NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date: **XXXX xx, 2023**

Region: Fayetteville Regional Office
County: Anson
NC Facility ID: 0400062
Inspector's Name: -------
Date of Last Inspection: N/A
Compliance Code: N/A (Greenfield)

Facility Data

Applicant (Facility's Name): Anson Gas Producers, LLC

Facility Address:
Anson Gas Producers, LLC
786 Dozer Drive
Polkton, NC 28135

SIC: 4923 / Natural Gas Transmission
NAICS: 221210 / Natural Gas Distribution (distribution of renewable natural gas)

Facility Classification: **Before:** Permit/Registration Pending **After:** Title V
Fee Classification: **Before:** N/A **After:** Title V

Permit Applicability (this application only)

SIP: 15A NCAC 02D .0516, 02D .0521, 02D. 1100, 02D .1806 and 02Q .0711 and 02Q .0317 for 02D .0530
NSPS: N/A
NESHAP: N/A
PSD: N/A
PSD Avoidance: N/A
NC Toxics: Yes
112(r): N/A
Other: Modeling of toxic air pollutant emissions for benzene, hydrogen chloride, vinyl chloride

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Dan Zimmerman Director of Operations, Compl. & EHS 10600 Nations Ford Road, Suite 150 Charlotte, NC 28273 (517) 896-4417	Dan Zimmerman Director of Operations, Compl. & EHS 10600 Nations Ford Road, Suite 150 Charlotte, NC 28273 (517) 896-4417	Dan Zimmerman Director of Operations, Compl. & EHS 10600 Nations Ford Road, Suite 150 Charlotte, NC 28273 (517) 896-4417

Application Data

Application Number: 0400062.22A
Date Received: 06/22/2022
Application Type: Greenfield Facility
Application Schedule: TV-Greenfield

Existing Permit Data
Existing Permit Number: N/A
Existing Permit Issue Date: N/A
Existing Permit Expiration Date: N/A

Consultant: Franklin Engineering & Consultants, PLLC **Contact:** Juene Franklin **Phone:** 832.244.1980
Email: jfranklin@franklinengineers.com

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP

<No Inventory>

Review Engineer: Booker Pullen

Review Engineer's Signature: **Date:** **XXXX xx, 2023**

Comments / Recommendations:
Issue: 10749T00
Permit Issue Date: XXXX xx, 2023
Permit Expiration Date: XXXX xx, 2028

1. Facility Description:

Anson Gas Producers, LLC (AGP) plans to develop a renewable natural gas facility (Anson Project) utilizing landfill gas that is generated in the adjacent Anson County Waste Management Facility (AWMF). AWMF is owned and operated by Chambers Development of North Carolina, Incorporated, which is a wholly owned subsidiary of Waste Connections of the Carolinas, Incorporated.

Anson Gas Producers, LLC will lease land from Chambers Development and has a physical address of 786 Dozer Drive, Polkton, North Carolina 28135. A lease and Access Agreement was signed on November 4, 2020 between AGP and Chambers Development of North Carolina.

The Anson Gas Producers, LLC (AGP) and the Anson County Waste Management Facility (AWMF) belong to the same industrial grouping (same two-digit SIC code: 49). The SIC number for AWMF is 4953 "Refuse Systems" and the SIC number for AGP is 4922 "Natural Gas Transmissions". The two facilities will be contiguous and adjacent. Generally, common control is determined through ownership (same parent company or subsidiary of a parent company). Common control can also be established through decision-making authority of one entity over the other through a contractual obligation or voting shares. Through the regulatory action, EPA emphasized that the:

> "Agency will be guided by the general definition of control used by the Securities and Exchange Commission (SEC). In SEC considerations of control, control "means the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a person (or organization or association) whether through the ownership of voting shares, contract, or otherwise. 17 CFR 210.1-02(g).""[1].

Moreover, through the EPA "*Meadowbrook"* guidance document[2] dated April 30, 2018, the EPA made it clear that the focus for a common control determination should be based upon:

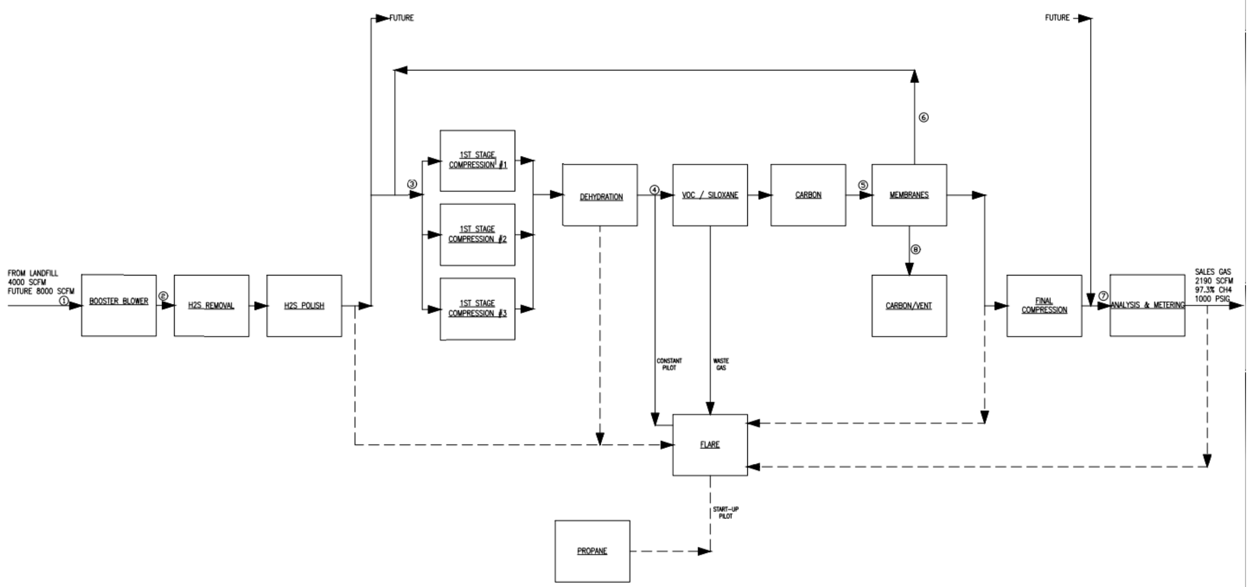
> "the power or authority of one entity to dictate a specific outcome at another facility…EPA believes the most relevant considerations should be whether entities have the power to direct the actions of other entities to the extent that they affect the applicability of and compliance with permitting requirements: e.g., the power to direct the construction or modification of equipment that will result in emissions of air pollution; the manner in which such emission units operate; the installation or operation of pollution control equipment; and monitoring, testing, recordkeeping, and reporting obligations. On the other hand, common control considerations should not focus on the power to direct aspects of an entity's operations that are wholly unrelated to air pollution permitting requirements. If one entity has power or authority over some aspect of another entity's operations that would have no impact on pollutant-emitting activities of the stationary source subject to permitting requirements, EPA does not consider that fact to be relevant to determining whether the two entities should be considered a single source for air quality permitting purposes (e.g., one entity providing security for both its facility and for an adjacent facility belonging to another entity)."

These two facilities will not be considered as "one single source" for regulatory requirements because they have completely different and separate ownership.

The Anson Project will be designed to treat and refine 4,000 standard cubic feet per minute (scfm) of landfill gas (LFG) and convert the gas to satisfy pipeline quality requirements. A booster blower will compress the landfill gas to approximately 8.5 psig and transport this LFG to a Sulfur Treatment System (CD-1). Once the LFG passes through the H_2S Removal System, it will then pass through an H_2S Polishing Unit (CD-2). The gas will then enter a 1st Stage Dehydration System (1st Chiller) which is designed to reduce the dewpoint of the LFG to approximately 40°F.

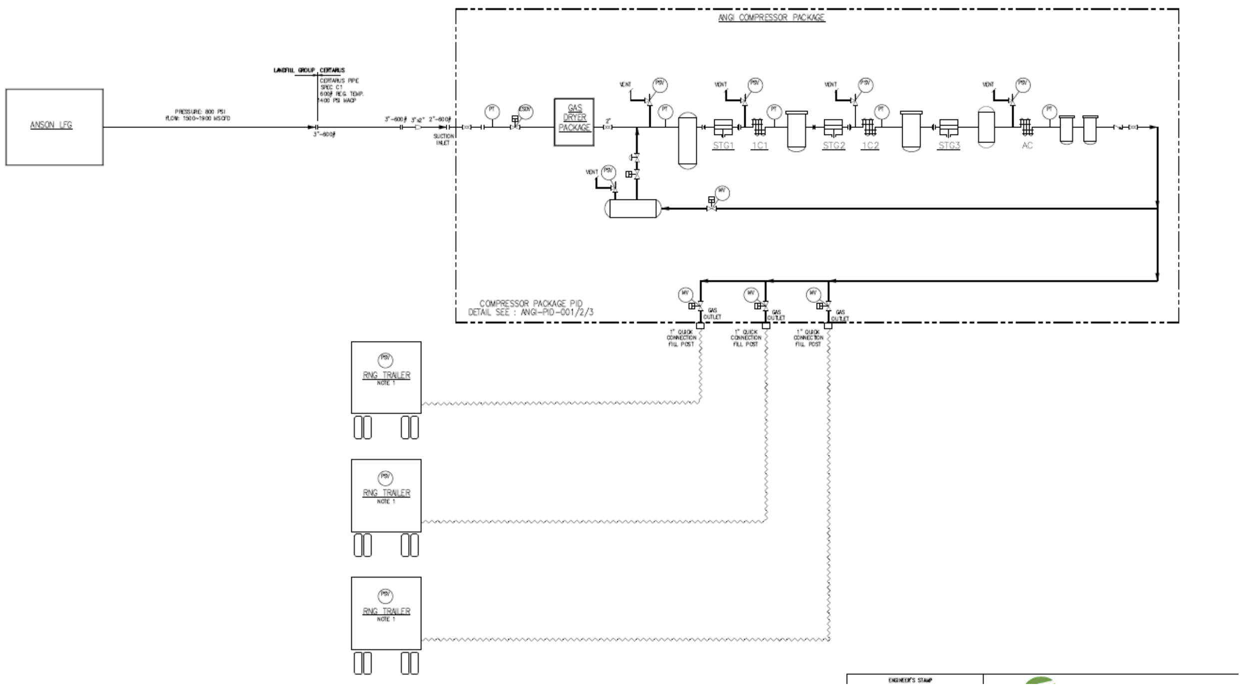
[1]*Requirements for Preparation, Adoption, and Submittal of Implementation Plans; Emission Offset Interpretive Ruling,* 45 FR 59874, September 11, 1980.
[2]Letter from William L. Wehrum, Assistant Administrator, U.S. Environmental Protection Agency, Office of Air and Radiation, to the Honorable Patrick McDonnell, Sec'y of the Pennsylvania Department of Environmental Protection (April 30, 2018).

Subsequent to completion of 1st Stage Dehydration, the LFG is then transported to a VOC/Siloxane Removal System (VRS, CD-3) which is a regenerable solid media system designed to remove approximately 95% of the VOCs present in the LFG. The waste gas (tail gas) is sent to a candlestick flare (CD-CF-1) designed to combust 400 scfm. Since the heat content of the waste gas (tail gas) will be very low, natural gas will be used to keep a continuous pilot flame to facilitate an acceptable (98%) destruction efficiency. According to the applicant, the added natural gas (slip stream from the processed gas) is used only to keep a continuous pilot flame present. The useful landfill gas will then be transported to the 1st Stage Compression system which will compress the gas to approximately 225 pounds per square inch gauge (psig). The LFG will then be transported to the 2nd Stage Dehydration Unit (2nd Chiller) which is designed to reduce the dewpoint of the LFG to 35°F to remove any remaining moisture that might be present. The LFG is then transported to the Carbon Polishing unit to remove any remaining contaminants. Once the LFG leaves the Carbon Polishing unit, it will be transported to a Membrane (CD-4) for final filtration treatment. The Membrane will be designed to remove any remaining VOCs, siloxanes, and/or other contaminants that may be present in the LFG. Once the treated LFG leaves the membrane it will be recirculated back through the 1st Stage Compression System, sent to the final Compression System. If the processed natural gas does not meet the specification for pipeline quality natura gas, it will be burned in the flare. Any off-gases emitted from the Membrane will be sent to the Carbon Vent system (1,785 scfm, CV-1) to remove any remaining contaminants except CO_2. The odorless, non-combustible CO_2 and trace contaminants will then be vented directly into the atmosphere.



