AECOM
1601 Prospect Parkway
Fort Collins, Colorado 80525

970-493-8878 tel
970-493-0213 fax

December 30, 2013

Bridget Psarianos
Planning and Environmental Specialist
BLM - Alaska State Office
bpsarianos@blm.gov
(907) 271-4208

Subject: Response to Comments Received on the Air Quality Impact Analysis for Greater Mooses Tooth 1 Alternative A

Dear Bridget:

AECOM received 12 sets of comments from the Greater Mooses Tooth 1 (GMT1) Air Quality Memorandum of Understanding (MOU) Air Modeling Working Group (AMWG) participants. These comments are related to a review of the emissions inventory (EI), modeling protocol, the Alternative A ambient air quality impact analysis (AQIA), and the dispersion modeling output files supporting both the near- and far-field AQIA. With the exception of the two comments received from USEPA Region 10 on the EI, the attachments to this letter respond to each set of comments separately. The following table summarizes the comments received and the corresponding attachment to this letter where the response can be found.

Att.	Date Rec'd	Author	Agency	Commenting on	Document Title
A	9/30/2013	Alan Peck	BLM	Protocol	Comment Table AQ Modeling Protocol_Peck 20130925.docx
B	11/1/2013	Craig Nicholls	BLM	Protocol	NPR-A AQ Modeling Protocol comments-nicholls.docx
C	11/1/2013	Herman Wong	R10	Protocol	V1-Summary of Comments on Microsoft Word - AQ Impact Assessment Greater Mooses Tooth 09182013.pdf
D	10/31/2013	Herman Wong	R10	AQIA	Sum of Comments=HW1@CPAI_GMT1_AQIA_18-OCT-2013.pdf
E	11/4/2013	Deanna Huff	ADEC	AQIA	CPAI_GMT1_AQIA_18-OCT-2013_dmh.pdf
F	11/5/2013	Julie Wroble	R10	AQIA	JW@CPAI_GMT1_AQIA_18-OCT-2013_jw (2).pdf
G	11/17/2013	Herman Wong	R10	AQIA	EMAIL: Review of Near Field AERMOD Input Files 17-NOV-2013.pdf
H	11/26/2013	Craig Nicholls	BLM	AQIA	CPAI-GMT AQIA comments-nicholls.docx
I	11/5/2013	Tim Allen	USFWS	Long Range Modeling	EMAIL: Preliminary thoughts on GMT1 Far-Field analysis
J	11/23/2013	John Notar	NPS	Long Range Modeling	EMAIL: NPS Comments on GMT1 Project 23-NOV-2013.pdf
K	10/31/2013	Meredith Bond	USFWS	EI	EMAIL: clarification questions about GMT1 EI spreadsheet calculation details
NA[1]	11/7/2013	Zach Hedgpeth	R10	EI	EMAIL: Two initial EI comments.pdf

[1] The response to this comment is being developed.

Once the responses are distributed, please don't hesitate to let us know if additional information or clarifications are required.

Sincerely,

Thomas Damiana
Air Quality Engineer/Meteorologist
Tel. (970) 530-3465
thomas.damiana@aecom.com

Amanda MacNutt
Air Quality Meteorologist
Tel. (978) 905-2297
Amanda.Macnutt@aecom.com

cc: Lynn DeGeorge (ConocoPhillips Alaska, Inc.)
Brad Thomas (ConocoPhillips Alaska, Inc.)
Alan Peck (BLM Alaska)
Jessica Stark (SLR International)

Attachment:

A - Response to 'Comment Table AQ Modeling Protocol_Peck 20130925.docx' from Alan Peck (BLM)

B - Response to 'NPR-A AQ Modeling Protocol comments-nicholls.docx' from Craig Nicholls (BLM)

C - Response to 'V1-Summary of Comments on Microsoft Word - AQ Impact Assessment Greater Mooses Tooth 09182013.pdf' from Herman Wong (R10)

E - Response to 'CPAI_GMT1_AQIA_18-OCT-2013_dmh.pdf' from Deanna Huff (ADEC)

F - Response to 'JW@CPAI_GMT1_AQIA_18-OCT-2013_jw (2).pdf' from Julie Wroble (R10)

G - Response to 'EMAIL: Review of Near Field AERMOD Input Files 17-NOV-2013.pdf' from Herman Wong (R10)

H - Response to 'CPAI-GMT AQIA comments-nicholls.docx' from Craig Nicholls (BLM)

I - Response to 'EMAIL: Preliminary thoughts on GMT1 Far-Field analysis' from Tim Allen (USFWS)

J - Response to 'EMAIL: NPS Comments on GMT1 Project 23-NOV-2013.pdf' from John Notar (NPS)

K - Response to 'EMAIL: clarification questions about GMT1 EI spreadsheet calculation details' from Meredith Bond (USFWS)

Attachment A
Response to 'Comment Table AQ Modeling Protocol_Peck 20130925.docx' from Alan Peck (BLM)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Modeling Protocol for Air Quality Impact Analysis

ATTACHMENT A - Response to Comments:

From:

Alan Peck (BLM)

Document:

Comment Table AQ Modeling Protocol_Peck 20130925.docx

Comment 1: *(Section 2.0, page 2-1)**:***

A) CPAI confirmed by email that "There is a difference in emissions when comparing drill rigs running on their own power and rigs on grid power." While the project plan is for operation on grid/highline power, would full NEPA disclosure require addressing the non-routine operation of a cold startup of the emergency generator (assuming line power would more likely fail when conditions are severe) and operation of the engine under load?

Response:

Based on the assumptions included in the Emissions Inventory (EI), there will be no cold startup of the emergency generator. The emergency generator has been assumed to be running at low load (spinning reserve) all the time. This is a conservative given current Alpine drilling operations. Currently, when highline power fails, the non-routine operating scenario is that the rig will go dark until power is restored. Operation at full load of this engine is not addressed since it cannot be anticipated and would be very transient.

B) The planned modeling scenario is for operation on grid/highline power. How are increased emissions above existing levels addressed at the power generation source (Alpine?)?

Response:

Section 2.3 of the GMT1 Alternative D Ambient Air Quality Impact Analysis[1] addresses the source of the GMT1 highline power. The source of highline power for the GMT1 project is the Alpine Central Processing Facility (CPF). The addition of GMT1 Alternative A will cause a change of less than 2 MWe at that facility at its peak during winter and less during the summer. Alternative D will result in approximately 2.5 MWe above that. For Alternative A, this change is well within permitted limits as well as the variability of actual historical demand from the Alpine CPF such that modeling is not warranted. For Alternative D, the increase is addressed qualitatively based on existing ambient measurements.

[1] AECOM Environment 2013. Greater Mooses Tooth 1 Alternative D (Roadless) Air Quality Impact Analysis. Submitted to: the Bureau of Land Managemet (BLM), Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. December 2013.

Comment 2: *(Section 3.1, page 3-1)**:** A more detailed explanation is needed for BLM and the public on why Ozone and secondary PM2.5 will not be modeled.*

Response:

A discussion regarding ozone and secondary $PM_{2.5}$ is provided in the final Alternative A and Alternative D ambient air quality impact analysis[2, 3].

Comment 3: *(Section 3.2, page 3-1)**:** Is there a significant difference in seasonal wind roses or would all seasons look similar to the annual wind rose provided? In either case, it may be useful to include seasonal wind roses.*

Response:

The wind roses for winter months (January – April, October – December) and summer months (May – September) are provided in **Figures 1** and **2**. There is a southwest wind component in the winter months that is not seen during the summer months.

Comment 4: *(Section 3.5, page 3-4)**:***

A) Provide a map that includes locations of BPXA and A Pad in relation to this project.

B) Please add who will approve the NO2 and PM2.5 values that CPAI proposes to develop instead of the using EPA determined values?

Response:

At the request of USEPA Region 10, ambient background data monitored at Nuiqsut will be replacing data from BPXA and A PAD sites. Therefore, the location of BPXA A Pad is no longer relevant to the project and no figure is provided. We anticipate that BLM or one of the MOU working group members will be responsible for reviewing the Nuiqsut data.

Comment 5: *(Section 3.7, page 3-7)**:** Has redefining the ambient air boundary been discussed with and approved by the BLM, as the landowner? To my knowledge, BLM and the Air Quality MOU Working Group were told by CPAI and AECOM that the boundary would only be defined at the edge of the pad.*

Is there a federal definition of the ambient air boundary?

What are the outer limits of acceptability when redefining the ambient air boundary?

How will public access be restricted at the boundary and especially if it moves beyond the pad? How do the nearby residents of Nuiqsut use this area in summer and winter?

Response:

Though the possibility of using an alternative ambient air quality boundary was discussed in the modeling protocol, it was not done and does not need to be approved by the landowner.

The definition of the ambient air boundary has not been codified, but the term “ambient air” has been defined as “that portion of the atmosphere, external to buildings, to which the general public has access” (40 CFR 50.1(e)).

[2] AECOM Environment 2013. Greater Mooses Tooth 1 Air Quality Impact Analysis. Submitted to: ConocoPhillips Company, Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. October 2013.

[3] Ibid. 1

Figure 1 Wind Rose for Nuiqsut Meteorological Monitoring Station – Summer Months

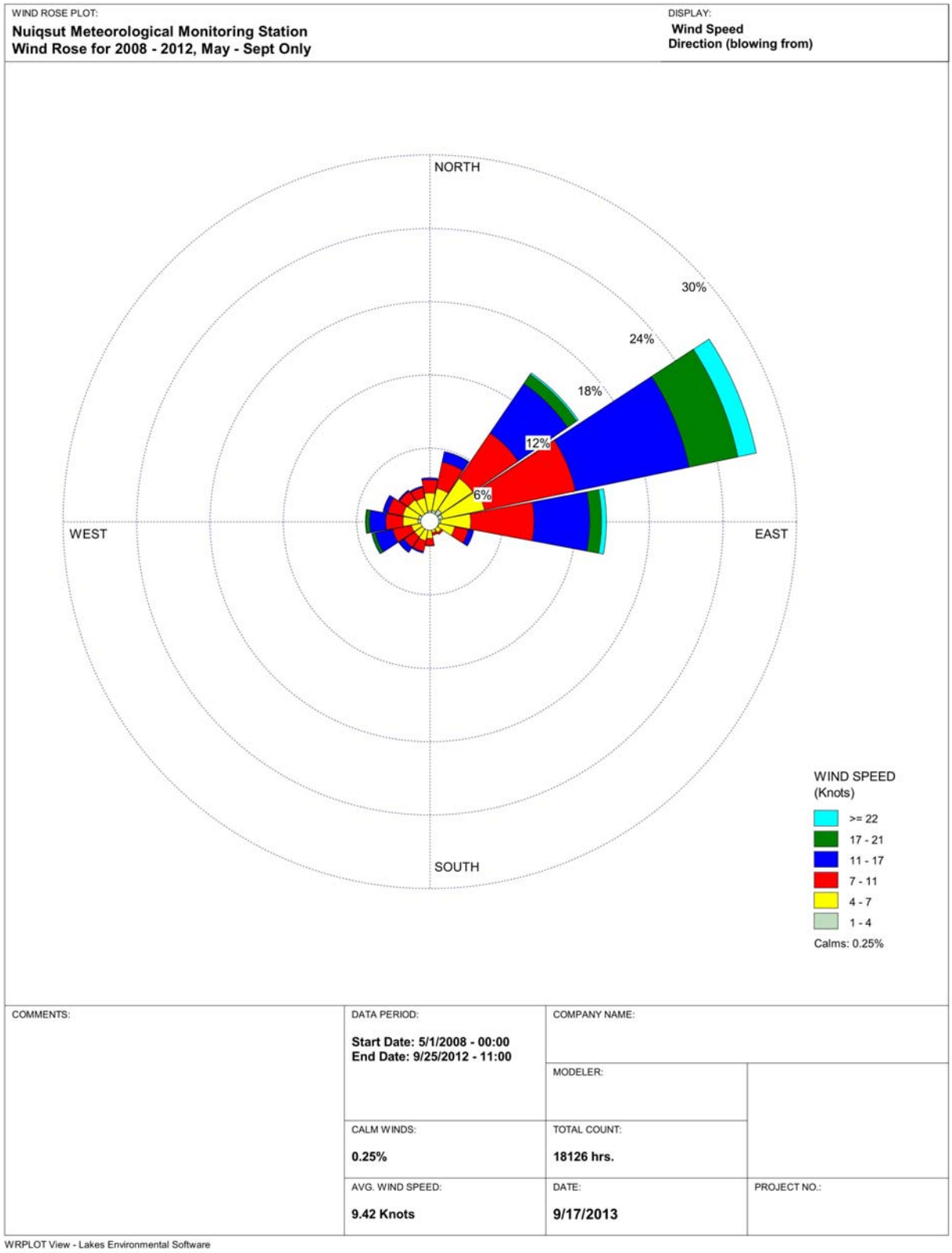
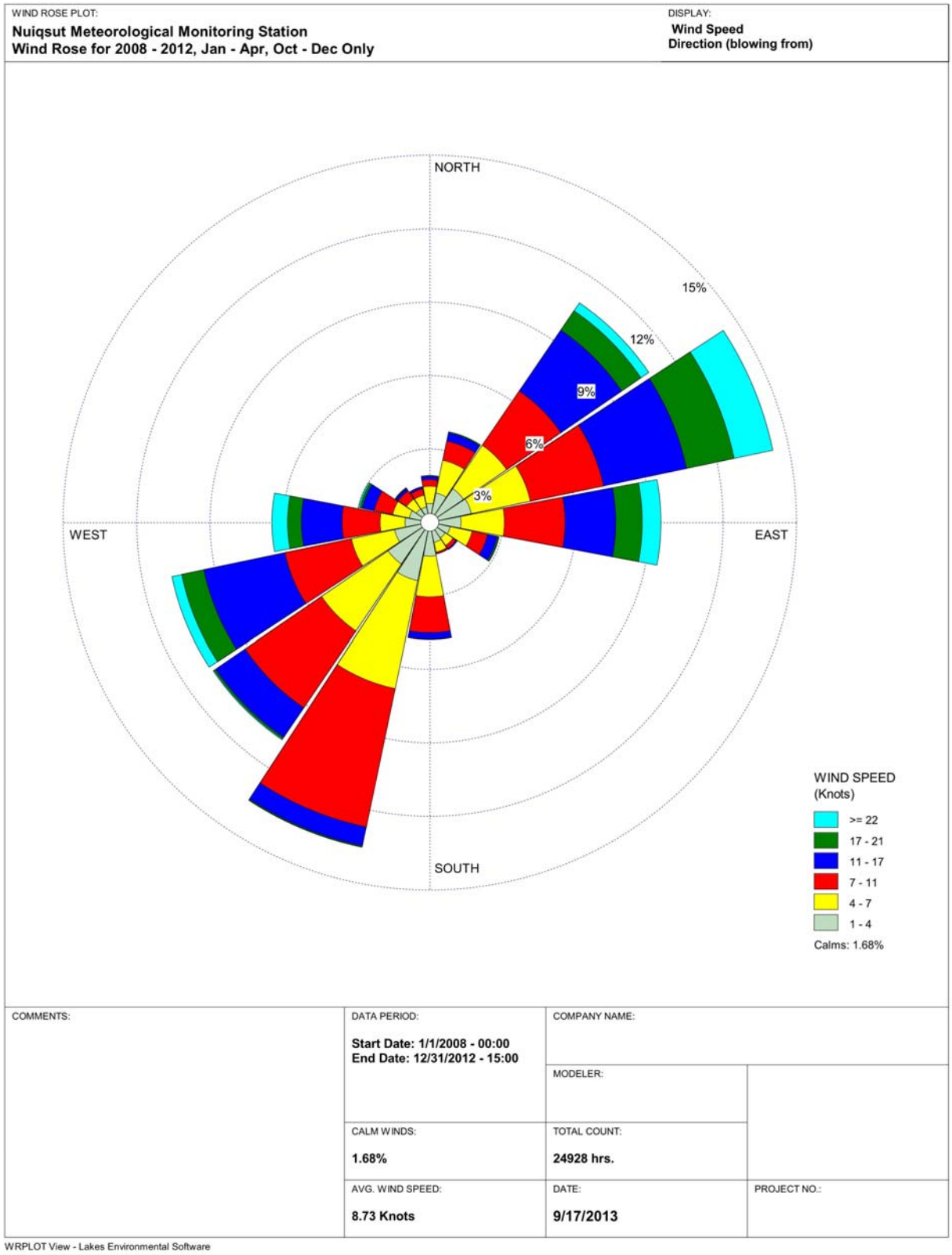


