NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date: DRAFT

Region: Washington Regional Office
County: Craven
NC Facility ID: 2500019
Inspector's Name: Robert Bright
Date of Last Inspection: 01/27/2021
Compliance Code: B / Violation - emissions

Facility Data

Applicant (Facility's Name): Marine Corps Air Station - Cherry Point

Facility Address:
Marine Corps Air Station - Cherry Point
EAD, Building 4223
Cherry Point, NC 28533

SIC: 9711 / National Security
NAICS: 92811 / National Security

Facility Classification: Before: Title V **After:** Title V
Fee Classification: Before: Title V **After:** Title V

Permit Applicability (this application only)

SIP: 15A NCAC 02Q .0516(c)
NSPS: N/A
NESHAP: N/A
PSD: N/A
PSD Avoidance: N/A
NC Toxics: N/A
112(r): N/A
Other: N/A

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Rich Weaver Air Quality Program Manager (252) 466-5917 EAD, Building 4223, Access Road Cherry Point, NC 28533+0006	George Radford Environmental Affairs Officer (252) 466-4599 EAD, Building 4223, Access Road Cherry Point, NC 28533+0006	Rich Weaver Air Quality Program Manager (252) 466-5917 EAD, Building 4223, Access Road Cherry Point, NC 28533+0006

Application Data

Application Number: 2500019.20A
Date Received: 09/28/2020
Application Type: Modification
Application Schedule: TV-Sign-501(b)(2) Part II

Existing Permit Data
Existing Permit Number: 04069/T40
Existing Permit Issue Date: 08/18/2020
Existing Permit Expiration Date: 07/31/2025

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2019	85.44	21.76	13.08	33.33	6.45	4.28	1.24 [Toluene]
2018	459.38	74.82	17.68	26.99	11.07	6.95	1.17 [Toluene]
2017	564.37	172.40	11.82	16.14	28.48	12.44	3.99 [Chlorine]
2016	643.17	186.60	18.73	17.27	35.55	16.17	4.88 [Chlorine]
2015	757.68	184.10	18.86	85.18	33.27	465.81	448.38 [Hydrogen chloride (hydrochlori]

Review Engineer: Kevin Godwin

Review Engineer's Signature: **Date:**

Comments / Recommendations:
Issue 04069/T41
Permit Issue Date: DRAFT
Permit Expiration Date: 07/31/2025

I. Purpose of Application

This permit action is Part II of a significant modification under 15A NCAC 02Q .0516(c). Pursuant to 15A NCAC 02Q .0501(b)(2), the applicant is filing this complete application within 12 months after commencing operation to modify the construction and operation permit to meet the requirements of 40 CFR Part 70. This application will go through a 30-day public comment period and a 45-day EPA review at this time. The Permit Review for the Part I application is attached to this document (see Attachment I).

Application Chronology

Received Part II application	September 28, 2020
Application deemed complete	October 6, 2020
Received comments from the Washington Regional Office (WARO)	November 24, 2020
Application on hold pending updates requested by applicant	February 1, 2021
Received an updated application	April 13, 2021
Draft sent to the applicant and WARO	August 27, 2021
Draft sent to Supervisor	September 16, 2021
Draft permit to Public Notice and EPA	September 29, 2021
Public comment period expired	XX
EPA review period expired	XX
Final permit issued	XX

II. Compliance Status

The most recent full compliance evaluation was performed on January 27, 2021 by Mr. Robert Bright of the WARO. According to the inspection report dated February 8, 2021, "Based on visual observations and records review, the facility appeared to operate in compliance with all applicable air quality regulations and permit conditions at the time of inspection."

The five-year compliance history is outlined in the inspection report as follows:

On May 17, 2016, a Notice of Violation – Recommended Enforcement was issued to the facility from January 20 through April 18, 2016 when the boiler was shut down due to decreased demand. The retest was performed on November 17, 2016. MCAS and DAQ have been in ongoing discussions/ legal hearings regarding sovereign immunity. On May 15, 2020, the United State District Court for the Eastern District of North Carolina's Eastern Division ruled that the case be dismissed.

On August 26, 2016, a Notice of Deficiency was issued for not submitting the initial notification for emergency generator CP-159-GEN within the 120-day requirement.

On January 29, 2020, a Notice of Violation was issued for exceeding the 48-hour fuel oil combustion for all four CHP boilers for the July – December 2019 time-period.

III. Changes to Permit

A. The following table provides a summary of changes made to existing permit No. 04069T40:

Page No.	Section	Description of Change
Cover letter	---	Amended application type; permit revision numbers, and dates.
Permit cover	---	Amended permit revision number, issue date, and application number.
All	Headers	Updated permit revision number to T41.
Insignificant Activities List	Insignificant Activities List	Updated the list based on the Part II application.
3	Table of Emission Sources	Updated the table based on the Part II application.
16	2.1 A. 5. c. and g.	Included the following statement, "Testing is not required if fuel burned contains less than 0.5 weight percent sulfur."
37	2.1 R.	Updated the condition for diesel-fired emergency generators based on the Part II application.
67	2.2 H.	Removed the requirement for a Part II application submittal.
69	Section 3.0 General Conditions	Updated General Conditions to most recent shell version (version 5.5, 08/25/2020).

B. The original Part II Operating Permit application was received on September 28, 2020 and placed on hold February 1, 2021 pending the submittal of further updates to the permit. The updates were received on April 13, 2021. The updates are outlined below:

1. Internal Combustion Emergency Engine Additions

MCAS Cherry Point requests in the Application to fill two (2) existing generator placeholders (ICP-NSPS-GEN-2 and ICP-NSPS-GEN-3) with:

ICP-4651-GEN, a 389 horsepower (hp) diesel-fired emergency generator engine located at Building 4651 and ICP-1406-GEN, a 150 kW diesel-fired emergency engine located at Building 1406.

MCAS Cherry Point has replaced the following permitted units:

CP-1640-GEN-1 (existing),
CP-3981-GEN (new),
CP-3987-GEN (existing).

Units CP-1640-GEN-1 and CP-3987-GEN were replaced with units manufactured after 2007 and will move to the new unit inventory under T40 Permit Section 2.1.R.4. Unit CP-1640-GEN-1 was previously rated less than 500 hp and was replaced by a 619 hp unit. Unit CP-3981-GEN was rated 35 kW and was replaced by CP-3981-GEN-2 a 60 kW unit. Unit CP-3981-GEN is inactive with the potential of re-installment. Unit CP-3987-GEN was previously rated 750 kW and was replaced by a 900 kW unit.

MCAS Cherry Point requests the addition of six (6) insignificant emergency generators to be constructed: ICP-5373-GEN estimated to be 200 kW and ICP-6012-6016-GEN (estimated to be ≤56 kW and <75 kW), US EPA Certificate Number: HPKXL04.4NL1-001. Each proposed unit will be less than 600 hp.

MCAS Cherry Point also requests the addition of five (5) emergency generator placeholders for future installations. These placeholders are ICP-NSPS-GEN-4 through ICP-NSPS-GEN-8, which will be rated at ≤600 hp each. It is anticipated that these units will be new pieces of equipment and thus, subject to the requirements of 40 CFR Part 63, Subpart ZZZZ and 40 CFR Part 60, Subpart IIII. Emissions calculations for these units are presented in Attachment II. Potential annual emissions for each ICP-NSPS-GEN emergency engine are less than five (5) tons for each criteria pollutant and less than one thousand (1,000) pounds of potential HAPs. A summary of these units is provided in Table 1.

Table 1

Permit ID	Description
ICP-4651-GEN (Place hold ICP-NSPS-GEN-2 filler)	Diesel fuel fired emergency generator (230 kW, 389 hp)
ICP-1406-GEN (Place hold ICP-NSPS-GEN-3 filler)	Diesel fuel fired emergency generator (150 kW, 200 hp)
CP-1640-GEN-1 (Replaced)	Diesel fuel fired emergency generator (462 kW, 619 hp)
CP-3987-GEN (Replaced)	Diesel fuel fired emergency generator (900 kW, 1,207 hp)
ICP-3981-GEN-2	Diesel fuel fired emergency generator (60 kW, 80 hp)
ICP-5373-GEN	Diesel fuel fired emergency generator (200 kW, 268 hp)
ICP-6012-GEN	Diesel fuel fired well house emergency generator (50 kW, 69 hp)
ICP-6013-GEN	Diesel fuel fired well house emergency generator (50 kW, 69 hp)
ICP-6014-GEN	Diesel fuel fired well house emergency generator (50 kW, 69 hp)
ICP-6015-GEN	Diesel fuel fired well house emergency generator (50 kW, 69 hp)

ICP-6016-GEN	Diesel fuel fired well house emergency generator (50 kW, 69 hp)
ICP-NSPS-GEN-4	Diesel fuel-fired emergency generator (≤ 600 hp, 447 kW)
ICP-NSPS-GEN-5	Diesel fuel-fired emergency generator (≤ 600 hp, 447 kW)
ICP-NSPS-GEN-6	Diesel fuel-fired emergency generator (≤ 600 hp, 447 kW)
ICP-NSPS-GEN-7	Diesel fuel-fired emergency generator (≤ 600 hp, 447 kW)
ICP-NSPS-GEN-8	Diesel fuel-fired emergency generator (≤ 600 hp, 447 kW)

2. Regulatory Review

a. 15A NCAC 02D .0524, 40 CFR Part 60 - Subpart IIII - Subpart IIII applies to owners and operators of new, modified, and reconstructed stationary compression ignition reciprocating internal combustion engines (CI RICE); existing CI RICE are not affected.

The emergency engines included in this Application are:

- ICP-4651-GEN (place hold filler),
- ICP-1406-GEN (place hold filler),
- CP-1640-GEN-1 (replaced unit),
- CP-3981-GEN-2 (replaced unit),
- CP-3987-GEN (replaced unit),
- ICP-5373-GEN (new unit),
- ICP-6012-6016-GEN (new unit), and
- ICP-NSPS-GEN-4 through ICP-NSPS-GEN-8 (future place holder units)

The new emergency engines are units that are subject to Subpart IIII. The units must comply with the emission standards for new non-road CI engines in §60.4202. The Permittee will purchase engines certified to meet the emission limits as per §60.4211(c).

b. 15A NCAC 02D .1111, 40 CFR Part 63, MACT- Subpart ZZZZ - Subpart ZZZZ applies to existing, new, or reconstructed stationary RICE (affected sources) located at major and area sources of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand.

The RICE MACT applies to all stationary internal combustion emergency engines at MCAS Cherry Point; however, certain engines have limited or no requirements under the rule. The applicant evaluated the engine additions to determine Subpart ZZZZ applicability. Compliance with Subpart ZZZZ is demonstrated by meeting the requirements of NSPS Subpart IIII and initial notification under Subpart ZZZZ.

c. 15A NCAC 02D .0516 "Sulfur Dioxide Emissions from Combustion Sources" - The new generators are subject to the requirements of 15A NCAC 2D.0516. Individual units' sulfur dioxide emissions shall not exceed 2.3 lb/MMBtu heat input. The generators use only ultra-low sulfur oil/diesel. No monitoring, recordkeeping, or reporting is required to demonstrate compliance.

d. 15A NCAC 02D .0521 "Control of Visible Emissions" - This rule applies to fuel burning sources and other processes that may have visible emissions. For sources manufactured after July 1, 1971, visible emissions shall not be more than 20% opacity averaged over a six-minute period. The 20% opacity limit may be exceeded one time in an hour, but not more than 4 times in 24 hours. Opacity may never exceed 87%. The new generators are subject to the 20% opacity visible emissions standard under 15A NCAC 02D .0521(d). Because the generators use only ultra-low sulfur oil/diesel, no monitoring, recordkeeping, or reporting is required to demonstrate compliance.

e. 15A NCAC 02D .1100 "Control of Toxic Air Pollutants" – This state-only rule applies to facility-wide toxic air pollutant (TAP) emissions. The exemptions under 15A NCAC 02Q .0702 include a categorical exemption for TAP emissions for affected sources under 40 CFR Part 63 provided that there is no unacceptable health risk. All of the emissions sources in this

Application are subject to a MACT standard. Addition of the new emergency generators is not expected to cause an unacceptable health risk. Therefore, the generators meet the exemption.

3. Storage Tank Additions

MCAS Cherry Point requests the addition of seven (7) aboveground tanks to the insignificant activities list under 15A NCAC 2Q .0503(8). These tanks are exempt from permitting requirements since criteria pollutants are less than 5 tons per year and HAP totals are less than 1,000 pounds per year as demonstrated in Attachment II, Emissions Calculations and Supporting Documentation.

Table 2

Permit ID	Description
ICP-4223-4-AST	Storage Tank (Gasoline 500 gallons)
ICP-4259-2-AST	Storage Tank (Diesel 250 gallons)
ICP-4390-4-AST	Storage Tank, Generator Integral (Diesel 275 gallons)
ICP-4390-5-AST	Storage Tank, Generator Integral (Diesel 275 gallons)
ICP-4390-6-AST	Storage Tank, Generator Integral (Diesel 275 gallons)
ICP-4415-AST	Storage Tank, Lift Station (Diesel 325 gallons)
ICP-4854-AST	Storage Tank (Diesel 1,200 gallons)

4. Administrative Amendments and Equipment Changes

MCAS Cherry Point requests clarification on Permit No. 04068T40 Section 2.1.5.c. and Section 2.1.5.g regarding the Method 9 performance test. According to 40 CFR Part 60, Subpart Dc, performance testing is not required if fuel containing less than 0.50 weight percent sulfur is burned. Compliance is met by providing fuel certifications according to §60.48c(f) demonstrating the fuel sulfur content is less than 0.5 weight percentsulfur. MCAS requested that DAQ incorporate language into Section 2.1.5.c. and Section 2.1.5.g indicating testing is not required if fuel burned contains less than 0.50 weight percent sulfur. Table 3 describes additional equipment changes and administrative amendments to update the currentTitle V Permit 04069T40, including changes to equipment capacity ratings and locations.

Table 3

Permit ID	Building	Description
DEBARKATION	4210	Boiler DEBARKATION, 1.01 MMBtu/hr, located at Building 4210 was inadvertently removed in AQP No. 04069T39. The unit is still in operation.
TOWER	199	Boiler TOWER, 2.65 MMBtu/hr, located at Building 199 was replaced by a like-kind unit rated 2.35 MMBtu/hr. Update the rated capacity to 2.35 MMBtu/hr.
ICP-4049-AST-5	4049	Aboveground Storage Tank ICP-4049-AST-5 update source name to ICP-4049-AST-6 and description to Storage Tank (#2 Fuel Oil 2,000 gallon).
ICP-4162-AST	4162	Aboveground Storage Tank ICP-4162-AST update source name to ICP-4162-AST-2 and description to Storage Tank (#2 Fuel Oil 300 gallon).

Permit ID	Building	Description
ICP-4223-AST-1	4223	Aboveground Storage Tank ICP-4223-AST-1 update source name to ICP-ICP-4223-AST-3 and description to Storage Tank (Diesel 475 gallon).
ICP-4223-AST-2	4223	Aboveground Storage Tank ICP-4223-AST-2 update source name to ICP-ICP-4223-AST-4 and description to Storage Tank (Gasoline 500 gallon).
CP-1244-UST-1	1244	Update source description to Inactive - One underground gasoline storage (20,000-gallon capacity). This tank is inactive in place.
CP-1244-UST-2	1244	Update source description to Inactive - One underground gasoline storage (20,000-gallon capacity). This tank is inactive in place.
CP-1244-UST-3	1244	Update source description to Inactive - One underground gasoline storage (20,000-gallon capacity). This tank is inactive in place.
CP-4351-AST	4351	Update source description to Inactive - One aboveground, internal floatingroof, JP-5 fuel storage tank (420,000-gallon capacity). This tank is inactive in place.
CP-1640-GEN-1	1640	The unit was replaced. Update source description to Subpart ZZZZ, New 462 kW maximum output, 619 hp
CP-1640-GEN-2	1640	The engine plate was verified with a standby rating 603 hp and model year 1988. Update the rating to 450 kW, 603 hp and categorize as Subpart ZZZZ, Existing $\geq$ 500 hp.
CP-199-GEN	199	The engine plate was verified, with a standby rating of 399 hp and model year 2010. Update rating to 298 kW, 399 hp and categorize as Subpart ZZZZ, New < 500 hp.
CP-3451-GEN	3451	The engine plate was verified with a standby rating 900 hp and model year 1994. Update the rating to 671 kW, 900 hp and categorize as SubpartZZZZ, Existing $\geq$ 500 hp.
CP-3918-GEN-2	3918	The engine plate was verified with a standby rating 755 hp. Update the rating to 563 kW, 755 hp and categorize as Subpart ZZZZ, New $\geq$ 500 hp.
CP-3956-GEN	3956	The engine plate was verified, model year 2013 with a standby rating of 145 hp. Update rating to 108 kW, 145 hp and categorize as Subpart ZZZZ, New < 500 hp.

Permit ID	Building	Description
CP-3981-GEN	3981	The unit was removed and may be re-installed at a future location. Update source description to Subpart ZZZZ, New 35 kW maximum output, 47 hp,Inactive
CP-3987-GEN	3987	The unit was replaced. Update source description to Subpart ZZZZ, New 900 kW maximum output, 1,207 hp.
CP-4346-GEN	4346	The engine plate was verified, model year 2007 with a standby rating of 99 hp. Update rating to 74 kW, 99 hp and categorize as Subpart ZZZZ, New < 500 hp.
CP-4347-GEN	4347	The engine plate was verified, model year 2007 with a standby rating of 99 hp. Update rating to 74 kW, 99 hp and categorize as Subpart ZZZZ, New < 500 hp.
CP-4357-GEN	4357	The engine plate was verified, model year 2014 with a standby rating of 910 kw, 2,876 hp. Update the engine rating and categorize as Subpart ZZZZ, New ≥ 500 hp.
CP-4397-GEN	4397	The engine plate was verified with a standby rating of 474 kw, 635 hp.Update the engine rating and categorize as Subpart ZZZZ, Existing ≥ 500 hp.
CP-4427-GEN	4427	This unit was removed and may be re-installed at a future location.Update source description to Diesel fuel-fired emergency generator (10 kW), Inactive.
CP-4259-GEN	4259	The engine plate was verified with standby rating of 216 hp. Change the rating to 160 kW, 216 hp and categorize as Subpart ZZZZ, Existing < 500 hp.
CP-4851-GEN	4851	The engine plate was verified, model year 2010. Update the category as Subpart ZZZZ, New < 500 hp.
ICP-160-PCLN-2	160	Parts washer located at Building 160 (ICP-160-PCLN-2) moved to Building 157. Rename ID ICP-160-PCLN-2 to ICP-157-PCLN-3 (page 3 of 6 Insignificant Activities).
ICP-4155-PCLN-1	4155	Parts washer located at Building 4155 (ICP-4155-PCLN-1) moved to Building 3992. Rename ID ICP-4155-PCLN-1 to ICP-3992-PCLN-1 (page 4 of 6 Insignificant Activities).
ICP-4155-PCLN-2	4155	Parts washer located at Building 4155 (ICP-4155-PCLN-2) moved to Building 3992. Rename ID ICP-4155-PCLN-2 to ICP-3992-PCLN-2 (page 4 of 6 Insignificant Activities).

