BEFORE THE NEBRASKA DEPARTMENT OF WATER, ENERGY, AND ENVIRONMENT

IN THE MATTER OF SOUTH SIOUX CITY WASTEWATER TREATMENT FACILITY FID # 65775 Respondent.	)))))))	Case No. 3651 CONSENT ORDER

I. INTRODUCTION

1. The Nebraska Department of Water, Energy, and Environment (the "Department") and Respondent, South Sioux City, voluntarily enter into this Consent Order, which establishes actions necessary for Respondent to come into compliance with the Nebraska Environmental Protection Act (NEPA), Neb. Rev. Stat. § 81-1501 et. seq.

2. The Department and Respondent agree that settlement of this matter is in the public interest to ensure compliance with state laws and rules and regulation.

II. PARTIES

3. The parties to this Consent Order are the Department and Respondent, and its employees, successors, and assigns. Respondent will ensure that all contractors hired to perform work required by this Consent Order are informed of applicable requirements.

III. JURISDICTION

4. The Department is the agency of the State of Nebraska charged with the duty, pursuant to Neb. Rev. Stat. § 81-1504(1), of exercising exclusive general supervision, administration, and enforcement of NEPA and all rules and regulations promulgated under such acts.

5. Pursuant to the Nebraska Environmental Quality Council's authority to adopt and promulgate rules and regulations as expressed in Neb. Rev. Stat. § 81-1505, the Council adopted rules and regulations codified as Neb. Admin. Code, Title 129, Nebraska Air Quality Regulations (Title 129) and Neb. Admin.

Code, Title 119, Rules and Regulations Pertaining to the Issuance of Permits under the National Pollutant Discharge Elimination System (Title 119).

6. At all times relevant, Respondent has owned and operated a wastewater treatment facility (the "WWTF") located in Dakota County, Nebraska.

7. Respondent agrees to undertake all corrective actions required by and agreed to in this Consent Order. Respondent agrees not to contest the Department's jurisdiction to enforce this Consent Order in any subsequent enforcement proceedings, either administrative or judicial.

IV. FINDINGS OF FACT

8. Respondent is a "person" as defined in Neb. Rev. Stat. § 81-1502(10)

9. Neb. Rev. Stat. § 81-1506(1)(a) makes it unlawful to cause pollution to air or waters of the state.

10. Neb. Rev. Stat. § 81-1506(2)(c) makes it unlawful to increase in volume or strength any waste in excess of permitted discharges specified under an existing Title 119 permit.

11. Neb. Rev. Stat. § 81-1506(4)(b) makes it unlawful to violate any term or condition of an air pollution permit or any emission limit set in the permit.

12. The WWTF is a publicly owned treatment works which receives wastewater from industrial users. The WWTF utilizes two anaerobic lagoons which are covered to capture biogas and discharges treated wastewater to the Missouri River.

FIRST CAUSE OF ACTION

13. On March 15, 2021, air construction permit CP20-024 (the "Air Permit") was issued by the Department to Respondent.

14. The Air Permit authorized the construction and operation of, among other things, two 13.9 MMBtu/hr boilers designed to combust biogas produced at the WTTF and one flare designed to combust any biogas produced at the WWTF which was not combusted in the two boilers.

15. The Air Permit set emission limitations and testing requirements for the flare and the two boilers.

16. The Air Permit prohibits the volumetric concentration of Hydrogen Sulfide (H_2S) in the biogas combusted in the flare from exceeding 7,000 parts per million volume dry (ppmvd) and the volumetric

concentration of H_2S combusted in the two boilers from exceeding 200 ppmvd. The permit prescribes an H_2S scrubber as required control equipment for the two boilers.

17. On March 22, 2024, Respondent informed the Department that testing results at the WWTF showed H_2S levels in excess of the limits set by the Air Permit.

18. On April 29, 2024, Respondent provided the Department with analytical testing results for the biogas produced at the WWTF showing H_2S levels in excess of the limits in the Air Permit.

19. On June 12, 2024, the Department sent a letter of non-compliance to Respondent citing Respondent's failure to comply with the H_2S limit for un-scrubbed biogas combusted in the flare and the H_2S limit for scrubbed biogas combusted in the two boilers as required by conditions III(B)(2)(a) and III(C)(2)(b) of the Air Permit, respectively.

20. On January 23, 2025, Respondent provided the Department with analytical testing results for the biogas produced at the WWTF showing H_2S levels in excess of the limit in the Air Permit.

21. On February 4, 2025, the Department sent a letter of non-compliance to Respondent citing, among other things, Respondent's failure to comply with the H_2S limits for un-scrubbed biogas combusted in the flare as required by condition III(B)(2)(a) of the Air Permit.

22. Respondent's failures to comply with the H_2S limit for the biogas combusted in the flare and with the H_2S limit for the biogas combusted in the two boilers as required by conditions III(B)(2)(a) and III(C)(2)(b) of the Air Permit are unlawful acts. Neb. Rev. Stat. § 81-1506(4)(b).

SECOND CAUSE OF ACTION

23. On April 1, 2023, NPDES Permit NE0139904 (the "NPDES Permit") was issued by the Department to Respondent.

24. The NPDES Permit authorizes the discharge of treated wastewater to the Missouri River, subject to the conditions and limitations set in the NPDES Permit.

25. The NPDES Permit includes monthly and weekly effluent limits, monitoring requirements, and reporting requirements for, among other things, total suspended solids (TSS) and carbonaceous biochemical oxygen demand (BOD).

26. Respondent reported to the Department that Respondent violated the effluent limitations for TSS in the NPDES Permit for the monitoring periods of July 2023, August 2023, September 2023, January 2024, April 2024, August 2024, and March 2025.

27. Respondent reported to the Department that Respondent violated the effluent limitations for BOD in the NPDES Permit for the monitoring period of February 2024.

28. Respondent's failures to comply with the effluent limits in the NPDES Permit are unlawful acts. Neb. Rev. Stat. § 81-1506(2)(c).

V. COMPLIANCE SCHEDULE

Respondent agrees to complete the following actions within the timeframe specified:

29. On July 30, 2025, and on August 22, 2025, Respondent provided the Department with written plans to reduce the concentration of H_2S in the biogas combusted at the WWTF (Attachments A and B, respectively, herein after the "H_2S reduction plan"). Respondent will provide the Department with written monthly updates on the status of Respondent's efforts to reduce the concentration of H_2S combusted at the WWTF through implementation of the H_2S reduction plan and compliance with this order. Updates will be provided within seven days from the first of each month and will continue to be provided until this order is satisfied.

30. By October 31, 2025, Respondent will submit all information required by Title 129, Ch. 3.002.02 and an ambient air quality impact analysis, as described in Title 129, Ch. 3.002.03C, for the WWTF as designed and described in the H_2S reduction plan.

31. By October 31, 2025, Respondent will submit, for Department approval, a plan to collect data on the total sulfur contributed to the WWTF by industrial users.

32. By December 31, 2025, Respondent will submit a plan to address exceedances of the NPDES Permit. The plan will include:

a. Evaluation of an expedited installation and commissioning of tertiary filters described in State Construction Permit: 2024-0155 for the expansion of the WWTF; and

b. Evaluation of temporary filtration systems to reduce TSS discharged from the WWTF until the tertiary filters described in Permit 2024-0155 are commissioned.

33. Respondent will install and initiate operation of a new Valkyrie Eco Flex 300 lb/d (the "H_2S wet scrubber") in accordance with the following schedule:

a. By December 31, 2025, Respondent will procure the H_2S wet scrubber;

b. By March 31, 2026, Respondent will complete installation of the H_2S wet scrubber; and

c. By May 31, 2026, start up and commission the H_2S wet scrubber.

34. By May 31, 2026, Respondent will retrofit and replace the absorption media in its existing scrubber and resume operation of the existing scrubber.

35. By May 31, 2026, Respondent will execute an amendment to this Consent Order which incorporates requirements identified by the Department as necessary for the continued collection and processing of biogas at the WWTF. At a minimum, the amendment will include:

a. A schedule for the implementation of emission limits;

b. Monitoring and reporting requirements;

c. Physical and operational controls; and

d. A schedule to apply for an air construction permit and air operating permit.

36. Respondent agrees to respond in writing within fourteen (14) working days to all Department requests for information. Submittals required by this order are to be sent to the following address or email:

Greg Lang
Supervisor – Air Compliance Section
Inspection and Compliance Division
Nebraska Department of Water Energy and Environment
245 Fallbrook Blvd.
Lincoln, Nebraska 68509-8922

or copies may be sent as an attachment via email to:
greg.lang@nebraska.gov

VI. RESERVATION OF RIGHTS AND PENALTY PROVISIONS

37. The Department reserves the right to require Respondent to complete additional work or take additional actions as necessary to achieve compliance with all applicable laws and regulations. Further, the Department reserves the right to pursue enforcement in the proper court of law for injunctive relief or to seek civil or criminal penalties for any violations that are the subject of this Consent Order. Nothing in this Consent Order precludes the Department from pursuing such enforcement.

38. Failure to obey this order may result in civil penalties as set out in Neb. Rev. Stat. § 81-1508.02.

VII. NEGATION OF AGENCY RELATIONSHIP

39. Nothing contained in this Consent Order will be construed to create, either expressly or by implication, the relationship of agency between the Department and Respondent

VIII. AMENDMENTS

40. This Consent Order may be modified and amended in writing by mutual agreement of the Department and the Respondent.

IX. EFFECTIVE DATE

41. This Consent Order will become effective on the date signed below by the Director of the Department or his designee.

X. SEVERABILITY

42. If any provision or authority of this Consent Order or the application of this Consent Order to any party or circumstances is held by any judicial or administrative authority to be invalid, the application of such provisions to other party or circumstances and the remainder of the Consent Order will remain in force and will not be affected thereby.

XI. SIGNATURES

For the Respondent: The undersigned representative of Respondent certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Order and to bind Respondent.

By: _____

Title: Mayor

Date: 10-22-2025

For the Department: IT IS ORDERED and agreed this 24 day of October, 2025.

By: _____

Jesse Bradley
Director,
Nebraska Department of Water,
Energy, and Environment

July 30th, 2025
NDWEE
245 Fallbrook Blvd.
Lincoln, NE 68521

Supplemental information on South Sioux City's H2S reduction plan

Dear NDWEE Review Team,

The City of South Sioux City has entered a procurement contract with Streamline Innovations, INC. for the procurement of a proprietary technology to remove Hydrogen Sulfide (H2S) from Biogas. It is also upgrading its existing media-based system with available media technology as the previous media is no longer purchasable. The purpose of this supplemental memo is to briefly outline the City's strategy to become compliant with air permitting regulations and allow biogas to be utilized as renewable natural gas (RNG) with a partnership with a third party (Northwest Natural – NWN) RNG facility.

Background

The City of South Sioux City's Wastewater Treatment Facility (WWTF) currently receives wastewater from three sources, Empirical Foods, Ingredion, and Richardson Milling. The WWTF sees an average influent flow rate of approximately 1.6 MGD, of that flow 1.0 is from Empirical foods, 0.6 MGD is from Ingredion, and Richardson Milling accounting for the rest which is minimal. This wastewater is pretreated prior to secondary treatment with an Anaerobic Lagoon process. The anaerobic process reduces BOD and TSS in the wastewater and produces biogas. The facility has encountered extremely high levels of H2S in the biogas.

Known sulfur being sent to the WWTF is from three primary sources.

1) Sulfate in water supply – typically 200-235 mg SO4/L
2) Sulfate from Empirical foods – typically 400-900 mg SO4/L
3) Sulfate from Ingredion – typically 260-310 mg SO4/L

H2S in biogas typically ranges from 15,000 ppmv to 23,000 ppmv. A graphical representation of the monthly biogas generation and Hydrogen sulfide measurements from the anaerobic process is shown in Figure 1. Sulfur reduction testing has been explored, including source reduction with Empirical foods, chemical addition to the anaerobic process for: sulfide removal in the liquid phase, chemical addition to retain sulfide in the liquid phase, and chemical treatment of H2S for removal in the gas phase.

A source reduction pilot was performed in May 2024. Results of the pilot were promising in reducing H2S levels, however it came with a consequence of untreatable colloidal solids being introduced into the WWTF causing NPDES permit violations for TSS and E. coli . The pilot was ceased with the hopes of returning to the pilot operation once the WWTF has the capability to handle the untreatable solids. Chemical treatment to remove sulfides in the liquid phase using metal salts was shown to be economically prohibitive. Chemical treatment to retain sulfides in the liquid phase via pH control is planned as a supplemental H2S reduction measure, and chemical treatment of H2S in the gas phase is planned as part of the WWTF expansion.

New H2S Removal Equipment

The WWTF is currently undergoing an expansion, with upgrades to the H2S removal technology, a key component. The planned units will remove H2S by two distinct pathways. First is a wet chemistry style proprietary treatment

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system, Streamline's Valkyrie Eco system. This operates with chemical addition of propriety blends of iron chelate solutions and surfactants to reaction chambers that come in contact with the biogas. The second is an iron hydroxide dry media vessel that removes H2S via absorption as biogas passes through the vessel.

The current draft submittal for the Streamlines Valkyrie Eco unit and associated project specification section is attached in Appendix A. The unit has the ability to remove 350 lbs of sulfur per day, with a maximum inlet concentration of 12,000 ppmv H2S. To achieve this inlet concentration when biogas has a higher concentration, a return clean and dry gas stream is recycled from after a gas chiller on the downstream piping and brought back to the inlet of the scrubber.

The project specification for the biogas H2S adsorption media for media replacement in the existing vessel is attached in Appendix B and the biogas process flow diagram and PIDs from the expansion project is attached in Appendix C. The existing vessel is designed for approximately 20,000 lbs of H2S removal before the media would require replacement.

The system is designed so that biogas can be operated with the dry media unit running in both series as a polishing vessel or in parallel as an additional treatment process. As shown in figure 1, the WWTF currently produces approximately an average of 180-200 scfm of biogas and approximately an average of 18,500 ppmv of H2S - this equates to 420-460 lbs of H2S/day. As the expansion project is for domestic wastewater addition with no anaerobic treatment of that that stream, no additional biogas will be produced.

H2S Reduction strategy

The WWTF will have its new scrubber system in operation prior to March 2026. The City has made it part of the contract documents for the expansion to address the installation of the new scrubber system as one of the first things that the contractor has to install and commission. As previously mentioned the current biogas production is higher than the new streamline scrubber systems removal capacity. During initial startup the WWTF will operate the Streamline unit in parallel with the new media in the existing vessel. However, due to the costs of the dry media, using the vessel as a main stream process is not ideal, but will be necessary until the full plant expansion is completed.

To offset costs for the dry media replacement the WWTF is planning to increase the pH in the lagoons. Although a detailed sulfur mass balance has not been performed enough information has been gathered to determine that the anaerobic lagoons operate in sulfur equilibrium within the gas phase and liquid phase. This allows the ability to control H2S in biogas directly by controlling the pH in the lagoons. The equation below depicts the dissociation ratio of H2S to Total Dissolved Sulfides. Using the equation below we can calculate that at the current operation pH of approximately 6.9, 50% of all sulfides in the lagoons are in the form of H2S and can off gas. If the operating pH was increased to 7.1, that ratio would decrease to 39%. This would decrease the concentration of H2S in the biogas by 23%. Since the caustic chemical used to increase pH is also expensive, an economically feasible balance will be determined through testing.

$$\frac{[H_sS]}{[Total\ Sulfide]} = \frac{1}{1 + 10^{pH - pK_{a1}}}$$

$$pK_{a1}\left(\frac{H_2S}{HS^-}\right) = 6.9\ at\ 33C$$

Once the WWTF expansion is complete, the facility will have use of tertiary disk filtration equipment. This will allow the pilot study that was previously attempted with Empirical foods to be restarted. The disk filters will allow the capture of the solids that previously caused issues with the NPDES permit during source reduction efforts. Based on current sampling and flow data this is estimated to decrease the total sulfur load to the WWTF by 30-50%. Due to the nuance of the lagoons system this should be linearly reflected in biogas H2S reduction.

With the combination of the two new scrubber systems, and pH control measures, the WWTF will be able to achieve compliance with air permit at current biogas production once the new scrubber systems have been installed. Once the

expansion is complete, the City will also explore source reduction strategies with the industries to reduce H2S levels in the gas even further and reduce operations and maintenance costs at the WWTF.. It is critical to note that once the new scrubber system is in operation all biogas that is being produced at the WWTF will be sent to the third part RNG facility as the primary flow path. Biogas will be flared sparingly only when the equipment is down for maintenance reasons.

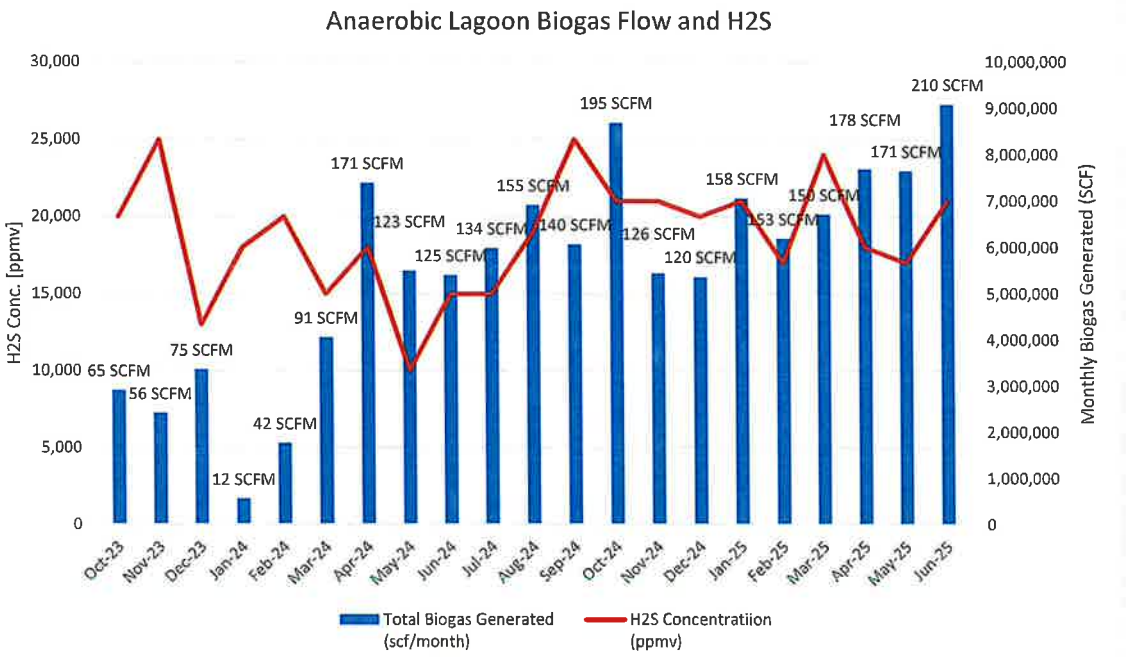

Figure 1

HDR
1917 S. 67th Street
Omaha, NE 68106-2973

Sincerely,
HDR

Dillon Devitt, PE, BCEE
Water/Wastewater Engineer

City of South Sioux City

HDR

HDR
1917 S 67th Street
Omaha, NE 68106-2973

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Appendix A

SECTION 43 13 41
BIOGAS H2S CHEMICAL REMOVAL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Furnish all labor, materials, equipment, and incidentals required to install, prepare for operation, and field test the complete H2S Removal "package" system. This shall include, but not be limited to instrumentation and controls, control panel, and accessories as shown on the Drawings and as specified herein.
2. All necessary accessories shall be furnished and installed as required for an operating installation meeting industry standard and Contract Document requirements, including System Supplier's onsite services.
3. The Supplier shall supply and support installation, startup and performance testing of the System as shown on the Drawings and as specified herein.
4. The location and space allocation for the equipment to be supplied in this Section is shown in Contract Documents.
5. The equipment is subject to a performance test for final acceptance following installation. Refer to additional requirements in PART 3 of this Specification for details.
6. The supplier shall provide a Local Control Panel (LCP) as specified herein and as shown on the Drawings. The supplier is responsible for the controls and programming associated with the LCPs to ensure that all safety interlocks and permissive required for start-up and shut down are properly implemented.
7. The supplier shall coordinate with Process Control Systems Supplier (PCSS) to provide data/tag mapping information adhering to the established tagging scheme to registers for the plant SCADA.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. National American Standards Institutions (ANSI):
   a. B31.3, Process Piping.
   b. B16.5, Pipe Flanges and Flanged Fittings.
2. American Society of Mechanical Engineers (ASME):
   a. SA240, Grade 304 Stainless Steel Sheet.
3. ASTM International (ASTM):
   a. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   b. F594, Standard Specification for Stainless Steel Nuts.
4. National Electrical Code (NEC):
   a. 70, National Electric Code.
5. National Electrical Manufacturers Association (NEMA):
   a. 12, Electrical Enclosure.
6. National Fire Protection Association (NFPA):
   a. 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
7. Underwriters Laboratory (UL):
8. Factory Mutual (FM Global) and/or Canadian Standard Association (CSA):

B. System Supplier technician shall be certified by the manufacturers of equipment included in this package, or otherwise qualified by to inspect, trouble-shoot, and provide start-up and

commissioning services on behalf of the System Supplier. The Technician shall have necessary experience designing and furnishing equipment and system components.

C. The equipment specified herein is intended to give a general description of what is required but does not cover all details which may vary in accordance with the exact requirements as offered. It is, however, intended to cover the furnishing, delivery, installation, field testing and field calibration of all materials and apparatus as required. Any additional equipment necessary for the proper operation of the proposed installation not specifically mentioned in this Section and/or shown on the Drawings shall be furnished and installed.

D. Prior to shipment the system shall be inspected for quality of construction verifying all fasteners and fittings are tight, all wires are secure and connections whisker-free. If leaks are found, they shall be repaired, and a new test shall be conducted until the plumbing system is verified to be leak free.

E. To the extent possible, like items and/or models of equipment provided hereunder should be the products of one manufacturer to achieve standardization of equipment, spare parts, operation, maintenance and manufacturer's services.

F. All items of equipment shall be the standard products of a manufacturer normally engaged in manufacture and marketing of the product and able.

G. All items of equipment incorporated in the work shall be new and unused.

H. If the equipment furnished is different than that shown on the Drawings or specified herein, any revisions or modifications required to accommodate such a substitution shall be made at the Contractor's expense and responsibility and shall be as approved by the Engineer. Furthermore, any auxiliary equipment recommended and/or required by the equipment manufacturer, whether or not specifically mentioned herein, shall be furnished and installed under this Section.

1.3 DEFINITIONS

A. Sour biogas: Saturated, unconditioned gas from the anaerobic lagoons going to the inlet of the H2S removal system.

B. Treated biogas: biogas exiting the H2S removal system.

1.4 UNIT RESPONSIBILITY

A. All the equipment, labor, and materials manufactured and supplied as specified under this Section shall be furnished by a single System Supplier. All equipment and components furnished together specified herein shall be considered the "System." The System Supplier shall have the responsibility for the proper manufacturing, shipping, delivery, assembly, testing, and shall assume proper functioning of all equipment, controls, components, and appurtenances specified.

B. The unit responsibility System Supplier shall coordinate selection, coordinate design, and shall furnish all System components to assure selected components of the system for compatibility, reliable operation, ease of construction, and efficient maintenance. The responsible System Supplier shall ensure coordination of design of all system components such that all equipment furnished under this Contract is compatible and operates properly to achieve the performance requirements specified. The responsible System Supplier shall ensure coordination with the Contractor. This requirement for system unit responsibility shall in no way relieve the Contractor of his responsibility to the Owner.

1.5 QUALIFICATIONS

A. The System Supplier shall submit with the bid the following information and documentation:

1. The equipment furnished under this Section shall be the product of a single System Supplier who has produced this same type of equipment for a period of at least 5 consecutive years and had a minimum of 10 operating installations.

2. System Supplier shall provide (with the bid documents/package) information on a minimum of three project references for similar projects of comparable scope and size which are fully constructed and currently in operation, including system size, design criteria, and all contact info for the Owner. The information will be utilized to ensure each submitted System Supplier meets the minimum requirements described herein.

1.6 COORDINATION MEETINGS AND WORKSHOPS

A. Within 14 days of notice to proceed to the General Contractor, the Contractor will schedule a System Supplier coordination workshop. The purpose of this workshop is for Engineer and System Supplier to provide an overview of the status of the procurement contract and facilitate discussion expectations and delineations of the Contractor and supplier responsibilities. At a minimum, the workshop shall be attended by the supplier's overall representative, mechanical equipment supplier representative and the supplier's OIT and PLC programmer who is developing the application programs for the project. The workshop schedule will be coordinated with all the above representatives for their attendance. The meeting will not exceed 2 HRS.

