorous	% wt	0.4
Percent Potassium	% wt	1.1

Published studies such as *Odour Measurements at Different Methanisation Sites* (Bayle et al 2018) indicate that solid digestate storage zones are amongst the least emitting zones for the studied biogas plants. This is further supported by the BATEA assessment (Attachment A), which demonstrates that enclosing the solid digestate staging area and tying it into an odour abatement system is predicted to only result in a 2.3% reduction of H_2S and 2.5% NH_3 in the Project case.

Odour abatement for the temporary staging of solid digestate will be achieved by significantly reducing volume of solid digestate staged at the facility and relocating the digestate staging area to the northeast of the facility so that it is immediately adjacent to the feedlot (see Figure 5-1B, Attachment C and Facility Renderings, Attachment B).

Rimrock proposes to limit the volume of solid digestate that can be staged at the facility to approximately 22% of the annual production (i.e., capped at 10,000 tonnes). As described in SIR No. 9 b), the remaining 78% of the annual solid digestate production will be transferred to the adjacent NRCB-regulated feedlot and farming operations for use as cattle bedding and/or as a soil amendment to be spread on adjacent lands.

It is important to note that 10,000 tonnes represents a maximum limit which is proposed. In practice, the maximum volume will only occur during limited periods of time throughout the year. The staging area will also be completely emptied each spring and fall (see Solid Digestate Staging Operations below).

Solid Digestate Staging Operations

Rimrock has completed a BATEA evaluation in considering odour abatement technologies for the solid digestate staging (see Attachment A). Solid digestate will be staged in windrows within the digestate staging area and left undisturbed until it is transferred offsite. This will reduce double handling and the potential for associated odourous emissions. Windrowing the digestate will allow for natural airflow and oxygen diffusion, enabling passive aeration and facilitating aerobic microbial activity, reducing potential odours.

As shown in Figure 5-1B, Attachment A and Illustration 4-1 below, sufficient space has been allocated in the design to accommodate staging of the maximum 10,000 tonne volume. However, the maximum volume will only occur during approximately 2-3 months of the year (1 month in late winter and 1 month in late summer/early fall). Further, the solid digestate staging area will be completely emptied twice per year (spring and fall) for application to lands as an organic fertilizer, in accordance with Nutrient Management Plan and *Agricultural Operations Practices Act* (AOPA) requirements. Between the spring and fall, the solid digestate windrows will be gradually filled.

If no solid digestate was transferred from the staging area to the adjacent feedlot between spring and fall, it would take approximately 80 – 85 days to reach the 10,000-tonne maximum capacity limit. However, during this period Rimrock plans to load some of the empty manure delivery trucks with solid digestate to be trucked offsite either via existing internal road to the feedlot for cattle bedding or to the fields where it will be land applied. This means a longer period to reach maximum capacity, and thus shorter periods of time when the maximum volume is staged onsite. This also means that, at some periods, there will not be separate trucks coming to the facility from the feedlot for solid digestate (i.e., it will be same the manure delivery trucks taking the digestate back to the feedlot).

In between the 10 to 14-week of the spring and fall land application periods approximately 4-7 trucks per day (approximately every third manure delivery truck) of solid digestate will be hauled offsite either to the feedlot for cattle bedding or to the fields where it will be land applied. In the spring, due to seasonal demand for solid digestate and AOPA regulations for land application, there will be a higher frequency of trucks (on average approximately 15-20 trucks per day), emptying the digestate staging area over a 4 to 6-week period. In the fall, after harvest where there will be less solid digestate demand, emptying of the staging area will likely occur over a 6 to 8-week period (on average approximately 10-15 trucks per day).

Contingency Manure Staging

Rimrock is proposing to stage a small volume of manure onsite at the facility, limited to 5,000 tonnes, or 6% of the total annual manure feedstock. It is important to note that:

- If the manure was not staged at the facility, it would be staged 200 – 300 m away at the feedlot (i.e., there would be no net reduction in regional odours while staged),
- 5,000 tonnes represents a worst case for the purpose of a proposed limit (i.e., staged manure volumes will vary and are anticipated to be well below this limit on any given day). There is incentive for Rimrock to keep staged manure to a minimum as receiving manure directly into the hoppers represents the lowest operational expenses and lowest potential release of emissions (as compared to staging it and then rehandling); and
- The manure staging area footprint will be approximately one-half of the area of a single pen at the adjacent feedlot (see Illustration 4-1 and Facility Renderings, Attachment B).

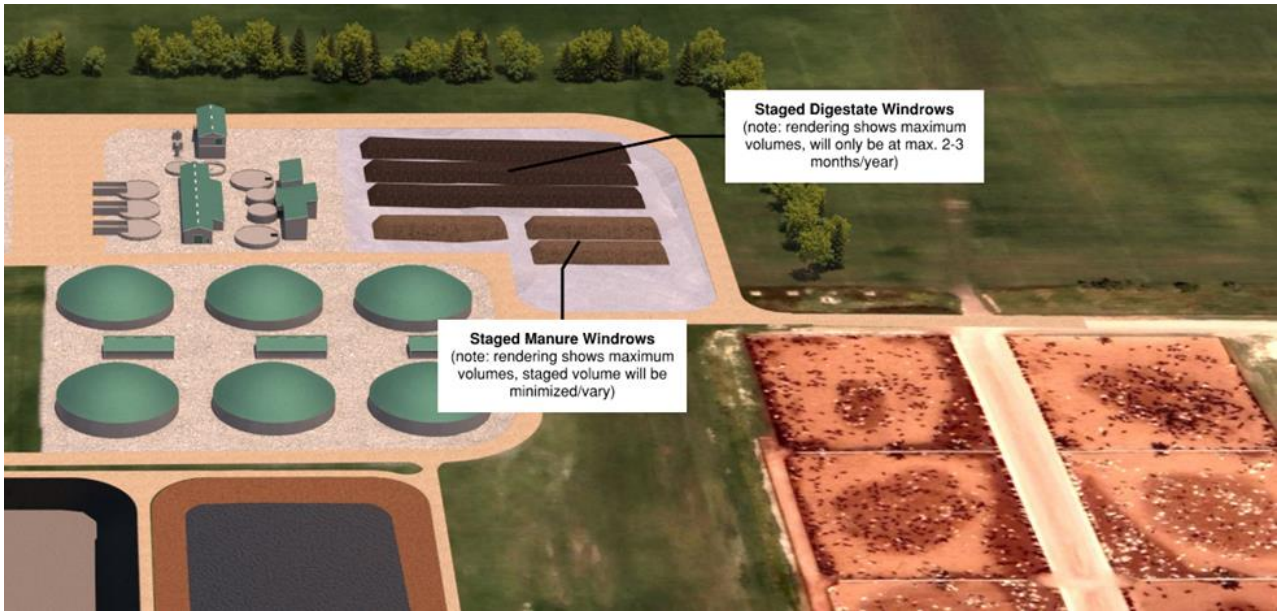


Illustration 4-1: Solid Digestate and Manure Feedstock Staging (Shown at Maximum Capacity)

As described in SIR No. 1, to accommodate an odour abatement system, the manure blend building in the previous design has been replaced with a feedstock receiving system with recessed hoppers to receive raw manure directly from trucks. Manure truck deliveries from the feedlot are anticipated to be approximately 15-20 truck loads per day (approximately one load every 30 minutes), during daytime operating hours. The raw manure will be primarily offloaded directly into the recessed hoppers. However, a limited volume of manure will need to be staged immediately adjacent to the solid digestate within the staging area (see Illustration 4-1) in the event more manure is delivered than can be received immediately in the hoppers.

For context, in a scenario without onsite staging, in the event the feedlot pens require clean-out, and the hoppers are already full, the manure would be removed from the pen(s) and temporarily stored at the

feedlot, only to be rehandled and loaded back into a truck again later to be brought to the facility. This would require additional equipment, labour, consumption of fuel and comparatively increased agitation of manure (creating odourous emissions). On days where little or no manure is being hauled from the feedlot manure feedstock will be pulled off the staged manure windrow using a front-end loader and placed into the hopper.

Digestate Staging Area Containment

The solid digestate staging area will be entirely underlain with a Rolled Compacted Concrete (RCC) pad. RCC is a special type of concrete that is denser and stronger than traditional concrete and differs from concrete used in other traditional structural applications (i.e., buildings) as rebar reinforcements are not required. RCC is made by combining a relatively dry mix of cement, aggregates, and water, which is then compacted using heavy rollers. This compaction process results in a highly durable and low-maintenance material that can withstand heavy traffic loads and has excellent resistance to cracking.

RCC has been implemented successfully at the adjacent feedlot utilizing a 200 mm depth designed for vehicle and equipment operational characteristics for the feedlot (Clifton 2019). With the higher frequency of travel anticipated over the RCC pad proposed for the Project, the engineered RCC thickness is proposed as 300 mm on a subgrade compacted at 100% dry density to protect against any leachate potential. This creates a highly impermeable structure which supports runoff conveyance into the stormwater conveyance system.

As shown in Illustration 4-1, the RCC pad will be sized to ensure a conservative buffer around the maximum extent of the windrowed solid digestate and windrowed staged manure. Rimrock will implement an integrity program for the RCC pad, including formal spring and fall inspections (after the solid digestate has been removed).

Potential impacts to groundwater will be mitigated by the RCC pad and further mitigated by deep groundwater elevations (1101.3 m at BH 205) (Clifton 2022) as the site is approximately 8 m (1109.3 m) above measured groundwater elevations (see Figure 4-10, Attachment C for borehole locations). As confirmed by geotechnical investigations, the surficial soils at the site are clay-rich and can provide surficial barrier layers due to relatively low hydraulic conductivity (Clifton 2022). Additionally, all roadways, ditches and pads are to be compacted as part of construction. Further, the proposed groundwater monitoring network includes monitoring wells upgradient and down gradient of the digestate staging area (see Figure 4-4, Attachment C). Groundwater monitoring during operations will provide detection in the unlikely event of unanticipated leachate impacts.

All runoff from the solid digestate staging area will be fully contained and directed to Cell 1 of the liquid digestate pond through the stormwater conveyance system (see Figure 5-3, Attachment C). Therefore, potential impacts to surface water are not anticipated.

Solid Digestate Staging Bays

While not located in the same location as the solid digestate staging area, solid digestate will also be staged (in bays) in association with the digestate separation process. As described in SIR No. 1, within the digestate separation building, digestate from the digestate nurse tank will be fed through the screw press to separate the solid digestate fraction from the liquid digestate fraction. The solid fraction will fall from the screw presses through openings in the building into piles within individual staging bays below. The solid digestate staging bays will be orientated eastward and closed in on west, north, and south sides, the east side of the

bays must remain open for access to front-end loaders that will relocate the material from the staging bays to the staging windrows (see Illustration 4-2 below of east elevation [view of east-side of digestate separation building), and Drawing 5, Attachment D for detail).

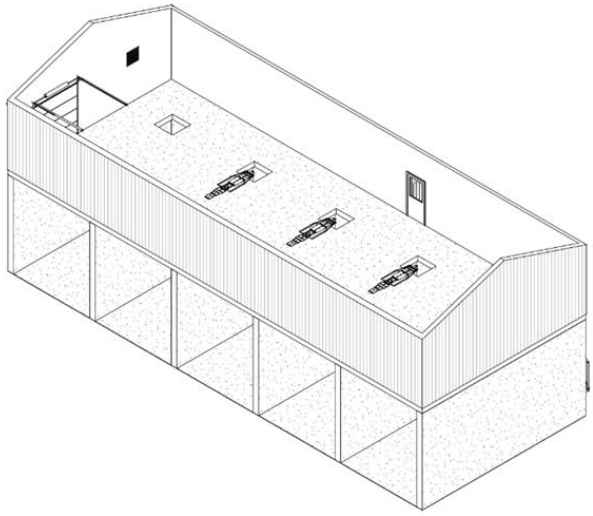


Illustration 4-2: Solid Digestate Staging Bays

Each individual bay has approximately one day of storage capacity available before the solid digestate needs to be moved to avoid piling up past the screw press. Therefore, the east side of the bays are necessarily designed to be open to allow access. During night operations, although solid digestate will continue to be added to the staging bays from the screw presses, the piles will remain undisturbed (i.e., not emitting odours due to handling); therefore, closing the bays in during the night will provide little to no additional reduction in potential odours as undisturbed solid digestate in these bays is considered a negligible source of odour (0.002109 g/s H_2S emissions and 0.000486 g/s NH_3 emissions for the total 220 m^2 area as per the AQA, see Attachment I).

b) The BATEA evaluation of cover systems and other pollution abatement technologies for the liquid digestate pond are detailed in Attachment A. Both cover systems and mechanical aeration options were deemed technologically feasible and, based on comparative H_2S emission rates, both options are expected to provide similar environmental performance (92% reduction in H_2S for the Project case, see Attachment A). However, based on the economic evaluation of both options the difference in cost-effectiveness is significant, with the costs of a cover system being much greater for equivalent environmental performance. The aeration option was evaluated to be 11 times more beneficial than a cover when comparing emissions abatement and cost (see Attachment A). Mechanical aeration was selected for implementation.

   Accordingly, the liquid digestate pond design has been optimized to a two-celled pond configuration with mechanical aeration. Mechanical aeration in the polishing cell (Cell 1) will remove greater than 95% of H2S through oxidation/stripping. Cell 2 will be used for storage of the fully stabilized liquid digestate after aeration occurs. A detailed description is provided in SIR No. 4.

References:

Bayle et al. 2018. *Odour Measurements at Different Methanisation Sites*. Updated February 18, 2021. Available at: https://www.aidic.it/cet/18/68/014.pdf. Accessed May 2023.

Clifton. 2019. *Roller Compacted Concrete Pavement Design Recommendations File CG3209.2 Korova Feedlots High River, Alberta. Report July 26, 2019.*

Clifton. 2022. *Tidewater Renewables Ltd. Rimrock Biodigester Foothills County, Alberta – Geotechnical Site Investigation Report.* June 24, 2022.

5 SIR No. 4

Request: *Design plan and specifications of the liquid digestate pond showing:*

a) Slopes of berms;
b) HDPE liners;
c) Cell dimensions and storage capacity factoring in slopes of berms and a free board of 1.0 metre;
d) Depths of aerobic layer, anoxic facultative layer and anaerobic layer of the facultative cell and the maturation cell;
e) Design criteria such as organic loading rates and performance indicators to be monitored for each cell; and
f) Protection against groundwater intrusion.

Response:

The liquid digestate pond design has been optimized to a two-celled pond configuration with mechanical aeration (see Figure 5-3, Attachment C and Drawing 8, Attachment D). Cell 1 (Polishing) is a polishing cell equipped with submerged mechanical aeration, and Cell 2 (Storage) is a storage cell.

The purpose of the mechanical aeration is to minimize emission of odours. Submerged aeration in the polishing cell (Cell 1) will introduce oxygen to:

- Promote the growth of aerobic bacteria which consume odorous compounds already dissolved in the liquid digestate (e.g., sulfides [H_2S] and VOCs) as part of their natural metabolic process, converting them to stable odourless CO_2, SO_4 and H_2O compounds (stripping), and

- Stop anaerobic processes via oxidation to prevent the generation of odourous compounds (H_2S, VOCs).

Mechanical aeration in the polishing cell (Cell 1) will remove greater than 95% of H_2S through oxidation/stripping (Nexom Design Brief, Attachment K). Cell 2 will be used for storage of the stabilized liquid digestate after aeration occurs. The liquid digestate leaving Cell 1 (polishing cell) will be fully stabilized as a result of aeration; therefore, aeration of the larger storage cell (Cell 2) is not required (Nexom Design Brief, Attachment K). Cell 2 will be used only for liquid digestate storage.

The mechanical aeration layout, details and section are provided in Drawing 8, Attachment D (see page 6). Refer to SIR No. 4 e) for a detailed description of the design criteria and performance indicators to be monitored for the proposed aeration system.

As noted in Section 1.2 of this report, another benefit of relocating the digestate separation process to the northeast area of the facility is heat recovery from the digestate which, in addition to further reducing the facility's environmental footprint by repurposing thermal energy, it will reduce the temperature of the liquid digestate entering the pond below which anerobic conditions could occur.

As per the Stormwater Management Plan (Attachment J), runoff from the feedstock receiving, digestate separation and solid digestate staging areas, as well as the anaerobic digester tanks, will be conveyed to Cell 1 (Polishing cell), where it will be treated via aeration along with liquid digestate (see Figure 5-3, Attachment C).

The digestate pond has been sized to hold 7 months of liquid digestate and stormwater at a capacity with zero discharge. The proposed operation of the digestate pond remains unchanged from the Application and proposes draining the digestate pond twice a year (March and September) and take approximately 6 months to fill. The anticipated filling and draining cycle for the digestate pond is provided in the Stormwater Management Plan (Attachment J). Maintenance and monitoring of the liquid digestate pond are discussed in the Stormwater Management Plan. Cleanout requirements for the pond will be met for both cells, using a floating pontoon dredge with a boom mounted inductor suction pump.

Rimrock notes that liquid digestate has lower odour compared to raw manure. The anaerobic digestion process reduces the concentration of volatile compounds responsible for odours in the original feedstock. The composition of liquid digestate can vary depending on the variability of the feedstock used in the anaerobic digestion process. However, in general, liquid digestate contains water, nutrients (primarily nitrogen (N), phosphorus (P), potassium (K)), residual organic matter, and may include microorganisms from the anerobic digestion process. The primary purpose of separating digestate into solid and liquid fractions is for odour mitigation in both the staged solid digestate and liquid digestate. Separation of the solid fraction from the liquid digestate will significantly decrease the volume of solids entering the pond, thereby preventing their anaerobic degradation and associated H_2S emissions. The liquid digestate composition in the pond (after solids-liquids separation) is detailed in the facility mass balance (Attachment E) and summarized in Table 5-1.

Table 5-1: Liquid Digestate Composition

Parameter	Units	Value
Percent total solids (TS)	% wt	3.3
Percent volatile solids	% wt (of TS)	71.1
Percent total nitrogen	% wt	0.3
Percentage ammonia nitrogen of total	% wt	90.0
Percentage organic nitrogen of total	% wt	10.0
Percent phosphorous	% wt	0.1
Percent Potassium	% wt	0.1

Responses to requests a) through f) are provided below:

a) The slopes of the berms for both Cell 1 and Cell 2 is 4:1 (see Drawing 8, Attachment D).

b) A 60 mil (1.5 mm) liner (HDPE Layfield EL 6060 Enviro Liner or equivalent) is proposed (see Attachment L), including gas release vents around the perimeter of the cell.

c) The cell dimensions and storage capacity of the liquid digestate pond are provided in Drawing 8, Attachment D and the Stormwater Management Plan (Attachment J), along with details on the proposed pond operation. The pond has been designed with an active storage zone of 3 m with a freeboard of 600 mm, based on a

1:100-year precipitation event (worst case with the 1:100-year event occurring at the same time the pond is at the high-water level). As part of the stormwater management planning, a wave runup calculation was performed to estimate the potential impact of wind-driven waves on the pond. This analysis was critical for accurately determining freeboard requirements, minimizing the risk of overtopping, and ensuring the pond's structural integrity under various weather conditions (see Section 8.2 of the Stormwater Management Plan, Attachment J); therefore a 1 m freeboard is not deemed necessary.

d) The liquid digestate pond design has been optimized to a two-celled pond configuration with an aeration system (see 4 e) below), as such no longer contains a facultative cell or a maturation cell.

e) Design criteria for the proposed OPTAER™ pond aeration system is provided in the Nexom Design Brief, Attachment K (influent flows and loading rates for total solids (TS), volatile solids (VS), total sulfur and H_2S are presented on page 3). Rimrock notes that some of the inputs for flow, TS, VS and H_2S in the Nexom Design Brief are higher than the current facility design, making the proposed Nexom aeration design more conservative than required for expected operations.

   Given the main objective for the operation of the polishing cell is to provide sufficient oxygen supply to meet the demand of biochemical and chemical processes of aerobic solids digestion and H_2S oxidation, a primary performance indicator will be the concentration of the dissolved oxygen (DO) in the pond. To ensure aeration is performing in the manner it is designed to, operators will periodically measure the DO in the polishing cell (minimum suggested DO is 0.5 mg/L with the objective of 2.0 mg/L) (Nexom Design Brief, Attachment K).

f) Measures for protection from groundwater intrusion are described in Section 9.0 of the Stormwater Management Plan (Attachment J).

6 SIR No. 5

Request: *Measures to be taken to prevent odour from the facultative cell and the maturation cell.*

Response:

Refer to Rimrock's response to SIR No. 4, the liquid digestate pond design has been optimized to a two-celled pond configuration with an aeration system, as such no longer contains a facultative cell or a maturation cell.

7 SIR No. 6

Request: *Documentation to support implication (SIRR, PDF page 95) that the percentage of the total H_2S emission rate to be emitted at the liquid digestate pond surface is equal to BOD removal percentage at the pond.*

Response:

The prior assertions related to correlating total H_2S emissions and BOD removal rate for the liquid digestate pond were based on a previous anaerobic pond design. As described in SIR No. 4, the liquid digestate pond design has been optimized to a two-celled pond configuration with submerged mechanical aeration. As such, the prior assertion is not applicable to the updated pond design described in SIR question No. 4. Refer to the Air Quality Assessment (Attachment I) regarding H_2S emission rate for the liquid digestate pond.

8 SIR No. 7

Request: *Confirmation of the height above grade of the organic food resource tanks and the anaerobic digesters (SIRR Table 3, PDF page 82) that are partially underground.*

Response:

Rimrock confirms that the heights of the organic reception tanks and anaerobic digester tanks provided in the updated Air Quality Assessment are heights at/or above grade (see Attachment I, Table 4: Applicable Building Heights). Tank height information is also provided in the updated Table 5-7 (Attachment G).

9 SIR No. 8

Request: *Rationale for:*

a) Selection of the methodology/approach (SIRR, PDF pages 94-98) for H_2S emission rate determination, the Department's literature review shows that mathematic modelling and direct measurement are conventional methods for similar studies;

b) Selection of the base H_2S emission factor of 2.77 ug/s/m^2 and 75% of H_2S emission reduction factor in developing H_2S emission rates from the digestate pond, review of the Reference Articles (SIRR, PDF page 96-97) indicates that the selected values are not representative of the proposed facility operation;

c) Assuming a zero H_2S emission rate for feedlot pens in the air quality modelling study, when sufficient evidence exists in the literature to the contrary;

d) Not modelling the volatile organic compounds (VOC) and other reduced sulfur compounds such as methyl mercaptan;

e) Not including H_2S and ammonia from the solid digestate staging and storage areas in the air quality modelling study; and

f) Not installing a double liner with leak detection system for the liquid digestate pond.

Response:

a) As described in Section 1.2 of this report, notable facility design changes have been implemented in response to SIR #2. To support these design changes, Rimrock has completed a mathematical model that includes direct measurement of manure feedstock. The model developed is a Project-specific process sulphur balance and Project-specific process nitrogen balance. The balances include site specific inputs (direct measurements), in combination with literature sources, to determine the sulphur mass throughout the facility processes and calculate the potential H_2S and NH_3 losses to the biogas upgrader, odour abatement system, or atmosphere at various stages. The process balance memos have been used to supplement the updated Air Quality Assessment (AQA). A copy of the process sulphur and nitrogen balance memos are included in the updated AQA (see Attachment I).

b) The liquid digestate pond has been redesigned from the previous multicell pond design to a two-celled pond configuration. Cell 1 is a polishing cell equipped with mechanical aeration; Cell 2 is a storage cell (see SIR No. 4). Potential H_2S emissions associated with the revised pond design were calculated using a Project-specific process sulphur balance (see response to a) above). The sulphur balance was used to model the amount of sulphur that remains entrained in the liquid digestate entering the pond. Henry's Law was then used to calculate the mass of potential H_2S that could be released to the atmosphere from the liquid digestate based on the solubility of H_2S in the liquid phase of the digestate supernatant. To prevent H_2S from being emitted to atmosphere, Rimrock will install and operate mechanical aeration in the polishing cell. The mechanical aeration in the polishing cell will maintain a high dissolved oxygen content resulting in the oxidization of H_2S to elemental sulphur, thereby preventing the release to atmosphere. Additional details are provided in Appendix A of the updated AQA (Attachment I).

c) Additional literature reviews have been conducted to assess potential H_2S emissions from the feedlot pens as background industrial emission sources in the updated AQA. The updated AQA uses calculated emission rates derived from an H_2S emission factor of 3.6 grams per day per head of cattle (g/d/hd), reported by Grant

et al (Grant et al. 2022). This emission factor allows for a site specific H_2S emission rate of 1.458 g/s for the adjacent Rimrock Cattle Company Ltd. feedlot. Additional information is provided in the updated AQA (Attachment I).

d) The US Environmental Protection Agency (EPA) has reported that of all the gaseous emissions associated with anaerobic decomposition of highly organic manure wastes, it is ammonia and hydrogen sulfide that occur in the greatest concentrations from organic wastes. The focus of the assessment was therefore on hydrogen sulphide (H_2S) and ammonia (NH_3). As such, VOCs and other reduced sulphur compounds (such as methyl mercaptan) were not identified as primary pollutants of concern; furthermore, they are not regulated substances under the Alberta Ambient Air Quality Objectives (AAAQOs). It is important to note however that consideration has been given to reduced sulfur compounds such as methyl mercaptan and VOCs in the design of the odour abatement system and the biogas upgrader where activated carbon filters are expected to remove the vast majority of these compounds contained in those air streams.

e) Potential H_2S emissions associated with the solid digestate storage piles have been calculated using a Project-specific process sulfur balance (see response to a) above). The sulfur balance was used to model the amount of sulfur that remains entrained in solid digestate. A literature review did not identify potential emission factors or rates for dewatered digestate solids. As such, it has been conservatively assumed that all the remaining H_2S present in the solid digestate staging and storage areas will be lost to atmosphere. Additional details are provided in the updated AQA (Attachment I).

   Additional literature reviews were conducted to assess potential ammonia emissions from the solid digestate. The updated AQA uses calculated emission rates derived from an ammonia emission factor 0.0009 kg of NH_3 per kg of nitrogen in the inlet feed (per Process Nitrogen Mass Balance Summary, AQA Appendix A). This emission factors allows for a site-specific ammonia emission rate. Additional details are provided in the updated AQA (Attachment I).

f) Rimrock is not proposing to install a double liner for the liquid digestate pond because the following design measures and site conditions are expected to provide suitable groundwater protection:

   - The design and positioning of the liquid digestate pond results in a pond elevation that is higher than the measured groundwater elevations (see Drawing 8, Attachment D). Cell 1 and Cell 2 sit above the groundwater elevations sampled in the geotechnical investigations (Clifton 2022). Cell 1 is 0.7 m or greater than measured groundwater elevations while Cell 2 is 1 m or greater above (see Stormwater Management Plan, Attachment J),

   - Hydraulic conductivity tests were completed in BH 109 during geotechnical investigations (see Figure 4-10, Attachment C for borehole locations), resulting in a K_{sat} value of 1.12×10^{-6} m/s, indicating low permeability (Clifton 2022). Surface preparation and compaction prior to liner installation is proposed. This includes: the surface shall be disked or scarified to a depth of 150mm then compacted with a sheepsfoot roller to obtain 98% Standard proctor compaction. Disking and compaction is anticipated to further decrease the hydraulic conductivity of the sub soils (Stormwater Management Plan, Attachment J),

   - As described in the Stormwater Management Plan (Attachment J), in order to further prevent groundwater intrusion and maintain the liner's functionality, a layer of sand is proposed beneath the liner. This sand layer will act as a buffer zone, allowing for the passage of air and moisture and serving to protect the liner from mechanical damage. The sand layer can also facilitate the identification of any

leaks and aid in the repair process and will be linked to the monitoring system. To manage moisture and prevent the buildup of gases beneath the liner, vents are proposed at the top of the slopes. These vents will allow for the release of accumulated gases, preventing pressure buildup that could compromise the integrity of the liner and hence the overall function of the pond,

- An annual inspection of the integrity of the liner, per manufacturer recommendations, will be completed when the cells have been drained, and

- The proposed groundwater monitoring network includes monitoring wells located upgradient and down gradient of the liquid digestate pond (see Figure 4-4, Attachment C), which will provide leak detection. Groundwater monitoring during operations will provide detection in the unlikely event of unanticipated leachate impacts.

References:

Alberta Environment and Protected Areas (AEPA). January 2019. *Alberta Ambient Air Quality Objectives and Guidelines Summary*. Government of Alberta. Accessed May 2023: https://open.alberta.ca/publications/9781460134856.

Clifton. 2022. Tidewater Renewables Ltd. Rimrock Biodigester Foothills County, Alberta – *Geotechnical Site Investigation Report*. June 24, 2022.

Grant, R.H., Boehm, M.T., Hagevoort, G.R. (Grant et al). 2022. *Emissions of Hydrogen Sulfide from a Western Open-lot Dairy*. Journal of Environmental Quality, 2021, 51:622-631.

United States Environmental Protection Agency. April 1978. *Control of Animal Production Odours – The State-of-the-Art (EPA-600/2-78-083).* Office of Research and Development. U.S. Environmental Protection Agency. Accessed June 2023 at: https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=47785&fed_org_id=111.

10 SIR No. 9

Request: *For minimization of odour from the proposed facility, an evaluation of the following:*

a) To release gas from the head space of the feedstock and digestate storage tanks to the RNG collection system instead of the atmosphere;
b) To release digestate to the facilities regulated by the NRCB to reduce the digestate quantity to be stored at the proposed facility;
c) To store the liquid digestate in covered tanks where gas from the head space can be released into the RNG system;
d) To relocate the manure blend building to the adjacent feedlot and to pump hydrated manure directly to the digesters;
e) To compost solid digestate at the proposed facility; and
f) To remove H_2S or sulfide in the liquid digestate before it enters into the pond.

Response:

a) To meet ATCO's pipeline specifications for renewable natural gas (RNG), the biogas upgrader can only accept certain concentrations of oxygen and nitrogen. Tying in the head space from these tanks would exceed those concentrations. Therefore, a separate odour abatement system is required to treat the head space from tanks.

As per SIR No. 1, the head space of all feedstock and digestate storage tanks will be enclosed, put under negative pressure, and tied into an odour abatement system (see Attachment F, Odour Abatement Process Flow Diagram). The odour abatement system is comprised of an ammonia scrubber and active carbon vessel which are very similar to the wet chemical scrubber and activated carbon filters used in biogas upgrading, the difference being treated air with 95% or greater removal of contaminants will be released to the atmosphere versus the RNG pipeline.

b) Rimrock proposes to release approximately 78% of the annual solid digestate production to the adjacent NRCB-regulated feedlot and farming operations for use as cattle bedding and/or as a soil amendment to be spread on adjacent lands in accordance with Nutrient Management Plan and *Agricultural Operations Protection Act* (AOPA) requirements. Rimrock confirms the annual volume of solid digestate to be released to the feedlot (approximately 34,500 tonnes/year) will not exceed the volume of manure transferred from the feedlot to the biodigester facility as feedstock (approximately 80,000 tonnes/year); therefore, will not exceed the limits of the feedlot NRCB permit.

For liquid digestate, there is physically not enough space at the adjacent feedlot for a liquid digestate pond. Further, liquid digestate will be released to NRCB-regulated lands twice a year (spring and fall), thereby reducing the amount that is temporarily stored at the facility.

c) Refer to 9 a) above, the head space from tanks cannot be released to the biogas upgrader to meet ATCO's pipeline specifications for RNG and a separate odour abatement system would be required. Based on the mass balance (Attachment E), the facility will produce 828 m^3/day of liquid digestate (~300,000 m^3/year) which, assuming 7 months of liquid digestate storage requirements, would require approximately 175,000

m^3 of storage capacity. The installation of a tank farm capable of storing that volume was evaluated in the BATEA assessment and was not selected using the environmental and economic evaluation (Attachment A).

Rimrock also notes the liquid digestate pond has been optimized to a two-celled pond configuration equipped with a mechanical aeration system in the polishing cell. The liquid digestate leaving the polishing cell) will be fully stabilized (i.e., not generating H_2S or VOCs) (see SIR No. 4). Further, as per the BATEA assessment (Attachment A), the % reduction in H_2S emissions in the Project-case for storing liquid digestate in tanks tied to an odour abatement system are equivalent to aeration.

d) As described in SIR No. 1, the manure blend building is no longer a part of the facility design. The feedstock receiving area has been relocated and redesigned such that recessed hoppers will receive raw (un-hydrated) manure and be placed in an enclosed building complete with air exchange system connected to the odour abatement system, with manure hydration only beginning in the enclosed blend tanks (which the headspace will be put under negative pressure and also tied into the odour abatement system).

Rimrock notes that relocating the manure blend building to the adjacent feedlot would have no net difference in regional odours, given the proximity of the two facilities. Further, relocating the manure blend building would present operational challenges given the distance the hydrated manure would have to be pumped along with the thermal needs of the broader facility (manure blend building included). Manure not only needs to be hydrated but also heated before it can be introduced into the anaerobic digester tanks, to maintain the temperatures required for anaerobic digestion. Heat for both the hydrated manure and the digestate in the anaerobic digester tanks will be generated using a combination of the cogeneration units and the process heater. Having a manure blend building a few hundred meters away from these heat sources would *not be an* efficient means of supplying the required thermal energy to the system.

e) Solid digestate is a by-product of anaerobic digestion that has been biologically reduced to a stabilized material. Additional composting of the solid digestate will not further enhance the stabilized solids, nor is there sufficient residual volatile solids in the solid digestate to support its use as feedstock in a compost operation. Further, the solid digestate staging area is not expected to be a significant source of odourous emissions (see SIR No. 3a). This is supported by published studies such as *Odour Measurements at Different Methanisation Sites* (Bayle et al 2018) which indicates the solid digestate storage zones are the least emitting zones for the studied biogas plants. This is supported further by the BATEA assessment (Attachment A), which demonstrates that enclosing the solid digestate staging area and tying it into an odour abatement system is predicted to only result in a 2.3% reduction of H_2S and 2.5% NH_3 in the Project case.

f) Rimrock has proposed to invest significant capital in the digestate separation building equipped with screw presses (approximately 10% of the total installed cost for the Project). The sole purpose of the screw presses is to separate the solid digestate fraction from the liquid fraction, upstream from the pond. Separation of the solid fraction from the liquid digestate will significantly decrease the volume of solids entering the pond, thereby preventing their anaerobic degradation and associated H_2S emissions. Further, as described in SIR 4, since a majority of the solids have been separated this allows for optimization of the pond to a two-celled configuration equipped with a mechanical aeration system in the polishing cell. The liquid digestate leaving the polishing cell will be fully stabilized (i.e., not generating any H_2S or VOCs). This allows for Cell 2 to be used only for stabilized liquid digestate storage.

References:

AESRD, ARD and NRCB. 2015. *Memorandum of Understanding (MOU) Among Alberta Environment and Sustainable Resources Development (AESRD), Alberta Agriculture and Rural Development (ARD), and the Natural Resources Conservation Board (NRCB), Regarding On-Farm Storage and Land Application of Digestate.* February 5, 2015.

Bayle et al. 2018. *Odour Measurements at Different Methanisation Sites*. Updated February 18, 2021. Available at: https://www.aidic.it/cet/18/68/014.pdf. Accessed May 2023.

Natural Resources Conservation Board (NRCB). 2021. *Minimum Distance (MDS) Separation Waivers – Fact Sheet*. Updated February 18, 2021. Available at: https://www.nrcb.ca/public/download/files/97539. Accessed April 2023.

Natural Resources Conservation Board (NRCB). 2023. *Minimum Distance Separation (MDS) & Land Base Calculator*. Available at: https://www.nrcb.ca/public/download/files/97539. Accessed May 2023.

Attachment A – BATEA

Rimrock Renewables Ltd.
(Application No. 001-484778)

EPEA Supplemental
Information Request #2
(dated March 23, 2023)

Subject: Evaluation of Best Available Technology Economically Achievable
Prepared By: Rimrock Renewables Ltd.
Date: July 17, 2023

1. Introduction

On March 23, 2023, Rimrock Renewables Ltd. (Rimrock) received an SIR #2 from Alberta Environment and Protected Areas (AEPA) requesting supplemental information to continue technical review of the Application. Within the preamble of the SIR #2, AEPA requested Rimrock to evaluate the most effective demonstrated technologies in accordance with AEPA's Industrial Release Limits Policy (Policy) by employing the principle of Best Available Technology Economically Achievable (BATEA) to further reduce odour from the proposed biodigester facility. In response to this request, Rimrock completed a BATEA evaluation, which is described in this memorandum as a supporting reference for the proposed design and odour abatement technologies outlined in Rimrock's SIR #2 responses.

The BATEA evaluation followed a three-step process, summarized below, for evaluating odour abatement technologies. This evaluation process was completed in three steps:

- **Step 1: Identification of Demonstrated Odour Abatement Technologies**
- **Step 2: Technical Feasibility and Preliminary Economic Evaluation of Odour Abatement Technologies**
- **Step 3: Environmental and Economic Evaluation of Remaining Abatement Technologies**

This document provides a detailed overview of the BATEA evaluation conducted to arrive at the proposed design and odour abatement technologies by contemplating BATEA principles and guidelines used by AEPA when developing industrial release limits. These technologies are described in Rimrock's SIR #2 response. Additionally, the Government of Alberta *Guidance for Assessing Best Available Technology Economically Achievable (BATEA) and Developing Technology-Based Standards* (Guidance) (APEA, 2011) was also reviewed in conjunction with developing this evaluation. It was used as a general guide but not fully adopted, given the purpose of this guidance document is to discuss BATEA in the development of technology-based standards by AEPA.

The BATEA evaluation aimed to evaluate various odour abatement technologies that effectively reduce odour emissions, with particular emphasis on hydrogen sulfide (H_2S) and ammonia (NH_3), with consideration for VOCs and other reduced sulfur compounds such as methyl mercaptans. The objective was to identify demonstrated cost-effective environmentally beneficial technologies for mitigating odour emissions associated with the proposed biodigester facility (the Project).

It is important to note that certain specialty technologies or emerging solutions may not have been considered in this evaluation. While efforts have been made to include a comprehensive range of technologies, it is possible that certain solutions may not have been evaluated within the scope of this report considering the dynamic nature of technological advancements. The odour abatement technologies included in this evaluation were based on available literature, industry practice, site specific

applicability, discussions with equipment and product suppliers, expert judgement of consultants for odour abatement, and numerous site visits to other on-farm biodigesters including GrowTEC near Chin, Alberta, and several sites in Ontario and Italy.

The BATEA evaluation summary should be read in the context of the proposed Project's contribution to cumulative emissions. As noted in the Air Quality Assessment (AQA) (Horizon, 2023a) (Attachment I, SIR#2 response), the proposed Project compiles with the Ambient Air Quality Objectives (AAQO) (for the project case) (AEPA, 2019) and represents a very small part of the cumulative emissions in the area for H_2S and NH_3 (Horizon, 2023b). Additionally, it is predicted to result in a net reduction of regional odourous air emissions (H_2S and NH_3) compared to current conditions (Horizon, 2023a).

2. Identification of Demonstrated Odour Abatement Technologies

Table 1 provides a summary of the odour abatement technologies evaluated with respect to the various process areas of the proposed biodigester facility served as a foundation for subsequent sections of this evaluation, where a more detailed evaluation of their effectiveness and economic feasibility are presented. Cells marked with an "x" were evaluated as potential odour mitigation solution while cells with "-" represents technologies that are not applicable to that respective process area.

Table 1: Demonstrated Odour Abatement Technologies

Process Area	Enclosure or Cover	Wet Chemical Scrubber	Activated Carbon	Biofilter	Bio-Scrubber/ Trickler	Additives	Mechanical Separation	Mechanical Aeration
Manure Staging Area (5000 tonnes)	x	x	x	x	x	-	-	-
Feedstock Hopper Building	x	x	x	x	x	-	-	-
Manure Blend and Feed Tanks	x	x	x	x	x	-	-	-
Organic Food Resource Tanks	x	x	x	x	x	-	-	-
Digesters/Upgrader	x	x	x	-	-	x	-	-
Digestate Separation Building	x	x	x	x	x	-	x	-
Nurse/Liquid Fraction Tanks	x	x	x	x	x	x	-	-
Solid Digestate Staging Area (10,000 tonnes)	x	x	x	x	x	x	-	-
Liquid Digestate Pond	x	x	x	x	x	x	-	x

An initial description of each of these technologies including their effectiveness, environmental benefits, advantages, and disadvantages is provided below. A majority of the information used to evaluate wet chemical scrubber, activated carbon, biofilter, and bio-scrubber/trickler was derived from discussions

with technical experts such as BIOREM Technologies Inc. (BIOREM), AB Energy Canada (AB Holding S.p.a.), and Obsidian Engineering Corp. (Obsidian), and presented in a technical proposal received from BIOREM (2023) (see Attachment H, SIR#2 response).

Enclosure or Cover:

Enclosures or covers are applicable to each of the process areas as shown in Table 1. In the context of this BATEA evaluation, an enclosure or cover represents any building, quonset, concrete lid on a tank, or non-rigid cover (such as a membrane) and their purpose is to allow for the collection of emissions and the implementation of venting systems to either aid in controlled, localized dispersion or subsequent air quality treatment.

It is important to note that enclosures without properly designed venting and air treatment systems are limited in their effectiveness to reduce odorous emissions. Instead of odorous emissions being released uniformly from the source that is left uncovered, odours would instead be emitted from open air ventilation from the enclosure or cover in the form of a point source. Therefore, an odour treatment system is required to reduce emissions from a covered or enclosed odour source. The size of the associated odour abatement system is therefore proportional to the volume of the enclosure, and quantified by determining the number of air exchanges, within the enclosure, needed to collect and treat odorous compounds.

Wet Chemical Scrubber:

Wet chemical scrubbers are applicable to all process areas that can be enclosed, collected, and vented. Wet chemical scrubbers operate by introducing a scrubbing liquid, typically a chemical solution, into contact with the odorous gas stream. The liquid absorbs (reacts) with the targeted odorous compounds, effectively removing them from the process air.

Wet chemical scrubbers are typically deployed to treat water-soluble compounds, such as ammonia, and have demonstrated high removal efficiencies. Scrubbing solutions including sulfuric acid are required to promote the reaction between ammonia and the scrubbing liquid. Their efficiency is influenced by factors such as liquid-to-gas ratio, contact time, scrubbing liquid composition, pH control, and temperature and can be adapted or optimized for different ammonia concentration levels and process conditions.

Activated Carbon Filter:

Activated carbon filters, also known as carbon adsorption systems, are also applicable to all process areas that can be enclosed to produce an air stream. Activated carbon filters utilize a sealed vessel filled with porous bulk carbon material, with a large surface area to adsorb odorous compounds. The odorous air passes through the carbon beds, and the compounds are physically adsorbed onto the carbon's surface.

Activated carbon filters are effective in removing a wide range of odorous compounds, including H_2S, VOCs, and reduced sulfur compounds but not as efficient as removing ammonia. They are particularly effective for intermittent odour sources. Activated carbon can achieve a very high removal efficiency for H_2S, VOCs, and reduced sulfur compounds. The efficiency depends on factors such as the type and quality of the activated carbon used, contact time, gas flow rate, temperature, and humidity. Regular replacement or regeneration of the carbon bed is necessary to maintain optimal performance.

Biofilter:

Biofilters use a bed of inorganic or organic media, such as compost, wood chips, or peat, to support the growth of microorganisms. Biofilters are applicable to all enclosed process areas that are collected to

produce an air stream that could be passed through the biofilter bed. Microorganisms present in the biofilter bed biologically degrade the odorous compounds through bio-oxidation.

Biofilters are commonly used for the treatment of certain sulfur compounds and VOCs and can achieve high removal efficiencies for a range of odorous compounds depending on factors such as media composition, moisture content, temperature, and pollutant characteristics. Inorganic media biofilters, with engineered coatings, are more efficient than organic media at treating compounds that are not water soluble such as many reduced sulfur compounds and VOCs. Engineered inorganic media biofilters are also better at treating intermittent and fluctuating contaminant loads.

Bio-Scrubber / Trickler:

Bioscrubbers and biotrickling filters are similar biofiltration technologies used for removing volatile organic compounds (VOCs) and odours from air or gas streams by using microorganisms that metabolize the contaminants. The key difference between them lies in their operation: a bioscrubber first absorbs pollutants into a scrubbing solution that is then circulated through a separate bioreactor where the contaminants are biodegraded, whereas in a biotrickling filter, the polluted air passes directly over a moist bed of microorganisms where the contaminants are both absorbed and biodegraded together. Although both systems employ biological degradation, biotrickling filters are generally more space-efficient, can handle higher pollutant loads, and require less maintenance due to continuous water recycling, as opposed to bioscrubbers which need periodic replacement of the scrubbing solution.

The removal efficiency is influenced by factors such as media selection, media surface area, liquid distribution, and retention time. Biotricklers are very efficient at removing water soluble compounds like hydrogen sulfide (above 10ppm) but less effective at removing reduced sulfur compounds and VOCs. They are also less effective on intermittent and fluctuating contaminant loads.

Additives:

Additives were evaluated as potential method to reduce sulfur and ammonia within the solid and liquid digestate fractions. Products from suppliers such as Kemko, Novemen, and Agrotech offer variations of acidifiers, oxidizing agents, or adsorbents to treat hydrogen sulfide and ammonia. Many of these products can trace their origins to various industries related to odour control, wastewater treatment, and agriculture.

Treatment using additives was considered at different points within the facility process including the addition of ferric chloride into the feedstock slurry and H_2S treatments to the liquid digestate. Consideration was also given to the addition of Triune to the raw manure feedstock to control the amount of ammonia produced within the biological process. Triune is a polymer-based manure additive intended to bind to ammonium delaying the conversion to ammonia and subsequent loss to the atmosphere from both the digestate storage tanks and liquid digestate pond.

For the liquid digestate, consideration was given to the addition of either Novamen Q7-10 or Novamen NeutraGas 365 as a potential option to reduce H_2S emissions from the pond. Novamen Q7-10 is a biological bacteria treatment intended to biodegrade the residual organic matter in the pond. Novamen Q7-10 is intended to enhance chemical oxygen demand/biochemical oxygen demand and total suspended solids removal while reducing H_2S production. Novamen NeutraGas 365 is a H_2S scavenger which is intended to neutralize H_2S through a permanent bonding and encapsulation of the sulfur ion, leaving an inert sulfide compound that is water soluble and biodegradable. Similarly, Kemko offers a product called U-Scav that is a water soluble triazine based hydrogen sulfide scavenger. Depending on the product, these

would need to be mixed into the liquid digestate stream before entering the pond or added directly into the pond and require additional mixing of the pond.

Mechanical Separation:

Mechanical separation of digestate into solid and liquid fractions using screw presses or centrifuges is an important odour abatement technology deployed at numerous biodigester facilities. The primary purpose of separating digestate is to provide odour mitigation for the liquid digestate pond by removing a large portion of the remaining organic compounds that would otherwise be discharged into the Liquid Digestate Pond following the digestion process.

Mechanical separation of digestate also enables further odour abatement technology to be deployed in a cost effective and efficient manner, such as mechanical aeration (described below) of the liquid digestate pond due to the significant reduction in solids within the liquid fraction and allowing the natural aeration of solid digestate by removing liquid and increasing porosity.

Mechanical separation of digestate therefore provides multiple benefits for odour abatement. It allows for targeted aeration of the liquid fraction, promoting aerobic conditions and reducing odour emissions. Simultaneously, it enhances the natural aeration of the solid fraction, supporting aerobic conditions and minimizing odour generation.

Although mechanical separation of solid and liquid digestate is shown to only be applicable to the Digestate Separation Building in Table 1, mechanical separation has an indirect application to the Liquid Digestate Tank, Solid Digestate Staging, and Liquid Digestate Pond as these process areas would either not exist or be modified in the absence of mechanical separation.

Mechanical Aeration:

Discussion with Nexom (2023) (see Attachment K, SIR#2 response), including preliminary design of an aeration system, were used to evaluate this technology. Mechanical aeration introduces oxygen to promote the growth of aerobic bacteria which consume odorous compounds entrained in the liquid digestate (e.g., sulfides [H_2S] and VOCs) as part of their natural metabolic process, converting them to stable odourless CO_2, SO_4 and H_2O, and stop anaerobic processes (bacteria) to prevent the generation of odourous compounds (H_2S, VOCs)).

Aeration is most effective at lowering H_2S concentrations (approximately 2.0 mg/L) in the liquid digestate, which is applicable to this application, reducing the resultant H_2S in solution to <0.1 mg/L through a reaction of H_2S with oxygen to form elemental sulfur. The effectiveness of the process will be dependent on the bubble size, density, and oxygen transfer rate into the water phase to produce an excess residual oxygen concentration, ensuring the stoichiometric requirements of the reaction are satisfied.

Although aeration is proven to breakdown sulfide compounds, it has limited direct impact on the nitrogen compounds. Nitrogen compounds, such as ammonia and ammonium, are predominantly inorganic and chemically stable. These compounds exist in a relatively stable form and are not easily broken down through aeration alone. The breakdown of nitrogen compounds typically involves separate treatment steps or dedicated systems, such as scrubbers or reactors, to facilitate nitrogen transformations.

3. Technical and Preliminary Economic Feasibility

The Technical and Initial Economic Feasibility section presents the evaluation completed to assess the viability of implementing specific odour abatement technologies to applicable process areas. This section focuses primarily on the technologies eliminated from consideration for technical reasons or selected for further analysis as a consequence of eliminating others. Specifically, additives, wet chemical scrubbers, activated carbon filter, biofilter, and bio-scrubber/trickler.

The remaining technologies not noted above (encloser/cover, mechanical separation, and mechanical aeration) have been considered technically feasible and have been brought forward to be assessed in Step 3 of the BATEA evaluation, below.

3.1 Odour Abatement System (OAS)

The following evaluation of wet chemical scrubbers, activated carbon filter, biofilter, and bio-scrubber/trickler is based on research, expert judgment, and technical discussions with BIOREM Technologies Inc. (BIOREM, 2023), AB Energy Canada (AB Holding S.p.a.), and Obsidian Engineering Corp. These specific technologies were grouped for further evaluation as they share the same purpose of treating odorous gas streams.

Wet Chemical Scrubber:

Compared to activated carbon filters, biofilters, bio-scrubbers, and/or bio-tricklers, wet chemical scrubbers are more efficient at removing ammonia and are often considered the primary choice by industry for ammonia treatment. Wet chemical scrubbers however are not as efficient at removing other compounds such as H_2S or volatile organic compounds (VOCs) and are therefore typically deployed in combination with other filters.

Activated Carbon:

As previously mentioned, activated carbon filters are not as efficient as removing ammonia compared to wet chemical scrubbers and are primarily used for the removal of H_2S, VOCs, and reduced sulfur compounds. As such, activated carbon filters are typically used in combination with wet chemical scrubbers as is the case with the proposed biogas upgrader for this Project.

Compared to biofilters and bio-scrubber/trickler, activated carbon filters typically require lower initial capital cost but require higher operational expenses due regular replacement of the activated carbon bed.

Biofilter:

As with activated carbon filters, biofilters are not as efficient for the treatment of ammonia and are typically used in combination with wet chemical scrubbers to enhance the overall efficiency of odour treatment. Organic media biofilters are not that efficient at removing reduced sulfur compounds and many VOCs. They also degrade and require frequent replacement.

Inorganic media biofilters with engineered coatings, are more efficient at removing reduced sulfur compounds and VOCs and the media lasts for 20 years, however, their initial capital cost is much higher than activated carbon. Their removal efficiency for H_2S, reduced sulfur compounds, and VOCs is very good, but still not as efficient as activated carbon.

Although biofilters have lower operational expenses due to the replacement frequency and cost of the media compared to activated carbon filters, biofilters have a higher initial capital cost and are less efficient at removing odourous compounds, hence they hence were not considered further for use on this Project.

Bio-Scrubber/Trickler:

Bio-scrubbers/tricklers are effective for treating water soluble compounds like H_2S above 5ppm. At lower concentrations of H_2S, their removal efficiency drops off. Additionally, they are less effective compared to activated carbon filters at removing VOCs and some reduced sulfur compounds and are less efficient at removing ammonia compared to wet chemical scrubbers. Bio-scrubbers/tricklers can achieve similarly high removal efficiencies as activated carbon filters when hydrogen sulfide levels on the inlet level are above 10 ppm and continuous but are less efficient when H_2S levels are below 10 ppm.

Given that biotrickling filter are not that effective at removing many reduced sulfur compounds, VOCs, and low levels of H_2S, they were not considered further for use on this Project.

3.1.1 Odour Abatement System Selection

Based on this evaluation, the selected Odour Abatement System (OAS) is a combination of a wet chemical scrubber for ammonia removal and an activated carbon filter for H2S, VOCs, and reduced sulfur removal. This combination was chosen because it has the highest removal efficiency, moderate capital cost, and synergies with the proposed biogas upgrader. This combination of odour abatement equipment will also be capable of managing intermittent and fluctuating contaminant loads.

Organic media biofilter were eliminated from consideration because they are not effective at removing many reduced sulfur compounds and VOCs and would be less responsive to intermittent or changing contaminant levels. Bio-scrubber/tricklers were eliminated because they are not effective at treating low levels of hydrogen sulfide as well as many reduced sulfur compounds and VOCs. They are less responsive to intermittent or changing contaminant levels. Inorganic media biofilters, with engineered coatings, were eliminated because they were less efficient at removing reduced sulfur compounds and VOCs compared to activated carbon, take up a greater footprint, and have a higher capital cost than activated carbon.

3.2 Additives

Except for the addition of ferric chloride to the feedstock slurry, all other additives evaluated in the feedstock receiving area or to the liquid digestate were not further considered due to one or a combination of the following reasons:

- Vendors were unable to provide adequate guarantees that their product would have the required reductions of H_2S or NH_3. (Whitepapers, case studies, performance guarantees, etc.)
- Additives require ongoing dosing of the pond/feedstock for continuous treatment,
- Some additives have resultant by-products derived from the chemical reactions or potential overdosing that may have an undesirable environmental impact and negatively impacting land spreading of solid and liquid digestate,

Additives, other than ferric chloride, were therefore eliminated as a proposed solution for the Nurse/Liquid Fraction Tank, Solid Digestate, and Liquid Digestate, as shown in Table 2 below.

3.3 Technical and Preliminary Economic Feasibility Results

Table 2 below provides a results summary of Step 2 of the BATEA evaluation. As described above, cells marked in grey have been evaluated with a preliminary technical and economic analysis and deemed not feasible to be brought forward to the final steps of the BATEA evaluation.

Table 2: Technical and Preliminary Economic Elimination of Odour Abatement Technologies

Process Area	Enclosure or Cover	Wet Chemical Scrubber	Activated Carbon	Biofilter	Bio-Scrubber / Trickler	Additives	Mechanical Separation	Mechanical Aeration
Manure Staging Area (5000 tonnes)	X	X	X	X	X	-	-	-
Feedstock Hopper Building	X	X	X	X	X	-	-	-
Manure Blend and Feed Tanks	X	X	X	X	X	-	-	-
Organic Food Resource Tanks	X	X	X	X	X	-	-	-
Digesters/Upgrader	X	X	X	-	-	X	-	-
Digestate Separation Building	X	X	X	X	X	-	X	-
Nurse/Liquid Fraction Tanks	X	X	X	X	X	X	-	-
Solid Digestate Staging Area (10,000 tonnes)	X	X	X	X	X	X	-	-
Liquid Digestate Pond	X	X	X	X	X	X	-	X

Note: grey fields indicate technologies removed due to technical feasibility.

4. Environmental and Economic Evaluation

This section provides a comprehensive overview of how each process area applies to the technology and identifies potential odour abatement scenarios that were considered in the BATEA evaluation, focusing on environmental and economic characteristics for the proposed Project.

Given the large number of combinations of process areas and abatement technologies, the remaining BATEA evaluation was conducted on complimentary pairs of technologies employed in each process area, rather than individually (See Figure 5-1, Attachment C, SIR#2 Response] for a description of Process Areas. This provides a pragmatic evaluation of the environmental benefits and costs for the following BATEA evaluation. For example, as noted earlier, an analysis of tank enclosures without an odour treatment system does not result in a material environmental benefit for the project and must be evaluated together.

Manure Staging Area:

The Manure Staging Area, situated 200-300m away from the feedlot, comprises a maximum on site capacity of 5,000 tonnes (6% of annual throughput) and approximately 25,000 ft^2 of surface area. To mitigate odours from the staging area, the primary identified solution is an enclosed building under negative pressure, equipped with an air exchange system connected to an Odour Abatement System (OAS). Consequently, the evaluation of the Manure Staging Area was conducted both with and without the enclosure (i.e., natural aeration) and odour abatement system. It is important to reiterate that enclosures themselves, for the Manure Staging Area and other process areas, do not result in large reductions to emissions without including odour treatment, the cost of which is proportional to the size of the enclosure. Due to the size of the enclosure, a conceptual cost estimate for a standalone odour treatment system was developed in addition to the cost of the enclosure for use in the BATEA evaluation.

As noted above, the manure staging area was also considered without an enclosure, given this is common practice at feedlots and other on-farm biodigesters and the relatively low H_2S emissions as shown in Table 4. This option considers staging manure in windrows to provide natural aeration.

Feedstock Receiving Hopper Building:

The Feedstock Hoppers were also evaluated with and without an enclosure and odour abatement system. The only identified solution for effective odour mitigation was constructing an enclosed building equipped with an air collection system connected to an odour treatment system. The Feedstock Hopper Building is proposed to be approximately 5,000 ft^2 and is be connected to the same odour abatement system as the tanks (mentioned below) and Digestate Separation Building due to proximity and relatively small footprint.

Manure Blend, Digester Feed, Organic Food Resource, Digestate Nurse, and Liquid Digestate Tanks:

For simplicity the Manure Blend, Digester Feed, Organic Food Resource, Digestate Nurse, and Liquid Digestate Tanks were combined into a single BATEA evaluation scenario, as shown in Table 3, since the same odour abatement technologies are applicable. The sole odour abatement technology identified comprises of concrete tank covers equipped with an air exchange system connected to the same odour treatment system as the Feedstock Hopper Building and Digestate Separation Building. Through the use of the air exchange system, the headspace of all tanks described above will be placed under negative pressure. Air from the headspace of each tank will be directed to the odour abatement system via sealed piping, and backdraft dampers and actuated dampers will provide full flow control.

Digesters/Upgrader:

The Digesters are proposed to be enclosed with airtight membranes and vented to the biogas upgrader. The Upgrader includes an ammonia scrubber, activated carbon vessels for absorption of H_2S, VOCs, and other sulfide compounds including methyl mercaptan. The Digesters will also be equipped with both passive (netting, a mesh material within the digester tanks which mitigates sulfur from leaving the digester in its gaseous state) and active methods to control H_2S levels in the biodigester headspace (i.e., addition of ferric chloride to the feedstock prior to entry into the digesters).

Since the Digesters and biogas upgrader have, and will, continue to be included in the proposed design, further BATEA evaluation is not required and as such, were excluded from the scenarios listed in Table 3.

Digestate Separation Building:

Two odour abatement technologies were evaluated for the Digestate Separation Building. These include mechanical separation (i.e., screw presses) and hood vents placed above the screw presses with an air exchange system connected to the same OAS as the Feedstock Hopper Building and Tanks. Although mechanical separation does not directly remove odours from the Digestate Separation Building itself, separation of digestate into solid and liquid fractions plays a significant role in mitigating odours from the Liquid Digestate Pond. In the absence of mechanical separation, a significantly higher volume of organic material would enter the Liquid Digestate Pond, which would reduce the effectiveness of implementing further odour abatement (aeration). There is no commercial benefit for the Project in separating digestate, the sole benefit is environmental and requires a significant capital investment to implement, approximately 10% of the total project cost. Since digestate separation has, and will, continue to be included in the proposed design, the cost of the building and screw presses were excluded from the BATEA evaluation.

Additionally, quantification of the environmental benefit of mechanical separation for the project would require a separate mass balance and AQA analysis that considers higher total solids entering the Liquid Digestate Pond which is outside the scope of this evaluation as it is not being considered. As such, mechanical separation was excluded from further BATEA evaluation, as shown in Table 3.

Due to the openings within the digestate separation building, where the solid digestate falls from the screw presses to the solid digestate bays, the digestate separation building is unable to be placed entirely under negative pressure via the air exchange system for odour abatement. As an alternative solution, to mitigate odorous emissions from the screw presses, hood vents will be placed directly above the screw presses to capture air and direct it to the OAS.

Solid Digestate Staging Area:

The Digestate Staging Area, situated 200-300m away from the feedlot, comprises a maximum capacity of 10,000 tonnes (23% of annual throughput) and approximately 50,000 ft^2 of surface area. To mitigate odour from the staging area, the primary identified solution was constructing an enclosed building under negative pressure, equipped with an air exchange system connected to an odour treatment system. Consequently, the evaluation of the Digestate Staging Area was conducted both with and without the enclosure (i.e., natural aeration) and odour abatement system. Due to the size of the enclosure required, a conceptual cost estimate for a standalone odour treatment system in addition to the enclosure was developed for use in the BATEA evaluation.

As noted earlier, the solid digestate staging area was also considered without an enclosure given the low H_2S and NH_3 emissions as shown in Table 4. This option considers staging digestate in windrows to provide natural aeration.

Liquid Digestate Pond:

Three possible solutions for odour mitigation of the Liquid Digestate Pond were identified including a pond enclosure, storing liquid digestate in tanks (i.e., a tank farm), and mechanical aeration. The pond enclosure and tank farm scenarios were both considered under the enclosures section of Tables 1 and 2 above. As mentioned, covers or enclosures as standalone solutions offer limited benefit in odour mitigation without the use of air exchangers connected to an odour treatment system, as these enclosures require venting for safety purposes. Additionally, it is important to note that depriving liquid digestate of oxygen is likely to increase anaerobic activity, leading to an increase in emissions, particularly H_2S, which requires consideration in the design and sizing of the venting system and associated odour treatment.

The proposed pond is expected to be approximately 6 hectares, and the resulting volume of gas within an enclosure would be approximately 35,000-40,000 m^3 based on an assumed 0.75 m of head space. For comparison, the combined head space of all the proposed Tanks is 2,500 m^3. The capital investment of material/equipment for a combination of wet chemical scrubber and activated carbon filter odour abatement system was estimated to be 2- 3x greater than the cost of the enclosure itself. An odour abatement system of this size would result in a material increase in operational expenses.

Similarly, containing and storing all the liquid digestate in a tank farm without an odour abatement system provides little benefit, as the tank headspace requires ventilation for safety purposes. Based on the mass balance (see Attachment E, SIR#2 Response), approximately 828 m^3/day of liquid digestate (assuming 25% liquid digestate reuse) will be discharged to the liquid digestate pond. This equates to an annual volume of approximately 300,000 m^3 and the minimum required 7-months storage volume of 175,000 m^3. A tank farm capable of storing this volume (the equivalent of 1,100,000 barrels or 20 additional anerobic Digesters) of liquid digestate, including secondary containment and odour abatement system would require a material capital investment, as outlined in Section 4.1 below. The odour abatement system and maintenance costs for the tank farm would result in an increase to the operational expenses of a pond enclosure due to tank maintenance and integrity.

Lastly, mechanical aeration was evaluated as a potential odour abatement solution. Based on the technical feasibility and cost estimate received from Nexom Inc. (2023) as well as discussions with Obsidian Engineering, aeration is expected to have a similar removal efficiency of H_2S as an enclosure or tank farm that's connected to an appropriately sized odour treatment system, as described previously. A disadvantage of a mechanical aeration system is the limited ability to reduce nitrogen compounds compared to a pond enclosure or tank farm that is equipped with a wet chemical scrubber to treat resulting ammonia emissions. However, as shown in Section 4.2 below, the percent reduction in ammonia a wet chemical scrubber would provide is relatively small. Additionally, the capital cost and operational expenses required to install and maintain a pond aeration system were found to be materially less than a pond cover or tank farm, as shown below in Section 4.2.

The three possible odour mitigation scenarios described above are listed in Table 3 and further evaluated in Section 4.1.

Environmental and Economic Evaluation Summary

Table 3 provides a summary of the combined technology areas associated with each of the individual process areas further evaluated in Section 4.1.

Table 3: Selected Odour Abatement Technologies for Environmental and Economic Evaluation

Process Area	Enclosure or Cover	Wet Chemical Scrubber	Activated Carbon	Biofilter	Bio-Scrubber / Trickler	Mechanical Separation	Mechanical Aeration
Manure Staging Area (5000 tonnes)	x	x	x	-	-	-	-
Feedstock Hopper Building	x	x	x	-	-	-	-
Manure Blend, Feed, Organic Food Resource, and Nurse/Liquid Fraction Tanks	x	x	x	-	-	-	-
Digestate Separation Building	x	x	x	-	-	x	-
Solid Digestate Staging Area (10,000 tonnes)	x	x	x	x	x	-	-
Liquid Digestate Pond	x	x	x	-	-	-	x

4.1 Environmental and Economic Evaluation Methods

To further evaluate technologies that were deemed feasible from a technical perspective, an environmental and economic efficiency evaluation was conducted (Table 4). The evaluation focused on percentage reductions in H_2S and NH_3, as these compounds are quantifiable, were modeled as part of the AQA completed for the project (Horizon, 2023a), and are identified as compounds of concern in the AAAQO (AEPA, 2019).

To establish the percentage reduction of H_2S and NH_3 in the Project and Cumulative Case (i.e., the Project plus the feedlot) for each scenario listed in Table 4, the mass emissions for the Project and Cumulative Cases without any odour controls were first established. Mass emissions for each of the scenarios were then implemented individually to calculate a specific percentage reduction in mass emissions for that scenario. Implementation of multiple scenarios simultaneously would therefore result in an aggregate percentage reduction in mass emissions, which was done for the proposed design then modeled in the AQA (Horizon 2023a and b).

Conceptual level capital cost estimates (+/- 50%) were developed for each scenario and compared to the total Project cost to establish the percentage increase in capital cost. Conceptual cost estimates were derived from previously established cost databases and scaled ratios of estimates received from vendors (BIOREM 2023, Nexom 2023, and others) for similar scenarios/applications.

An odour mitigation cost benefit factor was then calculated by dividing the percent reduction in the Project Case by the percent increase in capital cost. The results, presented in Table 4, provide a factor that can be used to compare environmental benefit between scenarios with consideration for capital costs. Higher numbers represent a greater odour mitigation cost benefit for the Project while lower numbers indicate a comparatively reduced odour mitigation cost benefit or unreasonableness between scenarios.

Table 4 also includes the percent reduction in the Cumulative Case (Proposed project and the existing Rimrock Feedlot) for H2S and NH3. The cumulative case reductions were not used in the odour mitigation cost benefit calculation. However, these have been calculated to provide important context regarding the potential impacts of a scenario within the regional setting.

While the Guidance (AEPA 2011) was reviewed in conjunction with developing this evaluation, variations were applied due to the complexities of the Project. For example, the cost ratio calculations were substituted with the above-mentioned cost benefit factor. A simplified factor was developed due to the number of scenarios and technologies that were assessed. The factor, however, provides a measure of economic achievability relative to the environmental benefit for each scenario with the level of accuracy required for design decisions.

For the Liquid Digestate scenarios in Table 4, the *Cover* and *Tanks* both capture all pond vapours and direct the vapours to the OAS. The OAS are expected to achieve a 95% (or more) reduction in emissions. As such, the Cover with OAS and Tanks with OAS are calculated to achieve the same overall reduction in H_2S and NH_2 emissions.

The *Mechanical Aeration* scenario in Table 4 will maintain a dissolved oxygen content in the liquid digestate pond which will oxidize the dissolved H_2S; resulting in a reduction in H_2S emissions of 95% (or more). *Mechanical Aeration* does not reduce overall NH_3 emissions.

4.2 Environmental and Economic Evaluation Results

Table 4: Environmental and Economic Benefit Analysis

Process Area / Scenario	% Reduction in Project Case[1]		% Reduction in Cumulative Case[1]		% Increase in Capital Cost[2]	Odour Mitigation Cost Benefit Factor (Project Case)	
	H_2S	NH_3	H_2S	NH_3		H_2S	NH_3
Feedstock Receiving							
Enclosed Manure Staging Area (5000 tonnes, 25,000 ft²) with OAS	0.2%	72.2%	0.06%	0.9%	19%	0.01	3.80
Enclosed Feedstock Hopper Building with OAS	0.1%	39.6%	0.03%	0.5%	2%	0.06	19.81
Enclosed Manure Blend, Feed Tanks, and Organics Food Resource Tanks with OATS	2%	13.3%	0.5%	0.2%	2%	0.99	6.66
Solid Digestate							
Digestate Separation with OAS	1.2%	1.2%	0.3%	0.02%	<1%	4.07	4.34
Enclosed Solid Digestate Staging Area (10,000 tonnes, 50,000 ft²) with OAS	2.3%	2.5%	0.6%	0.03%	25%	0.09	0.10
Liquid Digestate							
Cover with OAS	92%	8.2%	23%	0.1%	23%	3.98	0.36
Tanks with OAS	92%	8.2%	23%	0.1%	43%	2.13	0.19
Mechanical Aeration	92%	0.0%	23%	0.00%	2%	45.81	0.00

1. Data provided in Horizon 2023b.
2. Conceptual level cost estimates, accuracy +/- 50%

Based on the factors calculated in Table 4, enclosing the Feedstock Hopper Building and venting the air stream to the OAS (factor of 19.81) provides approximately 5 times greater odour mitigation cost benefit for the Project compared to enclosing the Manure Staging Area (factor of 3.80) for NH_3 reduction when considering the material difference in capital cost.

As identified in Table 4, an Enclosed Manure Staging Area with an OAS would result in a significant reduction in NH_3 emissions (though a negligible reduction in H_2S emissions). Although this option would result in a reduction of NH_3 for the Project Case, the change would be negligible (less than 1%) in comparison with the Cumulative NH_3 emissions. Related to this, while the manure staging at the Facility

does increase the Project Case emissions the manure is already being stored at the adjacent Rimrock Cattle Company Ltd. Feedlot (200 m – 300 m away), and as such, there would be no net increase in emissions in the local airshed because of storing the manure at the Facility. Furthermore, ground-level ambient air quality for NH_3 for the Project Case is still predicted to be well within the AAAQOs with the proposed onsite manure staging area emissions (Horizon, 2023a). Also, as identified in Table 4, enclosing the manure staging area is cost prohibitive (19% increase in capital cost).

Enclosing the Manure (factors 0.01 and 3.80) and Solid Digestate (factors 0.09 and 0.10) Staging Areas, covering the Liquid Digestate Pond (factors of 3.98 and 0.36), and constructing a tank farm for liquid digestate (factors of 2.13 and 0.19) were scenarios with the lowest odour mitigation cost benefit for the Project and were therefore deemed to be cost unreasonable and excluded from the proposed design.

The Liquid Digestate Pond aeration (factor of 45.81 for H_2S) was found to be approximately 11 times more beneficial for the Project compared to a pond enclosure (factor of 3.98 for H_2S) when factoring in the large capital investment required to enclose the pond and treat the resulting anaerobic air stream versus the relatively lower capital cost and effectiveness of mechanical aeration.

Mechanical aeration of the pond and enclosing the Feedstock Hopper Building resulted in the greatest odour mitigation cost benefit for the Project and were included in the proposed design.

Including hood vents above the screw presses in the digestate separation building (factors of 4.07 and 4.34) and covering the Manure Blend, Feed, Organic, Nurse, and Liquid Digestate Tanks (factors of 0.99 and 6.66) also had a relatively favourable odour mitigation cost benefit for the Project. These scenarios were therefore selected as part of the proposed design.

4.3 Results of the Environmental and Economic Evaluation

Table 5 provides the final results of the odour abatement technologies that were included (green) and excluded (grey) from the proposed design after the environmental and economic evaluation was completed. The included technologies represent those which provide environmental benefit, are technologically feasible in the design, and are economically achievable.

Table 5: Proposed Odour Abatement Technologies

Process Area	Enclosure or Cover	Wet Chemical Scrubber	Activated Carbon	Biofilter	Bio-Scrubber/ Trickler	Additives	Mechanical Separation	Mechanical Aeration
Manure Staging Area (5000 tonnes)	x	x	x	x	x	-	-	-
Feedstock Hopper Building	x	x	x	x	x	-	-	-
Manure Blend and Feed Tanks	x	x	x	x	x	-	-	-
Organic Food Resource Tanks	x	x	x	x	x	-	-	-
Digesters/Upgrader	x	x	x	-	-	x	-	-
Digestate Separation Building	x	x	x	x	x	-	x	-
Nurse/Liquid Fraction Tanks	x	x	x	x	x	x	-	-
Solid Digestate Staging Area (10,000 tonnes)	x	x	x	x	x	x	-	-
Liquid Digestate Pond	x	x	x	x	x	x	-	x

Note: grey fields indicate technologies removed during the environmental and economic analysis. Green cells indicate those incorporated into the proposed new design.

4.4 Summary of Environmental Effects of Included Technologies

With the inclusion of the technologies selected through this BATEA evaluation into the project design, there will be a significant reduction in both the project emissions and the cumulative emissions for H_2S and NH_3 (Horizon 2023a and b).

In summary, the proposed design results in a 93.8% reduction of H_2S and a 52.9% reduction in NH_3 for the project itself. It will also reduce the cumulative emissions for H_2S by 44% and 46.8% for NH_3 (Horizon 2023a). For context, the Project represents only 1.5% of cumulative H_2S emissions and 0.6% of the cumulative NH_3 emissions, demonstrating it is a very small regional contributor of odourous emissions (Horizon 2023b).

5. Conclusion

In conclusion, this report presents an evaluation of various odour abatement technologies based on the BATEA principles. The recommended technology(s) provide a balance between effectiveness in odour reduction and economic feasibility. As evidenced by the Air Quality Assessment completed for the proposed project, implementing the recommended technology(s) will enable the Project to achieve regulatory compliance with the AAAQO guidelines while minimizing odour emissions.

References

Alberta Environment and Protected Areas (AEPA). 2011. *Guidance for assessing best available technology economically achievable (BATEA) and developing technology-based standards.* January. Alberta.

AEPA. 2019. *Alberta Ambient Air Quality Objectives and Guidelines Summary (AAAQO).*

BIOREM. 2023. Technical Proposal Tidewater Rimrock AD. Proposal dated July 12, 2023 submitted to Rimrock Renewables Ltd.

Horizon Compliance. 2023a. *Rimrock Renewables Ltd. Rimrock Biodigester Facility Air Quality Assessment.* Report submitted to Rimrock Renewables Ltd.

Horizon Compliance. 2023b. *BATEA Calculations.* Data submitted to Rimrock Renewables Ltd.

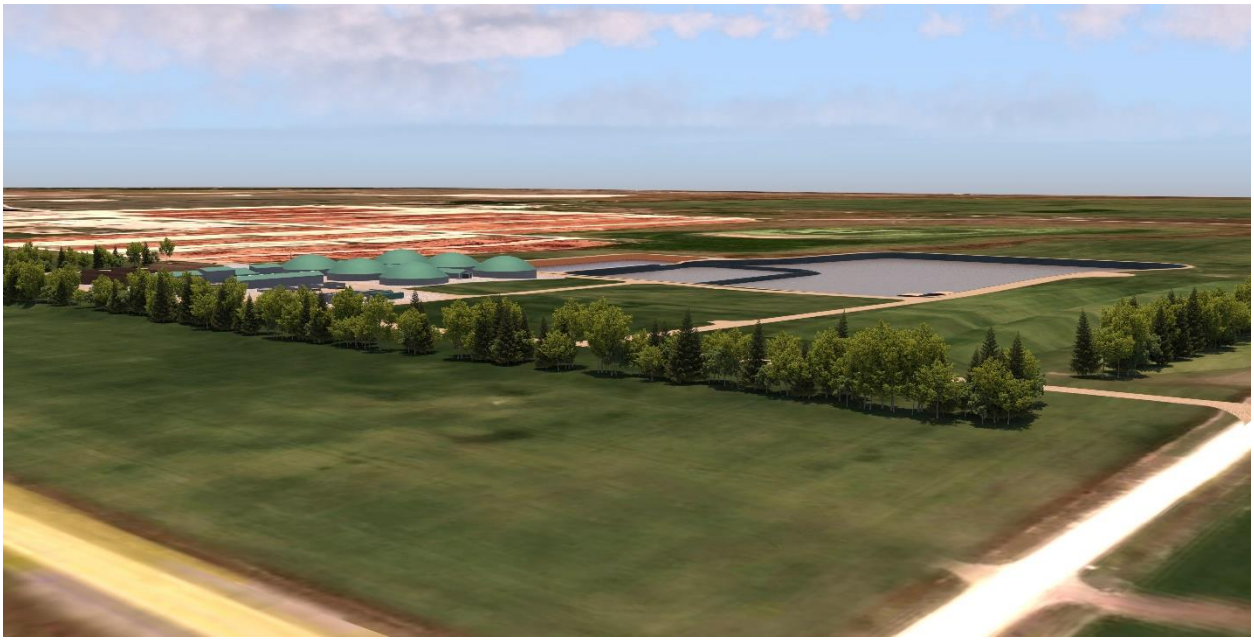
Nexom. 2023. *Rimrock High River, Alberta. Option 4. Preliminary Proposal for the Design, Supply, and Installation of the Lagoon Aeration System*. Proposal dated June 2, 2023 submitted to Rimrock Renewables Ltd.

Attachment B – Facility Renderings

Rendering No.1: View looking north, from south of the proposed Rimrock Biodigester Facility. Portion of Rimrock Cattle Company Ltd. Feedlot shown immediately adjacent to the east.

Rendering No. 2: View looking south from Coal Trail, from north of the facility. Range Road 10/Meridian Street running adjacent west of the facility, portion of existing feedlot on the east.

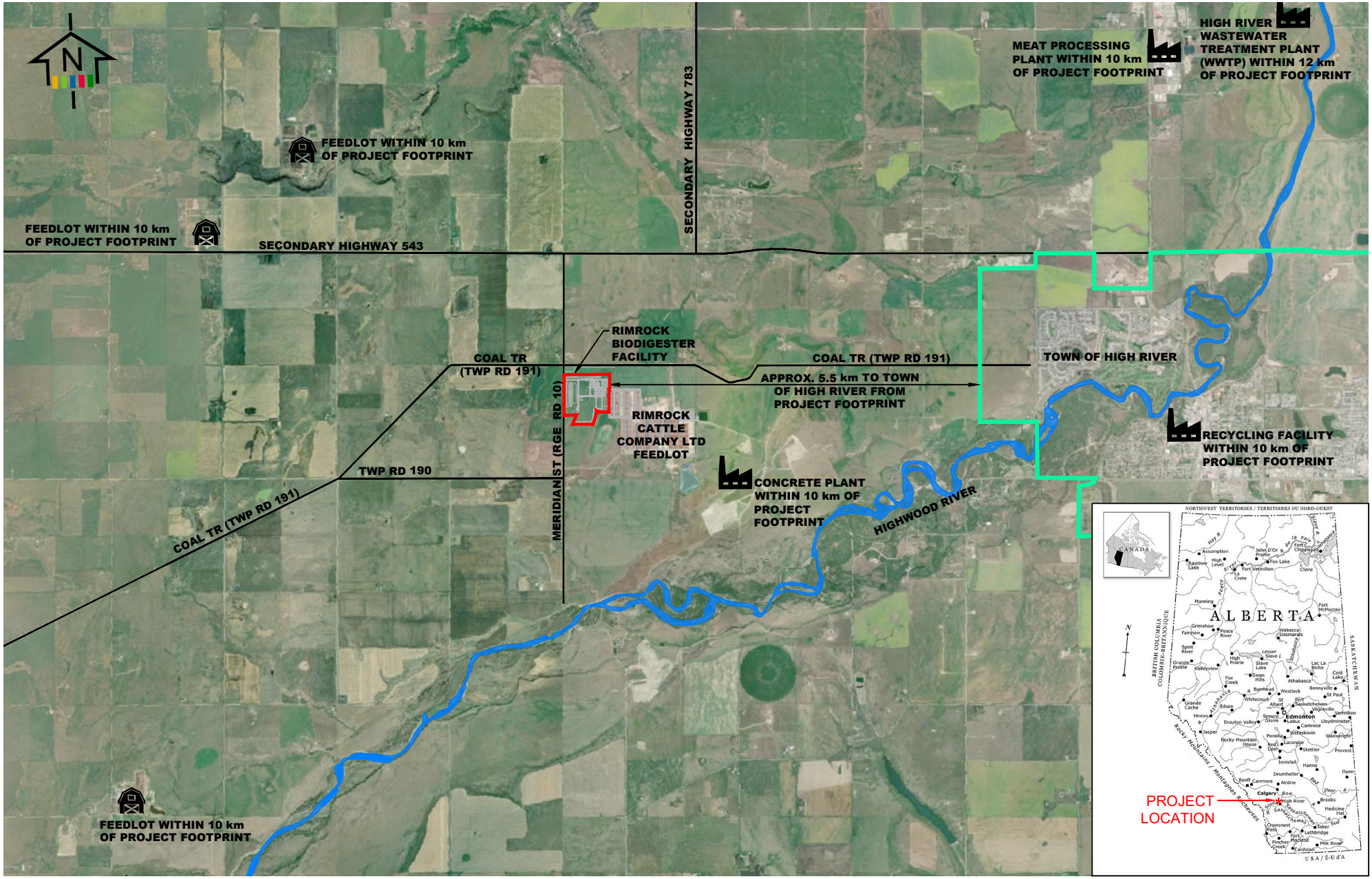
Rendering No. 3: View looking northeast from the liquid digestate pond.



Rendering No. 4: View looking southeast from the intersection of Coal Trail and Range Road 10/Meridian Street.

Attachment C – Figures

- Figure 2-1: Regional Map
- Figure 2-2: Location Map
- Figure 4-4: Existing & Proposed Groundwater Monitoring Well Locations
- Figure 4-10: Groundwater Elevation and Flows
- Figure 5-1A: Main Process Areas
- Figure 5-1B: Facility Process Areas in Proximity to Rimrock Cattle Company Ltd. Feedlot
- Figure 5-2: Facility Plot Plan
- Figure 5-3: Stormwater Collection Infrastructure



PROJECT FOOTPRINT
TOWN OF HIGH RIVER BOUNDARY
HIGHWAYS / ROADS
EXISTING INDUSTRIAL FACILITY
EXISTING FEEDLOT

ISL Engineering and Land Services

0 750 1500 3000 m
1:75,000

Rimrock Biodigester Facility
Foothills County, Alberta
Figure 2-1
Regional Map
July 2023

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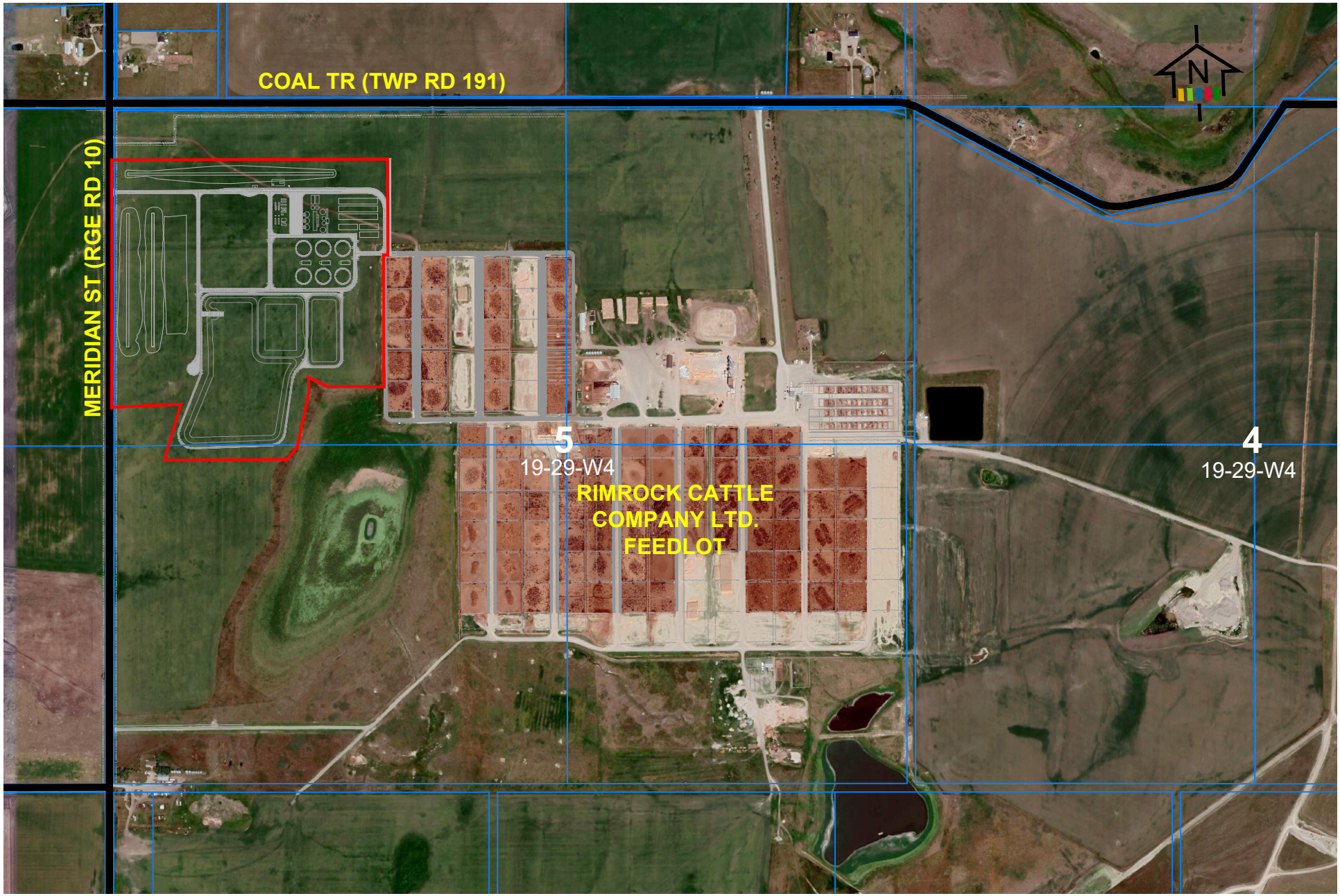

RIMROCK BIODIGESTER FACILITY BOUNDARY

HIGHWAY/ROADS

ISL Engineering and Land Services

0 250 500 m

1:12,500

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 2-2

Location Map

July 2023

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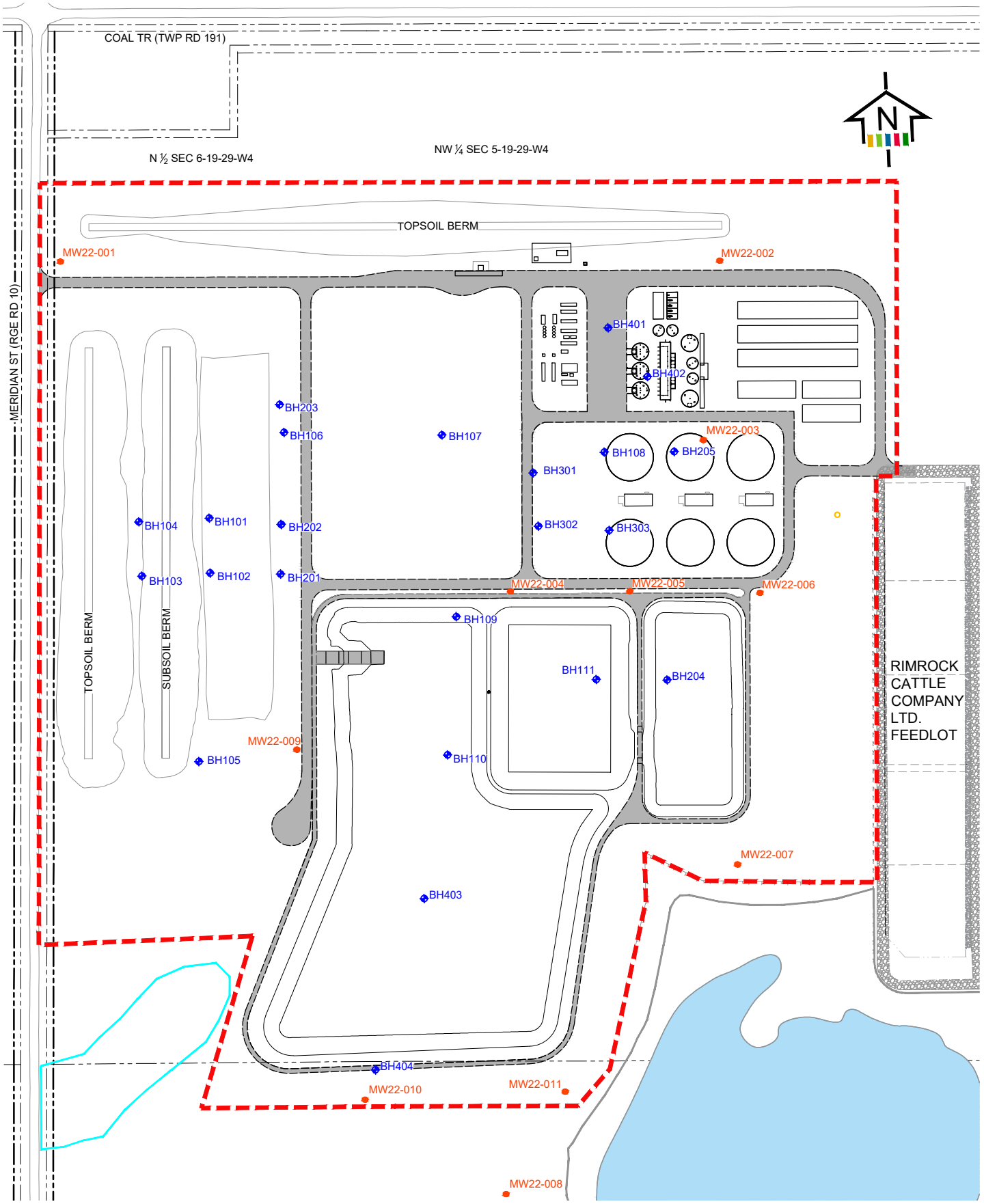

PROJECT FOOTPRINT
CATCH BASIN
EPHEMERAL WATERBODY
EXISTING BASELINE MONITORING WELLS
PROPOSED MONITORING WELLS

ISL Engineering and Land Services

0 80 160 m
1:4000

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 4-4
Existing & Proposed Groundwater Monitoring Well Locations
July 2023

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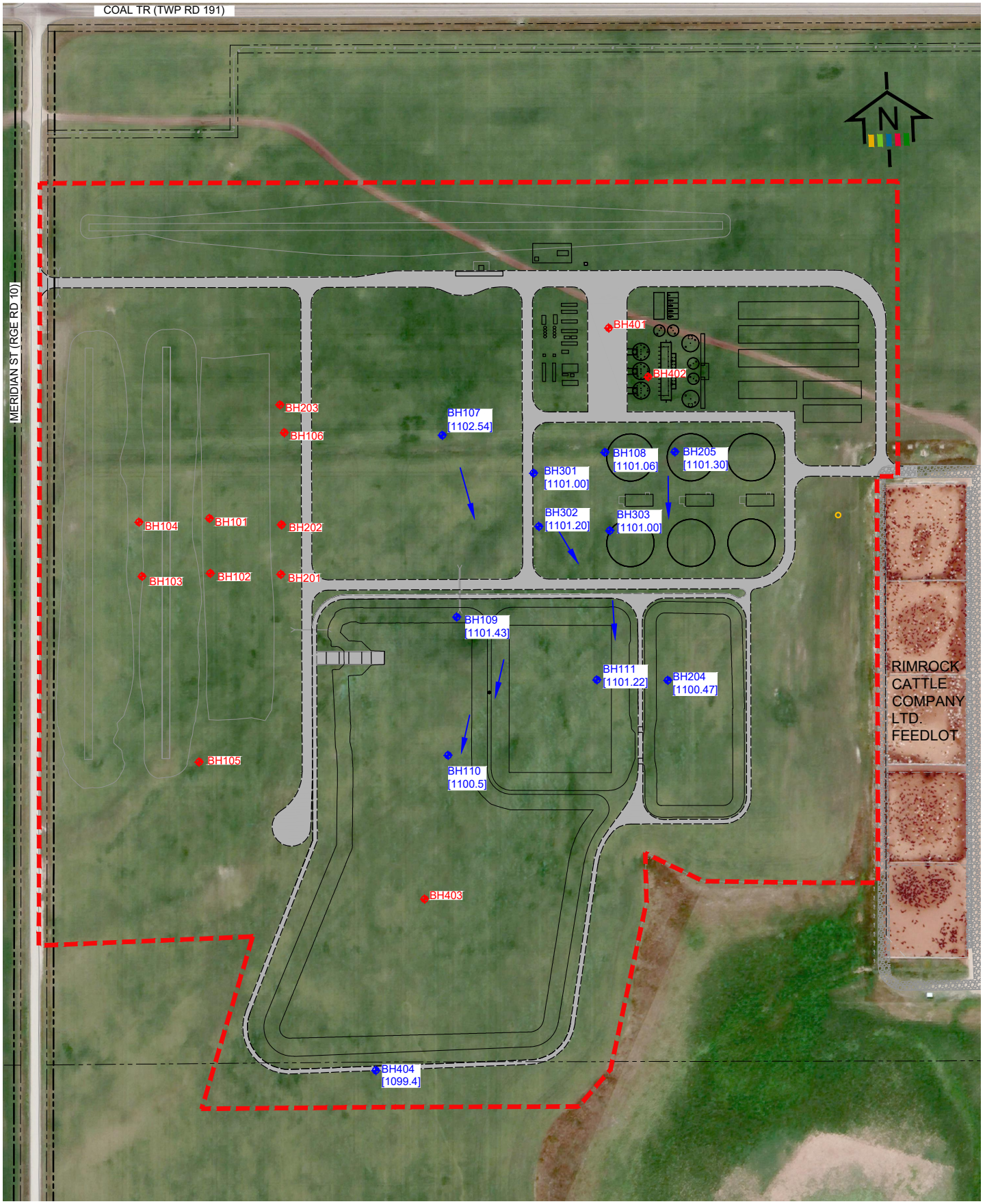

ISL Engineering and Land Services

0 80 160 m

1:4000

PROJECT FOOTPRINT

EXISTING BASELINE MONITORING WELLS

BOREHOLES

GROUNDWATER FLOW DIRECTION

[XXXX.XX] GROUNDWATER ELEVATION (m asl)

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 4-10

Groundwater Elevations and Flow

July 2023

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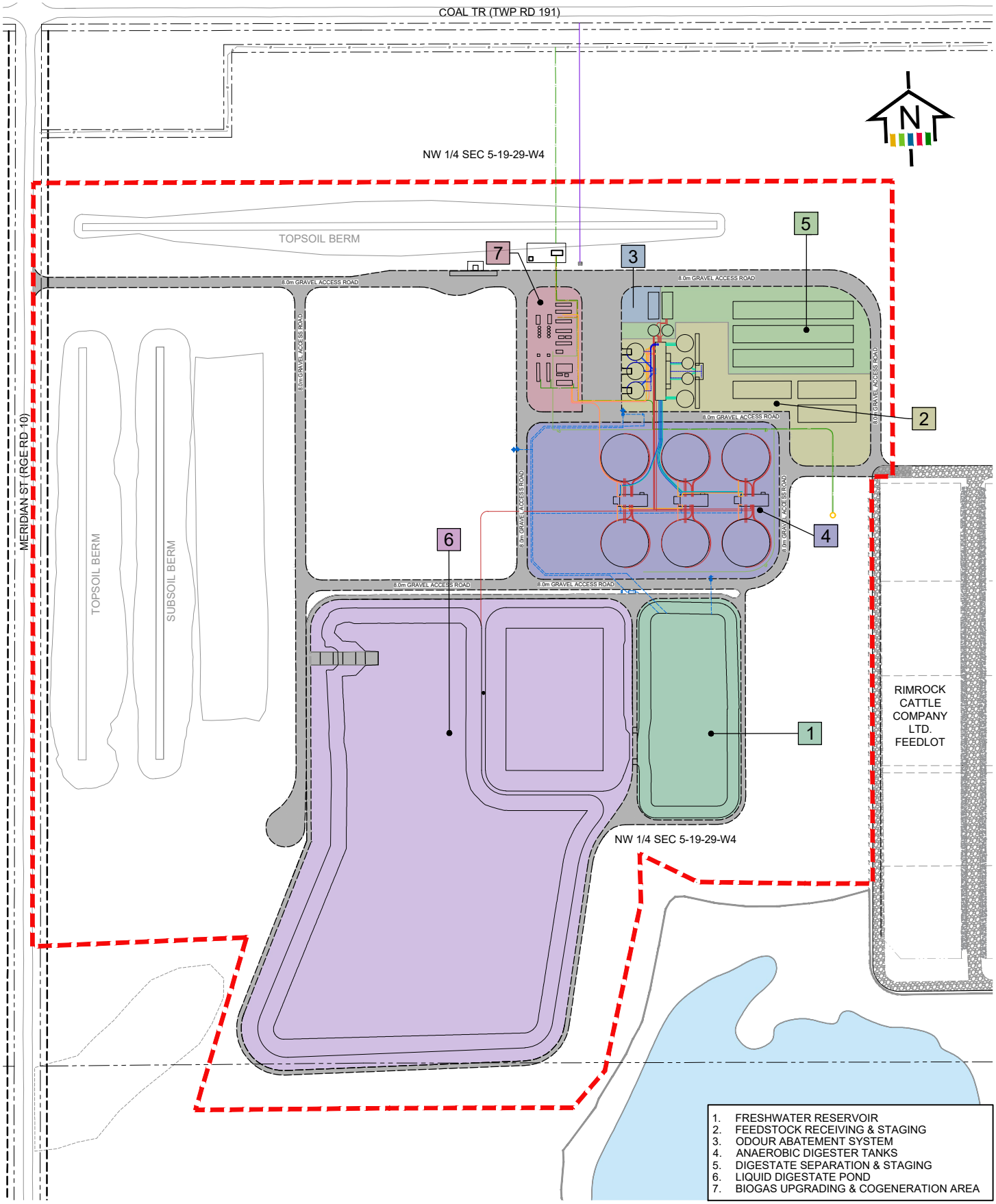

ISL Engineering and Land Services

0 80 160 m
1:4000

PROJECT FOOTPRINT
CATCH BASIN
EPHEMERAL WATERBODY
PROPOSED TRANSFORMER LOCATION
HYDRANT
MANHOLE
WATERLINE
ORGANIC FOOD RESOURCES SLURRY
HEAT MEDIUM RETURN LINE
HEAT MEDIUM SUPPLY LINE
DIGESTATE LINE
MANURE LINE
BIOGAS LINE
NATURAL GAS PIPELINE
RNG LINE
POWERLINE

Rimrock Biodigester Facility
Foothills County, Alberta
Figure 5-1A
Main Process Areas
July 2023

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PROJECT FOOTPRINT

CATCH BASIN

EPHEMERAL WATERBODY

1. FRESHWATER RESERVOIR
2. FEEDSTOCK RECEIVING & STAGING
3. ODOUR ABATEMENT SYSTEM
4. ANAEROBIC DIGESTER TANKS
5. DIGESTATE SEPARATION & STAGING
6. LIQUID DIGESTATE POND
7. BIOGAS UPGRADING & COGENERATION AREA

ISL Engineering and Land Services

0 100 200 m

1:5000

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 5-1B

Facility Process Areas in Proximity to Rimrock Cattle Company Ltd. Feedlot

July 2023

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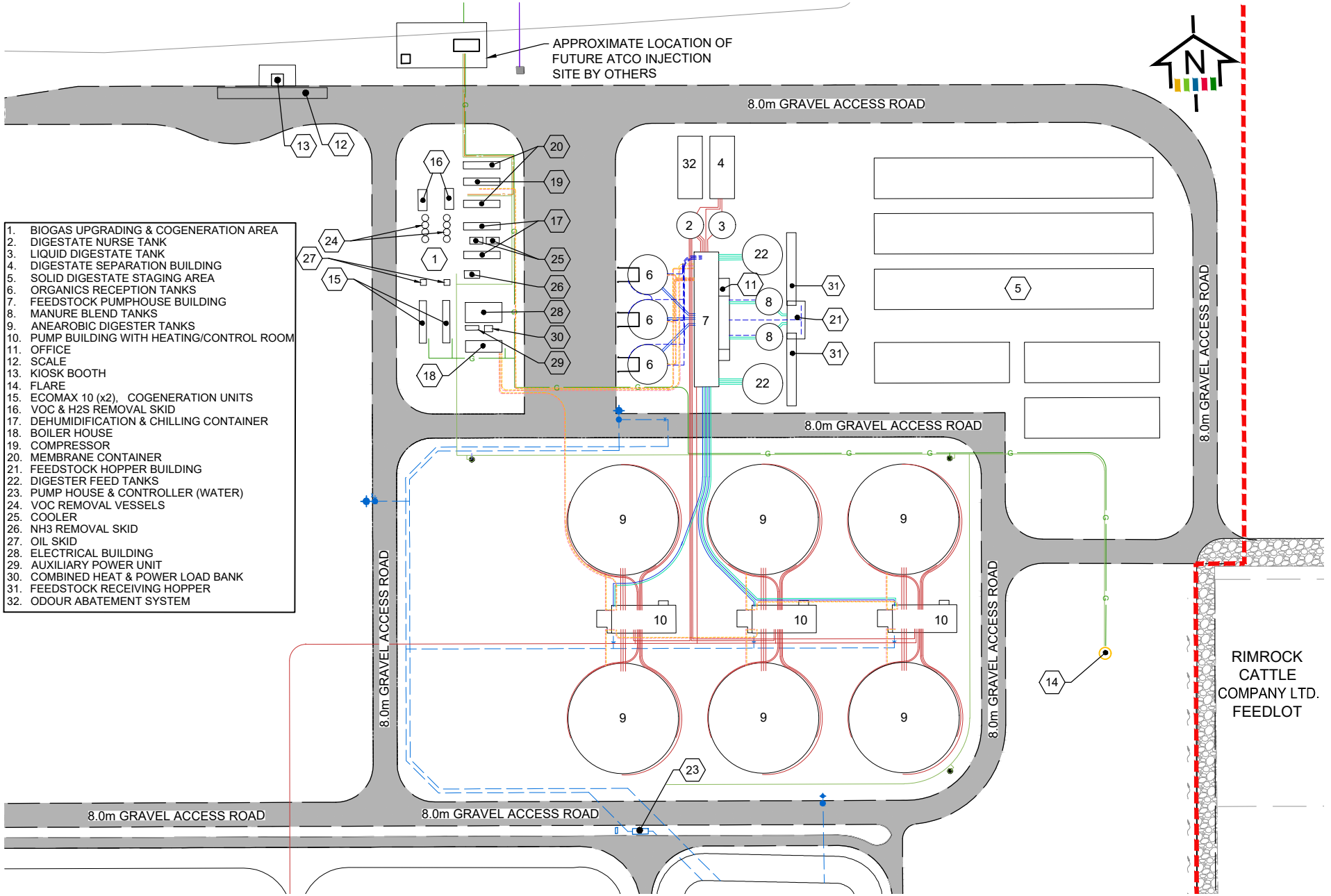

ISL Engineering and Land Services

0 35 75 m

1:1750

PROJECT FOOTPRINT
WATERLINE
HYDRANT
MANHOLE
PROPOSED TRANSFORMER LOCATION
HEAT MEDIUM RETURN LINE
HEAT MEDIUM SUPPLY LINE

DIGESTATE LINE
MANURE LINE
BIOGAS LINE
NATURAL GAS PIPELINE
RNG LINE
POWERLINE
ORGANIC FOOD RESOURCES SLURRY

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 5-2
Facility Plot Plan
July 2023

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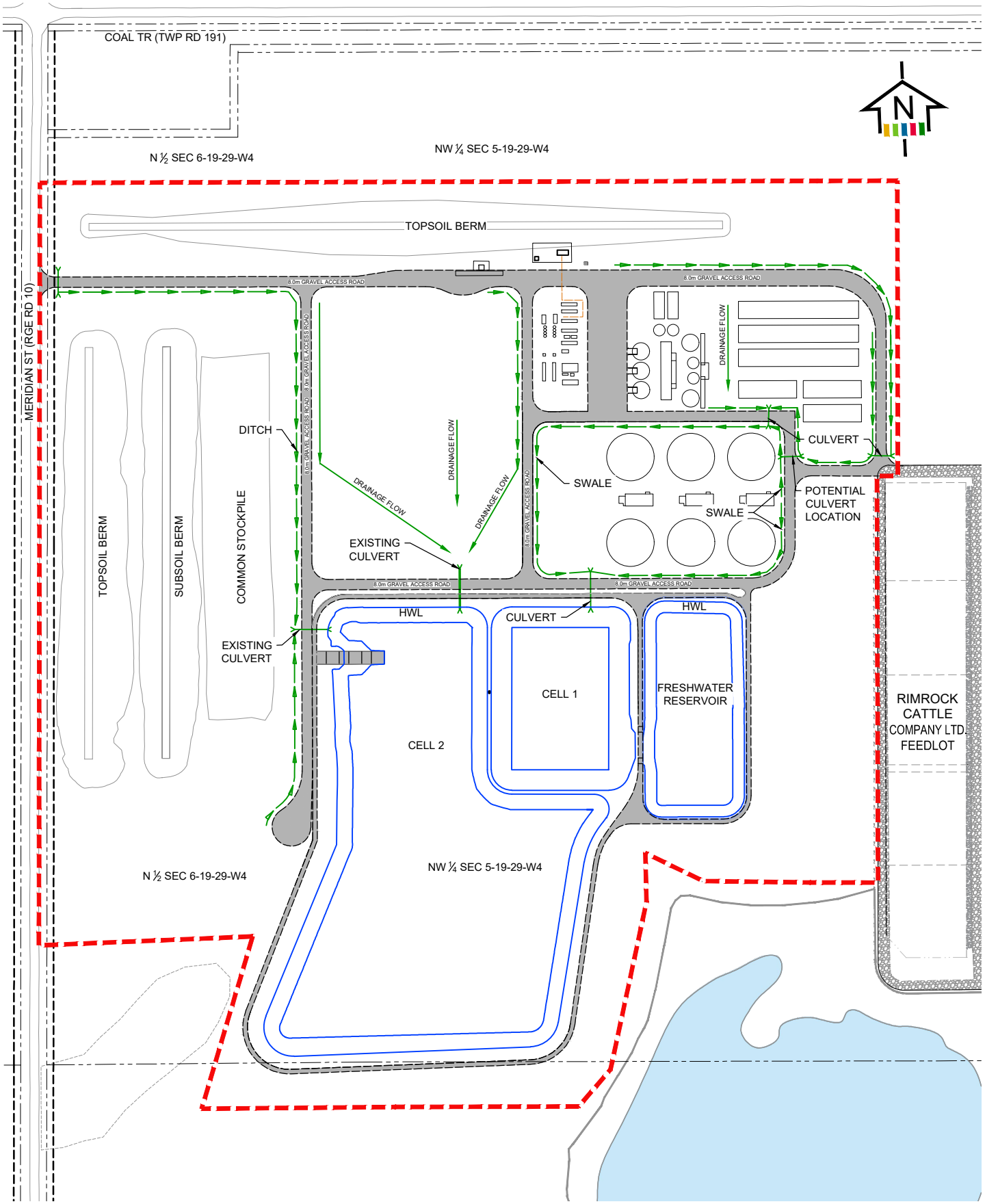


PROJECT FOOTPRINT
CATCH BASIN
EPHEMERAL WATERBODY
STORMWATER CONVEYANCE

ISL Engineering and Land Services

0 80 160 m
1:4000

Rimrock Biodigester Facility
Foothills County, Alberta
Figure 5-3
Stormwater Collection Infrastructure
July 2023

\\isledmonton.local\global\Projects\28000\28000\28028_Rimrock_Civil_Struct_Prelim_Eng\02_CADD\20_Drafting\202_Production\28028_SitePlan_Figure.dwg

Attachment D – Drawings

- Drawing 1: Feedstock Hopper Building
- Drawing 2: Digester Feed Tank
- Drawing 3: Organics Reception Tank
- Drawing 4: Feedstock Pumphouse Building
- Drawing 5: Digestate Separation Building
- Drawing 6: Digestate Nurse Tank
- Drawing 7: Liquid Digestate Tank
- Drawing 8: Liquid Digestate Pond and Freshwater Reservoir

Drawing 1 - Feedstock Hopper Building

DRAWINGS PROVIDED FOR

RIMROCK RNG INC.

