Hilcorp Alaska, LLC

Post Office Box 244027
Anchorage, AK 99524-4027

3800 Centerpoint Drive
Suite 1400
Anchorage, AK 99503

Phone: 907/777-8300
Fax: 907/777-8301

November 3, 2023

Sent via Email

Alaska Department of Environmental Conservation Air Permits Program
Attn: Air Permit Application Intake Clerk
555 Cordova Street
Anchorage, AK 99501
dec.aq.airreports@alaska.gov

Subject: **Endicott Short-Term H_2S Limit Increase Permitting**
Application for an Alaska Minor Permit under 18 AAC 50.508(6)
Permit Requested by the Owner to Revise a Permit Condition

Dear Sir or Madam:

Hilcorp Alaska, LLC (Hilcorp) hereby submits this application under Alaska Department of Environmental Conservation (ADEC) Air Quality Control Regulations 18 AAC 50.508(6) for a minor permit requested to revise a condition in the Endicott Production Facility Title I permit AQ0181MSS10. Specifically, Hilcorp seeks to increase the allowable short-term gaseous fuel H_2S concentration from 425 to 520 ppmv without changing the allowable annual average gaseous fuel H_2S concentration. This is being done to proactively deal with transient gaseous fuel H_2S concentration increases that result from normal operational changes. The application contains the information required under 18 AAC 50.540(a), (b), and (k), which are presented as attachments to this letter as detailed in **Table 1**.

The requested revision will impact the underlying ambient analysis conducted to demonstrate compliance with the SO_2 Alaska Ambient Air Quality Standards and PSD Class II Increments; therefore, an ambient air quality impact analysis demonstrating compliance with these standards and increments is included in Attachment C of this application.

If you have any questions or require additional information regarding this document, please contact Drew Anderson at 907.777.8488 or ananderson@hilcorp.com.

Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete.

Sincerely,

Matt Brown
Asset Team Lead
Hilcorp North Slope, LLC

Electronic cc: Sims Duggins (SLR International Corporation)
Jesse Jack (ADEC)
Yesenia Camarena (ADEC)
Aaron Simpson (ADEC)

Jim Plosay (ADEC)

Enclosures:

Attachment A Stationary Source Identification Form
Attachment B Ambient Air Quality Impact Analysis
Attachment C Copy of Air Quality Construction Permit No. AQ0181MSS10
Attachment D Modeling Files (Provided Electronically)

Table 1: Required Elements for a Minor Permit Requested by the Owner to Revise a Permit Condition under 18 AAC 50.508(6)

Regulatory Citation	Requirement	Location
18 AAC 50.540(a), (b)	General information. Information prescribed by the Stationary Source Identification Form	**Attachment A**
18 AAC 50.540(k)(1)	A copy of the Title I permit that established the permit term or condition.	**Attachment C**
18 AAC 50.540(k)(2)	An explanation of why the permit term or condition should be revised.	**Attachment A**
18 AAC 50.540(k)(3)	A description of the effect of revising or revoking the permit term or condition on:	
	(A) emissions	**Attachment A**
	(B) other permit terms	**Attachment A**
	(C) the underlying ambient demonstration	**Attachment B**
	(D) compliance monitoring	**Attachment A**
18 AAC 50.540(k)(4)	For a condition that allows an owner or operator to avoid a permit classification, the information required of an applicant for that type of permit, unless the revised condition would also allow the owner or operator to avoid the classification.	**Not Required:** The requested revision does not affect a permit condition that is necessary to avoid a permit classification.

Hilcorp Alaska, LLC

Alaska Department of Environmental Conservation
Air Quality Minor Permit Application

STATIONARY SOURCE IDENTIFICATION FORM

Section 1 Stationary Source Information

Name: Endicott Production Facility			SIC: 1311
Project Name (if different): Short-Term H_2S Limit Increase	Contact: Drew Anderson, Environmental Engineer		
Physical Address: Prudhoe Bay, Alaska Sections 5 and 8, T12S, R12E Umiat Meridian	City: Anchorage	State: AK	Zip: 99503
	Telephone: 907.777.8488		
	E-Mail Address: ananderson@hilcorp.com		
UTM Coordinates (m) or Latitude/Longitude:	Northing: 7,805,400	Easting: 464,200	Zone: 6
	Latitude: 70.351921 N	Longitude: 147.954017 W	

Section 2 Legal Owner

Name: **See last page of this form**		
Mailing Address:		
City:	State:	Zip:
Telephone #:		
E-Mail Address:		

Section 3 Operator *(if different from owner)*

Name: Hilcorp Alaska, LLC		
Mailing Address: 3800 Centerpoint Dr., Suite 1400		
City: Anchorage	State: AK	Zip: 99503
Telephone #:		
E-Mail Address:		

Section 4 Designated Agent *(for service of process)*

Name: CT Corporation Systems		
Mailing Address: 9360 Glacier Hwy, Suite 202		
City Juneau	State: AK	Zip: 99801
Telephone #: 907.586.3340		
E-Mail Address: NA		

Section 5 Billing Contact Person *(if different from owner)*

Name: Hilcorp Alaska – Account Payable		
Mailing Address: PO Box 61529		
City: Houston	State: TX	Zip: 77208
Telephone #: 713.209.2400		
E-Mail Address: NA		

Section 6 Application Contact

Name: Drew Anderson			
Mailing Address: **Same as Operator**	City:	State:	Zip:
	Telephone: 907.777.8488		
	E-Mail Address: ananderson@hilcorp.com		

Section 7 Desired Process Method *(Check only one – see 18 AAC 50.542(a) for process descriptions and restrictions)*

☐ Fast track for a permit classification under 18 AAC 50.502 [18 AAC 50.542(b)]

☒ Public comment [18 AAC 50.542(d)]

Section 8 Source Classification(s) *(Check all that apply)*

[18 AAC 50.502(b)]

- ☐ Asphalt Plant [≥ 5 ton per hour]
- ☐ Thermal Soil Remediation Unit [≥ 5 ton per hour]
- ☐ Rock Crusher [≥ 5 ton per hour]
- ☐ Incinerator(s) [total rated capacity ≥ 1000 lb/hour]
- ☐ Coal Preparation Plant
- ☐ Port of Anchorage Facility

If you checked any of the above, is (are) the emission unit(s) ☐ new, ☐ relocated*, or ☐ existing?

[18 AAC 50.502(c)(1)]

New or relocated* stationary source with potential emissions greater than:

- ☐ 40 tons per year (tpy) NOx
- ☐ 40 tpy SO_2
- ☐ 15 tpy PM-10
- ☐ 10 tpy PM-2.5
- ☐ 0.6 tpy lead
- ☐ 100 tpy CO in a nonattainment area

[18 AAC 50.502(c)(2)]

Construction or relocation* of a:

- ☐ Portable oil and gas operation
- ☐ ≥ 10 MMBtu/hr fuel burning equipment in a SO_2 special protection area

* *Relocation does NOT include moving equipment from one place to another within your current stationary source boundary.*

Section 9 Modification Classification(s) (*Check all that apply)*

[18 AAC 50.502(c)(3)]

- ☐ NOx Increase > 10 tpy [and existing PTE > 40 tpy]
- ☐ SO_2 Increase > 10 tpy [and existing PTE > 40 tpy]
- ☐ PM-10 Increase > 10 tpy [and existing PTE > 15 tpy]
- ☐ PM-2.5 Increase > 10 tpy [and existing PTE > 10 tpy]
- ☐ CO Increase > 100 tpy [and existing PTE > 100 tpy in a nonattainment area]

[18 AAC 50.502(c)(4)]

- ☐ NOx Increase > 40 tpy [and existing PTE ≤ 40 tpy]
- ☐ SO_2 Increase > 40 tpy [and existing PTE ≤ 40 tpy]
- ☐ PM-10 Increase > 15 tpy [and existing PTE ≤ 15 tpy]
- ☐ PM-2.5 Increase > 10 tpy [and existing PTE ≤ 10 tpy]
- ☐ CO Increase > 100 tpy [and Existing PTE ≤ 100 tpy in a nonattainment area]

Basis for calculating modification:

- ☐ Projected actual emissions minus baseline actual emissions
- ☐ New potential emissions minus existing potential emissions

Section 10 Permit Action Request (*Check all that apply)*

[18 AAC 50.508]

- ☐ Establish Plant-wide Applicability Limitation (PAL)
- ☐ Establish emission reductions to offset nonattainment pollutant
- ☐ Owner Requested Limit* (ORL)
- ☒ Revise or Rescind Title I Permit Conditions *

Permit Number: AQ0181MSS10
Condition No. 5.1b (Ambient Protection Limit)
Date: September 6, 2018

**Which to use? See* http://www.dec.state.ak.us/air/ap/docs/orlrtc.pdf

Section 11 Existing Permits and Limits

For an existing stationary source, do you have an existing:
(Check all that apply)

☒ Air quality permit Number(s)*:

- AQ0181MSS10 9/6/2018
- AQ0181TVP02 Rev 2 11/18/2014

☐ Owner Requested Limit(s) Permit Number(s):

☐ Pre-Approved Emission Limit (PAEL) Number(s)**:

** All active construction, Title V, and minor permit numbers.*
***Optional. Please provide this number if possible.*
http://dec.alaska.gov/Applications/Air/airtoolsweb/

Section 12 Project Description

Provide a short narrative describing the project. Discuss the purpose for conducting this project, what emission units/activities will be added/modified under this project (i.e., project scope), and the project timeline. If the project is a modification to an existing stationary source, describe how this project will affect the existing process. Include any other discussion that may assist the Department in understanding your project or processing your application. Include a schedule of construction.

Please use additional copies of this sheet if necessary.

Hilcorp Alaska, LLC (Hilcorp) is submitting this application under 18 Alaska Administrative Code (AAC) 50.508(6) to revise Air Quality Control Minor Permit AQ0181MSS10 wherein limits have been established for hydrogen sulfide (H_2S) in the gaseous fuel combusted by equipment at the Endicott Production Facility. Specifically, Condition 5.1 limits the long-term and short-term H_2S content of the gaseous fuel combusted to no more than 425 ppmv to protect ambient air quality. The objective for this permit action is to split the limit into a short-term and a long-term limit, and then increase the short-term limit to 520 ppmv. The short-term limit is being increased to reduce compliance risk during transient fuel gas composition changes that result from normal operational adjustments and field management.

The Endicott Production Facility is a Prevention of Significant Deterioration (PSD) major stationary source located off the coast of the Alaskan North Slope in the Beaufort Sea about 37 miles from Prudhoe Bay. It includes the Main Production Island (MPI, located 3.8 miles offshore) and the Endeavor Island located near the MPI. The nearby Satellite Development Island (SDI) is not aggregated with the stationary source. Endicott processes crude oil production fluids received from various crude oil accumulations. The crude oil is processed to remove hydrocarbon gas and water to meet specific crude oil sales specifications. The Endicott Production Facility emission unit inventory includes gas-fired turbines and heaters, diesel-fired emergency equipment, emergency and process control flares. The energy needed to support operations comes primarily from the combustion of produced hydrocarbon gas referred to in this application as gaseous fuel.

Between 2007 and 2011, the Endicott Production facility went through a permitting action to address a slow increase in the H_2S content of the gaseous fuel that had been occurring as the field soured. That action resulted in an SO_2 BACT limit of 1,000 ppmv H_2S, and 425 ppmv H_2S in the gaseous fuel to protect ambient air quality. These limits continue to be appropriate to address gradual souring of the gaseous fuel into the foreseeable future. However, the ambient air quality protection limit did not adequately anticipate the short-term variability (increases and decreases) in the gaseous fuel H_2S concentration resulting from the non-steady effect of the normal adjustment of wells producing to the Endicott Production Facility. This variability has caused short-term H_2S concentrations that are not only difficult to predict but have also approached the 425 ppmv limit resulting in unnecessary compliance risk given annual average H_2S concentrations show little change year-to-year. Splitting the existing ambient protection limit into a short-term and a long-term limit, and then increasing

the short-term limit will allow operators to deal more predictably with the short-term variability in gaseous fuel H_2S concentration.

It is worth emphasizing that this request is being made to address transient fuel gas H_2S concentration fluctuations and not because there is evidence of gaseous fuel souring beyond that anticipated when the existing H_2S limit was established in Air Quality Construction Permit No. AQ0181CPT07 in 2011. The main contributing factor to the gaseous fuel souring, seawater injection, was stopped over a decade ago. Accordingly, this request does not increase stationary source potential to emit, does not modify an existing limit to avoid a permit classification, does not change an existing BACT limit, does not cause an increase in actual emissions, nor will it require any construction activities at the source. Consequently, it does not trigger a permit classification under 18 AAC 50.502 or 18 AAC 50.306. However, while there is no increase in actual or potential emissions, the action does affect the underlying ambient demonstration. Therefore, a revised short-term ambient air quality impact analysis has been conducted.

Based on the information presented and after evaluating the changes requested, the proposed request will only result in the need to submit an application to revise or rescind Title I permit terms and conditions of an existing permit under 18 AAC 50.508(6). Based on this permit classification, this application must include the information requested by this form and the following elements required under 18 AAC 50.540, which are addressed in the remainder of this application:

- A copy of the Title I permit that established the permit term or condition is included in Attachment C.
- An explanation of why the permit term or condition should be revised or rescinded is provided later in this form.
- The effect of revising or revoking the permit term or condition on emissions, other permit terms, and compliance monitoring is provided later in this form.
- The effect of revising or revoking the permit term or condition on the underlying ambient demonstration is provided in Attachment B.
- This action does not revise a condition that allows avoidance of a permit classification; therefore, additional information related to avoiding a permit classification is not provided.

Section 12 Project Description Continued

For **PALs under Section 10** of this application, include the information listed in 40 C.F.R. 52.21(aa)(3), adopted by reference in 18 AAC 50.040 [18 AAC 50.540(h)].

Not applicable to this application

STATIONARY SOURCE IDENTIFICATION FORM

For a **limit to establish offsetting emissions under Section 10** of this application, specify the physical or operational limitations necessary to provide actual emission reductions of the nonattainment air pollutant; including [18 AAC 50.540(i)]:

- A calculation of the expected reduction in actual emissions; and

Not applicable to this application

- The emission limitation representing that quantity of emission reduction.

Not applicable to this application

Section 12 Project Description Continued

For **ORLs under Section 10** of this application [18 AAC 50.540(j)], include:

A description of each proposed limit, including for each air pollutant a calculation of the effect the limit will have on the stationary source's potential to emit and the allowable emissions [18 AAC 50.225(b)(4)];

Not applicable to this application

A description of a verifiable method to attain and maintain each limit, including monitoring and recordkeeping requirements [18 AAC 50.225(b)(5)];

Not applicable to this application

Citation to each requirement that the person seeks to avoid, including an explanation of why the requirement would apply in the absence of the limit and how the limit allows the person to avoid the requirement [18 AAC 50.225(b)(6)];

Not applicable to this application

A statement that the owner or operator of the stationary source will be able to comply with each limit [18 AAC 50.225(b)(8)];

Not applicable to this application

Section 12 Project Description Continued

For **revising or rescinding Title I permit conditions under Section 10** of this application [18 AAC 50.540(k)], include:

An explanation of why the permit term or condition should be revised or rescinded [18 AAC 50.540(k)(2)];

Replacing the 425 ppmv short-term and long-term ambient protection limit in AQ0181MSS10, Condition 5.1 with a 425 ppmv long-term H_2S concentration limit, and a short-term 520 ppmv short-term limit will allow facility operators more flexibility to comply with SO_2 ambient protection limits as the Endicott Production Facility experiences transient gaseous fuel H_2S concentration increases and decreases.

The effect of revising or revoking the permit term or condition on [18 AAC 50. 540 (k)(3)]:

- Emissions;

  The requested revision does not revise the basis used to establish source potential to emit, nor will it result in an increase in actual emissions.

- Other permit terms;

  The requested revision will have no effect on other permit terms that have not already been described.

- The underlying ambient demonstration, if any;

  The requested revision is to a condition established to protect the following short-term and long-term SO_2 National and Alaska Ambient Air Quality Standards and PSD Class II Increments.

Pollutant	Averaging Period	Standard/Threshold
SO_2	3-hour	Alaska Ambient Air Quality Standards (AAAQS) & PSD Class II Increment
	24-hour	
	Annual	

  However, the requested revision will only impact the short-term underlying ambient analysis because it only increases the allowable short-term gaseous fuel H_2S concentration beyond levels previously modeled. No request is being made to revise the previously modeled annual average gaseous fuel H_2S concentration. Therefore, an ambient air quality impact analysis demonstrating compliance with the same short-term Alaska Ambient Air Quality Standards and PSD Class II Increments is included in **Attachment B** of this application. This demonstration shows that with the revision requested the conclusions reached by the underlying ambient demonstration remain unaffected.

- Compliance monitoring; and

  There are no changes to the compliance monitoring.

For revising a condition that allows avoidance of a permit classification, the information required for that type of permit, unless the revised condition would also allow the owner or operator to avoid the classification. [18 AAC 50.540(k)(4)]

The requested revision does not affect a permit condition that is necessary to avoid a permit classification; therefore, no additional information is required to be provided under 18 AAC 50.540(k)(4).

Section 13 Other Application Material

The information listed below must be included in your air quality control minor permit application. *Note: These must be attached in order for your application to be complete.*

If required to submit an analysis of ambient air quality under 18 AAC 50.540(c)(2), or if otherwise requested by the Department:

☒ Attached are maps, plans, and/or aerial photographs as necessary to show the locations and distances of
- emissions units, buildings, emitting activities and boundaries of the associated with the stationary source, and
- nearby or adjacent residences, roads, other occupied structures and general topography within 15 kilometers.

(Indicate compass direction and scale on each.)

☒ Attached is a document (e.g., spreadsheet) showing coordinates and elevations of each modeled unit, along with parameters necessary to characterize each unit for dispersion modeling.

☒ Attached is an electronic copy of all modeling files.

Section 14 Certification

This certification applies to the Air Quality Control Minor Permit Application for the Endicott Production Facility (Stationary Source Name) submitted to the Department on: November 3, 2023

Type of Application

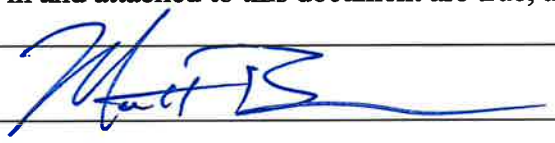
☒ Initial Application

☐ Change to Initial Application

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on this form bears the signature of a **Responsible Official**. Responsible Official is defined in 18 AAC 50.990. (18 AAC 50.205)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."

Signature: 	Date: November 3, 2023
Printed Name: Matt Brown	Title: Asset Team Leader

Section 15 Attachments

☒ Attachments Included.	List attachments:	Attachment A – Stationary Source Identification Form (This Attachment)
		Attachment B – Ambient Air Quality Impact Analysis
		Attachment C – Copy of Air Quality Construction Permit No. AQ0181MSS10
		Attachment D – Modeling Files (provided electronically)

Section 16 Mailing Address

Submit the minor permit application to the Permit Intake Clerk in the Department's Anchorage office. Submitting to a different office will delay processing. The mailing address and phone number for the Anchorage office is:

Alaska Department of Environmental Conservation
Air Permit Program
555 Cordova Street
Anchorage, Alaska 99501
(907) 269-4718

Section 2 (Continued) Legal Owners

Hilcorp Alaska, LLC
3800 Centerpoint Drive, Suite 1400
Anchorage, AK 99503

ConocoPhillips Alaska, Inc.
700 G Street
Anchorage, AK 99501
or
P.O. Box 100360
Anchorage, AK 99510-0360

NANA Regional Co.
1001 E. Benson Blvd.
Anchorage, AK 99508

Exxon Mobil Alaska Production, Inc.
3301 C Street, Suite 400
Anchorage, AK 99503
or
P.O. Box 196601
Anchorage, AK 99519-6601

Unocal Corporation Chevron USA, Inc.
P.O. Box 36366
Houston, TX 77236

Doyon Ltd.
201 First Ave., Ste. 300
Fairbanks, AK 99701

Hilcorp
Alaska, LLC

ATTACHMENT B

Endicott Production Facility Short-Term H_2S Limit Increase
Air Quality Permit Application
Ambient Air Quality Impact Analysis

3800 Centerpoint Drive, Suite 1400, Anchorage, AK 99503
Phone: 907/777-8300 hilcorp.com

Endicott Short-Term H2S Limit Increase Project

Ambient Air Quality Impact Analysis

Hilcorp Alaska, LLC

Prepared by:

SLR International Corporation

1612 Specht Point Road, Suite 119, Fort Collins, Colorado, 80525

November 3, 2023

Table of Contents

Tables in Text

Figures in Text

1.0 Introduction

This document presents the methodologies and results of a near-field cumulative ambient air quality impact assessment (AQIA) for applicable criteria pollutants and averaging periods conducted for the Hilcorp Alaska, LLC (Hilcorp) Endicott Production Facility permit application. Attachment A of the permit application package provides a project description and details related to permit applicability. Based on this evaluation, this project will trigger the following permit classifications for:

- A minor permit requested by the owner or operator to revise or rescind a term or condition of a Title I permit 18 AAC 50.508(5)

In accordance with 18 AAC 50.540(k)(3)(C), the permit application must describe the effect of revising or revoking the permit term on the underlying AQIA. There are no other specific ambient analysis requirements triggered.