Figure 2 Wind Rose for Nuiqsut Meteorological Monitoring Station – Winter Months



The ambient air boundary used in the dispersion modeling was defined at the edge of the gravel pads/roads associated with the GMT1 development. For the Clover Material Source, which has not gravel pad, the ambient boundary encompasses the area with significant safety concerns due to mobile source activity and blasting. In all cases ConocoPhillips Alaska Inc. will take the steps necessary to control public access to the areas within the ambient boundaries. Site access will be controlled as it has been historically.

How residents use this particular area during different seasons is described in other portions of SEIS but it is not specific to the ambient air quality impact analysis and therefore will not be discussed here.

Comment 6: *(Section 3.8, page 3-9)**:** The duration assumptions do not reflect a realistic residence scenario for villages on the North Slope, such as Nuiqsut. Residents in these communities are there much longer and often for their entire life. The duration periods need to be increased to represent the lifestyle of these communities.*

Response:

The exposure duration for Nuiqsut residents has been updated and is addressed in revised Alternative A and D air toxics analyses.

Comment 7: *(Section 4.3, page 4-3)**:** Bettles (located on the south side of the Central Brooks Range) has an IMPROVE site that may be a better choice for data than Denali National Park (several hundred miles south) to calculate visibility values. Bettles is a small, off-the-road community (pop. 27) and farther away from other possible pollution sources than Denali National Park. Denali National Park has seasonal visitation of 400,000 and is 11 miles from Healy (pop. 1000) with an older 25 megawatt coal power plant.*

Response:

The analysis used the 2010 FLAG-recommended values for the background aerosol species from the closest PSD Class I area for which those values are provided, Denali National Park. This is a common procedure when analyzing Class II areas, which were not included in FLAG 2010. The background aerosol levels provided by FLAG represent pristine, natural conditions and do not include effects from existing pollution sources such as road traffic, power generation, wild fires, etc..

Comment 8: *(Appendix, page A-1)**:** Beyond the 90% data capture, discuss the quality control conducted for the site during the collection period of 2008-2012.*

Response:

The meteorological data measured at Nuiqsut are considered Prevention of Significant Deterioration (PSD) quality. Data are collected in accordance with PSD protocols and in accordance with an ADEC-approved quality assurance project plan (QAPP).

Comment 9: *(Appendix, page A-1)**:** Provide a short data comparison to support the statement. The two sites may not have different weather conditions, but there can be differences in in recorded values due to equipment used.*

Response:

It can be inferred from 40 CFR Part 51 Appendix W, the Revision to the Guideline on Air Quality Models, that onsite meteorological data collected in accordance with PSD protocols (i.e., CPAI-collected Nuiqsut monitoring station data) is interchangeable with National Weather Service (NWS) data from the standpoint of dispersion modeling Measurement Quality Objectives (MQOs) irrespective of equipment used. Therefore any differences that might exist are within measurement precision/accuracy and not relevant to the dispersion modeling.

Attachment B
Response to 'NPR-A AQ Modeling Protocol comments-nicholls.docx' from Craig Nicholls (BLM)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Modeling Protocol for Air Quality Impact Analysis

ATTACHMENT B - Response to Comments:

From:

Craig Nicholls (BLM)

Document:

R NPR-A AQ Modeling Protocol comments-nicholls.docx

Comment 1: *(Section 2.2)*: *A line heater is the only source described here. How can that be the only emitting source during production? Please explain.*

Response:

Typical of the majority of North Slope oil development wellsites, a line heater is the only permanent source of emissions if the wellsite has any permanent emissions at all. This is the case because power is supplied to the wellsite from a power distribution grid, no fluids separation occurs at the wellsite and the produced gas is gathered and not flared or vented. We understand that this is different from typical wellsites in the lower 48 states.

Comment 2: *(Section 3.5)*: *The reference listed here, USEPA, 2011 is for the air toxics database which would not have background ambient monitoring data. Please include correct reference*.

Response:

The error is noted. The correct reference should be USEPA **Region 10** 2011[1].

Comment 3: *(Section 4.0)***:** *The BLM 2012 reference here appears to be incorrect.*

Response:

It is incorrect. The correct reference should be BLM 2004 as follows:

Bureau of Land Management (BLM). 2004. Alpine Satellite Development Plan Final Environmental Impact Statement. Department of Interior, Bureau of Land Management, Anchorage, Alaska. September 2004.

Comment 4: *(Section 4.3)***:** *Although not stated, I assume that CALPOST 6.221, which includes updated FLM preferences for the visibility analysis (method 8, mode 5), will be used*

Response:

Your assumption is correct; CALPOST 6.221 has been used for all analyses.

[1] "Supplemental Statement of Basis for Proposed Outer Continental Shelf Prevention of Significant Deterioration Permits – Noble Discoverer Drillship. Shell Offshore Inc." Beaufort Sea Exploration Drilling Program Permit Number R10OCS/PSD-AK-2010-01 and Shell Gulf of Mexico Inc. Chukchi Sea Exploration Drilling Program Permit Number R10OCS/PSD-AK-09-01. 2011. See also: http://www.epa.gov/region10/pdf/permits/shell/discoverer_supplemental_statement_of_basis_chukchi_and_beaufort_air_permits_070111.pdf

Attachment C
Response to 'V1-Summary of Comments on Microsoft Word - AQ Impact Assessment Greater Mooses Tooth 09182013.pdf' from Herman Wong (R10)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Modeling Protocol for Air Quality Impact Analysis

Response to Comments:

From:

Herman Wong (USEPA Region 10)

Document:

V1-Summary of Comments on Microsoft Word - AQ Impact Assessment Greater Mooses Tooth 09182013.pdf

Comment 1: *(Page 3)***:** *In subsequent, the abbreviation of "GMT1" is used. Please clarify.*

Response:

GMT refers to the Greater Mooses Tooth Development. GMT1 refers to the first wellsite within the Greater Mooses Tooth Development.

Comment 2: *(Page 3): Lower case "o" in "MOtor".*

Response:

The MOtor Vehicle Emissions Simulator (MOVES) program is what is being referenced. "MOtor" is noted as such so as to highlight the acronym "MOVES".

Comment 3: *(Page 4): For Project and Project Area, should be it be "GMT" or "GMT1"?*

Response:

The Project is the Greater Mooses Tooth 1 Development Project. The Project Area is the Greater Mooses Tooth 1 Project Area.

Comment 4: *(Page 4): Is there any difference between GMT/GMT1 and Project?*

Response:

The Project is the Greater Mooses Tooth 1 (GMT1) Development Project.

Comment 5: *(Page 7): Will nearby existing sources be modeled as part of the compliance demonstration?*

Response:

Background pollutant concentrations are assumed to include impacts from emissions from existing regional emission sources. Background concentrations used for this project are based on monitoring data collected regionally through 2012. Thus, any significant offsite sources would be reflected in the background concentrations since there have been no sources constructed since 2012. Furthermore, there are no other reasonably foreseeable development sources that would be large enough to create a significant concentration gradient in the impact area. Therefore, no offsite source inventory or inventory of reasonably foreseeable development sources was included in the near field dispersion modeling analysis.

Comment 6: *(Page 7): Will an air quality increment analysis be performed?*

Response:

Yes, a comparison of field GMT1 Project impacts to the PSD Class I and Class II Increments has been provided.

Comment 7: *(Page 7): Will the methodology described in this protocol be used model Project Alternatives? EPA has brought up Project Alternative during past conference calls*.

Response:

At the direction of the BLM on November 4, 2013, an ambient air quality impact analysis for Alternative D, the GMT1 Roadless Development, has been conducted. The AQIA for Alternative D has been provided separately[1].

Comment 8: *(Page 7): Is the (BLM 2012) reference correct?*

The reference listed is incorrect. The correct reference should be (BLM 2004) as follows:

Bureau of Land Management (BLM). 2004. Alpine Satellite Development Plan Final Environmental Impact Statement. Department of Interior, Bureau of Land Management, Anchorage, Alaska. September 2004.

Comment 9: *(Page 7): Section 6, References shows (BLM 2012) to be a DEIS in the CONUS.*

Response:

Please see the response to **Comment 8**.

Comment 10: *(Page 7): Please clarify the other references in the next sentence as they are shown to be 2004.*

Response:

The correct reference is to a 2004 document. Please see the response to **Comment 8** for the correct reference.

Comment 11: *(Page8): What is the height of the gravel pad above the surface?*

Response:

The pad is 5 feet above the ground surface. **Figure C-1** provides an illustration of the pad cross section indicating the pad height above the ground surface which is typically 5 feet.

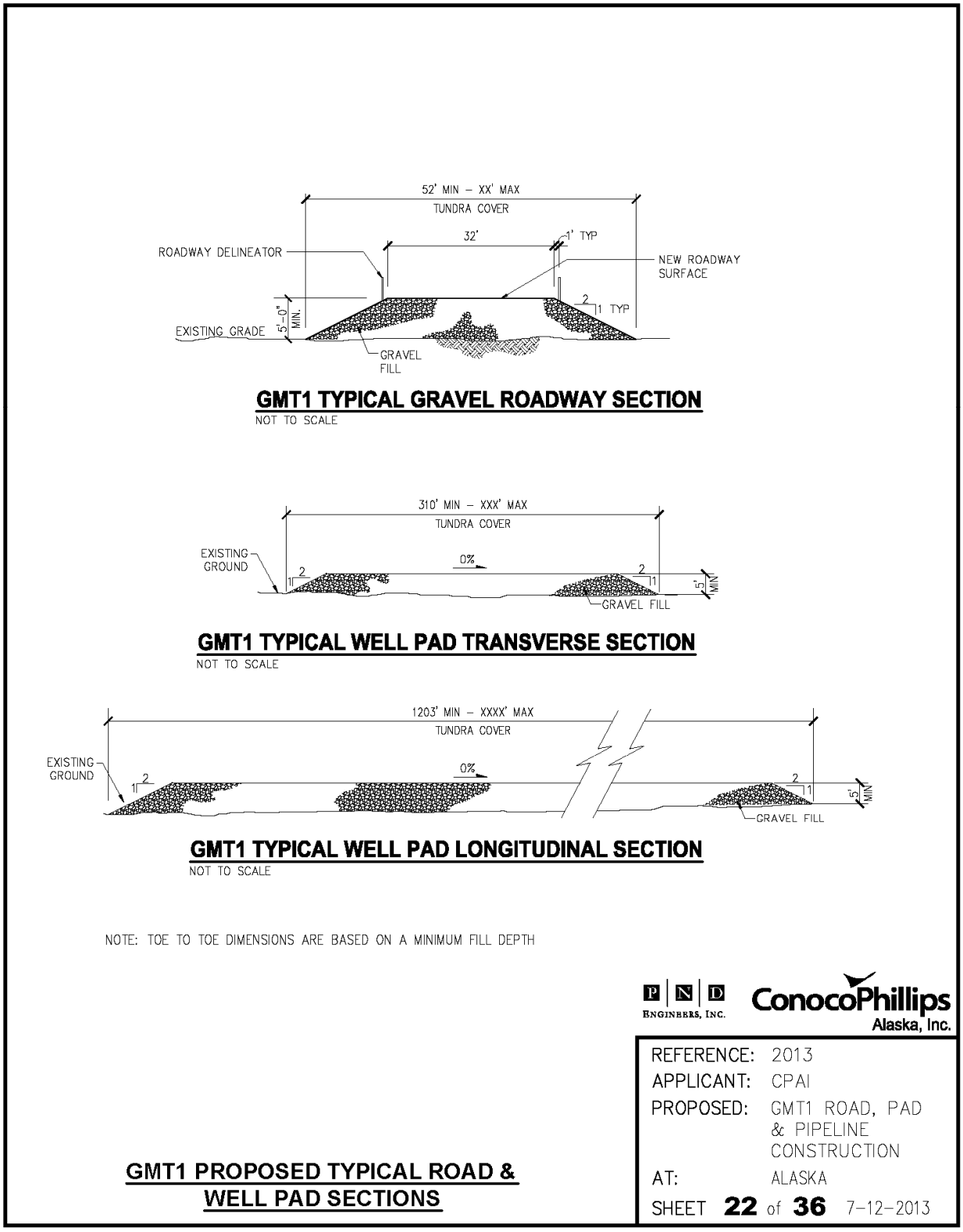
Comment 12: *(Page 8): Please verify that all the pipelines listed below will be constructed above ground.*

Response:

Yes, all pipelines will be constructed above ground.

[1] AECOM Environment 2013. Greater Mooses Tooth 1 Alternative D (Roadless) Air Quality Impact Analysis. Submitted to: the Bureau of Land Managemet (BLM), Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. December 2013.

Figure C-1 Typical Gravel Pad Cross Section Illustration



Comment 13: *(Page 10):* Please show the proposed location of CD7/GMT2 in Figure 1-1.

Response:

Please see **Figure C-2** for the location of CD5 and GMT2.

Comment 14: *(Page 10):* Will CD7/GMT2 be included in the modeling analyses?

