ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR PERMITS PROGRAM

TECHNICAL ANALYSIS REPORT
for
Air Quality Control Minor Permit AQ0942MSS01

ConocoPhillips Company
Beluga River Unit Wellsite

WELLSITE COMPRESSION PROJECT

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ABBREVIATIONS/ACRONYMS

AAC ..... Alaska Administrative Code
ACMP ..... Alaska Coastal Management Program
ADEC ..... Alaska Department of Environmental Conservation
AS ..... Alaska Statutes
ASTM ..... American Society of Testing and Materials
BAE ..... Baseline Actual Emissions
CEMS ..... Continuous Emission Monitoring System
C.F.R. ..... Code of Federal Regulations
EPA ..... Environmental Protection Agency
MACT ..... Maximum Achievable Control Technology
NA ..... Not Applicable
NAICS ..... North American Industry Classification System
NESHAPS ..... National Emission Standards for Hazardous Air Pollutants
NSPS ..... New Source Performance Standards
ORL ..... Owner Requested Limit
PAE ..... Projected Actual Emissions
PS ..... Performance Specification
PSD ..... Prevention of Significant Deterioration
PTE ..... Potential to Emit
RM ..... Reference Method
SIC ..... Standard Industrial Classification
SN ..... Serial Number
TBD ..... To Be Determined

Units and Measures

bhp ..... brake horsepower or boiler horsepower
gr./dscf ..... grains per dry standard cubic feet (1 pound = 7,000 grains)
dscf ..... dry standard cubic foot
gph ..... gallons per hour
kW ..... kiloWatts (electric)
lbs ..... pounds
mmBtu ..... million British thermal units
ppm ..... parts per million
ppmv ..... parts per million by volume
tph ..... tons per hour
tpy ..... tons per year
wt% ..... weight percent

Pollutants

CO ..... Carbon Monoxide
HAPS ..... Hazardous Air Pollutants
H_2S ..... Hydrogen Sulfide
NO_X ..... Oxides of Nitrogen
NO_2 ..... Nitrogen Dioxide
NO ..... Nitric Oxide
PM-10 ..... Particulate Matter with an aerodynamic diameter less than 10 microns
SO_2 ..... Sulfur Dioxide
VOC ..... Volatile Organic Compound

Permit Specific

NTE ..... Not-to-Exceed

1.0 Introduction

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Source Air Quality Control Permit AQ0942MSS01 to ConocoPhillips Company (CPC) for the Beluga River Unit Wellsite Compression Project. The project required a minor permit per 18 AAC 50.502(c)(3). The minor permit authorizes the installation of several gas compressor driver engines and heaters.

1.1 Stationary Source Description

The Beluga River Unit (BRU) is an existing stationary source located on the western side of Cook Inlet across from Anchorage. The BRU is a large reserve of natural gas interspersed with wells and connected by a road system. Natural gas drawn from BRU feeds the Anchorage area's power and heat needs.

CPA has not previously required an air quality control permit to operate BRU. CPC avoided the need for obtaining a Title V Operating Permit by operating the largest emission unit – a 7,700 horsepower (hp) turbine – under Owner Requested Limit AQ0942ORL01. The other BRU emission units include boilers, heaters, engines, and an incinerator.

1.2 Application Description

Through the natural gas extraction process, BRU has begun to age and the ideal well pressure has dropped. CPC therefore submitted a minor permit application on March 22, 2010 to add several gas compressor driver engines (identified as Unit 37) and heaters to the existing emission unit inventory. The number and precise location of the new engines and heaters is unknown. CPC instead provided the maximum aggregate rating for both types of emission units. CPC plans to install engines with a total capacity of up to 7,500 hp to keep the well pressure at optimum levels. They are also planning to install up to 1 million BTU per hour (MMBtu/hr) of additional heater capacity. CPC is requesting a generalized permit to allow different engine distributions throughout the pad and some degree of portability. CPC may need to move engines between pads based on pressure needs. **Table 1** shows the resulting emission unit inventory for BRU.