This document serves as a detailed approach to and the results of a near-field cumulative AQIA conducted to satisfy 18 AAC 50.540(k)(3)(C) for a revision to a condition limiting the short-term H_2S concentration in the gaseous fuel combusted by Endicott Production Facility equipment. Attachment A, Section 12 of the project air quality permit application package details the existing fuel gas H_2S concentration limit and the requested changes. In summary, the revision will increase the short-term limit from no more than 425 ppmv to 520 ppmv. No change is requested to the long-term limit of 425 ppmv.

The limit being revised is an ambient air quality protection limit set by the results of the underlying AQIA which demonstrated compliance with the short-term SO_2 Alaska Ambient Air Quality Standards (AAAQS) and Prevention of Significant Deterioration (PSD) Class II Increments. In this case, the underlying AQIA was submitted and approved before the 1-hour SO_2 AAAQS was promulgated. Therefore, this AQIA is limited to the 3-hour, and 24-hour SO_2 AAAQS and PSD Class II Increments only. The methodologies and results which demonstrate that the Endicott Production Facility remains in compliance with applicable AAAQS and PSD Class II Increments following the requested changes are presented in this AQIA.

This revised analysis relies heavily on the simulation built for the underlying AQIA which was only revised to add or remove emission units as appropriate based on modifications since that time. The most recent comprehensive underlying AQIA was described in a series of submittals between 2007 and 2010 and best summarized in the Modeling Memorandum that is part of the Technical Analysis Report included with air quality permit AQ0181CPT07. That memorandum is included as **Appendix A** of this report. It is worth noting that sufficient information was included in the underlying AQIA to estimate that the short-term gaseous fuel H_2S concentration could be over 500 ppmv without exceeding applicable AAAQS and PSD Class II Increments. This is based on an analysis of the 24-hour PSD Class II increment demonstration which resulted in the smallest compliance margin at 86% of the allowable increment. Furthermore, as alluded to in the Modeling Memorandum, compliance with the AAAQS was demonstrated with a gaseous fuel H_2S concentration as high as 1,000 ppmv, though ADEC did not rely on that result in their discussion of results for expediency. It is not known why a higher short-term limit was not requested at that time, but it is clear it could have been. Consequently, it should come at no surprise that this analysis demonstrates compliance assuming a gaseous fuel H_2S concentration of no more than 520 ppmv.

2.0 Project Information and Description of the Technical Approach

This AQIA involved the execution of a steady-state dispersion model to predict pollutant concentrations in ambient air based on stack parameters, emissions, and structures representative of Endicott sources. Unless otherwise noted, the AQIA follows guidelines and methodologies articulated in the following documents:

- Guideline on Air Quality Models [published as 40 CFR 51, Appendix W] (USEPA 2017).
- Alaska Department of Environmental Conservation (ADEC) Modeling Review Procedures Manual (ADEC 2018a).

Standard modeling approaches are described in **Table 2-1**. The ADEC Air Quality Modeling Submittal Checklist for Minor Permit Applications (ADEC 2017) was used as the foundation for developing this table. Each applicable element from the ADEC checklist was developed into a row in **Table 2-1** that includes a column indicating how each checklist item has been addressed.

Table 2-1: Modeling Approach

Checklist Element	Remarks
1. Background Information	
Map Showing the Source Location	See **Figure 2-1**.
Air Quality Control Region Containing the Source	The project is in the Northern Alaska Intrastate Air Quality Control Region.
Location Attainment Classification	The project location is attainment/unclassifiable and not located near a non-attainment area.
Requirements for an Ambient Assessment	This project will only effect short-term SO_2 emissions. Therefore, the project requires an ambient assessment for the 3-hour and 24-hour SO_2 AAAQS and Class II PSD Increments as required by a project classified under 18 AAC 50.508(6). Demonstrating compliance with the 1-hour SO_2 AAAQS is not required because, the underlying AQIA predates promulgation of the 1-hour SO_2 AAAQS.
Modeling Protocol	A modeling protocol was not submitted. All approaches follow closely those approved by ADEC and summarized in the Modeling Memorandum included in **Appendix A**.

Checklist Element	Remarks
2. Approach	
General Approach	The revised analysis relies heavily on the simulation built for the underlying AQIA and only revised to add or remove emission units to incorporate changes to the facility since 2010 that did not require modeling. **Table 2-2** provides a comparison of the inventory modeled as part of the underlying AQIA to the current inventory along with a brief explanation for the change. While it is possible that a Significant Impact Level analysis could have been used to avoid conducting a cumulative impact analysis, a cumulative impact analysis was conducted to avoid the complexities associated with the various emission unit inventory changes that have occurred over time.
Modeled Operating Scenario Description	One worst-case operating scenario was modeled with all sources operating concurrently at loads and emission rates evaluated for the underlying AQIA except for gaseous fuel-fired sources. Emission rates for those emission units were increased consistent with the requested permit revision.
2.1 Model Selection	
Model Source Code	• AERMOD version 23132 • AERMET version 23132 • BPIPPRM version 04274 • AERSURFACE: Not required to be used because the meteorological data was only reprocessed and relied on the same surface characteristics used to support the underlying AQIA.
Model Source Code Modifications	All codes were used without modification.
Alternative Modeling Techniques	Alternative modeling techniques were not used.
Model Options	All modeling options were set to default settings.

Checklist Element	Remarks
2.2 Modeling Domain	
Modeling Domain Description	The receptor grid extended to at least 1 kilometer in all directions from the Endicott Production Facility. All grids are of sufficient density to ensure maximum impact locations were predicted by the modeling. While the magnitude of the impacts changed because of this permit action, the location of the maximum impacts did not change materially. Consequently, the 1-kilometer domain is sufficient to include the maximum impact location based on the results of the underlying AQIA. Receptor grid details are provided under the 2.12 Receptor Grid section of this table.
2.3 Meteorological Data	
Description of Meteorological Data and Data Processing	This analysis relied on the same meteorological input data used to support the previously approved AQIA and described in in the Modeling Memorandum included in **Appendix A**. That data set was built from the following: • Approved site-specific, PSD-quality surface data collected at the Endicott Satellite Drilling Island (SDI) and at the Deadhorse Airport during calendar years 2002, 2003, 2004, and 2005. • National Weather Service (NWS) upper air data collected near Utqiaġvik, Alaska which is the nearest upper air station. AERMET settings followed those approved for modeling. The meteorological data processing followed the same approach approved as part of the underlying AQIA.
2.4 Coordinate System	
Coordinate System Used	Universal Transverse Mercator (UTM) Zone 5, NAD83.
2.5 Land Use Analysis	
Description of Surrounding Land Use	Surrounding land use is rural.
Land use Classification Methodology	Auer land classification procedure recommended in 40 CFR Part 51 Appendix W, Section 7.2.1.1(b)(i).

Checklist Element	Remarks
2.6 Terrain	
Handling of Terrain	The ground level elevation throughout the entire modeling domain was set to 0 meters to simulate the featureless terrain surrounding the project location. This is particularly appropriate since most of the domain is over water, but also because this is a practice common for assigning elevation to receptors on the Alaskan North Slope coastal plain.
Map Showing Local Topography	As described, the local terrain is featureless and was modeled with a constant elevation. Therefore, a topographic map has not been provided.
2.7 Emission Unit (EU) Inventory	
List of Project EUs	See **Table 2-2**.
List of Modeled Nearby Sources	As described in the Modeling Memorandum: "*The Department has found in past modeling assessments that off-site [Nearby] SO_2 sources do not have a significant impact at Endicott. Therefore, since nothing has changed to alter this previous conclusion, the Department continues to agree that offsite sources do not need to be included in a 3-hour, 24-hour and annual average SO_2 modeling analysis of Endicott.*" Based on this finding, and since there have been no material changes to the inventory of sources in the Endicott Production Facility impact area, no modeled Nearby Sources have been explicitly included in the modeling analyses.
Characterization of Project Sources	All project sources were modeled as point sources because the modeled emissions will pass through an exhaust stack. Modeled parameters for all modeled project sources are found in **Table 2-3**.
Cross Reference between EU Names and Model IDs	See **Table 2-2**
Description of Operating Scenarios	A single scenario was modeled with all sources operating concurrently at maximum emission rates consistent with the increased short-term gaseous fuel H_2S concentration limit requested and reflected in the emission rates detailed in **Table 2-4**.
Description of Increment Consuming and Expanding Sources	All modeled Endicott Production Facility sources were modeled as increment consuming. These sources were modeled at maximum emission rates detailed in **Table 2-4**.

Checklist Element	Remarks
	SO_2 emissions from regional mobile and nonroad source activity is assumed to be increment expanding and have not been modeled. This includes emissions from drill rigs and general oilfield maintenance activity. These emissions were higher at the baseline date compared to now because: 1. there was more mobile and nonroad source activity at the baseline date since these activities are tied to oil production, which was nearly 3 times higher at the baseline date, and 2. the sulfur content of the fuel combusted by these sources was at least 100 times higher than what is currently combusted. The potential benefit from these increment expanding emissions were not included in the analysis for the sake of simplicity.
List of Modeled and Non-Modeled Sources	Modeled sources are listed in **Table 2-2**. Non-modeled sources are listed and described in **Section 3.0**. The most notable among the non-modeled sources is EU ID 76 which is a collection of small engines that combust ULSD and the Portable Oil and Gas Operation (POGO) that was once listed on the Endicott Production Facility permit but has since been removed. POGO activities are now authorized under the MG2 permit.
Description and Justification for Non-Modeled Sources	Non-modeled sources include nearby sources that are not explicitly modeled, natural sources, other unidentified sources in the vicinity of the project (e.g., construction equipment, oilfield maintenance equipment, drilling activity and mobile activities, etc.), and regional transport contributions from more distant sources (i.e., domestic, and international). EU ID 76 and POGO activities authorized under an MG2 permit. The ambient contributions from these sources were accounted for largely through use of ambient monitoring data as described in **Section 3.0.**
2.8 EU Release Parameters	
Source Parameter Identification	See **Table 2-3**.
Modeled Emission Rates are Described	A list of modeled emission rates and their bases are found in **Table 2-4**.

Checklist Element	Remarks
Restrictions to Modeled Emission Rates are Described	See **Table 2-4** noting the following: Consistent with the revision requested as part of this permit action, all fuel gas-fired equipment were modeled with higher short-term SO_2 emission rates consistent the requested increase in fuel gas increase from 425 ppmv to 520 ppmv in the combusted gaseous fuel.
Modeled Stack Parameters are Described	See **Table 2-3** and **Table 2-4**.
The Basis for the Modeled Stack Parameters are Described	All modeled stack parameters except for emission rates associated with gaseous fuel-fired sources are the same as those used to develop the underlying AQIA. See **Table 2-3** and **Table 2-4**.
Stack Heights do not Exceed GEP	All stacks were evaluated to determine if heights are Good Engineering Practice (GEP) as defined in 40 CFR 51.100. The current version of BPIPPRM was used for this analysis.
Modeled Stack Parameters Reflect Worst-Case Based on a Load Screening Analysis as Warranted	All modeled stack parameters except for emission rates associated with gaseous fuel-fired sources are the same as those used to develop the underlying AQIA which included a load screening analysis as needed. Regardless, because SO_2 emissions are directly proportional to emission unit load, emissions will be maximized at full load and do not decrease with load quickly enough to result in higher impacts at part load when stack exit temperature and velocity are less favorable for plume dispersion. Therefore, Load Screening is not critical to this analysis.
Restricted (non-vertical, capped, etc.) Stack Parameters are Described	With the exceptions noted in **Table 2-3**, all stacks were assumed to be non-capped with vertical releases.
Description of Modeled Source Types	All project sources were modeled as point sources because the modeled emissions will pass through an exhaust stack.
2.9 Pollutant Specific Modeling Issues	
PM Modeling – Description of Deposition Approach	An AQIA was not conducted for PM; therefore, deposition modeling was not required or conducted.
$PM_{2.5}$ Modeling – Discussion of Secondary Impacts	An AQIA was not conducted for $PM_{2.5}$; therefore, determining secondary $PM_{2.5}$ impacts was not required or conducted.

Checklist Element	Remarks
NO_2 Modeling – Description of NO_x to NO_2 Chemical Transformation Technique used.	An AQIA was not conducted for NO_2; therefore, NO_2 modeling was not required or conducted.
2.10 Building Downwash	
Description of How Building Downwash was Accounted for	The effects of plume downwash were considered for all point sources. Direction-specific building dimensions were calculated using the current version of the USEPA approved Building Profile Input Program BPIPPRM. No relevant changes have been made to Endicott Production Facility structures since the underlying AQIA was conducted; therefore, inputs used for past modeling demonstrations were used without modification for the current modeling. However, that information was reviewed for accuracy. See **Figure 2-4** for a 3-D view of the source and building simulation.
Scaled Plot of the Stationary Source	See **Figure 2-2** and **Figure 2-3**.
2.11 Ambient Air Boundary	
Description of the Ambient Boundary	The ambient boundary was set at the edge of the Endicott Production Facility Island. This is consistent with ADEC Modeling Review Procedures recommendations. See **Figure 2-2**. While not specifically addressed in the underlying AQIA or Modeling Memorandum, given the project's remote location, workers will be housed on-site. All worker housing areas were included within the ambient boundary, consistent with the conditions laid out in ADEC Policy and Procedure Number 04.02.108 for Worker Housing Aggregation and Modeling (ADEC 2021). These areas were not treated as ambient air given that: • The worker housing area is located within a secure or remote site; • The worker housing is for official business/worker use only; and • The operator has a written policy stating that the on-site workers are on 24-hour call.

Checklist Element	Remarks
2.12 Receptor Grid	
Description of the Modeled Receptor Grid	This analysis relied on the same receptor grid used for the underlying AQIA which is described in the Modeling Memorandum. Cartesian receptor grids were used with the following resolution: • 25-meter receptor spacing along the ambient boundary; • 25-meter receptor spacing from the ambient boundary out to 100 meters in each cardinal direction; and • 100-meter receptor spacing from the 25-meter receptor grid spacing out to at least 1 kilometer in each cardinal direction. Like the underlying AQIA, maximum project impacts were predicted to occur on the ambient boundary in the highest density grid spacing surrounding the Endicott Production Facility and decreased in all directions away from the facility. This is expected given prior modeling results for Endicott and the fact only the emission rates and not the locations of the dominant facility sources changed. Regardless, at the edge of the 100-meter receptor grid, project impacts were below 10% of the maximum impact. This demonstrates that the modeling domain is large enough to show that the project impacts will not cause or contribute to a violation.
Description of How Modeled Receptor Elevations were Determined	The ground level elevation throughout the entire modeling domain was set to 0 meters to simulate the featureless terrain in the project impact area. This is common practice for sources with a modeling domain largely located over water.
Scaled Map Depicting Receptors Relative to the Ambient Boundary	See **Figure 2-5**.
2.13 Offsite Impacts	
Description of How Offsite [Nearby] Sources were Accounted for in the Analysis	As previously described, no Nearby Sources have been included explicitly in the dispersion modeling simulation. Therefore, all offsite/other sources are represented in the cumulative impact analysis through the addition of a representative ambient background concentration. Like other facilities on the North Slope, the Endicott Production Facility is in a remote part of Alaska. While there are some existing sources many kilometers away, none of them are expected to create a significant concentration gradient near the Endicott Production

Checklist Element	Remarks
	Facility and can be adequately represented through background concentrations. This is the same conclusion reached in the Modeling Memorandum. See **Section 3.0** for additional discussion regarding representativeness of the background data selected for this AQIA.
Description of Modeled Offsite Source Exhaust Parameters	No offsite sources were modeled explicitly.
Description of Ambient Monitoring Data Demonstrating it is Representative and meets Applicable Quality Assurance Requirements	Representative ambient background concentrations utilized in the analysis were obtained from data collected in 2009 as part of the Endicott Main Production Island (MPI) Monitoring Program to satisfy PSD preapplication monitoring requirements (40 CFR 52.21(m)). This data was collected at the Endicott Production Facility and includes the influence from a wide range of stationary and portable equipment. See additional discussion provided in **Section 3.0.**
Description of Measurements Culled from the Ambient Monitoring Dataset	No measurements were culled from the ambient monitoring dataset.
Listing of Background Concentrations used to Represent Non-Modeled Sources	See **Table 3-1.**
2.14 Design Concentrations	
Description of Modeled Output Compared to Applicable Thresholds	See **Section 4.0**.
2.15 Post-Processing	
Description of Post-Processing	No post-processing was conducted.
2.16 Results and Discussion	
Tables of Model-Predicted Impacts	See **Table 4-1** and **Table 4-2**.
Conclusions	See **Section 4.0**.
2.17 Electronic Data	
Has Digital Data been Transmitted?	Modeling files (both input and output) have been transmitted electronically in a package separate from this document.