Response:

Emissions from GMT2 will be modeled as part of the long-range modeling analysis. However, because the only permanent GMT2 emission unit would be a production heater, and because the GMT2 facility is 13 kilometers (8 miles) away from GMT1, impacts from this source are not expected to cause a significant concentration gradient in GMT1 impact area and GMT2 will not be included in the near-field impact analysis.

Comment 15: *(Page 11): Will the highline power source emissions be quanitified and modeled?*

Response:

As discussed in the GMT1 Alternative D AQIA[2], and response to comments included in Attachment K that is being submitted along with this attachment, the source of highline power for both alternatives of the GMT1 project is the Alpine Central Processing Facility (CPF). The GMT1 Alternative A (Preferred Alternative) is expected to cause an increased demand of less than 2 MWe peak during the winter at the CPF and less during the summer. This change is well within permitted limits as well as the variability of historical demand at the Alpine CPF such that the emissions increase will not be noticeable and modeling is not warranted.

Though the drill rig itself requires 2 to 5 MWe to operate, it has been a historical electrical demand on the Alpine CPF power generators since the beginning of Alpine; therefore, the GMT1 drill rig electrical load is an existing source of emissions and the project will not cause an increase in emissions.

Comment 16: *(Page 11): Can you define negligible (i.e., less than instrument threshold or what)?*

Response:

Lead emissions are considered negligible because they will be only present at trace element levels if at all. In other words, levels of lead would not be noticeable relative to existing background concentrations.

Comment 17: *(Page 11): Please provide references for MOVES, NMIM, EDMS, and Gas Research Institute.*

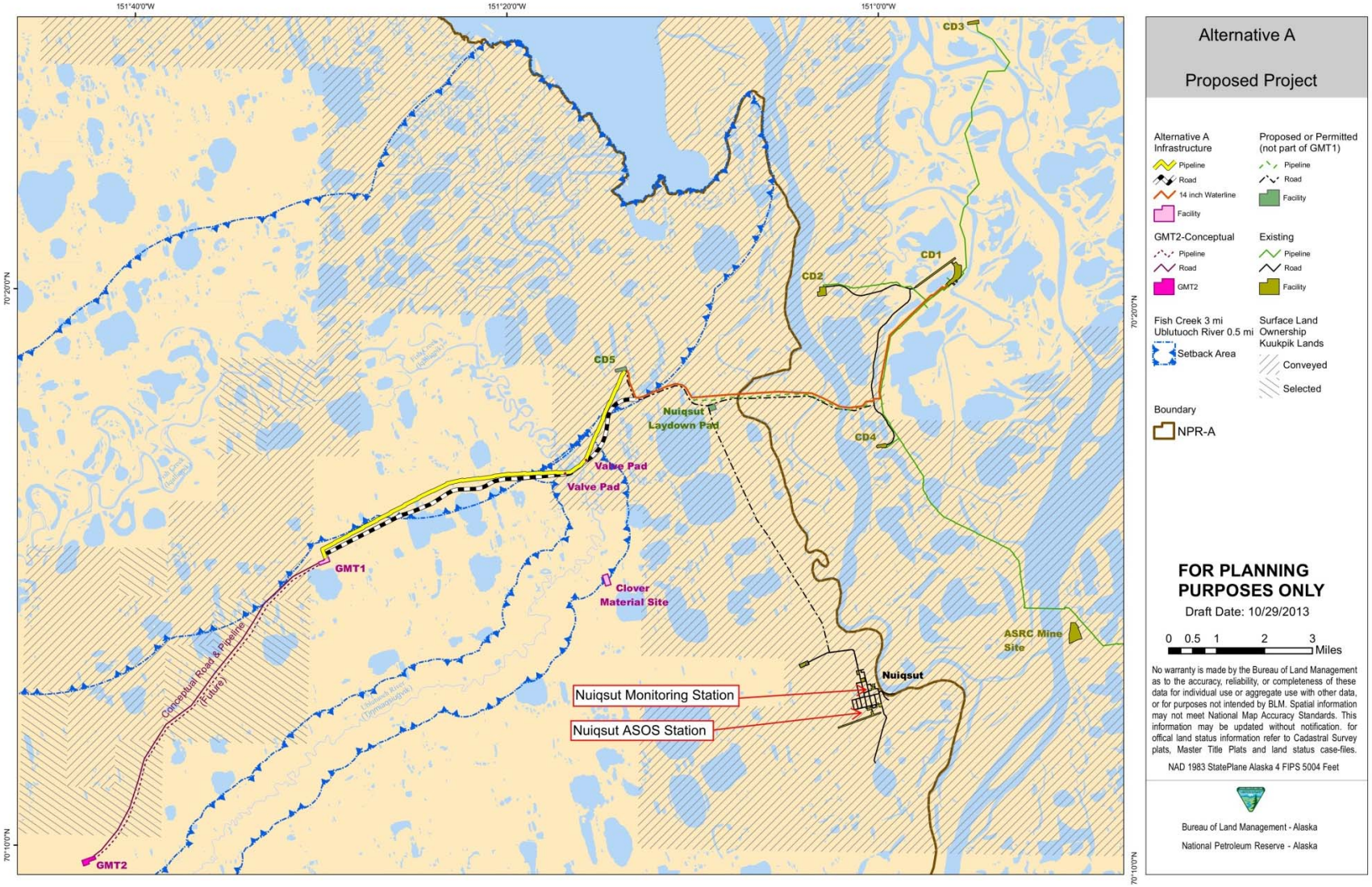
Response:

Federal Aviation Administration 2013. Emissions and Dispersion Modeling System (EDMS), EDMS User's Manual. Office of Environment and Energy. Prepared by CSSI, Inc. FAA-AEE-07-01, April 2009. Available at http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/edms_model/.

USEPA 2012. Motor Vehicle Emissions Simulator (MOVES), User Guide for MOVES2010b. Assessment and Standards Division. Office of Transportation and Air Quality. EPA-420-B-12-001b, June 2012. Available at http://www.epa.gov/otaq/models/moves/index.htm#generalinfo.

[2] AECOM Environment 2013. Greater Mooses Tooth 1 Alternative D (Roadless) Air Quality Impact Analysis. Submitted to: the Bureau of Land Managemet (BLM), Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. December 2013.

Figure C-2 Project Regional Map Including Location of GMT2



USEPA 2009. National Mobile Inventory Model (NMIM), NMIM User Guide.. EPA-420-B-09-015, April 2009. Assessment and Standards Division. Office of Transportation and Air Quality. Available at http://www.epa.gov/otaq/nmim.htm.

USEPA 1996. "Methane Emissions for the Natural Gas Industry: Volume 8: Equipment Leaks", GRI-94/0257.25 (EPA-600/R-96-080).

Comment 18: *(Page 11): Please identify the fuel that will be burned in the combustion sources?*

Response:

The production/line heater will be natural gas fired using gas produced by from the field. Liquid-fired sources will combust Ultra Low Sulfur Diesel (ULSD).

Comment 19: *(Page 11): Will the short term emission rates for the near field modeling be 1-hour rates?*

Response:

Modeling conducted to estimate 1-hour NO_2 and short-term SO_2 impacts will be based on maximum 1-hour emission rates. Modeling conducted to estimate 24-hour $PM_{2.5}$ and 24-hour PM_{10} impacts will be based on maximum 24-hour emission rates.

Comment 20: *(Page 14): Will the emission sources from the2012 BLM NPR-A EIS be included in the modeling analysis? If not, please explain.*

Response:

The current analysis included all reasonably foreseeable development (RFD) sources as well as those constructed after 2012. The impact from existing sources constructed prior to 2012 are included in the background concentration. Therefore, it was assumed that the source inventory included in the NPR-A EIS is already accounted for in the existing background data used for the AQIA.

Comment 21: *(Page 15): Please indicate that AK DEC has reviewed and accepted the 2008-2012 meteorological measurements.*

Response:

Data has been submitted to the Alaska DEC but not reviewed since it has not been used as part of a permitting action.

Comment 22: *(Page 15): R10 has Nuiqsut met measurements up to the end of calendar year 2011. Please provide a spreadsheet of the validated met data for calendar year 2012 to R10.*

Response:

This data will be supplied as a separate electronic submittal to BLM.

Comment 23: *(Page 15): Please explain the purpose of using NOAA/ESRL measurements?*

Response:

The Barrow, AK upper air data is needed to run AERMET. AERMET uses the upper air data to approximate the temperature structure of the atmosphere prior to sunrise. This is required by AERMET to estimate the growth of the convective boundary layer for the day.

Comment 24: *(Page 18): from the Nuiqsut monitoring station, please justify the use of measurements from three BPXA stations. R10 records show that for 2011, Nuiqsut measured SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$.*

Response:

At the suggestion of USEPA Region 10, BPXA data were not used as part of the GMT1 ambient air quality impact analysis. Therefore, the use of the BPXA data no longer needs to be justified. **Table C-1** provides a summary of Nuiqsut monitoring station the measurements. These values have been used as the background concentrations in the AQIA for comparison to the NAAQS/AAAQS. These measurements are discussed in an analysis of Nuiqsut monitoring station measurements submitted as part of this project[3].

Table C-1 Summary of Background Pollutant Concentrations from the Nuiqsut Monitoring Station using Data Collected from 2010 through 2012

Pollutant Metric		Mixing Ratio (ppm)	Concentration ($\mu g/m^3$)
CO	1-hour Average	1.3	1,488
	8-hour Running Average	1.1	1,259
NO_2	1-hour Average	0.020	38
	Annual Mean	0.002	2.9
$PM_{2.5}$	24-hour Average	--	7.1
	Annual Mean	--	2.2
PM_{10}	24-hour Average	--	48
	Annual Mean	--	7.7
SO_2	1-hour Average	0.003	7.7
	3-hour Average	0.007	18
	24-hour Average	0.003	6.8
	Annual Mean	0.000	0.3

Comment 25: *(Page 18): R10 has Nuiqsut met measurements up to the end of calendar year 2011. Please provide a spreadsheet of the validated air quality data for calendar year 2012.*

Response:

See the response to **Comment 22**.

[3] Letter from Tom Damiana (AECOM) to Lynn DeGeorge (ConocoPhillips Alaska, Inc.) regarding: ConocoPhillips GMT1 – Representative Background Air Pollutant Concentrations for the GMT1 Project Location – REVISED. Submitted December 20, 2013.

Comment 26: *(Page 19): Will full load operations will results highest predicted concentrations? That is, what affect will operating at lower loads have on stack parameters?*

Response:

The parameters used for the primary power stack on the drill rig were developed assuming a low operating load condition, minimizing stack dispersion. Full load conductions were assumed when developing stack parameters for all other point sources. However, results of AQIA are not particularly sensitive to the selection of stack parameters for the following reasons:

- Stack dispersion on the pad is dominated by structure downwash, thus any small changes to stack parameters will not significantly affect modeled impacts.
- There is only a small variation of operating load (and thus stack parameters) for the heaters/boilers located on the pad. The parameters selected for modeling are well within the typical range for these types of sources.
- The remaining emission sources were modeled as volumes sources and operating load has no bearing on the selection of volume source parameters.

Comment 27: *(Page 21): If the ambient air boundary is at the edge of pad, I would suggest 10-m receptor spacing. The stack heights shown in Figure 3-3 are not that tall.*

Response:

According to the Alaska Department of Environmental Conservation (ADEC), receptors spaced 25 meters apart are commonly used for modeling impacts within 200 meters of a downwash dominated stationary source[4]. AECOM believes a receptor spacing of 25 meters at the ambient boundary is sufficient for the dispersion modeling analysis.

Comment 28: *(Page 21): R10 is willing to accept the edge of the well pad as ambient air boundary because its surface is above ground level. If the well pad ambient air boundary is extended outward at 100-m intervals, will the pad height be as well? If not, how does Conoco intend to meet the definition of ambient air?*

Response:

The wellsite ambient boundary will not be extended outward at 100 meter intervals as indicated that it might be in the protocol. Therefore, for permanently constructed facilities, such as the well site, the pad will always be elevated. For temporary facilities such as the Clover Material Source and the Nuiqsut Camps, a gravel pad may not be part of the project; however, safety concerns will cause ConocoPhillips Alaska, Inc. to restrict public access. The following discusses ambient boundaries used in this project:

Access Road and Pad Construction, Infill Drilling, and Well Intervention scenarios – The ambient boundary was defined at the perimeter of the wellsite gravel pad and the edges of the gravel access road. ConocoPhillips Alaska, Inc. will take the steps necessary to control access to the area.

Clover Material Source scenario – The ambient boundary was defined as the extent of the material source itself and a small buffer around the source that will be frequented by non-road equipment and unsafe for the public. It is reasonable to assume that the public will not have access to the area due to the nature of the activities taking place, most notably blasting and heavy equipment traffic. Regardless, ConocoPhillips

[4] ADEC Modeling Review Procedures Manual, Alaska Department of Environmental Conservation, June 30, 2013. Available at http://dec.alaska.gov/air/ap/docs/ModelingProceduresManual.6-30-2013.pdf.

Alaska, Inc. will take the steps necessary to control access to the area primarily to keep the public safe from the construction activities.

Operation of Nuiqsut Man Camps scenario – The ambient boundary was defined as the edge of the active area surrounding the camps. The active area is an area frequented by vehicles transporting personnel and supplies to and from the camps. For safety reasons, the public will be encouraged to stay out of the active area. Since the camp will be located on leased land, ConocoPhillips Alaska, Inc, will have the right to control the area and will take the steps necessary to control access to the area around the camps.

Comment 29: *(Page 21): Are there any threatened or endangered species, flora, fauna...etc or habitat nearby?*

Response:

Assessment of threatened or endangered species; flora; fauna, etc.; or habitat in the vicinity of GMT1 is not within the scope of the air quality impact analysis and is not addressed. Please refer to the appropriate section of the Draft SEIS for the project once it is available for answers to your questions.

Comment 30: *(Page 28): Please add air quality increments.*

Response:

Please see the response to **Comment 6**.

Comment 31: *(Page 28): Like lead, please clarify what is meant by negligible for reduced sulfur compound emissions.*

Response:

Total reduced sulfur compounds are quantified in the final emissions inventory (EI). Except for a small period of time when wells are being flowed back, emissions are less than 0.01 tpy and are considered negligible.

Comment 32: *(Page 29): Please add air quality increments.*

Response:

Please see the response to **Comment 6**.

Comment 33: *(Page 31): Why is this reference relevant?*

Response:

It is not relevant - please see the response to **Comment 8**.

Comment 34: *(Page 33): At this ASOS station, was cloud covered measured? If yes, could it have been used in lieu of temperature subustitution?*

Response:

Cloud cover is measured at the Nuiqsut ASOS station, and it was used. When blocks of missing 2-meter and 10-meter temperatures prevented the use of the Bulk Richardson stability algorithm, Nuiqsut ASOS station cloud cover data was used by AERMOD to calculate atmospheric stability.

