TECHNICAL ANALYSIS REPORT

for the terms and conditions of

Minor Permit AQ1806MSS01

Issued to:
ConocoPhillips Alaska, Inc.

for the:
Willow Operations Center

Preliminary: December 5, 2023

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INTRODUCTION

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Permit AQ1806MSS01 to ConocoPhillips Alaska, Inc. (CPAI) for the Willow Operations Center (WOC). The permit application is classified under 18 AAC 50.502(c)(1) for NOx, PM_{10}, and $PM_{2.5}$, and 18 AAC 50.508(5) for establishing owner requested limits (ORLs) to avoid one or more permit classifications under AS 46.14.130.

STATIONARY SOURCE DESCRIPTION

The WOC is a new stationary source located in the Bear Tooth Unit on the Alaskan North Slope approximately 7 miles west-southwest of the Greater Mooses Tooth 2/Mooses Tooth 7 Drill Site and 24 miles west-southwest of Nuiqsut, Alaska. The WOC is the first stationary source of several that CPAI plans to permit, and will serve as a support facility for the Willow Development. Initially, the WOC will serve as a staging area and in the long-term as the primary place for locating support activities including but not limited to worker housing, equipment servicing, airport, and waste disposal. Like other support facilities across the North Slope, the WOC is necessary because of the remote location of the Willow Development but is not inherent to oil and gas production. Furthermore, the service infrastructure of the WOC has a different purpose compared to the production aspect of Willow Central Facility and remote drill sites. Therefore, the WOC (including adjacent airstrip) is considered a single stationary source and does not need to be aggregated with any other planned facilities in the Willow Development. Additionally, the WOC and other planned facilities will not meet the contiguous and adjacent criteria defining a building, structure, facility, or installation in 40 CFR 51.166(b)(6).

The early operations phase will include temporary camps and telecommunications infrastructure to support construction of the other Willow Development facilities. To support the camps and commissioning of other permanent infrastructure at the WOC, up to 13.5 megawatts electric (MWe) of diesel-fired engine-driven power generators will be set up as a temporary power plant until fuel gas is available and permanent power equipment is commissioned at the WOC. It is estimated that the WOC will begin actual construction in October 2024 according to the current interpretation of 40 CFR 52.21(b)(11).

The emissions unit (EU) inventory provided in the application for Minor Permit AQ1806MSS01 includes:

- One dual fuel power generator turbine rated at 15,780 kWe
- Two backup diesel generators (Tier 2 engines) rated at 2,250 kWe
- Three firewater pumps driven by (Tier 2) diesel engines rated at 460 bhp
- Two diesel generators (Tier 4 engines) rated at 50 kWe
- Six large diesel generators (Tier 4 engines) cumulatively rated at 13,500 kWe
- One solid waste incinerator rated at less than 833 lb/hr
- Various storage tanks for diesel, jet fuel, drilling muds, water, etc.
- Various diesel heaters and boilers cumulatively rated at 10 MMBtu/hr

- Various fuel gas-fired heaters and boilers cumulatively rated at 5 MMBtu/hr
- Venting of PM emissions from the bulk cement plant blending system
- Fugitive emissions from equipment component leaks, pad-generated dust, and refueling from storage tanks containing hydrocarbon liquids.

APPLICATION DESCRIPTION

CPAI submitted an application for Minor Permit AQ1806MSS01 on June 20, 2023 to authorize construction and operation of the WOC. The application included an ambient air quality impact analysis, as required under 18 AAC 50.540(c)(2)(A). CPAI submitted an application amendment on November 27, 2023.

The application states that CPAI proposes several ORLs to avoid Minor Source, Title V, and PSD permit classifications as well as certain New Source Performance Standard (NSPS) requirements. The potential emissions of at least one criteria pollutant are greater than 100 tons per year (TPY) so the WOC is therefore classified as a Title V major source. The limits requested for the incinerator are not what the Department considers ORLs because they do not avoid a Title I permit classification but they have been included in this permit. See Table 1 for a summary of the proposed ORLs.

Table 1 – Proposed Owner Requested Limits

EU ID	Description	Limit	Target Pollutant(s)	Effect on Stationary Source PTE
001	Power Generator Turbine (dual fuel)	Operate turbine with intake air temperature of -4 ºF or above.	NOx, CO, VOC	NOx < 250 TPY CO < 250 TPY VOC < 100 TPY
001	Power Generator Turbine (dual fuel)	Operate on emergency fuel (ULSD or unprocessed fuel gas) (with dry low NOx combustion controls) for no more than 500 hours per year.	NOx, CO	NOx < 250 TPY CO < 250 TPY
301	Incinerator	Burn no more than 10 percent hospital/medical/infectious waste on a quarterly basis to maintain classification as a "co-fired combustor" in 40 CFR 60.5c(c).	NOx, CO, PM, SO_2, HAP	None
301	Incinerator	Burn no more than 10 percent sewage sludge on a dry basis.	PM	None
001, 201–208, and 802	All Diesel-fired Equipment	Burn only liquid fuel that meets ULSD specifications (diesel fuel with a maximum sulfur content of 0.0015 percent by weight).	SO_2	SO_2 < 40 TPY SO_2 < 100 TPY SO_2 < 250 TPY
001 and 803	All Fuel Gas-fired Equipment	Burn fuel gas with a sulfur content of no greater than 200 ppmv H_2S.	SO_2	SO_2 < 40 TPY

On October 30, 2023, CPAI revised the turbine intake temp from 0 ºF to -4 ºF and changed the emergency fuel ORL from 500 hours/yr with or without dry low NOx controls to 500 hours/yr with dry low NOx controls.

CLASSIFICATION FINDINGS

1. Minor Permit AQ1806MSS01 is classified under 18 AAC 50.502(c)(1) for construction of a new stationary source with potential emissions greater than the thresholds listed under 18 AAC 50.502(c)(1) for NOx, PM_{10}, and $PM_{2.5}$.
2. The project is also classified under 18 AAC 50.508(5) for establishing ORLs to avoid classification as a prevention of significant deterioration (PSD) major source under 18 AAC 50.306.
3. The stationary source is classified as an area source of hazardous air pollutant (HAP) emissions because individual and combined HAP emissions are both below the HAP major source thresholds of 10 TPY and 25 TPY, respectively.
4. The stationary source is classified as a Title V major source because it will have potential NOx and CO emissions greater than 100 TPY, each.

APPLICATION REVIEW FINDINGS

Based on the review of the minor permit application, the Department makes the following findings:

1. CPAI's minor permit application for the Willow Operations Center contains the elements listed in 18 AAC 50.540.
2. Calculations submitted with the application demonstrate that the emissions of each regulated pollutant are less than 250 TPY, considering the requested operational restrictions. Therefore, the ORLs included in Minor Permit AQ1806MSS01 will allow the WOC to avoid classification as a PSD major source.
3. At the time the application was submitted, the make and model of the emissions units were "to be determined" and the ratings or maximum capacities were assumed values. This can sometimes introduce uncertainty into the emissions calculations. The Department therefore requested specification sheets for EU IDs 001, 201 through 208, and 301 within 30 days after installation.
4. Although the Department believes it is more appropriate to establish most federal rule avoidance limits directly in Title V permits, because they do not avoid Title I permit classifications, it agrees to include the limits requested for EU ID 301 in Minor Permit AQ1806MSS01. The NSPS Subpart Ec definition for "Co-fired combustor" in 40 CFR 60.51c specifically states, "subject to an enforceable requirement." Therefore, it is necessary to include the limit as a Title I requirement. The avoidance limit for NSPS Subpart O does not require an enforceable limit but is included in Minor Permit AQ1806MSS01 at the request of CPAI.
5. The ambient analysis submitted by CPAI, as required under 18 AAC 50.540(c)(2)(A), indicates that restrictions are needed to protect the Alaska Ambient Air Quality Standards for NO_2, PM_{10}, and $PM_{2.5}$. The Department summarized these restrictions in the modeling report (APPENDIX B) and included them as permit conditions per 18 AAC 50.544(c)(1). The Department did not find it necessary to request that CPAI provide an ambient analysis of any additional pollutants under 18 AAC 50.540(c)(2)(D).

6. The dual fuel-fired turbine (EU ID 001) will be equipped with a dry low NOx emissions control system designed to control NOx to 9 ppmv and CO to 15 ppmv during normal operations on fuel gas, provided the turbine is operated at 50% load or above with an intake air temperature of negative four degrees Fahrenheit (-4 °F) or above. Therefore, EU ID 001 will be equipped with intake air preheating and typically operated at loads above 50% except during startup, shutdown, and malfunctions (SSM).
7. For EU ID 001, CPAI added a safety factor of 1/3 to the NOx emission factor during normal operations. As a conservative estimate, they assumed the combustion control system would control NOx to 12 ppmv rather than the vendor provided 9 ppmv.
8. When calculating potential emissions operating on fuel gas, CPAI assumed 120 hours per year would be the maximum time that the turbine would operate below 50% load (i.e., out of dry low NOx mode) during SSM and (unforeseen) transient and rapid unloading of the power grid.
9. The initial application did not recognize that worst-case CO emissions were from the turbine operating out of dry low NOx mode on fuel gas (processed or unprocessed). As a result, the original ORL of 500 hours per year on backup fuel (including unprocessed fuel gas), out of dry low NOx mode, would have potential CO emissions greater than 250 TPY.
10. On October 30, 2023, CPAI indicated the new plan is to operate the turbine for no more than 500 hours per year on emergency fuel (ULSD or unprocessed fuel gas) in dry low NOx mode. This assumption was included in the 10/30/23 revised emissions calculations and therefore, the original ORL was modified accordingly. CPAI also revised the turbine intake temperature from 0 °F to -4 °F. Both revisions resulted in a slightly lower potential to emit (PTE)[1] for NOx and CO.
11. The worst-case PTE for turbine operations assumes 120 hours per year out of dry low NOx mode, 500 hours on backup fuel in dry low NOx mode, and remaining hours on fuel gas in dry low NOx mode. The PTE also includes emissions generated by a maximum of 12 startup/shutdown cycles per year.
12. The original PTE calculations included PM_{10} and $PM_{2.5}$ but not total particulate matter (PM) emissions. A revised spreadsheet was provided after the Department notified CPAI that assessable PM includes all size fractions.
13. Compliance demonstrations for the state emission standards under 18 AAC 50.055(a) through (c) were included in the application.