Table 2-2: Description of Project Emission Units and Their Model Identifier (ID)

EU ID	Tag No.	Model ID	Source Description	Included in the underlying AQIA (Y/N)	Included in the current AQIA (Y/N)	Notes
1	NGT-E3-1510A	2101	Nuovo-Pignone Frame 5D	Y	Y	Waste heat recovery unit stack. Of the two stacks, this stack has the worst dispersion properties. Therefore, to maximize impacts from this emission unit all the emissions were modeled through this stack and none through the bypass stack. This is consistent with the underlying AQIA.
		2102		Y	Y	Bypass Stack
2	NGT-E3-1510B	2103	Nuovo-Pignone Frame 5D	Y	Y	Waste heat recovery unit stack. Of the two stacks, this stack has the worst dispersion properties. Therefore, to maximize impacts from this emission unit all the emissions were modeled through this stack and none through the bypass stack. This is consistent with the underlying AQIA.
		2104		Y	Y	Bypass Stack
3	NGT-E3-1405	2105	Ruston Tornado (Nuovo-Pignone PGT-1)	Y	Y	--
4	NGT-E3-1802	2111	Ruston Tornado (Water Injection Pump)	Y	Y	--
5	NGT-E3-1907	2112	Ruston Tornado (Water Injection Pump)	Y	Y	--
6	NGT-E3-4501	2107	Ruston Tornado	Y	Y	--
7	NGT-E3-4502	2108	Ruston Tornado	Y	Y	--
8	NGT-E3-4503	2109	Ruston Tornado	Y	Y	--

EU ID	Tag No.	Model ID	Source Description	Included in the underlying AQIA (Y/N)	Included in the current AQIA (Y/N)	Notes
9	NGT-E3-4504	2110	Ruston Tornado	Y	Y	--
--	GTRB-E3-9210	2132	Nuovo-Pignone PGT-5	Y	**N**	Never installed and removed from the source through an Off Permit Change Notice (OPCN).
11	NGT-E3-3002	2113	Claudius Peters	Y	Y	--
12	NGH-E3-3031	2106	ENTECH	Y	Y	--
14	NGH-V-E3-1401-4	2117	BS&B	Y	Y	--
15	NGH-E3-1404	2118	CE NATCO	Y	Y	--
17	DO-GNED-E3-4505	2114	Fairbanks Morse	Y	Y	--
18	DO-GNED-E3-4506	2115	Fairbanks Morse	Y	Y	--
19	DO-PED-EO-4001	2128	Caterpillar D 3412	Y	**N**	Abandoned in place according to AQ0181TVP02 renewal application.
20	DO-PED-EO-4002	2129	Caterpillar D 3412	Y	**N**	Abandoned in place according to AQ0181TVP02 renewal application.
--	NGH-E3-3201	2116	WR Steel	Y	**N**	Removed from the source prior to the AQ0181TVP02 renewal application.
--	SDIH	2131	O'Neil Heater	Y	**N**	Previously located at the Satellite Drilling Island and no longer part of the source.
24	PED-4005	3000	Cummins Diesel 378F2	**N**	Y	Unclear why this emission unit was not included in the previous analysis.
25	H-EO-1602	2119A	GKN Birwelco LTD (HP flare)	Y	Y	--
26	H-EO-1601	2119B	GKN Birwelco LTD (LP flare)	Y	Y	--
27	Portable Flare	2133C	Haliburton	Y	Y	--

EU ID	Tag No.	Model ID	Source Description	Included in the underlying AQIA (Y/N)	Included in the current AQIA (Y/N)	Notes
76	Various	--	Backup Diesel Generators (2,800 total)	**N**	**N**	Authorized by Minor Permit AQ0181MSS06 and will combust ULSD. Considered Intermittently Used Oilfield Support Equipment. See **Section 3.0.**
77	DO-IS-MUDPLT	2134	Caterpillar D-3408 Diesel Mud Pump	Y	Y	Authorized in Minor Permit AQ0181MSS07.
58	GNED-L5-26001	3001	Caterpillar C27	**N**	Y	Previously located at the Satellite Drilling Island and relocated to the Endicott Production Facility by OPCN in 2023.
--	DO-GNED-0036	2135	Portable Emergency Generator	Y	Y	Not currently listed on the permit but modeled.
--	DO-KED-0041	2136	Portable Air Generator	Y	Y	Not currently listed on the permit but modeled.
--	NA	2120 through 2127	Portable oil and gas operations using Nordic 2 and Doyon 16	Y	**N**	Removed from the source permit in 2018. The POGO is now conducted under an MG2 permit.
25 Modeled Sources						

Table 2-3: Modeled Source Parameters

Model ID	Stack Exit Configuration	AERMOD Source Type	Stack Location (UTM Zone 5, NAD83)			Modeled Stack Parameters			
			Easting (m)	Northing (m)	Base Elev. (m)	Release Height (m)	Exit Temp. (K)	Exit Velocity (m/s)	Stack Dia. (m)
2101	Vert. / Uncap	POINT	464,213	7,805,417	4.6	39.9	515	21.6	3.0
2102	Vert. / Uncap	POINT	464,225	7,805,419	4.6	39.9	792	35.6	2.9
2103	Vert. / Uncap	POINT	464,211	7,805,430	4.6	39.9	515	21.6	3.0
2104	Vert. / Uncap	POINT	464,223	7,805,432	4.6	39.9	792	35.6	2.9
2105	Vert. / Uncap	POINT	464,144	7,805,417	4.6	38.1	818	35.9	1.3
2106	Vert. / Cap	POINTCAP	464,100	7,805,513	4.6	19.9	380	8.7	1.5
2107	Vert. / Uncap	POINT	464,206	7,805,511	4.6	26.2	745	32.6	1.5
2108	Vert. / Uncap	POINT	464,204	7,805,519	4.6	26.2	745	32.6	1.5
2109	Vert. / Uncap	POINT	464,203	7,805,527	4.6	26.2	745	32.6	1.5
2110	Vert. / Uncap	POINT	464,201	7,805,535	4.6	26.2	745	32.6	1.5
2111	Vert. / Uncap	POINT	464,212	7,805,484	4.6	38.4	745	32.6	1.5
2112	Vert. / Uncap	POINT	464,204	7,805,483	4.6	38.4	745	32.6	1.5
2113	Vert. / Uncap	POINT	464,126	7,805,451	4.6	44.8	556	4.90	1.7
2114	Vert. / Uncap	POINT	464,147	7,805,498	4.6	25.9	608	41.1	0.56
2115	Vert. / Uncap	POINT	464,155	7,805,499	4.6	25.9	608	41.1	0.56
2117	Vert. / Uncap	POINT	464,141	7,805,454	4.6	30.6	496	10.9	0.30
2118	Vert. / Uncap	POINT	464,137	7,805,454	4.6	38.3	707	4.00	0.90

Model ID	Stack Exit Configuration	AERMOD Source Type	Stack Location (UTM Zone 5, NAD83)			Modeled Stack Parameters			
			Easting (m)	Northing (m)	Base Elev. (m)	Release Height (m)	Exit Temp. (K)	Exit Velocity (m/s)	Stack Dia. (m)
2119A	Vert. / Uncap	POINT	464,022	7,805,371	4.6	68.3	1,273	20	0.30
2119B	Vert. / Uncap	POINT	464,022	7,805,371	4.6	68.3	1,273	20	0.30
2133C	Vert. / Uncap	POINT	464,022	7,805,365	4.6	9.14	1,273	20	3.08
2134	Vert. / Uncap	POINT	464,117	7,805,338	4.6	4.00	602	58.0	0.10
2135	Vert. / Uncap	POINT	464,144	7,805,390	4.6	4.00	602	58.0	0.10
2136	Vert. / Uncap	POINT	464,144	7,805,305	4.6	4.00	602	58.0	0.10
3000	Vert. / Uncap	POINT	464,144	7,805,305	4.6	4.00	602	58.0	0.10
3001	Vert. / Uncap	POINT	463,955	7,805,469	4.6	7.62	776	77.3	0.20
25 Modeled Sources									

Table 2-4: Modeled Emission Rates

Model ID	Fuel Sulfur Content	Rating	3- and 24-hour SO_2 Emissions [1]	
			(lb/hr)	(g/s)
2101	520 ppmvd H_2S	374 MMBtu/hr ISO	36.3	4.57
2102			0	0
2103	520 ppmvd H_2S	374 MMBtu/hr ISO	36.3	4.57
2104			0	0
2105	520 ppmvd H_2S	56.2 MMBtu/hr ISO	5.45	0.686
2106	520 ppmvd H_2S	40.5 MMBtu/hr	3.93	0.495
2107	520 ppmvd H_2S	72.4 MMBtu/hr ISO	7.03	0.885
2108	520 ppmvd H_2S	81.9 MMBtu/hr ISO	7.03	0.885
2109	520 ppmvd H_2S	81.9 MMBtu/hr ISO	7.03	0.885
2110	520 ppmvd H_2S	81.9 MMBtu/hr ISO	7.03	0.885
2111	520 ppmvd H_2S	79.8 MMBtu/hr ISO	6.84	0.862
2112	520 ppmvd H_2S	79.8 MMBtu/hr ISO	6.84	0.862
2113	520 ppmvd H_2S	97.9 MMBtu/hr	9.49	1.20
2114	0.10 wt.%S	4168 bhp	2.98	0.376
2115	0.10 wt.%S	4168 bhp	2.98	0.376
2117	520 ppmvd H_2S	7 MMBtu/hr	0.679	0.0855
2118	520 ppmvd H_2S	27 MMBtu/hr	2.62	0.330
2119A	520 ppmvd H_2S	500 MMscfd	5.14	0.648
2119B	520 ppmvd H_2S	25 MMscfd	0.257	0.0324
2133C	520 ppmvd H_2S	25 MMscfd	2.079	0.262
2134	0.0015 wt.%S	425 bhp	0.00456	0.000575
2135	0.15 wt.%S	22 gal/hr	0.462	0.0582

Model ID	Fuel Sulfur Content	Rating	3- and 24-hour SO_2 Emissions [1]	
			(lb/hr)	(g/s)
2136	0.15 wt.%S	13 gal/hr	0.273	0.0344
3000	0.10 wt.%S	137 bhp	0.0980	0.0123
3001	0.0015 wt.%S	1041 bhp	0.0104	0.00132

[1] Emissions based on a fuel sulfur mass balance as follows:

A gaseous fuel H_2S content limit of 520 ppmv:

Example Calculation: (520 scf H_2S / 10^6 scf) * (lb-mole H_2S / 379.9 scf H_2S) * (lb-mole SO_2/lb-mole H_2S) * (64 lb SO_2/lb-mole SO_2) * (scf/903.3 Btu [LHV]) =
= **0.09698 lb SO_2 /MMBtu**

A liquid fuel sulfur content of 0.10 wt.%S:

Example Calculation: (0.0010 lb S / lb fuel) * (2 lb SO_2 / lb S) * (7.00 lb fuel / gal) * (gal/137,000 Btu) * (10^6 Btu/MMBtu) * (7,000 Btu/hp-hr) =
= 0.0007153 lb SO_2/hp-hr

Figure 2-1: Endicott Production Facility Location

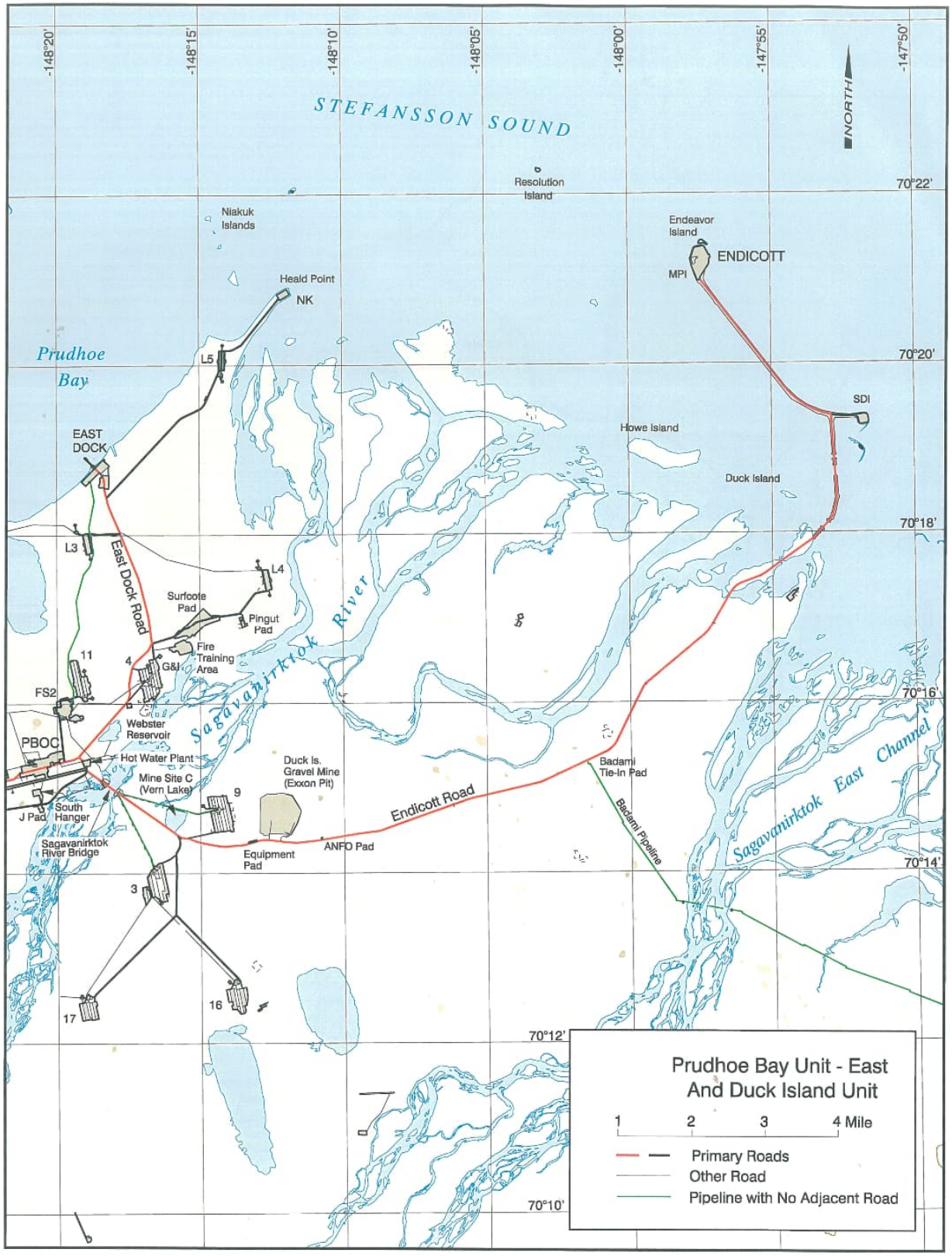


Figure 2-2: Endicott Source and Building Configuration (UTM Zone 6, NAD83)

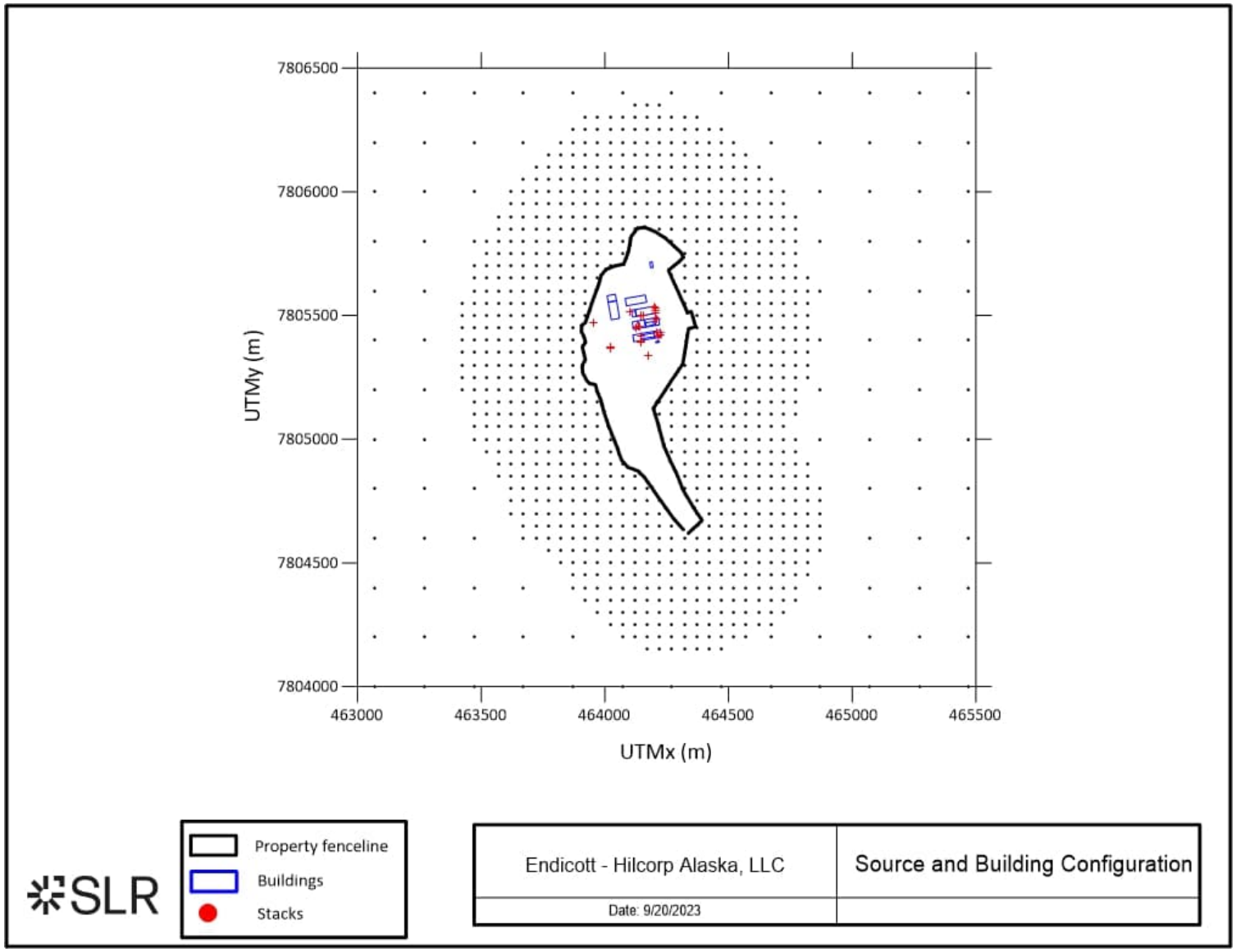


Figure 2-3: Endicott Source and Building Configuration (Zoomed In) (UTM Zone 6, NAD83)

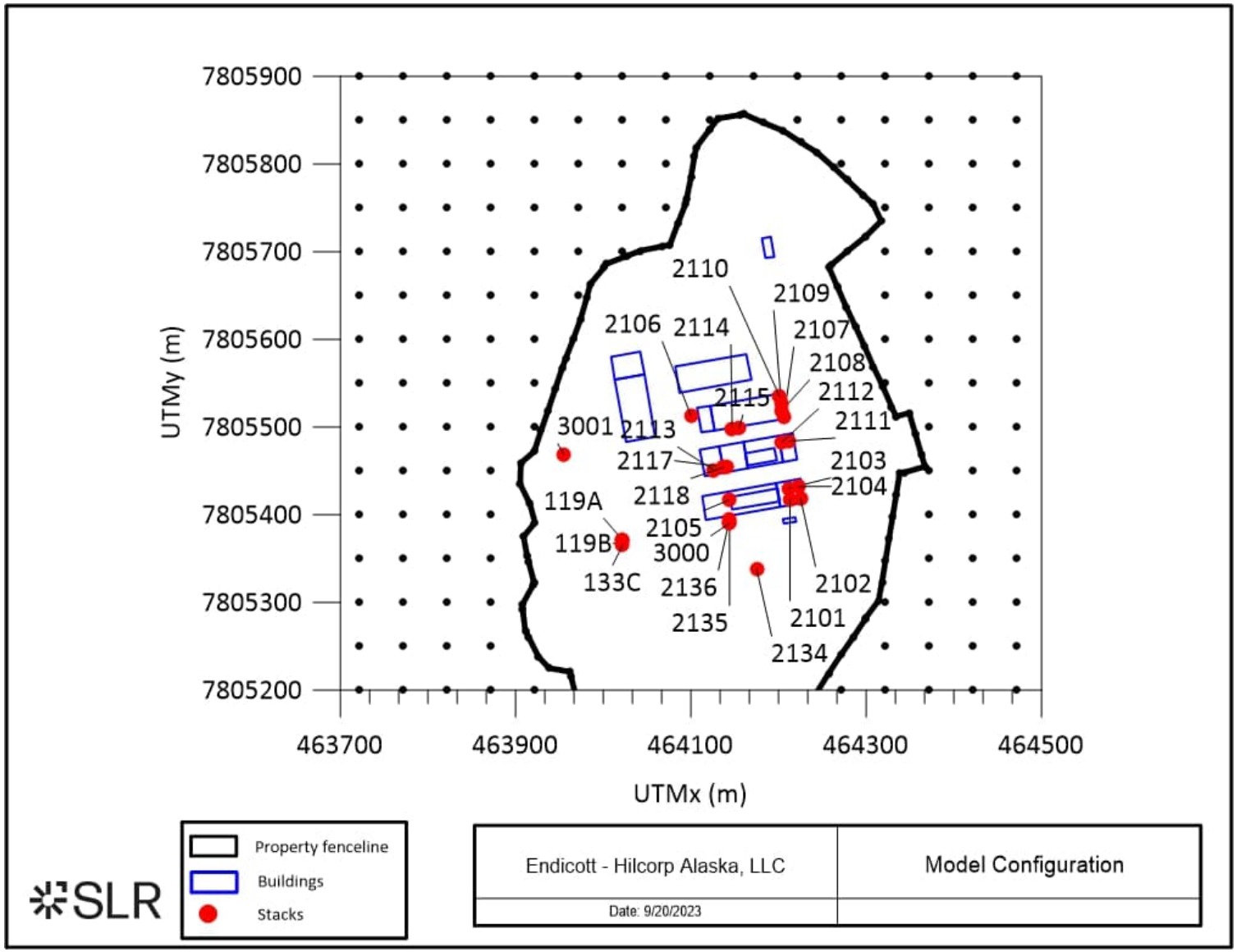


Figure 2-4: 3-D View of the Endicott Production Facility Source and Building Simulation