Comment 35: *(Page 34): Please identify the measurement of the temperature sensor at Nuiqsut ASOS station?*

Response:

The measurement height of the temperature sensor at the Nuiqsut ASOS station is believed to be 2 meters, based on the typical height of ASOS hygrothermometers.

Comment 36: *(Page 34): 1. In substituting temperature measurements with ASOS data, is measurement height ignored? If 10- and 2-m temperatures are missing for the same, how is the substitution made?*

Response:

Measured ASOS temperatures were not used in any non-standard way for input to stability calculations used by AERMET. Missing 2-meter temperature data were substituted with ASOS temperature data, which are also measured at a height of 2 meters. If both the 10-meter and 2-meter temperatures are missing for the same hour, the ASOS temperature measurement was substituted for the missing ambient temperature data. However, cloud cover data from the ASOS station were used for that hour for the purposes of calculating atmospheric stability in lieu of the missing delta-T value.

Specifically, the data were filled as follows:

- 2008 Q2/Q3:
    - The Nuiqsut temperature (T) and ΔT (10 minus 2 meter T) data was missing for a 2,017 hour period starting 6/4 1300 ending 8/27 1300. The missing ambient temperature data were block filled with ASOS temperature data obtained from the output of a SUBNWS AERMET run. In lieu of missing ΔT data, ASOS cloud cover from the same SUBNWS AERMET run were used for stability calculations for the specific time period.
- 2009 Q4:
    - The Nuiqsut wind speed and direction data was missing for a 232 hour period starting 12/11 1300 ending 12/21 0400. This data was block filled with ASOS wind data obtained from the output of a SUBNWS AERMET run.
- 2010 Q1/Q2:
    - The Nuiqsut wind speed and direction data was missing for a 494 hour period starting 3/24 2100 ending 4/14 1100. This data was block filled with ASOS wind data obtained from the output of a SUBNWS AERMET run.
- 2011 Q1/Q2:
    - The Nuiqsut wind speed and direction data was missing for a 55 hour period starting 2/25 0700 ending 2/27 1300. This data was block filled with ASOS wind data obtained from the output of a SUBNWS AERMET run.
    - The Nuiqsut temperature and ΔT data was missing for a 2,262 hour period starting 2/27 1400 ending 6/1 1900. The missing ambient temperature data were block filled with ASOS temperature data obtained from the output of a SUBNWS AERMET run. In lieu of missing ΔT data, ASOS cloud cover from the same SUBNWS AERMET run were used for stability calculations for the specific time period.
    - The Nuiqsut wind speed and direction data was missing for a 29 hour period starting 6/1 2000 ending 6/2 2400. This data will be block filled with ASOS wind data obtained from the output of a SUBNWS AERMET run.

- 2012 Q4:
    - The Nuiqsut wind speed and direction data was missing for a 193 hour period starting 12/23 2400 ending 12/31 2400. This data will be block filled with ASOS wind data obtained from the output of a SUBNWS AERMET run.

Attachment D
Response to 'Sum of Comments=HW1@CPAI_GMT1_AQIA_18-OCT-2013.pdf' from Herman Wong (R10)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

Response to Comments:

From:

Herman Wong (USEPA Region 10)

Document:

Sum of Comments=HW1@CPAI_GMT1_AQIA_18-OCT-2013.pdf

Comment 1: *(Page 9): Please include air quality increments.*

Response:

As requested, all air quality impact analyses (AQIA) submitted for the GMT1 project after the October 18, 2013 AQIA includes a comparison of project impacts to the Class II Prevention of Significant Deterioration (PSD) Increments for the Infill Drilling scenario. This scenario was selected since it includes the least amount of temporary activities.

Comment 2: *(page 9): What is the height of the pad above the ground surface?*

Response:

The pad is 5 feet above the ground surface. **Figure D-1** provides an illustration of the pad cross section indicating the pad height above the ground surface.

Comment 3: *(page 10): Please define VSM.*

Response:

A Vertical Support Member (VSM) is a support structure used to elevate the pipeline above the tundra or gravel pad. **Figure D-2** provides an illustration of VSMs.

Comment 4: *(page 10): Does GMT2 fit into the category of RFD source? If yes, do you plan to model its emissions?*

Response:

Yes, it is an RFD source and its emissions were modeled as part of the long-range modeling analysis. However, because the only permanent GMT2 emission unit would be a production heater, and because the GMT2 facility is 13 kilometers (8 miles) away from GMT1; impacts from this source are not expected to cause a significant concentration gradient in GMT1 impact area and GMT2 was not included in the near-field impact analysis.

Comment 5: *(page 10): Please include air quality increments.*

Response:

Please see response to **Comment 1** above.

Comment 6: *(page 10): Please include modeling results of project alternatives (e.g., No Project, CD6 in November 2004…etc.).*

Response:

At the direction of the BLM on November 4, 2013, an ambient air quality impact analysis for Alternative D, the GMT1 Roadless Development, has been conducted. The AQIA for Alternative D has been provided separately[1].

Comment 7: *(page 11): Is it possible to locate GMT2, Conoco monitoring station, and ASOS station in this figure?*

Response:

GMT2, the Conoco monitoring station at Nuiqsut and the Nuiqsut ASOS station are shown in **Figure D-3**.

Comment 8: *(page 12): Is it possible to locate GMT2, Conoco monitoring station, and ASOS station in this figure?*

Response:

GMT2, the Conoco monitoring station at Nuiqsut and the Nuiqsut ASOS station are shown in **Figure D-3**.

Comment 9: *(page 13): Please clarify if the edge of the pad is the ambient boundary?*

Response:

Yes, it was assumed that the edge of the gravel pad is the ambient boundary.

Comment 10: *(page 14): It is difficult to understand this EI section because I don't understand the five scenarios, operations specific scenarios, and the terminology. A graphic could provide understandings and links to the different scenarios.*

Response:

Section 2.1of the Alternative A AQIA describes the 5 modeling scenarios including what activities take place during each. Section 2.2 describes the refinements and assumptions made in order to translate these emissions into a worst-case modeled emissions inventory for the project. Furthermore, Figures 3-3 through 3-6 provide modeled layouts for each of the scenarios.

The following provides a brief narrative of the five modeled scenarios to supplement the information already given. This narrative is best understood by looking at Figure 2-7 and Figure 2-8 from the Alternative A AQIA which presents, among other things, a Gantt chart detailing which activities occur during what period. The following five scenarios were selected for the near-field analysis:

- Access Road and Pad Construction;
- Mining the Clover Material Source;
- Infill Drilling;
- Operation of the Nuiqsut Man Camps; and
- Well Intervention.

[1] AECOM Environment 2013. Greater Mooses Tooth 1 Alternative D (Roadless) Air Quality Impact Analysis. Submitted to: the Bureau of Land Management (BLM), Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. December 2013.

Figure D-1 Typical Gravel Pad Cross Section Illustration

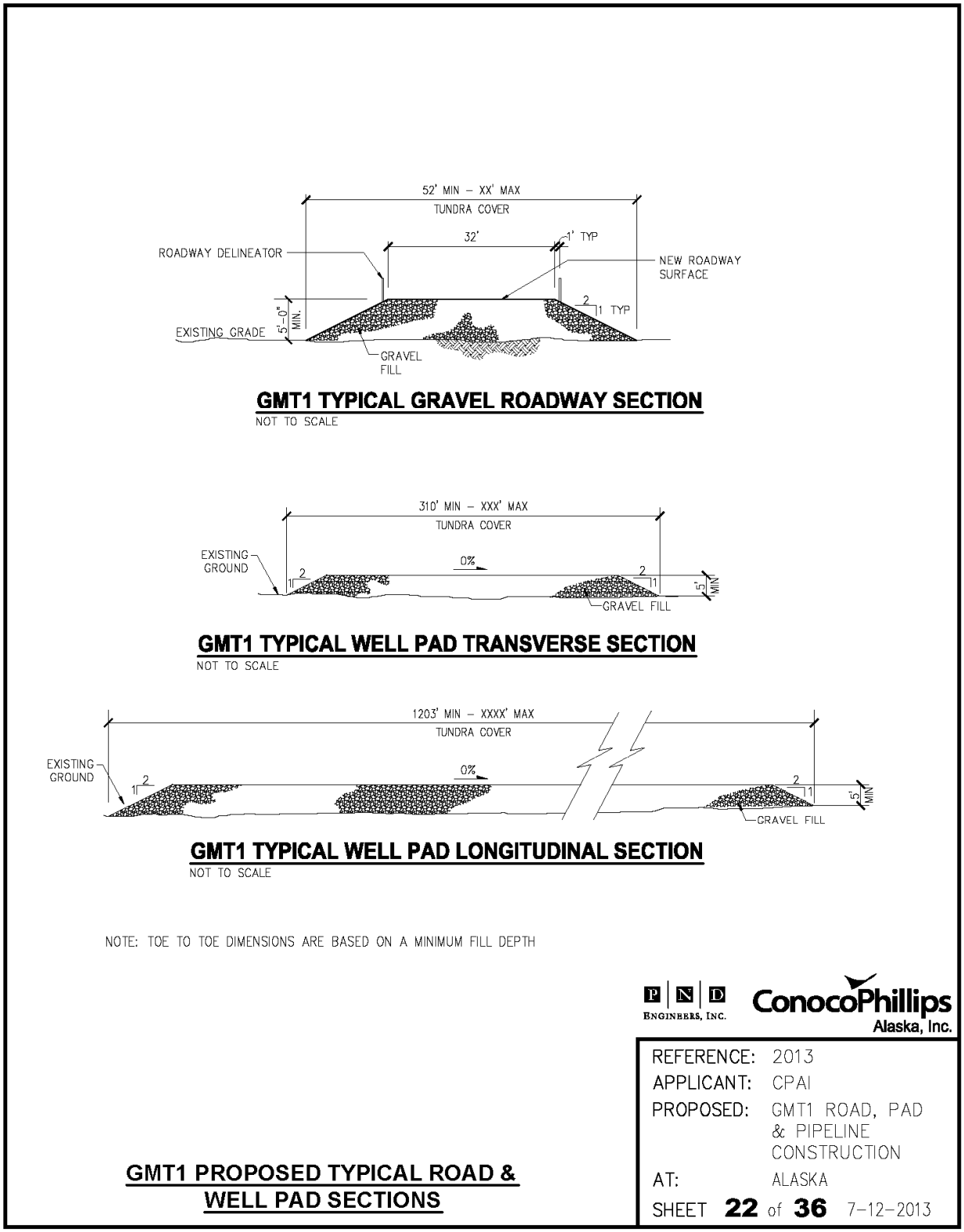


Figure D-2 Illustration of Vertical Support Members (VSMs)

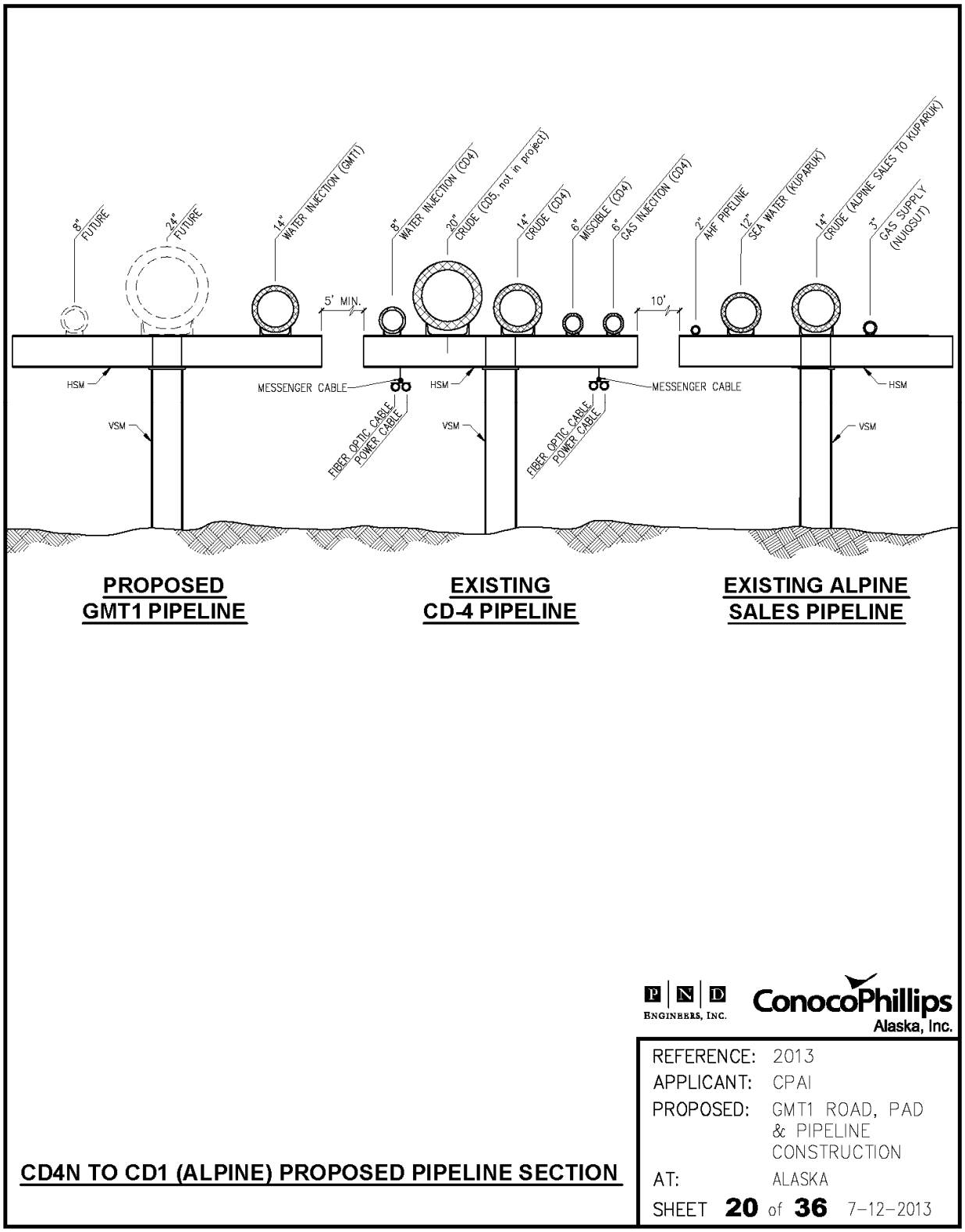
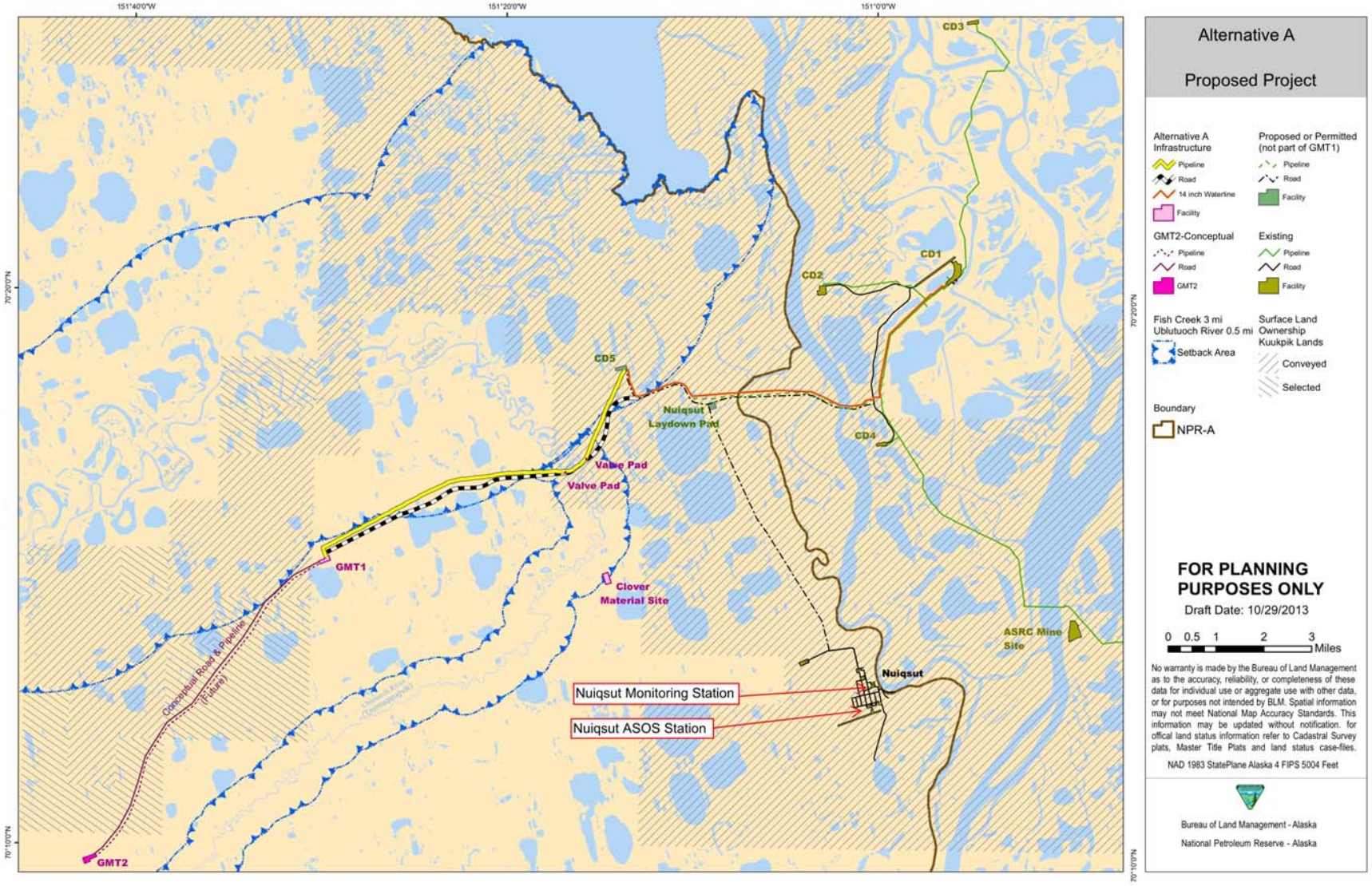