1.7 SYSTEM DESCRIPTION

A. The equipment specified herein shall be provided as one package and shall operate and be controlled as specified herein. Biogas from the lagoons will enter a bulk separator chamber where it contacts the proprietary iron chelate liquid solution. The biogas will run in and out of the bulk separator chamber for three rounds of chemical contact before being sent out of the system to downstream processes. As the chemical solution becomes spent, it is pumped to an aerated regenerator vessel before being pumped back to the bulk separator. A stream of chemical solution is also pumped to a centrifuge. The solid sulfur cake from the centrifuge is emptied into a disposal hopper right outside the unit, to be picked up and dumped to landfill when full. The filtrate from the centrifuge is collected into a tank and pumped back to the bulk separator. Some chemical solution is expected to be lost to the treated biogas stream and to the sulfur cake stream. Make-up chemical solution is stored in totes within the containerized unit, to be pumped to the system as needed.

B. Connections to/from outside of the equipment unit include but are not limited to: (1) instrument compressed air to the System, (2) potable water to the System, (3) condensate drain from the System, and (4) condensate from the treated biogas line, collected and returned to the System.

1.8 DESIGN REQUIREMENTS

A. Gas Qualities and Design Requirements:

1. The H2S removal system supplied under this Section shall be capable of treating the biogas to concentrations not exceeding those listed below at the gas flow rates and influent concentrations specified below.

Design Parameter	Value
design biogas flow range (CFM)	250
inlet biogas pressure (PSIG)	-0.02
H2S inlet concentration (PPMV)	12,000
H2S outlet concentration (PPMV)	150

2. The chemical supply needed to treat the biogas to the requirements above shall not exceed refill frequencies listed below.

Chemical	Refill Frequency (weeks)
N100 (Talon)	7
S200 (Surfactant)	13
A200 (Pot Carb)	7

B. System Supplier shall provide grouting and anchoring diagrams utilizing stamped and signed calculations performed by a Professional Engineer licensed in the State of Nebraska.

C. The nameplate rating of the motor shall not be exceeded, nor shall the motor design service factor be reduced when the compressor or pump is operating at any point on its characteristic curve.

D. The anchorage system for the equipment supplied under this Section and the structural design of the treatment system components shall be designed for all applicable dead, operating and seismic loads as required by the 2018 International Building Code. The design of all anchor bolts and attachments shall include the type of anchor, diameter, embedment length and anchorage type.

1.9 ELECTRICAL CLASSIFICATION OF AREAS / EQUIPMENT

A. Equipment specified in this section will be located outdoors as shown on the Contract Drawings. Per NFPA 820, all vessels, tanks, reactors and piping containing biogas and an envelope 3 meters (~10 feet) above and 1.5 meters (~5 feet) beyond this equipment is classified as Class I, Division 1, Group D. In addition, the area 5 meters (~16.5 feet) above and 1.5 meters (~5 feet) beyond the Class I, Division 1 envelope is classified as Class I, Division 2, Group D.

B. The System will be located outdoors and will be classified as Class 1, Division 1, Group D. All components, wiring, instruments, and devices installed within the skid boundary or the classified space surrounding the skid boundary shall be rated as such.

C. All equipment supplied under this Section to be installed within these envelopes shall be suitable for these hazardous area classifications as identified on the Electrical Classification Drawing.

1.10 SUPERVISION SERVICES BY SYSTEM SUPPLIER

A. Provide services of a System Supplier's services representative(s), specifically trained on type of equipment specified. Personnel should be fully familiar with the equipment and should be able to make recommendations for optimizing the system to achieve the most optimum performance. Submit qualifications of service representative(s) for approval. All of the number of required days listed below are exclusive of travel time and do not relieve Contractor of obligation to provide sufficient service to place equipment in satisfactory operation. The System Supplier shall cover all associated travel costs for the number of required days listed below, inclusive of airfare, lodging, transportation costs, and any other incurred costs shall all be included in the contract price. The days under each category of assistance below shall be transferable to other categories.

B. A total of 20 eight-hour days shall be included for on-site start up and training assistance as specified below:

1. On-Site Start-up Assistance: Check-out, start-up, calibration, and functional testing.
2. On-Site Post Start-up Assistance: The System Supplier shall assure that operation of equipment is in accordance with System Supplier's recommendations.
3. On-Site Acceptance/Performance Testing:
    a. The Supplier shall provide and install temporary Draeger detector tubes upstream of the equipment to determine sour gas concentrations. The Supplier shall use readings from the SulfiLogger H2S sensor that the Contractor shall have permanently installed downstream of the equipment to determine treated gas concentrations.
    b. Using the above measurements at a frequency of two times daily for a period of 10 days, Supplier shall prove that the system performance conforms to the treatment parameters specified in Paragraph 1.8.A.
    c. Supplier shall prove the system's total process chemical usage does not exceed the refill frequencies specified in Paragraph 1.8.A or exceed the proposal quote of $1.20 per pound of sulfur removed.

4. On-Site Operations Training: Classroom and hands-on instruction which will cover the theory of operation, actual operation of the system, and optimization of the operations. Note that the Final Operations & Maintenance Manual must be submitted prior to any onsite operations training being scheduled.
5. On-Site Operational Supervision: Onsite Operations Training shall be followed up with two weeks, each five days/week, one shift per day of operational supervision to train and supervise the actual operation of the equipment and to assist in optimization and on-the-job training.
6. On-Site Maintenance Training: During the same time period as the above operations training, provide classroom and hands-on training in separate sessions for electrical maintenance, instrumentation maintenance and mechanical maintenance. Each class or separate session shall be conducted in two sessions on consecutive days consisting of four hours each.
7. Provide video of all training sessions and copies of digital presentations of all training topics and turn over to Owner in an electronic DVD format.

C. 6 months of remote monitoring services shall be included as specified below:

1. After start-up, Owner shall be responsible to operate the equipment with six months of operational support from Supplier through the Supplier's Valkyrie Intelligence Platform (VIP) service package. During this period, Supplier shall provide advisory support with periodic remote monitoring, calculations of performance indicators, analysis, operating reports, operations feedback, regularly scheduled calls with Owner for performance checks, and control adjustment recommendations to optimize operations.

1.11 SPARE PARTS AND SUPPLIES

A. Furnish spare parts as recommended by the System Supplier for replacement of equipment items due to normal wear and tear during a one-year period of operation following acceptance of the equipment.

B. Supply oil, grease, and any special lubricants that are needed for the proper operation of the equipment provided under this Section. The oil, grease, and special lubricants supplied shall be sufficient for the operation of the equipment prior to its acceptance as substantially complete.

C. Spare parts shall be prepared for humid weather protection, packaged and labeled for storage. Spare parts shall be delivered at the time of delivery of the equipment to the site.

1.12 SHOP TESTS

A. Perform Certified Shop Tests for all Equipment Provided Under this Section,

1.13 AGREEMENTS

A. System contains proprietary technology; in order to protect this technology some additional Safeguards such as non-disclosure agreements (NDAs) and End User agreements (EUAs) are typical.

B. Prior to disclosure of confidential information that is the proprietary know-how of the System manufacturer, recipients, including Contractors, may be required to execute a NDA as supplied by System manufacturer. Executed NDAs will be required at Project execution (and at assignment of contract, if applicable).

PART 2 - PRODUCTS

2.1 SYSTEM SUPPLIERS

A. The equipment to be supplied under this Section shall be provided by the following suppliers:

1. Streamline Innovations of San Antonio, Texas, USA
2. Or Equal.

B. No significant deviations from the Contract Documents shall be permitted. Substitutions requests shall be approved by the Engineer.

2.2 SYSTEM EQUIPMENT REQUIREMENTS

A. Bulk separator.

B. Process eductors.

C. Bulk separator recirculation pump.

D. Regenerator vessel.

E. Regenerator aeration blower.

F. Regenerator return pump.

G. Centrifuge.

H. Filtrate tank.

I. Filtrate return pump.

J. Associated nozzles, valves, and instruments.

K. PLC.

2.3 DELEGATED DESIGN

A. The System Supplier is responsible for the design of the entire skid to produce gas quality under the design conditions as specified in Section 1.8 of this Section.

2.4 EQUIPMENT PIPING REQUIREMENTS

A. The piping materials as provided by the System Supplier within the equipment skids shall be according to the process characteristics and specific gases to be transported as follows:

1. Lagoon gas pipe and product gas pipe: TP316L Stainless Steel.
2. Lubrication Oil pipe: Carbon Steel.
3. Instrument Air dosing pipe: 304 Stainless Steel.

B. The piping terminations on the edge of the skid boundary shall be orientated to facilitate the required field connections and provided with ANSI flanged or NPT connections as appropriate.

C. All equipment piping shall be hydrostatically tested to 1.5 times the working pressure.

2.5 EQUIPMENT/PIPING SKID PLATFORM REQUIREMENTS

A. The process equipment identified shall be installed on skid platform systems to be placed as shown on the Drawings.

B. The equipment skid and attachment design shall be provided by the manufacturer to resist equipment, dynamic, and seismic loads as specified. Manufacturer to submit calculations stamped and signed by a Civil or Structural Engineer registered in the State of Nebraska.

C. The equipment skids shall include four-point lifting lugs at or near the corners of the skid base, with capacity for rigging the entire assembly. Design the skid base and attachment to the concrete support pad to support the skid gravity loads, dynamic loads, and seismic forces and shall conform to applicable requirement of the applicable building codes. Provide two electrical grounding lugs mounted on the base for connection to a grounding system to be provided by others.

D. NRTL Listing of entire equipment assembly.

a. Refer to 01 61 03 for listing requirements.

2.6 INSTRUMENTATION REQUIREMENTS

A. The System Supplier shall supply all necessary instrumentation for the operation of the System. Instrumentation shall be made of materials able to withstand the condition of their respective

flow stream. All instrument components in contact with lagoon biogas or product gas shall be manufactured of 316 stainless steel. Instrumentation shall provide accurate readings within +/- 3%. All transmitters shall be provided with local read / display capability.

B. Communication with instrumentation shall be by hardwire. The analog instruments shall be equipped with a 4-20 mA output signal. Discrete instruments and alarm contacts will be connected fail-safe where possible.

C. Where appropriate, electrical instruments and components shall be suitable for installation in Class I, Division 1, hazardous environments as defined on the Electrical Classification Drawings. System Supplier is responsible for ensuring that installation location of components meet the classified area requirements as shown on the Bid Procurement Drawings. All instruments shall have either FM/CSA or UL/FM approval.

2.7 MAIN CONTROL PANEL REQUIREMENTS

A. The control panel enclosure shall be rated NEMA 7.

B. Control panel shall meet all applicable requirements of the latest edition of the National Electrical Code and have the UL listing mark for industrial control panels. Panel shall be provided with nameplates and all face mounted devices shall be provided with nameplates and labels of laminated phenolic material with engraved letters legible up to 10 FT from the panel. Power supply shall be drawn from the skid power connection.

C. The System Supplier shall coordinate with the Owner to ensure compatible communications between the control panel and the plant's SCADA system.

D. The control panel shall be equipped with the safety features, functions and interlocks specified herein and recommended by the manufacturer. The control panel shall provide detection of malfunctions and shall shut down the equipment as needed for its protection. Controls shall prevent operation of the equipment when the controls are defective, failed or de-energized. Control interlocks shall include at a minimum: motor torque/current overload shutdown; emergency stop button shutdown; and PLC failure shutdown.

E. The control panel shall be equipped with critical alarm indicator lights and with a red strobe and horn that shall activate upon occurrence of a critical alarm. Critical alarms shall be provided for all system shutdowns, including the following events: motor torque/current overload shutdown; emergency stop pushbutton shutdown; PLC failure shutdown; and other system shutdowns as recommended by the manufacturer.

F. Panel Wiring:

1. All interconnecting wiring shall have 600-volt insulation and be rated for not less than 90°DEGC. All wiring shall be identified by number code. All equipment shall be grounded. Wiring shall use shielded conductors in order to prevent erroneous instrumentation readings.
2. Power distribution wiring on the line side of fuses shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 14 AWG minimum. Electronic analog circuits shall utilize 16 AWG shielded, twisted pair, cable insulated for not less than 600 volts.
3. Power and low voltage DC wiring systems shall be routed in separate wire-ways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 6 IN. Different wiring systems shall terminate on separate terminal blocks. Wiring troughs shall not be filled more than 60% visible fill. Provide separate wire-ways for both field and panel wiring.
4. All wiring shall terminate with crimped ends in a master terminal board, where each terminal is uniquely and sequentially numbered. Direct interlock wiring between equipment will not be allowed. The master terminal board shall have a minimum of 20% spares. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Terminal blocks shall be the screw type.
5. Discrete inputs and outputs (DI and DO) shall have two terminals per point with adjacent terminal assignments. All active and spare points shall be wired to terminal blocks.

6. Analog inputs/outputs (AI and AO) shall have three terminals per shielded pair connection with adjacent terminal assignment for each point. The third terminal is for shielded ground connection for cable pairs. Ground the shielded signal cable at the PLC cabinet. All active and spare points shall be wired to terminal blocks.
7. Wiring within a cabinet shall be done in a wire duct. Low power instrumentation shall be physically separated from 120V and above.
8. Minimum of UL Type 4 cabinets shall be supplied.
9. Terminal blocks for analog circuits shall have test terminals and bypasses for testing and troubleshooting.
10. Wire and tube markers shall be the sleeve type with letters and numbers or wrap around labels.
11. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6 IN of the side panel or adjacent terminal or within 12 IN of the bottom of the panel.
12. Terminal blocks shall have labels indicating the terminal block numbers.
13. All wiring to hand switches, etc., which are live circuits independent of the panel's normal circuit breaker protection shall be clearly identified as such.
14. All wiring shall be clearly tagged and color coded. All tag numbers and color coding shall correspond to the panel wiring diagrams and Loop Drawings prepared by the ISS. All power wiring, control wiring, grounding and DC wiring shall utilize different color insulation for each wiring system used. The color coding scheme shall be per manufactures standard.
15. Provide surge protectors on all incoming power supply lines to the panel.
16. Each field instrument deriving 120 VAC input power from the control panel shall have a separate power distribution circuit with circuit breaker or fuse with a blown fuse indication. Provide 24 VDC power supplies as required to power field instruments and panel devices.
17. Circuit power from the control panel out to field devices (switch, etc.) that are used as discrete inputs to the PLC input cards shall be isolated with an isolating switch terminal block with flip cover that is supplied with a dummy fuse.
18. All PLC discrete outputs to the field shall be isolated with an isolating fuse switch terminal block with a flip cover and a neon or LED blown fuse indicator.
19. PLC discrete outputs shall be supplied with a 5A interposing relay if needed.
20. No terminals shall be allowed to be mounted on the side of the panel.
21. Details of the provisions needed for remote monitoring and control of treatment system equipment and ancillary equipment by the supplier shall be submitted with the shop drawings to the Engineer.
22. Wiring shall be routed above drip pans in order to prevent submersion in standing water or oil mixtures.

G. The control panel shall be equipped to receive the following remote inputs from SCADA over a networked connection using Modbus TCP/IP protocol:
   1. Discrete Inputs:
      a. Start command signal.
      b. Stop command signal.
   2. Analog Inputs:
      a. Systems Pressure(s).
      b. Product Gas H2S Concentration.
      c. Biogas Production Flow.

H. The control panel shall transmit as output signals to SCADA over a networked connection using Modbus TCP/IP protocol all input and outlet signals received and transmitted from instrumentation and motor control equipment, all inputs and outputs to provide an overview of how the system is functioning and critical parameters that need to be monitored. The intent is

for the vendor-supplied control system to be completely visible from the Plant SCADA system. Final list of signals shall be coordinated during the Shop Drawings submittal phase.

I. The Minimum following information shall be displayed on the OIT:

1. Motor status (on, off).
2. Electrically controlled solenoid valve status (open, closed).
3. All analog measurement values from each of the instruments.
4. Digital measurement status and / or values (or associated alarms).
5. Pop-up menus to change status and set-point settings.
6. Any additional monitoring and control signals to be furnished to PLC/OIT shall be as shown in the P&ID Drawings.

2.8 HARDWARE

A. Except where specified otherwise, provide bolts of the best-quality refined stainless steel for equipment assembly. Use hexagonal nuts of the same quality of metal as the bolts. All threads shall be clean cut and shall conform to ANSI B1.1. Fasteners shall be ASTM F593 and ASTM F594 and manufactured of 316 stainless steel.

2.9 ANCHOR BOLTS

A. System Supplier shall design anchorage system, including anchor size, type, and placement for the System, and shall advise Contractor regarding installation. Anchorage design shall account for equipment, 10 IN slab, and equipment curbs and follow local building codes as identified on structural design criteria on Contract Drawings.

B. Anchor bolts, and related hardware (including but not limited to nuts and washers), used to anchor all equipment supplied under this Section shall be Type 316 stainless steel.

C. Contractor is responsible to install the anchorage hardware specified by the System Supplier in accordance with System Supplier's recommendations.

2.10 PIPING INSULATION

A. System Supplier shall provide and installation insulation on all process piping, vessels, and equipment required for either of the following reasons; retain heat for process reasons to optimize the system performance, or for personal protection where skin temperature of piping, vessels, or equipment can exceed 150 DEGF.

B. System supplier shall be responsible for all insulation within any of the skid boundaries, and for off-skid supplier-provided units such as the process gas cooler. The General Contractor will be responsible for insulation outside the skid boundaries on the piping between skids and/or tanks.

C. Insulation Material: 1 IN black foam insulation (Armacell).

D. Jacket: 0.016 IN aluminum insulation jacket (Insul-mate).

E. Adhesive: 3M Neoprene Contact Adhesive 10.

F. Refer to Process Mechanical Insulation and Heat Trace Requirements on Sheet M-1 for piping requirements.

2.11 SURFACE PREPARATION AND SHOP PAINTING

A. All surface preparation and shop painting shall be of correct materials and applied in accordance with this section.

B. Prior to priming and painting, all open ports shall be masked (duct tape is not permitted). Shop clean all ferrous metal surfaces, except stainless steel, by sandblasting in accordance with SP 6 prior to shop priming. Surfaces shall be dry and free of dust, oil, grease, and other foreign material before priming. If, in the opinion of the Engineer, any prime coating that has been improperly applied or if material contrary to this Section has been used, that coating shall be

removed by abrasive blasting to white metal and re-primed. Provide shop priming and painting as specified herein.

C. Remove any prime coats not in accordance with this Section by blast cleaning and apply the specified prime coat at no additional cost to the Owner. Primer shall be Sherwin Williams Fast Clad Zinc, in Manufacturer's color selected by Owner.

D. Shop primed surfaces shall be cleaned thoroughly and damaged or bare spots prepared as approved and retouched with the specified primer before the application of successive paint coats in the field. Paint shall be Sherwin Williams Macropoxy 646, in Manufacturer's color selected by Owner.

E. Shop finish coats, if proposed and allowed, shall be equal in appearance and protection quality to a field applied finish coat. If, in the opinion of the Engineer, a shop finish coat system does not give the appearance and protection quality of other work of similar nature, prepare the surfaces and apply the coat or coats of paint as directed by the Engineer to accomplish the desired appearance and protection quality. Submit to the Engineer substantial evidence that the standard finish is compatible with the specified finish coat. Topcoat shall be Sherwin Williams Acrolon Ultra, in Manufacturer's color selected by Owner.

F. Properly protect the shop prime and finish coats against damage from weather or any other cause. Wash particles from piping weldments after painting.

G. Wherever fabricated equipment is required to be blast cleaned, protect all motors, drives, bearings, gears, etc., from the entry of grit. Equipment found to contain grit shall be promptly and thoroughly cleaned.

H. Apply approved coatings to non-primed surfaces per the manufacturer's recommendations.

2.12 PRESSURE VESSEL SHOP TESTING

A. Pressure vessels shall be tested at the factory for leaks prior to prime coating.

B. Inspection and testing procedures and reports (certified copies of test results) shall be made for each tank. These procedures and reports shall be sent to the Engineer for review and approval prior to shipment.

PART 3 - EXECUTION

3.1 WITNESSED TESTING/INSPECTION

A. The System Supplier of the equipment provided under this Section shall allow inspection and witness of factory and functional tests of the equipment by the Owner at the site of manufacture or assembly. Notification shall be given to Owner 10 business days prior to scheduled witness test.

1. Prior to shipment, and at the Owner's option, Owner shall witness the shop factory and functional test of each component with the job control panel at the manufacturer's assembly location in the United States.
2. If the Owner decides to witness the initial performance testing the owner will cover all expenses for Owner's staffs or representatives to visit the site of manufacture or assembly.

B. Equipment to be Tested Shall Include:

1. All vessels shall undergo air tightness testing to 150% of the maximum operating pressure.
2. All gas piping located on any of the process skids shall undergo air tightness testing to 125% of the maximum operating pressure.
3. Owner may elect to witness equipment testing.

C. Test Conditions:

1. Factory testing may use Manufacturer's motors and controllers.
2. Shop functional testing shall utilize approved job motors, starters and control panels.

3. All circuits shall be checked and all alarms and shutdown conditions simulated to check the alarm circuits.

3.1 INSTALLATION

A. Installation shall be in strict accordance with the System Supplier's instructions and recommendations in the locations shown on the Drawings.

B. Contractor shall be responsible for field installation of system components as determined by System Supplier's proposal. Some items included in Contractor's installation scope are as follows (not all items are listed):

1. Accepting and unloading of equipment skids.
2. Setting equipment skids and required foundations.
3. Installing biogas, compressed air, drain, condensate return, and lubrication oil piping between equipment off-skid equipment. All piping shall be inclusive of pipe supports.
4. Electrical power, ethernet cabling, and instrument wiring to/from equipment skid, Control Panel, and motor starters as necessary.

C. Install all anchor bolts with necessary nuts and washers for the mounting of all equipment supplied. The anchor bolts shall of Type 316 stainless steel. Anchor bolt Layout Drawings shall be supplied to the Engineer with Shop Drawing submittals. Provide any anchor bolts not supplied by the Supplier but needed to anchor to the skid to the pad.

D. Thermal insulation shall be fully installed for off-skid piping and equipment as shown on the Design Drawings and/or required per System Supplier's recommendations prior to system startup. System supplier shall be responsible for all insulation within any of the skid boundaries. The General Contractor will be responsible for installing insulation on piping outside of skid boundaries.

1. Where factory-applied aluminum jacket is specified, factory-supplied aluminum closures with sealing compound shall be used at all joints. Seams shall be located to shed water.
2. Where field-applied aluminum jacket is specified, the jacket shall be attached with aluminum draw bands located within 3 IN of each joint and 24 IN OC maximum. Jacket on outdoor piping shall have joints arranged to shed water.
3. Fittings shall be wrapped with blanket insulation to provide the same insulation value as required for straight piping. PVC fitting covers, where specified, shall be attached with tacks and taping to the adjacent pipe insulation. Aluminum fitting covers shall be attached by aluminum draw bands with joints located to shed water.

