ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR PERMITS PROGRAM

TECHNICAL ANALYSIS REPORT

Air Quality Control Minor Permit AQ0186MSS01
BP Exploration (Alaska) Inc.
Central Power Station

H_2S LIMIT INCREASE

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Preliminary – May 12, 2010

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ABBREVIATIONS/ACRONYMS

AAAQS ..... Alaska Ambient Air Quality Standard
AAC..... Alaska Administrative Code
ADEC ..... Alaska Department of Environmental Conservation
AS..... Alaska Statutes
BACT ..... Best Available Control Technology
BPXA ..... BP Exploration (Alaska) Inc.
CPS..... Central Power Station
CFR. ..... Code of Federal Regulations
EPA ..... Environmental Protection Agency
NSR ..... New Source Review
NSPS ..... New Source Performance Standard
ORL ..... Owner Requested Limit
PBU ..... Prudhoe Bay Unit
PSD..... Prevention of Significant Deterioration
PTE..... Potential to Emit
SIP ..... State Implementation Plan
TAR ..... Technical Analysis Report

Units and Measures

gr./dscf..... grains per dry standard cubic foot (1 pound = 7,000 grains)
dscf ..... dry standard cubic foot
gph ..... gallons per hour
kW ..... kiloWatts[1]
lbs ..... pounds
mmBtu ..... million British Thermal Units
ppm..... parts per million
ppmv..... parts per million by volume
tpy..... tons per year
wt%..... weight percent

Pollutants

CO ..... Carbon Monoxide
H_2S ..... Hydrogen Sulfide
NO_X ..... Oxides of Nitrogen
NO_2..... Nitrogen Dioxide
PM-10 ..... Particulate Matter with an aerodynamic diameter less than 10 microns
SO_2 ..... Sulfur Dioxide
VOC..... Volatile Organic Compound

[1] kW refers to rated generator electrical output rather than engine output

1.0 Introduction

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Air Quality Control Minor Permit AQ0186MSS01to BP Exploration (Alaska) Inc. (BPXA) for the Central Power Station (CPS).

BPXA submitted an application dated December 20, 2007 requesting a permit under 18 AAC 50.508(6) to increase the fuel gas hydrogen sulfide (H_2S) limit for the natural gas used as fuel from the Prudhoe Bay reservoir. The Department sent BPXA an incompleteness letter on February 21, 2008 stating that their application was incomplete and put the application on hold.

On January 7, 2010, BPXA submitted a letter to the Department, laying down the historic perspective for the fuel gas H_2S limit and a proposed a path forward for revising the H_2S limit. In the letter, BPXA contended that the H_2S limit in Construction/Operating Permit 186CP01/186TVP01 is not an enforceable limit and asked the Department to accept the original 2007 application as complete.

The Department, BPXA and the U.S. Environmental Protection Agency (EPA) have discussed over the past few years, how to treat the sulfur dioxide (SO_2) emissions increase due to fuel gas souring over time. EPA has not yet made a final decision. Meanwhile the Greater Prudhoe Bay sources have curtailed production to comply with their permit limits.

In order to expedite the permit for emissions increase due to fuel gas souring, the Department reviewed BPXA's January 7, 2010 documentation, the documentation in the permit files and records of Alaska State Implementation Plan to determine the appropriate process for reviewing and permitting increased SO_2 emissions resulting from an increase to the H_2S limit for this stationary source.

1.1 Stationary Source Description

CPS produces the electrical power used by the Prudhoe Bay Unit (PBU) oil producing facilities. It is classified as a Prevention of Significant Deterioration (PSD) major source because it has the potential to emit more than 250 tons per year (tpy) of one or more regulated pollutants. However, CPS has never gone through PSD review since it started operating before the PSD program was developed.[2]

The stationary source contains seven General Electric (GE) Frame 5 gas fired turbines, four black start engines, five gas fired heaters, and two diesel fired emergency generators. Two of the turbines (Model GE 5001R) drive generators rated at 18.5 megawatts (MW) and five of the turbines (Model GE 5001P) drive generators rated at 25 MW each. The five gas heaters are used to raise the fuel gas temperatures to the turbines to 80 ºF. The two diesel fired emergency generators are used only to provide electricity during CPS power outages and to restart the fuel gas turbines when necessary. BPXA is not proposing to add any new emission units to the source. The fuel gas burned in all of the gas fired emission units at CPS originates at the PBU Central Gas Facility (CGF).

1.2 Hydrogen Sulfide Limit History for CPS

EPA issued the initial PSD permits for PBU. EPA issued four field-wide PSD permits (referenced in order as PSD I, PSD II, PSD III, and PSD IV) between May 1979 and September

[2] CPS started operating in 1974.

1981 for new equipment proposed by the two PBU operators at the time: Atlantic Richfield Company *(*ARCO) and Sohio Petroleum Company[3]. However, only one of the permits (Permit PSD-X81-13) contains SO_2 BACT limits. EPA revised the emission limits and language in all four PSD permits on August 29, 1997. These permits were renamed as PSD-X79-05, PSD-X80-09, PSD-X81-01 and PSD-X81-13 in 1997.

The Department has issued numerous permits for CPS. The initial Permit to Operate was issued in the early 1970's, prior to the advent of the PSD program. The original Permits to Operate for CPS did *not* list specific fuel gas H_2S limits. This permit did specify that the permit was issued for operation as described in the October 17, 1972 permit application. That application described the fuel as natural gas with an H_2S concentration of 8 – 10 ppm. The Department first documented an explicit fuel gas H_2S limit (25 ppm) on November 30, 1994 in Permit to Operate 9473-AA007. The Department did *not* specify an averaging period with the limit, but did impose monthly testing. The Department also required BPXA to calculate and report the resulting SO_2 emissions on a monthly basis. The Department maintained these requirements in Permit to Operate 9473-AA032, which the Department issued a month later on December 27, 1994.

In their January 3, 1997 construction/operating permit application, BPXA asked the Department to remove the H_2S limit. BPXA stated none of the H_2S enforceability triggers listed in Permit to Operate 9473-AA032 existed for CPS, nor had BPXA been required to maintain such a limit to demonstrate compliance with the ambient air quality standards or increments. The Department disagreed with BPXA's position and refused to allow unlimited SO_2 emissions. The Department further stated that BPXA would need to obtain a construction permit under the 18 AAC 50.300(h)(2) provision that existed at that time before increasing their actual SO_2 emissions.

BPXA submitted the information necessary to increase the H_2S limit. BPXA's request included the ambient modeling demonstration required under the then existing 18 AAC 50.310(n)(2) provision for applications classified under 18 AAC 50.300(h)(2). However, in order to avoid the need for conducting a full-scale cumulative impact analysis, BPXA only asked for a marginal H_2S increase (from 25 ppm to 29.9 ppm), which allowed them to limit the demonstration to the simpler, project impact-level analysis. The Department therefore imposed the 29.9 ppm limit as a Title I restriction in Construction/Operating Permit 186CP01/186TVP01. The Department imposed the limit as an "annual average[4]." Permit 186CP01/186TVP01 expired on February 6, 2008. BPXA is currently operating CPS under an application shield after applying for a timely operating permit renewal.