Figure D-3 Project Regional Map Detailing the Location of the Ambient Air Quality and Meteorological Monitoring Stations



Access Road and Pad Construction: The modeling conducted represents the worst-case emissions occurring during a period from October 2015 (Year 0) through December 2016 (Year 1). This period encompasses an intense period of gravel placement for the GMT1 gravel pad and access road, but begins with the development of ice roads. These roads are used for accessing the Clover Material Source, and locations where the GMT1 gravel pad and access road will be constructed. Throughout the ice road season (through May 2016), gravel mining followed by gravel mine reclamation, gravel placement, and bridge construction occur so that roads, and the GMT1 pad, will be largely complete prior to summer. When the ice road season ends, around May 2016, construction activity decreases while the placed gravel seasons (settles) and until ice roads can be installed (around November 2016). Once construction commences on the ice roads, the modeled construction period ends.

During the November 2016 through May 2017 ice road season, construction will be completed on the roads and pads, and infrastructure will be installed to support the GMT1 wellsite such as Vertical Support Members (VSMs), pipeline, power lines, and communication lines. Just before the ice roads are closed, construction of GMT1 wellsite facilities will begin and the drill rig will be brought over so that developmental drilling can begin in the summer of 2017. During this period, there is significantly less gravel work and heavy equipment traffic than the modeled construction period.

The dispersion modeling represents the intensive October 2015 (Year 0) through December 2016 (Year 1) construction period, and focuses on the GMT1 gravel pad and a segment of the access road nearest the pad. To avoid determining which specific timeframe during this modeled 1.25 year construction period would result in the highest short-term emissions, it was assumed that all activities would occur simultaneously and each activity was represented by the period with the highest short-term emissions. Similarly, modeled annual emissions represent the highest rolling annual emissions from the 1.25 year modeled period.

Mining the Clover Material Source: The modeling conducted represents the worst-case emissions occurring while the Clover Material Source is active. The Clover Material Source will be highly active during the first ice road season (November 2015 (year 0) through May 2016 (year 1)) with some lingering activity continuing through October 2016. During this period, the gravel must be extracted and the area remediated so that the majority of the activity is complete before spring break-up.

Mining the Clover Material Source requires the removal of overburden using heavy equipment. Once the overburden is removed, the gravel is extracted from the area using a combination of heavy equipment and blasting material loose from the permafrost. Once the material is loosened from the permafrost, it is worked and crushed to separate the material from the ice. At this point, the material is loaded on haul trucks and moved to the active road/pad construction location. This activity occurs day and night during the entire period in order to complete it before spring break-up. This will require a large fleet of haul trucks and loaders working continuously between the Clover Material Source and the active road/pad construction location.

The dispersion modeling conducted for this entire period focused on the Clover Material Source itself. To avoid determining which timeframe during this one-year modeled period would result in the highest short-term emissions, it was assumed that all activities would occur simultaneously and each activity was represented by the period with the highest short term emissions. Similarly, modeled annual emissions represent the highest rolling annual emissions from the one-year modeled period.

Infill Drilling: A worst-case infill drilling year was used to represent both future infill drilling and the initial developmental drilling. From this perspective, modeling was conducted to represent both the period from May 2017 (Year 2) through June 2018 (Year 3) and any future period that includes a year or more of new well drilling. Therefore, the modeled year included the emissions from the permanent wellsite line heater.

Typical of the drilling activity within Alpine, the drill rig will be electrified. This does not mean that there will be no fuel combustion, but the primary power generation on the drill rig will be replaced with grid-supplied power. Combustion equipment that will remain operating on the drill rig will be heater and boilers, support equipment engines such as the cement pump engines on the Doyon 19 drill rig, and one primary engine on

the drill rig operating in spinning reserve. Spinning reserve means that the generator will be running at low load in case there are interruptions in the grid power. Assuming an engine operating on spinning reserve is a conservative assumption given current Alpine drilling operations. Currently, it is not typical for an engine to be operating continuously on spinning reserve; therefore, when highline power fails, the rig will go dark until power is restored. Operation of this engine at full load is not addressed since it cannot be anticipated and would be very transient.

During drilling, there is a considerable amount of on-road and on-pad activity aside from the drill rig itself. On-road activity constitutes a continuous resupplying of the drill rig with drilling fluids, cement, diesel fuel, and water; and removing wastes from the drilling process including muds, water, and cuttings. The on-pad activity includes a large inventory of portable equipment used for light, heat, and power.

The dispersion modeling conducted for this entire period focused on the GMT1 wellsite and a segment of the access road nearest the pad. To avoid determining which timeframe during this modeled one-year drilling period would result in the highest short-term emissions, it was assumed that all activities would occur simultaneously and each activity was represented by the period with the highest short-term emissions. Modeled annual emissions assumed that the maximum monthly emissions persisted the entire period with the exception of fugitive dust which was only modeled for 4 months out of the year.

Operation of the Nuiqsut Man Camps: For a short period of time, ConocoPhillips Alaska, Inc. may locate two man camps to house construction workers seasonally from October 2015 (Year 0) through October 2017 (Year 3). Workers are bused from this set of camps to the construction sites.

Each of these camps will have two engines. One of the camps will be electrified from the Nuiqsut power grid and neither of its engines will operate except in an emergency; therefore, no engines were modeled as part of this camp. The other camp will be self-powered. Of its two engines, one is needed to provide power to the camp and the other is only in place to provide power should the first fail. Since only one engine will operate at a time, only one engine was modeled for this camp.

The dispersion modeling for this scenario focused on a generic location removed from the GMT1 wellsite. The modeled camp engine was modeled as operating continuously for both short-term and annual modeling.

Well Intervention: For an approximate one-month period during a typical production year, a well intervention activity may occur and therefore was modeled. A well intervention is not typically as intense as a well drilling activity but includes much of the same equipment. Before and after the well intervention, routine operations occur which are limited to daily routine visits and weekly maintenance visits.

Though a typical well intervention is not as intensive as a well drilling activity, it was assumed for simplicity that the well intervention would require the same on-road and on-pad equipment as the modeled infill drilling activity with one exception; the drill rig was replaced with a hydraulic fracturing operation. Though the hydraulic fracturing operation is smaller in size, it was not electrified and can combust as much fuel as a drill rig.

The dispersion modeling conducted for this entire period focused on the GMT1 wellsite and a segment of the access road nearest the pad. Short-term emissions were based on continuous operation during the month-long activity period, and it was assumed that all activities would occur simultaneously. Modeled annual emissions assumed that the maximum monthly emissions occurred for only one month out of the year. The active month was selected as summer because this would maximize fugitive dust emissions.

Comment 11: *(page 14): What is the relevance of the February – March to this project?*

Response:

The GMT1 Project is expected to be similar in operation to the February – March 2011 CD3 project with the exception that GMT1 is a single rig operation, as opposed to the dual rig operation at CD3. Therefore, the detailed list of non-mobile support equipment that is available for the CD3 project was used as the basis for the non-mobile inventory for GMT1.

Comment 12: *(page 14): What is the sulfur content by weight?*

Response:

The sulfur content of the Ultra Low Sulfur Diesel (ULSD) fuel combusted onsite is 0.0015 wt%. The sulfur content of the gaseous fuel combusted onsite is 40 ppm H_2S in fuel gas, which is the conservative upper limit expected at the end of field life based on field souring typical of other North Slope oil fields. At the beginning of field life, the gaseous fuel H_2S content will be less than 5 ppmv H_2S based on previous experience within the Alpine Development.

Comment 13: *(page 14): Will there be or not be emissions from this operation?*

Response:

The GMT1 Project rig camp will be electrified by highline power. Because generators for electricity will not be needed, there will not be emissions from any GMT1 rig camp generators.

Comment 14: *(page 14): What is a Ball Mill module? There should be process flow diagrams with details and explanations.*

Response:

A Ball Mill is type of rock crusher. The Ball Mill module is a module that travels with the Doyon 19 drill rig and it is used to crush drilling cuttings into fine material suitable for injection into a disposal well. The Ball Mill is fully electrified. The Doyon 19 Ball Mill module houses the cement units which are not part of the Ball Mill and crushing process.

Comment 15: *(page 14): How was the 500 hours modeled for short term and long term impacts?*

Response:

The cement units are intermittent sources, therefore the modeled 1-hour SO_2 and NO_x emission rates were based on the maximum hourly rate multiplied by 500/8,760, in accordance with USEPA guidance. The long term (annual) emission rates were also based on the maximum hourly rate multiplied by 500/8,760.

Comment 16: *(page 15): Define "Infill Drilling Construction".*

Response:

Infill drilling are future activities related to drilling the additional wells (expected to be 33 total) associated with the GMT1 Project. These will occur after developmental drilling is complete. Formally, infill drilling is the addition of wells in a field that decreases average well spacing. This practice both accelerates expected recovery and increases estimated ultimate recovery in heterogeneous reservoirs by improving the continuity between injectors and producers. As well spacing is decreased, the shifting well patterns alter the formation-fluid flow paths and increase sweep to areas where greater hydrocarbon saturations exist.[2]

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[2] The Schlumberger Oilfield Glossary (http://www.glossary.oilfield.slb.com/)

Comment 17: *(page 15): Between "specifically" and "the", insert "to".*

Response:

The typographical error is noted.

Comment 18: *(page 15): It will be helpful to generate a list of terms and operations and to define them.*

Response:

Agreed. AECOM will strive to define terms where confusion lies.

Comment 19: *(page 16): Assuming that "10" means October, does Conoco expect to start construction in 2014?*

Response:

Construction is expected to begin in October 2015.

Comment 20: *(page 16): Define Well Flowback.*

Response:

Well Flowback is the process of allowing fluids to flow from the well following drilling or a treatment, either in preparation for a subsequent phase of treatment or in preparation for cleanup and returning the well to production.[3]

Comment 21: *(page 16): Define Infill Drilling.*

Response:

Please see the response to **Comment 16**.

Comment 22: *(page 16): Define Well Intervention*

Response:

Well Intervention, or Well Workover, is the process of performing major maintenance or remedial treatments on an oil or gas well. In many cases, workover implies the removal and replacement of the production tubing string after the well has been killed and a workover rig has been placed on location. Through-tubing workover operations, using coiled tubing, snubbing or slickline equipment, are routinely conducted to complete treatments or well service activities that avoid a full workover where the tubing is removed. This operation saves considerable time and expense[4].

Comment 23: *(page 27): The modeling protocol included lead and total reduced sulfur emissions. Please include all criteria and non-criteria air pollutions in the emissions inventories even if negligible. And please define negligible.*

Response:

With the addition of Total Reduced Sulfur (TRS) emissions and the discussion of lead emissions that follows, emissions of all pollutants relevant to the SEIS have been quantified. The uncertainty associated with approaches to quantify lead emissions from project sources would be much larger than project lead

[3] Ibid. 2

[4] Ibid. 2

emissions; therefore, lead emissions have not been quantified. The primary source of lead emissions from combustion sources results from lead additives contained in some fuels and subsequently emitted during combustion. Since lead is not an additive to any project fuels, lead will only be present at trace element levels as a result of engine lubricant constituents or as a result of engine wear and will be negligible. Currently, the only liquid fuel type containing a lead additive is leaded aviation gasoline used in piston-engine aircraft which are not part of the project inventory.