3.2 COMMISSIONING AND STARTUP

A. Refer to Paragraph 1.10 of this Specification.

END OF SECTION

VALKYRIE ECO - 300 LB/D
SOUTH SIOUX CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM 43 13 41
AFE # 8106

DRAWING INDEX

DRAWING DESCRIPTION	DRAWING #	SHEET #	EQUIPMENT PER DRAWING	REV	DATE
DRAWING INDEX	8106-DW-PS-02-001	1 OF 14		9	6/27/2025
LEGENDS AND SYMBOLS 1 OF 3	8106-DW-PS-02-002	2 OF 14		6	5/14/2025
LEGENDS AND SYMBOLS 2 OF 3	8106-DW-PS-02-003	3 OF 14		6	5/14/2025
LEGENDS AND SYMBOLS 3 OF 3	8106-DW-PS-02-004	4 OF 14		6	5/14/2025
SOUR GAS TREATMENT	8106-DW-PS-02-005	5 OF 14		7	5/24/2025
SURGE TANK BULK SEPARATOR	8106-DW-PS-02-006	6 OF 14	V-2010, A-8011, A-8012, A-8013	7	5/24/2025
TALON CIRCULATION PUMP	8106-DW-PS-02-007	7 OF 14	P-3000, P-3030	7	5/24/2025
REGENERATOR	8106-DW-PS-02-008	8 OF 14	V-2030, C-3510, A-8520	6	5/14/2025
SULFUR REMOVAL SYSTEM	8106-DW-PS-02-009	9 OF 14	PK-7210, A-8510, TK-2040, P-3100	8	6/25/2025
CHEMICAL ADDITIVE SYSTEM	8106-DW-PS-02-010	10 OF 14	TK-4520, TK-4530, TK-4540, P-3220, P-3230, P-3240, PK-7160, V-7150	7	5/24/2025
PLANT INSTRUMENT AIR	8106-DW-PS-02-011	11 OF 14	V-2250	7	5/24/2025
POLISHER VESSEL	8106-DW-PS-02-012	12 OF 14	V-2015, P-3015	6	5/14/2025
EGD ALARM AREA HEATERS & VENTILATION	8106-DW-PS-02-013	13 OF 14		7	6/27/2025
INLET AND OUTLET SEPARATORS	8106-DW-PS-02-013	14 OF 14	V-2110, P-3110, V-2030, P-3030	7	5/24/2025

NOTES:

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
9	06/27/25	ADDED HEAT TRACE CONTROLLERS	MCT	CL	CL
1	02/03/25	REVISED AS NOTED	LU	CL	CL
2	04/25/25	REVISED PER REDLINES	MCT	JC	CL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS DWG	MCT	LU	CL
4	05/08/25	REVISED AS NOTED	LU	JT	CL
5	05/12/25	REVISED AS NOTED	LU	CL	CL
6	05/14/25	INSULATION THICK. UPDATED	LU	CL	CL
7	05/24/25	REVISED AS NOTED	LU	CL	CL
8	06/25/25	REVISED AS NOTED	LU	LU	CL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

Streamline®

ENGINEERING RECORD		
DRAWN BY		
CHECKED		
SQUAD LEADER		
PROCESS ENGINEER		
PROJECT ENGINEER		
PROJECT MANAGER		

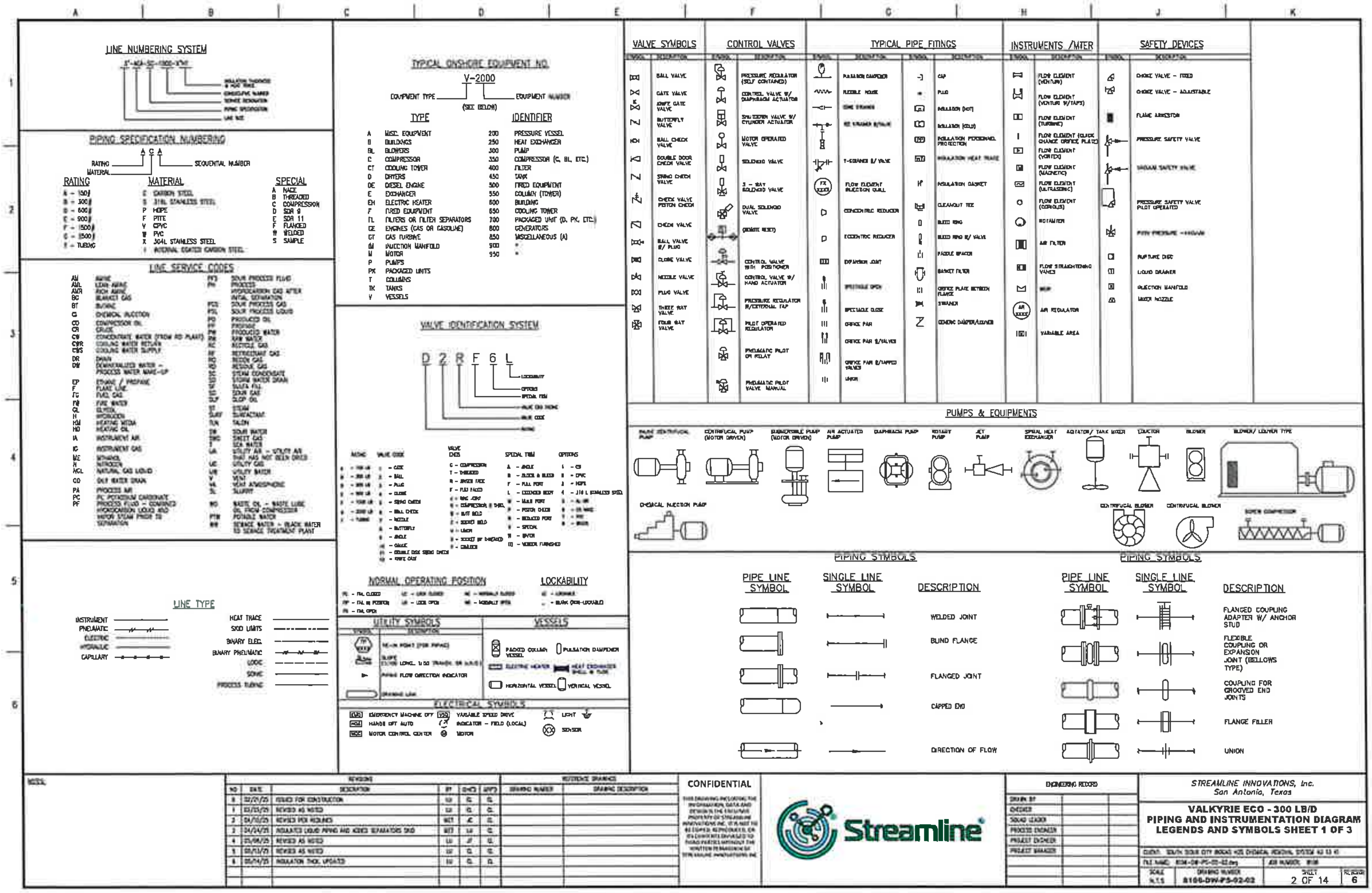
STREAMLINE INNOVATIONS, Inc.
San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
DRAWING INDEX

CLIENT: SOUTH SIOUX CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM 43 13 41

FILE NAME: 8106-DW-PS-02-01.dwg | JOB NUMBER: 8106

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8106-DW-PS-02-01	1 OF 14	9


LINE NUMBERING SYSTEM
PIPING SPECIFICATION NUMBERING
LINE SERVICE CODES
LINE TYPE
TYPICAL ONSHORE EQUIPMENT NO.
V-2000
TYPE
IDENTIFIER
VALVE IDENTIFICATION SYSTEM
D 2 R F 6 L
NORMAL OPERATING POSITION
LOCKABILITY
UTILITY SYMBOLS
VESSELS
ELECTRICAL SYMBOLS
VALVE SYMBOLS
CONTROL VALVES
TYPICAL PIPE FITTINGS
INSTRUMENTS /MTER
SAFETY DEVICES
PUMPS & EQUIPMENTS
PIPING SYMBOLS
PIPE LINE SYMBOL
SINGLE LINE SYMBOL
DESCRIPTION
WELDED JOINT
BLIND FLANGE
FLANGED JOINT
CAPPED END
DIRECTION OF FLOW
FLANGED COUPLING ADAPTER W/ ANCHOR STUD
FLEXIBLE COUPLING OR EXPANSION JOINT (BELLOWS TYPE)
COUPLING FOR GROOVED END JOINTS
FLANGE FILLER
UNION
CONFIDENTIAL
Streamline
ENGINEERING RECORD
STREAMLINE INNOVATIONS, Inc.
San Antonio, Texas
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
LEGENDS AND SYMBOLS SHEET 1 OF 3
N.T.S.
2 OF 14
6

INSTRUMENT IDENTIFICATION TABLE

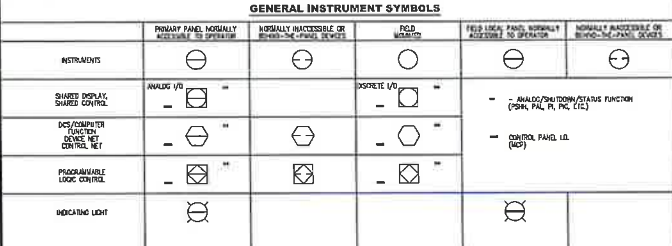
SYMBOL	MEASURED OR INITIAL VARIABLE	PRIMARY ELEMENT	WELL	READOUT (RECORDING)	READOUT (INDICATING)	TRANSMITTER (BLIND)	TRANSMITTER (RECORDING)	TRANSMITTER (INDICATING)	REGULATOR (LOCAL)	CONTROLLER (RECORDING)	CONTROLLER (INDICATING)	CONTROLLER (BLIND)	CONTROL VALVE	CONTROL VALVE (DAMPER/LOUVER)	FINAL CONTROL ELEMENT	ALARM: BLIND	ALARM: LOW / LOW LOW	ALARM: HIGH / HIGH HIGH	SWITCHES: INDICATING	SWITCHES: BLIND	SWITCHES: RELAY	SHUTDOWN LOW (ESL)	SHUTDOWN HIGH (XSH)	MISC.: SAFETY DEVICE
A	ANALYSIS	AE	AW	AR	AI	AT	ART	AIT		ARC	AIC	AC		AV		AA	AAL/AALL	AAH/AAHH	AIS	AS	AY	ASL	ASH	
B	BURNER, COMBUSTION	BE	BW	BR	BI	BT	BRT	BIT	BC	BRC	BIC	BC			BZ	BA	BAL/BALL	BAH/BAHH	BIS	BS	BY	BSL	BSH	
C	CONDUCTIVITY (ELECTRICAL)	CE		CR	CI	CT	CRT	CIT		CRC	CIC	CC			CZ	CA	CAL/CALL	CAH/CAHH	CIS	CS	CY	CSL	CSH	
D	DENSITY OR SPECIFIC GRAVITY	DE		DR	DI	DT	DRT	DIT		DRC	DIC	DC				DA	DAL/DALL	DAH/DAHH	DIS	DS	DY	DSL	DSH	
E	VOLTAGE (EMF)	EE		ER	EI	ET	ERT	EIT		ERC	EIC	EC			EZ	EA	EAL/EALL	EAH/EAHH	EIS	ES	EY	ESL	ESH	
F	FLOW	FE		FR	FI	FT	FRT	FIT	FG	FRC	FIC	FC	FCV	FV		FA	FAL/FALL	FAH/FAHH	FIS	FS	FY	FSL	FSH	
G	USER'S CHOICE																							
H	HAND INITIATED										HIC	HC	HCV	HV						HS	HY			
I	CURRENT (ELECTRICAL)	IE		IR	II	IT	IRT	IIT		IRC	IIC				IZ	IA	IAL/IALL	IAH/IAHH	IIS	IS	IY	ISL	ISH	
J	POWER	JE		JR	JI	JT	JRT	JIT		JRC	JIC				JZ	JA	JAL/JALL	JAH/JAHH	JIS	JS	JY	JSL	JSH	
K	TIME OR TIME SCHEDULE	KE		KR	KI	KT	KRT	KIT		KRC	KIC	KC	KCV		KZ	KA	KAL/KALL	KAH/KAHH	KIS	KS	KY	KSL	KSH	
L	LEVEL	LE	LW	LR	LI	LT	LRT	LIT	LG	LRC	LIC	LC	LCV	LV		LA	LAL/LALL	LAH/LAHH	LIS	LS	LY	LSL	LSH	
M	USER'S CHOICE																							
N	USER'S CHOICE																							
O	USER'S CHOICE																							
P	PRESSURE OR VACUUM	PE		PR	PI	PT	PRT	PIT	PG	PRC	PIC	PC	PCV	PV		PA	PAL/PALL	PAH/PAHH	PIS	PS	PY	PSL	PSH	PSV, PSE
Q	QUANTITY OR EVENT	QE		QR	QI	QT	QRT	QIT		QRC	QIC				QZ	QA	QAL/QALL	QAH/QAHH	QIS	QS	QY	QSL	QSH	
R	RADIOACTIVITY	RE	RW	RR	RI	RT	RRT	RIT		RRC	RIC	RC			RZ	RA	RAL/RALL	RAH/RAHH	RIS	RS	RY	RSL	RSH	
S	SPEED OR FREQUENCY	SE		SR	SI	ST	SRT	SIT		SRC	SIC	SC	SCV	SV	SZ	SA	SAL/SALL	SAH/SAHH	SIS	SS	SY	SSL	SSH	
T	TEMPERATURE	TE	TW	TR	TI	TT	TRT	TIT	TG	TRC	TIC	TC	TCV	TV		TA	TAL/TALL	TAH/TAHH	TIS	TS	TY	TSL	TSH	TSE
U	MULTI-VARIABLE OR UNIT													UV		UA					UY		UJ	
V	VIBRATION	VE		VR	VI	VT	VRT	VIT								VA		VAH/VAHH	VIS	VS	VY		VSH	
W	WEIGHT OR FORCE	WE		WR	WI	WT	WRT	WIT		WRC	WIC	WC	WCV		WZ	WA	WAL/WALL	WAH/WAHH	WIS	WS	WY	WSL	WSH	
X	UNCLASSIFIED											XC		XV		XA	XAL/XALL	XAH/XAHH		XS	XY			
Y	EVENT, STATE OR PRESENCE																							
Z	POSITION	ZE		ZR	ZI	ZT	ZRT	ZIT		ZRC	ZIC	ZC	ZCV	ZV		ZA	ZAL/CLOSE	ZAH/OPEN	ZIS	ZS	ZY			

* S, SWITCH, THE ACTUATING DEVICE MAY BE USED IN THE SAME FASHION AS A, ALARM, THE ANNUNCIATING DEVICE.

GENERAL INSTRUMENT ABBREVIATIONS

AP	ANALYTICAL POINT (MANUAL SAMPLE POINT)
ASH	COMBUSTIBLE GAS DETECTOR
BDV	BLOW DOWN VALVE
EFM	ADD TOTAL FLOW COMPUTER
ESD	EMERGENCY SHUTDOWN SYSTEM
(f)	VENDOR FURNISHED
FCP	FIELD CONTROL PANEL (ADD MODIFIER OR MULTIPLE PANELS)
MCP	MASTER CONTROL PANEL
OSH	TOXIC GAS DETECTOR
PDI	PRESSURE DIFFERENTIAL INDICATOR
PSE	PRESSURE SAFETY ELEMENT
ROV	MOTOR OPERATED VALVE
RTD	RESISTANCE TEMPERATURE DETECTOR
RTD	RESISTANCE TEMPERATURE DETECTOR
SDV	SHUTDOWN VALVE
SDY	SHUTDOWN RELAY/SOLENOID
SY	SOLENOID VALVE
TSE	FUSIBLE PLUG
TSH	THERMAL DETECTOR OR TEMPERATURE SWITCH HIGH
USH	FLAME DETECTOR (UV, IR, ETC.)
WCP	WELL CONTROL PANEL (ADD MODIFIER OR MULTIPLE PANELS)
	SMOKE DETECTOR

GENERAL INSTRUMENT SYMBOLS



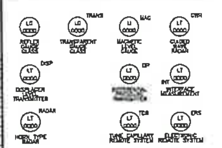
INSTRUMENT TAG NUMBER

PSH-1000

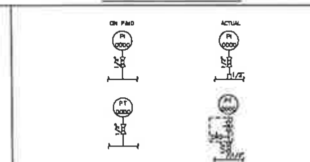
DEVICE IDENTIFIER — PSH

4 DIGIT LOOP NUMBERS BASED ON COMPONENT NUMBER — 1000

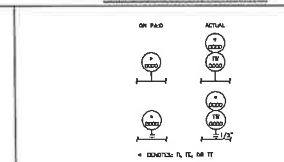
LEVEL INSTRUMENT



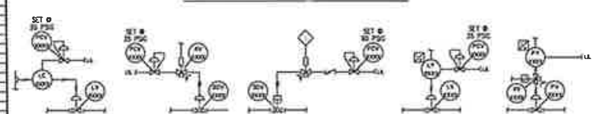
PRESSURE INSTRUMENT



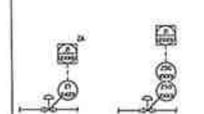
TEMPERATURE INSTRUMENT



INSTRUMENT AIR SUPPLY USER DETAIL

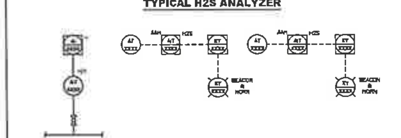


TYPICAL POSITIONER DETAIL



◇	INTERLOCK
	HIGH SELECT
	LOW SELECT
A/M	AUTO MANUAL
I/E	CURRENT TO VOLTAGE TRANSDUCER
I/P	CURRENT TO PNEUMATIC TRANSDUCER
P/E	PNEUMATIC TO VOLTAGE

TYPICAL H2S ANALYZER



ABBREVIATIONS

AC	AIR TO CLOSE
AO	AIR TO OPEN
AP	ANALYTICAL POINT (MANUAL SAMPLE POINT)
BCP	BURNER CONTROL PANEL
BF	BLIND FLANGE
CCP	COMPRESSOR CONTROL PANEL
CF	CUSTOMER FURNISHED
CSC/CSO	CAR SEAL OPEN/CLOSED
CWR	COOLING WATER RETURN
CWS	COOLING WATER SUPPLY
DA	DIRECT ACTING
DCS	DISTRIBUTED CONTROL SYSTEM
ELEV	ELEVATION
EOP	END OF PIPE
ERS	ELECTRONIC REMOTE SENSOR
FC	FAIL CLOSED
(f)	VENDOR FURNISHED
F/F	FACE OF FLANGE
FO	FAIL OPEN
GCP	GLYCOL CONTROL PANEL
HC	HEAT CONSERVATION INSULATION
HH	HANDHOLE
HS	HAND SWITCH
IA	INSTRUMENT AIR SUPPLY
IG	INSTRUMENT GAS SUPPLY
IM	INJECTION MANIFOLD
IS	INSTRUMENT SUPPLY
LC	LOCKED CLOSED
LO	LOCKED OPEN
LS	LIQUID SEAL
MAWP	MAXIMUM ALLOWABLE WORKING PRESSURE
MCC	MOTOR CONTROL CENTER
MLW	MEAN LOW WATER
MS	MOTOR STARTER
MSL	MEAN SEA LEVEL
MW	MANWAY
NC	NORMALLY CLOSED
NLL	NORMAL LIQUID LEVEL
NNF	NORMALLY NO FLOW
NO	NORMALLY OPEN
OP	OPERATING PRESSURE
OT	OPERATING TEMPERATURE
PCP	PUMP CONTROL PANEL
PLC	PROGRAMMABLE LOGIC CONTROLLER
PP	PERSONNEL PROTECTION INSULATION
RA	REVERSE ACTING
RO	RESTRICTION ORIFICE
RTU	REMOTE TERMINAL UNIT
SC	SAMPLE CONNECTION
SITP	SHUT-IN TUBING PRESSURE
SR	STRESS RELIEVE
S/S	SEAM TO SEAM
T/T	TANGENT TO TANGENT
VRUP	VRU CONTROL PANEL
UAS	UTILITY AIR SYSTEM
TCRS	TUNED CAPILLARY REMOTE SEAL

NOTES:

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/21/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	03/13/25	REVISED AS NOTED	LU	CL	CL
2	04/10/25	REVISED PER REDLINES	MIT	JC	CL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS SKID	MIT	LU	CL
4	05/08/25	REVISED AS NOTED	LU	JT	CL
5	05/12/25	REVISED AS NOTED	LU	CL	CL
6	05/14/25	INSULATION THICK. UPDATED	LU	CL	CL

REFERENCE DRAWINGS	
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STREAMLINE INNOVATIONS, Inc.
San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
LEGENDS AND SYMBOLS SHEET 2 OF 3

CLIENT: SOUTH SIOUX CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM AS 12 W

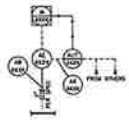
FILE NAME: 8106-DW-PS-02-03.dwg | JOB NUMBER: 8106

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8106-DW-PS-02-03	3 OF 14	6

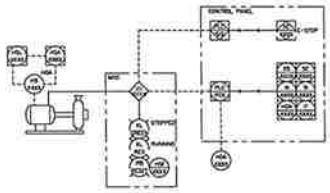
AIT DETAIL (LIQUID)

ON P&ID

ACTUAL



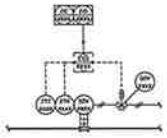
MOTOR DETAIL (PCS CONTROLLED WITH VFD)



SDV INSTRUMENTATION

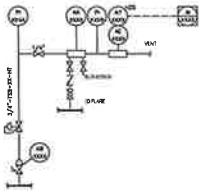
ON P&ID

ACTUAL

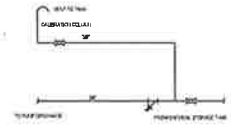


AP (GAS) DETAIL

AIT DETAIL (GAS)

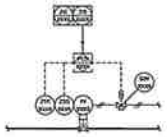


CHEMICAL INJECTION MANIFOLD

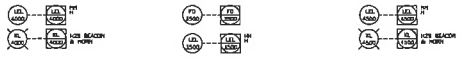


ON P&ID

ACTUAL

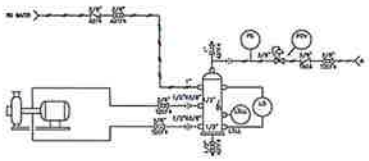


F&G INSTRUMENTATION



TYPICAL STD. DETAIL FOR PIPE TO TUBING

SEAL PLAN DETAIL 01



NOTES:

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/20/25	ISSUED FOR CONSTRUCTION	LJ	DL	DL
1	02/25/25	REVISED AS NOTED	LJ	DL	DL
2	04/10/25	REVISED PER REVIEWS	MCT	JC	DL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATOR SKID	MCT	LJ	DL
4	05/28/25	REVISED AS NOTED	LJ	JC	DL
5	07/11/25	REVISED AS NOTED	LJ	DL	DL
6	07/14/25	INSULATION THICK UPDATED	LJ	DL	DL

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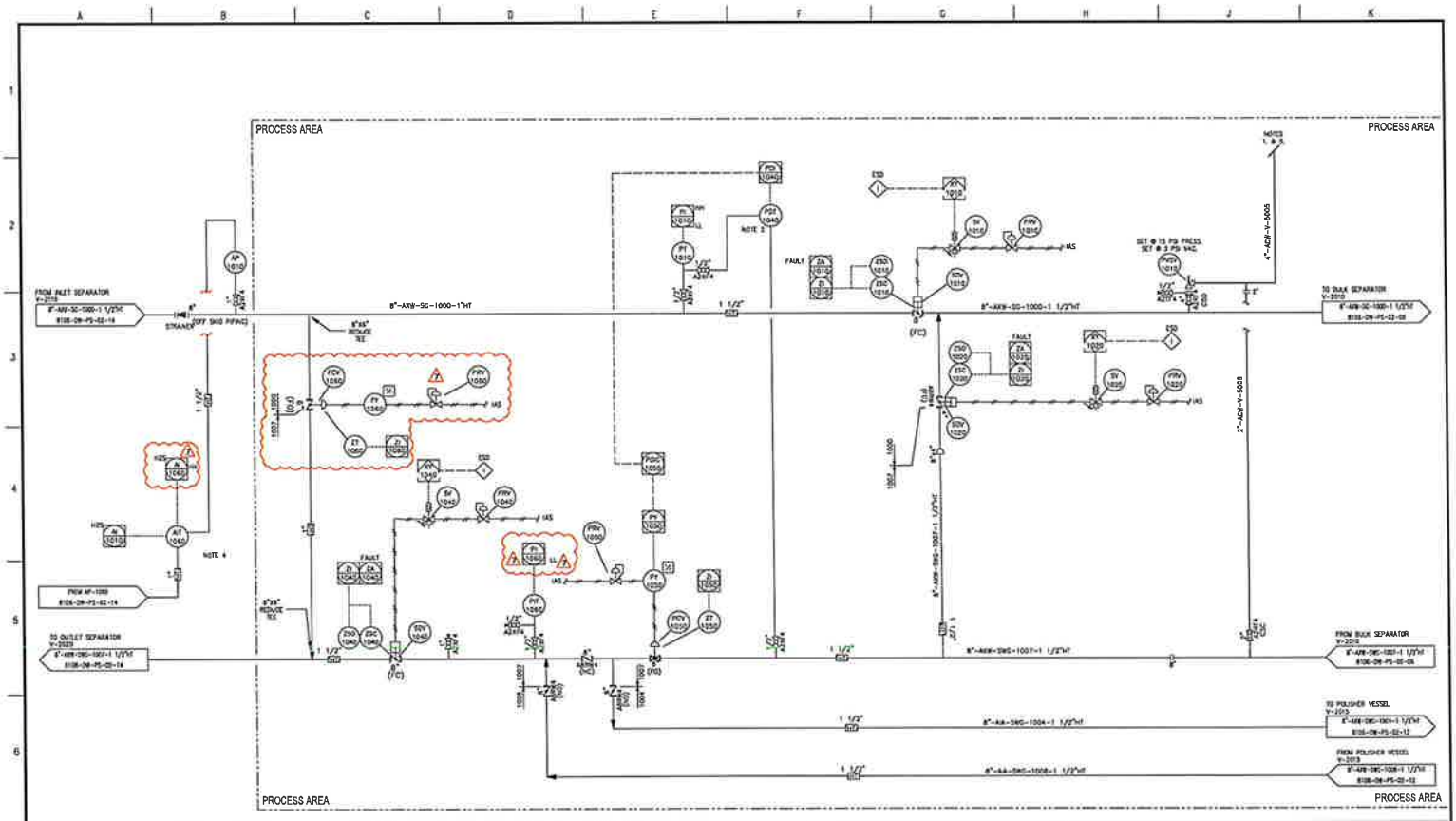
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
LEGENDS AND SYMBOLS SHEET 3 OF 3

CLIENT: SOUTH SIOUX CITY BIOGAS #23 CHEMICAL RENDERAL SYSTEM 42 13 41

FILE NAME: 8106-DW-PS-02-04.dwg | JOB NUMBER: 8106

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S	8106-DW-PS-02-04	4 OF 14	6



NOTES:
1. VENT TO SAFE LOCATION.
2. PT-100 CONNECTION TO LP SIDE OF DPT & 5 WAY MANIFOLD.
3. P-TRAP AT VESSEL CONNECTION.
4. DUAL STREAM ANALYZER.
5. 90° TO HORIZONTAL TO AVOID LIQUID ENTRENCHMENT.

