# Application for Amendment to Land Use Bylaw

**Foothills County** www.foothillscountyab.ca
309 Macleod Trail, Box 5605, High River, AB T1V 1M7 • Tel: 403-652-2341 Fax: 403-652-7880
Email: planning@foothillscountyab.ca

Note: An Application Fee of $ 3100 shall accompany this application.

Date Received: ____________ Receipt No. ____________

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**THIS SECTION TO BE COMPLETED IN FULL BY THE APPLICANT**

I, Rick Sears
*Name of Registered Owner (please print)*

hereby certify that I am the registered owner of the land described above and authorize

Daniele of 2716438 Ltd. to act as agent in the matter.
*Name of Agent (please print)*

PLEASE ACCEPT THIS APPLICATION REGARDING LEGAL LAND DESCRIPTION

All/part of the SE 1/4 sec. 11 twp. 17 range 27 west of 4 meridian.

Being all parts of lot ______ block ______ Reg. Plan No. ______ C.O.T. No. ______

TO: (Choose One)

☐ Redesignate from ____________ to ____________

☒ Amend the Land use Bylaw by Permitting a Site-Specific Amendment for an Anaerobic Facility as a Permitted use further detailed in the attached memo.

Size of existing parcel(s) ____________ Size of proposed parcel(s) ____________

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The reasons for the (redesignation) (amendment) are as follows:

2716438 Ltd. is a Wholly-owned subsidiary of Taurus Canada Renewable Natural Gas Corp.

Please see the attached memo and application package for more details.

***I certify that the information given on this form and attachment hereto are full and complete and is to the best of my knowledge a true statement of the facts concerning this application and I am the registered owner and/or the duly authorized agent.***

Date July 16, 2025 Signed ____________

| **Landowner Information** | **Agent Information** |
|---|---|
| Phone No. [redacted] | Phone No. 778-231-2199 |
| Address [redacted] | Address: 21-1201 West Pender Street Vancouver |
| | Vancouver BC Canada V6E 2V2 |
| I consent to receive documents by email: X Yes ___ No | I consent to receive documents by email: x Yes ___ No |
| Email Address: [redacted] | Email Address: dchiodini@taurusrng.com |

Right of Entry

I, being the owner or person in possession of the above described land and any buildings thereon consent to an authorized person designated by Foothills County to enter upon the land for the purpose of inspection during the processing of this application.

July 16, 2025 [redacted]
Date Signa[redacted]

Is there an access or safety concern with respect to a site inspection: X Yes ___ No

If yes, please clarify:

The parcel is the feedlot operation of Chinook Feeders. Please contact Chinook Feeders if a site visit is conducted.

*****Important Note: Applications must be received with original signed signature. Photocopies, faxes and emails will not be accepted.***

On behalf of our wholly-owned subsidiary, 2716438 Alberta Ltd. (the Developer), we are submitting this application for a site-specific amendment of the Land Use Bylaw the parcel of land (the Site) located in the eastern portion of Foothills County, as identified more precisely in the attached project location site plan.

The site-specific amendments being sought in this application are:

1. The designation of the proposed anaerobic digestion facility as a site-specific permitted use to the current agricultural use of the site;
2. Allowance for the installation of anaerobic digesters up to a total installed height of 30m.
3. Allowance for the installation of accessory buildings (Biogas upgrading building) up to a total installed height of 16m.
4. Allowance for the installation of flare tower up to a total installed height of 16m.

The Site is the parcel of land in a legal address of SE 11-17-27-W4 and is currently zoned as Agricultural District (A). The proposed development is immediately adjacent to a cattle feedlot operated by Chinook Feeders Ltd. (Chinook) occupying approximately 16 ac. (6.4 ha.) show in the attached site plan.

The Developer, in partnership with Chinook, is proposing to develop, construct, own and operate a manure-only biodigester facility (the Facility) that will produce renewable natural gas (RNG) through the anaerobic digestion process (the Project). RNG produced at the Facility will be injected into the TransCanada pipeline. The Project will also convert cattle manure into four different products: two solid digestate products, liquid digestate and ammonium sulfate, a potent fertilizer.

The Developer will separately submit a development permit application to Foothills County in respect of the Facility.

The Facility will be primarily regulated under the *Environmental Protection and Enhancement Act*, as well as other under applicable Provincial location, and will undergo thorough regulatory review. In support of these reviews, the Developer will undertake various studies to inform engineering activities and provide the various regulators the required information.

The Developer has also undertaken initial public consultation efforts in connection with the Project. As of June 24th 2025, Chinook has contacted neighbours approximately between 5-8 km from the proposed site (6 neighbours) and received 4 responses. None of the respondents are opposed to the Project; we will continue to reach out to neighbours who were not available and follow up with the respondents who are interested in learning more about the Project with an in-person meeting scheduled for later in July.

Please find attached as part of the application requirements:

1. The Project Location plan "2501-RRX-Project-Location-plan"
2. The Project Site Plan "2501-EDC-Project-Site-Plan"
3. Land Title Certificate of the Proposed Parcel
4. AER abandoned wells search.
5. The Applicable Fees Authorization form
6. Letter of Authorization - Land Use Bylaw
7. Detailed Process Summary "2501-ERP-Detailed-Process-Summary"
8. Civil Drawing Package
9. Credit Card Authorization Form - Taurus

Regards,

Daniele Chiodini
Taurus Canada Renewable Natural Gas Corp.

# 2501

# RENEWABLE NATURAL GAS FACILITY

# PROJECT DESCRIPTION

# WO 2501

# July 16th 2025

TAURUS CANADA RENEWABLE NATURAL GAS CORP
210 - 1201 West Pender Street
Vancouver, BC, Canada V6E 2V2

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| | **Civil Package** |
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**In this report, the units of measurement will refer to the International System (SI) or metric system.**

# 1 INTRODUCTION

## 1.1 Overview

2716438 ALBERTA LTD. (the “Developer”) is proposing to develop a manure-only biodigester facility that will produce renewable natural gas (RNG) through an anaerobic digestion process (the ”Project”) where the resultant RNG will be injected into the TransCanada pipeline. The Project will also convert cattle manure into four different products: two solid digestate products, liquid digestate and ammonium sulfate, a potent fertilizer. The facility is intended to be a 2-phased approach where the initial capacity will accommodate 70% of the cattle at the feed yard with a plant capacity that allows it to process approximately 136,000 tonnes/year of manure producing 406,000 GJ/year of RNG. The second phase of the Project would increase capacity to meet 100% of the cattle on feed, processing 190,000 tonnes of manure per year generating 566,000 GJ/year of RNG. Moreover, the developer will assess the geology of the subsurface for the potential to store carbon. A by-product of the anaerobic digestion process is $CO_2$. If there is favourable geology, the developer may pursue a $CO_2$ sequestration well to further reduce greenhouse gasses (GHGs).

The Developer is a wholly owned subsidiary of Taurus Canada Renewable Natural Gas Corp. (“Taurus”), a Vancouver based company focused on the development, design, construction and operation of renewable natural gas facilities. The Project is being developed in collaboration with Chinook Feeders Ltd. (“Chinook”), a key stakeholder providing both the site and a consistent supply of manure feedstock from its cattle operations. Taurus is actively developing several manure-only RNG projects in the southern Alberta region, where the high concentration of large-scale cattle feedlots presents a significant opportunity to mitigate greenhouse gas emissions by capturing methane that would otherwise be released from unmanaged manure. The region’s existing natural gas infrastructure, including access to the TransCanada and other natural gas pipeline networks, enables efficient RNG injection and distribution to downstream users. Taurus’s projects in the area are strategically located to take advantage of locally sourced feedstock, strong agricultural partnerships, and established offtake pathways, forming a closed-loop solution that turns waste into energy while supporting local economic and environmental goals.

## 1.2 Project Description

The plant is designed to receive manure delivered to the plant and process the manure such that it is fed into the anaerobic digesters. Anaerobic digestion is a naturally occurring process that consumes organic material (carbon) to produce biogas, a methane and carbon dioxide mixture. The digesters are designed to maximize biogas extraction by optimizing the process conditions of the anaerobic bacteria such as pressure and temperature. The biogas will undergo an upgrading process that will produce a pure stream of biomethane, also known as RNG, that will be ultimately injected into an NGTL Pipeline.

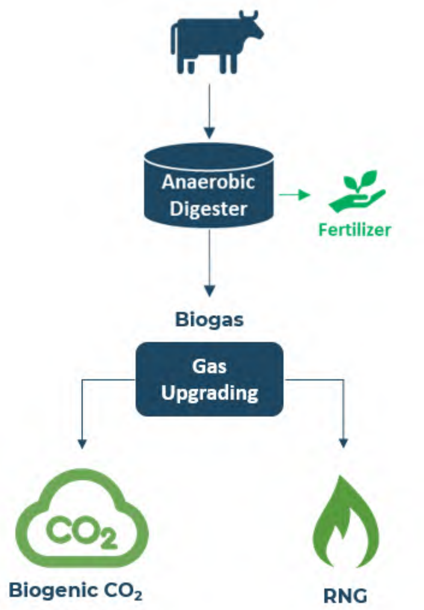


Figure 1: How RNG is created by anaerobic digestion

The removal of a substantial portion of the organic material stabilizes the manure, producing digestate as a byproduct. Digestate is a largely odourless compound that has a concentrated nutrient profile (nitrogen and phosphorous, N-P). The digestate will undergo various solid/liquid separation processes as well as an ammonia stripping process to produce solid digestate, liquid digestate and ammonium sulfate. Unlike raw manure, the concentrated nature of the solid digestate and ammonium sulfate makes long distance transport feasible, while the more difficult to transport liquid digestate will be applied to the surrounding region closer to the facility.