The Department issued numerous permits for CPS dating back to 1977. For purposes of this minor permit action a brief history of the fuel gas H_2S limit at CPS is described below.

[3] The permitted sources at PBU are now operated by BPXA

[4] To avoid cumulative impact analysis, BPXA used this value to keep the "project impacts" below the short-term (3-hour and 24-hour) significant impact levels (SILs) as well as the annual average SIL.

Table 1 - H_2S Permit History at CPS

Permit / Description	**Fuel gas H_2S / SO_2 limits and description**
EPA PSD-X81-13 issued September 29, 1981 revised through August 29, 1997	No limits
Permits to Operate issued prior to 1994	No explicit limits. Permits authorized construction and operation as described in the relevant permit applications. Application specified 8 -10 ppm H_2S in fuel gas.
9473-AA007 issued on November 30, 1994. This permit was a permit renewal to 8736-AA018.	Established a 25 ppmv H_2S limit for all gas fired units.
9473-AA032 issued December 27, 1994. This permit was issued to replace Permit 9473-AA007 because the Department inadvertently excluded several changes BPXA had requested to Permit 8736-AA018. The salient feature of this permit was to allow additional time until March 31, 1995 for BPXA to install and operate a fuel monitoring system for the turbines. This permit carried forward the NO_X and CO BACT limits that originated in EPA permit PSD I. This EPA permit did not list specific facilities or emission units but included limits for all the turbines. Although several units were permitted under PSD I, the units at CPS were never constructed. This led to the carryover of these limits to Permit 9473-AA032.	Carried over the 25 ppmv H_2S limit to all gas fired units from Permit 9473-AA007. No averaging period was specified. The limit is in **bold** font and the permit states: "The emission limits, fuel specifications and operating limits established in 18 AAC 50.040-060 (e.g., SIP limits), in a federal NSPS limit of federal NESHAP limit, as the result of a BACT or LAER determination, or as the result of an agreement pursuant to a request submitted under 18 AAC 50.300(e)(e.g., PSD avoidance limits) are listed in **bold** font."
186CP01/186TV01 issued May 3, 2002	Revised the H_2S limit to 29.9 ppmv (annual average) based on ambient modeling. The permit cites "18 AAC 50.315(b)(2) 12/27/94" as the basis for the limit.

2.0 Application Description

Because the Prudhoe Bay gas reservoir has soured over time, the H_2S content of the fuel gas burned at CPS has gradually increased to the point where BPXA must either remove H_2S from the fuel gas or curtail operations to comply with the 29.9 ppmv annual limit in Construction/Operating Permit 186CP01/186TVP01.

BPXA therefore requested the following changes to Construction/Operating Permit 186CP01/186TVP01 in their December 2007 minor permit application:

- Increase the annual average fuel gas H_2S limit in Condition 7 of the Construction/Operating Permit 186CP01/186TVP01 from 29.9 ppmv to 125 ppmv;
- Add a "not to exceed" fuel gas H_2S limit of 140 ppmv; and
- Add a new liquid fuel sulfur limit of 0.11 percent, by weight.

BPXA requested the Department to make the above revisions under the 18 AAC 50.508(6) minor permit provisions. The Department's review of the permit classification is discussed in Section 3.0 of this TAR.

On April 8, 2010, BPXA dropped their request for an annual average H_2S limit. BPXA also demonstrated that they did not need a liquid fuel sulfur limit to protect the SO_2 ambient air quality standards and increments. The project emissions associated with BPXA's request are discussed in Section 4.1 of this TAR. The Department's review of BXPA's ambient demonstration is in the Modeling Memorandum in Appendix to this TAR.

3.0 Department Review of Permit Classification

3.1 Regulatory Basis and Policy

The Alaska Department of Environmental Conservation (the Department), BP Exploration, Alaska (BPXA), and the United States Environmental Protection Agency (EPA) have struggled over the past few years with how to treat the increase in Sulfur Dioxide emissions that occur when the natural gas used as fuel from a reservoir sours over time. Prior to 2003, the Department charted its own path on this question through permits issued under the state's federally approved implementation plan. In 2002, the Air Permits Working Group[5] recommended that the Department adopt regulations more closely aligned with the Federal PSD permit program[6], and follow federal guidance except where Alaska's climate and geography make such guidance impractical. Federal policy and guidance has not been clear on whether increased SO_2 resulting from reservoir souring is a modification under the federal permitting rules, or the appropriate process for changing a limit related to SO_2 emissions. BPXA and the Department asked EPA to clarify the federal position. Until a federal decision clarified the matter, the Department agreed to continue to process permits which followed the most stringent permitting requirements (i.e. PSD). EPA continues to struggle with the pros and cons of national policy with respect to reservoir souring.

Permitting according to the PSD rules proceeds at a slow, steady pace, but the subject sources in Greater Prudhoe Bay currently curtail production to comply with their permit limits. To determine if any of the pending emission increases can be permitted more quickly, the Department will make its own best interpretation of the limited federal guidance. The Department will adopt any future EPA guidance specific to reservoir souring.

Until EPA clarifies its interpretation of the PSD rules with respect to field gas souring, the Department will treat the use of fuel gas with a greater concentration of H_2S than specified by the permit as a change in the method of operation under the PSD rules (use of an alternative fuel) unless such use is exempt from the definition of "Major modification" under 40 CFR 51.166(b)(2)(iii). For purposes of field gas souring, this means the use of higher H_2S fuel must

[5] A workgroup of stakeholder representatives, including the Alaska Oil and Gas Association, convened by the Department to address air permit funding and service issues.
[6] Alaska Statutes were changed in 2003 and the Department adopted regulations in 2004.

not be prohibited under a federally enforceable permit condition established after January 6, 1975 pursuant to 40 CFR 52.21 (Federal PSD regulations), or under regulations approved pursuant to 40 CFR Subpart I (State Implementation Plan (SIP) review of new sources and modifications), or 40 CFR 51.166 (State-approved PSD program).

3.2 Finding

The Department established a 25 ppmv H_2S limit in Air Quality Control Permit to Operate 9473-AA007[7]. This permit was issued under the rules approved by EPA in the Department's SIP. The H_2S limit in this permit is a federally-enforceable limit established after January 6, 1975 to control SO_2 emissions. The limit was not established under 40 CFR 52.21or under regulations approved pursuant to 40 CFR 51.166. It is unclear as to whether the limit was established under regulations approved pursuant to 40 CFR 51 Subpart I.