Table 1: Proposed Emission Units

EU	Equipment Description	Location	Fuel Type	Rating/Output	Installation Date
37	Compressor Engines	Various	NG	7,500 hp (cumulative)	Est. 2011
38	Glycol Reboilers	Various	NG	1.00 MMBtu/hr (cumulative)	Est. 2011

The potential to emit from the additional engines and heaters exceed the thresholds for a minor permit under 18 AAC 50.502(c)(3) for oxides of nitrogen (NO_X). CPC included with their application an ambient analysis to demonstrate compliance with the annual average NO_2 air quality standard.

1.3 Emissions Summary and Permit Applicability

Table 2 shows the emission summary and the assessable emissions. Emission fee requirements are required for a minor permit issued under 18 AAC 50.542, as described in 18 AAC 50.544(a). Calculation assumptions in **Table 2** include:

1) Hours of operation of 8,760 hrs/yr.
2) SO_2:
   a) Mass balance 5 parts per million by volume (ppmv) of fuel gas;
3) For EU 37:
   a) For NO_X, CO, and VOC, Subpart JJJJ limits;
   b) For PM-10, AP-42 Table 3.2.3; and
   c) For SO_2, mass balance.
4) For EU 38:
   a) For NO_X, CO, PM-10, and VOC, AP-42 Table 1.4-1.

Table 2: Emissions Summary, Permit Applicability and Assessable Emissions, tpy

Parameter	NO_x	CO	SO_2	PM-10	VOC
Current Total BRU PTE	49.8	87.3	4.1	6.9	6.9
Protect PTE Increase	72.8	145.1	0.23	4.3	50.7
Total PTE	**122.6**	**232.4**	**4.3**	**11.2**	**57.6**
	428.1				
Minor Permit Thresholds 18 AAC 50.502(c)(3)	10	N/A	10	10	N/A
Minor Permit Required?	Yes	No	No	No	No
Assessable Emissions	**123**	**232**	**0**	**11**	**58**
	424				

1.4 Department Findings

Based on the review of the application, the Department finds that:

1. The BRU Wellsite Compression Project requires a minor permit under 18 AAC 50.502(c)(3) due to the increase in NO_X emissions.
2. CPC is currently operating BRU under Owner Requested Limit (ORL) AQ0942ORL01 for the combustion turbine (EU 1). The ORL is for operation outside of SoLoNOx Mode.
3. Upon permit issuance, the potential NO_X and CO emissions will each exceed 100 tpy – which is the Title V permit threshold. Therefore, CPC will need to submit a complete Title V permit application within 12 months of starting operation under this minor permit.
4. CPC has not selected the number or size of the new emission units (EUs 37 and 38). Instead, CPC provided the Department with the maximum total capacity of each type of unit to allow flexibility in the number and size of emission units.
5. CPC's application for a minor permit for BRU Wellsite Compression Project contains the elements listed in 18 AAC 50.540.

6. BRU is located in the Kenai Peninsula Borough coastal district. The project is consistent with the Alaska Coastal Management Program (ACMP) through AS 46.40.040(b)(1). This permit is a minor permit classified under 18 AAC 50.502(c)(3). This classification is on the ACMP C list, therefore the ACMP project modification and Department single agency review procedures apply. The Department sent a notification to all the appropriate agencies for this project. The Department received no comments.

2.0 Permit Requirements

State regulations in 18 AAC 50.544 describe the elements that the Department must include in minor permits. This section of the TAR provides the technical and regulatory basis for the permit requirements in Minor Permit AQ0942MSS01.

2.1 General Requirements for all Minor Permits

As described in 18 AAC 50.544(a), this minor permit identifies the stationary source, the project, the Permittee, and contact information.

Emission fee requirements are required for each minor permit issued under 18 AAC 50.542, as described in 18 AAC 50.544(a). The Department is establishing the assessable emissions requirement in this permit. Table 2 shows the assessable emissions are 424 tpy.