Anson Gas Producer's responded to an additional information request and stated that "to date there is no natural gas pipeline located near the proposed facility". The gas pipeline design is not yet available as they are still working on easements. A full design is expected for release within the next 30-45 days (as of 7/6/2023) with pipeline completion in the next 12-18 months. In the interim, the processed natural gas will be collected in tanker trucks and transported to the nearest natural gas metering station and injected into a natural gas pipeline. The following schematic shows the process of placing the natural gas into the trucks prior to the pipeline being installed at the Anson Gas Producer's site.

Anson Gas Producers responded to an Additional Information Request (dated 9/18/2023) concerning the number of trucks that are estimated to be filled in the injection of the renewed natural gas into tanker trucks in the Truck Loading System. Anson Gas stated that an estimated 7 trucks per 24 hours will be filled and estimated natural gas (methane) losses during hookups and disconnects in the loading/unloading process will be 32 ft^3/ truck.



The candlestick flare that is proposed to be constructed at the Anson Gas Producers site is a dual-tip flare. A Dual high pressure/low pressure flare can be used for both pressure ranges. The perk of having this type of flare is that both tips can be tied in together and share one pilot burner without affecting the tips performance. This dual-tip flare tips are also integrated with one windshield. Having a dual tip flare allows the operational flexibility to combust partially treated low-Btu off-gases from the siloxane removal system or the high-Btu landfill gas post-treatment. The waste gas from the VOC/H_2S removal systems may not have enough heat content to facilitate destruction; therefore, the flare will be equipped with a continuous pilot that will provide enough natural gas to facilitate combustion under this operating condition and to keep the flare operational and to offer a 98% destruction efficiency.

2. Purpose of Application:

The purpose of this application (No. 0400062.22A) is to request a Title V permit for a greenfield facility that will be constructed on leased land with a facility address of 786 Dozer Drive, Polkton, North Carolina 28135 that is located adjacent to the existing AWMF (located at 375 Dozer Drive, North Carolina 28135). The application was received on June 22, 2022 and was considered complete on that date. Because this is a greenfield facility, the site address was placed into the Environmental Justice (EJ) database and was evaluated to determine if it will be located in an Environmental Justice community. This Title V permit will be processed using the one-step significant procedure which is required to go through a 30-day public notice and a 45-day EPA review prior to issuance.

The Responsible Official and facility contact for this application is Dan Zimmerman, Director of Operations, Compliance and EHS. His address is 10600 Nations Ford Road, Suite 150, Charlotte, NC 28273.

3. Process Descriptions:

Sulfur Treatment System (CD-1) and Hydrogen Sulfide Polishing System (CD-2)

The Hydrogen Sulfide treatment system at the Anson County Landfill is manufactured by Advanced Biogas Systems and the model number is IC-4000. The system is designed to lower H_2S levels in the gas from as high as 1,000 ppmv at the inlet to less than 50 ppmv after treatment. The system is designed for a flow rate of 4,000 SCFM (expandable to 8,000 SCFM). The system works by reacting chelated iron with the H_2S in the gas. The H_2S molecule reacts to form elemental sulfur. The iron chelate solution is then regenerated using Oxygen.

The following information details the steps involved in the H_2S removal process.

- Gas Path Step 1 – Sparger Vessel: The gas enters the sparger vessel at nominally 8 PSIG of pressure. The sparger vessel is full of iron chelate solution. The gas bubbles through the bottom of the vessel and the H_2S in the gas reacts with the iron and forms elemental sulfur.
- Gas Path Step 2 – Separator Vessel: After the sparger, the gas enters a separator vessel that removes any iron chelate or sulfur that is carried over from the sparger vessel with the gas.
- Gas Path Step 3 – H_2S Polishing Vessel: The gas then enters the H_2S polishing vessel where any remaining H_2S in the gas is removed. The vessel is filled with Darco BG1 (carbon based) media which removes the remaining H_2S entrained in the gas. After H_2S polishing, the gas continues to the compression step.
- Iron Chelate liquid path Step 1 – Sparger Vessel: The Iron Chelate solution is pumped to the sparger vessel where it can react with H_2S in the gas.
- Iron Chelate liquid path Step 2 – Regenerator Vessel: The spent Iron Chelate flows over a weir in the sparger vessel and continues to the regenerator vessel. Compressed air is injected into the regenerator vessel and Oxygen from the compressed air reacts with the chelated iron and converts the iron from Fe+2 to Fe+3 so that it can again react with the H_2S in the gas.
- Iron Chelate liquid path Step 3 – Settling Vessel: After the Iron Chelate leaves the regenerator vessel it continues to the settling tank. The purpose of the settling tank is to lower the liquid velocities so that the elemental sulfur can settle to the bottom of the vessel.
- Iron Chelate liquid path Step 4 – Belt Filter: The iron chelate with settled sulfur is pumped from the bottom of the settling tank to a belt filter that separates the elemental sulfur from the iron chelate. Elemental sulfur is dumped into a hopper and iron chelate solution continues to Step 5.
- Iron Chelate liquid path Step 5 – Filtrate Tank: After Filtration, the iron chelate solution is collected in a filtrate tank. Iron chelate solution is stored in this tank until it is pumped back to the sparger. At this point the Iron chelate has been filtered and regenerated and is ready to be pumped back to the sparger.
- Iron Chelate liquid path Step 6 – Pump and Heater: From the Filtrate tank the iron chelate is pumped through a heat exchanger that heats the solution slightly higher than the inlet gas temperature to prevent condensation in the iron chelate solution. The iron chelate solution is then finally conveyed back to the sparger vessel and the cycle is repeated.

VOC Removal System

After the H_2S removal system, gas compression, and dehydration, the gas will go to a VOC removal system. This system consists of two vessels filled with silica gel. The silica gel is standard 2 to 5 mm white/clear beads similar to what is shown in Attachment C of this RTQ.

One vessel will be treating the gas and will remove non-methane organic compounds from the gas in addition to any remaining water vapor. The second vessel is regenerated using a temperature swing adsorption process. Gas is heated to approximately 250°F to regenerate the vessel. Hot gas from the vessel is cooled down and liquids are removed before it is again returned to the vessel to continue heating. A slip-stream of this gas is sent to the flare to be thermally oxidized. When Silica gel is replaced, the plant will be shut down and the vessels will be isolated and vented. Existing Silica gel will be removed through a man way at the bottom of the vessel. New silica gel will be placed through the man way at the top of the vessel.

VOC Polishing

After the VOC Removal system, the gas proceeds to two lead-lag vessels filled with activated carbon. There are many vendors of activated carbon, and the material used will be a pelletized 4 mm activated carbon similar to what is included as Attachment D of this RTQ. The carbon vessels will be run lead-lag. This means that the gas will run through one vessel and then be followed by the second vessel. When the vessel requires change-out the first vessel will be changed out with new carbon, and the second vessel will be switched to the first vessel position using the valves supplied with the plant. The vessel containing the new carbon will be placed in the second vessel position using the hand valves. The vessels have a double block and bleed valve system that allows isolation while the plant is running. The vessels may be emptied using the bottom manway and filled using the top manway. Generally, they will be filled using supersacks of activated carbon from the top of the vessel.

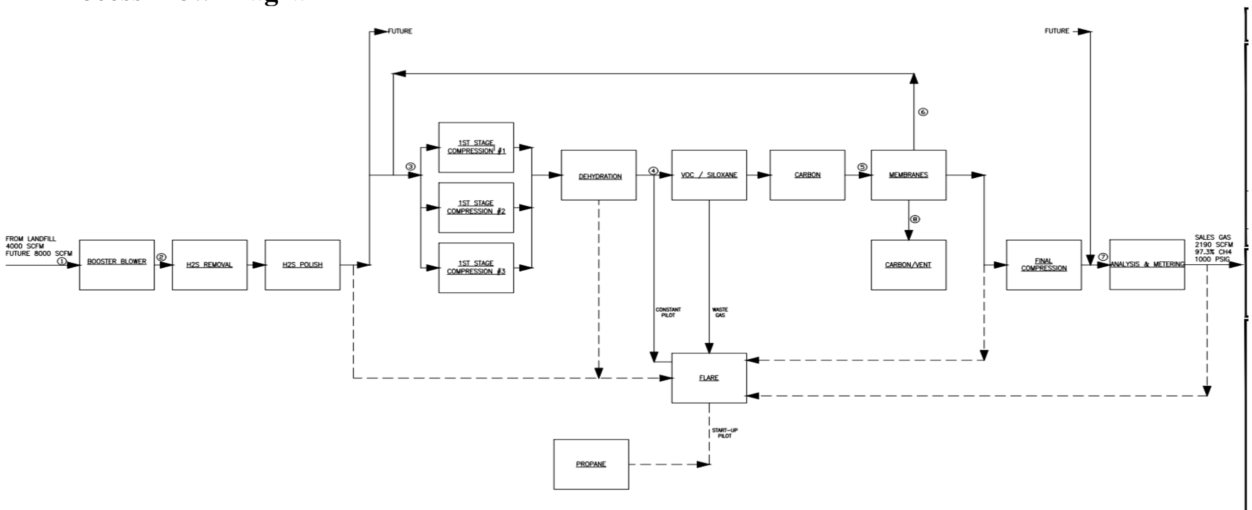
CO_2 Removal Membranes

Evonik membranes are used to remove the CO_2 from the biogas at the upgrading plant. These membranes are designed to reduce CO_2 content of 4,000 scfm of treated gas from 45% to < 1%. The gas enters the membrane system after the VOC Polishing step. The permeate from the first stage membrane is the CO_2 and is removed at about 1 PSIG and sent to a vessel filled with activated carbon and then vented to atmosphere. The retentate from the first stage membrane continues to the second stage membrane. The second stage permeate is recycled back to the compressor inlet. The second stage retentate is compressed to pipeline pressures and sold as pipeline quality natural gas.

Anson Gas Producers, LLC Process Flow Diagram

- One landfill gas removal system, ES-1
- One Candlestick Flare, CF-1 (4,000 standard cubic feet per minute of landfill gas)
- One Carbon Vent System, CV-1 (receives 1,785 standard cubic feet per minute of scrubbed gas)
- Sulfur Treatment System, CD-1 (Removes most of the sulfur compounds from the landfill gas)
- H_2S Polishing System, CD-2 (Removes additional sulfur from the landfill gas)
- Removal System, CD-3 (Removes VOCs and siloxanes from the landfill gas)
- VOC Membrane System, CD-4 (Removes additional VOCs and siloxanes from the landfill gas)

Process Flow Diagram



There is no natural gas available on site because there are no natural gas lines in the area. For this reason, a "slip stream" of the treated landfill gas is taken just before the VOC/Siloxane system and will be sent to the flare as fuel for the continuous pilot. This pilot will be continuously monitored using Type K thermocouples. Under normal operations the flow of waste gas from the VOC system to the flare will be about 1% of the inlet flow to the plant. This would be 40 standard cubic feet per minute (scfm) assuming the rated capacity of the plant is at 4,000 scfm. It is possible for the methane content of the waste gas to be as high as 50%. In these situations, supplemental fuel would not be required to facilitate combustion. However, since waste gas is not always sent to the flare, treated landfill gas that has been processed to pipeline quality gas will serve as fuel for the continuous pilot to make certain that a flame is present when waste gas is transported to the flare. In addition, the continuous pilot will flow approximately 10 scfm @ 70% methane.

4. Application Chronology:

06/22/22 Application No. 0400062.22A received and considered complete.

08/30/22 Booker Pullen called the consultant to ask for further explanation of the landfill gas refinement process, the leasing of land for the facility, and the function of adding natural gas to the flare.

09/28/22 Calculations indicate TPER exceedances for toxic air pollutants benzene, hydrogen chloride, vinyl chloride. No modeling was submitted with the application. Anson Gas producers responded (12/16/2022) by asking the DAQ to perform the modeling exercise.

