ENGINEERING ANALYSIS

PROCESS DESCRIPTION

W&T Offshore, Inc (W&T) currently operates the North Central Gulf Field Platform 115C (NCG) under Major Source Operating Permit (MSOP) No.: 503-0025. Instead of submitting a Title V renewal application for the MSOP, W&T Offshore, Inc (W&T) has elected to apply for a Synthetic Minor Operating Permit (SMOP). The initial SMOP application was received by the Department on November 23, 2022. Additional information was initially requested on December 16, 2022, and the completed application was received on August 14, 2023.

NCG is an offshore natural gas production platform that is permitted to operate the following emissions sources:

- Engines:
  - Drilling Rig Engines [D001, D002, and D003]
  - Workover Rig [D004]
  - 1100 HP, Natural Gas Fired, four stroke lean burn (4SLB), Gas Generator Engine [C-ZAN-505]
  - 1100 HP, Natural Gas Fired, 4SLB, Gas Generator Engine [C-ZAN-506]
  - 210 BHP, Diesel Fired, Black Start Emergency Generator [C-ZAN-521]
- Flares:
  - High Pressure Flare [C-ZZZ-503]
  - Low Pressure Flare [C-ZZZ-514]
- 5 MMBtu/hr process heater [C-EAL-601]
- Tri-ethylene Glycol Dehydration System [TEG]
- Tanks:
  - 3,780 gallon Methanol Tanks [CB-ABJ-403, CC-ABJ-403, and C-ABJ-410]
  - 3,780 gallon No. 2 Diesel Fuel Storage Tank [C-ABJ-412]
  - 3,780 gallon Corrosion Inhibitor Tank [C-ABJ-418]
  - 1,400 gallon Engine Lube Oil Storage Tank

NOTABLE CHANGES

This engineering analysis will address the following changes:

- W&T does not foresee engaging in drilling and workover operations in the future and has requested to remove the drilling rig engines and the drilling rig emergency generator from the permit. The three 2,500 Brake Horsepower (BHP) drilling rig engines had the potential to emit 249 tons per year (TPY) of nitrogen oxides (NO_X) and 181 TPY of carbon monoxide (CO).
- W&T has requested facility wide SMOP limits of 99 tons per 12-month rolling for sulfur dioxide (SO_2), NO_X, CO, and volatile organic compounds (VOC).
- In MSOP No.: 503-0025, the C-ZAN-505 and C-ZAN-506 generator engines had emission limits for NO_X and CO to avoid a review under Prevention of Significant Deterioration (Anti-PSD limits). These limits will remain in place but will be referred to as SMOP limits. W&T requested to raise the limits in a written request on April 24, 2025. NO_X emissions from both engines were originally limited to 4.9 pounds per hour, but are now limited to 8.8 pounds per hour. CO emissions from both engines were originally limited to 7.4 pounds per hour, but are now also limited to 8.8 pounds per hour. As shown in Table 1, W&T's potential to emit does not exceed the Title V major source thresholds with the increased limits.
- In MSOP No.: 503-0025, the C-ZAN-505 and C-ZAN-506 required periodic emissions tests for CO and NO_X every 12 months and performance emission tests every 5 years. This requirement will be changed to require periodic performance testing every 5 years.
- In MSOP No.: 503-0025, the C-ZAN-521 emergency engine was listed as a 350 HP engine. This has been corrected to 210 HP. The engine has not changed.
- MSOP No.: 503-0025 required W&T to maintain the optimum glycol recirculation rate to the TEG below 1,187 gallons per hour. In accordance with 40 CFR §63.764(d)(2)(iii), W&T has requested to change the optimum glycol circulation rate to 437 gallons per hour.
- MSOP No.: 503-0025 required the flares at the NCG platform to meet the smokeless flare requirements of 40 CFR §63.11(b). This requirement does not apply to TEGs that are not in UA plus offsets and UC and will be removed.
- Since the facility-wide SO_2 limit has been lowered from 245 TPY to 99 TPY, W&T requested to lower the allowable H_2S feed rate to the flares from 2,500 pounds per hour to 1,072 pounds per hour.
- Since NCG is no longer a major source (as defined in 40 CFR §64.1) of criteria pollutants, CAM requirements will no longer be applicable [40 CFR §64.2(a)]. The CAM requirements for the flares and generator engines will be removed.
- The 5 MMBtu/hr heater was listed as a trivial and insignificant source in MSOP No.: 503-0025 and had no requirements. Since trivial and insignificant sources do not apply to SMOPs, limits for PM and SO_2 have been added for the 5 MMBtu/hr heater. These limits come from ADEM Admin. Code r. 335-3-4-.03(1) and ADEM Admin. Code r. 335-3-5-.01(1)(a).
- Method 22 of 40 CFR 60, Appendix A-7 has been added as an alternative method for determining compliance with the visible emissions standards in ADEM Admin. Code r. 335-3-5-.01.

EMISSIONS

The potential to emit for all units is shown in Table 1. The detailed calculations for each unit are shown in Appendix A.

For each unit, the emissions factors for carbon dioxide (CO_2), nitrogen oxides (N_2O), and methane (CH_4) were given in Tables C-1 and C-2 to Subpart C of Part 98. The potential emissions for carbon dioxide equivalent (CO_2e) were were calculated by multiplying the methane, CO_2, and N_2O emissions by their global warming potentials and taking the sum of the resulting values. Global warming potentials of 1 for CO_2, 30 for methane, and 273 for N_2O were used

The emissions for C-ZAN-505 and C-ZAN-506 were calculated using SMOP limits, AP-42, Table C-1 to 40 CFR Part 98, and Table C-2 to 40 CFR Part 98. The SMOP limits of 8.8 pounds per hour were used to calculate emissions of NO_X and CO. The emissions factors for hexane, formaldehyde (CH_2O), condensable particulate matter (PM-CON), filterable particulate matter (PM-filterable), and total hazardous air pollutants (Total-HAPs) were given in AP-42 Table 3.2-3. For all calculations, 8,760 hours of operation per year and a maximum engine power of 1100 HP were used.

The emissions for C-ZAN-521 were calculated using emissions factors from AP-42, Table C-1 to 40 CFR Part 98, and Table C-2 to 40 CFR Part 98. The emissions factors for NO_X, CO, VOC, CH_2O, PM-CON, PM-filterable, Total-HAPs were given in AP-42 Table 3.2-3. According to AP-42, hexane emissions are expected to be negligible for this engine. For all calculations, 500 hours of operation per year and a maximum engine power of 210 HP were used. 500 hours per year were used because this is an emergency engine.

The emissions for the heater were calculated using emissions factors from AP-42 and Table C-1 to 40 CFR Part 98, and Table C-2 to 40 CFR Part 98. The emissions factors for NO_X, CO, VOC, CH_2O, SO_2, PM-CON, PM-filterable, hexane and Total-HAPs were given in AP-42 Table 1.4-1 and Table 1.4-2. For all calculations, 8760 hours of operation per year and 5 MMBtu/hr were used.

The potentials to emit for the high pressure flare and low pressure flare were provided by W&T. The emissions from the TEG are controlled by the low pressure flare, so its emissions are included with the emissions from the low pressure flare. The high pressure flare and low pressure flare are emergency flares that are operated intermittently. W&T based the flares' emissions on actual emissions data from 2017 to 2022.