Permit ID	Building	Description
ICP-4652-PCLN-2	4652	Parts washer located at Building 4652 (ICP-4652-PCLN-2) moved to Building 4243. Rename ID ICP-4652-PCLN-2 to ICP-4243-PCLN-3 (page 3 of 6 Insignificant Activities).
ICP-4833-PCLN-1	4833	Parts washer located at Building 4833 (ICP-4833-PCLN-1) moved to Building 4960. Rename ID ICP-4833-PCLN to ICP-4960-PCLN-1 (page 3 of 6 Insignificant Activities).
ICP-1672-PCLN	1672	Parts washer located at Building 1672 (ICP-1672-PCLN) moved to Building 4243. Rename ID ICP-1672-PCLN to ICP-4243-PCLN-4 (page 3 of 6 Insignificant Activities).

5. Sources Removed

MCAS Cherry Point has removed three (3) aboveground storage tanks, three (3) boilers, one (1) spray gun washers, twenty-five (25) insignificant parts washers, three (3) remediation systems, one (1) jet engine testcell, five (5) insignificant welding units, four (4) paint areas, and three (3) paint stripping areas from the permit. These sources are listed on Form A2 of this Application and below in Table 4. MCAS Cherry Point requests these sources be removed from the permit.

Table 4

Permit ID	Description
ICP-4041-AST-4	Aboveground Storage Tank
ICP-4041-AST-2	Aboveground Storage Tank
ICP-4041-AST-7	Aboveground Storage Tank
ICP-177-BOIL-3	Boiler
ICP-177-BOIL-4	Boiler
ICP-177-BOIL-5	Boiler
CP-1701-GWSH	Spray Gun Washing
CP-121-PCLN-1	Parts Cleaner
CP-121-PCLN-2	Parts Cleaner
CP-1229-PCLN	Parts Cleaner
CP-1667-PCLN-2	Parts Cleaner
CP-3566-PCLN	Parts Cleaner
CP-3916-PCLN-1	Part Cleaner
CP-3916-PCLN-2	Parts Cleaner
CP-3997-PCLN-1	Part Cleaner
CP-3997-PCLN-4	Parts Cleaner
CP-3998-PCLN-1	Part Cleaner
CP-4041-PCLN	Part Cleaner
CP-4048-PCLN-1	Part Cleaner

Permit ID	Description
CP-4048-PCLN-2	Part Cleaner
CP-4049-PCLN-1	Part Cleaner
CP-4049-PCLN-3	Part Cleaner
CP-4075-PCLN-1	Part Cleaner
CP-4213-PCLN-1	Part Cleaner
CP-4214-PCLN	Parts Cleaner
CP-4454-PCLN	Part Cleaner
CP-4571-PCLN	Part Cleaner
CP-4652-PCLN-3	Parts Cleaner
CP-4845-PCLN	Part Cleaner
CP-4849-PCLN	Parts Cleaner
CP-4948-PCLN-1	Part Cleaner
CP-4948-PCLN-2	Part Cleaner
BLDG130/3996-SVE	Remediation
CP-1640-SVE	Remediation
PIT15-SVE	Remediation
CP-4041-TSTD-2	Outdoor, open air aircraft test stations
CP-131-WELDHD	Welding
CP-157-WELD	Welding
CP-4067-WELDHD	Welding
ICP-130-WELD	Welding
CP-1672-WELD	Welding
CP-1700-PNT-1	Paint Area
CP-1700-PNT-2	Paint Area
CP-1701-PNT-1	Paint Area
CP-1701-PNT-2	Paint Area
CP-1701-PSTR-1	Paint Stripping
CP-1701-PSTR-2	Paint Stripping
CP-1700-PSTR	Paint Stripping

IV. Public Notice/EPA and Affected State(s) Review

A notice of the DRAFT Title V Permit will 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. Copies of the public notice will 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 pursuant will be provided to EPA. Also pursuant to 02Q .0522, a notice of the DRAFT Title V Permit will be provided to each affected State at or before the time notice provided to the public under 02Q .0521 above.

V. Other Regulatory Considerations

- A P.E. seal is not required for this application.

- A zoning consistency determination is not required for this application.
- A permit fee of $988.00 is required for this application and was received on October 6, 2020.
- According to the application, the facility is subject to 112r and submitted a Risk Management Plan (RMP) on June 17, 1999.
- The application was signed by Mr. George Radford, Environmental Affairs Officer as the designated Responsible Official on April 7, 2021.

VI. Recommendations

The Part II application for Marine Corps Air Station (MCAS) Cherry Point, Craven County, NC has been reviewed by DAQ to determine compliance with all procedures and requirements. NC DAQ has determined that this facility is complying or will achieve compliance, as specified in the permit, with all requirements that are applicable to the affected sources. The Public Comment and EPA review periods expired on XXXX and XXXX, respectively with XX comments received. Therefore, NC DAQ will make a recommendation regarding Permit issuance following the comment and review periods.

Attachment I – Permit Review for Part I of the Significant Modification

NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date: January 5, 2018

Region: Washington Regional Office
County: Craven
NC Facility ID: 2500019
Inspector's Name: Robert Bright
Date of Last Inspection: 11/17/2016
Compliance Code: B / Violation - emissions

Facility Data

Applicant (Facility's Name): Marine Corps Air Station - Cherry Point

Facility Address:
Marine Corps Air Station - Cherry Point
Highway 70 and Highway 101
Cherry Point, NC 28533

SIC: 9711 / National Security
NAICS: 92811 / National Security

Facility Classification: Before: Title V **After:** Title V
Fee Classification: Before: Title V **After:** Title V

Permit Applicability (this application only)

SIP: 15A NCAC 02D .0503, .0516, .0521; and 02Q .0503(8)
NSPS: 15A NCAC 02D .0524, Subpart Dc and Subpart Kb
NESHAP: 15A NCAC 02D.1111, Subpart GG and Subpart DDDDD
PSD: N/A
PSD Avoidance: N/A
NC Toxics: 15A NCAC 02Q .0702
112(r): N/A
Other: N/A

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Rich Weaver Air Quality Program Manager (252) 466-5917 PSC Box 8006 Cherry Point, NC 28533	George Radford Environmental Affairs Officer (252) 466-4599 PSC Box 8006 Cherry Point, NC 28533+0006	Rich Weaver Air Quality Program Manager (252) 466-5917 PSC Box 8006 Cherry Point, NC 28533

Application Data

Application Number: 2500019.17A
Date Received: 09/05/2017
Application Type: Modification
Application Schedule: TV-Sign-501(c)(2) Part I

Existing Permit Data
Existing Permit Number: 04069/T37
Existing Permit Issue Date: 12/14/2016
Existing Permit Expiration Date: 08/31/2019

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2016	643.17	186.60	18.73	80.65	35.55	16.17	4.88 [Chlorine]
2015	757.68	184.10	18.86	85.18	33.27	465.81	448.38 [Hydrogen chloride (hydrochlori]
2014	631.12	191.12	14.12	83.92	27.28	14.30	8.21 [Hydrogen chloride (hydrochlori]
2013	604.32	201.80	18.30	104.12	29.99	18.55	10.18 [Hydrogen chloride (hydrochlori]
2012	519.83	166.47	17.11	78.86	20.83	12.78	5.69 [Hydrogen chloride (hydrochlori]

Review Engineer: Kevin Godwin

Review Engineer's Signature: **Date:**

Comments / Recommendations:
Issue 04069/T38
Permit Issue Date: 01/05/18
Permit Expiration Date: 08/31/2019

I. Introduction and Purpose of Application

A. Marine Corps Air Station (MCAS) - Cherry Point is home to both the headquarters of the 2nd Marine Aircraft Wing and Marine Transport Squadron 1. The facility is a major source of both criteria pollutants and hazardous air pollutants (HAP). The current air permit 04069T37 covers sources including boilers, generators, paint booths, washing and cleaning operations, and remediation systems.

B. MCAS – Cherry Point is requesting that the current permit be modified as follows:

1. Convert existing Central Heating Plant Boilers (ID Nos. CP-152-BOIL-1 through 4) to natural gas as primary fuel with No. 2 fuel oil/used oil as back-up.
2. Include two (2) natural gas-fired temporary boilers scheduled to be on-site less than one year.
3. Change the status of Building 4075 paint booth (ID No. CP-4075-PBTH) from non-aerospace to aerospace subject to NESHAP Subpart GG.
4. Add two (2) soil vapor extraction units (ID Nos. IBLDG-137-SVE and IBLDG-4592-SVE) as insignificant activities.
5. Add sixteen (16) storage tanks as insignificant activities.
6. Remove one emergency generator (ID No. CP-3909-GEN).
7. Remove thirty-six (36) storage tanks.
8. Remove four (4) parts washers.
9. Remove facility-wide toxic air pollutant (TAP) limits.
10. Make various administrative amendments.

C. Because this modification does involve a significant change in existing monitoring and recordkeeping requirements it is classified as a significant modification under 15A NCAC 02Q .0516. The applicant has requested that the application be processed using the two-step procedures provided in 15A NCAC 02Q .0501(c)(2).

II. Application Chronology

Complete Application received at Washington Regional Office (WARO)	September 5, 2017
Application received at Raleigh Central Office (RCO)	September 7, 2017
Acknowledgment letter mailed	September 8, 2017
Draft Permit to applicant	November 6, 2017
Draft Permit to WARO	December 1, 2017
Draft Permit to Supervisor	December 18, 2017
Permit signed	January 5, 2018

III. Changes to Existing Air Permit

The following table provides a summary of changes made with this revision (04069T38, 2500019.17A).

Page No.	Section	Description of Change
Cover letter	N/A	Amended application type; permit revision numbers, and dates.
1	Permit cover page	Amended permit revision numbers and all dates.
N/A	All, Header	Updated permit revision number.
	Table of Emission Sources	Included converted boilers (ID Nos. CP-152-BOIL-1 through 4) and temporary boilers (ID Nos. CP-TEMP1 and 2). Changed status of paint booth (ID No. CP-4075-PBTH) to be subject to MACT Subpart GG.
12	Footnote to table	Included footnote: Boilers (ID Nos. CP-152-BOIL-1 through 4) are permitted to burn coal until the conversion to natural gas is completed. The Permittee shall comply with Section 2.2 G., I., M., and N. while burning coal until the conversion is complete. Included footnote pertaining to significant modification under

Page No.	Section	Description of Change
		15A NCAC 02Q .0501(c)(2). Included statement pertaining to temporary boilers.
14	2.1 A.5.	Included condition referencing requirements for the boilers (ID Nos. CP-152-BOIL-1 through 4) under 15A NCAC .1111, MACT, Subpart DDDDD.
15	2.1 A.5.g.	As requested by the applicant, included the following statement: There is no limit on liquid fuel usage during natural gas curtailment.
18	2.1 A.8. and 9.	Included definition of temporary boiler under 15A NCAC 02D .0524 and 15A NCAC 02D .1111.
65	2.2 H.	Removed facility-wide limits under 15A NCAC 02D .1100 for the following toxic air pollutants (TAP): acetic acid, pigments as chromium VI, cadmium, chloroform, ethylene dibromide, and vinyl chloride.
72	2.2 L.	Included condition pertaining to 15A NCAC 02Q .0504: Option for Obtaining Construction and Operation Permit.
72 and 76	2.2 M. and N.	Moved existing requirements for boilers (ID Nos. CP-152-BOIL-1 through 4) from Section 2.1 A. to 2.2 M. and N.
79	3.0	Included General Conditions from most recent shell version (v 5.1, 08/03/2017).

IV. Statement of Compliance

The facility was most recently inspected on November 17, 2016 by Mr. Robert Bright of the Washington Regional Office (WARO). According to Mr. Bright's November 30, 2016 inspection report, based on visual observation and records review, the facility appeared to operate in compliance with all applicable regulations and permit conditions at the time of inspection.

Compliance History (5-year):
On August 18, 2014, a Notice of Deficiency (NOD) was issued for late semi-annual reports.

On June 29, 2015, a Notice of Violation/Notice of Recommended Enforcement (NRE) was issued for exceeding the Hg emissions limit for Boiler 1. MCAS argued that the short duration of time between the cold startup of the boiler and test being conducted was the reason for the exceedance. MCAS was assessed $4,633 via DAQ Case Number 2015-024 on August 18, 2015. MCAS requested remission, which was upheld by the Environmental Management Commission.

On May 17, 2016, a NRE was issued to the facility from January 20 through April 18, 2016, when the boiler was shut down due to decreased demand. The retest was performed on November 17, 2016. MCAS and DAQ are working to enter a Special Order by Consent to address boiler emissions until the natural gas conversion project is completed.

On August 26, 2016, a NOD was issued for not submitting the initial notification for emergency generator CP-159-GEN within the 120-day requirement.

V. Description of Changes

A. Central Heating Plant (CHP) Boiler Conversion –The CHP currently operates two coal/No. 6/No. 2 fuel oil-fired boilers and two No. 2 fuel/off-spec JP 5/used oil-fired boilers. The CHP supplies steam for both comfort heat and process use. The proposed project is to modify the boilers to four natural gas/No. 2 fuel oil-fired boilers. Burning liquid fuel is expected to be used for periodic testing, maintenance, or operator training and during periods of gas curtailment or interruptions. Back-up fuel and is estimated to be one percent (1%) of annual fuel usage.

According to the application,

> modifications to Boiler 1 and 2 will include: burner replacement; removal of existing stoker fuel distributors and grate drives; removal of the over-fire air fans and ductwork; installation of new flow sensors in the existing suction ductwork; replacement of forced draft (FD) and induced draft (ID) fans; installation of flue gas recirculation (FGR) fans to provide flue gas into the FD fan discharge at a rate up to 20% of the FD air flow; and replacement of economizers,
>
> modifications to Boiler 3 and 4 will include: burner replacement; replacement of FD fans; and installation of FGR fans.

B. During the conversion, two temporary natural gas-fired boilers will be installed and are scheduled to be on-site less than one year. As stated in the application, due to the nature of the temporary boilers an increase in fuel use/production of the plant is not expected. The definition for temporary boiler under NSPS and MACT is included in the permit as follows:

1. **15A NCAC 02D .0524: NSPS 40 CFR 60 Subpart Dc -** Definitions
   Temporary boiler means a steam generating unit that combusts natural gas or distillate oil with a potential SO_2 emissions rate no greater than 26 ng/J (0.060 lb/MMBtu), and the unit is designed to, and is capable of, being carried or moved from one location to another by means of, for example, wheels, skids, carrying handles, dollies, trailers, or platforms. A steam generating unit is not a temporary boiler if any one of the following conditions exists:
   a. The equipment is attached to a foundation.
   b. The steam generating unit or a replacement remains at a location for more than 180 consecutive days. Any temporary boiler that replaces a temporary boiler at a location and performs the same or similar function will be included in calculating the consecutive time period.
   c. The equipment is located at a seasonal facility and operates during the full annual operating period of the seasonal facility, remains at the facility for at least 2 years, and operates at that facility for at least 3 months each year.
   d. The equipment is moved from one location to another in an attempt to circumvent the residence time requirements of this definition.

2. **15A NCAC 02D .1111 "Maximum Available Control Technology" – Subpart DDDDD -** Definitions
   Temporary boiler means any gaseous or liquid fuel boiler or process heater that is designed to, and is capable of, being carried or moved from one location to another by means of, for example, wheels, skids, carrying handles, dollies, trailers, or platforms. A boiler or process heater is not a temporary boiler or process heater if any one of the following conditions exists:
   a. The equipment is attached to a foundation.
   b. The boiler or process heater or a replacement remains at a location within the facility and performs the same or similar function for more than 12 consecutive months, unless the regulatory agency approves an extension. An extension may be granted by the regulating agency upon petition by the owner or operator of a unit specifying the basis for such a request. Any temporary boiler or process heater that replaces a temporary boiler or process heater at a location and performs the same or similar function will be included in calculating the consecutive time period.
   c. The equipment is located at a seasonal facility and operates during the full annual operating period of the seasonal facility, remains at the facility for at least 2 years, and operates at that facility for at least 3 months each year.
   d. The equipment is moved from one location to another within the facility but continues to perform the same or similar function and serve the same electricity, process heat, steam, and/or hot water system in an attempt to circumvent the residence time requirements of this definition.

C. Paint Booth Status Change – MALS-14 Airframes located in Building 4075 currently operates a paint booth to apply non-aerospace coatings. The booth was constructed to be compliant with 40 CFR 63, Subpart GG with cross flow ventilation and three (3) stage NESHAP compliant filters in the exhaust path. For future work on aircraft components, the applicant proposes to reclassify the booth to aerospace.

VI. Regulatory Review – Specific Emission Source Limitations

A. 15A NCAC 02D .0503 "Particulates from Fuel Burning Indirect Heat Exchangers" – This regulation establishes an allowable emission rate for particulate matter at installations in which fuel is burned for producing heat or power by indirect heat transfer. The regulation applies to Total Suspended Particulate (TSP) or PM less than 100 micrometers (μm). The rule applies to all indirect heat exchangers at the facility including the temporary boilers. For sources with maximum heat inputs greater than 10 million Btu/hour, the following equation is used to determine the PM limit:

$$E = 1.090 \times Q^{-0.2594}$$

where, E = allowable emission rate (lb/million Btu)
Q = sum of maximum heat input of all fuel burning indirect heat exchangers at the plant site

The maximum heat input for the boilers are 99 million Btu/hour each. The PM limit is calculated to be 0.33 lb/million Btu. PM emissions from natural gas and No. 2 fuel oil combustion are not expected to exceed the limit. Therefore, compliance is indicated. No monitoring, recordkeeping, or reporting is required.

B. 15A NCAC 02D .0516 "Sulfur Dioxide Emissions from Combustion Sources" – Under this regulation, sulfur dioxide emissions from combustion sources cannot exceed 2.3 lb/million Btu heat input. No. 2 fuel oil is the worst-case fuel. Firing No. 2 fuel oil (0.5% sulfur b.w.) will not cause this limit to be exceeded. Therefore, compliance is indicated. No monitoring or recordkeeping is required.