[1] *Potential to Emit* or *PTE* means the maximum capacity of a stationary source to emit a pollutant under its physical or operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source, as defined in AS 46.14.990(22).

EMISSIONS SUMMARY AND PERMIT APPLICABILITY

CPAI provided emission calculations with the application for Minor Permit AQ1806MSS01. The permit will be issued prior to construction so the make and model of the emissions units were described as "to be determined" and the ratings or maximum capacities were assumed.

Table 2 shows the emissions summary and permit applicability for the stationary source. Emission factors and detailed calculations are provided in APPENDIX A. Fugitive emissions are not considered when determining permit applicability, however, fugitive emissions are assessable and are therefore included with the assessable emissions in Table 3.

Table 2 – Emissions Summary and Permit Applicability, tons per year (TPY)

Parameter	Emissions				
	NO_X	CO	PM_{10}/ $PM_{2.5}$	SO_2	VOC
PTE (excluding fugitives)	241.61	227.65	37.67	30.26	77.20
18 AAC 50.502(c)(1) threshold	40	NA	15/10	40	NA
50.502(c)(1) permit required?	Yes	NA	Yes	No	NA
Title V permit threshold	100	100	100	100	100
Title V permit required?	Yes	Yes	No	No	No
PSD major source threshold	250	250	250	250	250
PSD major source?	No	No	No	No	No

A summary of the PTE and assessable PTE as indicated in the revised application and verified by the Department for the Willow Operations Center is shown in the table below.

Table 3 – Assessable Emissions (TPY)

	NOx	CO	PM	SO_2	VOC	CO_2e[1]	HAP	Total[2]
PTE (excluding fugitives)	241.61	227.65	37.97	30.26	77.20	222,111	7.21	620.37
Fugitives[3]	--	--	7.30	--	0.81	60.5	0.10	8.11
PTE (including fugitives)	241.61	227.65	45.27	30.26	78.01	222,172	7.31	628.48
Assessable PTE	241.61	227.65	45.27	30.26	78.01	0	5.68	628.48

Notes:

1. CO_2e emissions are defined as the sum of the mass emissions of each individual GHG adjusted for its global warming potential. CO_2e emissions are excluded from the Total PTE and Total Assessable PTE as they are not regulated under 18 AAC 50.
2. Total PTE and total assessable PTE include 5.25 TPY HCl, 0.42 TPY Pb, and 0.01 TPY Ni as assessable HAP emissions. The remaining HAP emissions are included as VOC or PM.
3. Fugitive emissions other than GHGs and HAP are assessable. Fugitives total does not include CO_2e or HAP.

The assessable PTE listed under Condition 4.1 is the sum of the PTE of each individual air pollutant, other than greenhouse gases (GHGs). The emissions listed in Table 3 are estimates that are for informational use only. The listing of the emissions does not create an enforceable limit for the stationary source.

The PTE calculations for the uncontrolled incinerator used emission factors from several different sources. The original application provided no information about the incinerator except that it would be rated at less than 10 tons per day. The Department requested more information to justify the choices of emission factors. CPAI provided a response on 8/28/23 with additional information. The uncontrolled incinerator will be a modular starved-air combustor with vendor guarantees that the emissions will meet the NSPS Subpart EEEE emission standards in Table 1b of the proposed rule published in the Federal Register on 8/31/2020. The assumed emission factors for CO and PM were twice the values in Table 1b of the proposed rule or 0.1444 lb/MMBtu and 0.000377 lb/MMBtu, respectively. NOx and SO_2 emission factors were from Table 2.1-9 of AP-42 for modular starved air combustors. Incinerator HAP emissions that are assessable include 5.25 TPY HCl, 0.42 TPY Pb, and 0.01 TPY Ni because they are not included in the VOC and PM totals.

CPAI provided total particulate matter emission estimates on 8/16/23, following a request by the Department. Assessable particulate matter includes all size fractions, as indicated in Topic #10 of Department Policy 04.02.103 effective 6/21/2012.

The applicant calculated HAP emissions for the stationary source using available emission factors from AP-42 and AB 2588. The largest individual HAP is HCl at 5.25 TPY and total HAP emissions are 7.31 TPY. The HAP major source thresholds are 10 TPY for a single HAP or 25 TPY for any combination of HAP, therefore, the WOC is classified as an area source of HAP emissions.

PERMIT ADMINISTRATION

ConocoPhillips Alaska, Inc. may operate in accordance with Minor Permit AQ1806MSS01 upon issuance.

PERMIT CONDITIONS

The bases for the conditions imposed in Minor Permit AQ1806MSS01 are described below.

Cover Page

18 AAC 50.544(a)(1) requires the Department to identify the stationary source, Permittee, and contact information. The Department provided this information on the cover page of the permit.

Section 1: Emissions Unit Inventory

The EUs authorized and/or restricted by this permit are listed in Table 1 of the permit. Unless otherwise noted in the permit, the information in Table 1 is for identification purposes only. Condition 1 is a general requirement to comply with AS 46.14 and 18 AAC 50 when installing a replacement EU. Condition 2 is included because EU specific information is yet to be determined. The Permittee is required to provide maximum design ratings, specifications, and any certifications within 30 days after installation.

Section 2: Fee Requirements

18 AAC 50.544(a)(2) requires the Department to include a requirement to pay fees in accordance with 18 AAC 50.400 – 18 AAC 50.499 in each minor permit issued under 18 AAC 50.542. The Department used the Standard Permit Condition (SPC) I language for Minor Permit AQ1806MSS01. However, the Department modified the condition by removing the requirement to only pay for emissions of each air pollutant in quantities of 10 tons per year or greater, to be consistent with the updates to the emission fees in 18 AAC 50.410(a) that became effective September 7, 2022. The Department is in the process of incorporating these updates into SPC I.

As indicated by Condition 5.3, if the stationary source has not commenced construction or operation on or before March 31, the Permittee is required to submit a transmittal letter certified by the responsible official under 18 AAC 50.205 indicating that the assessable emissions for the source are zero for the previous fiscal year and provide estimates for when construction or operation will commence.

Section 3: State Emission Standards

Condition 6, Visible Emissions. The visible emissions standard under 18 AAC 50.055(a)(1) applies to the operation of industrial processes and fuel-burning equipment. Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the effluent by more than 20 percent averaged over six consecutive minutes. Per 18 AAC 50.990(39), "fuel-burning equipment" does not include mobile internal combustion engines (e.g., NREs).

Permits classified under 18 AAC 50.502(c) must include terms and conditions requiring performance tests for emission limits under 18 AAC 50.050-18 AAC 50.090. The Department is requiring an initial compliance demonstration within 60 days of startup of the liquid fuel-burning units, EU IDs 201 through 208. Ongoing monitoring, recordkeeping, and reporting (MR&R) for visible emissions will be included in the Title V operating permit.

The Department has found that gas fuel burning equipment inherently has negligible visible emissions, therefore monitoring of visible emissions is waived for EU IDs 001 (when

burning fuel gas) and 803. As a dual fuel EU, the turbine can operate up to 400 hours per year on backup liquid fuel before Method 9 observations are required, in accordance with Topic #2 of Department Policy 04.02.103 effective 6/21/2012.

EU ID 801 is an industrial process with operational restrictions to limit particulate matter emissions.

Condition 7, Incinerator Visible Emissions Standard. The visible emissions standard under 18 AAC 50.050(a) applies to the operation of any incinerator in Alaska. Visible emissions, excluding condensed water vapor, may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.

Permits classified under 18 AAC 50.502(c) must include terms and conditions requiring performance tests for emission limits under 18 AAC 50.050 – 090. The Department is requiring an initial compliance demonstration within 60 days of startup of EU ID 301. The demonstration can be either a manufacturer's guarantee or Method 9 observations. Ongoing MR&R will be included in the Title V operating permit.

Condition 8, Particulate Matter (PM) Emissions. Under 18 AAC 50.050(b) (Table 4), there is no applicable PM standard for incinerators with a rated capacity less than 1,000 lb/hr. EU ID 301 has a rated capacity of less than 833 pounds per hour and therefore, no applicable PM standard.

Under 18 AAC 50.055(b), PM emitted from an industrial process or fuel burning equipment may not exceed 0.05 grains per cubic foot of exhaust gas (gr/dscf), averaged over three hours. Experience has shown there is a correlation between opacity and PM emissions. 20 percent visible emissions would normally comply with the 0.05 gr/dscf. As such, compliance with opacity limits is included as a surrogate method of assuring compliance with the PM standards. The application included a demonstration that the fuel burning equipment at the WOC would comply with the PM emission standard. Ongoing MR&R for particulate matter emissions will be included in the Title V operating permit.