FEEDSTOCK HOPPER BUILDING

FOOTHILLS, ALBERTA

FOOTING SCHEDULE

NO.	SIZE	REINFORCEMENT
PF1	84"x84"x24"	- 15M AT 10" c/c EACH WAY (BOTTOM)
SF1	8"x24"	- (2) 15M CONT.
SF2	10"x30"	- (3) 15M CONT.

WALL REINFORCEMENT SCHEDULE

NO.	THICKNESS	REINFORCEMENT	MIN. 28 DAY STRENGTH
FW1	8"	• 15M VERT. REBAR AT 48" c/c • 15M HOR. REBAR AT 24" c/c • (2) 15M CONT. REBAR AT TOP OF WALL	25MPa
FW2	12"	INTERIOR MAT: • 15M VERT. REBAR AT 24" c/c • 15M HOR. REBAR AT 24" c/c EXTERIOR MAT: (BACKFILLED SIDE) • 15M VERT. AT 24" c/c • 15M HOR. AT 24" c/c	25MPa

WALL SCHEDULE

NO.	ASSEMBLY
EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING
TW1	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c

DOOR / WINDOW SCHEDULE

NO.	DOOR / WINDOW TYPE	FRAMING COMPONENTS	
		REQ'D HEADER	REQ'D POST
D1	36"x80" EXT. ALUM. MAN DOOR (HALF GLASS)	(2) 2x6	(1) J + (1) K
D2	10'x10' INSULATED OVERHEAD DOOR	(3) 2x10	(2) J + (3) K

ROOF SCHEDULE

No.	ASSEMBLY
R1	• 29ga. HI-RIB COLOURED STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • PRE-ENGINEERED WOOD TRUSSES SPACED AS PER MFRS SPECS • BLOWN IN INSULATION (R-40) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 1x4 WOOD STRAPPING AT 24"c/c • INTERIOR PVC CEILING

GENERAL NOTES

1. THIS BUILDING IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE ONTARIO BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE PLANS ARE FOR STRUCTURAL DESIGN ONLY. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CO-ORDINATE THE DESIGN WITH RESPECT TO PLUMBING, ELECTRICAL, MECHANICAL, VENTILATION, PENNING, DRAINAGE AND SITE PREPARATION/GRADING.
4. ALL INTERIOR STABLING AND RELATED CONCRETE WORK SHOWN INCLUDING STRIP FOOTINGS, CURBS, FLOOR SLOPES AND FLOOR DRAINS ARE FOR REPRESENTATION ONLY. THE DESIGN OF THESE SYSTEMS IS THE RESPONSIBILITY OF THE OWNER, CONTRACTOR AND EQUIPMENT SUPPLIER
5. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
6. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
7. MAXIMUM ALLOWABLE FLOOR AREA FOR FARM BUILDINGS OF LOW-HUMAN OCCUPANCY IS 4800m² (51666.77ft²) AS PER NATIONAL FARM BUILDING CODE (3.1.1.2.(1) & 3.1.1.2.), A ONE HOUR FIRE SEPARATION REQUIRED TO SEPARATE BUILDING INTO COMPARTMENTS OR AN EQUIVALENT SYSTEM AS PER ARTICLE 2.7.2.2 OF THE 1997 ONTARIO BUILDING CODE MUST BE IMPLEMENTED BY THE CHIEF BUILDING OFFICIAL AS PER (2.7.1.1. - 1997 OBC).
8. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
9. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED OR SHARED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.
10. ANY PRELIMINARY DRAWINGS ARE NOT TO BE USED FOR FINAL COST ESTIMATES UNLESS INDICATED IN THE REVISIONS COLUMN. PRICING OR ESTIMATIONS COMPLETED FROM PRELIMINARY DRAWINGS SHOULD INCLUDE ADDITIONAL ALLOWANCES AND ALL SPECIFICATIONS TO BE RE-CHECKED BY THE OWNER / CONTRACTOR ON THE "ISSUED FOR PERMIT/CONSTRUCTION" DRAWING SET.
11. FINAL STAMPED ENGINEER/ARCHITECT-ISSUED PLANS ARE TO BE PROVIDED ONSITE AND TO ALL REQUIRED SUB-CONTRACTORS. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR OR OWNER TO DISTRIBUTE THE FINAL STAMPED PLANS. ANY TOWNSHIP OR CITY REDLINED/REVISED PLANS AFTER SUBMISSION FOR PERMIT, EITHER BE PROVIDED ONSITE THROUGHOUT THE DURATION OF CONSTRUCTION OR BE PROVIDED TO STONECREST ENGINEERING TO ISSUE REVISED "ISSUED FOR CONSTRUCTION" PLANS THAT IMPLEMENT THESE NOTATIONS. (IF THE TOWNSHIP CHANGES ARE SUBSTANTIAL, ADDITIONAL CHARGES MAY APPLY)
12. ALL PRODUCT AND MATERIALS TO BE INSTALLED AS PER THE SUPPLIER OR MANUFACTURER GUIDELINES. IMPROPER INSTALLATION, RESULTING IN DAMAGES, ARE NOT THE RESPONSIBILITY OF STONECREST ENGINEERING.

EXCAVATION AND BACKFILL

1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW BUILDINGS.
2. FOUNDATION DESIGNS HAVE BEEN DESIGNED FOR AN ASSUMED SOIL BEARING CAPACITY OF 3000 PSF (143 KPa) SLS.
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING. A GEOTECHNICAL ENGINEER MAY BE REQUIRED TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION. THIS MAY RESULT IN A DELAY IN CONSTRUCTION. CONTRACTOR MUST NOTIFY THE ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO, SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. IF A GEOTECNICAL ENGINEER IS REQUIRED A COPY OF THEIR REPORT MUST BE PROVIDED TO STONECREST ENGINEERING UPON ITS COMPLETION. THE CONTRACTOR IS TO READ AND FAMILIARIZE THEMSELVES WITH THIS DOCUMENT.
5. SUBGRADE FOR SLAB-ON-GRADE TO BE PROOF-ROLLED AND ANY LOOSE AREA DETECTED TO BE SUB-EXCAVATED AND REPLACED WITH APPROVED COMPACTED FILL. GRANULAR FILL UNDER THE SLAB-ON-GRADE SHALL BE COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE.
6. GRANULAR FILL UNDER THE FLOOR SLAB SHALL BE FREE-DRAINING CLEAN GRANULAR "B" MATERIAL OR BETTER, COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE
7. COMPACTED FILL BENEATH FOOTINGS AND FLOOR SLABS SHALL BE COMPACTED IN MAXIMUM 150mm (6") LAYERS.
8. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
9. FOOTING ELEVATIONS, IF SHOWN ON THE DRAWINGS, ARE FOR BIDDING PURPOSES ONLY. FOOTINGS MAY BE RAISED OR LOWERED DEPENDING ON BEARING CONDITIONS AND MUST BE RE-REVIEWED IN THE FIELD WITH THE CONTRACTOR WHEN NECESSARY.
10. ALL FOOTINGS TO BE FOUNDED ON FIRM UNDISTURBED GROUND CAPABLE OF SUPPORTING SPECIFIED BEARING CAPACITY AND TO HAVE A MINIMUM OF 48" OF COVER FOR FROST PROTECTION U.N.O.
11. MAXIMUM RATIO OF A STEPPED FOOTING SHALL BE 2:3 (i.e 2' DROP = 3' HORIZ.), UNLESS SPECIFIED OTHERWISE BY THE GEOTECHNICAL ENGINEER, AND TO BE FOUNDED ON FIRM BEARING.
12. IN THE EVENT THAT FILL IS REQUIRED UNDER FOOTINGS, FILL SHALL BE FREE-DRAINING CLEAN GRANULAR MATERIAL COMPACTED TO A MINIMUM 100% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE AND AS DIRECTED BY THE GEOTECHNICAL ENGINEERING.
13. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL AND A REPORT TO BE SUBMITTED TO STONECREST ENGINEERING.
14. IN AREAS SUBJECT TO FLOODING, ALL PROPOSED WORK TO MEET THE REQUIREMENTS OF THE MINISTRY OF THE ENVIRONMENT REGARDING FLOOD PROOFING. CONTACT THE LOCAL BUILDING INSPECTOR FOR INFORMATION.
15. SOIL CONDITIONS AND REINFORCING STEEL SHALL BE INSPECTED BY ENGINEER. CONTRACTOR SHALL GIVE THE ENGINEER A MINIMUM OF 24 HOURS NOTICE TO CARRY OUT INSPECTION PRIOR TO POURING CONCRETE.
16. DO NOT DISTURB OR UNDERMINE EXISTING FOOTINGS DURING CONSTRUCTION. CONTACT ENGINEER IMMEDIATELLY SHOULD UNDERPINNING DESIGN BE REQUIRED.
17. WHEN BACKFILLING, GC TO ENSURE LEVEL OF BACKFILL ON ONE SIDE OF THE WALL IS NEVER MORE THAN 500mm (20") HIGHER THAN THE LEVEL ON THE LOWER SIDE OF THE WALL EXCEPT WHERE TEMPORARY SUPPORT FOR THE WALL IS PROVIDED OR THE WALLS ARE DESIGNED FOR SUCH UNEVEN PRESSURES.
18. LOCATE ALL PIERS AND FOOTINGS CONCENTRIC UNDER COLUMNS AND WALLS UNLESS OTHERWISE NOTED.
19. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT OCCUR IN CONCRETE WALLS UNLESS APPROVED BY THE ENGINEER.
20. ALL FOOTINGS TO HAVE A MINIMUM OF 48" OR MORE OF COVER FOR FROST PROTECTION.
21. FINAL GRADING TO SLOPE AWAY FROM THE BUILDING.

MANURE HANDLING AND STORAGE

1. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
2. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT #XXXXXX, PREPARED BY YYYYYYYYY. AS A MINIMUM, STONECREST ENGINEERING REQUIRES A 6" PERIMETER TILE CONNECTED TO A PUMP/MONITORING STATION. THE PUMP/MONITORING STATION CAN BE USED TO SAMPLE WATER AROUND THE PERIMETER OF THE TANK AND REDUCE WATER PRESSURE ON THE TANK WALLS. SEE DETAIL XXXX
3. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32 MPa HS CONCRETE THROUGHOUT.
4. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
5. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
6. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
7. LIQUID STORAGE TANK TO HAVE PERMANENT SAFETY FENCE EXTENDING TO NOT LESS THAN 5' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING GATES WITH LATCHES TO DETER ACCESS.
8. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
9. ANY MANURE TRANSFER SYSTEM WHICH CAN BACKFLOW TO THE PUMP OR PUMPOUT CHAMBER MUST HAVE BOTH A PRIMARY AND SECONDARY SHUTOFF VALVE.
10. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
11. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER
12. AS PER 4.1.2.1.(1) OF THE N.F.B.C.C. 1995, MANURE DROP HOLES ARE REQUIRED TO HAVE A SAFETY RAILING OR FLOOR GRILL HAVING AN OPENING OF NOT MORE THAN 4 INCHES IN WIDTH. FLOOR GRILLS AND SAFETY RAILINGS DESIGNED BY OTHERS.
13. ALL DIMENSIONS AND LOCATIONS OF MANURE DROP HOLES TO BE VERIFIED BY MANURE EQUIPMENT SUPPLIER PRIOR TO CONSTRUCTION
14. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.
15. STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

EQUIPMENT

1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
2. ALL DETAILS AND DIMENSIONS REGARDING VENTILATION EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY VENTILATION EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
3. ALL STRUCTURAL DETAILS AND DIMENSIONS REGARDING MILKING EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MILKING EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
4. ALL STABLING AND OTHER HOUSING EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE THE RESPONSIBILITY OF THE OWNER AND CONTRACTOR
5. A GROUNDING GRID FOR EQUIPOTENTIAL PLANE SHOULD BE INSTALLED THROUGHOUT THE MILKING AREA. MILKING EQUIPMENT SUPPLIER AND QUALIFIED ELECTRICAL DESIGNER TO SPECIFY ALL DETAILS REGARDING WIRE GRID.
6. AS PER 3.1.5.1 OF THE 1995 NFBCC, ALL FUEL-FIRED APPLIANCES MUST BE LOCATED IN A SEPARATE ROOM HAVING A FIRE RESISTANCE RATING OF NOT LESS THAN 30 MINUTES. AS PER 3.1.5.2. OF THE NFBCC, FUEL-FIRED SPACE-HEATING APPLIANCES, SPACE-COOLING APPLIANCES AND SERVICE WATER HEATERS THAT SERVICE NOT MORE THAN ONE ROOM OR SUITE OR A SINGLE STOREY BUILDING LESS THAN 400m² ARE EXEMPT.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA CAN3-23.1-04 AND CAN3-A23.2-04
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 2009.
3. MINIMUM RADIUS FOR BENT REBAR IS 60MM FOR 10M REBAR AND 90MM FOR 15M REBAR
4. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS.
5. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
6. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
7. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE
8. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
9. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 20 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (58")	1850 (74")	N/A

NOTE: INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm (12") OF FRESH CONCRETE IS CAST BELOW THE SPLICE

10. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE
11. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR FOOTINGS SHALL NOT BE LESS THAN 3" FROM SOIL/FILL BELOW
12. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2"
13. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
14. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
15. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
16. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT.
17. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
18. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
19. ANCHOR RODS TO CONFORM TO CSA 640.21 GRADE 300W (Fy = 300 MPa) OR ASTM F1554 GRADE 36 (Fy = 248MPa) UNLESS OTHERWISE NOTED ON THE STRUCTURAL DRAWINGS OR PRE-ENGINEERED SHOP DRAWINGS.
20. ALL CONCRETE TO BE POURED TO CLASS OF CONCRETE SPECIFIED IN ENGINEERED DRAWINGS. ALL CONCRETE COMPONENTS NOT SPECIFIED SHALL BE CLASSED A-4. SEE FOLLOWING FOR CONCRETE CLASS SPECIFICATIONS

CLASS OF CONCRETE	MAX. W/CM	MIN. 28 DAY STRENGTH
A-1	0.40	35 MPa
A-2	0.45	32 MPa
A-3	0.50	30 MPa
A-4	0.55	25 MPa

FLOOR THICKNESS CHART:

- MINIMUM FLOOR THICKNESS AS SHOWN IN TABLE BELOW, UNLESS OTHERWISE NOTED.

AREA DESCRIPTION	MIN. REQ'D THICKNESS	REINFORCEMENT
SCRAPE ALLEY	4"	N/A
OFFICE/UTILITY/ADMIN	4"	N/A
MATERNITY PENS	4"	N/A
PARLOUR/ HOLDING AREA	5"	N/A
MANURE TANK FLOORS	6"	N/A
UNDER BULK TANK	6"	6x6#6 WIRE MESH OR FIBRE
DRIVE-THRU FEED ALLEYS	6"	6x6#6 WIRE MESH

FRAMING, BRACING AND TRUSSES

1. ALL LUMBER TO BE SPF NO.2 OR BETTER, UNLESS OTHERWISE NOTED
2. LUMBER IN CONTACT WITH THE EARTH, CONCRETE OR EXPOSED TO WEATHER ELEMENTS TO BE PRESSURE TREATED IN CONFORMANCE WITH CAN/CSA-O80-M97. PRESSURE TREATED WOOD TO BE CLASSIFIED AS CSA UC4.1 OR UC4.2.
3. ALL CONNECTORS USED FOR ACQ OR CA TREATED WOOD SHOULD BE GALVANIZED STEEL AS PER ASTM A653. ALL FASTENERS FOR ACQ OR CA TREATED WOOD SHOULD BE GALVANIZED IN ACCORDANCE WITH ASTM A153.
4. TRUSS DRAWINGS SHALL DETAIL THE TRUSS SIZE, SHAPE AND DESIGN AND SHALL BEAR THE SIGNATURE AND SEAL OF THE ENGINEER RESPONSIBLE
5. TRUSSES TO BE PRE MANUFACTURED TO TRUSS MANUFACTURERS ENGINEERED SHOP DETAILS c/w ALL BLOCKING AND BRACING TO TRUSS MFR. REQUIREMENTS
6. ENGINEER STAMPED TRUSS IS TO BE SUPPLIED TO STONECREST ENGINEERING BEFORE TIME OF TRUSS ERECTION.
7. BUILT UP WOOD POSTS IN DOOR / WINDOW SCHEDULE REFER TO TOTAL NUMBER OF JACK AND KING STUDS REQUIRED.
8. UNBALANCED LOAD CONDITIONS TO BE INCLUDED IN THE TRUSS DESIGN
9. TRUSS DESIGNER TO ACCOUNT FOR INCREASED SNOW LOADS DUE TO ROOF VALLEYS AND SNOW SHADOWS. TRUSS SUPPLIER IS TO VISIT THE SITE TO DETERMINE SNOW SHADOW CONDITIONS AND COMMUNICATE THIS INFORMATION TO TRUSS ENGINEER.
10. ADDITIONAL LOADS REQUIRED FOR MECHANICAL OR OTHER EQUIPMENT TO BE PROVIDED TO THE TRUSS ENGINEER BY THE CONTRACTOR AND/OR OWNER
11. TEMPORARY BRACING OF THE STRUCTURE DURING THE COURSE OF CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR UNLESS OTHERWISE NOTED.
12. PROVIDE ACCESS TO EACH ATTIC SPACE AS PER O.B.C. 3.6.4.4 AND 9.19.2.
13. IN STRUCTURES WHERE THE TRUSSES ARE EXPOSED TO A HIGH MOISTURE ENVIRONMENT IT IS STRONGLY RECOMMENDED THAT A PROTECTIVE COATING BE APPLIED TO THE STEEL TRUSS PLATES, AND THAT THE TRUSSES BE REGULARLY INSPECTED.
14. ALL STRUCTURAL MEMBERS AND COMPONENTS MADE OF WOOD TO CONFORM TO CSA O86, "ENGINEERING DESIGN IN WOOD". GLUED-LAMINATED MEMBERS SHALL BE FABRICATED IN PLANTS CONFORMING TO CSA O177, "QUALIFICATION CODE FOR MANUFACTURERS OF STRUCTURAL GLUED LAMINATED TIMBER

STRUCTURAL STEEL MEMBERS

1. STRUCTURAL STEEL COLUMNS:
   HOLLOW STRUCTURAL SECTIONS CONFORMING TO CSA G40.20, CLASS C
   CSA G40.21 GRADE 350W
2. STRUCTURAL STEEL BEAMS:
   W SHAPE CONFORMING TO G40.21-350W, ASTM A992 AND A572 GRADE 50
   - ALL WELDING SPECIFIED ON DRAWINGS TO BE DONE BY CERTIFIED WELDER IN ACCORDANCE WITH CAN/CSA-S16, DESIGN OF STEEL STRUCTURES, and CSA STANDARD W59, WELDED STEEL CONSTRUCTION (METAL ARC WELDING).
   - IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONFIRM ALL DIMENSIONS AND ELEVATIONS ON SITE PRIOR TO ORDERING AND ERECTING ALL STRUCTURAL STEEL MEMBERS
   - ALL BOLTS TO BE SAE J429 GRADE 5 UNLESS OTHERWISE SPECIFIED

GENERAL REVIEW

1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. AS PER O.B.C. DIVISION C 1.2.2.1 THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
4. SOIL CONDITIONS, WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING
5. TRANSFER SYSTEM, WHEN ALL COMPONENTS OF THE TRANSFER SYSTEM HAVE BEEN INSTALLED, PRIOR TO POURING OR BACKFILLING.
6. FOOTINGS, WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
7. CONCRETE REINFORCEMENT, WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED. THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
8. COMPLETION OF FRAMING, WHEN THE FACILITY HAS BEEN COMPLETELY FRAMED, PRIOR TO INSTALLING INTERIOR OR EXTERIOR SHEATHING THAT WOULD PREVENT A VISUAL INSPECTION OF KEY FRAMING COMPONENTS.
9. TRUSSES SET, WHEN THE TRUSSES HAVE BEEN SET AND ALL OF THE PERMANENT TRUSS BRACING INSTALLED, AS PER THIRD-PARTY ENGINEERED TRUSS DRAWINGS AS WELL AS DRAWINGS PREPARED BY THE ENGINEER.
10. FINAL REVIEW, WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED
11. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
12. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.

NAILING REQUIREMENTS

MEMBER CONNECTION	NAIL LENGTH	NUMBER OF NAILS
1. STUD TO WALL PLATE	89mm (3 1/2")	2
2. BOTTOM WALL PLATE TO FLOOR JOISTS	89mm (3 1/2")	2
3. BUILT-UP LINTELS	89mm (3 1/2")	300mm x 64mm (12"x3" o.c.)
4. BUILT-UP POST	89mm (3 1/2")	300mm (12") o.c
5. FLOOR / CEILING JOIST TO TOP PLATE	89mm (3 1/2")	2
6. ROOF RAFTER TO TOP PLATE	89mm (3 1/2")	3
7. LINTEL TO KING POST	89mm (3 1/2")	50mm (2") o.c
8. ROOF RAFTER TO RIDGE BEAM	89mm (3 1/2")	3
9. COLLAR TIE TO ROOF RAFTER	89mm (3 1/2")	3
WALL SHEATHING U.N.O. - PERIMETER - INTERIOR	64mm (2 1/2")	150mm (6") o.c 300mm (12") o.c
ROOF SHEATHING - PERIMETER - INTERIOR	64mm (2 1/2")	300mm (12") o.c 300mm (12") o.c
FLOOR SHEATHING - PERIMETER - INTERIOR	64mm (2 1/2")	300mm (12") o.c 300mm (12") o.c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
1	2023	For Review

PROJECT NORTH

TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING INC.
EST. 1995
440 Wright Blvd Unit #2, Stratford, ON, N4Z 1H3
519-625-8025 – info@stonecrestengineering.com

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: FEEDSTOCK HOPPER BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS LISE

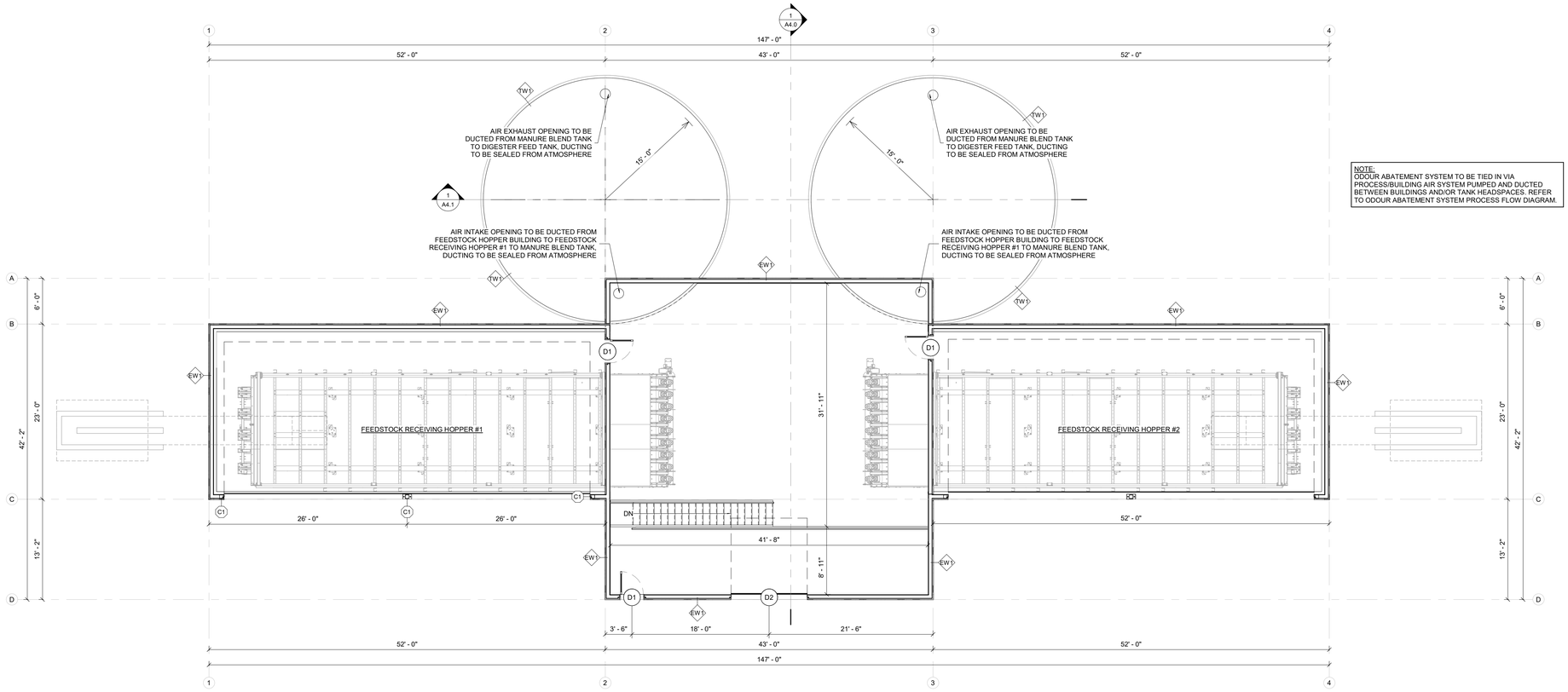
PRINT DATE: 2023

PAGE DESCRIPTION: TITLE PAGE AND NOTES

SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

PAGE NUMBER: A1.0



1 FLOOR PLAN
A2.0 SCALE: 1/8" = 1'-0"

NOTE:
ODOUR ABATEMENT SYSTEM TO BE TIED IN VIA PROCESS/BUILDING AIR SYSTEM PUMPED AND DUCTED BETWEEN BUILDINGS AND/OR TANK HEADSPACES. REFER TO ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM.

NOTES:

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LEGEND:

- SPOT ELEVATION (T/O FFE, T/O FTG U.N.O.)
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH

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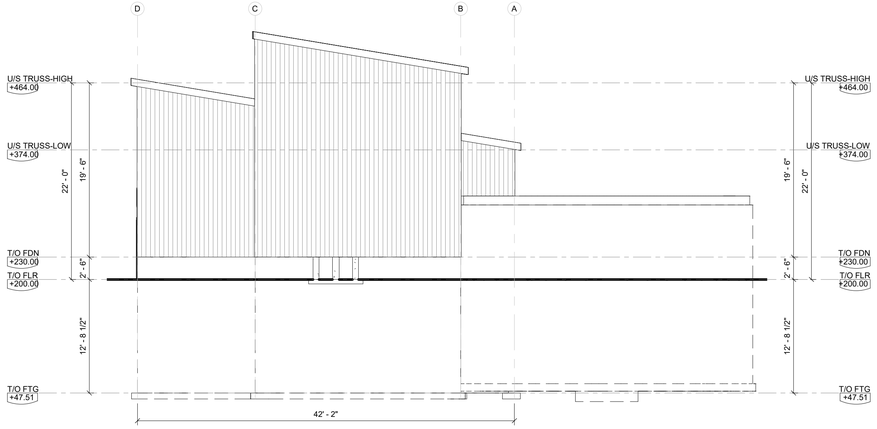
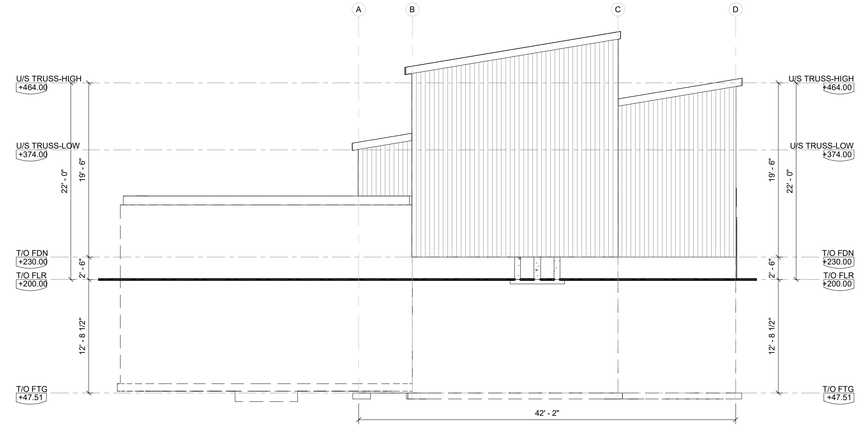
FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

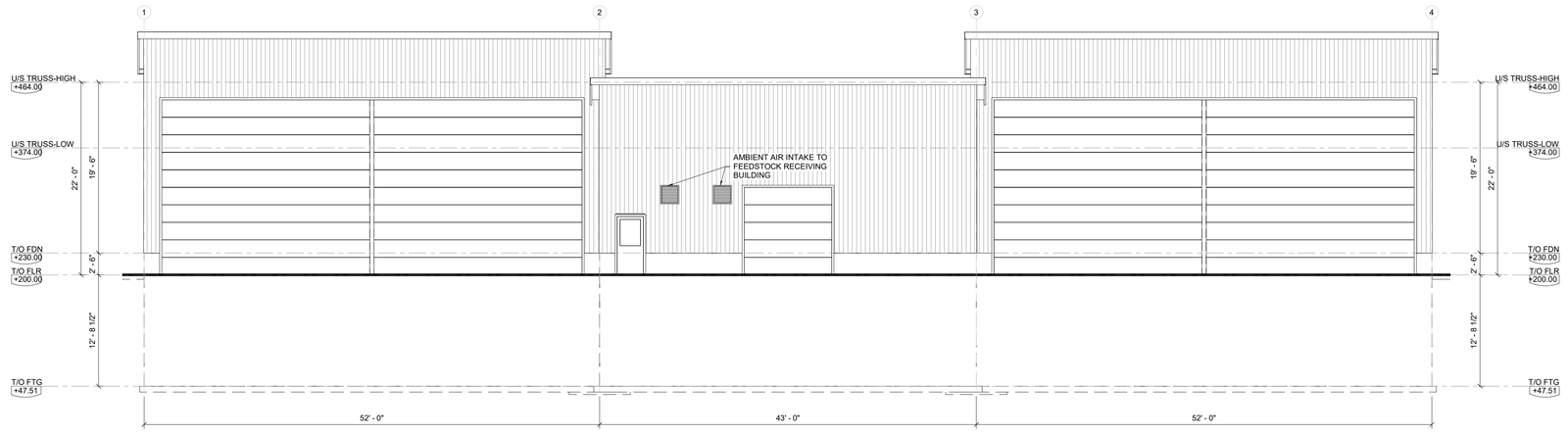
PAGE NUMBER: A2.0



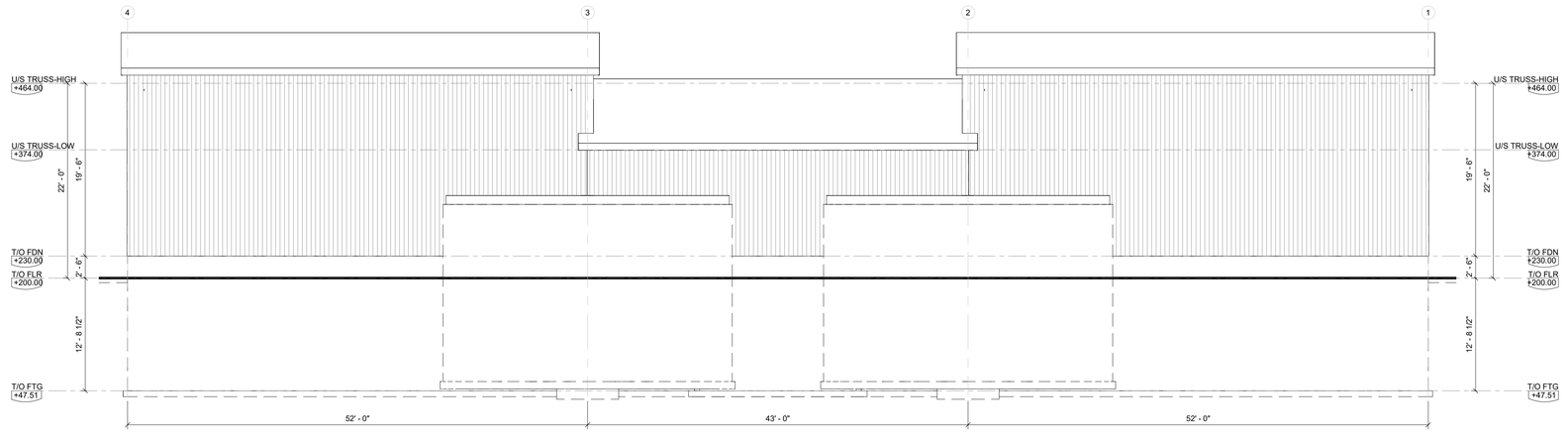
E1 EAST ELEVATION
A3.0 SCALE: 1/8" = 1'-0"



E2 WEST ELEVATION
A3.0 SCALE: 1/8" = 1'-0"



E3 SOUTH ELEVATION
A3.0 SCALE: 1/8" = 1'-0"



E4 NORTH ELEVATION
A3.0 SCALE: 1/8" = 1'-0"

NOTES:

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NO.	DATE:	DESCRIPTION:
1	2023	For Review

LEGEND:

- SPOT ELEVATION (T/O FFE, T/O FTG U.N.O.)
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- W1 WALL IDENTIFICATION TAG
- WN1 WINDOW IDENTIFICATION TAG
- C1 PIER / COLUMN IDENTIFICATION TAG
- F1 FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH	TRUE NORTH

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PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING INC.
EST. 1995
440 Wright Blvd Unit #2, Stratford, ON, N4Z 1H3
519-625-8025 – info@stonecrestengineering.com

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: FEEDSTOCK HOPPER BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS LISE

PRINT DATE: 2023

PAGE DESCRIPTION: BUILDING ELEVATIONS

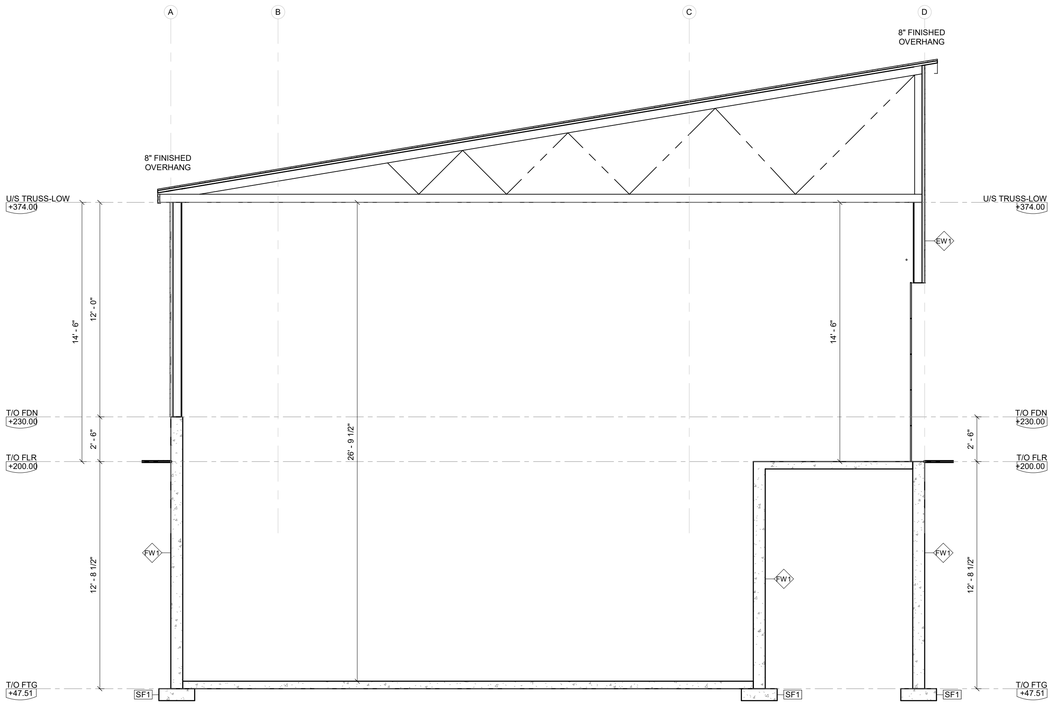
SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

PAGE NUMBER: A3.0

NOTE:
PRE MANUFACTURED TRUSSES TO TRUSS MFR. ENGINEERS SHOP DETAILS c/w ALL BLOCKING AND BRACING OF TRUSS MFR. REQUIREMENTS.

DESIGN OF PRE MANUFACTURED TRUSSES ON THESE SET OF DRAWINGS ARE FOR REPRESENTATION ONLY. ENGINEER STAMPED TRUSS PLANS TO BE SUPPLIED TO STONECREST ENGINEERING BEFORE TIME OF TRUSS ERECTION.



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PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS LISE

PRINT DATE: 2023

PAGE DESCRIPTION: CROSS SECTIONS

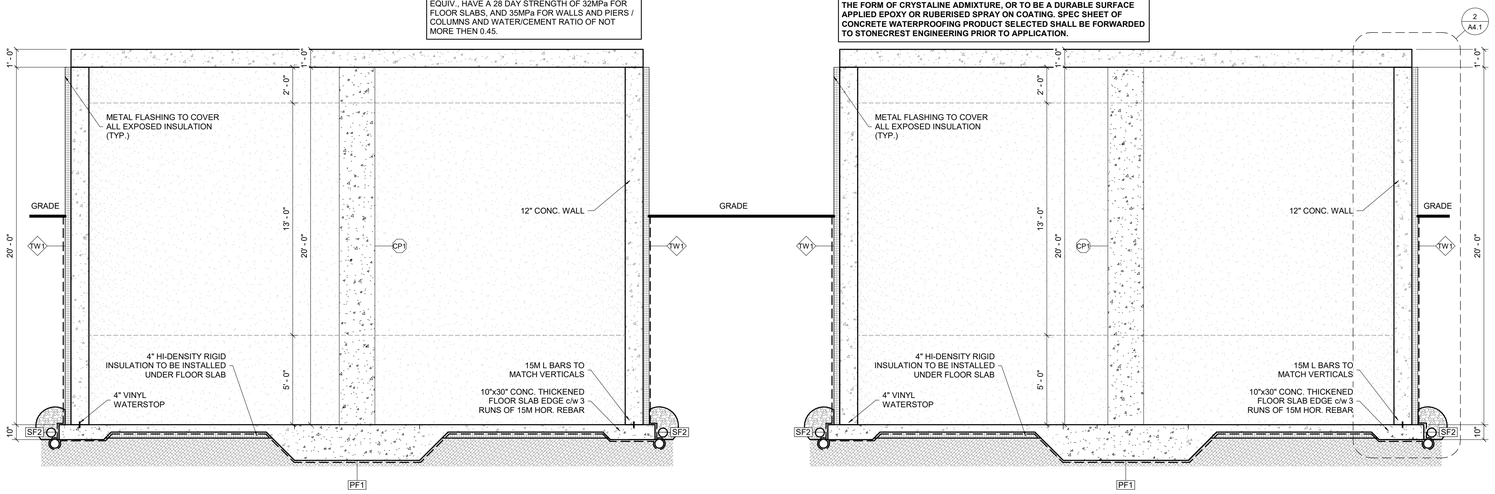
SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

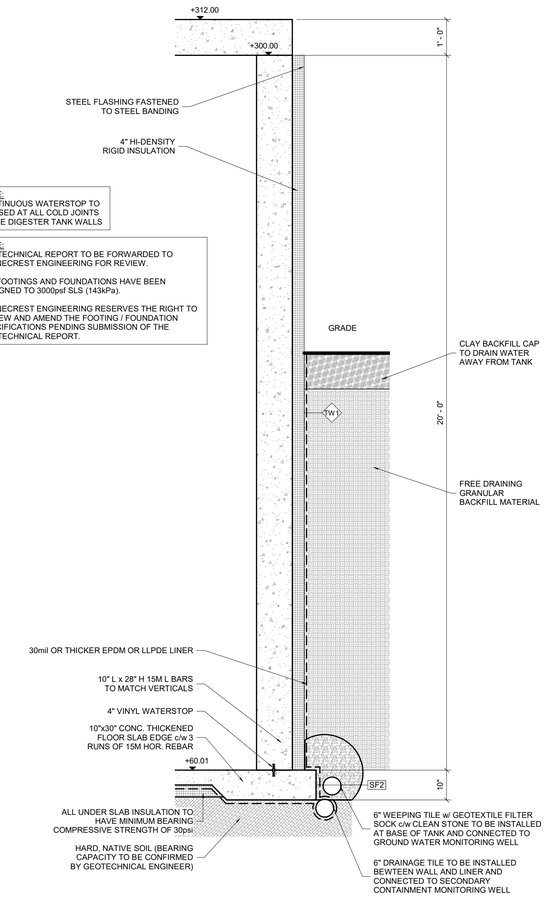
PAGE NUMBER: A4.0

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIV., HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

NOTE:
WATERPROOFING SHALL BE APPLIED TO ALL INTERIOR SURFACES. THIS WATERPROOFING CNA EITHER BE ADDED TO THE CONCRETE MIXTURE IN THE FORM OF CRYSTALINE ADMIXTURE, OR TO BE A DURABLE SURFACE APPLIED EPOXY OR RUBERISED SPRAY ON COATING. SPEC SHEET OF CONCRETE WATERPROOFING PRODUCT SELECTED SHALL BE FORWARDED TO STONECREST ENGINEERING PRIOR TO APPLICATION.



1 / A4.1 TANK CROSS SECTION
SCALE: 1/4" = 1'-0"



NOTE:
CONTINUOUS WATERSTOP TO BE USED AT ALL COLD JOINTS IN THE DIGESTER TANK WALLS

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

STONECREST ENGINEERING RESERVES THE RIGHT TO REVIEW AND AMEND THE FOOTING / FOUNDATION SPECIFICATIONS PENDING SUBMISSION OF THE GEOTECHNICAL REPORT.

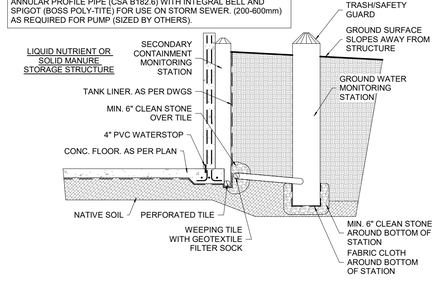
2 / A4.1 TANK WALL SECTION
SCALE: 1/2" = 1'-0"

NOTE:
PERIMETER TILE AND MONITORING STATION BE INSTALLED AND A SAMPLING/TESTING PROGRAM BE IMPLEMENTED.

IF EXTERIOR WATER PRESSURE IS NOT REMOVED PRIOR TO PUMPING MANURE FROM PIT, STONECREST ENGINEERING ACCEPTS NO RESPONSIBILITY, FINANCIAL OR OTHERWISE, FOR FLOOR FAILURE DUE TO HYDROSTATIC PRESSURE.

MONITORING STATION LOCATIONS, HEIGHTS AND MATERIALS ARE TO BE CONFIRMED BY GENERAL CONTRACTOR.

MONITORING STATION TO BE APPROVED CATCH BASIN MANHOLE OR VERTICALLY INSTALLED HPDE DOUBLE WALL SMOOTH INTERIOR ANNULAR PROFILE PIPE (CSA B182.6) WITH INTEGRAL BELL AND SPIGOT (BOSS POLY-TITE) FOR USE ON STORM SEWER. (200-600mm) AS REQUIRED FOR PUMP (SIZED BY OTHERS).



3 / A4.1 MONITORING STATION DETAIL
SCALE: N.T.S.

NOTES:

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LOCATION: FOOTHILLS, ALBERTA

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PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

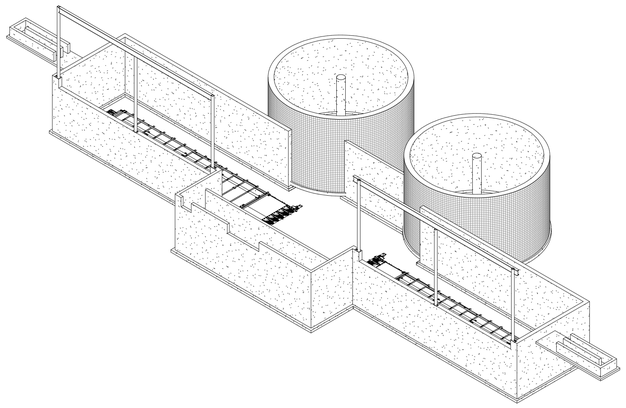
DESIGNED BY:	PRINT DATE:
TRAVIS LISE	2023

PAGE DESCRIPTION: TANK DETAILS

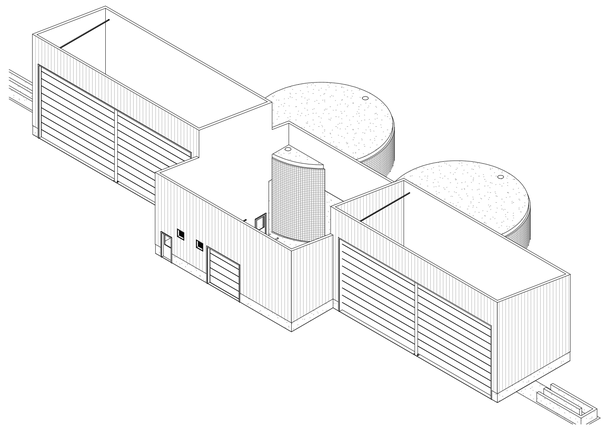
SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

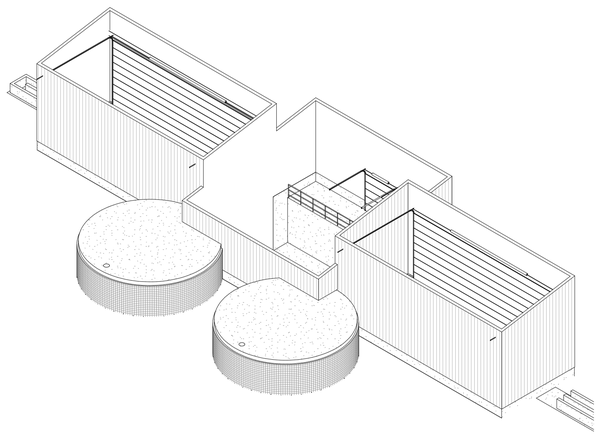
PAGE NUMBER: A4.1



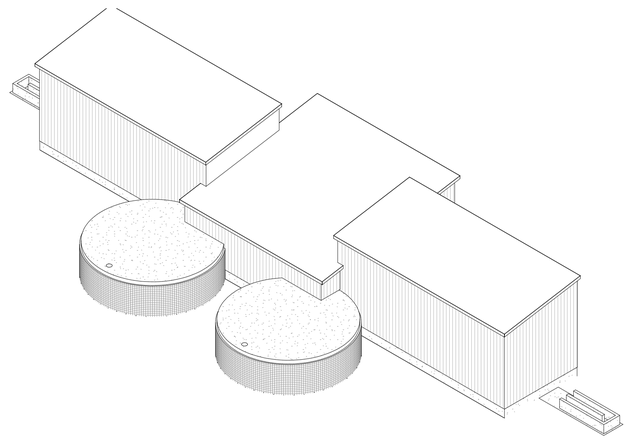
1 / A5.0 FOUNDATION PERSPECTIVE
SCALE: N.T.S.



2 / A5.0 INTERIOR PERSPECTIVE 1
SCALE: N.T.S.



3 / A5.0 INTERIOR PERSPECTIVE 2
SCALE: N.T.S.



4 / A5.0 EXTERIOR PERSPECTIVE
SCALE: N.T.S.

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DESIGNED BY: TRAVIS LISE

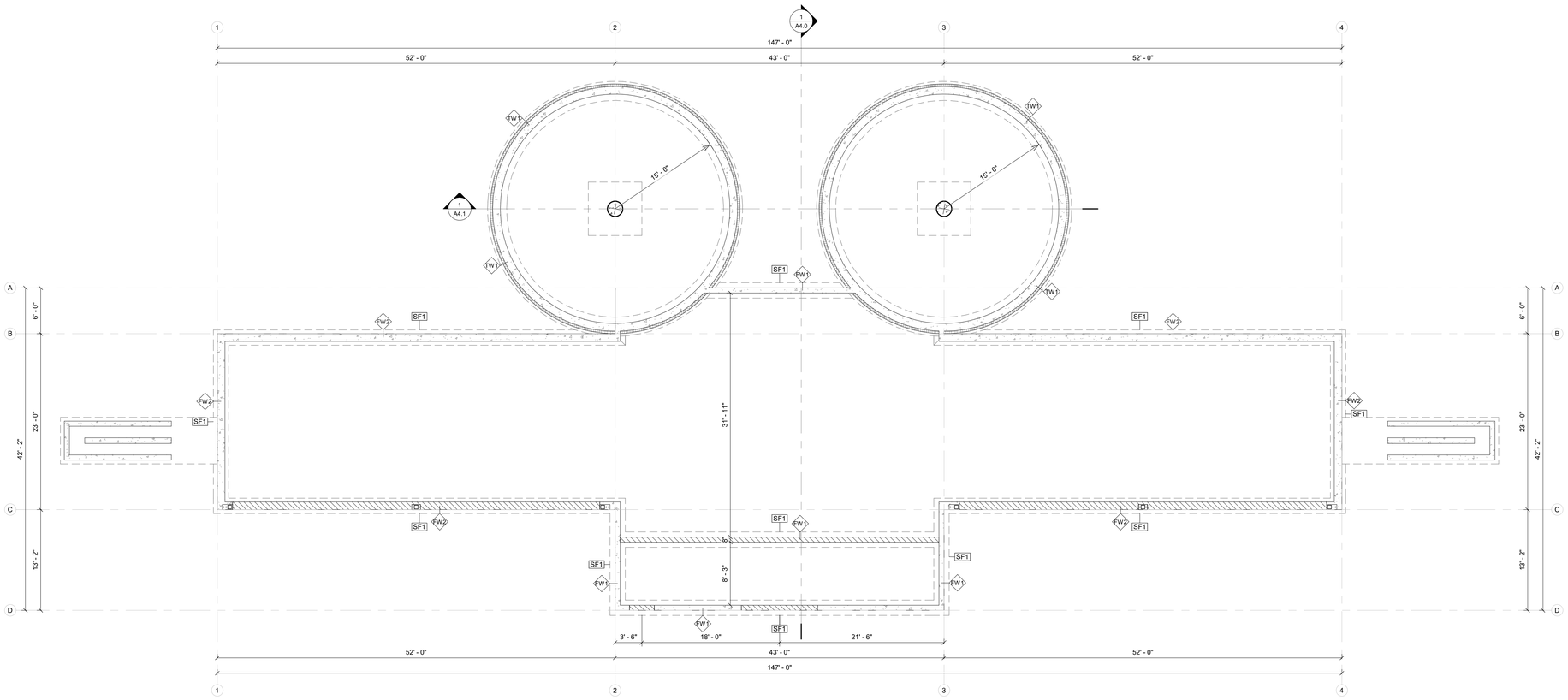
PRINT DATE: 2023

PAGE DESCRIPTION: PERSPECTIVE VIEWS

SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

PAGE NUMBER: A5.0



1 FOUNDATION PLAN
S1.0 SCALE: 1/8" = 1'-0"

NOTES:

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SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK HOPPER BUILDING - 1

PAGE NUMBER: S1.0

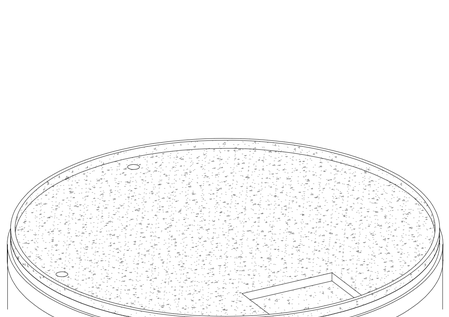
Drawing 2 - Digester Feed Tank

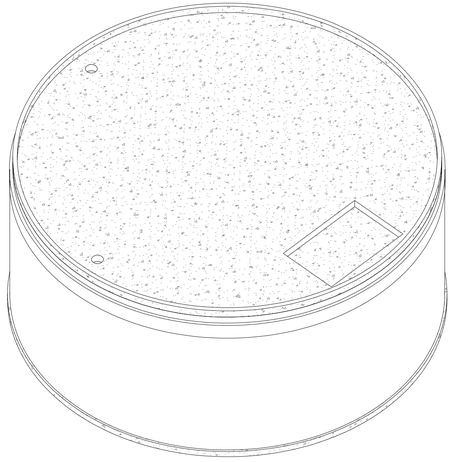
DRAWINGS PROVIDED FOR

RIMROCK RNG INC.

DIGESTER FEED TANK

FOOTHILLS, ALBERTA





WALL SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	ASSEMBLY	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC, CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

GENERAL NOTES

1. THIS TANK IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE ONTARIO BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
4. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
5. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
6. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.

EXCAVATION AND BACKFILL

1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW TANK AS PER GEOTECHNICAL RECOMMENDATIONS.
2. FOUNDATIONS HAVE BEEN DESIGNED FOR A SOIL BEARAPACITY OF 3000 PSF (143KPA)
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING BEFORE PROCEEDING WITH CONSTRUCTION. CONTRACTOR MUST NOTIFY STONECREST ENGINEERING AND THE GEOTECHNICAL ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL WITH A REPORT SUBMITTED TO STONECREST ENGINEERING
5. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL, OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
6. ALL FOOTINGS TO HAVE A MINIMUM OF 48" OR MORE OF COVER FOR FROST PROTECTION
7. FINAL GRADING TO SLOPE AWAY FROM THE STRUCTURE.

EQUIPMENT

1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER

MANURE HANDLING AND STORAGE

1. A GEOTECHNICAL ENGINEER IS TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION, AS PER THE NUTRIENT MANAGEMENT ACT. A COPY OF THE REPORT MUST BE PROVIDED TO STONECREST ENGINEERING PRIOR TO THE RELEASE OF ENGINEER-STAMPED PLANS
2. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
3. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT
4. ALTERNATIVELY, AS A MINIMUM, STONECREST ENGINEERING STRONGLY RECOMMENDS THE PERIMETER DRAINAGE SYSTEM. STONECREST ENGINEERING ASSUMES NO RESPONSIBILITY FINANCIALLY OR OTHERWISE, FOR DAMAGE CAUSED BY HYDROSTATIC PRESSURE TO THE FLOOR SLAB SHOULD THESE RECOMMENDATIONS BE IGNORED.
5. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32MPA HS CONCRETE THROUGHOUT.
6. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
7. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
8. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
9. LIQUID STORAGE TANK TO HAVE PERMANENT NON-CLIMBABLE SAFETY FENCE EXTENDING TO NOT LESS THAN 5' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING NON-CLIMBABLE GATES WITH LATCHES TO DETER ACCESS.
10. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
11. ANY MANURE TRANSFER SYSTEM WHICH CAN BACKFLOW TO THE PUMP OR PUMPOUT CHAMBER MUST HAVE BOTH A PRIMARY AND SECONDARY SHUTOFF VALVE.
12. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
13. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER.
14. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.
STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA CAN3-23.1-94 AND CAN3-A23.2-94
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 1992.
3. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING ANY CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE.
4. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
5. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE.
6. REINFORCEMENT SHALL HAVE NOT LESS THAN 3" OF CONCRETE COVERAGE BETWEEN REINFORCING AND SOIL/FILL.
7. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2".
8. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
9. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
10. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
11. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT
12. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
13. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
14. ALL CONCRETE IN CONTACT WITH MANURE TO BE 32MPa
15. TYPE 50 OR EQUIVALENT(HS). WITH A MAXIMUM WATER/CEMENT RATIO OF NOT MORE THAN 0.45.
16. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
17. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS
18. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
19. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

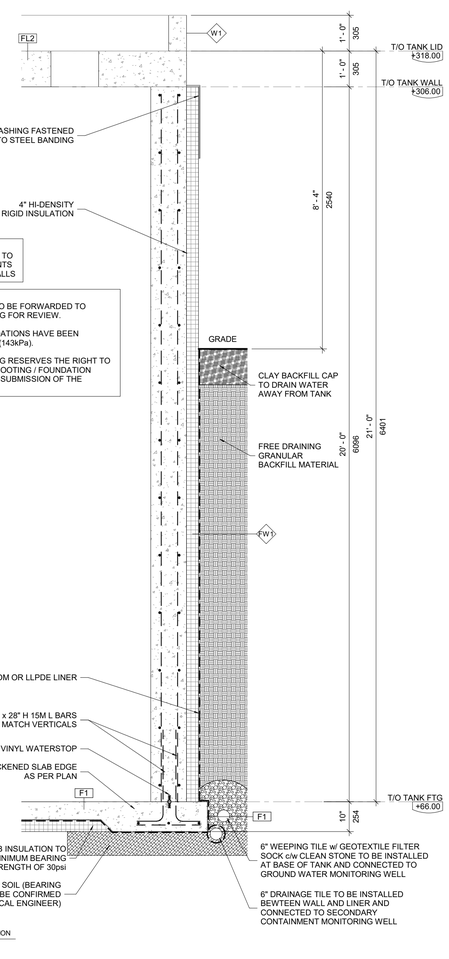
REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 30 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (56")	1850 (74")	N/A

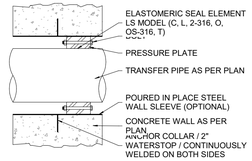
NOTE: INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm OF FRESH CONCRETE IS CAST BELOW THE SPLICE

GENERAL REVIEW

1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING IS RESPONSIBLE FOR THE DESIGN AND GENERAL REVIEW OF, THE LIQUID STORAGE FACILITY, THE TRANSFER SYSTEM, AND THE SYNTHETIC LINER.
4. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
5. SOIL CONDITIONS, WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS. WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING PRIOR TO DRAWINGS BEING RELEASED.
6. TRANSFER SYSTEM, WHEN ALL TRANSFER PIPES HAVE BEEN INSTALLED, THE ENGINEER MUST BE CONTACTED TO INSPECT THE CONNECTIONS AND SEALS. THE CONTRACTOR MUST BE AVAILABLE TO MAKE ANY GASKET-SEALED JOINT AVAILABLE FOR INSPECTION.
7. FOOTINGS, WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
8. CONCRETE REINFORCEMENT, WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED. THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
9. FINAL REVIEW, WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED, INCLUDING THE SAFETY FENCE AND BACKFILLING. THE MONITORING STATION MUST ALSO BE VISIBLE AT THIS TIME.
10. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
11. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.



4 TYPICAL WALL SECTION
A0.0 SCALE: 1/2" = 1'-0"



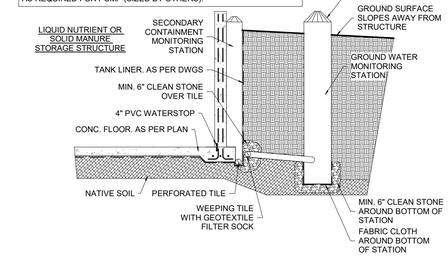
6 LINKSEAL DETAIL
A0.0 SCALE: N.T.S.

NOTE:
PERIMETER TILE AND MONITORING STATION BE INSTALLED AND A SAMPLING/TESTING PROGRAM BE IMPLEMENTED.

IF EXTERIOR WATER PRESSURE IS NOT REMOVED PRIOR TO PUMPING MANURE FROM PIT, STONECREST ENGINEERING ACCEPTS NO RESPONSIBILITY, FINANCIAL OR OTHERWISE, FOR FLOOR FAILURE DUE TO HYDROSTATIC PRESSURE.

MONITORING STATION LOCATIONS, HEIGHTS AND MATERIALS ARE TO BE CONFIRMED BY GENERAL CONTRACTOR.

MONITORING STATION TO BE APPROVED CATCH BASIN MANHOLE OR VERTICALLY INSTALLED HPDE DOUBLE WALL SMOOTH INTERIOR ANNULAR PROFILE PIPE (CSA B182.6) WITH INTEGRAL BELL AND SPIGOT (BOSS POLY-TITE) FOR USE ON STORM SEWER. (200-600mm) AS REQUIRED FOR PUMP (SIZED BY OTHERS).



5 MONITORING STATION DETAIL
A0.0 SCALE: N.T.S.

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
PH: (519)-625-8025
FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: DIGESTER FEED TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

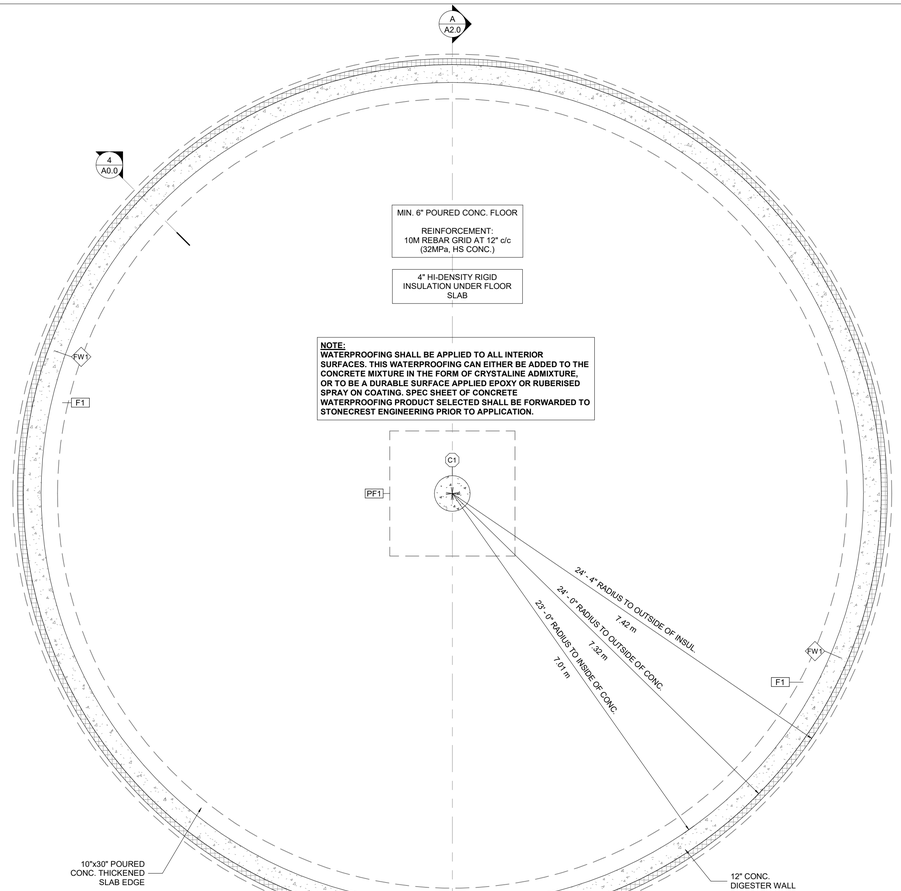
DRAWN BY:	PRINT DATE:
TRAVIS L.	2023

PAGE DESCRIPTION: TITLE PAGE

SCALE: AS NOTED

FILE: 7877 - DIGESTER FEED TANK - 1

PAGE NUMBER: A0.0



1 A1.0 FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

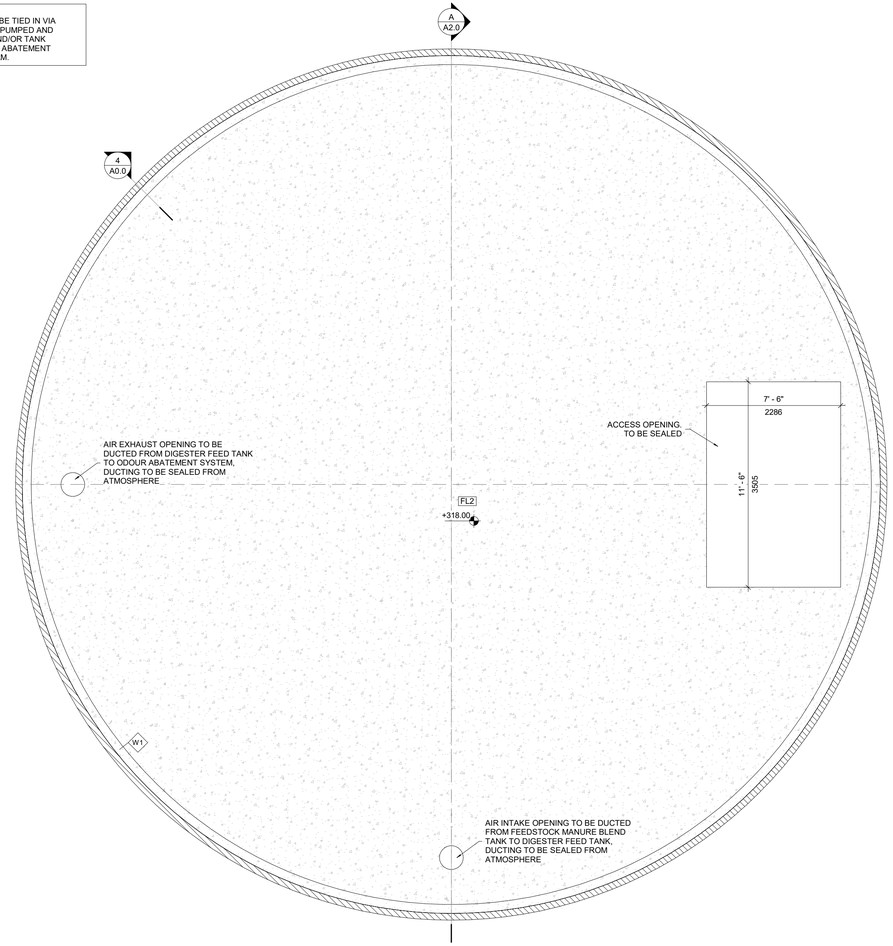
ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

A GEOTECHNICAL ENGINEERING REPORT IS REQUIRED. STONECREST ENGINEERING HAS COMPLETED THIS DESIGN ASSUMING A SOIL BEARING CAPACITY OF 3000psf (SLS) AND 4500psf (ULS). IT IS ALSO ASSUMED THAT NEITHER A REINFORCED SLAB NOR A LINER IS REQUIRED, AS PROVIDED IN THE NUTRIENT MANAGEMENT ACT. CONSTRUCTION MUST NOT PROCEED UNTIL THE GEOTECHNICAL REPORT HAS BEEN REVIEWED BY STONECREST ENGINEERING AND ANY NECESSARY DRAWING AMENDMENTS ARE COMPLETED.

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

NOTE:
ELEVATIONS AND SLOPES TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.

NOTE:
ODOUR ABATEMENT SYSTEM TO BE TIED IN VIA PROCESS/BUILDING AIR SYSTEM PUMPED AND DUCTED BETWEEN BUILDINGS AND/OR TANK HEADSPACES. REFER TO ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM.



2 A1.0 RECEPTION TANK LID
SCALE: 1/4" = 1'-0"

NOTE:
NO VEHICULAR TRAFFIC ALLOWED ON TOP OF TANK LID

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

A GEOTECHNICAL ENGINEERING REPORT IS REQUIRED. STONECREST ENGINEERING HAS COMPLETED THIS DESIGN ASSUMING A SOIL BEARING CAPACITY OF 3000psf (SLS) AND 4500psf (ULS). IT IS ALSO ASSUMED THAT NEITHER A REINFORCED SLAB NOR A LINER IS REQUIRED, AS PROVIDED IN THE NUTRIENT MANAGEMENT ACT. CONSTRUCTION MUST NOT PROCEED UNTIL THE GEOTECHNICAL REPORT HAS BEEN REVIEWED BY STONECREST ENGINEERING AND ANY NECESSARY DRAWING AMENDMENTS ARE COMPLETED.

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

WALL SCHEDULE

WALL TYPE		ASSEMBLY	MIN. 28 DAY STRENGTH
NO.	DESCRIPTION		
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" o/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
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CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: DIGESTER FEED TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

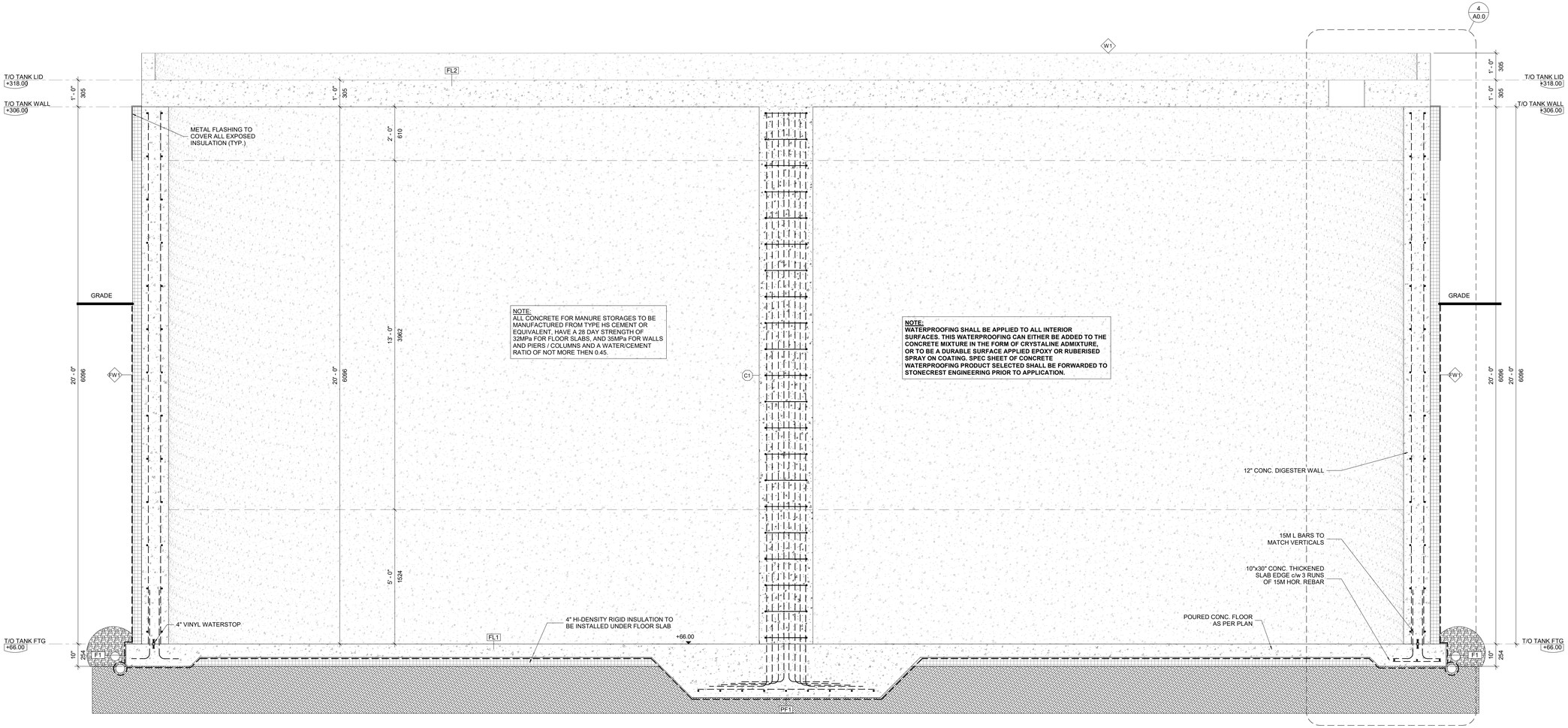
DRAWN BY:	PRINT DATE:
TRAVIS L.	2023

PAGE DESCRIPTION: FOUNDATION AND TANK LID PLANS

SCALE: AS NOTED

FILE: 7877 - DIGESTER FEED TANK - 1

PAGE NUMBER: A1.0



A TYPICAL CROSS SECTION
A2.0 SCALE: 1/2" = 1'-0"

WALL REINFORCMENT SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	WALL THICKCESS AND REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC, CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY, BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 DOOR IDENTIFICATION TAG
- W1 WALL IDENTIFICATION TAG
- WN1 WINDOW IDENTIFICATION TAG
- C1 PIER / COLUMN IDENTIFICATION TAG
- F1 FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH | TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

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DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: DIGESTER FEED TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY: TRAVIS L. | PRINT DATE: 2023

PAGE DESCRIPTION: CROSS SECTIONS

SCALE: AS NOTED

FILE: 7877 - DIGESTER FEED TANK - 1

PAGE NUMBER: A2.0

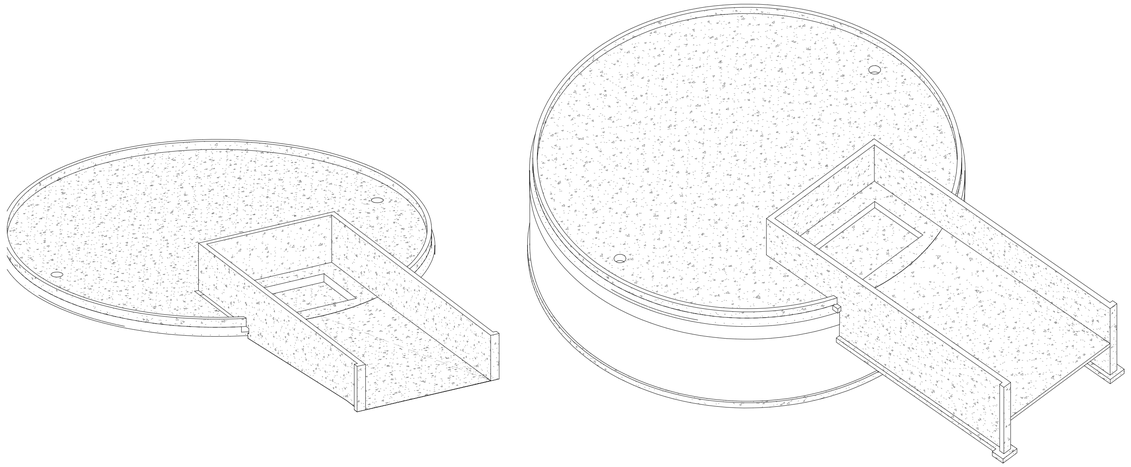
Drawing 3 - Organics Reception Tank

DRAWINGS PROVIDED FOR

RIMROCK RNG INC.

ORGANICS RECEPTION TANK

FOOTHILLS, ALBERTA



GENERAL NOTES

1. THIS TANK IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE ONTARIO BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
4. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
5. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
6. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.

EXCAVATION AND BACKFILL

1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW TANK AS PER GEOTECHNICAL RECOMMENDATIONS.
2. FOUNDATIONS HAVE BEEN DESIGNED FOR A SOIL BEARING CAPACITY OF 3000 PSF (143KPA)
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING BEFORE PROCEEDING WITH CONSTRUCTION. CONTRACTOR MUST NOTIFY STONECREST ENGINEERING AND THE GEOTECHNICAL ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL WITH A REPORT SUBMITTED TO STONECREST ENGINEERING
5. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL, OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
6. ALL FOOTINGS TO HAVE A MINIMUM OF 48" OR MORE OF COVER FOR FROST PROTECTION
7. FINAL GRADING TO SLOPE AWAY FROM THE STRUCTURE.

EQUIPMENT

1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER

MANURE HANDLING AND STORAGE

1. A GEOTECHNICAL ENGINEER IS TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION, AS PER THE NUTRIENT MANAGEMENT ACT. A COPY OF THE REPORT MUST BE PROVIDED TO STONECREST ENGINEERING PRIOR TO THE RELEASE OF ENGINEER-STAMPED PLANS
2. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
3. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT
4. ALTERNATIVELY, AS A MINIMUM, STONECREST ENGINEERING STRONGLY RECOMMENDS THE PERIMETER DRAINAGE SYSTEM. STONECREST ENGINEERING ASSUMES NO RESPONSIBILITY FINANCIALLY OR OTHERWISE, FOR DAMAGE CAUSED BY HYDROSTATIC PRESSURE TO THE FLOOR SLAB SHOULD THESE RECOMMENDATIONS BE IGNORED.
5. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32MPA HS CONCRETE THROUGHOUT.
6. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
7. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
8. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
9. LIQUID STORAGE TANK TO HAVE PERMANENT NON-CLIMBABLE SAFETY FENCE EXTENDING TO NOT LESS THAN 5' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING NON-CLIMBABLE GATES WITH LATCHES TO DETER ACCESS.
10. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
11. ANY MANURE TRANSFER SYSTEM WHICH CAN BACKFLOW TO THE PUMP OR PUMPOUT CHAMBER MUST HAVE BOTH A PRIMARY AND SECONDARY SHUTOFF VALVE.
12. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
13. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER.
14. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.

STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA CAN3-23. 1-94 AND CAN3-A23.2-94
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 1992.
3. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING ANY CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE.
4. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
5. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE.
6. REINFORCEMENT SHALL HAVE NOT LESS THAN 3" OF CONCRETE COVERAGE BETWEEN REINFORCING AND SOIL/FILL.
7. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2".
8. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
9. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
10. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
11. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT
12. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
13. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
14. ALL CONCRETE IN CONTACT WITH MANURE TO BE 32MPa
15. TYPE 50 OR EQUIVALENT(HS). WITH A MAXIMUM WATER/CEMENT RATIO OF NOT MORE THAN 0.45.
16. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
17. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS
18. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
19. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 30 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (56")	1850 (74")	N/A

NOTE: INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm OF FRESH CONCRETE IS CAST BELOW THE SPLICE

GENERAL REVIEW

1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING IS RESPONSIBLE FOR THE DESIGN AND GENERAL REVIEW OF, THE LIQUID STORAGE FACILITY, THE TRANSFER SYSTEM, AND THE SYNTHETIC LINER.
4. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
5. SOIL CONDITIONS, WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS. WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING PRIOR TO DRAWINGS BEING RELEASED.
6. TRANSFER SYSTEM, WHEN ALL TRANSFER PIPES HAVE BEEN INSTALLED, THE ENGINEER MUST BE CONTACTED TO INSPECT THE CONNECTIONS AND SEALS. THE CONTRACTOR MUST BE AVAILABLE TO MAKE ANY GASKET-SEALED JOINT AVAILABLE FOR INSPECTION.
7. FOOTINGS, WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
8. CONCRETE REINFORCEMENT, WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED, THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
9. FINAL REVIEW, WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED, INCLUDING THE SAFETY FENCE AND BACKFILLING. THE MONITORING STATION MUST ALSO BE VISIBLE AT THIS TIME.
10. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
11. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.

WALL SCHEDULE

WALL TYPE NO.	DESCRIPTION	ASSEMBLY	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
FW2	8" CONC. FDN WALL	8" POURED IN PLACE CONCRETE REINFORCEMENT: 15M HORIZ. REBAR AT 24" c/c 15M VERT. REBAR AT 24" c/c	25MPa
W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	8"x24" CONC. STRIP FOOTING	2 CONTINUOUS RUNS OF 15M REBAR	25MPa
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

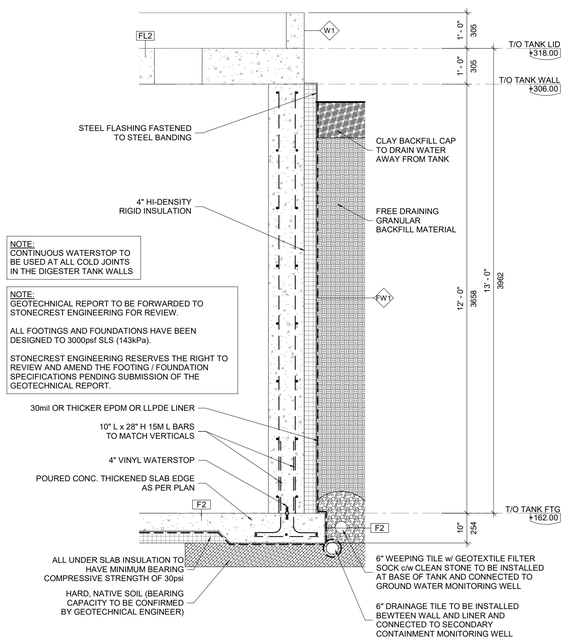
FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	
FL3	6" POURED CONCRETE FLOOR (32MPa, HS CONC. OR EQUIV.) MIN. 6" CRUSHED STONE REINFORCEMENT: 6x6/6 W.W.M.	

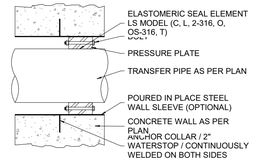
STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTE:
DIGESTER ROOF, BASE PLATES AND CONNECTION DETAILS TO BE PROVIDED BY EQUIPMENT SUPPLIER



4 A0.0 TYPICAL WALL SECTION
SCALE: 1/2" = 1'-0"



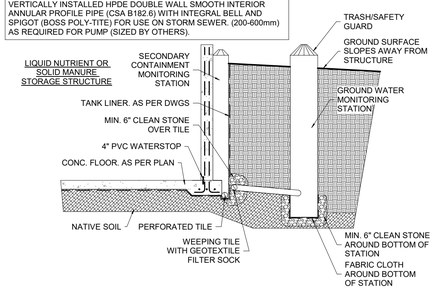
6 A0.0 LINKSEAL DETAIL
SCALE: N.T.S.

NOTE:
PERIMETER TILE AND MONITORING STATION BE INSTALLED AND A SAMPLING/TESTING PROGRAM BE IMPLEMENTED.

IF EXTERIOR WATER PRESSURE IS NOT REMOVED PRIOR TO PUMPING MANURE FROM PIT, STONECREST ENGINEERING ACCEPTS NO RESPONSIBILITY, FINANCIAL OR OTHERWISE, FOR FLOOR FAILURE DUE TO HYDROSTATIC PRESSURE.

MONITORING STATION LOCATIONS, HEIGHTS AND MATERIALS ARE TO BE CONFIRMED BY GENERAL CONTRACTOR.

MONITORING STATION TO BE APPROVED CATCH BASIN MANHOLE OR VERTICALLY INSTALLED HPDE DOUBLE WALL SMOOTH INTERIOR ANNULAR PROFILE PIPE (CSA B182.6) WITH INTEGRAL BELL AND SPIGOT (BOSS POLY-TITE) FOR USE ON STORM SEWER. (200-600mm) AS REQUIRED FOR PUMP (SIZED BY OTHERS).



5 A0.0 MONITORING STATION DETAIL
SCALE: N.T.S.

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

PROJECT NORTH

TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
PH: (519)-625-8025
FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: ORGANICS RECEPTION TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY: TRAVIS L.

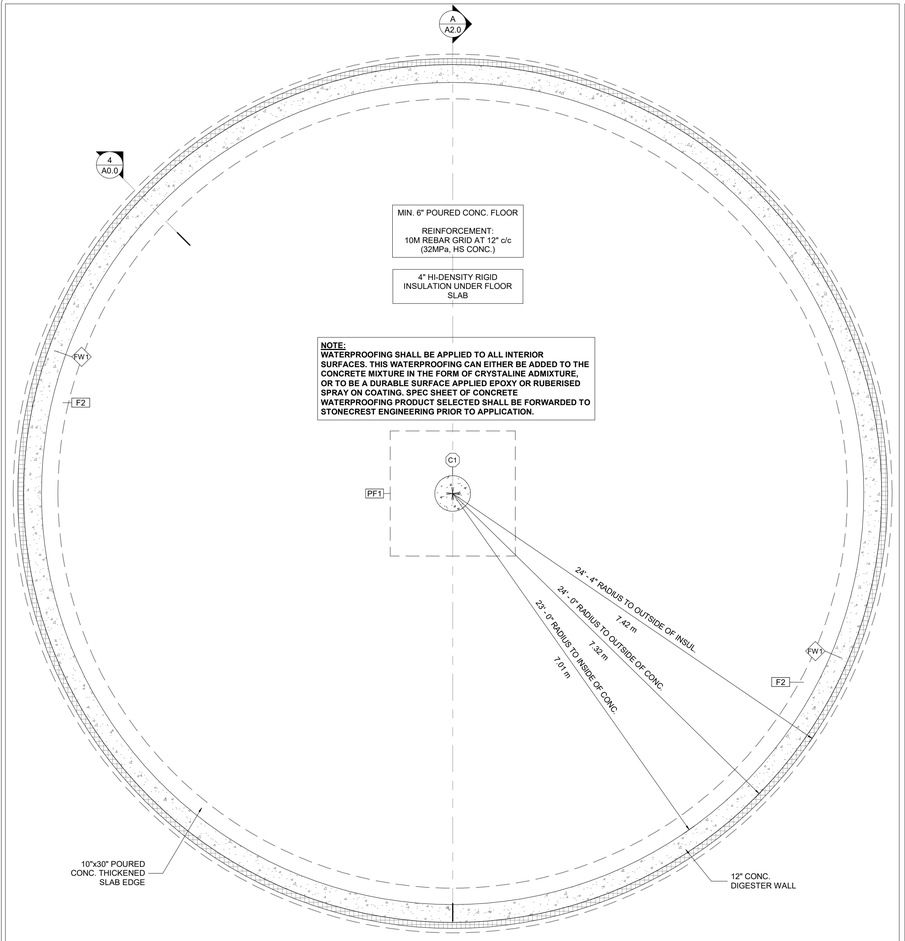
PRINT DATE: 2023

PAGE DESCRIPTION: TITLE PAGE

SCALE: AS NOTED

FILE: 7877 - ORGANICS RECEPTION TANK - 1

PAGE NUMBER: A0.0



1 / A1.0 FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

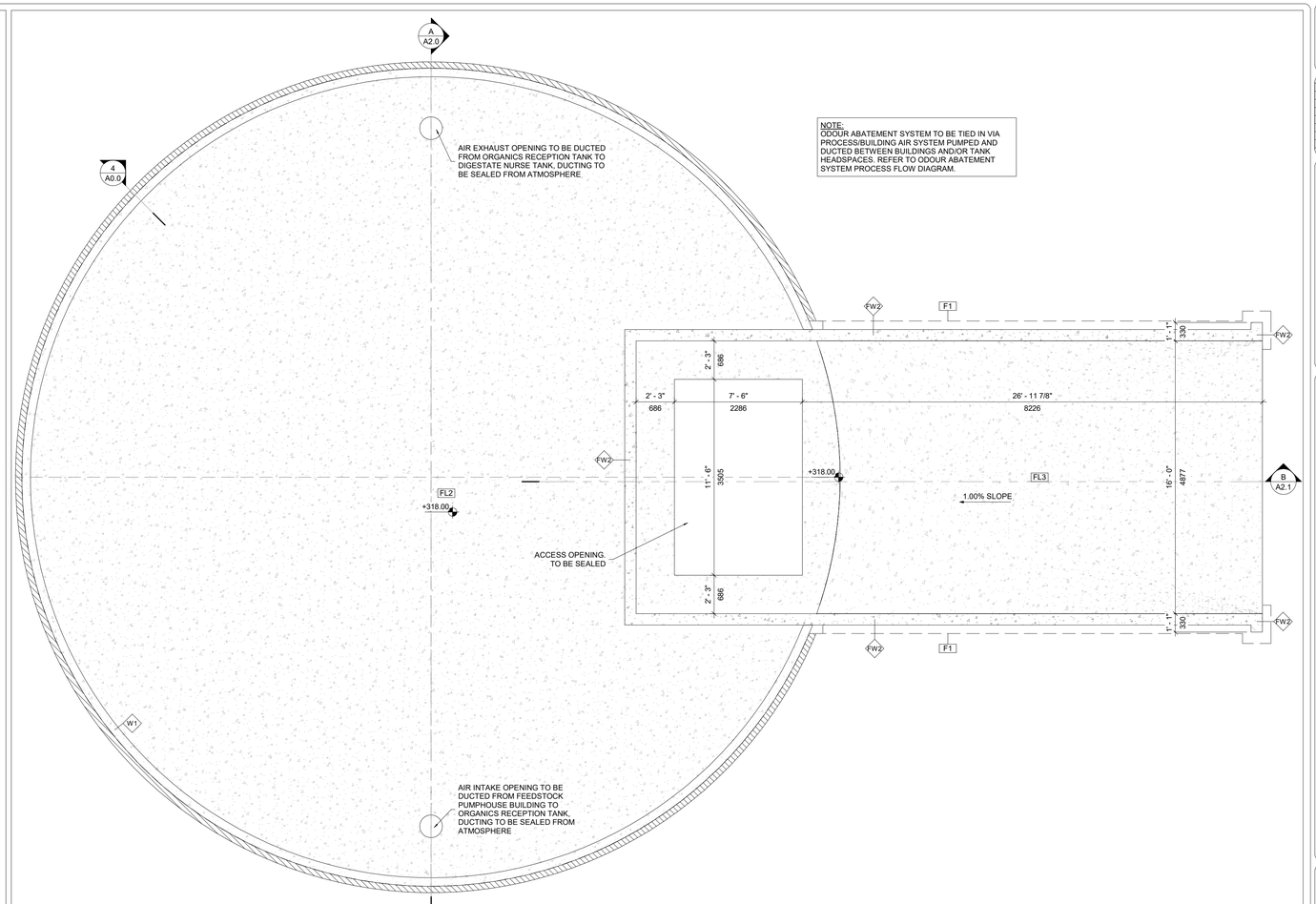
NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

A GEOTECHNICAL ENGINEERING REPORT IS REQUIRED. STONECREST ENGINEERING HAS COMPLETED THIS DESIGN ASSUMING A SOIL BEARING CAPACITY OF 3000psf (SLS) AND 4500psf (ULS). IT IS ALSO ASSUMED THAT NEITHER A REINFORCED SLAB NOR A LINER IS REQUIRED, AS PROVIDED IN THE NUTRIENT MANAGEMENT ACT. CONSTRUCTION MUST NOT PROCEED UNTIL THE GEOTECHNICAL REPORT HAS BEEN REVIEWED BY STONECREST ENGINEERING AND ANY NECESSARY DRAWING AMENDMENTS ARE COMPLETED.

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

NOTE:
ELEVATIONS AND SLOPES TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.