C. 15A NCAC 02D .0521 "Control of Visible Emissions" – This regulation establishes a visible emission standard for sources based on the manufacture date. For sources manufactured after July 1, 1971, the standard is 20% opacity when averaged over a 6-minute period. Compliance is expected. No monitoring or recordkeeping is required.

D. 15A NCAC 02D .0524 "New Source Performance Standards (NSPS 40 CFR Part 60, Subpart Dc)" – NSPS Subpart Dc applies to steam generating units with a heat input capacity greater than 10 million Btu/hour but less than 100 million Btu/hour for which construction or modification commenced after June 9, 1989.

Boilers (ID Nos. CP-152-BOIL-1 and 2) are not currently subject to Subpart Dc. These existing sources could become subject to Subpart Dc requirements upon modification or reconstruction. A modification under NSPS is defined as any physical or operational change that results in an increase in the emission rate of pollutant to which the standard applies. Reconstruction under NSPS is defined as the replacement of components of an existing source to such an extent that the fixed capital cost of the new components exceeds 50% of the fixed capital cost that would be required to construct a comparable entirely new source. The applicant has determined that the cost of the equipment conversion compared to the cost of replacement for the CHP is approximately 11% base on the cost estimate (prepared by Jacobs in July 2016). The applicant determined that the pollutants to which the NSPS standard applies decreased as a result of the fuel conversion. Therefore, Subpart Dc does not apply to Boilers 1 and 2.

Boilers (ID Nos. CP-152-BOIL-3 and 4) are currently subject to Subpart Dc and will remain so following the conversion. The boilers will be subject to a sulfur dioxide limit (sulfur content must be less than 0.5% by weight) and a Visible emissions standard (20% opacity). Pursuant to 40 CFR 60.48c(g), the facility must maintain the amount of each fuel combusted during each day and hours of operation. Compliance is expected.

E. 15A NCAC 02D .0524 "New Source Performance Standards (NSPS 40 CFR Part 60, Subpart Kb) – NSPS Subpart Kb applies to storage vessels for which construction, reconstruction, or modification commenced after July 23, 1984. The affected units under Subpart Kb are those with a storage capacity greater than 19,800 gallons which stores volatile organic liquid. The storage tanks proposed to be added have a maximum size of 5,000 gallons for JP-5, 1,200 gallons for Diesel, and 200 gallons for gasoline. Based on the size, these storage tanks are exempt from NSPS.

F. 15A NCAC 02Q .0700 "Toxic Air Pollutant Procedures" – With the exceptions in Rule .0702 of this Section, no person shall cause or allow any toxic air pollutant named in 15A NCAC 02D .1104 to be emitted from any facility into the atmosphere at a rate that exceeds the applicable rate(s) in Rule .0711 of this Section without having received a permit to emit toxic air pollutants (TAP). MCAS was required to submit a TAP demonstration no later than June 13, 2012. The DAQ Air Quality Analysis Branch (AQAB) received the modeling demonstration in a timely manner. The modeling demonstration was based on emission units operating at potential to emit rates. Mr. Tom Anderson, Meteorologist, AQAB reviewed the modeling analysis and responded with a memo on July 26, 2012 stating, "The modeling adequately demonstrates compliance, on a source-by-source basis, for all toxics modeled. All toxics were below their respective AALs and emission rates were optimized to correspond to 99.9% of the AAL(s) for each toxic."

Modeled TAP emission rates were placed in the permit as limits with no operating limitations necessary to comply with the AALs. No changes have taken place since the modeling was approved.

Exemptions under 15A NCAC 0702 include a categorical exemption for sources subject to a requirement under 40 CFR Part 63. Facility-wide sources subject to a MACT standard meet the exemption. With the exemption, TAP limits can be removed from the permit provided there is no unacceptable health risk. TAP emissions will decrease as a result of the fuel switch to natural gas. Actual emissions of formaldehyde will decrease from 1.02E+02 lb/hr to 9.69E+01 lb/hr.

Because pre-modification modeled TAP emissions demonstrated compliance with AALs and the fuel switch to natural gas results in a decrease in TAP emissions, this modification will not result in an unacceptable health risk. The facility requests the removal of existing facility-wide limits for: acetic acid, pigments as chromium (VI), cadmium, chloroform, ethylene dibromide, and vinyl chloride (Section 2.2 H.).

VII. Regulatory Review – Multiple Emission Source Limitations

A. 15A NCAC 02D .0530 "Prevention of Significant Deterioration" – This facility is an existing PSD major stationary source. Emissions increases from the project must be compared to the PSD significant emission rate (SER). Total emissions for the additional proposed sources are less than the SER. Therefore, no PSD review is triggered.

For new and existing units, emissions increases are defined as the difference between the potential-to-emit (PTE) following completion of the project and the baseline actual emissions (BAE) before the project (baseline actual-to-potential).

Baseline Actual Emissions (BAE)

For existing units BAE is defined as "the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner/operator within the five-year period immediately preceding the date that a complete application is received by the Division for a permit required under this Rule." For this project, the 24-month period beginning January 2015 and ending December 2016 was selected as the baseline period. Coal emission factors are taken from AP-42, Chapter 1.1 and stack testing completed in 1997. No. 2 fuel oil factors are taken from AP-42, Chapter 1.3 and stack testing completed in 1997.

Hours of operation are as follows:

2015 Operating Hours	
Boiler 1	6,957
Boiler 2	4,936
Boiler 3	1,172
Boiler 4	608

2016 Operating Hours	
Boiler 1	3,232
Boiler 2	8,036
Boiler 3	1,326
Boiler 4	1,452

Sample calculation 2016 NOx emissions:
Coal
NOx = (94 million Btu/hr) x (4.400E-07 lb/Btu) x [11,268 hrs/yr][1 t/2000 lb] = 233.02 tons per year

Fuel oil
NOx = (96 million Btu/hour) x (1.429E-07 lb/Btu) x [2,778 hrs/yr][1 t/2000 lb] = 19.05 tons per year

2016 NOx total = 252.07 tons per year
2015 NOx total = 258.15 tons per year

Average NOx = 255.11 tons per year

Potential to Emit (PTE)
PTE is calculated based on emission factors from AP-42 Chapter 1.4 and 8,760 hours of operation.

Sample calculation NOx emissions:
Natural gas
NOx = (4 units) x (99 million Btu/hour) x (3.12E-02 lb/million Btu)(8,760 hours/year)(2,000 lb/ton)
NOx = 54.1 tons per year

The following table taken from the application shows the difference between PTE and BAE for the proposed project is less than PSD SER for each pollutant.

Table – 1 PSD Evaluation

	NOx (tpy)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	HF (tpy)	Pb (tpy)	H_2SO_4 (tpy)	CO_2e (tpy)
Baseline Actual 2016 and 2015 average (BAE)	255.11	129.94	64.53	16.60	949.41	1.35	112.76	3.27	0.06	0.41	130,704
Projected Potential Emissions (PTE)	54.1	12.85	12.85	12.85	1.01	9.30	142.00	0.00	0.00	0.00	203,102
Emission Increase (PTE – BAE)	-201.0	-117.1	-51.7	-3.8	-948.4	7.94	29.24	-3.3	-0.1	-0.4	72,398
PSD SER	40	25	15	10	40	40	100	3	0.6	7	75,000
PSD Review Required	No	No	No	No	No	No	No	No	No	No	No

B. 15A NCAC 02D .1111 "Maximum Achievable Control Technology" 40 CFR Part 63, Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants: - This regulation applies to the converted boilers. Compliance is required upon start-up. Gas-fired boilers are only subject to work practice standards. Annual tune-ups are required with the first being conducted within 13 months of commencing operation. Initial notification must be submitted within 15 days of start-up. An energy assessment is not required. According to the application, the first compliance report will be submitted following completion of the tune-ups.
In order to be classified as Gas 1 units, burning of liquid fuel will be used for periodic testing, maintenance, or operator training; usage will not exceed a combined total of 48 hours during any calendar year (§63.7575). Liquid fuel is expected to primarily be used for periods of gas curtailment or supply interruptions. Notification of alternative fuel use must be submitted within 48 hours of the declaration of natural gas curtailment or supply interruption (§63.7545(f)). A new condition referencing the facility's requirements under Subpart DDDDD is included in the revised permit.

C. 15A NCAC 02D .1111 "Maximum Achievable Control Technology" 40 CFR Part 63, Subpart GG, National Emission Standards for Hazardous Air Pollutants: Aerospace Manufacturing and Rework Facilities – MCAS is subject to Subpart GG work practice standards. The existing permit includes a condition outlining the

facility's requirements under the MACT (Section 2.2 F.). Paint booth (ID No. CP-4075-PBTH) was constructed to be in compliance with Subpart GG. The following standards apply:

1. comply with organic HAP and VOC content limits (dependent on coating type),
2. utilize a control system that reduces the operations organic HAP and VOC emissions to the atmosphere by 81% or greater,
3. utilize the appropriate spray application technique for coatings,
4. utilize a 3-stage dry particulate filter with greater than 90% efficiency during the use of products containing inorganic HAPs,
5. record the pressure drop across the filter once per shift,
6. follow proper housekeeping techniques such as minimizing spills and closed storage of solvent materials.

D. 15A NCAC 02D .0614 "Compliance Assurance Monitoring (CAM)" – The CAM Rule applies to pollutant-specific emissions units at Title V facilities that are pre-control major sources and use a control device to comply with an emission limit. This project involves conversion of Boilers 1 and 2 from coal to natural gas, and no control devices are being installed. Therefore, the CAM Rule does not apply.

E. 15A NCAC 02Q .0503(8) "Definitions – Insignificant Activity" - 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, i.e., potential uncontrolled emissions, 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 1000 pounds per year.

At the request of the applicant, the following sources are removed from the insignificant activity list:

> CP-3909-GEN (generator less than 500 hp);
> Thirty six (36) storage tanks as follows; ICP-1005-AST-3, ICP-1088-AST, ICP-1119-UST, ICP-1121-UST, ICP-1189-UST, ICP-1190-UST, ICP-1290-AST-2, ICP-1408-AST, ICP-1504-AST, ICP-152-AST-11, ICP-152-AST-12, ICP-177-AST-01, ICP-177-AST-02, ICP-177-AST-03, ICP-1779-AST, ICP-1780-AST, ICP-1781-AST, ICP-1782-AST, ICP-1783-AST-2, ICP-2340-AST, ICP-2455-AST, ICP-3570-AST, ICP-3765-AST, ICP-3899-AST-3, ICP-4004-AST-1, ICP-4004-AST-2, ICP-4063-AST, ICP-4314-AST, ICP-4332-AST, ICP-4379-AST, ICP-491-AST-5, ICP-4927-AST-1, ICP-4927-AST-2, ICP-499-AST, and ICP-87-AST;
> Four (4) parts cleaners; ICP-1219-PCLN-3, ICP-1219-PCLN-4, ICP-4007-PCLN, and ICP-4576-PCLN

This modification will add two (2) soil vapor extraction units (ID Nos. IBLDG-137-SVE and IBLDG-4592 SVE) and sixteen (16) storage tanks (ID Nos. ICP-4505-AST-4, ICP-3294-AST, ICP-3499-AST, ICP-3524-AST, ICP-4040-AST-2, ICP-4041-AST-6, ICP-4041-AST-9, ICP-4243-AST-3, ICP-4472-AST-3, ICP-4598-AST-2, ICP-4651-AST, ICP-4852-AST, ICP-4865-AST-1, ICP-4865-AST-2, ICP-4948-AST, and ICP-8512-AST) to the insignificant activity list.

Storage Tank assumptions – According to the application, storage tank emissions are estimated by developing standing loss and working loss emission factors using EPA Tanks 4.09. Emissions were calculated for the largest storage tank by each fuel type. Potential emissions are well below are well below the insignificant activity threshold.

Soil Vapor Extraction (SVE) system assumptions – According to the application, the facility maintains numerous remediation systems to remove contaminates from soil and groundwater. Hourly potential emissions are calculated by assuming each remediation system operates at maximum capacity for 1 hour. Emissions from remediation activities are calculated using the maximum velocity (feet per minute) for each unit based on the available data from 2012 through 2016. The maximum rates are reported as 203 cfm for

IBLDG-137-SVE and 132 cfm for IBLDG-4592-SVE. Potential uncontrolled emissions are well below the insignificant activity threshold.

VIII. Other Regulatory Requirements

- An application fee of $929.00 is required and was received by DAQ.
- The appropriate number of application copies was received on September 7, 2017.
- A Professional Engineer's Seal is not required for this application.
- MCAS – Cherry Point is located on Federal property and is therefore not subject to local zoning regulations. All of the proposed modifications have been approved by the installation planning and development authority and are in accordance with the Post master plan.
- Public notice and EPA review are not required for this Step 1 of a Significant Modification being processed under 15A NCAC 02Q .0501(c)(2).
- IBEAM Title V Equipment Editor (TVEE) update was verified on December 15, 2017.
- According to the application, the facility does not handle any of the substances subject to 112(r) at quantities greater than the applicability threshold.
- The application was signed by Mr. George Radford, Environmental Affairs Officer by direction of the Commanding Officer, on August 28, 2017.

IX. Recommendations

This permit application has been reviewed by the DAQ to determine compliance with all procedures and requirements. The DAQ has determined that this facility is expected to achieve compliance as specified in the permit with all applicable requirements. The applicant was provided a draft permit on November 6, 2017. The WARO was provided a draft permit on December 1, 2017. The applicant responded on December 8, 2017 with minor comments. The WARO responded on December 8, 2017 with no comments. The DAQ recommends permit issuance.

Attachment II – Emissions Calculations and Supporting Documentation

Marine Corps Air Station Cherry Point
Cherry Point, North Carolina
Craven County

Appendix B - Table of Contents

Summary of Emissions from External Combustion Sources

Summary of Emissions for Insignificant Sources Proposed Permit Modifications

Summary of Emissions from External Combustion Sources

The units presented in this section are for the modification of the coal and fuel oil boilers at the Central Heating Plant as part of the natural gas conversion project. The emission calculations on the following pages compare potential emissions pre and post conversion by fuel type and source for this modification. Historically Boiler 1 and Boiler 2 primarily burn coal, and Boiler 3 and Boiler 4 burn a mixture of No. 2 Fuel Oil and used oil. The conversion upgraded all these units to primarily burn natural gas.

Prevention of Significant Deterioration Applicability

	Emissions, tpy										
	NOx	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**	**CO**	**HF**	**Pb**	**H_2SO_4**	**CO_2e**
Baseline Actual 2016 and 2015 Average	255.11	129.94	64.53	16.60	949.41	1.35	112.76	3.27	0.06	0.41	130,704
Projected Potential Emissions	54.10	12.85	12.85	12.85	1.01	9.30	142.00	0.00	0.00	0.00	203,102
Emission Increase (Baseline Actual Average to Project Potential)	-201.02	-117.09	-51.68	-3.75	-948.40	7.94	29.24	-3.27	-0.06	-0.41	72,398
PSD Significant Emission Rate	40	25	15	10	40	40	100	3	0.6	7	75,000
PSD Review Required	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Potential Emissions for Central Heating Plant Natural Gas Boilers

Conversion	
Natural Gas	*Units*
1,026	MMBtu/MMscf
99	MMBtu/hr
4	Number of Units
35,040	Total hr/yr

		CHP Conversion Units CP-152-BOIL-1 thru 4		Total Emissions
		Natural Gas		Post Conversion
Pollutant	**Cas No**	**(lb/MMscf)**	**(lb/MMBtu)**	
Greenhouse Gas Pollutants			***(ton***	***(ton/yr)***
Carbon Dioxide	CO_2	-	1.17E+02	202,892.66
Methane	CH_4	-	2.20E-03	3.82
Nitrous Oxide	N_2O	-	2.20E-04	0.38
Criteria Pollutants			***(ton***	***(ton/yr)***
Carbon Monoxide	CO	8.40E+01	8.19E-02	142.00
Nitrogen Oxides	NOx	3.20E+01	3.12E-02	54.10
Particulate Matter	PM	7.60E+00	7.41E-03	12.85
Particulate Matter (<10um)	PM_{10}	7.60E+00	7.41E-03	12.85
Particulate Matter (<2.5um)	$PM_{2.5}$	7.60E+00	7.41E-03	12.85
Sulfur Dioxide	SO2	6.00E-01	5.85E-04	1.01
Volatile Organic Compounds	VOC	5.50E+00	5.36E-03	9.30
Organic Compounds and Metals			***(lbs***	***(lbs/yr)***
Acenaphthene	83-32-9	1.80E-06	1.75E-09	6.09E-03
Acenaphthylene	208-96-8	1.80E-06	1.75E-09	6.09E-03
Anthracene	120-12-7	2.40E-06	2.34E-09	8.11E-03
Arsenic	7440-38-2	2.00E-04	1.95E-07	6.76E-01
Benzene	71-43-2	2.10E-03	2.05E-06	7.10E+00
Benzo(a)anthracene	56-55-3	1.80E-06	1.75E-09	6.09E-03
Benzo(a)pyrene	50-32-8	1.20E-06	1.17E-09	4.06E-03
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.75E-09	6.09E-03
Benzo(g,h,I)perylene	191-24-2	1.20E-06	1.17E-09	4.06E-03
Benzo(k)fluoranthene	207-08-9	1.80E-06	1.75E-09	6.09E-03
Beryllium	7440-41-7	1.20E-05	1.17E-08	4.06E-02
Cadmium	7440-43-9	1.10E-03	1.07E-06	3.72E+00
Chromium	CRC	1.40E-03	1.36E-06	4.73E+00
Chrysene	218-01-9	1.80E-06	1.75E-09	6.09E-03
Cobalt	7740-48-4	8.40E-05	8.19E-08	2.84E-01
Dibenzo(a,h)anthracene	53-70-3	1.20E-06	1.17E-09	4.06E-03
Dichlorobenzene	106-46-7	1.20E-03	1.17E-06	4.06E+00
7,12-Dimethylbenz[a]Anthracene	57-97-6	1.60E-05	1.56E-08	5.41E-02
Fluoranthene	206-44-0	3.00E-06	2.92E-09	1.01E-02
Fluorene	86-73-7	2.80E-06	2.73E-09	9.47E-03
Formaldehyde	50-00-0	7.50E-02	7.31E-05	2.54E+02
Hexane	110-54-3	1.80E+00	1.75E-03	6.09E+03

Potential Emissions for Central Heating Plant Natural Gas Boilers

Conversion	
Natural Gas	*Units*
1,026	MMBtu/MMscf
99	MMBtu/hr
4	Number of Units
35,040	Total hr/yr

		CHP Conversion Units CP-152-BOIL-1 thru 4		Total Emissions
		Natural Gas		Post Conversion
Pollutant	**Cas No**	**(lb/MMscf)**	**(lb/MMBtu)**	
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	1.75E-09	6.09E-03
Lead	7439-92-1	5.00E-04	4.87E-07	1.69E+00
Manganese	7439-96-5	3.80E-04	3.70E-07	1.28E+00
Mercury	7439-97-6	2.60E-04	2.53E-07	8.79E-01
3-Methylcholanthrene	56-49-5	1.80E-06	1.75E-09	6.09E-03
2-Methylnaphthalene	91-57-6	2.40E-05	2.34E-08	8.11E-02
Naphthalene	91-20-3	6.10E-04	5.95E-07	2.06E+00
Nickel	7440-02-0	2.10E-03	2.05E-06	7.10E+00
Phenanthrene	85-01-8	1.70E-05	1.66E-08	5.75E-02
Pyrene	129-00-0	5.00E-06	4.87E-09	1.69E-02
POM	POM			
Selenium	7782-49-2	2.40E-05	2.34E-08	8.11E-02
Toluene	108-88-3	3.40E-03	3.31E-06	1.15E+01

1. Natural gas emission factors taken from EPA's AP-42 Chapter 1.4. Please note that only TAP, HAP, PAH, and POM shown in calculations.