The Department has found that gas fuel burning equipment inherently has negligible PM emissions, therefore no monitoring or source testing is required of EU IDs 001 (when burning fuel gas) and 803.

Condition 9, Sulfur Compound Emissions. Sulfur compound emissions from an industrial process or fuel burning equipment may not exceed 500 ppm averaged over a period of three hours, under 18 AAC 50.055(c). Although EU ID 301 has potential SO_2 emissions from the waste and supplemental fuel combusted, the definition of "fuel burning equipment" under 18 AAC 50.990(39) does not include incinerators. Therefore, EU ID 301 was excluded from this condition. It is unlikely that SO_2 emissions from EU ID 301 would exceed the sulfur compound standard.

Permits classified under 18 AAC 50.502(c) must include terms and conditions requiring performance tests for emission limits under 18 AAC 50.050 – 090.

Calculations show that fuel oil with sulfur content less than 0.74 percent by weight will comply with the state emissions standard. Calculations show that fuel gas with sulfur content less than 4,000 parts per million by volume will comply with the state standards.

The application included a demonstration that the fuel burning equipment at the WOC would comply with the sulfur compound emission standard. The fuel limits in Section 5 restrict the sulfur content of liquid and gaseous fuels.

Section 4 Operation and Maintenance Requirements

Condition 10, Equipment Maintenance. 18 AAC 50.544(c) require the Department to include terms and conditions for proper maintenance of equipment so the Department is using the language in 18 AAC 50.544(c)(3).

Condition 11, Fugitive Dust. The condition reiterates 18 AAC 50.045(d), which requires a person to use reasonable precautions when handling, storing, or transporting bulk materials or engaging in an industrial activity. This requirement applies because the stationary source includes emissions units and activities that typically generate fugitive dust. The Department used the language in SPC X.

Section 5 Ambient Air Quality Protection Requirements

Conditions 12 and 13. 18 AAC 50.544(a)(3) and 18 AAC 50.544(a)(6) require the Department to include conditions to protect ambient air quality, when warranted. The Department determined that conditions are warranted to protect the annually averaged NO_2, annually averaged and 24-hour $PM_{2.5}$, and 24-hour PM_{10} AAAQS for the reasons described in APPENDIX B of this TAR.

Conditions 12.1 and 12.2. These requirements pertain to exhaust stack heights and configurations and are based on modeling assumptions.

Condition 12.3. This condition references an ORL that restricts the sulfur content of the liquid and gaseous fuels burned at the stationary source. The limits are also based on modeling assumptions and are protective of the AAAQS.

Condition 12.4. This requirement is included in the modeling report (APPENDIX B) as being necessary to protect the AAAQS. Because the condition is also an ORL in Section 6, the ambient condition just references the ORL condition.

Condition 13.1. This condition is necessary because the PTE of particulate matter was calculated based on the assumption that all venting of particulates from the bulk cement blending system (EU ID 801) is controlled by a dust cyclone and filter sock. The assumed control efficiency was 99.999 percent at all times that EU ID 801 operates.

Section 6 Owner Requested Limits (ORLs)

18 AAC 50.544(h) describes the requirements for a permit classified under 18 AAC 50.508(5). This permit describes the ORL, including specific testing, monitoring, recordkeeping, and reporting requirements; it lists all equipment covered by the ORL; and describes the classification that the limit allows the applicant to avoid.

Conditions 14 and 15 are not technically ORLs because they do not allow the Permittee to avoid a Title I permit classification. The Department has included them in this section of the permit because the applicant requested that the restrictions be included. Typically, the Department would wait to establish federal rule avoidance limits directly in the Title V permit. However, the NSPS Subpart Ec definition for "Co-fired combustor" in 40 CFR 60.51c specifically says, "subject to an enforceable requirement" and EU ID 301

may begin operating before a Title V permit is issued. Condition 14 limits the amount of hospital/medical/infectious waste combusted in EU ID 301 to no more than 10 percent of the total waste feed stream, on a calendar quarter basis. NSPS Subpart O does not specify the need for an enforceable requirement, but the Department is including this avoidance limit also, at the request of CPAI. Condition 15 limits the amount of sewage sludge combusted in EU ID 301 to no more than 10 percent sewage sludge (dry basis) and no more than 1,000 kilograms (2,205 pounds) per day of sewage sludge (dry basis). Although many incinerator rules specify "on a calendar quarter basis" for weights, NSPS Subpart O does not. In the absence of a specified averaging period, the Permittee must maintain continuous compliance.

Condition 16, PSD Avoidance Requirements. This general PSD avoidance requirement is necessary because unrestricted emissions of NOx, CO, and SO_2 are each greater than 250 TPY. The Permittee can avoid PSD classification by complying with the ORLs and monitoring requirements in Conditions 17 through 23.

Condition 17, Out of Dry Low NOx Mode Operating Limit. This was not initially included in the list of requested ORLs, however, it was an assumption used to estimate potential emissions. The Permittee may not operate the turbine, EU ID 001, out of dry low NOx mode, when burning fuel gas or backup fuel (ULSD or unprocessed fuel gas), for more than 120 hours in any consecutive 12-month period, except when conducting source tests. This limit restricts both NOx and CO emissions and is important for keeping the PTE of CO below 250 TPY.

The dry low NOx combustion control system is guaranteed at turbine intake temperatures of at least -4 °F and turbine operation at 50% load or above when burning fuel gas and 65% load or above when burning liquid fuel. Therefore, records of operating load, fuel type, and intake temperature may be used to demonstrate when the turbine operates out of dry low NOx mode.

This limit does not apply when the turbine is operating in dry low NOx mode.

Condition 18, In Dry Low NOx Mode Operating Limit for Backup Fuel. This ORL limits the number of hours that EU ID 001 can operate on backup fuel (ULSD or unprocessed fuel gas) in dry low NOx mode. Five hundred hours per year is a conservative, upper limit estimate. When the turbine is operating on in dry low NOx mode, worst-case NOx and CO emissions occur when burning liquid fuel.

Condition 19, Intake Temperature. This ORL is necessary to limit NOx and CO emissions from EU ID 001. The dry low NOx emission control system requires turbine intake temperatures of -4 °F or above. There is an exception for cold startups.

Conditions 20, 21, and 22, Ton Per Year Limits and Monitoring. These conditions specify the ton per year limits imposed on EU ID 001 for NOx and CO that are achieved by complying with Conditions 17 through 19. They also require that the Permittee calculate NOx and CO emissions to demonstrate that they are not subject to PSD permitting. EU ID 001 is subject to NOx source testing in accordance with NSPS Subpart KKKK and Condition 22 requires source testing for CO. Similar to the 400 hour operating trigger for visible emissions observations, the Department is not requiring a CO source test while combusting backup liquid fuel until the turbine has operated for 400 hours on ULSD in a

calendar year. The source test is required within 60 days after the end of the month in which the 400-hour trigger is reached.

Conditions 17 through 19 include operational limits and Conditions 20 through 23 include ton per year limits, consistent with EPA policy on limiting PTE.

Condition 23, PSD Avoidance Limit for SO_2. Conditions 23.1 and 23.2 keep the total stationary source emissions of SO_2 below 40 TPY. This allows CPAI to avoid permitting requirements under 18 AAC 50.302(a)(1), 18 AAC 50.306, and 18 AAC 50.502(c)(1). Condition 23 contains a ton per year limit and operational limits, consistent with EPA policy on limiting PTE. Although potential SO_2 emissions are kept below the 100 TPY threshold in Table 2, the source is still a Title V major source because PTE for NOx and CO are each above 100 TPY.

Section 7 Recordkeeping, Reporting, and Certification Requirements

Condition 24, Recordkeeping Requirements. The condition restates the regulatory requirements for recordkeeping, and supplements the recordkeeping defined for specific conditions in the permit.

Condition 25, Certification. 18 AAC 50.205 requires the Permittee to certify any permit application, report, affirmation, or compliance certification submitted to the Department. The Department used the language in SPC XVII. This requirement is reiterated as a standard permit condition in 18 AAC 50.345(j).

Condition 26, Submittals. This condition clarifies where the Permittee should send their reports, certifications, and other submittals required by the permit. The Department used the language in SPC XVII. The Department included this condition from a practical perspective rather than a regulatory obligation.

Condition 27, Information Requests. AS 46.14.020(b) allows the Department to obtain a wide variety of emissions, design and operational information from the owner and operator of a stationary source. This statutory provision is reiterated as a standard permit condition in 18 AAC 50.345(i). The Department used the standard language in Minor Permit AQ1806MSS01.

Condition 28, Excess Emission and Permit Deviation Reports. This condition reiterates the notification requirements in 18 AAC 50.235(a)(2) and 18 AAC 50.240 regarding unavoidable emergencies, malfunctions, and excess emissions. The Permittee is required to notify the Department when emissions or operations deviate from the requirements of the permit. The Department used the language of SPC III but with revised reporting instructions to comply with the September 7, 2023 deadline in 18 AAC 50.270(c).

Condition 29, Operating Reports. The Department mostly used the language of SPC VII (18 AAC 50.346(b)(6)) for the permit condition. However, the Department modified or eliminated the Title V-only aspects in order to make the language applicable for a minor permit.