2.2 Requirements for a Permit Classified under 18 AAC 50.502(c)(3)

As required under 18 AAC 50.544(c), each minor permit classified under 18 AAC 50.502(c) must contain:

1. terms and conditions as necessary to ensure that the source will not cause or contribute to a violation of an ambient standard;
2. performance tests for state emission limits; and
3. maintenance requirements according to the manufacturer's or operator's maintenance procedures.

2.3 State Emission Standards

CPC's stationary source inventory includes fuel burning equipment and industrial process subject to standards under 18 AAC 50.055. As described in 18 AAC 50.544(c)(2), each minor permit issued under 18 AAC 50.502(c) must include performance tests for emission limits under 18 AAC 50.050 – 18 AAC 50.090 as warranted.

2.3.1 Visible Emission Standard

Natural gas-fired compressor engines (EUs 37 and 38) are fuel-burning equipment subject to the state standards for visible emissions under 18 AAC 50.055(a).

Emission units burning natural gas produce little or no visible emissions. Therefore, the Department did not include the requirement for a first Method 9 observation.

2.3.2 Particulate Matter Standard

Natural gas and diesel-fired units are fuel-burning equipment subject to the state standards for PM emissions of 0.05 grains per dry standard cubic foot of exhaust gas (gr./dscf) in 18 AAC 50.055(b)(1).

CPC provided a compliance demonstration showing that EUs 37 and 38 will comply with the particulate matter standard based on available vendor data and AP-42. This demonstration indicates that the units will comply with the particulate matter standard by an adequate margin; therefore, the Department is not requiring an initial compliance demonstration in the minor permit for these emission units.

2.3.3 Sulfur Dioxide Standard

Natural gas units are fuel-burning equipment subject to the state standards for SO_2 emissions in 18 AAC 50.055(c).

CPC did not provide an initial compliance demonstration showing that EUs 37 or 38 will comply with the state standard but did provide information regarding the hydrogen sulfide content at BRU.

The Department does not expect EUs 37 or 38 to exceed the state standards of 18 AAC 50.055(c) because the natural gas at BRU rarely exceeds 5 ppmv. Fuel gas sulfur content less than 4000 ppmv has been shown to comply with the sulfur dioxide standard. The Department is not requiring any compliance demonstration of EUs 37 or 38.

2.4 Federal Standards

The minor permit program does not require the Department to include any federal standards in minor permits. However, the Department can elect to include any federal standard on a case-by-case basis, specifically if the Permittee requests a specific federal standard.

CPC specifically requested that all engines under EU 37 be subject to the standards under 40 C.F.R. Part 60 Subpart JJJJ for spark-ignition internal combustion engines. CPC included as part of their application an applicability summary for generic engines subject to this subpart. Subpart JJJJ outlines specific emission limits and appropriate monitoring, recordkeeping, and recording for all engines subject to this subpart. The emission limits for engines subject to Subpart JJJJ are:

(1) 1.0 grams per horsepower-hour (g/hp-hr) for NO_X;

(2) 2.0 g/hp-hr for CO; and

(3) 0.7 g/hp-hr for VOC.

Subpart JJJJ also has provisions that allow operators to use control devices to meet the emission rates. For engines without any controls, these include:

(1) two-way oxidation catalyst and selective catalytic reduction systems for lean burn engines; and

(2) three-way non-selective catalytic reduction system for rich burn engines.

CPC did not specify what type of engine they plan to use for the Compression Project. As part of their application, they did provide vendor data for a rich burn and lean burn engine, along with

Subpart JJJJ-compliant vendor data for control devices. Because of the uncertainties of CPC's engine selection, the Department elected to include all applicable language for New Source Performance Standards (NSPS) Subpart JJJJ in the minor permit.

2.5 Ambient Air Analysis

18 AAC 50.540(c)(2) requires minor permit applicants subject to 18 AAC 50.502(c)(3) to submit an ambient demonstration for each of the triggered pollutants. CPC's operations at BRU triggered NO_X. CPC submitted the appropriate modeling analysis and the review of the analysis is included as a memorandum to this TAR found in Appendix A.