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
8	02/27/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
7	02/25/25	REVISED AS NOTED	LU	CL	CL
6	04/15/25	REVISED PER REQUIRED	MST	JC	CL
5	04/24/25	REVISED LIQUID PIPING AND ADDED SEPARATORS SKID	MST	LU	CL
4	05/06/25	REVISED AS NOTED	LU	JC	CL
3	05/12/25	REVISED AS NOTED	LU	JC	CL
2	05/24/25	REGULATOR TAGS, UPDATED	LU	CL	CL
1	05/24/25	REVISED AS NOTED	LU	CL	CL

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San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
SOUR GAS TREATMENT

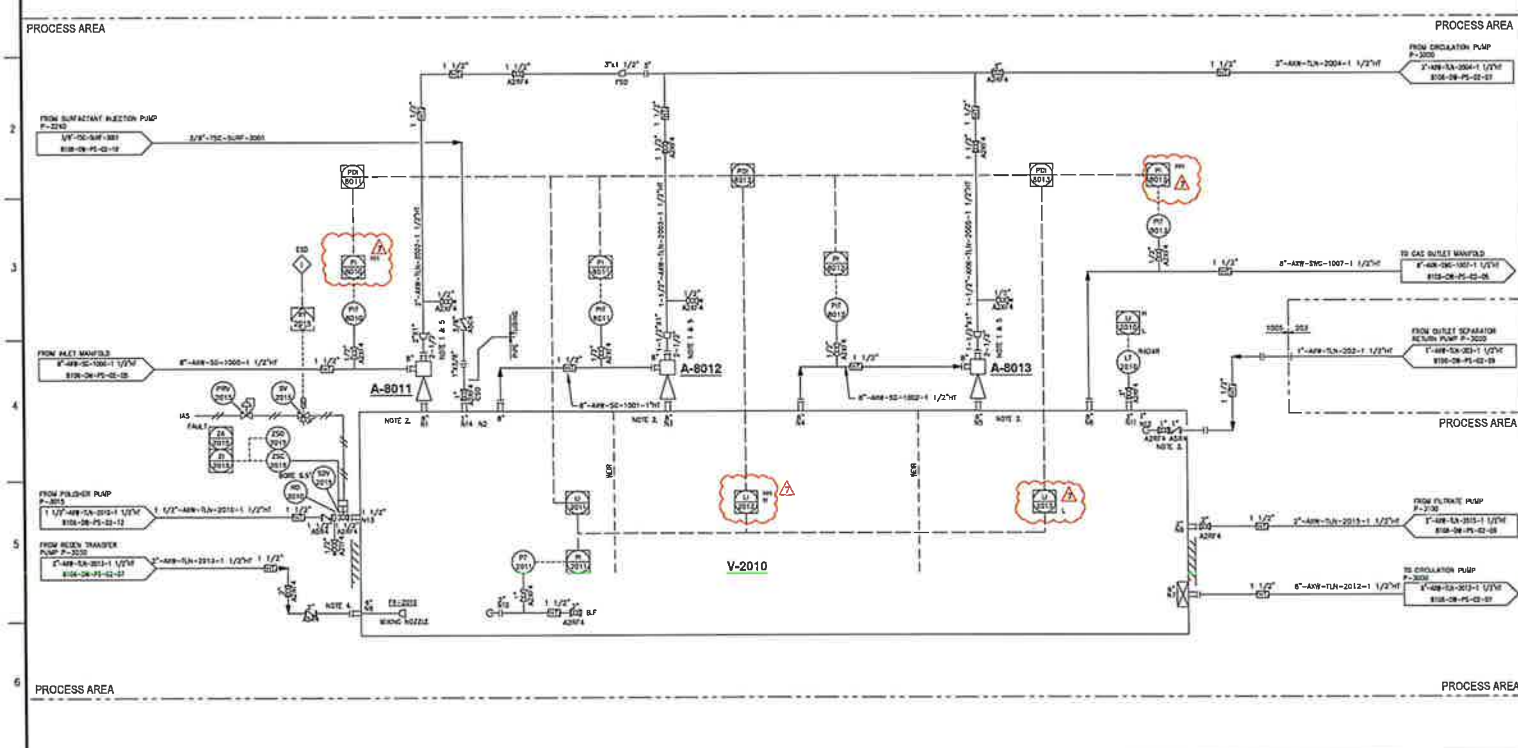
CLIENT: SOUTH SOUR CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM 42 12 41			
FILE NAME: 8106-DW-PS-02-05.dwg		JOB NUMBER: 8106	
SCALE: N.T.S	DRAWING NUMBER: 8106-DW-PS-02-05	SHEET: 5 OF 14	REVISION: 7

V-2010
BULK SEPARATOR
INTERNAL: 15 PSIG @ 200'F
EXTERNAL: 5 PSIG @ 200'F
NON-CODE RATED
MATERIALS: 304SS
CAPACITY: 725 GAL

A-8011
PROCESS EDUCTOR
MOTIVE FLOW: 33 GPM @ 120 PSIG
SUCTION FLOW: 835 SCFM @ 2 IN WC
INTERNAL: 15 PSIG @ 300'F
EXTERNAL: FV @ 200'F

A-8012
PROCESS EDUCTOR
MOTIVE FLOW: 29 GPM @ 120 PSIG
SUCTION FLOW: 835 SCFM @ 2 IN WC
INTERNAL: 15 PSIG @ 300'F
EXTERNAL: FV @ 200'F

A-8013
PROCESS EDUCTOR
MOTIVE FLOW: 29 GPM @ 120 PSIG
SUCTION FLOW: 835 SCFM @ 2 IN WC
INTERNAL: 15 PSIG @ 300'F
EXTERNAL: FV @ 200'F



NOTES:

1. MOTIVE FLUID CONNECTION, 1" NPT TAP IN A 2-1/2" 150# CLASS BLIND FLANGE.
2. 0.25" SPACER PLATE.
3. ANTI-FREEZE BALL VALVE, 150 CL RF
4. 8" BLIND FLANGE W/ 2" TAP CONNECTION.
5. S-K 7010 EDUCTOR, 8in LARGE NOZZLES.

REVISIONS

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/21/25	ISSUED FOR CONSTRUCTION	LU	GL	GL
1	03/25/25	REVISED AS NOTED	LU	GL	GL
2	04/10/25	REVISED PER REDLINES	MIT	JK	GL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS SKID	MIT	LU	GL
4	05/08/25	REVISED AS NOTED	CH	JT	GL
5	05/13/25	REVISED AS NOTED	LU	GL	GL
6	05/14/25	INSULATION THICK UPDATED	LU	GL	GL
7	05/24/25	REVISED AS NOTED	LU	GL	GL

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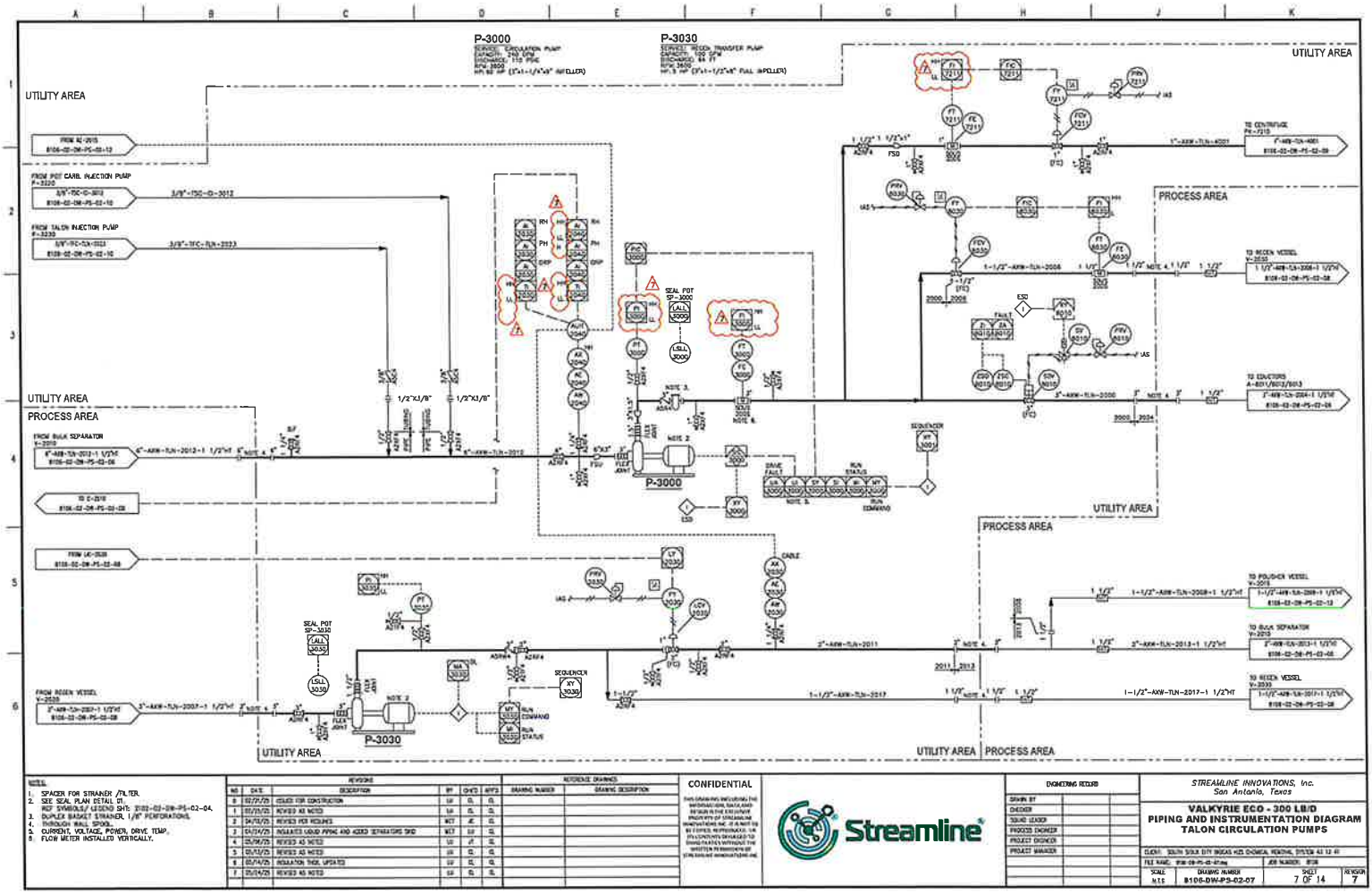
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
BULK SEPARATOR

CLIENT: SOUTH SIOUX CITY

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8106-DW-PS-02-06	6 OF 14	7



NOTES:
1. SPACER FOR STRAINER /FILTER.
2. SEE SEAL PLAN DETAIL 01.
   P&ID SYMBOLS/ LEGEND SHT: 2102-02-DW-PS-02-04.
3. DUPLEX BASKET STRAINER, 1/8" PERFORATIONS.
4. THROUGH WALL SPOOL.
5. CURRENT, VOLTAGE, POWER, DRIVE TEMP.
6. FLOW METER INSTALLED VERTICALLY.

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/27/25	ISSUED FOR CONSTRUCTION	LH	CL	CL
1	03/03/25	REVISED AS NOTED	LH	CL	CL
2	04/03/25	REVISED PER HOLDING	MCT	JC	CL
3	04/04/25	REVISED LIQUID PIPING AND ADDED SEPARATORS SKID	MCT	LH	CL
4	05/09/25	REVISED AS NOTED	LH	JC	CL
5	05/13/25	REVISED AS NOTED	LH	CL	CL
6	05/14/25	REGULATOR TAGS UPDATED	LH	CL	CL
7	05/16/25	REVISED AS NOTED	LH	CL	CL

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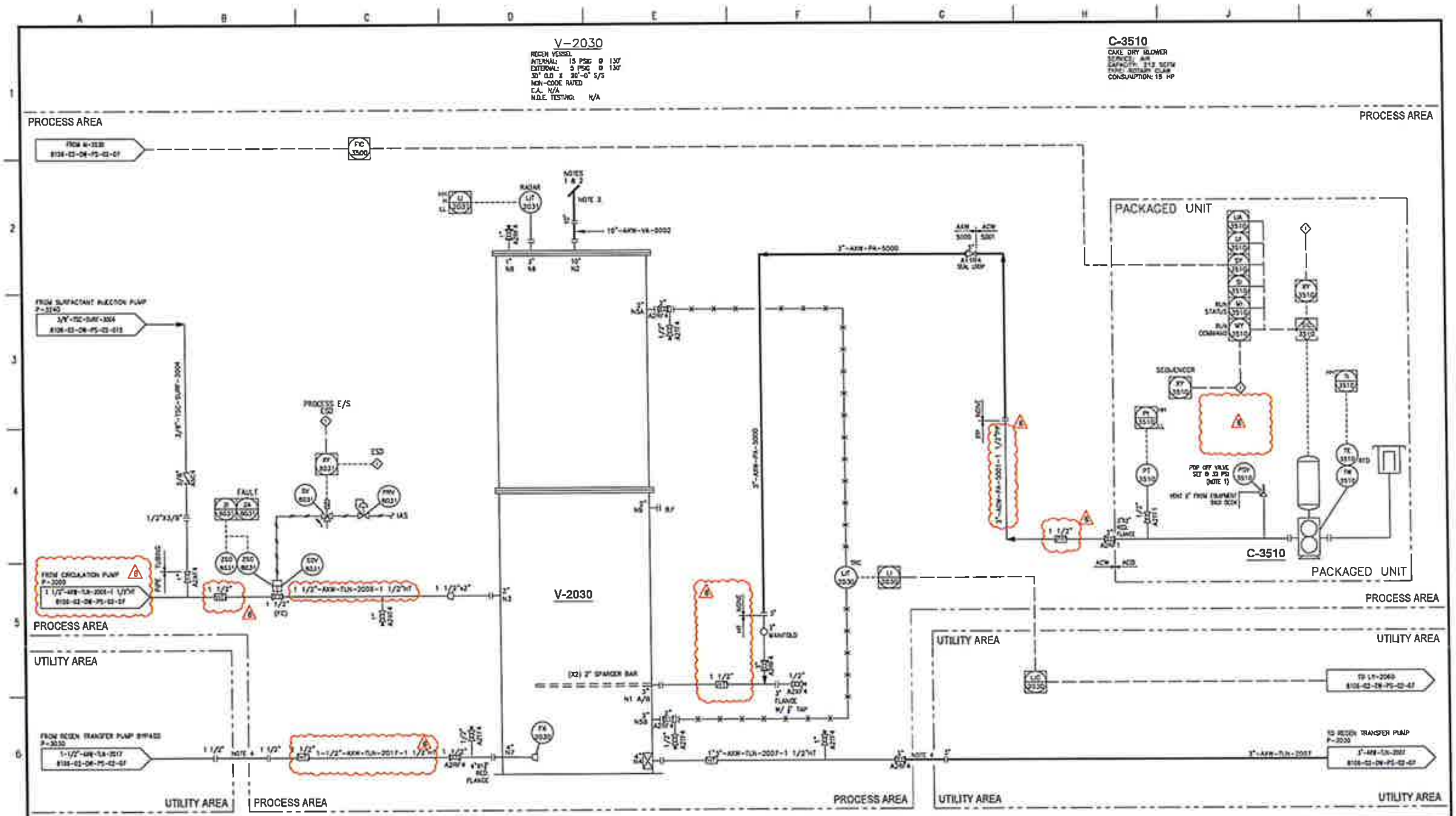
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
TALON CIRCULATION PUMPS

CLIENT: SOUTH SIOUX CITY BIOGAS HUB CHEMICAL HEATING SYSTEM 42 12 41
FILE NAME: 8106-DW-PS-02-07.dwg
JOB NUMBER: 8106

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S	8106-DW-PS-02-07	7 OF 14	7



NOTES:
1. VENT TO SAFE LOCATION.
2. VENT SCREENS.
3. REMOVABLE SPOOL FOR MIST ELIMINATOR.
4. THROUGH WALL SPOOL.
5. CURRENT, VOLTAGE, POWER, DRIVE TEMP.

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/21/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	03/03/25	REVISED AS NOTED	AH	CL	CL
2	04/14/25	REVISED PER REQUEST	MET	JE	CL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS [illegible]	MET	LU	CL
4	05/06/25	REVISED AS NOTED	LU	JT	CL
5	05/13/25	REVISED AS NOTED	LU	CL	CL
6	05/14/25	INSULATION THICK. UPDATED	LU	CL	CL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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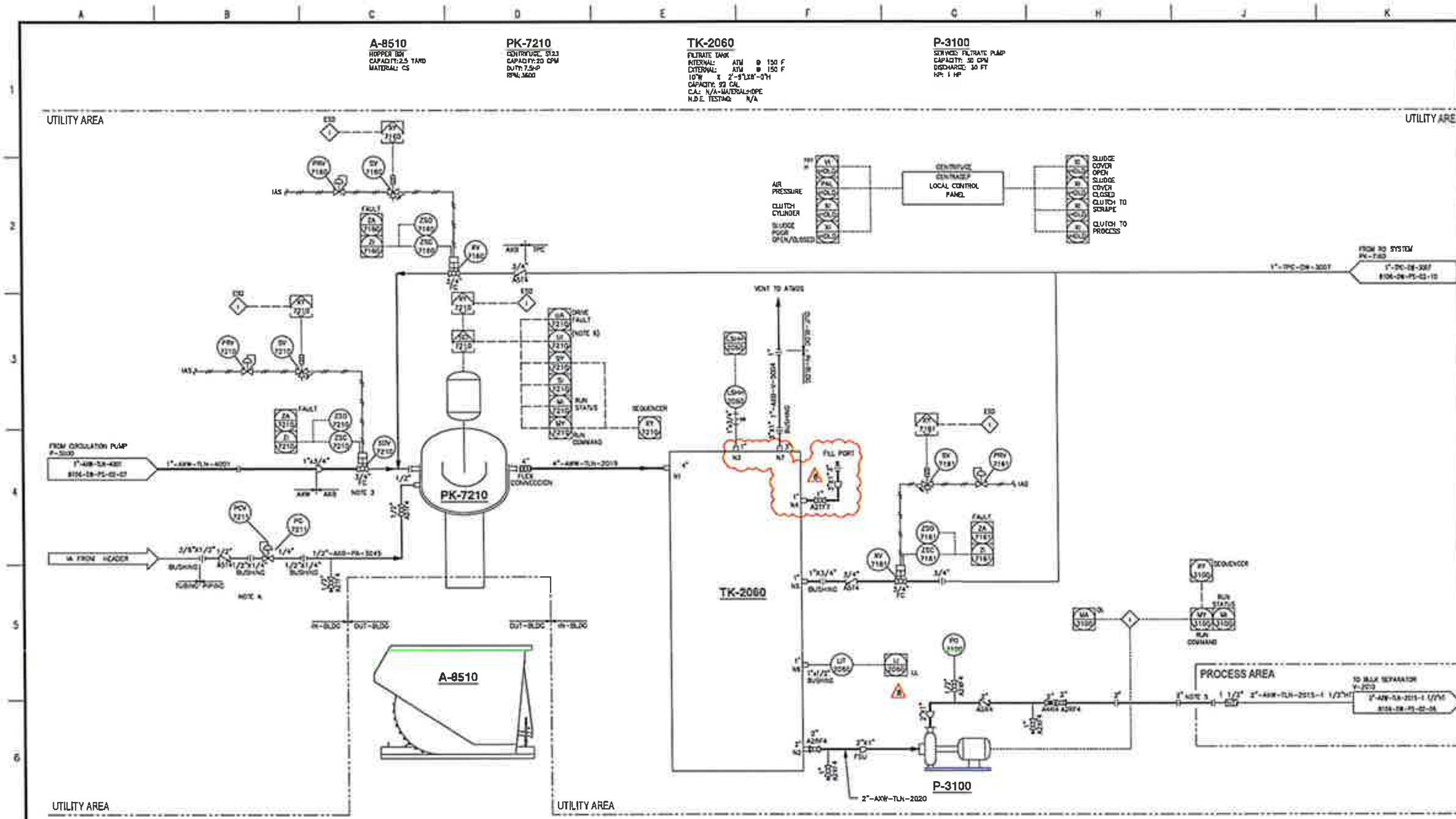
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
REGENERATOR

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8100-DW-PS-02-08	8 OF 14	6



NOTES:

1. VENT TO SAFE LOCATION.
2. VENT SCREENS.
3. SUPPLIED BY PK-7120 VENDOR
4. 12 SCFM PURGE.
5. THROUGH WALL SPOOL.
6. CURRENT, VOLTAGE, POWER, DRIVE TEMP.

REVISIONS

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/7/25	ISSUED FOR CONSTRUCTION	[illegible]	[illegible]	[illegible]
1	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]
2	[illegible]	REVISED PER REDLINES	[illegible]	[illegible]	[illegible]
3	[illegible]	INSULATED LIQUID PIPING AND ADDED SEPARATORS [illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]
5	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]
6	[illegible]	INSULATION THICK. UPDATED	[illegible]	[illegible]	[illegible]
7	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]
8	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]

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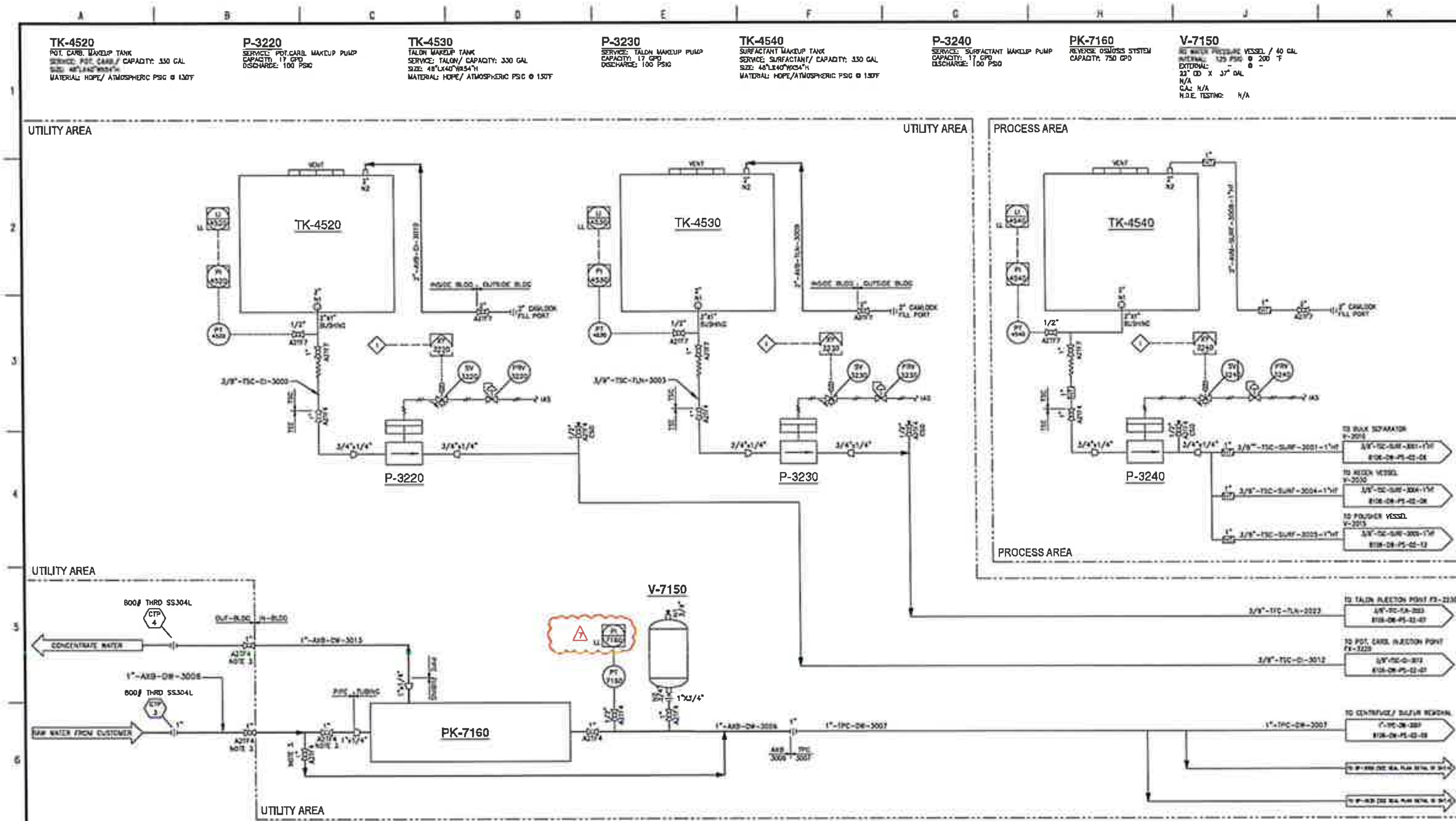
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
SULFUR REMOVAL SYSTEM

CLIENT: [illegible]

FILE NAME: [illegible] | JOB NUMBER: [illegible]

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8106-DW-PS-02-09	9 OF 14	8



NOTES:
1. PUMP TO BE INSTALLED IN INDIVIDUAL CONTAINMENT.
2. TUBING CONNECTION TO BE ROUTED ON FABRICATION SHOP.
3. ANTI-FREEZE BALL VALVE.