3.1 Analysis of the H_2S Limit

Although BPXA's January 7, 2010 letter to the Department states that they found no clear basis for the permit condition, it seems likely that the Department intended to properly document the source's potential to emit to evaluate changes in future permitting decisions. The term "potential to emit" (PTE) was not used in the department statutes or regulations prior to 1993. In 1993, the legislature passed statutes creating AS 46.14, and defined potential to emit:

> (19) "potential to emit" means the maximum quantity of a release of an air contaminant, considering a facility's physical or operational design, based on continual operation of all sources within the facility for 24 hours a day, 365 days a year, reduced by the effect of pollution control equipment and approved state or federal limitations on the capacity of the facility's sources or the facility to emit an air contaminant, including limitations such as restrictions on hours or rates of operation and type or amount of material combusted, stored, or processed; "potential to emit" does not include
>
> (A) a one-time, accidental release of an air contaminant; or
>
> (B) the fugitive emissions specifically exempted under 42 U.S.C. 7401 - 7671q (Clean Air Act);

The explicit phrase "approved state or federal limitations on the capacity of the facility's sources or the facility to emit an air contaminant, including limitations such as restrictions on hours or rates of operation and type or amount of material combusted" incorporated the federal concept of PTE in Alaska's rules. Before this statute, permits were often written presuming certain rates of operation or type or amount of material combusted. These permits relied on the common permit condition which specified that the permit only authorized operation in accordance with the permit application[8]. After 1993, the Department became more careful about establishing the PTE for emission units and began to insist on including presumed limitations as permit conditions.

The rules approved in Alaska pursuant to 40 CFR 51.166 are documented in 40 CFR 52.96. In 1994 these included "The State of Alaska Department of Environmental Conservation Air

[7] The limit was originally established in Permit 9473-AA007 on November 30, 1994. This permit was replaced by Permit 9473-AA032 on December 27, 1994 to include changes that BPXA had requested but the Department inadvertently left out in Permit 9473-AA007.

[8] For example, the original permit for the Central Power Station authorized "*operation of the two Phase I 17-MW Gas Turbine Generator units and two 550 KW Emergency Diesel Generators, as described in the BP Alaska Inc. permit application dated October 17, 1972, letter and data submittal forms dated October 13, 1972.*" This application specified the fuel as natural gas with 8 – 10 ppm H_2S.

Quality Control Regulations as in effect on June 2, 1988 (specifically 18 AAC 50.020, 50.021, 50.300, 50.400, 50.510, 50.520, 50.530, 50.600, 50.620, and 50.900) and the State air quality control plan (SAQCP) as in effect on June 2, 1988[9]." The rules approved under 40 CFR 51 Subpart I are documented in 40 CFR 52.70, and include the same regulatory citations. The question to be answered is whether the H_2S permit limit was established pursuant to these rules.

The rules required a permit to operate and describe the necessary application under 18 AAC 50.300. The rules specified how to review the application and issue the permit under 18 AAC 50.400. The SAQCP further explains how to apply the rules.

Section 18 AAC 50.300(b)(3) required an engineering report outlining the method of operation. For a large fuel-burning source, Section IV.F.2-5 of the SAQCP requires to specify the percent sulfur content of fuel in its application. Section 18 AAC 50.400 provides little detail on specific permit conditions, but Section IV.H-3 provides an example Permit-to-Operate. This example includes language that the permit is issued for operation as described in the permit application and supplementary material. Section IV.H of the State Air Quality control plan specifies that "The purpose for issuing an air quality control permit is to assure a facility maintains compliance with applicable air quality regulations. Every effort will be made to eliminate permit requirements not necessary to achieve this purpose." Nothing in the regulations or SAQCP appear to have specifically required or precluded fuel H_2S permit limits—they could be included if necessary to achieve the purpose of compliance with regulations.

Permit 9473-AA007 was established pursuant to 18 AAC 50.300 and 18 AAC 50.400 in effect at the time. The question is whether the subject limit should have been included in the permit. There is no clear documentation that the limit was imposed to ensure compliance with the regulations. One cannot, however, conclude from a lack of documentation that the limit was imposed by mistake. That question is best answered when the limit is first imposed, when the reasoning is fresh in the minds of the persons involved, not many years later by persons not involved with the original action. For this reason, the deadline for appeal of a permit is shortly after the permit is issued. For the CPS permit, the deadline for appeal is long past.

3.2 Other facts

The establishment of the H_2S limit in Permit 9473-AA007 is not well-documented, and the Department has made inconsistent decisions related to field gas H_2S limits in the past for other Prudhoe Bay sources. The rate of field gas souring is unpredictable. The Department has found for BPXA's CGF facility that additional controls are not a cost effective control technology[10], and it is unlikely that the Department would find differently for CPS. Therefore, a PSD permit would likely only ensure compliance with ambient air quality standards and increments for SO_2.

3.3 Decision

The Department is unwilling to determine conclusively that the existing limit has no basis or is unenforceable. At the same time the Department acknowledges some ambiguity associated with requiring a PSD permit for changing this limit. Until EPA provides definite guidance, the Department has decided to process the change for this facility under the simple minor permit procedures, but require compliance with both the standard and increments. This will provide

[9] 48 FR 30626, July 5, 1983, as amended at 56 FR 19288, April 26, 1991.
[10] Technical Analysis Report for Permit AQ0270CPT04 issued on October 13, 2009 for BPXA's Central Gas Facility.

essentially the same level of ambient protection as would be gained under a PSD permit. (The Department is confident that any BACT assessment would conclude that there are no cost effective control options.) This will also establish a clear basis for evaluating future SO_2 emission increases.

Minor permits do not usually require demonstrating compliance with the increment. However, lacking the increment demonstration, the Department would have no choice but to require a PSD permit for the change. In any event, the Department finds that the higher fuel gas H_2S content has the likelihood of causing or contributing to violations of the SO_2 ambient air quality standards and increments and is also requiring the analysis of the increment under 18 AAC 50.201.

The new H_2S limit established in Minor Permit AQ0186MSS01 is a limit under regulations approved pursuant to 40 CFR Subpart I. Unless EPA provides different guidance in the interim, any change to this H_2S limit, will be considered a change in the method of operation and evaluated for PSD applicability.

4.0 Emissions Calculations

4.1 Project SO_2 Emissions

Sulfur dioxide is the only pollutant affected by Permit AQ0186MSS01. There are no changes to emissions for any other pollutants. BPXA submitted potential emissions for each of the emission units in the December 2007 application using fuel gas H_2S content of 125 ppmv. The Department revised the PTE calculations (shown in Table 2) using a fuel gas H_2S content of 140 ppmv, equal to the value used in the modeling analysis submitted on April 8, 2010.

Although BPXA requested a fuel oil sulfur limit of 0.11 percent, the Department did not include the limit in the permit because the limit is not required for ambient protection. The PTE (shown in Table 2) is calculated using 1 percent (by weight) fuel sulfur, equal to the sulfur content used in the modeling analysis. This change will only effect the assessable emissions. The Department did not include a 1 percent fuel oil sulfur limit because there is no diesel fuel with this specification available in the market. Moreover, in order for BPXA to comply with the state emissions standards for sulfur compound emissions, BPXA must burn fuel oil with sulfur content less than 0.74 percent. This requirement is already in the Title V operating permit.