2 / A1.0 RECEPTION TANK LID
SCALE: 1/4" = 1'-0"

NOTE:
NO VEHICULAR TRAFFIC ALLOWED ON TOP OF TANK LID

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

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NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

WALL SCHEDULE

WALL TYPE		ASSEMBLY	MIN. 28 DAY STRENGTH
NO.	DESCRIPTION		
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
FW2	8" CONC. FDN WALL	8" POURED IN PLACE CONCRETE REINFORCEMENT: 15M HORIZ. REBAR AT 24" c/c 15M VERT. REBAR AT 24" c/c	25MPa
W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	8"x24" CONC. STRIP FOOTING	2 CONTINUOUS RUNS OF 15M REBAR	25MPa
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
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FL3	6" POURED CONCRETE FLOOR (32MPa, HS CONC. OR EQUIV.) MIN. 6" CRUSHED STONE REINFORCEMENT: 6x6/6 W.W.M.	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
PH: (519)-625-8025
FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: ORGANICS RECEPTION TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY: TRAVIS L.

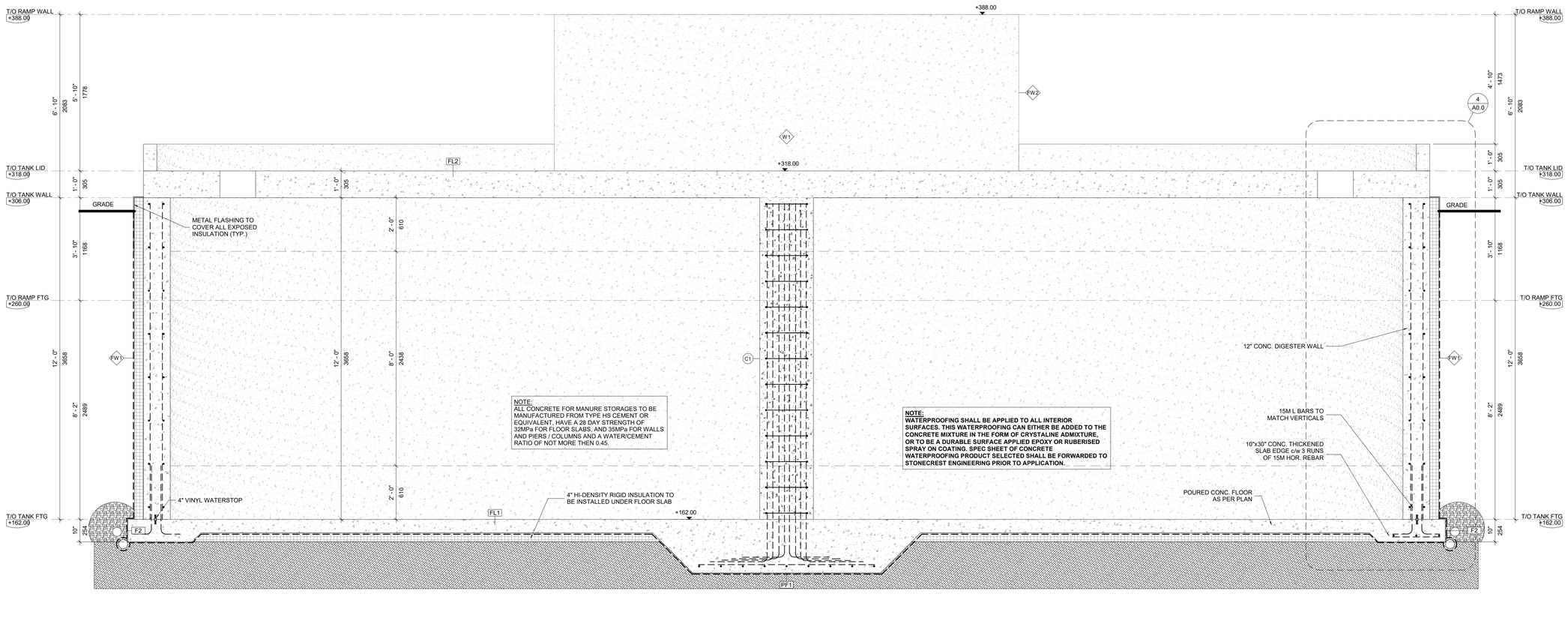
PRINT DATE: 2023

PAGE DESCRIPTION: FOUNDATION AND TANK LID PLANS

SCALE: AS NOTED

FILE: 7877 - ORGANICS RECEPTION TANK - 1

PAGE NUMBER: A1.0



A TYPICAL CROSS SECTION
A2.0 SCALE: 1/2" = 1'-0"

WALL REINFORCMENT SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	WALL THICKCESS AND REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
FW2	8" CONC. FDN WALL	8" POURED IN PLACE CONCRETE REINFORCEMENT: 15M HORIZ. REBAR AT 24" c/c 15M VERT. REBAR AT 24" c/c	25MPa
W1	6" CONC, CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	8"x24" CONC. STRIP FOOTING	2 CONTINUOUS RUNS OF 15M REBAR	25MPa
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	
FL3	6" POURED CONCRETE FLOOR (32MPa, HS CONC. OR EQUIV.) MIN. 6" CRUSHED STONE REINFORCEMENT: 6x6/6 W.W.M.	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

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- 001 — DOOR IDENTIFICATION TAG
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PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
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DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: ORGANICS RECEPTION TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY: TRAVIS L.

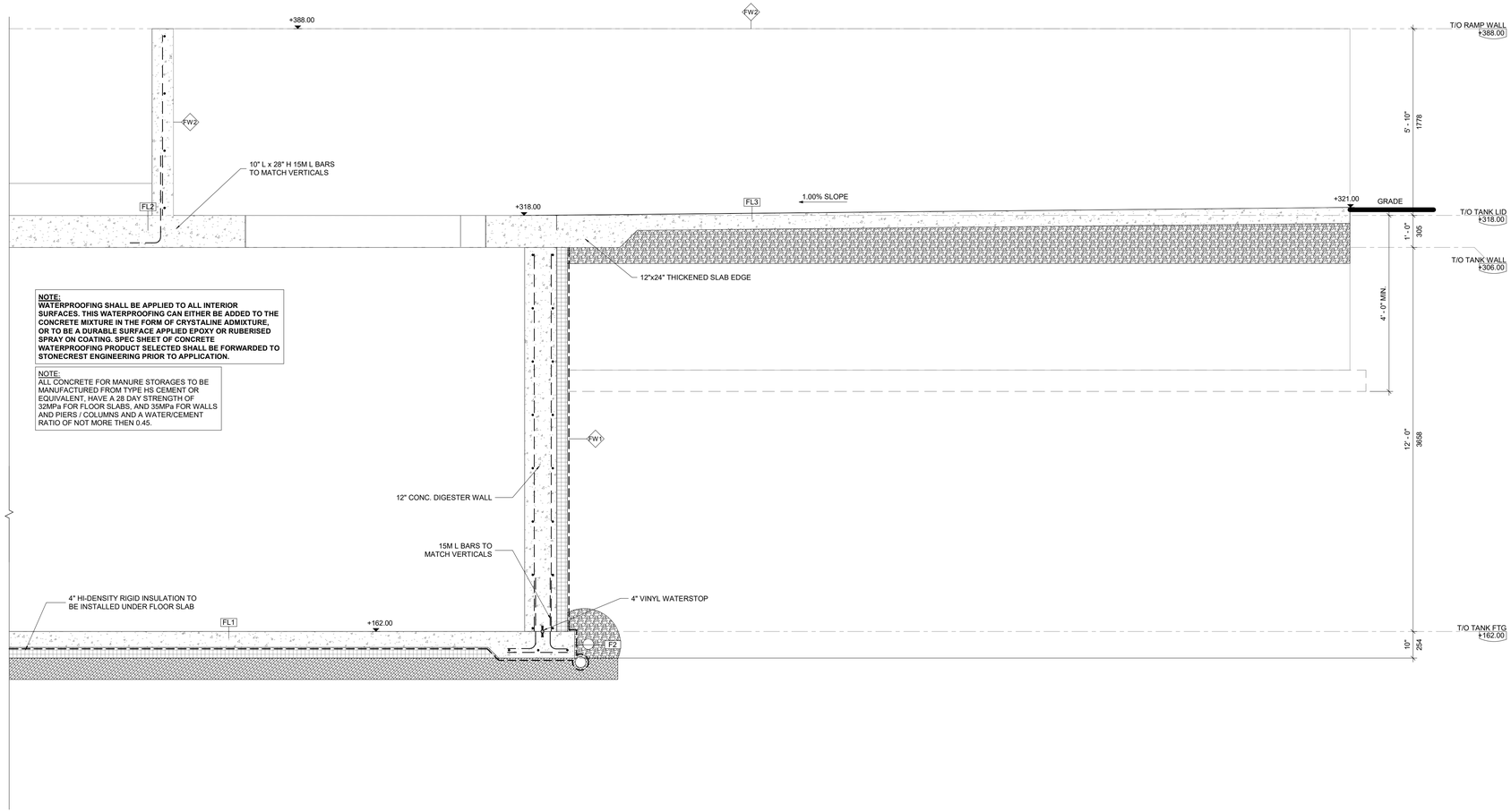
PRINT DATE: 2023

PAGE DESCRIPTION: CROSS SECTIONS

SCALE: AS NOTED

FILE: 7877 - ORGANICS RECEPTION TANK - 1

PAGE NUMBER: A2.0



NOTE:
WATERPROOFING SHALL BE APPLIED TO ALL INTERIOR SURFACES. THIS WATERPROOFING CAN EITHER BE ADDED TO THE CONCRETE MIXTURE IN THE FORM OF CRYSTALINE ADMIXTURE, OR TO BE A DURABLE SURFACE APPLIED EPOXY OR RUBERISED SPRAY ON COATING. SPEC SHEET OF CONCRETE WATERPROOFING PRODUCT SELECTED SHALL BE FORWARDED TO STONECREST ENGINEERING PRIOR TO APPLICATION.

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

B
A2.1
RAMP CROSS SECTION
SCALE: 1/2" = 1'-0"

WALL REINFORCMENT SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	WALL THICKCESS AND REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
FW2	8" CONC. FDN WALL	8" POURED IN PLACE CONCRETE REINFORCEMENT: 15M HORIZ. REBAR AT 24" c/c 15M VERT. REBAR AT 24" c/c	25MPa
W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F1	8"x24" CONC. STRIP FOOTING	2 CONTINUOUS RUNS OF 15M REBAR	25MPa
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	
FL3	6" POURED CONCRETE FLOOR (32MPa, HS CONC. OR EQUIV.) MIN. 6" CRUSHED STONE REINFORCEMENT: 6x6/6 W.W.M.	

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG
- FIRE SEPARATION RATED WALL (FS)
- FIRE RESISTANCE RATED WALL (FRR)

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
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FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: ORGANICS RECEPTION TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY:	PRINT DATE:
TRAVIS L.	2023

PAGE DESCRIPTION: CROSS SECTIONS

SCALE: AS NOTED

FILE: 7877 - ORGANICS RECEPTION TANK - 1

PAGE NUMBER: A2.1

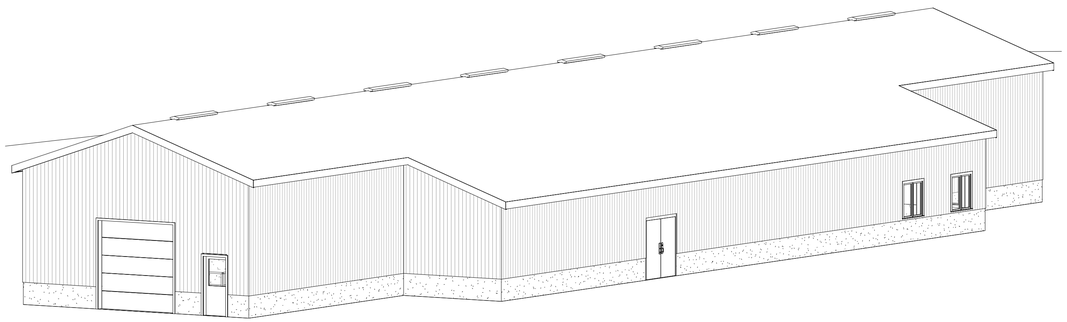
Drawing 4 - Feedstock Pumphouse Building

DRAWINGS PROVIDED FOR

RIMROCK RNG INC.

FEEDSTOCK PUMPHOUSE BUILDING

FOOTHILLS, ALBERTA



FOOTING SCHEDULE

NO.	SIZE	REINFORCEMENT
PF1	48"x48"x18" POURED CONC. PAD FOOTING	• (6) 15M REBAR E.W.
SF1	8"x24"	• (2) 15M CONT.

WALL REINFORCEMENT SCHEDULE

NO.	THICKNESS	REINFORCEMENT	MIN. 28 DAY STRENGTH
FW1	12"	INTERIOR MAT: • 15M VERT. REBAR AT 18" c/c • 15M HOR. REBAR AT 18" c/c EXTERIOR MAT: (BACKFILLED SIDE) • 30M VERT. REBAR AT 6" c/c • 15M HOR. REBAR AT 18" c/c	25MPa
FW2	8"	• 15M VERT. REBAR AT 48" c/c • 15M HOR. REBAR AT 24" c/c • (2) 15M CONT. REBAR AT TOP WALL	25MPa

PIER SCHEDULE

NO.	SIZE	REINFORCEMENT
CP1	18"x18"	(4) 20M VERT. REBAR w/ 10M STIRRUPS 10"c/c
CP2	18"x24"	(4) 20M VERT. REBAR w/ 10M STIRRUPS 10"c/c

WALL SCHEDULE

NO.	ASSEMBLY
EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING
PW1	• INTERIOR TRUSSCORE CLADDING • 7/16" OSB SHEATHING • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING

DOOR / WINDOW SCHEDULE

NO.	DOOR / WINDOW TYPE	FRAMING COMPONENTS	
		REQ'D HEADER	REQ'D POST
D1	36"x80" EXT. ALUM. MAN DOOR (HALF GLASS)	(2) 2x6	(1) J + (1) K
D2		(2) 2x8	(1) J + (1) K
D3	10'x10' INSULATED OVERHEAD DOOR	(3) 2x8	(1) J + (3) K
D4	10'x10' INSULATED OVERHEAD DOOR	(3) 2x10	(2) J + (3) K
WN1		(2) 2x6	(1) J + (1) K

ROOF SCHEDULE

No.	ASSEMBLY
R1	• 29ga. HI-RIB COLOURED STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • PRE-ENGINEERED WOOD TRUSSES SPACED AS PER MFRS SPECS • BLOWN IN INSULATION (R-40) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 1x4 WOOD STRAPPING AT 24"c/c • INTERIOR PVC CEILING

GENERAL NOTES

1. THIS BUILDING IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE ONTARIO BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE PLANS ARE FOR STRUCTURAL DESIGN ONLY. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CO-ORDINATE THE DESIGN WITH RESPECT TO PLUMBING, ELECTRICAL, MECHANICAL, VENTILATION, PENNING, DRAINAGE AND SITE PREPARATION/GRADING.
4. ALL INTERIOR STABLING AND RELATED CONCRETE WORK SHOWN INCLUDING STRIP FOOTINGS, CURBS, FLOOR SLOPES AND FLOOR DRAINS ARE FOR REPRESENTATION ONLY. THE DESIGN OF THESE SYSTEMS IS THE RESPONSIBILITY OF THE OWNER, CONTRACTOR AND EQUIPMENT SUPPLIER
5. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
6. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
7. MAXIMUM OCCUPANCY AREA FOR FARM BUILDINGS OF LOW-HUMAN OCCUPANCY IS 4800m² (51666.77ft²) AS PER NATIONAL FARM BUILDING CODE (3.1.1.2.(1) & 3.1.1.2.), A ONE HOUR FIRE SEPARATION REQUIRED TO SEPARATE BUILDING INTO COMPARTMENTS OR AN EQUIVALENT SYSTEM AS PER ARTICLE 2.7.2.2 OF THE 1997 ONTARIO BUILDING CODE MUST BE IMPLEMENTED BY THE CHIEF BUILDING OFFICIAL AS PER (2.7.1.1. - 1997 OBC).
8. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
9. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED OR SHARED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.
10. ANY PRELIMINARY DRAWINGS ARE NOT TO BE USED FOR FINAL COST ESTIMATES UNLESS INDICATED IN THE REVISIONS COLUMN. PRICING OR ESTIMATIONS COMPLETED FROM PRELIMINARY DRAWINGS SHOULD INCLUDE ADDITIONAL ALLOWANCES AND ALL SPECIFICATIONS TO BE RE-CHECKED BY THE OWNER / CONTRACTOR ON THE "ISSUED FOR PERMIT/CONSTRUCTION" DRAWING SET.
11. FINAL STAMPED ENGINEER/ARCHITECT-ISSUED PLANS ARE TO BE PROVIDED ONSITE AND TO ALL REQUIRED SUB-CONTRACTORS. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR OR OWNER TO DISTRIBUTE THE FINAL STAMPED PLANS. ANY TOWNSHIP OR CITY REDLINED/REVISED PLANS AFTER SUBMISSION FOR PERMIT, EITHER BE PROVIDED ONSITE THROUGHOUT THE DURATION OF CONSTRUCTION OR BE PROVIDED TO STONECREST ENGINEERING TO ISSUE REVISED "ISSUED FOR CONSTRUCTION" PLANS THAT IMPLEMENT THESE NOTATIONS. (IF THE TOWNSHIP CHANGES ARE SUBSTANTIAL, ADDITIONAL CHARGES MAY APPLY)
12. ALL PRODUCT AND MATERIALS TO BE INSTALLED AS PER THE SUPPLIER OR MANUFACTURER GUIDELINES. IMPROPER INSTALLATION, RESULTING IN DAMAGES, ARE NOT THE RESPONSIBILITY OF STONECREST ENGINEERING.

EXCAVATION AND BACKFILL

1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW BUILDINGS.
2. FOUNDATION DESIGNS HAVE BEEN DESIGNED FOR AN ASSUMED SOIL BEARING CAPACITY OF 3000 PSF (143 KPa) SLS.
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING. A GEOTECHNICAL ENGINEER MAY BE REQUIRED TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION. THIS WILL RESULT IN A DELAY IN CONSTRUCTION. CONTRACTOR MUST NOTIFY THE ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO, SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. IF A GEOTECNICAL ENGINEER IS REQUIRED A COPY OF THEIR REPORT MUST BE PROVIDED TO STONECREST ENGINEERING UPON ITS COMPLETION. THE CONTRACTOR IS TO READ AND FAMILIARIZE THEMSELVES WITH THIS DOCUMENT.
5. SUBGRADE FOR SLAB-ON-GRADE TO BE PROOF-ROLLED AND ANY LOOSE AREA DETECTED TO BE SUB-EXCAVATED AND REPLACED WITH APPROVED COMPACTED FILL. GRANULAR FILL UNDER THE SLAB-ON-GRADE SHALL BE COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE.
6. GRANULAR FILL UNDER THE FLOOR SLAB SHALL BE FREE-DRAINING CLEAN GRANULAR "B" MATERIAL OR BETTER, COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE
7. COMPACTED FILL BENEATH FOOTINGS AND FLOOR SLABS SHALL BE COMPACTED IN MAXIMUM 150mm (6") LAYERS.
8. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
9. FOOTING ELEVATIONS, IF SHOWN ON THE DRAWINGS, ARE FOR BIDDING PURPOSES ONLY. FOOTINGS MAY BE RAISED OR LOWERED DEPENDING ON BEARING CONDITIONS AND MUST BE RE-REVIEWED IN THE FIELD WITH THE CONTRACTOR WHEN NECESSARY.
10. ALL FOOTINGS TO BE FOUNDED ON FIRM UNDISTURBED GROUND CAPABLE OF SUPPORTING SPECIFIED BEARING CAPACITY AND TO HAVE A MINIMUM OF 48" OF COVER FOR FROST PROTECTION U.N.O.
11. MAXIMUM RATIO OF A STEPPED FOOTING SHALL BE 2:3 (i.e 2' DROP = 3' HORIZ.), UNLESS SPECIFIED OTHERWISE BY THE GEOTECHNICAL ENGINEER, AND TO BE FOUNDED ON FIRM BEARING.
12. IN THE EVENT THAT FILL IS REQUIRED UNDER FOOTINGS, FILL SHALL BE FREE-DRAINING CLEAN GRANULAR MATERIAL COMPACTED TO A MINIMUM 100% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE AND AS DIRECTED BY THE GEOTECHNICAL ENGINEER.
13. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL AND A REPORT TO BE SUBMITTED TO STONECREST ENGINEERING.
14. IN AREAS SUBJECT TO FLOODING, ALL PROPOSED WORK TO MEET THE REQUIREMENTS OF THE MINISTRY OF THE ENVIRONMENT REGARDING FLOOD PROOFING. CONTACT THE LOCAL BUILDING INSPECTOR FOR INFORMATION.
15. SOIL CONDITIONS AND REINFORCING STEEL SHALL BE INSPECTED BY ENGINEER. CONTRACTOR SHALL GIVE THE ENGINEER A MINIMUM OF 24 HOURS NOTICE TO CARRY OUT INSPECTION PRIOR TO POURING CONCRETE.
16. DO NOT DISTURB OR UNDERMINE EXISTING FOOTINGS DURING CONSTRUCTION. CONTACT ENGINEER IMMEDIATELLY SHOULD UNDERPINNING DESIGN BE REQUIRED.
17. WHEN BACKFILLING, GC TO ENSURE LEVEL OF BACKFILL ON ONE SIDE OF THE WALL IS NEVER MORE THAN 500mm (20") HIGHER THAN THE LEVEL ON THE LOWER SIDE OF THE WALL EXCEPT WHERE TEMPORARY SUPPORT FOR THE WALL IS PROVIDED OR THE WALLS ARE DESIGNED FOR SUCH UNEVEN PRESSURES.
18. LOCATE ALL PIERS AND FOOTINGS CONCENTRIC UNDER COLUMNS AND WALLS UNLESS OTHERWISE NOTED.
19. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT OCCUR IN CONCRETE WALLS UNLESS APPROVED BY THE ENGINEER.
20. ALL FOOTINGS TO HAVE A MINIMUM OF 48" OR MORE OF COVER FOR FROST PROTECTION
21. FINAL GRADING TO SLOPE AWAY FROM THE BUILDING.

MANURE HANDLING AND STORAGE

1. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
2. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT #XXXXXX, PREPARED BY YYYYYYYYY. AS A MINIMUM, STONECREST ENGINEERING REQUIRES A 6" PERIMETER TILE CONNECTED TO A PUMP/MONITORING STATION. THE PUMP/MONITORING STATION CAN BE USED TO SAMPLE WATER AROUND THE PERIMETER OF THE TANK AND REDUCE WATER PRESSURE ON THE TANK WALLS. SEE DETAIL XXXX
3. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32 MPa HS CONCRETE THROUGHOUT.
4. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
5. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
6. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
7. LIQUID STORAGE TANK TO HAVE PERMANENT SAFETY FENCE EXTENDING TO NOT LESS THAN 6' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING GATES WITH LATCHES TO DETER ACCESS.
8. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
9. ANY MANURE TRANSFER SYSTEM WHICH CAN BACKFLOW TO THE PUMP OR PUMPOUT CHAMBER MUST HAVE BOTH A PRIMARY AND SECONDARY SHUTOFF VALVE.
10. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
11. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER
12. AS PER 4.1.2.1.(1) OF THE N.F.B.C.C. 1995, MANURE DROP HOLES ARE REQUIRED TO HAVE A SAFETY RAILING OR FLOOR GRILL HAVING AN OPENING OF NOT MORE THAN 4 INCHES IN WIDTH. FLOOR GRILLS AND SAFETY RAILINGS DESIGNED BY OTHERS.
13. ALL DIMENSIONS AND LOCATIONS OF MANURE DROP HOLES TO BE VERIFIED BY MANURE EQUIPMENT SUPPLIER PRIOR TO CONSTRUCTION
14. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.
15. STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

EQUIPMENT

1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
2. ALL DETAILS AND DIMENSIONS REGARDING VENTILATION EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY VENTILATION EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
3. ALL STRUCTURAL DETAILS AND DIMENSIONS REGARDING MILKING EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MILKING EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
4. ALL STABLING AND OTHER HOUSING EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE THE RESPONSIBILITY OF THE OWNER AND CONTRACTOR
5. A GROUNDING GRID FOR EQUIPOTENTIAL PLANE SHOULD BE INSTALLED THROUGHOUT THE MILKING AREA. MILKING EQUIPMENT SUPPLIER AND QUALIFIED ELECTRICAL DESIGNER TO SPECIFY ALL DETAILS REGARDING WIRE GRID.
6. AS PER 3.1.5.1 OF THE 1995 NFBCC, ALL FUEL-FIRED APPLIANCES MUST BE LOCATED IN A SEPARATE ROOM HAVING A FIRE RESISTANCE RATING OF NOT LESS THAN 30 MINUTES. AS PER 3.1.5.2. OF THE NFBCC, FUEL-FIRED SPACE-HEATING APPLIANCES, SPACE-COOLING APPLIANCES AND SERVICE WATER HEATERS THAT SERVICE NOT MORE THAN ONE ROOM OR SUITE OR A SINGLE STOREY BUILDING LESS THAN 400m² ARE EXEMPT.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA CAN3-23.1-04 AND CAN3-A23.2-04
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 2009.
3. MINIMUM RADIUS FOR BENT REBAR IS 60MM FOR 10M REBAR AND 90MM FOR 15M REBAR
4. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS.
5. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
6. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
7. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING ANY CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE
8. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
9. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 20 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (58")	1850 (74")	N/A

NOTE: INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm (12") OF FRESH CONCRETE IS CAST BELOW THE SPLICE

10. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE
11. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR FOOTINGS SHALL NOT BE LESS THAN 3" FROM SOIL/FILL BELOW
12. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2"
13. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
14. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
15. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
16. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT.
17. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
18. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
19. ANCHOR RODS TO CONFORM TO CSA 640.21 GRADE 300W (Fy = 300 MPa) OR ASTM F1554 GRADE 36 (Fy = 248MPa) UNLESS OTHERWISE NOTED ON THE STRUCTURAL DRAWINGS OR PRE-ENGINEERED SHOP DRAWINGS.
20. ALL CONCRETE TO BE POURED TO CLASS OF CONCRETE SPECIFIED IN ENGINEERED DRAWINGS. ALL CONCRETE COMPONENTS NOT SPECIFIED SHALL BE CLASSED A-4. SEE FOLLOWING FOR CONCRETE CLASS SPECIFICATIONS

CLASS OF CONCRETE	MAX. W/CM	MIN. 28 DAY STRENGTH
A-1	0.40	35 MPa
A-2	0.45	32 MPa
A-3	0.50	30 MPa
A-4	0.55	25 MPa

FLOOR THICKNESS CHART:

- MINIMUM FLOOR THICKNESS AS SHOWN IN TABLE BELOW, UNLESS OTHERWISE NOTED.

AREA DESCRIPTION	MIN. REQ'D THICKNESS	REINFORCEMENT
SCRAPE ALLEY	4"	N/A
OFFICE/UTILITY/ADMIN	4"	N/A
MATERNITY PENS	4"	N/A
PARLOUR/ HOLDING AREA	5"	N/A
MANURE TANK FLOORS	5"	N/A
UNDER BULK TANK	6"	6x6#6 WIRE MESH OR FIBRE
DRIVE-THRU FEED ALLEYS	6"	6x6#6 WIRE MESH

FRAMING, BRACING AND TRUSSES

1. ALL LUMBER TO BE SPF NO.2 OR BETTER, UNLESS OTHERWISE NOTED
2. LUMBER IN CONTACT WITH THE EARTH, CONCRETE OR EXPOSED TO WEATHER ELEMENTS TO BE PRESSURE TREATED IN CONFORMANCE WITH CAN/CSA-O80-M97. PRESSURE TREATED WOOD TO BE CLASSIFIED AS CSA UC4.1 OR UC4.2.
3. ALL CONNECTORS USED FOR ACQ OR CA TREATED WOOD SHOULD BE GALVANIZED STEEL AS PER ASTM A653. ALL FASTENERS FOR ACQ OR CA TREATED WOOD SHOULD BE GALVANIZED IN ACCORDANCE WITH ASTM A153.
4. TRUSS DRAWINGS SHALL DETAIL THE TRUSS SIZE, SHAPE AND DESIGN AND SHALL BEAR THE SIGNATURE AND SEAL OF THE ENGINEER RESPONSIBLE
5. TRUSSES TO BE PRE-MANUFACTURED TO TRUSS MANUFACTURERS ENGINEERED SHOP DETAILS c/w ALL BLOCKING AND BRACING TO TRUSS MFR. REQUIREMENTS
6. ENGINEER STAMPED TRUSS PLANS TO BE SUPPLIED TO STONECREST ENGINEERING BEFORE TIME OF TRUSS ERECTION.
7. BUILT UP WOOD POSTS IN DOOR / WINDOW SCHEDULE REFER TO TOTAL NUMBER OF JACK AND KING STUDS REQUIRED.
8. UNBALANCED LOAD CONDITIONS TO BE INCLUDED IN THE TRUSS DESIGN
9. TRUSS DESIGNER TO ACCOUNT FOR INCREASED SNOW LOADS DUE TO ROOF VALLEYS AND SNOW SHADOWS. TRUSS SUPPLIER IS TO VISIT THE SITE TO DETERMINE SNOW SHADOW CONDITIONS AND COMMUNICATE THIS INFORMATION TO TRUSS ENGINEER.
10. ADDITIONAL LOADS REQUIRED FOR MECHANICAL OR OTHER EQUIPMENT TO BE PROVIDED TO THE TRUSS ENGINEER BY THE CONTRACTOR AND/OR OWNER
11. TEMPORARY BRACING OF THE STRUCTURE DURING THE COURSE OF CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR UNLESS OTHERWISE NOTED.
12. PROVIDE ACCESS TO EACH ATTIC SPACE AS PER O.B.C. 3.6.4.4 AND 9.19.2.
13. IN STRUCTURES WHERE THE TRUSSES ARE EXPOSED TO A HIGH MOISTURE ENVIRONMENT IT IS STRONGLY RECOMMENDED THAT A PROTECTIVE COATING BE APPLIED TO THE STEEL TRUSS PLATES, AND THAT THE TRUSSES BE REGULARLY INSPECTED.
14. ALL STRUCTURAL MEMBERS AND COMPONENTS MADE OF WOOD TO CONFORM TO CSA O86, "ENGINEERING DESIGN IN WOOD". GLUED-LAMINATED MEMBERS SHALL BE FABRICATED IN PLANTS CONFORMING TO CSA O177, "QUALIFICATION CODE FOR MANUFACTURERS OF STRUCTURAL GLUED LAMINATED TIMBER

STRUCTURAL STEEL MEMBERS

1. STRUCTURAL STEEL COLUMNS:
   HOLLOW STRUCTURAL SECTIONS CONFORMING TO CSA G40.20, CLASS C
   CSA G40.21 GRADE 350W
2. STRUCTURAL STEEL BEAMS:
   W SHAPE CONFORMING TO G40.21-350W, ASTM A992 AND A572 GRADE 50
   - ALL WELDING SPECIFIED ON DRAWINGS TO BE DONE BY CERTIFIED WELDER IN ACCORDANCE WITH CAN/CSA-S16, DESIGN OF STEEL STRUCTURES, AND CSA STANDARD W59, WELDED STEEL CONSTRUCTION (METAL ARC WELDING).
   - IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONFIRM ALL DIMENSIONS AND ELEVATIONS ON SITE PRIOR TO ORDERING AND ERECTING ALL STRUCTURAL STEEL MEMBERS
   - ALL BOLTS TO BE SAE J429 GRADE 5 UNLESS OTHERWISE SPECIFIED

GENERAL REVIEW

1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. AS PER O.B.C. DIVISION C 1.2.2.1 THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
4. SOIL CONDITIONS, WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING
5. TRANSFER SYSTEM, WHEN ALL COMPONENTS OF THE TRANSFER SYSTEM HAVE BEEN INSTALLED, PRIOR TO POURING OR BACKFILLING.
6. FOOTINGS, WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
7. CONCRETE REINFORCEMENT, WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED. THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
8. COMPLETION OF FRAMING, WHEN THE FACILITY HAS BEEN COMPLETELY FRAMED, PRIOR TO INSTALLING INTERIOR OR EXTERIOR SHEATHING THAT WOULD PREVENT A VISUAL INSPECTION OF KEY FRAMING COMPONENTS.
9. TRUSSES SET, WHEN THE TRUSSES HAVE BEEN SET AND ALL OF THE PERMANENT TRUSS BRACING INSTALLED, AS PER THIRD-PARTY ENGINEERED TRUSS DRAWINGS AS WELL AS DRAWINGS PREPARED BY THE ENGINEER.
10. FINAL REVIEW, WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED
11. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
12. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.

NAILING REQUIREMENTS

MEMBER CONNECTION	NAIL LENGTH	NUMBER OF NAILS
1. STUD TO WALL PLATE	89mm (3 1/2")	2
2. BOTTOM WALL PLATE TO FLOOR JOISTS	89mm (3 1/2")	2
3. BUILT-UP LINTELS	89mm (3 1/2")	300mm x 64mm (12"x3" o.c.)
4. BUILT-UP POST	89mm (3 1/2")	300mm (12") o.c
5. FLOOR / CEILING JOIST TO TOP PLATE	89mm (3 1/2")	2
6. ROOF RAFTER TO TOP PLATE	89mm (3 1/2")	3
7. LINTEL TO KING POST	89mm (3 1/2")	50mm (2") o.c
8. ROOF RAFTER TO RIDGE BEAM	89mm (3 1/2")	3
9. COLLAR TIE TO ROOF RAFTER	89mm (3 1/2")	3
WALL SHEATHING U.N.O. - PERIMETER - INTERIOR	64mm (2 1/2")	150mm (6") o.c 300mm (12") o.c
ROOF SHEATHING - PERIMETER - INTERIOR	64mm (2 1/2")	300mm (12") o.c 300mm (12") o.c
FLOOR SHEATHING - PERIMETER - INTERIOR	64mm (2 1/2")	300mm (12") o.c 300mm (12") o.c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
1	2023	FOR REVIEW

PROJECT NORTH | *TRUE NORTH*

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

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CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: FEEDSTOCK PUMPHOUSE BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS LISE

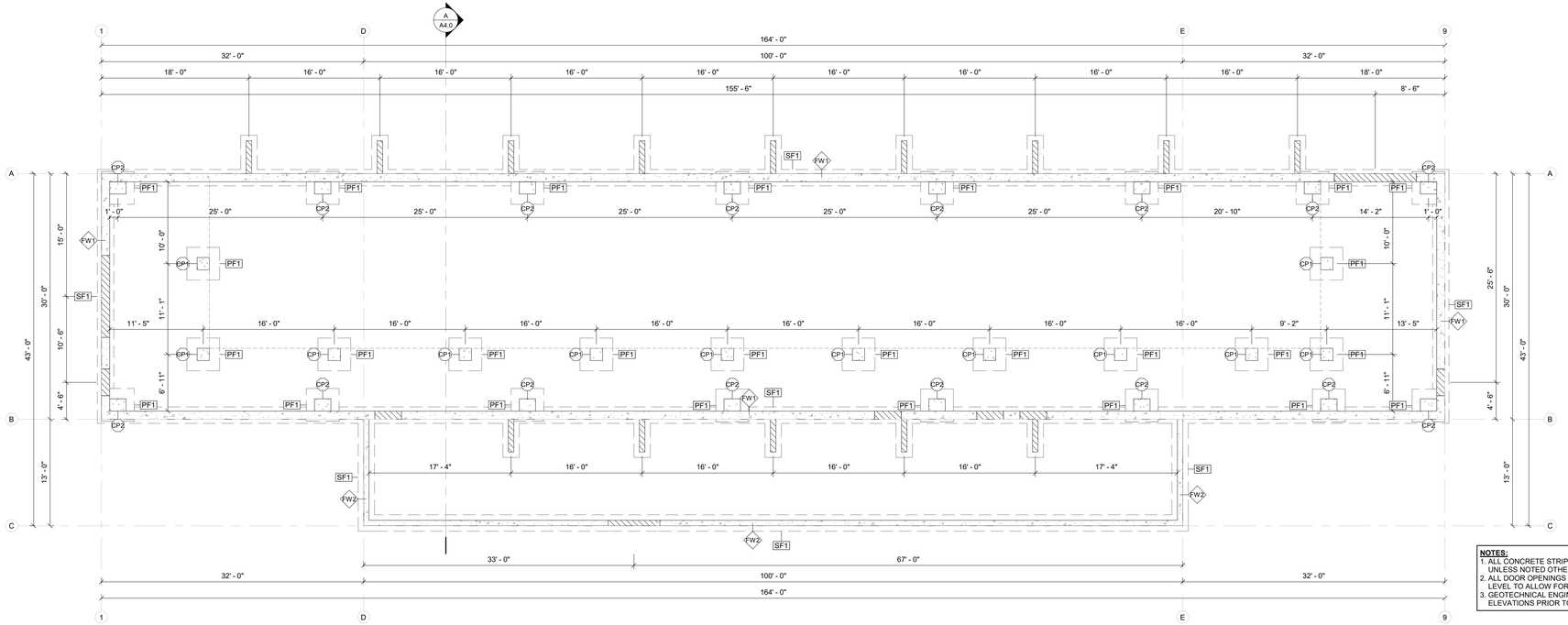
PRINT DATE: 2023

PAGE DESCRIPTION: TITLE PAGE AND NOTES

SCALE: AS NOTED

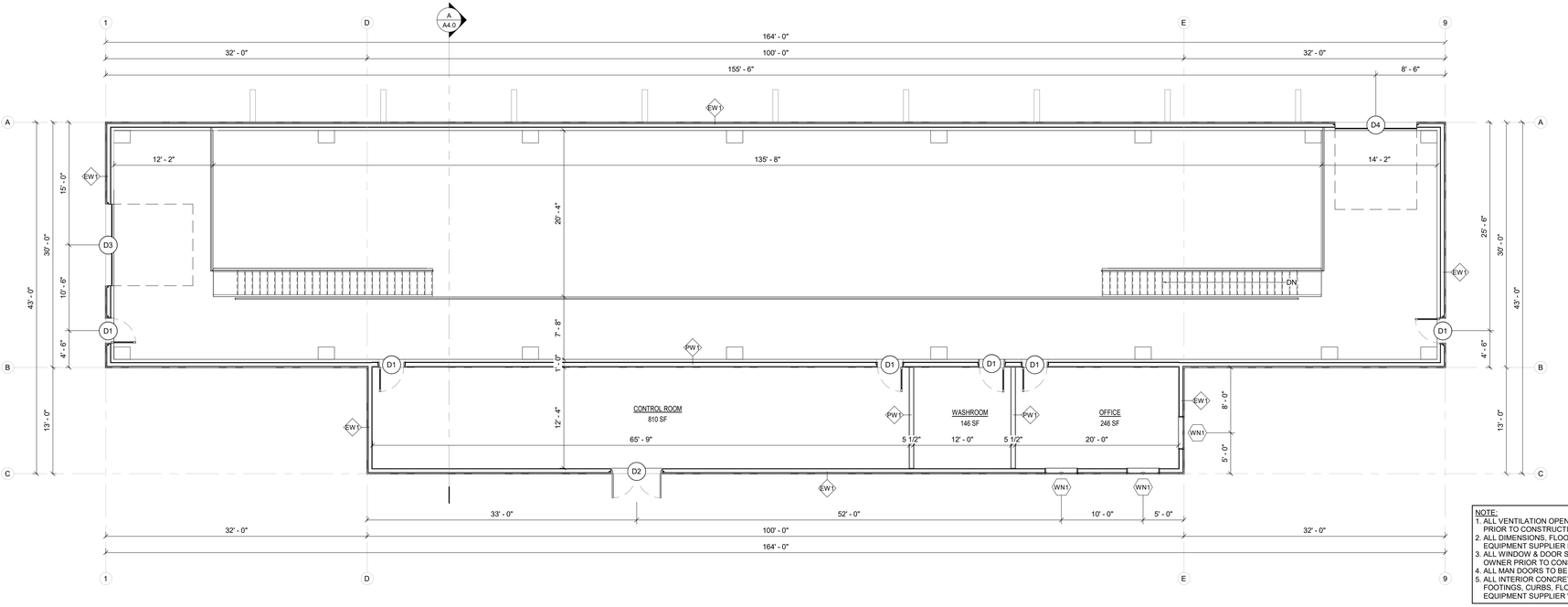
FILE: 7877 - FEEDSTOCK PUMP BUILDING - 1

PAGE NUMBER: A1.0



1 / A2.0 FOUNDATION PLAN
SCALE: 1/8" = 1'-0"

NOTES:
1. ALL CONCRETE STRIP FOOTINGS TO HAVE 2-15M CONTINUOUS REBAR UNLESS NOTED OTHERWISE.
2. ALL DOOR OPENINGS TO BE RECESSED 6" BELOW FINISHED FLOOR LEVEL TO ALLOW FOR FLOOR OVERPOUR.
3. GEOTECHNICAL ENGINEER TO APPROVE SITE CONDITIONS AND ELEVATIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION.



2 / A2.0 FLOOR PLAN
SCALE: 1/8" = 1'-0"

NOTE:
1. ALL VENTILATION OPENINGS TO BE CONFIRMED BY EQUIPMENT SUPPLIER PRIOR TO CONSTRUCTION
2. ALL DIMENSIONS, FLOOR SLOPES, & ELEVATIONS TO BE VERIFIED BY EQUIPMENT SUPPLIER PRIOR TO POURING INTERIOR CONCRETE
3. ALL WINDOW & DOOR SIZES, LOCATIONS TO BE VERIFIED BY CONTRACTOR & OWNER PRIOR TO CONSTRUCTION
4. ALL MAN DOORS TO BE 3'x6'-8" UNLESS OTHERWISE SPECIFIED ON DRAWINGS
5. ALL INTERIOR CONCRETE WORK INCLUDING NON STRUCTURAL STRIP FOOTINGS, CURBS, FLOOR SLOPES AND FLOOR DRAINS DESIGNED BY EQUIPMENT SUPPLIER WITH OWNERS APPROVAL

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
1	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION (T/O FFE, T/O FTG U.N.O.)
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PROJECT NORTH / TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING INC.
EST. 1995
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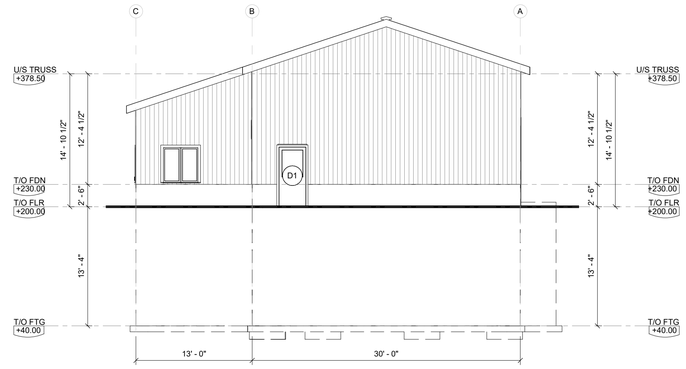
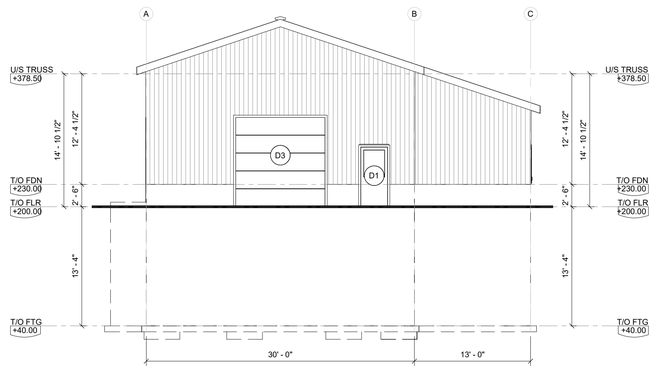
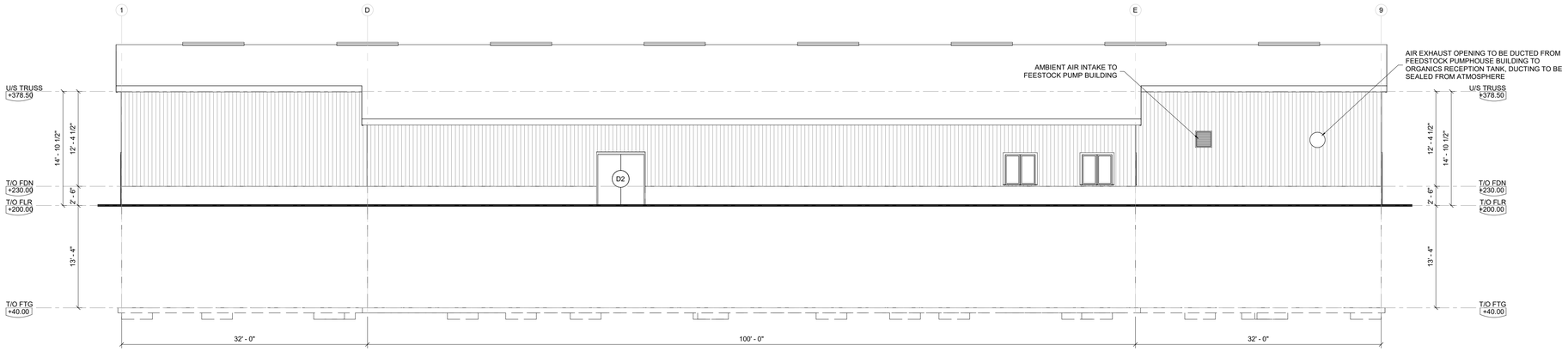
LOCATION:	FOOTHILLS, ALBERTA
PROJECT NAME:	FEEDSTOCK PUMPHOUSE BUILDING
PROJECT STATUS AND VERSION:	COORDINATION DRAWINGS
DESIGNED BY: TRAVIS LISE	PRINT DATE: 2023
PAGE DESCRIPTION:	PLAN VIEWS
SCALE:	AS NOTED
FILE:	7877 - FEEDSTOCK PUMP BUILDING - 1
PAGE NUMBER:	A2.0



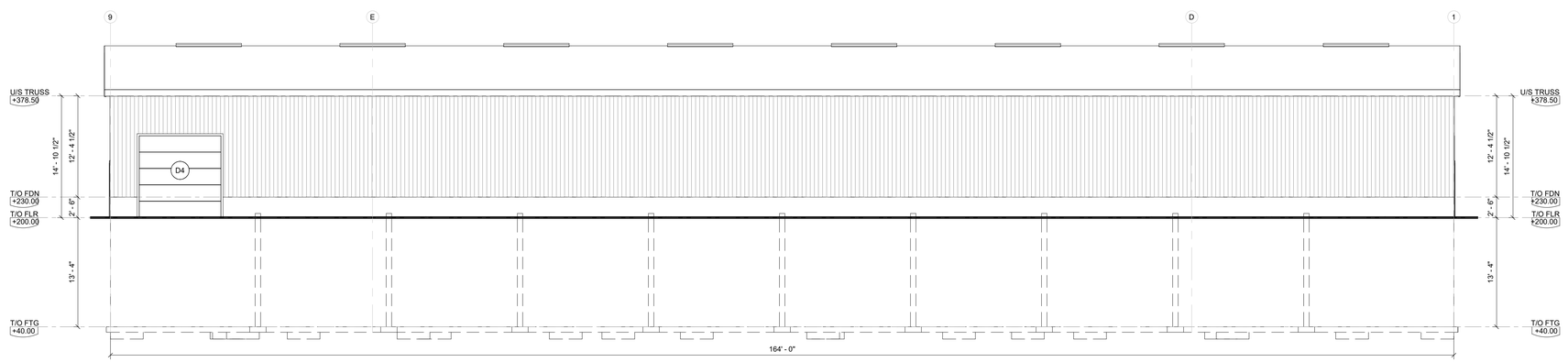
E1 / A3.0 EAST ELEVATION
SCALE: 1/8" = 1'-0"



E2 / A3.0 WEST ELEVATION
SCALE: 1/8" = 1'-0"



E3 / A3.0 SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



E4 / A3.0 NORTH ELEVATION
SCALE: 1/8" = 1'-0"

NOTE:
ODOUR ABATEMENT SYSTEM TO BE TIED IN VIA PROCESS/BUILDING AIR SYSTEM PUMPED AND DUCTED BETWEEN BUILDINGS AND/OR TANK HEADSPACES. REFER TO ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM.

NOTES:

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LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: FEEDSTOCK PUMPHOUSE BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS LISE
PRINT DATE: 2023

PAGE DESCRIPTION: BUILDING ELEVATIONS

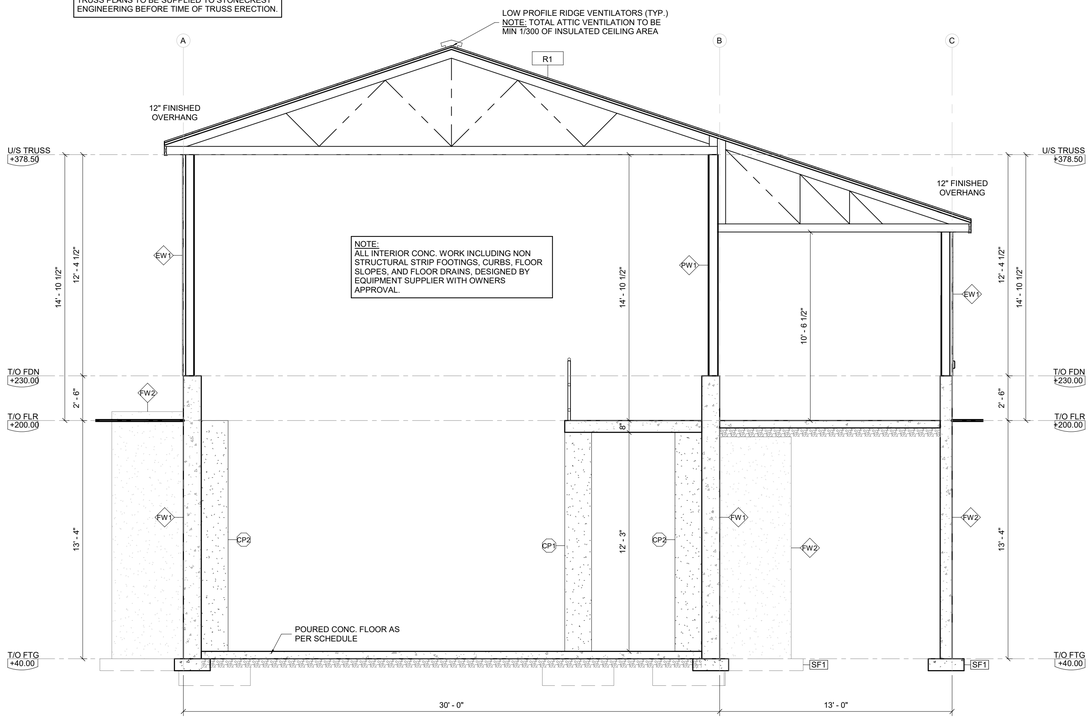
SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK PUMP BUILDING - 1

PAGE NUMBER: A3.0

NOTE:
PRE MANUFACTURED TRUSSES TO TRUSS MFR. ENGINEERS SHOP DETAILS c/w ALL BLOCKING AND BRACING OF TRUSS MFR. REQUIREMENTS.

DESIGN OF PRE MANUFACTURED TRUSSES ON THESE SET OF DRAWINGS ARE FOR REPRESENTATION ONLY. ENGINEER STAMPED TRUSS PLANS TO BE SUPPLIED TO STONECREST ENGINEERING BEFORE TIME OF TRUSS ERECTION.



A / A4.0 TYPICAL CROSS SECTION
SCALE: 1/4" = 1'-0"

NOTES:

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TRAVIS LISE	2023

PAGE DESCRIPTION: CROSS SECTIONS

SCALE: AS NOTED

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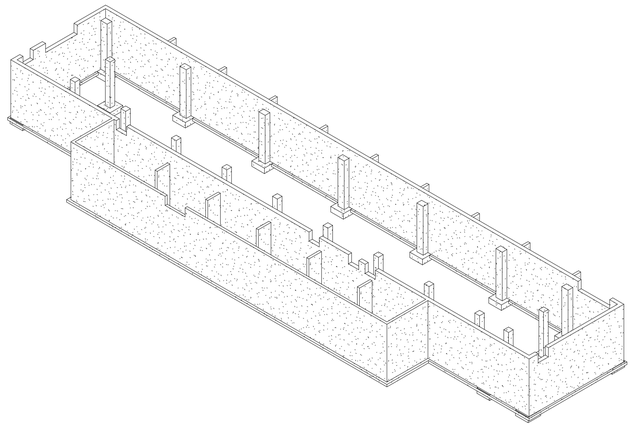
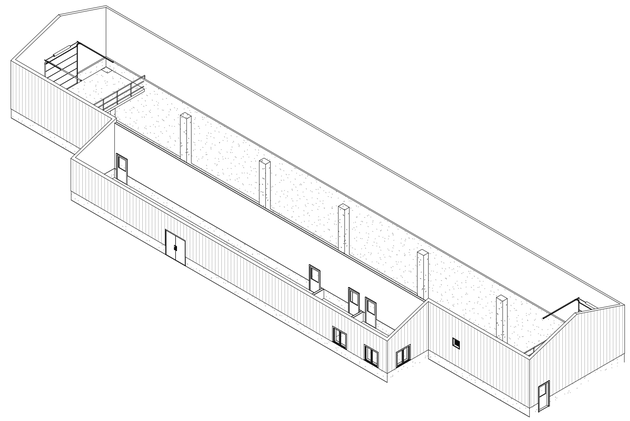
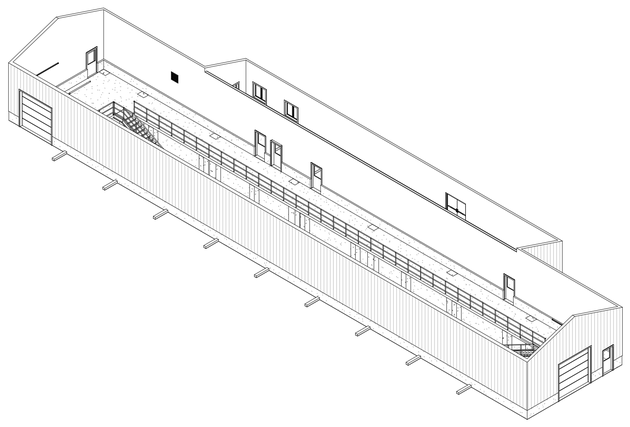


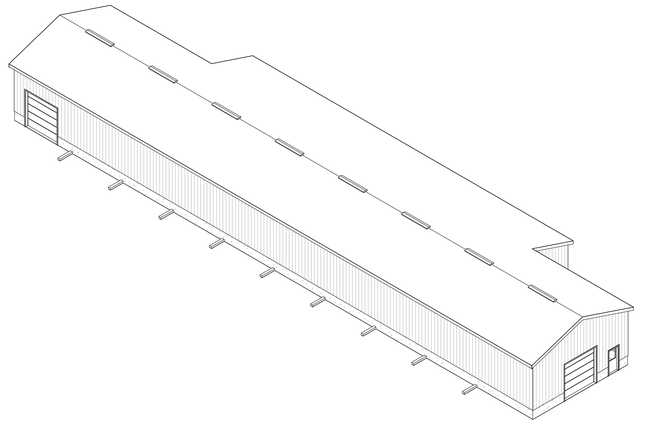
1 A5.0 FOUNDATION PERSPECTIVE
SCALE: N.T.S.



2 A5.0 INTERIOR PERSPECTIVE 1
SCALE: N.T.S.



3 A5.0 INTERIOR PERSPECTIVE 2
SCALE: N.T.S.



4 A5.0 EXTERIOR PERSPECTIVE
SCALE: N.T.S.

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DESIGNED BY: TRAVIS LISE

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PAGE DESCRIPTION: PERSPECTIVE VIEWS

SCALE: AS NOTED

FILE: 7877 - FEEDSTOCK PUMP BUILDING - 1

PAGE NUMBER: A5.0

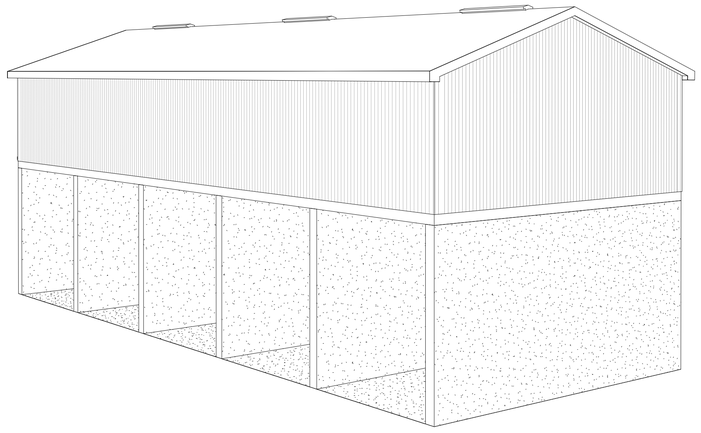
Drawing 5 - Digestate Separation Building

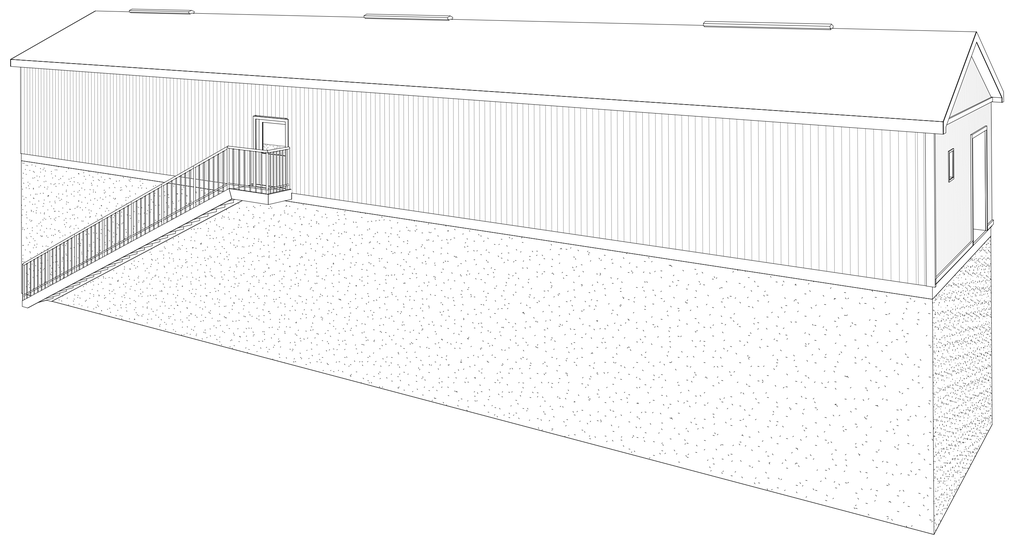
DRAWINGS PROVIDED FOR

RIMROCK Ltd.

DIGESTATE SEPARATION BUILDING

FOOTHILLS, ALBERTA





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LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: DIGESTATE SEPARATION BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY:	PRINT DATE:
TRAVIS L.	2023

PAGE DESCRIPTION: TITLE PAGE

SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

PAGE NUMBER: A1.0

FARM BUILDING CODE MATRIX:

TO BE CONFIRMED PRIOR TO CONSTRUCTION

PROJECT DESCRIPTION:
RIMROCK BIODIGESTER BUILDINGS

MAJOR OCCUPANCY:
LOW HUMAN FARM OCCUPANCY

BUILDING AREA = MAX. 4,800 m^2 (51,666.77 ft^2)
GROSS AREA = MAX. 4,800 m^2 (51,666.77 ft^2)

1 STOREY FACILITY

NOT DESIGNED TO BE BARRIER FREE

BUILDING HEIGHT = TBD.

MAXIMUM ALLOWABLE FLOOR AREA FOR FARM BUILDINGS OF LOW-HUMAN OCCUPANCY IS 4,800m^2 (51,666.77ft^2) AS PER NATIONAL FARM BUILDING CODE (3.1.1.2.(1) & 3.1.1.2.)

THE MAXIMUM TRAVEL DISTANCE TO AN EXIT IS 45m (147'-7 5/8") AS PER ARTICLE 3.2.1.5.(1)(B) OF THE NATIONAL FARM BUILDING CODE OF CANADA 1995

FARM BUILDINGS NOT REQUIRED TO HAVE ACCESS ROUTES (NFBC 3.1.1.1. (1))
FARM BUILDINGS NOT REQUIRED TO HAVE SPRINKLER SYSTEM, STAND PIPE OR FIRE ALARM (NFBC 3.1.1.1. (1) AND PART 3 OF NFBC)
FARM BUILDINGS ARE EXEMPT FROM ON SITE WATER AS PER A3.2.5.7.
HIGH BUILDING REQUIREMENTS ARE NOT APPLICABLE TO FARM BUILDINGS
NON COMBUSTIBLE AND COMBUSTIBLE CONSTRUCTION PERMITTED

NO PROPOSED MEZZANINES
OCCUPANT LOAD = BUILDING AREA / 40 = MAXIMUM OF PEOPLE

NO PROPOSED WASHROOMS FOR THIS FACILITY
NO PROPOSED HAZARDOUS STORED SUBSTANCE PROPOSED
NO FIRE SEPARATIONS REQUIRED FOR THIS AGRICULTURAL BUILDING

FACILITY SPATIAL SEPARATION IS DEEMED TO BE EVALUATED VIA 3.1.2. OF NFBC BASED ON OWNER INFORMATION, PROPOSED FACILITY APPEARS TO BE AN ADEQUATE DISTANCE FROM PROPERTY LINES.
SHOULD PROPOSED FACILITY BE WITHIN 30M OF EXISTING RESIDENCE, PROPERTY LINE OR FARM BUILDINGS THAT ARE NOT LOW HUMAN OCCUPANCY OR COMMERCIAL FACILITIES CONTACT ENGINEER FOR SPATIAL SEPARATION REQUIREMENTS.

FOOTING SCHEDULE

NO.	SIZE	REINFORCEMENT	MIN. 28 DAY STRENGTH
SF2	10"x30"	• (3) 15M CONT.	25MPa

WALL REINFORCEMENT SCHEDULE

NO.	THICKNESS	REINFORCEMENT	MIN. 28 DAY STRENGTH
FW1	12"	INTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 8" c/c EXTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.
FW2	12"	BOTH MATS: • 15M VERT. REBAR AT 8" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.

FLOOR SCHEDULE

No.	ASSEMBLY	MIN. 28 DAY STRENGTH
FL4	• 8" (MIN.) CONCRETE FLOOR • 6" (MIN.) COMPACTED GRANULAR BASE • COMPACTED NATIVE SOIL OR ENGINEER APPROVED MATERIAL	32MPa, HS
FL5	• 10" CONCRETE SUSPEND SLAB • REINFORCING AS PER DETAIL	32MPa, HS

WALL SCHEDULE

NO.	ASSEMBLY	MIN. 28 DAY STRENGTH
EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING	N/A

DOOR / WINDOW SCHEDULE

NO.	DOOR / WINDOW TYPE	FRAMING COMPONENTS	
		REQ'D HEADER	REQ'D POST
D1	36"x80" EXT. ALUM. MAN DOOR (HALF GLASS)	(2) 2x6	(1) J + (1) K
D4	8'x8' INSULATED OVERHEAD DOOR	(3) 2x10	(2) J + (3) K

ROOF SCHEDULE

No.	ASSEMBLY
R1	• 29ga. HI-RIB COLOURED STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • PRE-ENGINEERED WOOD TRUSSES SPACED AS PER MFRS SPECS • BLOWN IN INSULATION (R-40) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 1x4 WOOD STRAPPING AT 24"c/c • INTERIOR PVC CEILING

GENERAL NOTES
1. THIS BUILDING IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE NATIONAL BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE PLANS ARE FOR STRUCTURAL DESIGN ONLY. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CO-ORDINATE THE DESIGN WITH RESPECT TO PLUMBING, ELECTRICAL, MECHANICAL, VENTILATION, PENNING, DRAINAGE AND SITE PREPARATION/GRADING.
4. ALL INTERIOR STABLING AND RELATED CONCRETE WORK SHOWN INCLUDING STRIP FOOTINGS, CURBS, FLOOR SLOPES AND FLOOR DRAINS ARE FOR REPRESENTATION ONLY. THE DESIGN OF THESE SYSTEMS IS THE RESPONSIBILITY OF THE OWNER, CONTRACTOR AND EQUIPMENT SUPPLIER.
5. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
6. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
7. MAXIMUM ALLOWABLE FLOOR AREA FOR FARM BUILDINGS OF LOW-HUMAN OCCUPANCY IS 4800m^2 (51666.77ft^2) AS PER NATIONAL FARM BUILDING CODE (3.1.1.2.(1) & 3.1.1.2.). A ONE HOUR FIRE SEPARATION REQUIRED TO SEPARATE BUILDING INTO COMPARTMENTS UNDER ALLOWABLE AREA OR AN EQUIVALENT SYSTEM AS PER 3.2 OF THE 2019 NATIONAL BUILDING CODE OF CANADA (ALBERTA EDITION)
8. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
9. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED OR SHARED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.
10. ANY PRELIMINARY DRAWINGS ARE NOT TO BE USED FOR FINAL COST ESTIMATES UNLESS INDICATED IN THE REVISIONS COLUMN. PRICING OR ESTIMATIONS COMPLETED FROM PRELIMINARY DRAWINGS SHOULD INCLUDE ADDITIONAL ALLOWANCES AND ALL SPECIFICATIONS TO BE RE-CHECKED BY THE OWNER / CONTRACTOR ON THE "ISSUED FOR PERMIT/CONSTRUCTION" DRAWING SET.
11. FINAL STAMPED ENGINEER/ARCHITECT-ISSUED PLANS ARE TO BE PROVIDED ONSITE AND TO ALL REQUIRED SUB-CONTRACTORS. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR OR OWNER TO DISTRIBUTE THE FINAL STAMPED PLANS. ANY TOWNSHIP OR CITY REDLINED/REVISED PLANS AFTER SUBMISSION FOR PERMIT, EITHER BE PROVIDED ONSITE THROUGHOUT THE DURATION OF CONSTRUCTION OR BE PROVIDED TO STONECREST ENGINEERING TO ISSUE REVISED “ISSUED FOR CONSTRUCTION” PLANS THAT IMPLEMENT THESE NOTATIONS. (IF THE TOWNSHIP CHANGES ARE SUBSTANTIAL, ADDITIONAL CHARGES MAY APPLY)
12. ALL PRODUCT AND MATERIALS TO BE INSTALLED AS PER THE SUPPLIER OR MANUFACTURER GUIDELINES. IMPROPER INSTALLATION, RESULTING IN DAMAGES, ARE NOT THE RESPONSIBILITY OF STONECREST ENGINEERING.

EXCAVATION AND BACKFILL
1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW BUILDINGS.
2. FOUNDATION DESIGNS HAVE BEEN DESIGNED FOR AN ASSUMED SOIL BEARING CAPACITY OF 3000 PSF (143 KPa) SLS. ENSURE ULS BEARING CAPACITY IS NOT EXCEEDED
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING. A GEOTECHNICAL ENGINEER MAY BE REQUIRED TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION. THIS WILL RESULT IN A DELAY IN CONSTRUCTION. CONTRACTOR MUST NOTIFY THE ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO, SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. IF A GEOTECNICAL ENGINEER IS REQUIRED A COPY OF THEIR REPORT MUST BE PROVIDED TO STONECREST ENGINEERING UPON ITS COMPLETION. THE CONTRACTOR IS TO READ AND FAMILIARIZE THEMSELVES WITH THIS DOCUMENT.
5. SUBGRADE FOR SLAB-ON-GRADE TO BE PROOF-ROLLED AND ANY LOOSE AREA DETECTED TO BE SUB-EXCAVATED AND REPLACED WITH APPROVED COMPACTED FILL. GRANULAR FILL UNDER THE SLAB-ON-GRADE SHALL BE COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE.
6. GRANULAR FILL UNDER THE FLOOR SLAB SHALL BE FREE-DRAINING CLEAN GRANULAR "B" MATERIAL OR BETTER, COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE
7. COMPACTED FILL BENEATH FOOTINGS AND FLOOR SLABS SHALL BE COMPACTED IN MAXIMUM 150mm (6") LAYERS.
8. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
9. FOOTING ELEVATIONS, IF SHOWN ON THE DRAWINGS, ARE FOR BIDDING PURPOSES ONLY. FOOTINGS MAY BE RAISED OR LOWERED DEPENDING ON BEARING CONDITIONS AND MUST BE RE-REVIEWED IN THE FIELD WITH THE CONTRACTOR WHEN NECESSARY.
10. ALL FOOTINGS TO BE FOUNDED ON FIRM UNDISTURBED GROUND CAPABLE OF SUPPORTING SPECIFIED BEARING CAPACITY AND TO HAVE A MINIMUM OF 2.3m (7'-7") OF COVER FOR FROST PROTECTION FOR UNHEATED BUILDINGS AND 1.5M (4'-11") FOR HEATED BUILDINGS U.N.O.
11. MAXIMUM RATIO OF A STEPPED FOOTING SHALL BE 2:3 (i.e 2' DROP = 3' HORIZ.), UNLESS SPECIFIED OTHERWISE BY THE GEOTECHNICAL ENGINEER, AND TO BE FOUNDED ON FIRM BEARING.
12. IN THE EVENT THAT FILL IS REQUIRED UNDER FOOTINGS, FILL SHALL BE FREE-DRAINING CLEAN GRANULAR MATERIAL COMPACTED TO A MINIMUM 100% STANDARD PROCTOR DENSITY AT OPTIMUM MOISTURE AND AS DIRECTED BY THE GEOTECHNICAL ENGINEER.
13. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL AND A REPORT TO BE SUBMITTED TO STONECREST ENGINEERING.
14. IN AREAS SUBJECT TO FLOODING, ALL PROPOSED WORK TO MEET THE REQUIREMENTS OF THE MINISTRY OF THE ENVIRONMENT REGARDING FLOOD PROOFING. CONTACT THE LOCAL BUILDING INSPECTOR FOR INFORMATION.
15. SOIL CONDITIONS AND REINFORCING STEEL SHALL BE INSPECTED BY ENGINEER. CONTRACTOR SHALL GIVE THE ENGINEER A MINIMUM OF 24 HOURS NOTICE TO CARRY OUT INSPECTION PRIOR TO POURING CONCRETE.
16. DO NOT DISTURB OR UNDERMINE EXISTING FOOTINGS DURING CONSTRUCTION. CONTACT ENGINEER IMMEDIATELLY SHOULD UNDERPINNING DESIGN BE REQUIRED.
17. WHEN BACKFILLING, GC TO ENSURE LEVEL OF BACKFILL ON ONE SIDE OF THE WALL IS NEVER MORE THAN 500mm (20") HIGHER THAN THE LEVEL ON THE LOWER SIDE OF THE WALL EXCEPT WHERE TEMPORARY SUPPORT FOR THE WALL IS PROVIDED OR THE WALLS ARE DESIGNED FOR SUCH UNEVEN PRESSURES.
18. LOCATE ALL PIERS AND FOOTINGS CONCENTRIC UNDER COLUMNS AND WALLS UNLESS OTHERWISE NOTED.
19. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT OCCUR IN CONCRETE WALLS UNLESS APPROVED BY THE ENGINEER.
20. FINAL GRADING TO SLOPE AWAY FROM THE BUILDING.

MANURE HANDLING AND STORAGE
1. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
2. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT #CG3555, PREPARED BY CLIFTON ENGINEERING GROUP INC. AS A MINIMUM, STONECREST ENGINEERING REQUIRES A 6" PERIMETER TILE CONNECTED TO A PUMP/MONITORING STATION. THE PUMP/MONITORING STATION CAN BE USED TO SAMPLE WATER AROUND THE PERIMETER OF THE TANK AND REDUCE WATER PRESSURE ON THE TANK WALLS.
3. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32 MPa HS CONCRETE THROUGHOUT.
4. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
5. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
6. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
7. LIQUID STORAGE TANK TO HAVE PERMANENT SAFETY FENCE EXTENDING TO NOT LESS THAN 5' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING GATES WITH LATCHES TO DETER ACCESS.
8. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
9. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
10. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER
11. AS PER 4.1.2.1.(1) OF THE N.F.B.C.C. 1995, MANURE DROP HOLES ARE REQUIRED TO HAVE A SAFETY RAILING OR FLOOR GRILL HAVING AN OPENING OF NOT MORE THAN 4 INCHES IN WIDTH. FLOOR GRILLS AND SAFETY RAILINGS DESIGNED BY OTHERS.
12. ALL DIMENSIONS AND LOCATIONS OF MANURE DROP HOLES TO BE VERIFIED BY MANURE EQUIPMENT SUPPLIER PRIOR TO CONSTRUCTION
13. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.
14. STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

EQUIPMENT
1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
2. ALL DETAILS AND DIMENSIONS REGARDING VENTILATION EQUIPMENT ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY VENTILATION EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER
3. AS PER 3.1.5.1 OF THE 1995 NFBCC, ALL FUEL-FIRED APPLIANCES MUST BE LOCATED IN A SEPARATE ROOM HAVING A FIRE RESISTANCE RATING OF NOT LESS THAN 30 MINUTES. AS PER 3.1.5.2. OF THE NFBCC, FUEL-FIRED SPACE-HEATING APPLIANCES, SPACE-COOLING APPLIANCES AND SERVICE WATER HEATERS THAT SERVICE NOT MORE THAN ONE ROOM OR SUITE OR A SINGLE STOREY BUILDING LESS THAN 400m^2 ARE EXEMPT.

CONCRETE
1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA A23.1-19 AND CSA A23.2-19
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 2021.
3. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS.
4. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
5. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
6. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING ANY CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE
7. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
8. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 20 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (56")	1850 (74")	N/A

NOTE: INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm (12") OF FRESH CONCRETE IS CAST BELOW THE SPLICE

9. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE
10. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR FOOTINGS SHALL NOT BE LESS THAN 3" FROM SOIL/FILL BELOW
11. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2"
12. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
13. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
14. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
15. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT.
16. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
17. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
18. ANCHOR RODS TO CONFORM TO CSA 640.21 GRADE 300W (F_y = 300 MPa) OR ASTM F1554 GRADE 36 (F_y = 248MPa) UNLESS OTHERWISE NOTED ON THE STRUCTURAL DRAWINGS OR PRE-ENGINEERED SHOP DRAWINGS.
19. ALL CONCRETE TO BE POURED TO CLASS OF CONCRETE SPECIFIED IN ENGINEERED DRAWINGS. ALL CONCRETE COMPONENTS NOT SPECIFIED SHALL BE CLASSED A-4. SEE FOLLOWING FOR CONCRETE CLASS SPECIFICATIONS

CLASS OF CONCRETE	MAX. W/CM	MIN. 28 DAY STRENGTH
A-1	0.40	35 MPa
A-2	0.45	32 MPa
A-3	0.50	30 MPa
A-4	0.55	25 MPa

FLOOR THICKNESS CHART:
- MINIMUM FLOOR THICKNESS AS SHOWN IN TABLE BELOW, UNLESS OTHERWISE NOTED.

AREA DESCRIPTION	MIN. REQ'D THICKNESS	REINFORCEMENT
SCRAPE ALLEY	4"	N/A
OFFICE/UTILITY/ADMIN	4"	N/A
MATERNITY PENS	4"	N/A
PARLOUR/ HOLDING AREA	5"	N/A
MANURE TANK FLOORS	5"	N/A
UNDER BULK TANK	6"	6x6#6 WIRE MESH OR FIBRE
DRIVE-THRU FEED ALLEYS	6"	6x6#6 WIRE MESH

FRAMING, BRACING AND TRUSSES
1. ALL LUMBER TO BE SPF NO.2 OR BETTER, UNLESS OTHERWISE NOTED
2. LUMBER IN CONTACT WITH THE EARTH, CONCRETE OR EXPOSED TO WEATHER ELEMENTS TO BE PRESSURE TREATED IN CONFORMANCE WITH CAN/CSA-O80-M97. PRESSURE TREATED WOOD TO BE CLASSIFIED AS CSA UC4.1 OR UC4.2.
3. ALL CONNECTORS USED FOR ACQ OR CA TREATED WOOD SHOULD BE GALVANIZED STEEL AS PER ASTM A653. ALL FASTENERS FOR ACQ OR CA TREATED WOOD SHOULD BE GALVANIZED IN ACCORDANCE WITH ASTM A153.
4. TRUSS DRAWINGS SHALL DETAIL THE TRUSS SIZE, SHAPE AND DESIGN AND SHALL BEAR THE SIGNATURE AND STAMP OF THE ENGINEER RESPONSIBLE
5. TRUSSES TO BE PRE MANUFACTURED TO TRUSS MANUFACTURERS ENGINEERED SHOP DETAILS c/w ALL BLOCKING AND BRACING TO TRUSS MFR. REQUIREMENTS
6. ENGINEER STAMPED TRUSS PLANS TO BE SUPPLIED TO STONECREST ENGINEERING BEFORE TIME OF TRUSS ERECTION.
7. BUILT UP WOOD POSTS IN DOOR / WINDOW SCHEDULE REFER TO TOTAL NUMBER OF JACK AND KING STUDS REQUIRED.
8. UNBALANCED LOAD CONDITIONS TO BE INCLUDED IN THE TRUSS DESIGN
9. TRUSS DESIGNER TO ACCOUNT FOR INCREASED SNOW LOADS DUE TO ROOF VALLEYS AND SNOW SHADOWS. TRUSS SUPPLIER IS TO VISIT THE SITE TO DETERMINE SNOW SHADOW CONDITIONS AND COMMUNICATE THIS INFORMATION TO TRUSS ENGINEER.
10. ADDITIONAL LOADS REQUIRED FOR MECHANICAL OR OTHER EQUIPMENT TO BE PROVIDED TO THE TRUSS ENGINEER BY THE CONTRACTOR AND/OR OWNER
11. TEMPORARY BRACING OF THE STRUCTURE DURING THE COURSE OF CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR UNLESS OTHERWISE NOTED.
12. PROVIDE ACCESS TO EACH ATTIC SPACE AS PER N.B.C.C. (AB) 3.6.4.4 AND 9.19.2.
13. IN STRUCTURES WHERE THE TRUSSES ARE EXPOSED TO A HIGH MOISTURE ENVIRONMENT IT IS STRONGLY RECOMMENDED THAT A PROTECTIVE COATING BE APPLIED TO THE STEEL TRUSS PLATES, AND THAT THE TRUSSES BE REGULARLY INSPECTED.
14. ALL STRUCTURAL MEMBERS AND COMPONENTS MADE OF WOOD TO CONFORM TO CSA O86, "ENGINEERING DESIGN IN WOOD". GLUED-LAMINATED MEMBERS SHALL BE FABRICATED IN PLANTS CONFORMING TO CSA O177, "QUALIFICATION CODE FOR MANUFACTURERS OF STRUCTURAL GLUED LAMINATED TIMBER

STRUCTURAL STEEL MEMBERS
1. STRUCTURAL STEEL COLUMNS:
   HOLLOW STRUCTURAL SECTIONS CONFORMING TO CSA G40.20, CLASS C CSA G40.21 GRADE 350W
2. STRUCTURAL STEEL BEAMS:
   W SHAPE CONFORMING TO G40.21-350W, ASTM A992 AND A572 GRADE 50
- ALL WELDING SPECIFIED ON DRAWINGS TO BE DONE BY CERTIFIED WELDER IN ACCORDANCE WITH CAN/CSA-S16, LIMIT STATES DESIGN OF STEEL STRUCTURES, AND CSA STANDARD W59, WELDED STEEL CONSTRUCTION (METAL ARC WELDING).
- IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONFIRM ALL DIMENSIONS AND ELEVATIONS ON SITE PRIOR TO ORDERING AND ERECTING ALL STRUCTURAL STEEL MEMBERS

GENERAL REVIEW
1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. AS PER N.B.C.C. (AB) DIV. C2.4.2 THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
4. SOIL CONDITIONS. WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS. WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING
5. TRANSFER SYSTEM. WHEN ALL COMPONENTS OF THE TRANSFER SYSTEM HAVE BEEN INSTALLED, PRIOR TO POURING OR BACKFILLING.
6. FOOTINGS. WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
7. CONCRETE REINFORCEMENT. WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED. THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
8. COMPLETION OF FRAMING. WHEN THE FACILITY HAS BEEN COMPLETELY FRAMED, PRIOR TO INSTALLING INTERIOR OR EXTERIOR SHEATHING THAT WOULD PREVENT A VISUAL INSPECTION OF KEY FRAMING COMPONENTS.
9. TRUSSES SET. WHEN THE TRUSSES HAVE BEEN SET AND ALL OF THE PERMANENT TRUSS BRACING INSTALLED, AS PER THIRD-PARTY ENGINEERED TRUSS DRAWINGS AS WELL AS DRAWINGS PREPARED BY THE ENGINEER.
10. FINAL REVIEW. WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED.
11. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
12. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.

NAILING REQUIREMENTS

MEMBER CONNECTION	NAIL LENGTH	NUMBER OF NAILS
1. STUD TO WALL PLATE	89mm (3 1/2")	2
2. BOTTOM WALL PLATE TO FLOOR JOISTS	89mm (3 1/2")	2
3. BUILT-UP LINTELS	89mm (3 1/2")	300mm x 64mm (12"x3" o.c.)
4. BUILT-UP POST	89mm (3 1/2")	300mm (12") o.c
5. FLOOR / CEILING JOIST TO TOP PLATE	89mm (3 1/2")	2
6. ROOF RAFTER TO TOP PLATE	89mm (3 1/2")	3
7. LINTEL TO KING POST	89mm (3 1/2")	50mm (2") o.c
8. ROOF RAFTER TO RIDGE BEAM	89mm (3 1/2")	3
9. COLLAR TIE TO ROOF RAFTER	89mm (3 1/2")	3
WALL SHEATHING U.N.O. - PERIMETER - INTERIOR	64mm (2 1/2")	150mm (6") o.c 300mm (12") o.c
ROOF SHEATHING - PERIMETER - INTERIOR	64mm (2 1/2")	300mm (12") o.c 300mm (12") o.c
FLOOR SHEATHING - PERIMETER - INTERIOR	64mm (2 1/2")	300mm (12") o.c 300mm (12") o.c

NOTES:
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NO.	DATE:	DESCRIPTION:
1	2023	FOR REVIEW

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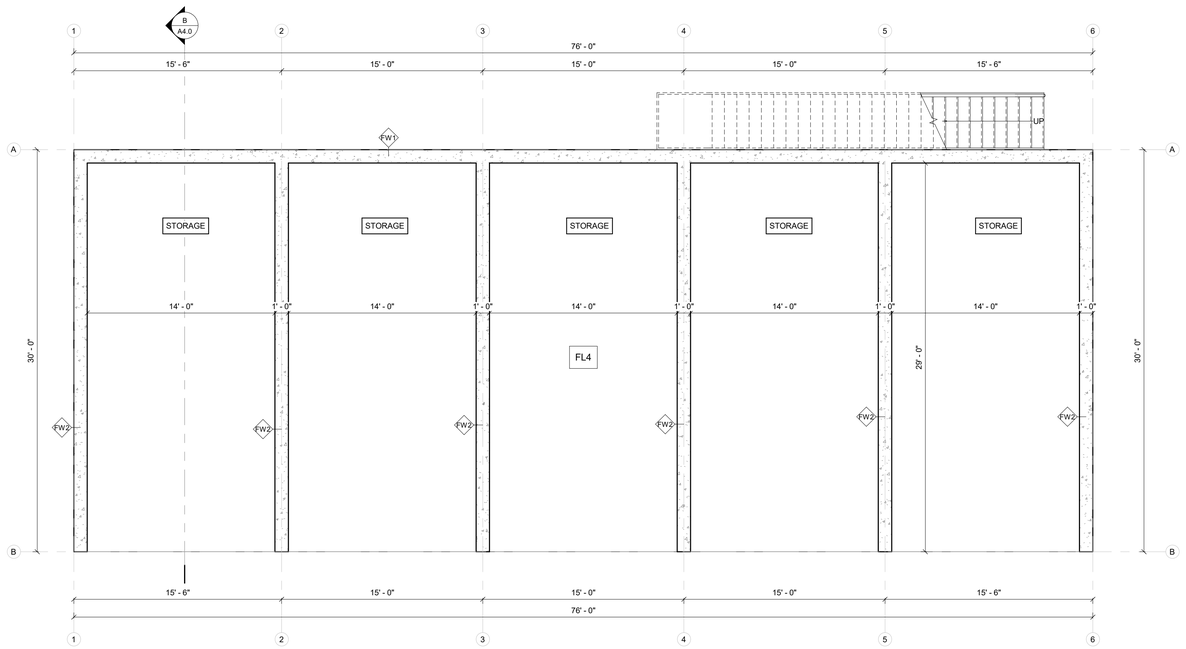
PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING INC.
EST. 1995
440 Wright Blvd Unit #2, Stratford, ON, N4Z 1H3
519-625-8025 ~ info@stonecrestengineering.com

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK Ltd.
LOCATION: FOOTHILLS, ALBERTA
PROJECT NAME: DIGESTATE SEPARATION BUILDING
PROJECT STATUS AND VERSION: COORDINATION DRAWINGS
DESIGNED BY: TRAVIS L.
PRINT DATE: 2023
PAGE DESCRIPTION: SCHEDULES & NOTES
SCALE: AS NOTED
FILE: 7877-DIGESTATE SEPARATION BUILDING-1
PAGE NUMBER: A1.1



1 A2.0 FLOOR PLAN
SCALE: 3/16" = 1'-0"

WALL SCHEDULE

NO.	ASSEMBLY	MIN. 28 DAY STRENGTH
EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING	N/A

DOOR / WINDOW SCHEDULE

NO.	DOOR / WINDOW TYPE	FRAMING COMPONENTS	
		REQ'D HEADER	REQ'D POST
D1	36"x80" EXT. ALUM. MAN DOOR (HALF GLASS)	(2) 2x6	(1) J + (1) K
D4	8'x8' INSULATED OVERHEAD DOOR	(3) 2x10	(2) J + (3) K

WALL REINFORCEMENT SCHEDULE

NO.	THICKNESS	REINFORCEMENT	MIN. 28 DAY STRENGTH
FW1	12"	INTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 8" c/c EXTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.
FW2	12"	BOTH MATS: • 15M VERT. REBAR AT 8" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.

FLOOR SCHEDULE

No.	ASSEMBLY	MIN. 28 DAY STRENGTH
FL4	• 8" (MIN.) CONCRETE FLOOR • 6" (MIN.) COMPACTED GRANULAR BASE • COMPACTED NATIVE SOIL OR ENGINEER APPROVED MATERIAL	32MPa, HS
FL5	• 10" CONCRETE SUSPEND SLAB • REINFORCING AS PER DETAIL	32MPa, HS

NOTES:

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NO.	DATE:	DESCRIPTION:
1	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- (001) DOOR IDENTIFICATION TAG
- W1 WALL IDENTIFICATION TAG
- WN1 WINDOW IDENTIFICATION TAG
- C1 PIER / COLUMN IDENTIFICATION TAG
- F1 FOOTING / LINTEL IDENTIFICATION TAG

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DESIGNED BY: TRAVIS L.

PRINT DATE: 2023

PAGE DESCRIPTION: FLOOR PLAN

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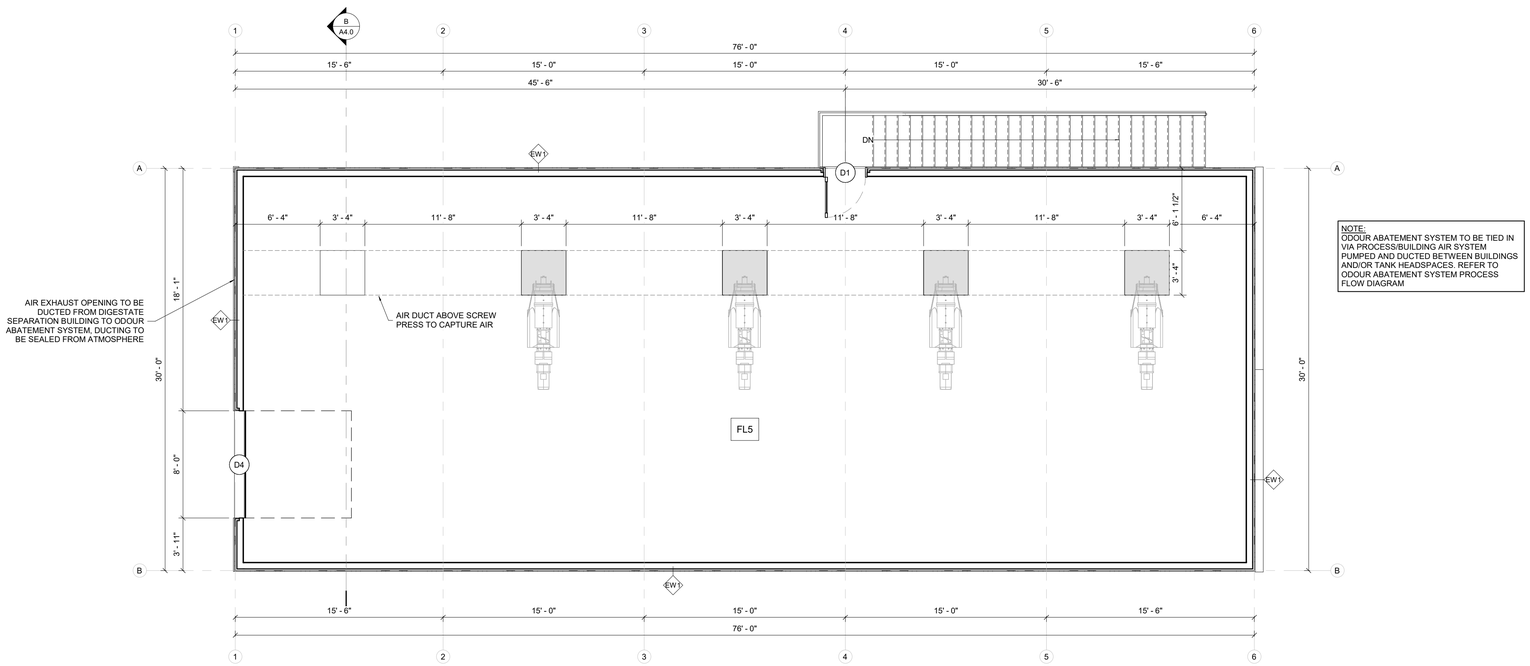
PAGE NUMBER: A2.0



NOTE:
ODOUR ABATEMENT SYSTEM TO BE TIED IN VIA PROCESS/BUILDING AIR SYSTEM PUMPED AND DUCTED BETWEEN BUILDINGS AND/OR TANK HEADSPACES. REFER TO ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM

1 / A2.1 UPPER FLOOR PLAN
SCALE: 3/16" = 1'-0"

DOOR / WINDOW SCHEDULE

NO.	DOOR / WINDOW TYPE	FRAMING COMPONENTS	
		REQ'D HEADER	REQ'D POST
D1	36"x80" EXT. ALUM. MAN DOOR (HALF GLASS)	(2) 2x6	(1) J + (1) K
D4	8'x8' INSULATED OVERHEAD DOOR	(3) 2x10	(2) J + (3) K

WALL SCHEDULE

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EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING	N/A

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1	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- (001) DOOR IDENTIFICATION TAG
- (W1) WALL IDENTIFICATION TAG
- (WN1) WINDOW IDENTIFICATION TAG
- (C1) PIER / COLUMN IDENTIFICATION TAG
- [F1] FOOTING / LINTEL IDENTIFICATION TAG

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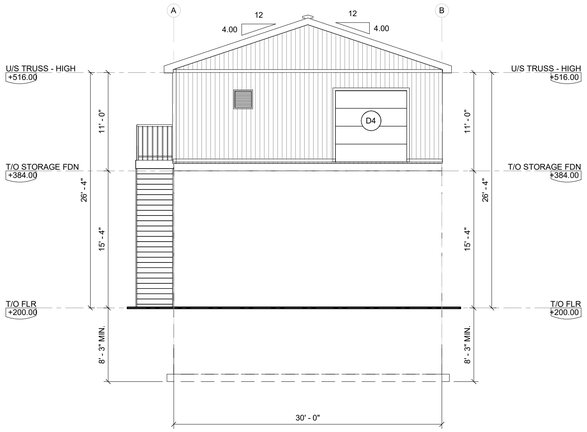
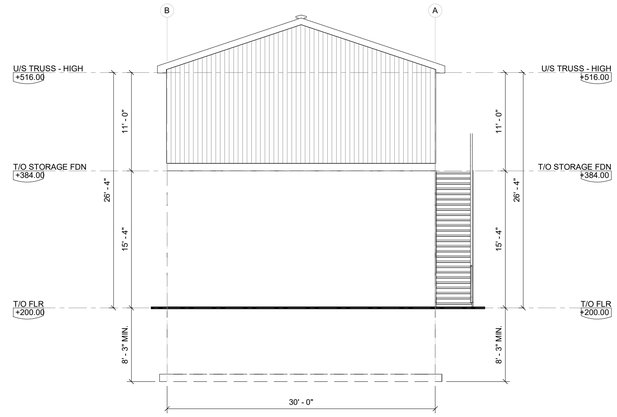
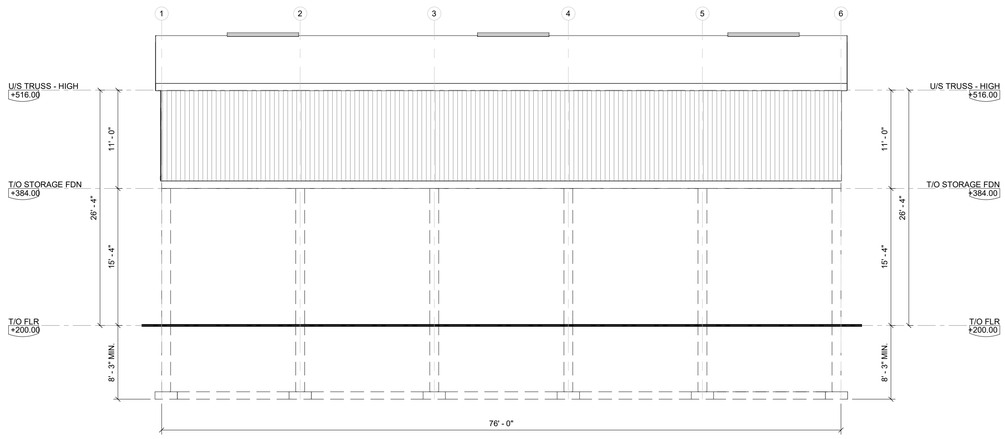


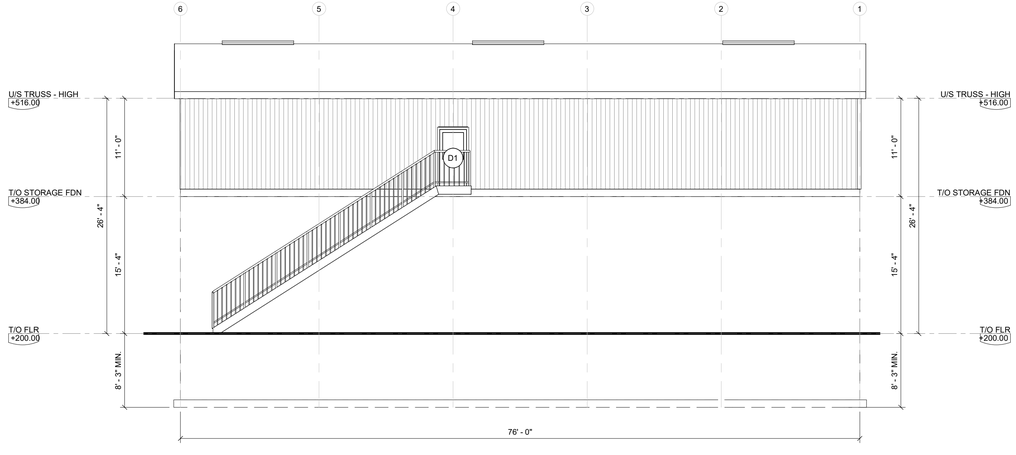
E1 / A3.0 SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



E2 / A3.0 NORTH ELEVATION
SCALE: 1/8" = 1'-0"



E3 / A3.0 EAST ELEVATION
SCALE: 1/8" = 1'-0"



E4 / A3.0 WEST ELEVATION
SCALE: 1/8" = 1'-0"

DOOR / WINDOW SCHEDULE

NO.	DOOR / WINDOW TYPE	FRAMING COMPONENTS	
		REQ'D HEADER	REQ'D POST
D1	36"x80" EXT. ALUM. MAN DOOR (HALF GLASS)	(2) 2x6	(1) J + (1) K
D4	8'x8' INSULATED OVERHEAD DOOR	(3) 2x10	(2) J + (3) K

NOTES:

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NO.	DATE:	DESCRIPTION:
1	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH	TRUE NORTH

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PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING INC.
EST. 1995
440 Wright Blvd Unit #2, Stratford, ON, N4Z 1H3
519-625-8025 ~ info@stonecrestengineering.com

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK Ltd.

LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: DIGESTATE SEPARATION BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS L.