Pollutant	C-ZAN-505	C-ZAN-506	C-ZAN-521	HP Flare	LP Flare/TEG	Heater	Total
NO_X	38.54	38.54	1.62	1.08	1.28	2.15	83.22
CO	38.54	38.54	0.35	4.90	5.85	1.80	89.99
VOC	4.55	4.55	0.13	10.44	12.45	0.12	32.23
PM-CON	0.38	0.38	2.83E-03	9.00E-02	0.10	0.12	1.08
PM-Filt	1.48	1.48	0.11	0.11	3.41E-02	4.08E-02	3.26
SO_2	0.10	0.10	5.71E-04	24.74	11.08	1.29E-02	36.03
Hexane	1.72E-02	1.72E-02	-	2.71E-02	3.23E-02	3.86E-02	0.13
Formaldehyde	2.04	2.04	4.34E-04	1.13E-03	1.35E-03	1.61E-03	4.07
Total HAPs	2.86	2.86	1.42E-03	2.84E-02	3.39E-02	4.04E-02	5.83
CO_2	4,509	4,509	60.80	1,807	2,155	2,576	15,617
N_2O	8.50E-03	8.50E-03	4.86E-04	3.31E-02	3.95E-02	4.72E-02	0.14
CH_4	8.50E-02	8.50E-02	2.43E-03	3.46E-02	4.13E-02	4.94E-02	0.30
CO_2e	4,513	4,513	60.80	1,818	2,168	2,577	15,651

Table 1 - Facility Wide Potential to Emit (TPY)

REGULATIONS

State Regulations

ADEM Admin. Code r. 335-3-4-.01(1)(a and b), "Visible Emissions"

Applicability

Each emission source, including the flares, is subject to this regulation and will continue to comply.

Emission Standards

ADEM Admin. Code r. 335-3-4-.01(1)(a) states that, except for one six-minute period in any sixty-minute period, no person shall emit particulate emissions to the atmosphere of an opacity of greater than twenty percent (20%) as determined by a six (6) minute average.

ADEM Admin. Code r. 335-3-4-.01(1)(b) states that a person may discharge into the atmosphere from any source of emissions, particulate of an opacity not greater than that designated as forty percent (40%) opacity, as determined by a six (6) minute average.

Compliance Test Methods and Procedures

Compliance with the opacity standards for the engines, heater, and flares shall be determined using one of the methods below:

- Method 9 of Appendix A-4 to 40 CFR Part 60 (Method 9) [ADEM Admin. Code r. 335-3-4-.01(2)].
    - Method 9 must be conducted by an observer that is certified and familiar with Method 9 procedures.

- Method 9 shall be conducted during daylight hours.
- Method 9 observations should be documented using an ADEM Visible Emissions Observation Report.

- Method 22 of Appendix A-7 to 40 CFR Part 60 (Method 22).
  - The observation must be done by an individual who is familiar with Method 22.
  - To determine compliance with the opacity standards, a violation is defined as visible emissions observed for a total of six (6) minutes in any 60-minute period.

Emissions Monitoring

When the facility is manned, the permittee must conduct weekly visual emissions checks for the presence or absence of visible emissions from the engines, heater, and flares' stacks. If visible emissions are observed and cannot be corrected within one hour, a visual emissions observation should be performed using Method 9 or Method 22.

Recordkeeping and Reporting Requirements

Records of each visual emissions inspection and observation should be maintained. Each inspection record should include the date, time, and result of each inspection and any corrective actions performed. Each observation record should include the date, time, duration, and any corrective actions performed.

ADEM Admin. Code r. 335-3-4-.03, "Fuel Burning Equipment"

ADEM Admin. Code r. 335-3-4-.03(1) states that no person shall cause or permit the emission of particulate matter from fuel-burning equipment in a Class 1 County in excess of the amount shown in Table 4-1 to ADEM Admin. Code r. 335-3-4 for the heat input allocated to the source.

Per ADEM Admin. Code r. 335-3-Appendix A, Mobile County is a Class 1 County.

The allowable emissions from Table 4-1 to ADEM Admin. Code r. 335-3-4 is 0.5 pounds per MMBtu (lb/MMBtu). The emission limit in this rule is much higher than the potential to emit that was calculated with the emission factor from AP-42 Table 1.4-2.

The heater will continue to be subject to this regulation and will comply by burning natural gas.

ADEM Admin. Code r. 335-3-5-.01, "Fuel Combustion"

ADEM Admin. Code r. 335-3-5-.01(1)(a) states that no person shall cause or permit the operation of a fuel burning installation in a Sulfur Dioxide Category I County in such a manner that sulfur oxides, measured as sulfur dioxide, are emitted in excess of 1.8 pounds per million BTU heat input.

Per ADEM Admin. Code r. 335-3-Appendix B, Mobile County is a Category I County.

According to ADEM Admin Code r. 335-3-5-.01(1)(b), the 5.0 MMBtu/hr process heater shall not emit greater than 1.8 pounds per MMBtu for SO_2. The emission limit in this rule is much higher than the potential to emit that was calculated with the emission factor from AP-42 Table 1.4-2.

The heater will continue to be subject to this regulation and will comply by burning natural gas.

ADEM Admin. Code r. 335-3-5-.03, "Petroleum Production"

ADEM Admin. Code r. 335-3-5-.03(1) and ADEM Admin. Code r. 335-3-5-.03(2) state that facilities that handle natural gas or refinery gas that contains more than 0.10 grains per standard cubic foot (gr/scf) of hydrogen sulfide (H_2S) shall not cause or permit the emission of a process gas stream containing more than 0.10 grain of hydrogen sulfide per SCF into the atmosphere unless it is properly burned to maintain the ground level concentrations of hydrogen sulfide to less than twenty (20) parts per billion beyond plant property limits, averaged over a thirty (30) minute period. The flares will continue to be subject to this rule.

In MSOP No.: 503-0025, W&T met this limit by limiting the H_2S feed rate to the flares to 2,500 pounds per hour. Since the facility-wide SO_2 limit has been lowered from 245 TPY to 99 TPY, W&T has chosen to lower the H_2S feed rate limit to 1,072 pounds per hour. W&T will demonstrate compliance with this limit by performing monthly calculations of the H_2S feed rate to the flares and the SO_2 emissions from the flares. The volume of gas flared and the H_2S concentration of the flared gas should be used to calculate the flare emissions.

ADEM Admin. Code r. 335-3-5-.03(3) requires that SO_2 emissions from a facility that is designed to dispose of or process natural gas containing more than 0.10 grains/scf of H_2S do not exceed the allowable limit based on the available sulfur coming into the facility. Since the available sulfur coming into the facility is not expected to exceed 5 Long tons per day (LTD) for a Category I County, the SO_2 emissions from the facility would be unlimited. However, the facility has been limited to 99 tons of SO_2 per year in order to remain a synthetic minor source. W&T will comply with this regulation by testing the H_2S content of gases that can be burned in the engines, heater, and flares and by maintaining monthly records of the facility-wide SO_2 emissions.