11/17/22 Additional information request sent via email requesting clarification on the emission factors used to perform the calculations in the application. Response to questions received on 11/17/2022.

12/09/22 Additional technical information request sent via email for the modeling parameters and other pertinent modeling questions that would be needed in order for the DAQ to perform toxics dispersion modeling. Response received on May 1, 2023.

12/19/22 Additional information request sent via email concerning the usage or emissions of PFAS in the production of pipeline quality natural gas and a second request for the modeling parameters for the stacks for all new or modified sources, and any existing sources that have pollutants in common with the new or modified sources. The stack parameters needed for each source are stack base elevation, stack height above ground, stack exit diameter, stack exit velocity, and stack temperature. Also, any information for any new or modified fugitive emissions sources along with the heat release in million BTU per hour for the flare stack height. Response received for the PFAS request on March 21, 2023 and the response for the remaining information on modeling was received on May 1, 2023.

05/22/23 Booker Pullen sent the draft permit and review to the Fayetteville Regional Office for review and comment. Comments were received on May 24th and additional comments on May 25th. Relevant changes were incorporated into the review and permit.

05/22/23 Booker Pullen sent the draft permit and review to the Stationary Compliance Branch. Stationary Compliance had the following comment. If the applicable regulation does not specify whether it is a 3-hour rolling average or a 3-hour block average, then the DAQ's general consensus is to use a 3-hour rolling average. This change was made in the permit and review.

06/08/23 Additional information request sent via email concerning more detailed specifications on the media and/or membranes used in the equipment for removing pollutants from the landfill gas (H_2S removal system, H_2S Polishing System, VOC/Siloxane Removal System, and the VOC Membrane System) in the conversion of the gas into pipeline quality natural gas. Response received on July 6, 2023.

06/13/23 Additional information request sent via email asking if a separate natural gas source will be used to provide fuel for the pilot flame of the flare or will there be a slip stream from the process to provide the gas for the pilot. Response received on 7/6/2023.

08/02/23 Additional information requests asking about the timing of the installation of the natural gas pipeline installation compared to the proposed construction of the Anson Gas Producer's facility and the plans to transport the natural gas in the event that the pipeline is not installed when the renewable natural gas plant begins operation. Response received on 8/31/2023.

09/18/23 Additional information request sent via email requesting a more detailed description and operation scenario for the Truck Loading system along with additional information on the Sulfur Treatment System. Response received on 9/22/2023.

09/18/23 Draft permit sent to applicant and consultant for review and comment. The Draft permit was resent to the applicant on 10/6/2023 due to revisions to the permit. Comments received on October 10/10/2023.

09/27/23 Additional information request sent via email requesting clarification on the number of trucks that will be filled per day with renewed natural gas.

10/6/23 Draft permit and review sent to the Fayetteville Regional Office for review and comments. Comments were received on October 30, 2023 and incorporated into the review and permit.

10/6/23 Draft permit and review sent to the Stationary Compliance Source Branch (SSCB) for review and comments. SSCB responded on 10/9/2023 with no Comments.

11/15/2023 Draft permit sent to 30-day public notice.

11/15/2023 Draft permit sent to EPA for the 45-day review.

5. Permitted Sources (All sources are new):

a. Sources/control devices that will be listed on the Title V permit.

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
ES-1	Landfill Gas-To-Renewable Natural Gas Processing Plant (4,000 standard cubic feet per minute) consisting of: ● One booster blower (4,000 standard cubic feet per minute ● Dehydration/Chiller System ● VOC Removal System	CD-1 CD-2 CD-CF-1	Hydrogen Sulfide Treatment System (Iron Chelate Medium) Hydrogen Sulfide Polishing System One candlestick flare (4,000 standard cubic feet per minute of landfill gas)
ES-CV-1	One carbon vent system (1,785 standard cubic feet per minute)	None	None

5. Permit Modification/Changes and TVEE Discussion:

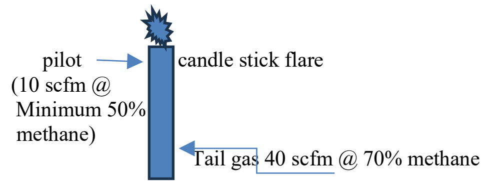
- This is the first permit for Anson Gas Producers, LLC, therefore there are no changes to any existing permit conditions or sources.
- All permitted sources at this facility that emit criteria pollutant will be placed into the Title V Equipment Editor (TVEE) Module.

6. Regulatory Review:

The facility is subject to the following air quality regulations in addition to the General Conditions:

- 15A NCAC 02D .0516 “Sulfur Dioxide Emissions from Combustion Sources”
- 15A NCAC 02D .0521 “Control of Visible Emissions”
- 15A NCAC 02D .0711 “Emission Rates Requiring a Permit”
- 15A NCAC 02D .1100 “Control of Toxic Air Pollutants”
- 15A NCAC 02D .1806 “Control and Prohibition of Odorous Emissions”
- 15A NCAC 02Q .0503(8) “Definitions, Insignificant Activities due to size”

6. Regulatory Review: Continued



Landfill gas collected by the Anson County Waste Management Facility (AWMF) Landfill will be transferred to Anson Gas Producers via pipeline. The landfill gas will be treated and refined as described previously and then initially loaded into tanker trucks until the natural gas pipeline connection is installed at the site. Therefore, the normal operation scenario for this facility is to route all the tail gas to the open flare and the processed gas will be sold as a commodity.

15A NCAC 02D .0516 - Sulfur Dioxide Emissions from Combustion Sources

Emission of sulfur dioxide from any source of combustion discharged from any vent, stack, or chimney shall not exceed 2.3 pounds of sulfur dioxide per million BTU input. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard. The only combustion source at this facility will be the candle stick type flare (CD-CF-1).

Data Used to calculate sulfur emissions:

Maximum lfg flowrate into facility	= 4,000 scfm of landfill gas (rated capacity of the flare)
Maximum natural gas (pilot) (flow)	= 10 scfm natural gas (minimum 50% methane content), Attachment F, July 6, additional information request
Methane Content	= Conservative worse-case estimate of 70% (by consultant) for calculations of criteria pollutants for gas that is sent to the flare along with the other sulfur bearing compounds. Under the "normal operation" scenario for this facility, the majority of methane that enters the facility in the landfill gas is being removed from the gas stream and sold as product. Only a small fraction of methane remains in the tail gas and is being sent to the flare.
Annual methane rate	= 41,673,337 m^3 CH_4/year (@ 8,760 hrs/yr, 70% methane and 4,000 scfm of landfill gas) – see calculation below.

$$\frac{4000\text{ ft}^3\text{ lfg}}{\text{min}} \text{ x } \frac{60\ min}{hr} \times \frac{8760\text{ hrs}}{\text{year}} \text{ x } \frac{70\%\ CH_4}{100\%\ lfg} = \frac{1{,}471{,}680{,}000\ ft^3\ CH_4}{yr} \text{ or } \frac{41{,}673{,}337\text{ meters}^3\text{ CH}_4}{\text{year}}$$

Hours of operation	= 8,760 hrs/yr
Methane heat content natural gas	= 1,012 Btu/standard cubic foot
Multiplication factor	= 1.43 (used in equation 3 of AP-42 Section 2.4.1 for 70% methane) $\frac{2}{70\%} = \frac{x}{50\%}$ where "x" = 1.43
Flare destruction eff.	= 98%
SO_2 Factor	= Calculated using AP-42 Section 2.4.4.1 Equation 3
Cl	= Calculated using AP-42 Section 2.4.4.1 Equation 10
Methane Content of the Waste Gas	= 50%
Waste Gas (tail gas) Flow rate	= 40 scfm
Methane Content of (Pilot Gas)	= 50%
Slip Stream flow rate for pilot	= 10 scfm

Included in the design for this facility, the flare could also be used to combust partially treated LFG at 4,000 scfm, waste gas from the VOC removal system, or treated LFG that does not meet pipeline quality natural gas specifications.

Possible scenarios based on the flow diagram contained in the application:

Scenario 1: Flare (CD-CF-1) burning tail-gas (@ 40 scfm containing 50% methane) comprised of the remaining sulfur bearing compounds not scrubbed out by the H_2S removal system and the polishing system and a slip stream of natural gas (10 scfm containing 50% methane) produced by the facility. The slip stream is added to provide the heat required to maintain the flame and to help establish the destruction efficiency of 98% for this control device. This scenario is the worse-case for SO_2 emissions when compared to heat input and will be used to establish compliance with 15A NCAC 02D. 0516.

Scenario 2: Flare (CD-CF-1) burning off-spec (does not meet specifications for sale) gas that has been treated and scrubbed of hydrogen sulfide in control devices CD-1 (H_2S removal), CD-2 (H_2S polish), CD-3 (VOC/Siloxane removal), and CD-4 (Membranes for final filtration) but has not finished the final stages before injection into trucks or pipeline. This scenario is almost equivalent to Scenario 3 below (pipeline quality gasoline).

Scenario 3: Flare (CD-CF-1) burning gas that has been scrubbed, compressed, carbon dioxide removed, by all the processing devices but cannot for some reason be sold as pipeline quality natural gas. This gas should be equivalent to natural gas with a heat input rate of approximately 1,012 Btu per standard cubic foot. This scenario would not be a regular occurrence under normal operation and would represent a type of upset condition. This scenario represents the worse-case for calculation of hourly criteria pollutants.

The maximum design flow rate into the flare was used to estimate the criteria pollutants (other than SO_2) for annual NOx, annual CO, annual PM, annual PM_{10} and annual $PM_{2.5}$, and toxic air pollutants). This will represent the worse-case scenario for these pollutants.

Example Calculation for Scenario 1:

Scenario 1 should be the worse-case operation for SO_2 emissions when the flare is burning the tail-gas and other sulfur bearing compounds from the process which contains a very small percentage of methane because most of the methane has been separated from the gas stream and is being collected for sale as natural gas. This will be the normal operation of the landfill gas conversion system. In order to keep the flame lit in the flare and to maintain enough heat for 98% control efficiency, supplemental natural gas (natural gas that has been through the conversion process at this facility) will be added to assist the flare.

The following equation from AP-42, fifth edition, Section 2.4.4.1 “Emissions”, Revised November 1998, can be used to calculate the volumetric emission rate of individual toxic air pollutants in the landfill gas. Normally the value of the methane (CH_4) is calculated from the EPA Landgem software program and used in Equation 3 of AP-42, fifth edition, Section 2.4.4.1. In general, landfill gas is approximately 50 percent methane and 50 percent CO_2 (this percentage has trace elements of N_2, and NMOC) when it comes from the landfill. However, for calculating the worse-case emissions of criteria pollutants, HAPs and air toxics, the applicant chose a gas flow rate of 4000 scfm (flare design capacity) at 70% methane content.

02D .0516 calculation at normal flow of tail gas and methane into the flare:

Pilot flame: 10 scfm 50% methane pilot flame (from amendment to application, 7/6/2023)
Tail gas : 40 scfm tail gas with 50% methane content (from amendment to application, 7/6/2023)

Total Flare Btu Rating using the estimated methane content from the application:

$$\frac{50 \text{ ft}^3 \text{ lfg}}{\text{minute}} \text{ x } \frac{60 \text{ minutes}}{1\ hour} \text{ x } \frac{1{,}012\ Btu}{ft^3\ lfg} \text{ x } \frac{50\%}{100\%} \text{ x } \frac{1\ mmBtu}{10^6\ Btu} = \frac{1.52\ mmBtu}{\text{hr}}$$

The total gas that goes through the flare under normal operation, with the majority of the methane that has been converted from the processing of landfill gas being sold, is 50 ft^3 per minute. This is the amount of gas that will be combusted at the lowest Btu rate with remining sulfur compounds after H_2S control. SO_2 will be created during combustion.

Calculation of sulfur emissions:

$$Q_{sulfur} = A \times Q_{CH_4} x \left(\frac{C_p}{1\times 10^6}\right)$$ Equation 3, Section 2.4.4.1

Where:

Q_p = Emission rate of pollutants, m^3/yr
Q_{CH4} = Methane generation rate, m^3/yr
C_p = concentration of reduced sulfur compounds from AP-42 Section 2.4: (46.9 ppmv)
A = multiplication factor (2.0) for 50% methane (CH_4) and that 50 percent is CO_2, N_2, and other constituents) – This factor used for the calculation of pounds of SO_2 per million Btu
A = multiplication factor (1.82) for 55% methane (CH_4) and that 45 percent is CO_2, N_2, and other constituents)
A = multiplication factor (1.43) for 70% methane (CH_4) and that 45 percent is CO_2, N_2, and other constituents) – This is the factor used for toxic pollutant and HAP calculations.