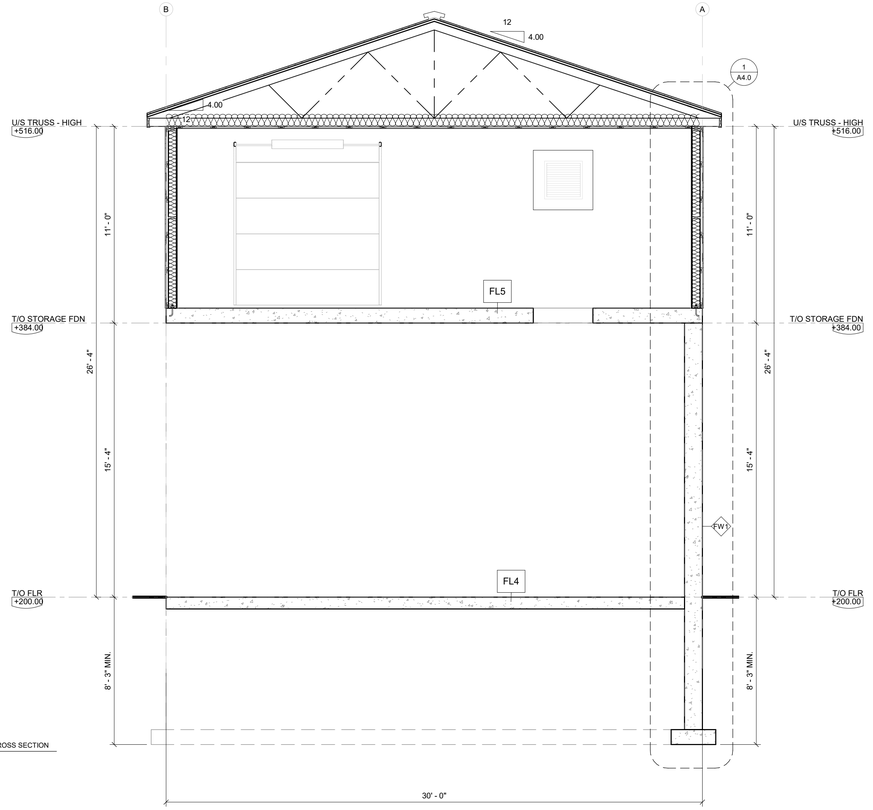
PRINT DATE: 2023

PAGE DESCRIPTION: BUILDING ELEVATIONS

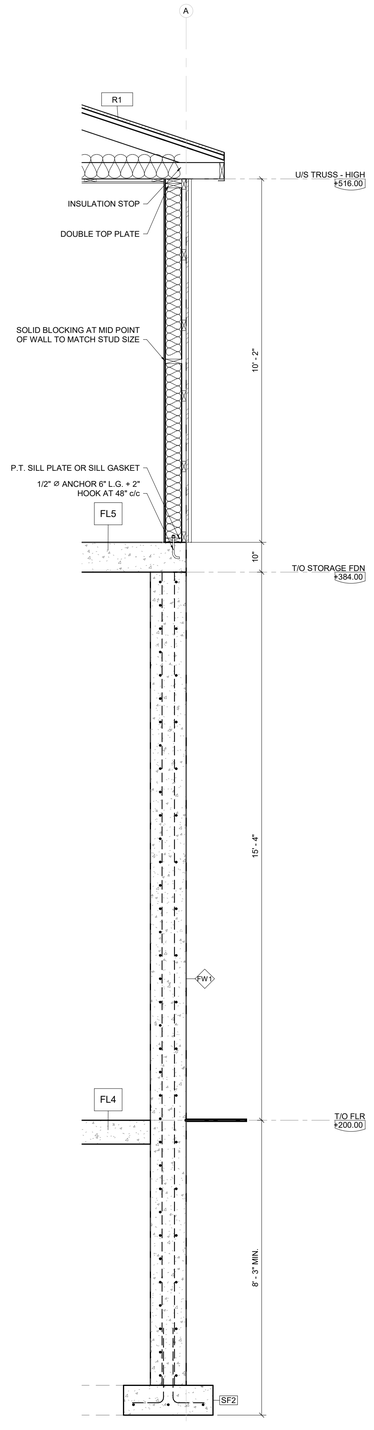
SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

PAGE NUMBER: A3.0



B
A4.0
TYPICAL SOLIDS STORAGE CROSS SECTION
SCALE: 1/4" = 1'-0"



FOOTING SCHEDULE

NO.	SIZE	REINFORCEMENT	MIN. 28 DAY STRENGTH
SF2	10"x30"	• (3) 15M CONT.	25MPa

FLOOR SCHEDULE

No.	ASSEMBLY	MIN. 28 DAY STRENGTH
FL4	• 8" (MIN.) CONCRETE FLOOR • 6" (MIN.) COMPACTED GRANULAR BASE • COMPACTED NATIVE SOIL OR ENGINEER APPROVED MATERIAL	32MPa, HS
FL5	• 10" CONCRETE SUSPEND SLAB • REINFORCING AS PER DETAIL	32MPa, HS

WALL REINFORCEMENT SCHEDULE

NO.	THICKNESS	REINFORCEMENT	MIN. 28 DAY STRENGTH
FW1	12"	INTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 8" c/c EXTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.
FW2	12"	BOTH MATS: • 15M VERT. REBAR AT 8" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.

WALL SCHEDULE

NO.	ASSEMBLY	MIN. 28 DAY STRENGTH
EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING	N/A

ROOF SCHEDULE

No.	ASSEMBLY
R1	• 29ga. HI-RIB COLOURED STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • PRE-ENGINEERED WOOD TRUSSES SPACED AS PER MFRS SPECS • BLOWN IN INSULATION (R-40) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 1x4 WOOD STRAPPING AT 24"c/c • INTERIOR PVC CEILING

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PROJECT NORTH	TRUE NORTH

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PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS L.

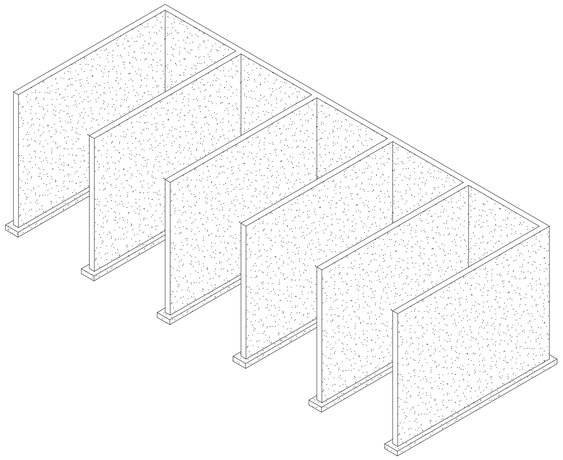
PRINT DATE: 2023

PAGE DESCRIPTION: CROSS SECTIONS

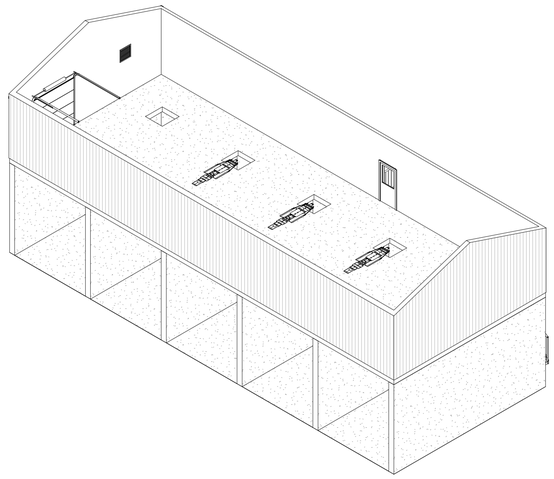
SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

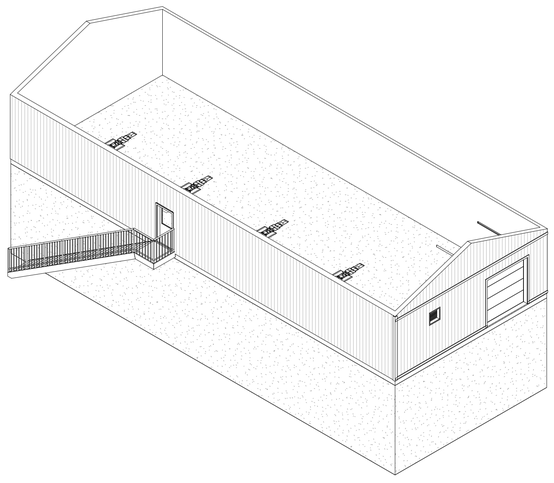
PAGE NUMBER: A4.0



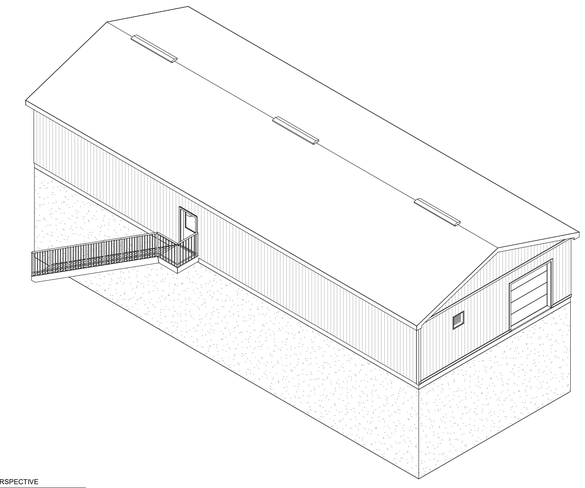
1 A5.0 FOUNDATION PERSPECTIVE
SCALE: N.T.S.



2 A5.0 INTERIOR PERSPECTIVE 1
SCALE: N.T.S.



3 A5.0 INTERIOR PERSPECTIVE 2
SCALE: N.T.S.



4 A5.0 EXTERIOR PERSPECTIVE
SCALE: N.T.S.

NOTES:

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PROJECT NORTH	TRUE NORTH

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DESIGNED BY: TRAVIS L.

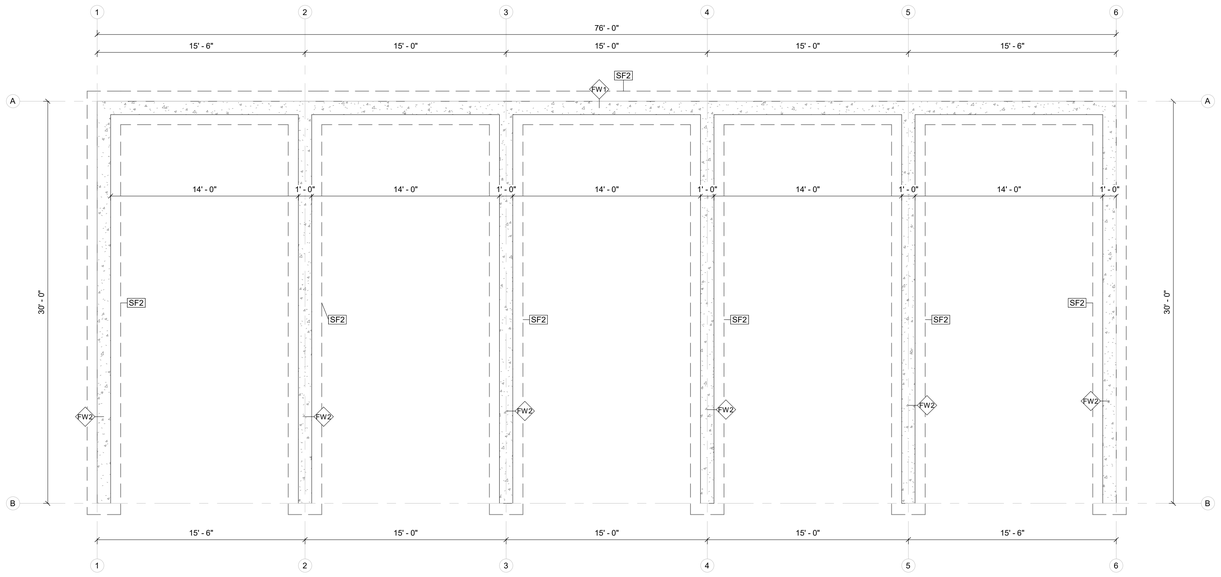
PRINT DATE: 2023

PAGE DESCRIPTION: PERSPECTIVE VIEWS

SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

PAGE NUMBER: A5.0



1 FOUNDATION PLAN
S1.0 SCALE: 3/16" = 1'-0"

WALL REINFORCEMENT SCHEDULE

NO.	THICKNESS	REINFORCEMENT	MIN. 28 DAY STRENGTH
FW1	12"	INTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 8" c/c EXTERIOR MAT: • 15M VERT. REBAR AT 16" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.
FW2	12"	BOTH MATS: • 15M VERT. REBAR AT 8" c/c • 15M HORIZ. REBAR AT 16" c/c	32MPa, HS CONC. OR EQUIV.

WALL SCHEDULE

NO.	ASSEMBLY	MIN. 28 DAY STRENGTH
EW1	• 29ga. HI-RIB STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"c/c • TYVEK AIR BARRIER (SEAL ALL SEAMS) • 2x6 WOOD STUDS SPF No.1/2 SPACED AT 24"c/c • BATT INSULATION (R-21) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 7/16" OSB SHEATHING • INTERIOR TRUSSCORE CLADDING	N/A

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PROJECT NORTH

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DESIGNED BY: TRAVIS L.

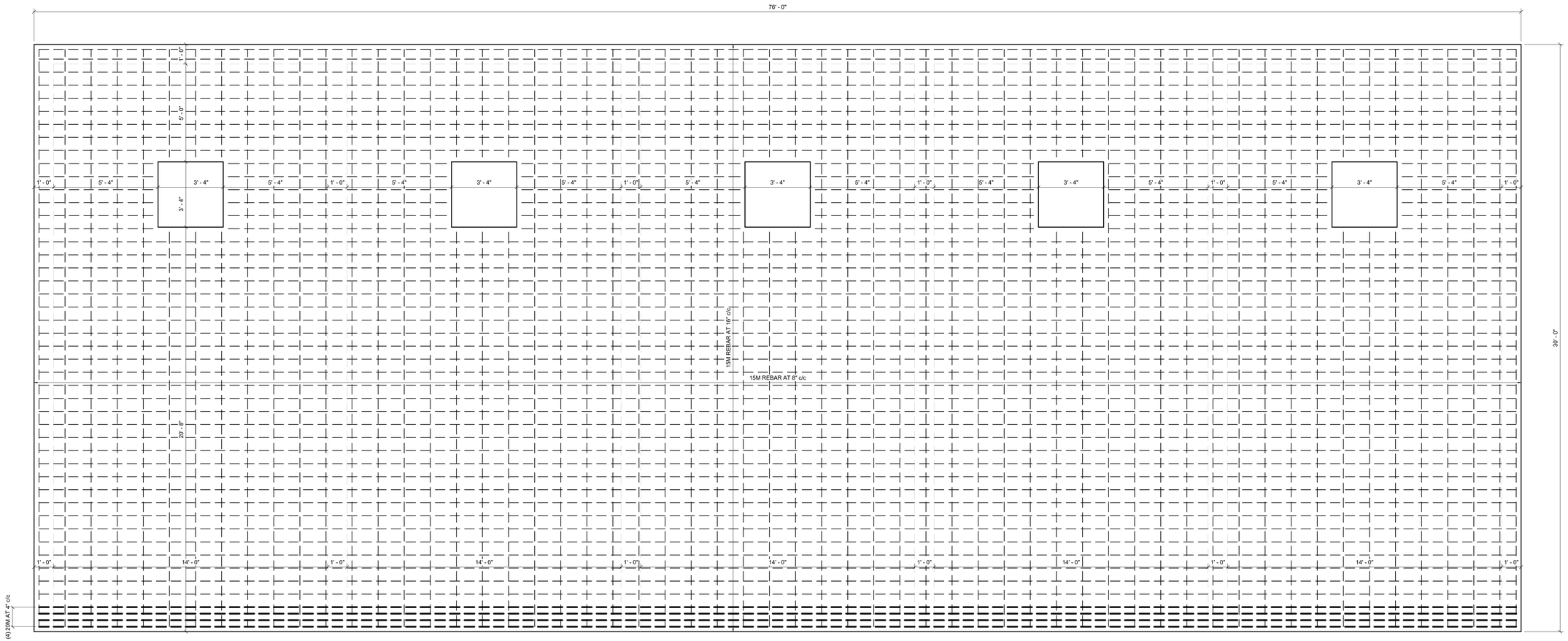
PRINT DATE: 2023

PAGE DESCRIPTION: FOUNDATION PLAN

SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

PAGE NUMBER: S1.0



1 / S1.1 FL5 REINFORCING DETAIL
SCALE: N.T.S.

NOTES:

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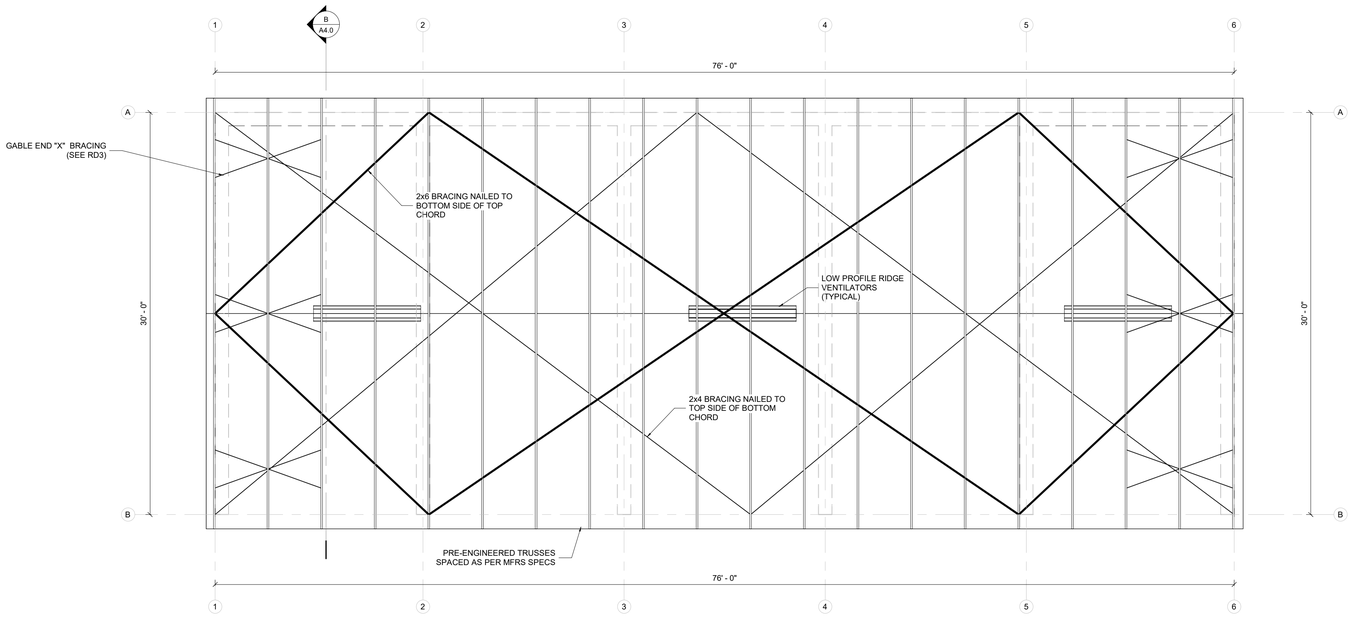
DESIGNED BY:	PRINT DATE:
TRAVIS L.	2023

PAGE DESCRIPTION: SUSPENDED SLAB DETAILS

SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

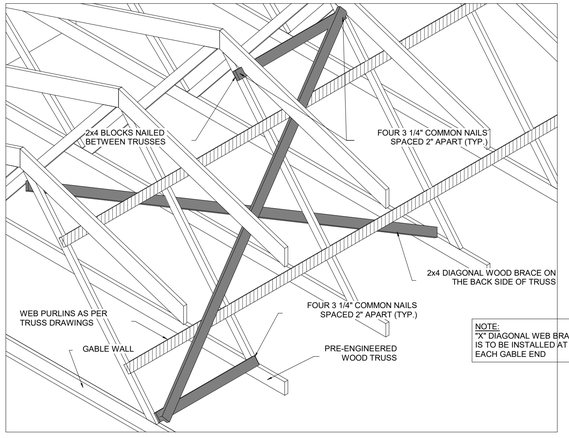
PAGE NUMBER: S1.1



1 / S2.0 ROOF FRAMING PLAN
SCALE: 3/16" = 1'-0"

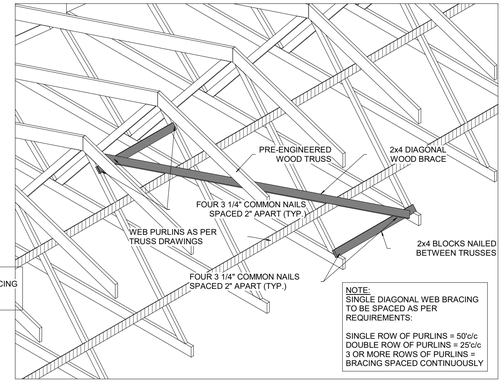
ROOF SCHEDULE

No.	ASSEMBLY
R1	• 29ga. HI-RIB COLOURED STEEL c/w SCREW FASTENERS • 2x4 WOOD STRAPPING AT 24"o/c • PRE-ENGINEERED WOOD TRUSSES SPACED AS PER MFRS SPECS • BLOWN IN INSULATION (R-40) • 6mil POLY VAPOUR BARRIER (SEAL ALL SEAMS) • 1x4 WOOD STRAPPING AT 24"o/c • INTERIOR PVC CEILING



RD1 / S2.0 DIAGONAL 'X' WEB BRACING DETAIL
SCALE: N.T.S.

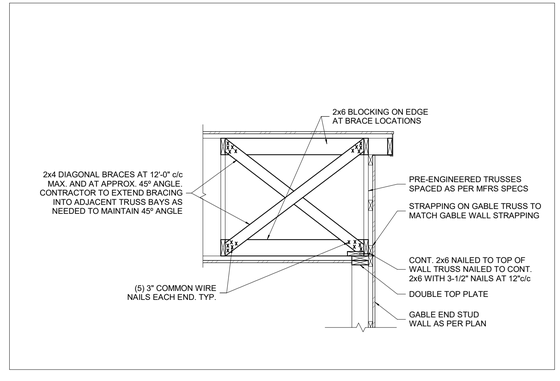
NOTE:
"X" DIAGONAL WEB BRACING
IS TO BE INSTALLED AT
EACH GABLE END



RD2 / S2.0 DIAGONAL SINGLE WEB BRACING DETAIL
SCALE: N.T.S.

NOTE:
SINGLE DIAGONAL WEB BRACING
TO BE SPACED AS PER
REQUIREMENTS:

SINGLE ROW OF PURLINS = 50'c/c
DOUBLE ROW OF PURLINS = 25'c/c
3 OR MORE ROWS OF PURLINS =
BRACING SPACED CONTINUOUSLY



RD3 / S2.0 GABLE END 'X' TRUSS CONNECTION
SCALE: N.T.S.

NOTES:

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PROJECT NORTH | TRUE NORTH

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LOCATION: FOOTHILLS, ALBERTA

PROJECT NAME: DIGESTATE SEPARATION BUILDING

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DESIGNED BY: TRAVIS L. | PRINT DATE: 2023

PAGE DESCRIPTION: ROOF FRAMING PLAN

SCALE: AS NOTED

FILE: 7877-DIGESTATE SEPARATION BUILDING-1

PAGE NUMBER: S2.0

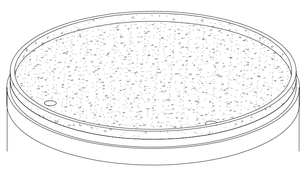
Drawing 6 - Digestate Nurse Tank

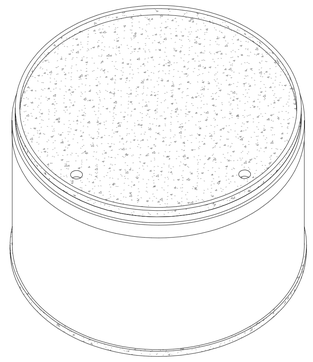
DRAWINGS PROVIDED FOR

RIMROCK RNG INC.

DIGESTATE NURSE TANK

FOOTHILLS, ALBERTA





GENERAL NOTES

1. THIS TANK IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE ONTARIO BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
4. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
5. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
6. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED OR USED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.

EXCAVATION AND BACKFILL

1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW TANK AS PER GEOTECHNICAL RECOMMENDATIONS.
2. FOUNDATIONS HAVE BEEN DESIGNED FOR A SOIL BEARING CAPACITY OF 3000 PSF (143KPA)
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING BEFORE PROCEEDING WITH CONSTRUCTION. CONTRACTOR MUST NOTIFY STONECREST ENGINEERING AND THE GEOTECHNICAL ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL WITH A REPORT SUBMITTED TO STONECREST ENGINEERING
5. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL, OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
6. ALL FOOTINGS TO HAVE A MINIMUM OF 48" OR MORE OF COVER FOR FROST PROTECTION
7. FINAL GRADING TO SLOPE AWAY FROM THE STRUCTURE.

EQUIPMENT

1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER

MANURE HANDLING AND STORAGE

1. A GEOTECHNICAL ENGINEER IS TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION, AS PER THE NUTRIENT MANAGEMENT ACT. A COPY OF THE REPORT MUST BE PROVIDED TO STONECREST ENGINEERING PRIOR TO THE RELEASE OF ENGINEER-STAMPED PLANS
2. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
3. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT
4. ALTERNATIVELY, AS A MINIMUM, STONECREST ENGINEERING STRONGLY RECOMMENDS THE PERIMETER DRAINAGE SYSTEM. STONECREST ENGINEERING ASSUMES NO RESPONSIBILITY FINANCIALLY OR OTHERWISE, FOR DAMAGE CAUSED BY HYDROSTATIC PRESSURE TO THE FLOOR SLAB SHOULD THESE RECOMMENDATIONS BE IGNORED.
5. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32MPA HS CONCRETE THROUGHOUT.
6. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
7. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
8. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
9. LIQUID STORAGE TANK TO HAVE PERMANENT NON-CLIMBABLE SAFETY FENCE EXTENDING TO NOT LESS THAN 5' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING NON-CLIMBABLE GATES WITH LATCHES TO DETER ACCESS.
10. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
11. ANY MANURE TRANSFER SYSTEM WHICH CAN BACKFLOW TO THE PUMP OR PUMPOUT CHAMBER MUST HAVE BOTH A PRIMARY AND SECONDARY SHUTOFF VALVE.
12. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
13. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER
14. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.
STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA CAN3-23. 1-94 AND CAN3-A23.2-94
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 1992.
3. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING ANY CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE.
4. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
5. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE.
6. REINFORCEMENT SHALL HAVE NOT LESS THAN 3" OF CONCRETE COVERAGE BETWEEN REINFORCING AND SOIL/FILL.
7. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2".
8. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
9. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
10. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
11. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT
12. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
13. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
14. ALL CONCRETE IN CONTACT WITH MANURE TO BE 32MPa
15. TYPE 50 OR EQUIVALENT(HS). WITH A MAXIMUM WATER/CEMENT RATIO OF NOT MORE THAN 0.45.
16. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
17. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS
18. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
19. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 30 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (56")	1850 (74")	N/A

NOTE: INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm OF FRESH CONCRETE IS CAST BELOW THE SPLICE

GENERAL REVIEW

1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING IS RESPONSIBLE FOR THE DESIGN AND GENERAL REVIEW OF, THE LIQUID STORAGE FACILITY, THE TRANSFER SYSTEM, AND THE SYNTHETIC LINER.
4. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
5. SOIL CONDITIONS, WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS. WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING PRIOR TO DRAWINGS BEING RELEASED.
6. TRANSFER SYSTEM, WHEN ALL TRANSFER PIPES HAVE BEEN INSTALLED, THE ENGINEER MUST BE CONTACTED TO INSPECT THE CONNECTIONS AND SEALS. THE CONTRACTOR MUST BE AVAILABLE TO MAKE ANY GASKET-SEALED JOINT AVAILABLE FOR INSPECTION.
7. FOOTINGS, WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
8. CONCRETE REINFORCEMENT, WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED. THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
9. FINAL REVIEW, WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED, INCLUDING THE SAFETY FENCE AND BACKFILLING. THE MONITORING STATION MUST ALSO BE VISIBLE AT THIS TIME.
10. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
11. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.

WALL SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	ASSEMBLY	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

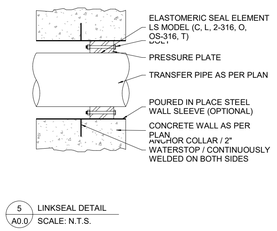
NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c



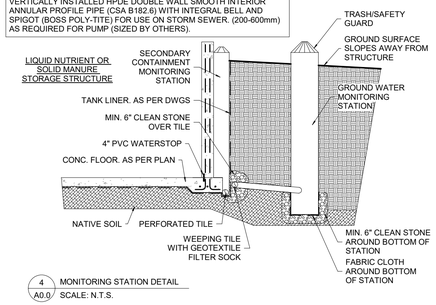
5 A0.0 LINKSEAL DETAIL
SCALE: N.T.S.

NOTE:
PERIMETER TILE AND MONITORING STATION BE INSTALLED AND A SAMPLING/TESTING PROGRAM BE IMPLEMENTED.

IF EXTERIOR WATER PRESSURE IS NOT REMOVED PRIOR TO PUMPING MANURE FROM PIT, STONECREST ENGINEERING ACCEPTS NO RESPONSIBILITY, FINANCIAL OR OTHERWISE, FOR FLOOR FAILURE DUE TO HYDROSTATIC PRESSURE.

MONITORING STATION LOCATIONS, HEIGHTS AND MATERIALS ARE TO BE CONFIRMED BY GENERAL CONTRACTOR.

MONITORING STATION TO BE APPROVED CATCH BASIN MANHOLE OR VERTICALLY INSTALLED HPDE DOUBLE WALL SMOOTH INTERIOR ANNULAR PROFILE PIPE (CSA B182.6) WITH INTEGRAL BELL AND SPIGOT (BOSS POLY-TITE) FOR USE ON STORM SEWER. (200-600mm) AS REQUIRED FOR PUMP (SIZED BY OTHERS).



4 A0.0 MONITORING STATION DETAIL
SCALE: N.T.S.

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
PH: (519)-625-8025
FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: DIGESTATE NURSE TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY: TRAVIS L.

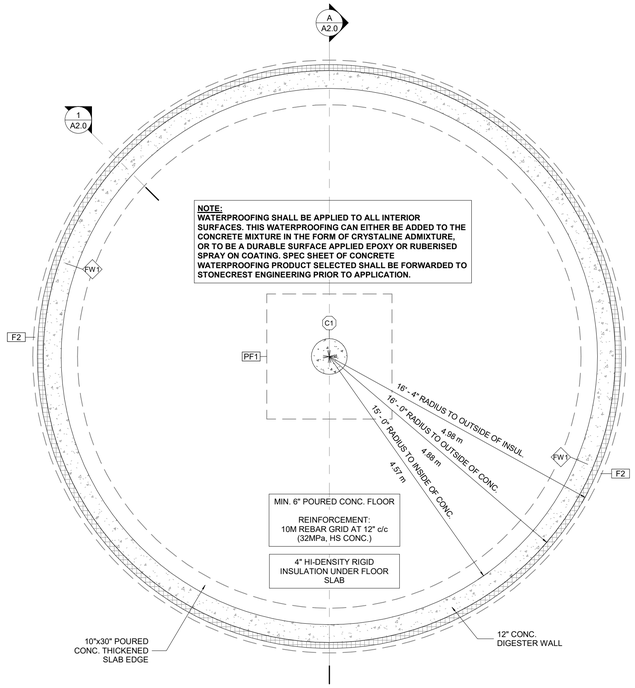
PRINT DATE: 2023

PAGE DESCRIPTION: TITLE PAGE

SCALE: AS NOTED

FILE: 7877 - DIGESTATE NURSE TANK - 1

PAGE NUMBER: A0.0



1 / A1.0 FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

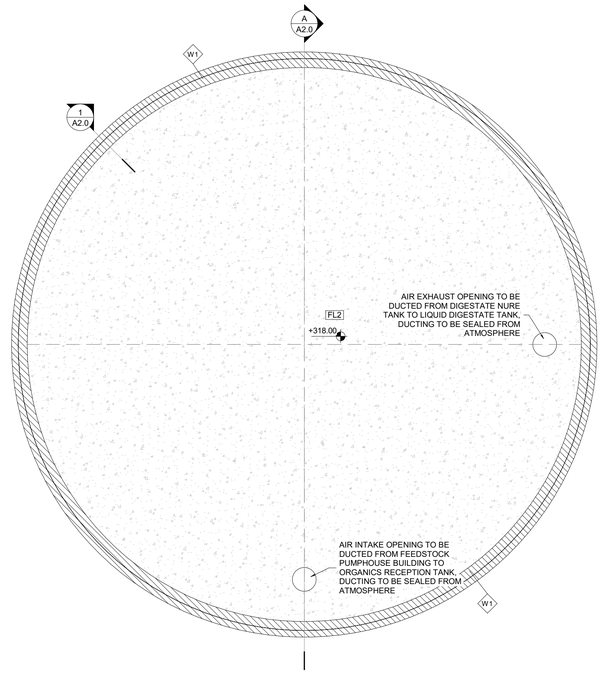
ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

A GEOTECHNICAL ENGINEERING REPORT IS REQUIRED. STONECREST ENGINEERING HAS COMPLETED THIS DESIGN ASSUMING A SOIL BEARING CAPACITY OF 3000psf (SLS) AND 4500psf (ULS). IT IS ALSO ASSUMED THAT NEITHER A REINFORCED SLAB NOR A LINER IS REQUIRED, AS PROVIDED IN THE NUTRIENT MANAGEMENT ACT. CONSTRUCTION MUST NOT PROCEED UNTIL THE GEOTECHNICAL REPORT HAS BEEN REVIEWED BY STONECREST ENGINEERING AND ANY NECESSARY DRAWING AMENDMENTS ARE COMPLETED.

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

NOTE:
ELEVATIONS AND SLOPES TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.

NOTE:
ODOUR ABATEMENT SYSTEM TO BE TIED IN VIA PROCESS/BUILDING AIR SYSTEM PUMPED AND DUCTED BETWEEN BUILDINGS AND/OR TANK HEADSPACES. REFER TO ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM.



2 / A1.0 RECEPTION TANK LID
SCALE: 1/4" = 1'-0"

NOTE:
NO VEHICULAR TRAFFIC ALLOWED ON TOP OF TANK LID

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

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WALL SCHEDULE

WALL TYPE		ASSEMBLY	MIN. 28 DAY STRENGTH
NO.	DESCRIPTION		
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" o/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC, CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
	2	2023 FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
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DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: DIGESTATE NURSE TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

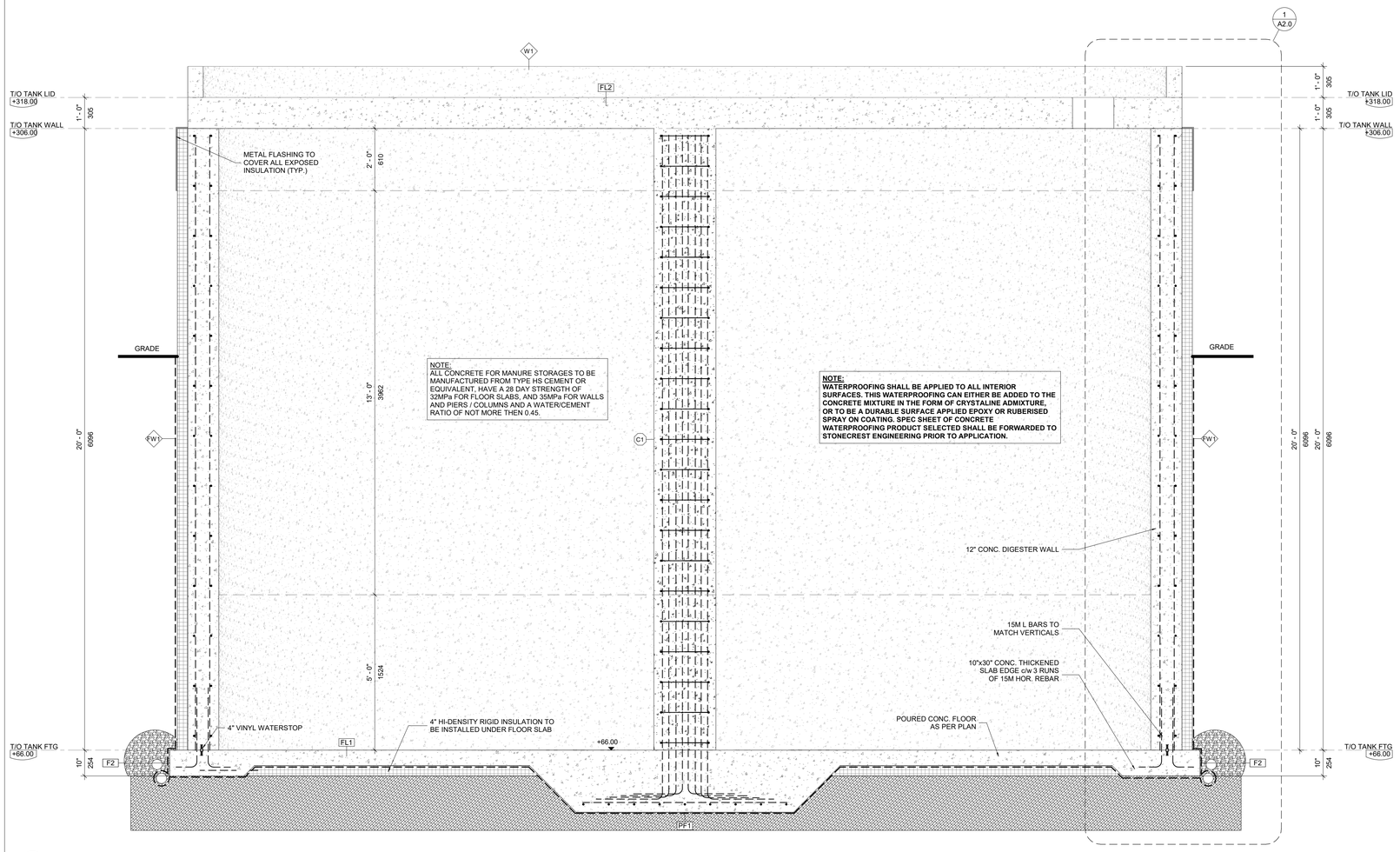
DRAWN BY: TRAVIS L. | PRINT DATE: 2023

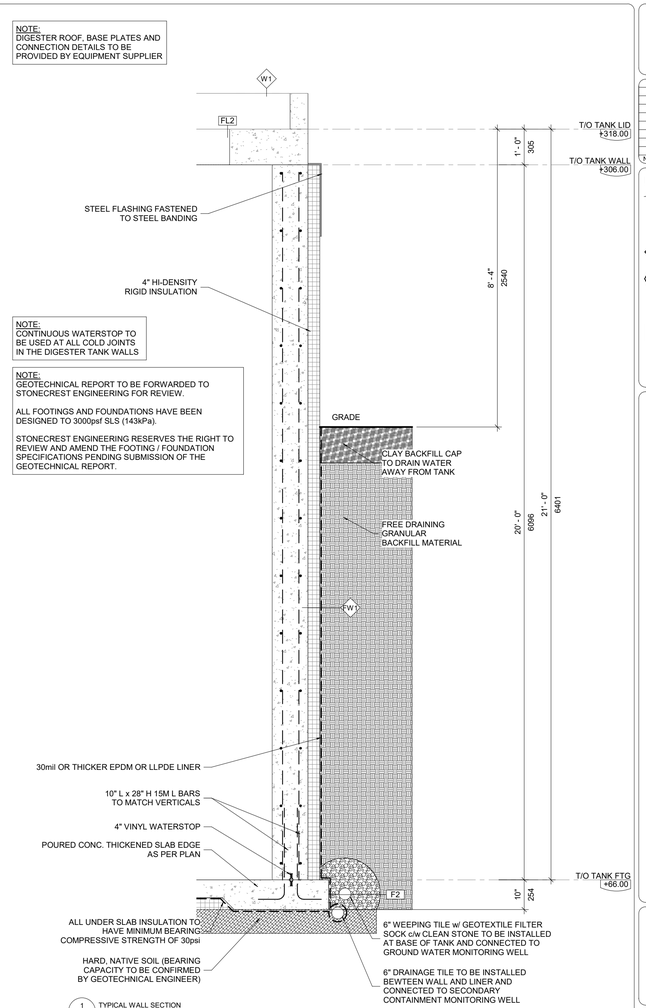
PAGE DESCRIPTION: FOUNDATION AND TANK LID PLANS

SCALE: AS NOTED

FILE: 7877 - DIGESTATE NURSE TANK - 1

PAGE NUMBER: A1.0





WALL REINFORCMENT SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	WALL THICKCESS AND REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
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W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

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STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY, BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

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NO.	DATE:	DESCRIPTION:
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PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

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DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: DIGESTATE NURSE TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY:	PRINT DATE:
TRAVIS L	2023

PAGE DESCRIPTION: CROSS SECTIONS

SCALE: AS NOTED

FILE: 7877 - DIGESTATE NURSE TANK - 1

PAGE NUMBER: A2.0

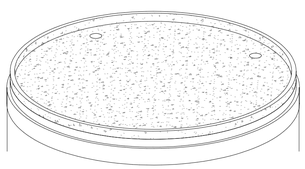
Drawing 7 - Liquid Digestate Tank

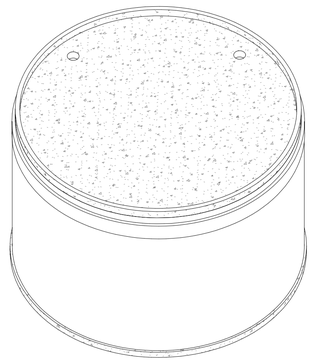
DRAWINGS PROVIDED FOR

RIMROCK RNG INC.

LIQUID DIGESTATE TANK

FOOTHILLS, ALBERTA





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FLOOR SCHEDULE		
No.	ASSEMBLY	COMMENTS
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STRUCTURAL COLUMN SCHEDULE		
NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

GENERAL NOTES

1. THIS TANK IS DESIGNATED AGRICULTURAL, LOW HUMAN OCCUPANCY
2. ALL WORK SHALL COMPLY WITH THE ONTARIO BUILDING CODE AND NATIONAL FARM BUILDING CODE, LATEST EDITIONS
3. THESE DRAWINGS ARE BASED ON INFORMATION PROVIDED BY THE CLIENT. IF DRAWINGS ARE NOT REFLECTIVE OF EXISTING CONDITIONS, THE ENGINEER IS TO BE CONTACTED IMMEDIATELY
4. STONECREST ENGINEERING IS NOT RESPONSIBLE FOR THE DESIGN OR CONSTRUCTION OF THE EXISTING FACILITY. THE DESIGN AND CONSTRUCTION OF THE EXISTING FACILITY HAS NOT BEEN REVIEWED BY STONECREST ENGINEERING.
5. WHEN IN DOUBT AS TO THE INTERPRETATION OF THE DRAWINGS, THE ENGINEER IS TO BE CONTACTED.
6. THIS DRAWING SET IS THE PROPERTY OF STONECREST ENGINEERING AND MAY NOT BE DUPLICATED OR USED IN ANY FORM WITHOUT WRITTEN CONSENT FROM STONECREST ENGINEERING.

EXCAVATION AND BACKFILL

1. ALL TOPSOIL AND OTHER FOREIGN MATERIAL TO BE REMOVED FROM BELOW TANK AS PER GEOTECHNICAL RECOMMENDATIONS.
2. FOUNDATIONS HAVE BEEN DESIGNED FOR A SOIL BEARING CAPACITY OF 3000 PSF (143KPA)
3. SHOULD UNUSUALLY SOFT SOILS BE ENCOUNTERED DURING EXCAVATION, NOTIFY STONECREST ENGINEERING BEFORE PROCEEDING WITH CONSTRUCTION. CONTRACTOR MUST NOTIFY STONECREST ENGINEERING AND THE GEOTECHNICAL ENGINEER OF ANY CONCERNS WITH REGARDS TO, BUT NOT LIMITED TO SOIL BEARING CAPACITY, SLOPE STABILITY, GROUNDWATER AND DRAINAGE.
4. ANY FILL MATERIAL USED IS TO BE INSPECTED AND APPROVED BY A QUALIFIED GEOTECHNICAL PROFESSIONAL WITH A REPORT SUBMITTED TO STONECREST ENGINEERING
5. ALL BACKFILL MATERIAL TO BE FREE DRAINING CLEAN GRANULAR MATERIAL, OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. IF SUITABILITY OF BACKFILL MATERIAL IS QUESTIONABLE, THE PROJECT ENGINEER IS TO BE CONTACTED IMMEDIATELY.
6. ALL FOOTINGS TO HAVE A MINIMUM OF 48" OR MORE OF COVER FOR FROST PROTECTION
7. FINAL GRADING TO SLOPE AWAY FROM THE STRUCTURE.

EQUIPMENT

1. ALL DETAILS AND DIMENSIONS REGARDING MANURE HANDLING SYSTEM ARE FOR REPRESENTATION ONLY AND ARE TO BE DETERMINED BY MANURE EQUIPMENT SUPPLIER AND VERIFIED BY CONTRACTOR AND OWNER

MANURE HANDLING AND STORAGE

1. A GEOTECHNICAL ENGINEER IS TO BE RETAINED TO COMPLETE A SITE CHARACTERIZATION, AS PER THE NUTRIENT MANAGEMENT ACT. A COPY OF THE REPORT MUST BE PROVIDED TO STONECREST ENGINEERING PRIOR TO THE RELEASE OF ENGINEER-STAMPED PLANS
2. PRIOR TO PROCEEDING WITH GENERAL EXCAVATION, DIG A TRENCH 50FT FROM THE PLANNED PERIMETER WALL TO INTERCEPT AND DISCONNECT ALL EXISTING FIELD DRAINS. PERIMETER TRENCH TO BE EXCAVATED TO 5' DEPTH.
3. MANURE STORAGE TO BE CONSTRUCTED IN ACCORDANCE WITH ALL DETAILS, ELEVATIONS AND NOTATION PROVIDED IN GEOTECHNICAL REPORT
4. ALTERNATIVELY, AS A MINIMUM, STONECREST ENGINEERING STRONGLY RECOMMENDS THE PERIMETER DRAINAGE SYSTEM. STONECREST ENGINEERING ASSUMES NO RESPONSIBILITY FINANCIALLY OR OTHERWISE, FOR DAMAGE CAUSED BY HYDROSTATIC PRESSURE TO THE FLOOR SLAB SHOULD THESE RECOMMENDATIONS BE IGNORED.
5. ALL MANURE STORAGE FACILITIES AND TRANSFER SYSTEMS TO BE DESIGNED AND CONSTRUCTED USING, NOT LESS THAN 32MPA HS CONCRETE THROUGHOUT.
6. ALL CONNECTIONS IN A LIQUID TRANSFER SYSTEM MUST BE INSTALLED USING FITTINGS AND GASKETS THAT ARE COMPATIBLE WITH THE PIPE MATERIAL.
7. ALL PIPES ENTERING A LIQUID MANURE STORAGE MUST HAVE A FLEXIBLE, WATERTIGHT GASKET OR MEMBRANE INSTALLED BETWEEN THE PIPE AND THE CONCRETE WALL OR FLOOR OF THE STRUCTURE TO ACT AS AN ANTI-SEEPAGE COLLAR.
8. PVC WATERSTOP TO BE DURAJOINT OR EQUIVALENT. WATER STOPS SHALL BE BUTT FUSED AT JOINTS, OR LAPPED A MINIMUM OF 24"
9. LIQUID STORAGE TANK TO HAVE PERMANENT NON-CLIMBABLE SAFETY FENCE EXTENDING TO NOT LESS THAN 5' ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING NON-CLIMBABLE GATES WITH LATCHES TO DETER ACCESS.
10. TANK WALL TO BE ADEQUATELY BRACED DURING BACKFILLING AND COMPACTION OF SOIL WITH HEAVY EQUIPMENT
11. ANY MANURE TRANSFER SYSTEM WHICH CAN BACKFLOW TO THE PUMP OR PUMPOUT CHAMBER MUST HAVE BOTH A PRIMARY AND SECONDARY SHUTOFF VALVE.
12. ALL COVERED STORAGE SYSTEMS MUST HAVE A VENTILATION SYSTEM (NATURAL OR POWERED) TO PREVENT THE ACCUMULATION OF CORROSIVE OR NOXIOUS GASES.
13. A SIGN INDICATING THE DANGER DUE TO TOXIC GASES SHALL BE INSTALLED AT EVERY ACCESS TO A LIQUID STORAGE TANK OR UNDER FLOOR MANURE TRANSFER CHAMBER
14. THE SIZE OF THE MANURE STORAGE HAS NOT BEEN DETERMINED BY STONECREST ENGINEERING. IT IS THE RESPONSIBILITY OF THE OWNER/CLIENT TO ENSURE THE TANK SIZE IS ADEQUATE.
STONECREST ENGINEERING HAS PROVIDED STRUCTURAL DESIGN OF THE MANURE HANDLING SYSTEM BUT TAKES NO RESPONSIBILITY FOR THE FUNCTIONALITY OF THE SYSTEM. SLOPES, OPENINGS AND PIPE SIZES HAVE NOT BEEN REVIEWED BY STONECREST ENGINEERING.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO CSA CAN3-23.1-94 AND CAN3-A23.2-94
2. ALL REINFORCING STEEL SHALL BE DEFORMED AS DEFINED IN CSA G30.18-M 1992.
3. REINFORCING STEEL IS TO BE FREE OF ALL DIRT, EXCESSIVE RUST AND SCALE AT THE TIME OF PLACING, AND IS TO BE SECURELY WIRED IN PLACE PRIOR TO PLACING ANY CONCRETE. NO BARS ARE TO BE WET DOWELED WITH THE EXCEPTION OF ANCHOR BOLTS, UNLESS NOTED OTHERWISE.
4. REINFORCEMENT IS TO BE LOCATED IN THE CENTRE OF THE WALL, EXCEPT WHERE OTHERWISE NOTED.
5. WHERE A DOUBLE MAT OF REINFORCEMENT IS REQUIRED, EACH MAT SHALL BE PLACED NOT MORE THAN 1/3 THE THICKNESS OF THE WALL FROM THE SURFACE.
6. REINFORCEMENT SHALL HAVE NOT LESS THAN 3" OF CONCRETE COVERAGE BETWEEN REINFORCING AND SOIL/FILL.
7. MINIMUM CONCRETE COVERAGE TO REINFORCEMENT FOR ALL OTHER STRUCTURAL COMPONENTS SHALL BE NOT LESS THAN 2".
8. ALL CONCRETE TO HAVE A MAXIMUM 4" SLUMP. WHERE INCREASED WORKABILITY IS REQUIRED, PLASTICIZER IS TO BE ADDED. WATER IS NOT TO BE ADDED ON SITE.
9. ALL STRUCTURAL CONCRETE AND CONCRETE EXPOSED TO FREEZE/THAW TO BE 6% AIR ENTRAINED
10. WHERE APPROPRIATE, USE VIBRATION EQUIPMENT TO PLACE CONCRETE.
11. ADEQUATE PROTECTION FROM FREEZING MUST BE PROVIDED TO POURED CONCRETE DURING COLD WEATHER PLACEMENT
12. ALL SLEEVES TO BE LOCATED BY ELECTRICAL AND MECHANICAL DESIGNERS PRIOR TO POURING CONCRETE
13. ALL FOOTINGS AND FLOOR SLABS TO BE PROTECTED FROM FROST DAMAGE DURING CONSTRUCTION. EXPOSED CONCRETE TANKS TO HAVE WATER ADDED TO PREVENT FROST HEAVE DURING COLD TEMPERATURES.
14. ALL CONCRETE IN CONTACT WITH MANURE TO BE 32MPa
15. TYPE 50 OR EQUIVALENT(HS). WITH A MAXIMUM WATER/CEMENT RATIO OF NOT MORE THAN 0.45.
16. MINIMUM RADIUS FOR BENT REBAR IS 60mm FOR 10M REBAR AND 90mm FOR 15M REBAR. ALL BARS SHOWN AS BEING BENT ON THE DRAWINGS ARE TO BE BENT PRIOR TO BEING PLACED.
17. OVERLAP REBAR 24" FOR SPLICES IN CONTINUOUS REBAR LENGTHS
18. WHERE REBAR JOIN AT CORNERS, PROVIDE CORNER BARS 24" EACH WAY.
19. UNLESS OTHERWISE NOTED MINIMUM BAR LAPS IN NORMAL DENSITY CONCRETE TO BE AS FOLLOWS:

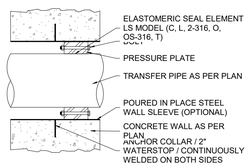
REINFORCING STEEL MINIMUM LAP LENGTHS

BAR SIZE \ CONCRETE	TENSION SPLICE 25 MPa	TENSION SPLICE 30 MPa	TENSION SPLICE 35 MPa	COMPRESSION EMBEDMENT 30 MPa	REINFORCED MASONRY 20 MPa GROUT
10M	400 (16")	400 (16")	400 (16")	450 (18")	500 (20")
15M	600 (24")	600 (24")	600 (24")	650 (26")	750 (30")
20M	800 (32")	800 (32")	800 (32")	900 (36")	900 (36")
25M	1200 (48")	1100 (44")	1000 (40")	1370 (54")	1370 (54")
30M	1400 (56")	1300 (52")	1200 (48")	1600 (64")	N/A
35M	1650 (66")	1500 (60")	1400 (56")	1850 (74")	N/A

NOTE:
INCREASE HORIZ. SPLICE LENGTH BY 1.3 WHERE MORE THAN 300mm OF FRESH CONCRETE IS CAST BELOW THE SPLICE

GENERAL REVIEW

1. IT IS THE RESPONSIBILITY OF THE OWNER/CONTRACTOR TO CONTACT THE MUNICIPALITY FOR INSPECTIONS PERFORMED BY THE LOCAL BUILDING DEPARTMENT.
2. THE OWNER/CONTRACTOR MUST RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO PERFORM A GENERAL REVIEW TO ENSURE THAT THE CONSTRUCTION IS IN GENERAL CONFORMITY WITH THE PLANS.
3. STONECREST ENGINEERING IS RESPONSIBLE FOR THE DESIGN AND GENERAL REVIEW OF, THE LIQUID STORAGE FACILITY, THE TRANSFER SYSTEM, AND THE SYNTHETIC LINER.
4. STONECREST ENGINEERING REQUIRES THAT THE FOLLOWING COMPONENTS BE INSPECTED:
5. SOIL CONDITIONS, WHEN THE SITE HAS BEEN COMPLETELY PREPARED FOR CONSTRUCTION, THE ENGINEER MUST BE NOTIFIED TO PROVIDE AN INSPECTION OF THE SOIL CONDITIONS. WHERE A GEOTECHNICAL TEST HAS BEEN PERFORMED, THE OWNER/CONTRACTOR MUST CONTACT THE GEOTECHNICAL ENGINEER TO PERFORM THE SOIL INSPECTION. A COPY OF THE GEOTECHNICAL SITE INVESTIGATION REPORT MUST BE FORWARDED TO STONECREST ENGINEERING PRIOR TO DRAWINGS BEING RELEASED.
6. TRANSFER SYSTEM, WHEN ALL TRANSFER PIPES HAVE BEEN INSTALLED, THE ENGINEER MUST BE CONTACTED TO INSPECT THE CONNECTIONS AND SEALS. THE CONTRACTOR MUST BE AVAILABLE TO MAKE ANY GASKET-SEALED JOINT AVAILABLE FOR INSPECTION.
7. FOOTINGS, WHEN THE CONCRETE FORMWORK AND REINFORCING STEEL HAVE BEEN SET FOR THE PLACEMENT OF THE FOOTINGS.
8. CONCRETE REINFORCEMENT, WHEN THE REINFORCING STEEL HAS BEEN TIED FOR CONCRETE COMPONENTS. NOTE THAT AS PART OF A GENERAL REVIEW, IT IS NOT REASONABLE FOR THE ENGINEER TO REVIEW THE REINFORCEMENT EACH TIME THAT CONCRETE IS POURED. THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR PROVIDING THE PROPER REINFORCEMENT AND PLACEMENT, AS SPECIFIED IN THE ENGINEERED PLANS, FOR COMPONENTS WHICH ARE NOT REVIEWED BY THE ENGINEER.
9. FINAL REVIEW, WHEN ALL STRUCTURAL COMPONENTS OF THE FACILITY HAVE BEEN COMPLETED, INCLUDING THE SAFETY FENCE AND BACKFILLING. THE MONITORING STATION MUST ALSO BE VISIBLE AT THIS TIME.
10. THE CLIENT MUST PROVIDE A MINIMUM OF 24 HOURS NOTICE TO STONECREST ENGINEERING FOR A REQUIRED INSPECTION.
11. THE CLIENT MUST REQUEST ADDITIONAL INSPECTIONS BE PERFORMED BY THE ENGINEER IF THERE IS ANY CONCERN ABOUT, OR CHANGES TO, ANY COMPONENT OF THE FACILITY. FAILURE TO NOTIFY THE ENGINEER IN SUCH SITUATIONS RELEASES THE ENGINEER OF LIABILITY FOR SUCH CHANGES OR COMPONENTS.



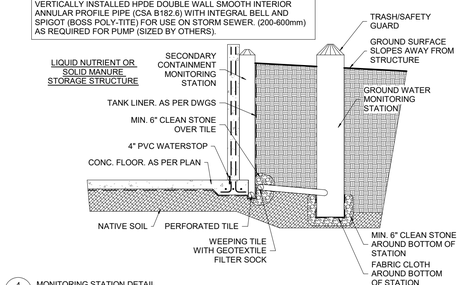
5 / A0.0 LINKSEAL DETAIL
SCALE: N.T.S.

NOTE:
PERIMETER TILE AND MONITORING STATION BE INSTALLED AND A SAMPLING/TESTING PROGRAM BE IMPLEMENTED.

IF EXTERIOR WATER PRESSURE IS NOT REMOVED PRIOR TO PUMPING MANURE FROM PIT, STONECREST ENGINEERING ACCEPTS NO RESPONSIBILITY, FINANCIAL OR OTHERWISE, FOR FLOOR FAILURE DUE TO HYDROSTATIC PRESSURE.

MONITORING STATION LOCATIONS, HEIGHTS AND MATERIALS ARE TO BE CONFIRMED BY GENERAL CONTRACTOR.

MONITORING STATION TO BE APPROVED CATCH BASIN MANHOLE OR VERTICALLY INSTALLED HPDE DOUBLE WALL SMOOTH INTERIOR ANNULAR PROFILE PIPE (CSA B182.6) WITH INTEGRAL BELL AND SPIGOT (BOSS POLY-TITE) FOR USE ON STORM SEWER. (200-600mm) AS REQUIRED FOR PUMP (SIZED BY OTHERS).



4 / A0.0 MONITORING STATION DETAIL
SCALE: N.T.S.

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

PROJECT NORTH

TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
PH: (519)-625-8025
FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: LIQUID DIGESTATE TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

DRAWN BY: TRAVIS L.

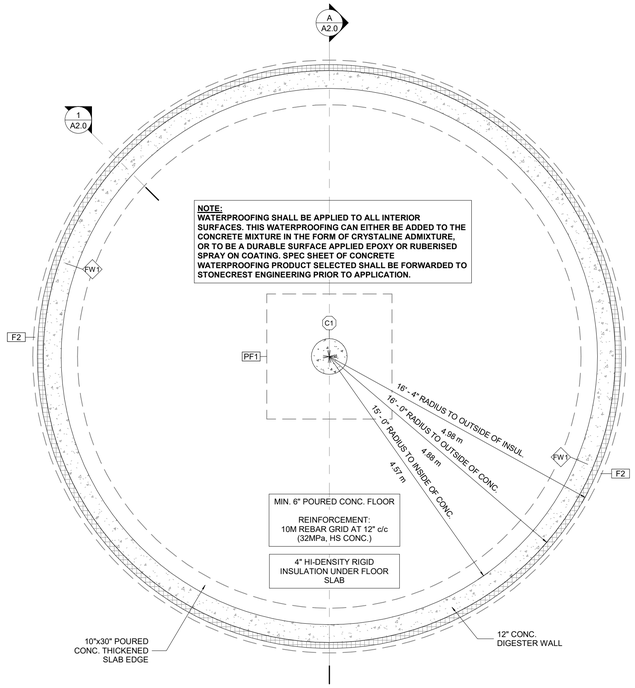
PRINT DATE: 2023

PAGE DESCRIPTION: TITLE PAGE

SCALE: AS NOTED

FILE: 7877 - LIQUID DIGESTATE TANK - 1

PAGE NUMBER: A0.0



NOTE:
WATERPROOFING SHALL BE APPLIED TO ALL INTERIOR SURFACES. THIS WATERPROOFING CAN EITHER BE ADDED TO THE CONCRETE MIXTURE IN THE FORM OF CRYSTALINE ADMIXTURE, OR TO BE A DURABLE SURFACE APPLIED EPOXY OR RUBERISED SPRAY ON COATING. SPEC SHEET OF CONCRETE WATERPROOFING PRODUCT SELECTED SHALL BE FORWARDED TO STONECREST ENGINEERING PRIOR TO APPLICATION.

1 / A1.0 FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

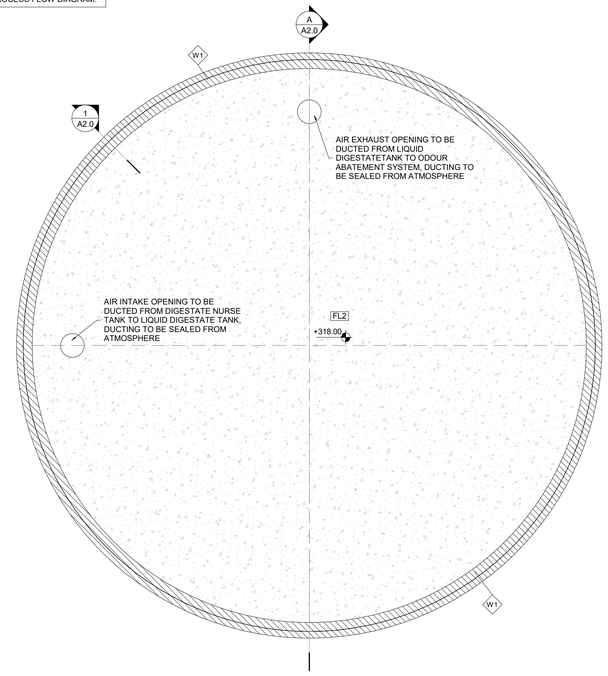
ALL FOOTINGS AND FOUNDATIONS HAVE BEEN DESIGNED TO 3000psf SLS (143kPa).

A GEOTECHNICAL ENGINEERING REPORT IS REQUIRED. STONECREST ENGINEERING HAS COMPLETED THIS DESIGN ASSUMING A SOIL BEARING CAPACITY OF 3000psf (SLS) AND 4500psf (ULS). IT IS ALSO ASSUMED THAT NEITHER A REINFORCED SLAB NOR A LINER IS REQUIRED, AS PROVIDED IN THE NUTRIENT MANAGEMENT ACT. CONSTRUCTION MUST NOT PROCEED UNTIL THE GEOTECHNICAL REPORT HAS BEEN REVIEWED BY STONECREST ENGINEERING AND ANY NECESSARY DRAWING AMENDMENTS ARE COMPLETED.

NOTE:
ALL CONCRETE FOR MANURE STORAGES TO BE MANUFACTURED FROM TYPE HS CEMENT OR EQUIVALENT, HAVE A 28 DAY STRENGTH OF 32MPa FOR FLOOR SLABS, AND 35MPa FOR WALLS AND PIERS / COLUMNS AND A WATER/CEMENT RATIO OF NOT MORE THEN 0.45.

NOTE:
ELEVATIONS AND SLOPES TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.

NOTE:
1. ALL AGITATOR AND PUMP OPENINGS TO BE SEALED.
2. ODOUR ABATEMENT SYSTEM TO BE TIED IN VIA PROCESS/BUILDING AIR SYSTEM PUMPED AND DUCTED BETWEEN BUILDINGS AND/OR TANK HEADSPACES. REFER TO ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM.



2 / A1.0 RECEPTION TANK LID
SCALE: 1/4" = 1'-0"

NOTE:
NO VEHICULAR TRAFFIC ALLOWED ON TOP OF TANK LID

NOTE:
GEOTECHNICAL REPORT TO BE FORWARDED TO STONECREST ENGINEERING FOR REVIEW.

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WALL SCHEDULE

WALL TYPE		ASSEMBLY	MIN. 28 DAY STRENGTH
NO.	DESCRIPTION		
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" o/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC, CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH | TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

STONECREST ENGINEERING
SHAKESPEARE, ONTARIO, CANADA
PH: (519)-625-8025
FX: (519)-625-8966

CONTRACTOR TO CHECK ALL DIMENSIONS AND ELEVATIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK

DO NOT SCALE THE DRAWINGS

CLIENT: RIMROCK RNG INC.

LOCATION: FOOTHILLS, ALBERTA

PROJECT TYPE: LIQUID DIGESTATE TANK

PROJECT STATUS AND VERSION: COORDINATION DRAWINGS

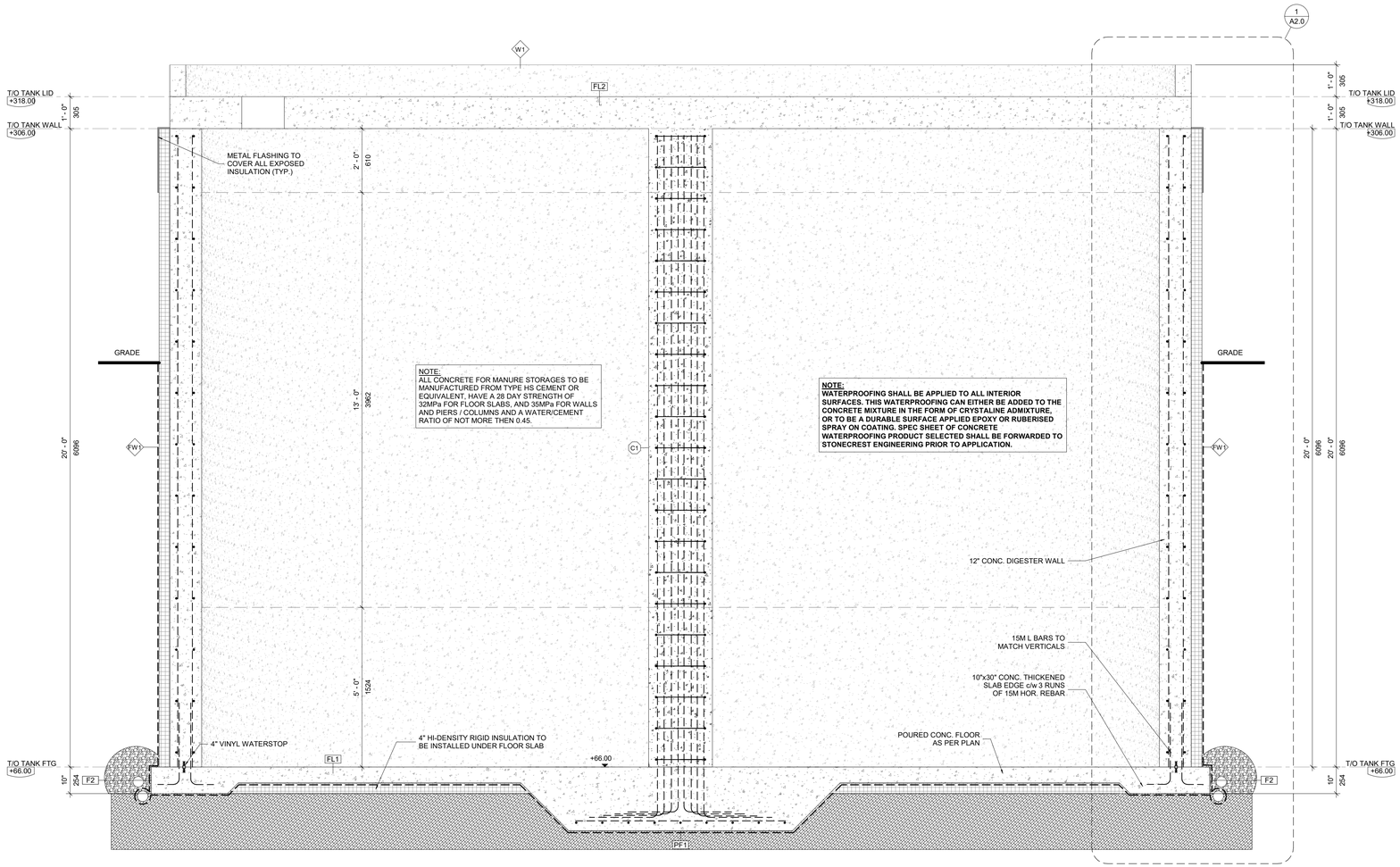
DRAWN BY: TRAVIS L. | PRINT DATE: 2023

PAGE DESCRIPTION: FOUNDATION AND TANK LID PLANS

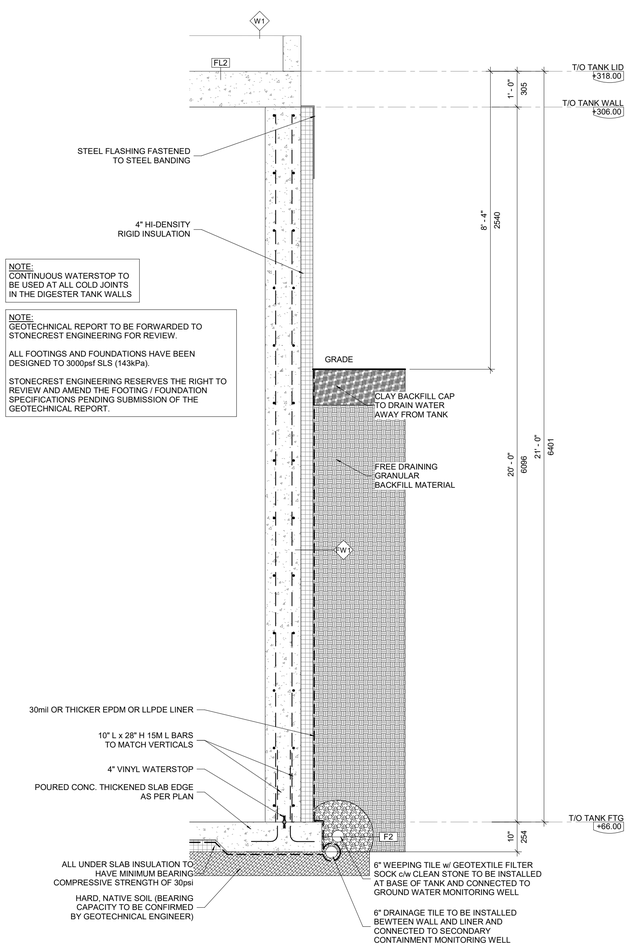
SCALE: AS NOTED

FILE: 7877 - LIQUID DIGESTATE TANK - 1

PAGE NUMBER: A1.0



A — A2.0 TYPICAL CROSS SECTION
SCALE: 1/2" = 1'-0"



FOOTING SCHEDULE

NO.	FOOTING SIZE	REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
F2	10"x30" CONC. STRIP FOOTING	3 CONTINUOUS RUNS OF 15M REBAR	32MPa, HS CONC.
PF1	84"x84"x24" POURED IN PLACE CONC. PAD FOOTING	15M AT 10" c/c EACH WAY (BOTTOM)	32MPa, HS CONC.

FLOOR SCHEDULE

No.	ASSEMBLY	COMMENTS
FL1	6" POURED CONCRETE FLOOR (32MPa, HS CONC.) 4" HI-DENSITY RIGID INSULATION REINFORCEMENT: 10M REBAR GRID AT 12" c/c EACH WAY	
FL2	12" POURED CONCRETE SUSPENDED SLAB (32MPa, HS CONC. OR EQUIV.) REINFORCEMENT: REFER TO DETAILS	

WALL REINFORCMENT SCHEDULE

WALL TYPE NO.	WALL TYPE DESCRIPTION	WALL THICKCESS AND REINFORCEMENT SPECS	MIN. 28 DAY STRENGTH
FW1	12" CONC. TANK WALL	12" POURED IN PLACE CONCRETE 4" HI-DENSITY RIGID INSULATION METAL FLASHING OVER RIGID INSULATION REINFORCEMENT: INTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c EXTERIOR MAT: 15M VERT. REBAR AT 18" c/c 15M HOR. REBAR AT 16" c/c 4" HI-DENSITY RIGID INSULATION FASTENED TO OUTSIDE OF TANK w/ STEEL BANDS AT 48" c/c	35MPa, HS CONC. OR EQUIV.
W1	6" CONC. CURB WALL	6" POURED IN PLACE CONCRETE REINFORCEMENT: 1-15M HOR. REBAR AT TOP OF WALL	25MPa

STRUCTURAL COLUMN SCHEDULE

NO.	COLUMN TYPE AND SIZE	REINFORCEMENT
C1	24"Ø POURED IN PLACE CONC. COLUMN	(8) 20M VERT. REBAR SPACED EVENLY. BENT INTO PAD FOOTING AND 10M HOR. STIRRUPS AT 12"c/c

NOTES:

PLEASE READ NOTE PAGE AT BEGINNING OF DRAWING SET FOR ALL NOTES REGARDING THIS PROJECT

NO.	DATE:	DESCRIPTION:
2	2023	FOR REVIEW

LEGEND:

- SPOT ELEVATION
- 001 — DOOR IDENTIFICATION TAG
- W1 — WALL IDENTIFICATION TAG
- WN1 — WINDOW IDENTIFICATION TAG
- C1 — PIER / COLUMN IDENTIFICATION TAG
- F1 — FOOTING / LINTEL IDENTIFICATION TAG

PROJECT NORTH	TRUE NORTH

DRAFT - NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER'S SEAL

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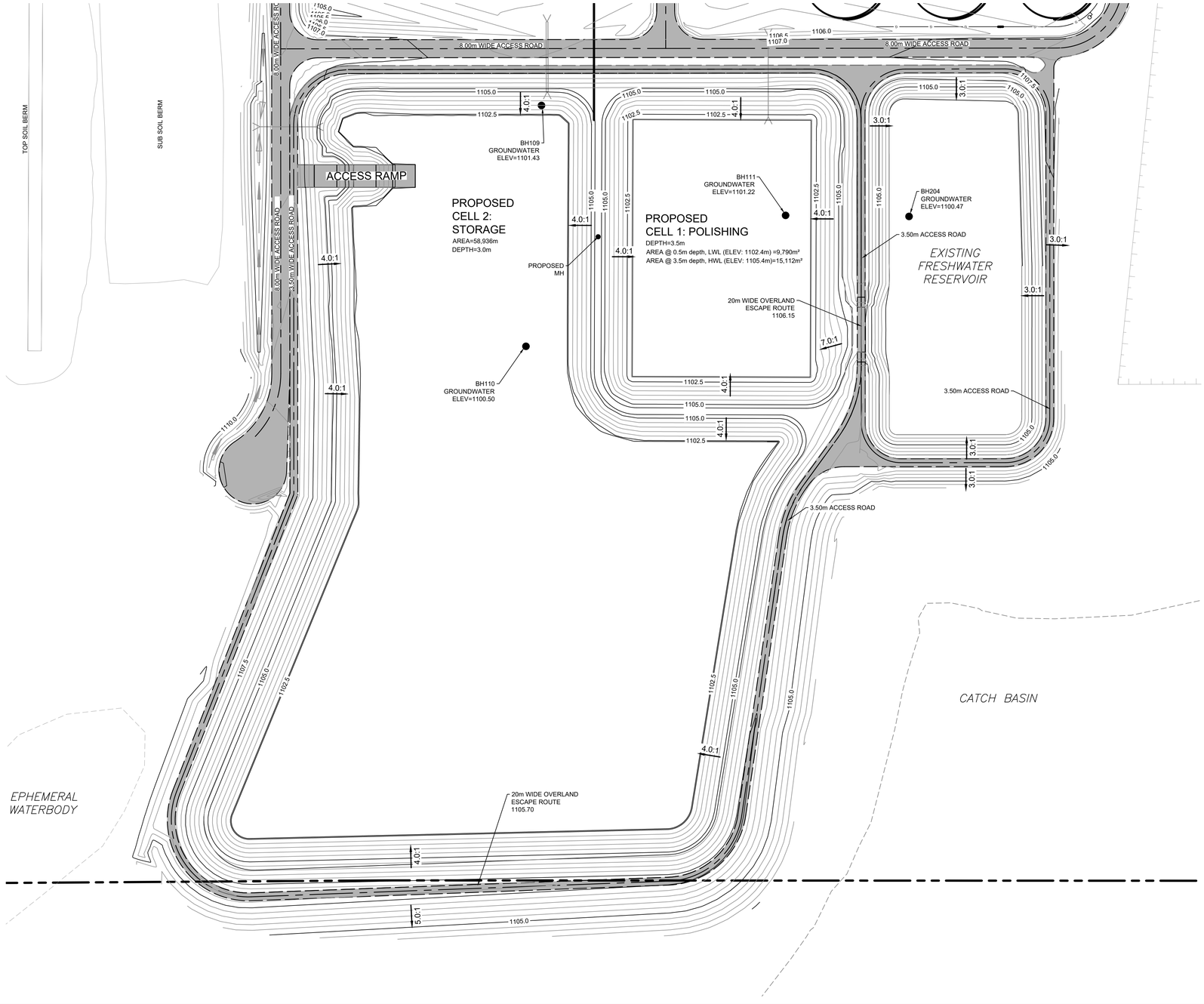
DO NOT SCALE THE DRAWINGS

CLIENT:	RIMROCK RNG INC.
LOCATION:	FOOTHILLS, ALBERTA
PROJECT TYPE:	LIQUID DIGESTATE TANK
PROJECT STATUS AND VERSION:	COORDINATION DRAWINGS
DRAWN BY: TRAVIS L.	PRINT DATE: 2023
PAGE DESCRIPTION:	CROSS SECTIONS
SCALE:	AS NOTED
FILE:	7877 - LIQUID DIGESTATE TANK - 1
PAGE NUMBER:	A2.0

Drawing 8 - Liquid Digestate Pond and Freshwater Resevoir



NAD 83
COORDINATES

NOTES:

1. ALL DIMENSIONS ARE IN METRES AND ALL PIPES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATIONS AND ALIGNMENTS OF ALL EXISTING UTILITIES.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23-07-06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

ISL Engineering and Land Services

RIMROCK RNG FACILITY | LSD: 5-19-29 W4M/6-19-29 W4M

LIQUID DIGESTATE POND AND FRESHWATER RESERVOIR

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
1:1000	AS	2023-06-21	21RG0001	RMR-34-LYS-0000-00014-01	0

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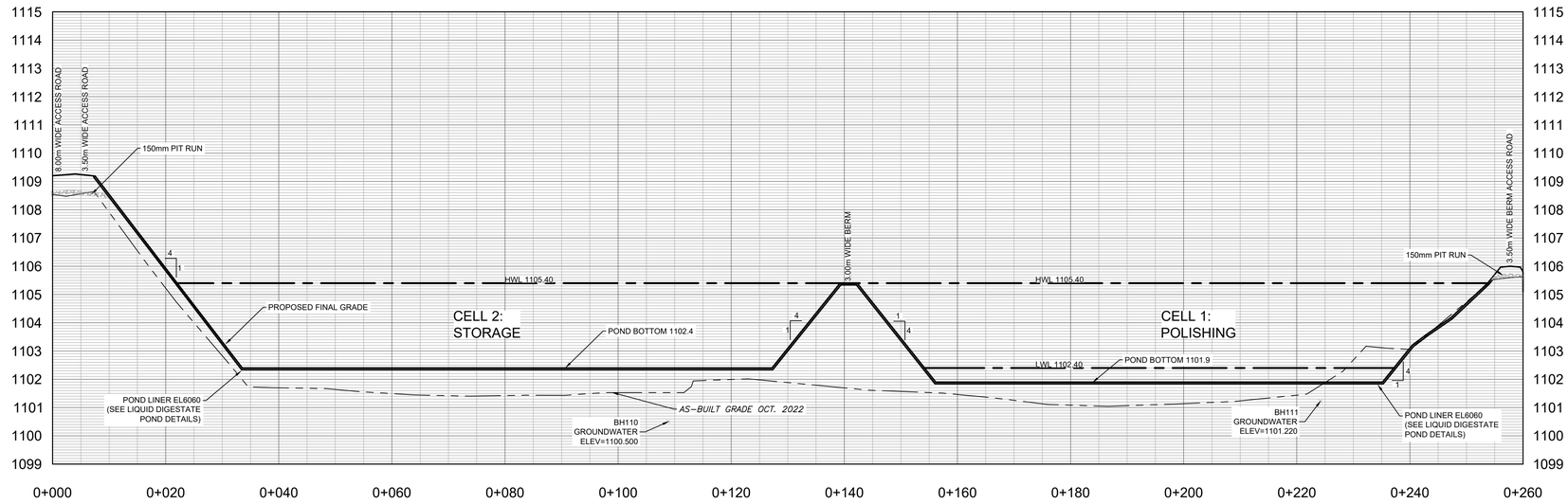
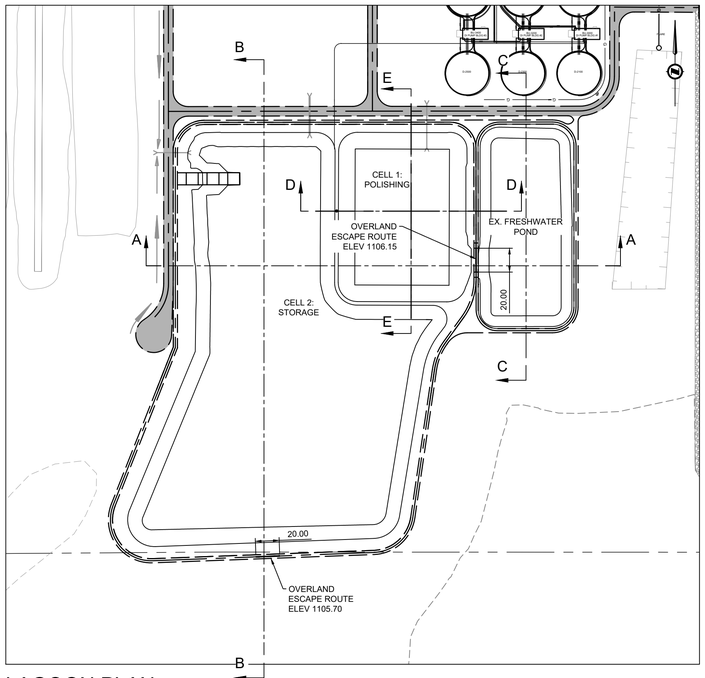


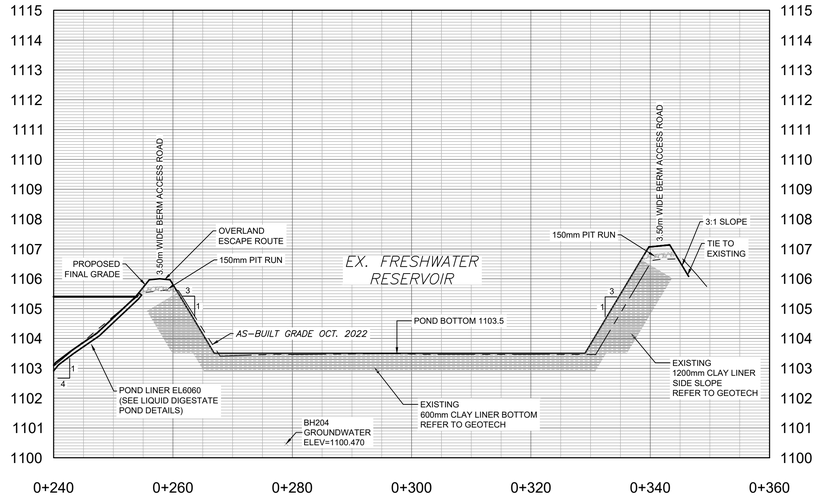
SECTION A-A - LIQUID DIGESTATE POND

SCALE 1: 500 HORZ / 1:100 VERT



LAGOON PLAN

SCALE 1:2500



SECTION A-A - FRESHWATER RESERVOIR

SCALE 1: 500 HORZ / 1:100 VERT

ALBERTA ONECALL

NAD 83
COORDINATES

NOTES:

1. ALL PIPE SIZES ARE IN MILLIMETRES AND ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND DISTANCES ARE BASED ON UTM COORDINATE SYSTEM (NAD 83).
3. POND LINER DETAILS TO BE PROVIDED ONCE FINALIZED.
4. EXISTING GRADE TO BE UPDATED EARLY CIVIL WORKS SURVEY IS AVAILABLE.
5. LINER FOR DIGESTATE/LAGOON POND TO BE CONSTRUCTED BY OTHERS.
6. FRESHWATER RESERVOIR AND NORTH PORTION OF THE DIGESTATE/LAGOON POND CONSTRUCTED IN 2022.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23-07-06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

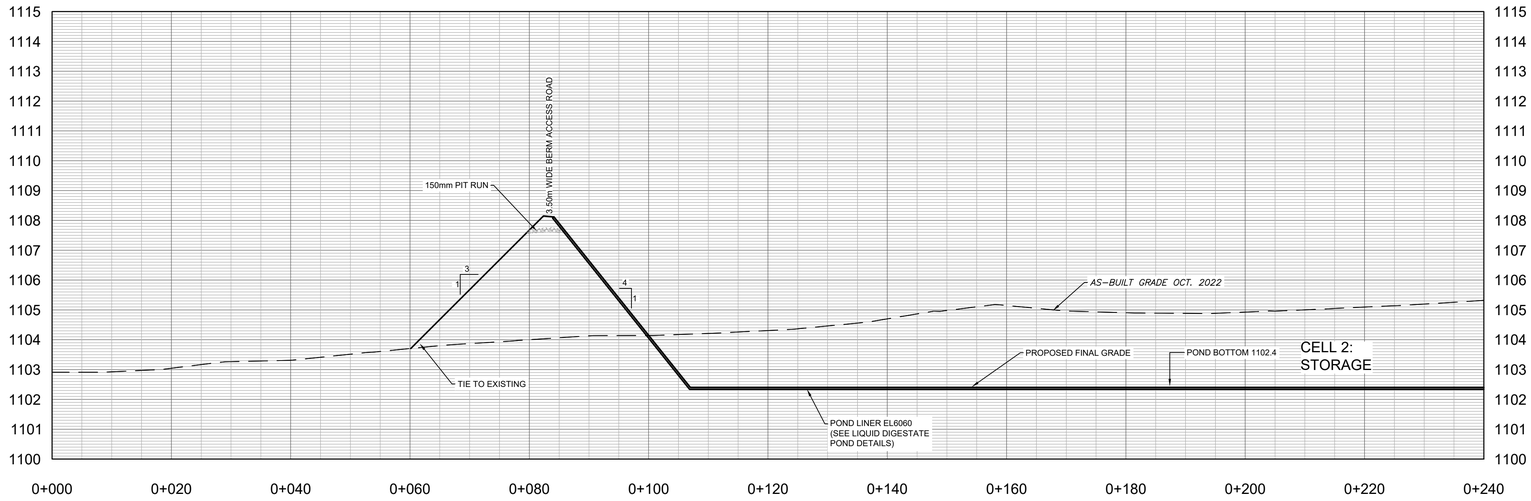
ISL Engineering and Land Services

RIMROCK RNG FACILITY | LSD: 5-19-29 W4M/6-19-29 W4M

PLAN AND SECTION
LAGOON PLAN AND SECTION A-A

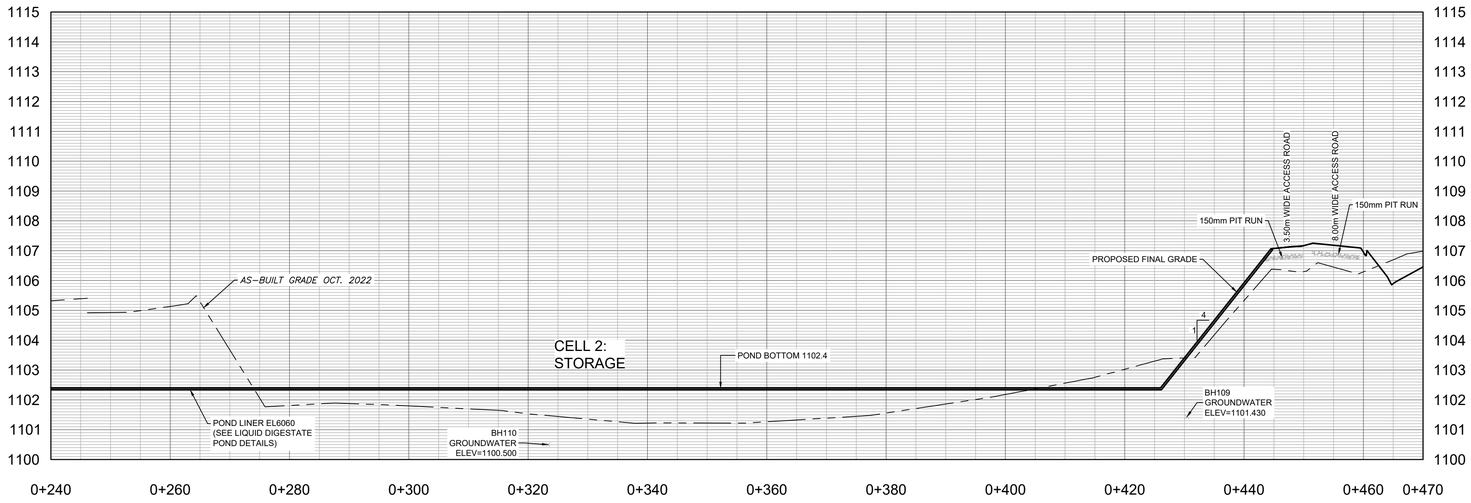
SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
AS SHOWN	AS	2022-07-12	21RG0001	RMR-34-RDP-0000-0015-01	0

G:\PROJECTS\28000\28000\28028_RIMROCK_CIVIL_STRUCT_PRELIM_ENG\02_CADD\20_DRAFTING\202_PRODUCTION\28028_LAGOON.DWG, 2023-07-14 10:44:56, Angelo Subia



SECTION B-B - SOUTH

SCALE 1: 500 HORZ / 1:100 VERT



SECTION B-B - NORTH

SCALE 1: 500 HORZ / 1:100 VERT

ALBERTA ONECALL

NAD 83
COORDINATES

NOTES:

1. ALL PIPE SIZES ARE IN MILLIMETRES AND ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND DISTANCES ARE BASED ON UTM COORDINATE SYSTEM (NAD 83).
3. POND LINER DETAILS TO BE PROVIDED ONCE FINALIZED.
4. EXISTING GRADE TO BE UPDATED EARLY CIVIL WORKS SURVEY IS AVAILABLE.
5. LINER FOR DIGESTATE/LAGOON POND TO BE CONSTRUCTED BY OTHERS.
6. FRESHWATER RESERVOIR AND NORTH PORTION OF THE DIGESTATE/LAGOON POND CONSTRUCTED IN 2022.

REV.	DATE: YY–MM–DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23–07–06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

ISL Engineering and Land Services

RIMROCK RNG FACILITY | LSD: 5–19–29 W4M/6–19–29 W4M

SECTIONS
SECTION B–B

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
AS SHWON	AS	2022–07–12	21RG0001	RMR–34–RDP–0000–0016–01	0

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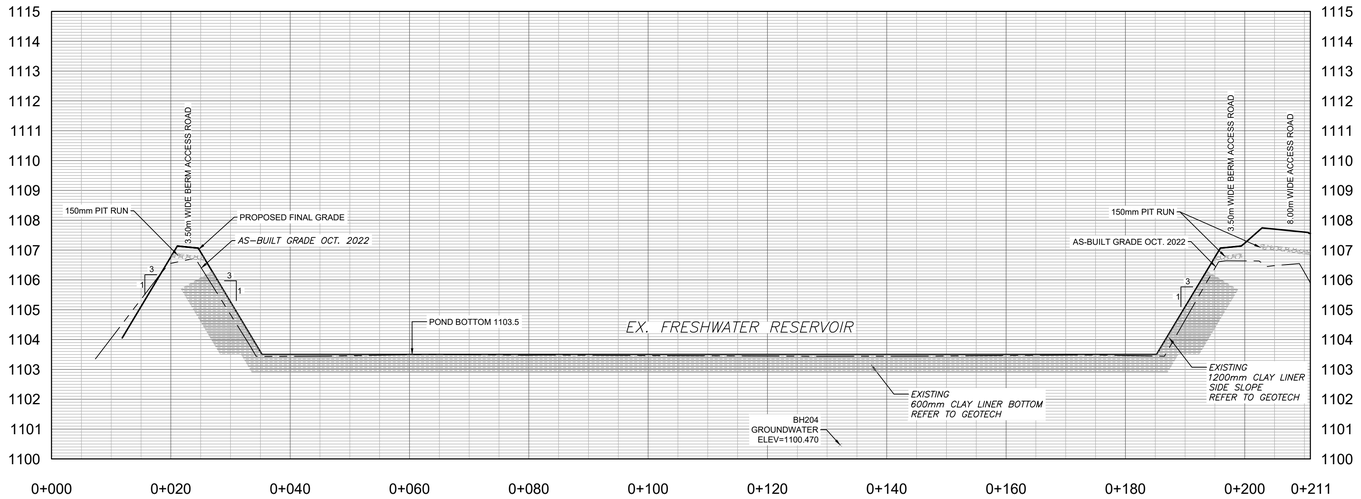


SECTION C-C

SCALE 1: 500 HORZ / 1:100 VERT

ALBERTA ONECALL

NAD 83
COORDINATES

NOTES:

1. ALL PIPE SIZES ARE IN MILLIMETRES AND ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND DISTANCES ARE BASED ON UTM COORDINATE SYSTEM (NAD 83).
3. POND LINER DETAILS TO BE PROVIDED ONCE FINALIZED.
4. EXISTING GRADE TO BE UPDATED EARLY CIVIL WORKS SURVEY IS AVAILABLE.
5. LINER FOR DIGESTATE/LAGOON POND TO BE CONSTRUCTED BY OTHERS.
6. FRESHWATER RESERVOIR AND NORTH PORTION OF THE DIGESTATE/LAGOON POND CONSTRUCTED IN 2022.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23-07-06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

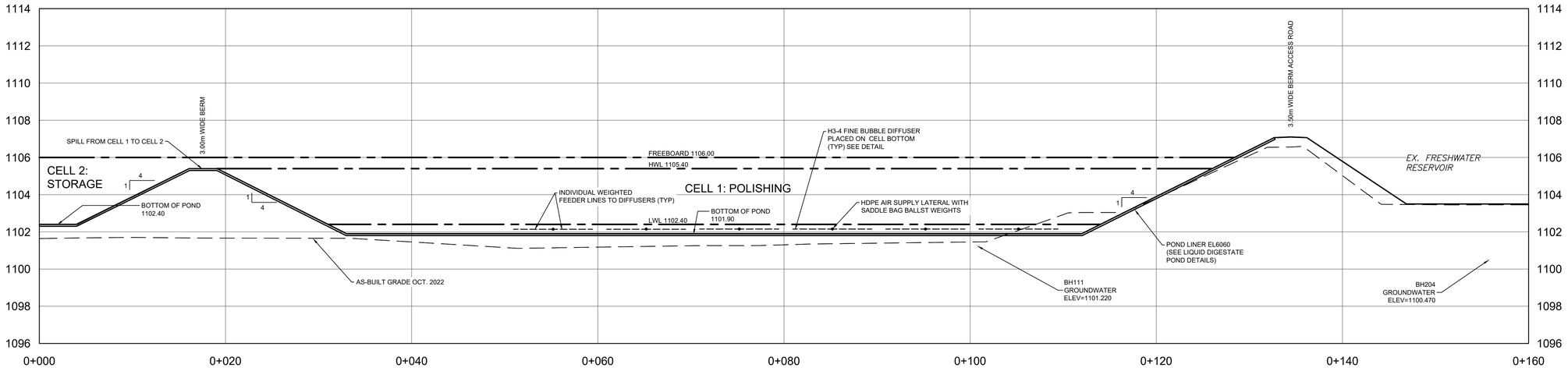
ISL Engineering and Land Services

RIMROCK RNG FACILITY | LSD: 5-19-29 W4M/6-19-29 W4M

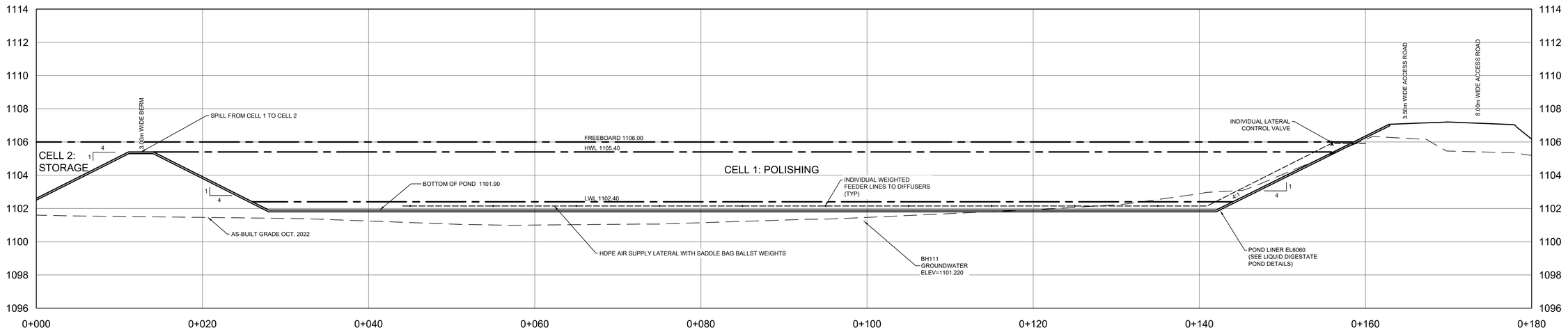
SECTION
SECTION C-C

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
AS SHWON	AS	2022-07-12	21RG0001	RMR-34-RDP-0000-0017-01	0

G:\PROJECTS\28000\28000\28028_RIMROCK_CIVIL_STRUCT_PRELIM_ENG\02_CADD\20_DRAFTING\202_PRODUCTION\28028_LAGOON.DWG, 2023-07-14 10:44:59, Angelo Subia



SECTION D-D
SCALE 1:1



SECTION E-E
SCALE 1:250 HORZ / 1:125 VERT

ALBERTA ONE CALL

NAD 83
COORDINATES

NOTES:

1. ALL DIMENSIONS ARE IN METRES AND ALL PIPES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATIONS AND ALIGNMENTS OF ALL EXISTING UTILITIES.
3. POND AERATION LAYOUT DESIGNED BY NEXOM.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23-07-06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

ISL Engineering and Land Services

RIMROCK RNG FACILITY | LSD: 5-19-29 W4M/6-19-29 W4M

SECTION
SECTION D-D AND E-E
CELL 1: POLISHING CELL

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
AS SHOWN	AS	2023-06-09	21RG0001	RMR-34-RDP-0000-00020-01	0

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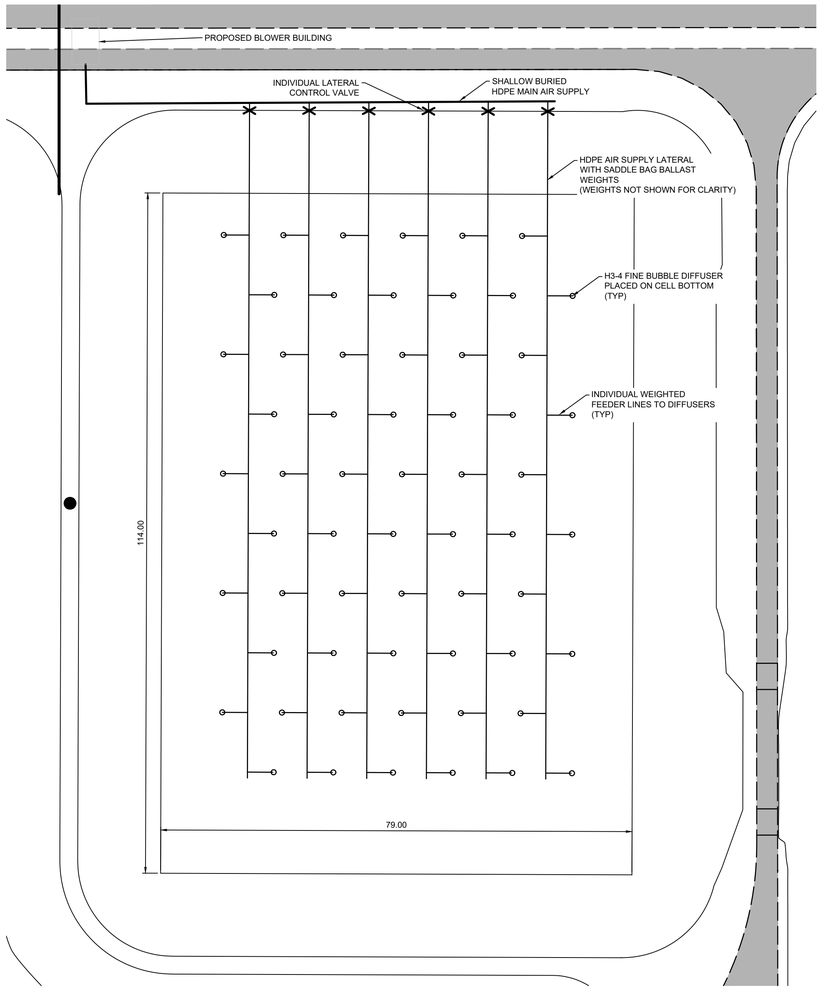
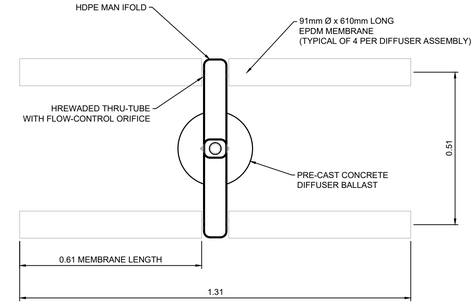


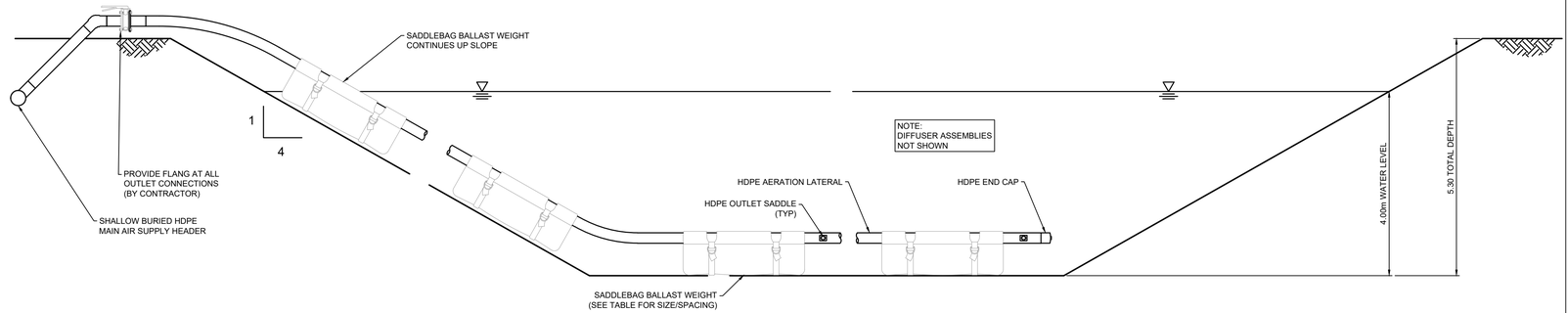
POLISHING CELL AERATION LAYOUT (BY OTHERS)

SCALE 1:500



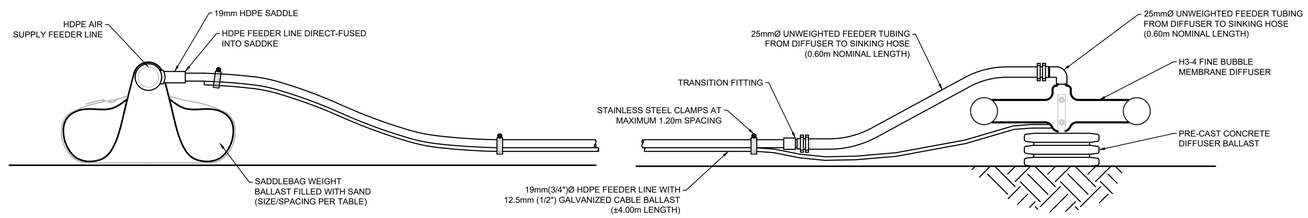
H3-4 DIFFUSER PLAN (BY OTHERS)

SCALE: N.T.S.