## 1.3 Project Location

The Project will be located on a parcel of land with a legal description of LSD 6 and 7 of 11-17-27W4 in the municipality of Foothills County, Alberta, Canada. The Project site is currently on an agricultural quarter, lying approximately 5 kilometers west of Provincial Highway 804, and 10 kilometers northeast of the Town of Nanton. The Developer will enter into a lease agreement with the landlord for the entirety of the Project's expected operational life of 25 years.

**Table 1-1: Project Location**

| | |
|---|---|
| County | Foothills |
| Province | *Alberta* |
| Address | *SE-11-17-27-W4M* |
| Latitude, Longitude | *50.414721°, -113.604379°* |
| General Map | *2501-RRX-Project-Location-00* |
| Site Plan | *2501-EDC-Project-Project-Site-Plan-00* |
| Site Layout | *2501-EDC-Site-Layout-Chinook_Feeders* |

# 2 PROJECT BACKGROUND

## 2.1 Project Rationale

Alberta contains 40% of Canada’s 11 million cattle herd, with over 2.3 million head in a pocket in southern Alberta. In addition to beef cattle, there are hogs, chickens and sheep that are grown to maturity and contributing to Canada’s food production system. Feedlot owners also manage large areas of crops. These large fields grow cereal, beans and oilseeds to either feed and provide bedding for their cattle or are sold to generate additional revenue streams. The number of farms is increasing by 2.1% per year[1]. Critical to understanding the systemic opportunity for Taurus is that the animal waste (manure) from the feedlots is typically currently reapplied to the land as a fertilizer on the farmers' fields.

In Alberta, background and finishing cattle are fed to 900 and 1500 lbs. respectively, from a starting weight of 500 lbs, with the latter delivered to food processors. Feedlot manure management has always been an issue for farmers, giving rise to such challenges as foot-rot disease, community odour complaints and GHG emissions from the unrealized energy from manure as well as nitrogen that volatizes to ammonia. Manure itself plays a vital role as a fertilizer, supplementing commercial fertilizers with the primary nutrients nitrogen, phosphorous, and potassium. Nutrient management can be challenging as volatilization and weather systems can upset the nutrient profile of the manure. Feedlot owners prefer to have a manure solution that advances their ability to manage the nutrient load onto their crop yielding land.

[1] https://www150.statcan.gc.ca/n1/pub/96-325-x/2021001/article/00009-eng.htm

**Anaerobic digesters can play a key role in facilitating Canada's commitment to low carbon, clean fuels, and soil health. There is a unique opportunity for the region to harness this otherwise wasted energy while retaining nutrients for land application, improving soil health and supporting the local economy.**

The anaerobic digestion process is an integrated waste management system that recovers both nutrients and energy from organic matter. Unlike exclusively aerobic processes (such as composting) which primarily produce $CO_2$ as a gaseous end-product dispersed into the atmosphere, anaerobic digestion transforms volatile organic substances into energy rich biogas while retaining the valuable soil nutrients in the organic byproduct, the digestate. To maximize nutrient flexibility for its feedlot partners, the Project will further separate the digestate into an ammonium sulfate fertilizer, an ammonia rich liquid, a balanced solid digestate, and a separate phosphorous-rich solid digestate. These four streams allow farmers more options for land application. For example, where soil conditions may be limited by phosphorous or where crops (such as canola) may have requirements for a specific element such as sulfur.

## 2.1 Benefits from the Project implementation

Anaerobic digestion is recognized[2] as a manure treatment system that helps livestock producers to reduce environmental risks and abate some of the social concerns that are associated with intensive cattle feeding operations. Some of the key benefits to be realized from the Project are:

**Benefits for feedlot operators:**

1. Economic opportunity to offset manure management costs.
2. Reduce manure inventories for improved animal health and streamlined operations.
3. Reduce the farming operation's overall carbon footprint / positive image for the industry.
4. Opportunity to reduce the use of chemical fertilizers.
5. Improved soil nutrient management opportunity by having different digestate fractions to apply as opposed to only manure that is currently being land applied.

**Benefits for the local community:**

[2] See, for example, Beneficial Management Practices – Environmental Manual for Feedlot Producers in Alberta developed by Alberta Agriculture, Food and Rural Development

1. Opportunity to play a significant role in the energy transition by becoming the largest renewable natural gas producing region in Canada.
2. Improvements in air quality arising out of the contained operations of a biodigester system.
3. Economic support deriving from the locally sourced construction and operational crews and vendors.
4. New commercial operations in the region.
5. Support for local farming operations by providing additional revenue for manure management.
6. Seamless integration with the gas pipeline, without requirements to build new infrastructure.

**Benefits for the Province:**

1. Ability to support and strengthen the cattle industry in Alberta economically and from an environmental footprint perspective.
2. Creation of a new industry that will play a major role in the energy transition.
3. Attract capital investments from around the world to build renewable energy infrastructure in Alberta
4. Ability to leverage existing network of natural gas pipelines to capture and deliver renewable energy throughout North America.

**Benefits for the Environment:**

1. Renewable natural gas has a negative carbon intensity score because it is derived from organic materials that would otherwise decompose and release greenhouse gases into the atmosphere. By processing these organics through anaerobic digestion, not only are these emissions avoided but the natural gas that is generated can be used to off-set the use of fossil-derived natural gas.
2. The anaerobic digestion process stabilizes the manure in the form of digestate which is odorless compared to raw manure. Because of a more frequent collection of the manure, nitrogen losses are much lower than traditional manure management practices, thus displacing more synthetic fertilizer during the farming season.
3. By improving manure management practices, anaerobic digestion provides better protection for groundwater.
4. This solution aligns with and exceeds the recommended practices for livestock manure management as described in the *Beneficial Management Practices* manual for livestock producers in Alberta.

## 2.2 Planning Framework

The cascading structure of the Alberta's Stewardship legislation provides regional guidance (South Saskatchewan Regional plan) and instructs municipal development plans such as the Foothills Municipal Development Plan 2010 (MDP2010) to provide vision, goals policies in how the land is developed for the community in the next 10-20 years. These policies help develop legislation in the form of land use bylaws and subdivision and development bylaws.

Foothills's MDP recognizes the importance of agriculture and livestock operations in the county. The Project benefits these operations by helping to close the loop for farmers and the cattle feeding industry. The Project will improve the land stewardship of the farmers through improved nutrient management and reducing truck traffic. The Project will align, and comply, with the regulatory requirements set by the various municipal and provincial regulators, such as the Foothills County Development Office and Alberta Environment and Protected Areas (AEP).

### 2.2.1 Municipal Application

The Developer is seeking a site-specific zoning amendment for the permitted use of a manure-only anaerobic digester as well as a development permit from the County of Foothills. The Developer will seek a building permit prior to construction following applicable standards such as CSA, and, at a minimum, those standards set forth in the National Building Code Alberta 2023.

### 2.2.2 Provincial legislation

At the provincial level, the Project will be regulated under the terms of Alberta's *Environment Protection and Enhancement Act* (EPEA) and its regulations, including the *Environmental Assessment (Mandatory and Exempted Activities) Regulation*. Per the terms of the latter regulation, the Project does not fall within the definition of a mandatory project and the Developer will accordingly seek an exemption from a requirement to perform an additional Environmental Impact Assessment (EIA) and will seek an Industrial Approval per the EPEA's *Activities Designation Regulation*. This approval is expected to establish requirements for the protection of air, water, land and biodiversity management. The Project will provide the following studies to EPEA for its review:

- an air quality study to demonstrate the Project's ability to meet *Alberta Ambient Air Quality Objectives* (AAAQOs)
- wildlife and vegetation surveys to identify any potential Species at Risk (SAR).

- geotechnical surveys to meet all groundwater and stormwater requirements
- groundwater and soil assessments to establish baseline conditions

The Developer understands that Alberta Environment and Protected Areas (EPA) previously entered into a memorandum of understanding with the Natural Resources Conservation Board (NRCB), wherein it was agreed that, in certain circumstances, the management of manure and digestate will fall under the jurisdiction of the NRCB. This understanding has since been codified pursuant to Bill 44 *Agricultural Operation Practices Amendment Act*, 2025, regulatory amendments under AOPA and EPEA, and the updated On-Farm Storage and Land Application Code. Accordingly, for the purposes of this Project, it is understood that EPA will regulate manure and digestate within the bounds of the facility, while the NRCB will regulate the application of digestate outside the facility boundaries.

The Project will meet the requirements of Alberta Energy Regulator (AER) Directives 006, 056, and 077 for the construction of any pipeline and the injection of RNG into the TransCanada system.

The Project will meet the requirements of the Alberta Utilities Commission (AUC) of the Project related to on-site cogeneration under its guideline such as Rule 007 *Applications for Power Plants, Substations, Transmission Lines, and Industrial System Designations*

Alberta has a duty to consult with first nations of which the Aboriginal Consultation Office (ACO) oversees the consultation process. Moreover, a *Historical Resources Act* (HRA) approval is required to evaluate the risk of encountering historical artifacts prior to any construction of the site. The Ministry of Arts, Culture and Status of Women oversees the HRA approval. The Project will meet its obligations and seek to receive approvals as part of the development process.