Table 2 – SO_2 Emissions After Permit AQ0186MSS01

ID	Tag No.	Name	Rating	New PTE
1	GRTB-17-1101	GE MS 5001 R	24,321 hp ISO (18.5 MW)	37.5
2	GRTB-17-2101	GE MS 5001 R		37.5
3	GRTB-17-3101	GE MS 5001P	33,875 hp ISO (25 MW)	42.4
4	GRTB-17-4101			42.4
5	GRTB-17-5101			42.4
6	GRTB-17-6101			42.4
7	GRTB-17-7101			42.4
8	H-17-0601	BS & B 400IH	4.0 MMBtu/hr	0.475
9	H-17-0602			0.475
10	H-17-0603	CW 4500IH	4.5 MMBtu/hr	0.534
11	H-17-1101	Jackson & Church	4.85 MMBtu/hr	0.581
12	H-17-2101			0.581
13	GNED-17-0101	Emergency Generator	738 hp (550 kW)	0.472[a]
14	GNED-17-0102			0.472[a]
Total Emissions				**291**

Table 2 Notes:

[a] The emissions are based on 200 hours of operation for the emergency generators.

4.2 Assessable Emissions

The assessable emissions for CPS are shown in Table 3. These values (except SO_2) are from BPXA's application for the operating permit renewal of August 8, 2007. The Department is establishing the SO_2 component of the assessable emissions in Permit AQ0186MSS01 based on the new PTE for CPS.

Table 3 – Assessable Emissions for CPS

		EMISSIONS IN TONS PER YEAR					
	NO_X	CO	PM-10	SO_2	VOC	HAP	Total
New Assessable Emissions	3,992	1,029	83	291	27	0	5,422

5.0 Department Findings

The Department finds that:

1. The CPS is classified as a PSD major stationary source under 40 CRR 52.21(b)(1)(i) because it has the ability to emit more than 250 tons of a regulated pollutant. CPS has never undergone PSD review because the source was operational before the implementation of the PSD program and it has never undergone a PSD modification.
2. BPXA submitted a permit application under 18 AAC 50.508(6) requesting to establish fuel gas H_2S limit of 140 ppmv for all gas fired Units 1 through 12 and fuel oil sulfur content limit of 0.11% by weight for the oil fired Units 13 and 14.
3. The reason for the fuel gas H_2S limit that originated in Permit 9473-AA007 in November 1994 is not documented. The Department believes that the limit is a federally enforceable limit.

4. The application addressed the effect of increasing the fuel gas H_2S content by submitting a modeling analysis to show compliance with the SO_2 Alaska Ambient Air Quality Standards (AAAQS) and increments.

5. A fuel oil sulfur limit is not required to protect the ambient air. A fuel gas H_2S limit of 140 pmv is necessary to protect the ambient air.

6. The basis for the historical 200 hours annual limit for the emergency generator Units 13 and 14 is unclear. The limit was carried over from Permit 9473-AA032 to Permit 186CP01/186TVP01. For the current permit action, BPXA relied on the limit to demonstrate compliance with the SO_2 AAAQS and increments.

7. Construction/Operating Permit 186CP01/186TVP01 contains Title 1 provisions carried forward from Permit 9473-AA032. Permit 186CP01/186TVP01 has expired, and these Title 1 provisions have also expired. The Department did not intend for Title 1 provisions to expire, and this result is an artifact of the combined nature of Permit 186CP01/186TVP01 and the change in permitting rules adopted in 2004. The Department is establishing the revised fuel gas H_2S limit and re-establishing the operating hour limit for the emergency generators.

8. The stationary source is located in the North Slope Borough. The project is consistent with the Alaska Coastal Management Program (ACMP) through AS 46.40.040(b)(1). The Department did not notify the local district and resource agencies of the permit action to request additional ACMP review because the North Slope Borough Coastal District plan does not have an enforceable policy in effect at this time. The Department informed the Coastal District Coordinator of the proposed project. The coastal District Coordinator has the opportunity to comment on the preliminary decision and the resource agencies have the opportunity to comment during the public notice period.

6.0 Permit Conditions

As described in 18 AAC 50.544(a)(1), each minor permit issued under 18 AAC 50.542 must identify the stationary source, the project, the Permittee, and contact information. The permit cover page identifies the stationary source, the project, Permittee and contact information.

As required under 18 AAC 50.544(a)(2), Section 2 of this minor permit contains the fee requirements of 18 AAC 50.400 – 18 AAC 50.499. An assessable emission fee of 7,900 tpy is included in the Minor Permit AQ0186MSS01 equal to that shown in Table 3 of this TAR.

As required under 18 AAC 50.544(a)(3), this minor permit contains conditions established under 18 AAC 50.201. See Section 6.1 below. The limits under this requirement are included in Section 3 of the Minor Permit AQ0186MSS01.

The requirements in 18 AAC 50.544(a)(4), do not apply to this permit because the Department did not establish any Owner Requested Limits under 18 AAC 50.225 to avoid a permit classification under AS 46.14.130 described in 18 AAC 50.508(5).

As required under 18 AAC 50.544(a)(5), the minor permit contains the standard permit conditions listed under 18 AAC 50.345(c)(1) and (2) and (d) – (h) to ensure that the Permittee will construct and operate the stationary source in accordance with 18 AAC 50. These

requirements are in Section 4 of Minor Permit AQ0186MSS01 under "Standard Permit Conditions."

6.1 Conditions Established Under 18 AAC 50.201

BPXA submitted a modeling analysis with their application for a permit under 18 AAC 50.508(6), to demonstrate compliance with the SO_2 standards and increments. Because there is a likelihood that the H_2S increase will cause or contribute to violations of the ambient standards and increments, an ambient demonstration was necessary. BPXA's modeling analysis satisfied the ambient air quality investigation requested under 18 AAC 50.201.

The Department's review of BPXA's modeling analysis found that in order to protect the SO_2 air quality standards and increments, the following limits are necessary.

1. For all gas-fired emission units, limit the maximum H_2S content to 140 ppm (on an instantaneous basis).
2. Limit the annual operations for the emergency generators to 200 hours.

For monitoring fuel gas H_2S content, BPXA asked that the Department cross-reference the monitoring in the operating permit. Since the language in the operating permit is specific for New Source Performance Subpart GG fuel sulfur monitoring, the Department included specific language in this minor permit. The Department did not however, revise the H_2S testing method or increase the current monthly testing frequency because the fuel gas H_2S increase is a very slow process and there is no benefit in increasing the monitoring frequency.

The monitoring requirements to comply with the 200 hour annual limit for the emergency generators are the same as the requirements in the operating permit. The Department has cross-referenced this requirement in this minor permit.

6.2 Requirements for a Title V Amendment under 18 AAC 50.326(c)(2)

The Department examined whether the Title I permit changes made by the minor permit to be Clean Air Action Section 502(b)(10) changes for the purposes of Title V permitting. Section 502(b)(10) changes are defined in 40 CFR 71.2 as

> *changes that contravene an express permit term. Such changes do not include changes that would violate applicable requirements or contravene federally enforceable permit terms and conditions that are monitoring (including test methods), recordkeeping, reporting, or compliance certification requirements.*

There are no changes to monitoring required of the permittee. BPXA will continue to monitor the fuel gas H_2S content on a monthly basis as before. The old H_2S limit could be exceeded under the new condition, but the old limit will no longer be an applicable requirement under the definition of *Applicable Requirement* in 40 CFR 71.2 because it is replaced by the new condition.