AERATED LAGOON SECTION (BY OTHERS)

SCALE: N.T.S.



DIFFUSER DETAIL (BY OTHERS)

SCALE: N.T.S.

ALBERTA ONECALL

NAD 83 COORDINATES

NOTES:

1. ALL DIMENSIONS ARE IN METRES AND ALL PIPES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATIONS AND ALIGNMENTS OF ALL EXISTING UTILITIES.
3. AERATION LAYOUT, DETAIL, AND SECTION PROVIDED BY NEXOM.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23-07-06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

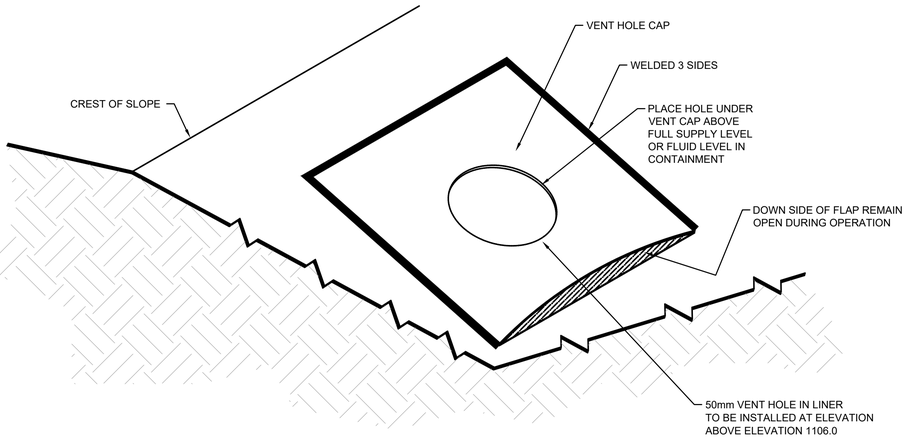
ISL Engineering and Land Services

RIMROCK RNG FACILITY | LSD: 5-19-29 W4M/6-19-29 W4M

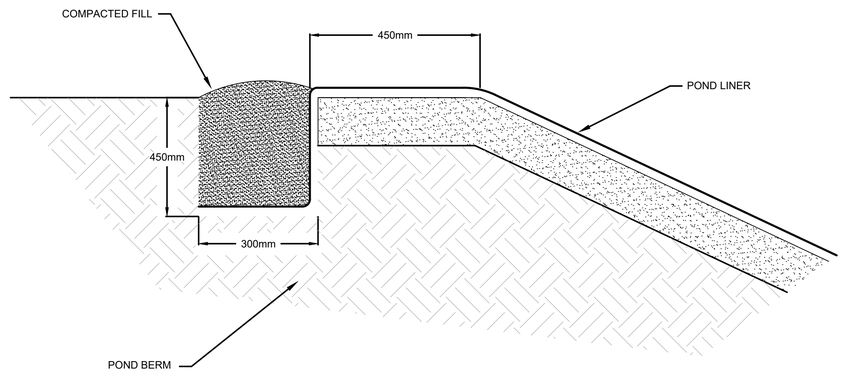
DETAILS
AERATION LAYOUT, DETAIL, AND SECTION

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
AS SHOWN	AS	2023-06-09	21RG0001	RMR-35-DDT-0000-0009-01	0

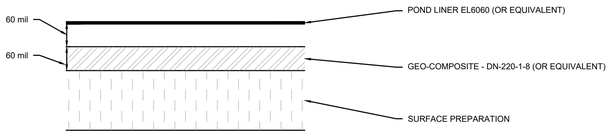
G:\PROJECTS\28000\28000\28028_RIMROCK_CIVIL_STRUCT_PRELIM_ENG\02_CADD\20_DRAFTING\202_PRODUCTION\28028_LAGOON.DWG, 2023-07-14 10:45:08, Angelo Subia



POND LINER VENT
NOT TO SCALE



POND LINER ANCHOR TRENCH DETAIL
NOT TO SCALE



POND BOTTOM - TYPICAL CROSS SECTION
NOT TO SCALE

ALBERTA ONE CALL

NAD 83
COORDINATES

NOTES:

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
0	23-07-06	AS	AS	GD	GD	ISSUED FOR APPROVAL

SEAL:

PERMIT:

RIMROCK RENEWABLES

ISL Engineering and Land Services

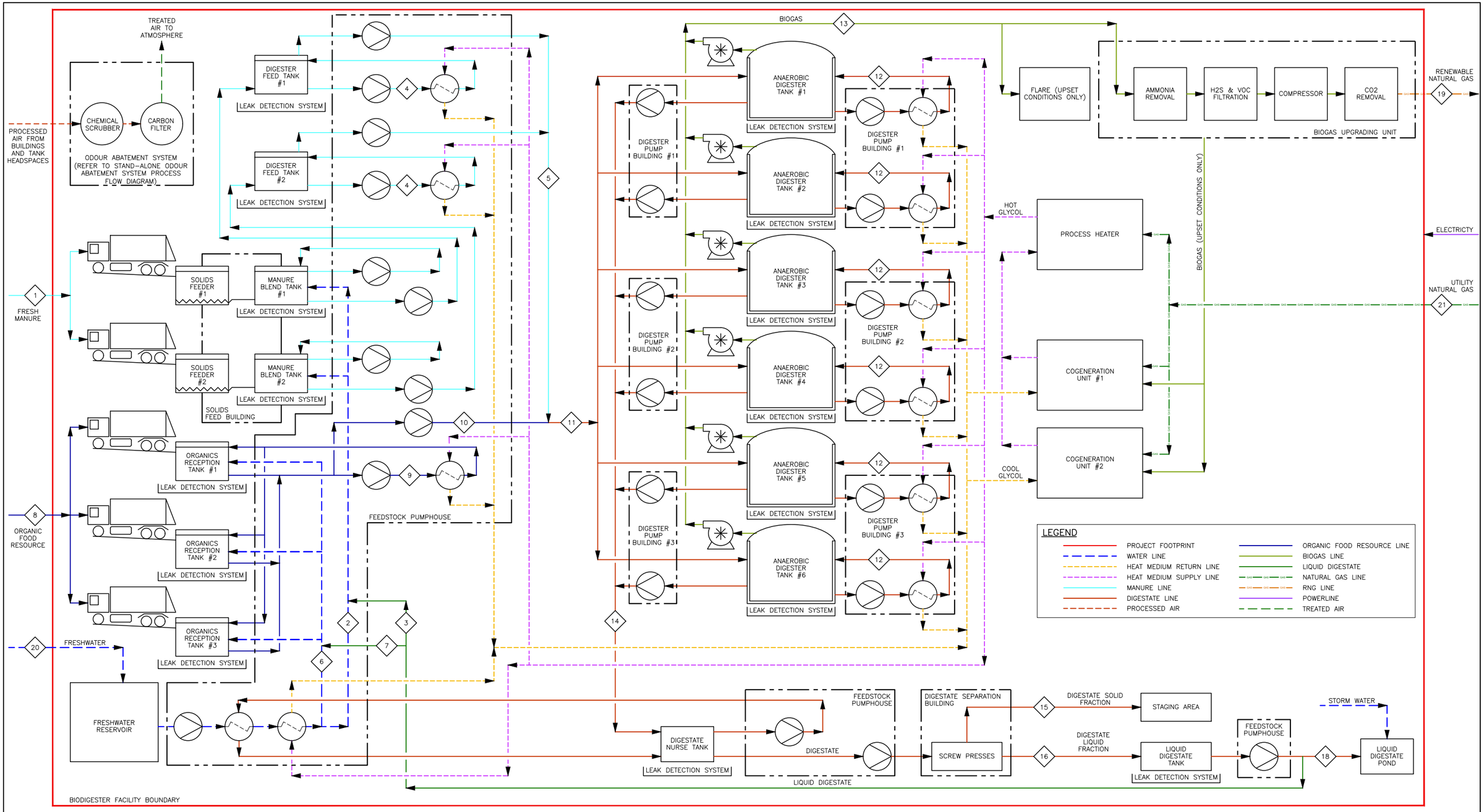
RIMROCK RNG FACILITY | LSD: 5-19-29 W4M/6-19-29 W4M

LIQUID DIGESTATE POND DETAILS

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
N.T.S.	AS	2023-07-05	21RG0001	RMR-343-DDT-0000-0009-01	0

G:\PROJECTS\28000\28000\28028_RIMROCK_CIVIL_STRUCT_PRELIM_ENG\02_CADD\20_DRAFTING\202_PRODUCTION\28028_LAGOON.DWG, 2023-07-14 10:45:11, Angelo Subia

Attachment E – Overall Facility Process Flow Diagram and Mass Balance



NOTES:

1. "STREAM 17" IS NOT INCLUDED. "STREAM 3, 7" HAVE BEEN CONFIRMED AND ADDED AS PART OF A DESIGN CHANGE. PER EPEA APPLICATION SECTION 5.3, STUDIES WERE COMPLETED CONFIRMING POTENTIAL TO REUSE APPROXIMATELY 25% OF LIQUID DIGESTATE (UPSTREAM OF THE DIGESTATE POND) AS PROCESS WATER FOR THE MANURE BLEND TANKS.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
A	22-12-15	WC	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)
B	23-02-07	WC	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)
C	23-06-30	JNG	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)
D	23-07-14	JNG	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)

SEAL:

PERMIT:

TIDEWATER RENEWABLES

OBSIDIAN ENGINEERING

RIMROCK RNG PLANT LSD: 16-06-019-29 W4M

BIODIGESTER FACILITY

OVERALL PROCESS FLOW DIAGRAM

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
N.T.S.	WC	22-12-06	21RG0001	RMR-32-BFD-0000-0001-01	D

X:_DRAFTING\CLIENTS\TIDEWATER RENEWABLES\RIMROCK\001 (16-06-019-29 W4M)\2.10_MECHANICAL\2.13_PFD\RMR-32-BFD-0000-0001-01.DWG, 2023-07-14 2:49:33, John Gian

MASS BALANCE

PFD STREAM NO.:		1	2	3	4	5	6	7	8	9	10	11
FROM:		FRESH MANURE INPUT	FRESHWATER RESERVOIR	LIQUID DIGESTATE TANK	DIGESTER FEED TANK	DIGESTER FEED TANKS	FRESHWATER RESERVOIR	LIQUID DIGESTATE TANK	ORGANICS FOOD RESOURCE INPUT	ORGANICS RECEPTION TANKS	ORGANICS RECEPTION TANKS	DIGESTATE HEADER
TO:		SOLIDS FEEDERS	MANURE BLEND TANKS	MANURE BLEND TANKS	DIGESTER FEED TANK	BLENDED SLURRY HEADER	ORGANICS RECEPTION TANKS	ORGANICS RECEPTION TANKS	ORGANICS RECEPTION TANKS	ORGANICS RECEPTION TANKS	DIGESTATE HEADER	ANAEROBIC DIGESTER TANKS
PARAMETER	UNITS											
STREAM DESCRIPTION		MANURE	WATER	LIQUID DIGESTATE	MANURE	MANURE	WATER	LIQUID DIGESTATE	ORGANIC FOOD RESOURCE	ORGANIC FOOD RESOURCE	ORGANIC FOOD RESOURCE	DIGESTATE
TOTAL MASS FLOW												
VAPOR FRACTION		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LIQUID FRACTION		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TEMPERATURE	deg C	-25	20	20	0	25	20	20	5	14	25	25
PRESSURE	kPag	ATM	345	345	345	300	345	345	ATM	345	300	300
MASS FLOW	tonnes/day	219.2	471.3	208.1	449.3	898.6	147.4	65.1	164.4	376.9	376.9	1,275.5
VOLUMETRIC FLOW	m3/day	259.6	472.2	210.3	480.3	960.6	147.7	65.8	177.6	390.0	390.0	1,285.8
MASS DENSITY	kg/m3	844.2	998.2	989.7	935.5	935.5	998.2	989.7	925.5	966.5	966.5	992.0
VAPOR PHASE												
PHASE STD GAS FLOW VOLUME	Nm3/day	---	---	---	---	---	---	---	---	---	---	---
PHASE MASS DENSITY	kg/m3	---	---	---	---	---	---	---	---	---	---	---
COMPOSITION (DRY BASIS)		---	---	---	---	---	---	---	---	---	---	---
METHANE (CH4)	% Vol	---	---	---	---	---	---	---	---	---	---	---
CARBON DIOXIDE (CO2)	% Vol	---	---	---	---	---	---	---	---	---	---	---
NITROGEN (N2)	% Vol	---	---	---	---	---	---	---	---	---	---	---
OXYGEN (O2)	% Vol	---	---	---	---	---	---	---	---	---	---	---
AMMONIA (NH3)	ppm	---	---	---	---	---	---	---	---	---	---	---
HYDROGEN SULFIDE (H2S)	ppm	---	---	---	---	---	---	---	---	---	---	---
LIQUID PHASE												
MASS FLOW	tonnes/day	219.2	471.3	208.1	449.3	898.6	147.4	65.1	164.4	376.9	376.9	1,275.5
VOLUMETRIC FLOW	m3/day	259.6	472.2	210.3	480.3	960.6	147.7	65.8	177.6	390.0	390.0	1,285.8
MASS DENSITY	kg/m3	844.2	998.2	989.7	935.5	935.5	998.2	989.7	925.5	966.5	966.5	992.0
PERCENT TOTAL SOLIDS	% wt	41.0	0.0	3.3	10.0	10.0	0.0	3.3	22.9	10.0	10.0	10.0
PERCENT VOLATILE SOLIDS OF TS	% wt	87.4	0.0	69.7	87.4	87.4	0.0	69.7	92.8	90.7	90.7	88.4
PERCENT TOTAL NITROGEN	% wt	1.3	0.0	0.2	0.3	0.3	0.0	0.2	0.6	0.3	0.3	0.3
PERCENTAGE AMMONIA NITROGEN OF TOTAL	% wt	23.6	0.0	77.3	25.0	24.9	0.0	77.3	0.0	2.9	2.9	19.3
PERCENTAGE ORGANIC NITROGEN OF TOTAL	% wt	76.4	0.0	22.7	75.0	75.1	0.0	22.7	100.0	97.1	97.1	80.7
PERCENT PHOSPHORUS	% wt	0.3	0.0	0.1	0.2	0.2	0.0	0.1	0.1	0.0	0.0	0.1
PERCENT POTASSIUM	% wt	0.6	0.0	0.1	0.3	0.3	0.0	0.1	0.3	0.1	0.1	0.2
NOTES		---	---	NOTE 3	NOTE 7	---	NOTE 4	NOTE 3	---	---	---	---

PFD STREAM NO.:		12	13	14	15	16	17	18	19	20	21	
FROM:		ANAEROBIC DIGESTER TANKS	ANAEROBIC DIGESTER TANKS	ANAEROBIC DIGESTER TANKS	SCREW PRESSES	SCREW PRESSES	LIQUID DIGESTATE TANK	LIQUID DIGESTATE TANK	BIOGAS UPGRADING UNIT	RIVER	UTILITY NATURAL GAS SUPPLY	
TO:		ANAEROBIC DIGESTER TANKS	BIOGAS UPGRADING UNIT	DIGESTATE NURSE TANK	STAGING AREA	LIQUID DIGESTATE TANK	MANURE BLEND TANKS	LIQUID DIGESTATE POND	ATCO DISTRIBUTION SYSTEM	FRESHWATER RESERVOIR	NATURAL GAS USERS	
PARAMETER	UNITS											
STREAM DESCRIPTION		HEATED BLENDED FEED	BIOGAS	DIGESTATE	DIGESTATE SOLIDS	LIQUID DIGESTATE	LIQUID DIGESTATE	LIQUID DIGESTATE	RENEWABLE NATURAL GAS	WATER	NATURAL GAS	
TOTAL MASS FLOW												
VAPOR FRACTION		0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	
LIQUID FRACTION		1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	
TEMPERATURE	deg C	38	38	38	20	20	0	20	5	1	5	
PRESSURE	kPag	340	0.1	300	ATM	345	0	345	345	ATM	862	
MASS FLOW	tonnes/day	202.4	61	1,214.7	121.8	1,092.9	0.0	819.7	24.4	618.8	17.7	
VOLUMETRIC FLOW	m3/day	204.1	70,666	1,224.5	137.2	1,104.2	0.0	828.2	41,828	619.9	23,328	
MASS DENSITY	kg/m3	992.0	0.94	992.0	888.0	989.7	0.0	989.7	0.58	998.2	0.76	
VAPOR PHASE												
PHASE STD GAS FLOW VOLUME	Nm3/day	---	58,219	---	---	---	---	---	41,828	---	23,328	
PHASE MASS DENSITY	kg/m3	---	0.94	---	---	---	---	---	0.58	---	0.76	
COMPOSITION (DRY BASIS)		---	---	---	---	---	---	---	---	---	---	
METHANE (CH4)	% Vol	---	57.7	---	---	---	---	---	97.0	---	TBD	
CARBON DIOXIDE (CO2)	% Vol	---	41.6	---	---	---	---	---	1.9	---	TBD	
NITROGEN (N2)	% Vol	---	0.5	---	---	---	---	---	0.9	---	TBD	
OXYGEN (O2)	% Vol	---	0.2	---	---	---	---	---	0.2	---	TBD	
AMMONIA (NH3)	ppm	---	300	---	---	---	---	---	4.3	---	TBD	
HYDROGEN SULFIDE (H2S)	ppm	---	200	---	---	---	---	---	5.0	---	TBD	
LIQUID PHASE												
MASS FLOW	tonnes/day	202.4	---	1,214.7	121.8	1,092.9	0.0	819.7	---	618.8	---	
VOLUMETRIC FLOW	m3/day	204.1	---	1,224.5	137.2	1,104.2	0.0	828.2	---	619.9	---	
MASS DENSITY	kg/m3	992.0	---	992.0	888.0	989.7	0.0	989.7	---	998.2	---	
PERCENT TOTAL SOLIDS	% wt	6.0	---	6.0	30.0	3.3	0.0	3.3	---	0.0	---	
PERCENT VOLATILE SOLIDS OF TS	% wt	59.0	---	59.0	90.4	71.1	0.0	71.1	---	0.0	---	
PERCENT TOTAL NITROGEN	% wt	0.3	---	0.3	0.6	0.3	0.0	0.3	---	0.0	---	
PERCENTAGE AMMONIA NITROGEN OF TOTAL	% wt	80.0	---	80.0	60.0	85.0	0.0	90.0	---	0.0	---	
PERCENTAGE ORGANIC NITROGEN OF TOTAL	% wt	20.0	---	20.0	40.0	15.0	0.0	10.0	---	0.0	---	
PERCENT PHOSPHORUS	% wt	0.1	---	0.1	0.4	0.1	0.0	0.1	---	0.0	---	
PERCENT POTASSIUM	% wt	0.2	---	0.2	1.1	0.1	0.0	0.1	---	0.0	---	
NOTES		NOTE 5	NOTE 1/2	---	---	---	NOTE 3	---	NOTE 6	NOTE 6	NOTE 6	

NOTES:

1. BIOGAS VOLUMETRIC FLOW EXPRESSED AS Nm^3/day.
2. BIOGAS COMPOSITION REPORTED ON A DRY BASIS.
3. "STREAM 17" IS NOT INCLUDED. "STREAM 3, 7" HAVE BEEN CONFIRMED AND ADDED AS PART OF A DESIGN CHANGE. PER EPEA APPLICATION SECTION 5.3, STUDIES WERE COMPLETED CONFIRMING POTENTIAL TO REUSE APPROXIMATELY 25% OF LIQUID DIGESTATE (UPSTREAM OF THE DIGESTATE POND) AS PROCESS WATER FOR THE MANURE BLEND TANKS.
4. "STREAM 6" WAS NOT INCLUDED IN THE ORIGINAL APPLICATION, ADDED AS PART OF A DESIGN CHANGE.
5. "STREAM 12" MASS FLOW SPLIT BETWEEN SIX ANAEROBIC DIGESTER TANKS.
6. "STREAM 19, 20, 21" VALUES WERE NOT INCLUDED IN ORIGINAL APPLICATION, ADDED FOR REFERENCE.
7. "STREAM 4" MASS FLOW SPLIT BETWEEN TWO DIGESTER FEED TANKS.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
A	22-12-15	WC	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)
B	23-02-07	WC	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)
C	23-06-06	JNG	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)
D	23-07-14	JNG	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)

SEAL:

PERMIT:

TIDEWATER RENEWABLES

OBSIDIAN ENGINEERING

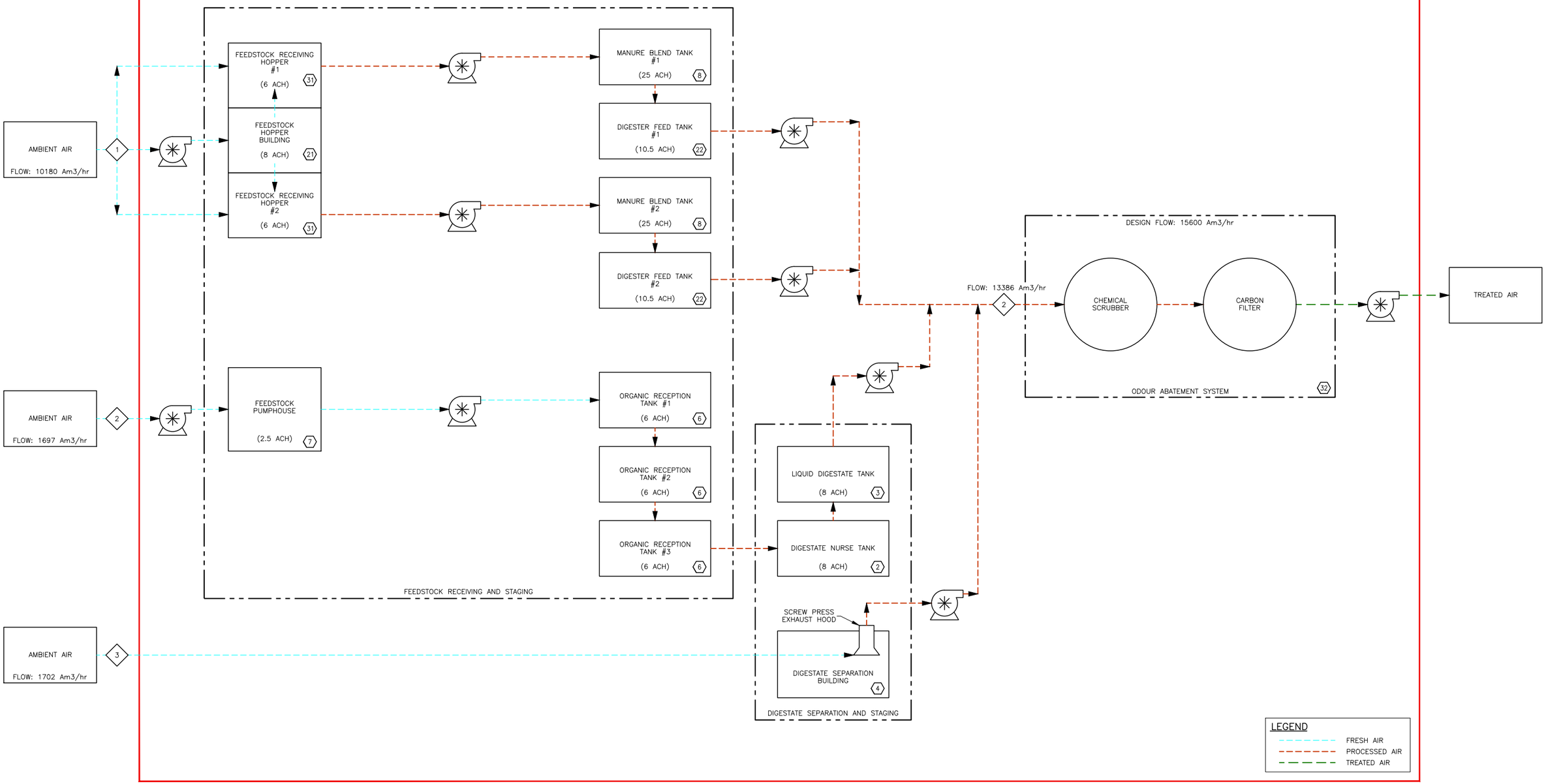
RIMROCK RNG PLANT LSD: 16-06-019-29 W4M

BIODIGESTER FACILITY
MASS BALANCE
OVERALL PROCESS FLOW DIAGRAM

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
N.T.S.	WC	22-12-06	21RG0001	RMR-32-BFD-0000-0002-01	D

X:_DRAFTING\CLIENTS\TIDEWATER RENEWABLES\RIMROCK\001 (16-06-019-29 W4M)\2.10_MECHANICAL\2.13_PFD\RMR-32-BFD-0000-0002-01.DWG, 2023-07-14 2:35:25, John Gian

Attachment F – Odour Abatement System Process Flow Diagram



NOTES:

1. NUMERICAL LABELS IN HEXAGON CORRESPONDS TO PROCESS EQUIPMENT AS SHOWN IN FIGURE 5-2.
2. MAIN PROCESS AREAS ARE DENOTED BY OUTLINED GROUPINGS AND LABELING, WHICH CORRESPONDS TO FIGURE 5-1.
3. ASSUMING MANURE BLEND TANKS AND DIGESTER FEED TANKS ARE 50% FULL. ACTUAL ACH WILL VARY DEPENDING ON ACTIVE VOLUME.

REV.	DATE: YY-MM-DD	BY	CHK'D DFTG	CHK'D ENG	APP'D PM	REVISION
A	23-06-30	JNG	TE	RMF	RF	ISSUED FOR REGULATORY (OEC#3007)

SEAL:

PERMIT:

TIDEWATER RENEWABLES

OBSIDIAN ENGINEERING

RIMROCK RNG PLANT LSD: 16-06-019-29 W4M

BIODIGESTER FACILITY

ODOUR ABATEMENT SYSTEM PROCESS FLOW DIAGRAM

SCALE:	DRAWN BY:	DATE CREATED:	PROJECT NO.	DRAWING NO.	REV.
N.T.S.	WC	22-12-06	21RG0001	RMR-32-BFD-0000-0003-01	A

X:_DRAFTING\CLIENTS\TIDEWATER RENEWABLES\RIMROCK\001 (16-06-019-29 W4M)\2.10_MECHANICAL\2.13_PFD\RMR-32-BFD-0000-0003-01.DWG, 2023-06-30 4:10:59, John Gian

Attachment G – Storage Tanks and Material Storage Tables

- Updated Application Table 5-7: Storage Tanks
- Updated Application Table 5-8: Material Storage

Table 5-7 Storage Tank Summary

Tank Description	Location	Contents	Tank Size (m^3)[5]	Placement	Material Type	Corrosion Control	Secondary Containmen[1] Description	Overfill Protection	Method of Leak Detection	Type of Vents	Max True Vapour Pressure	Fugitive Emission Controls
Manure Blend Tanks (two total)	Located adjacent to feedstock pumphouse on backside of feedstock hopper building	Mixture of livestock manure and water or liquid digestate	400	Both below and above ground (total height of 6.10 m with 2.44 m above grade)	Concrete	Coating selection pending [2]	LLDPE liner installed below and surrounding	Level Detection with automatic feed shutoffs[4]	Detected via tile in footing to dual observation dry well[3, 6]	Headspace vented to odour abatement system via digester feed tanks	N/A	N/A
Digester Feed Tanks (two total)	Located adjacent to blend tanks and hopper building	Mixture of livestock manure and water or liquid digestate	942	Both below and above ground (total height of 6.10 m with 2.44 m above grade)	Concrete	Coating selection pending [2]	LLDPE liner installed below and surrounding	Level Detection with automatic feed shutoffs[4]	Detected via tile in footing to dual observation dry well[3, 6]	Headspace vented to odour abatement system	N/A	N/A
Organic Reception Tanks (three total)	Located beside feedstock pumphouse building	Organic food resources and water	565	Below ground (total height of 3.66 m)	Concrete	Coating selection pending [2]	LLDPE liner installed below and surrounding	Level detection and concrete lips around top of the tanks to prevent effects of spillage or foaming[4]	Detected via tile in footing to dual observation dry well[3,6]	Headspace vented to odour abatement system via digestate nurse tank and liquid digestate tank	N/A	N/A
Anaerobic Digester Tanks (six total)	North of freshwater reservoir; south of feedstock pumphouse building	Feedstock and digestate	8,690	Both below and above ground (total concrete height of 8.53 m with above grade portion of 3.66 m[6])	Concrete	Concrete crystalline admixtures	LLDPE liner installed below and surrounding	Level detection with automatic feed shutoffs[4]	Detected via tile in footing to dual observation dry well[3, 5]	Biogas vented to biogas upgrader Emergency pressure relief valve	4.5 mbar	Biogas storage membranes (primary control)
Digestate Nurse Tank (one total)	Located North of the feedstock	Digestate	400	Both below and above ground (total height of	Concrete	Coating selection pending [2]	LLDPE liner installed	Level detection with	Detected via tile in footing to	Headspace vented to odour	N/A	N/A

Tank Description	Location	Contents	Tank Size (m^3)[5]	Placement	Material Type	Corrosion Control	Secondary Containmen[1] Description	Overfill Protection	Method of Leak Detection	Type of Vents	Max True Vapour Pressure	Fugitive Emission Controls
	pumphouse building			6.10 m with 2.44 m above grade)			below and surrounding	automatic feed shutoffs[4]	dual observation dry well[3, 6]	abatement system via liquid digestate tank		
Liquid Digestate Tank (one total)	Located North of the feedstock pumphouse building	Liquid digestate	400	Both below and above ground (total height of 6.10 m with 2.44 m above grade)	Concrete	Coating selection pending [2]	LLDPE liner installed below and surrounding	Level detection with automatic feed shutoffs[4]	Detected via tile in footing to dual observation dry well[3,6]	Headspace vented to odour abatement system	N/A	N/A
Sulfuric Acid Day Tank	Located adjacent to odour abatement system	Sulfuric Acid (93%)	1.3	Above ground	Plastic	TBD	Double-walled tank or equivalent	TBD	TBD	TBD	N/A	N/A

Notes:

[1] See tank drawings in **Attachment D** for process tanks and **Appendix G** (**from original EPEA Application)** for detail on digester tanks. As tertiary containment, the liquid digestate pond has been sized to accommodate an upset event of these materials (see **Attachment J,** Stormwater Management Plan).

[2]Coating options under consideration include internal spray on epoxy coating, plastic wall liner, or concrete crystalline admixtures. Coating selected will resist low pH feedstocks.

[3] Dual observation dry wells consisting of one well tied into perforated tile to detect leaks from tank wall and second well connected via weeping tile to detect leak from the tank liner (see tank drawings in **Attachment D** for monitoring station detail). The proposed groundwater monitoring well network includes down gradient wells for additional leak detection (refer to Figure 4-4 in **Attachment C**).

[4]In the event of an aboveground tank release, clay ditches onsite will act as a conveyance to the liquid digestate pond (see **Attachment J,** Stormwater Management Plan).

[5]Tank volumes provided represent the full tanks capacity for each individual tank however, normal operations conditions will remain below this volume.

[6]Anaerobic digester tank height in this table does not include the 4.8 m membrane (i.e., represents the concrete portion only).

Table 5-8: Summary of Material Staging Areas and Storage

Description	Location	Contents	Capacity	Placement	Material for Containment
Freshwater Reservoir	Located east of liquid digestate pond	Water diverted from Highwood River	25,000 m^3	Below ground	Compacted clay liner
Feedstock Receiving Hopper (two total)	Located on either end of the Feedstock Hopper Building	Livestock manure	440 m^3 [1]	Below ground	Metal hopper in concrete lined bays
Manure Staging Area	Located in the feedstock receiving area	Livestock manure	5,000 tonnes (maximum)	At grade	Rolled Compacted Concrete (RCC) pad (with runoff to stormwater conveyance system to the liquid digestate pond)
Liquid Digestate Pond	Located west of the freshwater reservoir	Liquid digestate and stormwater	180,000 m^3	Below ground	HDPE liner
Solid Digestate Staging Bays (five total)	Located inside digestate separation building	Solid digestate	750 m^3 [2]	At grade	Concrete slab on-grade pad (with runoff to stormwater conveyance system to the liquid digestate pond)
Digestate Staging Area	Located east of the digestate separation building	Solid digestate	10, 000 tonnes (maximum)	At grade	RCC pad (with runoff to stormwater conveyance system to the liquid digestate pond)

Notes:
[1]Combined capacity for two (2) feedstock receiving hoppers.
[2]Combined capacity of five (5) bays.

Attachment H – BIOREM Technical Proposal

BIOREM Technical Proposal

Project Name: Tidewater RimRock AD

BIOREM#: 23-00336

Revision: 1

Date: July 12, 2023

Local Representative (Calgary)
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LEADING INNOVATION IN BIO-ENGINEERED AIR CONTROL TECHNOLOGIES

Founded in 1991, BIOREM® is a global clean technology engineering company with one objective: engineer, design, manufacture and distribute the most innovative and effective biological-based emissions abatement technologies in the world.

As a leader in emissions abatement, our engineering teams have installed more than 1,200 projects worldwide. We specialize in tackling the exceptionally difficult problems of odour, volatile organic compounds (VOCs), and hazardous air pollutants, then engineering innovative solutions for the lowest life cycle cost of any technology.

BIOREM offers a lifetime commitment that our engineered systems will solve your air emissions and odour control problems. At the core of our business strategy is to be your trusted partner.

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Engineering the Difference

Superior physical, chemical and biological solutions that effectively and reliably control air emissions require advanced engineering knowledge and expertise. This is why all BIOREM teams are multidisciplinary units comprising biological, chemical, environmental and mechanical engineers and scientists.

Revision History

Number	Description	Date	Author
0	Initial proposal	June 20, 2023	AR / Bill
1	Updated Airflows and Concentrations	July 12, 2023	Bill

Contents

Project Details

Table 1 - Inlet Foul Air Quality

Process Parameter	Value
Flow Rate	Up to 15,600 m3/h (Operating Flow: 13,386m3/h with a 117% buffer) [NOTE 1]
Temperature	5C – 40 C
Relative Humidity	30% - 100% RH
Average H_2S Concentration	0 to 20 mg/m3 (Operating: 1.07 mg/m3 with a 1869% buffer)
Ammonia NH_3 Concentration	0 to 100 mg/m3 (Operating 43.98 mg/m3 with a 227% buffer)

Table 2: Overall System Configuration and Common Utilities

Design Parameter	Value
System Configuration	Chemical Scrubber followed by Dry Scrubber
Estimated Sulfuric Acid Consumption (@ average 44 mg/m3 NH3 concentration and 15,600 m3/h)	11,000 Litres / Year (93 % strength)
Estimated Blow Down (Ammonia Sulfate)	550 Litres / Day
Estimated Water Consumption	1,200 Litres / Day
Electrical Supply Required	575 V / 3PH / 60Hz, 50 amp supply
Estimated Electrical Consumption	164,000 kW·h/year
Estimated Carbon Life (@ average 1.07 mg/m3 H2S concentration)	3 years
Estimated System Footprint	32 ft x 14 ft

NOTE 1: Calculated operating air flow includes air flow through the Feedstock Receiving Hoppers/Building, Manure Blend Tanks, Digester Feed Tanks, Organic Reception Tanks, Digestate Nurse Tank, Liquid Digestate Tank, and Digestate Separation Building

Table 3: Client Water Quality Requirements

Design Parameter	Value
pH	5 - 8
Total Suspended Solids	<5 mg/L
Hardness	<100 mg/L
Biological Oxygen Demand	<5 mg/L
Total Nitrogen	<5 mg/L
Total Phosphorus	<5 mg/L
Free Chlorine	<2 mg/L
Turbidity	<25 NTU
Recommended Source	Potable preferred

Table 4: Chemical and Dry Scrubber Vessel Design

Design Parameter	Chemical Scrubber	Dry Scrubber
MODEL #	**MytilusCS 5-1**	**Mark V Dual Lift 11-2**
Number of Vessels	1	1
Vessel Dimensions	5 ft diameter : 14 ft height	11 ft diameter : 9 ft height
Vessel Empty Weight	3,100 lbs	6,900 lbs
Vessel Operating Weight	9,000 lbs	39,000 lbs
Number of Internal Treatment Stages	1: Chemical scrubber for ammonia removal	1. Dry scrubber for H_2S, RSCs, MM and VOC removal
EBRT	1 second	4 seconds
Water Recirculation Rate	89 gpm each	N/A
Drain Water pH	3 - 4	N/A
Sample Ports	8	2

System Performance

A. When loaded up to the design flow and average H_2S concentration, the carbon adsorption stage will achieve 95% or greater removal of H_2S when the inlet levels are below 20 mg/m3. If the inlet concentrations are less than 3mg/m3, the outlet concentrations will below **0.15 mg/m3** until the carbon bed is saturated.

B. At the design flow and average NH_3 concentration, the chemical scrubber stage will achieve up to **99%** removal of NH_3 when the inlets levels are below 100 mg/m^3. When inlet levels are below 20 mg/m3, the outlet concentration levels shall be less than **0.2 mg/m3** NH_3.

C. At the design flow rate, the carbon adsorption stage is capable of achieving **95% or greater removal** of the reduced sulfur compounds (RSCs), the methyl mercaptan (MM) concentrations, and the volatile organic compounds (VOC) concentrations when each inlet concentration levels are below 20mg/m3.

Operational Controls and Maintenance

Chemical Scrubber Operations and Maintenance (Ammonia Removal)

The chemical scrubber is equipped with a pH sensor that automatically doses sulfuric acid into the system to maintain the pH at the setpoint prescribed by the manufacturer for optimal system performance. This pH sensor will be calibrated every three months to ensure that it is operating properly.

A level switch will be located in the sulfuric acid tank to ensure a supply of sulfuric acid is available for meeting system dosing requirements. The anticipated sulfuric acid consumption per year is 11,000L based on a 43.98 mg/m3 NH3 concentration present in process air. (See Table 2 above)

Carbon Filter Operations and Maintenance (H2S removal)

To determine performance of the carbon filter for project-specific operation, Rimrock Renewables will use a portable H2S detector and take H2S readings in the sampling ports provided in BIOREM's carbon unit. The unit comprises three sampling ports at different locations within the vessel per attached drawings. Measurements from these sampling ports will be taken over a period of time to determine the rate at which the media is being consumed. Once H2S is detected in the third (last) sampling port, Rimrock Renewables will then determine when a media change out is required, and to ensure the system continues to perform per the expected removal frequency. The estimated carbon filter life is approximately 3 years based on a 1.07 mg/m3 H2S concentration. The presence of hydrogen sulfide capacity will also indicate that there is capacity for methyl mercaptan, VOCs, and reduced sulfur compounds.

Warranties

A. The Manufacturer warrants that the chemical scrubber mass transfer packing will not degrade or decompose for a period of 10 years from the date of Substantial Completion, provided that the system is operated in accordance with the Manufacturer's printed Operation and Maintenance Manuals.

B. All mechanical components will be warranted free of manufacturing defects for a period of 12 months from Substantial Completion, or 18 months of shipment, whichever occurs first.

Scope of Supply

1. (1) Chemical scrubber vessel with integral recirculation sump, media support flooring, mist eliminator and all required access hatches and nozzles. Material of construction to be UV and H_2S resistant FRP. Includes two sampling ports for measuring removal efficiency.
2. (1) Dry scrubber vessel with media support flooring and all required access hatches and nozzles. Material of construction to be UV and H2S resistant FRP. Includes six sampling ports for predicting media life and two sampling ports for measuring removal efficiency.
3. ***By Others:*** *(2) Chemical storage tanks for sulfuric acid and blowdown, including any required accessories such as secondary containment, level transmitters, level alarm panel, eye wash and shower.*
4. Mass transfer packing, provided in bags approximately 10 cubic feet in size.
5. Activated carbon media, provided in skidded 40 lb bags.
6. (1) Butterfly damper for airflow isolation upstream of fan.
7. (1) Rectangular flexible transition piece on fan outlet, flange material of construction to be 304 stainless steel.
8. (2) 3 HP recirculation pump rated for 89 GPM at 100 ft head with a TEFC motor. Pumps will be arranged in duty-standby configuration.
9. (1) 20 HP centrifugal FRP exhaust fan rated up to 15,600 m3/h with a TEFC motor. Fan static pressure allows for 2 inWC pressure loss through external ductwork.
10. (1) Chemical metering skid consisting of:
    i. (1) Pre-plumbed floor mount panel with all required valves and instruments including pressure relief valve, pressure gauge, back pressure valve and calibration column.
    ii. (2) Duty-standby solenoid metering pumps.
11. (1) Schedule 80 PVC manifold with spiral spray nozzles for optimized coverage of chemical scrubber mass transfer media.
12. (1) Control Panel:
    i. NEMA 4X 304 stainless steel floor mount enclosure sized to suit during design.
    ii. (1) Door interlocked fused disconnect.
    iii. (1) Fused VFD for exhaust fan.
    iv. (2) Fused motor starters for recirculation pump.
    v. (1) 120 VAC control transformer complete with primary and secondary fusing.
    vi. (1) 24 VDC power supply.
    vii. Lot hand switches and status lights.
    viii. Lot terminal strips for field connections such as instrumentation and dry contacts to SCADA. Motors direct wire to starters.
13. (1) Waterbox:
    i. NEMA 4X 304 stainless steel pre-plumbed floor mount enclosure
    ii. (1) Flow indicator/switch, on recirculation line (local read).
    iii. (1) Variable area rotameter, on blowdown line (local read).

iv. (1) pH indicating transmitter, on recirculation line.

v. (1) Conductivity indicating transmitter, on recirculation line.

vi. (1) Pressure indicator, on water supply line (local read).

14. Lot fluid control valves and strainers Instrumentation and fluid control valves external to waterbox:

    i. (3) Air differential pressure indicators, across media beds (local read).

    ii. (6) Pressure indicators, on each inlet and outlet of exhaust fan and pumps (local read).

    iii. (1) Air temperature indicator, on inlet duct to system (local read).

    iv. (1) Lot fluid control valves and strainers.

15. Engineering Submittal packages.

16. Operation and Maintenance manuals.

17. Field services will consist of the following:

    i. (1) Trip of 2 days for system commissioning and operator training.

    ii. (1) Trip of 2 days for performance testing. Includes taking four odor samples to be analyzed by a third party laboratory.

Note: The control panel and waterbox are not rated for use in a hazardous classified location. They must be installed in an unclassified location as defined by NFPA 70 and NFPA 820.

Contractor Scope of Supply

Unless specified previously in this document, the following items listed are to be supplied by the Contractor and are not in the Manufacturer's Scope of Supply.

1. Heat tracing and insulation of all external piping
2. Insulation of all ducting
3. Provide all equipment offloading, temporary storage and placement.
4. Provide labor, materials and equipment for the installation and assembly of all BIOREM supplied equipment and instrumentation. Supply and install all other materials or equipment required for a complete operational system.
5. Provide labor for assembly of sound enclosures if applicable. Typical assembly includes caulking and anchoring of base channel to concrete pad, caulking and assembling of tongue and groove acoustic panels with HWH screws and installation of flashing along corners.
6. Site preparation and clearing of materials.
7. Design and supply an appropriately sized reinforced concrete slab to handle full load of applicable vessels, fans, control panels and waterboxes. Provide collection and analysis of any geotechnical data as required.
8. Design, supply and install appropriately sized anchor bolts for all equipment including vessels, fans, control panels and waterboxes.
9. Supply and install all required protective coatings or paint such as UV paint for piping or concrete paint.
10. Supply and install all external water piping and drain piping to and from vessels, waterboxes and other fluid equipment including heat tracing, insulation, piping supports, drainage traps where necessary and / or UV protective paint. If winterizing system, contractor to insulate differential pressure gauge enclosures.
11. Supply and install all hardware, supports, guide wires, duct gaskets, expansion joints and connectors needed for a complete and operational system.
12. Supply make-up water at a minimum pressure of 40 psi. Water analysis for hardness or other parameters as necessary.
13. Provide main electrical service and system field wiring outside the main odor control panel. All electrical requirements for heat tracing and equipment not specifically provided by BIOREM to be provided by others.
14. Media onsite storage and installation. The Contractor shall be required to remove vessel access covers, install and distribute media evenly across the vessel, assemble media irrigation system and reinstall covers.
15. Provide duct balancing, and system functional, hydrostatic, vibration and performance testing to be conducted by OTHERS as may be specified.

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BIOREM has established a rigorous code of ethics that upholds the highest level of ethical conduct, standards of practice and integrity pertaining to our professional duties. Anti-corruption measures are applied to all our projects from RFP through to commissioning and ongoing support.

Our partnerships with consulting engineers, contractors, municipalities, industry, suppliers and government regulators are carefully scrutinized and monitored to ensure our worldwide reputation for fair and transparent transactions is protected. We reserve the right to refuse business based on ethical considerations.

PERFORMANCE GUARANTEED

We guarantee that the performance of our products and systems will meet or exceed your expectations. From initial discussions where we learn about the problems that you need solving, through to expert assessments, precision manufacturing, timely distribution, user-friendly training and complete administrative support, we hold ourselves to the highest standards.

It is our promise to you

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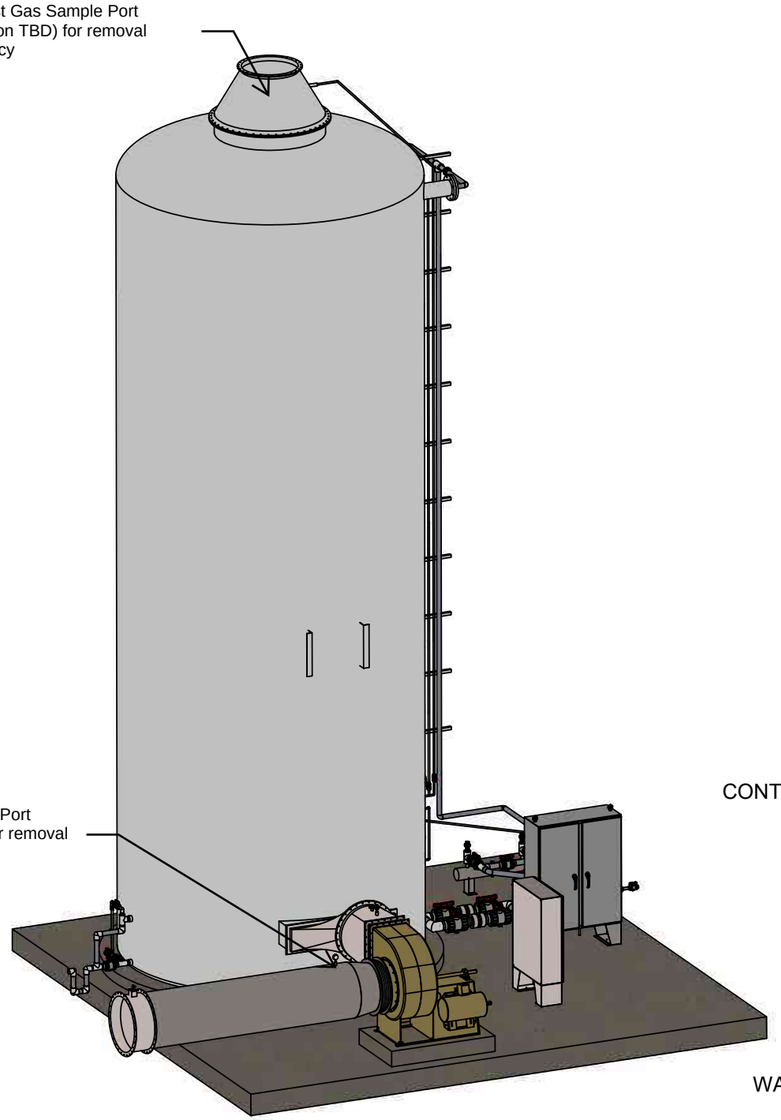
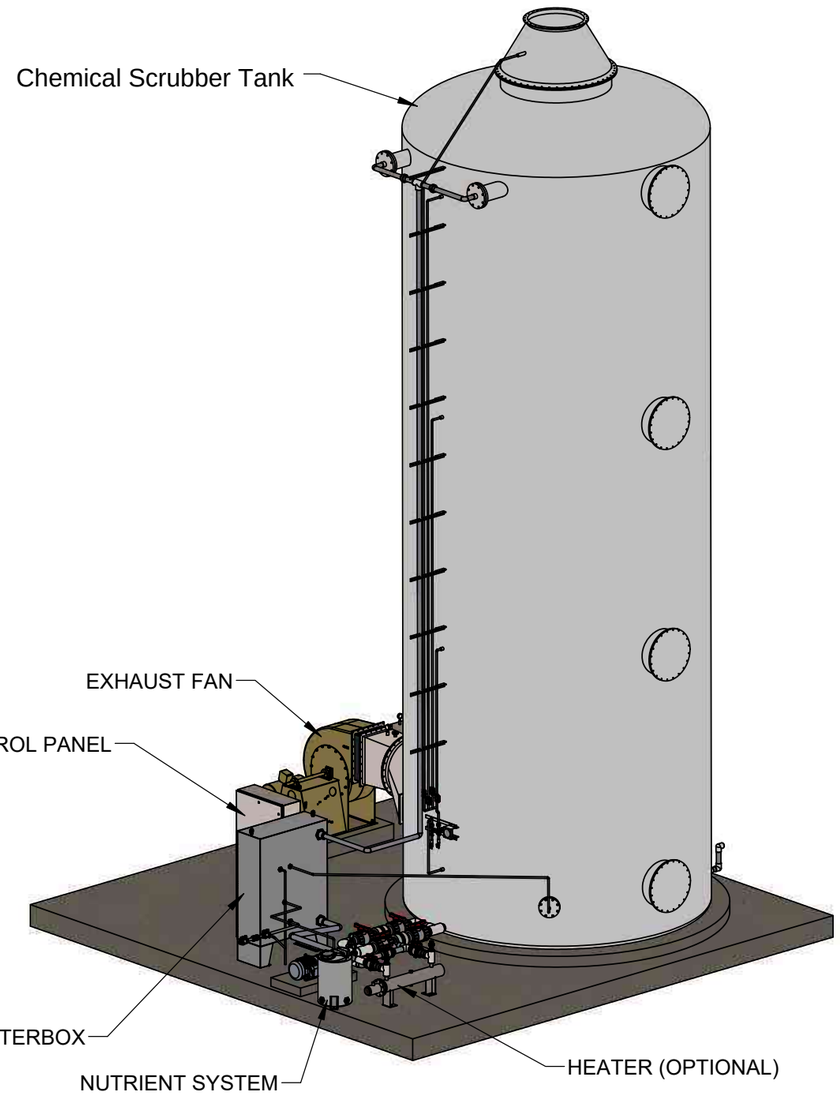
Beijing, China 100084
+86(10)6530 5080

REVISIONS			
REV.	DATE	DESCRIPTION	BY

PRELIMINARY DRAWINGS.
NOT FOR CONSTRUCTION.

SYSTEM (TANK DIAMETER [FT] - NUMTER OF LIFTS)	TANK DRY WEIGHT (LBS)	TANK OPERATING WEIGHT (LBS)
4-1	1700	5300
6-1	2100	10200
6-2	3200	15800
8-1	2600	16900
8-2	3900	26300
8-3	5100	35500
10-1	3000	25400
10-2	4500	39400
10-3	6000	53500
12-1	3500	35700
12-2	5200	55500
12-3	6900	75300





NOTES:

1. ALL GASKETS (TO BE EPDM), HARDWARE, PVC PIPING, DUCTWORK AND SUPPORTS FOR INTERCONNECTING DUCTWORK & PIPING BY OTHERS. ALL ANCHORAGE HARDWARE BY OTHERS.
2. ALL EXPOSED PIPING AND PUMP CAVITIES TO BE HEAT TRACED & INSULATED, IF REQUIRED, BY OTHERS.
3. VESSEL, FAN & WATERBOX HOUSEKEEPING PADS BY OTHERS
4. WATERBOX & ELECTRICAL CONTROL PANEL TO BE A MINIMUM DISTANCE OF 3 FT FROM ANY FOUL AIR SOURCE IN ACCORDANCE WITH NFPA 820 VENTILATION "C" AREA STANDARDS.
5. CONTRACTOR IS RESPONSIBLE FOR ANY/ALL FIELD CUTTING (IF REQUIRED)

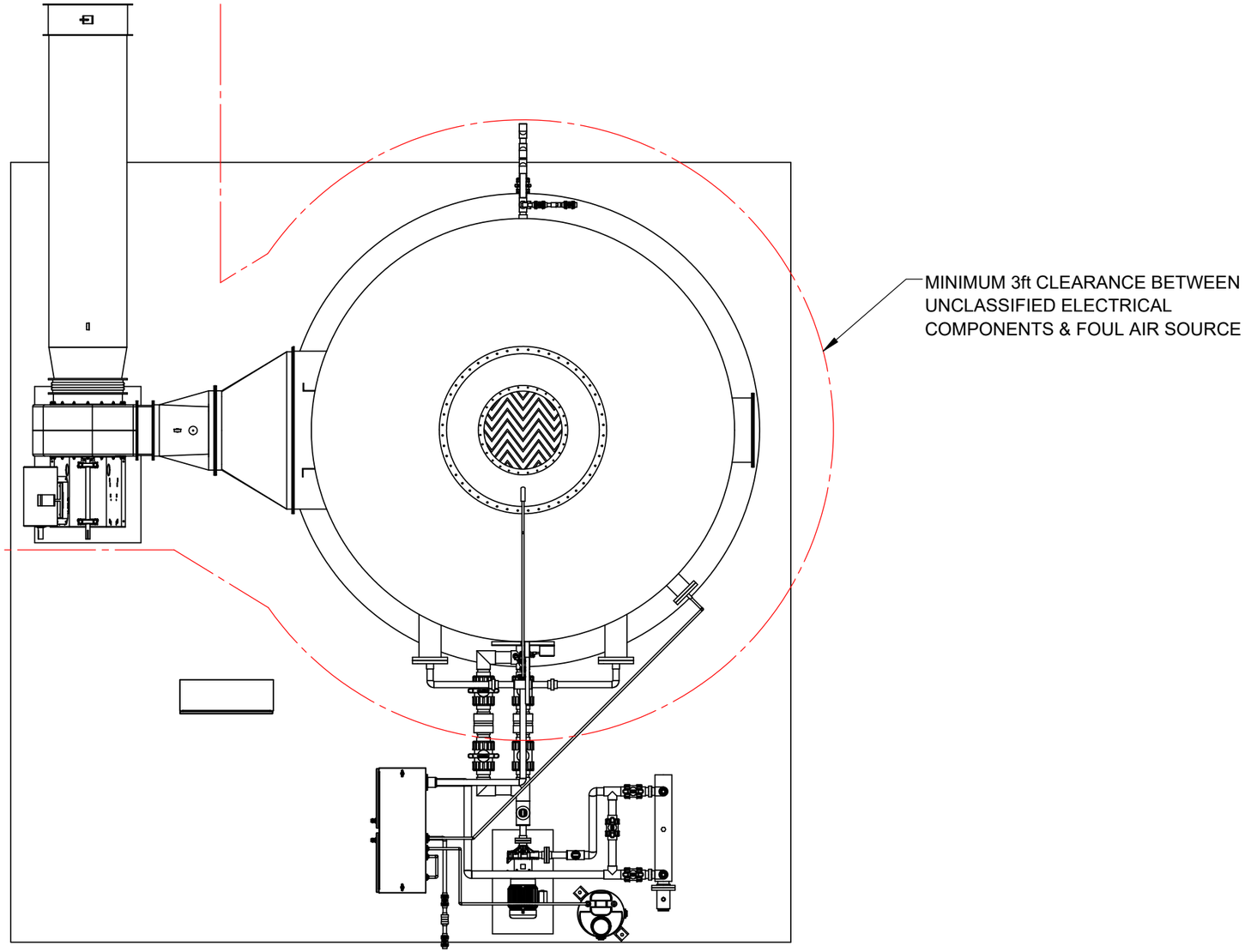
BIOREM
experience. integrity. performance.

APPROVAL	NAME	DD/MM/YY
DRAWN BY:	DS	14/05/2018
DESIGNED BY:	DS	14/05/2018
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS IN INCHES
2. TOLERANCES:
FRACTIONS ± 1/32
2 PLACE DEC. ±.030
3 PLACE DEC. ±.010
ANGLES ±1.0°

SCALE: NTS
MATERIAL:

CLIENT: BIOREM STD. SYSTEMS
TITLE:
PROJECT:
SIZE: B
DRAWING NUMBER: SHT 1 OF 5
REV: 0



PRELIMINARY DRAWINGS.
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APPROVAL	NAME	DD/MM/YY
DRAWN BY:	DS	14/05/2018
DESIGNED BY:	DS	14/05/2018
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS IN INCHES
2. TOLERANCES:
FRACTIONS ± 1/32
2 PLACE DEC. ±.030
3 PLACE DEC. ±.010
ANGLES ±1.0˚

SCALE: NTS
MATERIAL:

CLIENT: BIOREM STD. SYSTEMS

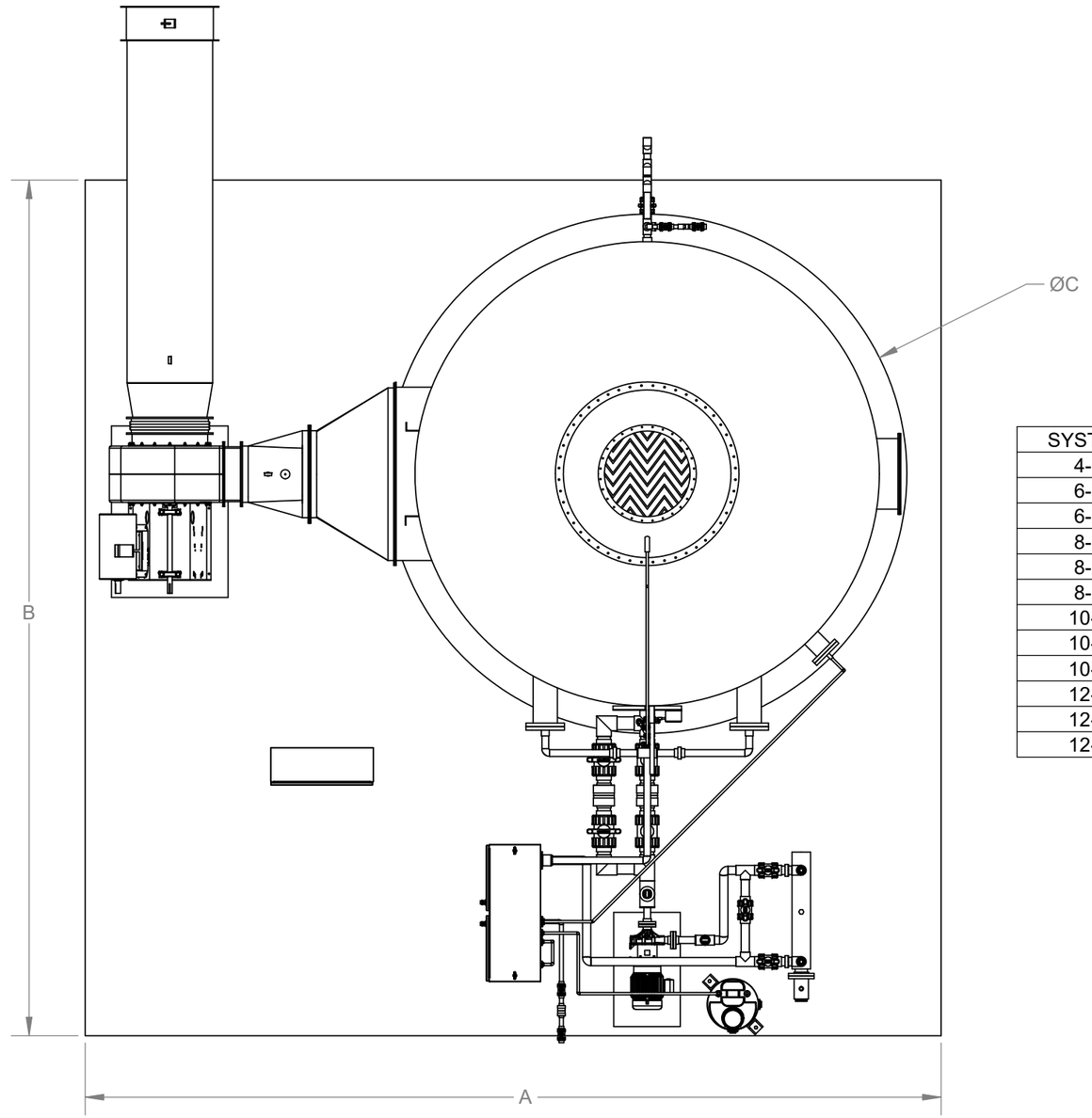
TITLE: STANDARD BTF SYSTEMS

PROJECT:

SIZE: B

DRAWING NUMBER: SHT 2 OF 5

REV: 0



SYSTEM	A	B	ØC
4-1	12'	14'	6'
6-1	16'	19'	8'
6-2	16'	19'	8'
8-1	19'	19'	10'
8-2	19'	19'	10'
8-3	19'	19'	10'
10-1	21'	21'	12'
10-2	21'	21'	12'
10-3	21'	21'	12'
12-1	24'	24'	14'
12-2	24'	24'	14'
12-3	24'	24'	14'

PRELIMINARY DRAWINGS.
NOT FOR CONSTRUCTION.

BIOREM
experience. integrity. performance.

APPROVAL	NAME	DD/MM/YY
DRAWN BY:	DS	14/05/2018
DESIGNED BY:	DS	14/05/2018
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS IN INCHES
2. TOLERANCES:
   FRACTIONS ± 1/32
   2 PLACE DEC. ±.030
   3 PLACE DEC. ±.010
   ANGLES ±1.0°

SCALE: NTS
MATERIAL:

CLIENT: BIOREM STD. SYSTEMS

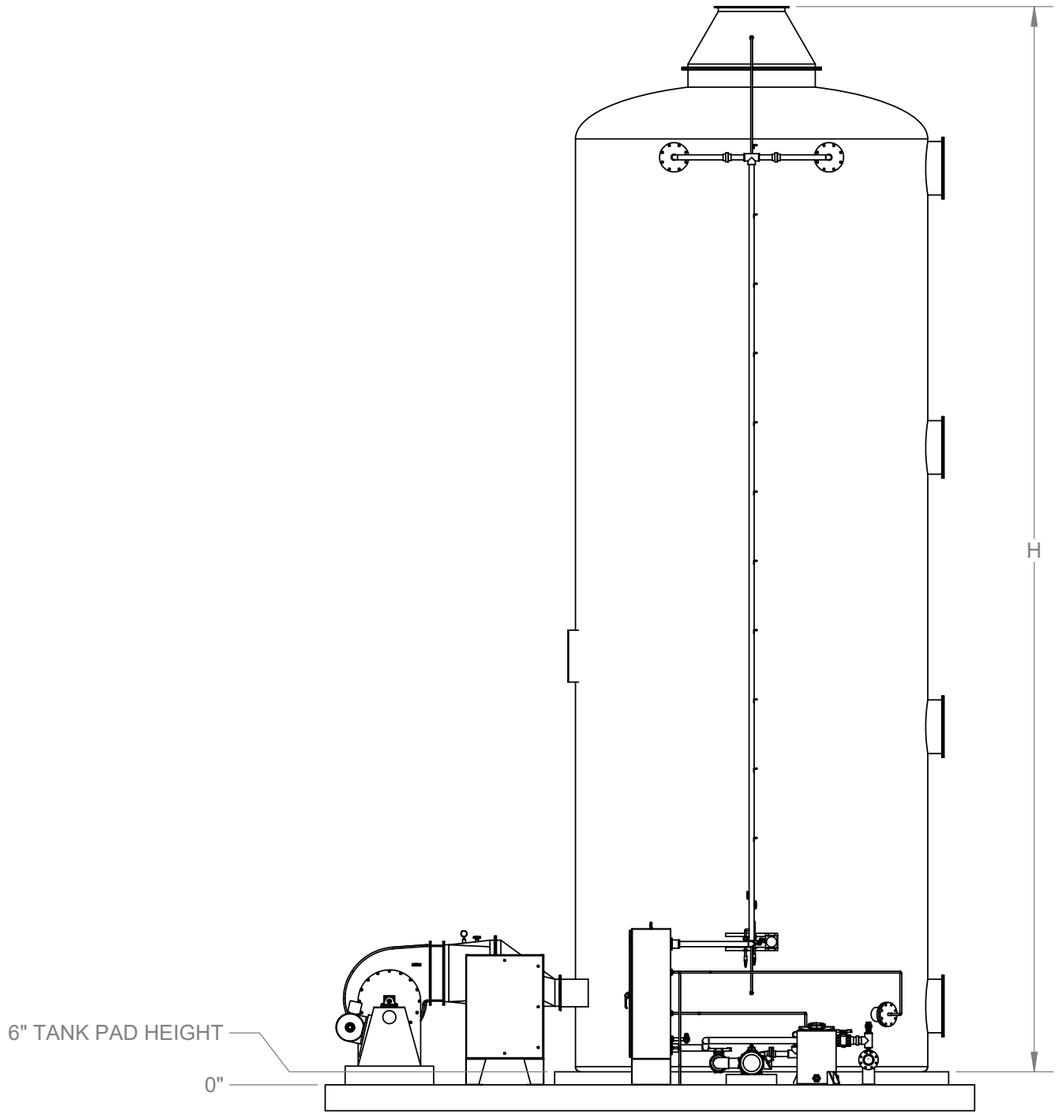
TITLE: STANDARD BTF SYSTEMS

PROJECT:

SIZE: B

DRAWING NUMBER: SHT 3 OF 5

REV: 0



SYSTEM	TANK HEIGHT 'H'
4-1	17'
6-1	18.5'
6-2	29'
8-1	19'
8-2	29.5'
8-3	40'
10-1	19'
10-2	30'
10-3	40.5'
12-1	19.5'
12-2	30.5'
12-3	41'

PRELIMINARY DRAWINGS.
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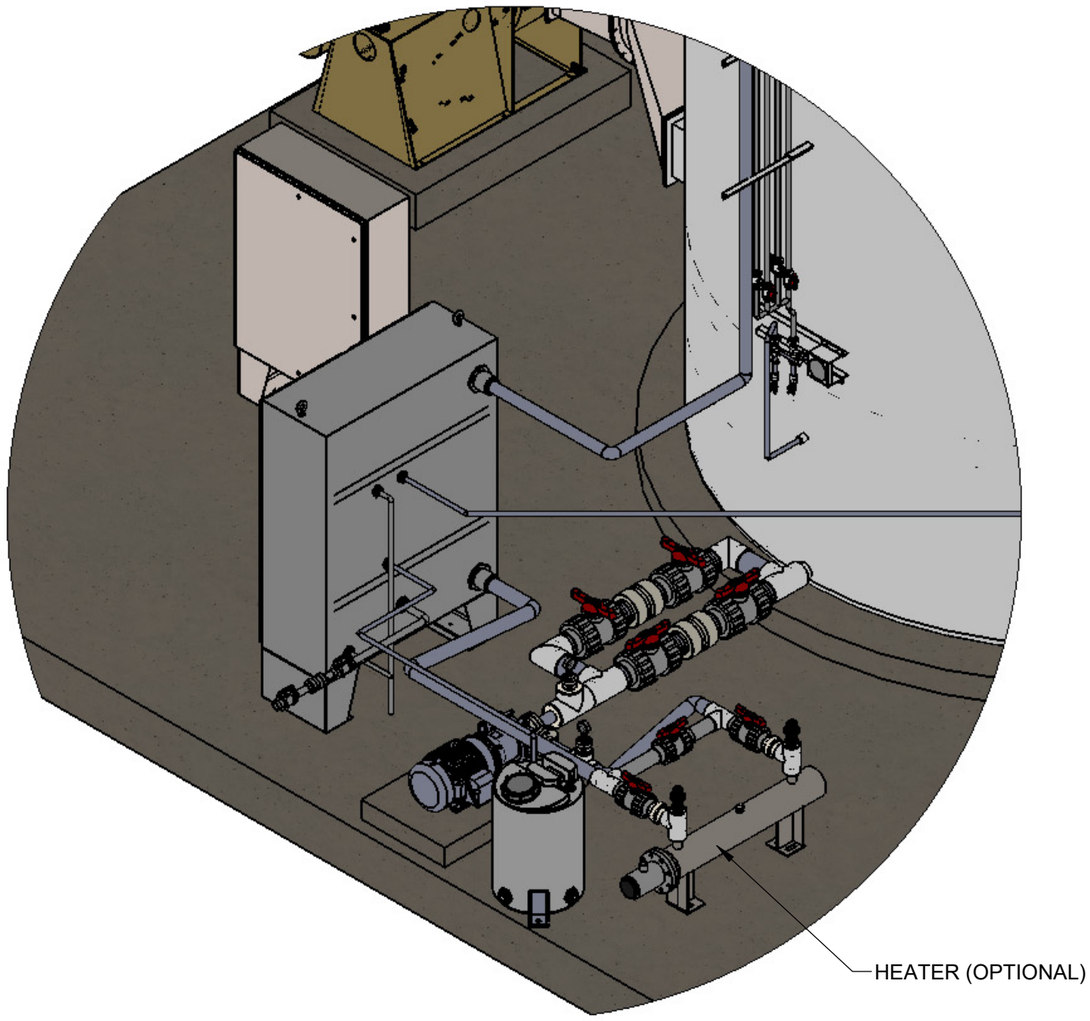
APPROVAL	NAME	DD/MM/YY
DRAWN BY:	DS	14/05/2018
DESIGNED BY:	DS	14/05/2018
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS IN INCHES
2. TOLERANCES:
FRACTIONS ± 1/32
2 PLACE DEC. ±.030
3 PLACE DEC. ±.010
ANGLES ±1.0°

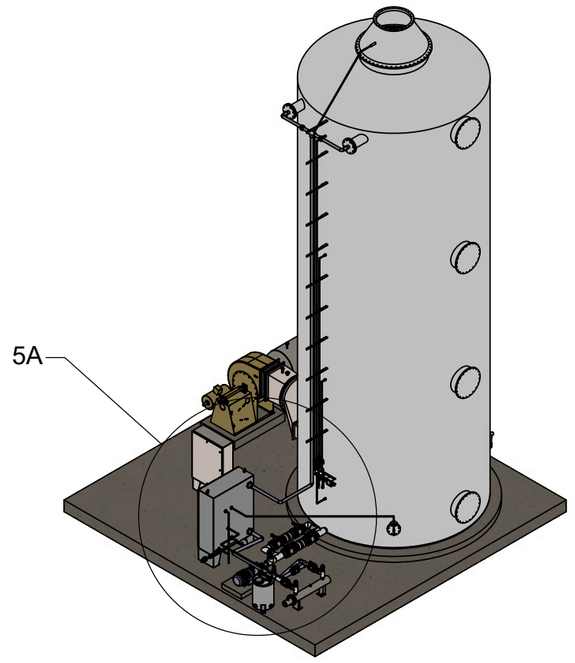
SCALE: NTS
MATERIAL:

CLIENT: BIOREM STD. SYSTEMS
TITLE: STANDARD BTF SYSTEMS
PROJECT:
SIZE: B
DRAWING NUMBER: SHT 4 OF 5
REV: 0

PRELIMINARY DRAWINGS.
NOT FOR CONSTRUCTION.



DETAIL 5A



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APPROVAL	NAME	DD/MM/YY
DRAWN BY:	DS	14/05/2018
DESIGNED BY:	DS	14/05/2018
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS IN INCHES
2. TOLERANCES:
   FRACTIONS ± 1/32
   2 PLACE DEC. ±.030
   3 PLACE DEC. ±.010
   ANGLES ±1.0°

SCALE: NTS
MATERIAL:

CLIENT: BIOREM STD. SYSTEMS

TITLE: STANDARD BTF SYSTEMS

PROJECT:

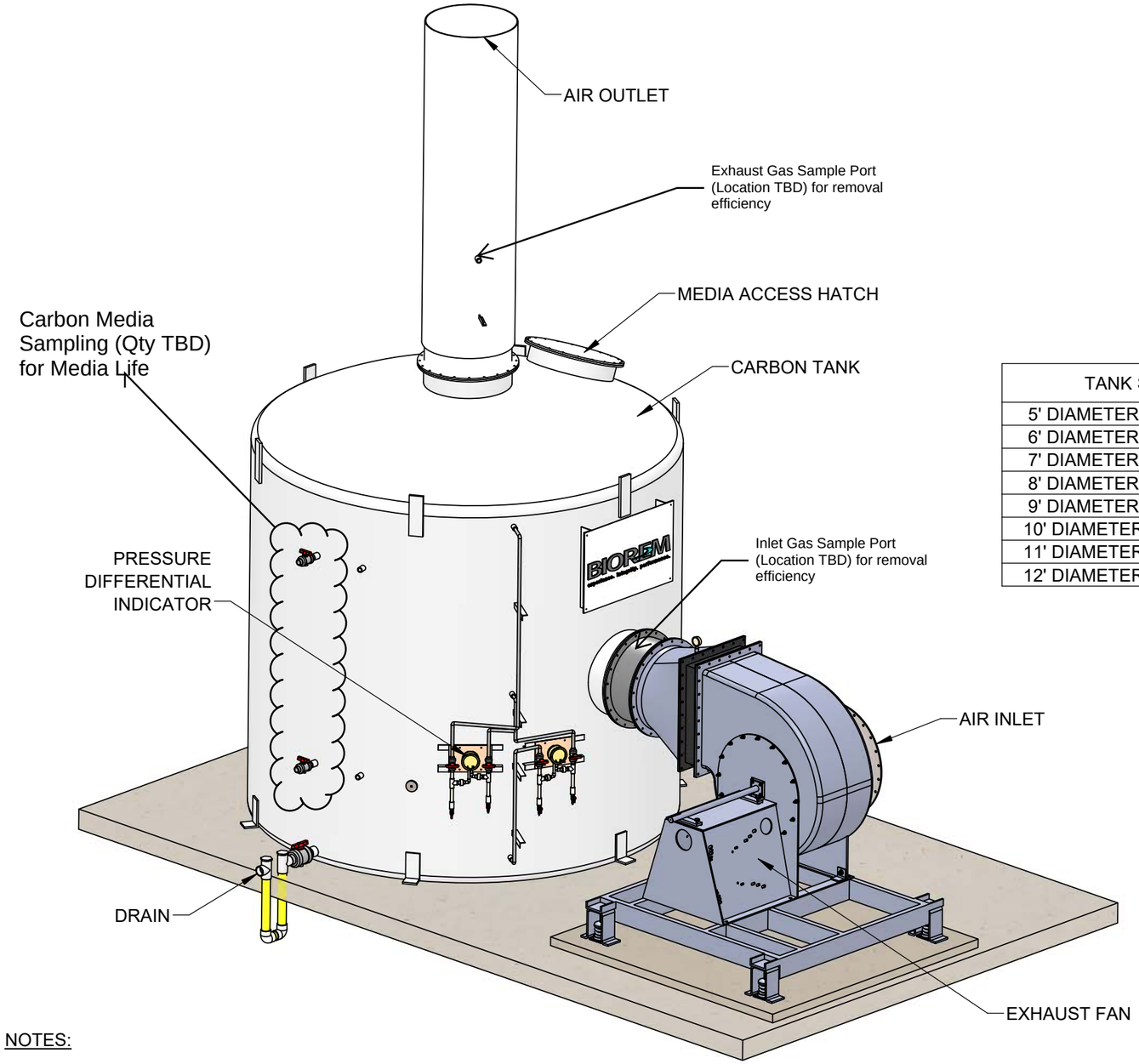
SIZE: B

DRAWING NUMBER: SHT 5 OF 5

REV: 0

REVISIONS			
REV.	DATE	DESCRIPTION	BY

PRELIMINARY DRAWINGS.
NOT FOR CONSTRUCTION.



TANK SIZE	AIRFLOW (CFM)	TANK EMPTY WEIGHT (LBS)	TANK OPERATING WEIGHT (LBS)
5' DIAMETER DUAL LIFT	2400	2400	5000
6' DIAMETER DUAL LIFT	3400	2800	6300
7' DIAMETER DUAL LIFT	4600	3300	8000
8' DIAMETER DUAL LIFT	6000	3900	10000
9' DIAMETER DUAL LIFT	7700	4500	12000
10' DIAMETER DUAL LIFT	9500	5100	14500
11' DIAMETER DUAL LIFT	11500	5700	17200
12' DIAMETER DUAL LIFT	13500	6300	20000

NOTES:

1. ALL GASKETS (TO BE EPDM), HARDWARE, PVC PIPING, DUCTWORK AND SUPPORTS FOR INTERCONNECTING DUCTWORK & PIPING BY OTHERS. ALL ANCHORAGE HARDWARE BY OTHERS.
2. VESSEL HOUSEKEEPING PAD BY OTHERS.
3. REFER TO P & ID DRAWING FOR SYSTEM INSTRUMENTATION & PROCESS FLOW DIAGRAM.
4. ELECTRICAL CONTROL PANEL TO BE A MINIMUM DISTANCE OF 3 FT FROM ANY FOUL AIR SOURCE IN ACCORDANCE WITH NFPA 820 VENTILATION "C" AREA STANDARDS.
5. ELECTRICAL JUNCTION BOX NOT SHOWN.

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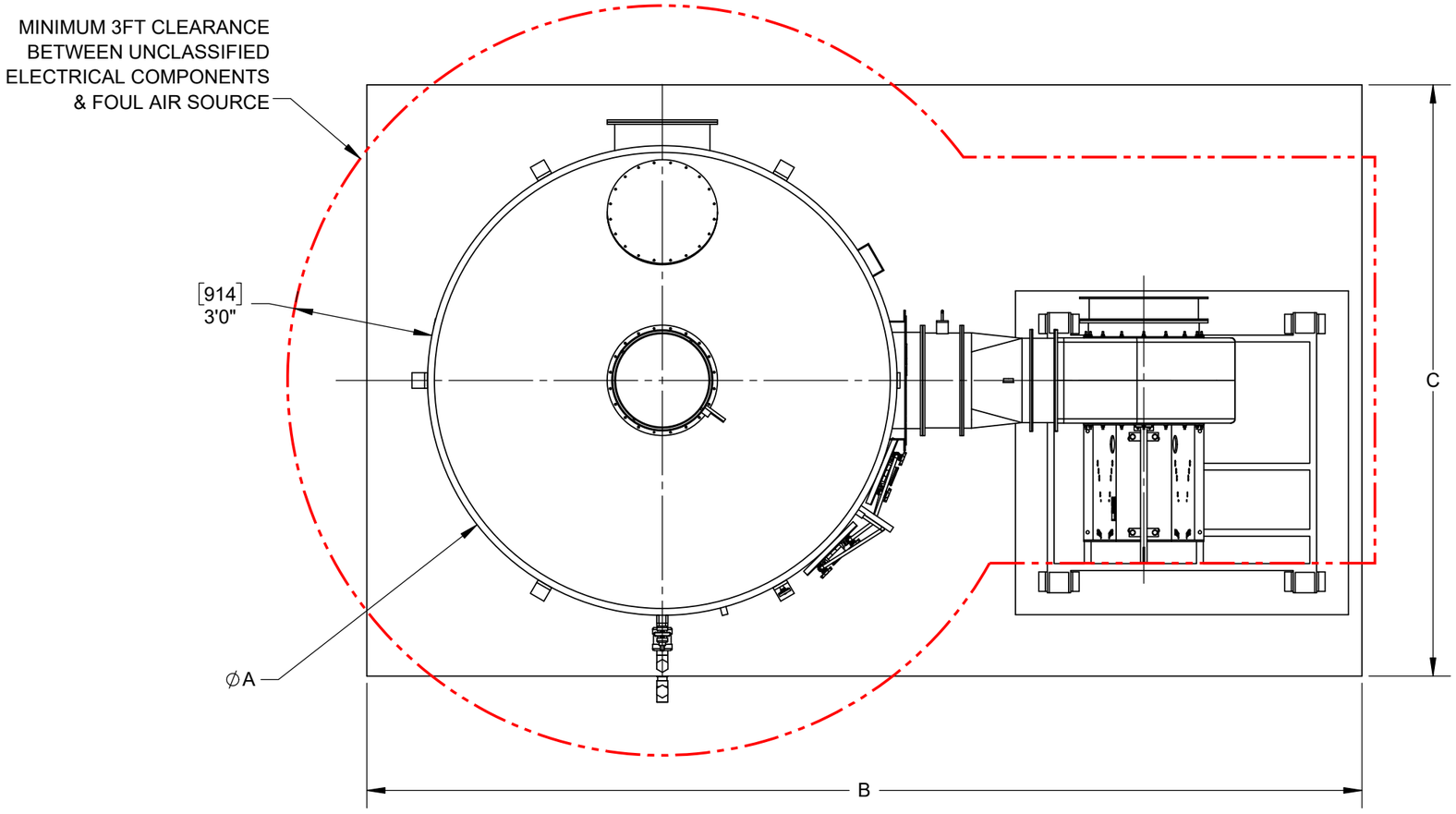
APPROVAL	NAME	DD/MM/YY
DRAWN BY:	LGA	23/06/2020
DESIGNED BY:	LGA	23/06/2020
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS IN INCHES
2. TOLERANCES:
FRACTIONS ± 1/32
2 PLACE DEC. ±.030
3 PLACE DEC. ±.010
ANGLES ±1.0°

SCALE: 1:36
MATERIAL:

CLIENT: BIOREM STANDARDS
TITLE: CARBON DUAL LIFT
PROJECT: N/A
SIZE: B
DRAWING NUMBER: N/A
SHT 1 OF 3
REV: 0

TANK SIZE	∅A' I.D.	B'	C'
5' DIAMETER DUAL LIFT	5'	16'	7'-8"
6' DIAMETER DUAL LIFT	6'	17'	8'-8"
7' DIAMETER DUAL LIFT	7'	18'	9'-8"
8' DIAMETER DUAL LIFT	8'	19'	10'-8"
9' DIAMETER DUAL LIFT	9'	20'	11'-8"
10' DIAMETER DUAL LIFT	10'	21'	12'-8"
11' DIAMETER DUAL LIFT	11'	22'	13'-8"
12' DIAMETER DUAL LIFT	12'	23'	14'-8"



PRELIMINARY DRAWINGS.
NOT FOR CONSTRUCTION.

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APPROVAL	NAME	DD/MM/YY
DRAWN BY:	LGA	23/06/2020
DESIGNED BY:	LGA	23/06/2020
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS IN INCHES
2. TOLERANCES:
FRACTIONS ± 1/32
2 PLACE DEC. ±.030
3 PLACE DEC. ±.010
ANGLES ±1.0°

SCALE: 1:36
MATERIAL:

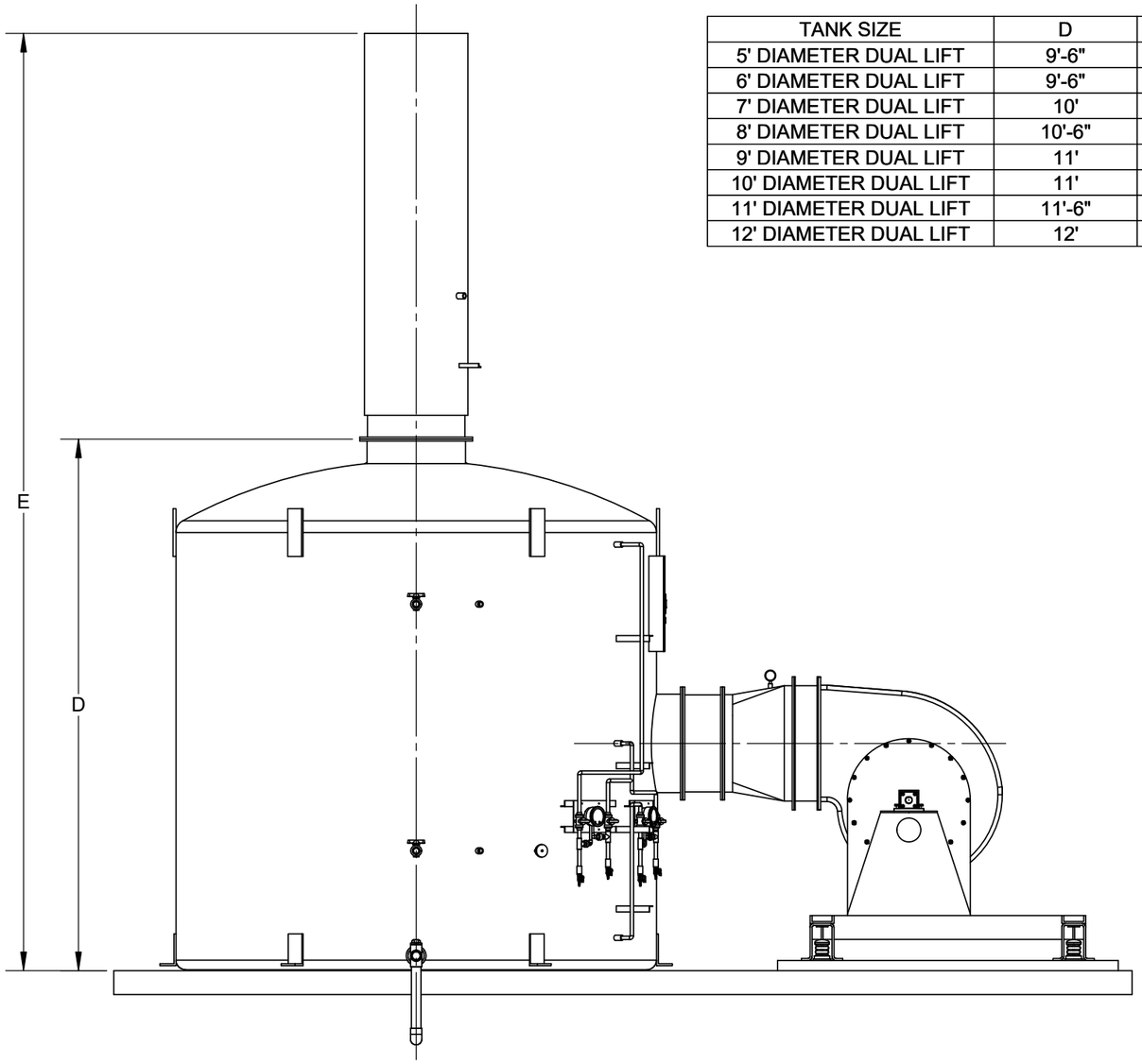
CLIENT: BIOREM STANDARDS

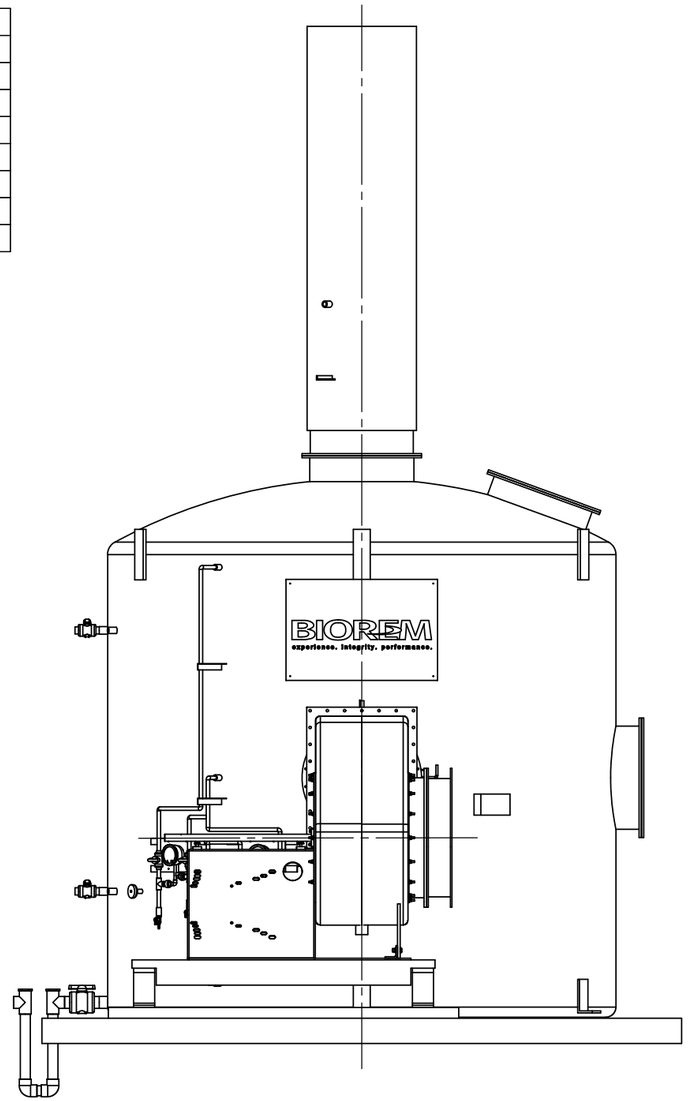
TITLE: CARBON DUAL LIFT

PROJECT: N/A

SIZE: B | DRAWING NUMBER: N/A | SHT 2 OF 3 | REV: 0

TANK SIZE	D	E
5' DIAMETER DUAL LIFT	9'-6"	18'
6' DIAMETER DUAL LIFT	9'-6"	18'
7' DIAMETER DUAL LIFT	10'	18'-6"
8' DIAMETER DUAL LIFT	10'-6"	19'
9' DIAMETER DUAL LIFT	11'	19'-8"
10' DIAMETER DUAL LIFT	11'	19'-8"
11' DIAMETER DUAL LIFT	11'-6"	19'-10"
12' DIAMETER DUAL LIFT	12'	20'





PRELIMINARY DRAWINGS.
NOT FOR CONSTRUCTION.

BIOREM
experience. integrity. performance.

APPROVAL	NAME	DD/MM/YY
DRAWN BY:	LGA	23/06/2020
DESIGNED BY:	LGA	23/06/2020
CHECKED BY:	CO	
PROJ MGR:		

UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS IN INCHES
2. TOLERANCES:
FRACTIONS ± 1/32
2 PLACE DEC. ±.030
3 PLACE DEC. ±.010
ANGLES ±1.0°

SCALE: 1:36
MATERIAL:

CLIENT: BIOREM STANDARDS

TITLE: CARBON DUAL LIFT

PROJECT: N/A

SIZE: B

DRAWING NUMBER: N/A

SHT 3 OF 3

REV: 0

Attachment I – Air Quality Assessment

Rimrock Renewables Ltd.
Rimrock Biodigester Facility
Air Quality Assessment

Prepared By: Horizon Compliance Group Inc.
Author: Ms. Annie Sun, PhD, EP
Date: July 2023
Revision: 0

HORIZON
COMPLIANCE

Executive Summary

Rimrock Renewables Ltd. (Rimrock), applied to Alberta Environment and Protected Areas (AEPA) under the *Environmental Protection and Enhancement Act* (*EPEA*) for an Approval to construct and operate the Rimrock Biodigester Facility (the Facility). The Facility is to be located within NW 05-019-29 W4M and NE 06-19-29 W4M. The *EPEA* Approval Application was assigned Application No. 001-484778.

On March 23, 2023, AEPA issued supplemental information request (SIR) No. 2 to proceed with the review of *EPEA* Approval Application No. 001-484778. In support of the SIR No. 2 response, Horizon Compliance Group Inc. (Horizon Compliance) has updated the Air Quality Assessment (AQA) for the odour compounds (hydrogen sulphide [H_2S] and ammonia [NH_3]) to reflect design changes including construction and operation of proposed pollution abatement equipment. These design changes include the installation of an odour abatement system (OAS) that treats emissions from numerous tanks and buildings, as well as a mechanical aeration in the liquid digestate pond polishing cell. Modelling of sulphur dioxide (SO_2) was also updated to reflect the change to flare stack location. There are no changes to the final design of the cogeneration units and heat medium heater (also referred to as a process heater), and as such, updates are not required for nitrogen oxides (NO_x) dispersion modelling.

Emission rate parameters for the odour compounds (H_2S and NH_3) have been updated by Obsidian Engineering Corp. (Obsidian) with support from Horizon Compliance and Rimrock Renewables. Summaries of the emissions updates are provided in Appendix A. Emission rates provided by Obsidian in Appendix A are reported in tonnes per day (t/d) as sulphur and nitrogen. Emission rates were converted from sulphur and nitrogen to H_2S and NH_3, respectively.

Dispersion modelling was performed using the United States Environmental Protection Agency (U.S. EPA) AERMOD v.22112 dispersion model, in accordance with the requirements outlined within the Alberta Environment and Parks (AEP) *Air Quality Model Guideline* (*AQMG*; AEP 2021a). The results of the SO_2, H_2S, and NH_3 dispersion modelling are summarized in Tables 1 to 3. The predicted maximum ground-level concentrations (MGLC) of SO_2 are predicted to comply with the *Alberta Ambient Air Quality Objectives* (*AAAQOs*; AEP, 2019). The predicted MGLC of H_2S and NH_3 are predicted to comply with the *AAAQOs* for the Project Case. The predicted MGLC of H_2S and NH_3 associated with the Baseline and Cumulative Cases are not in compliance with the applicable *AAAQOs*. However, ground-level concentrations from the Cumulative Case have reduced significantly from the Baseline Case. This indicates that the proposed Facility is predicted to result in a significant net positive improvement to air quality versus the current baseline operating conditions.

Table 1 SO_2 Dispersion Modelling Results

Averaging Period	UTM Coordinates (m E)	UTM Coordinates (m N)	Predicted (µg/m³)	Ambient Baseline (µg/m³)	MGLC (µg/m³)	*AAAQO* (µg/m³)
1-Hour	287023.81	5610332	5.3	1.7	7.0	**450**
24-Hour	288710.31	5608113.38	2.0	1.5	3.5	**125**
30-Day	288950	5608103.34	0.3	0.7	1.0	**30**

Table 2 H_2S Dispersion Modelling Results

Averaging Period	UTM Coordinates (m E)	UTM Coordinates (m N)	Predicted (µg/m³)	Ambient Baseline (µg/m³)	MGLC (µg/m³)	*AAAQO* (µg/m³)
Project Case (the Facility)						
1-Hour	288270.87	5608131.79	7.6	1.4	9.0	**14**
24-Hour	287507.45	5607545.25	2.6	1.0	3.6	**4**
Baseline Case (Rimrock Cattle Company Ltd. Feedlot – Current Operations) [(a)]						
1-Hour	288270.87	5608131.79	167.5	1.4	168.9	**14**
24-Hour	287507.45	5607545.25	63.8	1.0	64.8	**4**
Cumulative Case (Facility + Revised Rimrock Cattle Company Ltd. Feedlot) [(a)]						
1-Hour	287513.74	5607704.60	89.2	1.4	90.6	**14**
24-Hour	287508.24	5607565.17	35.3	1.0	36.3	**4**

(a) In this assessment, agricultural operations are regulated under the *Agricultural Operation Practices Act* (*AOPA*) by the Natural Resources Conservation Board (NRCB) and are not currently regulated under *EPEA* or by AEPA.