Carbon capture and sequestration may be possible for the Project given favourable geological conditions and a regulatory regime in Alberta which enables small scale sequestration projects. Carbon capture is regulated by both Alberta Energy and Minerals (MEM), who grant the Carbon Sequestration Tenure and Pore Space Unit Agreement, and the AER who regulate the wellbore, injection scheme, and reporting requirements under directive 056 and 065.

The following table summarizes the permits that the Project will be applying for before construction of the RNG facility.

| Governing Body | Authorization |
| --- | --- |
| EPA (Environment and Protected Areas) | EPEA Approval (environment) |
| EPA | EIA exemption |
| AER (Alberta Energy Regulator) | Directives 006,077,056 (pipeline) |
| AUC (Alberta Utilities Commission) | Rule 007 (Cogeneration) |
| Aboriginal Consultation office (ACO) | Pre-consultation assessment |
| Arts Culture and Status of Women | Historical Resources Act (HRA) |
| Foothills County | Site Specific Amendment |
| Foothills County | Development permit |
| Foothills County | Building Permit |

The Following table summarizes the permits that the CCS scheme requires before the injection of $CO_2$ is permitted.

| Governing Body | Authorization |
| --- | --- |
| EPA (Environment and Protected Areas) | EPEA Approval/Notification |
| MEM (Ministry of Energy and Minerals) | Carbon Sequestration Tenure |
| MEM | Pore Space Unit Agreement |
| AER (Alberta Energy Regulator) | Directives 056,065 |

# 3 PROJECT CHARACTERISTICS

## 3.1 Accepted materials

### 3.1.1 Livestock manure

Feedstock for the anerobic digestion process consists of livestock manure delivered by truck from Chinook. The total amount of manure delivered in one year at full, phase 2 capacity is expected to be 190,000 tonnes per year on a wet basis, subject to seasonal variability based on climate conditions. While the vast majority of the feedstock is expected to come from Chinook, the facility is open to receive livestock manure from other farms in the vicinity of the facility.

The only livestock manure to be accepted by the Project will be as described in section 1(c.2) of the Alberta *Agricultural Operation Practices Act*, namely " livestock excreta, associated feed losses, bedding, litter, soil and wash water, but does not include manure to which the *Fertilizers Act* applies”.

### 3.1.2 Emergency Feedstock

There may be some emergency periods during the operation of the Project where manure cannot be delivered for an extended duration (such as, for example, if there are outbreaks of cattle disease, or natural events affecting crop quality). For certainty, such emergency periods would not include normal winter conditions. In these emergency cases, the Project will be designed to be capable of receiving non-manure material to ensure continuity in the digester, protect beneficial bacteria and preserve the production of RNG. Acceptable materials during these emergency periods will be limited to energy crops, damaged or rejected crops, crop residues and glycerol.

### 3.1.3 Unaccepted material

Except as described above in this section 3.1, no other materials will be accepted by the Project.

## 3.2 Water

Water requirements for Project at commissioning are anticipated to be approximately 60,000 m$^3$, primarily for conducting tank leak testing and commencement of operations. Subsequently, up to 120,000 m$^3$ of water per year will be required for the Project's ongoing operations. Water consumption will be dependent on the annual rainfall affecting the moisture content of the feedstock. The Project will source all of its water requirements from Chinook’s effluent pond, which collects runoff from the Chinook feedlot. In doing so, the Project avoids the use of fresh water and alleviates stormwater management from the feedlot. Ultimately, this returns water through the application of liquid digestate (described in Section 5.4.2) ensuring that no surface water leaves the terrestrial water cycle.

## 3.3 Natural Gas Injection

The Project is evaluating two options for natural gas injection into the NGTL system. The first option is to work with TC/ATCO and construct a pipeline and a metering station at the site for the receipt of RNG. Alternatively, to avoid building a new metering station, the Project is also evaluating the potential to tie into the existing collection system of a nearby oil and gas operator of natural gas wells.

### 3.4 Process Flow Diagram

Figure 2 shows the detailed process flow diagram of plant operations:

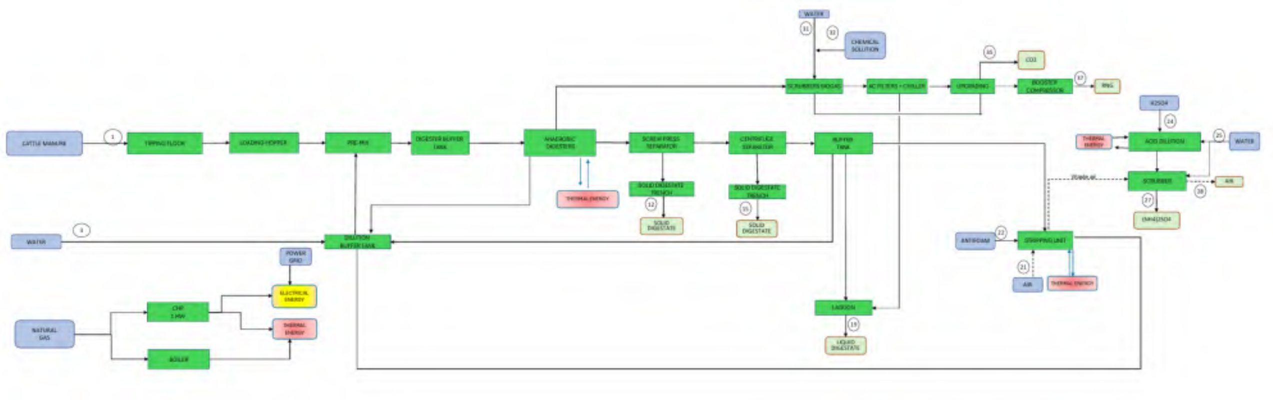


Figure 2: Process flow diagram

### 3.5 Mass Balance

Table 2 shows the detailed mass balance of the facility on an annual basis:

Table 2: Annual mass balance

| MASS BALANCE 7d/w; 24h/d | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | UM | 1 | 3 | 12 | 15 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 31 | 32 | 35 | 37 |
| Flow | tonnes/d | 521.6 | 246.6 | 96.4 | 110.8 | 157.6 | 58.6 | 0.06 | 1.08 | 2.46 | 3.83 | 69.8 | 1.2 | 0.09 | 60.2 | 30.31 |
| Flow | tonnes/h | 21.7 | 10.3 | 4.0 | 4.6 | 6.6 | 2.4 | 0.0 | 0.0 | 0.1 | 0.2 | 2.9 | 0.0 | 0.0 | 2.5 | 1.3 |
| Temperature (T) | | 5 | 5 | - | - | - | 15 | 15 | 15 | 10 | 65 | 65 | 10 | 15 | 20 | 49 |
| | | | | | | | | | | | | | | | | |
| Parameter | UM | 1 | 3 | 12 | 15 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 31 | 32 | 35 | 37 |
| Energy | GJ/h | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.3 | 64.7 |
| Gas Flow (Normal:0C-1atm) | Nm3/h | - | - | - | - | - | - | - | - | - | - | - | - | - | 1285 | 1691 |
| Gas Flow (T adjusted) | m3/h | - | - | - | - | - | - | - | - | - | - | - | - | - | 1380 | 1994 |

# 4 THE ANAEROBIC DIGESTION PROCESS

Anaerobic digestion is a natural process that occurs in nature to stabilise organic material. The volatile solid component of the feedstock is degraded by anaerobic microorganisms to produce biogas, a mixture comprising mainly of carbon dioxide ($CO_2$) and methane ($CH_4$). The methane is then purified and upgraded to RNG. This process captures the methane that would otherwise be released to the atmosphere as a greenhouse gas.

The anaerobic digester process is contained in closed vessels. Its design uses technology, equipment, and operating systems that promote the growth of specialized anaerobic bacteria and optimize natural biological processes. The design will also maximize energy recovery and stabilize the effluent streams so that the primary nutrients – nitrogen and phosphorous – are recovered for agricultural use.

The anaerobic digester is sized to guarantee a minimum residence time of the feedstock to ensure adequate removal of the volatile organics and its corresponding chemical oxygen demand, and ultimately to produce biogas.

The process of transforming complex organic material into methane takes place in four different phases (Figure 3.). Each phase is governed by a distinct metabolic group of microorganisms that differ in both the substrates they consume and the metabolic products they produce.

- 1$^{st}$ phase: Hydrolysis
  Hydrolysis breaks down and transforms complex organic substrates (i.e. sugars, fats, proteins) into simple compounds such as monosaccharides, fatty acids, and amino acids.
- 2$^{nd}$ phase: Acidogenesis
  In this stage, certain bacteria called acidogenic bacteria convert the simple sugars and amino acids into carbon dioxide, hydrogen, ammonia, and organic acids.
- 3$^{rd}$ phase: Acetogenesis
  The products of acidogenesis are then reduced to their base compounds, acetic acid, formic acid, carbon dioxide, and molecular hydrogen.
- 4$^{th}$ phase: Methanogenesis
  Methane is produced via two pathways: the catabolism of acetic acid and the reduction of carbon dioxide using hydrogen as an electron source.