40 CFR 71.6(a)(13)(i) allows the permittee to make Section 502(b)(10) changes without a permit revision if the changes are not Title 1 modifications, and the changes do not exceed emissions allowable emissions under the permit. Under this rule, Title I modifications are PSD/NSR major modification, and modifications under NSPS or under CAA Section 112. Therefore, this is not a Title I modification (see Section 3.2 of this TAR) for this purpose. However, since the emissions exceed allowable emissions, this change at CPS does not qualify for the operational flexibility provisions of 40 CFR 71.6(a)(13). Therefore, the change requires a Title V permit revision

before BPXA can operate under the provisions of Permit AQ0186MSS01.

7.0 Permit Administration

BPXA is currently operating CPS under Construction/Operating Permit 186CP01/186TVP01 (expired but operating under a permit shield after applying for operating permit renewals).

For reasons described in Section 6.2 of this TAR, BPXA must obtain a permit revision to the operating permit before operating CPS under the provisions of Minor Permit AQ0186MSS01.

The Department notes that the operating permit renewal for CPS is underway at the same time as this minor permit is processed. The Department intends to incorporate the provisions of this minor permit AQ0186MSS01 into the Title V operating permit renewal.

Appendix: Modeling Memorandum

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File
DATE: April 21, 2010

THRU:
FILE NO: AQ0186MSS01 – Modeling
AQ0184MSS01 – Modeling

PHONE: 465-5112
FAX: 465-5129

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

SUBJECT: Review of BPXA's H_2S Ambient Assessment for CPS and GC-3

This memorandum summarizes the Department's findings regarding the ambient sulfur dioxide (SO_2) analysis submitted by BP Exploration (Alaska) Inc. (BPXA) for the Central Power Station (CPS) and the Gathering Center 3 (GC-3) hydrogen sulfide (H_2S) limit Increase Projects. BPXA submitted this analysis in support of their December 2007 minor permit applications for these two stationary sources (AQ0186MSS01 and AQ0184MSS01, respectively). As described in this memorandum, BPXA's analysis adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the SO_2 Alaska Ambient Air Quality Standards (AAAQS) listed in 18 AAC 50.010; or the SO_2 maximum allowable increases (increments) listed in 18 AAC 50.020.

BACKGROUND

CPS and GC-3 are located within the Prudhoe Bay Unit (PBU) of Alaska's North Slope. Both facilities are classified as major stationary sources under the Prevention of Significant Deterioration (PSD) program. BPXA is currently operating CPS under Construction/Operating Permit 186CP01/186TVP01. They are operating GC-3 under Operating Permit 184TVP01.

The existing permits contain various H_2S limits for various reasons. The Department imposed a source-wide H_2S limit of 29.9 parts per million by volume (ppmv) at CPS to protect the SO_2 AAAQS and Increments. This is the H_2S level that BPXA assumed in a significant impact level (SIL) modeling analysis of CPS that BPXA submitted in September 2002. BPXA submitted the analysis in support of a September 2002 request to increase the fuel gas H_2S limit from 25 ppmv to 29.9 ppmv. The Department granted BPXA's request in Construction/Operating Permit 186CP01/186TVP01. The Department's findings regarding BPXA's 2002 SIL analysis are described in my December 13, 2002 memorandum, *Review of CPS H_2S Modeling Analysis*.

BPXA submitted minor permit applications for both sources in late 2007 to further increase the 29.9 ppmv limit at CPS and to increase the 25 ppmv limit at GC-3. The subsequent events and ultimate permitting strategy is described in the body of the Technical Analysis Report. In

summary, the Department decided in February 2010 to proceed with processing the CPS and GC-3 applications under the minor permit program, provided BPXA demonstrated compliance with the SO_2 ambient air quality standards *and* increments.

The 2007 applications included a separate ambient assessment for each stationary source. However, CPS and GC-3 have overlapping impacts[11], which made for a cumbersome review. The Department therefore asked BPXA on March 4, 2010 to recompile the two assessments into a combined, comprehensive analysis. BPXA submitted the recompiled analysis on April 8, 2010. They provided additional information on April 13, 2010. The recompiled analysis includes several minor updates and revisions, which are described in the accompanying report from BPXA's consultant, AECOM.

BPXA generally followed their August 2001 modeling protocol "Modeling Protocol for an Air Quality Impact Analysis of SO_2 Emissions at the Prudhoe Bay Unit," which the Department approved with comment on April 18, 2002. However, BPXA updated various aspects to incorporate emission unit/stationary source changes that have occurred since 2001, and to incorporate recent Department findings regarding other North Slope ambient assessments.

APPROACH

BPXA used computer analysis (modeling) to predict the ambient air quality impacts. AECOM conducted the modeling analysis on behalf of BPXA.

BPXA provided separate ambient demonstrations for CPS and GC-3 in their 2007 submittals. Each demonstration consisted of the following general approach:

1) a preliminary analysis of just the given stationary source to determine the general location of the maximum impacts from that source; and
2) a "full field" analysis of essentially "all" North Slope sources to determine the cumulative impact at the maximum impact locations found in step one.

The preliminary runs always showed that the maximum impacts occur in the immediate near-field. This is an expected and typical result for emission units subject to downwash.

BPXA only resubmitted the cumulative impact portion of their analysis. They did not revise their preliminary runs since that portion of the analysis remains essentially unchanged. BPXA's approach of just resubmitting the cumulative impact analysis is acceptable, especially since BPXA greatly expanded the receptor grid used in the compiled full field analysis (see Receptor Grid discussion).

[11] The significant impact area (SIA) for CPS extends to GC-3 at the newly requested H_2S level for CPS. The SIA for GC-3 likewise extends to CPS at the newly requested H_2S level for GC-3. Therefore, BPXA must demonstrate that the SO_2 emissions from CPS comply with the SO_2 AAAQS/Increments at both CPS and GC-3, and that the SO_2 emissions from GC-3 comply with the SO_2 AAAQS/Increments at both GC-3 and CPS.

Model Selection

There are a number of air dispersion models available to applicants and regulators. 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).

BPXA used EPA's *Industrial Source Complex Short-Term 3* (ISCST3) model for the ambient analysis. ISCST3 was as a "preferred" model in the Guideline version adopted by reference at the time BPXA submitted their permit applications. The Department therefore accepts the use of ISCST3 for this analysis.

BPXA used the SECOR variation of ISCST3 version 02035 (which is EPA's latest release of this model). SECOR modified the ISCST3 source code to characterize horizontal/capped stacks in a manner consistent with EPA guidance.[12] The modified version ignores stack tip downwash for horizontal/capped stacks (as recommended by EPA). The Department has previously accepted this code change in a number of assessments conducted by SECOR in support of North Slope applicants. The code change remains acceptable since EPA has not changed their guidance regarding the modeling of horizontal/capped stacks with ISCST3.[13]

Meteorological Data

ISCST3 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.