By negligible, we mean that emissions will be only present at trace element levels that would not be noticeable relative to existing background concentrations. Therefore, lead emissions from all GMT1 project emission units are considered negligible, and project emissions will not cause or contribute to an exceedance of the lead NAAQS/AAAQS.

A summary of GMT1 Project TRS emissions has been provided as part of all emissions inventory spreadsheet packages submitted after October 18, 2013.

Comment 24: *(page 28): Are the emissions in Figures 2-14 and 2-14 total HAPs?*

Response:

Yes, these emissions represent total HAPs.

Comment 25: *(page 33): Sources used to derive emissions should be identified in the text and listed in Section 6.0.*

Response:

Section 2.1 details sources used to derive emissions for the inventory. The electronic version of the emissions inventory transmitted by AECOM also provides sources used to develop the inventory. AECOM believes that between the text provided in the report and the digital spreadsheet packages, all sources used to derive emissions have been cited.

Comment 26: *(page 33): AP-42 emission factors were used to derive emission rates. The factor rating should be identified.*

Response:

AECOM believes that the emission factors used have been properly referenced. The quality of the emission factors is clearly stated in AP-42 and is readily available online: http://www.epa.gov/ttn/chief/ap42/index.html.

Comment 27: *(page 33): Please explain why AP-42 was used and not vendor guarantees, source test data…etc.*

Response:

Vendor guarantees and/or other site-specific information were used where possible. Vendor guarantees could not be used for much of the equipment since specific equipment makes/models have not been selected at this early stage of the project. Given the unknowns, AP-42 is an appropriate source for emission factors.

Comment 28: *(page 33): Why was a higher heating value used to quantify emission rates?*

Response:

The emission factors presented in Table 13.1 of the Climate Registry's General Reporting Protocol were used to develop the N_2O emission rates. These emission factors require using the higher heating value (HHV) of the fuel, rather than the lower heating value (LHV).

Comment 29: *(page 33): What was CPAI's source for heat input?*

Response:

Heat input rates are based on the expected size of the unit that will be purchased/used for these activities.

Comment 30: *(page 34): What is the purpose of blasting?*

Response:

The purpose of the blasting at the Clover Material Source is to mine gravel that will be used for GMT1 access road and pad construction. Blasting of material is only necessary to break it free from the permafrost it is locked in.

Comment 31: *(page 34): Where is the source of the highline power and what are the emissions?*

Response:

The source of highline power for GMT1 Is the Alpine Central Processing Facility. The Nuiqsut camps will be powered by the Nuiqsut municipal utility.

Comment 32: *(page 34): Will there be any idling emissions from the motor vehicles?*

Response:

Idling emissions were included in the emissions inventory. Because they were difficult to quantify, idling emissions were captured by augmenting the travel distance used in the on-road travel emissions calculations.

Comment 33: *(page 35): Define "well frac"?*

Response:

"Well frac" is the same as hydraulic well fracturing. Formally, it is a stimulation treatment routinely performed on oil and gas wells in low-permeability reservoirs. Specially engineered fluids are pumped at high pressure and rate into the reservoir interval to be treated, causing a vertical fracture to open. The wings of the fracture extend away from the wellbore in opposing directions according to the natural stresses within the formation. Proppant, such as grains of sand of a particular size, is mixed with the treatment fluid to keep the fracture open when the treatment is complete. Hydraulic fracturing creates high-conductivity communication with a large area of formation and bypasses any damage that may exist in the near-wellbore area.[5] At GMT1 hydralic fracturing will not be part of well completion, but may occur many year after a well is put into production to re-stimulate production.

Comment 34: *(page 37): Please expand explanation of blasting near the town of Nuiqsut.*

Response:

Blasting near the community of Nuiqsut will occur at the Clover Material Source. As mentioned above, the purpose of the blasting at the Clover Material Source is to mine gravel that will be used for GMT1 access road and pad construction. The Clover Material Source is located approximately 9 kilometers (5.5 miles) from the community of Nuiqsut, which is closer in proximity than the GMT1 pad which is 18 kilometers (11 miles) from Nuiqsut. Blasting activity at the Clover Material Source was therefore included in the dispersion modeling analysis to assess any impacts in its immediate vicinity as well as in the community of

[5] Ibid. 2

Nuiqsut. Note that activity at the Clover Material Sources is nearly identical to periodic gravel mining that occurs adjacent to Nuiqsut to produce gravel for projects within the community.

Comment 35: *(page 48): Please identify and address lead, ozone, secondary PM formation and reduced sulfur in this section.*

Response:

While AECOM acknowledges that information can be organized differently, Section 5.1 of the report does address lead, ozone, and secondary PM formation. Total reduced sulfur emissions have been addressed in the response to **Comment 23**.

Comment 36: *(page 48): If the five scenarios described in Section 2.0 overlapped, how were they modeled?*

Response:

The only overlapping and modeled scenarios were Pad and Access Road Construction, Clover Material Source activities, and the Nuiqsut Camps. Though they overlap in time, impacts from these activities have very little overlap in space since none of them are closer than 9 kilometers from each other. At this distance, these activities will not create significant concentration gradients in the impact areas of other activities and were not included as part of the offsite inventory following guidance in 40 CFR 51 Appendix W.

Comment 37: *(page 48): EPA believes that wake effects should have been modeled. Unless technically justified, please redo the modeling with include building wake effects.*

Response:

Building wake effects were included in the modeling for all point sources. As discussed in Section 3.7 the most recent PRIME version of the Building Profile Input Program (BPIP-PRIME version 04274) was used to determine appropriate direction specific building dimension downwash parameters for each affected source. Figures 3-3 through 3-6 provide modeled layouts for each scenario, including stack and structure heights input to BPIP.

Comment 38: *(page 48): An ambient air boundary for the five scenarios is missing from this section. Please add and justify with respect to the regulation.*

Response:

Access Road and Pad Construction, Infill Drilling, and Well Intervention scenarios – The ambient boundary was defined at the perimeter of the wellsite gravel pad and the edges of the gravel access road. ConocoPhillips Alaska, Inc. will take the steps necessary to control access to the area.

Clover Material Source scenario – The ambient boundary was defined as the extent of the material source itself and a small buffer around the source that will be frequented by non-road equipment and unsafe for the public. It is reasonable to assume that the public will not have access to the area due to the nature of the activities taking place, most notably blasting and heavy equipment traffic. Regardless, ConocoPhillips Alaska, Inc. will take the steps necessary to control access to the area primarily to keep the public safe from the construction activities.

Operation of Nuiqsut Man Camps scenario – The ambient boundary was defined as the edge of the active area surrounding the camps. The active area is an area frequented by vehicles transporting personnel and supplies to and from the camps. For safety reasons, the public will be encouraged to stay out of the active area. Since the camp will be located on leased land, ConocoPhillips Alaska, Inc, will have the right to control the area and will take the steps necessary to control access to the area around the camps.

Comment 39: *(page 48): Please discuss the emissions change at the source of highline power and model its impacts.*

Response:

As discussed in the GMT1 Alternative D AQIA[6], and response to comments included in Attachment K that is being submitted along with this attachment, the source of highline power for both alternatives of the GMT1 project is the Alpine Central Processing Facility (CPF). The GMT1 Alternative A (Preferred Alternative) is expected to cause an increased demand of less than 2 MWe peak during the winter at the CPF and less during the summer. This change is well within permitted limits as well as the variability of historical demand at the Alpine CPF such that the emissions increase will not be noticeable and modeling is not warranted.

Though the drill rig itself requires 2 to 5 MWe to operate, it has been a historical electrical demand on the Alpine CPF power generators since the beginning of Alpine; therefore, the GMT1 drill rig electrical load is an existing source of emissions and the project will not cause an increase in emissions.

Comment 40: *(page 48): Please see modeling protocol form EPA comments.*

Response:

Modeling protocol comments have been addressed separately.

Comment 41: (page 49): *If there are air quality monitors at same location, please correct label and figure title.*

Response:

The label and figures have been updated as shown in **Figure D-4**.

Comment 42: (page 49): *Please include ASOS station in this graphic.*

Response:

The ASOS station has been added to the graphic, as shown in **Figure D-4**.

Comment 43: *Page 51: Please see modeling protocol form EPA comments.*

Response:

Modeling protocol comments have been addressed separately.

Comment 44: *Page 52: If available, please add O3 and Pb background measurements.*

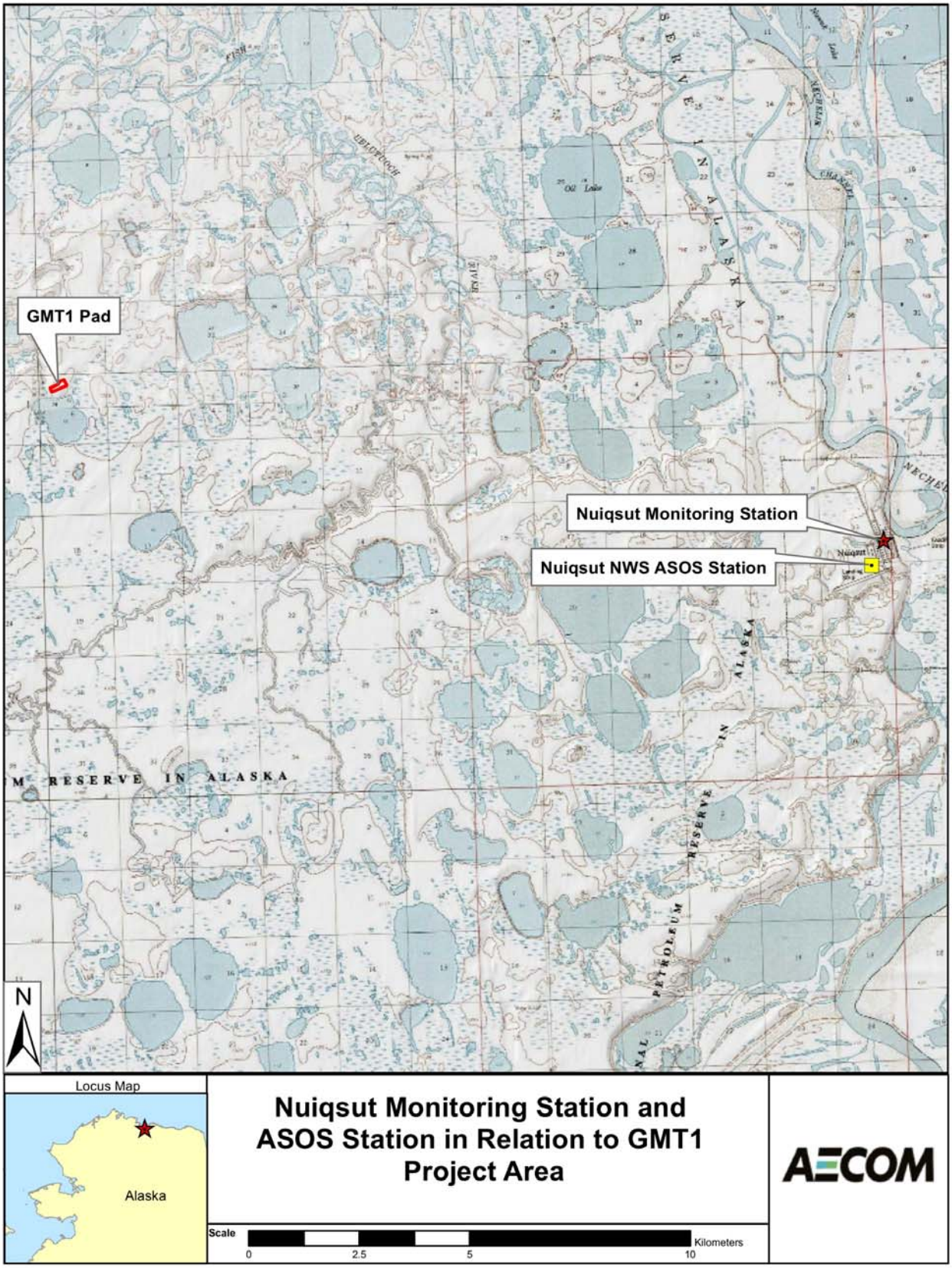
Response:

As mentioned above in the answer to **Comment 23**, GMT1 source lead emissions are negligible and will not cause or contribute to an exceedance of the lead NAAQS and have not been modeled. Existing background lead emissions will not be quantified here as it is not within the scope of the AQIA to address existing background concentrations for pollutants not included in the dispersion modeling.

Please see the response to **Comment 65** for a table of ozone values measured at the Nuiqsut monitoring station.

[6] Ibid. 1

Figure D-4 Nuiqsut Monitoring Station and ASOS Station in Relation to Project Area



Comment 45: *Page 53: Please provide references for the in-stack ratios.*

Response:

Please see Appendix A of the AQIA which describes the development of the in-stack NO_2/NO_x ratios.

Comment 46: *Page 53: Where is the NOx from>*

Response:

Explosives detonation is a combustion process. As such, NO_x is created upon combusting air and fuel. Furthermore, the fuel in this case is ammonium nitrate fuel oil (ANFO) which contains a considerable amount of fuel-bound nitrogen available for NO_x production.

Comment 47: *Page 53: "Access Road and Pad"*

Response:

Alternative word choice suggested has been noted.

Comment 48: *Page 53: For this and the subsequent four scenarios, was OLM similarly applied to annual predictions.*

Response:

For all five modeled scenarios, OLM was applied to both 1-hour NO_2 and annual NO_2 predictions.

Comment 49: *Page 53: For this and the subsequent four scenarios, how was secondary formation of PM2.5 quantified.*

Response:

Secondary formation of $PM_{2.5}$ was addressed qualitatively in Section 5.1.4 of the AQIA and a similar section in the Alternative D AQIA[7]. This was done because the AERMOD dispersion model does not have the capability to account for secondary particulate formation when predicting particulate impacts. Since the CALPUFF model can account for secondary particulate formation, the far-field modeling analysis addressed secondary formation directly.

Comment 50: *Page 53: "Mining the"*

Response:

Alternative word choice suggested has been noted.

Comment 51: *Page 54:"Operation of the Nuiqsut man"*

Response:

Alternative word choice suggested has been noted.

[7] Ibid. 1

Comment 52: *Page 55: It is difficult to determine if the modeling is adequate without the coordinates of the emission sources relative to each other for the five scenarios. Using your coordinate system, please graphics showing the location of the sources and its (x, y) location.*

Response:

Figure D-5 through **Figure D-8** are reproductions of the modeled layout figures provided in the AQIA, with the coordinate system displayed on the axes. The layout for the operation of the Nuiqsut Camps scenario has not been updated here because the modeling was conducted on a local coordinate system. However, the Nuiqsut camps were assumed to be located in Nuiqsut which is pictured relative to other source locations in **Figure D-3**.