2.6 General Recordkeeping Requirements

2.6.1 Recordkeeping Requirements

Air quality control permits under 18 AAC 50.502(c) must contain procedures for recordkeeping requirements under 18 AAC 50.544(c)(D).

2.6.2 Certification and Information Requests

All air quality control permits must contain procedures for information requests and certification, including certification requirements described in 18 AAC 50.544(h)(4). Information request requirements are specifically required under 18 AAC 50.200. Certification requirements are specifically required under 18 AAC 50.205.

2.6.3 Submittals

Reports, certification, and other relevant documentation must be submitted to the Compliance Technician at the address specified in the minor permit.

2.6.4 Excess Emission and Permit Deviation Reports, Operating Reports

Excess emission and permit deviation requirements are specifically required under 18 AAC 50.240. Operating reports are required for all permits under 18 AAC 50.502(c) as stipulated under 18 AAC 50.544(c)(1)(E).

2.7 Standard Conditions

The minor permit contains these requirements to ensure that the Permittee will construct and operate the stationary source or modification in accordance with 18 AAC 50, as described in 18 AAC 50.544(c) and 18 AAC 50.544(i).

3.0 Permit Administration

The Permittee may operate under minor permit AQ0942MSS01 upon issuance. The Permittee must apply for a Title V operating permit within one year of commencing operation per 18 AAC 50.326(c).

APPENDIX A – MODELING REVIEW MEMORANDUM

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File

DATE: August 23, 2010

THRU: Alan E. Schuler, P.E.
Environmental Engineer
Air Permits Program

FILE NO: AQ0942MSS01 - Modeling

PHONE: 269-7574
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FROM: Krystin Bablinskas
Environmental Engineer Assoc. I
Air Permits Program

SUBJECT: Review of CPC's BRU
Wellsite Compression Project
Ambient Assessment

This memorandum summarizes the Department's findings regarding the ambient analysis submitted by ConocoPhillips Company (CPC) for the Beluga River Unit (BRU) Wellsite Compression Project. CPC submitted this analysis in support of their March 22, 2010 minor permit application (AQ0942MSS01). As described in this memorandum, CPC's analysis adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the annual average nitrogen dioxide (NO_2) Alaska Ambient Air Quality Standard (AAAQS) provided in 18 AAC 50.010.

BACKGROUND

BRU is an existing stationary source located on the western side of Cook Inlet across from Anchorage. CPC currently operates the turbine at BRU under Owner Requested Limit (ORL) AQ0942ORL01. The stationary source also has several insignificant heaters and small emergency generators.

CPC plans to add several natural gas-fired internal combustion engines to aid in increasing the well pressure at the wellheads. Due to the aging of the natural gas fields as a result of extraction, the wellhead pressure has dropped making recovery more difficult. To keep up with the power and heat demands of the greater Anchorage area, CPC needs to install several engines with a total capacity of up to 7,500 horsepower (hp) that can be moved between wellheads based on pressure needs. CPC is also planning to install several gas-fired heaters, each with a rating of about 0.25 million Btu per hour (MMBtu/hr). These new units require a minor permit under 18 AAC 50.502(c)(3) since the increase in potential oxides of nitrogen (NO_X) emissions exceeds ten tons per year (tpy).

APPROACH

CPC used computer analysis (modeling) to predict the ambient air quality impacts. Hoefler Consulting Group (HGC) conducted the modeling analysis on behalf of CPC.

CPC's approach covered two issues unique to this ambient assessment. The first is the layout of the stationary source. BRU is a geographically large stationary source consisting of numerous natural gas wellheads interconnected by a road system. An independently owned and operated stationary source, the Beluga River Power Plant, is located within BRU on the "ENSTAR" pad. This "offsite" source is actually a source-within-a-source, which must be treated as "ambient air" when modeling the BRU impacts. Because of the source-within-a-source issue, CPC did not conduct a project impact analysis first. Instead, they conducted a full impact analysis and included emission units from the Beluga River Power Plant in their ambient assessment.