Condition 30 Title V Major Source Application Submittal. For a stationary source that directly emits, or has the potential to emit, 100 TPY or more of any air pollutant subject to regulation, the Permittee is required to submit a complete application to obtain a Title V operating permit within 12 months after the source becomes subject to the part 70 permit

program, as required by 40 CFR 70.5. For the WOC, the application submittal date is within 12 months after commencing operation of any combination of emissions units with the aggregate potential to emit at least 100 TPY. CPAI must also notify the Department of the date the WOC becomes subject to the Title V permit program.

Condition 31, Air Pollution Prohibited. 18 AAC 50.110 prohibits any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property. This condition reiterates this prohibition. The Department used the language of SPC II (18 AAC 50.346(a)).

Condition 32, Emission Inventory Reporting. This condition requires the Permittee to submit emissions data to the state so the state is able to satisfy the federal requirement to submit emission inventory data from point sources to the EPA as required under 40 CFR 51.15 and 51.321. The federal emission inventory requirement applies to sources defined as point sources in 40 CFR 51.50. Under 18 AAC 50.275, the state also requires reporting of emissions triennially for stationary sources with an air quality permit, regardless of permit classification. This includes sources that do not meet the federal emission thresholds in Table 1 to Appendix A of 40 CFR 51 Subpart A. The state must report emissions data as described in 40 CFR 51.15 and the data elements in Tables 2a and 2b to Appendix A of 40 CFR 51 Subpart A to EPA.

The Department modified the language in SPC XV for the permit condition by lowering the thresholds that require reporting to include all stationary sources regardless of permit classification (excluding ORLs and PAELs) to capture the new requirements found in 18 AAC 50.275, effective September 7, 2022.

Condition 33, Consistency of Reporting Methodologies. The condition is from 18 AAC 50.275(a), effective September 7, 2022. The regulation was added to include all stationary sources required to report actual emissions for the purpose of the federal emissions inventory obligation under 40 CFR 51. Condition 33.1 is from 18 AAC 50.275(b) and requires consistent emission factors and calculation methods when reporting actual emissions under Condition 32 and assessable emissions under Condition 4.2.

Section 8 Standard Permit Conditions

18 AAC 50.544(a)(5) requires each minor permit issued under 18 AAC 50.542 to contain the standard permit conditions in 18 AAC 50.345, as applicable. 18 AAC 50.345(a) clarifies that subparts (c)(1) and (2), and (d) through (o), may be applicable for a minor permit.

The Department included all of the minor permit-related standard conditions of 18 AAC 50.345 in Minor Permit AQ1806MSS01. The Department incorporated these standard conditions as follows:

- 18 AAC 50.345(c)(1) and (2) is incorporated as Condition 34 of Section 8 (Standard Permit Conditions);
- 18 AAC 50.345(d) through (h) is incorporated as Conditions 35 through 39, respectively, of Section 8 (Standard Permit Conditions);
- As previously discussed, 18 AAC 50.345(i) is incorporated as Condition 27 and 18 AAC 50.345(j) is incorporated as Condition 24 of Section 7 (Recordkeeping, Reporting, and Certification Requirements); and

- 18 AAC 50.345(k) is incorporated as Condition 40, and 18 AAC 50.345(l) through (o) is incorporated as Conditions 45 through 48, respectively, of Section 9 (General Source Testing Requirements).

Section 9 General Source Test Requirements

AS 46.14.180 states that monitoring requirements must be, "based on test methods, analytical procedures, and statistical conventions approved by the federal administrator or the department or otherwise generally accepted as scientifically competent." The Department incorporated this requirement as follows:

- 18 AAC 50.220(b) is incorporated as Condition 41 and requires the Permittee to conduct their source tests under conditions that reflects the actual discharge to ambient air; and
- 18 AAC 50.220(c) is incorporated as Condition 42 and requires the Permittee to use specific EPA reference methods when conducting a source test.

Section 9 also includes the previously discussed standard conditions for source testing.

APPENDIX A: Emissions Calculations

Table A1 presents emission factors for the emissions units and Table A2 presents potential emissions. Potential emissions are calculated using maximum annual operation for all equipment unless noted otherwise. Calculations also consider federally enforceable limits, including operational limits.

Table A1 – Emission Factor Summary

EU ID	Description	Maximum Rating or Capacity	NOx		CO		VOC		PM	
001	Generator Turbine	15,780 kWe (ISO)	Gas *In* = 8.7 lb/hr Gas *Out* = 69.4 lb/hr ULSD *In* = 47.0 lb/hr ULSD *Out* = 81.0 lb/hr	Vendor	Gas *In* = 6.6 lb/hr Gas *Out* = 2254.4 lb/hr ULSD *In* = 11.0 lb/hr ULSD *Out* = 328.6 lb/hr	Vendor	2.25 lb/hr	Vendor	6.18 lb/hr	Vendor
201	Backup Generator #1	2,250 kWe	8.0 g/bkW-hr	Tier 2 NTE	4.4 g/bkW-hr	Tier 2 NTE	6.42E-04 lb/bhp-hr	AP-42 Table 3.4-1	0.3 g/bkW-hr	Tier 2 NTE
202	Backup Generator #2	2,250 kWe								
203	Firewater Pump	460 bhp	8.0 g/bkW-hr	Tier 2 NTE	4.4 g/bkW-hr	Tier 2 NTE	2.51E-03 lb/bhp-hr	AP-42 Table 3.3-1	0.3 g/bkW-hr	Tier 2 NTE
204	Firewater Pump #1	460 bhp								
205	Firewater Pump #2	460 bhp								
206	Small Generator #1	50 kWe (cumulative)	5.9 g/bkW-hr	Tier 4 NTE	6.9 g/bkW-hr	Tier 4 NTE	2.51E-03 lb/bhp-hr	AP-42 Table 3.3-1	0.05 g/bkW-hr	Tier 4 NTE
207	Small Generator #2	50 kWe (cumulative)								
208	Large Generator	13,500 kWe (cumulative)	0.75 g/bkW-hr	Tier 4 NTE	0.18 g/bkW-hr	Tier 4 NTE	6.42E-04 lb/bhp-hr	AP-42 Table 3.4-1	0.045 g/bkW-hr	Tier 4 NTE
301	Incinerator	< 833 lb/hr; 9.95 MMBtu/ton	3.16 lb/ton	AP-42 Table 2.1-9	0.144 lb/MMBtu (HHV)	40 CFR 60 EEEE, Table 1b (x2)	3.0 lb/ton	AP-42 Table 2.1-12	3.77E-04 lb/MMBtu (HHV)	40 CFR 60 EEEE, Table 1b (x2)
801	Cement Blending Vent	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.67E-05 g/dscf	Cyclone and filter control guarantee
802	Small Portable Heaters and Boilers	10 MMBtu (HHV)/hr (cumulative)	20 lb/kgal	AP-42 Table 1.3-1	5 lb/kgal	AP-42 Table 1.3-1	0.34 lb/kgal	AP-42 Table 1.3-3	2.4 lb/kgal	AP-42 Table 1.3-2

EU ID	Description	Maximum Rating or Capacity	NOx		CO		VOC		PM	
803	Small Stationary Heaters and Boilers	5 MMBtu (HHV)/hr (cumulative)	100 lb/MMscf	AP-42 Table 1.4-1	84 lb/MMscf	AP-42 Table 1.4-1	5.5 lb/MMscf	AP-42 Table 1.4-2	7.6 lb/MMscf	AP-42 Table 1.4-2
805	Fuel Gas Skid Venting	12 startups/year	N/A	N/A	N/A	N/A	723 lb/startup	Fuel gas properties	N/A	N/A
901	Storage Tanks	Includes all tank types	N/A	N/A	N/A	N/A	186.7 lb/yr	Emission Master Tanks Software 8.4.3	N/A	N/A
1001	Equipment Component Leaks	Average component count for onshore production in western US	N/A	N/A	N/A	N/A	0.15 TPY	EPA protocol for leaks	N/A	N/A
1002	Refueling and Spillage from tanks	23,053,176 gal/yr throughput	N/A	N/A	N/A	N/A	0.057 lb/kgal	AP-42 Section 5.2	N/A	N/A
1003	Pad-Generated Fugitive Dust	76 acres 16 events/yr	N/A	N/A	N/A	N/A	N/A	N/A	913 lb/ disturbance	AP-42 Section 13.2.5

Table Notes:

Gas *In* is turbine operating on gaseous fuel in dry low NOx mode.
Gas *Out* is turbine operating on gaseous fuel out of dry low NOx mode.
ULSD *In* is turbine operating on liquid fuel in dry low NOx mode.
ULSD *Out* is turbine operating on liquid fuel out of dry low NOx mode.

SO_2 emissions are based on mass balance calculations using diesel heating value of 132,165 Btu/gal and diesel density of 6.80 lb/gal. Also using fuel gas higher heating value of 1,151 Btu/scf. SO_2 EF for incinerator is 3.23 lb/ton from Table 2.1-9 of AP-42.

The turbine EFs are for the worst-case of various operating scenarios. They correspond to 8,260 hrs in dry low NOx mode on fuel gas, 500 hours in dry low NOx mode on backup fuel, and no more than 120 hours out of dry low NOx mode.