Table 3 NH_3 Dispersion Modelling Results

Averaging Period	UTM Coordinates (m E)	UTM Coordinates (m N)	Predicted (µg/m³)	Ambient Baseline (µg/m³)	MGLC (µg/m³)	*AAAQO* (µg/m³)
Project Case (the Facility)						
1-Hour	287991.23	5608143.5	246.6	11.8	258.4	**1,400**
Baseline Case (Rimrock Cattle Company Ltd. Feedlot – Current Operations) [(a)]						
1-Hour	288071.12	5608140.16	8761.3	11.8	8773.1	**1,400**
Cumulative Case (Facility + Revised Rimrock Cattle Company Ltd. Feedlot) [(a)]						
1-Hour	288051.15	5608140.99	4654.2	11.8	4666.0	**1,400**

(a) In this assessment, agricultural operations are regulated under the AOPA by the NRCB and are not currently regulated under EPEA or by AEPA.

List of Tables

List of Figures

List of Appendices

1 INTRODUCTION

Rimrock Renewables Ltd. (Rimrock)applied to Alberta Environment and Protected Areas (AEPA) under the *Environmental Protection and Enhancement Act* (*EPEA*) for an Approval to construct and operate the Rimrock Biodigester Facility (the Facility). The *EPEA* Approval Application was assigned Application No. 001-484778.

On March 23, 2023, AEPA issued supplemental information request (SIR) No. 2 to proceed with the review of *EPEA* Approval Application No. 001-484778. In support of the SIR No. 2 response, Horizon Compliance has updated the Air Quality Assessment (AQA) for the odour compounds (hydrogen sulphide [H_2S] and ammonia [NH_3]) to reflect design changes including construction and operation of proposed pollution abatement equipment. These include the installation of an that treats emissions from numerous tanks and buildings, as well as a mechanical aeration in the liquid digestate pond polishing cell. Modelling of sulphur dioxide (SO_2) was also updated to reflect the change to flare stack location. There are no changes to the final design of the cogeneration units and heat medium heater (also referred to as a process heater), and as such, updates are not required for nitrogen oxides (NO_x) dispersion modelling. Emission rate parameters for the odour compounds (H_2S and NH_3) have been updated by Obsidian with support from Horizon Compliance and Rimrock Renewables. Summaries of the emissions updates are provided in Appendix A. Emission rates provided by Obsidian in Appendix A are reported in tonnes per day (t/d) as sulphur and nitrogen. Emission rates were converted from sulphur and nitrogen to H_2S and NH_3, respectively.

The Facility is located on privately owned cultivated agricultural land within Foothills County, approximately 5.2 km west of the Town of High River in NW 05-19-29 W4M and NE 06-19-29 W4M (Latitude: 50.582598° N, Longitude: -113.997265° W). A Project Area Map is included on Figure 1 within Appendix B.

1.1 Topography

The Facility is located within the Bow River Basin watershed and lies within the Foothills Fescue Natural Subregion of the Grassland Natural Region of Alberta. Elevations range from approximately 800 m above sea level (masl) in the north near Drumheller to over 1,500 masl on the east slopes of the Porcupine Hills. The average elevation of the subregion is 1,100 masl (Downing & Pettapiece, 2006).

Within the modelled domain, elevations range from approximately 1,027 masl in the east along Highwood River and 1,277 masl along the west boundary. The base elevation of the Facility is 1,108 masl. A Topographical Map is included on Figure 2 within Appendix B.

1.2 Vegetation

Reference vegetation in the Foothills Fescue Natural Subregion is characterized by nearly level cultivated plains in the north and cool, high-elevation grassy uplands along the mountains to the south. Fifty percent of the subregion is cultivated, with approximately 80 percent native prairie in the south at higher elevations. Mountain rough fescue and bluebunch fescue are the dominant grasses on lightly

grazed native range. Grasslands in the subregion have a diverse herb species such as sticky purple geranium and silvery perennial lupine (Downing & Pettapiece, 2006).

1.3 Climatology

The Foothills Fescue Natural Subregion is characterized by cooler summers and shorter growing seasons, but warmer winters and more precipitation than other grassland subregions. Proximity to the mountains and a greater incidence of Chinooks are responsible for these characteristics. The month of maximum precipitation is June, but the subregion also receives significant precipitation in May (Downing & Pettapiece, 2006).

The mean annual precipitation is 470 mm. The mean date of the first fall frost is September 5, and the mean date of the last spring frost is June 1. On average, the frost-free period spans 97 days. The mean annual temperature ranges from 16.3°C at the warmest and -9.7°C at the coldest. The mean annual temperature is 3.9°C (Downing & Pettapiece, 2006).

1.4 Land Use and Population

Agriculture is the principal land use in the Foothills Fescue Natural Subregion with cultivation being variable and ranging from 80 percent in the plains to less than 20 percent in the hilly uplands where grazing predominates. Significant oil and gas activities occur in the foothills, and the subregion is popular for recreation (Downing & Pettapiece, 2006).

The town of High River, which is located approximately 5.2 km east of the Facility, has a population of 14,324 people (Statistics Canada, 2022).

2 DISPERSION MODELLING APPROACH

Dispersion modelling was performed using AERMOD dispersion model (V22112) in accordance with the requirements outlined within the Alberta Environment and Parks (AEP) *Air Quality Model Guideline* (*AQMG*; AEP, 2021a). Descriptions of the model, meteorological data, and elevated terrain are presented in the following sections.

The AQA recognizes that emissions from the Facility can interact with those from other industrial activities in the area. As such, information is provided on air quality associated with the emissions from nearby existing and approved industrial background sources in combination with emissions from the Facility. In this assessment, existing and approved “industrial” developments near the Facility are agricultural operations (confined feedlot operations [CFO]), which are regulated under the *Agricultural Operation Practices Act* (*AOPA*) by the Natural Resources Conservation Board (NRCB) and are not currently regulated under *EPEA* or by AEPA.

Additionally, potential contributions from natural sources or emission sources outside of the modelling domain are accounted for by the addition of ambient baseline concentrations. Details on the industrial background sources and the ambient baseline concentrations are presented in Sections 3.2 and 3.3, respectively.

2.1 Refined Model

The latest version of the AERMOD dispersion model (V22112) was used in the modelling. The AERMOD is a multi-source, steady state plume model that was developed by the United States Environmental Protection Agency (US EPA) in collaboration with the American Meteorological Society. It uses hourly meteorological data to estimate pollutant concentrations at specified computational points. It is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases.

AERMOD consists of two pre-processors as well as the dispersion model. The meteorological pre-processor (AERMET) is a stand-alone program which provides AERMOD with the information required to characterize the planetary boundary layer. The mapping program (AERMAP) is a stand-alone terrain pre-processor, which is used to both characterize terrain and generate receptor grids for AERMOD.

AERMOD also integrates the Building Profile Input Program Plume Rise Model Enhancements (BPIP-PRIME), allowing it to consider the wake (turbulence) effect caused by the presence of buildings on point source emissions.

2.2 Meteorological Data

Five years of meteorological data were extracted from the Weather Research Forecast (WRF) V4.2.1 Meteorological Dataset from the Alberta Environment and Parks for 2015-2019 (AEP, 2021b), using *Multi-model Extraction Utility 2* (*MMEU2*; AEP, 2021c). The extracted WRF subdomain is centred on the geographical point 50.584° N and -113.996° W.

The meteorological data was prepared for AERMOD using AERMET module (version 22112) from US EPA. The AERMET model creates a meteorological file format which is compatible with the AERMOD program by combining the surface and upper air meteorological data.

A Wind Rose Plot and a Wind Class Frequency Distribution for the data used in the dispersion modelling are presented in Figures 3 and 4, respectively, within Appendix B. The Wind Rose Plot indicates that the prevailing surface wind direction in this region is from the west-southwest. Wind speeds between 0.5 and 2.1 m/s occurred for 51.9% of all 43,824 observations. Calm wind speeds (i.e., when values are less than 0.5 m/s) were reported 3.59% of the time. The average wind speed at this site is approximately 2.13 m/s.

2.3 Terrain Data

Terrain data in USGS DEM type data for a 1:50,000 scale maps (NAD83) were downloaded from the Government of Canada, Department of Natural Resources Geobase online portal (NRC, 2022), which provides public access to a base of quality geospatial data for all of Canada. The domain used for this AQA incorporates topographic data from map tiles identified as 082I05, 082I12, 082J08 and 082J09. The data were processed by AERMAP, the terrain pre-processor for the AERMOD model. Figure 2 in Appendix B presents the terrain elevations above sea-level for the modelling domain.

2.4 Modelling Receptor

The following receptor grids were used in the modelling as per the latest revision of the *AQMG* (AEP, 2021a):

- 20 m receptor spacing in the general area of maximum impact and the Facility boundary;
- 50 m receptor spacing within 0.5 km from sources;
- 250 m receptor spacing within 2 km sources;
- 500 m spacing within 5 km from sources; and,
- 1,000 m spacing beyond 5 km.

2.5 Building Downwash

The U.S. EPA Building Profile Input Program (BPIP) was used to determine the effects of building downwash on dispersion of emissions from the Facility. The heights for the various buildings are provided in Table 4. A Plot Plan of the Facility is provided in Appendix C.

Table 4 Applicable Building Heights

Building/Tank ID	Item on Plot Plan	Description	Height Above Grade (m)
DFT1	22	Digester Feed Tank - North	2.4
DFT2	22	Digester Feed Tank - South	2.4
ORG1	6	Organics Reception Tank #1	0.0
ORG2	6	Organics Reception Tank #2	0.0
ORG3	6	Organics Reception Tank #3	0.0
MBT1	8	Manure Blend Tank - North	2.4
MBT2	8	Manure Blend Tank - South	2.4
NT	2	Digestate Nurse Tank	2.4
LET	3	Liquid Digestate Tank	2.4
DIG1	9	Anaerobic Digester Tank #1	8.5[(a)]
DIG2	9	Anaerobic Digester Tank #2	8.5[(a)]
DIG3	9	Anaerobic Digester Tank #3	8.5[(a)]
DIG4	9	Anaerobic Digester Tank #4	8.5[(a)]
DIG5	9	Anaerobic Digester Tank #5	8.5[(a)]
DIG6	9	Anaerobic Digester Tank #6	8.5[(a)]
PH2	10	Pump Building with Heating/Control Room #1	7.4
PH3	10	Pump Building with Heating/Control Room #2	7.4
PH4	10	Pump Building with Heating/Control Room #3	7.4
PUMPH	7	Feedstock Pumphouse Building	6.4
OFFICE	11	Office	3.2
DSB	4	Digestate Separation Building	9.9
B32	32	Odour Abatement System	4.57
B28	28	Electrical Building	3.05
B18	18	Boiler House	3.7
B20_1	20	Membrane Container #1	3.7

Building/Tank ID	Item on Plot Plan	Description	Height Above Grade (m)
B20_2	20	Membrane Container #2	3.7
B19	19	Compressor Building	3.7
B17_1	17	Dehumidification & Chilling Container #1	3.7
B17_2	17	Dehumidification & Chilling Container #2	3.7
B15_W	15	Ecomax Cogeneration Unit #1	3.7
B15_E	15	Ecomax Cogeneration Unit #1	3.7
B31N	31	Feedstock Receiving Hopper	8.5
B31S	31	Feedstock Receiving Hopper	8.5
B21	21	Feeding Hopper Building	6.9

[(a)] Approximate height above grade to the top of the dome / membrane. The height to the top of the tank wall is 3.66 m.

2.6 Air Quality Criteria

Emissions can have direct and indirect effects on humans, animals, vegetation, soil, and water. For this reason, environmental regulatory agencies have established maximum ambient air concentration limits. An overview of the relevant air quality criteria for this assessment is provided in Table 5.

Table 5 Applicable Ambient Air Quality Criteria

Substance	Averaging Period	Percentile	Air Quality Criteria (µg/m³)[(a)]
SO_2	1-Hour	99.9th	450
	24-Hour	Overall Maximum Prediction	125
	30-Day	Overall Maximum Prediction	30
H_2S	1-Hour	99.9th	14
	24-Hour	Overall Maximum Prediction	4
NH_3	1-Hour	99.9th	1,400

(a) *Alberta Ambient Air Quality Objective* (AEP, 2019).

3 EMISSIONS

The Facility will process existing sources of manure and organic food resources slurry to produce renewable natural gas. The proposed Facility will produce up to 1.6 MMSCFD (45.31 e^3m^3/d) of renewable natural gas from manure feedstock. The following sections detail the potential emissions sources within the modelled domain.

3.1 Facility Emission Sources

Dispersion modelling was performed for the assessment of SO_2 concentrations associated with emergency flaring of biogas received from the anaerobic digester tanks under upset conditions. Stack and emission parameters associated with anaerobic digester tank biogas emergency flaring are presented in Table 6, noting that this flaring scenario represents non-routine flaring events, and the flare will operate continuously for up to 30 days during startup. The Alberta Energy Regulator (AER) Directive 060 flare spreadsheet was used to determine flare exit parameters for the flare modelling cases.

Table 6 SO_2 Emission Source Parameters – Digester Emergency Flaring

Parameter	Digester Offgas Flaring		
Stack Height (m)	12.0		
Stack Diameter (m)	0.100		
Parameter	**Qmax**	**Qave**	**Qmin**
Effective Height (m)[(a)]	12.466	12.146	11.853
Pseudo Diameter (m)[(a)]	2.641	2.641	2.650
Pseudo Velocity (m/s)[(a)]	0.313	0.155	0.037
Exit Temperature (K)[(a)]	1254.1	1238.2	1180.0
SO_2 Emission Rate (g/s)	0.172	0.086	0.022
Flow Rate (e^3m^3/d)	2.50	1.25	0.313
Mole Frac	**Digester Offgas**		
N_2	0.0040		
CO_2	0.4000		
H_2S	0.0022		
CH_4	0.5938		
Total	**1.000**		
Heating Value (MJ/m^3)	20.21		

[(a)] Pseudo parameters were used for flare modelling as per AER Directive 060.

Dispersion modelling was also performed for the assessment of H_2S and NH_3 concentrations associated with Facility operations. The H_2S and NH_3 emissions sources at the Facility are presented in Table 7 and the stack parameters associated with these emission sources are presented in Table 8.

Emission rate parameters for the odour compounds (H_2S and NH_3) have been updated by Obsidian Engineering Corp. (Obsidian) with support from Horizon Compliance and Rimrock Renewables. Summaries of the emissions updates are provided in Appendix A. Emission rates provided by Obsidian in Appendix A are reported in tonnes per day (t/d) as sulphur and nitrogen. Emission rates were converted from sulphur and nitrogen to H_2S and NH_3, respectively. The emission rates provided in Table 7 include the pollution abatement equipment, which is comprised of an OAS and mechanical aeration in the polishing cell of the liquid digestate pond.

A series of blowers and/or fans will be used to create negative pressure and direct all vapours from the Feedstock Receiving Hoppers (2), Feedstock Hopper Building, Feedstock Pumphouse Building, Manure Blend Tanks (2), Digester Feed Tanks (2), Organic Reception Tanks (3), Liquid Digestate Tank, Digestate Nurse Tank and the Digestate Separation Building to the OAS. The vapours will undergo treatment in a two-stage system consisting of a chemical scrubber to remove NH_3 and a dry scrubber to remove reduced sulphur compounds (RSCs) and volatile organic compounds (VOCs). The OAS is expected to have a minimum reduction efficiency of 95% for NH_3, RSCs (including H_2S), VOCs and odours.

The liquid digestate pond has been redesigned from the previous multicell pond design to a two-celled pond configuration with Cell 1 (polishing cell) being equipped with mechanical aeration. The mechanical aeration in the polishing cell will maintain a high dissolved oxygen content resulting in the oxidization of H_2S to elemental sulphur, thereby preventing the release of H_2S to atmosphere.

Mechanical aeration is expected to have a minimum reduction efficiency of 95% for H_2S. Additional details are provided in the emission summaries in Appendix A.

Table 7 Facility H_2S and NH_3 Emission Sources

Source Description	Description / Assumptions	H_2S Emission (g/s)	NH_3 Emission (g/s)
Odour Abatement System Vent Stack	BioRem Carbon Dual Lift System (MytilusCS 5-1 Chemical Scrubber and Mark V Dual Lift 11-2 Dry Scrubber)	0.000212	0.009942
Manure Feedstock Staging Area	Total Area (1822.5 m^2)	0.000233	0.122396
Liquid Digestate Pond - Polishing Cell 1[(a)]	Area (12,052 m^2)	0.001819	0.006062
Liquid Digestate Pond - Storage Cell 2[(a)]	Area (49,497 m^2)	0.007469	0.024898
Solid Digestate Separation Building Staging Bays	Total Area (212 m^2)	0.000126	0.000248
Solid Digestate Staging Area	Total Area (3766.5 m^2)	0.002229	0.004414

[(a)] The liquid digestate pond is designed with an oversized berm which acts as a physical disturbance. The emissions were modelled as 35 point sources, with an equivalent emission rate, to more accurately account for downwash and physical effects of the berm.

Table 8 Stack Parameters Associated with the Facility H_2S and NH_3 Emission Sources

Source Description	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)
Odour Abatement System Unit Vent Stack	6.045	0.457	22.7	278.2
Digestate Pond (35)	0.001	0.001	0.001	Ambient

3.2 Regional Industrial Emission Sources

In accordance with the *AQMG*, cumulative air quality conditions expected to result from the existing and approved industrial developments near the Facility should be assessed for a more accurate representation of predicted impacts within the modelling domain (AEP, 2021a).

In this assessment, existing and approved "industrial" developments near the Facility are agricultural CFOs, which are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA. Data for the feedlot operations are not readily available, as such, all emission rates were estimated and are expected to be conservative.

Four neighbouring feedlot operations emitting H_2S and NH_3 are located within the modelling domain: the adjacent Rimrock Cattle Company Ltd. Feedlot and three offsite feedlots (North Feedlot, Northwest Feedlot, and Southwest Feedlot). The locations of these four operations are presented on Figure 14 through Figure 19. These industrial background sources are area sources. The area and emission parameters are provided in Tables 9 and 10.

Emission rates for the feedlot operations were estimated using literature sources. Area source emission factors for NH_3 were derived from literature sources for the feedlot pens, manure storage areas and catch basins / lagoons. A comprehensive emission factor for H_2S from feedlots, was derived from an emission factor of 3.6 grams per day per head of cattle (g/d/hd). The emission factor of 3.6 g/d/hd was the basis for the feedlot H_2S emission rates used in the assessment.

3.3 Ambient Baseline Concentrations

In accordance with the *AQMG*, ambient baseline concentrations are added to the concentrations predicted by the model for a more accurate representation of cumulative effects. Ambient baseline concentrations are assumed to represent the air quality contribution of both natural and human-caused sources that are not included in the modelling. Ambient baseline concentrations are taken from representative ambient monitoring data.

The Facility is located within the South Saskatchewan Region, monitored by the Calgary Region Airshed Zone (CRAZ) airshed. The nearest continuous ambient air monitoring station that contains publicly available data for SO_2 is the Calgary SE monitoring station. This monitoring station is located approximately 40.8 km north of the Facility. The nearest continuous ambient air monitoring station that contains publicly available representative data for H_2S and NH_3 is the Lethbridge monitoring station. This monitoring station is located approximately 127.8 km south-southeast of the Facility. Measured 1-Hour NO_2, H_2S, and NH_3 data from January 1st, 2020, to December 31st, 2022, were used to estimate the 90th percentile concentrations for each averaging period as per the Alberta *AQMG* (AEP, 2021a). The calculated 90th percentile ambient baseline concentrations shown in Table 11 were added to the ground-level concentrations predicted by the dispersion modelling to calculate the MGLC.

A portable ambient monitoring lab (PAML) has been established within High River by the CRAZ and Town of High River to support air quality monitoring in areas with little or no previous monitoring. The PAML monitors total reduced sulphur (as H_2S), SO_2, nitrogen oxide, NO_2, NO_x, ozone, and fine particulate matter. The PAML has been in operation since December 1, 2022, and is anticipated to operate until November 30, 2023. In accordance with the *AQMG*, a minimum of one year of hourly ambient air quality monitoring data must be available to ensure accurate construction of a baseline for the modelling domain. Therefore, data from the PAML was not acceptable for use in this assessment.

Table 9 Background Industrial H_2S Emission Sources

Facility	Description	Head of Cattle	H_2S Emission Factor	Overall Emission Rate	Total Feedlot Area	Area Emission Rate
			(g/d/hd)	(g/s)	(m^2)	($g/s/m^2$)
Rimrock Cattle Company Ltd. Feedlot	Current Operating Conditions	35000	3.6	1.458	1,500,000	9.7222E-07
Offsite Feedlots[a]	Southwest Feedlot	9375	3.6	0.391	320,000	1.2207E-06
	North Feedlot	9800	3.6	0.408	410,000	9.9593E-07
	Northwest Feedlot	7250	3.6	0.302	465,000	6.4964E-07
Facility	**Description**	**Head of Cattle**	**Percent Reduction**	**Revised Overall Emission Rate**	**Total Feedlot Area**	**Revised Area Emission Rate**
			(%)	(g/s)	(m2)	(g/s/m2)
Rimrock Cattle Company Ltd. Feedlot	Revised Operating Conditions	35000	48.2[b]	0.7549	1,500,000	5.0327E-07

[a] Number of head of cattle estimated based on approximate pen surface area and assuming 160 ft^2 per head of cattle (14.864 m^2 / head of cattle).

[b] The Facility will allow the adjacent Rimrock Cattle Company Ltd. Feedlot to increase the frequency of pen cleaning and reduce onsite storage volumes thereby reducing the mass of manure in the pens and feedlot storage areas as well the amount of matter entering the catch basins from surface water runoff. The revised operating conditions are calculated to reduce the overall emission rate of the Rimrock Cattle Company Ltd. Feedlot by approximately 48.21%.

Table 10 Background Industrial NH_3 Emission Sources

Facility	Source Description	Area (m^2)	NH_3 Emission Rate ($g/s/m^2$)	NH_3 Emission Rate (g/s)
Rimrock Cattle Company Ltd. Feedlot - Current Operating Conditions	Feedlot pens	385,548	0.000124	47.81
	Manure Storage	60,387	0.000031	1.89
	Main Catch Basin	94,000	0.000030	2.82
	Grandfathered Catch Basin	13,400	0.000030	0.40
			Total	**52.92**
North Feedlot	Feedlot pens	42,700	0.000124	5.30
	Manure Storage	76,000	0.000031	2.38
	Catch Basin	8,000	0.000030	0.24
			Total	**7.91**
Northwest Feedlot	Feedlot pens	205,000	0.000124	25.42
	Manure Storage	70,000	0.000031	2.19
	Catch Basin	17,000	0.000030	0.51
			Total	**7.91**
Southwest Feedlot	Feedlot pens	119,864	0.000124	14.86
	Manure Storage	31,588	0.000031	0.99
	Catch Basin	26,653	0.000030	0.80
			Total	**16.65**
Facility (Revised)	**Source Description**	**Area (m^2)**	**NH_3 Emission Rate ($g/s/m^2$)**	**NH_3 Emission Rate (g/s)**
Rimrock Cattle Company Ltd. Feedlot - Revised Operating Conditions [(a)]	Feedlot pens	385,548	0.000066	25.34
	Manure Storage	10,169	0.000031	0.32
	Main Catch Basin	94,000	0.000015	1.43
	Grandfathered Catch Basin	13,400	0.000015	0.20
			Total	**27.29**

[(a)] The Facility will allow the adjacent Rimrock Cattle Company Ltd. Feedlot to increase the frequency of pen cleaning and reduce onsite storage volumes thereby reducing the mass of manure in the pens and feedlot storage areas as well the amount of matter entering the catch basins from surface water runoff. The revised operating conditions are calculated to reduce the overall emission rate of the Rimrock Cattle Company Ltd. Feedlot by approximately 48.21%.

Table 11 Ambient Baseline Concentrations Used in this Assessment

Substance	Averaging Period	Ambient Baseline Concentration ($\mu g/m^3$)
SO_2	1-Hour	1.7
	24-Hour	1.5
	30-Day	0.7
H_2S	1-Hour	1.4
	24-Hour	1.0
NH_3	1-Hour	11.8

4 DISPERSION MODELLING RESULTS

The following section presents the modelling results. SO_2 dispersion modelling was conducted for the digester emergency flaring. For H_2S and NH_3, dispersion modelling was conducted for the Project Case (the Facility), Baseline Case (the Rimrock Cattle Company Ltd. Feedlot under current operations), and Cumulative Case (the revised Rimrock Cattle Company Ltd. Feedlot in operation with the Facility), and included influences from the North Feedlot, Northwest Feedlot, and Southwest Feedlot.

4.1 SO_2 Modelling Results

The MGLC of SO_2 associated with emergency flaring of biogas received from the anaerobic digester tanks under upset conditions. at the Facility are provided in Table 12, noting that the flare will operate continuously for up to 30 days. As indicated, the MGLC of SO_2 for all associated flowrates are predicted to comply with the *AAAQOs*. The isopleth presenting the modelling results are not provided, as the predicted SO_2 concentrations for various averaging periods are lower than 5% of their respective objectives. The U.S. EPA AERMOD output file for this modelling is provided in Appendix D.

Table 12 Maximum Predicted Ground-level SO_2 Concentrations

Averaging Period	UTM Coordinates		Predicted ($\mu g/m^3$)	Ambient Baseline ($\mu g/m^3$)	MGLC ($\mu g/m^3$)	*AAAQO* ($\mu g/m^3$)
	(m E)	(m N)				
1-Hour	287023.81	5610332	5.3	1.7	7.0	**450**
24-Hour	288710.31	5608113.38	2.0	1.5	3.5	**125**
30-Day	288950	5608103.34	0.3	0.7	1.0	**30**

4.2 H_2S Modelling Results

Dispersion modelling was performed for the following three cases:

- **Project Case:** Modelling was conducted for emission sources from the Facility only.
- **Baseline Case:** Modelling was conducted for emission sources from the Rimrock Cattle Company Ltd. Feedlot under current operating conditions.
- **Cumulative Case:** Modelling was conducted for emission sources from both the Facility and the revised Rimrock Cattle Company Ltd. Feedlot.

The MGLC of H_2S, including ambient baseline H_2S concentrations, are provided in Table 13. As indicated, the maximum predicted H_2S concentrations associated with the Project Case are predicted to comply with their respective *AAAQOs*. The predicted concentrations associated with the Baseline and Cumulative Cases are not in compliance with the applicable *AAAQOs*. However, ground-level concentrations from the Cumulative Case have reduced significantly from the Baseline Case. Specifically, the 1-Hour and 24-Hour MGLC of H_2S are predicted to reduce by approximately 46.3% and 44.0%, respectively. This indicates that the proposed Facility is predicted to result in a significant net positive improvement to air quality versus the current baseline operating conditions.

Associated isopleths are presented on Figures 5 through 10 within Appendix B, while the examples of the U.S. EPA AERMOD input files and all the output files are provided in Appendix D.

Table 13 Maximum Predicted Ground-level H_2S Concentrations

Averaging Period	UTM Coordinates		Predicted (µg/m³)	Ambient Baseline (µg/m³)	MGLC (µg/m³)	*AAAQO* (µg/m³)
	(m E)	(m N)				
Project Case (the Facility)						
1-Hour	288270.87	5608131.79	7.6	1.4	9.0	**14**
24-Hour	287507.45	5607545.25	2.6	1.0	3.6	**4**
Baseline Case (Rimrock Cattle Company Ltd. Feedlot – Current Operations) [(a)]						
1-Hour	288270.87	5608131.79	167.5	1.4	168.9	**14**
24-Hour	287507.45	5607545.25	63.8	1.0	64.8	**4**
Cumulative Case (Facility + Revised Rimrock Cattle Company Ltd. Feedlot) [(a)]						
1-Hour	287513.74	5607704.60	89.2	1.4	90.6	**14**
24-Hour	287508.24	5607565.17	35.3	1.0	36.3	**4**

(a) In this assessment, CFOs are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA.

4.3 NH_3 Modelling Results

Dispersion modelling was performed for the following three cases:

- **Project Case:** Modelling was conducted for emission sources from the Facility only.
- **Baseline Case:** Modelling was conducted for emission sources from the Rimrock Cattle Company Ltd. Feedlot under current operating conditions.
- **Cumulative Case:** Modelling was conducted for emission sources from both the Facility and the revised Rimrock Cattle Company Ltd. Feedlot.

The MGLC of NH_3, including background NH_3 concentrations, are provided in Table 14. As indicated, the maximum predicted NH_3 concentration associated with the Project Case is predicted to comply with its respective *AAAQO*. The predicted concentrations associated with the Baseline and Cumulative Cases are not in compliance with the applicable *AAAQOs*. However, ground-level concentrations from the Cumulative Case have reduced significantly from the Baseline Case. Specifically, the MGLC of NH_3 are predicted to reduce by approximately 46.8%. This indicates that the proposed Facility is predicted to result in a significant net positive improvement to air quality versus the current baseline operating conditions. Associated isopleths are presented on Figures 11 through 13 within Appendix B, and the example of the U.S. EPA AERMOD input files and all the output files are provided in Appendix D.

Table 14 Maximum Predicted Ground-level NH_3 Concentrations

Averaging Period	UTM Coordinates (m E)	UTM Coordinates (m N)	Predicted (µg/m³)	Ambient Baseline (µg/m³)	MGLC (µg/m³)	*AAAQO* (µg/m³)
Project Case (the Facility)						
1-Hour	287991.23	5608143.5	246.6	11.8	258.4	**1,400**
Baseline Case (Rimrock Cattle Company Ltd. Feedlot – Current Operations) [(a)]						
1-Hour	288071.12	5608140.16	8761.3	11.8	8773.1	**1,400**
Cumulative Case (Facility + Revised Rimrock Cattle Company Ltd. Feedlot) [(a)]						
1-Hour	288051.15	5608140.99	4654.2	11.8	4666.0	**1,400**

(a) Agricultural operations are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA.

4.4 Offsite Feedlots

Dispersion modelling was performed for all Regional Industrial Facilities within the model domain. As mentioned, the existing and approved "industrial" developments near the Facility are agricultural CFOs, which are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA. This includes the adjacent Rimrock Cattle Company Ltd. Feedlot, as well as the offsite feedlots (i.e., the North Feedlot, Northwest Feedlot, and Southwest Feedlot). The offsite feedlots are located over 5 km away and are predominantly upwind of the proposed Facility. As such, the Project Case (the Facility only) was determined to have minimal effects on the MGLC at the offsite feedlots.

The focus of the AQA was on cumulative effects at the Rimrock Complex (the land associated with the proposed Facility and the and the adjacent Rimrock Cattle Company Ltd. Feedlot). The results for the Baseline and Cumulative Cases for the offsite feedlots are included for reference purposes in Appendix E, which includes the overall predicted MGLCs for H_2S and NH_3 within the model domain.

5 CONCLUSION

In support of the SIR No. 2 response, Horizon Compliance has updated the Air Quality Assessment (AQA) for the odour compounds (hydrogen sulphide [H_2S] and ammonia [NH_3]) to reflect design changes including construction and operation of proposed pollution abatement equipment. Modeling of sulphur dioxide (SO_2) was also updated to reflect the change to flare stack location.

Horizon Compliance assessed H_2S and NH_3 that may occur from the Facility (Project Case), adjacent Rimrock Cattle Company Ltd. Feedlot (Baseline Case), and the revised Rimrock Cattle Company Ltd. Feedlot in operation with the Facility (Cumulative Case). The Overall Baseline and Cumulative Cases included air quality effects from the offsite feedlots (i.e., the North Feedlot, Northwest Feedlot, and Southwest Feedlot).

The predicted MGLCs of H_2S and NH_3 are predicted to comply with the *AAAQOs* for the Project Case. The predicted MGLC of H_2S and NH_3 associated with the Baseline and Cumulative Cases are not in compliance with the applicable *AAAQOs*; however, ground-level concentrations from the Cumulative Case have reduced significantly from the Baseline Case. Specifically, the MGLC of H_2S and NH_3 are predicted to reduce by approximately 44.0% and 46.8%, respectively, indicating that the proposed Facility is predicted to result in a significant net positive improvement to air quality.

Horizon Compliance appreciated the opportunity to work on this project. If we can provide clarification on any part of this report, please contact the undersigned at (587) 885-0863.

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6 REFERENCES

Abacus Datagraphics Ltd. 2022. Abdala 2.0. Retrieved from: http://abadata.ca/

Alberta Environment and Parks (AEP). 2019. *Alberta Ambient Air Quality Objectives and Guidelines Summary* (*AAAQO*).

Alberta Environment and Parks (AEP). 2021a. *Air Quality Model Guideline*. November 2021.

Alberta Environment and Parks (AEP). 2021b. *Meteorological Data for Dispersion Models*. https://ccdsystems.com/albertawrfdata

Alberta Environment and Parks (AEP). 2021c. *Multi Model Extraction Utility 2*. November 2021.

Downing and W.W. Pettapiece (Downing & Pettapiece). 2006. *Natural Regions and Subregions of Alberta*.

Natural Resources Canada (NRC). 2022. *Natural Resources Canada's Canadian Digital Elevation Data (CDED)*. Retrieved from: https://ftp.maps.canada.ca/pub/nrcan_rncan/elevation/cdem_mnec/

Environment and Climate Change Canada. 2022. *National Pollutant Release Inventory.* https://www.canada.ca/en/services/environment/pollution-waste-management/national-pollutant-release-inventory.html

Statistics Canada. 2022. *Census Profile, 2021 Census of Population, High River, Alberta*. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?DGUIDlist=2021S0504821&GENDERlist=1&HEADERlist=0&Lang=E&STATISTIClist=1&SearchText=High+River

APPENDIX A

EMISSIONS ESTIMATES

OBSIDIAN ENGINEERING

16/07/2023
M# 46010

Job No.:	3007
Client:	Tidewater Renewables
Project:	Renewable Natural Gas Production Facility
Topic:	Process Sulfur Mass Balance Summary
Issue:	Issued for Use
Revision:	3
Date:	July 16, 2023
By:	RMF
Review By:	RF

1.0 Document Intent

Detailed within this document is the process sulfur balance and the design basis used to develop the mass balance. This mass balance was used to develop the facility FEED design and used as the input data for the air quality assessment study (AQA) and sizing of the BIOREM odor abatement system.

2.0 Process Sulfur Mass Balance

(i) Raw Cattle Manure Feedstock

Sulfur Content

The sulfur content in the raw cattle manure feedstock was based on actual manure samples collected in early April 2022 by Obsidian Engineering Ltd. These samples were analyzed by the Laboratory "Down to Earth Labs" located in Calgary, AB. Results for the raw manure are reported under the analysis entitled "Bag of Solid Manure" which represents "Solid Manure", dated 05/19/2022, (Report # 128796). A Copy of this analysis is included.

The total sulfur content reported in this laboratory report was then weight ratio corrected for the anticipated design percent solids concentration for the wet manure of 41 wt%. The total percent sulfur content in the feedstock was ratio corrected using the ratio: Design % Solids Content/Measured % Solids Content = 41.00 wt%/52.35 wt% = 0.783 to give a % total sulfur of 0.204 wt% as S.

Raw Cattle Manure (wet solids) Feedstock Material Input:

Cattle Manure Pile - Wet Solids		
Mass Flow	219.2	tonnes/day
% TS	41.0	wt%
% Moisture	59.0	wt%
% VS of TS	87.4	wt%
% Total Sulfur	0.2036	wt% as S
% H_2S	0.000014	wt% as S
% Sulfur	99.9932	wt% as S

Raw Cattle Manure Feedstock Pile Emission

The literature was consulted to determine what is a typical H_2S gaseous emission rate from cow manure based on its total sulfur content. Using the cited literature reference below, a H_2S gaseous emission rate of 45 mg H_2S/kg S was selected.

Henry's law was used to estimate the solubility of H_2S in the liquid phase based on the amount released to the atmosphere for the selected emission rate.

Reference: *Control of Gaseous Emissions of Ammonia and Hydrogen Sulphide from Cow Manure by use of Natural Materials, New Zealand Journal of Agricultural Research, 2004, Vol. 47: 545-5560028-8233/04/4704-0545 © The Royal Society of New Zealand 2004*

H_2S Loss to the Atmosphere from the Manure Pile:

Cattle Manure (wet Solids) Pile H_2S Emission		
H_2S (as Sulfur)	0.0000189	tonnes/day

(ii) Cattle Manure Slurring with Warm Water including transfer through Manure Blend Tanks into Digester Feed Tanks

The mass balance used to calculate the loss of H_2S to the atmosphere, was based on the slurring of raw cattle manure with warm slurry water to achieve a slurry percent solids concentration of 10 wt%. The sulfur emission during the slurring of the feedstock in the two (2) manure blend tanks and transfer into the two (2) digester feed tanks was based on the following calculation:

No. of Manure Blend Tanks:	2	Tanks
No. of Digester Feed Tanks:	2	Tanks
Atmospheric Operated Tanks:	Yes, Covered Tanks	
Tank Ventilation:	Forced Ventilated	
Tank Ventilation Arrangement:	One (1) Manure and one (1) Digester Tank in Series. Two (2) trains in parallel	
Manure Blend Tank Ventilation Rate:	25.4	ACH
Digester Feed Tank Ventilation Rate:	10.8	ACH
Final Slurry Temperature:		
Minimum:	20	deg C
Maximum:	25	deg C
Material Hydraulic Retention Time:	24	hrs. (max)
Slurry Cattle Manure:	960.6	m^3/day
Selected H_2S Emission Factor:	5.5	mg/m^3 as H_2S (from reference)

H_2S Loss to Process Air Abatement System from Slurring:

Cattle Manure Slurry H_2S Emission		
H_2S (as sulfur)	0.0000050	tonnes/day

Reference: *Hydrogen Sulfide Emissions from Cattle Manure: Experimental Study, V. Vtoryi*, S. Vtoryi and V. Gordeev, Agronomy Research 18(S1), 1090–1098, 2020 https://doi.org/10.15159/AR.20.04*

Slurry Cattle Manure Less H_2S Emission Loss		
Parameter	**Value**	**Units**
Mass Flow	898.6	tonnes/day
% TS	10.0	wt%
% Moisture	90.0	wt%
% VS of TS	87.4	wt%
% Total Sulfur	0.0525	wt%
% H_2S	0.000101	wt%
% Sulfur	99.999899	wt%
Mass Flow		
Total Solids	89.9	tonnes/day
Moisture	808.8	tonnes/day
Volatile Solids	78.5	tonnes/day
Total Sulfur	0.47147	tonnes/day
H_2S	0.00091	tonnes/day
Sulfur	0.47056	tonnes/day
Density	935.5	kg/m3
Volumetric Flow	960.6	m3/day
Total Sulfur Concentration	491	mg/L
H2S Concentration	0.9	mg/L as S

(iii) Organic Food Resource Slurring with Warm Water Within Organics Reception Tanks Daily organics food resource input. Results for the Organic Food Resources are reported under the analysis entitled “Bag of Organic Slurry” dated 05/19/2022, (Report # 128796). A Copy of this analysis is included.

Organic Food Resource (wet solids) input		
Parameter	**Value**	**Units**
Mass Flow	164.4	tonnes/day
% TS	22.9	wt%
% Moisture	77.1	wt%
% VS of TS	92.8	wt%
% Total Sulfur	0.02	wt% as S
% H_2S	0.00659	wt% as S

% Sulfur	99.34128	wt% as S
Mass Flow		
Total Solids	37.7	tonnes/day
Moisture	126.7	tonnes/day
Volatile Solids	35.0	tonnes/day
Total Sulfur	0.041	tonnes/day
H_2S	0.0000027	tonnes/day
Sulfur	0.041	tonnes/day
Density	925.5	kg/m3
Volumetric Flow	177.6	m3/day
Total Sulfur Concentration	231	mg/L
H2S Concentration	0.02	mg/L as S

The mass balance used to calculate the loss of H_2S to the atmosphere was based on the slurring of organic food resource with warm water slurry to achieve a slurry percent solids concentration of 10 wt%, within the three (3) organic food resource tanks while force ventilating the tanks in series as follows:

No. of Organic Food Resource Tanks:	3 Tanks
Atmospheric Operated Tanks:	Yes, Covered Tanks
Tank Ventilation:	Forced Ventilated
Tank Ventilation Arrangement:	3 X tanks in Series
Design Total Combined Tank Ventilation Rate:	6 ACH
Ventilation Rate:	1,697 Am^3/hr (tank ventilated in series)
Selected H_2S Concentration in Ventilated Air:	44.1 ug/m^3 as H_2S

Reference: OFFSET metric input spreadsheet, Jacobson, L., D. Schmidt, S. Wood. 2001. OFFSET: Odor from feedlots setback estimation tool. University of Minnesota Publication F0-07680-C

H_2S Loss to the Process Air Abatement System:

Organic Food Resource Slurry H_2S Emission		
H_2S (as sulfur)	0.00000169	tonnes/day

Slurry Organic Food Resource Less H_2S Emission Loss		
Parameter	**Value**	**Units**
Mass Flow	376.9	tonnes/day
% TS	10.0	wt%
% Moisture	90.0	wt%
% VS of TS	90.7	wt%
% Total Sulfur	0.0130	wt%
% H_2S	0.000081	wt%
% Sulfur	99.999919	wt%

Mass Flow		
Total Solids	37.7	tonnes/day
Moisture	339.2	tonnes/day
Volatile Solids	34.2	tonnes/day
Total Sulfur	0.04899	tonnes/day
H_2S	0.00031	tonnes/day
Sulfur	0.04868	tonnes/day
Density	966.5	kg/m3
Volumetric Flow	390.0	m3/day
Total Sulfur Concentration	126	mg/L
H2S Concentration	0.8	mg/L as S

(iv) Anaerobic Digestion and Biogas Upgrading

The mass balance used to calculate the production and amount of H_2S that is lost to the biogas was based on the following:

H_2S Loss to Biogas

The anaerobic digestion system is to be configured to provide for the injection of ferric chloride into the inlet feedstock manifold of each anaerobic digester tank to sequester sulfur to prevent the formation of H_2S. Furthermore, small amounts of oxygen are to be injected into the gas headspace of each digester to allow for facultative microbiological population to grow on a netting whereby any H_2S that is present within the biogas will be further reduced to the element sulfur. These two treatment strategies working in conjunction have been reported in the literature to limit the H_2S in the biogas to maximum of 200 ppmv. For this study, the maximum H_2S in the biogas was taken as 200 ppmv. Operationally, the H_2S in the biogas is expected to be much lower with the concentration to range between 55 to 65 ppmv.

Daily loss of H_2S to the biogas system, which is closed system, was calculated based on the following:

Estimated Daily Biogas Production:	58,219	Nm^3/day
H_2S Concentration in Biogas:	200	ppmv (max)
Express as mg/Nm^3:	278.8	mg/Nm^3 as H_2S
Express as mg/Nm^3:	262.1	mg/Nm^3 as S

Reference:
(1) *Biogas Upgrading – Desulfurization Part 6: In-situ H_2S removal – chemical desulfurization, Cornell CALS, College of Agriculture & Life Sciences, Dairy Environmental Systems Program, Oct 2020*
(2) *Control of hydrogen sulphide in full-scale anaerobic digesters using iron (III) chloride: performance, origin and effects, D. Erdirencelebi and M. Kucukhemek Selcuk University, Environmental Engineering Department, Konya, Turkey Konya Water and Sewerage Administration, Konya, Turkey, Water SA Vol. 44 No. 2 April 2018*

Daily H_2S Loss to Biogas: 0.01526 tonnes/day (closed system)

Biogas H_2S Loss (closed system)		
H_2S (as S)	0.01526	tonnes/day

Henry's law was used to estimate the solubility of H_2S in the liquid phase based on the amount H_2S present to the biogas.

Slurry Blended Feedstock into Anaerobic Digester Tank		
Parameter	**Value**	**Units**
Mass Flow	1275.6	tonnes/day
% TS	10.0	wt%
% Moisture	90.0	wt%
% VS of TS	88.4	wt%
% Total Sulfur	0.0408	wt%
% H_2S	0.000095	wt%
% Sulfur	99.999905	wt%
Mass Flow		
Total Solids	127.6	tonnes/day
Moisture	1148.0	tonnes/day
Volatile Solids	112.7	tonnes/day
Total Sulfur	0.5205	tonnes/day
H_2S	0.0012	tonnes/day
Sulfur	0.5192	tonnes/day
Density	992.0	kg/m3
Volumetric Flow	1285.8	m3/day
Total Sulfur Concentration	405	mg/L as S
H_2S Concentration	0.9	mg/L as S

Digestate Before Solids/Liquid Separation Less Biogas H_2S Loss		
Parameter	**Value**	**Units**
Mass Flow	1214.7	tonnes/day
% TS	6.0	wt%
% Moisture	94.0	wt%
% VS of TS	80.8	wt%
% Total Sulfur	0.0416	wt%
% H_2S	0.002010	wt%
% Sulfur	99.997990	wt%
Mass Flow		
Total Solids	73.1	tonnes/day
Moisture	1141.6	tonnes/day

Volatile Solids	59.0	tonnes/day
Total Sulfur	0.5052	tonnes/day
H_2S	0.0244	tonnes/day
Sulfur	0.4808	tonnes/day
Density	992.0	kg/m3
Volumetric Flow	1224.5	m3/day
Total Sulfur Concentration	413	mg/L
H2S Concentration	19.9	mg/L as S

(v) Digestate Liquid/Solids Separation

Liquid/Solids Separation

To calculate the distribution of sulfur and H_2S between the digestate liquid and solid fractions the following relationships were used:

% Total Sulfur to Solid Cake Fraction: 20 wt% (reference 1)
% Total Sulfur to Liquid Fraction: 80 wt% (reference 1)

The H_2S to Liquid Fraction Distribution: H_2S assumed dissolved in solution in the liquid phase where the distribution of H_2S in the digestate is split between the liquid and cake based on its percent water content in each.

Reference:

(1) *Personal Communication with DLS Biogas, the operating partner of the proposed facility, in regards to sulfur distribution between the cake and liquid fractions through operation of similar facility types in Ontario Canada*
(2) *DLS Biogas Facility Test Data, May 04, 2022*

Digestate Liquid Fraction

Liquid Digestate (supernatant)		
Parameter	**Value**	**Units**
Mass Flow	1092.9	tonnes/day
% TS	3.3	wt%
% Moisture	96.7	wt%
% VS of TS	71.1	wt%
% Total Sulfur	0.0092	wt%
% H2S	0.002059	wt%
% Sulfur	99.997941	wt%
Mass Flow		
Total Solids	36.5	tonnes/day
Moisture	1056.3	tonnes/day
Volatile Solids	26.0	tonnes/day
Total Sulfur	0.101	tonnes/day

H2S	0.0225	tonnes/day
Sulfur	0.0785	tonnes/day
Density	989.7	kg/m3
Volumetric Flow	1104.2	m3/day
Total Sulfur Concentration	92	mg/L as S
H2S Concentration	20.4	mg/L as S

Digestate Nurse Tank H_2S Emission

Summarized below is the calculated nurse tank H_2S emission:

No. of Digestate Nurse Tanks:	1	tank
Tank Diameter:	9.15	m
Tank Surface Area:	65.7	m^2
Liquid Fraction H_2S Emission:	0.012	mg/m^2s (as H_2S)

Reference: *Different Approaches to Assess the Environmental Performance of a Cow Manure Biogas Plant, Marta Torrellas et. la, Atmospheric Environment (2018), doi: 10.1016/j.atmosenv.2018.01.023 (accepted manuscript)*

Digestate Nurse Tank H_2S Loss to the Process Air Abatement System:

Digestate Nurse Tank H_2S Emission		
H_2S (as S)	0.000064	tonnes/day

Liquid Digestate Tank H_2S Emission

Summarized below is the calculated liquid digestate tank H_2S emission:

No. of Liquid Digestate Tanks:	1	tank
Tank Diameter:	9.15	m
Tank Surface Area:	65.7	m^2
Liquid Fraction H_2S Emission:	0.012	mg/m^2s (as H_2S)

Reference: *Different Approaches to Assess the Environmental Performance of a Cow Manure Biogas Plant, Marta Torrellas et. la, Atmospheric Environment (2018), doi: 10.1016/j.atmosenv.2018.01.023 (accepted manuscript)*

Liquid Digestate Tank H_2S Loss to Process Air Abatement System

Liquid Digestate Tank H_2S Emission		
H_2S (as S)	0.000064	tonnes/day

(vi) Digestate Liquid Pond Storage

Storage Pond

Approximately 25 % of the liquid digestate is to be recycled for use as slurry water for feedstock slurring.

Henry's law was used to estimate the amount of H_2S that would be released to the atmosphere from the liquid digestate based on the solubility of H_2S in the liquid phase of the digestate entering the pond.

Liquid Digestate to Pond (less 25% recycle)		
Parameter	**Value**	**Units**
Mass Flow	819.7	tonnes/day
% TS	3.3	wt%
% Moisture	96.7	wt%
% VS of TS	71.1	wt%
% Total Sulfur	0.0092	wt% of Total
% H2S	0.000206	wt%
% Sulfur	99.999794	wt%
Mass Flow		
Total Solids	27.4	tonnes/day
Moisture	792.3	tonnes/day
Volatile Solids	19.5	tonnes/day
Total Sulfur	0.0758	tonnes/day
H2S	0.0017	tonnes/day
Sulfur	0.0741	tonnes/day
Density	989.7	kg/m3
Volumetric Flow	828.2	m3/day
Total Sulfur Concentration	92	mg/L
H2S Concentration	2.0	mg/L as S

Storage Pond H_2S Emission (in the absence of aeration):

Storage Pond H_2S Emission (No-Aeration)		
H_2S (as S)	0.0151	tonnes/day

(xi) Pond Aeration

Aeration of liquid digestate in the pond will significantly reduce the pond's H_2S emissions through the reaction of hydrogen sulfide in solution with oxygen to form elemental sulfur. The H_2S level is around 2.0 mg/L in the liquid digestate, which is in the

upper limit for treatment by aeration. At this concentration, aeration is an effective treatment method to reducing the H_2S to around 0.1 mg/L. A residual oxygen concentration in the water of 0.5 mg/L or higher is recommended to ensure there is sufficient dissolved oxygen to stoichiometrically react with a majority of the H_2S in solution. The recommended aeration system type is forced draft aeration. This will achieve the bubble density, size and oxygen transfer rate required for effective treatment. It is anticipated aeration will reduce the resultant H_2S concentration in the liquid digestate pond to around 0.1 mg/L, which equates to 95 % reduction in H_2S emission. Nexom confirmed that the recommended aeration system will exceed a 95% reduction of H_2S in the polishing pond (2).

Provided below is the anticipated pond H_2S emission for an aerated pond.

Storage Pond H_2S Emission (with pond aeration)		
H_2S (as S)	0.00076	tonnes/day

References:

(1) Uttam Saha Pamela R. Turner, Your Household Water Quality: Removal of Hydrogen Sulfide and Sulfate, Circular 858-Series 15, University of Georgia, Extension, Oct 2022

(2) Nexom. 2023. Rimrock High River, Alberta. Option 4. Preliminary Proposal for the Design, Supply, and Installation of the Lagoon Aeration System. Proposal dated June 2, 2023 submitted to Rimrock Renewables Ltd. & Email communication with Nexom

(vii) Digestate Solids Storage

Digestate Cake Fraction

Digestate Cake		
Parameter	**Value**	**Units**
Mass Flow	121.8	tonnes/day
% TS	30.0	wt%
% Moisture	70.0	wt%
% VS of TS	90.4	wt%
% Total Sulfur	0.3318	wt% as S
% H_2S	0.001572	wt% as S
% Sulfur	99.998428	wt% as S
Mass Flow		
Total Solids	36.5	tonnes/day
Moisture	85.3	tonnes/day
Volatile Solids	33.0	tonnes/day
Total Sulfur	0.4042	tonnes/day
H_2S	0.00191	tonnes/day
Sulfur	0.40225	tonnes/day
Density	888.0	kg/m3

Volumetric Flow	137.2	m3/day
Total Sulfur Concentration	2,947	mg/L as S
H2S Concentration	14.0	mg/L as S

Solids Cake H_2S Emission:

The dewatered digestate cake H_2S emission value was estimated using Henry's law coupled with the fact the cake will undergo multiple cake handlings between pile material transfers and the requirement for the H_2S to be lost to the atmosphere via the surface area of the pile.

Solids Storage Pile H_2S Emission Loss to Atmosphere (Digestate Emission):

Total Digestate Cake H_2S Emission		
H_2S (as S)	0.00019	tonnes/day

The solid cake is stored in two locations:

1. The Digestate Separation Building Storage
2. Digestate Staging Pile

The total solid cake H_2S emissions from these two locations are split on a volume of storage basis, with the Digestate Separation Building storage accounting for 5% of the storage and the Digestate Staging Pile accounting for 95% of the storage.

Digestate Separation Building Storage H_2S Emission		
H_2S (as S)	0.0000095	tonnes/day
Digestate Staging Pile H_2S Emission		
H_2S (as S)	0.00018	tonnes/day

Digestate Separation Building H_2S Emission

Within the Digestate Separation Building there are three sources of H_2S.

1. The vapours associated with the separation / screw presses
2. The digestate separation building storage

Due to the difficulty of splitting up the emissions, a conservative approach of assigning the total solids cake H_2S emissions to the digestate separation building was implemented.

Digestate Separation Building H_2S Emission		
H_2S (as S)	0.00019	tonnes/day

(viii) Feedstock Slurry Water

Slurry Water

Slurry water used for feedstock slurring was modeled the have the following composition based on 25 % digestate liquid supernatant recycle:

Total Slurry Water		
Parameter	**Value**	**Units**
Mass Flow	892.0	tonnes/day
Volumetric Flow	895.4	m3/day
Total Sulfur	37.0	mg/L
H_2S	1.4	mg/L as S
Sulfur	35.6	mg/L as S
Total Sulfur	0.0331	tonnes/day
H_2S (as S)	0.0012	tonnes/day
Sulfur (as S)	0.0319	tonnes/day

Down To Earth Labs Inc.
The Science of Higher Yields

Obsidian Engineering Corp.
436-129 Ave SE.
Calgary, AB T2J 4A9

Report # : 128796-00
Report Date: 2022-05-19
Received: 2022-04-21
Completed: 2022-05-19
Test Package: FDObsidian

Project:
PO:
Grower:
Field:
Animal: No Energy

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Sample	ID	Type	Analysis	Dry Basis Result	Wet Basis Result	Units	Metric Units kg/tonne	Imperial Units #/ton
220421N004	Bag of Solid Manure	Manure, Solid	Moisture		47.65	%		
			Total Nitrogen	3.08	1.6	%	16	32
			Chloride	0.455	0.24	%	2.4	4.8
			pH		6.3			
			Potassium	1.46	0.76	%	7.6	15.2
			Phosphorous	0.74	0.39	%	3.9	7.8
			Calcium	2.44	1.3	%	13	26
			Magnesium	0.446	0.23	%	2.3	4.6
			Copper	21.9	11	ppm	0.011	0.022
			Manganese	62.0	32	ppm	0.032	0.064
			Zinc	123	64	ppm	0.064	0.128
			Sodium	0.24	0.13	%	1.3	2.6
			Iron	589	310	ppm	0.31	0.62
			Sulfur	0.49	0.26	%	2.6	5.2
			Total Solids		52.35	%	270	540
			Volatile Solids		87.39	%	460	920
			Total Suspended Solids		45.64	%	240	480

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Sample	ID	Type	Analysis	Dry Basis Result	Wet Basis Result	Units	Metric Units kg/tonne	Imperial Units #/ton
220421N005	Bag of OrganicSlurry	Compost, Liquid	Moisture		77.07	%		
			Total Nitrogen	2.49	0.57	%	5.7	11.4
			Chloride	0.634	0.15	%	1.5	3
			pH		4.7			
			Potassium	1.20	0.28	%	2.8	5.6
			Phosphorous	0.31	0.071	%	0.71	1.42
			Calcium	1.03	0.24	%	2.4	4.8
			Magnesium	0.0914	0.021	%	0.21	0.42
			Copper	8.98	2.1	ppm	0.0021	0.0042
			Manganese	14.3	3.3	ppm	0.0033	0.0066
			Zinc	22.9	5.3	ppm	0.0053	0.0106
			Sodium	0.64	0.15	%	1.5	3
			Iron	322	74	ppm	0.074	0.148
			Sulfur	0.11	0.025	%	0.25	0.5
			Total Solids		22.93	%	53	106
			Volatile Solids		92.78	%	210	420
			Total Suspended Solids		12.73	%	29	58

Approved by

Raygan Boyce, Lab Manager

BDL: Below Detection Limit

OBSIDIAN ENGINEERING

16/07/2023
M#46010

Job No.:	3007
Client:	Tidewater Renewables
Project:	Renewable Natural Gas Production Facility
Topic:	Process Nitrogen Mass Balance Summary
Issue:	Issued for Use
Revision:	3
Date:	July 16, 2023
By:	RMF
Review By:	RF

1.0 Document Intent

Detailed within this document is the process nitrogen balance and the design basis used to develop the mass balance. This mass balance was used to develop the facility FEED design and used as the input data for the air quality assessment study (AQA) and sizing of the BIOREM odor abatement system.

2.0 Process Nitrogen Mass Balance

(i) Raw Cattle Manure Feedstock
Nitrogen Content

The nitrogen content in the raw cattle manure feedstock was based on actual manure samples collected in early April 2022 by Obsidian Engineering Ltd. These samples were analyzed by the Laboratory "Down to Earth Labs" located in Calgary, AB. Results for the raw manure are reported under the analysis entitled "Bag of Solid Manure" which represents "Solid Manure", dated 05/19/2022, (Report # 128796). A Copy of this analysis is included.

The total nitrogen content reported in this laboratory report was then weight ratio corrected for the anticipated design percent solids concentration for the wet manure of 41 wt%. The total percent nitrogen content in the feedstock was ratio corrected using the ratio: Design % Solids Content/Measured % Solids Content = 41.00 wt%/52.35 wt% = 0.783 to give a % total nitrogen of 1.25 wt%.

Raw Cattle Manure (wet solids) Feedstock Material Input:

Cattle Manure Pile - Wet Solids Input		
Mass Flow	219.2	tonnes/day
% TS	41.0	wt%
% Moisture	59.0	wt%
% VS of TS	87.4	wt%
% Total Nitrogen	1.25	wt%
% Ammonia - N	23.6	wt%
% Organic - N	76.4	wt%

Organic Nitrogen to Ammonia Content

The literature was consulted to determine what the starting breakdown of the total nitrogen with respect to organic nitrogen and ammonia in the cattle manure. The starting ratio adopted for wet cattle manure was:

% Ammonia: 23.6 wt %
% Organic Nitrogen: 76.4 wt%
Total Nitrogen: 100 wt%

Reference Literature: *Table 1. Nitrogen, Phosphorus and Moisture Contents of Various Manures, Solid Dairy, Average Values Used based on the Material being Handled Multiple Times,*
Manure Management Facts – Manure Nutrients and Their Behaviour in Soil, Manitoba Agriculture, Food and Rural, January 2009

Raw Cattle Manure Feedstock Pile Emission

The tonne/day ammonia emission rate for the raw (wet) cattle manure in development of the mass balance was calculated based on the following:

Ammonia Emission Rate: 0.12239063 g/sec
Reference: Ammonia Emissions for Liquid Manure Storages are Affected by Anaerobic Digestion and Solid-Liquid Separation, Balde. H, et la, Agriculture and Forest Meteorology, Volume 258, August 2018, pages 80-88

Selected Emission Value: Annual average NH_3 emissions per surface area selected for the raw manure slurry was 2.7 g m^{-2} d^{-1}.

Emission Source: Cattle Manure Pile
Calculated Total Ammonia Loss to Atmosphere: 0.010575 tonnes/day.

Cattle Manure (wet Solids) Ammonia Emission		
Ammonia (as N)	0.0106	tonnes/day

(ii) Cattle Manure Slurring with Warm Water Including Transfer Through Manure Blend Tanks into Digester Feed Tanks

The mass balance to calculate the loss of ammonia to the atmosphere was based on the slurring of raw cattle manure with warm slurry water to achieve a slurry percent solids concentration of 10 wt%. The ammonia emission from the slurring of the feedstock in the two (2) manure blend and transfer into the two (2) digester feed tanks was based on the following calculation:

No. of Manure Blend Tanks:	2	Tanks
No. of Digester Feed Tanks:	2	Tanks
Atmospheric Operated Tanks:	Yes, Covered Tanks	
Tank Ventilation:	Forced Ventilated	
Tank Ventilation Arrangement:	One (1) Manure and one (1) Digester Tank in Series. Two (2) trains in parallel	
Manure Blend Tank Ventilation Rate:	25.4	ACH
Digester Feed Tank Ventilation Rate:	10.8	ACH
Final Slurry Temperature:		
Minimum:	20	deg C
Maximum:	25	deg C
Material Hydraulic Retention Time:	24	hrs (max)
Slurry Cattle Manure:	960.6	m^3/day
Selected Ammonia Emission Factor:	0.13	$g/m^2/hr$ as NH_3 (from reference)
Ammonia Emission Factor as Nitrogen:	0.122	$g/m^2/hr$ as N

Ammonia Loss to Process Air Abatement System:

Cattle Manure Slurry Ammonia Emission		
Ammonia (as N)	0.00129	tonnes/day

Reference: Ammonia and GHG Emission from Slurry Storage – A Review, Kupper et la., Agriculture, Ecosystems & Environment, Volume 300, 106963, Sept 2020

Slurry Cattle Manure Less Ammonia Loss		
Parameter	**Value**	**Units**
Mass Flow	898.6	tonnes/day
% TS	10.0	wt%
% Moisture	90.0	wt%

% VS of TS	87.4	wt%
% Total Nitrogen	0.33	wt%
% Ammonia – as N	24.92	wt%
% Organic – as N	75.08	wt%
Mass Flow		
Total Solids	89.9	tonnes/day
Moisture	808.8	tonnes/day
Volatile Solids	78.5	tonnes/day
Total Nitrogen	2.92	tonnes/day
Ammonia Nitrogen	0.73	tonnes/day
Organic Nitrogen	2.19	tonnes/day
Density	935.5	kg/m3
Volumetric Flow	960.6	m3/day
Total Nitrogen Concentration	3,042	mg/L as N
Ammonia Concentration	758	mg/L as N
Organic Nitrogen Concentration	2,284	mg/L as N

(iii) Organic Food Resource with Warm Water Within Organics Reception Tanks Daily Organics Food Resource Input. Results for the Organic Food Resources are reported under the analysis entitled "Bag of Organic Slurry" dated 05/19/2022, (Report # 128796). A Copy of this analysis is included.

Organic Food Resource (wet solids) input		
Parameter	**Value**	**Units**
Mass Flow	164.4	tonnes/day
% TS	22.9	wt%
% Moisture	77.1	wt%
% VS of TS	92.8	wt%
% Total Nitrogen	0.57	wt%
% Ammonia - as N	0.0018	wt%
% Organic - as N	99.9982	wt%
Mass Flow		
Total Solids	37.7	tonnes/day
Moisture	126.7	tonnes/day
Volatile Solids	35.0	tonnes/day
Total Nitrogen	0.935760	tonnes/day
Ammonia Nitrogen	0.000017	tonnes/day
Organic Nitrogen	0.935744	tonnes/day
Density	925.5	kg/m3
Volumetric Flow	177.6	m3/day
Total Nitrogen Concentration	5,268	mg/L as N
Ammonia Concentration	0.09	mg/L as N

Organic Nitrogen Concentration	5,268	mg/L as N

The mass balance used to calculate the loss of ammonia to the atmosphere was based on the slurring of organic food resource with warm water slurry to achieve a slurry percent solids concentration of 10 wt%, within the three (3) organic food resource tanks while force ventilating the tanks in series as follows:

No. of Organic Food Resource Tanks: 3 Tanks
Tank Ventilation: Forced Ventilated
Tank Ventilation Arrangement: 3 X tanks in Series
Design Total Combined Tank Ventilation Rate: 6 ACH
Ventilation Rate: 1,697 Am^3/hr (tank ventilated in series)
Selected Ammonia Concentration in Ventilated Air: 500.9 ug/m^3 as NH_3
Reference: OFFSET metric input spreadsheet, Jacobson, L., D. Schmidt, S. Wood. 2001. OFFSET: Odor from feedlots setback estimation tool. University of Minnesota Publication F0-07680-C

Ammonia Loss to the Process Air Abatement System:

Organic Food Resource Slurry Ammonia Emission		
Ammonia (as N)	0.0000168	tonnes/day

Slurry Organic Food Resource Less Ammonia Loss		
Parameter	**Value**	**Units**
Mass Flow	376.9	tonnes/day
% TS	10.0	wt%
% Moisture	90.0	wt%
% VS of TS	90.7	wt%
% Total Nitrogen	0.26	wt%
% Ammonia – as N	2.91	wt%
% Organic – as N	97.09	wt%
Mass Flow		
Total Solids	37.7	tonnes/day
Moisture	339.2	tonnes/day
Volatile Solids	34.2	tonnes/day
Total Nitrogen	0.99	tonnes/day
Ammonia Nitrogen	0.03	tonnes/day
Organic Nitrogen	0.97	tonnes/day
Density	966.5	kg/m3
Volumetric Flow	390.0	m3/day
Total Nitrogen Concentration	2,551	mg/L as N

Ammonia Concentration	74	mg/L as N
Organic Nitrogen Concentration	2,476	mg/L as N

(iv) Anaerobic Digestion and Biogas Upgrading

The mass balance used to calculate the amount of organic nitrogen converted into ammonia and that portion of ammonia lost to the biogas was based on the following:

Ammonia Loss to Biogas

Ammonia loss to biogas was based on historically what DLS Biogas, the operating partner of the proposed facility, has experienced in similar operations in Ontario Canada for similar co-digestion operations. Based on DLS's historical data, a maximum concentration value of ammonia in the biogas was taken as being 300 ppmv as NH_3, which equates to 209 mg/Nm^3 as NH_3. Operationally, the ammonia in the biogas is expected to be much lower with the concentration to range between 75 to 150 ppmv (DLS Biogas). Daily loss of ammonia to the biogas system, which is a closed system, was calculated based on the following:

Estimated Daily Biogas Production:	58,219	Nm^3/day
Ammonia Concentration in Biogas:	300	ppmv (max)
Express as mg/Nm^3:	209	mg/Nm^3 as NH^3
Express as mg/Nm^3:	196.5	mg/Nm^3 as Nitrogen
Reference Source:	*Verbal Communication, DLS*	
Daily Ammonia Loss to Biogas:	0.0114	tonnes/day (closed system)

Biogas Ammonia Loss (closed system)		
Ammonia (as N)	0.0114	tonnes/day

Organic Nitrogen to Ammonia Conversion within Anaerobic Digester Tank

Organic Nitrogen to Ammonia Distribution in Digestate Following Digestion:

% Ammonia:	80	% (Note 1)
% Organic Nitrogen Remaining:	20	%

Note 1: Upper Limit (80 %) Selected Based on Co-digestion of Cattle Manure with Organic Food Resource

Reference: Methods of Ammonia Removal in Anaerobic Digestion – A Review, Krakat, N. et la, Water Science Technology (2017) (76)(8): 1925-1938

Slurry Blended Feedstock into Anaerobic Digester Tank		
Parameter	**Value**	**Units**
Mass Flow	1275.5	tonnes/day
% TS	10.0	wt%
% Moisture	90.0	wt%
% VS of TS	88.4	wt%
% Total Nitrogen	0.31	wt%
% Ammonia - as N	19.33	wt%
% Organic - as N	80.67	wt%
Mass Flow		
Total Solids	127.6	tonnes/day
Moisture	1148.0	tonnes/day
Volatile Solids	112.7	tonnes/day
Total Nitrogen	3.92	tonnes/day
Ammonia Nitrogen as N	0.76	tonnes/day
Organic Nitrogen as N	3.16	tonnes/day
Density	992.0	kg/m3
Volumetric Flow	1285.8	m3/day
Total Nitrogen Concentration	3,046	mg/L
Ammonia Concentration	589	mg/L as N
Organic Nitrogen Concentration	2,457	mg/L as N

Digestate Before Solids/Liquid Separation Less Biogas Ammonia Loss		
Parameter	**Value**	**Units**
Mass Flow	1214.7	tonnes/day
% TS	6.0	wt%
% Moisture	94.0	wt%
% VS of TS	80.8	wt%
% Total Nitrogen	0.32	wt%
% Ammonia - as N	80.00	wt%
% Organic - as N	20.00	wt%
Mass Flow		
Total Solids	73.1	tonnes/day
Moisture	1141.6	tonnes/day
Volatile Solids	59.0	tonnes/day
Total Nitrogen	3.91	tonnes/day
Ammonia Nitrogen	3.12	tonnes/day
Organic Nitrogen	0.78	tonnes/day
Density	992.0	kg/m3
Volumetric Flow	1224.5	m3/day

Total Nitrogen Concentration	3,189	mg/L as N
Ammonia Concentration	2,551	mg/L as N
Organic Nitrogen Concentration	638	mg/L as N

(v) Digestate Liquid/Solids Separation

Liquid/Solids Separation

To calculate the distribution of total nitrogen & organic nitrogen/ammonia between the digestate liquid and solid fractions the following relationships were used:

% Total Nitrogen to Solid Cake Fraction: 20 wt%
% Total Nitrogen to Liquid Fraction: 80 wt%
% Ammonia to Liquid Fraction: 85 wt%
% Ammonia to Solid Cake Fraction: 15 wt%

Reference:

(1) Recovery of Ammonia from Anaerobically Digested Manure Using Gas-permeable Membranes, Maria Cruz García-González et la, Sci. Agric. v.73, n.5, p.434-438, September/October 2016

(2) Management strategies for anaerobic digestate of organic fraction of municipal solid waste: Current status and future prospects, Mohanakrishnan Logan and Chettiyappan Visvanathan, Waste Management & Research 2019, Vol. 37(1) Supplement 27–39 (Figure 4)

Digestate Liquid Fraction

Liquid Digestate		
Parameter	**Value**	**Units**
Mass Flow	1092.9	tonnes/day
% TS	3.3	wt%
% Moisture	96.7	wt%
% VS of TS	71.1	wt%
% Total Nitrogen	0.29	wt%
% Ammonia – as N	85.00	wt%
% Organic – as N	15.00	wt%
Mass Flow		
Total Solids	36.5	tonnes/day
Moisture	1056.3	tonnes/day
Volatile Solids	26.0	tonnes/day
Total Nitrogen	3.12	tonnes/day
Ammonia Nitrogen	2.66	tonnes/day
Organic Nitrogen	0.47	tonnes/day
Density	989.7	kg/m3

Volumetric Flow	1104.2	m3/day
Total Nitrogen Concentration	2,829	mg/L as N
Ammonia Concentration	2,405	mg/L as N
Organic Nitrogen Concentration	424	mg/L as N

Digestate Nurse Tank Ammonia Emission

Summarized below is the calculated digestate nurse tank ammonia emission:

No. of Digestate Nurse Tanks: 1 tank
Tank Diameter: 9.15 m
Tank Surface Area: 65.7 m^2
Liquid Fraction Ammonia Emission: 15.50 mg/m^2d
Reference: Ammonia Emissions for Liquid Manure Storages are Affected by Anaerobic Digestion and Solid-Liquid Separation, Balde, H. et la, Agricultural and Forest Meteorology, 258 80-882018

Digestate Nurse Tank Ammonia Loss to Process Air Abatement System

Digestate Nurse Tank Ammonia Emission		
Ammonia (as N)	0.000958	tonnes/day

Liquid Digestate Tank Ammonia Emission

Summarized below is the calculated liquid digestate tank ammonia emission:

No. of Liquid Digestate Tanks: 1 tank
Tank Diameter: 9.15 m
Tank Surface Area: 65.7 m^2
Liquid Fraction Ammonia Emission: 15.50 mg/m^2d
Reference: Ammonia Emissions for Liquid Manure Storages are Affected by Anaerobic Digestion and Solid-Liquid Separation, Balde, H. et la, Agricultural and Forest Meteorology, 258 80-882018

Liquid Digestate Tank Ammonia Loss to Process Air Abatement System

Liquid Digestate Tank Ammonia Emission		
Ammonia (as N)	0.000958	tonnes/day

(vi) Digestate Liquid Pond Storage

Approximately 25 % of the liquid digestate is to be recycled for use as slurry water for feedstock slurring.

Storage Pond

Liquid Digestate to Pond (less 25% recycle)		
Parameter	**Value**	**Units**
Mass Flow	819.7	tonnes/day
% TS	3.3	wt%
% Moisture	96.7	wt%
% VS of TS	71.1	wt%
% Total Nitrogen	0.29	wt%
% Ammonia – as N	84.99	wt%
% Organic – as N	15.01	wt%
Mass Flow		
Total Solids	27.4	tonnes/day
Moisture	792.3	tonnes/day
Volatile Solids	19.5	tonnes/day
Total Nitrogen	2.34	tonnes/day
Ammonia Nitrogen	1.99	tonnes/day
Organic Nitrogen	0.35	tonnes/day
Density	989.7	kg/m3
Volumetric Flow	828.2	m3/day
Total Nitrogen Concentration	2,828	mg/L as N
Ammonia Concentration	2,403	mg/L as N
Organic Nitrogen Concentration	424	mg/L as N

Storage Pond Ammonia Emission:

Ammonia Emission Factor (ave): 0.0009 kg NH3-N/kg N in Digestate
The above emission factor was used in calculation of the ammonia emission for both the solids cake and liquid digestate as it was based on the nitrogen content in the digestate prior to liquid/solids separation.

Reference: NFR 5.B.2, Biological Treatment of Waste – Anaerobic Digestion at at Biogas Facilities, Biogas Production, EMEP/EEA air pollutant emission inventory guidebook 2019, Section 3.4.2 - Open Storage Selected Emission Factor - Average Selected

Liquid Digestate Storage Pond Ammonia Emission		
Ammonia (as N)	0.0022	tonnes/day

(vii) Digestate Solids Storage

Digestate Cake Fraction

Digestate Cake		
Parameter	**Value**	**Units**
Mass Flow	121.8	tonnes/day
% TS	30.0	wt%
% Moisture	70.0	wt%
% VS of TS	90.4	wt%
% Total Nitrogen	0.64	wt%
% Ammonia – as N	60.00	wt%
% Organic – as N	40.00	wt%
Mass Flow		
Total Solids	36.5	tonnes/day
Moisture	85.3	tonnes/day
Volatile Solids	33.0	tonnes/day
Total Nitrogen	0.78	tonnes/day
Ammonia Nitrogen	0.47	tonnes/day
Organic Nitrogen	0.31	tonnes/day
Density	888.0	kg/m3
Volumetric Flow	137.2	m3/day
Total Nitrogen Concentration	5,694	mg/L as N
Ammonia Concentration	3,417	mg/L as N
Organic Nitrogen Concentration	2,278	mg/L as N

Solids Cake Ammonia Emission:

Ammonia Emission Factor (ave): 0.0009 kg NH3-N/kg N in Digestate
The above emission factor was used in calculation of the ammonia emission for both the solids cake and liquid digestate as it was based on the nitrogen content in the digestate prior to liquid/solids separation.

Reference: NFR 5.B.2, Biological Treatment of Waste – Anaerobic Digestion at at Biogas Facilities, Biogas Production, EMEP/EEA air pollutant emission inventory guidebook 2019, Section 3.4.2 - Open Storage Selected Emission Factor - Average Selected

Solids Cake Storage Ammonia Emission Loss to Atmosphere:

Total Digestate Cake Ammonia Emission		
Ammonia (as N)	0.00033	tonnes/day

The digestate solids cake is to be stored in two locations:

1. The Digestate Separation Building Storage
2. Digestate Staging Pile

The total solids cake ammonia emissions from these two locations are split on the volume of storage basis, with the Digestate Separation Building storage accounting for 5% of the storage volume and the Digestate Staging Pile accounting for 95% of the storage volume.

Digestate Separation Building Storage Ammonia Emission		
Ammonia (as N)	0.000016	tonnes/day
Digestate Staging Pile Ammonia Emission		
Ammonia (as N)	0.00029	tonnes/day

Digestate Separation Building Ammonia Emission

Within the Digestate Separation Building there are three sources of Ammonia.

1. The vapours associated with the separation / screw presses
2. The digestate separation building storage

Due to the difficulty of splitting up these emissions, a conservative approach of assigning the total solids cake ammonia emissions to the digestate separation building was implemented.

Digestate Separation Building Ammonia Emission		
Ammonia (as N)	0.00033	tonnes/day

(viii) Feedstock Slurry Water

Slurry Water

Slurry water used for feedstock slurring was modeled the have the following composition based on 25 % digestate liquid supernatant recycle:

Total Slurry Water		
Parameter	**Value**	**Units**
Mass Flow	892.0	tonnes/day
Volumetric Flow	895.4	m3/day
Total Nitrogen	275.0	mg/L as N
Ammonia Nitrogen	135.0	mg/L as N

Down To Earth Labs Inc.
The Science of Higher Yields

Obsidian Engineering Corp.
436-129 Ave SE.
Calgary, AB T2J 4A9

Report # : 128796-00
Report Date: 2022-05-19
Received: 2022-04-21
Completed: 2022-05-19
Test Package: FDObsidian

Project:
PO:
Grower:
Field:
Animal: No Energy

3510 6th Ave North
Lethbridge, AB T1H 5C3
403-328-1133
www.downtoearthlabs.com
info@downtoearthlabs.com

Sample	ID	Type	Analysis	Dry Basis Result	Wet Basis Result	Units	Metric Units kg/tonne	Imperial Units #/ton
220421N004	Bag of Solid Manure	Manure, Solid	Moisture		47.65	%		
			Total Nitrogen	3.08	1.6	%	16	32
			Chloride	0.455	0.24	%	2.4	4.8
			pH		6.3			
			Potassium	1.46	0.76	%	7.6	15.2
			Phosphorous	0.74	0.39	%	3.9	7.8
			Calcium	2.44	1.3	%	13	26
			Magnesium	0.446	0.23	%	2.3	4.6
			Copper	21.9	11	ppm	0.011	0.022
			Manganese	62.0	32	ppm	0.032	0.064
			Zinc	123	64	ppm	0.064	0.128
			Sodium	0.24	0.13	%	1.3	2.6
			Iron	589	310	ppm	0.31	0.62
			Sulfur	0.49	0.26	%	2.6	5.2
			Total Solids		52.35	%	270	540
			Volatile Solids		87.39	%	460	920
			Total Suspended Solids		45.64	%	240	480

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Sample	ID	Type	Analysis	Dry Basis Result	Wet Basis Result	Units	Metric Units kg/tonne	Imperial Units #/ton
220421N005	Bag of OrganicSlurry	Compost, Liquid	Moisture		77.07	%		
			Total Nitrogen	2.49	0.57	%	5.7	11.4
			Chloride	0.634	0.15	%	1.5	3
			pH		4.7			
			Potassium	1.20	0.28	%	2.8	5.6
			Phosphorous	0.31	0.071	%	0.71	1.42
			Calcium	1.03	0.24	%	2.4	4.8
			Magnesium	0.0914	0.021	%	0.21	0.42
			Copper	8.98	2.1	ppm	0.0021	0.0042
			Manganese	14.3	3.3	ppm	0.0033	0.0066
			Zinc	22.9	5.3	ppm	0.0053	0.0106
			Sodium	0.64	0.15	%	1.5	3
			Iron	322	74	ppm	0.074	0.148
			Sulfur	0.11	0.025	%	0.25	0.5
			Total Solids		22.93	%	53	106
			Volatile Solids		92.78	%	210	420
			Total Suspended Solids		12.73	%	29	58

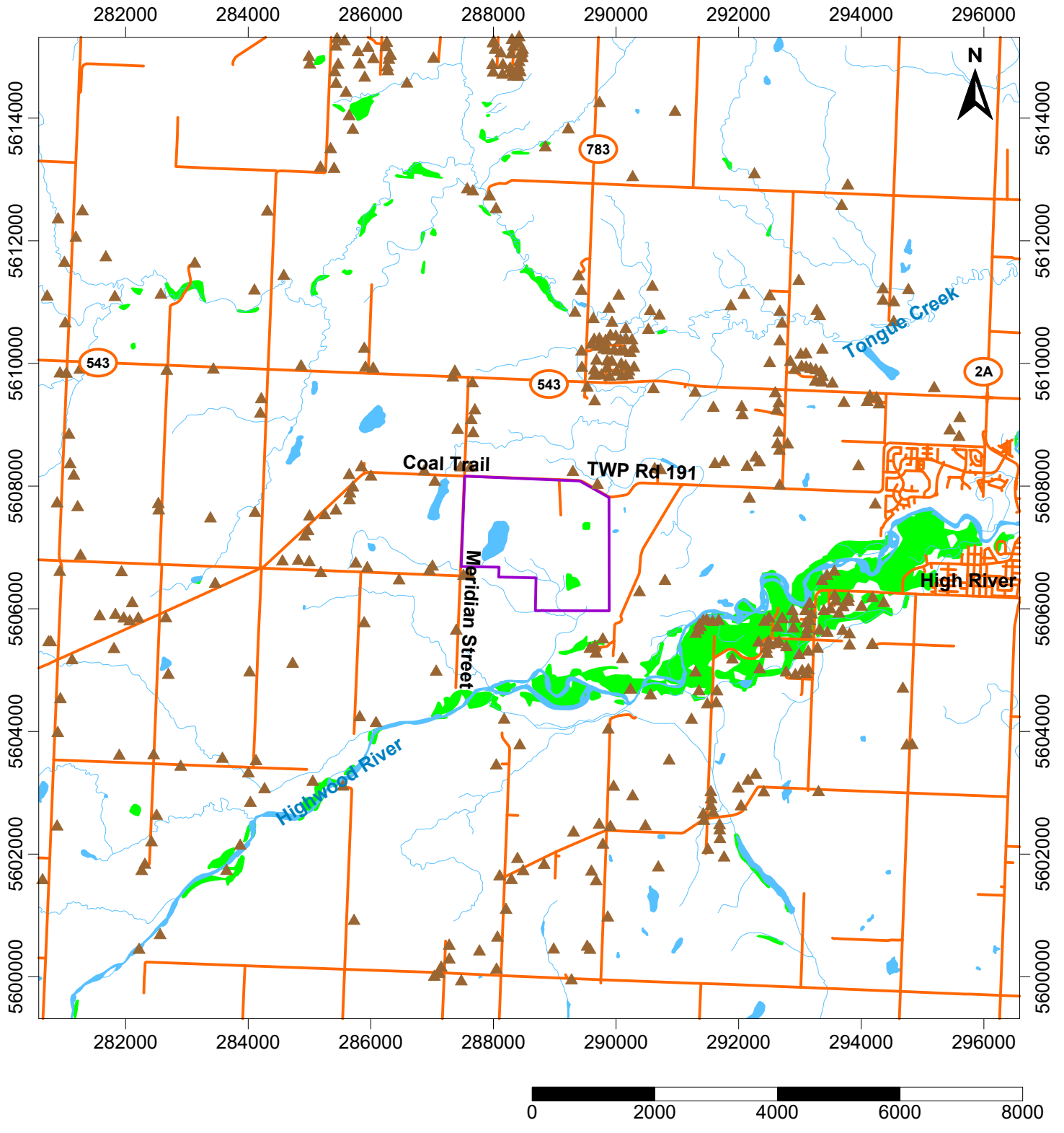
Approved by

Raygan Boyce, Lab Manager

BDL: Below Detection Limit

APPENDIX B

FIGURES

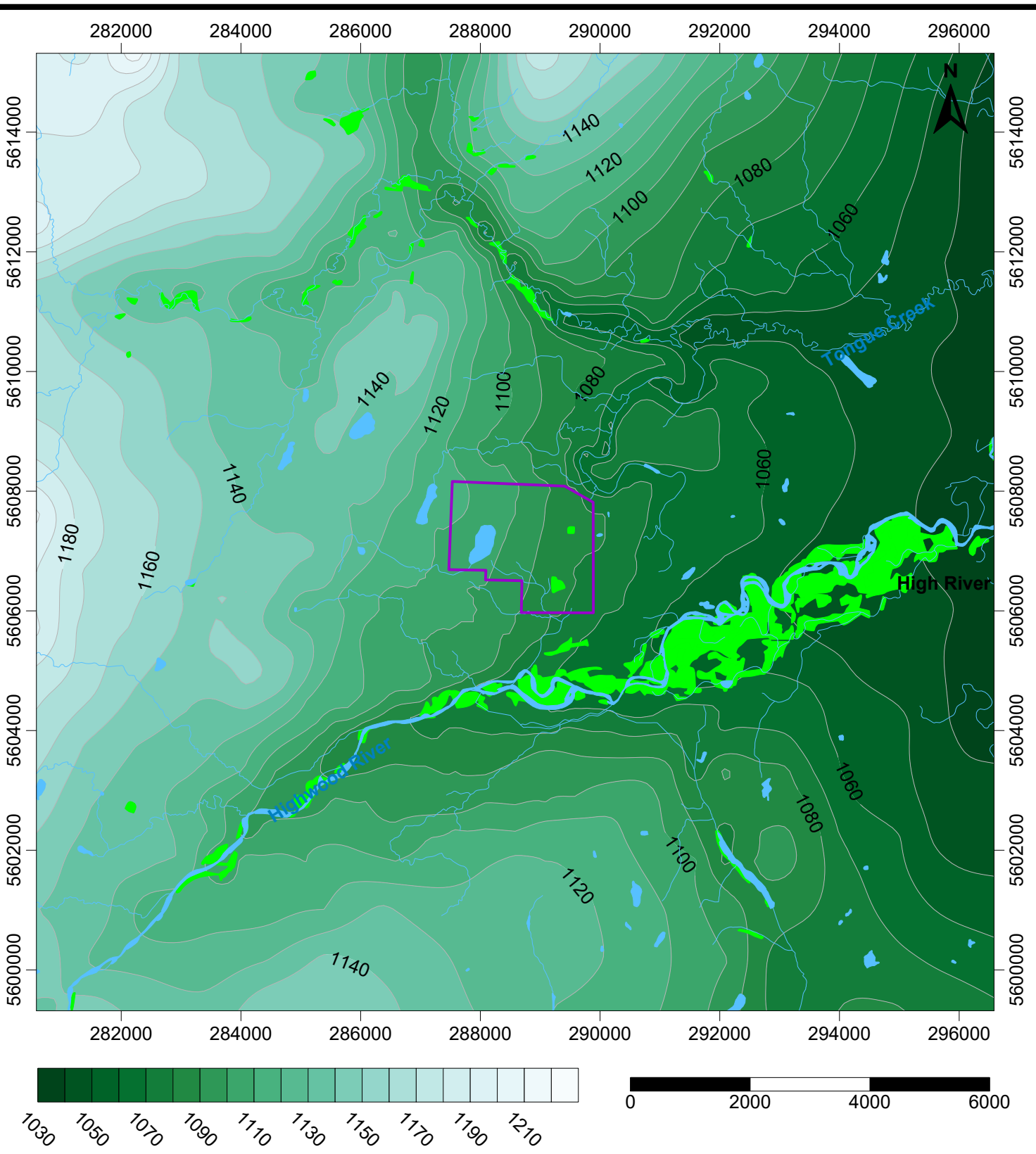


LEGEND

- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area
- Resident

PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Project Area Map**
DATE	July 10, 2023
	FIGURE 1

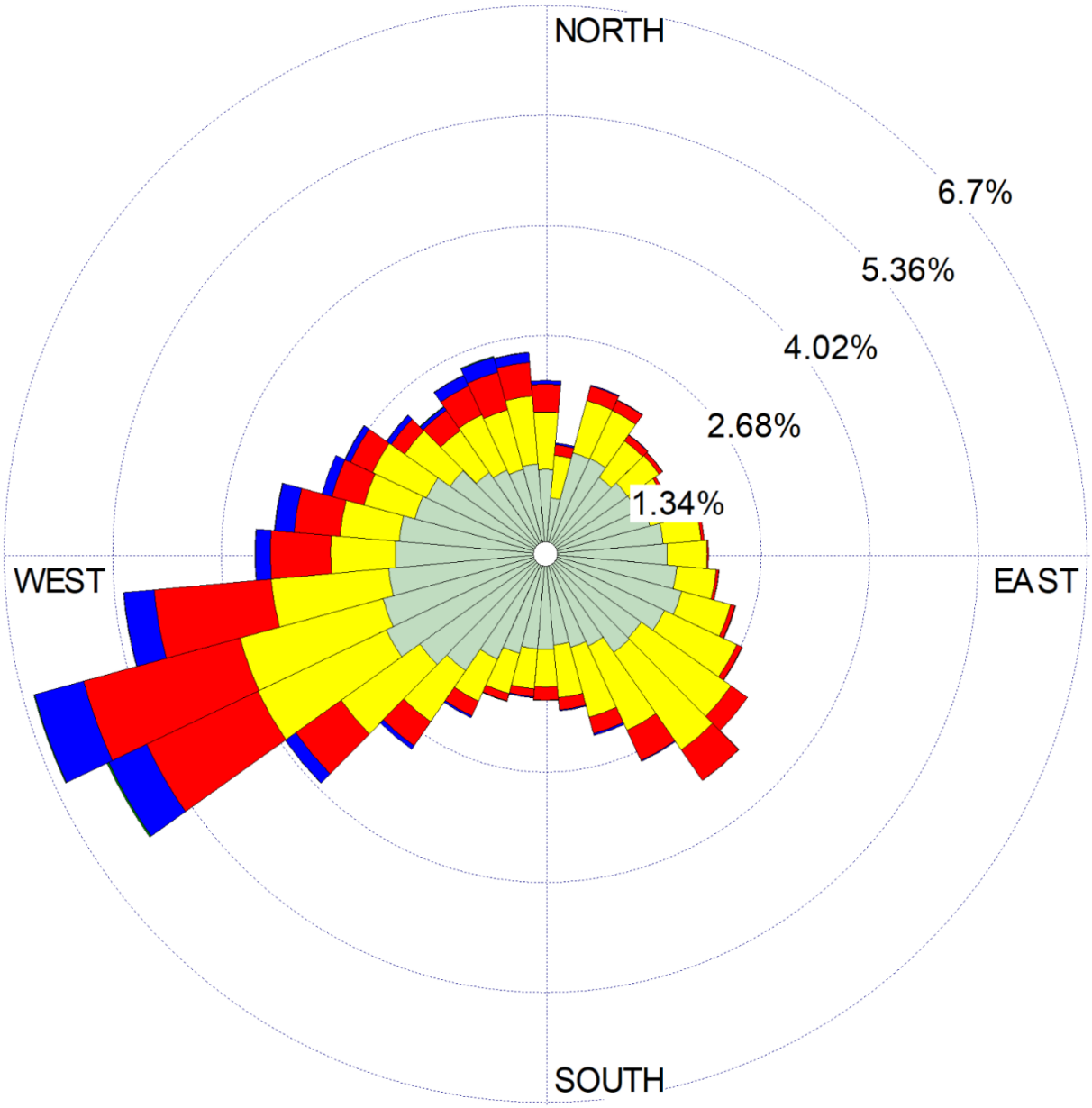
HORIZON COMPLIANCE



LEGEND

- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Wooded Area

PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Topographical Map**
HORIZON COMPLIANCE	DATE: July 10, 2023
	FIGURE 2

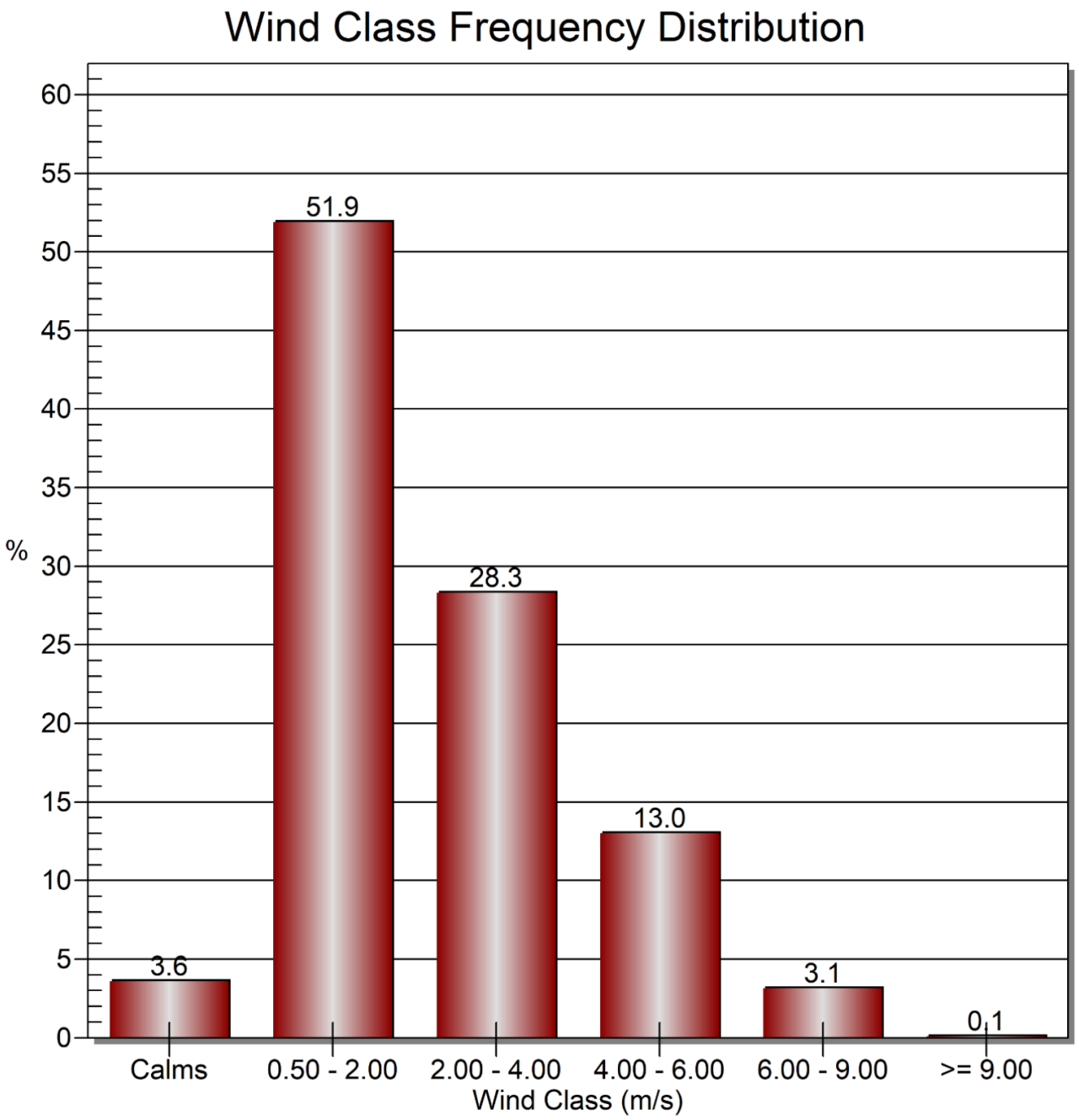


WIND SPEED
(m/s)

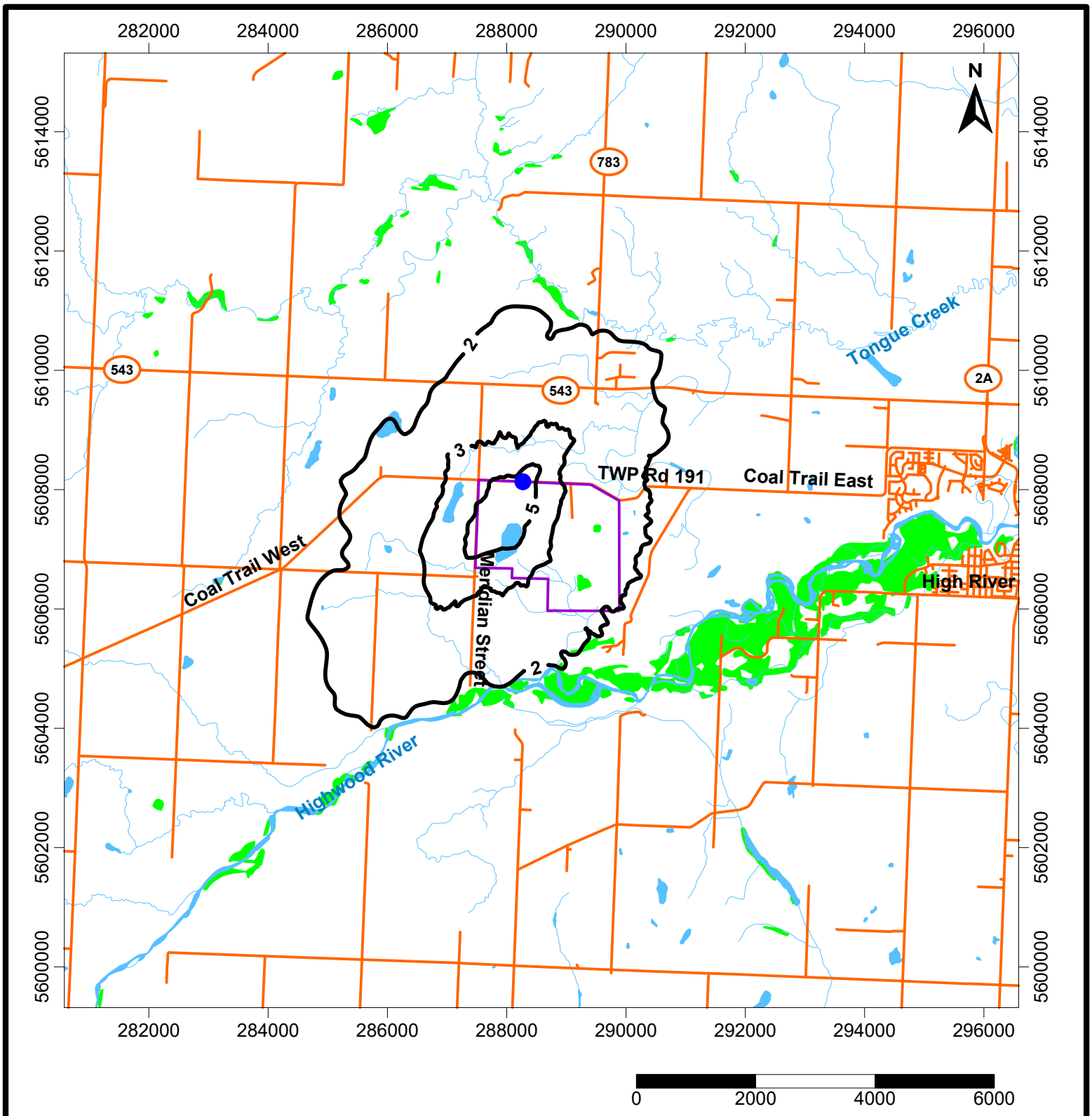
- >= 9.00
- 6.00 - 9.00
- 4.00 - 6.00
- 2.00 - 4.00
- 0.50 - 2.00

Calms: 3.59%

PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Wind Rose Plot at the Project Area (2015 to 2019)**
HORIZON COMPLIANCE	DATE: July 10, 2023
	FIGURE 3