2. GHG factors taken from 40 CFR Part 98, Subpart C, Table C-1 and C-2. The default CO_2 factor for the Used Oil Blend is assumed to be Kerosene-type jet fuel as jet fuel is the main constituent of the off-spec fuel combusted in the boilers

Actual Emissions for Central Heating Plant Natural Gas Boilers RY16
For PSD Applicability

2016 Operating Hours	
Boiler 1	3,232
Boiler 2	8,036
Boiler 3	1,326
Boiler 4	1,452

	2016 Fuel Usage			Conversion	
Fuel	*Coal*	*No. 2 FO*	*Used Oil*	*Natural Gas*	*Units*
Heat Rate	94	96	96	99	MMBtu/hr
Number of Units	2	2	2	4	
Fuel Proportion (2016 AEI)	1	0.90	0.10	1	
Total Operating Hours	11,268	2,509	269	13,393	hr/yr
Total Heat Content	1,059,192	240,903	25,785	1,325,880	MMBtu/yr
			Natural Gas HHV	1,026	MMBtu/MMscf

		Coal Fired		CP-152-BOIL-1 CP-152-BOIL-2	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CHP Conversion Units CP-152-BOIL-1 thru 4		Total Emissions	
										Pre Conversion	Post Conversion
		Boiler No. 1	Boiler No. 2	Actual	No. 2 Oil	Blended Fuel	Actual	Natural Gas			
Pollutant	**Cas No**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/MMscf)**	**(lb/MMBtu)**		
Greenhouse Gas Pollutants				***(ton/yr)***			***(ton/yr)***			***(ton/yr)***	***(ton/yr)***
Carbon Dioxide	CO_2	2.056E-04	2.056E-04	108,908.82	1.631E-04	1.592E-04	21,692.58	-	1.17E+02	130,601.39	77,548.12
Methane	CH_4	2.425E-08	2.425E-08	12.84	6.614E-09	6.614E-09	0.88	-	2.20E-03	13.72	1.46
Nitrous Oxide	N_2O	3.527E-09	3.527E-09	1.87	1.323E-09	1.323E-09	0.18	-	2.20E-04	2.04	0.15
Criteria Pollutants				***(ton/yr)***			***(ton/yr)***			***(ton/yr)***	***(ton/yr)***
Carbon Monoxide	CO	2.000E-07	2.000E-07	105.92	3.571E-08	3.571E-08	4.76	8.40E+01	8.19E-02	110.68	54.28
Nitrogen Oxides	NOx	4.400E-07	4.400E-07	233.02	1.429E-07	1.429E-07	19.05	3.20E+01	3.12E-02	252.07	20.68
Particulate Matter	PM	2.340E-07	6.000E-08	123.93	2.357E-08	2.357E-08	3.14	7.60E+00	7.41E-03	127.07	4.91
Particulate Matter (<10um)	PM_{10}	1.170E-07	3.240E-08	61.96	7.714E-09	7.714E-09	1.03	7.60E+00	7.41E-03	62.99	4.91
Particulate Matter (<2.5um)	$PM_{2.5}$	2.930E-08	1.490E-08	15.52	5.929E-09	5.929E-09	0.79	7.60E+00	7.41E-03	16.31	4.91
Sulfur Dioxide	SO2	1.316E-06	1.316E-06	697.07	2.130E-06	2.130E-06	284.02	6.00E-01	5.85E-04	981.10	0.39
Volatile Organic Compounds	VOC	2.000E-09	2.000E-09	1.06	2.429E-09	2.429E-09	0.32	5.50E+00	5.36E-03	1.38	3.55
Organic Compounds and Metals				***(lbs/yr)***			***(lbs/yr)***			***(lbs/yr)***	***(lbs/yr)***
1,1,1-TCA (Methyl Chloroform)	71-55-6	8.000E-13	8.000E-13	8.47E-01	1.686E-12	1.686E-12	0.45			1.30E+00	
2,4-Dinitrotoluene	121-14-2	1.120E-14	1.120E-14	1.19E-02						1.19E-02	
2-Chloroacetophenone	532-27-4	2.800E-13	2.800E-13	2.97E-01						2.97E-01	
Acenaphthene	83-32-9	2.040E-14	2.040E-14	2.16E-02	1.507E-13	1.507E-13	0.04	1.80E-06	1.75E-09	6.18E-02	2.33E-03
Acenaphthylene	208-96-8	1.000E-14	1.000E-14	1.06E-02	1.836E-15	1.836E-15	0.00	1.80E-06	1.75E-09	1.11E-02	2.33E-03
Acetaldehyde	75-07-0	2.280E-11	2.280E-11	2.41E+01						2.41E+01	
Acetophenone	98-86-2	6.000E-13	6.000E-13	6.36E-01						6.36E-01	
Acrolein	107-02-8	1.160E-11	1.160E-11	1.23E+01						1.23E+01	
Anthracene	120-12-7	8.400E-15	8.400E-15	8.90E-03	8.714E-15	8.714E-15	0.00	2.40E-06	2.34E-09	1.12E-02	3.10E-03
Antimony	7440-36-0	7.200E-13	7.200E-13	7.63E-01						7.63E-01	
Arsenic	7440-38-2	1.165E-10	3.320E-11	1.23E+02	4.000E-12	2.932E-11	1.72	2.00E-04	1.95E-07	1.25E+02	2.58E-01
Benzene	71-43-2	5.200E-11	5.200E-11	5.51E+01	1.964E-11	1.964E-11	5.24	2.10E-03	2.05E-06	6.03E+01	2.71E+00
Benzo(a)anthracene	56-55-3	3.200E-15	3.200E-15	3.39E-03	2.864E-14	2.864E-14	0.01	1.80E-06	1.75E-09	1.10E-02	2.33E-03
Benzo(a)pyrene	50-32-8	1.520E-15	1.520E-15	1.61E-03				1.20E-06	1.17E-09	1.61E-03	1.55E-03
Benzo(b)fluoranthene	205-99-2							1.80E-06	1.75E-09		2.33E-03
Benzo(b,j,k)fluoranthene	207-08-9	4.400E-15	4.400E-15	4.66E-03	1.057E-14	1.057E-14	0.00			7.48E-03	
Benzo(g,h,I)perylene	191-24-2	1.080E-15	1.080E-15	1.14E-03	1.614E-14	1.614E-14	0.00	1.20E-06	1.17E-09	5.45E-03	1.55E-03
Benzo(k)fluoranthene	207-08-9							1.80E-06	1.75E-09		2.33E-03

Actual Emissions for Central Heating Plant Natural Gas Boilers RY16
For PSD Applicability

2016 Operating Hours	
Boiler 1	3,232
Boiler 2	8,036
Boiler 3	1,326
Boiler 4	1,452

	2016 Fuel Usage			Conversion	
Fuel	*Coal*	*No. 2 FO*	*Used Oil*	*Natural Gas*	*Units*
Heat Rate	94	96	96	99	MMBtu/hr
Number of Units	2	2	2	4	
Fuel Proportion (2016 AEI)	1	0.90	0.10	1	
Total Operating Hours	11,268	2,509	269	13,393	hr/yr
Total Heat Content	1,059,192	240,903	25,785	1,325,880	MMBtu/yr
			Natural Gas HHV	1,026	MMBtu/MMscf

		Coal Fired		CP-152-BOIL-1 CP-152-BOIL-2	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CHP Conversion Units CP-152-BOIL-1 thru 4		Total Emissions	
										Pre Conversion	Post Conversion
		Boiler No. 1	Boiler No. 2	Actual	No. 2 Oil	Blended Fuel	Actual	Natural Gas			
Pollutant	**Cas No**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/MMscf)**	**(lb/MMBtu)**		
Benzyl chloride	100-44-7	2.800E-11	2.800E-11	2.97E+01						2.97E+01	
Beryllium	7440-41-7	3.349E-12	4.065E-13	3.55E+00	3.000E-12	3.000E-12	0.80	1.20E-05	1.17E-08	4.35E+00	1.55E-02
Biphenyl	92-52-4	6.800E-14	6.800E-14	7.20E-02						7.20E-02	
Bromoform	75-25-2	1.560E-12	1.560E-12	1.65E+00						1.65E+00	
Cadmium	7440-43-9	1.811E-12	2.480E-13	1.92E+00	3.000E-12	2.932E-12	0.80	1.10E-03	1.07E-06	2.72E+00	1.42E+00
Carbon disulfide	75-15-0	5.200E-12	5.200E-12	5.51E+00						5.51E+00	
Chlorine	7782-50-5	1.358E-08	1.358E-08	1.44E+04	1.400E-15		0.00			1.44E+04	
Chlorobenzene	108-90-7	8.800E-13	8.800E-13	9.32E-01						9.32E-01	
Chloroform	67-66-3	2.360E-12	2.360E-12	2.50E+00						2.50E+00	
Chromium	CRC	3.370E-11	9.960E-12	3.57E+01	3.000E-12	1.173E-10	3.75	1.40E-03	1.36E-06	3.94E+01	1.81E+00
Chromium(VI)	18540-29-9	3.160E-12	3.160E-12	3.35E+00	1.075E-14	1.075E-14	0.00			3.35E+00	
Chrysene	218-01-9	4.000E-15	4.000E-15	4.24E-03	1.700E-14	1.700E-14	0.00	1.80E-06	1.75E-09	8.77E-03	2.33E-03
Cobalt	7740-48-4	4.000E-12	4.000E-12	4.24E+00				8.40E-05	8.19E-08	4.24E+00	1.09E-01
Cumene	98-82-8	2.120E-13	2.120E-13	2.25E-01						2.25E-01	
Cyanide (as HCN)	74-90-8	1.000E-10	1.000E-10	1.06E+02						1.06E+02	
Di(2-ethylhexyl)phthalate (DEHP)	117-81-7	2.920E-12	2.920E-12	3.09E+00						3.09E+00	
Dibenzo(a,h)anthracene	53-70-3				1.193E-14	1.193E-14	0.00	1.20E-06	1.17E-09	3.18E-03	1.55E-03
Dibenzofurans	132-64-9	4.360E-17	4.360E-17	4.62E-05						4.62E-05	
Dichlorobenzene	106-46-7							1.20E-03	1.17E-06		1.55E+00
7,12-Dimethylbenz[a]Anthracene	57-97-6							1.60E-05	1.56E-08		2.07E-02
Dimethyl sulfate	77-78-1	1.920E-12	1.920E-12	2.03E+00						2.03E+00	
Ethyl Benzene	100-41-4	3.760E-12	3.760E-12	3.98E+00	5.838E-12	5.838E-12	1.56			5.54E+00	
Ethyl chloride	75-00-3	1.680E-12	1.680E-12	1.78E+00						1.78E+00	
Ethylene dibromide	106-93-4	4.800E-14	4.800E-14	5.08E-02						5.08E-02	
Ethylene dichloride	107-06-2	1.600E-12	1.600E-12	1.69E+00						1.69E+00	
Fluoranthene	206-44-0	2.840E-14	2.840E-14	3.01E-02	3.457E-14	3.457E-14	0.01	3.00E-06	2.92E-09	3.93E-02	3.88E-03
Fluorene	86-73-7	3.640E-14	3.640E-14	3.86E-02	3.193E-14	3.193E-14	0.01	2.80E-06	2.73E-09	4.71E-02	3.62E-03
Fluoride	16984-48-8				2.664E-10	2.664E-10	71.05			7.11E+01	
Formaldehyde	50-00-0	9.600E-12	9.600E-12	1.02E+01	3.429E-10	3.429E-10	91.44	7.50E-02	7.31E-05	1.02E+02	9.69E+01
Hexachlorodibenzo dioxin mixture	34465-46-8	1.148E-18	1.148E-18	1.22E-06						1.22E-06	
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	57653-85-7	1.148E-18	1.148E-18	1.22E-06						1.22E-06	

Actual Emissions for Central Heating Plant Natural Gas Boilers RY16
For PSD Applicability

2016 Operating Hours	
Boiler 1	3,232
Boiler 2	8,036
Boiler 3	1,326
Boiler 4	1,452

	2016 Fuel Usage			Conversion	
Fuel	*Coal*	*No. 2 FO*	*Used Oil*	*Natural Gas*	*Units*
Heat Rate	94	96	96	99	MMBtu/hr
Number of Units	2	2	2	4	
Fuel Proportion (2016 AEI)	1	0.90	0.10	1	
Total Operating Hours	11,268	2,509	269	13,393	hr/yr
Total Heat Content	1,059,192	240,903	25,785	1,325,880	MMBtu/yr
			Natural Gas HHV	1,026	MMBtu/MMscf

		Coal Fired		CP-152-BOIL-1 CP-152-BOIL-2	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CHP Conversion Units CP-152-BOIL-1 thru 4		Total Emissions	
										Pre Conversion	Post Conversion
		Boiler No. 1	Boiler No. 2	Actual	No. 2 Oil	Blended Fuel	Actual	Natural Gas			
Pollutant	**Cas No**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/MMscf)**	**(lb/MMBtu)**		
Hexane	110-54-3	2.680E-12	2.680E-12	2.84E+00				1.80E+00	1.75E-03	2.84E+00	2.33E+03
Hydrogen Chloride	7647-01-0	1.396E-08	1.396E-08	1.48E+04	7.000E-16		0.00			1.48E+04	
Hydrogen Fluoride	7664-39-3	6.000E-09	6.000E-09	6.36E+03						6.36E+03	
Indeno(1,2,3-cd)pyrene	193-39-5	2.440E-15	2.440E-15	2.58E-03	1.529E-14	1.529E-14	0.00	1.80E-06	1.75E-09	6.66E-03	2.33E-03
Isophorone	78-59-1	2.320E-11	2.320E-11	2.46E+01						2.46E+01	
Lead	7439-92-1	1.070E-10	1.215E-11	1.13E+02	9.000E-12	8.585E-11	4.38	5.00E-04	4.87E-07	1.18E+02	6.46E-01
Manganese	7439-96-5	1.960E-11	3.810E-12	2.08E+01	6.000E-12	6.000E-12	1.60	3.80E-04	3.70E-07	2.24E+01	4.91E-01
Mercury	7439-97-6	5.910E-12	5.489E-12	6.26E+00	3.000E-12	3.000E-12	0.80	2.60E-04	2.53E-07	7.06E+00	3.36E-01
Methyl bromide	74-83-9	6.400E-12	6.400E-12	6.78E+00						6.78E+00	
3-Methylcholanthrene	56-49-5							1.80E-06	1.75E-09		2.33E-03
Methyl chloride	74-87-3	2.120E-11	2.120E-11	2.25E+01						2.25E+01	
Methyl ethyl ketone	78-93-3	1.560E-11	1.560E-11	1.65E+01						1.65E+01	
Methyl hydrazine	60-34-4	6.800E-12	6.800E-12	7.20E+00						7.20E+00	
Methyl methacrylate	80-62-6	8.000E-13	8.000E-13	8.47E-01						8.47E-01	
2-Methylnaphthalene	91-57-6							2.40E-05	2.34E-08		3.10E-02
Methyl tert butyl ether	1634-04-4	1.400E-12	1.400E-12	1.48E+00						1.48E+00	
Methylene chloride	75-09-2	1.160E-11	1.160E-11	1.23E+01						1.23E+01	
Naphthalene	91-20-3	5.200E-13	5.200E-13	5.51E-01	2.379E-12	2.379E-12	0.63	6.10E-04	5.95E-07	1.19E+00	7.88E-01
Nickel	7440-02-0	6.260E-11	1.205E-11	6.63E+01	3.000E-12	3.000E-12	0.80	2.10E-03	2.05E-06	6.71E+01	2.71E+00
Perchloroethylene	127-18-4	1.720E-12	1.720E-12	1.82E+00						1.82E+00	
Phenanthrene	85-01-8	1.080E-13	1.080E-13	1.14E-01	7.500E-14	7.500E-14	0.02	1.70E-05	1.66E-08	1.34E-01	2.20E-02
Phenol	108-95-2	6.400E-13	6.400E-13	6.78E-01						6.78E-01	
Propionaldehyde	123-38-6	1.520E-11	1.520E-11	1.61E+01						1.61E+01	
Pyrene	129-00-0	1.320E-14	1.320E-14	1.40E-02	3.036E-14	3.036E-14	0.01	5.00E-06	4.87E-09	2.21E-02	6.46E-03
POM	POM	8.295E-13	8.295E-13	8.79E-01	2.811E-12	2.811E-12	0.75			1.63E+00	
Selenium	7782-49-2	6.170E-11	1.270E-10	1.35E+02	1.500E-11	1.500E-11	4.00	2.40E-05	2.34E-08	1.39E+02	3.10E-02
Styrene	100-42-5	1.000E-12	1.000E-12	1.06E+00						1.06E+00	
Sulfur Oxides	CASSOX	1.386E-06	1.386E-06	1.47E+06						1.47E+06	
Sulfur Trioxide	7446-11-9	9.699E-09	9.699E-09	1.03E+04	7.143E-09	7.143E-09	1904.91			1.22E+04	
Sulfuric Acid	7664-93-9				3.527E-09	7.143E-09	1033.74			1.03E+03	
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	1746-01-6	5.720E-19	5.720E-19	6.06E-07						6.06E-07	