ADEM Admin. Code r. 335-3-11-.06, "National Emission Standards for Hazardous Air Pollutants"

This rule lists the National Emission Standards for Hazardous Air Pollutants (NESHAP) under the ADEM Administrative Code. The following NESHAPs may be applicable to this facility:

- Per ADEM Admin. Code r. 335-3-11-.06(1), 40 CFR 63, Subpart A – General Provisions
- Per ADEM Admin. Code r. 335-3-11-.06(33), 40 CFR 63, Subpart HH – National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities
- Per ADEM Admin. Code r. 335-3-11-.06(103), 40 CFR 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

ADEM Admin. Code r. 335-3-14-.04, "Prevention of Significant Deterioration (PSD) Permitting"

The facility previously elected a 245 ton per year (TPY) anti-PSD limit for criteria pollutants in order to stay below the major source threshold for PSD regulations. Based on the emissions found in Table 1, the potential to emit for the facility would not exceed the 250 TPY threshold for PSD; therefore, these limits are no longer needed.

Anti-PSD limits were previously placed on the C-ZAN-505 and C-ZAN-506 generator engines to maintain emissions below the PSD threshold. These limits will remain in place in but will be converted to SMOP limits and will be used to avoid exceeding the Title V major source thresholds of 100 TPY.

ADEM Admin. Code r. 335-3-14-.06, "Determinations for Major Sources in Accordance with Clean Air Act Section 112(g)"

Because hazardous air pollutant (HAP) emissions greater than 10 TPY of any single HAP or 25 TPY of any combination of HAPs are not expected from the proposed facility, a 112(g) case by case MACT review would not be necessary.

ADEM Admin. Code r. 335-3-15, "Synthetic Minor Operating Permits"

The facility has been deemed a synthetic minor source of criteria pollutants under this regulation since limits have been taken to restrict the emission sources from emitting more than 100 TPY (major source threshold) of criteria pollutants. This facility has elected to take limits of 99 tons per rolling 12-month period for SO_2, NO_X, CO, and VOC. The emissions of each pollutant will be calculated separately. The facility will meet the limits for NO_X and CO by limiting the C-ZAN-505 and C-ZAN-506 engines to 8.8 pounds per hour (lb/hr) of NO_X and 8.8 lb/hr of CO. Compliance with these limits will be demonstrated by performance tests conducted on the engines every 5 years. The SO_2 limit will be met by testing H_2S content of fuels burned in engines, heater, and flares and by maintaining monthly calculations of the SO_2 emissions from each emission source. The emissions of SO_2, NO_X, CO, and VOC will be calculated monthly, and the records of the calculations will be used to demonstrate compliance with the rolling twelve-month emission limits.

ADEM Admin. Code r. 335-3-16, "Major Source Operating Permits"

The facility is currently operating under MSOP No.: 503-0025. Based on the emissions in Table 1, this facility will no longer be classified as a major source for criteria pollutants or HAPs with respect to this regulation as long as the SMOP limits are met. When the SMOPs are issued, the major source operating permit will be voided, and all copies should be returned to the Department. The reporting period for the final annual compliance certification for this facility should end on the day before the issuance date of the SMOPs.

Class I Area

The nearest Class I Area is the Breton Wildlife Refuge. This area is located 88 kilometers from the facility; however, the emissions from this facility are not expected to exceed PSD standards, so this project is not expected to have a significant impact on this area.

Coastal Consistency

The NCG platform is an existing facility located in Mobile Bay at a base elevation of 58.4 feet. Since no new emissions sources will be added to the facility during this project, the Coastal Branch of ADEM was not contacted concerning this project.

Federal Regulations

Black Start, Emergency Diesel Engine (C-ZAN-521)

Engine Type:	Reciprocating Engine	**Model Year**	1991
Ignition Type:	Compression Ignition (CI)	**Construction Date:**	1993
Fuel Type:	Diesel Fuel	**Certified Engine:**	No
Engine Service Type	Emergency	**Control Devices:**	None
Engine Rating: BHP (kW)	210 (127)		

Table 2 – C-ZAN-521 Engine Information

40 CFR 60 Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (NSPS IIII)"

It was determined in the Statement of Basis for the 2018 Title V Permit renewal that this engine was not subject to the requirements of NSPS IIII. The C-ZAN 521 engine was manufactured in 1991 and installed in 1993. Since the engine is not being reconstructed or modified at this time, this engine is still not subject to this regulation.

Gas Generator Engines (C-ZAN-505 and C-ZAN-506)

Engine Type:	Reciprocating Engine	**Engine Rating: BHP (kW)**	1,100 (820)
Piston Movement:	4-Stroke Reciprocating Internal Combustion Engine (RICE)	**Model Year**	1993
Ignition Type:	Spark Ignition (SI)	**Construction Date:**	1993
Fuel Type:	Primary: Natural Gas	**Certified Engine:**	No
Air/Fuel Mix	Lean Burn RICE	**Control Devices:**	None
Engine Service Type	Non-emergency, non-limited use, fire/other pump driver		

Table 3 – C-ZAN-505 and C-ZAN-506 Engine Specifications

40 CFR 60 Subpart JJJJ, "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS JJJJ)"

It was determined in the Statement of Basis for the 2018 Title V Permit renewal that these engines were not subject to the requirements of NSPS JJJJ. The C-ZAN-505 and C-ZAN-506 engines were constructed in 1993. Since the engines are not being reconstructed or modified at this time, they are still not subject to this regulation.

Gas Generator Engines (C-ZAN-505 and C-ZAN-506) and Black Start, Emergency Diesel Engine (C-ZAN-521)

40 CFR 63 Subpart A, "General Provisions"

Subpart A is applicable because the facility is subject to one of the applicable subparts found under 40 CFR part 63. The engines are subject to requirements under 40 CFR 63, Subpart ZZZZ. Per 40 CFR §63.6665, the applicable General Provisions are shown in Table 8 to Subpart ZZZZ.

40 CFR 63 Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutant for Stationary Reciprocating Internal Combustion Engines [MACT ZZZZ]"

It was determined in the Statement of Basis for the 2018 Title V Permit renewal that each engine is an affected source under MACT ZZZZ located at an area source of HAPs. The engines' applicability to MACT ZZZZ has not changed, but some permit requirements will be updated to address the revisions to MACT ZZZZ that were made in August 2024.

Emission Standards

The following emission standards apply to the C-ZAN-505, C-ZAN-506, and C-ZAN-521 engines:

- Per 40 CFR §63.6605(a), you must be in compliance with the applicable operating limitations and requirements of MACT ZZZZ at all times.

- Per 40 CFR §63.6605(b), at all times you must operate and maintain any affected source in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require you to make any further efforts to reduce emissions if levels required by MACT ZZZZ have been achieved. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Department which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

- Per 40 CFR §63.6625(h), if you operate an existing stationary engine, you must minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.

The following emission standards apply to the C-ZAN-521 emergency engine:

- Per 40 CFR §63.6603(a), W&T should continue to comply with the requirements found in Item 4 of Table 2d as follows:

    - Change oil filter every 500 hours of operation or within 1 year and 30 days of the previous change, whichever comes first.