Calculation of the uncontrolled SO_2 emission rate for the combustion of tail gas and pilot gas being burned in the flare under the normal operation scenario, using a 50% methane content per the amended application, 7/6/2023. The annual emissions of Sulfur coming from the flare under normal worse case conditions would be created from 50 scfm gas (372,083 m^3 CH_4/yr - tail gas and pilot @ 50% methane content) for 8760 hours per year.

$$Q_{sulfur} = A \times Q_{CH_4} x \left(\frac{C_p}{1\times 10^6}\right)$$ Equation 3, Section 2.4.4.1

$$Q_{sulfur} = 2.0 \times \frac{372{,}083\ m^3}{yr}\ x \left(\frac{46.9\ parts}{1\times 10^6}\right) = \frac{35\ m^3\ sulfur}{yr}$$

The potential emissions of sulfur that would come from the landfill gas at 46.9 ppmv equates to 35 m^3 per year. Under normal operation, the majority of the sulfur compounds will be removed in the H_2S control device, however, the total amount will be used as a worse case amount for the calculation of SO_2 created by combustion of the sulfur in the flare.

The following equation from AP-42, fifth edition, Section 2.4.4.1 “Emissions”, Revised November 1998, was used to calculate the uncontrolled mass emission rate individual toxic air pollutants present in methane gas.

$$UM_{sulfur} = \frac{35.0\ m^3\ sulfur}{yr} \quad x \left[\frac{MW\ (g/gmole) \times (1\ atmosphere)}{(\frac{8.205 \times 10^{-5}\ m^3-atmospere}{gmol-\ ^0K}) \times \frac{1000\ g}{kg} \times (273+\ 25\ ^0C)\ ^0K} \right] = \frac{kg\ Sulfur}{year}$$

Where:

UM_{sulfur} = Uncontrolled mass emissions of pollutants, kg sulfur/yr
MW_p = Molecular weight of pollutant, 32.065 grams sulfur/gmol
Q_p = Emission rate of pollutant, m^3/yr
T^0 = 25^0 C (77 ^{0}F), recommended by AP-42 for landfill gas temperature if temperature is unknown

$$UM_{sulfur} = \frac{35.0\ m^3}{yr}\ x \left[\frac{32.065\ grams\ sulfur/gmole \times (1\ atmosphere)}{(\frac{8.205 \times 10^{-5}\ m^3-atmospere}{gmol-\ ^0K}) \times \frac{1000\ g}{kg} \times (273+\ 25\ ^0C)\ ^0K} \right] = \frac{46.0\ kg\ sulfur}{year}$$

The calculated emissions of SO_2 are twice the emissions of Sulfur (MW ratio).

CM_{SO2} = Controlled mass emissions of SO_2 (kg/yr)
UM = Uncontrolled mass emissions of reduced sulfur compounds as sulfur (kg/yr) (from AP-42 Section 2.4.4.1 equations 3 and 4)
η = Efficiency of the landfill gas collection system (percent)
2.0 = Ratio of the molecular weight of SO_2 to the molecular weight of S
170.02 = Flare heat input rate

$$CM_{SO2} = UM_S \times \frac{\eta_{col}}{100} \times 2.0 \quad \text{Equation 7, Section 2.4.4.1}$$

$$= \frac{46.0\ kg\ S}{year} \times \frac{100}{100} \times 2.0 \times \frac{2.205\ lbs\ SO2}{kg\ SO2} \times \frac{1\ year}{8760\ hours} = \frac{0.023\ lbs\ SO2}{hour}$$

$$= \frac{0.023\ lbs\ SO2}{hour} \times \frac{1\ hour}{1.52\ mmBtu} = \frac{0.015\ lbs\ SO2}{mmBtu}$$

This value is well below the allowable emissions of 2.3 lbs SO_2 per million Btu.

Scenarios 2 and 3 would be practically the equivalent of pipeline natural gas and will have minimal sulfur content, since the H_2S, moisture and CO_2 pollutants have been scrubbed out of the landfill gas. In these situations, the flare should always be in compliance 15A NCAC 02D .0516. However, this scenario would be representative of the worst-case emissions of PM, PM_{10}, $PM_{2.5}$, CO (created in flare), NOx (created in flare), and toxics prior to any control because it has the highest volume of gas that could theoretically go to the flare. Note: if this calculation was performed for the normal operation scenario for this facility (40 scfm waste gas to flare, 10 scfm pilot gas to flare, ≈ 70% methane content, at 8760 hours per year, the annual SO_2 emissions would be:

<u>15A NCAC 02D .0521: Control of Visible Emissions</u>

Flare CD-CF-1 and the Carbon Vent (CV-1) are subject to this regulation because they both will be manufactured after July 1, 1971. Visible emissions from the flare (ID No. CD-CF-1) and the Carbon Vent (CV-1) are limited to a six-minute average opacity of 20%. Visible emissions from a properly maintained and operated flare are commonly not a concern.

The CO_2 vent (CV-1) is not expected to have visible emissions. No monitoring, recordkeeping or reporting is required for LFG/natural gas combustion or the venting of CO_2 from these sources. Compliance is expected.

15A NCAC 02D .1806: Control and Prohibition of Odorous Emissions - State-enforceable Only
The Permittee shall not operate the facility without implementing management practices or installing and operating odor control equipment sufficient to prevent odorous emissions from the facility from causing or contributing to objectionable odors beyond the facility's boundary.

15A NCAC 02Q .0503(8): Insignificant Activities Based on Size or Production Rate
"Insignificant activities because of size or production rate" means any activity whose emissions would not violate any applicable emissions standard and whose potential emission of particulate, sulfur dioxide, nitrogen oxides, volatile organic compounds, and carbon monoxide before air pollution control devices, are each no more than five tons per year and whose potential emissions of hazardous air pollutants before air pollution control devices, are each below 1,000 pounds per year.

DAQ requested that Anson Gas Producers provide more information concerning the loading operation of the converted natural gas into the tanker trucks for the transporting of the gas to the local metering station. Anson Gas Producers responded that the expected operation of the Truck Loading System is to fill up to 7 trucks per 24 hours, with estimated natural gas (methane) losses (to the atmosphere), when connecting/disconnecting hoses, of up to 32 ft^3 per truck.

$$\frac{32\ ft^3}{disconnect} \times \frac{7\ disconnects}{day} \times \frac{365\ days}{year} = \frac{81{,}760\ ft^3\ CH_4\ (2315\ m^3\ or\ 2{,}315{,}000\ liters)}{year}$$

The definition of VOCs is found in 40 CFR 51.100(s)(1). The definition includes a list of chemicals not defined as VOCs. Volatile organic compounds means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. This includes any such organic compound except those that have been determined to have negligible photochemical reactivity such as methane, ethane…and some others.

For the purposes of this calculation, it is believed that a percentage of volatile organic compounds may remain in the proposed processed natural gas in very small amounts. Therefore, for a worse case calculation, the methane released during the disconnection process will be used to calculate the annual volatile organic compounds and hazardous air pollutants. The Ideal Gas Law will be used to calculate the annual emissions of volatile organic compounds and hazardous air pollutants.

As stated previously, the DEQ requested information from the applicant concerning the potential emissions into the atmosphere when the hose connections were connected to and removed from the tank trucks during the filling operation.

The National Institute of Standards and Technology (NIST) uses a temperature of 20 °C (293.15 K, 68 °F) and an absolute pressure of 101.325 kPa (14.696 psi, 1 atm) for standard temperature and pressure (STP). For an ideal gas (ambient air approximates an ideal gas), volume percent is the same as mole percent. Using these values, the constant for the volume that one mole of gas would occupy (molar volume) under STP would be 22.4 L (0.791 ft^3).

$$\frac{2{,}315{,}000\ liters\ CH_4}{yr} \times \frac{1\ mole\ CH_4}{22.4\ liters\ CH_4} \times \frac{16.04\ grams\ CH_4}{mole} \times \frac{lbs}{453.592\ grams} \times \frac{tons\ CH_4}{2000\ lbs} = \frac{1.8\ tons\ CH_4}{yr}$$

The DAQ believes that only a small portion of this amount would be considered a volatile organic compound. This amount is well below the insignificant activity threshold of 5 tons per year for a criteria pollutant [15A NCAC 02Q .0503(8)].

The amounts of hazardous air pollutants coming from this amount of methane release would be less than 1,000 pounds per year and be below the insignificant activity threshold for hazardous air pollutants [15A NCAC 02Q .0503(8)]. This source (IES-Truck Filling) will be added to the permit as an insignificant activity. As such, its emissions will be reported as part of the annual facility inventory.

15A NCAC 02Q .0711: Emission Rates Requiring A Permit

The mass emissions of toxic air pollutant constituents found in landfill gas were calculated from the maximum methane flow rate into the flare and Carbon Vent. The applicant used the average sampled constituent concentrations as determined using the Waste Industry Air Coalition Concentrations (WIACC) for LFG Constituents factors in the application. The applicant requested that the DAQ perform the modeling evaluation for this project. Therefore, the DAQ used AP-42 factors which are usually more conservative than the WIACC. See Table 1 below.

However, since Anson Gas Producers does not currently have site specific data for the constituents of the landfill gas, AP-42 factors were used to calculate emissions. If landfill gas testing is required in the Title V permit, the following constituents in Table 1 below will be some of the pollutants tested for in the landfill gas entering the facility.

Table 1: Molecular Weights and Concentrations of Toxic Air Pollutants that are common in landfill gas

Constituent	Molecular Weight (AP-42)	AP-42 Concentrations LFG constituents
1,1,1-Trichloroethane (Methyl chloroform)	133.41grams/gmole	0.48 ppmv
1,1,2,2-Tetrachloroethane	167.85 grams/gmole	1.11 ppmv
1,1-Dichloroethene (Vinylidene chloride)	96.94 grams/gmole	0.20 ppmv
1,2-Dichloroethane (Ethylene dichloride)	98.96 grams/gmole	0.41 ppmv
Acrylonitrile	53.06 grams/gmole	6.33 ppmv
Benzene (no co-disposal or unknow co-disposal)	78.11 grams/gmole	1.91 ppmv
Carbon disulfide	76.13 grams/gmole	0.58 ppmv
Carbon tetrachloride	153.84 grams/gmole	0.004 ppmv
Chlorobenzene	112.56 grams/gmole	0.25 ppmv
Chloroform	119.39 grams/gmole	0.03 ppmv
Chlorine	35.453 grams/gmole	42.0 ppmv
p-Dichlorobenzene	147.0 grams/gmole	0.21 ppmv
Dichloromethane (Methylene chloride)	84.94 grams/gmole	14.3 ppmv
Ethyl acetate	88.11 grams/gmole	1.88 ppmv
Ethylene dibromide	187.88 grams/gmole	0.001 ppmv
Ethyl mercaptan (Ethanethiol)	62.13 grams/gmole	2.28 ppmv
Hydrogen sulfide	34.08 grams/gmole	35.5 ppmv

Hydrogen chloride (calculated below using the Cl^-)	36.46 grams/gmole	------------
Mercury	200.61 grams/gmole	0.000292 ppmv
Methyl ethyl ketone	72.11 grams/gmole	7.09 ppmv
Methyl isobutyl ketone	100.16 grams/gmole	1.87 ppmv
Methyl mercaptan	48.11grams/gmole	2.49 ppmv
n-hexane	86.18 grams/gmole	6.57 ppmv
Perchloroethylene (Tetrachloroethene)	165.83 grams/gmole	3.73 ppmv
Styrene	104.15 grams/gmole	0.411 ppmv
Toluene	92.13 grams/gmole	39.3 ppmv
Trichloroethylene (Trichloroethene)	131.40 grams/gmole	2.82 ppmv
Vinyl chloride	62.50 grams/gmole	7.34 ppmv
Xylenes	106.16 grams/gmole	12.1 ppmv

The following equation from AP-42, fifth edition, Section 2.4.4.1 “Emissions”, Revised November 1998, was used to calculate the volumetric emission rate of individual toxic air pollutants in the landfill/methane gas.