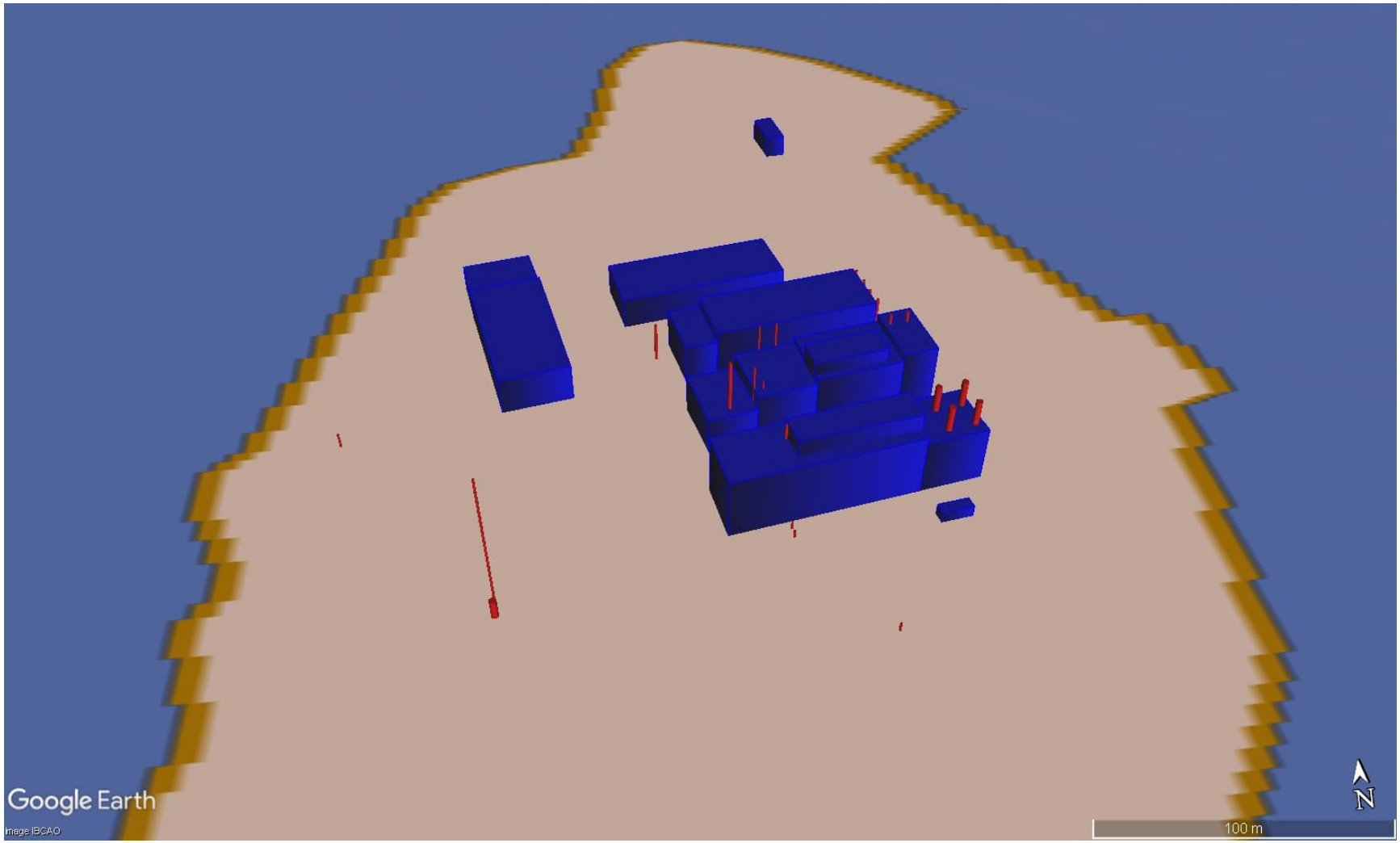
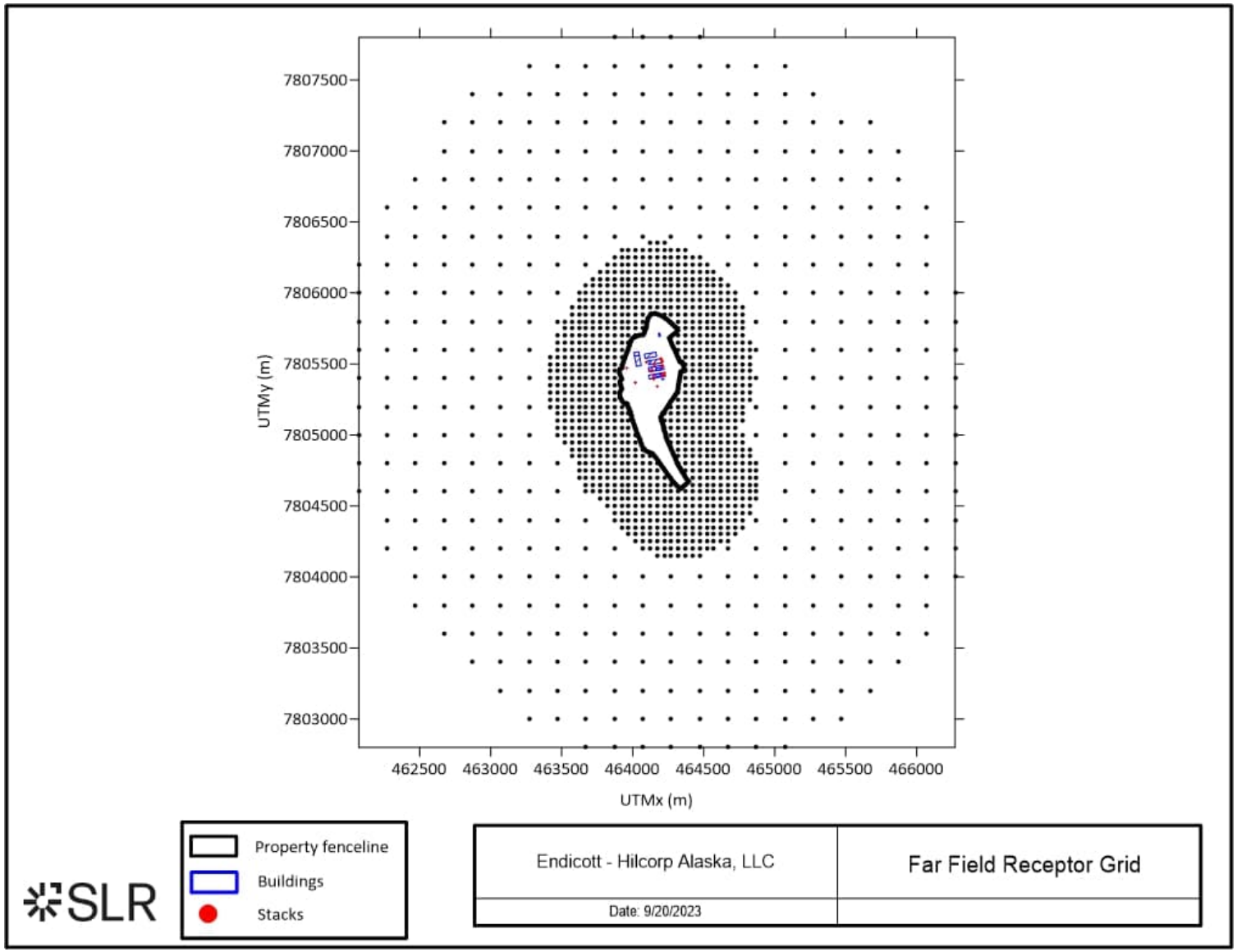


Figure 2-5: Full Modeling Domain and Receptor Grid (UTM Zone 6, NAD83)



3.0 Ambient Background Data and Non-Modeled Sources

This section discusses the use of ambient monitoring data collected during calendar year 2009 at the Endicott Main Production Island (MPI) Monitoring Program located at the Endicott Production facility to develop representative background concentrations to combine with model-predicted impacts for the Endicott Production Facility cumulative modeling demonstration. There has been very little change to the inventory of and emissions from sources that were known to influence concentrations measured by this station when the data was collected. This includes the sulfur content of the fuels combusted by nearby sources. Therefore, while this data is almost 15 years old, there is no reason to believe that concentrations measured today would be materially different.

Concentrations derived from ambient data collected at the Endicott MPI Monitoring Station were used because these background SO_2 concentrations are representative of the inventory of non-modeled nearby and other non-modeled sources in the vicinity of Endicott Production Facility. Since the Endicott MPI Monitoring Station is located on the same island as the Endicott Production Facility, and the data was collected to support PSD preapplication monitoring requirements, measurements are surely influenced by modeled stationary source emissions.

Since the Endicott MPI Monitoring Station was located at a well site and production facility, the ambient data also includes impacts from near-field mobile and stationary emission sources operating at the combined well site and production facility, including portable heaters, drill rigs, well servicing equipment, mobile sources, and other portable and temporary equipment supporting oil and gas operations. This makes the background data representative of these types of non-modeled sources but also at times is influenced by the impacts from a large production facility.

The Endicott MPI Monitoring Program was comprised of one station located at the northern edge of the Endicott Island and was installed to collect one-year of PSD quality preapplication monitoring data to support the H_2S Increase Project. The underlying AQIA was developed for that project. Approval of the data for use in PSD permitting is described in the Modeling Memorandum. It is worth noting that because it is a preapplication monitoring site satisfying 40 CFR 52.21(m), it is expected that concentrations will be influenced by emissions from the Endicott Production Facility and are higher than those used in support of the underlying AQIA.

3.1 Monitoring Station Representativeness

For a cumulative impact analysis, representative ambient background concentrations must be developed to combine with model-predicted impacts to account for any non-modeled emission sources. According to Section 8.3.1 of the Guideline on Air Quality Models, background concentrations should be representative of the following in the vicinity of the source(s) under consideration:

- Nearby sources, other than the sources(s) currently under consideration and other source(s) that are explicitly modeled; and
- Other sources, including natural sources, unidentified sources, and regional transport.

Concentrations derived from ambient data collected at the Endicott MPI Monitoring Station located just north of the Endicott Production Facility were used because these background concentrations are representative of the inventory of modeled nearby, non-modeled nearby, and other non-modeled sources in the vicinity of the Endicott Production Facility. Calendar year

2009 data was used because it represents the most current available PSD quality data collected and nothing has changed that would make it outdated.

3.1.1 Modeled Nearby Stationary Sources

There are no stationary emission sources expected to be near enough to cause a significant concentration gradient in the impact area of the Endicott Production Facility that would need to be included explicitly in the AQIA. The closest stationary source (Heald Point Well Site) to Endicott is located approximately 9 kilometers distant, and the nearest PSD major facility (Flow Station 2) is located over 17 kilometers from Endicott. Therefore, no Nearby Stationary Sources were included explicitly in the modeling simulation.

3.1.2 Non-Modeled Nearby Sources - Pollutant-Emitting Intermittently Used Oilfield Support Equipment and Maintenance Activities

In addition to the types of non-modeled sources described in the Guideline on Air Quality models, the inventory of non-modeled sources could include onsite construction and maintenance activities that fall under the purview of various ADEC policies. This project does not include any construction; however, small construction activities occur at the Endicott Production Facility and are hard to distinguish from maintenance activities. On an ongoing basis, Hilcorp will provide general maintenance of buildings, roads, pads, pipelines, and other existing infrastructure at or near the Endicott Production Facility and may construct temporary ice pads or roads to support these activities as needed. Maintenance activities at the Endicott Production Facility could include:

- maintenance and testing of permanent combustion equipment, such as the turbines, and emergency equipment
- general maintenance of buildings, roads, pads, pipelines, and other existing infrastructure
- compactors, excavators, trenchers, graders, bulldozers, loaders, cranes, trimmers, pumpers, manlifts, and trucks
- vacuum trucks
- snow melters, snowblowers, and all-terrain vehicles
- portable air and water heaters to provide heat for personnel and equipment
- other portable engine-driven equipment, such as small generators, compressors, pumps, welders, light plant generators, and drilling equipment or augers
- associated mobile activity for transportation of personnel, supplies, and materials to and from the worksite

At times this maintenance will include of the use of equipment identified as EU ID 76 (Backup Diesel Generators - (2,800 total) in the Endicott Production Facility AQ0181MSS10 permit. This type of equipment was operating around the Endicott Production Facility when the ambient background data was collected. Therefore, measured concentrations include the impacts from sources included in this category. Furthermore, this equipment is considered intermittently used oilfield support equipment. Policy related to modeling and permitting of this equipment is described in ADEC Policy and Procedure Number 04.02.105 for Intermittently Used Oilfield Support Equipment (ADEC 2006). Based on the rationale provided in that policy, ADEC believes that emissions and impacts from intermittently used oilfield support equipment can be

managed through fuel sulfur levels, rather than ambient air quality assessments. At the Endicott Production Facility much of this equipment is required to combust ULSD fuel as in the case of EU ID 76 [Backup Diesel Generators - (2,800 total)], and the rest will likely combust ULSD lacking the availability of alternative fuel types at the Endicott Production Facility and because it is required by rule depending on engine certification. It would be rare for non-permitted, intermittently used emissions units at the Endicott Production Facility to combust anything but ULSD.

Because of their transient nature and predominance of ULSD fuel, after a reasonable inquiry we believe ADEC will agree that impacts from these emission units are appropriately managed through fuel sulfur levels and do not need to be included explicitly in an AQIA. Regardless, because of this and primarily the representativeness of the ambient background data, the underlying AQIA did not include these sources explicitly. Furthermore, the Modeling Memorandum did not dwell on these types of activities, nor did it recommend a source-wide ULSD requirement.

3.1.3 Non-Modeled Nearby Sources - Portable Oil and Gas Operations (POGO) Authorized under the Minor General 2 (MG2) Permit

In addition to the types of non-modeled sources described in the Guideline on Air Quality models, the inventory of non-modeled sources could include POGO activities authorized under the MG2 permit. The Endicott Production Facility includes several well lines approximately 180 meters south of the production facility emission units. While there was a time early in the development when POGO activities along the well line were nearly continuous, it is currently a temporary construction activity authorized under an MG2 permit. For the following reasons, this activity was not included explicitly this AQIA.

1 The MG2 permit basis modeling demonstration is representative of a wide range of isolated and collocated well sites. POGO activities at the Endicott Production Facility fall under the Routine Infill Drilling at a Collocated Well Pad category. This category is representative of drilling that lasts less than 24 consecutive months at a well pad that is adjacent to, adjoining, or abutting a major stationary source. As described in the Ambient Demonstration for the North Slope Portable Oil and Gas Operation Simulation (MG2 Modeling Report), the cumulative impacts from the following types of equipment were included in the MG2 ambient demonstration:

   a) Reciprocating internal combustion engines, heaters, and boilers directly supporting the drill rig

   b) Oilfield Construction Equipment

   c) Well Drilling, Servicing, Maintenance, and Miscellaneous Oilfield Support Equipment

   d) Permanent Well Pad Equipment including a production heater, freeze protection pump engines, and small stationary engines in power generation or mechanical service.

   e) An oil and gas processing facility equivalent to the Alpine Central Facility.

   The first of these (the reciprocating internal combustion engines, heaters, and boilers directly supporting the drill rig) was included through explicit modeling, and the last four were included through a representative background concentration with additional support for this approach vetted with sensitivity modeling as described below.

In the case of a permanent emission unit inventory, specific sensitivity modeling was conducted that included a flare and a nearby production heater. That modeling lead to the conclusion that it was not necessary to consider the presence of a permanent production heater or a flare when making an ambient demonstration for a POGO because of their placement on the pad relative to the POGO, and because of their stack exit characteristics, these types of equipment are unlikely to produce plumes of emissions that overlap with the dominate sources of emissions when a POGO is operating on a well line. The same could likely be shown for the Endicott Production Facility stationary sources because the largest Endicott Production Facility sources are located north of the well lines and outside the predominant wind directions. In fact, the similarity between the magnitude and location of impacts predicted for the underlying AQIA which included a POGO, and the current demonstration strongly suggests a lack of overlap between plumes from permanent facility emissions and those from the POGO.

Because the impacts from a large production facility were included in the MG2 cumulative impact analysis and there is strong evidence that the impacts from a POGO operating on the Endicott well line will not overlap with those from permanent sources, the ambient demonstration supporting the MG2 permit is a fitting surrogate for a POGO operating at Endicott. That AQIA demonstrated compliance with applicable 3-hour and 24-hour AAAQS; providing reasonable assurance that the combined impacts from a POGO and the Endicott Production Facility will demonstrate compliance with these same thresholds.

2 POGO activities at the Endicott well lines are infrequent. Therefore, a low probability exists that POGO emissions will influence facility impacts which will be dominated by the sources that operate the most. Admittedly this may not be the case if the POGO was assumed to operate continuously, but that is not consistent with the nature of current POGO activities at Endicott.

3 As with the underlying AQIA, the results of this analysis show that the limiting case is demonstrating compliance with the short-term PSD Class II Increments. In fact, the underlying AQIA which explicitly included the impacts from a POGO demonstrated compliance with the AAAQS assuming a gaseous fuel H_2S concentration over 1,000 ppmv. Regardless, POGO activities at the Endicott well lines are considered temporary construction activities and do not consume increment. Since the limiting analysis is the PSD Class II Increment analysis and Endicott POGO activities do not consume increment, whether they are modeled explicitly or not is inconsequential to setting a short-term ambient protection limit.

3.1.4 Other Sources

The Endicott MPI Monitoring Station is located on the same island as the Endicott Production Facility. Both are exposed to the same exact regional transport, and neither are influenced much by regional oil and gas development on the North Slope because they are located offshore and generally upwind of Prudhoe Bay. The location of the Endicott MPI Monitoring Station ensures that the station captures the same regional impacts from minor stationary, major stationary, and mobile transportation sources as the Endicott Production Facility.

Therefore, the Endicott MPI Monitoring Station ambient SO_2 data is representative of impacts at Endicott from other non-modeled sources, including regional oil and gas development activity, biogenic, unidentified, and globally transported emissions throughout the North Slope.

3.2 Monitoring Station Background

Table 3-1 summarizes the ambient background concentrations calculated from data collected by the Endicott MPI Monitoring Program during calendar year 2009 as documented in the Modeling Memorandum. No measurements were culled from the ambient monitoring dataset for the development of background concentrations.

Table 3-1: Ambient Background Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Rank of Background Value
SO_2	3-hour	34.1	Maximum
SO_2	24-hour	28.8	Maximum

4.0 Results and Conclusion

A single near-field analysis was conducted for this assessment to confirm compliance with applicable standards and increments at Endicott. The results of the assessment are described in this section.

Maximum design-value cumulative model-predicted concentrations in the near-field of the Endicott Production Facility are presented in **Table 4-1** and **Table 4-2**. To calculate the total concentration, model-predicted concentrations were added to the background concentrations summarized in **Table 3-1** and then compared to applicable AAAQS and PSD Class II Increments.

In all cases, the predicted impacts for all pollutants and averaging periods show compliance with all applicable AAAQS and PSD Class II Increments. These impacts were all predicted to occur on or near the ambient boundary. Like the underlying AQIA, compliance with applicable AAAQS is easily demonstrated. Using a simple scaling exercise and assuming impacts are solely from gaseous fuel-fired sources, the gaseous fuel H_2S concentration could be increased to at least 1,000 ppmv and compliance would still be shown.

Table 4-1: Modeled-Predicted Cumulative Concentrations Compared to the AAAQS

Averaging Period	Rank	AERMOD Predicted Design Value (µg/m³)	Ambient Background (µg/m³)	Total (µg/m³)	AAAQS (µg/m³)	% of AAAQS
3-hour	H2H [1]	148.7	34.1	183	1,300	14
24-hour	H2H [1]	89.80	28.8	119	365	32

[1] Maximum of the highest-second-high concentration obtained from each of the 3 modeled years.