The second unique issue is the nature of CPC's new engines, designated as Emission Unit (EU) 37. EU 37 is a collection of natural gas-fired compressor engines totaling at most 7,500 hp. CPC does not know the number of engines required and the location of each engine, and has not yet finalized the engine make and model. To conservatively model this situation, CPC assumed that all EU 37 emissions simultaneously exhausted through a single stack at every wellhead location. CPC also used conservative parameters to characterize the exhaust stacks. The Department accepts CPC's approach for addressing these unique situations.

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). CPC used EPA's AERMOD Modeling System (AERMOD) for the ambient analysis. AERMOD is an appropriate modeling system for this application.

The AERMOD Modeling System consists of three components: AERMAP (which is used to process terrain data and develop elevations for the receptor grid/emission units), AERMET (which is used to process the meteorological data), and the AERMOD dispersion model (which is used to estimate the ambient concentrations). CPC used the current version of each component (version 09292 for AERMOD, version 09040 for AERMAP and version 06341 for AERMET).

Meteorological Data

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

CPC used one and three-quarter years of site-specific meteorological data from the Chuitna Coal Project North Ladd Landing monitoring station, which is located approximately two kilometers northwest of BRU. The first year of data was collected from May 1, 2006 through April 30, 2007. Another year of data set was collected from May 1, 2008 through April 30, 2009, but the first quarter of that data set was subsequently invalidated. The data sets included solar radiation and differential temperature data, which CPC used in place of cloud cover data. CPC used concurrent upper air meteorological data collected by the National Weather Service (NWS) at the Anchorage NWS forecast office.

The Department previously found the 2006-2007 data to be PSD quality. The 2008 – 2009 data is not PSD-quality due to inadequate data capture of the solar radiation data. However, the Department allowed CPC to use that portion of the 2008-2009 data set that met all other aspects of the PSD quality assurance requirements.[1] The Department allowed CPC to augment the one year of PSD-quality data with a partial year of data, per Section 8.3.1.2.b of the Guideline.

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

CPC segregated the surrounding area into two sectors to reflect the three main types of surface conditions: water, mixed forest, and desert shrubland (bare rock/sand/clay). CPC assigned the values by month in order to adjust the surface characteristics according to season. The Department agrees with CPC approach. The accepted values are repeated below in Table 1.

Table 1: Approved AERMET Surface Parameters for North Ladd Landing Site

Surface Parameter			Season[a]			
			Spring	**Summer**	**Autumn**	**Winter**
Albedo			0.122	0.113	0.131	0.552
Bowen Ratio			0.296	0.189	0.338	0.500
Surface Roughness Length						
Sector		*Range*				
1	*water*	$35^o – 225^o$	0.001	0.001	0.001	0.002
2	*mixed forest/desert shrubland*	$225^o – 35^o$	0.765	0.851	0.765	0.618

[a] For Anchorage AERMET surface parameters, season are defined as: Spring is April, May; Summer is June, July, and August; Autumn is September, October; Winter is November, December, January, February, March.

Emission Unit Inventory

CPC modeled all substantive on-site and Beluga River Power Plant emission units. Table 2 (next page) summarizes the modeled units and their general locations.

As previously noted, CPC assumed EU 37 is located on each pad. This redundant placement of the engines created a conservative assessment, but also allows CPC to locate the engines without restriction.

CPC did not model heaters and boilers rated at less than 1.0 million British Thermal Units per hour (MMBtu/hr), including the proposed heaters (EU 38), since these units are considered insignificant under the Title V program. This approach warrants discussion. The Department does not automatically use the Title V insignificant emission unit thresholds to cull small units/activities from the modeling inventory. The Department instead makes a case-by-case decision as to what types of emission units/activities can be considered as inconsequential. The

[1] Email correspondence from Alan Schuler (Department) to Theresa Barnard (HGC) and cc'd to Al Trbovich (HGC), Keith Quincey (HGC), Brad Thomas (CPC), and MartaCzarnezki (CPC) dated November 23, 2009.

decision is based on factors such as: number of "small" units, relative location of the small units to the ambient air boundary, averaging period of the modeled pollutant, and the degree of conservatism in the overall analysis is. For the case at hand, the Department agrees with CPC that units rated at less than 1 MMBtu/hr do not need to be explicitly modeled, especially considering the conservative nature of CPC's overall modeling approach.