REVISIONS

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/27/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	03/21/25	REVISED AS NOTED	LU	CL	CL
2	04/10/25	REVISED PER REDLINES	MET	JE	CL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS TAGS	MET	LU	CL
4	05/08/25	REVISED AS NOTED	LU	JE	CL
5	05/13/25	REVISED AS NOTED	LU	CL	CL
6	05/14/25	INSULATION THICK. UPDATED	LU	CL	CL
7	05/24/25	REVISED AS NOTED	LU	CL	CL

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING DESCRIPTION

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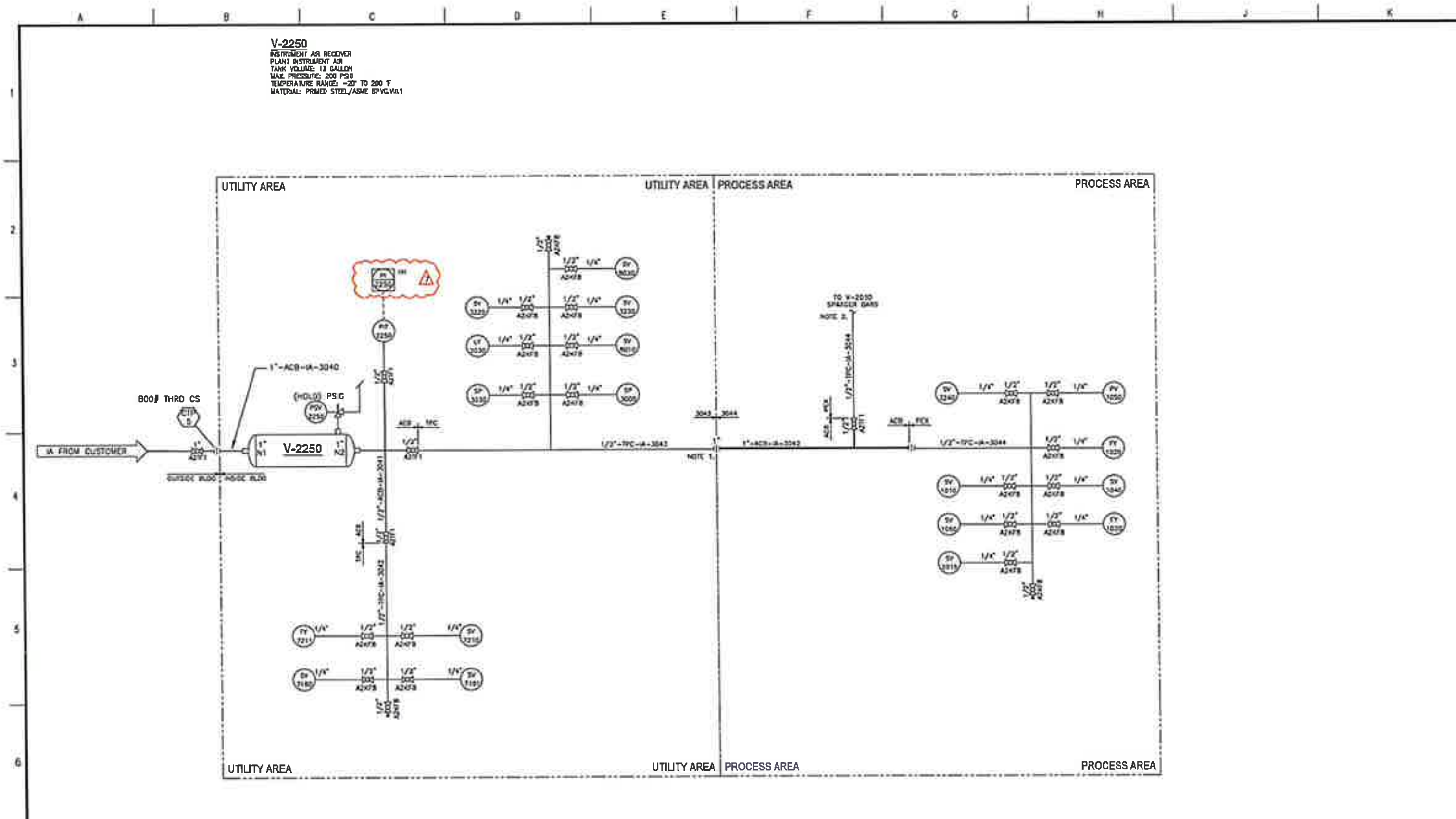
San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
CHEMICAL ADDITIVE SYSTEM

CLIENT: SOUTH SIOUX CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8106-DW-PS-02-10	10 OF 14	7



NOTES:

1. THROUGH WALL THREADED COUPLING.
2. PROVISIONAL CONNECTION FOR SPARGER BAR CLEANOUT.

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/27/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	03/25/25	REVISED AS NOTED	LU	CL	CL
2	04/10/25	REVISED PER REDLINES	MET	JE	CL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS SKID	MET	LU	CL
4	05/06/25	REVISED AS NOTED	LU	JT	CL
5	05/13/25	REVISED AS NOTED	LU	CL	CL
6	05/14/25	INSULATION THICK. UPDATED	LU	CL	CL
7	05/14/25	REVISED AS NOTED	LU	CL	CL

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DRAWING NUMBER	DRAWING DESCRIPTION

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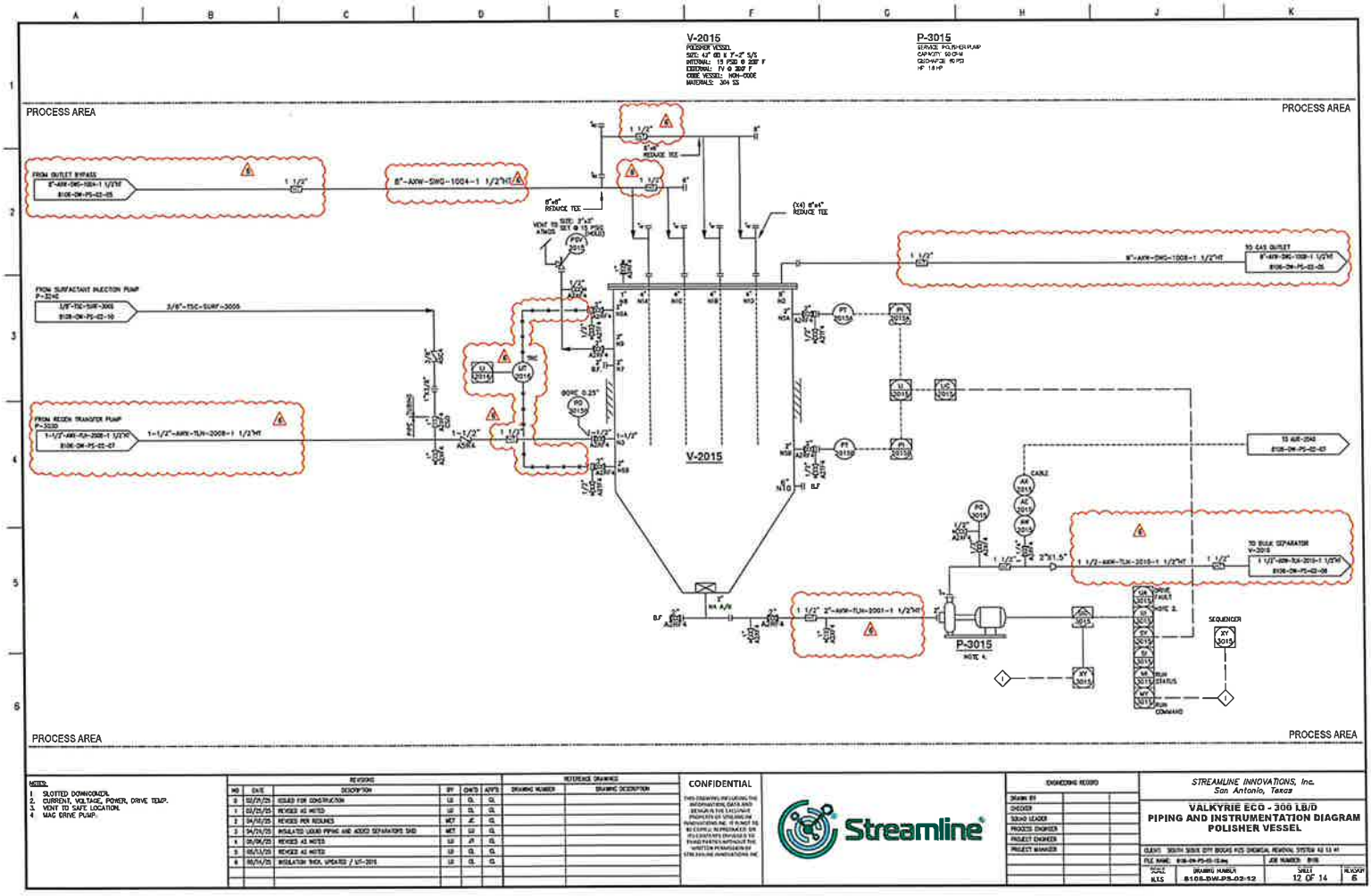
San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
PLANT INSTRUMENT AIR

CLIENT: [illegible]

FILE NAME: [illegible] | JOB NUMBER: [illegible]

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S	8106-DW-PS-02-11	11 OF 14	7



NOTES:
1. SLOTTED DOWNCOMER.
2. CURRENT, VOLTAGE, POWER, DRIVE TEMP.
3. VENT TO SAFE LOCATION.
4. MAG DRIVE PUMP.

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/21/25	ISSUED FOR CONSTRUCTION	LB	GL	GL
1	03/25/25	REVISED AS NOTED	LB	GL	GL
2	04/16/25	REVISED PER REDLINES	MGT	JC	GL
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS SKID	MGT	LB	GL
4	05/08/25	REVISED AS NOTED	LB	JR	GL
5	05/13/25	REVISED AS NOTED	LB	GL	GL
6	05/14/25	INSULATION THICK. UPDATED / LIT-2015	LB	GL	GL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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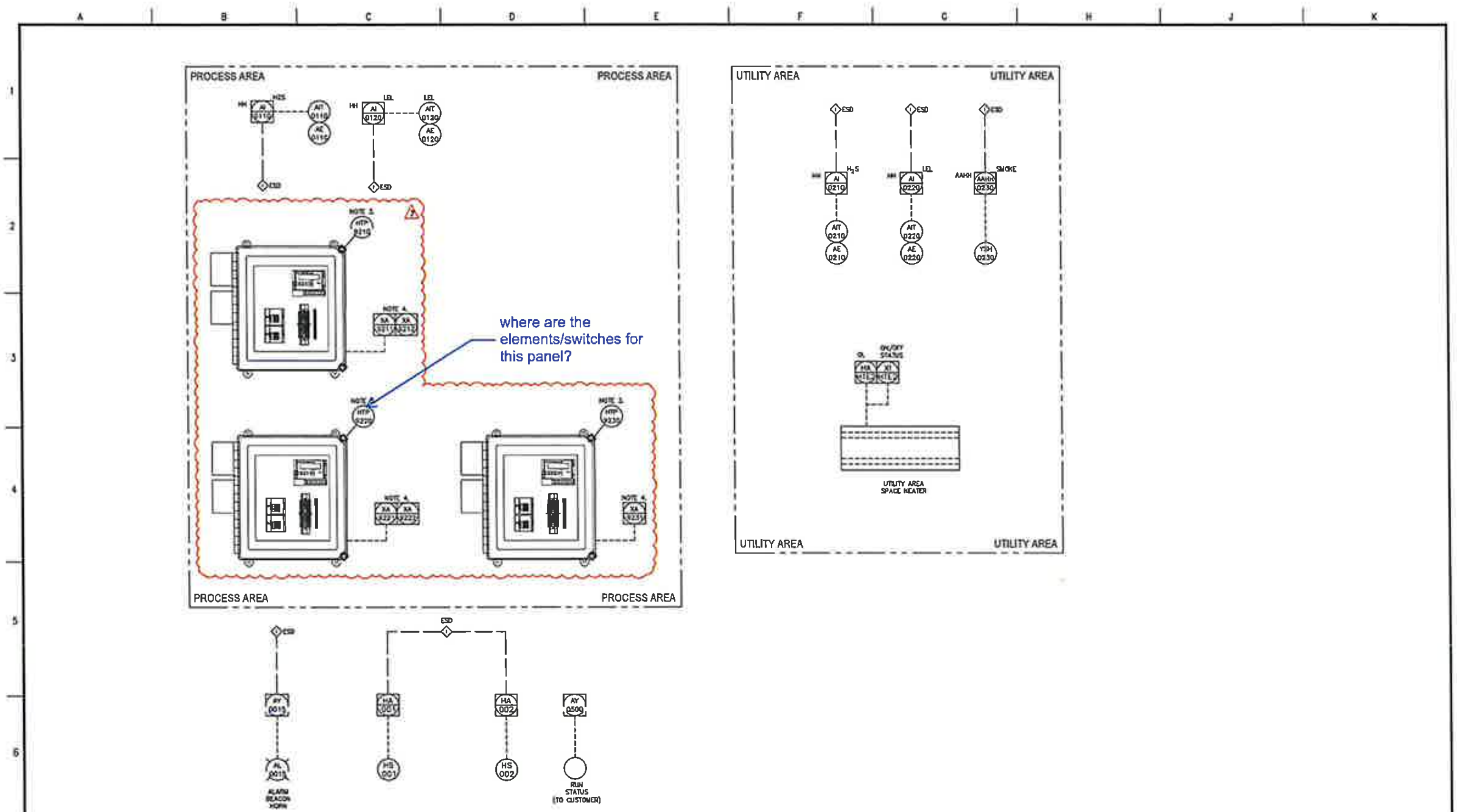
SQUAD LEADER		
PROCESS ENGINEER		
PROJECT ENGINEER		
PROJECT MANAGER		

STREAMLINE INNOVATIONS, Inc.
San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
POLISHER VESSEL

CLIENT: SOUTH SIOUX CITY BIOGAS RCS CHEMICAL REMOVAL SYSTEM AS 13 #1

FILE NAME: 8106-DW-PS-02-12.dwg	JOB NUMBER: 8106	
SCALE: N.T.S.	DRAWING NUMBER: 8106-DW-PS-02-12	SHEET: 12 OF 14
REVISION: 6		



NOTES:
1. SLOTTED DOWNCOMER.
2. CURRENT, VOLTAGE, POWER, DRIVE TEMP.
3. HEAT TRACE CONTROLLER FOR TWO CIRCUITS.
4. ALARMS: LOW TEMP, HIGH TEMP, LOW CURRENT, HIGH CURRENT, GROUND FAULT, AND RTD FAULT.

REVISIONS						REFERENCE DRAWINGS	
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D	DRAWING NUMBER	DRAWING DESCRIPTION
0	02/21/25	ISSUED FOR CONSTRUCTION	LU	CL	CL		
1	02/25/25	REVISED AS NOTED	LU	CL	CL		
2	04/10/25	REVISED PER REDLINES	MET	JC	CL		
3	04/24/25	INSULATED LIQUID PIPING AND ADDED SEPARATORS [illegible]	MET	LU	CL		
4	05/06/25	REVISED AS NOTED	LU	JP	CL		
5	06/13/25	REVISED AS NOTED	LU	CL	CL		
6	06/14/25	INSULATION THICK. UPDATED	LU	CL	CL		
7	06/27/25	ADDED HEAT TRACE CONTROLLERS	MET	CL	CL		

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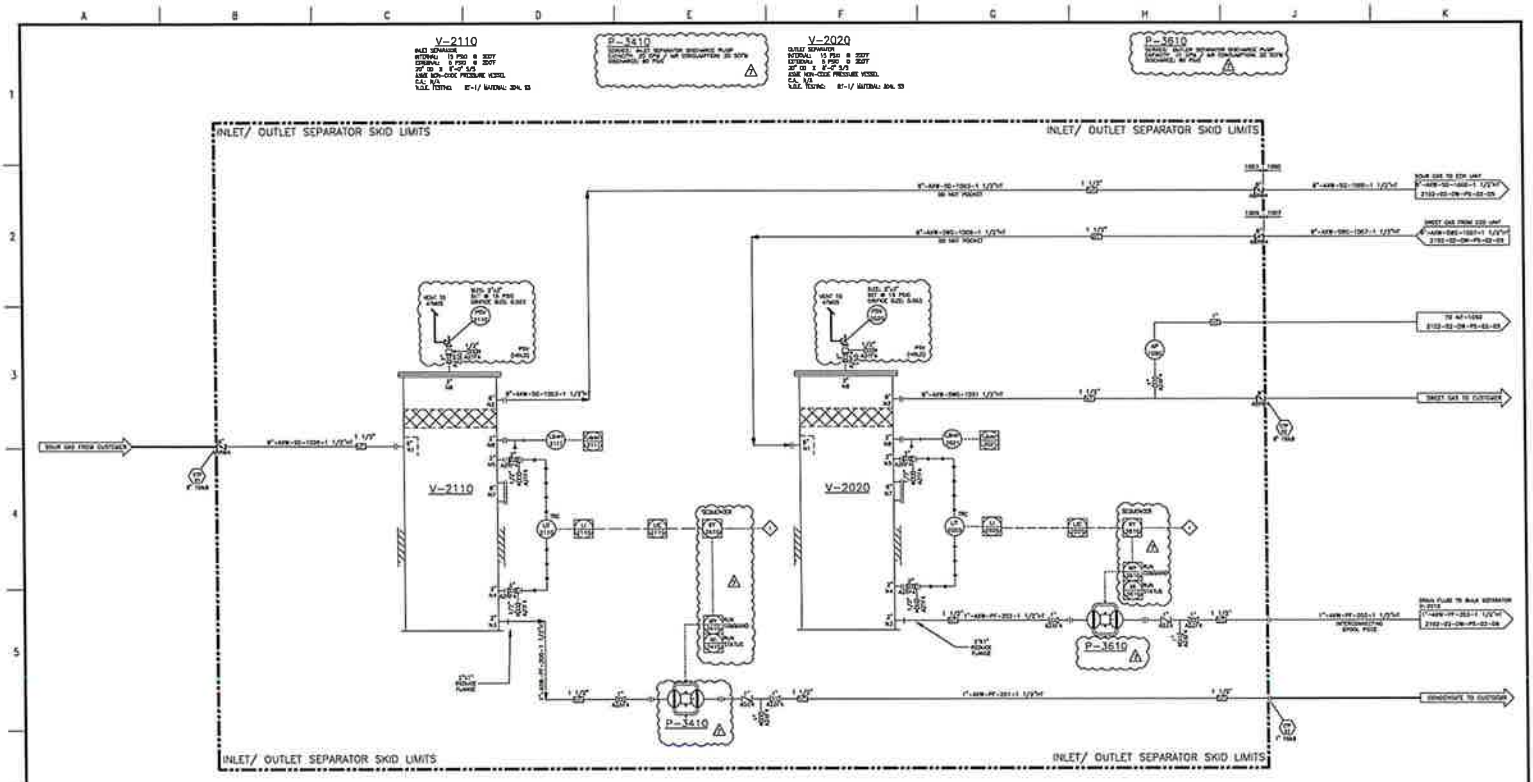
VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
ESD ALARM/ AREA HEATERS & VENTAILATION

SCALE	DRAWING NUMBER	SHEET	REVISION
N.T.S.	8108-DW-PS-02-13	13 OF 14	7



NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/01/25	ISSUED FOR CONSTRUCTION	LU	GL	GL
1	02/25/25	REVISED AS NOTED	LU	GL	GL
2	04/10/25	REVISED PER REDLINES	MET	JC	GL
3	04/24/25	ADDATED LIQUID PIPING AND ADDED SEPARATORS SKID	MET	LU	GL
4	05/08/25	REVISED AS NOTED	LU	JC	GL
5	05/11/25	REVISED AS NOTED	LU	GL	GL
6	05/14/25	INSULATION THICK UPDATED	LU	GL	GL
7	05/24/25	REVISED AS NOTED	LU	GL	GL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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PROJECT ENGINEER		
PROJECT MANAGER		

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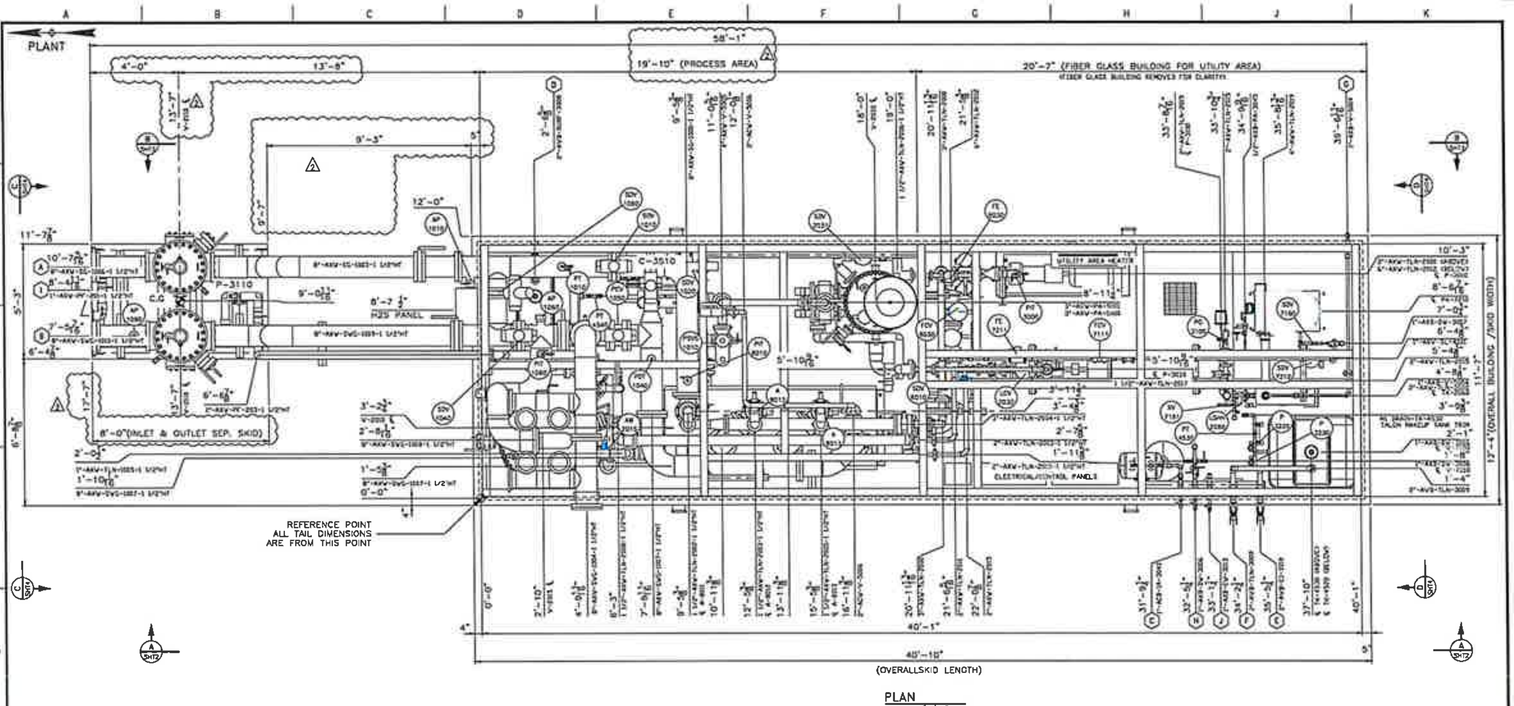
San Antonio, Texas

VALKYRIE ECO - 300 LB/D
PIPING AND INSTRUMENTATION DIAGRAM
INLET AND OUTLET SEPARATORS

SCALE: N.T.S.	DRAWING NUMBER: S108-DIAPS-02-14	SHEET: 14 OF 14	REVISION: 7



CONNECTIONS

MARK	QTY	SIZE	CLASS	TYPE	SERVICE	MARK	QTY	SIZE	CLASS	TYPE	SERVICE
A	1	8"	150	RFSO	SOUR GAS FROM CUSTOMER	I	1	1"	150	RFSW	CONDENSATE TO CUSTOMER
B	1	8"	150	RFSO	SWEET GAS TO CUSTOMER	J	1	1"	800	THRD	CONCENTRATE WATER TO CUSTOMER
C	1	1"	800	THRD	IA FROM CUSTOMER						
D	1	2"	150	THRD/CAM	TK-4540 FILL PORT						
E	1	2"	150	THRD/CAM	TK-4520 FILL PORT						
F	1	2"	150	THRD/CAM	TK-4530 FILL PORT						
G	1	1"	150	THRD	VENT FROM TK-2060						
H	1	1"	800	THRD	RAW WATER FROM CUSTOMER						