Actual Emissions for Central Heating Plant Natural Gas Boilers RY16
For PSD Applicability

2016 Operating Hours	
Boiler 1	3,232
Boiler 2	8,036
Boiler 3	1,326
Boiler 4	1,452

	2016 Fuel Usage			Conversion	
Fuel	*Coal*	*No. 2 FO*	*Used Oil*	*Natural Gas*	*Units*
Heat Rate	94	96	96	99	MMBtu/hr
Number of Units	2	2	2	4	
Fuel Proportion (2016 AEI)	1	0.90	0.10	1	
Total Operating Hours	11,268	2,509	269	13,393	hr/yr
Total Heat Content	1,059,192	240,903	25,785	1,325,880	MMBtu/yr
			Natural Gas HHV	1,026	MMBtu/MMscf

		Coal Fired		CP-152-BOIL-1 CP-152-BOIL-2	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CP-152-BOIL-3 CP-152-BOIL-4	CHP Conversion Units CP-152-BOIL-1 thru 4		Total Emissions	
										Pre Conversion	Post Conversion
		Boiler No. 1	Boiler No. 2	Actual	No. 2 Oil	Blended Fuel	Actual	Natural Gas			
Pollutant	**Cas No**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/Btu)**	**(lb/Btu)**	**Emissions**	**(lb/MMscf)**	**(lb/MMBtu)**		
Toluene	108-88-3	9.600E-12	9.600E-12	1.02E+01	5.691E-10	5.691E-10	151.77	3.40E-03	3.31E-06	1.62E+02	4.39E+00
Vinyl acetate	108-05-4	3.040E-13	3.040E-13	3.22E-01						3.22E-01	
Xylene	1330-20-7	1.480E-12	1.480E-12	1.57E+00	1.001E-11	1.001E-11	2.67			4.24E+00	

1. Coal emission factors taken from EPA's AP-42 Chapter 1.1, Sep 98 and stack testing completed in 1997.
2. Coal emission factors taken from EPA's AP-42 Chapter 1.1, Sep 98 and stack testing completed in 1997, and 112(j) compliance testing (fuel analysis and stack test) for 2016.
3. No.2 fuel oil emission factors for industrial boilers taken from EPA's AP-42 Chapter 1.3, May 2010 and NCDAQ Fuel Oil Combustion Emissions Calculation Revision G (11/5/2012).
4. No.2 fuel oil emission factors taken from EPA's AP-42 Chapter 1.3, May 2010, stack testing completed in 1997, stack testing completed in 2006, and NCDAQ Fuel Oil Combustion Emissions Calculation Revision G (11/5/2012).
5. Blended fuel emission factors consist of emission factors based on fuel analysis from 2016 and No. 2 fuel oil emission factors (see footnote 3).
6. No.2 fuel oil emission factors for commercial boilers taken from EPA's AP-42 Chapter 1.3, May 2010 and NCDAQ Fuel Oil Combustion Emissions Calculation Revision G (11/5/2012).
7. Natural gas emission factors taken from EPA's AP-42 Chapter 1.4. Please note that only TAP, HAP, PAH, and POM shown in calculations.
8. GHG factors taken from 40 CFR Part 98, Subpart C, Table C-1 and C-2. The default CO_2 factor for the Used Oil Blend is assumed to be Kerosene-type jet fuel as jet fuel is the main constituent of the off-spec fuel combusted

Summary of Emissions

for Insignificant Sources Proposed Permit Modifications

Please note that all additions to this permit are funded separately based on location and unit purpose and thus evaluated individually. The generator and tank emission calculations demonstrates these unit additions and modifications are insignificant and are lower than the 5 ton per year limit. The generators replaced emission calculations demonstrate that the newer NSPS engine emissions are lower than their predecessors. Therefore they are not included in the PSD evaluation.

Marine Corps Air Station Cherry Point
Cherry Point, North Carolina
Craven County

Summary of Emissions from all Permit Modifications

CAS #	Compound	*TAP*	*HAP*	*PAH*	*POM*	Total Emissions ton/yr	[B2-2] ICP-5373-GEN ton/yr	[B2-3] 50<hp<100 GENS ton/yr	[B2-4] CP-NSPS-GEN ton/yr
Greenhouse Gas Pollutants [2]									
CO_2	CARBON DIOXIDE					1053.77	76.47	121.27	856.02
CH_4	METHANE					0.04	0.003	0.005	0.03
N_2O	NITROUS OXIDE					0.01	0.001	0.001	0.01
Criteria Pollutants									
CO	CARBON MONOXIDE					5.55	0.38	0.87	4.30
NO_x	NITROGEN OXIDE					5.80	0.41	0.76	4.62
PM	PARTICULATE MATTER					0.34	0.02	0.07	0.25
PM_{10}	PARTICULATE MATTER (LESS THAN 10μ)					0.34	0.02	0.07	0.25
$PM_{2.5}$	PARTICULATE MATTER (LESS THAN 2.5μ)					0.34	0.02	0.07	0.25
SO_2	SULFUR DIOXIDE					0.01	0.00	0.00	0.01
VOC	VOLATILE ORGANIC COMPOUNDS					0.45	0.03	0.06	0.36
Organic Compounds		***TAP***	***HAP***	***PAH***	***POM***			**lb/yr**	
106-99-0	1,3-BUTADIENE	*Y*	*Y*			2.75E-01	2.00E-02	3.17E-02	2.24E-01
75-07-0	ACETALDEHYDE	*Y*	*Y*			5.39E+00	3.91E-01	6.21E-01	4.38E+00
107-02-8	ACROLEIN	*Y*	*Y*			6.50E-01	4.72E-02	7.48E-02	5.28E-01
71-43-2	BENZENE	*Y*	*Y*			6.56E+00	4.76E-01	7.54E-01	5.33E+00
108-88-3	TOLUENE	*Y*	*Y*			2.88E+00	2.09E-01	3.32E-01	2.34E+00
1330-20-7	XYLENE (MIXED ISOMERS)	*Y*	*Y*			2.01E+00	1.46E-01	2.32E-01	1.64E+00
50-00-0	FORMALDEHYDE	*Y*	*Y*			8.31E+00	6.03E-01	9.56E-01	6.75E+00
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		***TAP***	***HAP***	***PAH***	***POM***			**lb/yr**	
120-12-7	ANTHRACENE		*Y*		*Y*	1.31E-02	9.54E-04	1.51E-03	1.07E-02
208-96-8	ACENAPHTHYLENE		*Y*		*Y*	3.56E-02	2.59E-03	4.10E-03	2.90E-02
83-32-9	ACENAPHTHENE		*Y*		*Y*	9.99E-03	7.25E-04	1.15E-03	8.12E-03
86-73-7	FLUORENE		*Y*		*Y*	2.05E-01	1.49E-02	2.36E-02	1.67E-01
129-00-0	PYRENE		*Y*		*Y*	3.36E-02	2.44E-03	3.87E-03	2.73E-02
191-24-2	BENZO(G,H,I)PERYLENE		*Y*		*Y*	3.43E-03	2.49E-04	3.95E-04	2.79E-03
91-20-3	NAPHTHALENE		*Y*		*Y*	5.96E-01	4.33E-02	6.86E-02	4.85E-01
85-01-8	PHENANTHRENE		*Y*		*Y*	2.07E-01	1.50E-02	2.38E-02	1.68E-01
56-55-3	BENZ(A)ANTHRACENE		*Y*	*Y*	*Y*	1.18E-02	8.58E-04	1.36E-03	9.60E-03
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		*Y*	*Y*	*Y*	2.47E-03	1.80E-04	2.85E-04	2.01E-03
50-32-8	BENZO(A)PYRENE	*Y*	*Y*	*Y*	*Y*	1.32E-03	9.59E-05	1.52E-04	1.07E-03
205-99-2	BENZO(B)FLUORANTHENE		*Y*	*Y*	*Y*	6.98E-04	5.07E-05	8.03E-05	5.67E-04
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		*Y*		*Y*	5.35E-02	3.89E-03	6.16E-03	4.35E-02
207-08-9	BENZO(K)FLUORANTHENE		*Y*	*Y*	*Y*	1.09E-03	7.91E-05	1.25E-04	8.85E-04
53-70-3	DIBENZO(A,H)ANTHRACENE		*Y*	*Y*	*Y*	4.10E-03	2.97E-04	4.72E-04	3.33E-03
193-39-5	INDENO(1,2,3-CD)PYRENE		*Y*	*Y*	*Y*	2.64E-03	1.92E-04	3.04E-04	2.15E-03

Diesel Fired Emergency Generators Requested for Addition to the Permit

The units presented in this section are determined by location or unit purpose. Emission factors as published in AP-42 are grouped by large (> 600 hp) diesel engines, and smaller (≤ 600 hp) diesel engines. The emission calculations on the following pages are performed for small engine based on the size.

Building No.	Requested Permit ID	Fuel Type	Rating (kW)	Rating (hp)
Small Units (≤ 600 hp)				
5373	ICP-5373-GEN	Diesel	200	268
3981	CP-3981-GEN-2	Diesel	60	80
6012	ICP-6012-GEN	Diesel	50	69
6013	ICP-6013-GEN	Diesel	50	69
6014	ICP-6014-GEN	Diesel	50	69
6015	ICP-6015-GEN	Diesel	50	69
6016	ICP-6016-GEN	Diesel	50	69
Placeholder	ICP-NSPS-GEN-4	Diesel	447	600
Placeholder	ICP-NSPS-GEN-5	Diesel	447	600
Placeholder	ICP-NSPS-GEN-6	Diesel	447	600
Placeholder	ICP-NSPS-GEN-7	Diesel	447	600
Placeholder	ICP-NSPS-GEN-8	Diesel	447	600

Maximum Rating for the group of Small Units	447
Total kW for Group of Small Generators	2,747
Total hp for Group of Small Generators	3,693

Replaced Engines

Building No.	Requested Permit ID	Fuel Type	Rating (kW)	Rating (hp)
Small Units (< 600 hp)				
1640	CP-1640-GEN-1	Diesel	462	619
Large Units (> 600 hp)				
3987	CP-3987-GEN	Diesel	900	1,207

Emission calculations were provided for CP-3987-GEN to demonstrate that NSPS unit emissions are lower than pre-NSPS existing unit.

kW converted to hp using conversion factor of 0.7457 kW/hp when manufacturer data was unavailable.
Placeholders assumed at maximum rating for small units for conservatism (600 hp).

Potential Emissions For Building 5373 Small Emergency Engine

Potential emissions for emergency use units are calculated assuming 500 hours of operation per year per unit.

Building Number: 5373
Emission Source ID: ICP-5373-GEN

Fuel:	*Diesel*	
Rating:	200	kW each
	268	hp each
Operating Hours:	500	hr/yr total
Number of Units:	1	

CAS #	Compound	TAP	HAP	PAH	POM	Emission Factors (lb/MMBtu) [1] IC Engines (<447 KW, 600 HP) Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr) [3]	Total Emissions (ton/yr)
Greenhouse Gas Pollutants [2]								
CO_2	CARBON DIOXIDE					1.63E+02	1.14E+00	76.471
CH_4	METHANE					6.61E-03	4.63E-05	0.003
N_2O	NITROUS OXIDE					1.32E-03	9.26E-06	0.001
Criteria Pollutants								
CO	CARBON MONOXIDE					7.09E-01	5.73E-03	0.38
NO_x	NITROGEN OXIDE					7.62E-01	6.16E-03	0.41
PM	PARTICULATE MATTER					4.09E-02	3.31E-04	0.02
PM_{10}	PARTICULATE MATTER (LESS THAN 10μ)					4.09E-02	3.31E-04	0.02
$PM_{2.5}$	PARTICULATE MATTER (LESS THAN 2.5μ)					4.09E-02	3.31E-04	0.02
SO_2	SULFUR DIOXIDE					1.55E-03	1.26E-05	0.00
VOC	VOLATILE ORGANIC COMPOUNDS					5.95E-02	4.81E-04	0.03
Organic Compounds		***TAP***	***HAP***	***PAH***	***POM***	**(lb/MMBtu)**	**(lb/hp-hr)**	**(lb/yr)**
106-99-0	1,3-BUTADIENE	*Y*	*Y*			1.84E-05	1.49E-07	0.02
75-07-0	ACETALDEHYDE	*Y*	*Y*			3.61E-04	2.92E-06	0.39
107-02-8	ACROLEIN	*Y*	*Y*			4.36E-05	3.52E-07	0.05
71-43-2	BENZENE	*Y*	*Y*			4.39E-04	3.55E-06	0.48
108-88-3	TOLUENE	*Y*	*Y*			1.93E-04	1.56E-06	0.21
1330-20-7	XYLENE (MIXED ISOMERS)	*Y*	*Y*			1.34E-04	1.09E-06	0.15
50-00-0	FORMALDEHYDE	*Y*	*Y*			5.56E-04	4.50E-06	0.60
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		***TAP***	***HAP***	***PAH***	***POM***	**(lb/MMBtu)**	**(lb/hp-hr)**	**(lb/yr)**
83-32-9	ACENAPHTHENE		*Y*		*Y*	6.69E-07	5.41E-09	7.25E-04
208-96-8	ACENAPHTHYLENE		*Y*		*Y*	2.38E-06	1.93E-08	2.59E-03
120-12-7	ANTHRACENE		*Y*		*Y*	8.81E-07	7.12E-09	9.54E-04
56-55-3	BENZ(A)ANTHRACENE		*Y*	*Y*	*Y*	7.91E-07	6.40E-09	8.58E-04
205-99-2	BENZO(B)FLUORANTHENE		*Y*	*Y*	*Y*	4.67E-08	3.78E-10	5.07E-05
207-08-9	BENZO(K)FLUORANTHENE		*Y*	*Y*	*Y*	7.30E-08	5.90E-10	7.91E-05
191-24-2	BENZO(G,H,I)PERYLENE		*Y*		*Y*	2.30E-07	1.86E-09	2.49E-04
50-32-8	BENZO(A)PYRENE	*Y*	*Y*	*Y*	*Y*	8.85E-08	7.16E-10	9.59E-05
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		*Y*	*Y*	*Y*	1.66E-07	1.34E-09	1.80E-04
53-70-3	DIBENZO(A,H)ANTHRACENE		*Y*	*Y*	*Y*	2.75E-07	2.22E-09	2.97E-04
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		*Y*		*Y*	3.58E-06	2.90E-08	3.89E-03
86-73-7	FLUORENE		*Y*		*Y*	1.38E-05	1.11E-07	1.49E-02
193-39-5	INDENO(1,2,3-CD)PYRENE		*Y*	*Y*	*Y*	1.77E-07	1.43E-09	1.92E-04
129-00-0	PYRENE		*Y*		*Y*	2.25E-06	1.82E-08	2.44E-03
91-20-3	NAPHTHALENE		*Y*		*Y*	3.99E-05	3.23E-07	4.33E-02
85-01-8	PHENANTHRENE		*Y*		*Y*	1.38E-05	1.12E-07	1.50E-02

1. Values for diesel internal combustion taken from Table 3-4. Criteria Pollutant Emission Factors for Stationary Emergency Non-Fire Pump Compression Ignition ICOM Engines for displacement < 10, 175 ≤ hp < 600, NSPS-2007. Please note that $PM=PM_{10}=PM_{2.5}$ and HAP emissions are from Table 3-7. HAP Emission Factors for Stationary Compression Ignition ICOM Engines (Air Emissions Guide for Air Force Stationary Sources, AFCEC, June 2020).

2. GHG factors taken from 40 CFR Part 98, Subpart C, Table C-1 for Distillate Fuel No. 2 and from Table C-2 for Petroleum fuel types.

3. In accordance with EPA's AP-42 Chapter 3.3 (Table 3.3-1; Reference a), an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr, when necessary.

Potential Emissions For Buildings 6012-6016 Small Emergency Engines

Potential emissions for emergency use units are calculated assuming 500 hours of operation per year per unit.