Table 2: Modeled Emission Unit Inventory

EU ID	Description	Stack Orientation	Rain Cap (Y/N)
BRU Pad 214-26/ENSTAR			
37	Compressor Engines	Vertical	N
1	Solar Taurus 60 Compressor Turbine	Vertical	N
2	Waukesha H24GLD Compressor Engine	Vertical	N
3	John Deere Emergency Generator	Vertical	Y
BRU Pad 232-4			
37	Compressor Engines	Vertical	N
BRU Pad 211-3/224-34			
37	Compressor Engines	Vertical	N
BRU Pad 214-35/243-34			
37	Compressor Engines	Vertical	N
12	Emergency Generator	Vertical	Y
BRU Pad 212-35/212-35T			
37	Compressor Engines	Vertical	N
BRU Pad 241-34			
37	Compressor Engines	Vertical	N
BRU Pad 224-23/232-26/211-26			
37	Compressor Engines	Vertical	N
17	Emergency Generator	Vertical	Y
BRU Pad 212-24/232-23			
37	Compressor Engines	Vertical	N
Off-Site Equipment (Beluga River Power Plant)			
-	GE Frame 5 Turbine Unit 1	Vertical	N
-	GE Frame 5 Turbine Unit 2	Vertical	N
-	GE Frame 7 Turbine Unit 3	Vertical	N
-	Dual Stacks	Vertical	N
-	GE Frame 7 Turbine Unit 5	Vertical	N
-	Dual Stacks	Vertical	N
-	Brown Boveri 11D4 Turbine Unit 6	Vertical	N
-	Brown Boveri 11D4 Turbine Unit 7	Vertical	N
-	Therm-Tec G-30M Incinerator	Vertical	N
-	CAT G-398 NG Emergency Generator	Horizontal	N

Emission Rates and Stack Parameters

The assumed emission rates and stack parameters have significant roles in an ambient demonstration. CPC's modeled inventory includes emission rates based on vendor data, AP-42, and the requested NSPS Subpart JJJJ emission limit for NO_X. The Department checked the emission rates and stack parameters, and concluded that these are acceptable.

As previously discussed, CPC assumed that the collective horsepower for the EU 37 engines is 7,500 hp and that the engines exhaust through a single stack. However, they used the stack

diameter and exhaust flow rate from a 690 hp Caterpillar G3508B LE Gas Petroleum Engine to characterize the stack parameters. CPC stated the Caterpillar G3508B is one of the two candidate units they are considering. The Department accepts CPC's approach.

CPC assumed the EU 37 engines have a stack height of 5 meters (16.4 feet). While possible, the height seems semi-tall. The Department is therefore incorporating CPC's assumption as an ambient air condition in the minor permit.

Operational Restrictions

CPC used the NSPS Subpart JJJJ NO_X emission limit of 1.0 grams per horsepower-hour (g/hp-hr) to estimate the EU 37 NO_X emissions. The Subpart JJJJ limit is a phased requirement based on engine manufacture date. Because CPC assumed the 1.0 g/hp-hr rate, rather than the higher emission rates allowed for earlier manufacture dates, the following engine manufacture dates apply:

- Manufacture date on or after January 1, 2011 for engines greater than or equal to 100 hp and less than 500 hp; and
- Manufacture date on or after January 1, 2010 for engines greater than 500 hp.

Because the emission rate directly impacts the ambient air, the Department included this emission rate and manufacture dates as ambient air requirements.