NOTES:

REVISIONS

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	[illegible]	ISSUED FOR CONSTRUCTION	[illegible]	[illegible]	[illegible]
1	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]
2	[illegible]	REVISED AS NOTED	[illegible]	[illegible]	[illegible]

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING DESCRIPTION

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PROJECT MANAGER		

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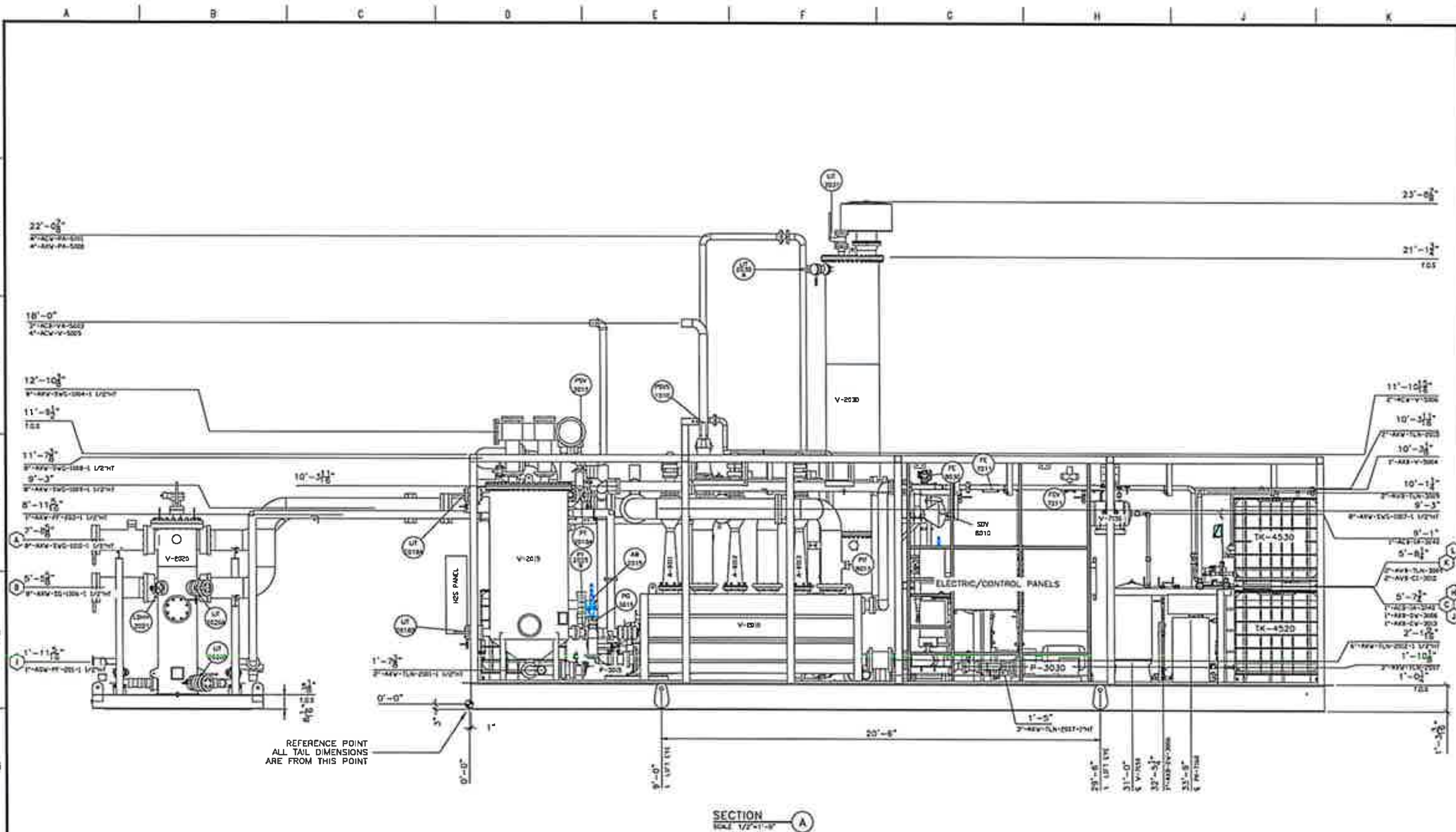
San Antonio, Texas

PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
PIPING PLAN-VIEW

CLIENT: [illegible]

FILE NAME: [illegible] | JOB NUMBER: [illegible]

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	8109-DW-PG-01-02	1 OF 5	2



NOTES:
1. SEE SHT. 1 FOR CONNECTION SCHEDULE.

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/22/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	05/11/25	REVISED AS NOTED	LU	CL	CL
2	06/24/25	REVISED AS NOTED	LU	CL	CL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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PROCESS ENGINEER		
PROJECT ENGINEER		
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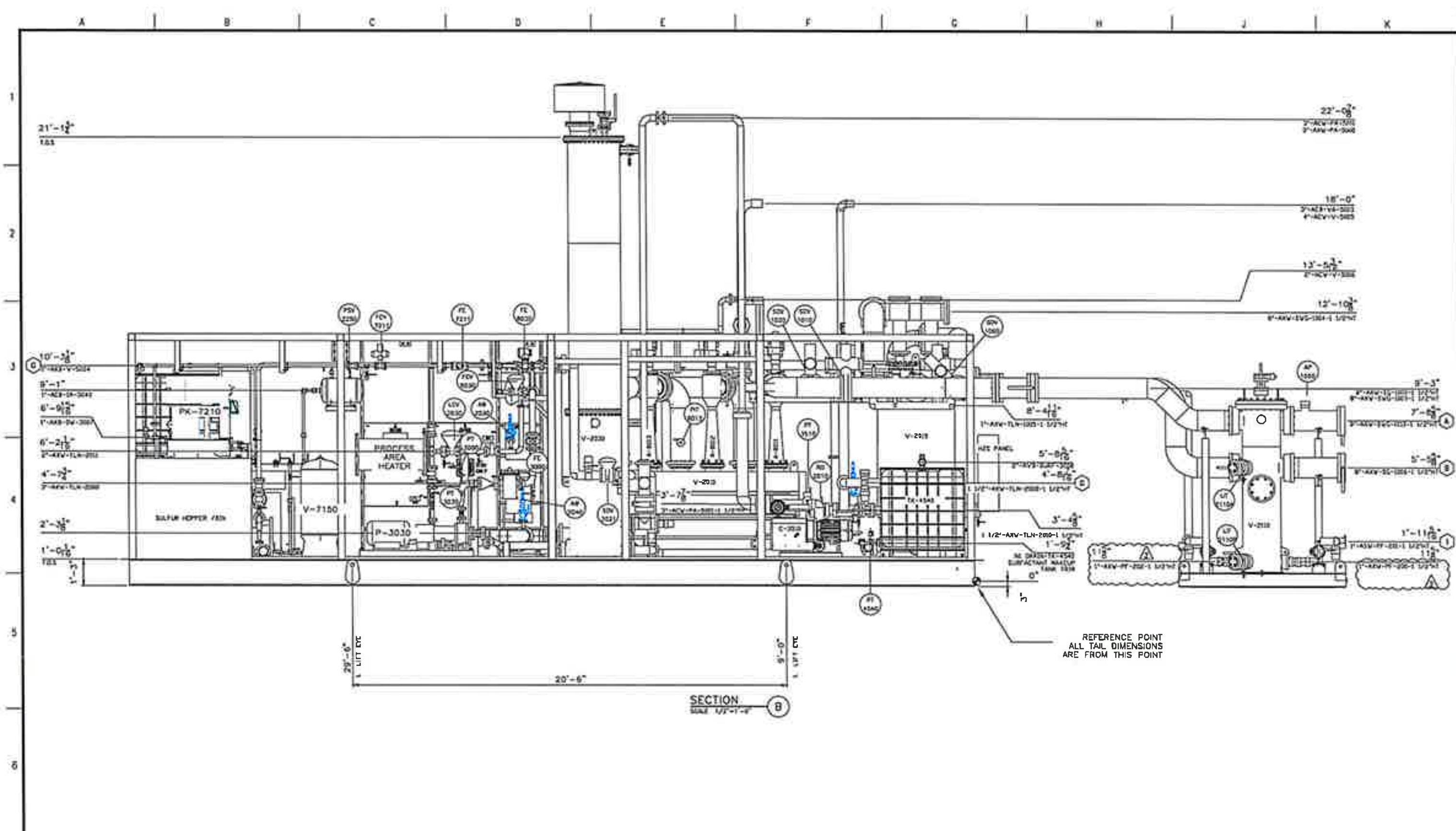
San Antonio, Texas

PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
SECTION A- ELEVATION

SCALE: AS NOTED
SHEET: 2 OF 5
REVISION: 2



NOTES:
1. SEE SHT. 1 FOR CONNECTION SCHEDULE.

REVISIONS						REFERENCE DRAWINGS	
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D	DRAWING NUMBER	DRAWING DESCRIPTION
0	02/02/[illegible]	ISSUED FOR CONSTRUCTION	LW	GL	GL		
1	05/17/25	REVISED AS NOTED	LW	GL	GL		
2	06/24/25	REVISED AS NOTED	LW	GL	GL		

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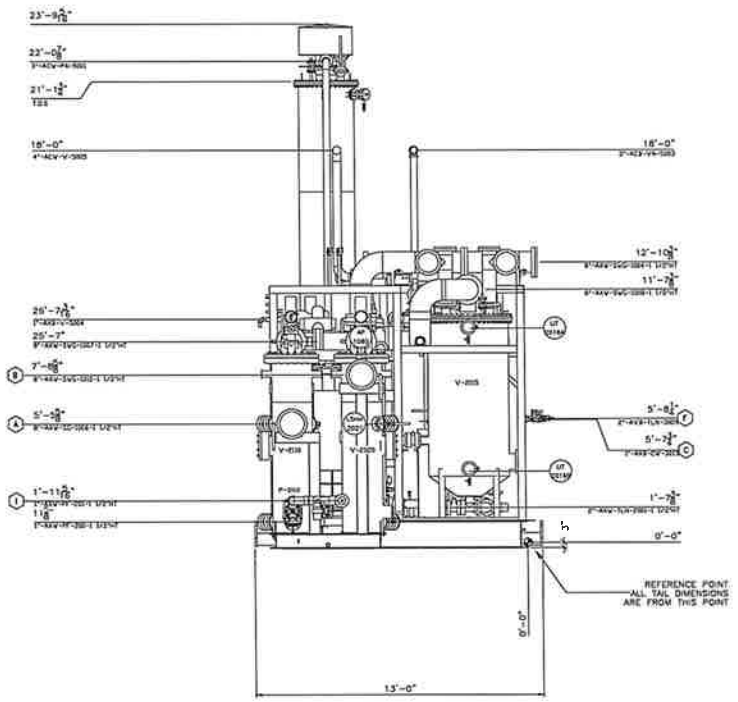
STREAMLINE INNOVATIONS, Inc.
San Antonio, Texas

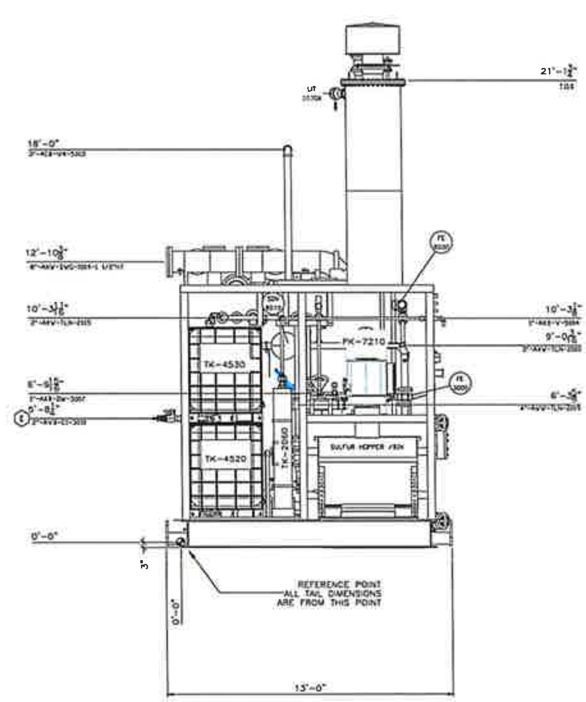
PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
SECTION B- ELEVATION

CLIENT: [illegible]
FILE NAME: [illegible] JOB NUMBER: [illegible]

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	[illegible]	3 OF 5	2



SECTION (C)
SCALE 1/2"=1'-0"



SECTION (D)
SCALE 1/2"=1'-0"

NOTES:

1. SHOP TO VERIFY DIMENSIONS BEFORE OPENING HOLES ON FIBERGLASS WALL.
2. BOLTED FIBERGLASS ACCESS HATCH PANEL.
3. SEE SHT. 1 FOR CONNECTION SCHEDULE.
4. FIBER GLASS DETAILS BY VENDOR.

REVISIONS						REFERENCE DRAWINGS	
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D	DRAWING NUMBER	DRAWING DESCRIPTION
0	02/23/25	ISSUED FOR CONSTRUCTION	LU	CL	CL		
1	05/17/25	REVISED AS NOTED	LU	CL	CL		
2	08/24/25	REVISED AS NOTED	LU	CL	CL		

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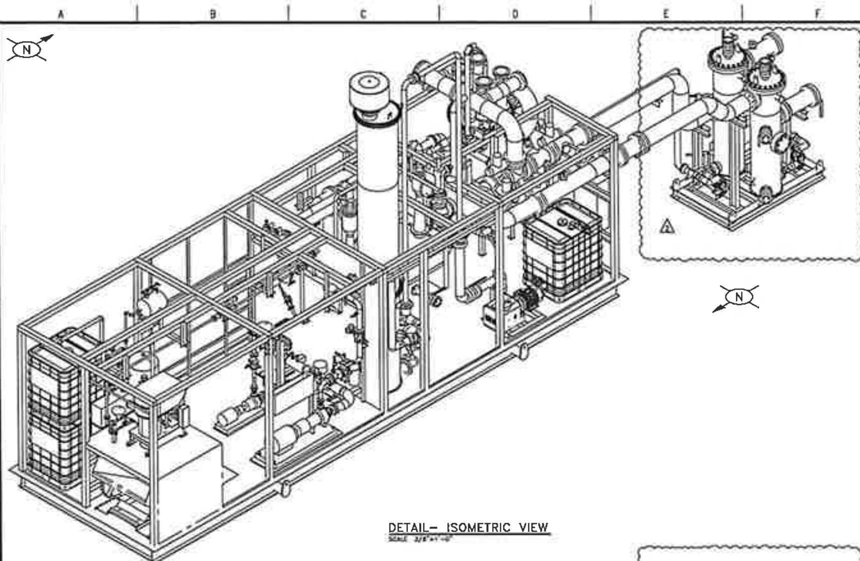
San Antonio, Texas

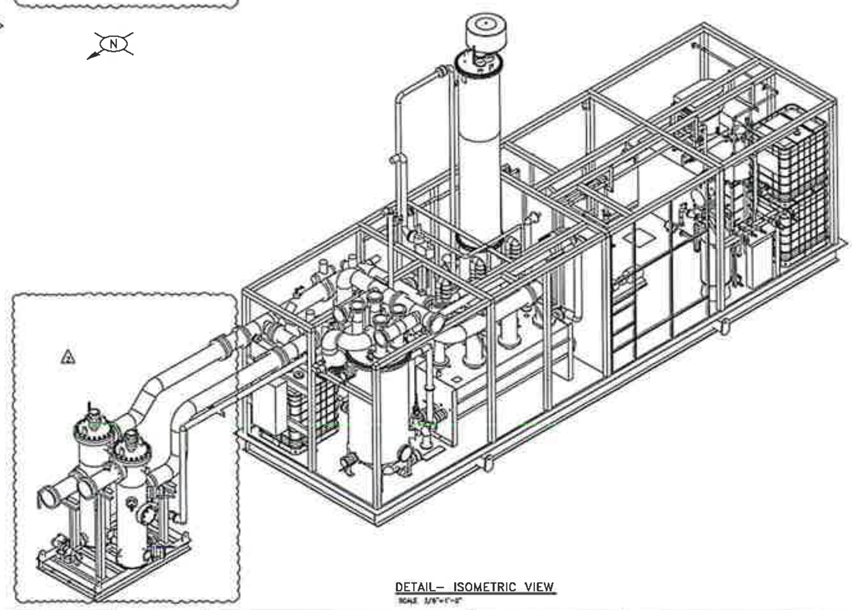
PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
SECTION C&D- ELEVATION

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	[illegible]	4 OF 5	2



DETAIL– ISOMETRIC VIEW

SCALE: 3/8"=1'-0"



DETAIL– ISOMETRIC VIEW

SCALE: 3/8"=1'-0"

NOTES:

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/22/25	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	05/17/25	REVISED AS NOTED	LU	CL	CL
2	06/24/25	REVISED AS NOTED	LU	CL	CL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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PIPING PLANS & ELEVATIONS
VALKYRIE
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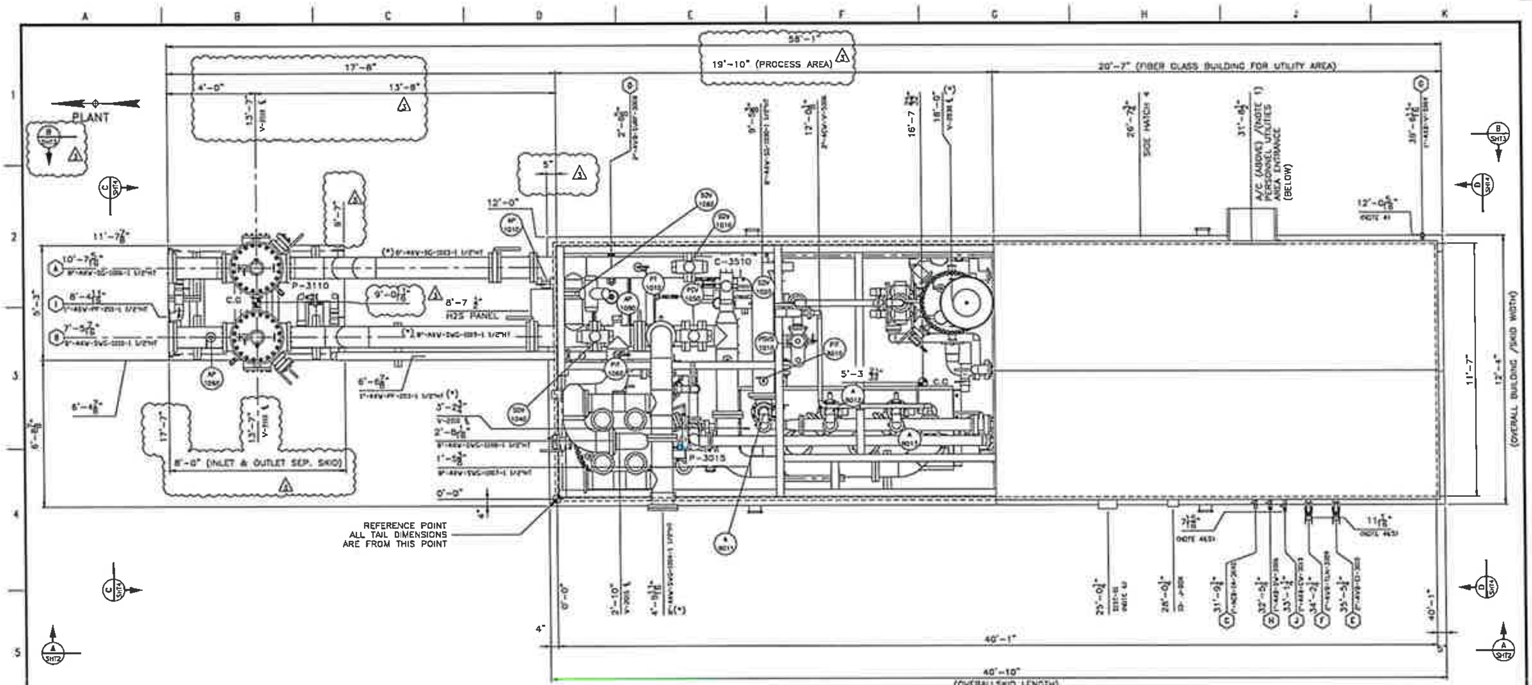
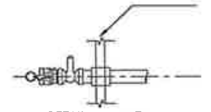
ISOMETRIC VIEW

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED		5 OF 5	2



PLAN
SCALE 1/2"=1'-0"



DETAIL (1)
SCALE N.T.S
TYP. FOR CONNECTION
C/E/F/G/H/J

NOTE: ALL LINE NUMBERS OR ITEMS APPENDED OR MARKED WITH AN ASTERISK "*" NEED TO BE SHIPPED LOOSE

ESTIMATED DRY WEIGHT FOR STRUCTURAL, PIPING & EQUIPMENTS COMPONENTS:
- ECO UNIT SKID =62,177.89 LBS
- INLET & OULET SEP SKID. 5713.83 LBS

* CG BASED ON THIS WEIGHT

CONNECTIONS

MARK	QTY	SIZE	CLASS	TYPE	SERVICE
A	1	8"	150	RFSO	SOUR GAS FROM CUSTOMER
B	1	8"	150	RFSO	SWEET GAS TO CUSTOMER
C	1	1"	800	THRD	IA FROM CUSTOMER
D	1	2"	150	THRD/CAM	TK-4540 FILL PORT
E	1	2"	150	THRD/CAM	TK-4520 FILL PORT
F	1	2"	150	THRD/CAM	TK-4530 FILL PORT
G	1	1"	150	THRD	VENT FROM TK-2060
H	1	1"	800	THRD	RAW WATER FROM CUSTOMER
I	1	1"	150	RFSW	CONDENSATE TO CUSTOMER
J	1	1"	800	THRD	CONCENTRATE WATER TO CUSTOMER

NOTES:
1. A/C UNIT MOUNTING AND CONNECTION TO BE DONE BY CONTRACTOR AT SHOP SITE.
2. REFERENCE PROJECTION TO FLANGE FACE.
3. REFERENCE PROJECTION TO EDGE OF THE VALVE.
4. REFERENCE PROJECTION TO CENTER OF THE PIPE.
5. REMOVE THREADED CONNECTION DURING LIFTING OPERATION.