BPXA used five years (1991 – 1995) of PBU A Pad surface data and concurrent upper air data from the nearest available source, the NWS station in Barrow. A Pad is part of the GC-3 stationary source. The Department considers the A Pad meteorological data as site-specific for both GC-3 and CPS. The Department has also previously accepted the 1991 – 1995 A Pad/Barrow data set for ISCST3 modeling assessments of PBU stationary sources. Therefore, the Department accepts the 1991 - 1995 A Pad/Barrow data set for the CPS/GC-3 analysis.

EPA allows applicants to compare the high second-high (h2h) modeled concentration to the short-term air quality standards/increments if at least one year of temporally representative site-specific, or five years of representative NWS data, are used. When these criteria are not met, then applicants must use the high first-high (h1h) concentration. In all cases, applicants must compare the highest modeled concentration to the annual average standards. The Department allowed BPXA to compare the h2h concentration to the short-term AAAQS/increments since they used site-specific data.

[12] EPA Memorandum from Joseph Tikvart to Ken Eng, *Proposal for Calculating Plume Rise for Stacks with Horizontal Releases or Rain Caps for Cookson Pigment, Newark, New Jersey*, July 9, 1993.

[13] SECOR's code change appears to be inconsequential for this assessment. The Department only found differences in the third or fourth decimal place of the maximum impact when spot checking BPXA's analysis with the unmodified version of ISCST3 – which is the version of ISCST3 that comes standard with the modeling software package used by the Department.

Emission Unit Inventory

BPXA modeled all of the gas-fired and liquid-fired emission units listed in the current operating permits for CPS and GC-3. BPXA listed the modeled emission units in the modeling reports provided with each minor permit application. The following aspects of the emission unit inventory warrant additional discussion.

Intermittent Well Servicing Equipment

The Department stated in its April 2002 protocol approval that the ambient impact from well servicing equipment can be notable. The Department further noted that the significant impact area (SIA) for the controlling SO_2 averaging period (24-hour) can be 2.6 km – based on an analysis of the well servicing equipment associated with the Alpine Production Facility. The Department therefore asked BPXA to conduct a preliminary assessment to determine whether well servicing equipment should be included in the ambient demonstrations submitted with the PBU H_2S permit applications.

The Department noted that the closes facility-pad combination within PBU is Flow Station 2 (FS-2) and Drill Site 11 (DS11). The Department therefore stated that BPXA may first assess the impact of operating well servicing equipment on DS11 in the initial FS-2 analysis. If the well servicing impacts notably influence the FS-2 results, then BPXA would need to include well servicing activity at pads located within 2.6 km of a modeled facility. However, if the well servicing impacts do not notably change the FS-2 results, BPXA could report this finding and then exclude the well servicing activity from the ambient demonstrations.

BPXA provided the well-servicing analysis in the December 2007 minor permit application for H_2S increases at FS-2. While the Department has not yet conducted a comprehensive review of the FS-2 demonstration, the Department did review the well-servicing portion as part of the CPS/GC-3 review.

AECOM provided additional details regarding the well-servicing analysis on March 12, 2010 – in response to Department questions.[14] AECOM clarified that they obtained the well servicing equipment stack parameters from a January 2004 permit application submitted by ConocoPhillips Alaska Inc. (CPAI) for the Alpine Satellite Drilling Pad (CD3 and CD4) project. However, they used a corrected SO_2 emission rate for the Frac Unit engines rated at less than 600 brake-horsepower (bhp). CPAI reported a pound per day SO_2 emission rate as a pound per hour value in Table A-20 of their January 2004 application. BPXA therefore divided the reported value by 24 and used the corrected value in their well servicing analysis. The modeled short-term SO_2 emission rate for the well servicing equipment is provided below in 0.

BPXA's analysis showed that including well servicing equipment increased the cumulative 24-hour AAAQS impact at the worst-case receptors by no more than 0.5 micrograms per cubic meter ($\mu g/m^3$), and less than this for the other averaging periods. This amount is well below the

[14] E-Mail from Thomas Damiana (AECOM) to Alan Schuler (Department); *RE: FS2WSE Demonstration*; March 12, 2010.

significant impact level (SIL). Therefore, BPXA appropriately excluded well servicing equipment from the CPS/GC-3 SO_2 modeling assessments.

Table 1 - Corrected SO_2 Emission Rates for Well Servicing Equipment (Sulfur Content = 0.11 percent, by weight)

Frac Unit	Short-term SO_2 Emissions (lb/hr)	(g/s)
IC Engines < 600 hp	0.0966	0.012
IC Engines > 600 hp	0.881	0.111
"Small" Engine Subtotal	0.9776	0.123
IC Engines >> 600 hp	12.8	1.615

Increment Analysis

The SO_2 baseline date for the Northern Alaska Intrastate Air Quality Control Region is June 1, 1979. Therefore, there are both baseline and increment consuming emission units within the PBU, including CPS and GC-3.

BPXA's approach for modeling the SO_2 increment consumption is described in the modeling reports that they submitted in support of their minor permit applications. In summary, BPXA assumed the SO_2 emissions from all *gas-fired* CPS/GC-3 emission units are *entirely* increment consuming since the baseline H_2S level is unknown (i.e., they did not take any credit for the baseline SO_2 emissions). They likewise did not take credit for the increment expanding CPS/GC-3 emissions associated with the decrease in liquid fuel sulfur content. Both of these assumptions result in a larger SO_2 modeled increment impact than what will really occur.

Emission Rates and Stack Parameters

The assumed emission rates and stack parameters have significant roles in an ambient demonstration. Therefore, the Department checks these parameters very carefully.

SO_2 Emissions

SO_2 emissions are directly related to the amount of sulfur in the fuel. The sulfur in fuel gas is in the form of H_2S. The sulfur in liquid fuel (e.g., diesel) is in the form of elemental sulfur.

BPXA provided one operating scenario for CPS and three operating scenarios for GC-3. The GC-3 scenarios varied by assumed H_2S content, fuel sulfur content, and stack configuration for the liquid-fired Alison 501KB Emergency Turbine Generator (Unit 21; Tag No. GTRB-03-8001; model ID 1423). The H_2S and fuel sulfur contents that BPXA assumed are summarized in 0 and are further discussed below.