Table A2 – Potential Emissions Summary (tpy)

EU ID	Description	Assumptions and Limits			NOx	CO	VOC	PM	SO_2
001	Generator Turbine [1]	15,780 kWe	120 hr/yr part load	500 hr/yr backup fuel	51.88	165.28	8.34	27.33	22.69
201	Backup Generator #1	2,250 kWe	500 hr/yr	ULSD	10.99	6.01	0.51	0.34	0.009
202	Backup Generator #2	2,250 kWe	500 hr/yr	ULSD	10.99	6.01	0.51	0.34	0.009
203	Firewater Pump	460 bhp	500 hr/yr	ULSD	1.51	0.83	0.29	0.047	0.001
204	Firewater Pump #1	460 bhp	500 hr/yr	ULSD	1.51	0.83	0.29	0.047	0.001
205	Firewater Pump #2	460 bhp	500 hr/yr	ULSD	1.51	0.83	0.29	0.047	0.001
206	Small Generator #1	50 kWe	8760 hr/yr	ULSD	3.14	3.68	0.78	0.024	0.003
207	Small Generator #2	50 kWe	8760 hr/yr	ULSD	3.14	3.68	0.78	0.024	0.003
208	Large Generator	13,500 kWe	8760 hr/yr	ULSD	142.38	34.43	55.28	8.50	0.93
301	Incinerator	833 lb/hr	8760 hr/yr	waste/fuel gas	5.77	2.62	5.48	0.01	5.89
801	Cement Blending Vent	15 dscfm			--	--	--	1.45E-04	--
802	Small Portable Heaters and Boilers	10 MMBtu/hr			6.63	1.66	0.11	1.09	0.068
803	Small Stationary Heaters and Boilers	5 MMBtu/hr			2.15	1.80	0.12	0.16	0.64
805	Fuel Gas Skid Venting			12 startups/yr	--	--	4.34	--	--
901	Storage Tanks			Diesel conservatively represented by Jet A	--	--	0.09	--	--
1001	Equipment Leaks		8760 hr/yr	average component count	--	--	0.15	--	--
1002	Refueling and Spillage from tanks	23,053,176 gal/yr throughput			--	--	0.66	--	--
1003	Pad-Generated Fugitive Dust	16 events/yr	50% control for watering	59.9 mph fastest wind speed	--	--	--	7.30	--
	TOTAL (excluding fugitive emissions)				241.61	227.65	77.20	37.97	30.26
	TOTAL (including fugitive emissions)				241.61	227.65	78.01	45.27	30.26

Table Notes:

Fugitive emissions from EU IDs 1001, 1002, and 1003 do not count towards permit applicability, but are assessable.

APPENDIX B: Modeling Report

Alaska Department of Environmental Conservation

Air Permit Program

Review of

ConocoPhillips Alaska, Inc's.

Ambient Demonstration

for the

Willow Operations Center

Minor Permit AQ1806MSS01

Prepared by: James Julian Renovatio
Prepared on: 31 October, 2023

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1. INTRODUCTION

This report summarizes the Alaska Department of Environmental Conservation's (Department's) findings regarding the ambient demonstration submitted by ConocoPhillips Alaska, Inc. (CPAI) for the Willow Operations Center (WOC). CPAI submitted this analysis in support of their 20 June, 2023 application for Minor Permit AQ1806MSS01. CPAI adequately demonstrated that operating the WOC emissions units (EUs) within the restrictions listed in this report will not cause or contribute to a violation of the following Alaskan Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010:

- annually averaged nitrogen dioxide (NO_2);
- annually averaged and 24-hour particulate matter with an aerodynamic diameter of 2.5 microns or less (PM-2.5); and
- 24-hour particulate matter with an aerodynamic diameter of 10 microns or less (PM-10).

2. BACKGROUND

The following sub-sections provide additional background on the proposed project and application materials.

2.1. Project Location

The WOC is a new stationary source within the Bear Tooth Unit on the Alaskan North Slope. CPAI's application materials indicate the source is to be constructed at 70°08'31.7358" N, 151°59'45.1953" W. This location is situated approximately 38 kilometers (km) west-southwest from the community of Nuiqsut.

2.2. Project Description

Construction of the WOC stationary source is proposed as the first of multiple sources supporting the greater Willow Development effort, which will include the Willow Central Facility and multiple drill sites. It is a new stationary source with operations that are characterized by 'crude petroleum and natural gas' under the standard industrial classification (SIC)[1] scheme. The installed emissions unit (EU) inventory at the source will vary across three phases: construction, early operations, and routine operations. Power generation at the WOC will initially be met using liquid fuel-fired reciprocating units, with a dual fuel-fired turbine to be subsequently installed for routine operations. Liquid fuel-fired reciprocating units will also be operated for backup and emergency use, with various smaller or mobile EUs such as boilers, heaters, and non-road engines employed across each phase. An incinerator, and tank EUs will also be included within the WOC EU inventory; detail is provided under Section 3.6.

[1] Application materials indicate the stationary source is classified under SIC 1311.

2.3. Project Classification

CPAI's application is classified under 18 AAC 50.502(c)(1) for the construction of a new stationary source with a potential to emit greater than the applicable thresholds for oxides of nitrogen (NOx), PM-2.5, and PM-10. Applicants must provide an AAAQS analysis for each pollutant triggered under this classification in accordance with the requirements of 18 AAC 50.540(c)(2)(A). CPAI fulfilled this requirement by submitting an AAAQS analysis for annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 with their application. Applicants for minor permits are not generally required to demonstrate compliance with the one-hour NO_2 AAAQS in observation of 18 AAC 50.540(l).

CPAI's application is also classified under 18 AAC 50.508(5) for establishing owner requested limits (ORLs) to avoid one or more permit classifications under AS 46.14.130. The requested limits are intended to avoid Prevention of Significant Deterioration (PSD) and Title V classifications by restricting the emissions of NOx, carbon monoxide (CO), sulfur dioxide (SO_2), and volatile organic compounds (VOC). CPAI has also proposed ORLs to both protect ambient air quality and avoid select federal requirements. There are no ambient air demonstration requirements associated with this permit classification.

2.4. Modeling Protocol Submittal

The Department does not typically require a modeling protocol to be submitted[2] with applications for minor permits. However, a protocol is helpful to ensure that the modeling tools, procedures, input data, and assumptions that are used by an applicant are consistent with both State and Federal guidance.

CPAI did not submit a modeling protocol for the WOC construction project. However, they met telephonically with the Department on 25 May, 2023 to discuss salient concerns prior to submission of their application.

2.5. Application Submittal

CPAI submitted an application for a minor permit with an ambient analysis on 20 June, 2023. Their consultant, SLR International Corporation (SLR), prepared the application and ambient analysis on their behalf.

3. .SOURCE IMPACT ANALYSIS

CPAI used computer analysis (modeling) to predict the ambient air quality impacts from NO_2, PM-2.5, PM-10. The Department's findings regarding CPAI's analysis are discussed below.

3.1. Approach

An applicant may use a multi-step approach in performing an ambient demonstration. In this approach, project impacts are first compared to the significant impact levels (SILs) listed in Table 5 of 18 AAC 50.215(d). Impacts less than the SIL are considered negligible. For those

[2] The Department may request an applicant to submit a modeling protocol in accordance with 18 AAC 50.540(c)(2).

pollutants and averaging periods with significant impacts, a cumulative impact analysis is warranted.

CPAI performed a cumulative impact analysis given significant impacts from all pollutants and averaging periods. Their analysis observed one modeled scenario that reflects the contemporaneous operation of both early and routine operational phase EUs. CPAI did not model their construction phase operations citing conservatism in the former approach. The Department finds CPAI's approach sufficient to identify the maximum potential impacts associated with operation of the WOC.

3.2. Model Selection

There are a number of air dispersion models available to applicants and regulators. The U.S. Environmental Protection Agency (EPA) lists these models in their Guideline on Air Quality Models (Guideline), which the Department has adopted by reference in 18 AAC 50.040(f). CPAI used EPA's AERMOD Modeling System (AERMOD) for their ambient analysis. AERMOD is an appropriate modeling system for this permit application.

The AERMOD Modeling System consists of three major components: AERMAP, used to process terrain data, and develop elevations for the receptor grid and EUs; AERMET, used to process the meteorological data; and the AERMOD dispersion model, used to estimate the ambient pollutant concentrations. CPAI used the current version of AERMOD and AERMET, both version 22112. They assumed flat terrain within the modeled domain rather than running AERMAP, which is common practice for new source review modeling on the North Slope coastal plain.

3.3. Meteorological Data

AERMOD requires hourly meteorological data to estimate plume dispersion. A *minimum* of one-year of site-specific data, or five years of representative National Weather Service (NWS) data is required, per Section 8.3 of the Guideline. When modeling with site-specific data, the Guideline states that up to five years should be used, when available, to account for year-to-year variation in meteorological conditions.

CPAI used three years of surface data[3] collected at the Nuiqsut meteorological monitoring station during 2016, 2017, and 2019[4]. They used concurrent upper air data collected by the NWS at Utqiagvik. CPAI's application materials indicate that these data are representative of the meteorological conditions at the WOC stationary source due to station proximity and similarity of approved use in support of Minor Permit AQ0267MSS01. The Department provided its case-specific approval of this approach in a 25 May, 2023 pre-application meeting with CPAI.

[3] The applicant reprocessed these data for the subject permit application using the current version of AERMET. The Stage 1 AERMET inputs reflect a revised anemometer instrumentation height of 10 m above ground level.
[4] Data from monitoring year 2018 were not observed citing missing or invalid upper air data.