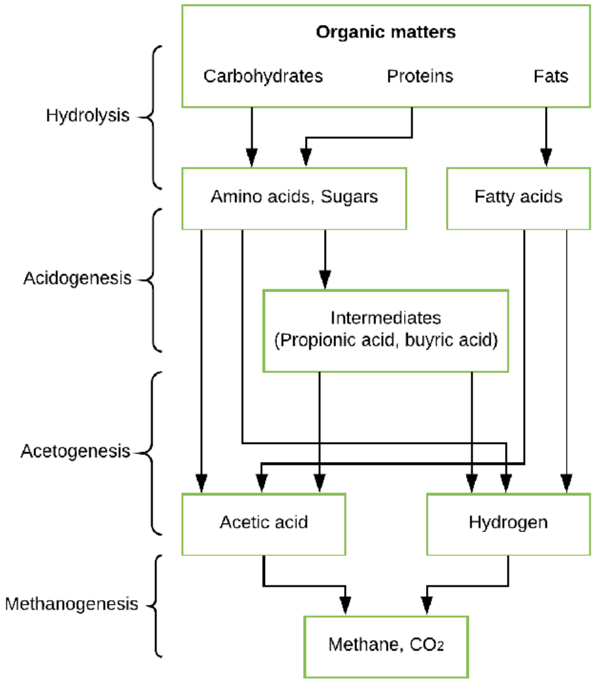



Figure 3: The Chemical Processes involved in Anaerobic digestion process

# 5 PROJECT TECHNICAL DESCRIPTION

The plant will be composed of the following sections:

1. Feedstock Receiving and pretreatment
   - Traffic, feedstock receiving and storage
   - Dilution and pre-processing
   - Digester buffer tank
2. Anaerobic Digestion
   - Anaerobic digestion tanks
3. Nutrient recovery system
   - Digestate dewatering
   - Ammonia stripping
4. Digestate Management
   - Solid Digestate
   - Liquid Digestate
5. Biogas line
   - Biogas storage

- Biogas cleanup
- Upgrading to RNG
- Safety flare

6. Utilities production
    - Electric and thermal energy
    - Water
    - Compressed air
7. Auxiliary Facility systems
    - Stormwater Management
    - Grading and Excavation
    - Leachate collection
    - Septic

Civil drawings indicating the building profiles are attached in the *ProjectCivilDrawings* folder.

Here follows a detailed description of the processing areas:

## 5.1 Feedstock receiving and pretreatment

### 5.1.1 Traffic, feedstock receiving and storage

The facility operations are designed to be operated according to the following schedules:

- Operating days with crews on site and/or deliveries: Monday to Saturday, 7.00 am to 7.00 pm
- Operating days of the biodigester: 7/24, 365 days per year

Manure is delivered by trucks to the facility's reception with different type of trucks, depending on the hauling company that delivers the feedstock: Tractor with semi-trailer, A-Train, B-Train configurations are anticipated. Trucks may vary in size and capacity, typically ranging from 24 to 30 tonne trucks.


Figure 4: Different kinds of manure hauling trucks; some have manure spreaders attached at the rear

No additional road traffic is expected to result from fresh manure deliveries to the facility, as the biodigester is directly connected to the feedyard, keeping all manure transport off public roads.

Digestate removal will utilize existing road infrastructure. In traditional manure management without a biodigester, manure is removed from the pens three to four times per year, causing peak traffic, intersection congestion, and added strain on roads. Because of the efficient conversion of carbon into renewable natural gas by the anaerobic bacteria, the average manure tonnage of 190,000 per year, will be reduced to only 97,440 tonnes per year of solid digestate, representing approximately a 50% weight reduction. Additionally, the biodigester’s continuous operation (together with the ability to stockpile digestate when not required on fields) is expected to significantly reduce peak traffic by spreading the transportation of the digestate to farm fields over several months.

An average of 20-25 trucks per day (on a 5 day a week basis) will remove solid digestate from the facility over an eight-month window to avoid transportation during spring when roads are more exposed to damage by heavy vehicles. This approach is expected to drastically reduce road maintenance costs incurred by the County, both because of total tonnage reduction as well as avoiding spring time when conditions for transportation are more restrictive. Traffic outside the facility will follow similar haul routes as the current practices and based on nutrient management plans for the land application of nutrients.

Seasonal factors like precipitation and climate may affect manure and digestate volumes. Truck numbers may also vary depending on manure quantity and differences in truck models and sizes.

On arrival, deliveries are weighed and sampled to determine energy content. Following the initial registration procedures, the trucks drive up to the maneuvering area in front of the receiving building.

Figure 5: Left to right; an example of a weigh station and reception building

The reception building is equipped with two roll-up doors and the vehicles will reverse into one of the available receiving bays. The door will be opened, and the truck will be maneuvered to discharge the manure onto the tipping floor. The tipping floor has a storage capacity of approximately 2 days. In order to reduce odour emissions, the roll-up door will immediately be closed once the feedstock off-load is completed.

Figure 6: An example of a reception building with four roll-up doors

The Project will also contain an outdoor manure overflow storage area to provide operational flexibility. It is anticipated that this outdoor storage will be used to stockpile inventory in the following situations:

- in anticipation of freezing conditions where truck traffic might be restricted;
- in anticipation of holidays or festivities;
- to accommodate pen cleaning operations at the feedyard during herd replacement or extreme weather conditions;

The inventory stockpiled in the overflow storage area will be delivered inside the reception building by means of a wheel loader dedicated to the operation.

### 5.1.2 Dilution and pre-processing

The reception building is equipped with an overhead bridge crane for automatic pick-up and feeding into the pre-processing system.

The feedstock preparation system is composed of a set of loading hoppers that deliver the feedstock into the dilution and grinding equipment, which are designed to prepare a homogeneous slurry for processing in the anaerobic digestion tanks. The feedstock preparation system is fed with liquid digestate recycled from the end of the process as well as fresh water added according to process needs. All the liquids are blended into the dilution buffer tank and pumped to the pre-processing system to dilute the incoming materials.

To ensure proper handling and control over the mixture composition, a metering or feeding mechanism is employed to accurately measure and feed the desired quantity of manure into the mixing process.

### 5.1.3 Digester buffer tank

The discharge of the feedstock preparation system is sent to the digester buffer tank. The buffer tank further homogenizes the feedstock and feeds the resultant diluted mix to the digesters. This tank allows for equalization between the different digesters' feeding cycles and the operation of the pretreatment system.

## 5.2 Anaerobic digestion section

Anaerobic digestion is performed inside of enclosed tanks (anaerobic digesters) where biogas is produced from the bacterial decomposition of organic matter. To maintain a stable equilibrium and a reliable process that maximises the gas production, a heating and mixing system are installed.

### 5.2.1 Anaerobic digestion tanks

The facility comprises multiple digester tanks where the bulk of the biogas production takes place. The digesters are operated with carefully controlled parameters to maximize the degradation of the organic materials and subsequent production of biogas. The primary digesters will operate under mesophilic conditions at 40°C, the optimal temperature for the anaerobic bacteria to grow.

Figure 7: Example of anaerobic digesters and associated heat exchangers

The digesters are sized on the basis of a retention time of more than 30 days and they are constructed with bolted steel panels, with a concrete bottom, and insulated cladding to reduce heat loss. The primary digester will be equipped with an external heating system to maintain the process temperature at optimal levels.

### 5.2.2 Heating System

The heating system for the Project is designed to operate efficiently and reliably. Equipment redundancies and a modular design allow for easy maintenance in the event of failures or malfunctions in the system. Servicing can be carried out by isolating the heat exchanger from the process, without the need for shutting down and emptying the digester, a problem common to traditional internal heating systems. A tube-in-tube heat exchanger is used for the digester to obtain efficient heat transfer while minimizing construction and clogging in the system. Figure 8. shows a typical example of a tube-in-tube heat exchanger installed in a biogas plant.

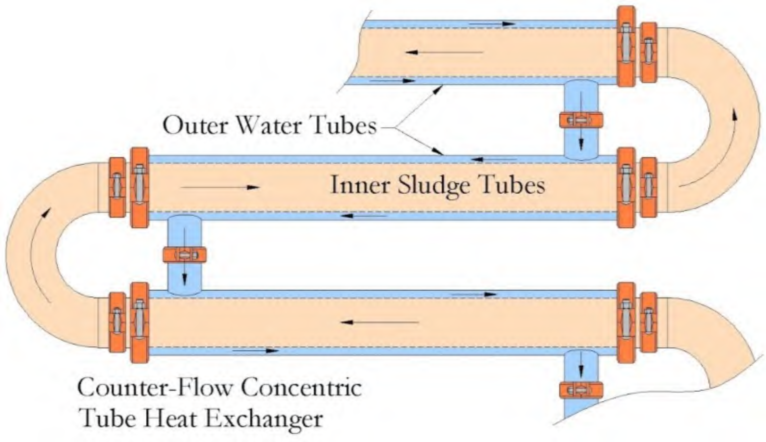



Figure 8: “Tube in tube” heat exchanger

This type of heat exchanger is composed of two concentric tubes, in a counterflow arrangement in which the two fluids flow in opposite directions at different temperatures. Hot water from the boiler unit and CHP exhaust is used as the service fluid and will flow through the outer pipe, transferring heat to the inner pipe. The incoming water temperature will be between 70°C and 90°C. To minimize heat losses, the pipes will be insulated.

The inner pipe is fed with feedstock material combined with recirculated contents from the digester (digestate, or organic matter in the process of degradation). The recirculated digestate is pumped through the heat exchangers with lobe pumps before being returned to the digesters.

PLC and SCADA systems will be used to monitor and manage optimal temperatures for the anaerobic organisms.

### 5.2.3 Digester Mixing System

Mixing in the digesters will be carried out by one vertical mixer per digester, which ensures complete and even mixing of the organic material. The vertical mixers, placed on the roof of the tank, are composed of a vertical shaft equipped with an engine and driving geared motor. In addition to mixing, they will also break up any foaming on the surface. This will ensure optimal mixing of the digester content, optimal biogas yields, and prevention of overflow from foaming.