        - As an alternative, the facility has the option of utilizing an oil analysis program in order to extend the specified oil change requirement above. The oil analysis must be performed as described in 40 CFR 63.6625(j).

- Inspect air cleaner every 1,000 hours of operation or within 1 year and 30 days, whichever comes first, and replace as necessary.

- Inspect all hoses and belts every 500 hours of operation or within 1 year and 30 days, whichever comes first, and replace as necessary.

- Per 40 CFR §63.6604(a) and 40 CFR §63.6604(b), existing emergency CI stationary RICE with a site rating of more than 100 brake HP and a displacement of less than 30 liters per cylinder that use diesel fuel and operate for the purpose specified in 40 CFR §63.6640(f)(4)(ii) must use diesel fuel that meets the requirements in 40 CFR §1090.305 for nonroad diesel fuel. The C-ZAN-521 engine has a site rating of 210 BHP and will not be operated for the purpose specified in 40 CFR §63.6640(f)(4)(ii), so it will not be required to use diesel fuel that meets the requirements in 40 CFR §1090.305 for nonroad diesel fuel.

- Per 40 CFR §63.6625(e) and 40 CFR §63.6625(e)(3), existing emergency or black start stationary RICE located at area sources of HAP emissions must be operated and maintained according to the manufacturer's emission-related written instructions.

The following emission standards apply to the C-ZAN-505 and C-ZAN-506, non-emergency, generator engines:

- Per 40 CFR §63.6603(a), W&T should continue to comply with the requirements found in Item 8 of Table 2d as follows:

  - Change oil and filter every 2,160 hours of operation or within 1 year and 30 days, whichever comes first.

    - As an alternative, the facility has the option of utilizing an oil analysis program in order to extend the specified oil change requirement above. The oil analysis must be performed as described in 40 CFR 63.6625(j).

  - Inspect spark plugs every 2,160 hours of operation or within 1 year and 30 days, whichever comes first, and replace as necessary.

  - Inspect all hoses and belts every 2,160 hours of operation or within 1 year and 30 days, whichever comes first, and replace as necessary.

Compliance and Performance Test Methods and Procedures

- There are no applicable compliance and performance test methods and procedures for the C-ZAN-505, C-ZAN-506, or C-ZAN-521 engines under MACT ZZZZ.

Emissions Monitoring

The following emissions monitoring requirements apply to the C-ZAN-505 and C-ZAN-506 engines:

- Per 40 CFR §63.6603(f), existing non-emergency, SI 4-stroke lean burn stationary RICE with site ratings greater than 500 HP located at area sources of HAPs must meet the definition of remote stationary RICE in 40 CFR §63.6675 as of October 19, 2013, to be considered remote stationary RICE. The status of engines

that meet this definition must be evaluated every 12 months. Owners must keep records of the initial and annual evaluation of the status of the engine. If the engine stops meeting the definition of remote stationary RICE, it must comply with the requirements for non-emergency 4SLB engines with site ratings greater than 500 HP within 1 year of the evaluation. The generator engines are considered remote sources because they are on offshore platforms [40 CFR §63.6675]. Annual evaluations must continue to be made.

The following emissions monitoring requirements apply to the C-ZAN-521 engine:

- Per 40 CFR §63.6625(f), existing emergency stationary RICE located at area sources of HAP emissions must have non-resettable hour meters installed. The C-ZAN-521 engine is equipped with a non-resettable hour meter and will continue to comply with the recordkeeping requirements.

- Per 40 CFR §63.6640(a), you must demonstrate continuous compliance with each applicable operating limitation and requirement in Table 2d to MACT ZZZZ according to the methods specified in Table 6 to MACT ZZZZ.

  According to Item 9 of Table 6 to MACT ZZZZ, existing emergency and black start stationary RICE located at an area source of HAP must comply with work management practices by operating and maintaining the stationary RICE according to the manufacturer's emission-related operation and maintenance instructions or by developing and following your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions.

- Per 40 CFR §63.6640(f), if you own or operate an emergency stationary RICE, you must operate the emergency stationary RICE according to the requirements in 40 CFR §63.6640(f)(1) through 40 CFR §63.6640(f)(4). In order for the engine to be considered an emergency stationary RICE under MACT ZZZZ, any operation other than emergency operation, maintenance and testing, and operation in non-emergency situations for 50 hours per year, as described in 40 CFR §63.6640(f)(1) through 40 CFR §63.6640(f)(4), is prohibited. If you do not operate the engine according to the requirements in 40 CFR §63.6640(f)(1) through 40 CFR §63.6640(f)(4), the engine will not be considered an emergency engine under MACT ZZZZ and must meet all requirements for non-emergency engines.

Recordkeeping and Reporting Requirements

The following records should be kept for the C-ZAN-505, C-ZAN-506, and C-ZAN-521 engines:

- Per 40 CFR §63.6655(e) and 40 CFR §63.6655(e)(3), you must keep records of the maintenance conducted on the stationary RICE in order to demonstrate that you operated and maintained the stationary RICE and after-treatment control device (if any) according to your own maintenance plan if you own or operate an existing stationary RICE located at an area source of HAP emissions subject to management practices as shown in Table 2d to MACT ZZZZ.

- Per 40 CFR §63.6660(a), 40 CFR §63.6660(b), and 40 CFR §63.6660(c), you must keep each record readily accessible in hard copy or electronic form for at least 5 years after the date of each occurrence, measurement, maintenance, corrective action, report, or record, according to §63.10(b)(1).

The following records should be kept for the C-ZAN-521 engine:

- Per 40 CFR §63.6650(f) and 40 CFR §63.6650(f)(2), records of the hours of operation of the C-ZAN-521 engine must be recorded through the non-resettable hour meter. The hours of emergency operation must be documented, including what classified the operation as emergency and how many hours were spent for non-emergency operation.

The following reports should be submitted for the C-ZAN-505, C-ZAN-506, and C-ZAN-521 engine:

- The reports listed in 40 CFR §63.6645(a) and 40 CFR §63.6645(a)(2) are not required because they are not applicable.

- Per 40 CFR §63.6640(b), you must report each instance in which you did not meet each emission limitation or operating limitation in Table 2d to MACT ZZZZ that applies to you. These instances are deviations from the operating limitations MACT ZZZZ. These deviations must be reported according to the requirements in 40 CFR §63.6650.

- Per 40 CFR §63.6640(e), you must also report each instance in which you did not meet the applicable requirements in Table 8 to MACT ZZZZ.

Tri-ethylene Glycol (TEG) Dehydration System

40 CFR 63, Subpart A, "General Provisions"

Subpart A is applicable because the facility is subject to one of the applicable subparts found under 40 CFR Part 63. Per 40 CFR §63.764(a), 40 CFR §63.774(a), and 40 CFR §63.775(a), the applicable General Provisions, recordkeeping requirements, and reporting requirements shown in Table 2 to MACT HH must be met.