REVISIONS

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	[illegible]	ISSUED FOR CONSTRUCTION	LW	CL	CL
1	[illegible]	SECTION A ADDED	LW	CL	CL
2	[illegible]	REVISED AS NOTED	LW	CL	CL
3	[illegible]	REVISED AS NOTED	LW	CL	CL

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING DESCRIPTION

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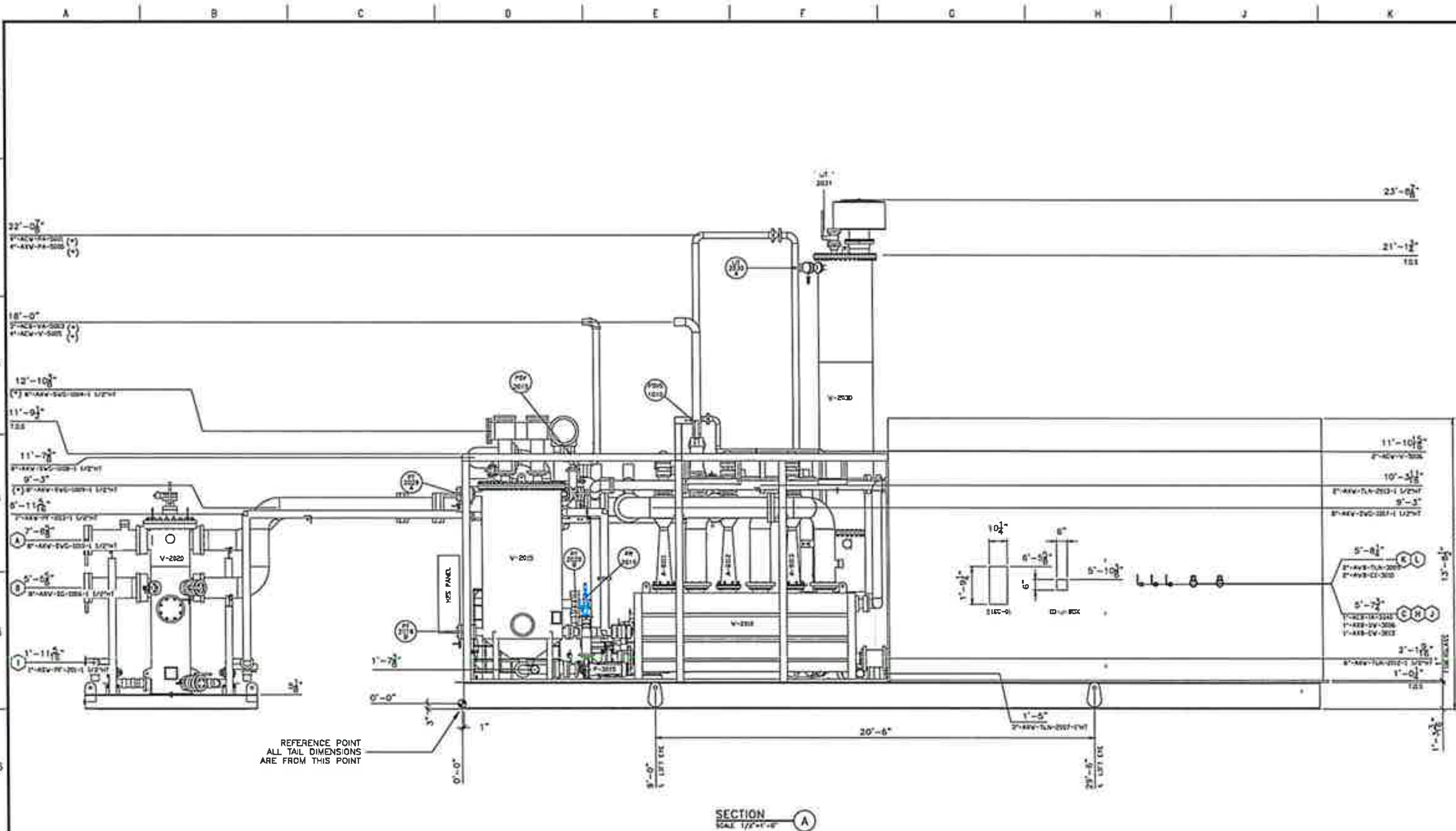
PROJECT ENGINEER		
PROJECT MANAGER		

STREAMLINE INNOVATIONS, Inc.
San Antonio, Texas

PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
PLAN-VIEW

CLIENT: SOUTH SIOUX CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM
FILE NAME: [illegible] | JOB NUMBER: [illegible]

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	[illegible]	1 OF 5	3



NOTES:

1. SHOP TO VERIFY DIMENSIONS BEFORE OPENING HOLES ON FIBERGLASS WALL.
2. SHOP TO VERIFY PANEL DIMENSION AND AND ANCHOR BEFORE INSTALL.
3. SEE SHT. 1 FOR CONNECTION SCHEDULE.

REVISIONS						REFERENCE DRAWINGS	
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D	DRAWING NUMBER	DRAWING DESCRIPTION
0	02/22/25	ISSUED FOR CONSTRUCTION	SW	CL	CL		
1	05/?/25	SECTION A ADDED	SW	CL	CL		
2	05/14/25	REVISED AS NOTED	SW	CL	CL		
3	06/23/25	REVISED AS NOTED	SW	CL	CL		

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PROJECT MANAGER		

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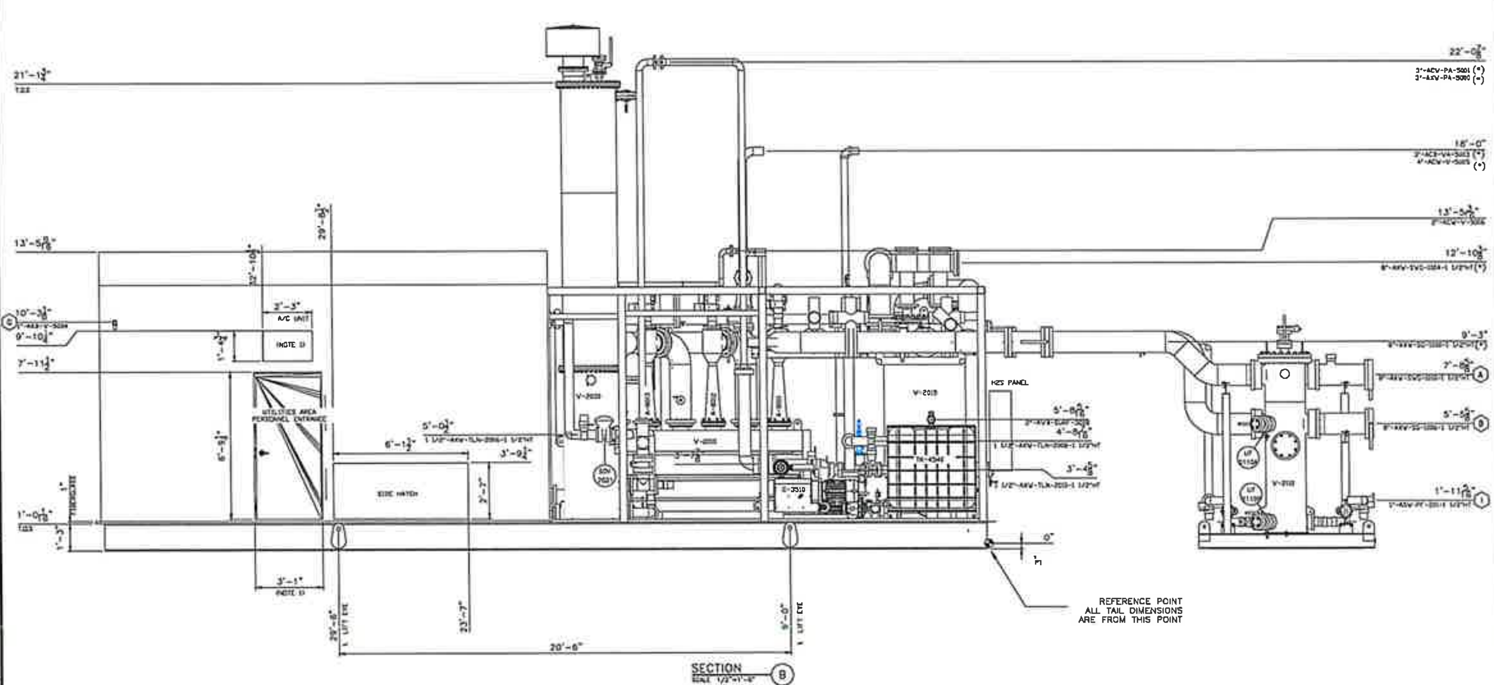
San Antonio, Texas

PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
SECTION A- ELEVATION

CLIENT: SOUTH SIOUX CITY BOOKS H2S CHEMICAL REMOVAL SYSTEM
FILE NAME: 8105-OM-PG-01-02 | JOB NUMBER: 8105

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	8105-OM-PG-01-02	2 OF 5	3



NOTES:
1. SHOP TO VERIFY DIMENSIONS BEFORE OPENING HOLES ON FIBERGLASS WALL.
2. SEE SHT. 1 FOR CONNECTION SCHEDULE.

REVISIONS					
NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	[illegible]	ISSUED FOR CONSTRUCTION	LU	CL	CL
1	[illegible]	SECTION A ADDED	LU	CL	CL
2	05/14/25	REVISED AS NOTED	LU	CL	CL
3	06/23/25	REVISED AS NOTED	LU	CL	CL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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PROCESS ENGINEER		
PROJECT ENGINEER		
PROJECT MANAGER		

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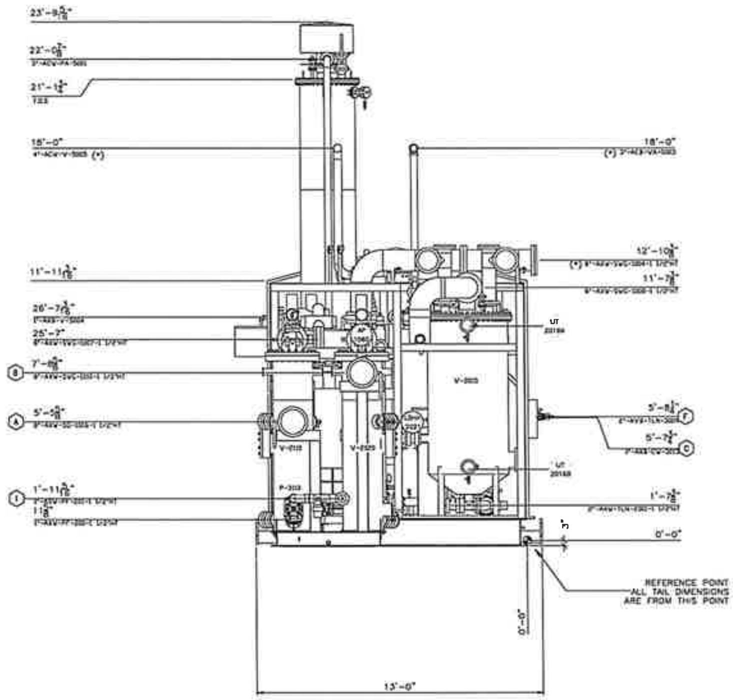
San Antonio, Texas

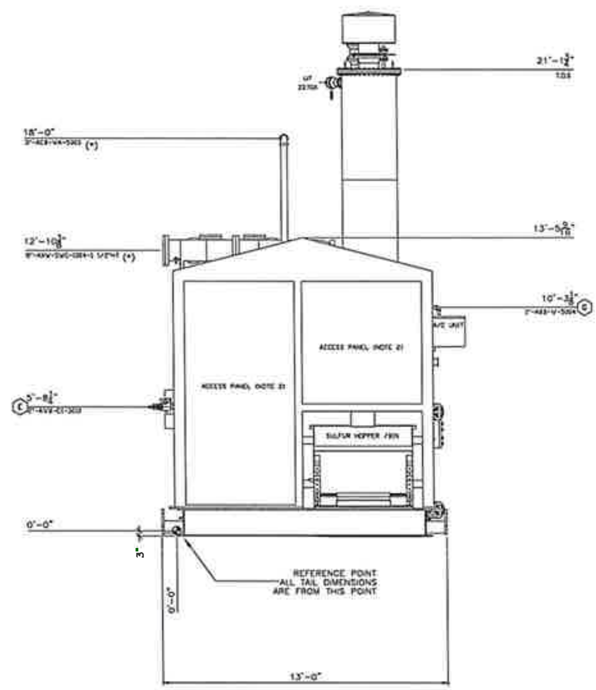
PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
SECTION B- ELEVATION

CLIENT: SOUTH SIOUX CITY [illegible] H2S CHEMICAL REMOVAL SYSTEM [illegible]

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	[illegible]	3 OF 5	3



SECTION (C)
SCALE: 1/2"=1'-0"



SECTION (D)
SCALE: 1/2"=1'-0"

NOTES:

1. SHOP TO VERIFY DIMENSIONS BEFORE OPENING HOLES ON FIBERGLASS WALL.
2. BOLTED FIBERGLASS ACCESS HATCH PANEL.
3. SEE SHT. 1 FOR CONNECTION SCHEDULE.
4. FIBER GLASS DETAILS BY VENDOR.

REVISIONS

NO	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/22/25	ISSUED FOR CONSTRUCTION	LW	CL	CL
1	05/01/25	SECTION & ADDED	LW	CL	CL
2	05/14/25	REVISED AS NOTED	LW	CL	CL
3	06/11/25	REVISED AS NOTED	LW	CL	CL

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING DESCRIPTION

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PROJECT MANAGER		

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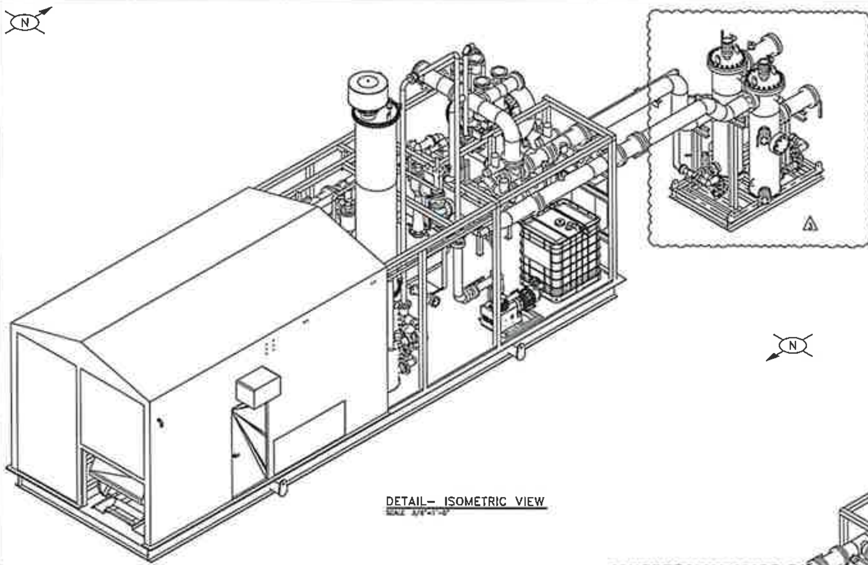
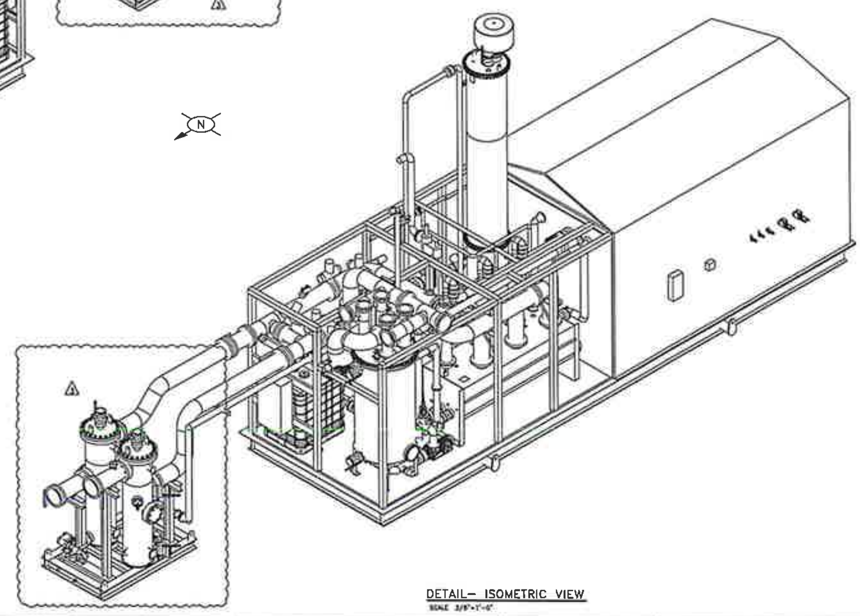
San Antonio, Texas

PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
SECTION C&D- ELEVATION

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	8100-DW-PG-01-03	4 OF 5	3



DETAIL– ISOMETRIC VIEW
SCALE 3/8"=1'-0"



DETAIL– ISOMETRIC VIEW
SCALE 3/8"=1'-0"

NOTES:

REVISIONS					
NO.	DATE	DESCRIPTION	BY	CHK'D	APP'D
0	02/02/25	ISSUED FOR CONSTRUCTION	LW	GL	GL
1	05/01/25	SECTION # ADDED	LW	GL	GL
2	05/14/25	REVISED AS NOTED	LW	GL	GL
3	06/13/25	REVISED AS NOTED	LW	GL	GL

REFERENCE DRAWINGS	
DRAWING NUMBER	DRAWING DESCRIPTION

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PROJECT ENGINEER		
PROJECT MANAGER		

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San Antonio, Texas

PIPING PLANS & ELEVATIONS
VALKYRIE
ECO
ISOMETRIC VIEW

CLIENT: SOUTH SIOUX CITY BIOGAS H2S CHEMICAL REMOVAL SYSTEM 43 12 41
FILE NAME: 9105-DW-PG-01-03 | JOB NUMBER: 9105

SCALE	DRAWING NUMBER	SHEET	REVISION
AS NOTED	9105-DW-PG-01-03	5 OF 5	3

1. Delivery of ECO unit – ½ day of logistics and positioning of the unit
    a. Arrives on two flatbed trailers and will require crane ops to raise and place into position
    b. Unit requires flat level ground, sits directly. Compacted caliche or concrete lab
2. Utilities hookup – customer dependent. This prevents any commissioning activities from taking place until its ready
    a. Connect unit instrument air supply connection
    b. Gas piping connection – for main gas inlet and outlet
    c. Connect main electrical power – 3 phase 480VAC, connected at main disconnect on side of unit
    d. Connect main ethernet/SCADA connection – from junction box on side of unit
    e. Plumb in process water connections: water inlet, wastewater outlet [from RO]
    f. Condensate return from P-3410 – tie in on inlet/outlet separator skid
3. Ship Loose Item Installation – forklift/heavy equipment assistance needed – Streamline and Customer work to complete these tasks. Typically, 2-3 days total time.
    a. AC unit re-installation and electrical connection at its junction box
    b. Centrifuge (PK-7210) locking bolts – removal
    c. Install PSV-1010 & PSV-2015 valves and vent piping
    d. V-2030 -
        i. Top vessel section installation
        ii. LIT-2030 & LIT-2031 installation, wiring and termination
        iii. C-3510 seal loop piping installation
    e. V-2015 overhead piping installation
    f. Inlet/outlet separator skid installation
        i. Install inlet/outlet piping to ECO skid and customer tie ins
            1. Ensure 8" strainer is installed on 8"-ASW-SG-1000 per P&IDs
        ii. Install V-2020 liquid return piping to ECO skid
        iii. Install PSV-2110 & PSV-2020 valves and vent piping
        iv. Install, wire and terminate –
            1. LSHH-2111 & LSHH-2021
            2. LIT-2110 & LIT-2020
        v. H2S Sample points (AP-1010 & 1060) –
            1. Sample probes will need to be installed and tubed back to the dual stream analyzer
            2. Tubing will need to be heat traced and insulated
                a. Heat trace to be terminated
    g. Heat trace & Insulation
        i. Pre-insulated heat traced and insulated piping – heat trace will need to be terminated to designated heat trace power panel
    h. Unit Hopper/sulfur bin – typically tack welded and strapped in place during shipping. Remove welds, paint and clean spots, return hopper
4. Unit Preparation

a. System Comms/Integration verification – 1 day
b. Fastener and mechanical connection check post shipping – retorque - 1 day
c. Commission all rotating equipment – 1 day
d. System water fill – once connected, flush and activate the RO unit and begin to generate RO water – 1 day to generate water
    i. Fill unit with fresh water
e. Circulate liquid water and test system for leaks – ½ day
f. Load chemistry into storage totes on system – ½ day
g. Pre-load chemistry into system and circulate pump, mix chem and water together – 1 day
h. Nitrogen leak check on gas piping of system – ½ day
    i. Include Nitrogen purge of gas piping
i. PSSR review and completion
j. System Startup – 1 day
k. Chemistry buffering and equilibrium – 1 day
l. Customer Training – 3 days

Overall process from the moment streamline is on the ground takes 8-11 days, depending on site and staff availability over the weekend, and assuming availability of all utilities on the ECO unit.

VALKYRIE ECO 14 - THREE PHASE LOAD LIST, Rev 2 (6/25/25)

PROTECTIVE DEVICE	RATING (A)	TAG	DESCRIPTION	VOLTAGE (V)	PHASE	MOTOR (HP)	KW	NEC 430.250 FULL LOAD CURRENT	CALCULATED KVA	RUN CURRENT (A)	RUN KVA	EFFICIENCY	POWER FACTOR
MCB-104	100	P-3000	MAIN CIRCULATION PUMP	480	3	60	49.7	77.0	65.0	78.2	58.5	0.90	0.85
MCB-110	20	PK-7210	CENTRIFUGE	480	3	7.5	6.6	11.0	9.1	11.0	7.7	0.85	0.85
MCB-116	30	C-3510	AERATION BLOWER	480	3	15	13.2	21.0	18.2	21.9	15.5	0.85	0.85
MCB-131	15	P-3030	REGEN TRANSFER PUMP	480	3	5	4.4	7.6	6.1	7.3	5.2	0.85	0.85
MCB-122	15	P-3015	POLISHING PUMP	480	3	2	1.8	3.4	2.4	2.9	2.1	0.85	0.85
CB-210	10	HTR-2	UTILITY AREA HEATER	480	3	-	3.6	4.3	3.6	4.3	3.6	1	1
						TOTALS	79.2	143.6	104.4	125.6	92.5		

VALKYRIE ECO 14 - SINGLE PHASE LOAD LIST, Rev 2 (6/25/25)

PROTECTIVE DEVICE	RATING (A)	TAG	DESCRIPTION	VOLTAGE (V)	PHASE	MOTOR (HP)	KW	NEC 430.250 FULL LOAD CURRENT	CALCULATED KVA	RUN CURRENT (A)	RUN KVA	EFFICIENCY	POWER FACTOR
CB-222	5	DC-PS1	480vac X 24VDC PWR. SUP.	480	3					1.0			
CB-225	5	DC-PS2	480vac X 24VDC PWR. SUP.	480	3					1.0			
CB-237	100	XMFR-1	480 x 240/120 TRANSFORMER	480	2	-	37.5	78.0	37.5	45.0	37.5		0.8
120/240 PDP-(1,3)	20	HVAC-303	HVAC (Utility Area) 35kBTU	240	2		3.6	17.5	4.2	17.0	17.5		
120/240 PDP - (2)	10	PK-7160	RO Water System	120	1								
120/240 PDP - (4)	5	AIT-1060	H2S Analyzer (Inlet/Outlet)	120	1								
120/240 PDP - (5)	20	N/A	Heat Trace 1 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (6)	20	N/A	Heat Trace 2 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (7)	20	N/A	Heat Trace 3 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (8)	20	N/A	Heat Trace 4 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (9)	20	N/A	Heat Trace 5 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (10)	20	N/A	Heat Trace 6 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (11)	20	N/A	Heat Trace 7 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (12)	20	N/A	Heat Trace 8 - 10w/ft - 200'max	120	1		2.0	16.6	2.0	16.6	2.0		
120/240 PDP - (13)	15	P-3110	Inlet Separator Return Pump	120	1	2	1.9	24.0	2.0	24.0	2.2	0.80	0.85
120/240 PDP - (14)	15	P-3020	Outlet Separator Return Pump	120	1	2	1.9	24.0	2.0	24.0	2.2	0.80	0.85

Objective

The process skid area of the Valkyrie ECO requires that sufficient temperatures be maintained for all vessel and liquid process piping in low ambient conditions. Depending on the installation sites, requirements shall vary. Specifically, the primary equipment listed below is of highest concern.

- V-2010 – Bulk Separator
- V-2030 – Regen Vessel
- V-2015 – Polishing Vessel
- P-3015 – Polishing Vessel Pump
- Liquid Piping (Service designation TLN)

Depending on the site installation, Streamline may provide an inlet and outlet separator. If so, additional regard shall be provided for such equipment.

- V-2210 – Inlet Separator
- V-2020 – Outlet Separator
- P-3410 – Inlet Separator Pump
- P-3610 – Outlet Separator Pump
- Liquid Piping (Service designation TLN, PF)

The appropriate measures shall be taken to prevent freezing of the liquid redox chemistry to avoid more serious issues such as mechanical damage, leakage & spills, and extended periods or downtime if thawing is required. Other equipment is not considered to be at elevated risk of damage or malfunction from low ambient temperatures are listed below. This is either extremely low freezing point of the fluid, or mechanical ratings from the equipment manufacturer.

- TK-4540 – Surfactant Tank
- P-3240 – Surfactant Pump
- C-3510 – Aeration Blower

Vessels

Standard Mitigation Measures

- Heat Tracing Rating: 10W/ft
- Insulation Rating: Vendor-to-Specify
- Minimum Controller Temp.: 40°F
- Maximum Controller Temp.: 75°

Routine Maintenance & Check

- Check alarm statuses from heat trace controller(s)
- Inspect thermal insulation
- Follow any site-specific CUI inspection frequency, if applicable

Other Recommendations

- For planned downtime period in excess of (5) days, it is recommended that the system is drained if low ambient conditions are anticipated.

Pumps & Piping

Standard Mitigation Measures

- Heat Tracing Rating: 7-10W/ft
- Insulation Rating: Vendor-to-Specify
- Minimum Controller Temp.: 40°F

- Maximum Controller Temp.: 75°

Routine Maintenance & Check

- For diaphragm pump, retain repair kits as part of critical spares
- For centrifugal pumps, retain seal replacement as part of critical spares (if applicable)
- Check alarm statuses from heat trace controller(s)
- Inspect thermal insulation
- Follow any site-specific CUI inspection frequency, if applicable

Other Recommendations

- For planned downtime period in excess of (5) days, it is recommended that the system is drained if low ambient conditions are anticipated.