Methane generation rate (@ 8,760 hrs/yr, 70% methane and 4,000 scfm) = 41,673,337 m^3 CH_4/year.

$$\frac{4000 \text{ ft}^3 \text{ lfg}}{\text{minute}} \text{ x } \frac{60 \text{ minutes}}{1\ hour} \text{ x } \frac{8760\ hours}{yr} \text{ x } \frac{70}{100} (\text{methane } \%) = \frac{1{,}471{,}680{,}000 ft^3}{yr} \text{ or } \frac{41{,}673{,}337\ m^3\ CH_4}{\text{yr}}$$

$$Q_p = A \times Q_{CH_4} \left(\frac{C_p}{1\times 10^6}\right)$$ AP-42 Section 2.4, Equation 3

Where:
Q_p = Emission rate of pollutants, m^3/yr
Q_{CH4} = Methane generation rate, m^3/yr
C_p = concentration of pollutant from AP-42
A = multiplication factor (1.43) for 70% methane (CH_4) and that 30 percent is CO_2, N_2, and other constituents) $\left[\frac{2}{70\%} = \frac{x}{50\%}\ or\ x = 1.43\right]$
A = multiplication factor (1.82) for 55% methane (CH_4) and that 45 percent is CO_2, N_2, and other constituents)
A = multiplication factor (2.00) for 50% methane (CH_4) and that 50 percent is CO_2, N_2, and other constituents)

The following equation from AP-42, fifth edition, Section 2.4.4.1 “Emissions”, Revised November 1998, was used to calculate the uncontrolled **mass** emission rate individual toxic air pollutants present in methane gas.

$$UM_p = Q_p\,(m^3/yr)\left[\frac{MW\,(g/gmole)\times(1\ atmosphere)}{\left(\frac{8.205\times10^{-5}\ m^3 - atmospere}{gmol-{}^0K}\right)\times\frac{1000\ g}{kg}\times(273+25^0C)\ {}^0K}\right]$$ AP-42 Section 2.4 Eq. 4

Where:

UM_p = Uncontrolled mass emissions of pollutants, kg/yr
MW_p = Molecular weight of pollutant, g/gmol
Q_p = Emission rate of pollutant, m^3/yr
T^0 = 25^0 C (77 ^{0}F), recommended by AP-42 for landfill gas temperature if temperature is unknown

<u>Example Calculation for benzene:</u>

The following equation from AP-42, fifth edition, Section 2.4.4.1 "Emissions", Revised November 1998, is used to calculate the benzene volumetric flow rate (m^3/yr) as a part of the methane gas generation from the landfill.

$$Q_p = A \times Q_{CH_4} \left(\frac{C_p}{1\times 10^6}\right)$$

Where:

Q_p = Emission rate of pollutant benzene, m^3/yr
Q_{CH4} = 41,673,337 m^3/year (maximum methane flow rate in the flare)
C_p = 1.91 ppmv (AP-42)
Molecular wt. = 78.11 grams/gmole benzene
A = Multiplication factor (1.43 is for 70 percent CH4 in scrubbed landfill gas and 30 percent is CO_2, N_2, and other constituents)

$$Q_{benzene} = 1.43 \text{ (70\% methane)} \times \left(\frac{41{,}673{,}337\ m^3}{\text{year}}\right) \times \left(\frac{1.91\ parts}{1\times 10^6}\right) = \frac{113.82\ m^3\ benzene}{year}$$

The following equation from AP-42, fifth edition, Section 2.4.4.1 "Emissions", Revised November 1998, was used to calculate the uncontrolled mass emission rate of benzene present in the methane gas.

$$UM_p = \frac{113.82\ m^3}{year} \times \left[\frac{78.11\ g/gmole \times 1\ atmosphere}{\left(\frac{8.205\times 10^{-5}\ m^3-atmospere}{gmol-\ ^0K}\right)\times \frac{1000\ g}{kg} \times (273+25\ ^0C)\ ^0K}\right] \times \frac{2.205\ lbs}{kg} = \frac{801.75\ lbs\ benzene}{year}$$

The total benzene mass emission rate from the gas has been calculated to be 801.75 lbs per year uncontrolled. The flare will control 98% of the benzene emissions and only 2% will escape the flare stack = 16.035 lbs benzene per year. The threshold TPER amount is 11.09 lbs of benzene per year from an unobstructed stack. Therefore, the calculated benzene emission rate (16.035 lbs per year) is greater than the TPER listed in 15A NCAC 2Q .0711 and will be modeled for compliance with the Acceptable Ambient Levels (AALs). All of the other toxic air pollutants present in the landfill gas were calculated using the same methodology as above and have been placed Table 3 below, along with their respective TPER thresholds.

Inlet landfill gas is expected to be 50% methane and 50% CO_2 (this percentage has trace elements of N_2, and NMOC) when it comes from the Landfill. Normal operation of this facility will be for the majority of the toxic air pollutants that are constituents of the methane in the landfill gas will remain in the methane that is sold as a commodity. Only a small percentage will be sent to the open flare (controlled at 98%) and portion possibly sent to the uncontrolled CO_2 vent. For the modeling of all of the toxic air emissions, the maximum generated emission amounts were used. Even using this extreme scenario, only three toxic air pollutants were calculated to be above their respective TPERs (Benzene, Hydrogen Chloride and Vinyl Chloride)

Calculation for Hydrogen Chloride emission from the combustion process in the flare:
The following example calculation is for the emission of hydrogen chloride (HCl) created from the combustion of landfill gas in a flare. The calculation method used is from AP-42, Section 2.4.4.2 – Controlled Emissions.

Hydrochloric acid (HCl) is formed when chlorinated compounds in landfill gas are combusted in control equipment. The best methods to estimate emissions are mass balance methods using site-specific data on total chloride [expressed in ppmv as the chloride ion (Cl^-)].

$$Q_{cl^-} = 1.43 \times Q_{CH_4} \left(\frac{C_{cl-}}{1\times 10^6}\right)$$ (Equation 3, AP-42, Section 2.4.4.2)

Q_{cl^-} = Emission rate of chloride ions, m^3/yr
Q_{CH4} = 41,673,337 m^3/yr
C_{cl^-} = concentration of chloride ions (42.0 ppmv, AP-42 default value when concentration not known,

Multiplication factor = 1.43 assumes 70% of the landfill gas is methane

$$UM_{Cl^-} = 1.43 \times 41{,}673{,}337 \frac{m^3}{year} \text{ x } \left(\frac{84.0 \text{ parts } Cl^-}{1\times 10^6}\right) = \frac{5006.0 \text{ m}^3\ Cl^-}{year}$$

The uncontrolled mass emissions of chloride ions present in the methane were found in the following manner using Equation 4, AP-42, Section 2.4.4.2. (Note: the applicant/consultant chose to double the concentration of Cl^- (84 ppmv) because the gas that is burned in the flare at this site is practically equivalent mostly methane. The concentrations in AP-42 are for landfill gas which is 50% methane.)

Where:
UM_{cl^-} = Uncontrolled mass emissions of Chlorine (kg/yr)
MW_{cl^-} = Molecular weight of chloride ions (35.45 g/mol)
Q_{cl^-} = Emission rate of chloride ions, (2502.90 m^3/yr)
T^0 = 25^0 C (77 ^{0}F), recommended by AP-42 for landfill gas temperature if temperature is unknown

$$UM = \frac{5006.0 \text{ m}^3}{year} \times \left[\frac{35.45 \text{ g/gmole} \times 1 \text{ atmosphere}}{\left(\frac{8.205 \times 10^{-5} \text{ m}^3 - \text{atmospere}}{\text{gmol} - {}^0\text{K}}\right) \times \frac{1000 \text{ g}}{\text{kg}} \times (273 + 25\ {}^0\text{C})\ {}^0\text{K}}\right] = \frac{7258.0 \text{ kg } Cl^-}{year}$$

The mass emissions of hydrochloric acid (HCl) created by the flare combustion of chloride ions is found by using Equation 10, AP-42, Section 2.4.4.2.:

Where:
CM_{HCl} = Mass emissions of hydrogen chloride (kg/yr)
UM_{cl^-} = Uncontrolled mass emission of chloride ions (3628.82 kg/yr)
η_{col} = LFG collection system capture efficiency (100%, using flow rate design capacity of flare)
1.03 = Ratio of molecular weight of HCl to Cl^-
η_{cnt} = used 100% conversion. Chlorinated compounds entering the burn zone of the flare will be converted to HCL as a product of combustion at 100% for most conservative.

$$CM_{cl^-} = UM_{cl^-} \times \left(\frac{\eta_{col}}{100}\right) \times 1.03 \times \left(\frac{\eta_{cnt}}{100}\right) \times \frac{2.2\ lbs}{1\ kg}$$

$$CM_{cl^-} = \frac{7258\ kg}{year} \times \left(\frac{100}{100}\right) \times 1.03 \times \left(\frac{100}{100}\right) \times \frac{2.205\ lbs\ HCl}{kg} \times \frac{1 year}{8760\ hrs} = \frac{1.9\ lbs\ HCl}{hour}$$

The threshold TPER amount for hydrogen chloride is 0.74 lbs/hr from an unobstructed stack. Therefore, the calculated emission rate (1.9 lbs/hr) is higher than the TPER listed in 15A NCAC 2Q .0711 for unobstructed stacks and will have to be modeled for compliance with the National Ambient Air Quality Standards.

Table 2: The calculated toxic air pollutant emissions from the Anson Gas Producers Project have been summarized below and compared to TPER limits from an unobstructed stack in accordance with 15A NCAC 02Q .0711(b).

Constituent	Threshold (lbs/yr)	Calculated Emission Rate (lbs/yr)	Threshold (lbs/day)	Emission Rate (lbs/day)	Threshold (lbs/hr)	Calculated Emission Rate (lbs/hr)	Threshold Exceedance (Yes/No)
1,1,1-Trichloroethane [a,b] (Methyl chloroform)	------------	------------	505.4	0.019	257.98	0.0008	No
1,1,2,2-Tetrachloroethane [a,b]	581.110	19.99	----------	-----------	----------	-----------	No
1,1-Dichloroethene [a,b] (Vinylidene chloride)	------------	-----------	5.1	0.006	----------	-----------	No
1,2-Dichloroethane [a,b] (Ethylene dichloride)	350.511	4.35	----------	-----------	----------	-----------	No
Acrylonitrile [a,b]	----------	------------	1.3	0.099	1.05	0.004	No
Benzene [a,b]	11.069	16.03	----------	--------------	----------	-----------	Yes
Carbon disulfide [a,b]	----------	---------	7.8	0.13	----------	-----------	No
Carbon tetrachloride [a,b]	618.006	0.07	----------	-------------	----------	-----------	No
Chlorobenzene [a,b]	----------	----------	92.7	0.008	----------	-----------	No
Chloroform [a,b]	396.631	0.385	----------	-------------	----------	-----------	No
Dichlorobenzene [a,b]	----------	-----------	----------	------------	69.50	0.009	No
Dichloromethane [a,b] (Methylene chloride)	2213.752	130.29	----------	------------	1.79	0.36	No
Ethyl acetate	----------	-------------	----------	------------	147.41	0.10	No
Ethyl mercaptan [b] (Ethanethiol)	----------	-------------	----------	------------	0.11	0.042	No
Ethylene dibromide [a,b]	36.896	0.02	----------	------------	----------	------------	No
Hydrogen sulfide [b]	----------	-------------	5.1	0.36	----------	------------	No
Hydrogen chloride [a,b,**]	----------	------------	----------	------------	0.74	0.92	Yes
Mercury [a,b]	----------	-----------	0.025	1.72×10^{-5}	----------	-----------	No
Methyl ethyl ketone [b]	----------	-----------	155.8	0.15	93.19	0.006	No
Methyl isobutyl ketone [a,b]	----------	-----------	107.8	0.056	31.59	0.002	No
Methyl mercaptan [b]	----------	-----------	----------	-------------	0.05	0.0015	No
n-Hexane [a,b]	----------	----------	46.3	0.17	----------	-----------	No
Perchloroethylene [a,b] (Tetrachloroethene)	17525.534	66.35	----------	----------	----------	-----------	No
Styrene					11.16	0.026	No
Toluene [a,b]	----------		197.96	1.06	58.97	0.044	No
Trichloroethylene [a,b] (Trichloroethene)	5442.140	39.75	----------	----------	----------	----------	No
Vinyl chloride [a,b]	35.051	49.21	----------	----------	----------	----------	Yes
Xylenes [a,b]	----------	----------	113.7	0.38	68.44	0.016	No

** Pollutant formed in the combustion process of landfill gas in the flare
[a] HAP
[b] Toxic Air Pollutant

Per the calculated emissions of toxic air pollutants, vinyl chloride, hydrogen chloride and benzene require modeling to show compliance with the AALs. Since the maximum flow rate and design capacity of the flare were used to calculate the toxic air pollutant emissions at 8760 hours per year, the individual flows into the flare (4,000 scfm) and the carbon vent (1,785 scfm) can be used to determine the amounts of pollutants that go through each exit point. This is a very conservative estimate because the flare should never operate for 8760 hours per year with all of the landfill gas (methane and CO_2) going into the flare because the majority of the methane (which contains the toxics and HAPs) will be refined and sold as a commodity.