Building Number: 3981, 6012-6016
Emission Source ID: ICP-3981-GEN-2 and ICP-6012-6016-GEN

	3981	6012-6016	UOM
Fuel:	*Diesel*		
Rating:	60	50	kW each
	80	69	hp each
Operating Hours:	500	2,500	hr/yr total
Number of Units:	1	5	

CAS #	Compound	TAP	HAP	PAH	POM	Emission Factors (lb/MMBtu) [1] IC Engines (≤447 KW, 600 HP) Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr) [3]	Emissions for 3981 Unit (ton/yr)	Emissions per Placeholder Unit (ton/yr)	Total Emissions 6 Units (ton/yr)
Greenhouse Gas Pollutants [2]										
CO_2	CARBON DIOXIDE					1.63E+02	1.14E+00	22.83	24.25	121.27
CH_4	METHANE					6.61E-03	4.63E-05	0.001	0.001	0.005
N_2O	NITROUS OXIDE					1.32E-03	9.26E-06	0.0002	0.0002	0.001
Criteria Pollutants										
CO	CARBON MONOXIDE					1.01E+00	8.16E-03	1.63E-01	1.73E-01	8.67E-01
NO_x	NITROGEN OXIDE					8.89E-01	7.19E-03	1.44E-01	1.53E-01	7.64E-01
PM	PARTICULATE MATTER					8.18E-02	6.61E-04	1.32E-02	1.40E-02	7.02E-02
PM_{10}	PARTICULATE MATTER (LESS THAN 10μ)					8.18E-02	6.61E-04	1.32E-02	1.40E-02	7.02E-02
$PM_{2.5}$	PARTICULATE MATTER (LESS THAN 2.5μ)					8.18E-02	6.61E-04	1.32E-02	1.40E-02	7.02E-02
SO_2	SULFUR DIOXIDE					1.55E-03	1.26E-05	2.52E-04	2.68E-04	1.34E-03
VOC	VOLATILE ORGANIC COMPOUNDS					6.94E-02	5.62E-04	1.12E-02	1.19E-02	5.97E-02
Organic Compounds		*TAP*	*HAP*	*PAH*	*POM*	(lb/MMBtu)	(lb/hp-hr)	lb/yr	lb/yr	(lb/yr)
106-99-0	1,3-BUTADIENE	*Y*	*Y*			1.84E-05	1.49E-07	0.01	0.01	0.03
75-07-0	ACETALDEHYDE	*Y*	*Y*			3.61E-04	2.92E-06	0.12	0.12	0.62
107-02-8	ACROLEIN	*Y*	*Y*			4.36E-05	3.52E-07	0.01	0.01	0.07
71-43-2	BENZENE	*Y*	*Y*			4.39E-04	3.55E-06	0.14	0.15	0.75
108-88-3	TOLUENE	*Y*	*Y*			1.93E-04	1.56E-06	0.06	0.07	0.33
1330-20-7	XYLENE (MIXED ISOMERS)	*Y*	*Y*			1.34E-04	1.09E-06	0.04	0.05	0.23
50-00-0	FORMALDEHYDE	*Y*	*Y*			5.56E-04	4.50E-06	0.18	0.19	0.96
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		*TAP*	*HAP*	*PAH*	*POM*	(lb/MMBtu)	(lb/hp-hr)	lb/yr	lb/yr	(lb/yr)
83-32-9	ACENAPHTHENE		*Y*		*Y*	6.69E-07	5.41E-09	2.16E-04	2.30E-04	1.15E-03
208-96-8	ACENAPHTHYLENE		*Y*		*Y*	2.38E-06	1.93E-08	7.72E-04	8.20E-04	4.10E-03
120-12-7	ANTHRACENE		*Y*		*Y*	8.81E-07	7.12E-09	2.85E-04	3.03E-04	1.51E-03
56-55-3	BENZ(A)ANTHRACENE		*Y*	*Y*	*Y*	7.91E-07	6.40E-09	2.56E-04	2.72E-04	1.36E-03
205-99-2	BENZO(B)FLUORANTHENE		*Y*	*Y*	*Y*	4.67E-08	3.78E-10	1.51E-05	1.61E-05	8.03E-05
207-08-9	BENZO(K)FLUORANTHENE		*Y*	*Y*	*Y*	7.30E-08	5.90E-10	2.36E-05	2.51E-05	1.25E-04
191-24-2	BENZO(G,H,I)PERYLENE		*Y*		*Y*	2.30E-07	1.86E-09	7.44E-05	7.91E-05	3.95E-04
50-32-8	BENZO(A)PYRENE	*Y*	*Y*	*Y*	*Y*	8.85E-08	7.16E-10	2.86E-05	3.04E-05	1.52E-04
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		*Y*	*Y*	*Y*	1.66E-07	1.34E-09	5.36E-05	5.70E-05	2.85E-04
53-70-3	DIBENZO(A,H)ANTHRACENE		*Y*	*Y*	*Y*	2.75E-07	2.22E-09	8.88E-05	9.44E-05	4.72E-04
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		*Y*		*Y*	3.58E-06	2.90E-08	1.16E-03	1.23E-03	6.16E-03
86-73-7	FLUORENE		*Y*		*Y*	1.38E-05	1.11E-07	4.44E-03	4.72E-03	2.36E-02
193-39-5	INDENO(1,2,3-CD)PYRENE		*Y*	*Y*	*Y*	1.77E-07	1.43E-09	5.72E-05	6.08E-05	3.04E-04
129-00-0	PYRENE		*Y*		*Y*	2.25E-06	1.82E-08	7.28E-04	7.74E-04	3.87E-03
91-20-3	NAPHTHALENE		*Y*		*Y*	3.99E-05	3.23E-07	1.29E-02	1.37E-02	6.86E-02
85-01-8	PHENANTHRENE		*Y*		*Y*	1.38E-05	1.12E-07	4.48E-03	4.76E-03	2.38E-02

1. Values for diesel internal combustion taken from Table 3-4. Criteria Pollutant Emission Factors for Stationary Emergency Non-Fire Pump Compression Ignition ICOM Engines for displacement < 10, 50 ≤ hp < 100, NSPS 2008. Please note that $PM=PM_{10}=PM_{2.5}$ and HAP emissions are from Table 3-7. HAP Emission Factors for Stationary Compression Ignition ICOM Engines (Air Emissions Guide for Air Force Stationary Sources, AFCEC, June 2020).
2. GHG factors taken from 40 CFR Part 98, Subpart C, Table C-1 for Distillate Fuel No. 2 and from Table C-2 for Petroleum fuel types.
3. In accordance with EPA's AP-42 Chapter 3.3 (Table 3.3-1; Reference a), an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr, when necessary.

Potential Emissions For Placeholder Small Emergency Engines

Potential emissions for emergency use units are calculated assuming 500 hours of operation per year per unit.

Building Number: TBD (Placeholders)
Emission Source ID: ICP-NSPS-GEN-4 to 8

Fuel:	*Diesel*	
Rating:	447	kW each
	600	hp each
Operating Hours:	2,500	hr/yr total
Number of Units:	5	

CAS #	Compound					Emission Factors (lb/MMBtu) [1] IC Engines (<447 KW, 600 HP) Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr) [3]	Emissions per Placeholder Unit (ton/yr)	Total Emissions (ton/yr)
Greenhouse Gas Pollutants [2]									
CO_2	CARBON DIOXIDE					1.63E+02	1.14E+00	171	856.024
CH_4	METHANE					6.61E-03	4.63E-05	0.01	0.035
N_2O	NITROUS OXIDE					1.32E-03	9.26E-06	0.001	0.007
Criteria Pollutants									
CO	CARBON MONOXIDE					7.09E-01	5.73E-03	0.86	4.30
NO_x	NITROGEN OXIDE					7.62E-01	6.16E-03	0.92	4.62
PM	PARTICULATE MATTER					4.09E-02	3.31E-04	0.05	0.25
PM_{10}	PARTICULATE MATTER (LESS THAN 10μ)					4.09E-02	3.31E-04	0.05	0.25
$PM_{2.5}$	PARTICULATE MATTER (LESS THAN 2.5μ)					4.09E-02	3.31E-04	0.05	0.25
SO_2	SULFUR DIOXIDE					1.55E-03	1.26E-05	0.00	0.01
VOC	VOLATILE ORGANIC COMPOUNDS					5.95E-02	4.81E-04	0.07	0.36
Organic Compounds		***TAP***	***HAP***	***PAH***	***POM***	**(lb/MMBtu)**	**(lb/hp-hr)**	**lb/yr**	**(lb/yr)**
106-99-0	1,3-BUTADIENE	*Y*	*Y*			1.84E-05	1.49E-07	0.04	0.22
75-07-0	ACETALDEHYDE	*Y*	*Y*			3.61E-04	2.92E-06	0.88	4.38
107-02-8	ACROLEIN	*Y*	*Y*			4.36E-05	3.52E-07	0.11	0.53
71-43-2	BENZENE	*Y*	*Y*			4.39E-04	3.55E-06	1.07	5.33
108-88-3	TOLUENE	*Y*	*Y*			1.93E-04	1.56E-06	0.47	2.34
1330-20-7	XYLENE (MIXED ISOMERS)	*Y*	*Y*			1.34E-04	1.09E-06	0.33	1.64
50-00-0	FORMALDEHYDE	*Y*	*Y*			5.56E-04	4.50E-06	1.35	6.75
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		***TAP***	***HAP***	***PAH***	***POM***	**(lb/MMBtu)**	**(lb/hp-hr)**	**lb/yr**	**(lb/yr)**
83-32-9	ACENAPHTHENE		*Y*		*Y*	6.69E-07	5.41E-09	1.62E-03	8.12E-03
208-96-8	ACENAPHTHYLENE		*Y*		*Y*	2.38E-06	1.93E-08	5.79E-03	2.90E-02
120-12-7	ANTHRACENE		*Y*		*Y*	8.81E-07	7.12E-09	2.14E-03	1.07E-02
56-55-3	BENZ(A)ANTHRACENE		*Y*	*Y*	*Y*	7.91E-07	6.40E-09	1.92E-03	9.60E-03
205-99-2	BENZO(B)FLUORANTHENE		*Y*	*Y*	*Y*	4.67E-08	3.78E-10	1.13E-04	5.67E-04
207-08-9	BENZO(K)FLUORANTHENE		*Y*	*Y*	*Y*	7.30E-08	5.90E-10	1.77E-04	8.85E-04
191-24-2	BENZO(G,H,I)PERYLENE		*Y*		*Y*	2.30E-07	1.86E-09	5.58E-04	2.79E-03
50-32-8	BENZO(A)PYRENE	*Y*	*Y*	*Y*	*Y*	8.85E-08	7.16E-10	2.15E-04	1.07E-03
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		*Y*	*Y*	*Y*	1.66E-07	1.34E-09	4.02E-04	2.01E-03
53-70-3	DIBENZO(A,H)ANTHRACENE		*Y*	*Y*	*Y*	2.75E-07	2.22E-09	6.66E-04	3.33E-03
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		*Y*		*Y*	3.58E-06	2.90E-08	8.70E-03	4.35E-02
86-73-7	FLUORENE		*Y*		*Y*	1.38E-05	1.11E-07	3.33E-02	1.67E-01
193-39-5	INDENO(1,2,3-CD)PYRENE		*Y*	*Y*	*Y*	1.77E-07	1.43E-09	4.29E-04	2.15E-03
129-00-0	PYRENE		*Y*		*Y*	2.25E-06	1.82E-08	5.46E-03	2.73E-02
91-20-3	NAPHTHALENE		*Y*		*Y*	3.99E-05	3.23E-07	9.69E-02	4.85E-01
85-01-8	PHENANTHRENE		*Y*		*Y*	1.38E-05	1.12E-07	3.36E-02	1.68E-01

1. Values for diesel internal combustion taken from Table 3-4. Criteria Pollutant Emission Factors for Stationary Emergency Non-Fire Pump Compression Ignition ICOM Engines for displacement < 10, 175 ≤ hp < 600, NSPS-2007. Please note that $PM=PM_{10}=PM_{2.5}$ and HAP emissions are from Table 3-7. HAP Emission Factors for Stationary Compression Ignition ICOM Engines (Air Emissions Guide for Air Force Stationary Sources, AFCEC, June 2020).

2. GHG factors taken from 40 CFR Part 98, Subpart C, Table C-1 for Distillate Fuel No. 2 and from Table C-2 for Petroleum fuel types.

3. In accordance with EPA's AP-42 Chapter 3.3 (Table 3.3-1; Reference a), an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr, when necessary.

Potential Emissions For Large Emergency Engine Modification

Emergency engine CP-3987-GEN 750 kW non-NSPS engine was replaced with a 900 kW NSPS engine.
Potential emissions for emergency use units are calculated assuming 500 hours of operation per year.

Building Number: 3987
Emission Source ID: CP-3987-GEN
Number of Generators: 1

Engine	Existing	Replacement	UOM
Fuel:	Diesel	Diesel	-
Rating:	750	900	kW
	1,006	1207	hp
Operating Hours:	500	500	hr/yr

CAS #	Compound	TAP	HAP	PAH	POM	Emission Factors (lb/MMBtu) IC Engines (>447 KW, 600 HP) Emission Factor (lb/MMBtu)[1]	Emission Factor (lb/hp-hr) [1,3]	NSPS Emission Factors (lb/hp-hr)[4]	Original 750 kW Emissions (ton/yr)	Replacement 900 kW Emissions (ton/yr)	Modification Emissions Change (ton/yr)
Greenhouse Gas Pollutants [2]											
CO_2	CARBON DIOXIDE					1.63E+02	1.14E+00	1.14E+00	287	344	57
CH_4	METHANE					6.61E-03	4.63E-05	4.63E-05	0.01	0.01	0.00
N_2O	NITROUS OXIDE					1.32E-03	9.26E-06	9.26E-06	0.002	0.003	0.000
Criteria Pollutants											
CO	CARBON MONOXIDE					8.50E-01	5.50E-03	9.86E-04	1.38	0.30	(1.09)
NO_x	NITROGEN OXIDE					3.20E+00	2.40E-02	9.06E-03	6.04	2.73	(3.30)
PM	PARTICULATE MATTER					6.97E-02	4.88E-04	2.63E-04	0.12	0.08	(0.04)
PM_{10}	PARTICULATE MATTER (LESS THAN 10µ)					5.73E-02	4.01E-04	2.63E-04	0.10	0.08	(0.02)
$PM_{2.5}$	PARTICULATE MATTER (LESS THAN 2.5µ)					5.56E-02	3.89E-04	2.63E-04	0.10	0.08	(0.02)
SO_2	SULFUR DIOXIDE					1.52E-03	1.21E-05	1.26E-05	0.003	0.004	0.001
VOC	VOLATILE ORGANIC COMPOUNDS					9.00E-02	7.05E-04	4.12E-04	0.18	0.12	(0.05)
Organic Compounds		***TAP***	***HAP***	***PAH***	***POM***	(lb/MMBtu)	(lb/hp-hr)		(lb/yr)	(lb/yr)	(lb/yr)
106-99-0	1,3-BUTADIENE	Y	Y			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
75-07-0	ACETALDEHYDE	Y	Y			2.52E-05	1.76E-07	6.72E-08	8.87E-02	4.06E-02	-4.82E-02
107-02-8	ACROLEIN	Y	Y			7.88E-06	5.52E-08	2.10E-08	2.77E-02	1.27E-02	-1.51E-02
71-43-2	BENZENE	Y	Y			7.76E-04	5.43E-06	2.07E-06	2.73E+00	1.25E+00	-1.48E+00
108-88-3	TOLUENE	Y	Y			2.81E-04	1.97E-06	7.49E-07	9.89E-01	4.52E-01	-5.37E-01
1330-20-7	XYLENE (MIXED ISOMERS)	Y	Y			1.93E-04	1.35E-06	5.15E-07	6.80E-01	3.11E-01	-3.69E-01
50-00-0	FORMALDEHYDE	Y	Y			7.89E-05	5.52E-07	2.10E-07	2.78E-01	1.27E-01	-1.51E-01
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		***TAP***	***HAP***	***PAH***	***POM***	(lb/MMBtu)	(lb/hp-hr)		(lb/yr)	(lb/yr)	(lb/yr)
120-12-7	ANTHRACENE		Y		Y	1.23E-06	8.61E-09	3.28E-09	4.33E-03	1.98E-03	-2.35E-03
208-96-8	ACENAPHTHYLENE		Y		Y	9.23E-06	6.46E-08	2.46E-08	3.25E-02	1.48E-02	-1.77E-02
83-32-9	ACENAPHTHENE		Y		Y	4.68E-06	3.28E-08	1.25E-08	1.65E-02	7.54E-03	-8.93E-03
86-73-7	FLUORENE		Y		Y	1.28E-05	8.96E-08	3.41E-08	4.51E-02	2.06E-02	-2.45E-02
129-00-0	PYRENE		Y		Y	3.71E-06	2.60E-08	9.89E-09	1.31E-02	5.97E-03	-7.09E-03
191-24-2	BENZO(G,H,I)PERYLENE		Y		Y	5.56E-07	3.89E-09	1.48E-09	1.96E-03	8.93E-04	-1.06E-03
91-20-3	NAPHTHALENE		Y		Y	1.30E-04	9.10E-07	3.47E-07	4.58E-01	2.09E-01	-2.48E-01
85-01-8	PHENANTHRENE		Y		Y	4.08E-05	2.86E-07	1.09E-07	1.44E-01	6.58E-02	-7.79E-02
56-55-3	BENZ(A)ANTHRACENE		Y	Y	Y	6.22E-07	4.35E-09	1.66E-09	2.19E-03	1.00E-03	-1.19E-03
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		Y	Y	Y	1.53E-06	1.07E-08	4.08E-09	5.39E-03	2.46E-03	-2.92E-03
50-32-8	BENZO(A)PYRENE	Y	Y	Y	Y	2.57E-07	1.80E-09	6.85E-10	9.05E-04	4.13E-04	-4.91E-04
205-99-2	BENZO(B)FLUORANTHENE		Y	Y	Y	1.11E-06	7.77E-09	2.96E-09	3.91E-03	1.79E-03	-2.12E-03
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		Y		Y	4.03E-06	2.82E-08	1.07E-08	1.42E-02	6.46E-03	-7.73E-03
207-08-9	BENZO(K)FLUORANTHENE		Y	Y	Y	2.18E-07	1.53E-09	5.81E-10	7.68E-04	3.51E-04	-4.17E-04
53-70-3	DIBENZO(A,H)ANTHRACENE		Y	Y	Y	3.46E-07	2.42E-09	9.22E-10	1.22E-03	5.56E-04	-6.62E-04
193-39-5	INDENO(1,2,3-CD)PYRENE		Y	Y	Y	4.14E-07	2.90E-09	1.10E-09	1.46E-03	6.64E-04	-7.94E-04

1. Values for diesel internal combustion taken from EPA's AP-42 Chapter 3.4 (>600 hp). Please note that only TAP, HAP, PAH, and POM shown in calculations.
2. GHG factors and heat content taken from 40 CFR Part 98, Subpart C, Table C-1 for Distillate Fuel No. 2 and from Table C-2 for Petroleum fuel types.
3. In accordance with EPA's AP-42 Chapter 3.3 (Table 3.3-1; Reference a), an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr, when necessary. AP-42 Table 3.4-1 Based on data from 1 engine, TOC is by weight 9% methane and 91% nonmethane.
4. Emission factors for CO, NOx, PM and VOC were obtained from the EPA certificate of conformity for engine family KMVXL33.9BBA-009. For particulate matter (PM), it is assumed that $PM=PM_{10}=PM_{2.5}$. HAP emissions are from Table 3-7. HAP Emission Factors for Stationary Compression Ignition ICOM Engines (Air Emissions Guide for Air Force Stationary Sources, AFCEC, June 2020).

Heat content 138,000 Btu/gallon
Sulfur Content 0.0015 %

Aboveground Storage Tank Requested for Addition to the Permit

The units presented in this section are determined by location or unit purpose. Tank emissions are calculated via the methods described in United States Environmental Protection Agency's AP-42, Compilation of Air Pollutant Emissions Factors, Chapter 7.1, Organic Liquid Storage Tanks. The emission calculations on the following pages are performed for the largest tank per fuel type to demonstrate insignificant emissions.