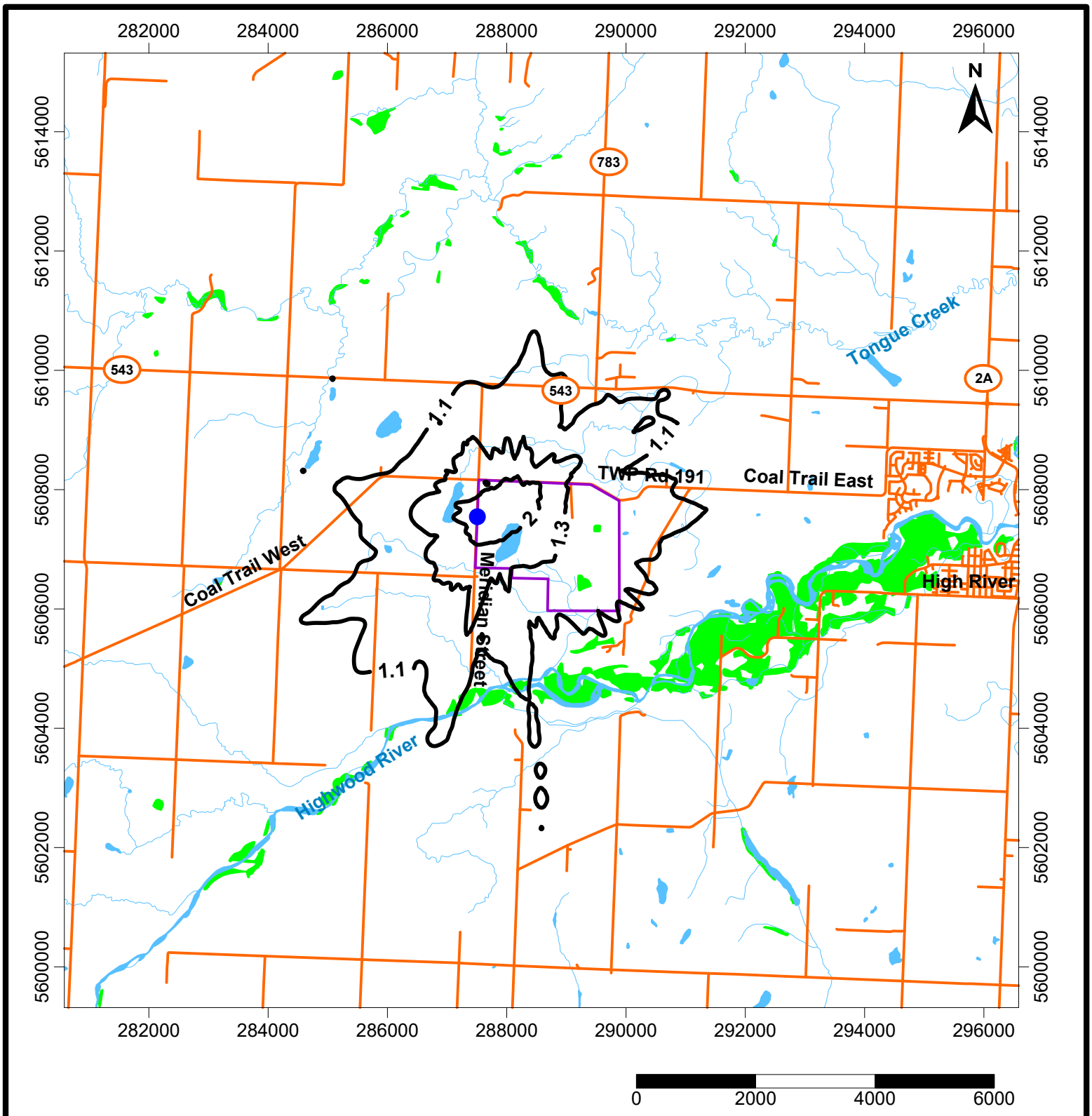
PROJECT: Rimrock Renewables Ltd. Rimrock Biodigester Facility		
TITLE: **Wind Class Frequency Distribution at the Project Area (2015 to 2019)**		
HORIZON COMPLIANCE	DATE: July 10, 2023	**FIGURE 4**



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

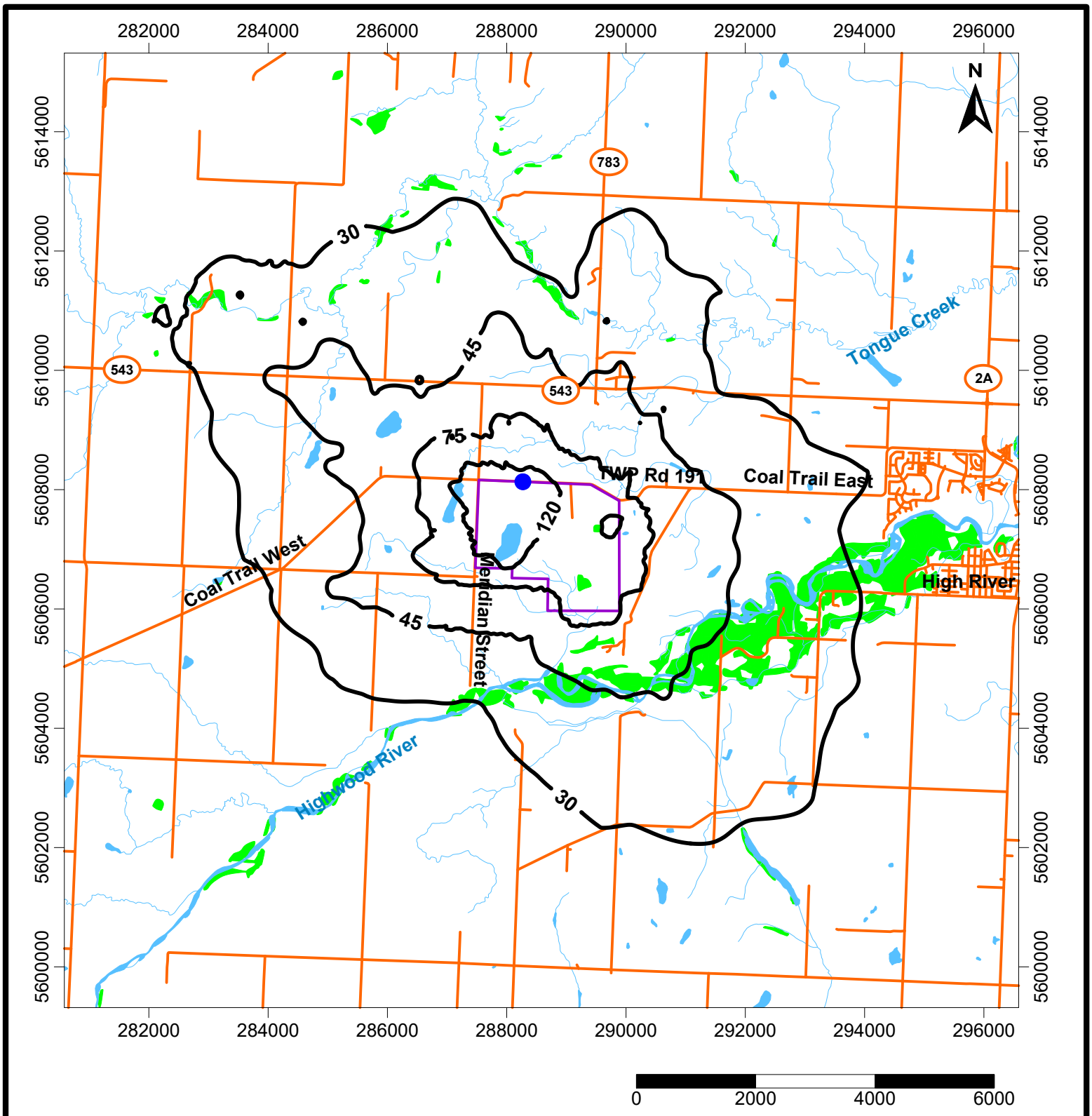
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average H_2S Concentrations (Project Case)**
HORIZON COMPLIANCE	MGLC: H_2S = 9.0 (µg/m³)
	FIGURE 5



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

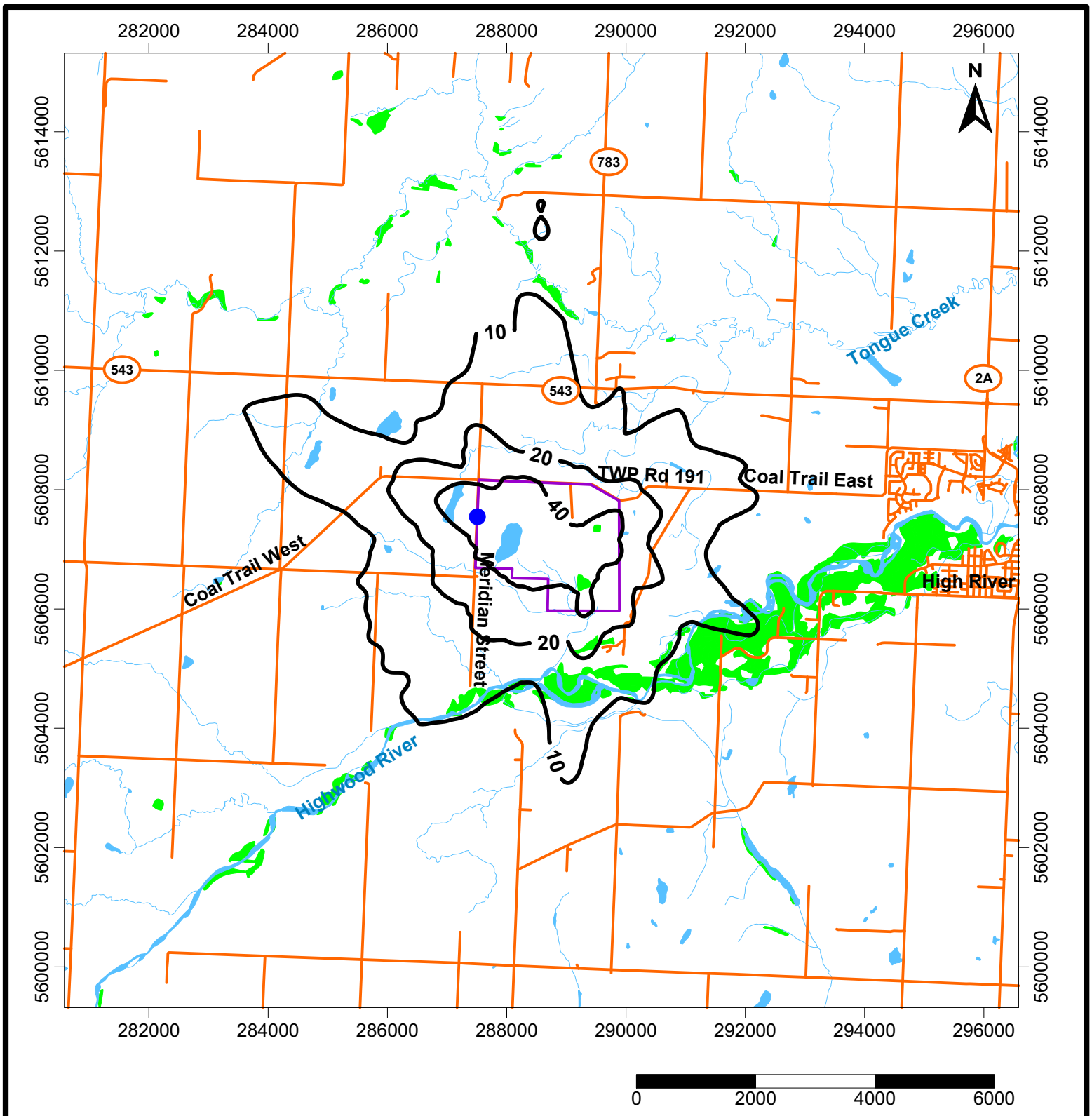
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Maximum Predicted 24-Hour Average H_2S Concentrations (Project Case)**
HORIZON COMPLIANCE	MGLC: H_2S = 3.6 (µg/m³)
	FIGURE 6



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

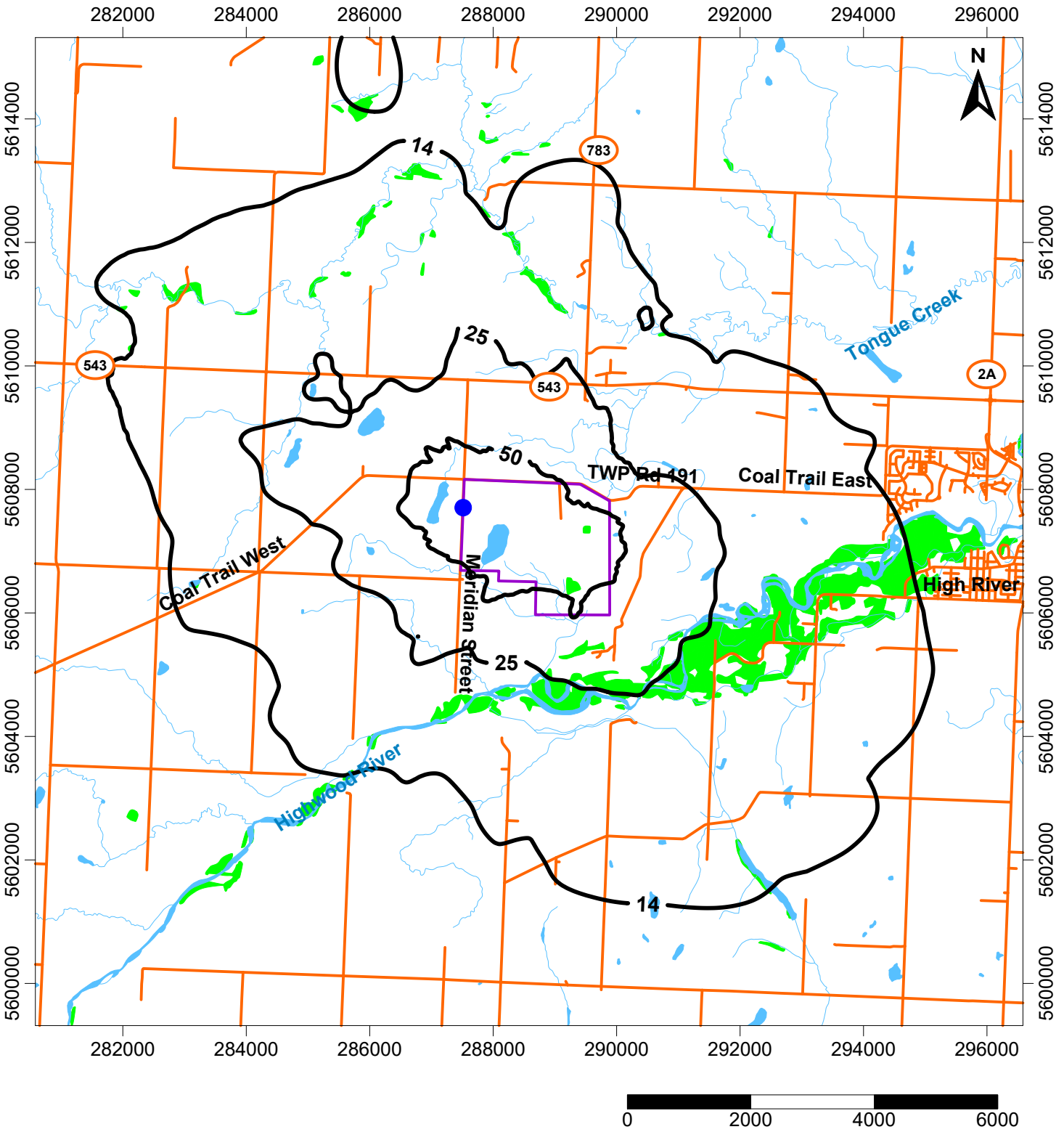
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average H_2S Concentrations (Baseline Case: Rimrock Cattle Company Ltd. feedlot)**
HORIZON COMPLIANCE	MGLC: H_2S = 168.9 (µg/m³)
	FIGURE 7



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

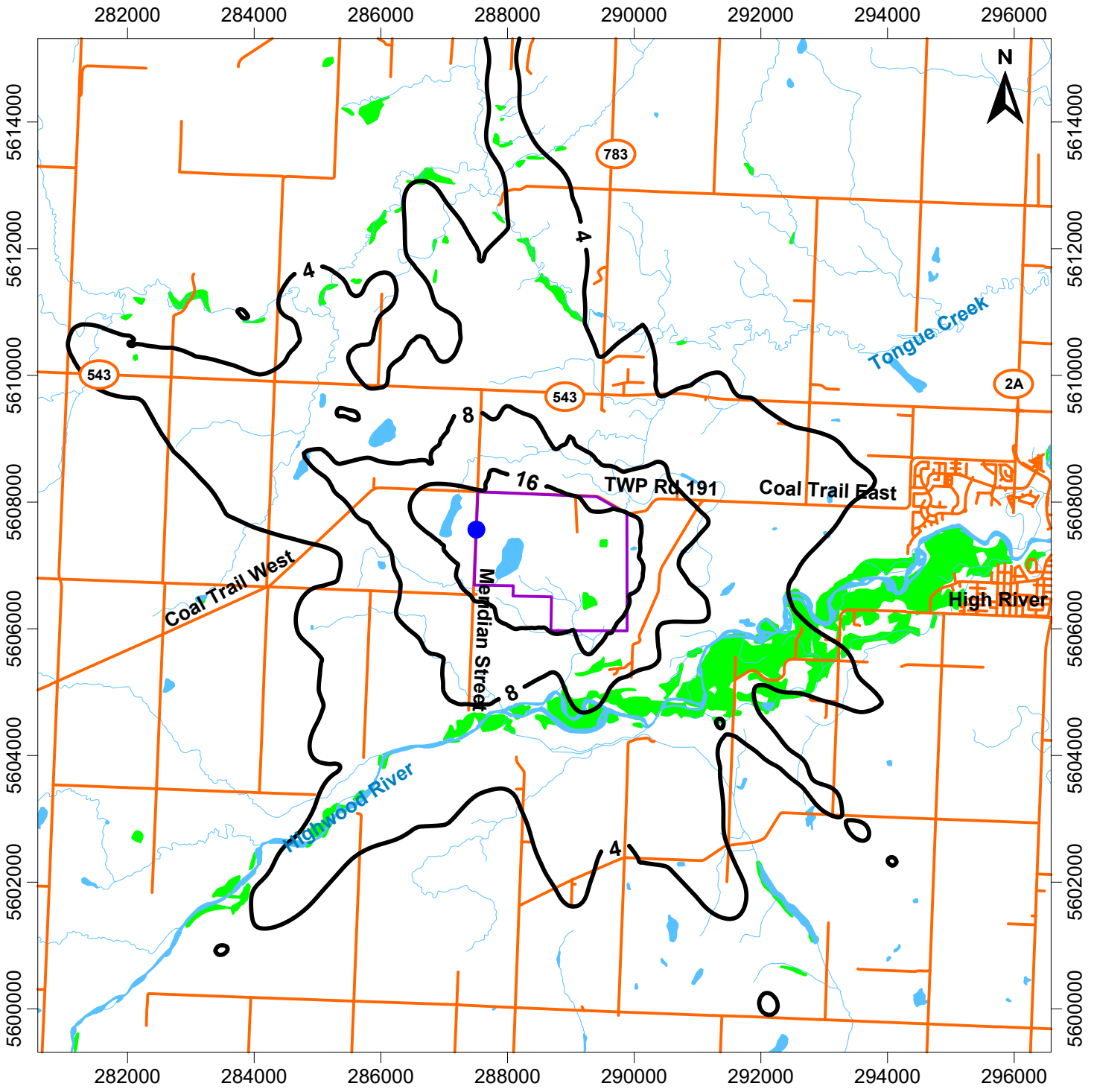
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Maximum Predicted 24-Hour Average H_2S Concentrations (Baseline Case: Rimrock Cattle Company Ltd. feedlot)**
HORIZON COMPLIANCE	MGLC: H_2S = 64.8 (µg/m³)
	FIGURE 8



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

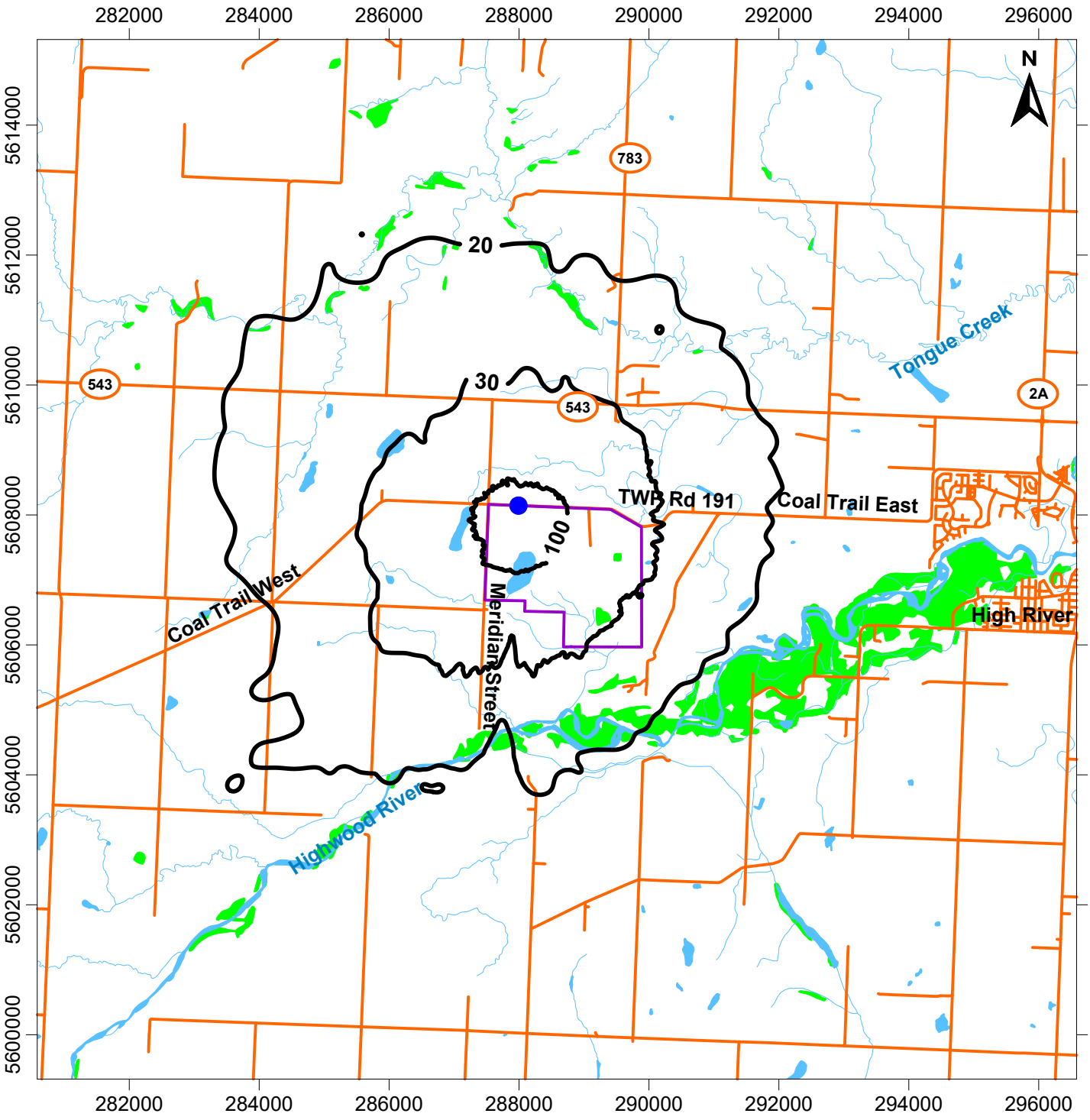
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average H_2S Concentrations (Cumulative Case: Rimrock Complex)**
HORIZON COMPLIANCE	MGLC: H_2S = 90.6 (µg/m³)
	FIGURE 9



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

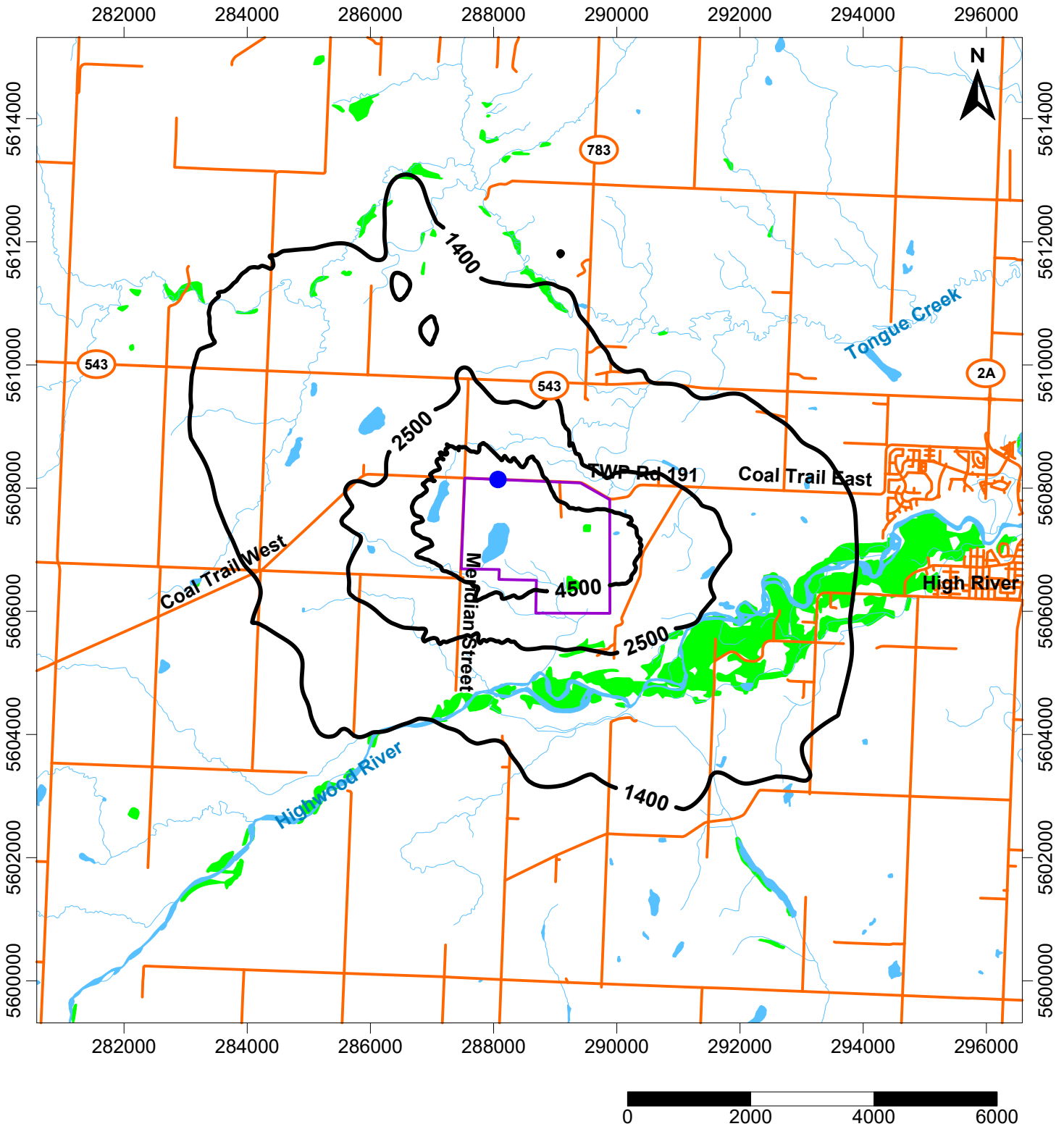
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Maximum Predicted 24-Hour Average H_2S Concentrations (Cumulative Case: Rimrock Complex)**
HORIZON COMPLIANCE	MGLC: H_2S = 36.3 (µg/m³)
	FIGURE 10



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

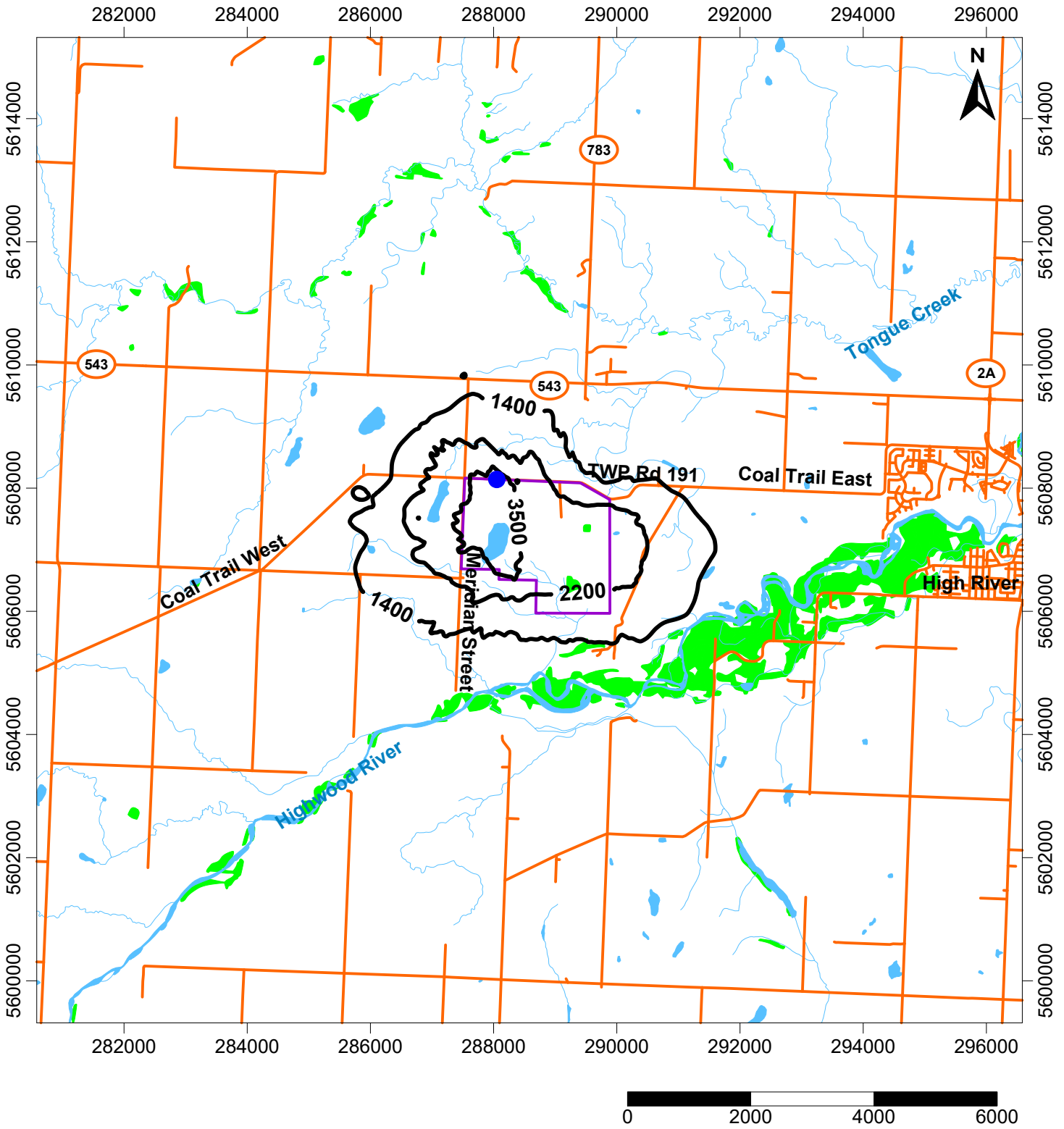
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average NH_3 Concentrations (Project Case)**
HORIZON COMPLIANCE	MGLC: NH_3 = 258.4 (µg/m³)
	FIGURE 11



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

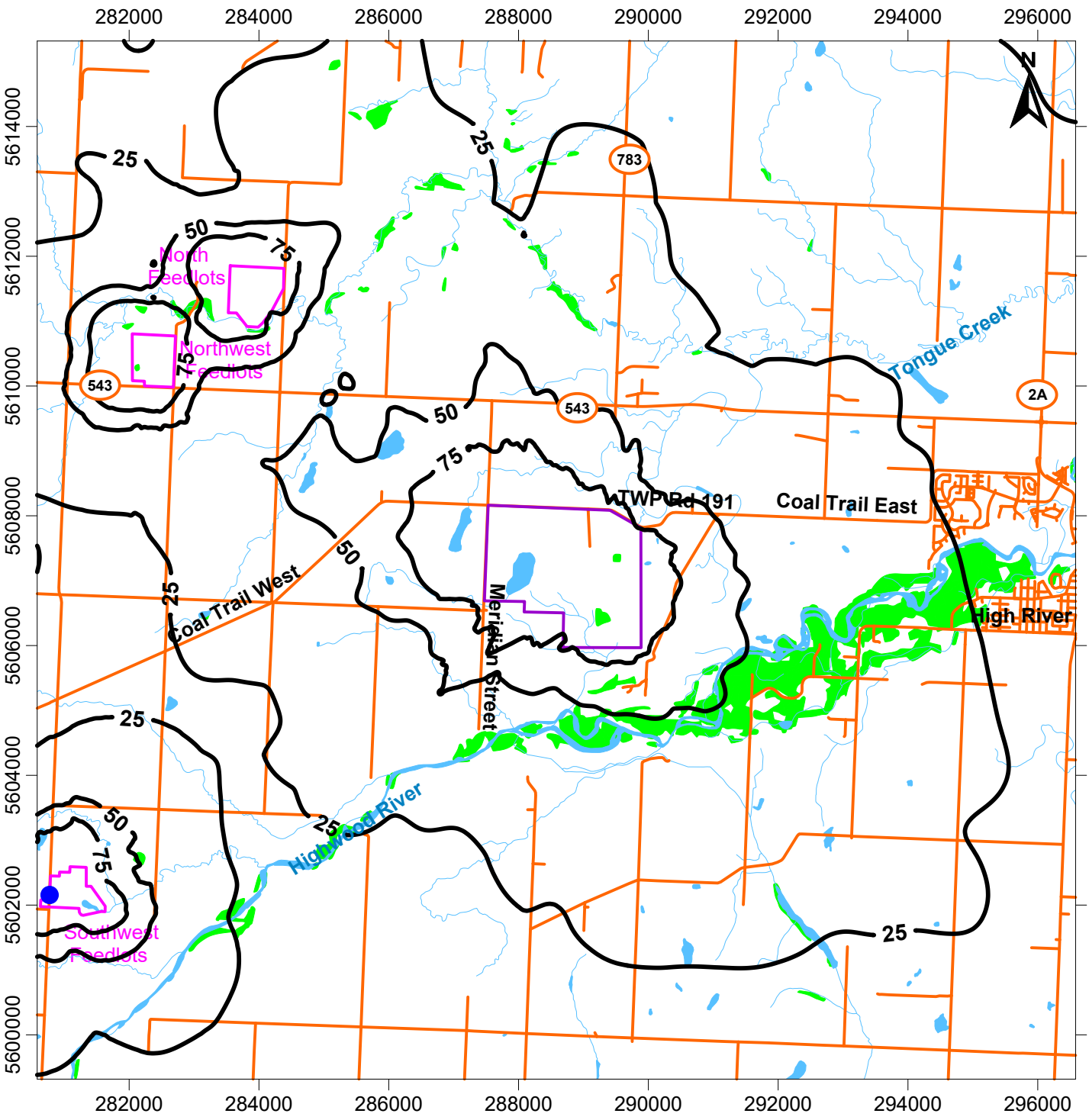
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average NH_3 Concentrations (Baseline Case: Rimrock Cattle Company Ltd. feedlot)**
HORIZON COMPLIANCE	MGLC: NH_3 = 8773.1 (µg/m³)
	FIGURE 12



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Water Body or Course
- Roads
- Wooded Area

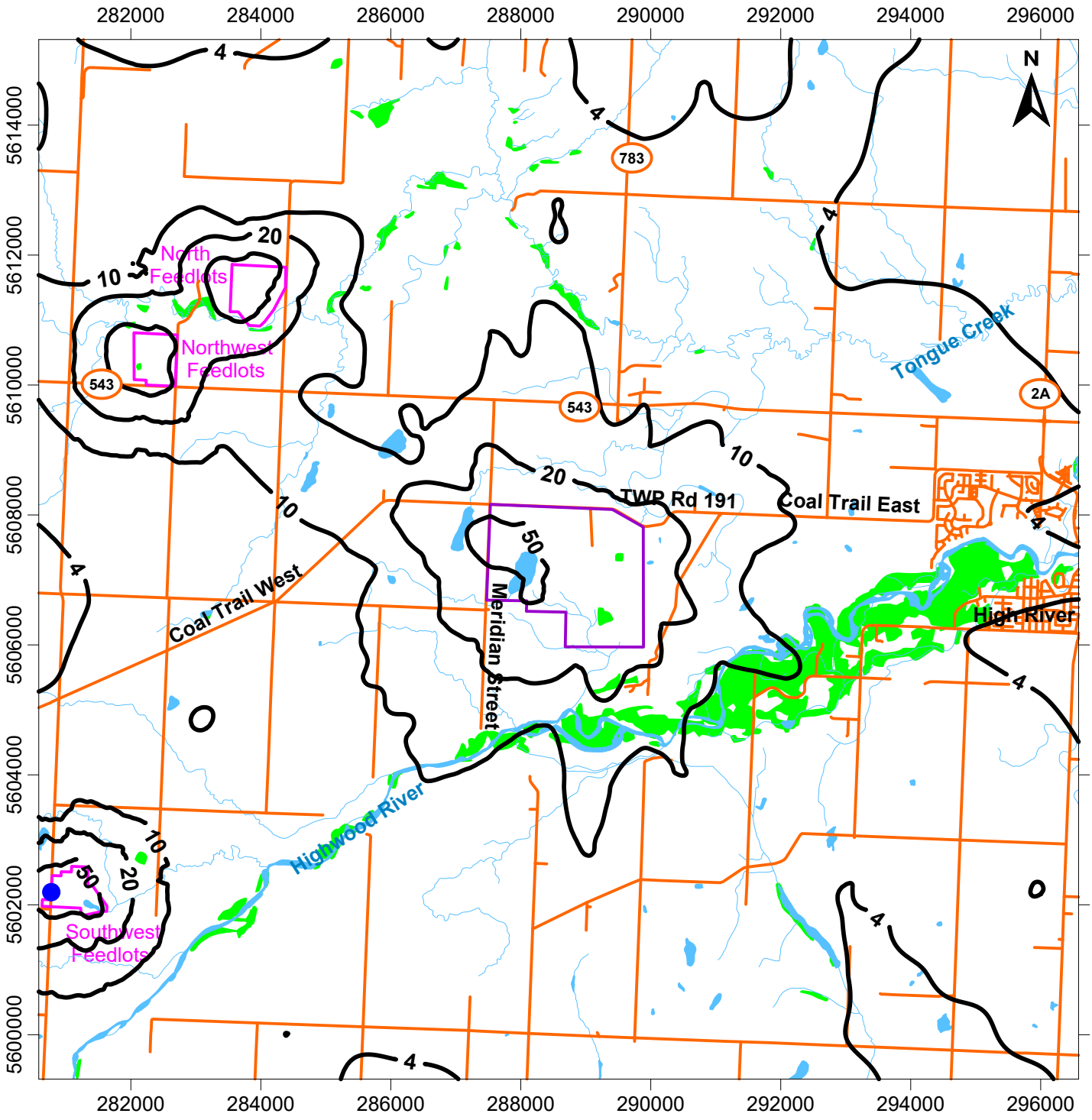
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average NH_3 Concentrations (Cumulative Case: Rimrock Complex)**
HORIZON COMPLIANCE	MGLC: NH_3 = 4666.0 (µg/m³)
	FIGURE 13



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Background Facilities
- Water Body or Course
- Roads
- Wooded Area

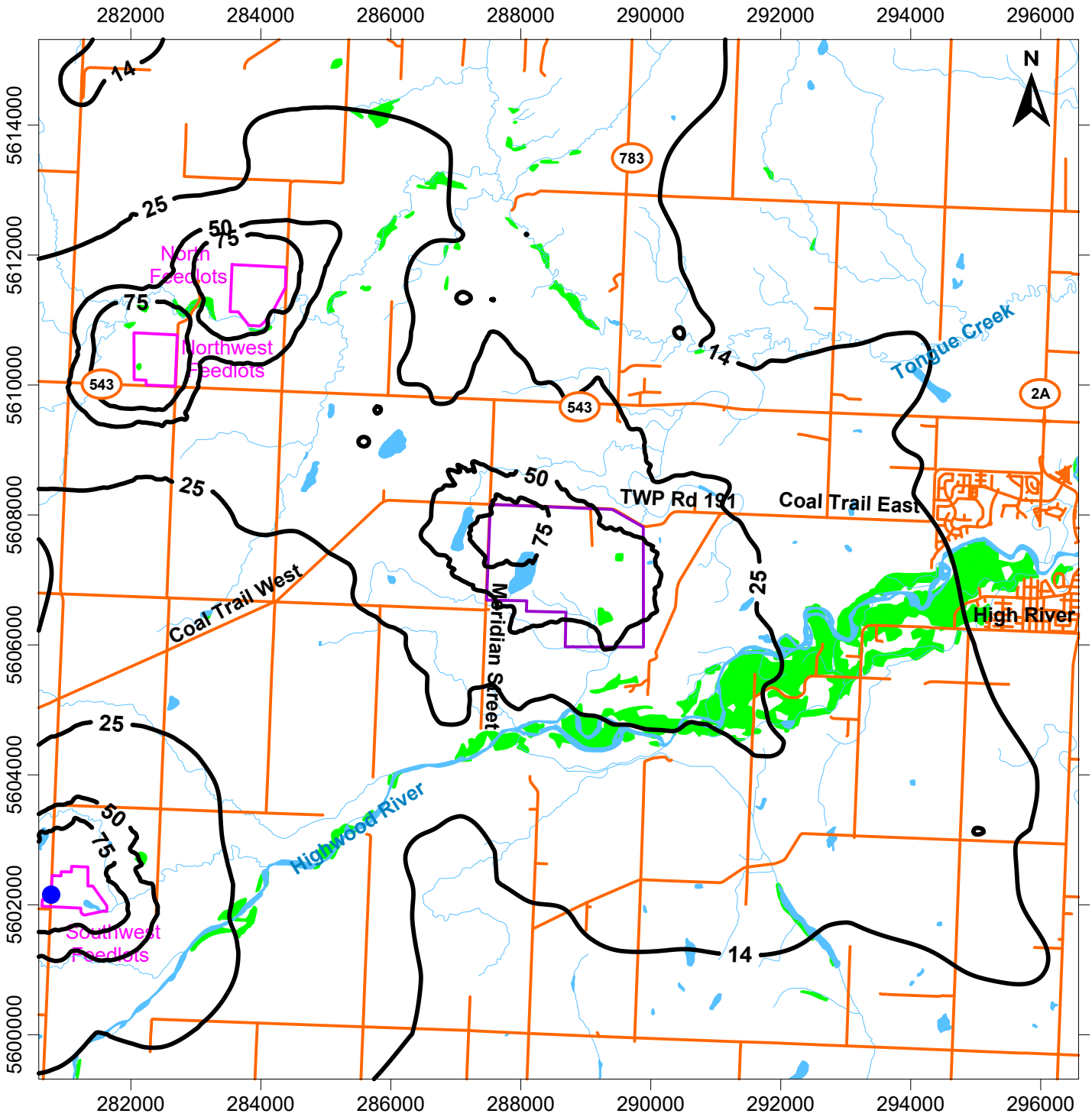
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average H_2S Concentrations (Overall Baseline Case)**
HORIZON COMPLIANCE	MGLC: H_2S = 327.8 (µg/m³)
	FIGURE 14



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Background Facilities
- Water Body or Course
- Roads
- Wooded Area

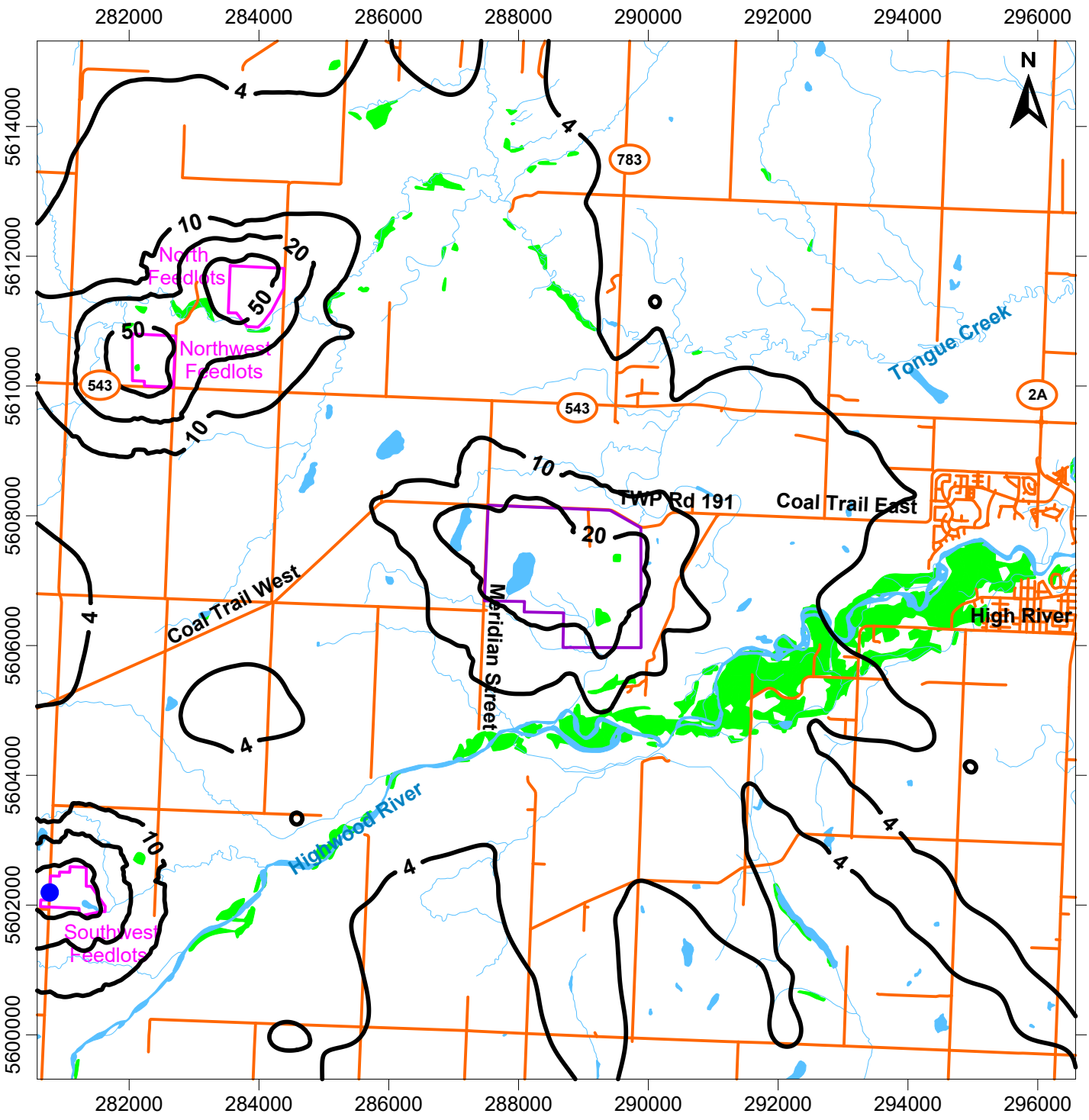
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Maximum Predicted 24-Hour Average H_2S Concentrations (Overall Baseline Case)**
HORIZON COMPLIANCE	MGLC: H_2S = 156.1 (µg/m³)
	FIGURE 15



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Background Facilities
- Water Body or Course
- Roads
- Wooded Area

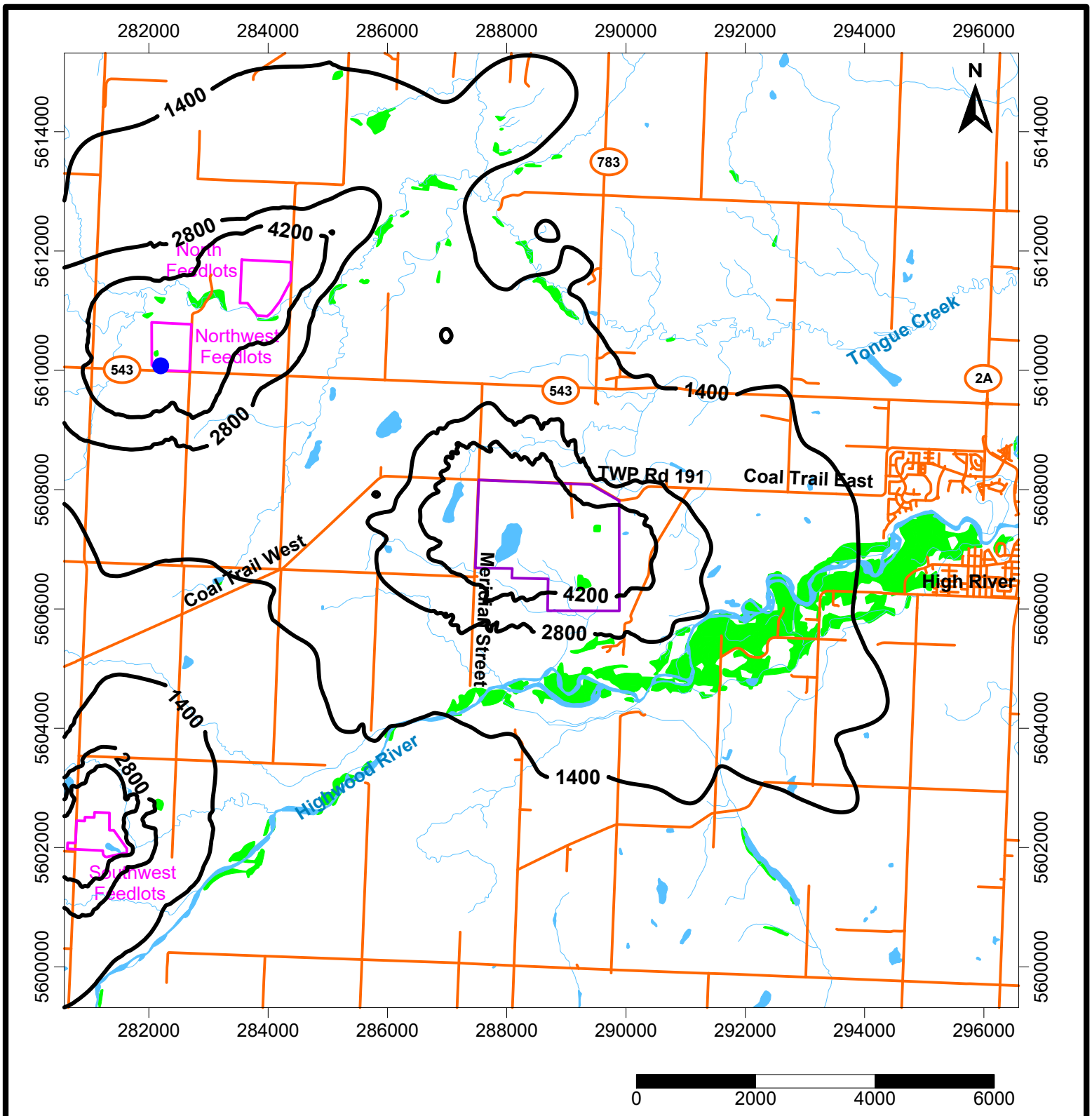
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average H_2S Concentrations (Overall Cumulative Case)**
HORIZON COMPLIANCE	MGLC: H_2S = 324.5 (µg/m³)
	FIGURE 16



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Background Facilities
- Water Body or Course
- Roads
- Wooded Area

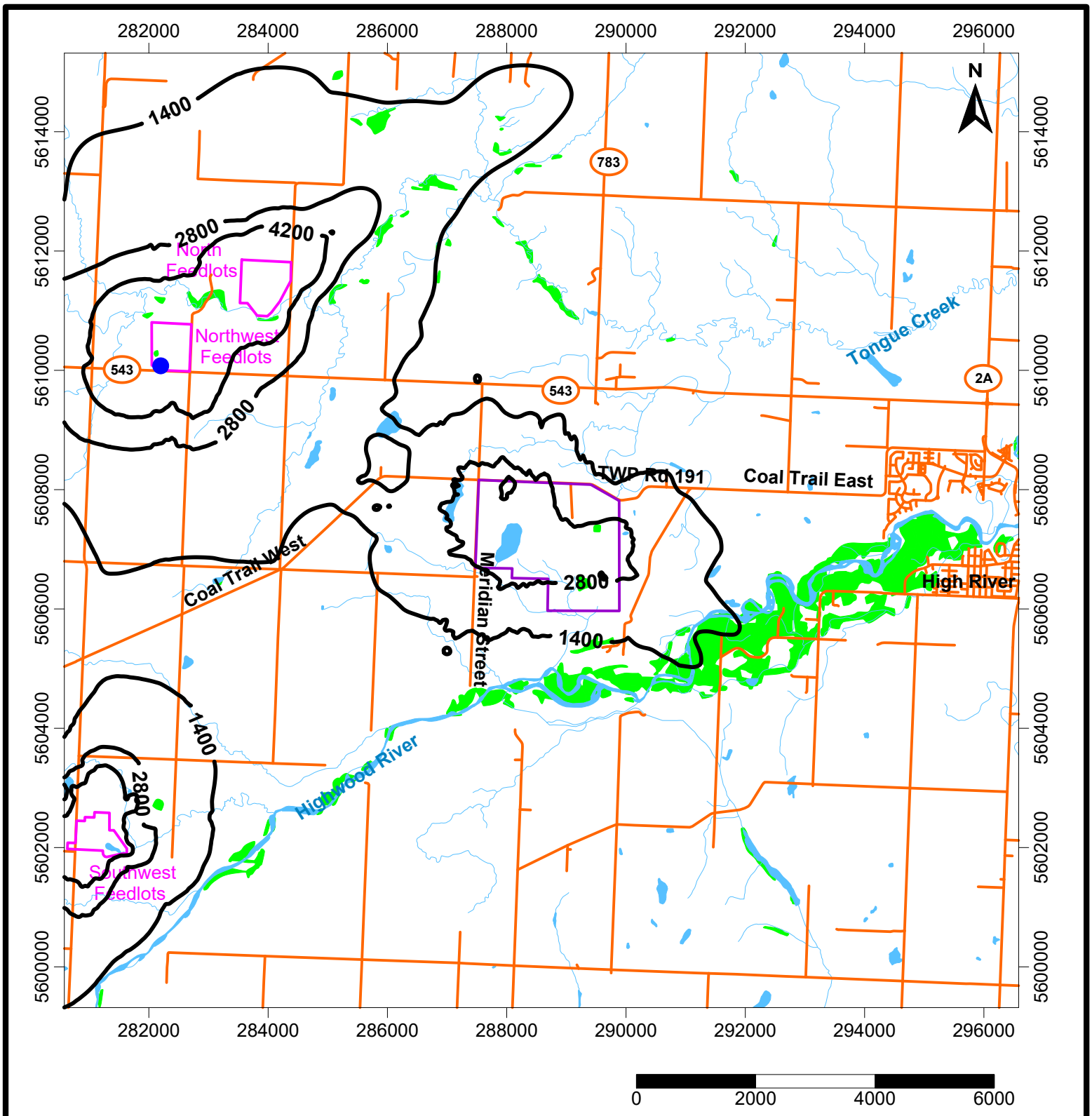
PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**Maximum Predicted 24-Hour Average H_2S Concentrations (Overall Cumulative Case)**
HORIZON COMPLIANCE	MGLC: H_2S = 155.9 (µg/m³)
	FIGURE 17



LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Background Facilities
- Water Body or Course
- Roads
- Wooded Area

PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average NH_3 Concentrations (Overall Baseline Case)**
HORIZON COMPLIANCE	MGLC: NH_3 = 23032.6 (µg/m³)
	FIGURE 18



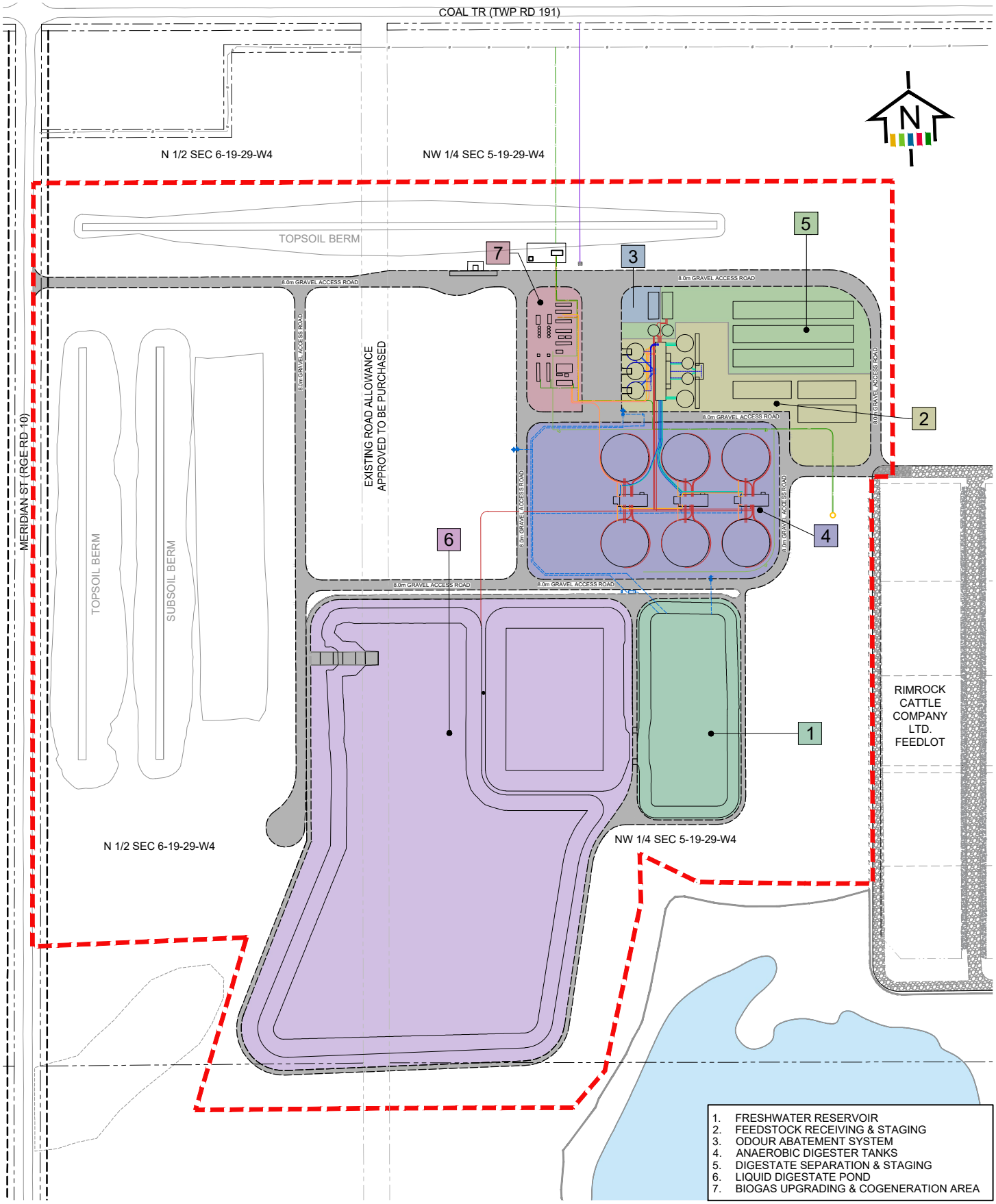
LEGEND

- Maximum Ground Level Concentration (MGLC)
- Rimrock Feeders & Biodigester Facilities
- Background Facilities
- Water Body or Course
- Roads
- Wooded Area

PROJECT	Rimrock Renewables Ltd. Rimrock Biodigester Facility
TITLE	**99.9th Percentile of Predicted 1-Hour Average NH_3 Concentrations (Overall Cumulative Case)**
HORIZON COMPLIANCE	MGLC: NH_3 = 23032.6 (µg/m³)
	FIGURE 19

APPENDIX C

PLOT PLAN



ISL Engineering and Land Services

0 80 160 m

1:4000

PROJECT FOOTPRINT
CATCH BASIN
EPHEMERAL WATERBODY
PROPOSED TRANSFORMER LOCATION
HYDRANT
MANHOLE
WATERLINE
ORGANIC FOOD RESOURCES SLURRY
HEAT MEDIUM RETURN LINE
HEAT MEDIUM SUPPLY LINE
DIGESTATE LINE
MANURE LINE
BIOGAS LINE
NATURAL GAS PIPELINE
RNG LINE
POWERLINE

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 5-1A

Main Process Areas

July 2023

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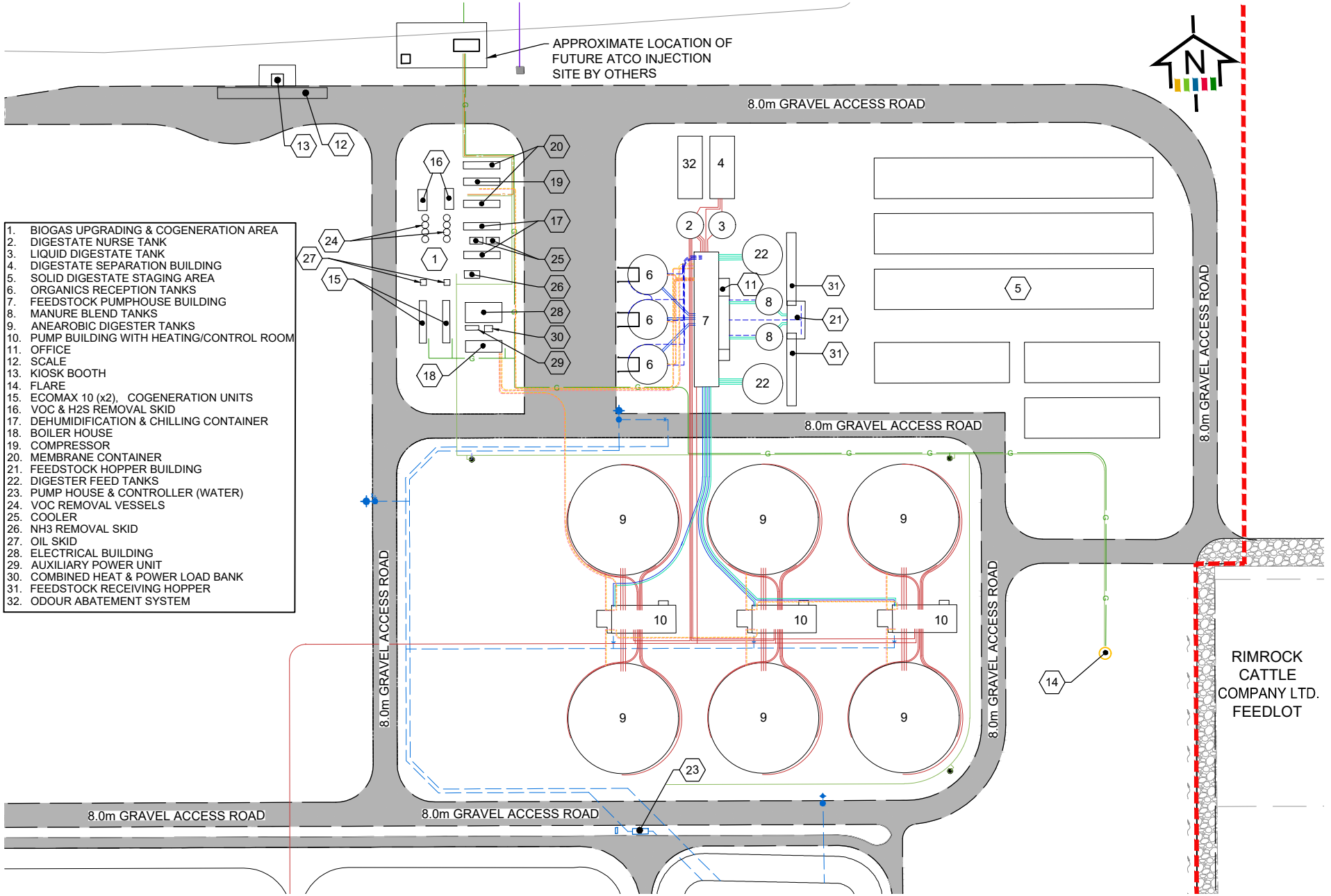

ISL Engineering and Land Services

0 35 75 m

1:1750

PROJECT FOOTPRINT
WATERLINE
HYDRANT
MANHOLE
PROPOSED TRANSFORMER LOCATION
HEAT MEDIUM RETURN LINE
HEAT MEDIUM SUPPLY LINE

DIGESTATE LINE
MANURE LINE
BIOGAS LINE
NATURAL GAS PIPELINE
RNG LINE
POWERLINE
ORGANIC FOOD RESOURCES SLURRY

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 5-2
Facility Plot Plan
July 2023

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APPENDIX D

MODELLING INPUT AND OUTPUT FILES

H_2S DISPERSION MODELLING INPUT
Project Case

```
**
**********************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 11.2.0
** Lakes Environmental Software Inc.
** Date: 7/17/2023
** File: D:\Modelling\Rimrock\UpdatedLayout\MODELLING\20230716\PJ\H2S\2019\2019.ADI
**
**********************************
**
**
**********************************
** AERMOD Control Pathway
**********************************
**
**
CO STARTING
  TITLEONE H2S
  MODELOPT DFAULT CONC
  AVERTIME 1 24
  POLLUTID H2S
  RUNORNOT RUN
  ERRORFIL 2019.err
CO FINISHED
**
**********************************
** AERMOD Source Pathway
**********************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
  LOCATION VENT       POINT     288001.640  5607915.720    1108.000
  LOCATION DSP        AREA      288064.988  5607874.933    1108.000
  LOCATION RCM        AREAPOLY  288064.311  5607853.772    1108.000
  LOCATION STCK1      POINT     287941.217  5607661.771    1103.400
  LOCATION STCK2      POINT     287899.076  5607662.265    1103.400
  LOCATION STCK3      POINT     287856.176  5607668.098    1103.400
  LOCATION STCK4      POINT     287807.766  5607668.098    1103.400
  LOCATION STCK5      POINT     287762.812  5607668.098    1103.400
  LOCATION STCK6      POINT     287940.513  5607631.802    1103.400
  LOCATION STCK7      POINT     287896.030  5607632.296    1103.400
  LOCATION STCK8      POINT     287853.520  5607629.541    1103.400
  LOCATION STCK9      POINT     287807.063  5607629.541    1103.400
  LOCATION STCK10     POINT     287764.060  5607629.541    1103.400
  LOCATION STCK11     POINT     287937.780  5607598.320    1103.400
  LOCATION STCK12     POINT     287893.297  5607598.814    1103.400
```

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LOCATION STCK13     POINT     287850.788  5607590.984    1103.400
LOCATION STCK14     POINT     287804.330  5607590.984    1103.400
LOCATION STCK15     POINT     287761.327  5607590.984    1103.400
LOCATION STCK16     POINT     287920.670  5607569.994    1103.400
LOCATION STCK17     POINT     287879.287  5607553.597    1103.400
LOCATION STCK18     POINT     287839.857  5607553.207    1103.400
LOCATION STCK19     POINT     287798.474  5607552.426    1103.400
LOCATION STCK20     POINT     287757.814  5607552.426    1103.400
LOCATION STCK21     POINT     287909.421  5607512.882    1103.400
LOCATION STCK22     POINT     287878.203  5607513.869    1103.400
LOCATION STCK23     POINT     287837.113  5607513.869    1103.400
LOCATION STCK24     POINT     287797.010  5607513.869    1103.400
LOCATION STCK25     POINT     287755.921  5607513.869    1103.400
LOCATION STCK26     POINT     287898.100  5607474.324    1103.400
LOCATION STCK27     POINT     287865.515  5607475.311    1103.400
LOCATION STCK28     POINT     287823.059  5607475.311    1103.400
LOCATION STCK29     POINT     287781.590  5607475.311    1103.400
LOCATION STCK30     POINT     287739.134  5607475.311    1103.400
LOCATION STCK31     POINT     287891.390  5607436.754    1103.400
LOCATION STCK32     POINT     287849.411  5607436.754    1103.400
LOCATION STCK33     POINT     287809.406  5607436.754    1103.400
LOCATION STCK34     POINT     287768.414  5607436.754    1103.400
LOCATION STCK35     POINT     287727.422  5607436.754    1103.400
LOCATION DSBS       AREA      288009.200  5607928.490    1108.000
** Source Parameters **
SRCPARAM VENT       0.000212261    6.045   278.200     22.7     0.457
SRCPARAM DSP        5.9182E-07     0.000    90.000    41.850    2.173    0.000
SRCPARAM RCM        1.2757E-07     0.000         6    0.000
AREAVERT RCM        288064.311 5607853.772 288152.911 5607852.782
AREAVERT RCM        288152.706 5607824.822 288111.246 5607824.822
AREAVERT RCM        288111.986 5607838.727 288063.863 5607840.454
SRCPARAM STCK1      0.0002598091    0.001    0.000    0.001    0.001
SRCPARAM STCK2      0.0002598091    0.001    0.000    0.001    0.001
SRCPARAM STCK3      0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK4      0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK5      0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK6      0.0002598091    0.001    0.000    0.001    0.001
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SRCPARAM STCK9      0.000266756     0.001    0.000    0.001    0.001
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SRCPARAM STCK13     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK14     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK15     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK16     0.0002598091    0.001    0.000    0.001    0.001
SRCPARAM STCK17     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK18     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK19     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK20     0.000266756     0.001    0.000    0.001    0.001
SRCPARAM STCK21     0.000266756     0.001    0.000    0.001    0.001
```

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SRCPARAM STCK22     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK23     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK24     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK25     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK26     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK27     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK28     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK29     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK30     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK31     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK32     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK33     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK34     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM STCK35     0.000266756   0.001   0.000   0.001   0.001
SRCPARAM DSBS      5.9182E-07     0.000   22.960   9.250   91.332

** Building Downwash **
BUILDHGT VENT       4.57   9.90   9.90   9.90   9.90   9.90
BUILDHGT VENT       9.90   9.90   9.90   9.90   9.90   9.90
BUILDHGT VENT       9.90   9.90   9.90   9.90   4.57   4.57
BUILDHGT VENT       4.57   9.90   9.90   9.90   9.90   9.90
BUILDHGT VENT       9.90   9.90   9.90   9.90   9.90   9.90
BUILDHGT VENT       9.90   9.90   9.90   9.90   6.40   6.40

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BUILDHGT STCK1      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK1      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK1      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK1      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK1      3.50   3.50   3.50   3.50   3.50   3.50

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BUILDHGT STCK3      3.50   3.50   3.50   3.50   3.50   3.50

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BUILDHGT STCK5      3.50   3.50   3.50   3.50   3.50   3.50

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BUILDHGT STCK6      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK6      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK6      3.50   3.50   3.50   3.50   3.50   3.50
BUILDHGT STCK6      3.50   3.50   3.50   3.50   3.50   3.50
```

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BUILDHGT STCK25	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK25	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK26	3.50	3.50	3.50	3.50	3.50	3.50
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BUILDHGT STCK30	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK30	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK30	3.50	3.50	3.50	3.50	3.50	3.50
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BUILDHGT STCK30	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK30	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK31	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK31	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK31	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK31	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK31	3.50	3.50	3.50	3.50	3.50	3.50
BUILDHGT STCK31	3.50	3.50	3.50	3.50	3.50	3.50
BUILDWID VENT	12.65	15.85	18.94	21.46	23.33	24.48
BUILDWID VENT	24.89	24.55	23.46	24.21	24.85	24.74
BUILDWID VENT	23.88	22.29	20.02	17.15	13.39	9.54

BUILDWID VENT	12.65	15.85	18.94	21.46	23.33	24.48
BUILDWID VENT	24.89	24.55	23.46	24.21	24.85	24.74
BUILDWID VENT	23.88	22.29	20.02	17.15	17.98	10.39
BUILDWID STCK1	246.57	262.45	270.36	270.05	261.54	245.08
BUILDWID STCK1	221.18	190.55	154.14	145.35	141.34	133.05
BUILDWID STCK1	146.12	173.43	196.28	213.16	223.82	228.66
BUILDWID STCK1	246.57	262.45	270.36	270.05	261.54	245.08
BUILDWID STCK1	221.18	190.55	154.14	145.35	141.34	133.05
BUILDWID STCK1	146.12	173.43	196.28	213.16	223.82	228.66
BUILDWID STCK3	223.06	213.82	199.54	179.63	154.26	164.70
BUILDWID STCK3	178.63	187.58	190.83	219.65	250.51	273.76
BUILDWID STCK3	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK3	223.06	213.82	199.54	179.63	154.26	164.70
BUILDWID STCK3	178.63	187.58	190.83	219.65	250.51	273.76
BUILDWID STCK3	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK5	223.06	213.82	199.54	179.63	154.26	164.70
BUILDWID STCK5	178.63	187.58	190.83	219.65	250.51	273.76
BUILDWID STCK5	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK5	223.06	213.82	199.54	179.63	154.26	164.70
BUILDWID STCK5	178.63	187.58	190.83	219.65	250.51	273.76
BUILDWID STCK5	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK6	246.57	262.45	270.36	270.05	261.54	245.08
BUILDWID STCK6	221.18	190.55	154.14	145.35	141.34	133.05
BUILDWID STCK6	146.12	173.43	196.28	213.16	223.82	228.66
BUILDWID STCK6	246.57	262.45	270.36	270.05	261.54	245.08
BUILDWID STCK6	221.18	190.55	154.14	145.35	141.34	133.05
BUILDWID STCK6	146.12	173.43	196.28	213.16	223.82	228.66
BUILDWID STCK11	246.57	262.45	270.36	270.05	261.54	245.08
BUILDWID STCK11	221.18	190.55	154.14	145.35	141.34	133.05
BUILDWID STCK11	146.12	173.43	196.28	213.16	223.82	228.66
BUILDWID STCK11	246.57	262.45	270.36	270.05	261.54	245.08
BUILDWID STCK11	221.18	190.55	154.14	145.35	141.34	133.05
BUILDWID STCK11	146.12	173.43	196.28	213.16	223.82	228.66
BUILDWID STCK20	223.06	213.82	199.54	179.63	154.26	164.70
BUILDWID STCK20	178.63	187.58	190.83	219.65	250.51	273.76
BUILDWID STCK20	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK20	223.06	213.82	199.54	179.63	154.26	164.70
BUILDWID STCK20	178.63	187.58	190.83	219.65	250.51	273.76
BUILDWID STCK20	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK21	53.49	68.09	91.52	118.41	144.44	166.09
BUILDWID STCK21	182.69	151.59	163.36	173.53	197.04	190.08
BUILDWID STCK21	177.86	160.87	149.14	129.27	105.47	79.46
BUILDWID STCK21	53.49	68.09	91.52	118.41	144.44	166.09
BUILDWID STCK21	182.69	193.74	198.90	198.48	197.04	190.08
BUILDWID STCK21	177.86	160.87	78.83	67.62	54.36	39.44

BUILDWID STCK25	223.06	213.82	199.54	179.63	170.15	221.17
BUILDWID STCK25	247.10	265.96	190.83	219.65	250.51	273.76
BUILDWID STCK25	288.69	294.85	292.05	280.37	260.18	232.08
BUILDWID STCK25	223.06	213.82	199.54	179.63	170.15	221.17
BUILDWID STCK25	247.10	265.96	190.83	219.65	250.51	273.76
BUILDWID STCK25	288.69	294.85	188.12	280.37	260.18	232.08
BUILDWID STCK26	205.74	61.19	107.79	62.54	74.62	84.43
BUILDWID STCK26	91.67	96.13	97.67	173.53	282.69	97.10
BUILDWID STCK26	93.80	87.65	78.83	67.62	54.36	39.44
BUILDWID STCK26	205.74	61.19	107.79	62.54	74.62	84.43
BUILDWID STCK26	91.67	96.13	97.67	96.24	97.45	97.10
BUILDWID STCK26	93.80	87.65	78.83	67.62	54.36	39.44
BUILDWID STCK30	223.06	89.75	137.12	43.50	55.66	66.13
BUILDWID STCK30	74.59	80.79	84.53	85.70	84.27	85.15
BUILDWID STCK30	85.54	83.33	78.59	71.46	62.16	62.25
BUILDWID STCK30	223.06	89.75	137.12	43.50	55.66	66.13
BUILDWID STCK30	74.59	80.79	84.53	294.78	286.86	85.15
BUILDWID STCK30	85.54	83.33	78.59	71.46	62.16	62.25
BUILDWID STCK31	205.74	61.19	48.57	62.54	74.62	84.43
BUILDWID STCK31	91.67	96.13	163.36	173.53	97.45	97.10
BUILDWID STCK31	93.80	87.65	78.83	67.62	105.47	79.46
BUILDWID STCK31	205.74	61.19	48.57	62.54	74.62	84.43
BUILDWID STCK31	91.67	96.13	97.67	96.24	97.45	97.10
BUILDWID STCK31	93.80	87.65	78.83	67.62	105.47	79.46
BUILDLEN VENT	24.31	24.85	24.74	23.88	22.29	20.02
BUILDLEN VENT	17.15	13.75	9.94	12.28	15.85	18.94
BUILDLEN VENT	21.46	23.33	24.48	24.89	24.48	23.32
BUILDLEN VENT	24.31	24.85	24.74	23.88	22.29	20.02
BUILDLEN VENT	17.15	13.75	9.94	12.28	15.85	18.94
BUILDLEN VENT	21.46	23.33	24.48	24.89	45.78	45.21
BUILDLEN STCK1	145.35	141.34	133.05	146.12	173.43	196.28
BUILDLEN STCK1	213.16	223.82	228.66	246.57	262.45	270.36
BUILDLEN STCK1	270.05	261.54	245.08	221.18	190.55	154.14
BUILDLEN STCK1	145.35	141.34	133.05	146.12	173.43	196.28
BUILDLEN STCK1	213.16	223.82	228.66	246.57	262.45	270.36
BUILDLEN STCK1	270.05	261.54	245.08	221.18	190.55	154.14
BUILDLEN STCK3	219.65	250.51	273.76	288.69	294.85	292.05
BUILDLEN STCK3	280.37	260.18	232.08	223.06	213.82	199.54
BUILDLEN STCK3	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK3	219.65	250.51	273.76	288.69	294.85	292.05
BUILDLEN STCK3	280.37	260.18	232.08	223.06	213.82	199.54
BUILDLEN STCK3	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK5	219.65	250.51	273.76	288.69	294.85	292.05
BUILDLEN STCK5	280.37	260.18	232.08	223.06	213.82	199.54

BUILDLEN STCK5	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK5	219.65	250.51	273.76	288.69	294.85	292.05
BUILDLEN STCK5	280.37	260.18	232.08	223.06	213.82	199.54
BUILDLEN STCK5	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK6	145.35	141.34	133.05	146.12	173.43	196.28
BUILDLEN STCK6	213.16	223.82	228.66	246.57	262.45	270.36
BUILDLEN STCK6	270.05	261.54	245.08	221.18	190.55	154.14
BUILDLEN STCK6	145.35	141.34	133.05	146.12	173.43	196.28
BUILDLEN STCK6	213.16	223.82	228.66	246.57	262.45	270.36
BUILDLEN STCK6	270.05	261.54	245.08	221.18	190.55	154.14
BUILDLEN STCK11	145.35	141.34	133.05	146.12	173.43	196.28
BUILDLEN STCK11	213.16	223.82	228.66	246.57	262.45	270.36
BUILDLEN STCK11	270.05	261.54	245.08	221.18	190.55	154.14
BUILDLEN STCK11	145.35	141.34	133.05	146.12	173.43	196.28
BUILDLEN STCK11	213.16	223.82	228.66	246.57	262.45	270.36
BUILDLEN STCK11	270.05	261.54	245.08	221.18	190.55	154.14
BUILDLEN STCK20	219.65	250.51	273.76	288.69	294.85	292.05
BUILDLEN STCK20	280.37	260.18	232.08	223.06	213.82	199.54
BUILDLEN STCK20	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK20	219.65	250.51	273.76	288.69	294.85	292.05
BUILDLEN STCK20	280.37	260.18	232.08	223.06	213.82	199.54
BUILDLEN STCK20	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK21	173.53	197.04	190.08	177.86	160.87	139.80
BUILDLEN STCK21	114.48	105.47	79.46	53.49	68.09	91.52
BUILDLEN STCK21	118.41	144.44	116.68	136.20	151.59	163.36
BUILDLEN STCK21	173.53	197.04	190.08	177.86	160.87	139.80
BUILDLEN STCK21	114.48	85.95	55.77	44.09	68.09	91.52
BUILDLEN STCK21	118.41	144.44	84.43	91.67	96.13	97.67
BUILDLEN STCK25	219.65	250.51	273.76	288.69	305.98	361.15
BUILDLEN STCK25	339.56	307.64	232.08	223.06	213.82	199.54
BUILDLEN STCK25	179.63	154.26	164.70	178.63	187.58	190.83
BUILDLEN STCK25	219.65	250.51	273.76	288.69	305.98	361.15
BUILDLEN STCK25	339.56	307.64	232.08	223.06	213.82	199.54
BUILDLEN STCK25	179.63	154.26	249.16	178.63	187.58	190.83
BUILDLEN STCK26	144.11	282.69	274.52	93.80	87.65	78.83
BUILDLEN STCK26	67.62	54.36	39.44	53.49	61.19	48.57
BUILDLEN STCK26	62.54	74.62	84.43	91.67	96.13	97.67
BUILDLEN STCK26	144.11	282.69	274.52	93.80	87.65	78.83
BUILDLEN STCK26	67.62	54.36	39.44	23.33	33.11	48.57
BUILDLEN STCK26	62.54	74.62	84.43	91.67	96.13	97.67
BUILDLEN STCK30	307.72	286.86	272.98	85.54	83.33	78.59
BUILDLEN STCK30	71.46	62.16	50.97	38.23	24.33	30.01
BUILDLEN STCK30	43.50	55.66	66.13	74.59	80.79	294.44
BUILDLEN STCK30	307.72	286.86	272.98	85.54	83.33	78.59
BUILDLEN STCK30	71.46	62.16	50.97	43.85	89.75	30.01

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BUILDLEN STCK30      43.50   55.66   66.13   74.59   80.79  294.44

BUILDLEN STCK31     144.11  282.69   97.10   93.80   87.65   78.83
BUILDLEN STCK31      67.62   54.36   79.46   53.49   33.11   48.57
BUILDLEN STCK31      62.54   74.62   84.43   91.67  151.59  163.36
BUILDLEN STCK31     144.11  282.69   97.10   93.80   87.65   78.83
BUILDLEN STCK31      67.62   54.36   39.44   23.33   33.11   48.57
BUILDLEN STCK31      62.54   74.62   84.43   91.67  151.59  163.36

XBADJ   VENT      -11.07   -7.03   -5.22   -3.26   -1.19    0.91
XBADJ   VENT        2.98    4.96    6.79    5.19    2.63   -0.02
XBADJ   VENT       -2.66   -5.23   -7.63   -9.80  -13.11  -12.65
XBADJ   VENT      -13.24  -17.83  -19.52  -20.62  -21.10  -20.93
XBADJ   VENT      -20.13  -18.71  -16.73  -17.47  -18.48  -18.93
XBADJ   VENT      -18.80  -18.10  -16.85  -15.09  -72.19  -71.83

XBADJ   STCK1     -108.77 -102.14  -92.40 -104.75 -131.95 -155.15
XBADJ   STCK1     -173.63 -186.83 -194.36 -198.07 -196.29 -188.54
XBADJ   STCK1     -175.06 -156.27 -132.72 -105.14  -74.37  -41.34
XBADJ   STCK1      -36.57  -39.21  -40.65  -41.38  -41.48  -41.13
XBADJ   STCK1      -39.53  -36.99  -34.30  -48.49  -66.16  -81.82
XBADJ   STCK1      -94.99 -105.28 -112.36 -116.04 -116.18 -112.80

XBADJ   STCK3     -175.55 -191.51 -201.65 -205.66 -203.42 -195.00
XBADJ   STCK3     -180.66 -160.83 -136.11 -131.30 -128.52 -123.31
XBADJ   STCK3     -114.78 -102.77  -88.56  -72.73  -55.14  -35.87
XBADJ   STCK3      -44.10  -59.00  -72.11  -83.03  -91.43  -97.04
XBADJ   STCK3      -99.71  -99.35  -95.97  -91.77  -85.29  -76.23
XBADJ   STCK3      -64.85  -51.50  -76.14 -105.90 -132.44 -154.96

XBADJ   STCK5     -159.34 -159.57 -154.96 -145.64 -131.90 -114.14
XBADJ   STCK5      -92.92  -68.88  -42.74  -39.35  -40.79  -42.45
XBADJ   STCK5      -43.26  -42.75  -41.88  -40.80  -38.92  -35.87
XBADJ   STCK5      -60.32  -90.94 -118.80 -143.05 -162.95 -177.90
XBADJ   STCK5     -187.45 -191.30 -189.34 -183.72 -173.03 -157.09
XBADJ   STCK5     -136.37 -111.51 -122.82 -137.83 -148.66 -154.96

XBADJ   STCK6      -79.13  -73.73  -66.09  -81.33 -112.14 -139.55
XBADJ   STCK6     -162.71 -180.93 -193.65 -202.58 -205.87 -202.91
XBADJ   STCK6     -193.78 -178.77 -158.32 -133.06 -103.76  -71.31
XBADJ   STCK6      -66.21  -67.61  -66.96  -64.79  -61.29  -56.73
XBADJ   STCK6      -50.45  -42.90  -35.01  -43.99  -56.58  -67.45
XBADJ   STCK6      -76.27  -82.77  -86.76  -88.12  -86.79  -82.83

XBADJ   STCK11     -45.69  -41.34  -35.73  -53.93  -88.53 -120.44
XBADJ   STCK11    -148.69 -172.43 -190.92 -205.70 -214.76 -217.29
XBADJ   STCK11    -213.21 -202.66 -185.95 -163.59 -136.26 -104.79
XBADJ   STCK11     -99.66 -100.01  -97.32  -92.19  -84.90  -75.84
XBADJ   STCK11     -64.47  -51.40  -37.74  -40.86  -47.69  -53.07
XBADJ   STCK11     -56.84  -58.88  -59.13  -57.59  -54.29  -49.35

XBADJ   STCK20     -44.56  -49.17  -52.29  -53.82  -53.72  -51.98
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XBADJ   STCK20     -48.66  -43.87  -37.74  -54.51  -75.65  -95.96
XBADJ   STCK20    -113.78 -128.15 -139.55 -147.78 -151.97 -151.54
XBADJ   STCK20    -175.10 -201.34 -221.47 -234.87 -241.13 -240.07
XBADJ   STCK20    -231.71 -216.31 -194.34 -168.55 -138.17 -103.58
XBADJ   STCK20     -65.85  -26.12  -25.15  -30.85  -35.61  -39.29

XBADJ   STCK21    -126.85   -7.05   -4.59   -1.99    0.68    3.32
XBADJ   STCK21       5.86  -38.88  -18.29    0.40  -22.97  -55.12
XBADJ   STCK21     -85.59 -113.45  -11.85  -21.16  -29.83  -37.60
XBADJ   STCK21     -46.68 -189.99 -185.49 -175.87 -161.55 -143.12
XBADJ   STCK21    -120.34  -94.16  -66.10  -53.95  -45.12  -36.40
XBADJ   STCK21     -32.82  -30.99  -99.75 -106.31 -109.63 -109.62

XBADJ   STCK25      -6.25  -12.29  -17.95  -23.07  -27.48 -100.17
XBADJ   STCK25     -92.88  -82.77  -35.85  -59.34  -87.06 -113.60
XBADJ   STCK25    -137.12 -156.47 -172.00 -183.37 -189.62 -190.10
XBADJ   STCK25    -213.40 -238.22 -255.81 -265.62 -278.50 -260.99
XBADJ   STCK25    -246.67 -224.87 -196.23 -163.72 -126.76  -85.94
XBADJ   STCK25     -42.51    2.21  -84.76    4.74    2.04   -0.73

XBADJ   STCK26    -114.21  -62.39  -57.24  -50.35  -41.94  -32.25
XBADJ   STCK26     -21.57  -10.25    1.39    4.85  -17.19    5.12
XBADJ   STCK26      -0.81   -6.71  -12.41  -17.73  -22.51  -26.61
XBADJ   STCK26     -29.90 -220.30 -217.27  -43.44  -45.71  -46.58
XBADJ   STCK26     -46.05  -44.11  -40.83  -36.31  -44.00  -53.68
XBADJ   STCK26     -61.73  -67.91  -72.02  -73.94  -73.62  -71.06

XBADJ   STCK30     -53.43  -86.68  -87.21  -65.15  -66.76  -66.35
XBADJ   STCK30     -63.92  -59.54  -53.36  -45.56  -36.37  -36.23
XBADJ   STCK30     -39.36  -41.28  -41.96  -41.36  -39.50 -211.18
XBADJ   STCK30    -254.29 -200.18 -185.77  -20.40  -16.57  -12.25
XBADJ   STCK30      -7.55   -2.62    2.39    5.65   -5.28    6.22
XBADJ   STCK30      -4.14  -14.37  -24.17  -33.24  -41.29  -83.26

XBADJ   STCK31     -76.05  -24.79  -21.35  -17.26  -12.65   -7.65
XBADJ   STCK31      -2.42    2.88   -0.26    4.93    4.34   -7.86
XBADJ   STCK31     -19.82  -31.18  -41.59  -50.74 -101.68 -113.73
XBADJ   STCK31     -68.06 -257.90  -75.75  -76.54  -75.00  -71.18
XBADJ   STCK31     -65.20  -57.24  -47.54  -36.40  -37.46  -40.71
XBADJ   STCK31     -42.72  -43.44  -42.84  -40.93  -49.91  -49.63

YBADJ   VENT       -0.43  -10.55   -9.45   -8.07   -6.44   -4.61
YBADJ   VENT       -2.64   -0.60    1.47    3.48    5.40    7.15
YBADJ   VENT        8.68    9.95   10.92   11.55    0.78    0.62
YBADJ   VENT        0.43   10.55    9.45    8.07    6.44    4.61
YBADJ   VENT        2.64    0.60   -1.47   -3.48   -5.40   -7.15
YBADJ   VENT       -8.68   -9.95  -10.92  -11.55    3.88   -4.74

YBADJ   STCK1      74.79   65.06   53.36   40.04   25.50   10.18
YBADJ   STCK1      -5.45  -20.91  -35.73  -36.10  -31.47  -25.88
YBADJ   STCK1     -31.68  -45.23  -57.01  -67.05  -74.92  -80.03
YBADJ   STCK1     -74.79  -65.06  -53.36  -40.04  -25.50  -10.18
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YBADJ   STCK1      5.45   20.91   35.73   36.10   31.47   25.88
YBADJ   STCK1     31.68   45.23   57.01   67.05   74.92   80.03

YBADJ   STCK3     19.77   21.62   23.54   24.97   25.64    6.21
YBADJ   STCK3    -16.58  -38.65  -59.55  -65.72  -66.25  -64.77
YBADJ   STCK3    -61.31  -56.00  -48.98  -40.48  -30.74  -20.07
YBADJ   STCK3    -19.77  -21.62  -23.54  -24.97  -25.64   -6.21
YBADJ   STCK3     16.58   38.65   59.55   65.72   66.25   64.77
YBADJ   STCK3     61.31   56.00   48.98   40.48   30.74   20.07

YBADJ   STCK5    -72.19  -66.12  -57.32  -46.56  -34.38  -40.47
YBADJ   STCK5    -48.52  -54.87  -59.55  -49.51  -34.32  -18.08
YBADJ   STCK5     -1.30   15.53   31.88   47.26   61.21   73.30
YBADJ   STCK5     72.19   66.12   57.32   46.56   34.38   40.47
YBADJ   STCK5     48.52   54.87   59.55   49.51   34.32   18.08
YBADJ   STCK5      1.30  -15.53  -31.88  -47.26  -61.21  -73.30

YBADJ   STCK6     79.30   74.65   67.73   58.76   48.00   35.78
YBADJ   STCK6     22.47    8.49   -5.76   -6.46   -3.06    0.43
YBADJ   STCK6     -8.27  -25.43  -41.41  -56.13  -69.02  -79.32
YBADJ   STCK6    -79.30  -74.65  -67.73  -58.76  -48.00  -35.78
YBADJ   STCK6    -22.47   -8.49    5.76    6.46    3.06   -0.43
YBADJ   STCK6      8.27   25.43   41.41   56.13   69.02   79.32

YBADJ   STCK11    82.42   83.53   82.11   78.19   71.89   63.41
YBADJ   STCK11    53.00   40.98   27.72   26.98   29.33   30.79
YBADJ   STCK11    19.13   -1.81  -22.30  -42.11  -60.51  -76.59
YBADJ   STCK11   -82.42  -83.53  -82.11  -78.19  -71.89  -63.41
YBADJ   STCK11   -53.00  -40.98  -27.72  -26.98  -29.33  -30.79
YBADJ   STCK11   -19.13    1.81   22.30   42.11   60.51   76.59

YBADJ   STCK20   -57.02  -31.26   -3.81   23.96   51.01   57.20
YBADJ   STCK20    58.47   58.18   56.12   65.27   76.09   84.59
YBADJ   STCK20    90.52   93.71   94.04   91.52   86.22   78.30
YBADJ   STCK20    57.02   31.26    3.81  -23.96  -51.01  -57.20
YBADJ   STCK20   -58.47  -58.18  -56.12  -65.27  -76.09  -84.59
YBADJ   STCK20   -90.52  -93.71  -94.04  -91.52  -86.22  -78.30

YBADJ   STCK21   -27.14  -11.07    9.36   26.38   41.23   54.83
YBADJ   STCK21    66.76  -45.96  -44.08  -40.09   91.47   90.45
YBADJ   STCK21    86.94   81.11   -3.29    5.37   13.86   21.44
YBADJ   STCK21    27.14   11.07   -9.36  -26.38  -41.23  -54.83
YBADJ   STCK21   -66.76  -76.67  -84.24  -89.48  -91.47  -90.45
YBADJ   STCK21   -86.94  -81.11   21.91   11.59    0.91   -9.79

YBADJ   STCK25   -52.19  -19.85   13.83   47.30   71.40   61.41
YBADJ   STCK25    59.82   56.63   94.68  103.57  112.97  118.93
YBADJ   STCK25   121.28  119.94  114.96  106.49   94.78   80.19
YBADJ   STCK25    52.19   19.85  -13.83  -47.30  -71.40  -61.41
YBADJ   STCK25   -59.82  -56.63  -94.68 -103.57 -112.97 -118.93
YBADJ   STCK25  -121.28 -119.94   16.61 -106.49  -94.78  -80.19
```

```
  YBADJ   STCK26      66.56  -13.40    0.22  -30.46  -30.60  -29.80
  YBADJ   STCK26     -28.11  -25.55  -22.23   -0.15   78.96   -8.69
  YBADJ   STCK26      -3.46    1.89    7.17   12.24   16.93   21.11
  YBADJ   STCK26     -66.56   13.40   -0.22   30.46   30.60   29.80
  YBADJ   STCK26      28.11   25.55   22.23   18.22   13.66    8.69
  YBADJ   STCK26       3.46   -1.89   -7.17  -12.24  -16.93  -21.11

  YBADJ   STCK30     -62.03   39.60   48.31   17.61   13.46    8.89
  YBADJ   STCK30       4.06   -0.90   -5.82  -10.58  -15.01  -18.98
  YBADJ   STCK30     -22.38  -25.09  -27.05  -28.18  -28.46  -24.17
  YBADJ   STCK30      62.03  -39.60  -48.31  -17.61  -13.46   -8.89
  YBADJ   STCK30      -4.06    0.90    5.82  -61.11  -56.75   18.98
  YBADJ   STCK30      22.38   25.09   27.05   28.18   28.46   24.17

  YBADJ   STCK31      66.48   -6.86  -16.42  -11.45   -6.13   -0.62
  YBADJ   STCK31       4.90   10.28   32.05   38.02   23.93   27.20
  YBADJ   STCK31      29.64   31.17   31.77   31.39   44.84   39.47
  YBADJ   STCK31     -66.48    6.86   16.42   11.45    6.13    0.62
  YBADJ   STCK31      -4.90  -10.28  -15.35  -19.94  -23.93  -27.20
  YBADJ   STCK31     -29.64  -31.17  -31.77  -31.39  -44.84  -39.47

  SRCGROUP ALL
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
  INCLUDED 2019.rou
RE FINISHED
**
****************************************
** AERMOD Meteorology Pathway
****************************************
**
**
ME STARTING
  SURFFILE ..\..\..\..\Files\AERMET.SFC
  PROFFILE ..\..\..\..\Files\AERMET.PFL
  SURFDATA 12345 2015
  UAIRDATA 12345678 2015
  PROFBASE 1090.2 METERS
  STARTEND 2019 1 1 1 2019 12 31 24
ME FINISHED
**
****************************************
** AERMOD Output Pathway
****************************************
**
**
```

```
OU STARTING
  RECTABLE 1 9TH
  RECTABLE 24 1ST
  MAXTABLE ALLAVE 50
** Auto-Generated Plotfiles
  PLOTFILE 24 ALL 1ST 2019.AD\24H1GALL.PLT 31
  PLOTFILE 1 ALL 9TH 2019.AD\01H9GALL.PLT 32
  SUMMFILE 2019.sum
OU FINISHED
```

H_2S DISPERSION MODELLING INPUT
Baseline Case

```
**
**********************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 11.2.0
** Lakes Environmental Software Inc.
** Date: 6/26/2023
** File: D:\Modelling\Rimrock\UpdatedLayout\MODELLING\B\H2S\2015\2015.ADI
**
**********************************************
**
**
**********************************************
** AERMOD Control Pathway
**********************************************
**
**
CO STARTING
  TITLEONE H2S - Baseline Case
  MODELOPT DFAULT CONC
  AVERTIME 1 24
  POLLUTID H2S
  RUNORNOT RUN
  ERRORFIL 2015.err
CO FINISHED
**
**********************************************
** AERMOD Source Pathway
**********************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
  LOCATION MAINCB      AREAPOLY   289352.956  5606698.477     1084.000
  LOCATION GRANDCB     AREAPOLY   288099.880  5607165.621     1100.000
  LOCATION NORTH       AREAPOLY   283573.299  5611802.100     1139.000
  LOCATION NW          AREAPOLY   282061.363  5610789.619     1158.490
  LOCATION SW          AREAPOLY   281107.398  5602566.829     1145.920
  LOCATION RR          AREAPOLY   288090.000  5607800.000     1108.000
** Source Parameters **
  SRCPARAM MAINCB      9.7222E-07     0.000       22
  AREAVERT MAINCB      289352.956 5606698.477 289272.956 5606674.057
  AREAVERT MAINCB      289240.956 5606661.846 289197.956 5606643.531
  AREAVERT MAINCB      289152.956 5606578.409 289135.956 5606509.217
  AREAVERT MAINCB      289128.306 5606415.604 289108.956 5606326.983
  AREAVERT MAINCB      289257.357 5606238.554 289289.918 5606275.185
  AREAVERT MAINCB      289369.285 5606289.430 289414.057 5606321.991
  AREAVERT MAINCB      289448.653 5606354.552 289456.793 5606374.903
```

```
  AREAVERT MAINCB      289450.688 5606429.849 289416.092 5606480.726
  AREAVERT MAINCB      289340.795 5606513.983 289291.953 5606554.983
  AREAVERT MAINCB      289282.956 5606570.268 289286.956 5606598.759
  AREAVERT MAINCB      289324.514 5606633.355 289363.180 5606659.811
  SRCPARAM GRANDCB     9.7222E-07     0.000        5
  AREAVERT GRANDCB     288099.880 5607165.621 288168.183 5607151.300
  AREAVERT GRANDCB     288136.235 5607053.251 288048.101 5607009.184
  AREAVERT GRANDCB     288001.831 5607031.218
  SRCPARAM NORTH       9.9593E-07     0.000        8
  AREAVERT NORTH       283573.299 5611802.100 284209.000 5611786.550
  AREAVERT NORTH       284204.600 5611267.433 284004.861 5611274.422
  AREAVERT NORTH       283992.630 5611052.526 283800.436 5611057.768
  AREAVERT NORTH       283693.856 5611157.359 283557.574 5611166.095
  SRCPARAM NW          6.4964E-07     0.000        6
  AREAVERT NW          282061.363 5610789.619 282696.867 5610761.746
  AREAVERT NW          282671.660 5610001.500 282245.324 5610001.900
  AREAVERT NW          282246.718 5610085.826 282064.150 5610094.188
  SRCPARAM SW          1.2207E-06     0.000       15
  AREAVERT SW          281107.398 5602566.829 281319.770 5602563.858
  AREAVERT SW          281319.770 5602280.201 281383.630 5602278.716
  AREAVERT SW          281544.022 5601949.021 281539.567 5601919.319
  AREAVERT SW          281318.285 5601877.735 281241.059 5601971.298
  AREAVERT SW          280688.596 5601992.089 280694.536 5602050.009
  AREAVERT SW          280782.158 5602045.553 280795.524 5602258.040
  AREAVERT SW          280874.300 5602257.130 280874.200 5602418.317
  AREAVERT SW          281098.488 5602421.287
  SRCPARAM RR          9.7222E-07     0.000       12
  AREAVERT RR          288090.000 5607800.000 288660.000 5607800.000
  AREAVERT RR          288660.690 5607693.440 289175.380 5607692.920
  AREAVERT RR          289175.900 5607550.320 289676.000 5607550.270
  AREAVERT RR          289662.000 5606720.470 288647.941 5606730.000
  AREAVERT RR          288571.243 5606800.600 288240.000 5606810.160
  AREAVERT RR          288240.000 5607361.920 288090.940 5607367.602
  SRCGROUP N       NORTH
  SRCGROUP NW      NW
  SRCGROUP SW      SW
  SRCGROUP RR      MAINCB GRANDCB RR
  SRCGROUP ALL
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
  INCLUDED 2015.rou
RE FINISHED
**
****************************************
** AERMOD Meteorology Pathway
****************************************
```

```
**
**
ME STARTING
  SURFFILE AERMET.SFC
  PROFFILE AERMET.PFL
  SURFDATA 12345 2015
  UAIRDATA 12345678 2015
  PROFBASE 1090.2 METERS
  STARTEND 2015 1 1 1 2015 12 31 24
ME FINISHED
**
**********************************
** AERMOD Output Pathway
**********************************
**
**
OU STARTING
  RECTABLE 1 9TH
  RECTABLE 24 1ST
  MAXTABLE ALLAVE 50
** Auto-Generated Plotfiles
  PLOTFILE 24 ALL 1ST 2015.AD\24H1GALL.PLT 31
  PLOTFILE 24 N 1ST 2015.AD\24H1G001.PLT 32
  PLOTFILE 24 NW 1ST 2015.AD\24H1G002.PLT 33
  PLOTFILE 24 SW 1ST 2015.AD\24H1G003.PLT 34
  PLOTFILE 24 RR 1ST 2015.AD\24H1G004.PLT 35
  PLOTFILE 1 ALL 9TH 2015.AD\01H9GALL.PLT 36
  PLOTFILE 1 N 9TH 2015.AD\01H9G001.PLT 37
  PLOTFILE 1 NW 9TH 2015.AD\01H9G002.PLT 38
  PLOTFILE 1 SW 9TH 2015.AD\01H9G003.PLT 39
  PLOTFILE 1 RR 9TH 2015.AD\01H9G004.PLT 40
  SUMMFILE 2015.sum
OU FINISHED
**
**********************************
** Project Parameters
**********************************
** PROJCTN  CoordinateSystemUTM
** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    North American Datum 1983
** DTMRGN   CONUS
** UNITS    m
** ZONE     12
** ZONEINX  0
**
```

NH_3 DISPERSION MODELLING INPUT
Project Case

```
**
**************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 11.2.0
** Lakes Environmental Software Inc.
** Date: 7/17/2023
** File: D:\Modelling\Rimrock\UpdatedLayout\MODELLING\20230716\PJ\NH3\2015\2015.ADI
**
**************************************
**
**
**************************************
** AERMOD Control Pathway
**************************************
**
**
CO STARTING
  TITLEONE NH3 Project Case
  MODELOPT DFAULT CONC
  AVERTIME 1
  POLLUTID NH3
  RUNORNOT RUN
  ERRORFIL 2015.err
CO FINISHED
**
**************************************
** AERMOD Source Pathway
**************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
  LOCATION VENT       POINT     288001.640  5607915.720    1108.000
  LOCATION DSP        AREA      288064.988  5607874.933    1108.000
  LOCATION RCM        AREAPOLY  288064.311  5607853.772    1108.000
  LOCATION STCK1      POINT     287941.217  5607661.771    1103.400
  LOCATION STCK2      POINT     287899.076  5607662.265    1103.400
  LOCATION STCK3      POINT     287856.176  5607668.098    1103.400
  LOCATION STCK4      POINT     287807.766  5607668.098    1103.400
  LOCATION STCK5      POINT     287762.812  5607668.098    1103.400
  LOCATION STCK6      POINT     287940.513  5607631.802    1103.400
  LOCATION STCK7      POINT     287896.030  5607632.296    1103.400
  LOCATION STCK8      POINT     287853.520  5607629.541    1103.400
  LOCATION STCK9      POINT     287807.063  5607629.541    1103.400
  LOCATION STCK10     POINT     287764.060  5607629.541    1103.400
  LOCATION STCK11     POINT     287937.780  5607598.320    1103.400
  LOCATION STCK12     POINT     287893.297  5607598.814    1103.400
```

```
LOCATION STCK13     POINT     287850.788  5607590.984     1103.400
LOCATION STCK14     POINT     287804.330  5607590.984     1103.400
LOCATION STCK15     POINT     287761.327  5607590.984     1103.400
LOCATION STCK16     POINT     287920.670  5607569.994     1103.400
LOCATION STCK17     POINT     287879.287  5607553.597     1103.400
LOCATION STCK18     POINT     287839.857  5607553.207     1103.400
LOCATION STCK19     POINT     287798.474  5607552.426     1103.400
LOCATION STCK20     POINT     287757.814  5607552.426     1103.400
LOCATION STCK21     POINT     287909.421  5607512.882     1103.400
LOCATION STCK22     POINT     287878.203  5607513.869     1103.400
LOCATION STCK23     POINT     287837.113  5607513.869     1103.400
LOCATION STCK24     POINT     287797.010  5607513.869     1103.400
LOCATION STCK25     POINT     287755.921  5607513.869     1103.400
LOCATION STCK26     POINT     287898.100  5607474.324     1103.400
LOCATION STCK27     POINT     287865.515  5607475.311     1103.400
LOCATION STCK28     POINT     287823.059  5607475.311     1103.400
LOCATION STCK29     POINT     287781.590  5607475.311     1103.400
LOCATION STCK30     POINT     287739.134  5607475.311     1103.400
LOCATION STCK31     POINT     287891.390  5607436.754     1103.400
LOCATION STCK32     POINT     287849.411  5607436.754     1103.400
LOCATION STCK33     POINT     287809.406  5607436.754     1103.400
LOCATION STCK34     POINT     287768.414  5607436.754     1103.400
LOCATION STCK35     POINT     287727.422  5607436.754     1103.400
LOCATION DSBS       AREA      288009.200  5607928.490     1108.000
** Source Parameters **
SRCPARAM VENT       0.0099424331    6.045   278.200     22.7    0.457
SRCPARAM DSP        1.1719E-06    0.000    90.000    41.850    2.173    0.000
SRCPARAM RCM        0.0000671582    0.000       6    0.000
AREAVERT RCM        288064.311 5607853.772 288152.911 5607852.782
AREAVERT RCM        288152.706 5607824.822 288111.246 5607824.822
AREAVERT RCM        288111.986 5607838.727 288063.863 5607840.454
SRCPARAM STCK1      0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK2      0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK3      0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK4      0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK5      0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK6      0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK7      0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK8      0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK9      0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK10     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK11     0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK12     0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK13     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK14     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK15     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK16     0.0008660521    0.001    0.000    0.001    0.001
SRCPARAM STCK17     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK18     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK19     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK20     0.0008892089    0.001    0.000    0.001    0.001
SRCPARAM STCK21     0.0008892089    0.001    0.000    0.001    0.001
```

```
  SRCPARAM STCK22     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK23     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK24     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK25     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK26     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK27     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK28     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK29     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK30     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK31     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK32     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK33     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK34     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM STCK35     0.0008892089    0.001    0.000    0.001    0.001
  SRCPARAM DSBS       1.1719E-06      0.000   22.960    9.250   91.332

** Building Downwash **
  BUILDHGT VENT        4.57   9.90   9.90   9.90   9.90   9.90
  BUILDHGT VENT        9.90   9.90   9.90   9.90   9.90   9.90
  BUILDHGT VENT        9.90   9.90   9.90   9.90   4.57   4.57
  BUILDHGT VENT        4.57   9.90   9.90   9.90   9.90   9.90
  BUILDHGT VENT        9.90   9.90   9.90   9.90   9.90   9.90
  BUILDHGT VENT        9.90   9.90   9.90   9.90   6.40   6.40

...