The modeling analysis was conducted after emission rates used in the June 2023 modeling were revised. The adjacent Anson County Landfill was also modeled to determine the cumulative impacts from both sites. Facility-wide emissions of benzene, hydrogen chloride, vinyl chloride, and hydrogen sulfide were estimated to exceed toxic air pollutant (TAP) emissions rates (TPERs) outlined in 15A NCAC 02Q .0700. The modeling adequately demonstrates compliance with Acceptable Ambient Levels (AALs) outlined in 15A NCAC 02D.1104, on a source-by-source basis.

AERMOD (version 22112) along with five years (2014-2018) of surface meteorological data from Monroe, NC and upper air data compiled from Greensboro, NC was used to evaluate impacts in both simple and complex terrain. The modeling demonstration included two landfill gas flares represented as point sources, a carbon vent represented as a point source, and the landfill represented as an area source. Modeled point source release parameters are provided in the attached Table A1. Modeled area source release parameters are provided in the attached Table A2. Facility-wide modeled TAP emissions are shown in the attached Table A3. Direction-specific building downwash parameters, calculated using EPA's BPIP-PRIME program (04274), were used as input to AERMOD to determine building downwash effects on plume rise and effects on entrainment of stack emissions into the cavity and turbulent wake zones downwind of existing buildings. Receptors were plotted around the Anson County Landfill's two property lines at 25-meter intervals, out to 250 meters at 25-meter intervals, out to 500 meters at 50-meter intervals, out to 1,000 meters at 100-meter intervals, out to 2,500 meters at 250-meter intervals, and out to 5,000 meters at 500-meter intervals. Additionally, receptors were plotted at 25-meter intervals along Boylin Road and the property line of the Richmond Sturdivant Cemetery. In all, a total of 8,728 receptors were modeled. Source and receptor elevations and receptor dividing streamline heights were calculated from 1/3-arc-second resolution (10-meter) USGS NED terrain data using the AERMOD terrain pre-processor AERMAP.

Modeled results for each TAP and associated averaging period are in the tables shown below as a percentage of the applicable AAL.

Anson Gas Producers: Maximum Modeled Toxics Impacts

Pollutant	Averaging Period	Max Conc. (µg/m3)	AAL (µg/m3)	Maximum Modeled Impacts % of AAL
Benzene	Annual	0.08	0.12	66.7%
Hydrogen Chloride	1-hour	1.13	700	0.2%
Vinyl Chloride	Annual	0.15	0.38	39.5%

Facility-wide Expected Actual Emissions under normal operation of the system:

Hours of operation = 8,760 hrs/yr
Methane heat content = 1,012 Btu/standard cubic foot
Multiplication factor = 1.43 (used in equation 3 of AP-42 Section 2.4.1 for 70% methane)

$$\{\frac{2}{70\%} = \frac{x}{50\%}\ where\ "x" = 1.43\}$$

Flare destruction eff. = 98%
CO Factor (for open flares) = 0.31 lbs/million Btu (AP-42, Section 13.5, Final Section 2018)

NOx Factor (for open flares)	= 0.068 lbs/million Btu (AP-42, Section 13.5, Final Section 2018)
PM_{10} Factor	= Calculated using AP-42 Table 2.4-5
$PM_{2.5}$ Factor	= Calculated using AP-42 Table 2.4-5
VOC Factor	= Calculated using AP-42 Section 2.4
SO_2 Factor	= Calculated using AP-42 Section 2.4.4.1 Equation 3
Cl_2	= Calculated using AP-42 Section 2.4.4.1 Equation 10
Methane % of the Waste Gas	= 50%
Methane Content of (Pilot Gas)	= 70%
Waste Gas (tail gas) Flow rate	= 40 scfm
Slip Stream flow rate for pilot	= 10 scfm

The flare could be used to combust partially treated LFG, waste gas from the VOC removal system, or treated LFG that has been recirculated post-treatment.

Flare Data:

CO	= 0.31 lbs/mmBtu (AP-42, Table 13.5)
NOx	= 0.068 lbs/mmBtu (AP-42, Table 13.5)
PM_{10}	= 17 lbs per million cubic feet of methane (4P-42)
Flare heat input	= 170.02 million Btu per hour (@ 70% methane content) used in calculations

The emission factors from AP-42 Section 13.5 “Industrial Flare” with open flame were used to calculate the CO and NOx emissions because these factors are more representative of the flare at this facility. The testing for the AP-42 emission factors in Section 2.4 for Municipal Solid Waste Landfills are for enclosed flares and the factors are assumed to comply for open flares.

A sample calculation for the criteria pollutant emissions from the flare listed in Table 3 below, are as follows. As stated previously, this is a very conservative estimate because the flare should never operate for 8760 hours per year with all of the landfill gas (methane and CO_2) going into the flare because the majority of the methane (which contains the toxics and HAPs) will be refined and eventually placed into a pipeline.

Note: the flare does not have any annual hourly operation limits, therefore the potential of 8760 hours per year at 70% methane will be used for the calculation to compare against the PSD threshold.

0.31 lbs CO per million Btu heat input
0.068 lbs NOx per million Btu heat input

<u>Flare Btu Rating @ 70% methane (this scenario is should not occur):</u>

$$\frac{4000\text{ ft}^3\text{ lfg}}{\text{minute}}\ \text{x}\ \frac{60\text{ minutes}}{1\text{ hour}}\ \text{x}\ \frac{70\%\ CH_4}{100\%\ lfg}\times\frac{1{,}012\ Btu}{ft^3\ CH_4}\ \text{x x}\ \frac{1\ mmBtu}{10^6\ Btu}=\frac{170.02\ mmBtu}{\text{hr}}$$

$$\frac{0.31\text{ lbs CO}}{\text{million Btu}}\times\frac{170\text{ million Btu heat input}}{\text{hour}}\times\frac{8760\text{ hours}}{\text{year}}\times\frac{1\text{ ton CO}}{2000\text{ lbs CO}}=\frac{230.85\text{ tons CO}}{\text{year}}$$

As stated earlier this situation is an unlikely event because normal operation is to refine the landfill gas into methane and place the natural gas into tank trucks and eventually into a pipeline. In the event that the refined natural gas cannot be sold, the site would burn the gas until the gas met pipeline specifications. There should not be a scenario where this type of event lasts for an extended period of time. Because of this, a PSD avoidance limit will not be placed in the permit.

Facility-wide Emission under the normal operation scenario: 40 scfm waste gas going to flare at 70% methane content, 10 scfm pilot gas going to flare at 50% methane content, operation at 8760 hours per year, with the remainder of the accepted gas being refined and sold as product (no emissions).

Sample calculation for NOx (normal operation) from the flare using AP-42, Section 13.5:

NOx Emission Factor = 0.068 lbs/mmBtu at 70% methane content in waste gas going into the flare.
0.068 lbs/mmBtu at 50% methane content in the pilot gas.

$$\frac{40\ ft^3\ lfg}{min} \times \frac{70\ (CH_{4\ content})}{100\ lfg} \times \frac{60\ min}{hr} \times \frac{1{,}012\ Btu}{ft^3\ CH_4} \times \frac{8760\ hrs}{yr} \times \frac{0.068\ lbs\ NOx}{1{,}000{,}000\ Btu} \times \frac{tons\ NOx}{2000\ lbs} = \frac{0.51\ tons\ NOx}{yr}$$

$$\frac{10\ ft^3\ lfg}{min} \times \frac{50\ (CH_{4\ content})}{100\ lfg} \times \frac{60\ min}{hr} \times \frac{1{,}012\ Btu}{ft^3\ CH_4} \times \frac{8760\ hrs}{yr} \times \frac{0.068\ lbs\ NOx}{1{,}000{,}000\ Btu} \times \frac{tons\ NOx}{2000\ lbs} = \frac{0.09\ tons\ NOx}{yr}$$

Total is: 0.60 tpy of NOx.

Sample calculation for PM10 (normal operation) from the flare using AP-42, Section 2.4:

PM_{10} Emission Factor = 17 lbs/mmft^3 CH_4 at 70% methane content in the waste gas going into the flare.
17 lbs/mmft^3 CH_4 at 50% methane content in the pilot gas.

$$\frac{40\ \text{ft}^3\ \text{gas}}{\text{min}} \times \frac{70\%\ (\text{CH}_4)}{100\%\ (\text{gas})} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{8760\ \text{hrs}}{\text{yr}} \times \frac{17.0\ \text{lbs PM}_{10}}{1 \text{ x } 10^6\ \text{ft}^3\ \text{CH}_4} \times \frac{\text{tons PM}_{10}}{2000\ \text{lbs}} = \frac{0.13\ \text{tons PM}_{10}}{\text{yr}}$$

$$\frac{10\ \text{ft}^3\ \text{gas}}{\text{min}} \times \frac{70\%\ (\text{CH}_4)}{100\%\ (\text{gas})} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{8760\ \text{hrs}}{\text{yr}} \times \frac{17.0\ \text{lbs PM}_{10}}{1 \text{ x } 10^6\ \text{ft}^3\ \text{CH}_4} \times \frac{\text{tons PM}_{10}}{2000\ \text{lbs PM}_{10}} = \frac{0.03\ \text{tons PM}_{10}}{\text{yr}}$$

Total is: 0.16 tpy PM10/PM2.5

Sample calculation for CO (normal operation) from the flare using AP-42, Section 13.5:

CO Emission Factor = 0.31 lbs/mmBtu at 70% methane content in waste gas going into the flare.
0.31 lbs/mmBtu at 50% methane content in the pilot gas.

$$\frac{(10+40)\ \text{ft}^3\ \text{lfg}}{\text{minute}} \text{ x } \frac{60\ \text{minutes}}{1\ hour} \text{ x } \frac{1{,}012\ Btu}{ft^3} \text{ x } \frac{70\%}{100\%} \text{ x } \frac{1\ mmBtu}{10^6\ Btu} = \frac{2.13\ mmBtu}{\text{hr}}$$

$$\frac{0.31\ lbs\ CO}{million\ Btu} \times \frac{2.13\ million\ Btu\ heat\ input}{hour} \times \frac{8760\ hours}{year} \times \frac{1\ ton\ CO}{2000\ lbs\ CO} = \frac{2.89\ tons\ CO}{year}$$

Total is: 2.89 tpy CO

Table 3: Expected actual Facility-wide Emissions Summary based on maximum 4000 scfm throughput into the landfill gas conversion system, 70% methane content for the 10 scfm pilot flame, 50% methane content for the waste gas into the flare for 8760 hrs/yr. These values will be used to show the reduction of criteria pollutants between the Anson County Landfill and the Anson Gas Producer facility. These values differ from the ones in the permit application, because the applicant used much more conservative operation values that do not represent "normal operation".