3.3.1. Quality Assurance Review

Site-specific meteorological data must meet the PSD quality assurance requirements outlined in the EPA's *Meteorological Monitoring Guidance for Regulatory Modeling Applications* per 18 AAC 50.215(a)(3). The Department reviewed and found these data to be PSD-quality in a report dated 25 June, 2020. Additional detail regarding the review of these data is provided in the Technical Analysis Report for Minor Permit AQ0267MSS01 in addition to the aforementioned findings report.

3.3.2. Surface Characteristics

AERMET requires the area surrounding the meteorological tower to be characterized using the following surface characteristics: noon-time albedo, Bowen ratio, and surface roughness length. The EPA has provided additional guidance regarding the selection and processing of values for these surface characteristics in their *AERMOD Implementation Guide*.

CPAI used surface parameters previously approved by the Department for tundra[5] on the Alaskan North Slope. The approved surface parameters are repeated below in Table 1.

Table 1. Approved AERMET surface parameters

Surface Parameter	Winter Value	Summer Value
Albedo	0.8	0.18
Bowen Ratio	1.5	0.80
Surface Roughness Length (m)	0.004	0.02

Table Note: Summer is defined as June through September, and winter is defined as October through May for purposes of processing the A-Pad data using AERMET.

3.4. Coordinate System

Air quality models need to know the relative location of the EUs, structures, and receptors in order to properly estimate ambient pollutant concentrations. Therefore, applicants must use a consistent coordinate system in their analysis. CPAI used the Universal Transverse Mercator (UTM) system, Zone 5.

3.5. Terrain

Terrain features can influence the dispersion of exhaust plumes from EUs and the resulting ambient air concentrations of the pollutants being emitted. Digitized terrain elevation data is, therefore, generally included in a modeling analysis, unless the entire modeling domain is over water or the terrain features are so slight that a flat terrain assumption can be made. AERMOD's terrain preprocessor, AERMAP, uses terrain data to obtain the base elevations for the modeled EUs, buildings, and receptors; and to calculate a "hill height scale" for each receptor.

[5] The Department has provided approved surface parameters for tundra in various North Slope modeling reviews and under Section 2.6.4.2 of its *Modeling Procedures Review Manual.*

CPAI did not include terrain data in their modeling analysis. Their application indicates the project is situated within the North Slope coastal plain, which may be assumed flat for the purposes of modeling. This is an appropriate assumption for the current demonstration at the WOC stationary source.

3.6. EU Inventory

CPAI modeled the EUs listed under Table 2 in their ambient demonstration. The modeled locations of these EUs are presented under Table G.2-3 of Attachment G to their 20 June, 2023 application. CPAI characterized all of the modeled EUs, save the bulk cement blending system, as point sources.

Table 2. Modeled EU inventory

EU ID	Model ID	Application Description	Rating
001	TB70801	Dual Fuel Power Generation Turbine	15,780 kWe
201	G70810	EPA Tier 2 Certified Backup Power Generator No.1	2,250 kWe
202	G70820	EPA Tier 2 Certified Backup Power Generator No.2	2,250 kWe
203	P82803	EPA Tier 2 Certified Firewater Pump	460 bhp
204	FWP_01	EPA Tier 2 Certified Temporary Firewater Pump No. 1	460 bhp
205	FWP_02	EPA Tier 2 Certified Temporary Firewater Pump No.2	460 bhp
206	TEMP_01	EPA Tier 4f Certified Small Temporary Power Generator No.1	50 kWe (cumulative)
207	TEMP_02	EPA Tier 4f Certified Small Temporary Power Generator No.2	50 kWe (cumulative)
208	TEMP_03	EPA Tier 4f Certified Large Temporary Power Generator	13,500 kWe (cumulative)
301	U59801	Incinerator[6]	< 833 lb/hr; 9.95 MMBtu/ton
801	U59866	Bulk Cement Blending System (vent)	15 dscfm

3.6.1. Excluded EUs

CPAI excluded multiple EUs from their modeled ambient demonstration. The stated bases and assumptions for their exclusion is provided in Attachment G of their 20 June, 2023 application. The excluded EUs are summarized as follows:

[6] EU-specific emissions information for the proposed incinerator was not provided in application materials at the time of this report citing outstanding elements of a final unit design to be constructed. The applicant provided supplemental information by e-mail on 28 August, 2023 proposing a vendor guarantee for an anticipated design that will meet the NSPS Subpart EEEE emission standards under Table 1b of the proposed rule published in the Federal Register on 31 August, 2020.

- EU ID 802, small portable heaters/boilers with a cumulative rating of 10 MMBtu/hr. Excluded citing ADEC Policy and Procedure 04.02.105; see Section 3.6.3 of this report for detail.
- EU ID 803, small stationary heaters/boilers with a cumulative rating of 5 MMBtu/hr. Excluded assuming representation of impacts through ambient pollutant background data.
- EU ID 805, fuel gas skid venting with an assumed 12 startup per-year. Excluded as not emitting a pollutant subject to ambient review.
- EU ID 901, storage tanks of various rating/capacity. Excluded as not emitting a pollutant subject to ambient review.
- EU ID 1001, equipment component leakage. Excluded as not emitting a pollutant subject to ambient review.
- EU ID 1002, Refueling and tank spillage. Excluded as not emitting a pollutant subject to ambient review.
- EU ID 1003, fugitive dust from pad. Anticipated impacts principally attributed to construction phase operations.

The Department is including terms and conditions to protect ambient air quality in observation of requirements germane to CPAI's non-modeled[7] EUs. These terms and conditions include restrictions on the firing of liquid fuels with a sulfur content of 15 parts-per-million by weight (ppmw) or less in all policy-excluded EUs.

3.6.2. Construction Phase Air Emissions at Oil Fields

Department policy[8] provides for North Slope applicants to exclude select construction phase emissions from their AAAQS analysis. Observing the guidance within this policy, applicants may exclude internal combustion equipment rated at less than 400 brake-horsepower (bhp), and boilers/heaters with a heat-input rating of less than 2.8 million British thermal units per-hour (MMBtu/hr) This policy is not an exemption from compliance with the ambient air quality standards[9], but a simplification of the ambient demonstration and associated monitoring, recordkeeping, and reporting (MR&R) for subject equipment. EUs excluded from an ambient demonstration under this policy must comply with a limit on the maximum sulfur content of liquid fuels fired of to no greater than 15 ppmw. The Department may impose this limit by permit condition.

CPAI's application materials indicate that they relied upon the Department's policy for construction phase air emissions at oil fields to exclude unspecified construction EUs from their AAAQS analyses. These materials also note CPAI's commitment to fire ULSD in construction phase EUs in comport with the Willow Master Development Plan Supplemental Environmental Impact Statement Record of Decision. The Department is,

[7] The Department is also including simplified terms and conditions for the modeled incinerator to verify its assumed emissions once a final design is selected and constructed. This approach is used in lieu of source testing noting that the unit will be an affected source under 40 C.F.R. 60 Subpart EEEE, which will entail more rigorous terms and conditions in the Applicant's forthcoming Title V Operating Permit.
[8] Policy and Procedure 04.02.104, *Construction Phase Air Emissions at Oil Fields,* November 20, 2006.
[9] The Department is obligated to make reasonable inquiry to assure that emissions from excluded units will not result in violations of the ambient air quality standards. Therefore, use of this policy is reviewed on a case-specific basis.

therefore, limiting the sulfur content of fuels fired in the non-modeled units as an enforceable permit condition to protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS.

3.6.3. Intermittently Used Oilfield Support Equipment

Department policy[10] provides for North Slope applicants to exclude certain small and intermittently used equipment from their AAAQS analysis. Observing the guidance within this policy, applicants may exclude intermittently used oilfield support engines rated at less than 400 brake hp (bhp), and boilers/heaters with a heat-input rating of less than 2.8 million British thermal units per hour (MMBtu/hr). This policy is not an exemption from compliance with the ambient air quality standards[11], but a simplification of the ambient demonstration and associated MR&R for subject equipment. EUs excluded from an ambient demonstration under this policy must comply with a limit on the maximum sulfur content of liquid fuels fired of to no greater than 15 ppmw. The Department may impose this limit by permit condition.

CPAI's application materials indicate that they relied upon the Department's policy for intermittently used oilfield support equipment to exclude EU IDs 802 and 803 from their AAAQS analyses. The Department is, therefore, limiting the sulfur content of fuels fired in the non-modeled units as an enforceable permit condition to protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS.

3.7. EU Release Parameters

The assumed emission rates and characterization of how the emissions enter the atmosphere will significantly influence modeled results. Therefore, applicants must provide the stack height, diameter, location, and base elevation, in addition to the pollutant emission rates, exhaust plume exit velocity, and exhaust temperature for each exhaust stack.

3.7.1. Emission Rates

The Department generally found CPAI's modeled emission rates to be consistent with the emissions information provided throughout their application. The exceptions, or items that otherwise warrant additional information, are discussed below. A discussion regarding CPAI's modeled turbine emissions is provided under Section 3.7.2.1.

3.7.1.1 Operational Limits

CPAI generally assumed that the WOC stationary source EUs operate continuously throughout the year at their respective maximum capacities. Exceptions to the former include EU IDs 201 through 205, identified as emergency engine generators and firewater pumps, which entail an assumed 500 hours-per-year of use. The

[10] ADEC Policy and Procedure 04.02.105: *Intermittently Used Oilfield Support Equipment*, November 20, 2006.
[11] The Department is obligated to make reasonable inquiry to assure that emissions from excluded units will not result in violations of the ambient air quality standards. Therefore, use of this policy is reviewed on a case-specific basis.