  YBADJ   STCK31      66.48  -6.86 -16.42 -11.45  -6.13  -0.62
  YBADJ   STCK31       4.90  10.28  32.05  38.02  23.93  27.20
  YBADJ   STCK31      29.64  31.17  31.77  31.39  44.84  39.47
  YBADJ   STCK31     -66.48   6.86  16.42  11.45   6.13   0.62
  YBADJ   STCK31      -4.90 -10.28 -15.35 -19.94 -23.93 -27.20
  YBADJ   STCK31     -29.64 -31.17 -31.77 -31.39 -44.84 -39.47
  SRCGROUP ALL
SO FINISHED
**
**********************************
** AERMOD Receptor Pathway
**********************************
**
**
RE STARTING
  INCLUDED 2015.rou
RE FINISHED
**
**********************************
** AERMOD Meteorology Pathway
**********************************
**
**
ME STARTING
  SURFFILE ..\..\..\..\Files\AERMET.SFC
  PROFFILE ..\..\..\..\Files\AERMET.PFL
```

```
  SURFDATA 12345 2015
  UAIRDATA 12345678 2015
  PROFBASE 1090.2 METERS
  STARTEND 2015 1 1 1 2015 12 31 24
ME FINISHED
**
**********************************
** AERMOD Output Pathway
**********************************
**
**
OU STARTING
  RECTABLE ALLAVE 9TH
  RECTABLE 1 9TH
  MAXTABLE ALLAVE 50
** Auto-Generated Plotfiles
  PLOTFILE 1 ALL 9TH 2015.AD\01H9GALL.PLT 31
  SUMMFILE 2015.sum
OU FINISHED
```

DISPERSION MODELLING OUTPUT

Results Summary

SO2

SO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	3.27736	ug/m^3	288710.31	5608113.38	1098.09	0.00	1098.09	12/13/2018, 24
MONTH	1ST	0.58408	ug/m^3	288750.26	5608111.70	1097.01	0.00	1097.01	12/31/2018, 24
1-HR	9TH	8.48096	ug/m^3	286782.91	5609846.00	1142.23	0.00	1142.23	1/18/2015, 10
MONTH	9TH	0.30522	ug/m^3	288850.13	5608107.52	1094.03	0.00	1094.03	11/30/2017, 24

SO2 - Concentration - Source Group: QAVE

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	1.31301	ug/m^3	288690.34	5608114.22	1099.01	0.00	1099.01	1/3/2019, 24
MONTH	1ST	0.24032	ug/m^3	288750.26	5608111.70	1097.01	0.00	1097.01	12/31/2018, 24
1-HR	9TH	3.62836	ug/m^3	287871.38	5608148.52	1107.68	0.00	1107.68	10/10/2019, 9
MONTH	9TH	0.13085	ug/m^3	288830.16	5608108.36	1094.67	0.00	1094.67	11/30/2017, 24

SO2 - Concentration - Source Group: QMAX

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	2.02286	ug/m^3	288710.31	5608113.38	1098.09	0.00	1098.09	12/13/2018, 24
MONTH	1ST	0.33590	ug/m^3	288950.00	5608103.34	1092.00	0.00	1092.00	12/31/2016, 24
1-HR	9TH	5.25812	ug/m^3	287023.81	5610332.00	1146.00	0.00	1146.00	11/19/2017, 5
MONTH	9TH	0.17217	ug/m^3	288850.13	5608107.52	1094.03	0.00	1094.03	2/28/2018, 24

Results Summary

SO2

SO2 - Concentration - Source Group: QMIN

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	0.06090	ug/m^3	287751.53	5608153.55	1110.05	0.00	1110.05	9/30/2018, 24
MONTH	1ST	0.00930	ug/m^3	288750.26	5608111.70	1097.01	0.00	1097.01	12/31/2018, 24
1-HR	9TH	0.21681	ug/m^3	287931.30	5608146.01	1107.00	0.00	1107.00	4/5/2019, 8
MONTH	9TH	0.00687	ug/m^3	288910.06	5608105.01	1092.31	0.00	1092.31	4/30/2019, 24

Results Summary

H2S -Project Case

H2S - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	2.10066	ug/m^3	287501.17	5607385.89	1109.78	0.00	1109.78	10/2/2019, 24
1-HR	9TH	7.62719	ug/m^3	288290.84	5608130.95	1106.00	0.00	1106.00	2/20/2019, 5

Results Summary

H2S -Project Case

H2S - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	2.60483	ug/m^3	287507.45	5607545.25	1111.19	0.00	1111.19	1/2/2018, 24
1-HR	9TH	7.13690	ug/m^3	288270.87	5608131.79	1106.00	0.00	1106.00	12/4/2018, 2

Results Summary

H2S - Baseline Case

H2S - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	144.64998	ug/m^3	280772.96	5602135.91	1146.00	0.00	1146.00	1/11/2019, 24
1-HR	9TH	309.01616	ug/m^3	280774.93	5602175.16	1146.00	0.00	1146.00	1/11/2019, 13

H2S - Concentration - Source Group: N

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	104.60652	ug/m^3	283534.85	5611305.71	1137.00	0.00	1137.00	1/11/2019, 24
1-HR	9TH	235.94942	ug/m^3	283553.93	5611779.93	1139.00	0.00	1139.00	1/11/2019, 13

H2S - Concentration - Source Group: NW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	85.43387	ug/m^3	282049.83	5610198.92	1159.02	0.00	1159.02	1/11/2019, 24
1-HR	9TH	167.99665	ug/m^3	282086.47	5610802.27	1157.90	0.00	1157.90	5/6/2019, 7

H2S - Concentration - Source Group: RIM - Rimrock Cattle Company Ltd. feedlot

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	55.75947	ug/m^3	289886.24	5607039.43	1081.70	0.00	1081.70	11/29/2019, 24
1-HR	9TH	167.53092	ug/m^3	288270.87	5608131.79	1106.00	0.00	1106.00	12/21/2019, 14

Results Summary

H2S - Cumulative Case

H2S - Concentration - Source Group: SW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	143.70186	ug/m^3	280772.96	5602135.91	1146.00	0.00	1146.00	1/11/2019, 24
1-HR	9TH	309.01616	ug/m^3	280774.93	5602175.16	1146.00	0.00	1146.00	1/11/2019, 13

Results Summary

H2S - Baseline Case

H2S - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	155.12047	ug/m^3	280775.91	5602194.78	1146.00	0.00	1146.00	11/27/2015, 24
1-HR	9TH	326.35655	ug/m^3	280773.94	5602155.53	1146.00	0.00	1146.00	1/1/2015, 14

H2S - Concentration - Source Group: N

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	118.33612	ug/m^3	283551.54	5611720.66	1138.00	0.00	1138.00	11/27/2015, 24
1-HR	9TH	257.91611	ug/m^3	283553.13	5611760.17	1139.00	0.00	1139.00	12/23/2015, 14

H2S - Concentration - Source Group: NW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	80.00710	ug/m^3	282047.53	5610745.65	1159.41	0.00	1159.41	11/27/2015, 24
1-HR	9TH	179.86435	ug/m^3	282047.44	5610765.18	1159.00	0.00	1159.00	11/27/2015, 14

H2S - Concentration - Source Group: RIM - Rimrock Cattle Company Ltd. feedlot

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	63.81030	ug/m^3	287507.45	5607545.25	1111.19	0.00	1111.19	11/27/2015, 24
1-HR	9TH	165.78561	ug/m^3	288091.10	5608139.32	1106.00	0.00	1106.00	12/13/2015, 13

Results Summary

H2S - Cumulative Case

H2S - Concentration - Source Group: SW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	154.63425	ug/m^3	280775.91	5602194.78	1146.00	0.00	1146.00	11/27/2015, 24
1-HR	9TH	323.07418	ug/m^3	280773.94	5602155.53	1146.00	0.00	1146.00	11/9/2015, 13

Results Summary

H2S - Cumulative Case

H2S - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	154.88673	ug/m^3	280775.91	5602194.78	1146.00	0.00	1146.00	11/27/2015, 24
1-HR	9TH	323.11512	ug/m^3	280773.94	5602155.53	1146.00	0.00	1146.00	11/9/2015, 13

H2S - Concentration - Source Group: N

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	118.33612	ug/m^3	283551.54	5611720.66	1138.00	0.00	1138.00	11/27/2015, 24
1-HR	9TH	257.91611	ug/m^3	283553.13	5611760.17	1139.00	0.00	1139.00	12/23/2015, 14

H2S - Concentration - Source Group: NW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	80.00710	ug/m^3	282047.53	5610745.65	1159.41	0.00	1159.41	11/27/2015, 24
1-HR	9TH	179.86435	ug/m^3	282047.44	5610765.18	1159.00	0.00	1159.00	11/27/2015, 14

H2S - Concentration - Source Group: RIMCUMU - Rimrock Complex

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	35.29910	ug/m^3	287508.24	5607565.17	1111.70	0.00	1111.70	11/27/2015, 24
1-HR	9TH	89.24169	ug/m^3	287513.74	5607704.60	1113.00	0.00	1113.00	1/9/2015, 14

Results Summary

H2S - Cumulative Case

H2S - Concentration - Source Group: SW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	154.63425	ug/m^3	280775.91	5602194.78	1146.00	0.00	1146.00	11/27/2015, 24
1-HR	9TH	323.07418	ug/m^3	280773.94	5602155.53	1146.00	0.00	1146.00	11/9/2015, 13

Results Summary

NH3 Project Case

NH3 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	246.62608	ug/m^3	287991.23	5608143.50	1106.00	0.00	1106.00	12/10/2015, 11

Results Summary

NH3 - Baseline Case

NH3 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	23020.84152	ug/m^3	282198.46	5610075.69	1156.00	0.00	1156.00	11/28/2015, 11

NH3 - Concentration - Source Group: SRCGP1- Rimrock Cattle Company Ltd. feedlot

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	8761.32594	ug/m^3	288071.12	5608140.16	1106.00	0.00	1106.00	10/26/2015, 9

NH3 - Concentration - Source Group: SRCGP2

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	17491.25242	ug/m^3	283543.59	5611523.06	1135.00	0.00	1135.00	1/9/2015, 12

NH3 - Concentration - Source Group: SRCGP3

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	22933.72755	ug/m^3	282198.46	5610075.69	1156.00	0.00	1156.00	11/28/2015, 11

Results Summary

NH3

NH3 - Concentration - Source Group: SRCGP4

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	21152.31046	ug/m^3	280770.02	5602077.05	1145.00	0.00	1145.00	9/28/2015, 8

Results Summary

NH3 - Cumulative Case

NH3 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	23020.84660	ug/m^3	282198.46	5610075.69	1156.00	0.00	1156.00	11/28/2015, 11

NH3 - Concentration - Source Group: N

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	17491.25242	ug/m^3	283543.59	5611523.06	1135.00	0.00	1135.00	1/9/2015, 12

NH3 - Concentration - Source Group: NW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	22933.72755	ug/m^3	282198.46	5610075.69	1156.00	0.00	1156.00	11/28/2015, 11

NH3 - Concentration - Source Group: RIMCUMU - Rimrock Complex

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	4654.17543	ug/m^3	288051.15	5608140.99	1106.00	0.00	1106.00	10/26/2015, 9

Results Summary

NH3

NH3 - Concentration - Source Group: SW

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	9TH	21152.31046	ug/m^3	280770.02	5602077.05	1145.00	0.00	1145.00	9/28/2015, 8

APPENDIX E

REGIONAL INDUSTRIAL FACILITIES OVERALL RESULTS (OFFSITE FEEDLOTS)

Regional Industrial Facilities Results

In accordance with the *AQMG*, cumulative air quality conditions from existing and approved industrial developments near the Facility should be assessed (AEP, 2021a). As mentioned, the existing and approved "industrial" developments near the Facility are agricultural confined feedlot operations (CFO), which are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA. This includes the adjacent Rimrock Cattle Company Ltd. Feedlot, as well as the offsite feedlots (i.e., the North Feedlot, Northwest Feedlot, and Southwest Feedlot). The offsite feedlots are located over 5 km away and are predominantly upwind of the proposed Facility. As such, the Project Case (the Facility only) was determined to have minimal effects on the MGLC at the offsite feedlots. Dispersion modelling was performed for the overall Baseline Case (including the offsite feedlots) and Overall Cumulative Case (overall maximum predicted concentrations within the modelling domain).

The MGLC of H_2S for the Regional Industrial Facilities, including ambient baseline H_2S concentrations, are provided in Table 15. Isopleths associated with the overall Baseline and Cumulative Cases are presented on Figures 14 through 19 within Appendix B, while the U.S. EPA AERMOD input and output files are provided in Appendix D.

Table 15 Predicted H_2S Concentrations Associated with Regional Industrial Facilities

Averaging Period	UTM Coordinates		Predicted ($\mu g/m^3$)	Ambient Baseline ($\mu g/m^3$)	MGLC ($\mu g/m^3$)	*AAAQO* ($\mu g/m^3$)
	(m E)	(m N)				
Overall Baseline Case [(a)]						
1-Hour	280773.94	5602155.53	326.4	1.4	327.8	**14**
24-Hour	280775.91	5602194.78	155.1	1.0	156.1	**4**
Overall Cumulative Case [(a)]						
1-Hour	280773.94	5602155.53	323.1	1.4	324.5	**14**
24-Hour	280775.91	5602194.78	154.9	1.0	155.9	**4**

(a) In this assessment, regional industrial facilities include agricultural operations which are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA.

The MGLC of NH_3 for the Regional Industrial Facilities, including ambient baseline NH_3 concentrations, are provided in Table 16. Isopleths associated with the Baseline and Cumulative Cases are presented on Figures 20 and 21 within Appendix B, while the U.S. EPA AERMOD input and output files are provided in Appendix D.

Table 16 Predicted NH_3 Concentrations Associated with Regional Industrial Facilities

Averaging Period	UTM Coordinates		Predicted ($\mu g/m^3$)	Ambient Baseline ($\mu g/m^3$)	MGLC ($\mu g/m^3$)	*AAAQO* ($\mu g/m^3$)
	(m E)	(m N)				
Overall Baseline Case [(a)]						
1-Hour	282198.46	5610075.69	23020.8	11.8	23032.6	**1,400**
Overall Cumulative Case [(a)]						
1-Hour	282198.46	5610075.69	23020.8	11.8	23032.6	**1,400**

(a) In this assessment, regional industrial facilities include agricultural operations which are regulated under the *AOPA* by the NRCB and are not currently regulated under *EPEA* or by AEPA.

As indicated by the results, the largest contributions of odours in the area are the background Regional Industrial Activities. The proposed Facility is determined to have negligeable effects on the cumulative air quality within the modelling domain.

Attachment J – Stormwater Management Plan

4015 7 Street SE, Calgary AB T2G 2Y9, T: 403.254.0544 F: 403.254.9186

July 14, 2023

Our Reference: 28028

Rimrock Renewables
900, 222 3rd Avenue SW
Calgary, AB
T2P 0B4

Attention: Denny Boisvert P.Eng

Dear Denny:

Reference: Stormwater Management Plan for the Proposed Rimrock Biodigester Facility NE 6-19-29-W4M and NW5-19-29-W4M, Foothills County, Alberta

1.0 Purpose

This Stormwater Management Plan aims to outline how the Liquid Digestate Pond within the Rimrock Biodigester Facility Site (The Site) also provides adequate stormwater management for the 10.9ha Biodigester site while the site is operating at full capacity.

2.0 Introduction

Rimrock Renewables (the "Client") has requested that ISL Engineering and Land Services ("ISL") provide a stormwater management report for the stormwater runoff generated by the Rimrock Biodigester Facility (the "Project") located in Foothills County, Alberta. This stormwater management report/drainage assessment was conducted in accordance with Alberta Environment and Protected Areas (AEPAA) current design guidelines. Additionally, due to the project's unique nature, additional externalities around the site drainage relative to operation and approvals are outlined within this report.

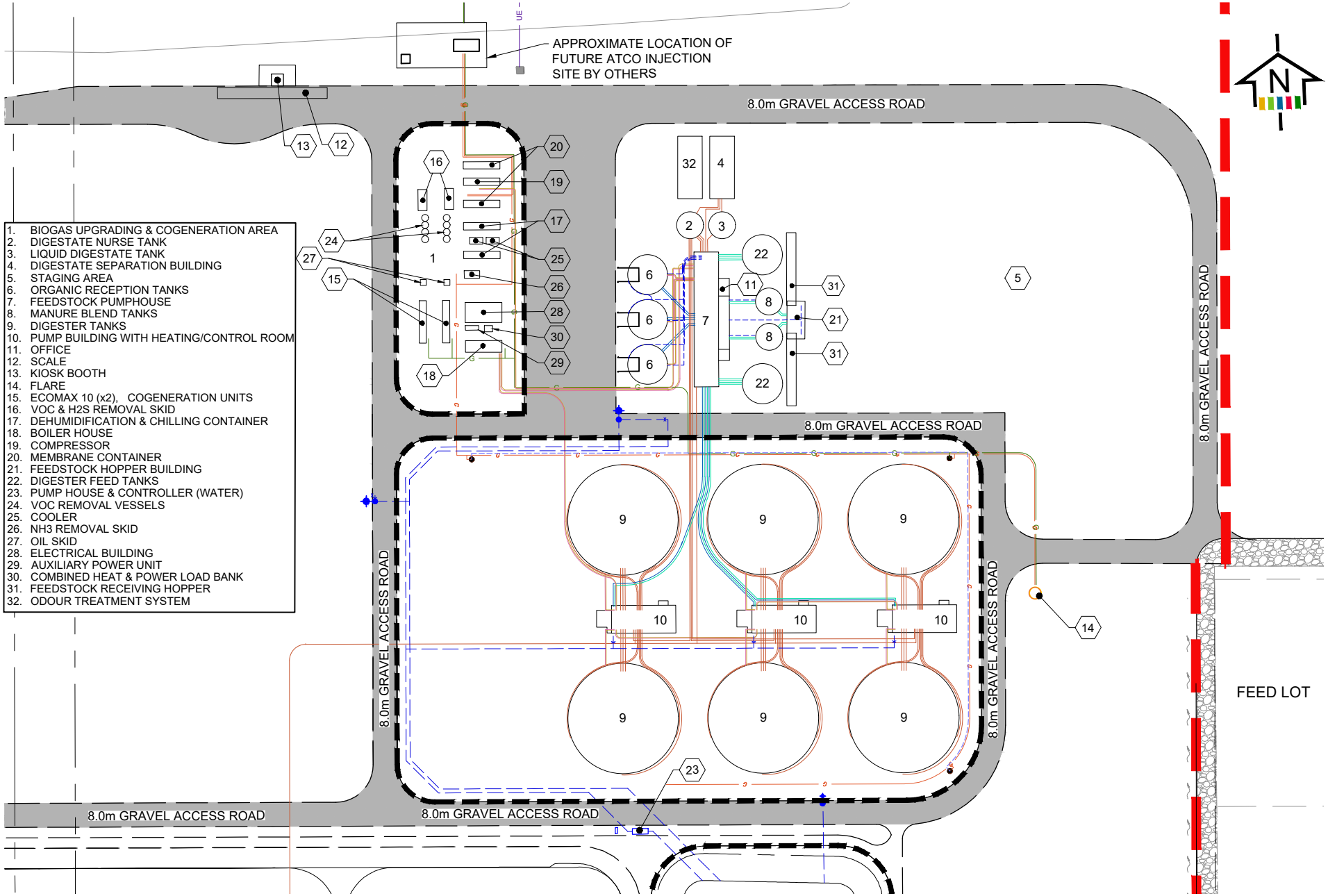
Stormwater is initially being directed to the Liquid Digestate Pond instead of into the NRCB Approved Catch Basin and will be returned to the watershed via land application of digestate per NRCB/AOPA regulations.

Primarily all stormwater generated by the project is self-contained on-site through the conveyance of surface flows into the proposed Liquid Digestate Pond. For storage sizing on-site, a worst-case zero discharge evaporation ideology was applied to determine the maximum Pond footprint that the 10.86ha project area could require. Refer to the attached Figures for a complete site plan, catchment areas, and proposed on-site conveyance system.

The Pond consists of two Cells (Polishing and Storage). The first Cell (Polishing) operates as a polishing cell for the incoming digestate by applying aeration. The second Cell (Storage) is utilized for storage prior to the bi-annual/seasonal application of liquid digestate to neighboring lands.

The objectives and key considerations of the stormwater management plan are as follows:

- To analyze the site runoff volume and peak flows for the post-development area.
- To understand the stormwater management methods used to transport and store stormwater.



ISL Engineering and Land Services

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WATERLINE
HYDRANT
MANHOLE
PROPOSED TRANSFORMER LOCATION
ORGANIC FOOD RESOURCES SLURRY
HEAT MEDIUM RETURN LINE
HEAT MEDIUM SUPPLY LINE
DIGESTATE LINE
MANURE LINE
BIOGAS LINE
NATURAL GAS PIPELINE
CONDENSATE
POWERLINE

Rimrock RNG Facility
Foothills County, Alberta
Figure 5-2
Facility Plot Plan
June, 2023

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- Outline the worst-case SWMF footprint required to manage 10.9ha of the site area through evaporation.
- Discuss the impacts of draining the Pond twice a year relative to stormwater inflows.
- Confirm the site achieves AOPA/EPEA stormwater sizing requirements.
- Predevelopment Conditions
- Post Development Conditions
- Predevelopment versus proposed development conditions comparison
- Outline clearly that predevelopment volumes are not being used in the digestate process and are returned to the environment via evaporation or land spreading.
- Outline opportunities to reduce the overall SWMF footprint as the design process moves forward.

3.0 Proposed Pond Operation

The Pond comprises two cells: Cell 1 and Cell 2. Cell 1 is referred to as the polishing cell, and it incorporates an aeration system, while Cell 2 functions as the storage cell. Both cells are designed with a 4:1 side slope, providing a total volume of 35,000m³ for the polishing cell and 145,000m³ for the storage cell.

The Pond has been designed with a maximum depth of 3.5 meters (Cell 1) and 3 meters (Cell 2)l, of which 3 meters is active depth. Cell 1 has a 0.5m zone below the active water depth for aeration infrastructure. This allows for a 3-meter active storage volume, with additional space allotted for the aeration infrastructure in Cell 1. The top of the freeboard is at an elevation of 1106 meters with a freeboard height of 600mm. The high water level (HWL) is at 1105.4 meters, and the Cell 1 pond bottom is set at an elevation of 1101.9m (due to aeration infrastructuer) and Cell 2 is set at 1102.4 m

It's important to note that the groundwater level varies between 1101.3 to 1099.4 meters, as determined by geotechnical investigation boreholes (BH109, BH110, BH205, BH303, BH404). The proposed operation of the Liquid Digestate Pond includes a semi-annual draining of digestate. The table below provides a detailed filling and draining cycle anticipated throughout the year:

Cell 1: Polishing Cell (Note 3m active storage zone summarized below.
Cell depth containing aeration infrastructure not included

Month	Volume (m^3)	Depth (m)	Notes
January	23333	2	Filling
February	29167	2.5	Filling
March	**35000**	**3**	**Draining**
April	5833	0.5	Filling
May	11667	1	Filling
June	17500	1.5	Filling
July	23333	2	Filling
August	29167	2.5	Filling
September	**35000**	**3**	**Draining**
October	5833	0.5	Filling
November	11667	1	Filling
December	17500	1.5	Filling

Cell 2: Storage Cell

Month	Volume (m^3)	Depth (m)	Notes
January	96667	2	Filling
February	120833	2.5	Filling
March	**145000**	**3**	**Draining**
April	24167	0.5	Filling
May	48333	1	Filling
June	72500	1.5	Filling
July	96667	2	Filling
August	120833	2.5	Filling
September	**145000**	**3**	**Draining**
October	24167	0.5	Filling
November	48333	1	Filling
December	72500	1.5	Filling

4.0 Pond Sizing ideology

To demonstrate the adequate sizing of the Liquid Digestate Pond to capture stormwater generated from the 10.9ha developed area. A conservative continuous simulation model is provided. This model begins with the assumption that the 6.1 ha Pond is 3m deep and remains there through the 50-year continuous stormwater simulation. This provides a worst-case understanding of how the Pond footprint responds to the 10.9ha contribution of the developed area. As well as provides insight into how much freeboard is available. Modeling relies solely on evaporation to outlet stormwater from the system. No allocation to land spreading has been included in this model scenario (Which would occur in practice, further reducing the stormwater volumes in the Pond).

Model results have been summarized below in two ways:

1.) Net volume fluctuation of contributing stormwater to the Pond. This scenario utilizes a starting volume of 10,000m^3 to represent the baseline/Highwater Level of the Pond.
2.) Net water level fluctuation of the Pond based on stormwater contributions, with the Pond volume from digestate production remaining constant. This scenario utilizes a starting elevation of 0.1m to represent the HWL elevation of 3m within the Pond.

Cell 2 does not contain any aeration infrastructure, and therefor the pond bottom is 3m below the HWL of 1105.4m at 1102.4m. Cell 1 has aeration infrastructure requiring the bottom elevation to be 0.5m lower (1101.9m). Since this cell is aerated mechanically, there is no anerobic zone anticipated below 3m.

Model results are summarized below in Figures 4.3a and 4.3b. Model results indicate that the 6.1-ha Pond footprint experiences a negligible rise and falls under constant Digestate production at High Water Level, with no long-term trend in volume or elevation up or down. This indicates that the Pond sizing is

conservative and sustainable long term. Additionally, if land spreading were to be incorporated into the continuous simulation, a net drawdown in Pond volume would be expected to be observed. Model results are available upon request.

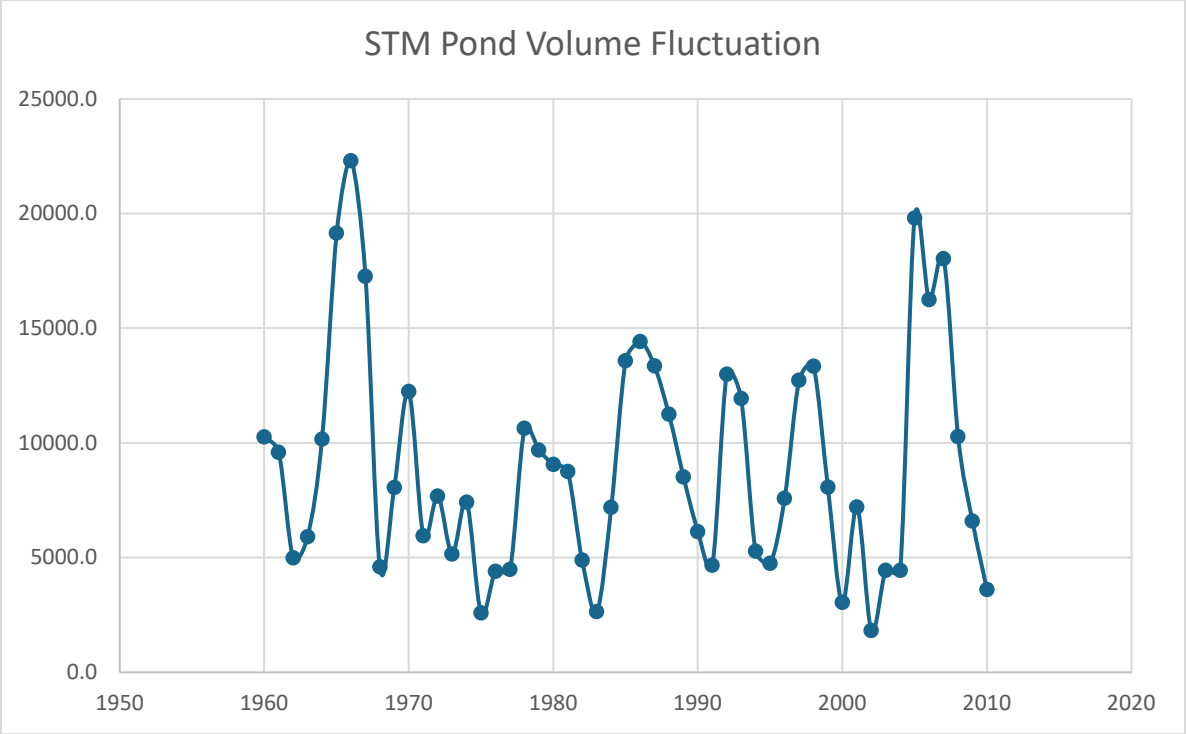


Figure 4.3a: Continuous Simulation Annual Volume Fluctuations within the 6.1ha Pond (10.9ha Contributing Area)

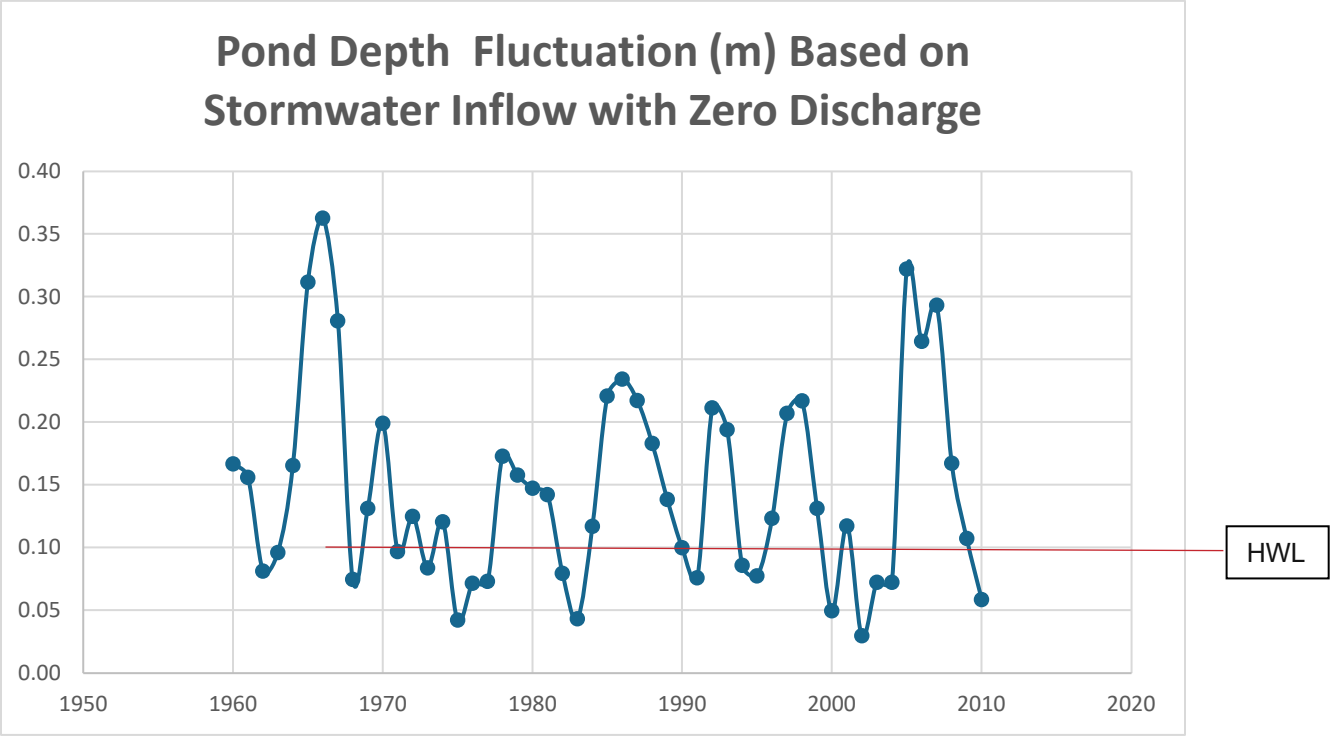


Figure 4.3b: Continuous Simulation Annual Water Level Fluctuations within the 5ha Pond (8.62ha Contributing Area) – Digestate Volume Constant

The small net fluctuation in water level ~26cm maximum under a very conservative model scenario relative to a 0.6 m freeboard indicates there is adequate storage for greater than a 1:500 year event, which satisfies a zero discharger facility criteria.

5.0 Key Findings

The key findings from the stormwater analysis, utilizing a continuous simulation model, is that in addition to the estimated pond level fluctuation, an additional 35,300m^3 of stormwater is estimated to enter the Pond annually on an average basis (some years will be higher, and some lower) without accounting for bi-annual pumping occurring or evaporation between rain events. The Pond has an active storage zone of 3m with 600mm of freeboard (Set based on the incoming upstream ditch bottom elevation). The HWL is achieved twice per year as the liquid digestate fills the Pond. Continuous simulation results indicate that the stormwater from the site would be in the range of 25cm annually in a wet year (Without accounting for any release from the Pond).

Pond draining is triggered by elevation as observed in the field by operations staff and not dictated by a specific date. As a result, the Pond would begin to be drained at the time the HWL is close to being reached. The Pond maintains a 600mm freeboard, meaning that the worst-case design scenario would be a single event 1:100-year rain event occurring on the site at the time the Pond is at the HWL. It should be highlighted that there is additional storage above this freeboard, though it would involve the inundation of the upstream conveyance ditch.

A 1:100-year rain event total volume (Over the 10.9ha industrial site, not counting the SWMF area of 6.1ha) would be estimated at 13,000 m^3, which translates into 0.26m of storage depth at the HWL of the Pond. This would be accommodated within the 600mm freeboard of the Pond in this scenario.

It is important to note that the rainy season in this geography is ~June/July annually. Based on the proposed pond operation annually, the Pond should only contain ~50-60% of its capacity (~1m of available active storage zone before entering the freeboard), meaning there would be additional storage volume available in the event of a 1:100 year storm event occurring.

6.0 Study Area

6.1 Location and Extent

The proposed plant site is located within the NE ¼ Sec. 6, Twp. 19, Rge. 29, W4th M and NW ¼ Sec. 5, Twp. 19, Rge. 29, W4th M located in Foothills County, Alberta. It is approximately 12 km west of High River, Alberta. The site is situated on cultivated lands for agricultural use.

6.2 Soil Conditions

In the Geotechnical Borehole Log Draft provided by Clifton on November 5, 2021 (Submitted as part of the broader Approval Package not appended to this report), the soil on the subject lands is dry, stiff, and contains large amounts of clay. Silts and sands are also present in lower quantities in dry conditions. Given the density and dryness of the soils, it is expected that bulking of excavated materials will be observed rather than shrinkage during construction.

6.3 Existing NRCB Approved Catch Basin

The existing waterbody (Catch basin) near the site is fed by a 381-ha upstream catchment, along with the existing Rimrock Feedlot contributing area. The existing feedlot is operating under NRCB Approval which grants rainwater discharge into the existing Southwest catchbasin neighboring the existing feedlot. The proposed digestor site is not contributing any post-development flows to this waterbody. The existing feedlot is contributing some flows to the catch basin. The 10.86 ha of the contributing area is being directed into the Liquid Digestate Pond. No Water Act application has been submitted for this site due to the legacy treatment of the water body as a catch basin within the site.

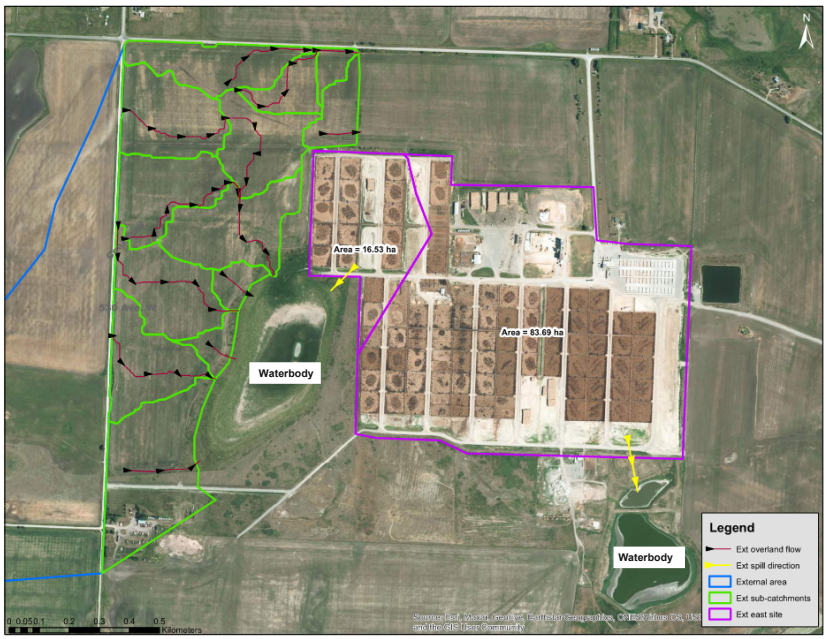
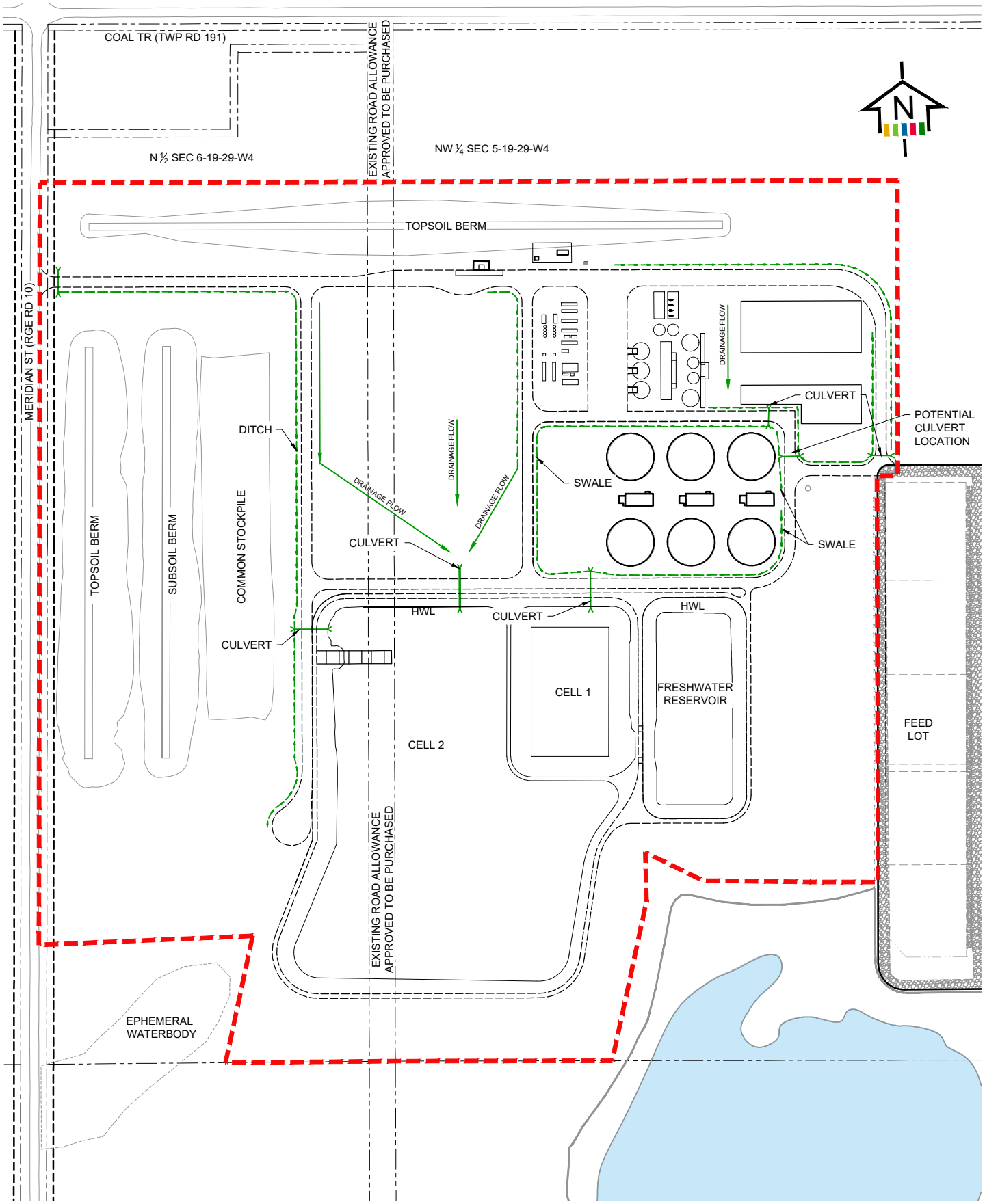


Figure 2.3a: Existing Site Catchment Areas

Within the context of the broader catchment area feeding the existing catch basin, the small catchment area diversion represents a 2% impact on the upstream catchment. The broader net contributing area to the existing water body (based on historical catchment properties) is being preserved. Factoring in that the existing feedlot area is contributing to the waterbody at a historically increased imperviousness. Portions of the external catchment area north of the site are to be maintained around the site, maintaining the natural drainage of the broader catchment area.



PROJECT FOOTPRINT
CATCH BASIN
EPHEMERAL WATERBODY
STORMWATER CONVEYANCE

ISL Engineering and Land Services

0 80 160 m
1:4000

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 6
Stormwater Collection Infrastructure
June, 2023

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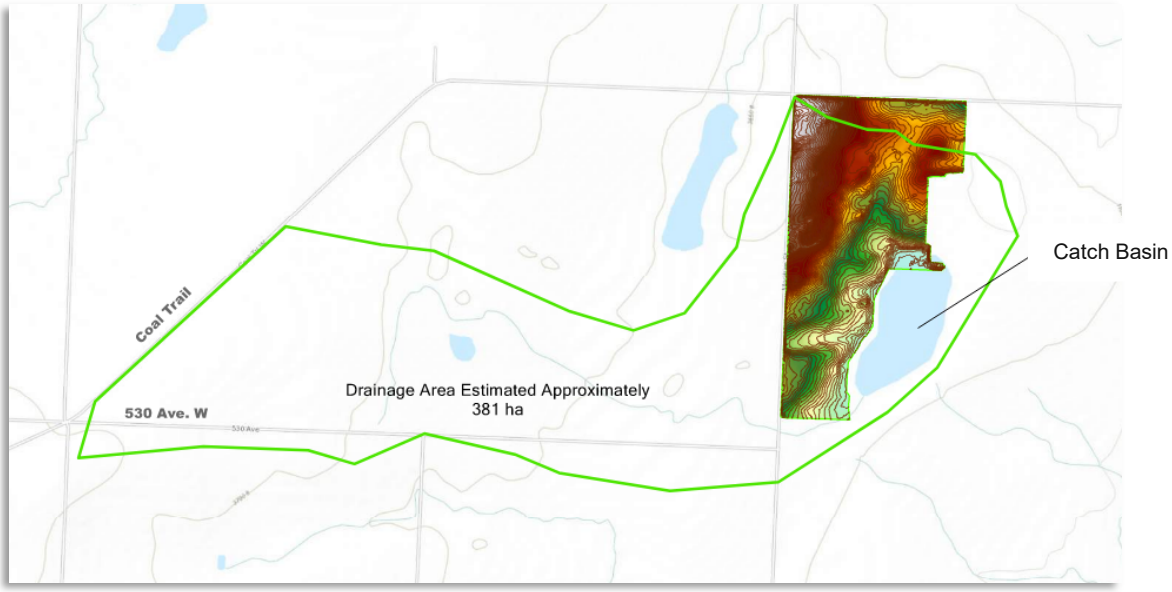


Figure 2.3b: Existing Catch Basin Catchment Area

7.0 Stormwater Runoff

7.1 Climate Summary

Foothills County is a municipal district located in southern Alberta. The weather history in this region is best represented by data collected from 1904-2006 by the High River Meteorological Station (station #3033240. As seen in Figure 3.1, the average annual precipitation within this time period is 550 mm per year. The summer months of June - September tend to experience the greatest amount of precipitation due to the high amounts of rainfall. Alternatively, the High River tends to have very dry fall and winter seasons, where most of the runoff comes from melted snow and ice. The highest amount of precipitation that High River has ever experienced was in 2005, when 887 mm of precipitation was collected. The driest year ever recorded in the Town was in 1909 when only 235 mm of precipitation occurred. The lowest, highest, and average monthly values of precipitation collected in High River are seen below in Figure 3.1.

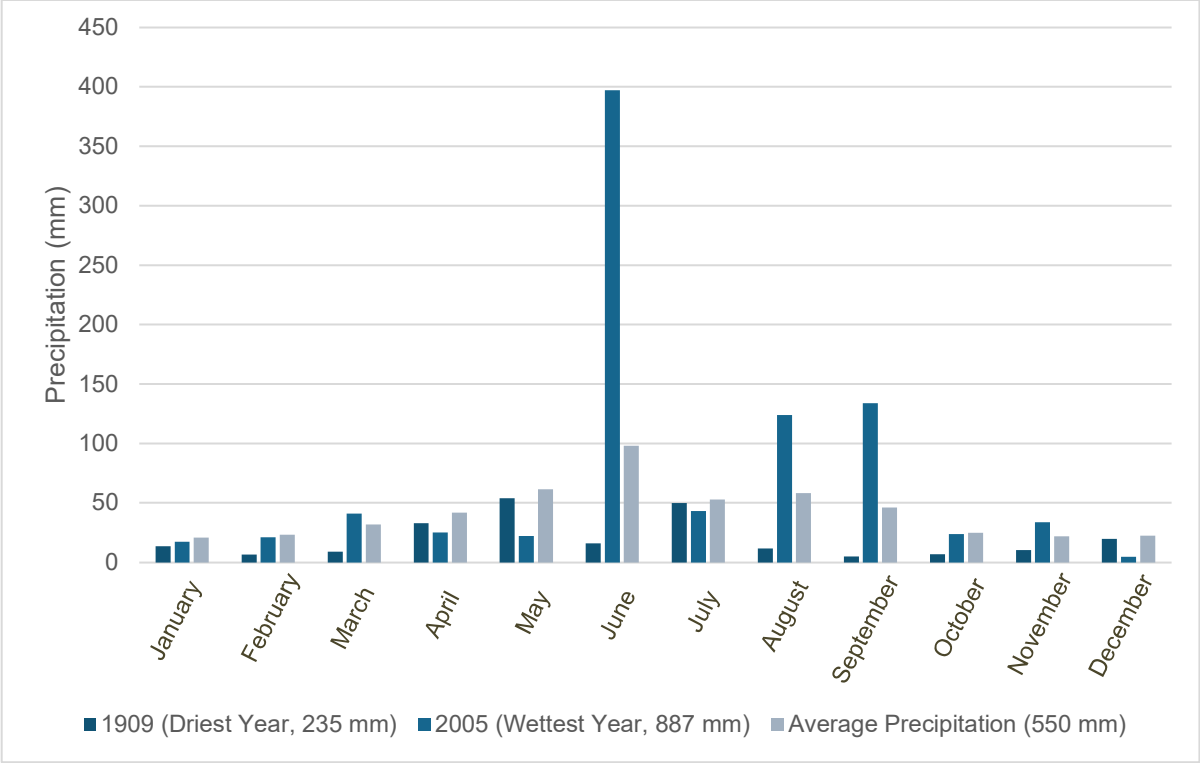


Figure 3.1: Monthly precipitation values in High River collected by meteorological station #3033240. Data were retrieved from the Government of Canada's webpage for historical climate data on November 2, 2021.

7.2 Evaporation

To estimate evaporation from the project area satisfies sizing requirements, the following evaporation data was applied to the site.

> Alberta Environment. *Evaporation and Evapotranspiration in Alberta (*2013), Shallow-lake evaporation data on a monthly basis can be seen in Table 1 below. The data was collected from 1921 to 2009 at the Calgary International Airport.

Note that there is no data provided for the Town of High River. Thus, data for the closest municipality, the City of Calgary, is used for the evaporation purposes of this letter.

Table 1: Shallow Lake Evaporation Data in the City of Calgary from 1921-2009

Month	Evaporation (mm)
January	2
February	8
March	30
April	69
May	111
June	130
July	154
August	121
September	65
October	29
November	7
December	1
Total	**728**

The total annual evaporation value for shallow lakes in the City of Calgary is 728 mm/year. This is greater than the annual precipitation value of 550 mm/year. Therefore, the runoff collected on-site due to precipitation should be accounted for with shallow lake evaporation.

7.3 Catchment Areas

The proposed stormwater catchment areas of the project are seen in the attached Figures. For modeling purposes, the total catchment areas sum up to approximately 17 ha (i.e., 10.9 ha of developed area and 6.1 ha of Pond). This was done as part of the initial iterative design process to combine the Digestate volume produced through manure processing and the stormwater volumes generated by the site areas flowing into the Liquid Digestate Pond.

For the purposes of this analysis, the proposed Liquid Digestate Pond in the figure above is treated as self-contained due to the evaporation and frequent draining of the Pond to fertilize neighboring fields. Since the Pond is considered zero discharge relative to stormwater management outlet ideology, it is being modeled as a zero-discharge evaporation facility for sizing purposes. The stormwater contributing area has been modeled at 10.9ha of 85% Impervious area contributing to the Liquid Digestate Pond. These contributing elements are shown separately to outline the worst-case footprints and allow for an easier explanation of the stormwater design.

Portions of the external catchment area north of the site are to be maintained around the site, maintaining the natural drainage of the broader catchment area.

Runoff from the site catchment will not be utilized within the digestion process. Conveyance of surface flows into the Liquid Digestate Pond is returned to the watershed through land spreading per NCRB/AOPA requirements.

8.0 Liquid Digestate Pond

The Liquid Digestate Pond is split into two cells (refer to the attached figure for the layout). This configuration is required to provide polishing, storage, and odor control of the digestate as it waits to be spread on neighboring lands.

The HWL area of each cell is outlined below, with an additional 600mm of freeboard above. Though the Pond is drained twice a year, the HWL relative to the freeboard was used as the worst-case scenario for this stormwater analysis. Additionally, stormwater entering the Pond is anticipated to have a diluting effect on the digestate within the Pond but is assumed to be negligible for the purposes of the broader analysis.

Digestate flows into Cell 1 after the required residency time is achieved. Site stormwater conveyance is achieved via ditches within the site that convey all surface flows to the Pond through two culverts, one in Cell 1 and the other in Cell 2.

- Cell 1 has a Mid-elevation Surface area of 12 052 m2 (1103.9m)
- Cell 2 has a Mid-elevation Surface area of 49,497 m2 (1103.9m)

8.1 Liquid Digestate Pond - Site Secondary Containment

Beyond the primary role as a component of the stormwater management system, the liquid digestate liquid digestate Pond has an added function as a secondary containment measure for the entire site. This extended role is facilitated by the strategic site design, which directs all site drainage ditches to drain into the Pond.

Under normal circumstances, the primary containment structures in place are expected to prevent any uncontrolled releases from the site. However, should these fail, the liquid digestate Pond can act as a secondary line of defense, capturing and containing any materials that escape the primary containment facilities.

This capability reduces the risk of environmental contamination and potential harm to local ecosystems. Given that the liquid digestate Pond serves this dual function, it is critical that it is maintained effectively, both as a component of the stormwater management system and as a secondary containment measure. This involves regular monitoring and maintenance of the Pond and its associated structures, as well as frequent inspections and tests to ensure it remains capable of performing its functions.

Moreover, having a containment pond that can capture potential leaks not only serves as a safety measure but also aids in identifying the source of the failure in the primary containment. Any captured material can be traced back to its source, enabling a more efficient response and facilitating subsequent remedial actions.

The Pond has 600mm of freeboard over a total area of 61,549 m2 which represents a storage volume of ~37,000m3 (assuming the Pond is full if a breach were to occur). This would be adequate volume to contain the total upstream tank storage of 27,390m3 if there was a complete failure of all containment. Note this would be an extremely low-probability event. Failure of a single digester would result in ~4,300m^3.

In essence, the dual functionality of the liquid digestate Pond significantly enhances the resilience of our environmental protection measures, safeguarding the site and the surrounding environment against any unexpected incidents.

8.1.1 Ditch Conveyance of a Failure Condition

In the unlikely event that a digester tank fails and the secondary containment does not contain the 4,300m^3 of liquid released, flows would be conveyed into the liquid digestate pond. The roadway ditches utilize a cross-section of 3:1 side slopes and a 1m ditch bottom and 1m. These digesters are located upstream of the Liquid Digestate pond and are connected through an 800mm culvert. This culvert would

be the conveyance mechanism for the 4,300m3 of liquid released. ~0.202m of head on the culvert would result in a peak flow rate of 1m^3/s.

It would be anticipated that 1m of the head would result in 2.25m^3/s of conveyance through the culvert, meaning that ponding of the liquid would be anticipated around the digesters in the event of a failure while it drained into the liquid digestate pond.

8.2 Pond Wave Impacts Assessment

As part of the site's comprehensive stormwater management planning, a high-level wave calculation was performed to estimate the potential impact of wind-driven waves on the Liquid Digestate Pond. This analysis is critical for accurately determining freeboard requirements, minimizing the risk of overtopping, and ensuring the Pond's structural integrity under various weather conditions.

High-level wave calculations were undertaken based on available wind speed data for the site. Results from these calculations indicate that the maximum wave height is expected to be approximately 30cm. This calculation takes into account the fetch distance, wind speed, and duration, all of which can contribute to wave generation in the Pond.

In the absence of statistical data for wave heights in water bodies located in the same area of the proposed lagoon, the anticipated max. The wave height was estimated based on published empirical charts and manual Fetch calculation formula.

A wind speed of 100 km/hr. (assumed the 100-Yr Max Speed) was applied over a fetch length of 325m.

The estimated "significant wave height H1/3" is 38cm. The estimated "Max. wave height" is (1.8 x $H_{1/3}$)= 69cm. The Max. wave height is defined as the vertical distance from the wave bottom to the wave crest.

The wave height relative to the freeboard is estimated to be 0.38m versus a provided 0.6m of freeboard. While the wave height might seem relatively low, it is essential to consider that the force exerted by these waves can cause erosion on the Pond's banks and potentially compromise the liner integrity. Therefore, these results are factored into the design and operational strategies for the liquid digestate Pond, ensuring it can withstand the calculated wave action.

9.0 Ground Water Protection

Cell 1 and 2 sit above the groundwater elevations sampled in the geotechnical investigation. Cell 1 is 0.7m or greater than measured groundwater elevations. Cell 2 is 1m or greater than ground water elevations sampled (1101.9m versus 1102.4m BH 109 with other holes lower).

Cell 1 has been shown with a bottom elevation of 1101.9m as a 0.5m depth is required for the aeration equipment. This results in the cell siting 0.7m above the recorded groundwater elevation. The following measures are proposed to safeguard the integrity of the Pond and the overall stormwater management system.

1.) **Pond Elevation:** The design and positioning of the liquid digestate Pond is a key factor in preventing groundwater intrusion. The base elevation of both cells has been set above the groundwater table, as informed by groundwater level data obtained from the geotechnical investigation.
2.) **Groundwater Monitoring Wells:** For an ongoing evaluation of the liner's integrity and to monitor for potential leaks, monitoring wells will be installed on-site. These wells will provide a mechanism

for continuous surveillance of groundwater levels and offer an early warning system for any breaches in the liner. This systematic and continuous monitoring approach will facilitate detection and remediation of any potential issues, protecting both the liquid digestate Pond and the surrounding environment.

   a. Groundwater monitoring is proposed to be linked to the sand layer for early detection.

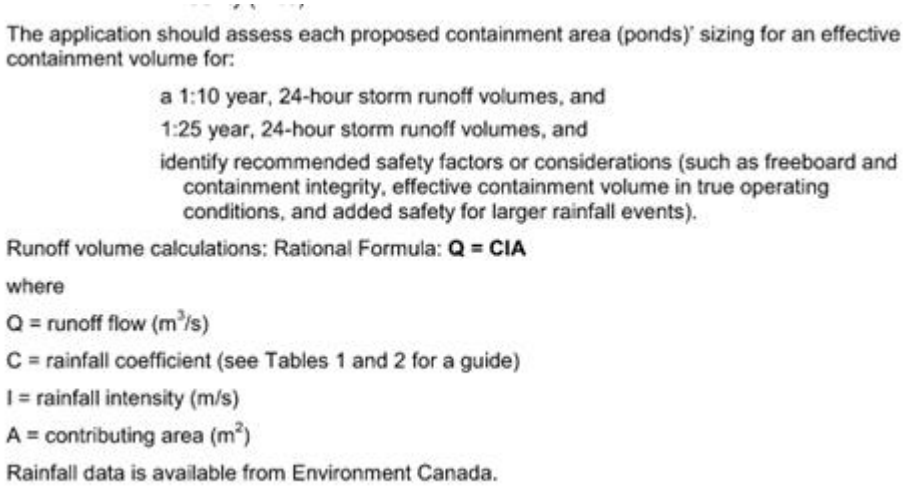
3.) **HDPE Liner:** An HDPE liner's impermeability, durability, flexibility, weldability, and UV resistance all combine to make it an excellent barrier against groundwater intrusion. Whether in a landfill, lagoon, or other environmental containment application, these liners play a crucial role in protecting the groundwater and surrounding environments from contamination. HDPE liners serve as an excellent barrier against groundwater intrusion due to several characteristics:
   a. Impermeability: HDPE liners are virtually impermeable. They are manufactured to have a very low hydraulic conductivity, which means water and other fluids cannot easily pass through them.
   b. Durability: HDPE is a robust and durable material. It is resistant to a wide range of chemicals, enabling it to withstand corrosive environments that could otherwise compromise the liner and allow groundwater intrusion.
   c. Flexibility: Despite its strength, HDPE is also quite flexible. This flexibility allows it to accommodate ground settling or movement without cracking, which could otherwise lead to leaks.
   d. Weldability: HDPE liners can be seamed together on-site using a process called fusion welding, creating a continuous membrane. The seams between the liner panels are thus as resistant to water passage as the rest of the liner.
   e. UV Resistance: HDPE has good resistance to UV radiation, which can degrade many other types of plastic over time.
4.) **Liner Surface Preparation:** Prior to placement of the liner sand and HDPE layers the pond surface is to be compacted.
   a. Compaction shall be performed with a sheepsfoot roller to 98% standard procotor.
   b. The surface shall be disked or scarified to a depth of 150mm.
   c. If the lift surface is too wet or eroded from runoff, the affected material shall be removed and replaced. Disking and compaction of the with new material and recompacted:
5.) **Sand Layer Underneath Liner:** In order to further prevent groundwater intrusion and maintain the liner's functionality, a layer of sand is proposed beneath the liner. This sand layer will act as a buffer zone, allowing for the passage of air and moisture and serving to protect the liner from mechanical damage. The sand layer can also facilitate the identification of any leaks and aid in the repair process and can be linked to the monitoring system..
6.) **Liner Vents:** To manage moisture and prevent the buildup of gases beneath the liner, vents are proposed at the top of the slopes. These vents will allow for the release of accumulated gases, preventing pressure buildup that could compromise the integrity of the liner and hence the overall function of the Pond.

By employing a combination of strategic design choices and proactive monitoring strategies, we can effectively manage and protect against groundwater intrusion, maintaining the ongoing efficiency and longevity of the stormwater management system.

10.0 Imperviousness

With the construction of the site, a larger quantity of the ground will be composed of impervious material, which will increase the amount of surface stormwater runoff. An imperviousness of 85% was applied to the 10.9ha project area contributing to the Liquid Digestate Pond (6.1ha Pond).

The digest pond stormwater allocation is based on AEPA guidelines. As noted previously, the Liquid Digestate Pond stormwater volumes are being accounted for separately from the zero-discharge sizing to outline the worst-case footprint for the site.



The application should assess each proposed containment area (ponds)' sizing for an effective containment volume for:

a 1:10 year, 24-hour storm runoff volumes, and

1:25 year, 24-hour storm runoff volumes, and

identify recommended safety factors or considerations (such as freeboard and containment integrity, effective containment volume in true operating conditions, and added safety for larger rainfall events).

Runoff volume calculations: Rational Formula: **Q = CIA**

where

Q = runoff flow (m^3/s)

C = rainfall coefficient (see Tables 1 and 2 for a guide)

I = rainfall intensity (m/s)

A = contributing area (m^2)

Rainfall data is available from Environment Canada.

Figure 4: AEPA Pond, Stormwater Sizing Criteria, based on rational method

10.1 Predevelopment Conditions

The existing site consists of highly pervious agricultural grassland. A predevelopment water balance model was developed to approximate the existing site conditions for comparison to post-development. The site imperviousness is estimated at 5%. The existing site catchment sheet flows south to the existing water body. Existing flows are contained within the broader geography. This condition is proposed to remain post-construction. Refer to the predevelopment Figure 2.3a above.

10.2 Post-development Conditions

A continuous simulation is required to focus on the stormwater contribution of the developed area to the Pond. Sizing for the 10.9ha (85% Imperviousness) developed area is based on an evaporation pond modeling concept. This deviates from Alberta Environment single event sizing Guidelines as there is no outlet conveyance network downstream of the proposed SWMF.

Flows from within the site post-development will continue to be contained, and the bi-annual/seasonal application of liquid digestate to neighboring lands returns water back to the broader watershed.

10.3 Liquid Digestate Pond Free Board

The Liquid Digestate Pond has two sizing criteria that govern its size. They are as follows:

1.) A 90% production rate stored for 7 months = 180,000m^3
2.) The stormwater contribution of the 10.9ha Site and 6.1 ha Pond

The Pond utilizes an active storage depth of 3m, depending on the cell. Plus, a 0.6m freeboard, as outlined in section 4.3, as a worst-case scenario. If the Pond is full to the HWL mark, stormwater fluctuation within the Pond will modify the HWL +/- 10cm most years.

It should also be noted that the stormwater impacts do not factor in the bi-annual/seasonal application of liquid digestate to neighboring lands that will be occurring on-site.

10.4 Liquid Digestate Pond Stormwater Disposal

The only stormwater accounted for in the digestate Pond at this time is the rainfall that would land in the Pond directly. No SWMF water and digest pond mixing is accounted for in the digest pond sizing, as a separate standalone SWMF has been sized. This is not to say that the two ponds will remain separate once constructed, but it allows for the worst-case footprint of the site to be evaluated at this stage of the design. Combining the two ponds would result in a reduction of the overall footprint as the design process progresses.

10.5 SWMF Zero Discharge Sizing

The zero discharge SWMF sized for the site utilized a continuous simulation model. The continuous simulation used a PCSWMM model to iteratively size the SWMF footprint required to evaporate the stormwater runoff generated by the site, utilizing the above-outlined evaporation data and 36 years of High River climatic data (1970-2005), including the effective daily precipitation and average temperature.

10.6 AOPA Catch Basin Sizing

Section 19 (2) of the AOPA guidelines requires a minimum catch basin volume (Storage volume relative to the context of SWMF within this report) of a 1:30-year storm event.

The published rainfall depth for High River (Table 2) is 95mm, spread over the 10.9ha site with an assumed imperviousness of 0.85. This results in a 1:30-year storage volume requirement of 7,601m^3.

For reference, relative to the proposed 6.1ha Pond, this storage volume translates into ~12 cm water elevation increase over the Pond. Further to Figure 4.3, this is in line with the estimate of Pond water level fluctuations determined using continuous simulation showing a net balance within the Pond of ~+/-10cm over time.

11.0 NCRB/AOPA Land Application return to the watershed

Once the digester is operational, a nutrient-rich liquid digestate product will be produced and temporarily stored in the liquid digestate Pond prior to being applied to the neighboring lands on a bi-annual/seasonal basis as was done previously with the raw manure. Stormwater drainage from the site is proposed to be incorporated into the liquid digestate pond. By incorporating the stormwater into the liquid digestate pond, the stormwater will ultimately be returned back to the watershed via land application.

The initial stormwater management sizing elements outlined in this report do not assume any land spreading is occurring. Therefore the stormwater management design can be considered conservative.

12.0 Summary

The stormwater analysis for the site can be summarized into the following points:

1.) A worst-case dedicated stormwater volume has been generated for the 10.9 ha (85% Imperviousness) developed area in addition to the Pond Digestate volume requirements.
2.) Continuous simulation results indicate that the stormwater from the site would be in the range of 0.26cm annually in a wet year. The Liquid Digestate Pond utilizes a 6.1ha footprint to contain the 180,000m^3 of liquid digestate product created.

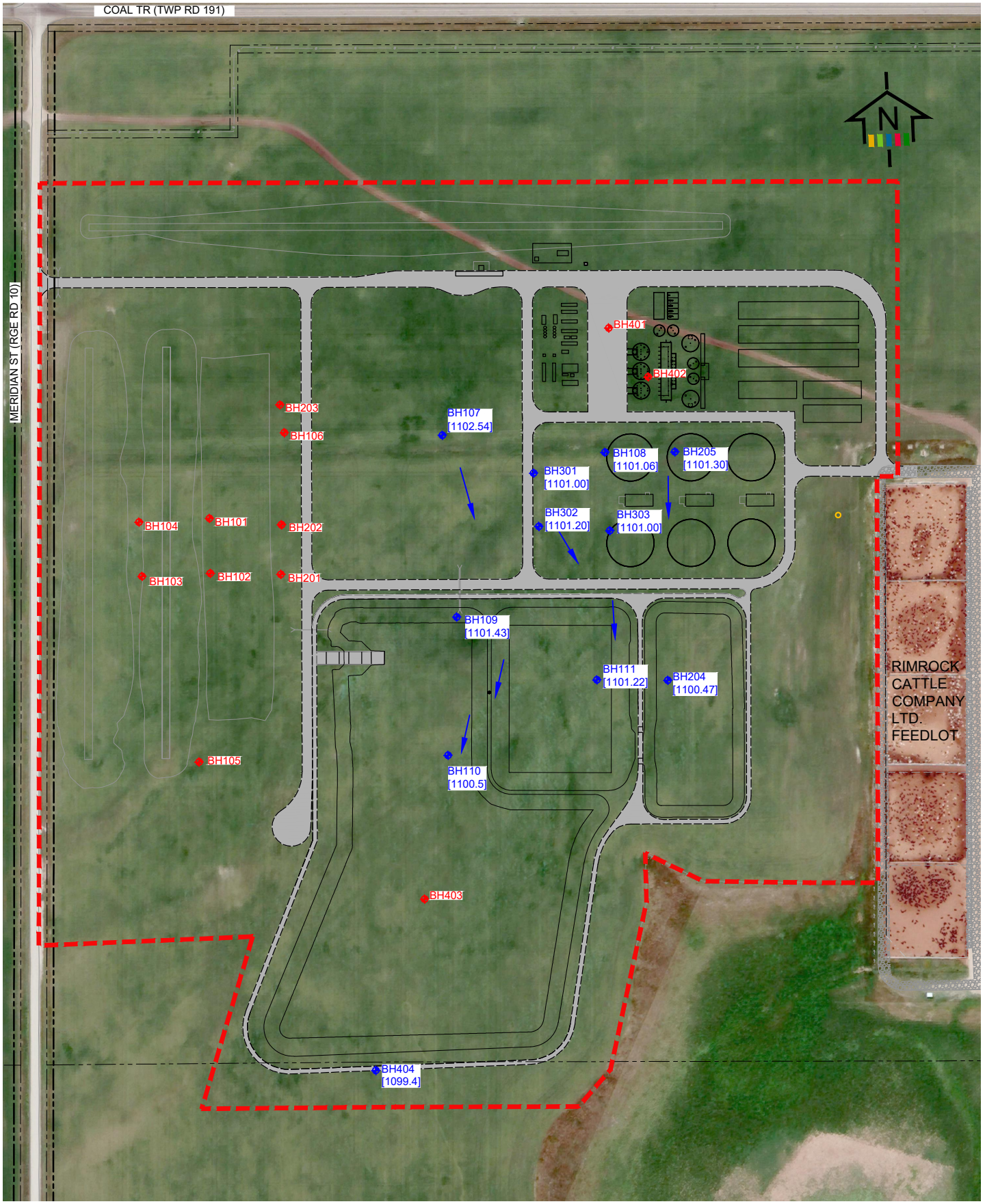
3.) A 1:100-year rain event total volume would be estimated at 13,000 m^3, which translates into 0.26m of storage depth at the HWL of the Pond. This would be accommodated within the 600mm freeboard of the Pond in this scenario. This is an unlikely scenario based on the operating level within the Pond during the June/July Rainy Season.
4.) Pond maintains enough freeboard to contain >1:500 year event, satisfying zero discharge requirements.
5.) Post Development flows are contained within the site.
6.) The stormwater within the site is contained and conveyed through a series of ditches and pipes to the Liquid Digestate Pond.
7.) The site achieves AOPA/EPEA stormwater sizing requirements.
8.) The NRCB-approved catch basin receives no stormwater from the proposed site. All stormwater is contained within the Liquid Digestate Pond.
9.) Existing drainage patterns for the broader catchment are preserved post-development. There is a slight reduction of the predevelopment catchment area to the NRCB-approved catch basin through the construction of this site.
10.) Predevelopment stormwater volumes are not being used in any facility process. Stormwater flows are being directed to the Liquid Digestate Pond.
11.) Stormwater captured within the Pond is returned to the watershed via the bi-annual/seasonal application of liquid digestate to neighboring lands.
12.) Groundwater monitoring will occur through the use of monitoring wells
13.) The liquid digestate Pond acts as a secondary containment for the entire site.

13.0 Closure

Please do not hesitate to contact the undersigned if any additional information or details pertaining to ISL's comments are required.

Sincerely,

Garnet Dawes P.Eng. DBIA.
Community Development Manager



ISL Engineering and Land Services

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1:4000

PROJECT FOOTPRINT

EXISTING BASELINE MONITORING WELLS

BOREHOLES

GROUNDWATER FLOW DIRECTION

[XXXX.XX] GROUNDWATER ELEVATION (m asl)

Rimrock Biodigester Facility
Foothills County, Alberta

Figure 4-10

Groundwater Elevations and Flow

July 2023

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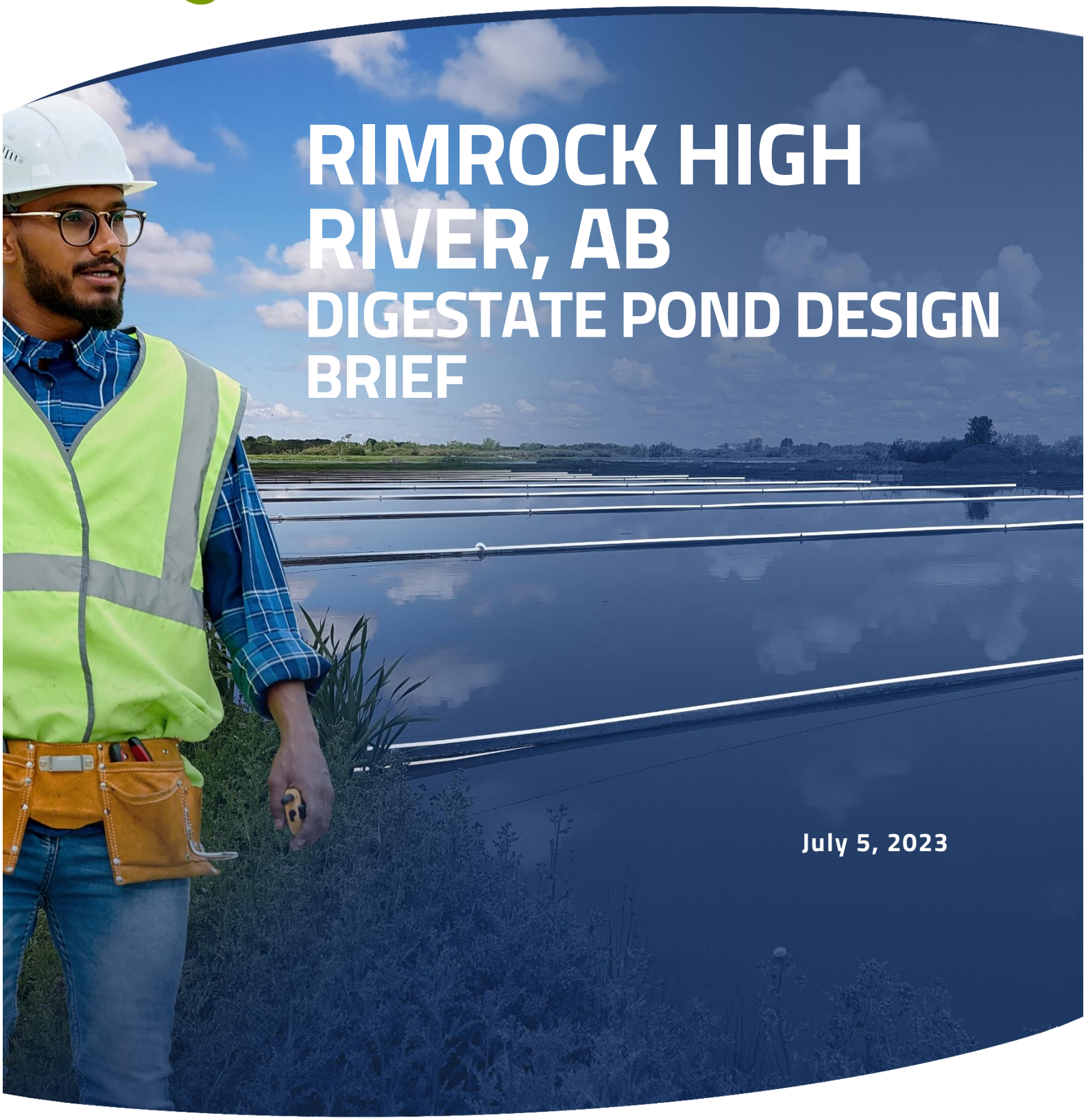
Attachment K – Nexom Design Brief

Nexom™



RIMROCK HIGH RIVER, AB
DIGESTATE POND DESIGN BRIEF

July 5, 2023

technologies for cleaner water

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Project Overview

An OPTAER™ lagoon aeration system is proposed for digestate storage ponds at Rimrock Biodigester Facility in High River, AB. The purpose of the aeration is to minimize emission of odours.

The main potential sources of odour generated by digestate are ammonia, sulfide and volatile organic compounds. All these compounds are either products or intermediates of the anaerobic digestion process. Odour control strategies can be categorized in to three groups:

1. Containment: which in this case would mean storage in enclosed tanks or covered lagoons with controlled head space. This is not practical due to the scale.
2. Mitigation: One of the main goals of the digestion facility is to generate the biogas for energy recovery. A well operated digester will have developed mature methanogenic biomass population which will convert most of the organic acids (volatile or not) into methane gas. Sulfides generated under anaerobic conditions in the digester are not only odorous but also harmful to the process and equipment. Thus, there are steps made within the digesters to minimize the production of sulfide, e.g. ferric chloride dosing. Ammonia production in the digester is a function of the feed stock characteristic and can't be controlled in any meaningful way but the ratio of free ammonia (NH3, fraction which has the potential to become volatile and cause odour) to ionized ammonia can be controlled by pH adjustment. Lowering the pH of the digestate keeps more ammonia in the ionized form and limits NH3 emissions.
3. Removal: Aeration of the digestate will stop anaerobic processes which generate H2S, VOCs and methane. Furthermore, odorous compounds already dissolved in the digestate will be oxidized to CO2, SO4 and H2O.

The proposed aerated digestate storage ponds directly address the removal strategy. A two-cell system with submerged aeration in the first smaller cell sized to satisfy demand from oxidation of any biodegradable organic material, and from oxidation of dissolved sulfides, ensures aerobic conditions and prevents further generation of VOCs and H2S. The second larger cell will be used only for storage. The material leaving the polishing cell will be fully stabilized, so no significant anaerobic activity is expected in the storage cell.

System Design Parameters

Influent flows and loads are presented in the following table:

		Digestate liquor
Flow	m^3/d	828
Total Solids	wt%	3.3
Total Solids	kg/d	27,300
Volatile Solids	kg/d	19,000
Total Sulfur	kg/d	480
H2S[1]	kg/d	343
Estimated Max VS Destruction[2]	%	0.3
Design Max VS Destruction[3]	%	1.0

Notes:

1. Total sulfur load was provided to Nexom, and was estimated from the total system mass balance. H2S fraction was estimated assuming that sulfur constitutes up to 1% of volatile solids by mass and subtracting this load from the total sulfur load. This is a conservative assumption as it does not account for any sulfates that will be also present in the digestate and which will not generate additional oxygen demand.
2. Maximum VS Destruction was back calculated from provided biogas yield potential. The biogas yield potential for the digestate was estimated as the difference between tested in the lab ultimate biogas yield and the biogas yield within the design digester retention time. In other words, it is the amount of organic solids which could be further digested if the anaerobic process was extended well beyond 30 days.
3. The VS destruction rate used for the design is increased to account for organic compounds that will be oxidized in the aerobic conditions but would not otherwise be digested in anaerobic digestion lab tests. Given that the storage ponds will be operated at temperatures below 20°C and the digestate originates from 30-day

mesophilic digester, further 1% of VS destruction in the storage ponds is a conservative estimate even for aerobic ponds.

4. The design used conservative assumptions relative to the actual estimated proforma rates, resulting in a conservative sizing.
5. The process anticipates over 95% reduction of H2S in the pond effluent through oxidation/stripping by the aeration system.

Aeration design parameters are presented in the following table:

	Cell 1[3] Polishing
Site elevation (m)	1,097
Max water depth (m)	4.0
Min water depth (m)[2]	0.3
Approximate water volume (m^3)	32,447
Max Diffuser Submergence, Df (m)	3.82
Required AOR (kg/d)[1]	738
# H3-4 diffusers (Fine Bubble)	60
SCFM per diffuser	15.0
Total SCFM	900

Notes:

1. The actual oxygen requirement was estimated assuming 1.4 kg O2/kg VS for full aerobic digestion of biodegradable solids and 1.5 kg O2/kg S for oxidation of sulfides to sulfates.
2. Polishing cell will be operated with variable water level to provide additional storage capacity. The minimum water level of 0.3 m is required to prevent damage of aeration system by extended exposure to direct sunlight.
3. The unaerated storage pond to be designed by the consulting engineer to satisfy the storage needs. Aeration is not required as the effluent form the polishing cell will be fully stabilized and not generating any more H2S or VOCs.

Blower design parameters are presented in the following table:

		Lagoons
Number of blowers total		2
Number of blowers on duty		2
Number of blowers on standby		0
Motor nameplate horsepower	hp	30
Design airflow per blower	SCFM	450

Process Control Strategy

The main objective for the operation of the polishing cell is to provide sufficient oxygen supply to meet the demand of biochemical and chemical processes of aerobic solids digestion and H2S oxidation. If the oxygen demand is not satisfied the pond will turn anaerobic. Thus, the main control parameter is the concentration of the dissolved oxygen (DO) in the pond.

The aeration system will be supplied with controls allowing activation/deactivation of both blowers and manual selection of the speed of the blowers. The system will be continuously aerated throughout the fill and draw periods. Operators will periodically measure the DO in the polishing pond. Our recommendation is to adjust the speed of the blowers manually on weekly basis based on the DO measurements. Minimum suggested DO is 0.5 mg/L with the objective of 2.0 mg/L.

Although an automated blower speed control solution is available and could be supplied here, our recommendation is to adjust the speed of the blowers manually. The characteristic of the feed stock to the polishing cell is not expected to vary significantly on daily or hourly basis so more frequent adjustments are not required. Our experience also indicates that automated systems heavily relying on sensors installed permanently in high solids liquids tend to encounter issues related to maintenance of the sensors. Handheld DO meters have much better chance to be regularly cleaned and calibrated.

In addition to the monitoring and controlling the DO in the pond, operators will monitor blower discharge pressures. Expected life of the diffuser membranes in this process is up to 5 years. As the membranes age they will start clogging and the head loss of the system will increase. Once prescribed max back pressure will be reached, membrane replacement will be scheduled.

Treatment Equipment

POSITIVE DISPLACEMENT BLOWERS

Positive displacement blowers are used to provide air supply for the treatment system. Blowers are designed to provide the required airflow at normal system operating pressure and have the capability of operating at the maximum required pressure intermittently for diffuser purging. The blowers are equipped with sound attenuating enclosures.

OPTAER® HEADER SYSTEM (AERATED CELL)

A metal manifold and discharge piping are used to dissipate the heat produced by the blowers. Shallow buried HDPE header piping connects to the galvanized steel manifold, and supplies air to the floating laterals. The header has flanged connections for each lateral as shown on the drawings. Each lateral is individually valved for ease of maintenance.

All header, lateral, and feeder piping is designed to accommodate increased airflow for high pressure and volume cleaning without increasing header friction losses by more than 1 psi. This allows for management of additional organic load, improved diffuser maintenance and additional odor control.

AIR DISTRIBUTION SYSTEM: SUBMERGED LATERALS

Diffusers are fed by a submerged flow distribution lateral. The 6” and 4” laterals are ballasted to rest on the bottom of the cell. 3/4” ballasted feeder lines from the lateral to each diffuser allow individual diffusers to be brought to the surface for repair or maintenance.

All maintenance can be performed from a boat with a 2-person crew. All header, lateral, and feeder piping is designed to accommodate increased airflow for high pressure and

volume cleaning without increasing header friction losses by more than 1 psi. This allows for management of additional organic load, improved diffuser maintenance and additional odor control.

H3-4 FINE BUBBLE MEMBRANE DIFFUSERS

H3-4 Fine bubble diffusers are used to provide oxygen to the wastewater. The diffusers consist of an air distribution body with individual tubular EPDM membranes extending outwards in a horizontal plane. This design prevents bubbles from coalescing, and results in an excellent oxygen transfer rate with minimal head loss.

The diffusers rest on the cell bottom and are equipped with individual feeder lines from the main submerged lateral to allow for maintenance and diffuser retrieval. Each diffuser is attached to a small concrete weight, encased in HDPE pipe. Diffuser assemblies may be retrieved from a boat but lowering the water level is recommended for maintenance.

For details of the equipment please see attached specifications and cut sheets for that major equipment.

Scope of Supply

Included in the wastewater treatment system capital cost are:

- Nexom System Process Design (Alberta P. Eng. Stamped)
- CAD Drawings and specifications (Alberta P. Eng. stamped)
- ***Equipment installation/start-up/commissioning/training***
- Operation and maintenance manuals
- Project Record Drawings

OPTAER® LAGOON AERATION SYSTEM:

- HDPE shallow buried main header piping
- Submerged Lateral Assemblies including:
    - Air supply lateral piping, fittings and lateral valves as required
    - Weighted feeder piping and feeder connections
    - H3-4 Diffuser assemblies complete with EPDM Membranes and pre-cast diffuser weights.
    - Saddlebag lateral ballasts

AIR SUPPLY

- Two (2) 30 hp positive displacement blowers with sound attenuating enclosures
- Blower control panel with VFDs (shared)
- Galvanized metal blower header and connection pipe (heat dissipation)

ITEMS SPECIFICALLY NOT INCLUDED:

- Material offloading and secure on-site storage.
- Civil works including lagoon cells design and construction, liner, transport piping, inter-cell piping, discharge piping, manholes, valves, access roads to site, site roads and landscaping, lagoon desludging etc. if required.
- Additional air header piping if the blower building is farther than 15m from the edge of the pond
- Standby blower, if required
- Building or upgrades to building, including concrete, electrical, and HVAC
- Electrical hookup or electrical work
- Site Preparation and Restoration

- Specialty labor wages if required by federal or state agencies (such as Davis-Bacon Act, Prevailing Wages, etc.)

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Attachment L – HDPE Liner Technical Specifications

LAYFIELD GEOSYNTHETICS

TECHNICAL SPECIFICATIONS

ENVIRO LINER® 6000 - GEOMEMBRANE

With its exceptional flexibility and endurance properties, Layfield's Enviro Liner® (EL) brand of geomembranes has been a trusted performer in our portfolio for many years. Available in four unique formulations, this series of geomembranes offers solutions for a wide range of containment applications.

The flagship Enviro Liner® 6000 incorporates the latest ultraviolet/anti-oxidant (UV/AO) stabilization technology, providing a new level of UV resistance and endurance properties. It is designed for long-term exposed applications and has excellent chemical resistance, making it one of the most durable geomembranes on the market.

April 2023		Enviro Liner® 6000				
Material Properties	Style	ASTM	**Enviro Liner® 6030**	**Enviro Liner® 6040**	**Enviro Liner® 6050**	**Enviro Liner® 6060**	**Enviro Liner® 6080**
	Thickness (min. Avg)	D5199	30 mil 0.75 mm	40 mil 1.0 mm	50 mil 1.25 mm	60 mil 1.5 mm	80 mil 2.0 mm
	Strength at Break (min. Avg)	D6693	141 ppi 25 N/mm	180 ppi 31 N/mm	220 ppi 38 N/mm	255 ppi 44 N/mm	304 ppi 53 N/mm
	Elongation at Break (min. Avg) Gauge Length- 2"(50 mm)	D6693	800%	800%	800%	800%	800%
	Trapezoidal Tear Resistance (typical)	D751	63 lbs 280 N	90 lbs 400 N	108 lbs 480 N	132 lbs 590 N	176 lbs 780 N
	Puncture Resistance (min. avg)	D4833	53 lbs 236 N	67 lbs 298 N	75 lbs 333 N	90 lbs 4000 N	112 lbs 500 N
	Critical Cone Height[1]	D5514	2" 50 mm	2" 50 mm	2" 50 mm	2" 50 mm	-
	Axi-Symmetric Break Strain[1]	D5617	50%	50%	80%	80%	50%
	High Pressure Oxidative Induction Time (HPOIT)	D5885	>2000 minutes				
	Oxidative Induction Time (OIT(	D3895	>200 minutes				
	UV Resistance[1] % HPOIT Retained after 1600 hrs	GRI GM13/17	>80%				
	UV Resistance, 40,000 hrs Strength Retained (Black) [1,2]	D4329	>90%				
	Brine Resistance[1] HPOIT after 1000 hrs at 90°C (194°F)	D1693 D5885	>90%				

Disclaimer: *Layfield disclaims any and all express, implied, or statutory standards, warranties or guarantees, including without limitation any implied warranty as to merchantability or fitness for a particular purpose or arising from a course of dealing or usage of trade as to any equipment, materials, or information furnished herewith. This document should not be construed as engineering advice.*

Oven Aging at 85°C[1] % OIT retained after 90 days % HPOIT retained after 90 days	D5271 D3895/ D5885	 >70% >90%
Water Vapor Transmission [1,2]	F1249	3x10 $^{-13}$ cm/sec
Solvent Vapor Permeability[1,3]	D814	Fuel C (Toluene/Octane) < 4 g/m ^{2} •hr Diesel Fuel < 0.4 g/m ^{2} •hr
Methane Permeability[1,4]	D1434	2.40 x 10 $^{-5}$ m ^{3} /m ^{2} •day. atm
Coefficient of Expansion, [1,3]	D696	1.4x10 $^{-4}$ m/m/deg C
Notes: [1]Performance Properties once per formulation (as tested values), [2]Tested on 30 mil, [3]Tested on 40 mil, [4]Tested on 60 mil		

April 2023

Enviro Liner® 6000 Minimum Shop Seam Strengths

Style	ASTM D6392	**Enviro Liner® 6030**	**Enviro Liner® 6040**	**Enviro Liner® 6050**	**Enviro Liner® 6060**	**Enviro Liner® 6080**
Heat Bonded Seam Strength	25.4 mm (1") Strip	45 ppi 7.8 N/mm	60 ppi 10.5 N/mm	75 ppi 13.1 N/mm	Not Shop Fabricated	Not Shop Fabricated
Peel Adhesion Strength (Wedge Welded	25.4 mm (1") Strip	38 ppi 6.7 N/mm	50 ppi 8.8 N/mm	63 ppi 11.0 N/mm	Not Shop Fabricated	Not Shop Fabricated

April 2023

Enviro Liner® 6000 Minimum Field Seam Strengths

Style	ASTM D6392	**Enviro Liner® 6030**	**Enviro Liner® 6040**	**Enviro Liner® 6050**	**Enviro Liner® 6060**	**Enviro Liner® 6080**
Heat Bonded Seam Strength *Test Temp 23°C, 73°F*	25.4 mm (1") Strip	45 ppi 7.8 N/mm	60 ppi 10.5 N/mm	75 ppi 13.1 N/mm	90 ppi 15.7 N/mm	120 ppi 21.0 N/mm
Peel Adhesion Strength (Wedge Welded	25.4 mm (1") Strip	34 ppi 6.0 N/mm	44 ppi 7.7 N/mm	57 ppi 10.0 N/mm	66 ppi 11.5 N/mm	88 ppi 15.4 N/mm

INSTALLATION

Layfield's Enviro Liner® 6000 geomembrane is supplied in prefabricated panels with a thickness of 50 mil (1.25 mm) or less. These fabricated panels are deployed on-site, often covering a small project in a single piece. Custom rectangular panels, round tank liners, and other prefabricated shapes are available. On larger projects or with the use of thicker materials, skilled Layfield welding technicians can provide full installation services. Enviro Liner® uses wedge and extrusion welding equipment to join panels in the field. On substantial projects, Enviro Liner® panels can be economically prefabricated up to 85 ft wide on our GeoFab5x welding unit. Installation guide specifications are available on our web site. After installation, if small welds or repairs are needed, there is a special Enviro Liner® welding gun available. This an inexpensive tool that can be used to make minor repairs until a crew is available.