CPC assumed most emission units operate continuously. The exceptions are:

- The existing emergency generators EU 3, EU 12, and EU 17, which CPC assumed only operate 500 hours per year (each), per EPA's guidance for calculating potential emissions from emergency generators; [2] and
- The existing turbine (EU 1), which CPC assumed operates 400 hours per year (hr/yr) *out of* SoLoNOx mode, as currently authorized under AQ0942ORL01. CPC assumed EU 1 operates *in* SoLoNOx mode for the remaining 8,360 hours per year. CPC used a resulting weighted emission rate of 6.7 pounds per hour (lb/hr), based on 8,370 hr/yr at 6.58 lb/hr (in SoLoNOx) and 400 hr/yr at 9.12 lb/hr (out of SoLoNOx), for the modeling analysis.

The Department evaluated CPC's use of EPA's emergency generator guidance. The Department agrees that electrical power is available from a local utility and that the stated purpose for EU 3, EU 12 and EU17 is to provide back-up power for when utility service is interrupted. Therefore, the Department accepts CPC's use of this guidance and their assumption that the generators would only operate up to 500 hr/yr.

Sensitivity Analysis

Since ORL AQ0942ORL01 will likely be revoked upon issuance of the Title V operating permit, the Department conducted a sensitivity analysis on the effects of removing the current 400 hr/yr restriction on turbine (EU 1). The Department took a worst-case approach of assuming EU 1 operates *out of* SoLoNOx mode for the full 8,760 hours per year. The Department modified the emission rate of the turbine from 6.7 lb/hr, the rate with the ORL, to 9.12 lb/hr, the emission rate out of SoLoNOx mode. The Department did not make any other changes. The maximum

[2] See EPA's September 6, 1995 memorandum "Calculating the Potential to Emit (PTE) for Emergency Generators."

modeled concentration for NO_2 was 55 µg/m^3, which is only slightly above the modeled concentration with the ORL. Therefore, the Department did *not* include the 400 hr/yr limit as an ambient air restriction in the minor permit.

Horizontal/Capped Stacks

The presence of non-vertical stacks or stacks with rain caps requires special handling in an AERMOD analysis. The proper approach for characterizing a horizontal/capped stack is described in EPA's, *AERMOD Implementation Guide*. For capped and horizontal stacks subject to building downwash, the user should input the actual stack diameter and exit temperature, but set the exit velocity to a nominally low value (0.001 m/s). If the capped/horizontal stack is *not* subject to downwash, then the 0.001 m/s exit velocity should be used along with an artificially large diameter (set to maintain the actual exhaust flow rate). Minor adjustments to the stack height may also be warranted.

EPA has developed a non-default option in AERMOD that will revise the stack characteristics as warranted, for stacks that are identified as capped or horizontal. EPA Region 10 granted the Department permission to use this option in general in October 2007.[3] CPC used this non-default option to characterize their capped/horizontal stacks. The Department agrees with this approach.

Ambient NO_2 Modeling

The modeling of ambient NO_2 concentrations can sometimes be refined through the use of ambient air data assumptions. CPC used the national default ambient NO_2-to-NOx ratio of 0.75, as provided in the Guideline, to refine the estimated ambient NO_2 concentrations. The 0.75 ratio is appropriate for this analysis.

Ambient Air Boundary

For purposes of air quality modeling, "ambient air" means outside air to which the public has access. Ambient air typically excludes that portion of the atmosphere within a stationary source's boundary. Since BRU is a collection of wellheads over a large area with interconnecting roads, CPC did not assume any excluded area because the public could access each wellhead. The Department agrees with this approach.

Receptor Grid

CPC placed polar receptor grids centered on each pad. CPC determined the polar receptor grid radii by conducting a Significant Impact Area (SIA) analysis, with polar grids centered on the ENSTAR pad and CPC's 212-35/35T pad. The ENSTAR pad is located just north of the 212-35/35T pad and contains the source-within-a-source emission units from the Beluga River Power Plant. The 212-35/35T pad is central to the BRU. The SIA analysis determined the distance from each pad center to the Significant Impact Level (SIL) for NO_2, which is 1 µg/m^3. The SIA for both pads had a similar shape, with the maximum distance to the southeast. This distance is about 2,600 m, which CPC used as the maximum radii for each polar grid.