40 CFR 63, Subpart HH, "National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities" (MACT HH)

Applicability

This facility is an area source of hazardous air pollutants (HAPs). Per 40 CFR §63.760(b)(2), for area sources, only TEG dehydrators are subject to this regulation. In MSOP No.: 503-0025, the TEG's glycol recirculation rate was not allowed to exceed 1,187 gallons per hour as required by 40 CFR §63.764(d). During the permitting process, W&T requested to meet the exemption for TEGs that emit less than 0.90 megagrams of benzene per year, as allowed by 40 CFR §63.764(e)(1)(ii). 40 CFR §63.764(e)(1)(ii) requires that the benzene emission rate is determined with the procedures in 40 CFR §63.772(b)(2). Documentation of the TEG's ability to meet the 0.90 megagram per year of benzene limit was requested on April 27, 2023. During a phone call with the Department on July 6, 2023, W&T informed the Department that the GlyCalc simulation required by 40 CFR §63.772(b)(2) showed that the 0.90 megagram per year limit could not be met. Since the exemption in 40 CFR §63.764(e)(1)(ii) could not be met, W&T provided documentation requesting to change the current glycol recirculation rate required by 40 CFR §63.764(e)(1)(i) from 1,187 gallons per hour to 437 gallons per hour. The SMOPs will be updated to include the new glycol recirculation rate and the requirements of MACT HH that were updated in October 2024.

Emissions Standards

- Per 40 CFR §63.760(i), the emission standards in MACT HH shall apply at all times.

- Per 40 CFR §63.764(d), the owner or operator of an affected source located at an existing or new area source of HAP emissions shall comply with the applicable standards specified in 40 CFR §63.764(d).

    - Per 40 CFR §63.764(d)(2), each owner or operator of an area source not located in a UA plus offset and UC boundary (as defined in 40 CFR §63.761) shall comply with 40 CFR §63.764(d)(2)(i) through §63.764(d)(2)(iii). The TEG is located more than 2 miles from the shore, so it is not located in a UA plus offset and UC boundary.

        - Per 40 CFR §63.764(d)(2)(i) and 40 CFR §63.764(d)(2)(ii), the optimum glycol recirculation rate must be determined with the equation in 40 CFR §63.764(d)(2)(i). The unit must be operated so the optimum glycol recirculation rate is not exceeded. If the TEG dehydration unit is unable to meet the sales gas specification for moisture content using the glycol circulation rate determined in accordance with 40 CFR §63.764(d)(2)(i), the owner or operator must calculate an alternate circulation rate using GRI–GLYCalcTM, Version 3.0 or higher. The owner or operator must document why the TEG dehydration unit must be operated using the alternate circulation rate and submit this documentation with the initial notification in accordance with 40 CFR §63.775(c)(7).

            - W&T has determined that the optimum glycol recirculation rate is 437 gallons per hour. The glycol recirculation rate is limited by the throughput of the glycol pump to 420 gallons per hour.

        - Per 40 CFR §63.764(d)(2)(iii), the owner or operator must maintain a record of the determination specified in 40 CFR §63.764(d)(2)(ii) in accordance with the requirements in 40 CFR §63.774(f) and submit the Initial Notification in accordance with the requirements in 40 CFR §63.775(c)(7). If operating conditions change and a modification to the optimum glycol circulation rate is required, the owner or operator shall prepare a new determination in accordance with 40 CFR §63.764(d)(2)(i) or 40 CFR §63.764(d)(2)(ii) and submit the information specified under 40 CFR §63.775(c)(7)(ii) through 40 CFR §63.775(c)(7)(v).

- Per 40 CFR §63.764(j), at all times the owner or operator must operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Department which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

Compliance and Performance Test Methods and Procedures

- No performance testing is required for the TEG.

Emissions Monitoring

- There are no monitoring requirements for the TEG under MACT HH.

Recordkeeping and Reporting Requirements

- Per 40 CFR §63.774(b), owners and operators of facilities subject to the requirements of MACT HH shall maintain the records specified in 40 CFR §63.774(b)(1) through 40 CFR §63.774(b)(11) unless they meet the requirements of 40 CFR §63.774(c), 40 CFR §63.774(d), or 40 CFR §63.774(f). Since the TEG is not located within a UA plus offset and UC boundary, records must be kept of the calculation used to determine the optimum glycol circulation rate in accordance with 40 CFR §63.764(d)(2)(i) or 40 CFR §63.764(d)(2)(ii), as applicable.

- Per 40 CFR §63.774(g), the owner or operator of an affected source subject to MACT HH shall maintain records of the occurrence and duration of each malfunction of operation (i.e., process equipment) or the air pollution control equipment and monitoring equipment. The owner or operator shall maintain records of actions taken during periods of malfunction to minimize emissions in accordance with 40 CFR §63.764(j), including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

- Per 40 CFR §63.775(a), the reporting provisions of 40 CFR 63, Subpart A, that apply and those that do not apply to owners and operators of sources subject to MACT HH are listed in Table 2 to MACT HH.

- Per 40 CFR §63.775(c), each owner or operator of an area source subject to MACT HH shall submit the information listed in 40 CFR §63.775(c)(1). If the source is not located within any UA plus offset and UC boundaries, the owner or operator shall also submit the information listed within 40 CFR §63.775(c)(7). The information required in 40 CFR §63.775(c)(1) and 40 CFR §63.775(c)(7) is for initial compliance notifications. Since this is an existing facility under MACT HH, initial notifications are not required.

- Per 40 CFR §63.775(f) and 40 CFR §63.775(f)(1-4), whenever a process change is made, or a change in any of the information submitted in the Notification of Compliance Status Report, the owner or operator shall submit a report within 180 days after the process change is made. The report shall include:
    - A brief description of the process change.
    - A description of any modification to standard procedures or quality assurance procedures.
    - Revisions to any of the information reported in the original Notification of Compliance Status Report under 40 CFR §63.775(d).
    - Information required by the Notification of Compliance Status Report under 40 CFR §63.775(d) for changes involving the addition of processes or equipment.

- Per 40 CFR §63.775(g)(2), all reports required by MACT HH that are not subject to the requirements in 40 CFR §63.775(g)(1) must be sent to the Department at the appropriate address listed in 40 CFR §63.13. The Department may request a report in any form suitable for the specific case (e.g., by commonly used electronic media such as Excel spreadsheet, on CD or hard copy).

Process Heater

Name:	C-EAL-601
Rating:	5 MMBtu/hr

Table 4 – Process Heater Information

40 CFR 60 Subpart Dc, "Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (NSPS Dc)"

NSPS Dc applies to each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989, and that has a maximum design heat input capacity of 29 megawatts (MW) (100 million British thermal units per hour (MMBtu/hr)) or less, but greater than or equal to 2.9 MW (10 MMBtu/hr). The process heater has a capacity of 5 MMBtu, so NSPS Dc does not apply.

40 CFR 63 Subpart DDDDD, "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (Boiler MACT)"

40 CFR 63 Subpart DDDDD applies to owners and operators of industrial, commercial, and institutional boilers and process heaters that are located at major source of HAPs. Subpart DDDDD does not apply because W&T is not a major source of HAPs.

40 CFR 63 Subpart JJJJJJ, "National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources (Subpart JJJJJJ)"

40 CFR 63 Subpart JJJJJJ applies to owners and operators of industrial, commercial, or institutional boilers that are located at area sources of HAPs. As defined in 40 CFR §63.11237, process heaters are not boilers, so Subpart JJJJJJ does not apply.