Table 2 - Assumed H_2S and Fuel Sulfur Content

Stationary Source	Source Configuration Notes for Each H_2S/Fuel Sulfur Scenario	H_2S Content (ppmv)	Fuel Sulfur Content (%)
CPS	NA	140	1.0
GC-3	Capped stack on Alison turbine (Unit 21)	120	0.11
	Uncapped stack on Alison turbine (Unit 21)	125	0.11
	Capped stack on Alison turbine (Unit 21)	135	0.0015

BPXA assumed the maximum liquid fuel sulfur content at CPS is 0.11 percent, by weight, *for purposes of determining the potential emissions for permit applicability purposes*. However, in order to show that a liquid fuel sulfur limit is not required at CPS to protect the SO_2 AAAQS and increments, they assumed the two liquid-fired emission units at CPS are burning fuel containing 1.0 percent, by weight, sulfur in the ambient demonstration. The Department accepts BPXA's demonstration that a liquid-fuel sulfur limit is *not* needed at **CPS** to protect the SO_2 AAAQS/increment for the reasons described below:

1) the two liquid-fired emission units at CPS (Emergency Generator GNED-17010 and GNED-17-0102) are pre-baseline units and therefore, do not consume SO_2 increment – i.e., a fuel sulfur limit is not needed to protect the SO_2 increments; and

2) the assumed 1.0 percent, by weight, fuel sulfur content exceeds the more restrictive 0.75 percent, by weight, limit typically imposed to meet the 500 part per million (ppm) sulfur compound emission limit required for fuel-burning equipment under 18 AAC 50.055(c).

In one of the GC-3 scenarios, BPXA assumed the liquid-fired emission units are burning "ultra-low sulfur diesel (ULSD), which has a maximum sulfur content of 15 ppm (0.0015 percent, by weight).

Operational Restrictions

BPXA assumed the gas-fired emission units at CPS and GC-3 are constantly operating. They assumed the liquid-fired emission units only operate 200 hours per year. The 200 hour per year assumption matches the existing operational limits for these units.

BPXA found that new short-term operational limits are needed under the 0.11 percent fuel sulfur scenarios for two of the GC-3 liquid-fired emission units. BPXA stated the limits are needed to protect the 24-hour SO_2 increment. The restricted units are: Unit 20 – a 3,600 bhp Detroit Diesel Emergency Generator; and Unit 21 – a 5,000 bhp Alison 501KB Emergency Turbine Generator. The new short-term limits are 12-hours per day for Unit 20 and 10-hours per day for Unit 21.[15] No short-term operational limits are needed under the ULSD scenario.

[15] BPXA originally requested a 12-hour per day operational limit for the Alison 501KB turbine (Unit 21). However, they reduced the requested limit to 10 hours per day when they submitted the recompiled analysis.

Horizontal/Capped Stacks

The presence of horizontal stacks or stacks with rain caps requires special handling in an ISCST3 analysis. EPA recommends that the plumes be characterized with an artificially small exit velocity (0.001 m/s) and an "equivalent diameter" to conserve the volume flow rate. Therefore, BPXA used EPA's recommended approach to characterize the stack parameters units with horizontal or capped stacks.

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. BPXA used the pad edge as the ambient air boundary. This is an appropriate boundary for North Slope sources.

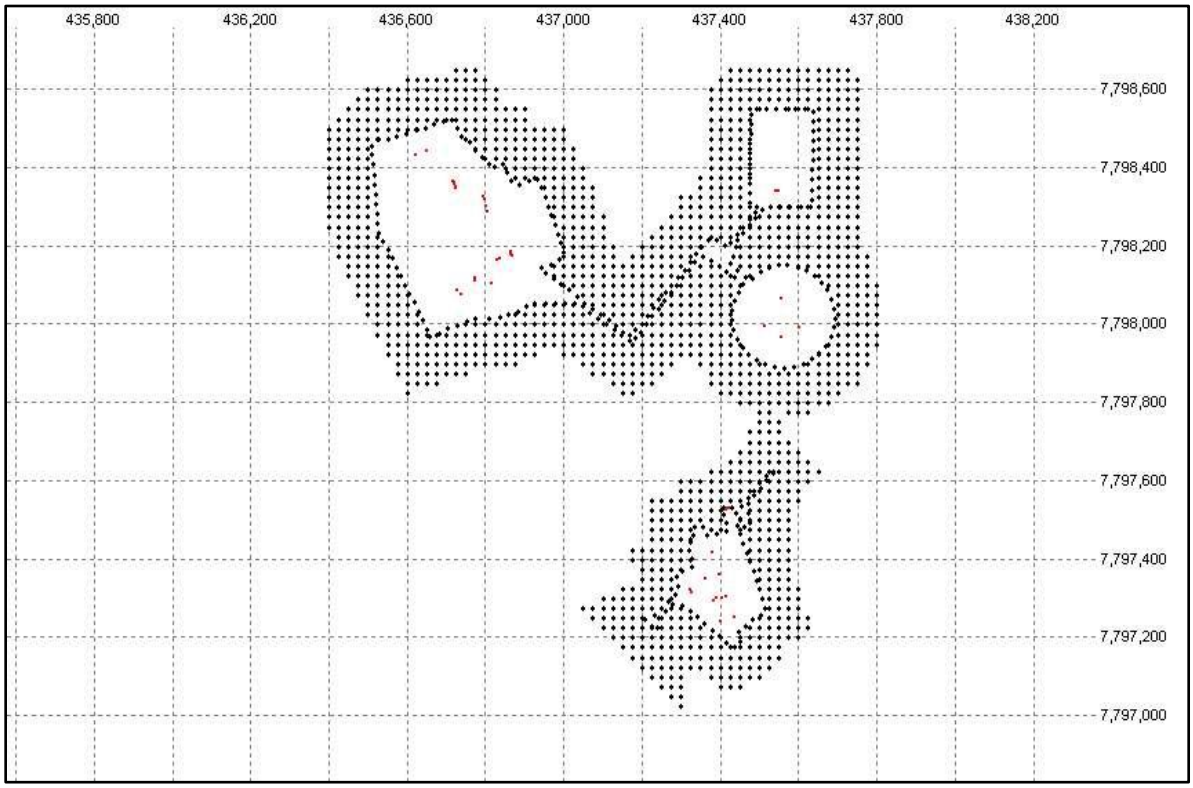
Receptor Grid

BPXA used a semi-extensive receptor grid for the initial modeling analysis of just the stationary source of interest; and a limited, "focused" receptor grid in the cumulative impact analysis. BPXA used the following grid density in the preliminary CPS and GC-3 runs:

- 25-meter resolution along the ambient air boundary ;
- 25-meter resolution within 100 meters of the boundary;
- 100-meter resolution from the 25-meter grid outward to 1 kilometer (km) in each direction; and
- 250-meter resolution from the 1 km grid outward to 2 km in each direction.

In the 2007 submittal, BPXA limited the receptor grid for the cumulative impact analysis to the ten receptors with the highest preliminary impacts. This approach is consistent with their 2001 modeling protocol. The Department approved the protocol's 10-receptor approach due to concerns with the slow computer run times of that era. However, as noted under Section 2.10.2 of the Department's April 2002 protocol comments, the Department reserved the right to revisit the receptor grid issue "if there was reason to believe that the maximum cumulative impact could occur at some other location for a particular facility." The Department invoked that right when asking for the recompiled run since it wasn't clear whether the maximum *cumulative* impact would occur near CPS or GC-3. The Department asked BPXA to use the entire 25-meter grid developed for the CPS and GC-3 preliminary runs in the composite cumulative impact analysis. The resulting receptor grid is illustrated in Figure 1. The Department spot-checked the isopleths associated with the cumulative impact analysis, and determined that the use of just the 25-meter grid is adequate for determining the maximum SO_2 impacts.