Building No.	Requested Permit ID	Fuel Type	Capacity (gallons)
Insignificant Tanks			
4223	ICP-4223-4-AST	Gasoline	500
4259	ICP-4259-2-AST	Diesel	250
4390	ICP-4390-4-AST	Diesel	275
4390	ICP-4390-5-AST	Diesel	275
4390	ICP-4390-6-AST	Diesel	275
4415	ICP-4415-AST	Diesel	325
4854	ICP-4854-AST	Diesel	1,200

Maximum Capacity for Diesel	1,200
Maximum Capacity for Gasoline	500

Aboveground Storage Tank Emissions for Largest Tank by Fuel Type

Diesel Emission Unit (1,200 gal)	Emissions, tpy						
	VOC	Naphthalene	Biphenyl	Cumene	Xylene	Ethylbenzene	Total HAPs
Tank	7.81E-03	2.22E-04	5.16E-04	5.22E-04	7.85E-05	6.25E-03	7.59E-03
Loading	1.54E-02	4.39E-04	1.02E-03	1.03E-03	1.55E-04	1.24E-02	1.50E-02
Total	**2.33E-02**	**6.61E-04**	**1.54E-03**	**1.56E-03**	**2.34E-04**	**1.86E-02**	**2.26E-02**

Gasoline Emission Unit (500 gal)	Emissions, tpy							
	VOC	Benzene	n-Hexane	Toluene	Xylene	Ethylbenzene	Naphthalene	Total HAPs
Tank	5.71E-04	5.34E-06	1.44E-05	1.68E-04	2.26E-04	6.80E-06	1.50E-04	5.71E-04
Tank Loading	1.47E-03	1.37E-05	3.71E-05	4.31E-04	5.81E-04	1.75E-05	3.86E-04	1.47E-03
Total	**2.04E-03**	**1.91E-05**	**5.15E-05**	**5.99E-04**	**8.08E-04**	**2.43E-05**	**5.37E-04**	**6.69E-04**

Aboveground Storage Tank Vapor Pressure for Diesel Constituents

Vapor Pressure Derivations

Vapor Pressures estimated using Antoine's Equation.

$$\log P_{VA} = A - \left(\frac{B}{T_{LA} + C}\right)$$

Equation 1-26

P_{VA} = vapor pressure at average liquid surface temperature, mmHg
P_{Xi} = partial pressure of component i

log = log 10
A = constant in vapor pressure equation, dimensionless
B = constant in vapor pressure equation, °CC
= constant in vapor pressure equation, °C
T_{LA} = average daily liquid surface temperature, °C
P_{VA} = vapor pressure at average liquid surface temperature, mmHg

Chemical[1,2]	Temperature (Degrees F)				20	30	40	50	60	70	80	100	120	130	140	150	160	190	200	240	
	Temperature (Degrees C)				-7	-1	4	10	16	21	27	38	49	54	60	66	71	88	93	116	
	A	B	C	Molecular Weight	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	Density (lb/gal)
Trimethylbenzene isomers	7.044	1,573.30	208.56	120.19	0.18	0.29	0.45	0.70	1.06	1.56	2.27	4.54	8.57	11.53	15.34	20.16	26.21	54.31	68.01	154.83	7.31
Naphthalene	7.146	1,831.60	211.82	128.17	0.02	0.03	0.05	0.08	0.12	0.19	0.29	0.64	1.32	1.85	2.56	3.49	4.70	10.78	13.92	35.58	8.56
Biphenyl	7.245	1,998.70	202.73	154.21	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.09	0.20	0.30	0.43	0.62	0.88	2.32	3.12	9.23	8.68
Cumene	6.929	1,455.81	207.202	120.19	0.47	0.73	1.12	1.69	2.48	3.57	5.06	9.70	17.56	23.19	30.26	39.08	49.94	98.63	121.68	262.27	7.19
Xylene	7.021	1,474.40	217.77	106.17	1.09	1.64	2.43	3.53	5.03	7.06	9.75	17.84	31.03	40.24	51.64	65.63	82.64	156.88	191.31	396.00	7.19
Ethylbenzene	6.95	1,419.30	212.61	134	1.14	1.74	2.58	3.75	5.36	7.54	10.43	19.12	33.30	43.19	55.42	70.41	88.62	167.92	204.60	421.74	7.24

1 - Constants derived from AP-42 Chapter 7, Table 7.1-3 where available.

2 - Constants for cumene derived from National Institute of Standards and Technology Chemistry WebBook, SRD 69. Constants were converted from pressure in bar and temperature in K to pressure in mmHg and temperature in C.

Aboveground Storage Tank Emissions for Largest Diesel Tank

Tank Emissions

Tank ID: ICP-4854-AST
Material: Diesel

The following tank emissions are calculated via the methods described in United States Environmental Protection Agency's AP-42, *Compilation of Air Pollutant Emissions Factors* , Chapter 7.1, *Organic Liquid Storage Tanks* .

Tank Information

Tank Orientation:	Horizontal
Roof Type:	Fixed
Roof Shape:	Dome
Roof Slope:	0.0625
Tank Condition:	Average
Paint Color:	White
Tank Insulation:	Uninsulated
Insulation Temperature:	
Tank Location:	Cherry Point, North Carolina
Nearest AP-42 Location:	Wilmington, NC
Tank Construction:	Welded
Tank Diameter (ft): Tank	10.3
Shell Height (ft): Liquid	5.3
Height (ft):	5.035

Paint Solar Absorbtance (α):	0.25
Breather Vent Pressure Setting, psig:	0.03
Breather Vent Vacuum Setting, psig:	-0.03
Vapor Molecular Weight, lb/lb-mol:	133
Liquid Molecular Weight, lb/lb-mol:	1420
Tank Capacity (bbl):	79
Tank Turnovers per year:	2
Tank Pressure (N/A if atmospheric):	N/A

See equations 1-14 and 1-15
See equations 1-14 and 1-15

Month	Turnovers/Month	Monthly Throughput bbl/month
January	0.17	13
February	0.17	13
March	0.17	13
April	0.17	13
May	0.17	13
June	0.17	13
July	0.17	13
August	0.17	13
September	0.17	13
October	0.17	13
November	0.17	13
December	0.17	13
Annual:	2	157

Meteorological Data

The following Meteorological Data is based on the nearest location to the tank listed in Table 7.1-7, Wilmington, NC.

Month	Days	T_{AN} °F	T_{AX} °F	V mi/hr	I Btu/ft²/day	P_A psi
January	31	36.9	56.3	8.1	811	14.68
February	28	38	58.8	8.3	1,068	14.68
March	31	44.2	65.5	8.9	1,426	14.68
April	30	52.5	73.7	9.2	1,808	14.68
May	31	60.7	79.7	8.3	1,938	14.68
June	30	69.2	85.7	7.4	1,942	14.68
July	31	73	88.7	6.9	1,917	14.68
August	31	71.5	87.2	6.5	1,722	14.68
September	30	66.2	82.6	7.2	1,405	14.68
October	31	55.1	74.8	6.5	1,178	14.68
November	30	45.3	66.7	6.9	910	14.68
December	31	38.1	58.4	7.4	747	14.68

Tank Emissions

VOC

Speciated VOC emissions are calculated using equation 1-1 as shown below. Detailed emissions calculations for this tank are included on the following pages.

Aboveground Storage Tank Emissions for Largest Diesel Tank

$$L_T = L_S + L_W$$ Equation 1-1

L_T = total loss, lb
L_S = standing storage losses, lb
L_W = working losses, lb

Month	L_S lb/month	L_W lb/month	L_T lb/month
January	3.82E-01	8.62E-02	4.68E-01
February	4.50E-01	1.00E-01	5.50E-01
March	7.56E-01	1.38E-01	8.94E-01
April	1.12E+00	1.97E-01	1.32E+00
May	1.50E+00	2.67E-01	1.77E+00
June	1.77E+00	3.54E-01	2.13E+00
July	2.01E+00	4.02E-01	2.41E+00
August	1.83E+00	3.83E-01	2.21E+00
September	1.35E+00	3.06E-01	1.66E+00
October	1.06E+00	2.16E-01	1.28E+00
November	6.95E-01	1.46E-01	8.41E-01
December	4.51E-01	9.96E-02	5.50E-01
Annual	**1.34E+01**	**2.69E+00**	**1.61E+01**

VOC Annual Emissions (tpy):

VOC	**7.81E-03**

HAP Annual Emissions (tpy):

Naphthalene	**2.22E-04**
Biphenyl	**5.16E-04**
Cumene	**5.22E-04**
Xylene	**7.85E-05**
Ethylbenzene	**6.25E-03**

Tank Contents

	Z_{Li} (wt% L)	MW (lb/lb-mol)	xi (mol% L)	Pi (psi)	Summed for VOC? (Y/N)	yi (mol% V)	Z_{Vi} (wt% V)
Trimethylbenzene isomers	2.000%	120	2.36E-01	4.35E-03		3.15E-02	2.84E-02
Naphthalene	2.000%	128	2.22E-01	4.08E-03	Y	2.95E-02	2.84E-02
Biphenyl	2.000%	154	1.84E-01	7.90E-03	Y	5.71E-02	6.61E-02
Cumene	1.000%	120	1.18E-01	1.02E-02	Y	7.41E-02	6.69E-02
Xylene	1.000%	106	1.34E-01	1.74E-03	Y	1.26E-02	1.01E-02
Ethylbenzene	1.000%	134	1.06E-01	1.10E-01	Y	7.95E-01	8.00E-01

Tank Temperature Data Tank Insulation: Uninsulated

$$\Delta T_V = \left(1 - \frac{0.8}{2.2\,(H_S/D) + 1.9}\right)\Delta T_A + \frac{0.042\alpha_R I + 0.026(H_S/D)\alpha_S I}{2.2\,(H_S/D) + 1.9}$$ Equation 1-6

ΔT_V = daily vapor temperature range, °R
H_S = tank shell height, ft
D = tank diameter, ft
ΔT_A = daily ambient temperature range, °R
α_R = tank roof paint solar absorptance, dimensionless
α_S = tank shell paint solar absorptance, dimensionlessI
= daily total solar insolation factor, Btu/ft² d

$$T_{LA} = \left(0.5 - \frac{0.8}{4.4(H_S/D) + 3.8}\right) T_{AA} + \left(0.5 + \frac{0.8}{4.4(H_S/D) + 3.8}\right) T_B + \frac{0.021\,\alpha_R\, I + 0.013(H_S/D)\,\alpha_S\, I}{4.4(H_S/D) + 3.8}$$ Equation 1-27

T_{LA}= average daily liquid surface temperature, °R
T_{AA} = average daily ambient temperature, °R
T_B = liquid bulk temperature, °R

$$T_{AA} = \left(\frac{T_{AX} + T_{AN}}{2}\right)$$ Equation 1-30

$$\Delta T_A = T_{AX} - T_{AN}$$ Equation 1-11

ΔT_A = daily ambient temperature range, °R T_{AX}
= daily maximum ambient temperature, °RT_{AN} =
daily minimum ambient temperature, °R

$$T_B = T_{AA} + 0.003\,\alpha_S\, I$$ Equation 1-31

$$T_V = \frac{[2.2\,(H_S/D)+1.1]\,T_{AA} + 0.8\,T_B + 0.021\alpha_R I + 0.013(H_S/D)\alpha_S I}{2.2\,(H_S/D) + 1.9}$$ Equation 1-32

T_V = average vapor temperature, °R

Notes: Assume $\alpha_R = \alpha_S$.

Aboveground Storage Tank Emissions for Largest Diesel Tank

H_S/D: 0.51
α_R and α_S: 0.25

Month	ΔT_V ºR	T_V ºR	T_{LA} ºR	T_{AX} ºR	T_{AN} ºR	ΔT_A ºR	T_{AA} ºR	T_B ºR
January	18	508	508	516	497	19	506	507
February	20	511	510	518	498	21	508	509
March	22	518	517	525	504	21	515	516
April	24	527	526	533	512	21	523	524
May	23	535	533	539	520	19	530	531
June	21	542	540	545	529	17	537	539
July	20	545	544	548	533	16	541	542
August	19	543	542	547	531	16	539	540
September	18	538	536	542	526	16	534	535
October	20	528	527	534	515	20	525	526
November	20	518	517	526	505	21	516	516
December	18	510	509	518	498	20	508	508

Pressure Data

$$\Delta P_V = P_{VX} - P_{VN}$$ Equation 1-9

ΔP_V = daily vapor pressure range, psi
P_{VX} = vapor pressure at daily maximum liquid surface temperature, psia
P_{VN} = vapor pressure at daily minimum liquid surface temperature, psia

Month	P_{VX} psia	P_{VN} psia	ΔP_V psia	P_{VA} psia
January	6.16E-02	3.92E-02	2.24E-02	5.06E-02
February	7.16E-02	4.47E-02	2.69E-02	5.91E-02
March	1.01E-01	5.97E-02	4.17E-02	8.27E-02
April	1.48E-01	8.32E-02	6.53E-02	1.20E-01
May	2.03E-01	1.12E-01	9.05E-02	1.65E-01
June	2.67E-01	1.52E-01	1.15E-01	2.21E-01
July	2.99E-01	1.80E-01	1.19E-01	2.53E-01
August	2.83E-01	1.75E-01	1.08E-01	2.40E-01
September	2.35E-01	1.35E-01	9.93E-02	1.90E-01
October	1.64E-01	9.58E-02	6.84E-02	1.32E-01
November	1.07E-01	6.72E-02	3.98E-02	8.75E-02
December	7.09E-02	4.61E-02	2.47E-02	5.86E-02

Note: P_{VX} and P_{VN} are calculated using the same method listed for P_{VA} above.

Aboveground Storage Tank Emissions for Largest Diesel Tank

Standing Storage Losses

$$L_S = 365 K_E \left(\frac{\pi}{4} D^2\right) H_{VO} K_S W_V$$ Equation 1-4

L_S = standing storage loss, lb/month
E_M = the number of daily events in month, (month)$^{-1}$
D = diameter, ft
H_{VO} = vapor space outage, ft
W_V = stock vapor density, lb/ft^3
K_E = vapor space expansion factor, dimensionless
K_S = vented vapor saturation factor, dimensionless

D	10.3
H_{VO}	3.70
S_R	0.0625
R_S	5.15
R_R	5.15
H_S	5.3
H_L	5.035
H_{RO}	3.43

Month	E_M days	W_V lb/ft^3	K_E	K_S	L_S lb/month
January	31	1.24E-03	0.03	1.00	3.82E-01
February	28	1.44E-03	0.04	1.00	4.50E-01
March	31	1.98E-03	0.04	1.00	7.56E-01
April	30	2.82E-03	0.04	1.00	1.12E+00
May	31	3.82E-03	0.04	1.00	1.50E+00
June	30	5.07E-03	0.04	1.00	1.77E+00
July	31	5.76E-03	0.04	1.00	2.01E+00
August	31	5.48E-03	0.03	1.00	1.83E+00
September	30	4.39E-03	0.03	1.00	1.35E+00
October	31	3.10E-03	0.04	1.00	1.06E+00
November	30	2.10E-03	0.04	1.00	6.95E-01
December	31	1.43E-03	0.03	1.00	4.51E-01

$$H_{VO} = H_S - H_L + H_{RO}$$ Equation 1-16

H_{VO} = vapor space outage, ft
H_S = tank shell height, ft
H_L = liquid height, ft
H_{RO} = roof outage, ft

Cone Roof:

$$H_{RO} = (1/3)\, H_R$$ Equation 1-17

Dome Roof:

$$H_{RO} = H_R \left[\frac{1}{2} + \frac{1}{6}\left[\frac{H_R}{R_S}\right]^2\right]$$ Equation 1-19

H_R = tank roof height, ft
S_R = tank cone roof slope, ft
R_S = tank shell radius, ft
R_R = tank dome radius, ft

Roof Shape: Dome

$$W_V = \frac{M_V P_{VA}}{R T_V}$$ Equation 1-22

W_V = vapor density, lb/ft^3
M_V = vapor molecular weight, lb/lb-mole
R = the ideal gas constant, 10.731 psia ft^3/lb-mole °R
P_{VA} = vapor pressure at daily average liquid surface temperature, psia

Equation 1-12 $K_E = 0.0018 \Delta T_V = 0.0018 [0.7 (T_{AX} - T_{AN}) + 0.02 \alpha I]$

Equation 1-21
$$K_S = \frac{1}{1 + 0.053 P_{VA} H_{VO}}$$

Working Losses

$$L_W = V_Q K_N K_P W_V K_B$$ Equation 1-35

L_W = working loss, lb
V_Q = net throughput, ft^3/month
K_N = working loss turnover (saturation) factor, dimensionless*
*turnovers >36 = (180 + N)/6N where N = # of turnovers/yr
*turnovers ≤36 = 1
K_P = working loss product factor for fixed roof tanks, dimensionless**
**1 for volatile organic liquids, 0.75 for crude oil
N = number of turnovers per year, dimensionless
K_B = vent setting correction factor, dimensionless, For a vent setting range up to ± 0.03 psig, K_B = 1

K_N	1
K_P	1

Month	ΣH_{QI} ft/yr	V_Q ft^3/month	K_B	L_W lb/month
January	0.84	69.92	1.00	8.62E-02
February	0.84	69.92	1.00	1.00E-01
March	0.84	69.92	1.00	1.38E-01
April	0.84	69.92	1.00	1.97E-01
May	0.84	69.92	1.00	2.67E-01
June	0.84	69.92	1.00	3.54E-01
July	0.84	69.92	1.00	4.02E-01
August	0.84	69.92	1.00	3.83E-01
September	0.84	69.92	1.00	3.06E-01
October	0.84	69.92	1.00	2.16E-01
November	0.84	69.92	1.00	1.46E-01
December	0.84	69.92	1.00	9.96E-02

Aboveground Storage Tank Emissions for Largest Diesel Tank

$$V_Q = (\Sigma H_{QI})(\pi/4)\, D^2$$ Equation 1-38

ΣH_{QI} = the annual sum of the increases in liquid level, ft/yr

$$K_B = \left[\frac{\frac{P_I + P_A}{K_N} - P_{VA}}{P_{BP} + P_A - P_{VA}} \right]$$ Equation 1-41

K_B = vent setting correction factor, dimensionless
P_I = pressure of the vapor space at normal operating conditions, psig
If the tank is held at atmospheric pressure (not held under a vacuum or at a steady pressure) P_I would be 0.
P_A = atmospheric pressure, psia

Aboveground Storage Loading Emissions for Largest Diesel Tank

Loading emissions are calculated via the methods described in United States Environmental Protection Agency's AP-42, *Compilation of Air Pollutant Emissions Factors* , Chapter 5.2, *Transportation And Marketing Of Petroleum Liquids* .

$$L_T = L_S + L_W \quad \text{Equation 1}$$

L_L = loading loss, pounds per 1000 gallons ($lb/10^3$ gal) of liquid loaded
S = a saturation factor
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)M
= molecular weight of vapors, pounds per pound-mole (lb/lb-mole)
T = temperature of bulk liquid loaded, °R
eff = control efficiency

Biodiesel

Material	Emissions (tpy)	
	Uncontrolled	Controlled
VOC	1.54E-02	N/A
Naphthalene	4.39E-04	N/A
Biphenyl	1.02E-03	N/A
Cumene	1.03E-03	N/A
Xylene	1.55E-04	N/A
Ethylbenzene	1.24E-02	N/A

Annual Loading Throughput	6,607	gal/year
Annual Loading Throughput	157	bbl/year
L_L (Uncontrolled)	4.68	$lb/10^3$ gal
L_L (Controlled)	4.68	$lb/10^3$ gal
S	1	
P	0.1	psia
M	1420	lb/lb-mol
T	523	°R
eff	0	

Average annual temperature and pressure are assumed.
Saturation Factor from AP-42 Table 5.2-1, assumed mode of operation is submerged loading: dedicated normal service

Aboveground Storage Tank Vapor Pressure for Gasoline Constituents

Vapor Pressures estimated using Antoine's Equation.