Table 4-2: Modeled-Predicted Cumulative SO_2 Concentrations Compared to Class II PSD Increments

Averaging Period	Rank	AERMOD Predicted Design Value (µg/m³)	Class II PSD Increment (µg/m³)	% of Increment
3-hour	H2H [1]	148.7	512	29
24-hour	H2H [1]	89.80	91	99

[1] Maximum of the highest-second-high concentration obtained from each of the 3 modeled years.

5.0 References

Alaska Department of Environmental Conservation (ADEC), 2021. ADEC Policy and Procedure Number 04.02.108. Worker Housing Aggregation and Modeling. May 5, 2021.

Alaska Department of Environmental Conservation (ADEC), 2018a. ADEC. Modeling Review Procedures Manual. October 8, 2018.

Alaska Department of Environmental Conservation (ADEC), 2017. Air Quality Modeling Submittal Checklist Minor Permit Applications. Version 1.0. October 24, 2017.

Alaska Department of Environmental Conservation (ADEC), 2006. ADEC Policy and Procedure Number 04.02.105. Intermittently Used Oil Field Support Equipment. November 20, 2006.

U.S. Environmental Protection Agency (USEPA), 2017. Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter. 40 CFR 51. January 17, 2017.

Appendix A ADEC Modeling Memorandum

Endicott Short-Term H2S Limit Increase Project

Ambient Air Quality Impact Analysis

Hilcorp Alaska, LLC

November 3, 2023

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File
DATE: July 12, 2011

THRU: Alan Schuler
Environmental Engineer
Air Permits Program
FILE NO:

PHONE: 269-7577
FAX: 269-7508

FROM: Patrick Dunn
Environmental Engineer Associate
Air Permits Program

SUBJECT: Review of Endicott
Fuel Gas H_2S Increase
Ambient Assessment REVISED

Note: This revision supersedes the May 18, 2011 version of the Department's modeling review memorandum for the Fuel Gas H_2S Increase Project. Per the applicant's request, the Department clarified references to the location of Endicott and the current Title V Operating Permit. The Department made no other changes to the memorandum.

This memorandum summarizes the Department's findings regarding the ambient assessment submitted by BP Exploration (Alaska) Inc. (BPXA) for the Endicott Production Facility (Endicott). BPXA submitted this analysis in support of their Prevention of Significant Deterioration (PSD) permit application (AQ0181CPT07) to increase the hydrogen sulfide (H_2S) content of their fuel gas. The project triggers PSD review for sulfur dioxide (SO_2) and particulate matter with an aerodynamic diameter of less than 2.5 microns (PM-2.5).

The Department finds that BPXA's application and supplemental information adequately complies with the source impact analysis required under 40 CFR 52.21(k), the pre-construction monitoring analysis required under 40 CFR 52.21(m)(1), and the additional impact analysis required under 40 CFR 52.21(o). BPXA's ambient air analysis adequately demonstrates that operating the Endicott emission units within the requested constraints will not cause or contribute to a violation of the 3-hour, 24-hour or annual SO_2 Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010, or the 3-hour, 24-hour or annual SO_2 maximum allowable increases (increments) listed in 18 AAC 50.020. PM-2.5 modeling was not required for the reasons described in this memorandum.

BACKGROUND

Project Location and Area Classification

Endicott is located east of the Prudhoe Bay Unit on Alaska's North Slope. The area is unclassified in regards to compliance with the AAAQS. For purposes of increment compliance,

Endicott is located within a Class II area of the Northern Alaska Intrastate Air Quality Control Region. The nearest Class I area, Denali National Park, is located approximately 550 km to the south.

Source/Project Description

Endicott is an existing PSD-major stationary source. BPXA is presently operating Endicott under Construction/Operating Permit AQ0181TVP01, Revision 3 under an application shield until the Department makes a decision on their permit renewal application. Under the application shield BPXA must comply with the requirements of Construction/Operating Permit 181TVP01, Revision 3 and any new requirements specified in their AQ0181TVP02 application.. BPXA is also operating Endicott under Construction Permit AQ0181CPT06 and Minor Permit AQ0181MSS04. These Title I permit conditions are not included in Construction/Operating Permit AQ0181TVP01.

BPXA is requesting to revise the fuel gas H_2S concentration for the fuel gas fired emission units from 250 parts per million volume (ppmv) to 425 ppmv due to fuel gas souring. An H_2S limit was established in previous Title I permits as either a Best Available Control Technology (BACT) limit and/or to protect the 3-hour, 24-hour and annual average SO_2 AAAQS and increments. An H_2S limit of 250 ppmv was then carried forward in Construction/Operating Permit 181TVP01. Because Construction/Operating Permit 181TVP01 expired, the Department re-established the 250 ppmv H_2S limit in Minor Permit AQ0181MSS04 as described in the Technical Analysis Report (TAR) for AQ0181MSS04.

The increase in SO_2 emissions due to the increase in H_2S concentration classifies the project as a PSD-major modification for SO_2. The SO_2 emissions are also considered a PM-2.5 precursor . Therefore the project is also classified as a PSD major modification for PM-2.5. Because the U.S. Environmental Protection Agency (EPA) has not yet provided sufficient tools and guidance to predict the PM-2.5 impacts due to the secondary formation of PM-2.5 the Department is not requiring BPXA to demonstrate compliance with the PM-2.5 AAAQS. The PM-2.5 increment promulgated by the EPA in October 2010 is not yet in effect and the state has not yet adopted a PM-2.5 increment.

Ambient Demonstration Requirements

Per 18 AAC 50.306, PSD applicants must essentially comply with the federal PSD requirements in 40 CFR 52.21. The ambient requirements include:

- A "Source Impact Analysis" (aka as ambient AAAQS and increment analysis) for the PSD-triggered pollutants – per 40 CFR 52.21(k),
- An "Air Quality Analysis" (aka preconstruction monitoring data) for the PSD-triggered pollutants – per 40 CFR 52.21(m);
- An "Additional Impact Analyses" – per 40 CFR 52.21(o); and
- A Class I impact analysis (for sources which may affect a Class I area) – per 40 CFR 52.21(p).

In the case of the Fuel Gas H_2S project, the nearest Class I area is too distant to warrant a Class I impact analysis. However, BPXA is subject to the remaining PSD requirements.

Modeling Protocol

BPXA did not submit a modeling protocol for Department approval.

Project Submittal

BPXA originally submitted a minor permit application for this project on November 30, 2007. BPXA included a SO_2 AAAQS analysis with an assumed fuel gas H_2S concentration of 1,000 ppmv. The Department notified BPXA in a January 11, 2008 letter that revising the fuel gas H_2S limit at Endicott required a PSD permit. The Department further stated that the November 2007 application was therefore incomplete and that BPXA needed to provide pre-construction monitoring data; an increment analysis; and an additional impact analysis.[1] BPXA then began collecting SO_2 pre-construction monitoring data (See Pre-Construction Monitoring section below).

BPXA initially intended to meet the increment request with a January 14, 2008 SO_2 increment assessment analysis provided in response to a Department request associated with finalizing a Compliance Order by Consent (COBC).
BPXA subsequently submitted a revised increment analysis on September 29, 2010. The revised analysis used an assumed fuel gas H_2S concentration of 425 ppmv.

SLR International Corporation prepared the PSD application, including the ambient assessment, on behalf of BPXA.

AMBIENT AIR POLLUTANT DATA

40 CFR 52.21(m)(1) requires PSD applicants to submit ambient air monitoring data describing the air quality in the vicinity of the project, unless the existing concentration or the project impact is less than the monitoring threshold provided in 40 CFR 52.21(i)(5), or if the pollutant is not listed under 40 CFR 52.21(i)(5). The pre-construction monitoring requirement only pertains to the pollutants subject to PSD review. If monitoring is required, the data are to be collected prior to construction. Hence, these data are referred as "pre-construction monitoring" data. Ambient "background" data may also be needed to supplement the estimated ambient impact from the proposed project. BPXA's approach for meeting both data needs is discussed below.

Pre-Construction Monitoring

On July 3, 2008 BPXA requested Department approval for the use of the ambient SO_2 data collected at the Liberty Project Satellite Development Island (SDI) between February 1, 2007 and January 31, 2008 to meet the SO_2 pre-construction monitoring data requirement. The Department notified BPXA on November 26, 2008 that the SDI data was not representative of the maximum impacts at the Main Production Island (MPI) portion of Endicott and suggested that BPXA collect pre-construction monitoring data at MPI. BPXA collected ambient SO_2 data at MPI between January 1, 2009 and December 31, 2009. The data was reviewed on behalf of the Department by Enviroplan Consulting (Enviroplan). Enviroplan's May 31, 2010 Final Findings Report found the SO_2 data to be PSD quality. The Department concurred with Enviroplan's findings. The Department therefore accepts the use of the SO_2 data collected at MPI to satisfy

[1] The Department also asked for a Best Available Control Technology (BACT) analysis on May 28, 2008.

the requirements of pre-construction monitoring. The maximum measured values are shown in Table 1.

Table 1 – Pre-Construction Monitoring Assessment [a]

Air Pollutant	Avg. Period	Monitored Value ($\mu g/m^3$)
SO_2	Annual	2.6
	24-hour	28.8
	3-hour	34.1

[a] All concentrations are reported in micrograms per cubic meter ($\mu g/m^3$).

Pre-construction monitoring for PM-2.5 is not required for this project since PM-2.5 is not listed in the version of 40 CFR 52.21(i) currently adopted by reference in 18 AAC 50.040(h).

Background Concentrations

In addition to the pre-construction monitoring requirements for PSD pollutants, ambient "background" data may also be needed to supplement the ambient impact analysis. 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. Hence, background concentrations are typically needed for all air pollutants included in an AAAQS compliance demonstration, regardless of whether or not PSD pre-construction monitoring is required.

BPXA used the same background concentrations as used in the past Endicott submittals, including the Minor Permit AQ0181MSS04 ambient analysis. The SO_2 background values are the maximum concentrations measured at Badami during BPXA's 1999 "Alaska North Slope Eastern Region" (ANSER) monitoring program.

The Department's monitoring group has previously reviewed and approved the ANSER monitoring data. The Department considers the data as adequately representative of the expected background concentrations at Endicott.

SOURCE IMPACT ANALYSIS

BPXA used computer analysis (modeling) to predict the ambient SO_2 air quality impacts. The Department's findings regarding BPXA's analysis are provided below.

Approach

BPXA assumed there is no significant overlapping ambient impacts between the MPI and SDI emission units due to the predominant wind patterns. Therefore, BPXA did not include the SDI emission units in this analysis. The Department agrees with BPXA's assumption.

BPXA also assumed the off-site inventory of Greater Prudhoe Bay does not significantly impact air quality at Endicott. The Department agrees with this assumption (See the Off-Site Impacts section below).

BPXA included the emission units of the transportable drill rigs authorized by Minor Permit AQ0181MSS04 to operate at MPI. This is an appropriate approach.

Increment Analysis

The SO_2 baseline date for the Northern Alaska Intrastate Air Quality Control Region is June 1, 1979. Therefore, all of the Endicott emission units are increment consuming. BPXA appropriately included all of the Endicott emission units in the increment analysis.

AAAQS Analysis

BPXA did not revise the AAAQS analysis in their September 27, 2010 submittal since the increment impacts are more restrictive. The Department is nevertheless reporting the AAAAQS impacts in this memorandum for informational purposes. Because all of the emission units at MPI are increment consuming the Department constructed the AAAQS analysis shown below in Table 3 using the results from the increment analysis and adding in the background concentrations submitted with the November 20, 2007 AAAQS analysis.

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 AERMOD Modeling System (AERMOD) for the ambient analysis. AERMOD is an appropriate modeling system for this application.

The AERMOD Modeling System consists of three major 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 AERMOD (which is used to estimate the ambient concentrations). BPXA used the current version of each component at the time of their application, version 09292 for AERMOD and version 06341 for AERMET. The Department finds the versions used by BPXA acceptable.

BPXA did not use AERMAP in this analysis because the area surrounding Endicott is ocean. the Department finds this approach acceptable.

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.

BPXA used five years (2001-2005) of wind and temperature data collected by the Mineral Management Service (MMS) at SDI, along with concurrent Deadhorse cloud cover data and Barrow upper air data. This is the same data set used by BPXA in past Endicott modeling assessments. The Department continues to accept this data set for this project.

On May 19, 2010, BPXA asked the Department to invalidate the December 2, 2001 through December 28, 2001 wind speed data due to riming of the anemometer cup. The Department subsequently determined that only a subset of the requested period (December 8, 2001 – December 27, 2001) should be invalidated. Although the Department agreed to allow BPXA to exclude this data, BPXA chose to use the entire 2001 SDI data set in their September 29, 2010 submittal. The Department finds this acceptable because the inclusion of the entire 2001 SDI data set will lead to a more conservative analysis.

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*.

BPXA did not use the values the Department has previously approved for North Slope locations surrounded by ocean. Table 2 shows the values used by BPXA and the Department's approved values in parenthesis. BPXA used one sector because of the uniform surroundings. BPXA assigned the values by month in order to adjust the surface characteristics according to season. Although BPXA did not use the Department approved values, the Department nevertheless finds BPXA's values acceptable because they are within the range of potentially viable values for Endicott. ***However, the Department requests that BPXA use the Department approved values in future modeling submittals for Endicott.***

Table 2 – Approved AERMET Surface Parameters for SDI

Surface Parameter	Winter Value	Summer Value
Albedo	0.6 (0.8)	0.2 (0.18)
Bowen Ratio	2.0 (1.5)	1.0 (0.80)
Surface Roughness Length	0.0005 (0.004)	0.0005 (0.02)

For purposes of the SDI AERMET surface parameters, summer is defined as June through September, and winter is defined as October through May.

EPA allows applicants to compare the high second-high (h2h) modeled concentration to the short-term air quality standards 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 h1h modeled concentration to the annual average standards/increments, the SILs, and the pre-construction monitoring thresholds. The Department allowed BPXA to compare the h2h concentration to the short-term AAAQS/increments since they used site-specific data.

Emission Unit Inventory

BPXA modeled the emission units authorized to operate at MPI. The unit locations are shown in Figure D-1 of their November 30, 2007 application. BPXA characterized all emission units as point sources.

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.

Seasonal Operation

The transportable drill rigs are limited to seasonal operations while operating at MPI by Minor Permit AQ0181MSS04. BPXA could have included only the seasonal operations of the drill rigs in their annual impact analysis. However BPXA assumed the drill rigs are operating continuously. Therefore their annual AAAQS and increment analyses are conservative.

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.[2] BPXA used this non-default option to characterize their capped/horizontal stacks.

SO_2 Emissions

SO_2 emissions are directly related to the amount of sulfur in the fuel. BPXA's emission units consist of both liquid and gas fired units.

BPXA modeled the MPI liquid fired emission units with a fuel sulfur content of 0.10 weight percent sulfur (wt%S). This assumed liquid fuel sulfur content is a fuel sulfur limit established in Minor Permit AQ0181MSS02 to protect the SO_2 AAAQS and increment and was carried forward into Minor Permit AQ0181MSS04. BPXA modeled the liquid fired boiler/hearers on the transportable drill rigs with a fuel sulfur content of 0.10 wt%S. BPXA modeled the liquid fired engines on the transportable drill rigs with a fuel sulfur content of 0.0015 wt%S, which is also known as Ultra Low Sulfur Diesel (ULSD). Both of these assumed fuel sulfur limits on the

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

drill rig emission units are fuel sulfur limits established in Minor Permit AQ0184MSS04 to protect the SO_2 AAAQS and increment.

The sulfur in fuel gas is in the form of hydrogen sulfide (H_2S). BPXA assumed the MPI gas-fired units are burning gas with a maximum H_2S content of 425 ppmv as discussed in the Background section of this memo. The Department is including the fuel gas H_2S concentration assumption in the construction permit to protect the 3-hour, 24-hour and annual SO_2 AAAQS and the 3-hour, 24-hour and annual SO_2 increment.

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 at Endicott as they have done in previous modeling assessments. The Department finds this acceptable.

Receptor Grid

BPXA used 25 meter spacing around the pad edge, with receptor spacing of 50 meters to a distance of 500 meters from the pad edge, and receptors spaced at 200 meters from 500 meters to a distance of approximately three kilometers.

BPXA's receptor grids are acceptable.

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 "Building Profile Input Program" (BPIP) computer program. BPXA used EPA's PRIME version of BPIP (BPIPPRM, version 04274) to determine the building profiles needed by AERMOD. This is an appropriate version of BPIP.

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 did not include any off-site sources in their modeling analysis. They stated in their modeling report that the off-site inventory was filtered by the Q/D approach. However, BPXA did not provide any supporting documentation with their report. The Department has found in past modeling assessments that off-site SO_2 sources do not have a significant impact at Endicott.

Therefore, since nothing has changed to alter this previous conclusion, the Department continues to agree that offsite sources do not need to be included in a 3-hour, 24-hour and annual average SO_2 modeling analysis of Endicott.

Results and Discussion

The maximum SO_2 AAAQS impacts are shown in Table 3. The background concentrations, total impacts and ambient standards are also shown.

Table 3 – Maximum AAAQS Impacts

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	152.8	9.8	**162.6**	1,300
	24-hr	78.3	7.2	**85.5**	365
	Annual	16	2.6	**18.6**	80

The maximum SO_2increment impacts are shown in Table 4, along with the Class II increments. All of the maximum impacts are less than the applicable Class II increments.

Table 4 – Maximum Increment Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc. ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO_2	3-hr	**152.8**	512
	24-hr	**78.3**	91
	Annual	**16**	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 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.

ADDITIONAL IMPACT ANALYSES

Per 40 CFR 52.21(o), PSD applicants must assess the impact from the proposed project and associated growth on visibility, soils, and vegetation. BPXA did not address the additional

impact analysis in their application. The Department therefore assessed the additional impact analysis. The Department's findings are reported below.

Visibility Impacts

The typical tool for assessing the potential visibility impact from North Slope sources is EPA's VISCREEN model. According to EPA's *Workbook for Plume Visual Impact Screening and Analysis (Revised)*, the pollutants of concern in a VISCREEN analysis are particulates and nitrogen oxides. SO_2 emissions are not included in the assessment. Therefore, this permit action should not affect the visibility of BPXA's exhaust plumes.

Vegetation Impacts

The Department compared the modeled impacts to the secondary air quality standard and an annual sensitivity threshold for lichens. The secondary air quality standards are set to protect public welfare, which includes protection against vegetative damage. As previously shown in Table 3, the maximum 3-hour SO_2 impact is well below the 3-hour SO_2 standard. Therefore, the general vegetation should be protected.

Lichens are more sensitive to air pollutants than vascular plants since they lack roots and derive all growth requirements from the atmosphere. Some lichen species are adversely affected when the annual average SO_2 concentration ranges between 13 to 26 $\mu g/m^3$.[3] While it is not known whether lichens on the North Slope have this same sensitivity, these values provide a surrogate measure of the potential sensitivity threshold.

The maximum annual average SO_2 impact (18.6 $\mu g/m^3$) does exceed the 13 $\mu g/m^3$ sensitivity threshold. This maximum impact however occurs near the ambient air boundary due to downwash. Because the ambient air boundary is surrounded by ocean there would be no lichens in the vicinity of the maximum impact. Therefore, the local lichens should not be adversely impacted by the proposed increase in SO_2 emissions.

Soil Impacts

The Department notes that there is little information available regarding the effects of air pollutants on soils. The Department also notes that protecting the vegetative cover helps protect the soil. Since the air quality impacts are below the applicable vegetation thresholds, the soil should likewise be protected. Furthermore, because the maximum impacts occur over the ocean, there should be minimal soil impacts.

Secondary Impacts

40 CFR 52.21(o)(2) requires PSD applicants to assess the impacts from general commercial, residential, industrial and other growth associated with the source or modification. The Department does not expect significant changes in these categories.

CONCLUSION

[3] *Air Quality Monitoring on the Tongass National Forest* (USDA – Forest Service; September 1994).