Summary of facility wide emissions from the operation of the Anson Gas Producers facility:

Source	NOx (tpy)	SO_2 (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	VOCs (tpy)	HAPs (tpy)
Candlestick Flare (CD-CF-1)	0.60	0.04	2.89	0.16	0.16	1.30	0.10 (HCL) largest single HAP
Carbon vent (ES-CV-1)	0.0	0.0	0.0	0.0	0.0	0.73	0.0
Total Emissions	0.60	0.04	2.89	0.16	0.16	2.03	0.10 total HAP

The following information is from the 2022 Emissions Inventory submitted by the Anson County Landfill for actual emissions of criteria pollutants from the landfill.

Facility Total CY 2022 Emissions Summary

COPY of RECORD Date Submitted: 6/19/2023 11:22:33

As entered in AERO

Facility Name: Anson County Waste Management Facility
375 Dozer Drive
Polkton, NC 28135

Facility ID : 0400052
Permit : 09835
County : Anson
DAQ Region : FRO

North Carolina Department of Environmental Quality
Division of Air Quality
Air Pollutant Point Source Emissions Inventory - Calendar Year 2022

Record Facility-Wide Totals From all Permitted and Non-Permitted AirPollutant Emission Sources

Green House Gases Pollutants(GHG)

		Actual Emissions (Tons/Year)		
Pollutant	**CAS**	**2022**	**2021**	**% Change**

Criteria Pollutants

		Actual Emissions (Tons/Year)		
Pollutant	**CAS**	**2022**	**2021**	**% Change**
CO	CO	44.48	43.91	1.298109%
NOx	NOx	8.17	8.07	1.2391621%
PM(TSP)	TSP	2.02	1.99	1.5075363%
PM10	PM10	2.02	1.99	1.5075363%
PM2.5	PM2.5	2.02	1.99	1.5075363%
SO2	SO2	1.37	1.35	1.48148%
VOC	VOC	5.13	4.13	24.213074%

Hazardous Air Pollutants(HAPS) and/or Toxic Air Pollutants(TAPs)

		Actual Emissions (Pounds/Year)		
Pollutant	**CAS**	**2022**	**2021**	**% Change**
Pollutant Group: Mercury & Compounds - all total mass, inc Hg Vapor **Group Sum:**.07732				
Mercury, vapor (Component of HGC)	7439-97-6	0.07732	.06191	24.890974%
Pollutant Group: Total Reduced Sulfur (TRS as total mass) **Group Sum:**1142.66093				
Hydrogen sulfide	7783-06-4	1060.6165	849.26103	24.886978%
Methyl mercaptan	74-93-1	82.04453	65.69503	24.886969%
Acrylonitrile	107-13-1	3.00659	2.57942	16.560692%
Benzene	71-43-2	100.21302	80.2431	24.88677%
Bromoform	75-25-2	0.48531	.56057	-13.425623%
CFC-11(Trichlorofluoromethane)	75-69-4	0.48531	.56057	-13.425623%
CFC-12 (Dichlorodifluoromethane)	75-71-8	279.44745	223.76029	24.886974%
Carbon disulfide	75-15-0	32.64098	26.30839	24.070612%
Carbon tetrachloride	56-23-5	1.42165	1.13844	24.877028%
Carbonyl sulfide	463-58-1	14.50977	11.61832	24.886988%
Chlorobenzene	108-90-7	33.73061	27.01064	24.878977%
Chloroform	67-66-3	3.79463	3.21042	18.197313%
Dichlorobenzene(p), 1,4-	106-46-7	311.8355	249.70449	24.881823%
Dichloropropene, 1,3-	542-75-6	0.48531	.56057	-13.425623%
Ethyl benzene	100-41-4	951.3362	761.76978	24.885%
Ethyl chloride (chloroethane)	75-00-3	20.83904	16.85829	23.613018%
Ethyl mercaptan	75-08-1	111.20206	89.04216	24.886972%
Ethylene dibromide	106-93-4	11.40773	9.13453	24.885792%
Ethylene dichloride (1,2-dichloroethane)	107-06-2	15.6747	12.5512	24.886065%
Ethylidene dichloride (1,1-dichloroethane)	75-34-3	97.28491	78.07034	24.611868%
Hexane, n-	110-54-3	264.3592	211.67875	24.886972%
Hydrogen chloride (hydrochloric acid)	7647-01-0	1407.4149	1389.37626	1.2983305%
Methyl bromide	74-83-9	0.48531	.56057	-13.425623%
Methyl chloride	74-87-3	17.07952	13.84795	23.336084%
Methyl chloroform	71-55-6	29.5932	23.69942	24.868877%
Methyl ethyl ketone	78-93-3	1005.30426	805.14682	24.859747%
Methyl iodide	74-88-4	0.48531	.56057	-13.425623%
Methyl isobutyl ketone	108-10-1	99.63865	79.95504	24.618345%
Methylene chloride	75-09-2	380.63095	304.78043	24.886942%
Perchloroethylene (tetrachloroethylene)	127-18-4	261.1294	209.09265	24.88693%
Propylene dichloride	78-87-5	3.43044	2.74692	24.883135%

HAP and or toxic air pollutants (continued)

Styrene	100-42-5	0.00485	.00561	-13.547233%
Tetrachloro-2,2-difluoroethane, 1,1,1,2- (CFC 112a)	76-11-9	0.48531	.56057	-13.425623%
Tetrachloroethane, 1,1,2,2-	79-34-5	15.99386	12.97864	23.232178%
Toluene	108-88-3	3089.4336	2473.801	24.886099%
Trichloroethane, 1,1,2-	79-00-5	2.4E-4	.00028	-14.28572%
Trichloroethylene	79-01-6	118.11231	94.57545	24.886866%
Vinyl chloride	75-01-4	88.84807	71.14281	24.88693%
Vinylidene chloride	75-35-4	12.2571	9.98653	22.736322%
Xylene	1330-20-7	2324.0225	1861.07254	24.875439%

Facility wide actual emissions from the operation of the Anson County Landfill in year 2022:

Source	NOx (tpy)	SO_2 (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	VOCs (tpy)	HAPs (tpy)
Candlestick Flare (CD-CF-1)	8.13	1.37	44.48	2.02	2.02	5.13	6.03
Landfill (ES-1)							
Total Emissions							

The following table estimates the reduction in emission between the criteria pollutants emitted at the facility in year 2022 and the reductions in emissions that will be seen by the normal operating scenario at the Anson Gas Producers facility. The 2022 Emissions Inventory was based on a landfill gas collection rate of 948 scfm. The facility does not currently have the capability to supply all of the gas that will be processed at the Anson Gas Producer facility (4,000 scfm). More wells are currently being added on the landfill property.

Reductions realized by the addition of the gas to energy facility.

Source	NOx (tpy)	SO_2 (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	VOCs (tpy)	HAPs (tpy)
1. Anson County Landfill	8.13	1.37	44.48	2.02	2.02	5.13	6.03
2. Anson Gas Producers	0.6	0.04	2.89	0.16	0.16	2.03	0.10
Total Reductions	7.53	1.33	41.59	1.86	1.86	3.1	5.93

Note: As the gas flow rates at the Anson County Landfill increase up to 4,000 scfm (amount going to the Anson Gas Producer facility), the reduction in actual criteria pollutants will increase until the landfill has to once again begin burning the landfill gas that is collected in excess of the 4,000 scfm routed to Anson Gas Producers.

7. NSPS, NESHAP/MACT, PSD, 112(g), 112(r), CAM, Attainment Status:

- **NESHAP/MACT** –
  There are no National Emission Standards for Hazardous Air Pollutants or Maximum Control Technology standards for this type of Industry that converts landfill gas to pipeline quality natural gas.

  Anson Gas Producers is shielded from the following nonapplicable requirement in accordance with 15A NCAC 02Q .0512(a)(1)(B).

40 CFR 63 Subpart HHH "National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities" is not applicable because this facility does not meet the definition of the Natural Gas Transmissions and Storage Facility source category as listed in 40 CFR 63.1271.

- **112(g)** –
  On December 15, 1996, the United States Environmental Protection Agency (EPA) promulgated the final regulations implementing Section 112(g) of the Clean Air Act. Section 112(g) addresses new and reconstructed major sources of hazardous air pollutants (HAPs). A major source emits or has the potential to emit 10 tons per year or more of any single HAP or 25 tons per year or more of any combination of HAPs. A primary requirement of this section is that these sources apply Maximum Achievable Control Technology (MACT) for control of HAPs. EPA is required under section 112(d) of the Clean Air Act to develop MACT standards for a list of source categories that are designated a major source of HAPs. 112(g) is intended to address those sources for which EPA has not established a source specific MACT standard, until a MACT standard is developed.

  The Anson Gas Producers facility has the potential to emit a single HAP (HCL created in the flare) at a level of less than 9.0 tons per year and a combined total amount of HAP of less than 9 tons per year. Therefore, 112(g) requirements do not apply to this "new" construction.

- **NSPS** –
  There are no New Source Performance Standards for this type of industry that converts landfill gas to pipeline quality natural gas.

  Anson Gas Producers is shielded from the following nonapplicable requirement. [15A NCAC 02Q .0512(a)(1)(B)]

  40 CFR 60 Subpart OOOOa "Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015" is not applicable because this facility does not meet the definition of the Crude Oil and Natural Gas Production source category. [40 CFR 60.5430a]

- **PSD**
  The facility's potential emissions of criteria pollutants do not exceed the PSD permitting thresholds (250 tons per year). Anson County is located in an area that is considered "non-classifiable" for all criteria pollutants. This County has not triggered increment tracking under PSD for any pollutants, so no tracking is required.

  No PSD avoidance condition will be placed into the Anson Title V permit because the CO emissions using a very conservative scenario is less than 250 tons per year.

- **112(r)** –
  This facility does not store any of the listed 112(r) chemicals in amounts that exceed the threshold quantities. Therefore, the facility is not required to maintain a written Risk Management Plan (RMP).

- **CAM (15A NCAC 02D .0614)** –
  CAM does not apply to this facility because it is not subject to an emission limitation or standard for the applicable regulated air pollutant, or a surrogate thereof. Also, the facility does not use a

control device to achieve compliance with any such emission limitation or standard. This facility is subject to Title V due to the emissions of carbon monoxide (CO) which are created in the control device from the burning of landfill gas, off specification gas, and natural gas.

- **Attainment status** – Anson County is listed as a non-classifiable area for criteria pollutants.

8. Other Regulatory Requirements:

a. Emergency Affirmative Defense

EPA has promulgated a rule (88 FR 47029, July 21, 2023), with an effective date of August 21, 2023, removing the emergency affirmative defense provisions in operating permits programs, codified in both 40 CFR 70.6(g) and 71.6(g). EPA has concluded that these provisions are inconsistent with the EPA's current interpretation of the enforcement structure of the CAA, in light of prior court decisions[2]. Moreover, per EPA, the removal of these provisions is also consistent with other recent EPA actions involving affirmative defenses[3] and will harmonize the EPA's treatment of affirmative defenses across different CAA programs.

As a consequence of this EPA action to remove these provisions from 40 CFR 70.6(g), it will be necessary for states and local agencies that have adopted similar affirmative defense provisions in their Part 70 operating permit programs to revise their Part 70 programs (regulations) to remove these provisions. In addition, individual operating permits that contain Title V affirmative defenses based on 40 CFR 70.6(g) or similar state regulations will need to be revised.

Regarding NCDAQ, it has not adopted these discretionary affirmative defense provisions in its Title V regulations (15A NCAC 02Q .0500). Instead, DAQ has chosen to include them directly in individual Title V permits as General Condition (GC) J.

Per EPA, DAQ is required to promptly remove such impermissible provisions, as stated above, from individual Title V permits, after August 21, 2023, through normal course of permit issuance.

State enforceable only

b. Initial testing for the constituents in the landfill gas.

i. Initial Performance Tests – Under the provisions of North Carolina General Statute 143-215.108, the Permittee shall perform an initial performance test for concentrations (ppmv) of toxic air pollutants in the landfill gas entering the facility.

ii. The Permittee shall submit a protocol to DAQ at least 45 days prior to initial compliance testing and shall submit a notification of initial compliance testing at least 15 days in advance of the testing.

iii. The Permittee shall be responsible for ensuring, within practicable limits, that the equipment or processes being tested are operated at or near the maximum normal production rate or at a lesser rate if specified by the Director or his delegate.