Fugitive Emissions and Storage Tanks

Unit ID	Capacity (Liters)
CB-ABJ-403	14,307
CC-ABJ-403	14,307
C-ABJ-410	14,307
C-ABJ-412	14,307
C-ABJ-418	14,307
C-ABJ-406	5,299

Table 5 – Storage Tank Information

40 CFR 60 Subpart Kb, "Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984, and On or Before October 4, 2023 (NSPS Kb)"

NSPS Kb applies to storage vessels with a capacity greater than or equal to 75 cubic meters (75,000 liters) that are used to store volatile organic liquids and were constructed, reconstructed, or modified after July 23, 1984. The tanks were installed in 1993 and have capacities of 14,307 liters and 5,299 liters, so NSPS Kb does not apply.

40 CFR 60 Subpart Kc, "Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After October 4, 2023 (NSPS Kc)"

NSPS Kc applies to each storage vessel with a capacity greater than or equal to 20,000 gallons (gal) (75.7 cubic meters (m^3)) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after October 4, 2023. None of W&T's storage tanks were constructed, reconstructed, or modified after October 4, 2023, so NSPS Kc is not applicable.

40 CFR 60 Subpart OOOO, "Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification, or Reconstruction Commenced After August 23, 2011, and on or Before September 18, 2015"

Per 40 CFR §60.5365, Subpart OOOO applies to owners and operators of the onshore facilities listed in 40 CFR §60.5365(a) through 40 CFR §60.5365(g) that are located within the Crude Oil and Natural Gas Production source category, as defined 40 CFR §60.5430 and are constructed, modified, or reconstructed between August 23, 2011, and September 18, 2015. Subpart OOOO does not apply because W&T is an offshore facility.

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 and On or Before December 6, 2022 [NSPS OOOOa]"

Per 40 CFR §60.5365a, NSPS OOOOa applies to owners and operators of the onshore facilities listed in 40 CFR §60.5365a(a) through 40 CFR §60.5365a(j) that are located within the Crude Oil and Natural Gas Production source

category, as defined 40 CFR §60.5430a and are constructed, modified, or reconstructed after September 18, 2015. NSPS OOOOa does not apply because W&T is an offshore facility.

40 CFR 60 Subpart OOOOb, "Stand Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification or Reconstruction Commenced After September 18, 2015 and On or Before December 6, 2022 [NSPS OOOOb]"

Per 40 CFR §60.5365b, NSPS OOOOb applies to owners and operators of the onshore facilities listed in 40 CFR §60.5365b(a) through 40 CFR §60.5365b(i) that are located within the Crude Oil and Natural Gas Production source category, as defined 40 CFR §60.5430b and are constructed, modified, or reconstructed after December 6, 2022. NSPS OOOOb does not apply because W&T is an offshore facility.

RECOMMENDATIONS

This analysis indicates that the proposed emission sources would continue to comply with requirements of all federal and state rules and regulations. I recommend that W&T Offshore, North Central Gulf Platform be issued Synthetic Minor Operating Permits No. 503-0025-X006 for the C-ZAN-505, C-ZAN-506, and C-ZAN-521 engines and No. 503-0025-X007 for the flares, heater, and TEG. The SMOPs will replace MSOP No.: 503-0025 and any copies of the MSOP should be returned to the Department.

DRAFT

Jason Mote
Industrial Minerals Section
Energy Branch
Air Division
ADEM

Date

APPENDIX A: CALCULATIONS

Pollutant	Emission Factor	Units	Source	Pounds per Hour	Tons per Year
NO_X	8.8	Lb/hr	SMOP Limit	8.8	38.54
CO	8.8	Lb/hr	SMOP Limit	8.8	38.54
VOC	0.120	Lb/MMBtu	AP-42 Table 3.2-2	1.04	4.55
PM-CON	9.9E-3	Lb/MMBtu	AP-42 Table 3.2-2	8.72E-02	0.38
PM2.5/PM10 (filterable)	3.84E-2	Lb/MMBtu	AP-42 Table 3.2-2	0.34	1.48
PT	None	N/A	N/A	0.43	1.86
SO_2	5.88E-4	Lb/MMBtu	AP-42 Table 3.2-2	2.26E-02	9.88E-02
Hexane	4.45E-4	Lb/MMBtu	AP-42 Table 3.2-2	3.92E-03	1.72E-02
Formaldehyde	5.28E-2	Lb/MMBtu	AP-42 Table 3.2-2	0.47	2.04
Total HAPs	7.42E-2	Lb/MMBtu	AP-42 Table 3.2-2	0.65	2.86
CO_2	53.06	Kg/MMBtu	Subpart 98 Table C-1	1,030	4,510
N_2O	1E-4	Kg/MMBtu	Subpart 98 Table C-2	1.94E-03	8.50E-03
CH_4	1E-3	Kg/MMBtu	Subpart 98 Table C-2	1.94E-02	8.50E-02
CO_2e	None	N/A	N/A	1,030	4,510

Table 6 - C-ZAN-505 and Z-ZAN-506 Allowable Emissions (emissions for a single engine)

DATA:

		Engine	
ENGINE TYPE	=	4SLB	NG
FUEL HEAT CONTENT	=	1,060	Btu/Scf
FUEL H2S CONTENT	=	15.00	ppmv
MAXIMUM ENGINE HP	=	1100	HP
ENGINE OP HOURS	=	8,760	Hr
ENGINE RATING	=	**8.80**	MMBtu/hr
BRAKE-SPECIFIC FUEL CONSUMPTION	=	8,000	Btu/ HP-hr
CALCULATION BASIS	=	**Controlled and Uncontrolled**	

EMISSION FACTORS (EF)		MANUFACTURER'S EF Uncontrolled	Controlled
NO_X	=	8.8 *lb/hr*	*g/HP-hr*
CO	=	8.8 *lb/hr*	*g/HP-hr*
VOC	=	*g/HP-hr*	*g/HP-hr*
CH_2O	=	*g/HP-hr*	*g/HP-hr*
CH_4	=	*g/HP-hr*	*g/HP-hr*

AP-42 Emission Factors (lb/MMBtu)

Type	PM	SO_2[1]	NO_X	CO	VOC	CH_2O	Other HAPs
Diesel	1.00E-1	[By Mass]	3.20E+0	1.16E+0	6.42E-4	1.18E-3	4.58E-3
2SLB	3.84E-2	5.88E-4	3.17E+0	3.86E-1	1.20E-1	5.52E-2	2.53E-2
4SLB	7.71E-5	5.88E-4	4.08E+0	3.17E-1	1.18E-1	5.28E-2	2.10E-2
4SRB	9.50E-3	5.88E-4	2.27E+0	3.72E+0	2.96E-2	2.05E-2	1.20E-2

40 CFR Part 98 Subpart C Greenhouse Gas Emission Factors
Tables C-1 & C-2
(kg/MMBtu)

	N_2O	CO_2	CH_4
Diesel	0.0006	75.04	0.003
NG	0.0001	53.06	0.001
LPG	0.0006	62.72	0.003
Propane	0.0006	61.46	0.003