By minimizing dead zones, the mixing system will maximize digester retention time and allow for a high degree of efficiency in the anaerobic digestion process. Furthermore, it will minimize sediment build-up in the tank by keeping fine material suspended.

The digestate portion will be discharged from digesters to the dewatering system using lobe pumps. The intake pipes are located nearby the bottom of the tank to allow for the continuous removal of coarse and/or inert material that may have settled inside the tank.

## 5.3 Nutrient Recovery System

After anaerobic digestion, the digestate portion is further processed into solid and liquid fractions with various process units to manage the nitrogen and phosphorous loads. Managing these nutrients is crucial for the use of digestate as land application. Some of the liquid fraction is also used to recycle water in the process, thereby lowering water demand. Digestate is managed through the following processes:

- Primary Solid/Liquid Separation system with screw presses
- Secondary Solid/Liquid Separation with centrifuge
- Ammonia Stripping ($NH_{FREE}$ System)

### 5.3.1 Primary Solid/Liquid Separation with screw presses

Digestate exiting the reactor is processed by an array of screw presses which are located inside of a mechanical room, protected from the elements to extend the lifetime of the equipment and protect them from the harsh winter conditions. The screw press is a physical separation system with the following operating principle:

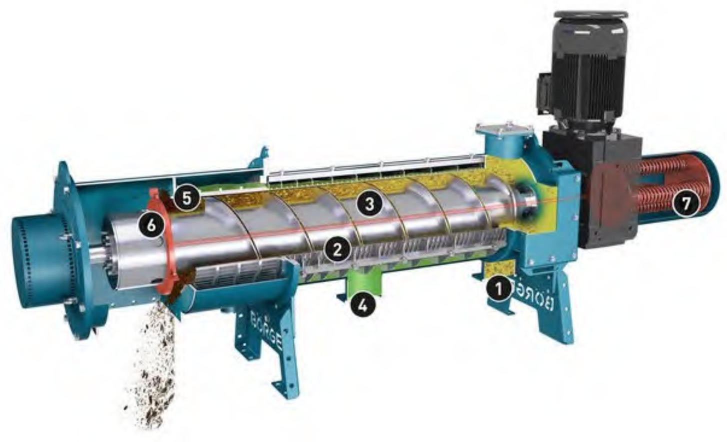



Figure 9: A screw press separates the bulk solids from the liquid phase

The digestate to be separated find their way through the inlet opening (1) into the dewatering vessel. The outer cylinder is separated from the auger (3) by a mesh wire screen (2). The auger has a connection to the drive. The digestate flows into the screen area next to the drive. The liquid flows through the mesh wire screen (2) into the outer vessel area. The liquid drains through the liquid outlet (4) and it is sent to the secondary dewatering phase.

The solid contents remain on the screen surface. Solids are conveyed into the press channel (5) by the rotating auger (3). Powerful subsequent dewatering takes place in the press channel (5). The rotating auger has a multi disc (6) (sealing disk), which can be shifted in axial direction, at the non-drive end. The adjusting unit (7) presses the multi disc against the auger and the compressed thick matter plug. The solid phase drops onto the digestate storage pad where it is stored until the farming season allows for land application.

### 5.3.2 Secondary Solid/Liquid Separation with centrifuge

Centrifuges, unlike screw presses, create centrifugal force to separate solids and liquids. Typically consisting of a horizontal bowl which continuously turns at a high velocity, centrifuges have a conveyor which rotates at a slightly different speed than the bowl; conveying cake to one end of the centrifuge for discharge, and centrate on the other end.

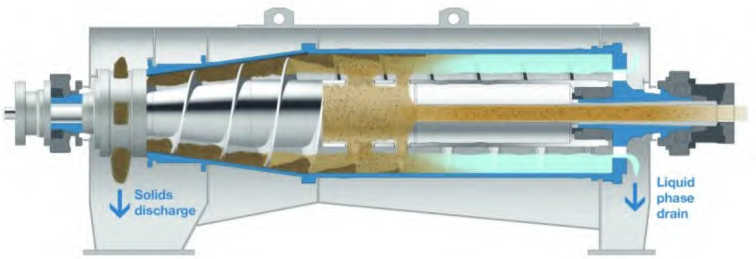



Figure 10: A centrifuge further separates finer solids from the liquid phase

The centrifuge is located in the same mechanical room with the screw presses. The digestate is pumped to the centrifuge by a lobe pump. Once separated, the cake is gravity fed onto the digestate storage area, whereas the liquid effluent called centrate is pumped to the buffer tank for distribution into the downstream processes. From the buffer tank, the liquid is directed to the following sections:

- Dilution buffer tank
- Ammonia stripping process
- Liquid digestate storage lagoon

### 5.3.3 Ammonia stripping system

The ammonia stripping process involves the removal of ammonia ($NH_3$) from the liquid fraction of the liquid digestate which is pumped from the buffer tank into this section of the Project. The process typically involves the following steps:

- Digestate heating: the temperature of the liquid digestate is increased up to 60-70 C to improve process efficiency
- Ammonia Stripping: ambient air is introduced into the ammonia stripping tank by a blower. The air captures the free ammonia in the liquid digestate, which leaves the tank from the top.
- Ammonia scrubbing: the air, rich in ammonia, is processed into a wet scrubber where the ammonia reacts with sulfuric acid to generate ammonium sulfate, a highly valuable liquid fertilizer. The resulting air, free of ammonia, is then vented from the stack of the wet scrubber
- Ammonium sulfate storage: a dedicated storage tank is provided to store the ammonium sulfate to accommodate the deliveries of the product to the farmers.

Figure 11: An Ammonia stripping system to pull out excess nitrate

## 5.4 Digestate management

Liquid and solid digestate is nutrient rich and will be used as fertilizers by farmers for land application purposes. Solid digestate may be transported farther due to its nutrient density while the liquid digestate must be applied closer to the Project site.

### 5.4.1 Solid digestate

Solid digestate will be stored on a digestate storage pad. The storage pad is designed to hold up to 5 months' worth of solid digestate as the farmers are expected to backhaul digestate to their fields to save on transportation costs. Land application of solid digestate can be performed using the same equipment as currently in use. The nutrient composition and the density of the digestate is within the limits of existing equipment to land apply using vertical beaters.

### 5.4.2 Liquid digestate

Liquid digestate will be stored in a liquid digestate lagoon. The lagoon will have a storage capacity sufficient to hold the sum of

- 9 months' worth of liquid digestate;
- the annual rainfall onto the facility footprint (inclusive of a 1:100 year rainfall event) as stormwater management;
- the secondary confinement for the Project;

The digestate pond is lined with an HDPE plastic bottom liner as well as LDPE top cover to prevent ammonia losses and odours. Liquid digestate will be applied by irrigation line or drag hose system to the surrounding farmlands.

Figure 12: Empty Lagoon with liner

## 5.5 Biogas Line

The biogas produced in the anaerobic digesters will be conveyed by pipe to the biogas pre-treatment (i.e. desulfurization and condensate removal) and upgrading processes. In case of shutdowns or excess biogas production, an emergency safety flare is installed to ensure that no gas is vented into the atmosphere.

### 5.5.1 Biogas Collection system

The biogas produced in the anaerobic digesters is collected from the headspace of the tanks and piped towards the biogas treatment system. The collection system operates at low pressure (10-25 mbar) and a ground-mounted gasholder provides operating flexibility to the gas treatment system.

The gasholder is designed to regulate pressure in the biogas line ensuring consistent flow of gas is maintained in the process. A double-membraned system is used for better process control and for reduction of biogas losses compared to a single membrane system.

Figure 13: biogas gasholder with 2-layered membrane

The biogas produced by the anaerobic process is a mixture of approximately 55% CH4, 45% CO2 with minor trace components such as N2, O2, H2S and VOC which will be removed by the pretreatment system before being processed by the upgrading unit.

### 5.5.2 Biogas Cleaning

Biogas contains hydrogen sulfide ($H_2S$) which is removed prior to the gas upgrading equipment to avoid damage to the mechanical components. To remove $H_2S$, the biogas passes through two 2-stage scrubbing columns. The scrubbing solution is sodium hydroxide and an additive based on iron salts which flows counter to the biogas. Biogas will move upwards in the column and sodium hydroxide will be sprayed downwards.

The columns are usually filled with plastic media that have a high specific surface area. This allows for a very high contact surface between the biogas and countercurrent flow of sodium hydroxide solution.

The washing solution is then sent to an adjacent tank for regeneration, to lower the chemical consumption for the gas cleanup. The regeneration occurs by bubbling air into a rectangular tank to oxidise the sulfur which is then removed by gravity separation into a traditional clarifier. The elemental sulfur is then sent to the digestate storage lagoon to increase the fertiliser value of the liquid whereas the biogas, clean from H2S, is sent to the gas upgrading system.

Figure 14: A two-stage H2S scrubbing system

### 5.5.3 Biogas Upgrading

The process gas is compressed and treated in the following sequence:

**H2S and VOC polishing**

The raw biogas first passes through a blower where the gas is compressed at 100 mbar, providing a positive pressure and conveying the gas into the H2S and VOC polishing unit. This system is composed of two vessels containing a granular media where H2S and VOC are captured and converted into a non-hazardous compound which is disposed of via third party service once the vessels are fully saturated.