Comment 53: *Page 62: Please provide references.*

Response:

References for the vendor data used to develop stack parameters for the primary power common stack of the Doyon 19 rig were included in the emissions inventory digital spreadsheet package. Specifically, the references can be found in GMT1_driling_inventory_Emissions_Ver1-3.xls.

Comment 54: *Page 67: Was source groups used with procedure*

Response:

No source groups were used to model air toxics. Emissions from well venting combined with those sources involved in drilling were combined and the total was modeled as a single volume source centered on the wellsite. The single volume source was modeled with a unitized (1 g/sec) emission rate.

Comment 55: *Page 67: Based on the location of the emissions sources and ambient air quality, EPA believes 10-meter spacing along ambient boundary is appropriate.*

Response:

According to the Alaska Department of Environmental Conservation (ADEC), receptors spaced 25 meters apart are commonly used for modeling impacts within 200 meters of a downwash dominated stationary source[8]. AECOM believes a receptor spacing of 25 meters at the ambient boundary is sufficient for the dispersion modeling analysis.

Comment 56: *Page 67: This statement is true if Nuiqsut measurement are used. Please clarify.*

Response:

The NAAQS/AAAQS compliance analysis has been updated to use ambient background measurements from the Nuiqsut monitoring station. Revisions to the AQIA have been submitted separately.

Comment 57: *Page 67: Table 4-5 identifies Reasonably Foreseeable Development Sources for the far field modeling but not the near field modeling such as GMT2 and CD5. Please clarify*

Response:

The GMT2 facility is 13 kilometers (8 miles) away from GMT1 and the CD5 facility is 16 kilometers (10 miles) away from GMT1. Impacts from these sources are not expected to cause a significant concentration gradient in GMT1 near-field impact area. Therefore, GMT2 and CD5 were not included in the near-field impact analysis.

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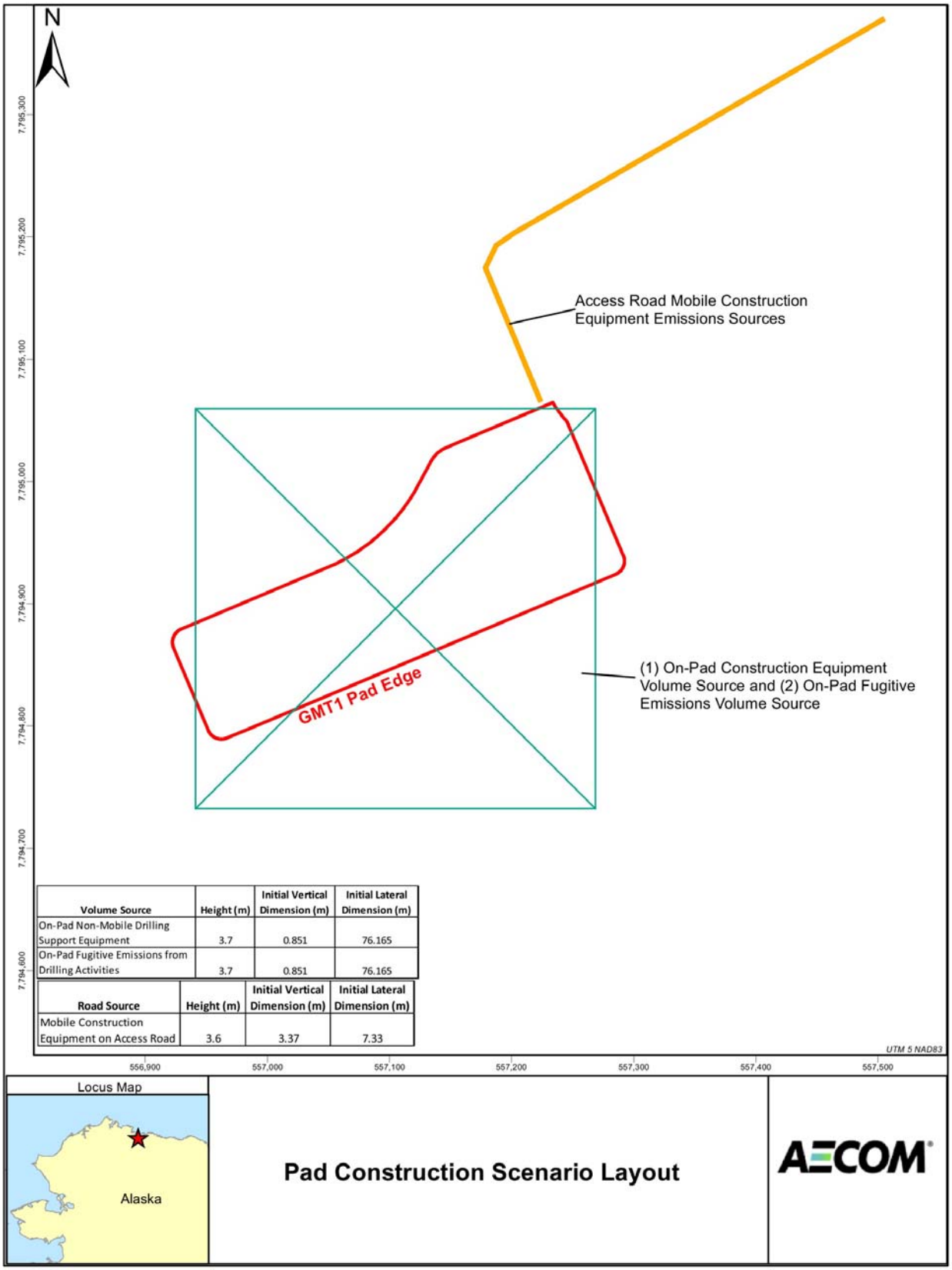
[8] ADEC Modeling Review Procedures Manual, Alaska Department of Environmental Conservation, June 30, 2013. Available at http://dec.alaska.gov/air/ap/docs/ModelingProceduresManual.6-30-2013.pdf.

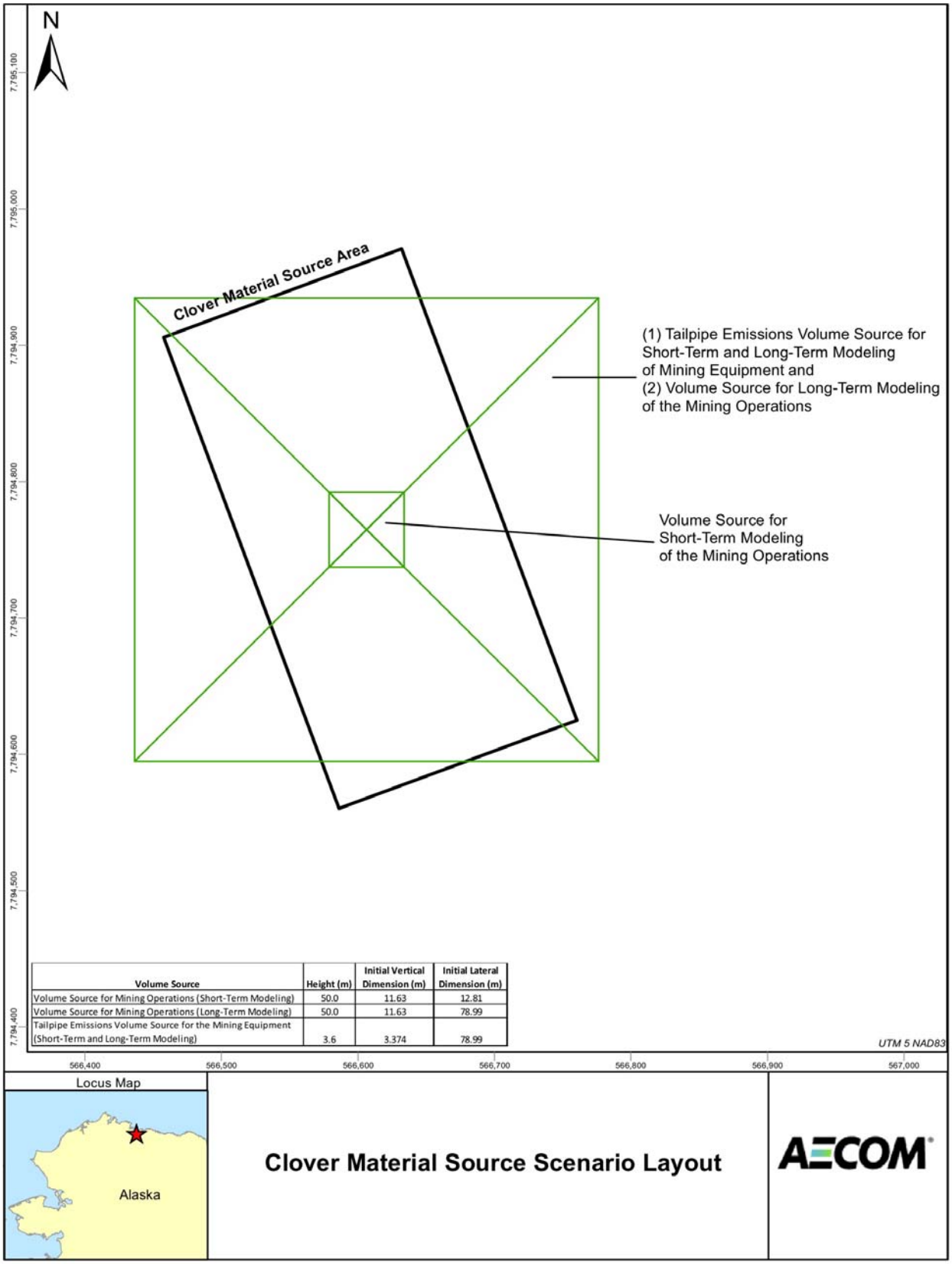
Figure D-5 Access Road and Pad Construction Model Layout



Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
On-Pad Non-Mobile Drilling Support Equipment	3.7	0.851	76.165
On-Pad Fugitive Emissions from Drilling Activities	3.7	0.851	76.165

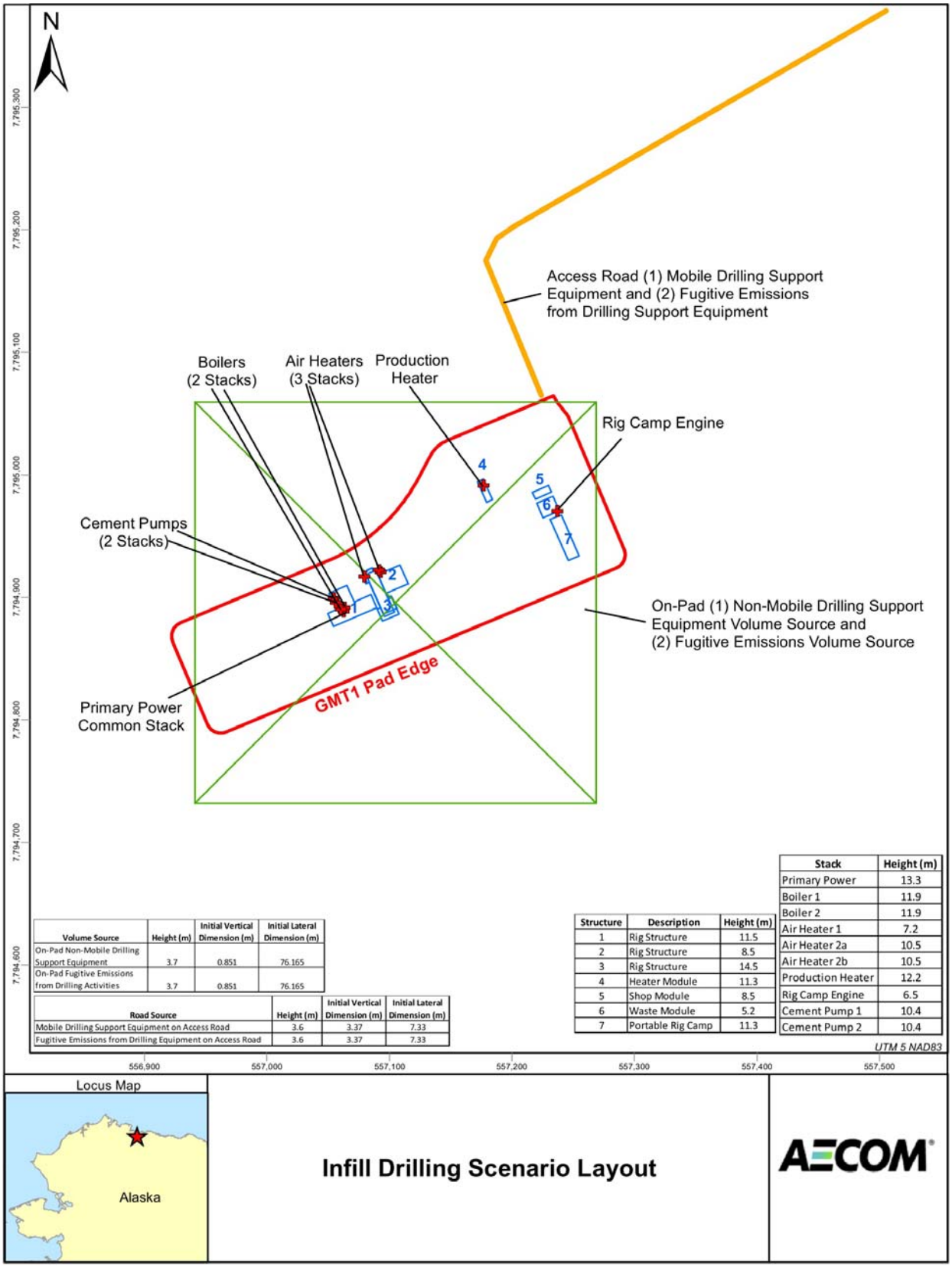
Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Construction Equipment on Access Road	3.6	3.37	7.33

Figure D-6 Clover Material Source Model Layout



Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Volume Source for Mining Operations (Short-Term Modeling)	50.0	11.63	12.81
Volume Source for Mining Operations (Long-Term Modeling)	50.0	11.63	78.99
Tailpipe Emissions Volume Source for the Mining Equipment (Short-Term and Long-Term Modeling)	3.6	3.374	78.99