The Department reviewed BPXA's modeling analysis for the Endicott fuel gas H_2S increase and concluded the following:

1. BPXA's application and supplemental information adequately complies with the source impact analysis required under 40 CFR 52.21(k) ***Source Impact Analysis***. BPXA has adequately demonstrated that the SO_2 emissions associated with operating the stationary source within the requested operating limits will not cause or contribute to a violation of the 3-hour, 24-hour, and annual SO_2AAAQS provided in 18 AAC 50.010 or the 3-hour, 24-hour, and annual SO_2 maximum allowable increases (increments)provided in 18 AAC 50.020.
2. BPXA appropriately used the models and methods required under 40 CFR 52.21(l) ***Air Quality Models***.
3. BPXA adequately complies with the pre-application air quality analysis required under 40 CFR 52.21(m)(1) ***Preapplication Analysis***.
4. BPXA's application adequately complies with the additional visibility, soils, vegetation and secondary impact analysis required under 40 CFR 52.21(o) ***Additional Impact Analysis***.

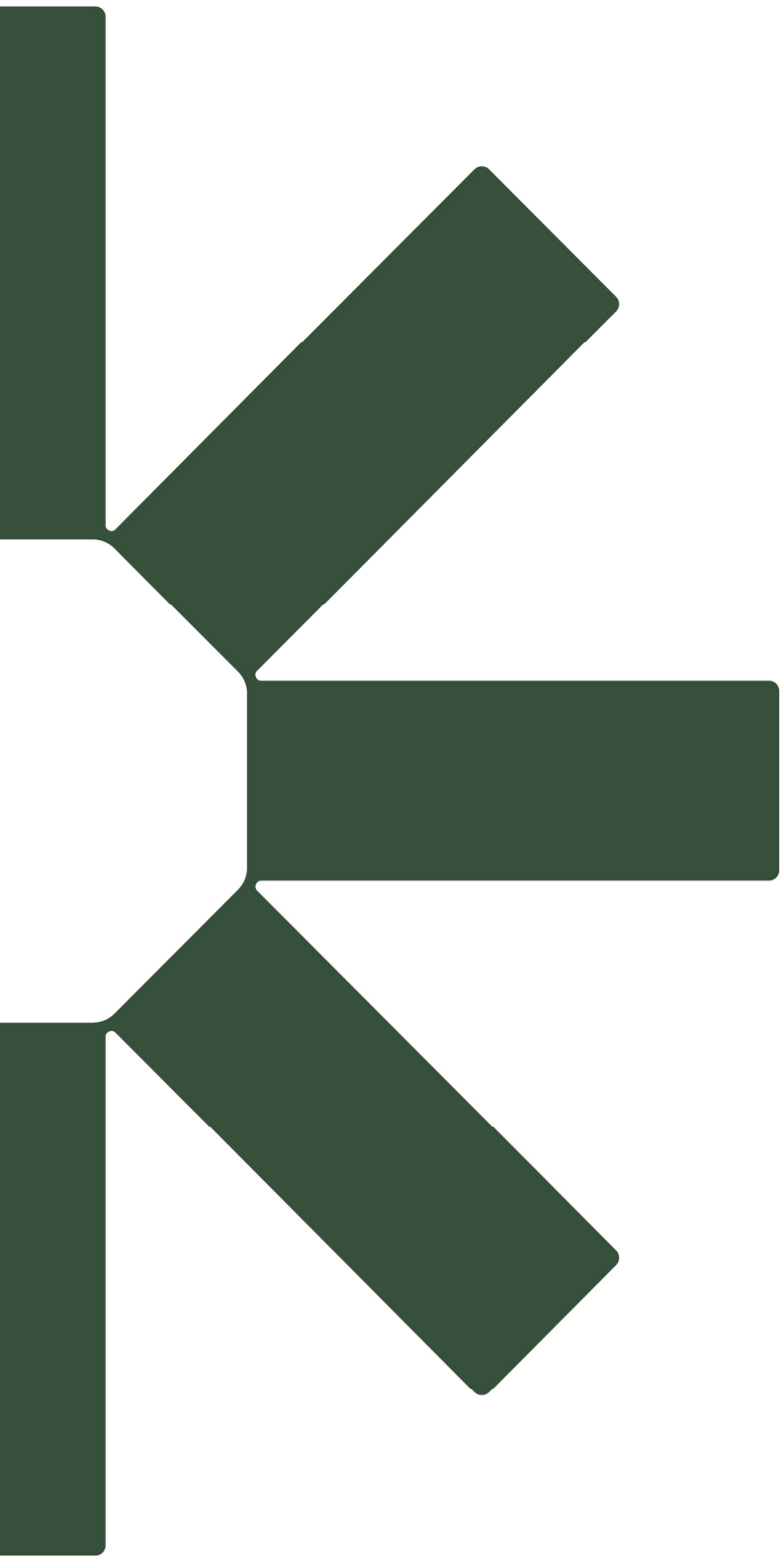
The Department has developed conditions in Construction Permit AQ0181CPT07 to ensure BPXA complies with the ambient air quality standards and increments. These conditions are summarized below:

To protect the 3-hour, 24-hour and annual SO_2 AAAQS and the 3-hour, 24-hour and annual SO_2 increment:

- Limit the fuel gas H_2S concentration of the fuel gas fired MPI emission units to 425 ppmv.

In addition to conditions referenced above, to protect the 3-hour, 24-hour and annual SO_2 AAAQS and the 3-hour, 24-hour and annual SO_2 increment the Department will:

- Continue to limit the liquid fuel sulfur content of the liquid fired MPI emission units to 0.10 wt%S, as required by Minor Permit AQ0181MSS04;
- Continue to limit the liquid fuel sulfur content of the liquid fired heaters/boilers on the transportable drill rigs to 0.10 wt%S, as required by Minor Permit AQ0181MSS04; and
- Continue to limit the liquid fuel sulfur content of the liquid fired engines on the transportable drill rigs to ULSD, as required by Minor Permit AQ0181MSS04.



Making Sustainability Happen

Hilcorp
Alaska, LLC

ATTACHMENT C

Endicott Production Facility Short-Term H_2S Limit Increase
Air Quality Permit Application
Copy of Air Quality Construction Permit No.
AQ0181MSS10

3800 Centerpoint Drive, Suite 1400, Anchorage, AK 99503
Phone: 907/777-8300 hilcorp.com

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

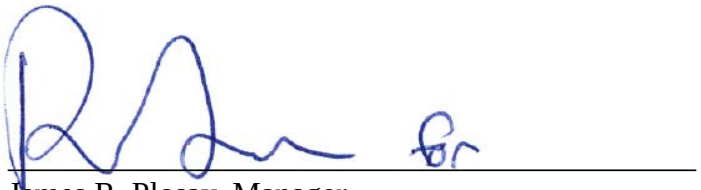
AIR QUALITY CONTROL MINOR PERMIT

Minor Permit: **AQ0181MSS10** **Final Date – September 6, 2018**
Rescinds Permits: AQ0181MSS09

The Alaska Department of Environmental Conservation (Department), under the authority of AS 46.14 and 18 AAC 50, issues Air Quality Control Minor Permit AQ0181MSS10 to the Permittee listed below.

Permittee:	**Hilcorp Alaska, LLC**
	3800 Centerpoint Drive, Suite 1400, Anchorage, AK 99503
Stationary Source:	**Endicott Production Facility**
Project:	Removal of Existing Drilling Conditoins
Permit Contact:	Drew Anderson, (907) 777-8488, ananderson@hilcorp.com

The Permittee requested Minor Permit AQ0181MSS10 under 18 AAC 50.508(6) in order to revise the terms and conditions of a Title I permit. Minor Permit AQ0181MSS10 satisfies the obligation of the Permittee to obtain a minor permit under 18 AAC 50. As required by AS 46.14.120(c), the Permittee shall comply with the terms and conditions of this permit.



James R. Plosay, Manager
Air Permits Program

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Abbreviations and 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
bhp.....brake horsepower
C.F.R. .....Code of Federal Regulations
CO .....carbon monoxide
Department .....Alaska Department of Environmental Conservation
EPA .....US Environmental Protection Agency
EU.....emissions unit
hp.....horsepower
MMBtu/hr.....million British thermal units per hour
MMscf .....million standard cubic feet
MMscf/day .....million standard cubic feet per day
NOx .....nitrogen oxides
NSPS .....New Source Performance Standards [as contained in 40 C.F.R. 60]
O_2.....oxygen
PM-10.....particulate matter less than or equal to a nominal 10 microns in diameter
ppm .....parts per million
ppmv, ppmvd.....parts per million by volume on a dry basis
PSD .....prevention of significant deterioration
SO_2 .....sulfur dioxide
tpy.....tons per year
VOC .....volatile organic compound [as defined in 40 C.F.R. 51.100(s)]

Section 1 Emissions Unit Inventory

Emissions Unit (EU) Authorization. The Permittee is authorized to operate the EUs listed in Table 1 in accordance with the terms and conditions of this permit. Except as noted elsewhere in this permit, the information in Table 1 is for identification purposes only. The specific EU descriptions do not restrict the Permittee from replacing an EU identified in Table 1.

Table 1 – EU Inventory

EU ID	EU Description	Make/Model	Rating	Construction/Startup or Modification Date
1	Gas-fired Main Gas Compressor Turbines	Nuovo-Pignone Frame 5D	43,000 bhp ISO	Upgrade 1999
2			43,000 bhp ISO	Upgrade 1999
3	Gas-fired NGL Compressor Turbine	Nuovo-Pignone Frame 1	5,400 bhp ISO	1986-87
4	Gas-fired Water Injection Pump Turbines	Ruston Tornado	8,485 bhp ISO	1986-87
5		Ruston Tornado	8,485 bhp ISO	1986-87
6	Gas-fired Generator Turbines	Ruston Tornado	8,717 bhp ISO	1986-87
7		Ruston Tornado	8,717 bhp ISO	1986-87
8		Ruston Tornado	8,717 bhp ISO	1986-87
9		Ruston Tornado	8,717 bhp ISO	1986-87
10	Gas-fired MI Compressor Turbine	Nuovo-Pignone PGT-5	7,300 bhp ISO	1999
11	Gas-fired Utility / Process Heater	Claudius Peters	97.9 MMBtu/hr [heat input (maximum) LHV]	1986-87
12	Gas-fired Building Heat Medium Heater	ENTECH	40.5 MMBtu/hr [heat input (maximum) LHV]	1986-87
14	Gas-fired TEG Reboiler	BS&B	7.0 MMBtu/hr heat input, LHV	New Burner 1997
15	Gas-fired Natural Gas Liquid Reboiler	CE NATCO	27.0 MMBtu/hr heat input, LHV	1986-87
17	Liquid fuel-fired Emergency Generators	Fairbanks Morse	4,168 bhp	1986-87
18		Fairbanks Morse	4,168 bhp	1986-87
19	Liquid fuel-fired Emergency Generators	Caterpillar D 3412	739 bhp	1986-87
20		Caterpillar D 3412	739 bhp	1986-87
24	Liquid fuel-fired Emergency Fire Water Pump	Cummins Diesel 378F2	137 bhp	1986-87
25	High Pressure Flare	GKN Birwelco LTD	500 MMscf/day	Modified 1999
26	Low Pressure Flare	GKN Birwelco LTD	25 MMscf/day	1986-87
27	Portable Flare	Halliburton	25 MMscf/day	1986-87
75	Gasoline Dispensing Facility	Storage tanks	< 10,000 gal/month	On or before Nov 2006
76	Backup Diesel Generators	Various	2,800 bhp, total	Installed 2016
77	Diesel Mud Pump	Caterpillar 3408	425 bhp	Installed 2016

Table Note: All of the EUs have already been installed at the stationary source under previous permitting actions.

1. The Permittee shall comply with all applicable provisions of AS 46.14 and 18 AAC 50 when installing a replacement EU, including any applicable minor or construction permit requirements.

Section 2 Fee Requirements

2. **Administration Fees.** The Permittee shall pay to the Department all assessed permit administration fees. Administration fee rates are set out in 18 AAC 50.400-499.

3. **Assessable Emissions**. The Permittee shall pay to the Department annual emission fees based on the stationary source's assessable emissions as determined by the Department under 18 AAC 50.410. The assessable emission fee rate is set out in 18 AAC 50.410. The Department will assess fees per ton of each air pollutant that the stationary source emits or has the potential to emit in quantities 10 tons per year (tpy) or greater. The quantity for which fees will be assessed is the lesser of:

   3.1 the stationary source's assessable potential to emit of 4,993 tpy; or

   3.2 the stationary source's projected annual rate of emissions that will occur from July 1 to the following June 30, based upon credible evidence of actual annual emissions emitted during the most recent calendar year or another 12 month period approved in writing by the Department, when demonstrated by the most representative of one or more of the following methods:

      a. an enforceable test method described in 18 AAC 50.220;

      b. material balance calculations;

      c. emission factors from EPA's publication AP-42, Vol. I, adopted by reference in 18 AAC 50.035;

      d. other methods and calculations approved by the Department, including appropriate vendor-provided emissions factors when sufficient documentation is provided.

4. **Assessable Emission Estimates.** Emission fees will be assessed as follows:

   4.1 no later than March 31 of each year, the Permittee may submit an estimate of the stationary source's assessable emissions to ADEC, Air Permits Program, ATTN: Assessable Emissions Estimate, 410 Willoughby Ave., Suite 303, PO Box 111800, Juneau, AK 99811-1800; the submittal must include all of the assumptions and calculations used to estimate the assessable emissions in sufficient detail so the Department can verify the estimates; or

   4.2 if no estimate is received on or before March 31 of each year, emission fees for the next fiscal year will be based on the potential to emit set out in Condition 3.1.

Section 3 Ambient Air Quality Protection Requirements

5. **SO_2 AAAQS and Increments Protection.** The Permittee shall protect the 3-hour, 24-hour, and annual SO_2 AAAQS, and the 3-hour, 24-hour, and annual Class II increments, as follows.

   5.1 Limit the H_2S content of the natural gas burned in EUs 1 through 15 and 25 through 27 to no more than 425 ppmv at any time.

      a. Monitor as described under the NSPS Subpart GG Sulfur Standard provisions listed in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50.

      b. Include in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50:

         (i) the concentration of H_2S (in ppmv) measured in the representative fuel gas for each month of the reporting period, and

         (ii) any change in the type of fuel and tests or analyses performed.

      c. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if the limit in Condition 5.1 is exceeded, or if Conditions 5.1a or 5.1b are not met.

   5.2 Limit the fuel sulfur content to no more than 0.10 percent by weight in the fuel consumed in EUs 17 through 20, 24.

      a. Monitor the fuel sulfur content on a monthly basis as follows:

         (i) Obtain test results showing the sulfur content of the fuel from the supplier or refinery; the test results must include a statement signed by the supplier or refinery of what fuel they represent; or

         (ii) Test the fuel for sulfur content using an appropriate method listed in 18 AAC 50.035.

      b. Report the concentration of sulfur (in percent by weight) obtained under Condition 5.2a in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 for each month of the reporting period.

      c. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if the limit in Condition 5.2 is exceeded, or if Conditions 5.2a through 5.2b are not met.

Section 4 Owner Requested Limits to Avoid PSD Review under 18 AAC 50.306 and Classification under 18 AAC 50.502(c)

6. For the engines operated as EU 76, the Permittee shall avoid project classification under 18 AAC 50.306(a) and under 18 AAC 50.502(c)(3) by limiting the NOx emissions to no more than 9.9 tons per rolling 12-month period.

    6.1 The Permittee shall only install engines operated as EU 76 that correspond to the following categories:

        a. Non-tier engines less than or equal to 600 hp

        b. Non-tier engines greater than 600 hp

        c. Tier 1 engines greater than or equal to 300 hp

        d. Tier 2 engines greater than or equal to 300 hp

        e. Tier 3 engines greater than or equal to 300 hp and less than 750 hp

        f. Tier 4 engines greater than or equal to 300 hp and less than 750 hp

        g. Tier 4 engines greater than or equal to 750 hp

    6.2 Maintain a list of all engines operated as EU 76, including the horsepower and engine category.

        a. Include the current list in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50.

        b. Notify the Department in writing when an engine is added to or removed from the list.

        c. Report as a permit deviation as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if an engine operated as EU 76 does not belong to one of the engine categories identified in Condition 6.1.

    6.3 For each engine operated as EU 76, monitor and record the hours of operation as follows:

        a. Install and maintain a non-resettable hour meter on each engine.

        b. Record the hour meter reading at the beginning and end periods during which each engine operates.

        c. By the end of each calendar month, calculate and record the hours of operation for each engine during the previous calendar month.

    6.4 For each engine category of Condition 6.1, calculate the total horsepower-hours (hp-hr) as follows:

a. For each engine operated as EU 76, multiply the engine's horsepower by its hours of operation.

b. By the end of each calendar month, sum the horsepower-hours for each engine category of Condition 6.1 that contains engines operating as EU 76.

Table 2 – NOx Emission Factors (EFs) for Different Engine Categories

Engine Category	Horsepower	NOx EF (g/hp-hr)
Non-tier	≤ 600 hp	14.1
Non-tier	> 600 hp	10.9
Tier 1	≥ 300 hp	8.6
Tier 2	≥ 300 hp	5.6
Tier 3	300 ≤ hp ≤ 750	3.5
Tier 4	300 ≤ hp ≤ 750	0.38
Tier 4	≥ 750 hp	0.6

Table Notes:
EFs for non-tier engines are from AP-42 Tables 3.3-1 and 3.4-1
EFs for tier engines are the tiered emission standards * 1.25

6.5 The Permittee shall monitor NOx emissions as follows:

a. Calculate and record the monthly NOx emissions for each engine category using the total horsepower-hours of each engine category determined in Condition 6.4, the emission factors in Table 3, and the following equation:

$$NOx\left(\frac{tons}{mo}\right) = EF\left(\frac{g}{hp-hr}\right) * \ total\ hp\text{-}hr\ of\ category * 0.0022\left(\frac{lb}{g}\right) * \frac{ton}{2000\ lb}$$

b. Calculate the total monthly NOx emissions for EU 76 by summing the NOx emissions of each engine category determined in Condition 6.5a

c. By the end of each calendar month, calculate and record the rolling 12-month NOx emissions for EU 76.

6.6 Include the records and calculations required under Conditions 6.2 through 6.5 in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 for each month of the reporting period.

6.7 Report as excess emissions as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if any of the rolling 12-month emissions calculated under Condition 6.5c exceed the limit specified in Condition 6.

7. For the engines operated as EU 76, the Permittee shall avoid project classification under 18 AAC 50.306(a) and under 18 AAC 50.502(c)(3) by limiting the annual SO_2 emissions to no more than 0.12 tons by combusting only liquid fuel that meets the ULSD specifications (0.0015 percent sulfur by weight)

Monitor, record, and report as follows:

7.1 Obtain and keep certified receipts from fuel suppliers that confirm all diesel fuel combusted in the engines operated as EU 76 meets the specifications of ULSD.

7.2 Include in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 a statement indicating whether all fuel combusted in the engines operated as EU 76 during the reporting period is ULSD.

7.3 Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if any fuel combusted in the engines operated as EU 76 did not meet the ULSD specifications, or if Conditions 7.1 or 7.2 are not met.

8. For EU 77, the Permittee shall avoid project classification under 18 AAC 50.306(a) and under 18 AAC 50.502(c)(3) by limiting the NOx emissions to less than 9.6 tons per year by limiting the hours of operation to less than 1,400 hours per rolling 12-month period.

Monitor, record, and report as follows:

8.1 Install, maintain and operate a non-resettable hour meter on EU 77;

8.2 Record the hour meter reading for EU 77 on the last day of each month;

8.3 By the 15th day of each month, calculate and record:

a. the number of hours EU 77 operated during the previous month; if the meter is not operational assume continuous operation for that period;

b. the total number of hours EU 77 operated during the previous 12 month period;

8.4 Report in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 the values determined under Condition 8.3 for each month of the reporting period;

8.5 Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 whenever the operating hours for EU 77 exceeds the limit in Condition 8 in any consecutive 12-month period.

9. For EUs 25 and 26, the Permittee shall avoid project classification under 18 AAC 50.306(a) by limiting the total VOC emissions from the pilot, purge, and assist gas consumption to no more than 161 tons per year as follows:

   9.1 Limit the combined pilot, purge, and assist gas consumption in EUs 25 and 26 to no more than 1.48 million standard cubic feed per day (MMscf/day).