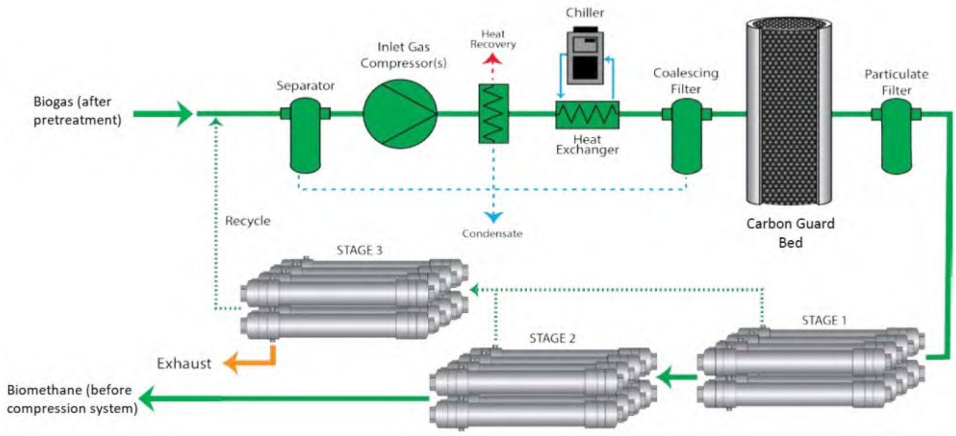



Figure 15: Multistage polishing ensures that biogas meets standards for injection

## Compression and dehydration

Here the gas is compressed to the optimum process pressure and dehydrated to the optimum temperature and humidity level to maximize efficiency and performance of the membrane upgrading process.

## Membrane Upgrading

The membrane biogas upgrading system includes three stages of permeable membrane filters installed in a container with all associated interconnecting stainless-steel piping, VFD driven exhaust gas vacuum blowers and PLC controls. The membrane filters use the principle of selective permeation. Smaller molecule gases such as carbon dioxide ($CO_2$), oxygen ($O_2$) and water ($H_2O$) selectively permeate (pass through) the membrane while larger methane ($CH_4$) and nitrogen ($N_2$) molecules do not.

The result is a separation of $CO_2$, $O_2$ and $H_2O$ from the $CH_4$ and $N_2$. The gas first passes through the Stage 1 membrane where the bulk of the $CO_2$ is separated. The gas then passes through the Stage 2 membrane, where the remainder of the $CO_2$ is separated, resulting in high purity RNG at the outlet. To maximize methane recovery, the rejected gases from Stages 1 and 2 pass through a third stage of membranes to recover any methane. The methane at the outlet of the Stage 3 membranes is reinjected upstream of the raw gas compressor, and the exhaust is released to atmosphere.

Figure 16: Membrane system

**Booster Compressor**

Finally, the clean and dry gas passes through the reciprocating booster compressor where it is compressed to the required pipeline injection pressure and then cooled using an ambient air aftercooler.

**Metering station**

Before being injected into the gas pipeline, the RNG is metered, and the quality is checked by the pipeline operator to ensure compliance with quality specifications. In case of noncompliance, the gas is returned to the gas upgrading system for further polishing; otherwise, it is injected into the pipeline.

### 5.5.4 Emergency Flare

During maintenance activities of the gas upgrading unit, in case of shut downs or power outages, plant start-up and unforeseen events, the biogas is flared with an emergency safety flare. The system is linked to the biogas line pressure through the system programmable logic controller (PLC).

When the flare is in operation, the temperature and the flow rate of biogas is monitored continuously, and the combustion air flow rate is automatically adjusted for these conditions. The safety flare will be able to dispose of the entire biogas flow if needed.

Figure 17: Example of a safety flare

The burner will be a natural draft burner and will consist of:

- Pilot light with thermocouple, powered with natural gas
- Manual shut-off valve
- On-off valve controlled by the operation logics of the system
- Flame arrester
- Supply pilot line complete with on-off block valve
- Sample intake
- Pressure indicator

## 5.6 Utilities and chemicals

The Project has been carefully designed to minimize the consumption of external resources through the adoption of the following technologies:

### 5.6.1 Electrical and thermal energy

The Project includes a cogeneration unit (CHP) for the combined production of electrical energy and thermal energy which will be both used in the anaerobic digestion process. The CHP has a nameplate capacity of 1.56 MW and it is maximising the waste heat recovery from the oil jacket as well as the exhausts.

Figure 18: Cogeneration System supplies both thermal and electrical energy

To fulfill peak demand from the equipment, a dedicated power line connection is available from Fortis Alberta. Also, in case of downtime of the CHP and to ensure maximum reliability of the system during cold winters, a back up boiler powered with natural gas is available in stand-by.

Both the grid connection and the boiler are sized to maintain production when the CHP is out of service.

### 5.6.2 Water

Water for the Project is broken down into 3 categories:

- Dilution water: this water is used for feedstock dilution, and it requires a screen filtration before being used by the system. This water will be sourced as described in section 3.2.
- Industrial water: after the filtering system, this water is further processed with a water softener to comply with the equipment quality requirements. This water will be sourced as described in section 3.2.
- Sanitary water and potable water: Water is purified on site with a prepackaged system for office use that will be installed inside the office to provide water for the employees working at site.

### 5.6.3 Compressed air

A dedicated air compressor with accumulator is installed on site to provide compressed air to the project.

### 5.6.4 Chemicals

The Project uses the following chemicals:

- Anaerobic digesters - antifoam dosing
- Biogas washing towers – Caustic soda and ferric solution
- Ammonia stripping system – Sulfuric acid at 93% diluted to 50%
- Water treatment system: Sodium chloride for the regeneration of the water softener's resins

Chemicals will be stored in IBC (Intermediate Bulk Container) totes, or vertical tanks depending on the type of chemical and the quantities used:

**IBCs** are useful for transporting and storing small quantities of bulk liquid. The IBC is typically made of polyethylene resin and comes equipped with a steel cage and pallet, features that make these tanks useful for storing hazardous chemicals. The storage, preparation, and dosage of chemicals from IBCs will take place inside the chemical room. The storage area includes housing for dosing pumps and a containment basin to capture any leaks. The dosing lines will be made of suitable material depending on material compatibility with the chemical.

Chemical storage tanks are designed for storing large quantities of bulk liquids. These tanks are typically HDPE or fiberglass with double wall containment to prevent spills as secondary containment. As with IBCs, dosing pumps are placed close to the tank and lines will be plastic or suitable material depending on chemical compatibility.

## 5.7 Other Systems

### 5.7.1 Stormwater Management

All stormwater is contained within the Project footprint. Runoff will be conveyed through the grading of the site, drainage ditches, culverts, and pipes to the digestate lagoon. The collected stormwater, in combination with the liquid digestate, will be stored in the digestate pond and applied to land following nutrient management plans. Stormwater management will meet the requirements of *Guidelines For*

*Secondary Containment For Above Ground Storage Tanks Industrial Waste And Wastewater Branch Alberta Environmental Protection.*

### 5.7.2 Grading and Excavation

A geotechnical study will be conducted to assess the conditions of the soil and probe for the presence of groundwater. Earthworks and excavation will follow the design of the facility with any necessary consolidation of soil. Soil compaction will be conducted where manure is stored per NRCB guidelines to meet secondary containment requirements. Grading of the site will be done in accordance with the stormwater management plan.

### 5.7.3 Leachate collection

The leachate network refers to the multiple points where potential leachate is collected.

Leachate from the reception and processing area is collected into a dedicated sump and recycled into the dilution buffer tank to dilute the feedstock to minimize water consumption and recover the energy contained in the leachate.

Leachate from the storage areas, mechanical rooms, concrete foundations where equipment is installed is collected into a dedicated sump and sent by gravity or by a pumping station into the digestate lagoon.

Condensate from gas line and gas upgrading system flow by gravity to a dedicated sump located near the biogas scrubbers and is pumped into the lagoon.

### 5.7.4 Septic

Septic will be constructed following appropriate guidelines such as *Alberta Private Sewage systems, Standard Practice 2021*. A conventional septic system collects the wastewater from toilets and drains located in the office. It retains solids and scum in a septic tank and pipes the liquids to a septic drain field. The septic tank system operates as follows:

- Wastewater from toilet, shower, sinks, washing machine, and dishwasher runs into a main drainage pipe that leads to the septic tank
- Solid materials sink to the bottom of the septic tank and form sludge
- Fats, oils, and greases float to the top of the septic tank and form scum
- Anaerobic bacteria feed on organic wastewater pollutants
- Liquids pass through an effluent filter near the outlet of the septic tank
- Filtered liquids flow through a pipe that leads to the septic drain field

- Perforated pipes in the drain field allow wastewater to seep into a layer of gravel


Figure 19: Septic tank setup

# 6 EMISSIONS

The Project will generate emissions to process the manure and maintain the AD process and RNG upgrading. Air dispersion models are done using historical wind and weather conditions as well as ground terrain that are combined with the facility's emissions to evaluate the impacts against the base line ambient air conditions using reference from AAAQOs. EPA will perform this evaluation as part of the Industrial Approval process.
Emissions are composed of 2 categories: point and fugitive emissions. Point sources are considered constant sources of emissions whereas fugitive emissions are intermittent and more nuanced in the modelling assumption. Air dispersion models are often done from a conservative standpoint. An example is the flare; it should be considered a fugitive emission as it shouldn't operate under normal conditions but is often modelled as point source to show its impacts per AER guidelines (directive 60).
The Project will implement various design considerations to further minimize impacts, and will also conduct an odour modelling study to evaluate the impact of the facility as part of the air dispersion modelling. Overall the Project is expected to reduce the overall odour impact as the decomposition of manure is taking place in an enclosed environment.