Department is not imposing enforceable terms and conditions to limit the emergency operation of these units in observation of relevant guidance[12] from the EPA.

3.7.1.2 Short-term Emission Rates

The modeled emission rate should generally reflect the maximum capacity of an EU to emit a pollutant under its physical and operational design during a particular averaging period.

CPAI used the maximum assumed emissions potential, by pollutant and averaging period, to develop their modeled EU emission rates. The Department is, therefore, not including any short-term operational restrictions to protect ambient air quality.

3.7.2. Point Source Parameters

In addition to the previously discussed emission rates, applicants must provide the stack height, diameter, location, base elevation, exhaust plume exit velocity, and exhaust temperature for each EU that is characterized as a point source.

The Department generally found the modeled stack parameters to be consistent with the vendor information or expectations for similarly sized EUs. Information that warrants additional discussion is discussed below.

3.7.2.1 Load Analysis

The maximum ambient pollutant concentration does not always occur during the full-load operating conditions that typically produce the maximum emissions. The relatively poor dispersion that occurs with cooler exhaust temperatures and slower part-load exit velocities may produce the maximum ambient impacts. Turbine emissions also vary by fuel type, load, and inlet air temperature. Therefore, the EPA recommends a load analysis be performed on the primary EUs to determine the worst-case conditions.

CPAI did prepared a simplified analysis of load and temperature for the proposed dual-fuel turbine, EU ID 001. Their application materials cite the use of representative vendor data to calculate the modeled NOx and particulate emissions rates for this unit. CPAI's calculated emission factors generally assume the contemporaneous operation of both dry low emissions controls and inlet air heating along with an attendant steady-state load regime of greater than 50-percent when firing gaseous fuels, and greater than 65-percent when firing liquid fuels to ensure operation of the controls. Their methodology of calculation for the modeled turbine emission rates observe 500 annual hours of emergency use when firing ULSD or unprocessed fuel gas, and 120 hours of use outside of emissions-controlled operation to account for low loads and emissions during startup, shutdown, and malfunction. CPAI appropriately relied upon the maximum assumed emission rates to characterize

[12] Memorandum from J. Seitz, Dir. OAQPS to Regional Air Division Directors, *Calculating Potential to Emit (PTE) for Emergency Engines,* dated September 6, 1995.

the short-term turbine emissions. The Department is including CPAI's turbine assumptions as enforceable permit conditions to protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS.

3.7.2.2 Stack Heights

The Department generally found CPAI's modeled stack heights to be consistent with those of similarly sized units, except as noted. It is, therefore, requiring the construction and operation of EUs with the minimum stack heights listed in Table 3 as enforceable permit conditions to protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS.

Table 3. Minimum stack heights

EU ID	Model ID	Description	Min. Stack Height (m)
001	TB70801	Dual Fuel Power Generation Turbine	20.0
301	U59801	Incinerator	12.0

3.7.2.3 Horizontal/Capped Stacks

Capped stacks or horizontal releases warrant additional discussion, because they generally lead to higher impacts in the immediate near-field than would occur from uncapped, vertical releases. Therefore, the non-vertical stacks or those with rain caps require special handling in an AERMOD analysis. EPA describes the proper approach for characterizing these types of stacks in their *AERMOD Implementation Guide*.[13] EPA has also developed options in AERMOD that will automatically revise the stack and exhaust parameters for any releases identified as horizontal or capped by using the POINTHOR and POINTCAP keywords.

CPAI used the POINTHOR option to characterize the firewater pumps, EU IDs 203 through 205, as horizontal releases. They considered all other point source EUs as having uncapped, vertical releases. The Department is, therefore, requiring the construction of exhaust releases as characterized as enforceable permit conditions to protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS.

3.7.2.4 Weighted Standards as Emission Factors

CPAI's ambient demonstration relies upon the EPA's emissions standards for both Tier 2 and 4f equipment to characterize the NOx and particulate emissions from EU IDs 201 through 208. The Department notes that these standards were developed using the weighted emissions from various class-specific equipment and do not represent a unit-specific maximum, or not-to-exceed factor typically suitable for use

[13] *AERMOD Implementation Guide* (EPA-454/B-18-003); April 2018.

in characterizing an EUs maximum emissions potential. Guidance[14] exists to mitigate the uncertainty associated with using these standards in estimating unit-specific emissions. Succinctly, the use of a case-specific multiplication factor is recommended to address the not-to-exceed potential. CPAI appropriately observed the former recommendation in developing emission factors for their subject EUs. Based on CPAI's use of EPA standards to characterize their case-specific EU emissions, the Department is including enforceable terms and conditions that require the Permittee to obtain and report certified manufacturer's guarantees that each of EU IDs 201 through 208 will comply with EPA's tier emission standards, or perform source testing for these EUs, to protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS.

3.7.3. Volume Parameters

The volume source option is frequently used to characterize fugitive emissions that have initial lateral and vertical spread near the point of release. Examples include the fugitive dust associated with construction activities or dirt roads, and wind-blown dust from storage piles. Applicants who characterize an EU or emissions activity as a volume source must provide AERMOD with the initial lateral and vertical dimensions of the volume, the release height at volume center, location and base elevation, in addition to the previously discussed emissions rate.

CPAI characterized EU ID 801, the bulk cement blending system vent, as a volume source[15] of particulate matter. The Department evaluated the appropriateness of this characterization noting the surrounding structures, proximity of an ambient air boundary, and potential for downwash-driven impacts. It found that model results are not sensitive to impacts from this EU, which is likely attributable to a relatively small emissions potential. The Department, therefore, finds CPAI's characterization of EU ID 801 as a volume source appropriate to represent its potential impacts at the WOC stationary source.

3.8. Off-site Source Characterization

CPAI considered the impacts from nearby stationary sources in their cumulative analysis. They relied upon ambient pollutant data to represent impacts from these off-site sources in lieu of explicit modeling. See section 3.14 for additional information regarding CPAI's consideration of impacts from off-site sources.

3.9. Pollutant Specific Considerations

The following pollutants warrant additional discussion.

[14] Relevant information is provided under 40 C.F.R. Part 1039.
[15] The applicant defined this source using a volume of one cubic meter and a release height of three meters.

3.9.1. Ambient NO_2 Modeling

The emissions of NOx from combustion sources include both nitric oxide (NO) and NO_2 as constituents. After combustion gases exit a stack, additional NO_2 can be formed due to reactions within the atmosphere. Section 4.2.3.4 of the Guideline describes a three-tiered approach for estimating the ambient concentrations of NO_2 from this process, ranging from the simplest but conservative assumption that all NO is converted to NO_2, to other more complex methods.

CPAI used the Ambient Ratio Method version 2 (ARM2), which is the EPA's currently recommended Tier 2 approach to estimating the ambient concentrations of NO_2. This method uses an ambient NO_2-to-NOx ratio to convert the modeled annually averaged NOx concentrations to annually averaged NO_2 concentrations. CPAI assumed maximum and minimum equilibrium ratios of 0.90 and 0.50, respectively, in comport with EPA guidance. CPAI's approach is appropriate for the WOC stationary source construction project.

3.9.2. PM-2.5

PM-2.5 may be directly emitted from a source and is also formed through chemical reactions in the atmosphere, i.e. by secondary formation with other pollutants.[16] AERMOD is an acceptable model for performing a near-field analysis of the direct emissions, but EPA has not developed a near-field model that includes the necessary chemistry algorithms for estimating secondary impacts. EPA, therefore, recommends that applicants use existing technical information to assess their secondary PM-2.5 impacts by way of a "Tier 1" analysis[17]. The use of photochemical modeling to assess secondary impacts, i.e. a "Tier 2" analysis, may be appropriate as warranted, though the former approach is typical. CPAI's application materials indicate that an evaluation of secondary PM-2.5 impacts was neither required nor performed. The Department finds that this position is inconsistent with current regulatory guidance. Its staff, therefore, evaluated the potential impacts from secondary PM-2.5 in association with the proposed construction and operation of the WOC stationary source.

EPA has issued guidance regarding the characterization of secondary formation in various PSD scenarios.[18] This guidance was not explicitly developed for minor permit modeling. However, it offers useful information to support regulatory assessments of PM-2.5. EPA notes that the maximum direct impacts and the maximum secondary impacts from a stationary source "*...are not likely well-correlated in time or space*", i.e., they are anticipated to occur in different locations and at different times. This difference occurs because secondary PM-2.5 formation is a complex photochemical process that requires the presence of precursor pollutants in sufficient quantity for significant formation to occur. The Department found that conditions for this reaction process to meaningfully occur within areas of the modeled domain near the ambient air boundary,

[16] The emissions of NOx, SO_2, VOC, and Ozone are considered "precursor emissions".
[17] EPA's tiered approach to assessing secondary PM-2.5 formation is described in Section 5.4 of the Guideline.
[18] Guidance for $PM_{2.5}$ Permit Modeling (EPA-454/B-14-001); May 2014.

the location(s) of maximum estimated project impacts, are not anticipated to be likely based on its review of CPAI's modeled assumptions and estimated results.

EPA further states that representative ambient monitoring data could be used to address the secondary formation that occurs from existing sources in a demonstration of the ambient standard. The background data CPAI used to in their PM-2.5 AAAQS analysis meets this objective; see Section 3.14 for detail.