GWP	
N_2O=	298
CO_2=	1
CH_4=	25

Controlled and Uncontrolled 1100 HP Engine Emissions Calculations

											Uncont		Uncontrolle	
PM2.5/PM10	0.0384 Lb / MMBtu	8.80 MMBtu / Hr	*8760 Hrs / Year*	*1 Ton / 2000 Lb*		S.F.			=		**0.3379**	**o Hour**	**1.4801**	**Tons Year**
PM-CON	0.0099 Lb / MMBtu	8.80 MMBtu / Hr	*8760 Hrs / Year*	*1 Ton / 2000 Lb*		S.F.			=		**0.0872**	**o Hour**	**0.3820**	**Tons Year**
SO_2	0.0006 lb / MMBtu	8.80 MMBtu / Hr	*8760 Hrs / Year*	*1 Ton / 2000 Lb*		S.F.	15 ppmv S / 3.44 ppmv S		=		**0.0226**	**o Hour**	**0.0988**	**Tons Year**
NO_X	8.8 lb / hr			*8,760 Hr / Year*	*1* / *2000*	ton / lb	S.F.		=		**8.8000**	**o Hour**	**38.54**	**Tons Year**
CO	8.8 lb / hr			*8,760 Hr / Year*	*1* / *2000*	ton / lb	S.F.		=		**8.8000**	**o Hour**	**38.54**	**Tons Year**
VOC	0.12 lb / MMBtu	8.80 MMBtu / hr		*8,760 Hr / Year*	*1 Ton / 2000 Lb*		S.F.		=		**1.0384**	**o Hour**	**4.5482**	**Tons Year**
Hexane	0.0004 Lb / MMBtu	8.80 MMBtu / Hr	*8760 Hrs / Year*	*1 Ton / 2000 Lb*		S.F.			=		**0.0039**	**o Hour**	**0.0172**	**Tons Year**
CH_2O	0.0528 lb / MMBtu	8.80 MMBtu / hr		*8,760 Hr / Year*	*1 Ton / 2000 Lb*		S.F.		=		**0.4646**	**o Hour**	**2.0351**	**Tons Year**
Total HAPs	0.0210 lb / MMBtu	8.80 MMBtu / Hr		*8,760 Hr / Year*	*1 Ton / 2000 Lb*		S.F.		=		**0.6534**	**o Hour**	**2.8617**	**Tons Year**
CO_2	8.80 MMBtu / Hr	53.06 kg / MMBtu	*0.001 Metric Ton / kg*	*8,760 Hr / Year*		1.10231 Tons / *1 M Ton*			=		**1029.4**	**o Hour**	**4508.8**	**Tons Year**
N_2O	8.80 MMBtu / Hr	0.0001 kg / MMBtu	*0.001 Metric Ton / kg*	*8,760 Hr / Year*		1.10231 Tons / *1 M Ton*			=		**0.0019**	**o Hour**	**0.0085**	**Tons Year**
CH_4	8.80 MMBtu / Hr	0.001 kg / MMBtu	*0.001 Metric Ton / kg*	*8,760 Hr / Year*		1.10231 Tons / *1 M Ton*			=		**0.0194**	**o Hour**	**0.0850**	**Tons Year**
Mass Sum	4,508.77 Tons / Year (CO_2)	+	0.0085 Tons / Year (N_2O)	+		0.0850 Tons / Year (CH_4)			=		**1029.4**	**o Hour**	**4508.9**	**Tons Year**
CO_2e	4,508.77 TPY*1 / 4,508.77 (CO_2)	+	0.0085 TPY*298 / 2.53 (N_2O)	+		0.085 TPY*25 / 2.12 (CH_4)			=		**1030.5**	**o Hour**	**4513.4**	**Tons Year**

[1] EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H_2S = ppmv S (true if H_2S = TRS and TRS is entirely monosulfur compounds).

Figure 1 - C-ZAN-505 and Z-ZAN-506 Excel Calculations

Pollutant	Emissions Factor	Units	Source	Pounds per Hour	Tons per Year
NO_X	4.41	Lb/MMBtu	AP-42 Table 3.3-1	6.48	1.62
CO	9.5E-1	Lb/MMBtu	AP-42 Table 3.4-2	1.40	0.35
VOC	3.5E-1	Lb/MMBtu	AP-42 Table 3.3-1 and 3.4-2	0.52	0.13
PM-CON	7.7E-3	Lb/MMBtu	AP-42 Table 3.3-1	1.13E-02	2.83E-03
PM2.5/PM10 (filterable)	0.31	Lb/MMBtu	AP-42 Table 3.3-1	0.46	0.11
PT	None	N/A	AP-42 Table 3.3-1	0.47	0.11
SO_2	51.814	Lb fuel/MMBtu	AP-42 Table 3.3-1	2.28E-03	5.71E-04
Hexane	None	N/A	N/A	Negligible	Negligible
Formaldehyde	1.2E-3	Lb/MMBtu	AP-42 Table 3.2-2	1.73E-03	4.34E-04
Total HAPs	2.7E-3	Lb/MMBtu	AP-42 Table 3.2-2	5.69E-03	1.42E-03
CO_2	75.04	Kg/MMBtu	Subpart 98 Table C-1	243	60.8
N_2O	6E-4	Kg/MMBtu	Subpart 98 Table C-2	1.94E-03	4.86E-04
CH_4	6E-4	Kg/MMBtu	Subpart 98 Table C-2	9.72E-03	2.43E-03
CO_2e	None	N/A	N/A	243	60.8

Table 7 - C-ZAN-521 Emissions

DATA:			
		Engine	
ENGINE TYPE	=	Diesel	
FUEL HEAT CONTENT	=	19,300	Btu/lb
FUEL S CONTENT	=	15.00	ppmm
MAXIMUM ENGINE HP	=	210	HP
ENGINE OP HOURS	=	500	Hr
ENGINE RATING	=	1.47	MMBtu/hr
BRAKE-SPECIFIC FUEL CONSUMPTION	=	7,000	Btu/ HP-hr
CALCULATION BASIS	=	Controlled and Uncontrolled	
EMISSION FACTORS (EF)		MANUFACTURER'S EF	
		Uncontrolled	Controlled
NO_X	=	g/HP-hr	g/HP-hr
CO	=	g/HP-hr	g/HP-hr
VOC	=	g/HP-hr	g/HP-hr
CH_2O	=	g/HP-hr	g/HP-hr
CH_4	=	g/HP-hr	g/HP-hr

AP-42 Emission Factors (lb/MMBtu)

Type	PM	SO_2[1]	NO_X	CO	VOC	CH_2O	Other HAPs
Diesel	3.10E-1	[By Mass]	4.41E+0	9.50E-1	3.50E-1	1.18E-3	2.69E-3
2SLB	3.84E-2	5.88E-4	3.17E+0	3.86E-1	1.20E-1	5.52E-2	2.53E-2
4SLB	7.71E-5	5.88E-4	4.08E+0	3.17E-1	1.18E-1	5.28E-2	2.10E-2
4SRB	9.50E-3	5.88E-4	2.27E+0	3.72E+0	2.96E-2	2.05E-2	1.20E-2

40 CFR Part 98 Subpart C Greenhouse Gas Emission Factors

Tables C-1 & C-2

(kg/MMBtu)