## 6.1 Point sources

The emission sources of the Project consist of:

**Point Emission Sources:**

- Cogeneration unit
- Safety flare
- Boiler
- Dewatering
- Reception Building

Emissions from these point sources will be products of combustion (NOx, SOx, PM) as well as $H_2S$ and $NH_4$. The stack associated with the biogas upgrading equipment is not considered an air emission point source; CO2 and $CH4_4$ are the effluent emissions and are not regulated by AAAQOs; they are emissions that are regulated through legislation such as the *Clean Fuels Regulation* that implement the federal carbon tax.

**Fugitive Sources:**

Emissions from manure may be considered fugitive as they enter the reception building; however, it is important to consider that manure existing storage practices generate equivalent emissions and the facility will divert manure to the digester tanks which are closed systems, resulting in a net reduction in emissions. Emissions from transportation are not considered fugitive as they are negligible. Moreover, manure management and hence, transportation, would still occur with current practices.

## 6.2 Odour Reduction and Control

**Enclosed process:**

The Reception building where manure is deposited is designed with fast rollup doors such that the manure is not exposed to wind drift or uncontrolled environmental emissions. This approach will greatly reduce the amount of feedlot manure stockpiled outdoor at Chinook's manure laydown area, hence reducing the overall odor impact of the feedlot operation.

**Scrubber Towers and Polishing:**

The biogas cleaning line, is where the odorous compounds in the biogas are captured. $H_2S$ is removed in 2 stages by the wet scrubbing tower. The bulk of $H_2S$ is removed in this stage. Subsequently, the biogas enters a polishing column where the remaining $H_2S$ and VOCs (volatile organic compounds) are removed.

**Steel Top Digesters:**

The Developer's experience in the biogas industry has led the company to the adoption of steel top roofs as opposed to gas membrane covered roofs. Figure **7** in Section 5.2.1 illustrates this. Membrane topped roofs serve the same function as the gas holder in Section 5.5.1 but require maintenance and replacement (typically every 7-10 years). Replacement of these gas holder tops may generate significant odour events without proper maintenance plans. Moreover, the time to replace these tops directly impacts revenues as biogas is not generated. The Project's gas holder is a separate entity that can be bypassed during maintenance and replaced avoiding potential odour issues. The design of the anaerobic digesters is such that they never need to be opened, avoiding potential odour events.

**Digestate Lagoon covered with top liner:**

The Project will utilize a covered lagoon approach as mentioned in the section above. This will both preserve ammonia that would otherwise be volatized and prevent the release of odors. Ammonia is an odorous compound that tends towards the gaseous phase. The top liner is impermeable similar to the design of biogas lagoons.

**Safety flare:**

During the events described in 5.5.4, the flare combusts the biogas, avoiding direct venting into the atmosphere and destroying the odorous compounds present in the gas.

# 7 PLANT SAFETY

## 7.1 Public safety

The facility will be designed, constructed, and operated to meet all applicable health and safety standards, codes, and regulations. Detailed health and safety plans, emergency response plans, operations plans, shutdown keys, alarm systems, and control narratives are also being developed to ensure the safe operation of the facility.

Access to the facility will be limited to operational personnel and approved third-party personnel. The site is fenced and restricted access to the facility will be maintained through a controlled entry point.

## 7.2 Signage

The plant will be equipped with signs that describe operations performed in each area and, based on the risks involved, the potential dangers and safety precautions required to be taken.

Four different types of signs will be used:

- **Horizontal signs**: For traffic route management, vehicle transitions, walking paths, and handling of materials.
- **Vertical signs (pole mounted)**: For road regulations and dangers, including speed limits, area access restrictions, weight limits, and other hazards.
- **Wall signs**: For identifying equipment, its use, and hazards. The signs will show the TAG of each piece of equipment, a description of the intended use of the area, the hazards present, PPE use requirements, and the location of the nearest safety and emergency devices (eyewash, shower, first aid).
- **Fire warning**: For identifying equipment and procedures to be used in case of fire (e.g. fire extinguishers, fire hoses, fire-fighting equipment).

## 7.3 Ladders and railings

Fixed ladders will be constructed and maintained to withstand the maximum loads (e.g. use during emergency conditions). Steps will have treads and risers, dimensioned for ease of use and to meet regulations. The top and bottom of fixed ladders and their landings will be equipped with railings or equivalent protection.

## 7.4 Piping Colour

Plant piping will be marked by coloured labels which identify the fluid inside according to applicable standards.

## 7.5 Alarms

Alarms caused by mechanical, or process faults will be displayed on the control desk SCADA in the control room. Alarms will follow a standard colour scheme for normal, warning, and alarm operations. In addition, auditory warnings accompany each visual alarm.

- **Green light**: The process is operating normally.
- **Orange light**: The process is operating under abnormal conditions (pre-warning)
- **Red light**: The process is operating outside of operating conditions (alarm)

## 7.6 Electrical grounding system

The ground network will be built using cables with PVC insulation and/or copper-bounded steel rods (electrodes). The ground network will be designed such that the voltage to the ground at any one electrode in the network does not exceed 65V (under normal conditions).

## 7.7 General protection switch

In case of emergency (e.g. fire), the entire facility will be disconnected from the electrical network.

## 7.8 Safety Flare

For a detailed description of this safety equipment please refer to Section 5.5.4

## 7.9 Emergency vents and hydraulic guards

In the event of biogas overpressure, the digester is designed with multiple safety systems. It will be equipped with a mechanical overpressure valve, vacuum breaker valve and flame arrester. Biogas venting is not anticipated to be part of regular operation as the emergency flare is designed to handle 100% of the biogas production.

A liquid overflow system will be installed to allow emergency overflow of liquid from the digester. The digester overflow is protected with a hydraulic guard designed to protect the structure of the digester and prevent biogas escaping from the overflow system. In the event of overpressure, this measure is secondary to the overpressure hydraulic guard in the downstream biogas line and would be activated in the event of a downstream gas line blockage.

## 7.10 Plant start-up

During the first filling of the digester tank, the air contained in the headspace of the digester is vented because it doesn't contain enough methane to be flared. This practise is anticipated to last for several hours during the first filling of the tanks and it stops as soon as the methane concentration in the biogas achieves flammable concentration. During the plant start-up, the feedstock load to the digesters is slowly increased and the rate of biogas production will grow proportionally. The biogas produced will be flared until the feedstock loading is high enough to sustain a biogas production rate of at least 50% of the design value. This is the minimum quantity required to operate the gas upgrading system.

### 7.11 Fire

In the event of fire, emergency responses and procedures are activated to isolate and shut down various components of the plant, including the power supply to the upgrading unit. Only the safety flare will continue operation to ensure no biogas is accumulated in the system.

#### 7.11.1 Water Supply and Hydrants

Following the National Building code (AB Edition), the facility will ensure that 790 $m^3$ of water will be accessible at all times for firefighting purposes. The Project is in discussion with Chinook and may access their water pump for fire suppression purposes or erect a water cistern with a hydrant.

# 8 ADDITIONAL CONSIDERATIONS

## 8.1 Lighting

Lighting needs will be determined after plant design is finalized. Placement and intensity of lighting will be based on plant layout and surrounding structures and will respect local regulations such as the *Dark Sky* Bylaw.