3.10. Downwash

Downwash refers to the situation where local structures influence the plume from an exhaust stack. Downwash can occur when a stack height is less than a height derived by a procedure called "Good Engineering Practice" (GEP), which is defined in 18 AAC 50.990(42). It is a consideration when there are receptors relatively near the applicant's structures and exhaust stacks.

EPA developed the "Building Profile Input Program - PRIME" (BPIPPRM) program to determine which stacks could be influenced by nearby structures and to generate the cross-sectional profiles needed by AERMOD to determine the resulting downwash. CPAI used the current version of BPIPPRM, version 04274, to determine the building profiles needed by AERMOD.

CPAI included all of the modeled point sources[19] in their downwash analysis. The Department used a proprietary 3-D visualization program to review their characterization of the exhaust stacks and structures. The characterization matches the figures provided in their permit application. CPAI appropriately accounted for downwash in their modeling analysis. BPIPPRM indicated that the modeled exhaust stacks are within the GEP stack height requirements.

3.11. Ambient Air Boundary

The AAAQS only apply within location of *ambient air*, which has been defined by the EPA as "*…that portion of the atmosphere, external to buildings, to which the general public has access*." [20] Applicants may, therefore, exclude areas that they own or lease from an ambient demonstration if they employ "*…measures, which may include physical barriers, that are effective in precluding access to the land by the general public.*" [21] They conversely need to model that portion of their property/lease that has no such restriction, or where there is an easement or public right-of-way. Natural features, such as dense vegetation or topographical

[19] The Applicant's approach to characterizing the configuration of structures proposed for construction and use during their 'early operations' phase is described in Attachment G to their 20 June, 2023 application.
[20] The term "ambient air" is defined in 40 CFR 50.1. The Alaska Legislature has also adopted the definition by reference in AS 46.14.990(2).
[21] EPA has authored multiple guidance documents regarding ambient air issues which may be found in their Modeling Clearinghouse Information Storage and Retrieval System at http://cfpub.epa.gov/oarweb/MCHISRS/. This language originates from the December 2, 2019 Memorandum from EPA Administrator Andrew R. Wheeler to Regional Administrators: *Revised Policy on Exclusions from 'Ambient Air*.

features, can provide adequate barriers to public access, although the adequacy of the given features must be evaluated on a case-specific basis.

CPAI assumed the perimeter of the gravel pads for the WOC and its airstrip, in addition to approximately 600 m of private connecting road between the two, as their ambient air boundary. This is a typical approach and generally suitable North Slope stationary sources on a case-specific basis.

3.12. Worker Housing

CPAI will need to house their workers on site due to the project's remote location. Worker housing areas must be treated as ambient air, except under the conditions described in the Department's *Ambient Air Quality Issues at Worker Housing* policy.[22] The conditions are:

1) the worker housing area is located within a secure or remote site;
2) the worker housing area is for official business/worker use only; and
3) the operator has a written policy stating that the on-site workers are on 24-hour call.

CPAI did not characterize their worker housing area as a part of ambient air in comport with the aforementioned policy. The Department finds CPAI's use of this policy is appropriate.

3.13. Receptor Grid

CPAI used a rectangular receptor grid of decreasing resolution with distance from the stationary source to estimate their ambient impacts. The receptor resolutions used are:

- 25-m spacing along the ambient boundary described in Section 3.11;
- 25-m spacing within an area set 100 m outward from the WOC pad edge; and
- 100-m spacing within a one km^2 area beyond the former.

The Department generally recommends applicants include a mid-range receptor resolution to provide detail within the modeled domain. It, therefore, examined areas of greater estimated ambient concentrations within coarse receptor areas of CPAI's modeled domain to better evaluate potential impacts of significance. The Department found that CPAI's grid has sufficient resolution and coverage to determine the maximum impacts for AQ1806MSS01.

3.14. Off-Site Impacts

The air quality impact from natural and regional sources, along with long-range transport from far away sources, must be accounted for in a cumulative AAAQS demonstration. The approach for incorporating these impacts must be evaluated on a case-specific basis for each type of assessment and for each pollutant, as applicable.

Section 8.3 of the Guideline discusses how the off-site impacts could be incorporated for purposes of demonstrating compliance with an air quality standard. These impacts must be represented through either ambient monitoring data or through modeling. However, Section

[22] ADEC Policy and Procedure 04.02.108: *Worker Housing Aggregation and Modeling*, 5 May, 2021.

8.3.3(b)(iii) notes, "*The number of nearby sources to be explicitly modeled in the air quality analysis is expected to be few except in unusual situations*." The language in this section further states that "*…sources that cause a significant concentration gradient in the vicinity of the* [applicant's source] *are not likely to be adequately characterized by the monitored data due to the high degree of variability of the source's impacts.*"

Attachment G of CPAI's 20 June, 2023 application indicate they considered four nearby stationary sources that may cause significant concentration gradients in the vicinity of the WOC stationary source, the nearest approximately 12 km distant. Application materials also identify three proposed sources associated with the Willow Development effort, the nearest approximately 1.7 km distant. CPAI did not explicitly model any of the off-site sources considered. They relied upon ambient pollutant data collected at the Nuiqsut monitoring station to represent impacts from these off-site sources in lieu of explicit modeling. CPAI's basis for the former characterization is predicated upon an anticipated conservatism of monitored ambient impacts from both natural and anthropogenic sources about the Nuiqsut monitoring station. The presence of community-driven ambient impacts and downwind station location from multiple stationary sources, including those considered, are cited in this regard.

The Department considered CPAI's approach noting the distance between sources, potential constituents of ambient monitoring data, and probable trends of atmospheric transport. Based upon the former, it does not anticipate significant gradient-driving impacts from the off-site sources occur within the modeled project domain. The use of these background pollutant data to characterize off-site impacts may, therefore, be considered appropriate on a case-specific basis. CPAI correctly indicates that the separately considered Willow Development sources will require evaluation in a future ambient demonstration as the sources remain to be constructed or permitted.

3.15. Design Concentrations

The EPA generally allows applicants to use modeled concentrations that are consistent with the form of the standard as their design concentration. Applicants must always compare their highest modeled concentrations to the deterministic annually average standards, increments, and SILs

CPAI's assumed design concentrations are summarized in Table 4.

Table 4. Design concentrations

Pollutant	Avg. Period	Design Value
NO_2	Annual	The maximum annual concentration from any modeled year
PM-2.5	Annual	The multi-year average of the mean annual modeled concentrations
PM-2.5	24-hour	The 98th percentile of yearly 24-hour concentrations, averaged over all modeled years
PM-10	24-hour	The high fourth-high 24-hour concentration over all modeled years

4. RESULTS AND DISCUSSION

The maximum modeled annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 impacts from CPAI's cumulative analysis is provided in Table 5. The background concentration, total impact, and respective ambient standards are also provided for comparison. The total modeled impacts are less than the respective AAAQS. Therefore, CPAI has demonstrated compliance with the AAAQS.

Table 5. Maximum impacts compared to the ambient standards

Pollutant	Avg. Period	Max. Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	AAAQS ($\mu g/m^3$)
NO_2	Annual	27.5	2.0	**29.5**	100
PM-2.5	Annual	0.8	2.6	**3.4**	12
	24-hour	21.2	7.0	**28.2**	35
PM-10	24-hour	45.2	60	**105.2**	150

5. CONCLUSION

The Department reviewed CPAI's modeling analysis and concludes the following:

1. Emissions from the proposed WOC stationary source EUs will not cause or contribute to a violation of the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS listed in 18 AAC 50.010.

2. CPAI's modeled analysis complies with the ambient demonstration requirements of 18 AAC 50.540(c)(2).

3. CPAI performed their modeled analysis in a manner consistent with the Guideline, as required under 18 AAC 50.215(b)(1).

The Department developed conditions in Minor Permit AQ1806MSS01 to ensure CPAI complies with the AAAQS. These conditions are *summarized* as follows:

To protect the annually averaged NO_2, annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS, the Permittee shall:

- Limit the sulfur content of liquid fuels fired in
  - EU ID 802 to no greater than 15 ppmw; and
  - all EU IDs at the stationary source during construction phase operations to no greater than 15 ppmw.
- construct and maintain all EU IDs with vertical and uncapped exhaust releases, excluding EU IDs 203 through 205;
- construct and maintain the following minimum stack heights:

    - EU ID 001: 20 m above pad height; and
    - EU ID 301: 12 m above pad height.
- construct and maintain inlet air heating for EU ID 001;
- limit the operation of EU ID 001
    - without dry-low NOx control to no greater than 120 hours in any consecutive 12-month period; and
    - with dry-low NOx control when firing "emergency fuels" to no greater than 500 hours in any consecutive 12-month period.
- perform and report source test results, or certified manufacturer's guarantees, that demonstrate each of EU IDs 201 through 208 meet the following standards for NOx and PM emissions:
    - EU IDs 201 through 205, or replacement units, will comply with EPA's Tier 2 emission standards; and
    - EU IDs 206 through 208, or replacement units, will comply with EPA's Tier 4 (final) emission standards.
- obtain and report a certified manufacturer's guarantee that EU ID 301 will meet the assumed emissions factors for PM-2.5, and PM-10.

To protect the annually averaged and 24-hour PM-2.5, and 24-hour PM-10 AAAQS, the Permittee shall:

- operate EU ID 801 with dust cyclone/filter controls at all times when in use.