   9.2 Monitor and record the combined total daily pilot, purge, and assist gas rate for each calendar day.

   9.3 Include a copy of the records required by Condition 9.2 in each operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 for each month of the reporting period.

   9.4 Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 whenever the combined pilot, purge, and assist gas consumed in EUs 25 and 26 exceeds the limit in Condition 9.1.

Section 5 Conditions established in Permits 9773-AC011 Amendment 3 and 9573-AA029 carried forward, as revised by Construction/Operating Permit AQ0181TVP01

Best Available Controls Technology (BACT) Emission Limits for Combustion Turbines, EUs 1 through 10

10. **Turbine BACT Limits.** The Permittee shall not cause or allow emissions from the combustion turbines, EUs 1 through 10 to exceed the limits in Table 4 below.

    10.1 For EUs 1 through 10, monitor and record as described under the NSPS Subpart GG NOx Standard provisions listed in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50. Report as excess emissions and permit deviation as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if the short-term NOx BACT emission limits in Table 4 are exceeded.

    10.2 For EUs 1 through 9, to show continued compliance with the short-term CO BACT emission limits set out in Table 4, the Permittee shall keep records available for inspection, which demonstrate each turbine is maintained in good operating condition and in accordance with Hilcorp established guidelines and operating procedures.

    10.3 For EUs 1 through 10, monitor, record, and report as follows to demonstrate compliance with the applicable PM and SO_2 BACT limits.

        a. Submit an annual compliance certification report, as described by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50, indicating that each of these EUs fired only gas.

        b. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if any fuel is burned other than gas.

        c. Monitor and report in accordance with Conditions 5.1a and 5.1b to demonstrate compliance with the H_2S limit in Table 4.

        d. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if the H_2S limit in Table 4 is exceeded.

Table 3 – Combustion Turbine BACT Emission Limits

Pollutant	EU(s)	Make/Model	Tag No(s)	BACT Limit per Individual Turbine
NOx	1 & 2	Nuovo-Pignone Frame 5	GTRB-1510A GTRB-1510B	150 ppmvd at 15% O_2
	3	Nuovo-Pignone Frame 1	GTRB-1405	125 ppmvd at 15% O_2
	4 & 5	Ruston Tornado	GTRB-1802 GTRB-1907	157 ppmvd at 15% O_2
	6 through 9	Ruston Tornado	GTRB-E3-4501 GTRB-E3-4502 GTRB-E3-4503 GTRB-E3-4504	158 ppmvd at 15% O_2
	10	Nuovo-Pignone PGT-5	GTRB-E3-9210	125 ppmvd at 15% O_2
PM	1 through 10	All	All	10% opacity
SO_2	1 through 10	All	All	1,000 ppmv H_2S at any time for gas, and EUs 1 through 10 shall only burn gas fuel
CO	1 & 2	Nuovo-Pignone Frame 5	GTRB-1510A GTRB-1510B	109 lb/MMscf at 100% rated capacity
	3	Nuovo-Pignone Frame 1	GTRB-1405	
	4 through 9	Ruston Tornado	GTRB-1802 GTRB-1907 GTRB-E3-4501 GTRB-E3-4502 GTRB-E3-4503 GTRB-E3-4504	

Notes: 1) All turbine emission limits for NOx refer to full load ISO conditions.
2) All emission limitations are per individual unit unless otherwise noted.
3) In this table, lb/MMscf means pounds per million standard cubic feet, ppmv means parts per million volume, ppmvd means parts per million volume dry.

BACT Emission Limits for Heaters, EUs 11 through 15

11. The Permittee shall not cause or allow emissions from EUs 11 through 15 to exceed the limits in Table 5 below.

    11.1 For EUs 11 through 15, to show compliance with the short-term NOx and CO BACT emission limits set out in Table 5, the Permittee shall keep records available for inspection, which demonstrate each heater/boiler is maintained in good operating condition and in accordance with Hilcorp established guidelines and operating procedures.

    11.2 For EUs 11 through 15, monitor, record, and report as follows to demonstrate compliance with the applicable PM and SO_2 BACT limits.

    a. Submit an annual compliance certification report, as described by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50, indicating that each of these EUs fired only gas.

    b. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if any fuel is burned other than gas.

    c. Monitor and report in accordance with Conditions 5.1a and 5.1b to demonstrate compliance with the H_2S limit in Table 5.

    d. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if the H_2S limit in Table 5 is exceeded.

Table 4 – Heater BACT Emission Limits

Pollutant	EU(s)	Make/Model	Tag No(s)	BACT Limit per Individual Heater
NOx	11	Claudius Peters	H-3002	0.08 lb/MMBtu
	12	ENTECH	H-3031	
	13	Maloney Crawford Steel Fabrication, Inc.	H-3201	0.16 lb/MMBtu
	14	BS&B	H-V-E3-1401	
	15	CE NATCO	H-E3-1404	0.15 lb/MMBtu
PM	11 through 15	All	All	10% opacity
SO_2	11 through 15	All	All	1,000 ppmv H_2S at any time for gas, and EUs 11 through 15 shall only burn gas fuel
CO	11	Claudius Peters	H-3002	200 ppmv
	12	ENTECH	H-3031	0.035 lb/MMBtu
	13	Maloney Crawford Steel Fabrication, Inc.	H-3201	
	14	BS&B	H-V-E3-1401	
	15	CE NATCO	H-E3-1404	

Note: 1) All emission limits pertain to each individual unit, unless otherwise noted.
2) In this table, lb/MMBtu means pounds per million British thermal units.

BACT Emission Limits for Liquid Fuel-Fired Engines, EUs 17 through 20

12. The Permittee shall not cause or allow emissions from EUs 17 through 20 to exceed the limits in Table 6 below.

    12.1 To show compliance with the short-term NOx BACT emission limits set out in Table 6, the Permittee shall keep records, available for inspection, which demonstrate each engine is maintained in good operating condition and in accordance with Hilcorp established guidelines and operating procedures.

Table 5 – Engine BACT Emission Limits

Pollutant	EU(s)	Make/Model	Tag No(s)	BACT Limit per Individual Unit
PM	17 through 20	All	All	10% opacity
NOx	17 & 18	Fairbanks Morse Emergency Engine Generators	GNED-E3-4505 GNED-E3-4506	14.7 g/hp-hr
	19 & 20	Caterpillar D 3412 Emergency Engine Generators	PED-EO-4001 PED-EO-4002	

Note: 1) All emission limits pertain to each individual unit, unless otherwise noted.
2) In this table, g/hp-hr means grams per horsepower hour.

BACT Emission Limit for Flare, EUs 25 through 27

13. The Permittee shall not cause or allow emissions from EUs 25 through 27 to exceed the limit in Table 7 below.

    13.1 Monitor, record, and report as follows to demonstrate compliance with the PM and SO_2 BACT limits.

        a. Submit an annual compliance certification report, as described by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50, indicating that each of these EUs fired only gas.

        b. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if any fuel is burned other than gas.

        c. Monitor and report in accordance with Conditions 5.1a through 5.1b to demonstrate compliance with the H_2S limit in Table 7.

        d. Report as excess emissions and permit deviations as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if the H_2S limit in Table 7 is exceeded.

Table 6 – Flare BACT Emission Limits

Pollutant	EU	Make/Model	Tag No(s)	BACT Limit per Individual Unit
PM	25	GKM Birwelco LTD	H-1602 (HP)	20% opacity
SO_2	25	GKM Birwelco LTD	H-1602 (HP)	1,000 ppmv H_2S at any time for gas, and burn only gas fuel
	26	GKM Birwelco LTD	H-1602 (LP)	
	27	Haliburton	None	

Operating Limits, Emission Units 11, 17 through 20, and 24 through 27

14. The Permittee shall comply with the operating limits specified in Table 8 for EUs 11, 17 through 20, and 24 through 27.

    14.1 For EUs 11, 17 through 20, 24, and 27:

        a. Monitor and record the monthly operating time (hours).

        b. Calculate and record the consecutive 12-month summation of the total operating time (hours) for each of EUs 11, 17 through 20, 24, and 27, to determine compliance with the operating limits in Table 8.

        c. Report in the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 the data recorded under Conditions 14.1a and 14.1b.

    14.2 For flare EUs 25 and 26, monitor, record, and report as required by Condition 9.2 through 9.4.

    14.3 For portable flare EU 27:

        a. Monitor and record the total volume of gas flared (MMscf). Record the date, time and duration that EU 27 is operated.

        b. Include the records required by Condition 14.3a with the operating report required by the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 for each month of the reporting period.

    14.4 Report as excess emissions as described in the applicable operating permit issued for the stationary source under AS 46.14 and 18 AAC 50 if a fuel consumption or operating limit specified in Table 8 is exceeded.

Table 7 – Operating Limits[a]

EU	Operating Limit(s) Per Individual Unit
11	194 days (4,656 hrs) per rolling 12-month period
17 & 18	504 hours per rolling 12-month period
19 & 20	200 hours per rolling 12-month period
24	400 hours per rolling 12 month period (this is an owner requested limit)
25 & 26	Pilot, purge and assist rate not to exceed 1.48 MMscf per calendar day (combined total for both units)
27	Total annual flare volume for Emission Unit 27 not to exceed 208.3 MMscf per rolling 12-month period
	200 hours per rolling 12-month period

[a]Operating limits pertain to each individual unit, unless otherwise noted.

Section 6 Recordkeeping, Reporting, and Certification Requirements

15. **Certification.** The Permittee shall certify any permit application, report, affirmation, or compliance certification submitted to the Department and required under the permit by including the signature of a responsible official for the permitted stationary source following the statement: "Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete." Excess emissions reports must be certified either upon submittal or with an operating report required for the same reporting period. All other reports and other documents must be certified upon submittal.

    15.1 The Department may accept an electronic signature on an electronic application or other electronic record required by the Department if

        a. A certifying authority registered under AS 09.25.510 verifies that the electronic signature is authentic; and

        b. The person providing the electronic signature has made an agreement with the certifying authority described in Condition 15.1a that the person accepts or agrees to be bound by an electronic record executed or adopted with that signature.

16. **Submittals.** Unless otherwise directed by the Department or this permit, the Permittee shall send an original version of reports, compliance certifications, and other submittals required by this permit to ADEC, Air Permits Program, 610 University Ave., Fairbanks, AK 99709-3643, ATTN: Compliance Technician. The Permittee may, upon consultation with the Compliance Technician regarding software compatibility, provide electronic copies of data reports, emission source test reports, or other records under a cover letter certified in accordance with Condition 15.

Section 7 Standard Permit Conditions

17. The Permittee must comply with each permit term and condition. Noncompliance with a permit term or condition constitutes a violation of AS 46.14, 18 AAC 50, and, except for those terms or conditions designated in the permit as not federally enforceable, the Clean Air Act, and is grounds for

    17.1 an enforcement action; or

    17.2 permit termination, revocation and reissuance, or modification in accordance with AS 46.14.280.

18. It is not a defense in an enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with a permit term or condition.

19. Each permit term and condition is independent of the permit as a whole and remains valid regardless of a challenge to any other part of the permit.

20. The permit may be modified, reopened, revoked and reissued, or terminated for cause. A request by the Permittee for modification, revocation and reissuance, or termination or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

21. The permit does not convey any property rights of any sort, nor any exclusive privilege.

Section 8 General Source Test Requirements

22. **Requested Source Tests.** In addition to any source testing explicitly required by this permit, the Permittee shall conduct source testing as requested by the Department to determine compliance with applicable permit requirements.

23. **Operating Conditions.** Unless otherwise specified by an applicable requirement or test method, the Permittee shall conduct source testing

    23.1 at a point or points that characterize the actual discharge into the ambient air; and

    23.2 at the maximum rated burning or operating capacity of the source or another rate determined by the Department to characterize the actual discharge into the ambient air.

24. **Reference Test Methods.** The Permittee shall use the following references for test methods when conducting source testing for compliance with this permit:

    24.1 Source testing for the reduction in visibility through the exhaust effluent must be conducted in accordance with the procedures set out in 40 C.F.R. 60, Appendix A, Reference Method 9. The Permittee may use the form in Attachment 1 of this permit to record data.

    24.2 Source testing for emissions of total particulate matter, sulfur compounds, nitrogen compounds, carbon monoxide, lead, volatile organic compounds, fluorides, sulfuric acid mist, municipal waste combustor organics, metals and acid gases must be conducted in accordance with the methods and procedures specified in 40 C.F.R. 60, Appendix A.

    24.3 Source testing for emissions of PM-10 must be conducted in accordance with the procedures specified in 40 C.F.R. 51, Appendix M, Methods 201 or 201A and 202.

    24.4 Source testing for emissions of any contaminant may be determined using an alternative method approved by the Department in accordance with 40 C.F.R. 63 Appendix A, Method 301.

25. **Test Deadline Extension.** The Permittee may request an extension to a source test deadline established by the Department. The Permittee may delay a source test beyond the original deadline only if the extension is approved in writing by the Department's appropriate division director or designee.

26. **Test Plans.** Before conducting any source tests, the Permittee shall submit a plan to the Department. The plan must include the methods and procedures to be used for sampling, testing, and quality assurance, and must specify how the emissions unit will operate during the test and how the Permittee will document that operation. The Permittee shall submit a complete test plan at least 30 days before the scheduled date of any test unless the Department agrees in writing to some other time period. Retesting may be done without resubmitting the plan.

27. **Test Notification.** At least 10 days before conducting a source test, the Permittee shall give the Department written notice of the date and time the source test will begin.

28. **Test Reports.** Within 60 days after completing a source test, the Permittee shall submit one certified copy of the results in the format set out in the *Source Test Report Outline*, adopted by reference in 18 AAC 50.030. The Permittee shall certify the results as set out in Condition 15. If requested in writing by the Department, the Permittee must provide preliminary results in a shorter period of time specified by the Department.

Section 9 Permit Documentation

Date	Document Details
June 28, 2018	Application Received

Attachment 1 – Visible Emissions Form

VISIBLE EMISSION OBSERVATION FORM

This form is designed to be used in conjunction with EPA Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources." Temporal changes in emission color, plume water droplet content, background color, sky conditions, observer position, etc. should be noted in the comments section adjacent to each minute of readings. Any information not dealt with elsewhere on the form should be noted under additional information. Following are brief descriptions of the type of information that needs to be entered on the form: for a more detailed discussion of each part of the form, refer to "Instructions for Use of Visible Emission Observation Form." https://www3.epa.gov/ttnemc01/methods/webinar8.pdf

- Source Name: full company name, parent company or division or subsidiary information, if necessary.
- Address: street (not mailing or home office) address of facility where VE observation is being made.
- Phone (Key Contact): number for appropriate contact.
- Source ID Number: number from NEDS, agency file, etc.
- Process Equipment, Operating Mode: brief description of process equipment (include type of facility) and operating rate, % capacity, and/or mode (e.g. charging, tapping, shutdown).
- Control Equipment, Operating Mode: specify type of control device(s) and % utilization, control efficiency.
- Describe Emission Point: for identification purposes, stack or emission point appearance, location, and geometry; and whether emissions are confined (have a specifically designed outlet) or unconfined (fugitive).
- Height Above Ground Level: stack or emission point height relative to ground level; can use engineering drawings, Abney level, or clineometer.
- Height Relative to Observer: indicate height of emission point relative to the observation point.
- Distance from Observer: distance to emission point; can use rangefinder or map.
- Direction from Observer: direction plume is traveling from observer.
- Describe Emissions and Color: include physical characteristics, plume behavior (e.g., looping, lacy, condensing, fumigating, secondary particle formation, distance plume visible, etc.), and color of emissions (gray, brown, white, red, black, etc.). Note color changes in comments section.
- Visible Water Vapor Present?: check "yes" if visible water vapor is present.
- If Present, is Plume…: check "attached" if water droplet plume forms prior to exiting stack, and "detached" if water droplet plume forms after exiting stack.
- Point in Plume at Which Opacity was Determined: describe physical location in plume where readings were made (e.g., 1 ft above stack exit or 10 ft. after dissipation of water plume).
- Describe Plume Background: object plume is read against, include texture and atmospheric conditions (e.g., hazy).
- Background Color: sky blue, gray-white, new leaf green, etc.
- Sky Conditions: indicate cloud cover by percentage or by description (clear, scattered, broken, overcast).
- Wind Speed: record wind speed; can use Beaufort wind scale or hand-held anemometer to estimate.
- Wind Direction From: direction from which wind is blowing; can use compass to estimate to eight points.
- Ambient Temperature: in degrees Fahrenheit or Celsius.

  Wet Bulb Temperature: can be measured using a sling psychrometer

  RH Percent: relative humidity measured using a sling psychrometer; use local US Weather Bureau measurements only if nearby.
- Source Layout Sketch: include wind direction, sun position, associated stacks, roads, and other landmarks to fully identify location of emission point and observer position.

  Draw North Arrow: to determine, point line of sight in direction of emission point, place compass beside circle, and draw in arrow parallel to compass needle.

  Sun's Location: point line of sight in direction of emission point, move pen upright along sun location line, mark location of sun when pen's shadow crosses the observer's position.
- Observation Date: date observations conducted.
- Start Time, End Time: beginning and end times of observation period (e.g., 1635 or 4:35 p.m.).
- Data Set: percent opacity to nearest 5%; enter from left to right starting in left column. Use a second (third, etc.) form, if readings continue beyond 30 minutes. Use dash (-) for readings not made; explain in adjacent comments section.

  Comments: note changing observation conditions, plume characteristics, and/or reasons for missed readings.

  Range of Opacity: note highest and lowest opacity number.
- Observer's Name: print in full.

  Observer's Signature, Date: sign and date after performing VE observation.
- Organization: observer's employer.

Certified By, Date: name of "smoke school" certifying observer and date of most recent certification.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR QUALITY DIVISION - VISIBLE EMISSIONS OBSERVATION FORM

Page No._____

Source Name	Type of Source			Observation Date			Start Time		End Time
Address				Sec / Min	0	15	30	45	Comments
				1					
City	State	Zip		2					
Phone # (Key Contact)		Source ID Number		3					
Process Equipment		Operating Mode		4					
Control Equipment		Operating Mode		5					
Describe Emission Point				6					
Height above ground level	Height relative to observer	Inclinometer Reading		7					
Distance From Observer		Direction From Observer		8					
		Start	End						
Describe Emissions & Color				9					
Start		End							
Visible Water Vapor Present? If yes, determine approximate distance from the				10					
No Yes stack exit to where the plume was read									
Point in Plume at Which Opacity Was Determined				11					
Describe Plume Background		Background Color		12					
Start		Start							
End		End		13					
Sky Conditions: Start				14					
Wind Speed		Wind Direction From		15					
		Start	End						
Ambient Temperature		Wet Bulb Temp	RH percent	16					
NOTES: 1 Stack or Point Being Read		2 Wind Direction From		17					
3 Observer Location 4 Sun Location 5 North Arrow 6 Other Stacks				18					
				19					
				20					
				21					
				22					
				23					
				24					
				25					
				26					
				27					
				28					
				29					
				30					
				Range of Opacity					
				Minimum			Maximum		
I have received a copy of these opacity observations				Print Observer's Name					
Print Name:				Observer's Signature			Date		
Signature:									
Title		Date		Organization					
				Certified By:			Date		

Attachment 2 – Sample Fuel Consumption Monitoring Plan

Sample Fuel Consumption Monitoring Plan

Purpose

To monitor and record daily fuel consumed in rig diesel-fired equipment.

Scope

This Plan covers drilling rigs' emissions units powered with diesel fuel. It does not cover fuel consumed by individual vehicles or ancillary equipment.