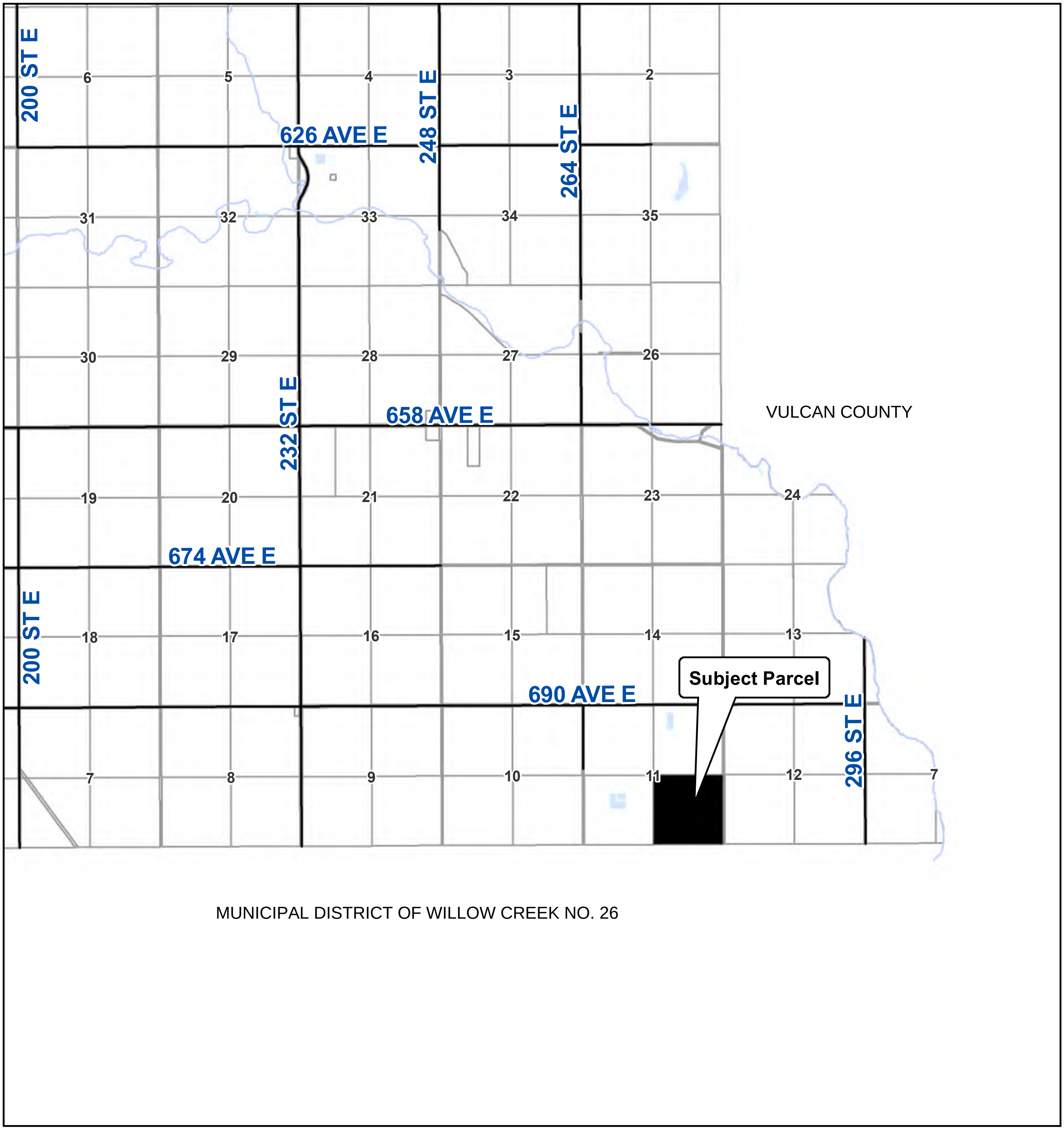
## 8.2 Land Reclamation

As part of the EPA approval, the Project is required to have a reclamation plan as a condition precedent to operating the facility and the Developer will be required to post and maintain financial security for indicated reclamation costs. The Project will create and estimate financial security costs when factors such as excavation and concrete volumes are indicated and develop a reclamation plan as the Project approaches construction.

## 8.3 Noise

The Project will ensure that noise emissions are minimized following the considerations of the AUC rule 012: Noise Control. The Project may consider sound proofing walls, mufflers or enclosing equipment to minimize noise emissions.

# Location Map
# SE 11-17-27 W4M




## Legend

Roads

Parcels

Subject Parcel

Date: 2025-07-31

0 0.25 0.5 1 Miles



Document Path: C:\prj\PlanningData\MDF_Planning_HalfMileCirc.mxd


1:15000

0 400 800 1600 m

Approximate Location Project Footprint*

TAURUS RNG

210 - 1201 West Pender Street,
Vancouver, BC, Canada,
V6E 2V2
Email:
info@taurusrng.com



| Document Name | DATE |
| --- | --- |
| 2501-Project Location | |

*See Document 2501-EDC-Site-Layout-Chinook_Feeders for detailed components of the facility


| DATE | REV. | COMMENTS | DRAWN BY | CHECKED BY | APPROVED BY |
|---|---|---|---|---|---|
| – | – | – | – | – | – |
| – | – | – | – | – | – |
| – | – | – | – | – | – |
| – | – | – | – | – | – |
| – | – | – | – | – | – |
| – | – | – | – | – | – |

REFERENCE ONLY

FOOTHILLS COUNTY, ALBERTA

*APPROXIMATE DATUM LOCATION:
Coordinates
Lat: 50.4173
Long: -113.6085

NAD83-UTM 12
E 314690.14
N 5588281.58

Est. ELEV.: 3289ft/1002m

*PROPERTY BOUNDARY
APPROX. 16.085 Acres
(700,665ft$^2$/65094m$^2$)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3rd ANGLE PROJECTION



DIM.
ANSI D

CHINOOK FEEDERS
ANAEROBIC DIGESTION PLANT
SETBACKS

DRAWING SCALE
1"=150' (1:1800)

PAGE
1 of 1

DOCUMENT NAME
2501-EDC-LAYOUT_SETBACKS-CHINOOK-00

PROJECT
2501 - CHINOOK

| TAURUS Renewable Natural Gas Corporation | Unit:<br>Process Dept. - Vancouver | Date:<br>05-27-2025 |
|---|---|---|
| | Project name/number:<br>2501 | |
| | Client:<br>2716438 Alberta Ltd. | Document Classification: |

# Abandoned Wells Search: Schedule A

## EXECUTIVE SUMMARY

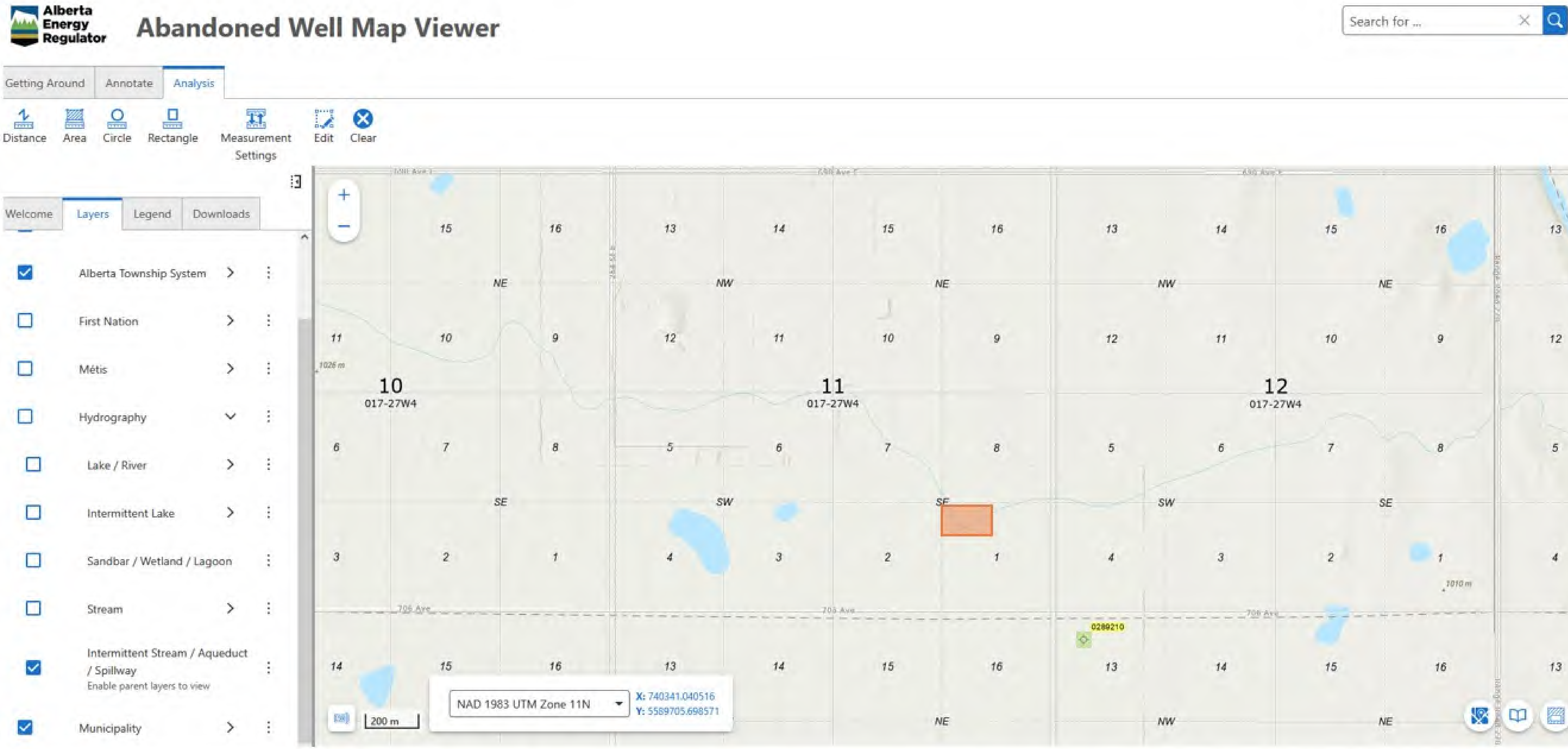
Taurus Canada Renewable Natural gas Corp. ("Taurus") evaluated the proximity of the proposed development ("The Project") to any abandoned wells to support the Abandoned Well Site form.

The distance between the site at the SE section of 11-17-27-W4 (50.416662, -113.596911) and the nearest abandoned well (0289210) at 1-17-27-W4 NW (50.41417, -113.60056) is approximately 1,000 meters. Per Directive 079, Alberta Energy Regulator (AER) recommends that wells within 25 meters are considered "within proximity".

There are no abandoned wells on the Project site.

## VERIFICATION

Taurus accessed AER's abandoned well map tool to verify the absence of wells on the subject property. (https://maps.aer.ca/awm/index.html). The project boundary shown is an approximate boundary to illustrate the distance relative to the well. Please see the process summary (2501-ERP-Detailed_Process_Summary-00) and layout for details of the actual site boundary. The nearest well was noted approximately 1000 meters, confirming that it does not fall within proximity of the proposed development.




*Project Location Boundary

Registered Abandoned Well

*Precise locations for the Project can be found in the Development Permit and Land-Use Application.

| TAURUS RNG | 210 - 1201 West Pender Street, Vancouver, BC, Canada, V6E 2V2 Email: info@taurusrng.com |
|---|---|
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| **Document Title** Abandoned Well Evaluaton | |
| **Document Name** | DATE |
| AER-Well-Viewer | |