[3] E-mail from Herman Wong (EPA R10) to Alan Schuler (Department); *RE: Capped/Horizontal Stack Issue*; October 2, 2007.

CPC used 36 radials with a 10 degree angle between each radial in each of their polar receptor grids. From the center outward, CPC placed receptor rings every 25 meters for the first 100 meters to capture any near field effects. The distance expands to 50 m between receptors up to 400 m. From 400 m to 2,600 m, the distance between receptors is 100 m to capture far-field effects. Each polar grid centers on a pad, with five pads in total. Since the pads are close together, there is much overlapping in the grids creating a finer grid in the center of the modeled area. The Department finds this method adequate for analysis.

Downwash

Downwash refers to conditions where nearby structures influence plume dispersion. Downwash can occur when a stack height is less than a height derived by a procedure called "Good Engineering Practice," (GEP) as defined in 18 AAC 50.990(42). The modeling of downwash-related impacts requires the inclusion of dimensions from nearby buildings.

All of CPC's units in the modeled inventory are potentially subject to downwash, since the stack heights are less than the GEP-derived heights. CPC included nearby and offsite buildings, such as the Beluga River Power Plant in their analysis. The Department agrees with this approach.

Off-Site Impacts

In a cumulative impact analysis, the applicant must include impacts from large sources located within 50 km of the applicant's SIA. These impacts from "off-site" sources are typically assessed through modeling. However, the off-site impacts in an AAAQS analysis can also be accounted for with ambient monitoring data, if representative data is available.

CPC assessed the offsite impacts from the Beluga River Power Plant. The power plant is located within the BRU stationary source and thus is an off-site source of concern. CPC included the emission units from the power plant in the modeled inventory. The nearest populated area to BRU is Anchorage; however Anchorage is more than 50 km away from CPC's SIA, so CPC did not include impacts from Anchorage. The Department agrees that there are no other notable off-site sources in this area.

Background Concentrations

The background concentration represents impacts from sources not included in the modeling analysis. Typical examples include natural, area-wide, and long-range transport sources. The background concentration must be evaluated on a case-by-case basis for each ambient analysis. Once the background concentration is determined, it is added to the modeled concentration to estimate the total ambient concentration.

CPC assumed a background concentration of 5.6 $\mu g/m^3$ at BRU. CPC obtained this value from ambient air monitoring data collected by the Chevron Trading Bay Production Facility from May 2008 through April 2009. The monitoring site is located just south of BRU also on the western side of Cook Inlet. Trading Bay, like BRU, is a remote oil and gas production facility. The Department concurs that this background concentration is representative of the expected concentrations at BRU.

RESULTS AND DISCUSSION

The maximum NO_2 AAAQS impact, along with the background concentration, total impact, and AAAQS are shown in Table 3. The total impacts are less than the AAAQS. Therefore, CPC has demonstrated compliance with the annual average NO_2 AAAQS.

Table 3: Maximum AAAQS Impacts

Air Pollutant	Avg. Period	Met Data Period	Maximum Modeled Conc ($\mu g/m^3$)	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
NO_2	Annual	2008-2009	46.08	5.6	**51.68**	100

It is important to note that since ambient concentrations vary with distance and direction from each emission unit, the maximum values shown represent the highest value that may occur within the area.

CONCLUSION

The Department reviewed CPC's modeling analysis for the BRU Wellsite Compression Project and concluded the following:

1. The NO_X emissions associated with operating the proposed emission units will not cause or contribute to a violation of the annual average NO_2 AAAQS listed in 18 AAC 50.010.
2. CPC conducted their modeling analysis in a manner consistent with EPA's *Guideline on Air Quality Models*, as required under 18 AAC 50.215(b)(1).

The Department developed conditions in the minor permit to ensure CPC complies with the annual average NO_2 AAAQS. These conditions are summarized below.

1. Limit the emission rate of each engine under EU 37 to the 1.0 grams per horsepower-hour (g/hp-hr) Subpart JJJJ emission limit for NO_X; and
2. The top of each stack for each engine under EU 37 must be at least 16 feet above grade.

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