Vapor Pressure Derivations

$$\log P_{VA} = A - \left(\frac{B}{T_{LA} + C}\right)$$

Equation 1-26

P_{VA} = vapor pressure at average liquid surface temperature, mmHg
P_{Xi} = partial pressure of component i

log = log 10
A = constant in vapor pressure equation, dimensionless
B = constant in vapor pressure equation, °CC
= constant in vapor pressure equation, °C
T_{LA} = average daily liquid surface temperature, °C
P_{VA} = vapor pressure at average liquid surface temperature, mmHg

Chemical[1,2]	Temperature (Degrees F)				20	30	40	50	60	70	80	100	120	130	140	150	160	190	200	240	Density (lb/gal)
	Temperature (Degrees C)				-7	-1	4	10	16	21	27	38	49	54	60	66	71	88	93	116	
	A	B	C	Molecular Weight	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	P_{VA} (mmHg)	
Benzene	6.906	1,211.00	220.79	78.11	17.80	24.74	33.84	45.58	60.55	79.40	102.85	166.92	260.30	320.71	391.89	475.16	571.92	958.11	1124.16	2020.86	7.32
n-Hexane	6.866	1,153.00	225.85	84.16	40.32	54.40	72.34	94.91	122.97	157.49	199.51	310.75	466.97	565.55	679.85	811.55	962.36	1547.63	1793.31	3081.66	5.62
Toluene	7.017	1,377.60	222.64	92.14	4.35	6.29	8.92	12.46	17.12	23.19	30.99	53.34	87.80	110.98	138.98	172.55	212.48	379.41	454.09	878.25	7.24
Xylene	7.021	1,474.40	217.77	106.17	1.09	1.64	2.43	3.53	5.03	7.06	9.75	17.84	31.03	40.24	51.64	65.63	82.64	156.88	191.31	396.00	7.19
Ethylbenzene	6.95	1,419.30	212.61	134	1.14	1.74	2.58	3.75	5.36	7.54	10.43	19.12	33.30	43.19	55.42	70.41	88.62	167.92	204.60	421.74	7.24
Naphthalene	7.146	1,831.60	211.82	128.17	0.02	0.03	0.05	0.08	0.12	0.19	0.29	0.64	1.32	1.85	2.56	3.49	4.70	10.78	13.92	35.58	8.56

1 - Constants derived from AP-42 Chapter 7, Table 7.1-3 where available.

Aboveground Storage Tank Emissions for Largest Diesel Tank

Tank Emissions

Tank ID: ICP-4223-4-AST
Material: Gasoline

The following tank emissions are calculated via the methods described in United States Environmental Protection Agency's AP-42, *Compilation of Air Pollutant Emissions Factors*, Chapter 7.1, *Organic Liquid Storage Tanks*.

Tank Information

Tank Orientation:	Horizontal
Roof Type:	Fixed
Roof Shape:	Dome
Roof Slope:	0.0625
Tank Condition:	Average
Paint Color:	White
Tank Insulation:	Uninsulated
Insulation Temperature:	
Tank Location:	Cherry Point, North Carolina
Nearest AP-42 Location:	Wilmington, NC
Tank Construction:	Welded
Tank Diameter (ft):	3.9
Tank Shell Height (ft):	5.3
Liquid Height (ft):	5.035

Paint Solar Absorbtance (α):	0.25
Breather Vent Pressure Setting, psig:	0.03
Breather Vent Vacuum Setting, psig:	-0.03
Vapor Molecular Weight, lb/lb-mol:	105
Liquid Molecular Weight, lb/lb-mol:	341
Tank Capacity (bbl):	11
Tank Turnovers per year:	12
Tank Pressure (N/A if atmospheric):	N/A

See equations 1-14 and 1-15
See equations 1-14 and 1-15

Month	Turnovers/Month	Monthly Throughput bbl/month
January	1.00	11
February	1.00	11
March	1.00	11
April	1.00	11
May	1.00	11
June	1.00	11
July	1.00	11
August	1.00	11
September	1.00	11
October	1.00	11
November	1.00	11
December	1.00	11
Annual:	12	135

Meteorological Data

The following Meteorological Data is based on the nearest location to the tank listed in Table 7.1-7, Wilmington, NC.

Month	Days	T_{AN} °F	T_{AX} °F	V mi/hr	I Btu/ft^2/day	P_A psi
January	31	36.9	56.3	8.1	811	14.68
February	28	38	58.8	8.3	1,068	14.68
March	31	44.2	65.5	8.9	1,426	14.68
April	30	52.5	73.7	9.2	1,808	14.68
May	31	60.7	79.7	8.3	1,938	14.68
June	30	69.2	85.7	7.4	1,942	14.68
July	31	73	88.7	6.9	1,917	14.68
August	31	71.5	87.2	6.5	1,722	14.68
September	30	66.2	82.6	7.2	1,405	14.68
October	31	55.1	74.8	6.5	1,178	14.68
November	30	45.3	66.7	6.9	910	14.68
December	31	38.1	58.4	7.4	747	14.68

Aboveground Storage Tank Emissions for Largest Diesel Tank

Tank Emissions

VOC

Speciated VOC emissions are calculated using equation 1-1 as shown below. Detailed emissions calculations for this tank are included on the following pages.

$$L_T = L_S + L_W$$ Equation 1-1

L_T = total loss, lb
L_S = standing storage losses, lb
L_W = working losses, lb

Month	L_S lb/month	L_W lb/month	L_T lb/month
January	7.58E-03	2.25E-02	3.00E-02
February	9.09E-03	2.68E-02	3.59E-02
March	1.59E-02	3.90E-02	5.50E-02
April	2.47E-02	5.91E-02	8.38E-02
May	3.44E-02	8.41E-02	1.19E-01
June	4.22E-02	1.17E-01	1.59E-01
July	4.88E-02	1.35E-01	1.84E-01
August	4.43E-02	1.28E-01	1.72E-01
September	3.20E-02	9.88E-02	1.31E-01
October	2.42E-02	6.58E-02	8.99E-02
November	1.51E-02	4.17E-02	5.67E-02
December	9.21E-03	2.66E-02	3.58E-02
Annual	**3.07E-01**	**8.44E-01**	**1.15E+00**

VOC Annual Emissions (tpy):

VOC	**5.71E-04**

HAP Annual Emissions (tpy):

Benzene	**5.34E-06**
n-Hexane	**1.44E-05**
Toluene	**1.68E-04**
Xylene	**2.26E-04**
Ethylbenzene	**6.80E-06**
Naphthalene	**1.50E-04**

Tank Contents

	Z_{Li} (wt% L)	MW (lb/lb-mol)	xi (mol% L)	Pi (psi)	Summed for VOC? (Y/N)	yi (mol% V)	Z_{Vi} (wt% V)
Benzene	1.000%	78	4.36E-02	8.04E-04		1.26E-02	9.35E-03
n-Hexane	2.700%	84	1.09E-01	2.01E-03	Y	3.16E-02	2.53E-02
Toluene	13.500%	92	4.99E-01	2.14E-02	Y	3.36E-01	2.94E-01
Xylene	9.000%	106	2.89E-01	2.50E-02	Y	3.93E-01	3.96E-01
Ethylbenzene	1.800%	134	4.58E-02	5.97E-04	Y	9.37E-03	1.19E-02
Naphthalene	0.500%	128	1.33E-02	1.38E-02	Y	2.17E-01	2.63E-01

Tank Temperature Data

Tank Insulation: Uninsulated

$$\Delta T_V = \left(1 - \frac{0.8}{2.2\,(H_S/D) + 1.9}\right)\Delta T_A + \frac{0.042\alpha_R I + 0.026(H_S/D)\alpha_S I}{2.2\,(H_S/D) + 1.9}$$ Equation 1-6

ΔT_V = daily vapor temperature range, °R
H_S = tank shell height, ft
D = tank diameter, ft
ΔT_A = daily ambient temperature range, °R
α_R = tank roof paint solar absorptance, dimensionless
α_S = tank shell paint solar absorptance, dimensionless I
= daily total solar insolation factor, Btu/ft² d

$$T_{LA} = \left(0.5 - \frac{0.8}{4.4(H_S/D) + 3.8}\right) T_{AA} + \left(0.5 + \frac{0.8}{4.4(H_S/D) + 3.8}\right) T_B + \frac{0.021\ \alpha_R\ I + 0.013(H_S/D)\ \alpha_S\ I}{4.4(H_S/D) + 3.8}$$ Equation 1-27

T_{LA}= average daily liquid surface temperature, °R
T_{AA} = average daily ambient temperature, °R
T_B = liquid bulk temperature, °R

$$T_{AA} = \left(\frac{T_{AX} + T_{AN}}{2}\right)$$ Equation 1-30

$$\Delta T_A = T_{AX} - T_{AN}$$ Equation 1-11

$$T_B = T_{AA} + 0.003\ \alpha_S\ I$$ Equation 1-31

ΔT_A = daily ambient temperature range, °R T_{AX}
= daily maximum ambient temperature, °RT_{AN}
= daily minimum ambient temperature, °R

$$T_V = \frac{[2.2\ (H_S/D)+1.1]\ T_{AA} + 0.8\ T_B + 0.021\alpha_R I + 0.013(H_S/D)\alpha_S I}{2.2\ (H_S/D) + 1.9}$$ Equation 1-32

T_V = average vapor temperature, °R

Notes: Assume $\alpha_R = \alpha_S$.

Aboveground Storage Tank Emissions for Largest Diesel Tank

H_S/D: 1.36
α_R and α_S: 0.25

Month	ΔT_V °R	T_V °R	T_{LA} °R	T_{AX} °R	T_{AN} °R	ΔT_A °R	T_{AA} °R	T_B °R
January	19	508	507	516	497	19	506	507
February	22	510	510	518	498	21	508	509
March	23	518	517	525	504	21	515	516
April	25	527	525	533	512	21	523	524
May	24	534	533	539	520	19	530	531
June	21	541	540	545	529	17	537	539
July	21	545	543	548	533	16	541	542
August	20	543	541	547	531	16	539	540
September	19	537	536	542	526	16	534	535
October	21	527	526	534	515	20	525	526
November	21	518	517	526	505	21	516	516
December	20	509	509	518	498	20	508	508

Pressure Data

$$\Delta P_V = P_{VX} - P_{VN}$$ Equation 1-9

ΔP_V = daily vapor pressure range, psi
P_{VX} = vapor pressure at daily maximum liquid surface temperature, psia
P_{VN} = vapor pressure at daily minimum liquid surface temperature, psia

Month	P_{VX} psia	P_{VN} psia	ΔP_V psia	P_{VA} psia
January	2.43E-02	1.44E-02	9.95E-03	1.93E-02
February	2.90E-02	1.67E-02	1.22E-02	2.32E-02
March	4.34E-02	2.35E-02	2.00E-02	3.43E-02
April	6.75E-02	3.45E-02	3.30E-02	5.27E-02
May	9.70E-02	4.90E-02	4.80E-02	7.61E-02
June	1.33E-01	6.97E-02	6.35E-02	1.07E-01
July	1.52E-01	8.43E-02	6.72E-02	1.25E-01
August	1.42E-01	8.18E-02	6.05E-02	1.18E-01
September	1.15E-01	6.06E-02	5.40E-02	9.00E-02
October	7.59E-02	4.06E-02	3.53E-02	5.88E-02
November	4.62E-02	2.69E-02	1.93E-02	3.66E-02
December	2.86E-02	1.74E-02	1.13E-02	2.30E-02

Note: P_{VX} and P_{VN} are calculated using the same method listed for P_{VA} above.

Aboveground Storage Tank Emissions for Largest Diesel TankStanding

Storage Losses

$$L_S = 365 K_E \left(\frac{\pi}{4} D^2\right) H_{VO} K_S W_V$$ Equation 1-4

L_S = standing storage loss, lb/month	
E_M = the number of daily events in month, $(month)^{-1}$	
D = diameter, ft	
H_{VO} = vapor space outage, ft	
W_V = stock vapor density, lb/ft^3	
K_E = vapor space expansion factor, dimensionless	
K_S = vented vapor saturation factor, dimensionless	

D	3.9
H_{VO}	1.57
S_R	0.0625
R_S	1.95
R_R	1.95
H_S	5.3
H_L	5.035
H_{RO}	1.30

Month	E_M days	W_V lb/ft^3	K_E	K_S	L_S lb/month
January	31	3.74E-04	0.03	1.00	7.58E-03
February	28	4.46E-04	0.04	1.00	9.09E-03
March	31	6.50E-04	0.04	1.00	1.59E-02
April	30	9.84E-04	0.04	1.00	2.47E-02
May	31	1.40E-03	0.04	1.00	3.44E-02
June	30	1.95E-03	0.04	1.00	4.22E-02
July	31	2.26E-03	0.04	1.00	4.88E-02
August	31	2.13E-03	0.04	1.00	4.43E-02
September	30	1.65E-03	0.03	1.00	3.20E-02
October	31	1.10E-03	0.04	1.00	2.42E-02
November	30	6.94E-04	0.04	1.00	1.51E-02
December	31	4.43E-04	0.04	1.00	9.21E-03

$$H_{VO} = H_S - H_L + H_{RO}$$ Equation 1-16

H_{VO} = vapor space outage, ft	
H_S = tank shell height, ft	
H_L = liquid height, ft	
H_{RO} = roof outage, ft	

Cone Roof:

$$H_{RO} = (1/3)\, H_R$$ Equation 1-17

Dome Roof: Equation 1-19

$$H_{RO} = H_R \left[\frac{1}{2} + \frac{1}{6}\left[\frac{H_R}{R_S}\right]^2\right]$$

H_R = tank roof height, ft	
S_R = tank cone roof slope, ft	
R_S = tank shell radius, ft	
R_R = tank dome radius, ft	

Roof Shape: Dome

$$W_V = \frac{M_V P_{VA}}{R T_V}$$ Equation 1-22

W_V = vapor density, lb/ft^3	
M_V = vapor molecular weight, lb/lb-mole	
R = the ideal gas constant, 10.731 psia ft^3/lb-mole °R	
P_{VA} = vapor pressure at daily average liquid surface temperature, psia	

Equation 1-12 $K_E = 0.0018 \Delta T_V = 0.0018 [0.7 (T_{AX} - T_{AN}) + 0.02 \alpha I]$

$$K_S = \frac{1}{1 + 0.053 P_{VA} H_{VO}}$$ Equation 1-21

Aboveground Storage Tank Emissions for Largest Diesel TankWorking Losses

$$L_W = V_Q K_N K_P W_V K_B$$ Equation 1-35

L_W = working loss, lb
V_Q = net throughput, ft^3/month
K_N = working loss turnover (saturation) factor, dimensionless*
*turnovers >36 = (180 + N)/6N where N = # of turnovers/yr
*turnovers ≤36 = 1
K_P = working loss product factor for fixed roof tanks, dimensionless**
**1 for volatile organic liquids, 0.75 for crude oil
N = number of turnovers per year, dimensionless
K_B = vent setting correction factor, dimensionless, For a vent setting range up to ± 0.03 psig, K_B = 1

K_N 1
K_P 1

$$V_Q = (\Sigma H_{QI})(\pi/4)\, D^2$$ Equation 1-38

ΣH_{QI} = the annual sum of the increases in liquid level, ft/yr

$$K_B = \left[\frac{\frac{P_I + P_A}{K_N} - P_{VA}}{P_{BP} + P_A - P_{VA}}\right]$$ Equation 1-41

K_B = vent setting correction factor, dimensionless
P_I = pressure of the vapor space at normal operating conditions, psig
If the tank is held at atmospheric pressure (not held under a vacuum or at a steady pressure) P_I would be 0.
P_A = atmospheric pressure, psia

Month	ΣH_{QI} ft/yr	V_Q ft^3/month	K_B	L_W lb/month
January	5.04	60.15	1.00	2.25E-02
February	5.04	60.15	1.00	2.68E-02
March	5.04	60.15	1.00	3.90E-02
April	5.04	60.15	1.00	5.91E-02
May	5.04	60.15	1.00	8.41E-02
June	5.04	60.15	1.00	1.17E-01
July	5.04	60.15	1.00	1.35E-01
August	5.04	60.15	1.00	1.28E-01
September	5.04	60.15	1.00	9.88E-02
October	5.04	60.15	1.00	6.58E-02
November	5.04	60.15	1.00	4.17E-02
December	5.04	60.15	1.00	2.66E-02

Marine Corps Air Station Cherry Point **[B3-8]**
Cherry Point, North Carolina
Craven County

Aboveground Storage Loading Emissions for Largest Diesel Tank

Loading emissions are calculated via the methods described in United States Environmental ProtectionAgency's AP-42, *Compilation of Air Pollutant Emissions Factors* , Chapter 5.2, *Transportation And Marketing Of Petroleum Liquids* .

Equation 1

L_L = loading loss, pounds per 1000 gallons ($lb/10^3$ gal) of liquid loaded
S = a saturation factor
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)M
= molecular weight of vapors, pounds per pound-mole (lb/lb-mole)
T = temperature of bulk liquid loaded, °R
eff = control efficiency

Biodiesel

Material	Emissions (tpy)	
	Uncontrolled	Controlled
VOC	1.47E-03	N/A
Benzene	1.37E-05	N/A
n-Hexane	3.71E-05	N/A
Toluene	4.31E-04	N/A
Xylene	5.81E-04	N/A
Ethylbenzene	1.75E-05	N/A
Naphthalene	3.86E-04	N/A

Annual Loading Throughput	5,683	gal/year
Annual Loading Throughput	135	bbl/year
L_L (Uncontrolled)	0.52	$lb/10^3$ gal
L_L (Controlled)	0.52	$lb/10^3$ gal
S	1	
P	0.1	psia
M	341	lb/lb-mol
T	523	°R
eff	0	

Average annual temperature and pressure are assumed.
Saturation Factor from AP-42 Table 5.2-1, assumed mode of operation is submerged loading:dedicated normal service