Figure 1: CPS/GC-3 Cumulative Impact Receptor Grid



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," as defined in 18 AAC 50.990(42). The modeling of downwash-related impacts requires the inclusion of dimensions from nearby buildings.

EPA has established specific algorithms for determining which buildings must be included in the analysis and for determining the profile dimensions that would influence the plume from a given stack. EPA has incorporated these algorithms into the following computer programs "Building Profile Input Program" (BPIP). BPXA used the current version of BPIP (version 04112) to determine the building profiles needed by ISCST3.

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.

BPXA included the permitted stationary sources located within Prudhoe Bay, Endicott, Milne Point, Kuparuk and Deadhorse in the modeled off-site inventory. They also included the recently permitted "Liberty" project emission units in the recompiled analysis, along with the increased H_2S and fuel sulfur limits authorized for several sources subsequent to the initial 2007

submittal. When BPXA found that an emission rate had increased for a given emission unit, they used the EMISFACT keyword in ISCST3 to prorate the modeled emission rate. This made the recompiled analysis easier to review since it minimized the changes from the initial, partially reviewed submittal.

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.

BPXA used the maximum 3-hour, 24-hour and annual average concentrations measured from January 2003 through December 2005 at their Prudhoe Bay A Pad monitoring station. They stated that these concentrations are as high or higher than those measured at Kuparuk Drill Site IF (DS1F) during the July 2001 through June 2002 monitoring period, "which is the next closes (from a proximity of standpoint) available SO_2 air quality data set." BPXA further noted that since the 24-hour SO_2 increment demonstration is the controlling factor in determining the H_2S and fuel sulfur ambient air limits, the values assumed for background are non-critical.

BPXA's observation regarding the role of the assumed background concentration is correct. As shown below in the Results and Discussion section of this memorandum, the 24-hour SO_2 increment impact is the controlling factor in this analysis. However, the Department is unable to accept BPXA's use of the 2003 – 2005 A Pad monitoring data since it has never been reviewed by the Department. The Department is therefore using the maximum concentrations measured at A Pad in 2008, since this is the most recent data set that the Department has reviewed and accepted. BPXA's values and the Department's values are shown below in 0.

Table 3 - Assumed SO_2 Background Concentrations

Avg. Period	BPXA's Values: 2003 – 2005 A Pad Data ($\mu g/m^3$)	Dept Values: 2008 A Pad Data ($\mu g/m^3$)
3-hr	28.8	91.7
24-hr	21.0	60.3
Annual	7.9	2.6

The 2008 3-hour and 24-hour concentrations are substantively larger than the 2003 – 2005 values. However, as BPXA correctly observed, the use of these larger values does not change any of the conclusions. BPXA is able to easily demonstrate compliance with the 3-hour, 24-hour and annual average SO_2 AAAQS with either set of values.

RESULTS AND DISCUSSION

The maximum SO_2 AAAQS impacts, along with the background concentrations, total impacts, and AAAQS are shown below. The maximum impacts are very similar for each of the scenarios. All of the total impacts are less than the AAAQS. Therefore, BPXA has demonstrated compliance with the AAAQS.

Table 4 - Maximum AAAQS Impacts When Using 120 ppm H_2S and 0.11% sulfur at GC-3

Air Pollutant	Avg. 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 ($\mu g/m^3$)
SO_2	3-hr	546.9	91.7	**639**	1,300
	24-hr	226.4	60.3	**287**	365
	Annual	12.1	2.6	**15**	80

Table 5 - Maximum AAAQS Impacts When Using 125 ppm H_2S and 0.11% sulfur at GC-3

Air Pollutant	Avg. 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 ($\mu g/m^3$)
SO_2	3-hr	547.0	91.7	**639**	1,300
	24-hr	226.4	60.3	**287**	365
	Annual	12.5	2.6	**15**	80

Memo Table 6 - Maximum AAAQS Impacts When Using 135 ppm H_2S and ULSD at GC-3

Air Pollutant	Avg. 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 ($\mu g/m^3$)
SO_2	3-hr	547.0	91.7	**639**	1,300
	24-hr	226.4	60.3	**287**	365
	Annual	13.4	2.6	**16**	80

The maximum SO_2 increment impacts are shown below, along with the Class II increments. Once again, all of the maximum impacts are similar between the scenarios and all are less than the applicable Class II increments.

Table 7 - Maximum Increment Impacts When Using 120 ppm H_2S and 0.11% sulfur at GC-3

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO_2	3-hr	295.7	512
	24-hr	90.1	91
	Annual	12.1	20

Table 8 - Maximum Increment Impacts When Using 125 ppm H_2S and 0.11% sulfur at GC-3

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO_2	3-hr	311.3	512
	24-hr	90.1	91
	Annual	12.5	20

Table 9 - Maximum Increment Impacts When Using 135 ppm H_2S and ULSD at GC-3

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO_2	3-hr	202.0	512
	24-hr	90.1	91
	Annual	13.4	20

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 annual and high second high short term values value that may occur within the area. Except for maximum short term concentrations which are allowed to exceed the respective standards once per year, the concentrations at other locations within the modeling domain should be less than the values reported above.

CONCLUSION

The Department reviewed BPXA's SO_2 modeling analysis and concluded the following:

1. The SO_2 emissions associated with operating the CPS and GC-3 emission units will not cause or contribute to a violation of the SO_2 AAAQS listed in 18 AAC 50.010, or the SO_2 increments in 18 AAC 50.020.

2. BPXA 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 permits for CPS and GC-3 to ensure BPXA complies with the SO_2 AAAQS and increments. These conditions are summarized below.

In the CPS Permit

1. For all gas-fired emission units, limit the maximum H_2S content to 140 ppmv.

2. Maintain the existing 200 hour per year operational limit on the liquid-fired units to protect the annual average SO_2 AAAQS/increment.

In the GC-3 Permit

1. For all diesel-fired emission units, limit the maximum fuel sulfur content to 0.11 percent, by weight.

2. To protect the 24-hour SO_2 increment, restrict the daily operation of the Alison 501KB Emergency Turbine Generator (Unit 21) to 10 hours per day, when burning fuel with a sulfur content that exceeds 15 ppmw. (Allow continuous operation throughout the day when burning ULSD.)

3. To protect the 24-hour SO_2 increment, restrict the daily operation of the Detroit Diesel Emergency Generator (Unit 20) to 12 hours per day, when burning fuel with a sulfur content that exceeds 15 ppmw. (Allow continuous operation throughout the day when burning ULSD.)

4. For all gas-fired emission units, limit the maximum H_2S content as follows:
    a. 135 ppmv when burning ULSD in the liquid-fired units;
    b. 125 ppmv when burning non-ULSD fuel in the liquid-fired units and the exhaust stack for Unit 21 is uncapped; and
    c. 120 ppmv when burning non-ULSD fuel in the liquid-fired units and the exhaust stack for Unit 21 is capped.

5. Maintain the existing 200 hour per year operational limit on the liquid-fired units to protect the annual average SO_2 AAAQS/increment.