	N_2O	CO_2	CH_4
Diesel	0.0006	75.04	0.003
NG	0.0001	53.06	0.001
LPG	0.0006	62.72	0.003
Propane	0.0006	61.46	0.003

GWP	
N_2O=	298
CO_2=	1
CH_4=	25

Controlled and Uncontrolled 210 HP Engine Emissions Calculations

											Uncontroll	Uncontrolled
PM2.5/10	0.3100 Lb / MMBtu	1.47 MMBtu / Hr	500 Hrs / Year	1 Ton / 2000 Lb		S.F.			=		0.4557 ds / Hour	0.1139 Tons / Year
PM-CON	0.0077 Lb / MMBtu	1.47 MMBtu / Hr	500 Hrs / Year	1 Ton / 2000 Lb		S.F.			=		0.0113 ds / Hour	0.0028 Tons / Year
SO_2	51.8135 lb fuel / MMBtu	1.47 MMBtu / Hr	500 Hrs / Year	1 Ton / 2000 Lb	64.08 lb SO2 / 32.06 lb S		15 ppmm S / 1000000 total ppm		=		0.0023 ds / Hour	0.0006 Tons / Year
NO_X	4.41E+0 lb / MMBtu	1.47 MMBtu / hr		500 Hr / Year		1 Ton / 2000 Lb		S.F.	=		6.4827 ds / Hour	1.6207 Tons / Year
CO	9.50E-1 lb / MMBtu	1.47 MMBtu / hr		500 Hr / Year		1 Ton / 2000 Lb		S.F.	=		1.3965 ds / Hour	0.3491 Tons / Year
VOC	0.35 lb / MMBtu	1.47 MMBtu / hr		500 Hr / Year		1 Ton / 2000 Lb		S.F.	=		0.5145 ds / Hour	0.1286 Tons / Year
CH_2O	0.0012 lb / MMBtu	1.47 MMBtu / hr		500 Hr / Year		1 Ton / 2000 Lb		S.F.	=		0.0017 ds / Hour	0.0004 Tons / Year
Total HAPs	0.0027 lb / MMBtu	1.47 MMBtu / Hr		500 Hr / Year		1 Ton / 2000 Lb		S.F.	=		0.0057 ds / Hour	0.0014 Tons / Year
CO_2	1.47 MMBtu / Hr	75.04 kg / MMBtu	0.001 Metric Ton / kg		500 Hr / Year		1.10231 Tons / 1 M Ton		=		243.19 ds / Hour	60.7973 Tons / Year
N_2O	1.47 MMBtu / Hr	0.0006 kg / MMBtu	0.001 Metric Ton / kg		500 Hr / Year		1.10231 Tons / 1 M Ton		=		0.0019 ds / Hour	0.0005 Tons / Year
CH_4	1.47 MMBtu / Hr	0.003 kg / MMBtu	0.001 Metric Ton / kg		500 Hr / Year		1.10231 Tons / 1 M Ton		=		0.0097 ds / Hour	0.0024 Tons / Year
Mass Sum	60.80 Tons / Year CO_2	+	0.0005 Tons / Year N_2O	+	0.0024 Tons / Year CH_4				=		243.20 ds / Hour	60.8002 Tons / Year
CO_2e	60.80 TPY*1 / 60.80 CO_2	+	0.0005 TPY*298 / 0.14 N_2O	+	0.002 TPY*25 / 0.06 CH_4				=		244.01 ds / Hour	61.00 Tons / Year

Figure 2 - C-ZAN-521 Excel Calculations

Pollutant	Emissions Factor	Units	Source	Pounds per Hour	Tons per Year
NO_X	100	Lb/MMScf	AP-42 Table 1.4-2	0.49	2.15
CO	84	Lb/MMScf	AP-42 Table 1.4-2	0.41	1.80
VOC	5.5	Lb/MMScf	AP-42 Table 1.4-2	2.70E-02	0.12
PM-CON	5.7	Lb/MMScf	AP-42 Table 1.4-2	2.79E-02	0.12
PM2.5/PM10 (filterable)	1.9	Lb/MMScf	AP-42 Table 1.4-2	9.31E-03	4.08E-02
PT	None	N/A	N/A	3.73E-02	0.16
SO_2	0.6	Lb/MMScf	AP-42 Table 1.4-2	2.94E-03	1.29E-02
Hexane	1.8	Lb/MMScf	N/A	8.82E-03	3.86E-02
Formaldehyde	0.075	Lb/MMScf	AP-42 Table 1.4-2	3.68E-04	1.61E-03
Total HAPs	1.88	Lb/MMScf	AP-42 Table 1.4-2	9.22E-03	4.04E-02
CO_2	120,000	Kg/MMBtu	Subpart 98 Table C-1	588	2580
N_2O	2.2	Kg/MMBtu	Subpart 98 Table C-2	1.08E-02	4.72E-02
CH_4	2.3	Kg/MMBtu	Subpart 98 Table C-2	1.13E-02	4.94E-02
CO_2e	None	N/A	N/A	588	2,580

Table 8 - C-EAL-601 Emissions

Total Boiler Heat Input -	0	(MMBtu/hr)	Total of boilers 10.0 MMBtu/hr and greater, unless in extreme ozone nonattainment area then include 2.0 MMBtu/hr and greater.	
Fuels Used				
Natural Gas-	Y	(Y or N)		
LPG	N	(Y or N)	Sulfur %	
Liquid Fuel (distillate, diesel, etc.)	N	(Y or N)	0.0015	Default = 0.0015
Total Small Boilers and Heaters Input -	5	(MMBtu/hr	Total of boilers less than 10.0 MMBtu/hr, unless in extreme ozone nonattainment area then less than 2.0 MMBtu/hr.	
Fuels Used				
Natural Gas	Y	(Y or N)		
LPG	N	(Y or N)	Sulfur %	
Liquid Fuel (distiallate, diesel, etc.)	N	(Y or N)	0.0015	Defalut = 0.0015
Emergency Generator/Engines -	0	(hp)		
Fuels Used			Sulfur %	
Diesel-	Y	(Y or N)	0.0015	Default = 0.0015
Gasoline	N	(Y or N)		
Natural Gas/LPG	N	(Y or N)		
Ozone Attainment Status				
Severe or Extreme Ozone Nonattainment	N	(Y or N)		

Figure 3 – Inputs for C-EAL-601 Emissions Calculations

Fuel Type:	**Natural Gas**	Used:	Y														
			Pollutant														
			PM-Con	PM filterable	PT	SO_2	NO_x	CO	VOC	CO2	Hexane	Formaldehyde	Total HAPs	N2O	CH4	CO2e	
	Emission Factor[1] (lb/MMSCF)		5.7	1.9	7.6	0.6	100	84	5.5	120000	1.8	0.075	1.88	2.2	2.3	N/A	
	pounds/hr		0.02794	0.00931	0.03725	0.00294	0.49020	0.41176	0.02696	588.23529	0.00882	0.00037	0.00922				
	PTE (ton/yr)		**0.122**	**0.041**	**0.163**	**0.013**	**2.147**	**1.804**	**0.118**	**2,576.471**	**0.039**	**0.002**	**0.040**	0.05	0.05	2,576.57	

Figure 4 – C-EAL-601 Emissions Calculations