Roles and Responsibilities

Role	Responsibilities
Toolpusher	**Daily** Ensure all diesel-fired equipment has one of the following methods in place to track daily fuel usage; 1. Metering; 2. Tank strapping; or 3. Operational hours tracking **Fuel Delivery Tracking** Ensure all fuel usage is tracked on the "daily fuel usage report" Ensure this plan is understood and carried out by operating personnel. Be knowledgeable of current permit requirements pertaining to fuel consumption monitoring and recording. Assign competent personnel to record consumed fuel of stipulated diesel fired equipment. Ensure correct and consistent fuel consumption monitoring and recording. Keep fuel use logs on location. Submit reports as requested to the Company Representative Review recording process with assigned personnel periodically. Use Management of Change process for all design, usage or process modifications involving diesel fired equipment.
Assigned Personnel	Be knowledgeable of current permit requirements pertaining to fuel consumption monitoring and recording.

Role	Responsibilities
	Be knowledgeable and competent to perform task of recording daily operational hours and consumed fuel of all diesel fired equipment. Keep accurate records. Immediately report any failure of measurement devices.
HSE Manager	Develop and Maintain Fuel Consumption Procedure Assist in monitoring and communicating fuel usage to Operators Respond to questions and concerns from Field Personnel
HSE Administrative Assistant	Receive Daily Fuel Use Logs Maintain Fuel Use Logs Prepare quarterly a table of daily fuel use by rig and transmit this to Company Environmental Coordinator

Procedure/Requirements

1. Assigned Personnel shall monitor daily drill rig fuel use in all rig engines, heaters, and boilers using the methods below and will provide the HSE Administrative Assistant the daily fuel usage reports at the end of each month.
2. Fuel usage monitoring and recordkeeping (if using equipment fuel flow meters)
    a. Record on daily fuel usage report the equipment fuel flow meter reading and the time reading was taken.
    b. Calculate and record on the daily fuel usage report daily fuel use by subtracting previous day's meter reading from today's.
3. Fuel usage monitoring and recordkeeping (if strapping)
    a. For each tank being strapped, record on daily fuel usage report the fuel height and time of daily reading.
    b. On days where fuel is delivered into the tank, record the height on the daily fuel log before the delivery and after the delivery with a note that these additional heights are recorded due to a fuel delivery. The fuel consumption for that day may be determined using the pre-delivery height reading or by taking and recording one at the end of the day. Thus, for the following day use the post-delivery height reading or the end of the day height reading as appropriate.
    c. Document the method of volume calculation from height in inches to gallons (conversion chart, site glass, calculation), keep the conversion chart on location.
4. Fuel usage monitoring and recordkeeping where daily deliveries are made to rig tank(s)

a. If the deliveries are metered, record metered volume on daily fuel usage report. This is the amount assumed to be consumed by rig equipment.

b. If the deliveries are not metered, record initial and final fuel height readings in the receiving tank(s) and use this to calculate the volume delivered. Record this on the daily fuel usage report as the amount assumed to be consumed.

c. Generally, tanks should be filled to a similar level each day.

5. Fuel usage monitoring and recordkeeping (no metering or strapping)

   a. Ensure affected equipment has a non-resettable hour meter installed

   b. Using Excel, for each piece of equipment on the rig, create a table with columns labeled Date, Time, Equipment Maximum Fuel Consumption Rate Per Hour, Hours Operated, Fuel Consumed (maximum fuel consumption rate per hour x hours operated). Each row on the table will be a separate calendar day. Use separate tabs for each piece of equipment; label the tabs with the equipment ID.

   c. Create a summary tab that contains a table with rows representing each day. Label the first column Date and the second column Total Rig Fuel Consumed. Set up each cell in the second column to sum the daily Fuel Consumed from each individual equipment tab.

6. HSE Administrative Assistant will transmit to Company Environmental Coordinator within one week of the end of each calendar quarter a table of daily rig fuel consumption over that calendar quarter.

Technical Analysis Report

For the Terms and Conditions of
Minor Permit AQ0181MSS10

Issued to Hilcorp Alaska, LLC

For the Endicott Production Facility

Alaska Department of Environmental Conservation
Air Permits Program

Prepared by Brittany Crutchfield

Final – September 6, 2018

1. INTRODUCTION

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Permit AQ0181MSS10 to Hilcorp Alaska, LLC (Hilcorp) for the Endicott Production Facility (Endicott). Hilcorp requested the permit under 18 AAC 50.508(6) in order to rescind conditions for drilling and drill rigs in Minor Permit AQ0181MSS09 and replace them with conditions for the Minor General Permit for Oil or Gas Drilling Rigs (MG-2) or simply remove the conditions should the MG-2 be issued prior to this permit's issuance. The Department will rescind Minor Permit AQ0181MSS09 with the issuance of this minor permit. This TAR only provides the basis for the revisions made in this permitting action.

2. STATIONARY SOURCE DESCRIPTION AND PERMIT HISTORY

Endicott is an existing offshore oil and gas production facility located in the Beaufort Sea about 37 miles from Prudhoe Bay. Endicott was originally permitted under the Department's Prevention of Significant Deterioration (PSD) program in 1984. The permit authorized the operation of emissions units (EUs) located on the Main Production Island (MPI), the Satellite Drilling Island (SDI), and a temporary Construction Camp (CC).[1] The past owners have made various changes to the stationary source over time, which frequently lead to additional permits or permit revisions. Hilcorp currently operates Endicott under Minor Permit AQ0181MSS09 and Operating Permit AQ0181TVP02 Revision 2 (Rev. 2). Minor Permit AQ0181MSS09 replaced and rescinded Construction Permit AQ0181CPT07 Rev. 1 and Minor Permits AQ0181MSS04 Rev. 1, AQ0181MSS06, AQ0181MSS07, and AQ0181MSS08.

Minor Permit AQ0181MSS04 authorized the concurrent operation of two drilling rigs, and revised various conditions established in previous air quality control permits. It also carried forward a flare limit that was originally imposed in Permit to Operate 9573-AA029 in January 1997. The limit restricted the amount of pilot and purge gas that could be burned by the high pressure flare (EU 25) and the low pressure flare (EU 26) to a combined total of 1.17 million standard cubic feet of gas per day (MMscf/day). The original basis for the condition is not explicitly stated, but it appears that the Department imposed the limit as a means for determining the potential emissions.

Minor Permit AQ0181MSS06 authorized the operation of additional backup generators (EU 76); and Minor Permit AQ0181MSS07 authorized the operation of a mud pump (EU 77). Minor Permit AQ0181MSS08 disaggregated SDI from MPI, and rescinded Construction Permit AQ0181CPT06 Revision 6.[2] Hilcorp stated in their application for Minor Permit AQ0181MSS08 that they were not pursuing the Liberty Project with the "Liberty Drill Rig" and "Liberty turbine" (EU 10A) – as authorized in Construction Permit AQ0181CPT06 Revision 6. Hilcorp further stated that EU 10A was never installed, and that the EUs on SDI have either been abandoned in place or removed.

[1] A third island, known as Endeavor Island, is located a couple of hundred feet north of MPI. It is connected to MPI by a cause-way and has structures, but no EUs.

[2] Construction Permit AQ0181CPT06 authorized the "Liberty Development Project" – as proposed by BP Exploration (Alaska), Inc. (BPXA) in 2008. The Department issued several permit revisions per BPXA request, prior to transferring the permit to Hilcorp in November 2014 (Construction Permit AQ0181CPT06 Revision 6).

Minor Permit AQ0181MSS09 authorized an increase to a flare limit in Minor Permit AQ0181MSS04 Rev. 1. Hilcorp also asked the Department to consolidate all of the active minor permits for Endicott into a single minor permit, in order to minimize confusion and simplify permit management. Minor Permit AQ0181MSS09 incorporates the revision requested by Hilcorp and also consolidates the terms and conditions of Minor Permits AQ0181MSS04 Rev. 1, AQ0181MSS06, AQ0181MSS07, and AQ0181MSS08. It also consolidates the terms and conditions of Construction Permit AQ0181CPT07 Rev. 1, which revised various Best Available Control Technology (BACT) terms and ambient air conditions in Minor Permit AQ0181MSS04.

3. APPLICATION DESCRIPTION

Hilcorp submitted an application on June 25, 2018 to revise Minor Permit AQ0181MSS09 to remove all drilling conditions and drill rigs and to incorporate provisions from the MG-2 for Routine Infill Drilling at a Collocated Well Pad into the permit. Hilcorp also requested a sunset clause for the incorporated MG-2 conditions to allow for POGO operations, and to remove a condition specifying that incinerators or flares are not authorized to operate in conjunction with drilling activities. Additionally, Hilcorp requested removal of the existing drilling conditions should the MG-2 be available during the period in which this permit is processed.

4. CLASSIFICATION FINDINGS

Based on the review of the application, the Department finds that Minor Permit AQ0181MSS10 is classified under:

1. 18 AAC 50.508(6) to revise or rescind terms and conditions of a Title I permit.

5. APPLICATION REVIEW FINDINGS

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

1. Hilcorp's minor permit application contains the required elements listed in 18 AAC 50.540;
2. The project only regards the transportable drilling rig emission units;
3. EUs 69 through 74 were removed from Condition 7.2 in Minor Permit AQ0181MSS09 as they were included as boilers and heaters in the approved transportable drilling rigs emission unit inventory in that minor permit.
4. The Department removed Condition 3 of Minor Permit AQ0181MSS09 as adding an incinerator or flare would be subject to permitting requirements under 18 AAC 50, therefore a condition to prohibit their operation is unnecessary.
5. The Department corrected the calculations assessable emissions from Minor Permit AQ0181MSS09 using the emission unit information provided in the applications for Operating Permits AQ0181TVP02 and AQ0181TVP03.
6. Hilcorp originally requested that the minor permit be incorporated via administrative amendment under 18 AAC 50.326(c)(2) to revise the Title V operating permit before they can operate under this permit. However, the Department is currently processing the July 2017 renewal application for Endicott (Application AQ0181TVP03). Amending the renewal application with a request to remove the drilling conditions would provide

adequate basis for establishing a Title V application shield. Hilcorp may operate under the application shield once the renewal application has been amended.

6. EMISSIONS SUMMARY AND PERMIT APPLICABLITY

Table 1 shows the emissions summary and permit applicability with the assessable emissions from the stationary source. Emission factors and detailed calculations are provided in Appendix A.

A summary of the potential to emit (PTE) and assessable PTE, as determined by the Department is shown in Table 1 below.

Table 1 – Emissions Summary and Permit Applicability, tons per year (tpy)

Parameter	NOx	CO	VOC	PM-2.5[a]	PM-10	SO_2
PTE before Modification[b]	3,374.0	943.3	103.9	60.5	60.5	537.4
PTE after Modification	3370.5	922.4	102.5	60.1	60.1	537.2
Change in PTE	-3.5	-20.9	-1.4	-0.4	-0.4	-0.2
18 AAC 50.502(c)(3) Permit Thresholds	10	N/A	N/A	10	10	10
502(c)(3) Applicable?	N	N/A	N/A	N	N	N
Title V Permit Thresholds	100	100	100	100	100	100
Title V Permit Required?	Y	Y	Y	N	N	Y
Assessable Emissions [c] [d]	3,371	922	103	0[e]	60	537
Total Assessable	4,993					

Table Notes:

[a] – Hilcorp conservatively assumed the fine particulate matter (PM-2.5) emissions are equal to the coarse particulate matter (PM-10) emissions.

[b] – PTE before modification is from the permit applications for Operating Permits AQ0181TVP02 and AQ0181TVP03. PTE listed in this table does not include nonroad engines.

[c] – Assessable emissions include fugitive emissions.

[d] – Assessable emissions include any pollutant greater than or equal to 10 tpy.

[e] – Assessable emissions does not include PM-2.5 as they are included in the PM-10 emissions.

7. REVISIONS TO PERMIT CONDITIONS

Table 2 below lists the requirements carried over from Minor Permit AQ0181MSS09 into Minor Permit AQ0181MSS10.

Table 2 – Comparison of Conditions in AQ0181MSS09 to Conditions in AQ0181MSS10[3]

Permit AQ0181MSS09 Condition No.	Description of Requirement	Permit AQ0181MSS10 Condition No.	How Condition was Revised
Table 2	Transportable Drilling Rig Emission Units	None	Table was removed.
1 and 3	Incinerator and flare operating restrictions	None	Condition was removed.
5.1	Assessable potential to emit.	3.1	Revised to reflect the increase in emissions from this permitting action.
7.2	Fuel sulfur ambient air quality limit.	5.2	Revised to remove reference to EUs 69 through 74.
7.3, 7.4, 8 and sub conditions	Drilling rig ambient air quality conditions.	None	Conditions were removed.

8. PERMIT CONDITIONS

The bases for the standard and general conditions imposed in Minor Permit AQ0181MSS010 are described below. The new conditions established in Minor Permit AQ0181MSS10 are also described below.

Cover Page

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

Section 1: Emissions Unit Inventory

Minor Permit AQ0181MSS10 does not authorize the construction and operation of new EUs. All of the EUs listed in Table 1 have already been installed at the stationary source. The Department has likewise previously authorized the transportable drilling rigs listed in Table 2. However, Table 2 has been removed to reflect the removal of the previously authorized drill rigs.

Except as noted elsewhere in this permit, the information in Table 1 is for identification purposes only. Condition 1 is a general requirement to comply with AS 46.14 and 18 AAC 50 when installing a replacement EU.

[3] This table does not include all standard and general conditions

Section 2: Emission Fees

18 AAC 50.544(a)(2) requires the Department to include a requirement to pay fees in accordance with 18 AAC 50.400 – 18 AAC 50.499 in each minor permit issued under 18 AAC 50.542. The Department used the Standard Permit Condition I language for Minor Permit AQ0181MSS10.

Section 6: Recordkeeping, Reporting, and Certification Requirements

Condition 15, Certification

18 AAC 50.205 requires the Permittee to certify any permit application, report, affirmation, or compliance certification submitted to the Department. This requirement is reiterated as a standard permit condition in 18 AAC 50.345(j). Minor Permit AQ0181MSS10 uses the standard condition language, but also expands it by allowing the Permittee to provide electronic signatures.

Condition 16, Submittals

Condition 16 clarifies where the Permittee should send their reports, certifications, and other submittals required by the permit. The Department included this condition from a practical perspective rather than a regulatory obligation.

Section 7: Standard Permit Conditions

Conditions 17 - 21, Standard Permit Conditions

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

The Department included subparts (c)(1) and (2) as Condition 17, and subparts (d) through (g) as Conditions 18 through 21, respectively. The Department incorporated subpart (j) as Condition 15, as previously stated in the Section 6 discussion. The Department did not include the remaining subparts since those provisions are adequately addressed by the Title V operating permit.

APPENDIX A: EMISSIONS CALCULATIONS

Table A-1 presents details of the EUs, their characteristics, and emissions. Potential emissions are estimated using maximum annual operation for all fuel burning equipment as defined in 18 AAC 50.990(39) subject to any operating limits.

Table A-1 – Emissions Summary, in Tons Per Year (TPY)

EU ID	Description	Operational Limit	NOx		CO		VOC		PM		SO_2
			EF	PTE	EF	PTE	EF	PTE	EF	PTE	PTE
1	Gas-fired Main Gas Compressor Turbines		150 ppmvd[1]	918.2	109 lb/MMscf[1]	197.7	0.0021 lb/MMBtu[2]	3.4	0.0066 lb/MMBtu[2]	10.8	129.9[3]
2				918.2		197.7		3.4		10.8	129.9[3]
3	Gas-fired NGL Compressor Turbine		125 ppmvd[1]	114.9	109 lb/MMscf[1]	29.7	0.0021 lb/MMBtu	0.5	0.0066 lb/MMBtu	1.6	19.5[3]
4	Gas-fired Water Injection Pump Turbines		157 ppmvd[1]	181.2	109 lb/MMscf[1]	37.3	0.0021 lb/MMBtu	0.6	0.0066 lb/MMBtu	2.0	24.5[3]
5				181.2		37.3		0.6		2.0	24.5[3]
6	Gas-fired Generator Turbines		158 ppmvd[1]	187.3	109 lb/MMscf[1]	38.3	0.0021 lb/MMBtu	0.7	0.0066 lb/MMBtu	2.1	25.2[3]
7				187.3		38.3		0.7		2.1	25.2[3]
8				187.3		38.3		0.7		2.1	25.2[3]
9				187.3		38.3		0.7		2.1	25.2[3]
10	Gas-fired MI Compressor Turbine		125 ppmvd[1]	140.4	0.082 lb/MMBtu[2]	24.6	0.0021 lb/MMBtu[2]	0.6	0.0066 lb/MMBtu[2]	2.0	23.8[3]
11	Gas-fired Utility / Process Heater	4,656 hr/yr	0.08 lb/MMBtu[1]	18.2	200 ppmw[1]	29.3	5.5 lb/MMscf[4]	1.4	7.6 lb/MMscf[4]	1.9	34.0[3]

12	Gas-fired Building Heat Medium Heater		0.08 lb/MMBtu[1]	14.2	0.035 lb/MMBtu[1]	6.2	5.5 lb/MMscf[4]	1.1	7.6 lb/MMscf[4]	1.5	14.1[3]
14	Gas-fired TEG Reboiler		0.16 lb/MMBtu[1]	4.9	0.035 lb/MMBtu[1]	1.1	5.5 lb/MMscf[4]	0.2	7.6 lb/MMscf[4]	0.3	2.4[3]
15	Gas-fired Natural Gas Liquid Reboiler		0.15 lb/MMBtu[1]	17.7	0.035 lb/MMBtu[1]	4.1	5.5 lb/MMscf[4]	0.7	7.6 lb/MMscf[4]	1.0	9.4[3]
17	Liquid fuel-fired Emergency Generators	504 hr/yr	14.7 g/hp-hr[1]	34.0	0.0055 lb/hp-hr[5]	5.8	0.00071 lb/hp-hr[5]	0.7	0.0573 lb/MMBtu[6]	0.4	0.8[3]
18		504 hr/yr		34.0		5.8		0.7		0.4	0.8[3]
19	Liquid fuel-fired Emergency Generators	200 hr/yr	14.7 g/hp-hr[1]	2.4	0.0055 lb/hp-hr[5]	0.4	0.00071 lb/hp-hr[5]	0.05	0.053 g/s[7]	0.04	0.0008[3]
20		200 hr/yr		2.4		0.4		0.05		0.04	0.0008[3]
24	Liquid fuel-fired Emergency Fire Water Pump	400 hr/yr	0.031 lb/hp-hr[8]	0.8	0.0068 lb/hp-hr[8]	0.2	0.0024 lb/hp-hr[8]	0.1	0.0022 lb/hp-hr[8]	0.1	0.0[3]
25	High Pressure Flare	1.2 MMscfd	0.068 lb/MMBtu[9]	13.1	0.37 lb/MMBtu[10]	71.4	0.14 lb/MMBtu[10]	27.0	40 µg/L[10]	4.2	15.3[3]
26	Low Pressure Flare										
27	Portable Flare	205 MMscf/yr		6.4		34.8		13.2		2.0	7.4[3]
75	Gasoline Dispensing Facility			0.0		0.0	24 lb/kgal[11]	14.4		0.0	0.0[3]
76	Backup Diesel Generators		0.031 lb/hp-hr[8]	9.9	0.0068 lb/hp-hr[8]	83.4	0.0024 lb/hp-hr[8]	30.3	0.0022 lb/hp-hr[8]	9.9	0.1[3]
77	Diesel Mud Pump	1,400 hr/yr	0.031 lb/hp-h[8]r	9.2	0.0068 lb/hp-hr[8]	2.0	0.0024 lb/hp-hr[8]	0.7	0.0022 lb/hp-hr[8]	0.7	0.0[3]
TOTALS (TPY)			**3,370.5**		**922.4**		**102.5**		**60.1**		**537.2**

Table Notes:
[1]BACT Limit
[2]AP-42, Table 3.1-2a

[3]SO_2 emissions based on permit limits for fuel sulfur content.
[4]AP-42, Table 1.4-2
[5]AP-42, Table 3.4-1
[6]AP-42, Table 3.4-2
[7]Vendor Data
[8]AP-42, Table 3.3-1
[9]AP-42, Table 3.4-2
[10]AP-42, Table 13.5-1
[11]AP-42, Table 5.2-7

Hilcorp
Alaska, LLC

ATTACHMENT D

Endicott Production Facility Short-Term H_2S Limit Increase
Air Quality Permit Application
Modeling Files (Provided Electronically)

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