TAG OR INSTRUMENT	DESCRIPTION	POINT TYPE	ETHERNET/ HARDWIRED	CONNECTION TO SCADA FROM:	Parameter to Share				
					Val	LL	L	H	HH
XS-HTR1	HTR-1 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
XS-HTR2	HTR-2 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
XA-3000	P-3000 VFD Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
XA-7210	PK-7210 VFD Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
XA-3510	C-3510 VFD Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
XA-3015	P-3015 VFD Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
AT-1000-H2S	Influent Sour Gas H2S Level Indication (Biogas 3000)	AI	E	MCP-3000	X	-	-	X	X
AT-1000-CH4	Influent Sour Gas CH4 Level Indication (Biogas 3000)	AI	E	MCP-3000	X	-	-	X	X
AT-1000-CO2	Influent Sour Gas CO2 Level Indication (Biogas 3000)	AI	E	MCP-3000	X	-	-	X	X
AT-1060-H2S	Effluent Sweet Gas H2S Level Indication (Biogas 3000)	AI	E	MCP-3000	X	-	-	X	X
AT-1060-CH4	Effluent Sweet Gas CH4 Level Indication (Biogas 3000)	AI	E	MCP-3000	X	-	-	X	X
AT-1060-CO2	Effluent Sweet Gas CO2 Level Indication (Biogas 3000)	AI	E	MCP-3000	X	-	-	X	X
ZDA-1060	SDV-1060 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
ZDA-1040	SDV-1040 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
PT-1060	Effluent Sweet Gas Pressure Indication	AI	E	MCP-3000	X	X	-	-	X
PT-1010	Influent Sour Gas Pressure Indication	AI	E	MCP-3000	X	X	-	-	X
ZDA-1010	SDV-1010 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
ZDA-2015	SDV-2015 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
ZDA-8010	SDV-8010 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
ZDA-8030	SDV-8030 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
ZDA-7210	SDV-7210 Fault Alarm	DI	E	MCP-3000	X	-	-	-	-
AT-0110HIHI	Process Area H2S Level Indication	AI	E	MCP-3000	X	-	-	X	X
AT-0120HIHI	Process Area LEL Level Indication	AI	E	MCP-3000	X	-	-	X	X
AE-0210	Utility Area H2S Level Indication	AI	E	MCP-3000	X	-	-	X	X
AE-0220	Utility Area LEL Level Indication	AI	E	MCP-3000	X	-	-	X	X
YSH-0230	Utility Area High-High Level Smoke Alarm	DI	E	MCP-3000	X	-	-	-	-

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ive
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Tags Suggested by Streamline:

Tag Name	*Description*	POINT TYPE	ETHERNET/ HARDWIRED	CONNECTION TO SCADA FROM:	*Parameter to Share*				
					Val	LL	L	H	HH
AT-2040-rH	system RH	AI	E	MCP-3000	X	X	-	-	X
AT-2040-pH	system PH	AI	E	MCP-3000	X	X	-	-	X
AT-2030-rH	regen RH	AI	E	MCP-3000	X	X	-	-	X
AT-2030-pH	regen PH	AI	E	MCP-3000	X	X	-	-	X
AT-2040-pT	System chem temperature (Deg. F)	AI	E	MCP-3000	X	-	-	X	X
PT-3000	MCP outlet pressure (psig)	AI	E	MCP-3000	X	X	-	-	X
FT-8030	Regen Circulation FLow (GPM)	AI	E	MCP-3000	X	X	-	-	X
PT-2250	Instrument air (psig)	AI	E	MCP-3000	X	X	-	-	-
PT-1010	Inlet gas pressure (In. H2O)	AI	E	MCP-3000	X	X	-	-	X
PT-1060	Outlet Gas Pressure (In. H2O)	AI	E	MCP-3000	X	X	-	-	-
PDT-1040	ECO System DP (In. H2O)	AI	E	MCP-3000	X	-	-	-	-
LT-2030	Aerator Tank DP level (%)	AI	E	MCP-3000	X	X	-	-	X
LT-2031	Aerator Tank Radar Level (%)	AI	E	MCP-3000	X	-	-	-	-
LT-2015	Polisher Tank Level (%)	AI	E	MCP-3000	X	X	-	-	X
LT-2010	Contactor Radar level (%)	AI	E	MCP-3000	X	-	-	-	-
LT-2012	Contactor DP level (%)	AI	E	MCP-3000	X	-	-	X	X
LT-2060	Filtrate Tank Level (%)	AI	E	MCP-3000	X	X	-	-	X
PT-3510	Blower Discharge Pressure (psig)	AI	E	MCP-3000	X	-	-	-	X
PT-7160	RO Water System Pressure (psig)	AI	E	MCP-3000	X	X	-	-	-
LT-4520	Pot Carb Tank Level (%)	AI	E	MCP-3000	X	X	-	-	-
LT-4530	Talon Tank Level (%)	AI	E	MCP-3000	X	X	-	-	-
LT-4540	Surfactant Tank Level (%)	AI	E	MCP-3000	X	X	-	-	-
PK-7210	Centrasep Fault Status	DER	E	MCP-3000	X	-	-	-	-

Appendix B

SECTION 46 73 36
BIOGAS FILTER MEDIA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. All materials and labor required to perform media replacement in the existing H_2S scrubber BG-SCR-1001.
2. Items furnished under this Section by the media supplier shall include, but are not limited to:
   a. New absorption media.

B. Other Related Sections include but are not necessarily limited to:

1. Division 05 - Metals.
2. Division 09 - Finishes.
3. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC).
4. Division 26 - Electrical.
5. Division 40 - Process Interconnections.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. Air Movement and Control Association (AMCA).
2. American National Standards Institute (ANSI).

B. Qualifications:

1. Manufacturer's Experience Qualifications:
   a. Manufacturer shall have experience in manufacturing absorption media.
   b. Verifiable contact information is to be provided for at least 5 operational adsorption media installations similar to this project in scale and type of H_2S challenge.

C. Manufacturer's Quality Assurance Program:

1. Either in-house program or retained from qualified and approved outside source.
2. Independent from manufacturing production personnel.

1.3 SUBMITTALS

A. Drawings and Data:

1. A marked up copy of this specification is to be included showing any proposed exceptions or deviations from the specified requirements.
2. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.
3. Performance data for the media including relevant calculations of lifetime total H_2S removal.
4. Manufacturer's information on the media:
   a. Manufacturer's data on the media, including:
      1) H_2S capacity (lbs. H_2S/lbs. Media).
      2) Apparent density.
      3) Hardness number.
      4) Mean particle diameter.
      5) Media weight (lbs.) per bag.

b. Calculations showing theoretical anticipated life of media, based on specified average H_2S concentrations and biogas flowrate.
c. Media MSDS and specification sheets.
d. Provide a 1 GAL container of the proposed media for review and comparison to what is delivered to the site.
1) Testing results for the proposed carbon media completed and dated within the last 6 months showing it meets the specified design requirements.

5. Details on installation and replacement requirements/SOPs.
6. Quality Control and other Test reports.
7. Operation and Maintenance Manuals per Section 01 78 23 are to be submitted and approved prior to start-up.
8. Training outlines are to be submitted prior to Owner's staff training. Training is to be completed prior to system Start-up.
9. Performance and Guarantee Documentation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Odor Control System Suppliers are acceptable:

1. SJ Environmental Corporation, USA.
2. Interra Global.
3. Or pre-approved equal.

2.2 DESIGN CONDITIONS

A. Design Conditions:

1. Media type: Iron Oxide.
2. Media capacity: A minimum of 35 LBS H_2S / 100 LBS Media.
3. Location is inside existing FRP vessel. See sheet 20D101 for location.
4. Continuous service.
5. Airflow Rate: 250 CFM.
6. Vessel diameter: 14 feet.
7. Vessel height: 16 feet.
8. Available volume for media: 1,500 ft^3.
9. Relative humidity of biogas: 100%.
10. Average biogas temperature: 100 DEGF.
11. O_2 availability: Approximately 0.2% by Volume.
12. Capacity for reagent injection: None.
13. Flow direction: Bottom-up.
14. Spent media weight not to exceed limit for the plenum base plate of 80,000 LBS.
15. Performance Requirements:
    a. Hydrogen Sulfide:
        1) Average inlet concentration: 150 PPMV.
        2) Peak inlet concentration: 15,000 PPMV.
            a) Outlet concentration requirement: Not to exceed 50 PPMV.

PART 3 - EXECUTION

3.1 GENERAL

A. The shipment, storage, handling and installation shall be in strict accordance with the manufacturer's printed instructions.

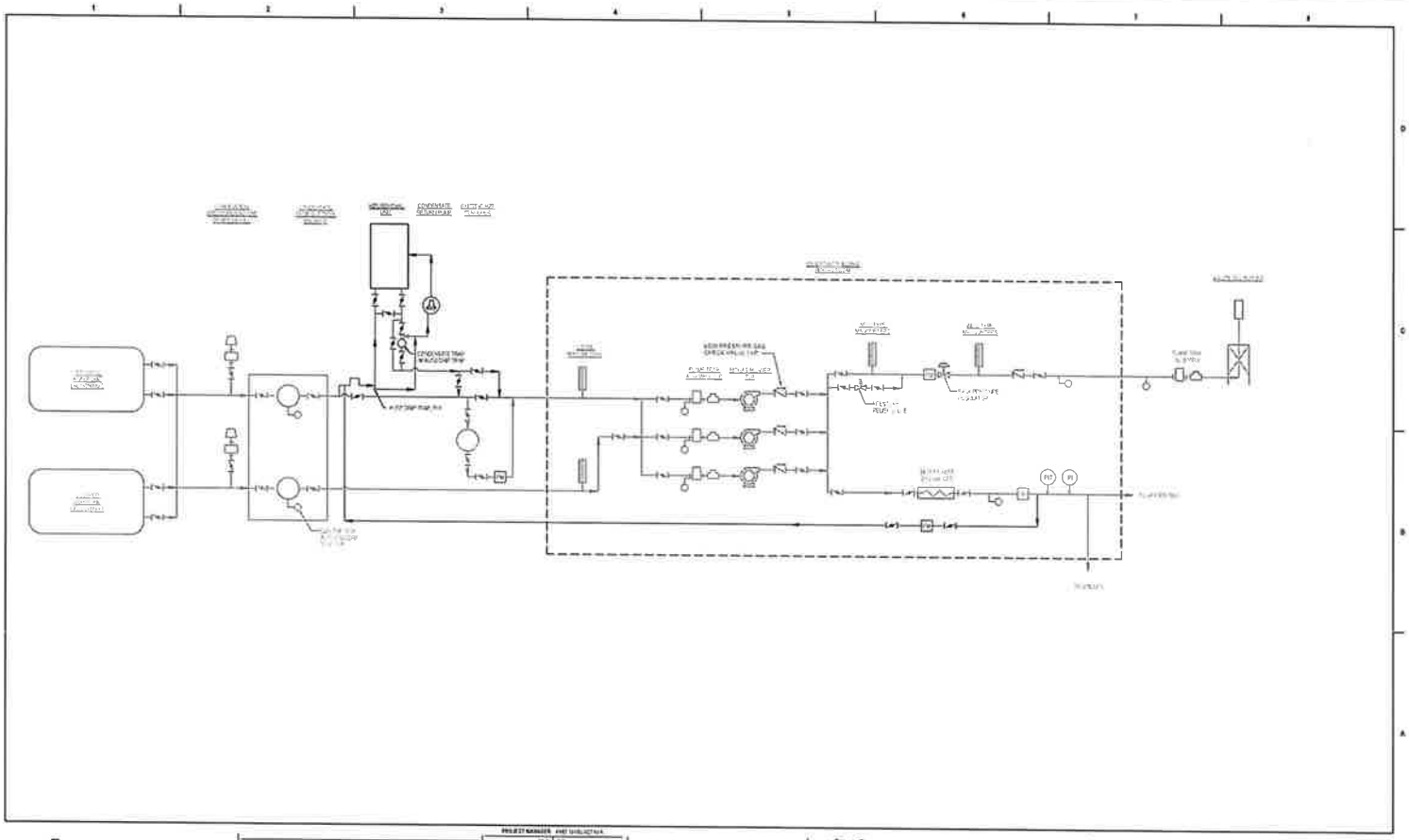
B. Be responsible for the media's condition until the completion of the Work. Damage or loss of equipment and materials shall be repaired or replaced at the Contractors expense.

3.2 INSTALLATION

A. The system components specified herein shall be installed in accordance with the supplier's written installation instructions, and as approved by the Engineer.

END OF SECTION

Appendix C



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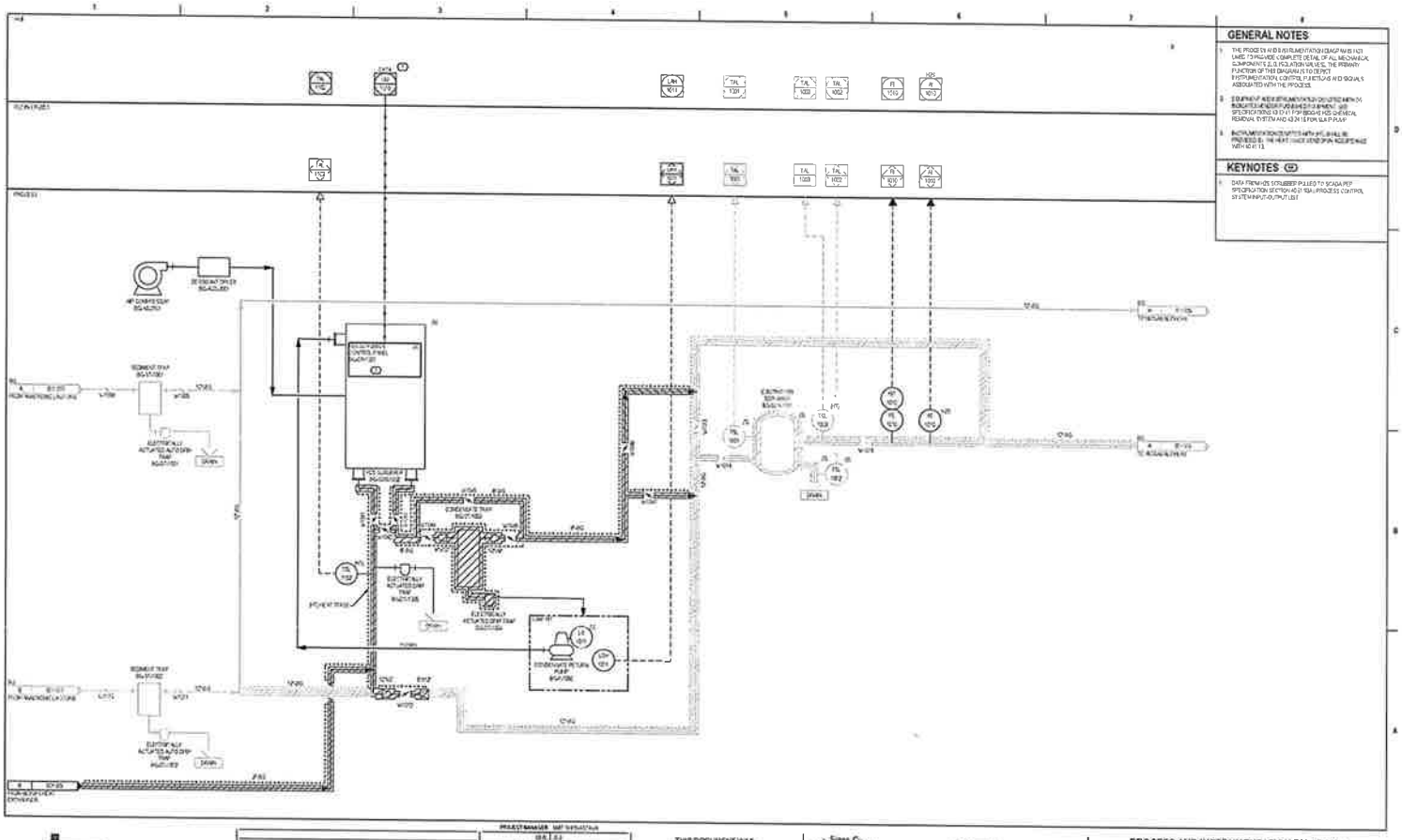
SOUTH SIOUX CITY NEBRASKA

WASTEWATER TREATMENT FACILITY EXPANSION

GAS PROCESS FLOW DIAGRAM

SCALE: NONE

SHEET 00D606



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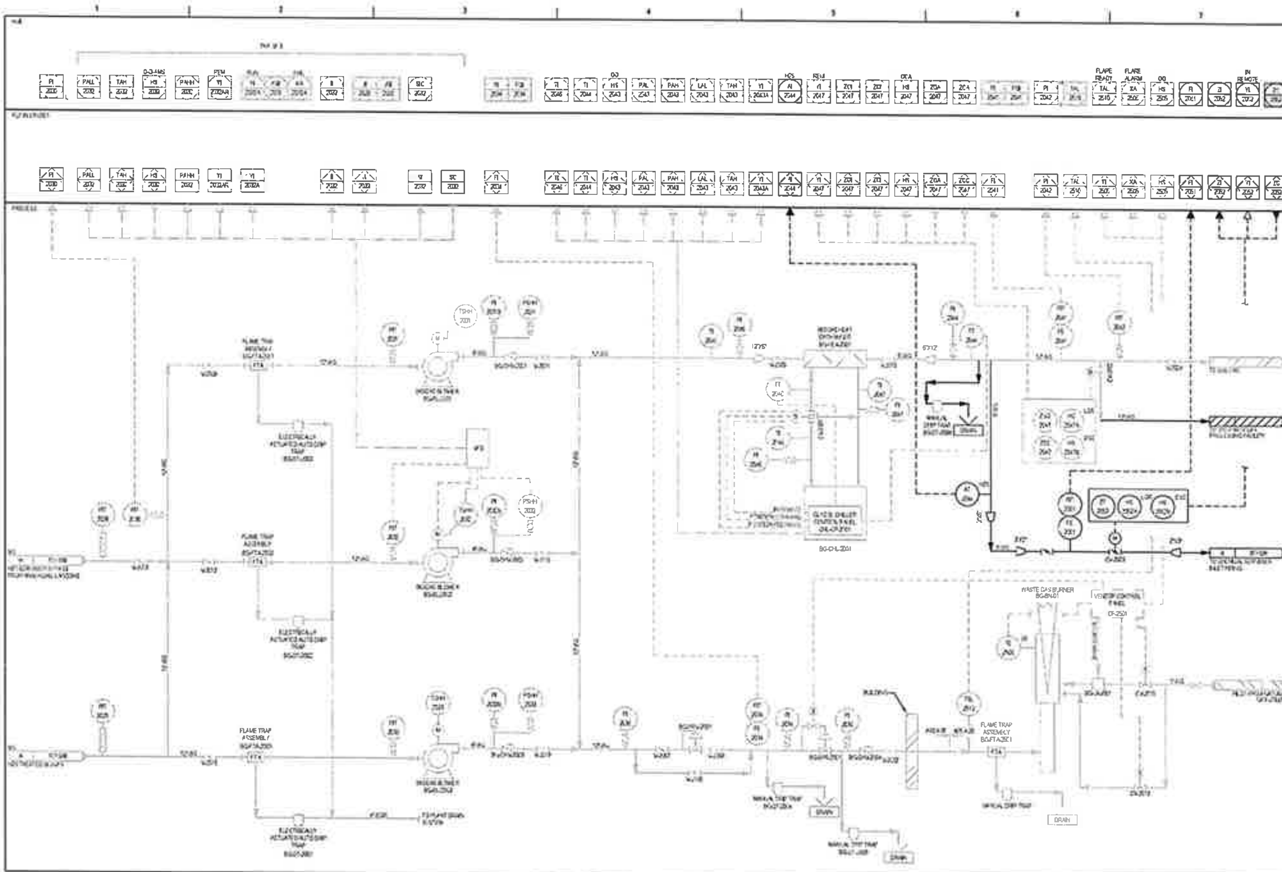
SOUTH SIOUX CITY
NEBRASKA

WASTEWATER TREATMENT FACILITY EXPANSION

PROCESS AND INSTRUMENTATION DIAGRAM - BIOGAS SCRUBBERS BID ALTERNATE 1

00Y608



GENERAL NOTES

1. THE PROCESS AND INSTRUMENTATION DIAGRAM IS NOT USED TO PROVIDE COMPLETE DETAIL OF ALL MECHANICAL COMPONENTS (E.G. ISOLATION VALVES). THE PRIMARY FUNCTION OF THIS DIAGRAM IS TO DEPICT INSTRUMENTATION, CONTROL FUNCTIONS AND SIGNALS ASSOCIATED WITH THE PROCESS.

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SOUTH SIOUX CITY NEBRASKA

WASTEWATER TREATMENT FACILITY EXPANSION

PROCESS AND INSTRUMENTATION DIAGRAM - BIOGAS SYSTEM

SHEET 00Y609

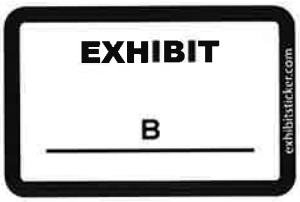
South Sioux City Wastewater Treatment Facility
Facility ID 65775
Update on facility activities to address H_2S levels in the facility biogas
August 2025

This submittal provides additional summary information on the activities planned for the South Sioux City Wastewater Treatment Facility (SSCWWTF), Facility ID 65775, to address air emissions concerns relating to the distribution of biogas generated by the facility. As previously conveyed to the NDWEE, the hydrogen sulfide (H_2S) concentration of the biogas generated at the SSCWWTF facility has fluctuated between levels greater than and less than the concentration anticipated. The facility is undertaking a number of changes that will alleviate concerns regarding sulfur dioxide (SO_2) emissions associated with combustion of biogas in the facility flare and boilers. Components of these changes involve pretreatment of the wastewater (pH adjustment) and future installation of tertiary disk filtration equipment to minimize H2S formation in the biogas, and improved scrubber treatment of the biogas via the procurement and installation of new scrubbing equipment, along with the repurposing of the existing scrubber to be capable of reducing H2S in the biogas to the level originally anticipated.

Both the new scrubber and the repurposed existing scrubber will have operations controls regarding the maximum H_2S concentration of the biogas entering the scrubbers. If the raw biogas H_2S concentration is less than 12,000 ppm the biogas will be treated by the new scrubber down to a maximum of 150 ppm for use as renewable natural gas (RNG). If the H_2S concentration is greater than 12,000 ppm or the mass of H_2S to be treated is above 350 lb/d, the biogas flow will be split between the two scrubbers and a clean recycled gas stream from the gas chiller will be added to the raw biogas inlet at the new scrubber as necessary to achieve the required scrubber inlet H_2S concentration.

The facility is targeting installation and commencement of operation of both the new scrubber and the repurposed existing scrubber for May-July of 2026. While the main focus is the installation of the new scrubber and re-purposing the existing scrubber, the facility is also planning on taking steps that are aimed at reducing the H_2S concentration of the biogas generated through the anaerobic pretreatment process, primarily via pH adjustment in the anaerobic lagoons and source reduction from the Industrial contributors. Source reduction will be explored once the WWTF can utilize disk filtration equipment that will be installed as part of the WWTF expansion project. These steps will be taken after installation/operation of the new scrubber and repurposed scrubber and are intended to assist in the efficient operation of the new scrubbing processes. The goal of these projects is to achieve a maximum scrubbed biogas H_2S concentration of 200 parts per million by volume (ppmv) and to increase the life of the scrubber media in the repurposed existing scrubber.

The facility has come to an agreement with an off-site renewable fuels processor that will be the primary distribution of the scrubbed biogas once the scrubber projects are operational resulting



in scrubbed biogas to be of sufficient quality to allow for its use as RNG. Scrubbed biogas sent off-site for use as RNG will not contribute to emissions at the facility and therefore not be included in the facility potential to emit (PTE), but it is important to acknowledge it as the primary distribution of the biogas. If the scrubbed biogas cannot be directed off-site for use as RNG, it will be combusted in either the boilers or the flare. In the rare cases where the scrubbers are unavailable or it is operationally necessary to bypass the scrubbers, the un-scrubbed biogas would be combusted in the flare for a limited number of hours per year. The following provides a general hierarchy of expected distribution of the biogas:

1. Scrubbed biogas (150 ppm H_2S) is sent off-site for use as RNG (unlimited hours per year).
2. Scrubbed biogas is combusted in either the on-site boilers (maximum 150 ppm H_2S) or the on-site flare (maximum 1000 ppm H_2S) for unlimited hours per year.
3. When the biogas scrubbers are not available, the un-scrubbed biogas will be combusted in the flare as an intermittent use (up to a maximum of 500 hours per year).

Option 3 is considered a scenario outside of normal operation that would only occur when the scrubbers are unable to treat the raw biogas. In that case, the biogas couldn't be used as RNG or combusted in the on-site boiler(s), so the only available disposition of the un-scrubbed biogas would be combustion in the on-site flare.

Upon completion of the scrubber project and other facility changes, the facility will submit an air construction permit revision application to include the new processes/control schema in the air construction permit. The facility will remain a minor source for prevention of significant deterioration (PSD) purposes and any air dispersion modeling needed to capture the new operating scenarios will be provided to NDWEE as part of the permit revision application.