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[2] *NRDC v. EPA, 749 F.3d 1055 (D.C. Cir. 2014).*

[3] *In newly issued and revised New Source Performance Standards (NSPS), emission guidelines for existing sources, and NESHAP regulations, the EPA has either omitted new affirmative defense provisions or removed existing affirmative defense provisions. See, e.g., National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants; Final Rule, 80 FR 44771 (July 27, 2015); National Emission Standards for Hazardous Air Pollutants for Major Sources:*
Industrial, Commercial, and Institutional Boilers and Process Heaters; Final Rule, 80 FR 72789 (November 20, 2015); Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units; Final Rule, 81 FR 40956 (June 23, 2016).

iv. Testing shall be completed within 180 days of commencement of operation of the new equipment unless an alternate date is approved in advance by DAQ.
v. The Permittee shall submit a written report of the test results to the Regional Supervisor, DAQ, no later than 30 days following the sample collection test in accordance with 15A NCAC 02D .2602(f), unless an alternative date is approved in advance by DAQ.

c. An additional information request was sent to Anson Gas Producers via email on December 19, 2022 concerning the usage or emissions of PFAS in the production of pipeline quality natural gas.

The NC DEQ has determined that per- and polyfluoroalkyl substances, also known as PFAS, have been and are being deposited in landfills. PFAS has become a significant concern since 2017.
PFAS compounds are commonly used in industrial processes and found in waste streams where they can be emitted into the air, deposited into surface water or soil, and eventually reach groundwater. PFAS are also found in many commercial products that eventually find their way to landfills.

In response to the growing concern about PFAS, NC DAQ has developed a list of screening questions for Permittees to help us identify potential air emission sources of emerging contaminants which are listed below. Listed below are the questions asked by DAQ concerning per- and polyfluoroalkyl substances and the responses from Anson Gas Producers, LLC. The responses were received on March 21, 2023.

On behalf of Anson Gas Producers, LLC. (AGP), Franklin Engineers & Consultants, LLC. (FE&C) submits this letter in response to your request for additional information concerning polyfluoroalkyl substances (PFAS).

DAQ Question 1:
Will your facility use any material or products in your operations that contain fluorinated chemicals? If so, please identify such materials or products and the fluorinated chemicals they contain.

Response 1:
LFG generation in landfills is the result of anaerobic decomposition. Based on information gathered at various landfills across the country it is not unusual for compounds that contain fluorine to be present in LFG. As previously mentioned, LFG generation is the result of anaerobic decomposition. This type of decomposition is the result of the break-down of matter through the digestive process of bacteria in the absence of oxygen. It is our understanding that PFAS are manmade chemicals. The compounds indicated below were included in the original application and based on default factors from the Waste Industry Air Coalition (WIAC) data:
- *Chlorodifluoromethane (CAS # 75-45-6)*
- *Dichlorodifluoromethane (CAS # 75-71-8)*
- *Dichlorofluoromethane (CAS # 75-43-4)*
- *Fluorotrichloromethane (CAS # 75-69-4)*

DAQ Question 2:
Will your facility formulate/create products or byproducts (directly or indirectly) that contain fluorinated chemicals (across multiple media)? If so, please identify such products or byproducts and the fluorinated chemicals they contain.

Response 2:
AGP will not formulate/create products or byproducts (directly or indirectly) that contain fluorinated chemicals (across multiple media). The proposed AGP Project is not designed to create any new materials. It is designed to remove contaminants, impurities, etc. from the LFG generated by decomposing waste at the adjacent landfill so that it can satisfy natural gas pipeline requirements to serve as a surrogate for natural gas.

DAQ Question 3:
Will your facility generate solid, liquid, or gaseous related emissions, discharges, or wastes/products containing fluorinated chemicals? If so, please identify such waste streams or materials and the fluorinated chemicals they contain.

Response 3:
As previously mentioned, compounds that contain fluorine can be found in LFG, so there is the possibility that there will be gaseous emissions into the atmosphere of these compounds. The presence and concentration of LFG constituents will vary based on the type of waste landfilled. Based on the WIAC default values used in the application, the following constituents may be present in low concentrations in the LFG received by the facility:

- *Chlorodifluoromethane (CAS # 75-45-6)*
- *Dichlorodifluoromethane (CAS # 75-71-8)*
- *Dichlorofluoromethane (CAS # 75-43-4)*
- *Fluorotrichloromethane (CAS # 75-69-4)*

Emissions of these compounds may occur after these contaminants are removed from the LFG via RNG processing equipment. However, it is important to note that we expect that the emissions of these compounds will be minimal because of the controls that are set in place. Any waste gas produced will be transported for combustion in an enclosed flare designed to achieve a 98% destruction efficiency of VOCs. Moreover, there is a carbon polishing unit designed to minimize any additional emissions of contaminants that have not been removed by filtration system and/or refrigeration system used to treat the LFG. As a result, any emissions of these compounds will occur in greatly reduced concentrations from those received by the facility.

DAQ Question 4:
Do your facility's processes or operations use equipment, material, or components that contain fluorinated chemicals (e.g., surface coating, clean room applications, solvents, lubricants, fittings, tubing, processing tools, packaging, facility infrastructure, air pollution control units)? Could these processes or operations directly or indirectly (e.g., through leaching, chemical process, heat treatment, pressurization, etc.) result in the release of fluorinated chemicals into the environment?

Response 4:
AGP is unaware of any processes or operations which use equipment, material, or components that contain fluorinated chemicals as indicated in Question 4 above. The SDS information available to AGP does not indicate this as an exposure risk. However, AGP is not entirely sure how to determine either the presence of fluorinated chemicals or potential of release in cases where this information is not provided by the manufacturer.

DAQ Question 5:
List the fluorinated chemicals identified (i.e., through testing or desktop review) above in your response under the appropriate methods/approaches? If one is not, are they on any

other known US or International target lists? OTM-45 (air emissions) Methods 533 & 537.1 (drinking water) SW-846: Method 8327 (water) Draft Method 1633 (water, solids, tissue) Total PFAS" Draft Method 1621 for Adsorbable Organic Fluorine (wastewater) Non targeted analytical methods Qualitative approach through suspect screening.

Response 5:
The compounds and concentrations provided were not obtained through site-specific analysis. As previously mentioned, the following analytes are listed in the WIAC default factors used in the Title V Application:
- *Chlorodifluoromethane (CAS # 75-45-6)*
- *Dichlorodifluoromethane (CAS # 75-71-8)*
- *Dichlorofluoromethane (CAS # 75-43-4)*
- *Fluorotrichloromethane (CAS # 75-69-4)*

The foregoing compounds are also listed in Section 2.4 of AP-42 (Municipal Solid Waste Landfills). Both lists of default factors were developed from surveys of U.S. landfills and provide typical compounds present in LFG and their corresponding average concentrations for use in determining emissions.

DAQ Question 6:
Are there other facilities or operations in the U.S. or internationally engaged in the same or similar activities involving fluorinated chemicals addressed in your response to the above questions? If so, please provide facility identification information? In addition, are there any ISO (International Organization for Standardization) certification requirements?

Response 6:
There are other facilities in the US and internationally that develop Renewable Energy Projects utilizing LFG. A database of US facilities that operate LFG energy projects is maintained by the USEPA's Landfill Methane Outreach Program. It is our understanding that PFAS are manmade chemicals; however, as previously mentioned, the LFG utilized in these projects is generated as part of the anaerobic decomposition of landfilled waste before the LFG is refined by the RNG facility.
LFG may carry trace amounts of these chemicals from the waste landfilled, but these chemicals were present in the waste material before it was deposited in the landfill. The anaerobic decomposition process does not create these chemicals.

DAQ Question 7:
Do you plan to store AFFF on site, use it in fire training at the site, use it for fighting fires at the facility, or include it in a fire fighting system at the site?

Response 7:
RNG facilities, including AGP, do not typically handle or store flammable liquid fuel or similar materials in large quantities which would require a specialized Class B suppressant. AFFF will not be used in our training events. We do not have firefighting systems at our facilities. AGP will use standard ABC fire extinguishers (and in some cases CO_2 extinguishers) and will make arrangements to purchase fire extinguishers that do not contain AFFF.

DAQ Question 8:
Are other emerging contaminants (e.g., 1,4-dioxane, brome, perchlorate, 1,2,3-Trichloropropane) used in some capacity within your facility or operations?

Response 8:
AGP does not have any information indicating that any of the listed chemicals are present at its facilities, but AGP is not sure how this would be determined definitively. If a more detailed response is needed, more guidance is requested to address this question.

DAQ Question 9: Do you need technical assistance to answer the questions above.

Response 9:
Though we believe the answers that we have provided are accurate, we welcome any feedback that the NCDEQ submits concerning PFAS.

d. The following State-enforceable only condition will be placed in the Title V permit for this facility along with a one-time testing requirement to test for per- and polyfluoroalkyl substances (PFAS) at the inlet where the landfill gas enters the facility.

- **Disclosure of Information Relating to Emissions of Fluorinated Chemicals:**
  The Permittee shall have an ongoing duty to disclose the known presence of materials containing fluorinated chemicals at the Facility that have the potential to result in the emission of fluorinated chemicals to the environment. Such disclosures shall be in writing and submitted to the Regional Office Supervisor within thirty days of the Permittee becoming aware of such information, unless such information has already been disclosed to DAQ by the Permittee.

e. Zoning: 15A NCAC 02Q .0113 "Notification in Areas Without Zoning"
This facility will be located in an area in Anson County which is non-classifiable. As such, Anson Gas Producers was required to perform the following:

- Publish a legal notice in a newspaper of general circulation in the area where the source is or will be located at least two weeks before submitting the permit application for the source.
- The notice shall identify: (A) the name of the affected facility; (B) the name and address of the permit applicant; and (C) the activity or activities involved in the permit action;
- Post a sign on the property where the new or expanded source is or will be located.

  The sign shall meet the following specifications: (A) it shall be at least six square feet in area; (B) it shall be set off the road right-of-way, but no more than 10 feet from the road right-of-way; (C) the bottom of the sign shall be at least six feet above ground; (D) it shall contain the name of the affected facility, the name and address of the permit applicant, and the activity or activities involved in the permit action;
  (E) lettering shall be a size that the sign can be read by a person with 20/20 vision standing in the center of the road; (F) the side with the lettering shall face the road, and sign shall be parallel to the road; and (G) the sign shall be posted at least 10 days before the permit application is submitted and shall remain posted for at least 30 days after the application is submitted.
- The permit applicant shall submit with the permit application, an affidavit and proof of publication that the legal notice was published.

A legal notice was published in the Anson Record on May 25, 2022. A copy of the affidavit and Proof of Publication was included in Appendix C of Application 0400062.22A. Also, a sign prepared in accordance with 15A NCAC 02Q .0113 was placed on the property where the new source will be located.

f. The application was sealed by Juene Franklin, who is a registered Professional Engineer in the State of North Carolina (Seal #041073).

g. The required permit application fee of 10,635 for a greenfield Title V facility was received by Raleigh Central Office on June 22, 2022.

9. Statement of Compliance:

This is the first permit for this site, no compliance inspections have been performed for this facility to date.

10. Public Notice Review:

A notice of the DRAFT Title V Permit shall be made pursuant to 15A NCAC 02Q .0521. The notice will provide for a 30-day comment period, with an opportunity for a public hearing. Consistent with 15A NCAC 02Q .0525, the EPA will have a concurrent 45-day review period. Copies of the public notice shall be sent to persons on the Title V mailing list and EPA. Pursuant to 15A NCAC 02Q .0522, a copy of each permit application, each proposed permit and each final permit shall be provided to EPA.

The 30-day public notice period was from XXXXX through XXXXX. ___ public comments were received during the public comment period.

The EPA 45-day review period was from XXXXXX, 2023 through ______2023. The EPA contacted the DAQ via email on _______XXXXX 2023 and stated that _____________. Comments were received from the EPA on XXXX, 2023 and the comments were incorporated into the final permit.

11. Comments and Recommendations:

This application for the Anson County Gas Producers, LLC Project-Anson is a greenfield facility which will receive a Title V permit (T00). The Division of Air Quality has reviewed this application and determined that the facility will achieve compliance with all procedures and requirements listed in the permit. The DAQ recommends the issuance of Air Permit No. 10749T00.