Figure D-7 Infill Drilling Model Layout



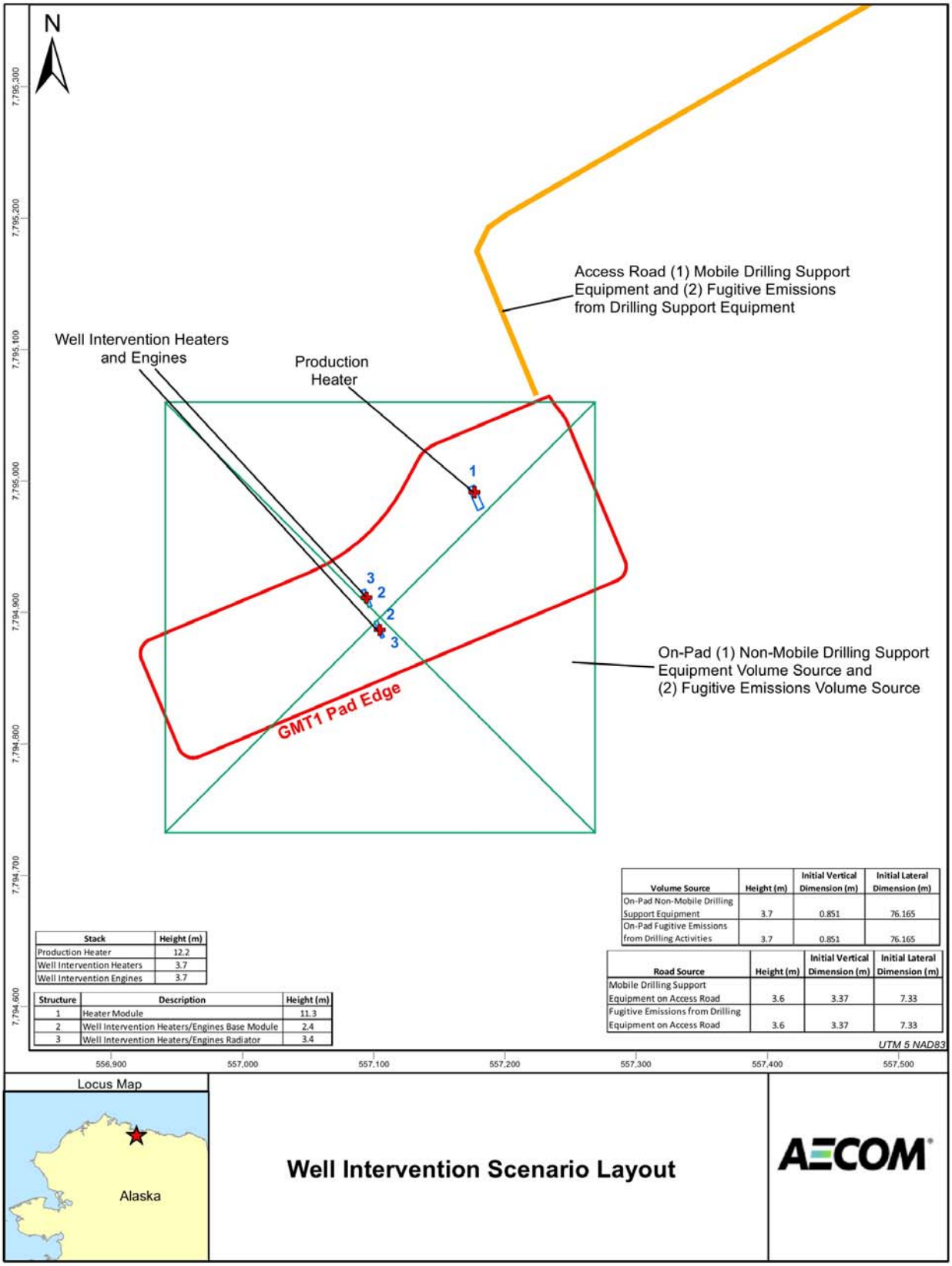
Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
On-Pad Non-Mobile Drilling Support Equipment	3.7	0.851	76.165
On-Pad Fugitive Emissions from Drilling Activities	3.7	0.851	76.165

Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Drilling Support Equipment on Access Road	3.6	3.37	7.33
Fugitive Emissions from Drilling Equipment on Access Road	3.6	3.37	7.33

Structure	Description	Height (m)
1	Rig Structure	11.5
2	Rig Structure	8.5
3	Rig Structure	14.5
4	Heater Module	11.3
5	Shop Module	8.5
6	Waste Module	5.2
7	Portable Rig Camp	11.3

Stack	Height (m)
Primary Power	13.3
Boiler 1	11.9
Boiler 2	11.9
Air Heater 1	7.2
Air Heater 2a	10.5
Air Heater 2b	10.5
Production Heater	12.2
Rig Camp Engine	6.5
Cement Pump 1	10.4
Cement Pump 2	10.4

Figure D-8 Well Intervention Model Layout



Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
On-Pad Non-Mobile Drilling Support Equipment	3.7	0.851	76.165
On-Pad Fugitive Emissions from Drilling Activities	3.7	0.851	76.165

Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Drilling Support Equipment on Access Road	3.6	3.37	7.33
Fugitive Emissions from Drilling Equipment on Access Road	3.6	3.37	7.33

Stack	Height (m)
Production Heater	12.2
Well Intervention Heaters	3.7
Well Intervention Engines	3.7

Structure	Description	Height (m)
1	Heater Module	11.3
2	Well Intervention Heaters/Engines Base Module	2.4
3	Well Intervention Heaters/Engines Radiator	3.4

Comment 58: *Page: 69: Please justify Clover Material Source Area Ambient Air Boundary and consistency with regulation.*

Response:

Please see the response to **Comment 38**.

Comment 59: *Page 70: Please justify Nuiqsut Camps Ambient Air Boundary and consistency with regulation.*

Response:

Please see the response to **Comment 38**.

Comment 60: *Page 77: Please list the specific conservative assumptions.*

Response:

The AQIA lists the specific conservative assumptions leading to significant over predictions of 1-hour NO_2 impacts during the Access Road and Pad Construction Scenario as follows:

1) All potential construction equipment engaged in road and pad construction was assumed to be operating concurrent when in reality the equipment will be staged depending on what is being constructed (i.e., the access road construction will be completed prior to pad construction rather than concurrently as modeled) and which phase of construction is occurring (i.e., gravel placement and gravel compaction are unlikely to occur concurrently),
2) All potential construction equipment engaged in road and pad construction was assumed to operate every day of the entire construction phase.

Comment 61: *Page 77: Do you mean 24/7 for each phase?*

Response:

Details regarding the number of hours per day of operation that was assumed for construction equipment can be found in the digital spreadsheet package, specifically in **GMT1_Construction_Equipment_Emissions_Ver1-1.xls.**

Comment 62: *Page 77: Are there any cultural resources or biological resources near GMT1 that could be affected by the impacts? For example, threatened or endangered species or plants and its habitats.*

Response:

Assessment of cultural or biological resources in the vicinity of GMT1 is not within the scope of the air quality impact analysis and is not addressed. Please refer to the appropriate section of the Draft SEIS for the project once it is available for answers to your questions.

Comment 63: *Page 78: Comments to be provided by Region 10 toxicologist.*

Response:

Comments were received from the Region 10 toxicologist and addressed in Attachment F that is included along with this Attachment.

Comment 64: *Page 79: Is 2008 the most recent NEI?*

Response:

The most recent NEI is 2011. **Table D-1** presents the National Emission Inventory (NEI) documented emissions of ozone precursors from all sources in the North Slope Borough from 2002 through the most recent year (2011). Prior to 2002, borough level emissions data was not available and not included in this analysis. Furthermore, starting in 2011, USEPA introduced a new nationwide emissions calculation tool for non-point oil and gas sources which drastically changed reporting for VOC emissions making it very difficult to compare the 2011 NEI values to previous years. Therefore, the 2011 VOC emission value was left off the table. This table shows that even with the changes in regional precursor load, ozone trends have remained essentially unchanged.

Table D-1 National Emissions Inventory Reported Annual Levels of Ozone Precursors for the North Slope Borough

NEI Year	NO_x [1]		VOC [1]	
	(tons/year)	Δ% from 2002	(tons/year)	Δ% from 2002
2002	41,790	0	1,932	0
2005	41,977	0.4	1,395	-28
2008	47,604	13	1,588	14
2011	47,828	0.5	NA [2]	NA

1 The NEI database is routinely updated as errors are discovered and better data becomes available. Therefore, the data is current based on a November 11, 2013 query of the NEI database, and values may be different from those reported based on previous queries. This is particularly the case for the most recent years.

2 Starting in 2011, USEPA introduced a new nationwide emissions calculation tool for non-point oil and gas sources which drastically changed reporting for VOC emissions making it very difficult to compare the 2011 NEI values to previous years; therefore, the 2011 VOC emission value was left off the table

Comment 65: *(Page 80): Region 10 suggests presenting and discussing ozone measurement at Nuiqust.*

Response:

A summary of ozone values measured at Nuiqsut from 2010 through 2012 reproduced from an analysis of measurements from the Nuiqsut monitoring station submitted as part of this project[9] are presented in **Table D-2**. Ozone measurements at Nuiqsut remain well below the NAAQS/AAAQS which is the annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years of 0.075 ppm.

Comment 66: *(Page 81): Region 10 has PM2.5 speciation measurements from Deadhorse and are available should Conoco want to describe background levels.*

Response:

Noted.

[9] Letter from Tom Damiana (AECOM) to Lynn DeGeorge (ConocoPhillips Alaska, Inc.) regarding: ConocoPhillips GMT1 – Representative Background Air Pollutant Concentrations for the GMT1 Project Location – REVISED. Submitted December 20, 2013.

Table D-2 Summary of O_3 Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 1-hour Average (ppb)	1st High Daily Maximum 8-hour Running Average (ppb)	4th High Daily Maximum 8-hour Running Average (ppb)
2010	8,352	95	46	43	41
2011	7,976	91	59	53	51
2012	7,308	83	48	46	39
3-Year Average	--	--	51	47	44

NOTE: O_3 8-hour Running Averages are calculated for 8-hour periods for which there are at least 6 valid hours (75% completeness).

Comment 67: *(Page 81): Is it possible to describe negligible (e.g., less than instrument threshold)?*

Response:

Please see the response to **Comment 23**.

Comment 68: *(Page 81): The protocol identified reduced sulfur compounds as a regulate air pollutant. Please why this air pollutant is no discussed in the AQIA.*

Response:

Total reduced sulfur emissions have been provided in all version of the emissions inventory digital spreadsheet package submitted after October 18, 2013.

Comment 69: *(Page 82): Please compare project impacts with PSD air quality Class I and II increments.*

Response:

Please see the response to **Comment 1**.

Comment 70: *(Page 83): In this and all subsequent tables, please use air pollutant measurements from the Nuiqsut monitoring station.*

Response:

Measurements from the Nuiqsut monitoring station have been used in the updated version of the Alternative A AQIA and the Alternative D AQIA, submitted separately.

Comment 71: *(Page 93): The CD1 and CD3 measurements are not in the possession of Region 10 to determine its validity. Has AK DEC made validity determination for these two data sets?*

Response:

The Alaska DEC has reviewed the CD3 measurements, but not the CD1 measurements since they have only recently been submitted. Due to proximity to near-by structures (i.e., the drill rig and site permanent warehouse), the CD3 meteorological measurements are not considered PSD quality. This was expected given that the meteorological measurements were primarily made to interpret the ambient measurements.

With the exception of the short-duration of the monitoring program, the ambient measurements were determined to be PSD quality. The final findings report[10] is included at the end of this attachment.

Comment 72: *(Page 93): What is distance between the monitoring station?*

Response:

The monitoring station is located approximately 100 meters from the Doyon 141 rig.

Comment 73: *(Page 96): What is the distance between the monitoring station and CD1?*

Response:

The distance between the monitoring station and the southern end of the CD1 well line is approximately 40 meters.

Comment 74: *(Page 98): Defer to FLMS.*

Response:

Noted.

Comment 75: *(Page 109): Defer to Zach*

Response:

Noted.

Comment 76: *(Page 114): Where is the ASOS station in relation to the GMT1 site and Conoco Nuiqsut monitoring station?*

Response:

Please see **Figure D-4** for the proximity of the ASOS station to GMT1 and the Nuiqsut monitoring station.

Comment 77: *(Page 114): Does Conoco consider the ASOS station and the Conoco station site specific? If yes, Conoco could have used either station measured data and the minimum one year of data for modeling.*

Response:

Please see the response to **Comment 81** below.

Comment 78: *(Page 114): If measured at the ASOS station using a ceilometer, why wasn't cloud cover used in lieu of delta-T?*

Response:

The delta-T measurements were used by AERMOD to calculate stability because delta-T was measured by the Nuiqsut meteorological station, which was the primary source of data selected for dispersion modeling, for reasons discussed below in the response to **Comment 81**.

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[10] Letter from Jim O. Paumier (AMEC) to Brittany Crutchfield (ADEC) regarding: Final Findings Report ConocoPhillips Alaska, Inc. - Western North Slope (WNS) Ambient Air Quality Monitoring Program at CD3 Data Report February 21 - April 16, 2011 Under ADEC Contract No. 18-6004-17, NTP SOB, AMEC Project Number 6480121134. Submitted 28 September 2012.

Comment 79: *(Page 114): Delete "of".*

Response:

The erroneous word is noted.

Comment 80: *(Page 116): Region 10 would accept 2009 measurements with 88.6% recovery rates for wind*

Response:

It is noted Region 10 would accept 2009 ConocoPhillips Alaska, Inc. monitor data without substitution of missing data with Nuiqsut ASOS data. However the addition of the Nuiqsut ASOS wind data creates a more robust dataset with more “usable” hours for AERMOD to calculate impacts.

Comment 81: *(Page 116): With 2009 and 2012, Conoco could have used two years from the Conoco station in the modeling analysis or 2 years of Conoco plus 3 years from the ASOS station for a total of five years.*

Response:

While AECOM believes that both the Nuiqsut ASOS station and the ConocoPhillips Alaska, Inc. Nuiqsut meteorological monitoring station to be site specific for the GMT1 project, 5 years of data were selected for the dispersion modeling in lieu of only one year to ensure inter-annual variability was captured.

Meteorological data from the ConocoPhillips Alaska, Inc. Nuiqsut station was selected as the primary data set because of the documentation of quality control of data. AECOM believes that the best quality and most recent dataset for dispersion modeling consists of 2008 through 2012 data from the Conoco Nuiqsut monitor, with minor substitutions from the ASOS data where the monitor data are missing. Without substitutions from the ASOS station, older data from the ConocoPhillips Alaska, Inc. monitor would have been required which AECOM considered unacceptable.

Comment 82: *(Page 118): Defer to FLMs.*

Response:

Noted.

ADEC Review of the CD3/WNS Monitoring Data

28 September 2012

Alaska Department of Environmental Conservation
Division of Air Quality
610 University Avenue
Fairbanks, Alaska 99709

Attention: Ms. Brittany Crutchfield

Subject: **Final Findings Report ConocoPhillips Alaska, Inc. – Western North Slope (WNS) Ambient Air Quality Monitoring Program at CD3 Data Report February 21 – April 16, 2011 Under ADEC Contract No. 18-6004-17, NTP 50B, AMEC Project Number 6480 12 1134**

Dear Ms. Crutchfield:

AMEC Environment & Infrastructure, Inc. (AMEC) has prepared this final Findings report for ConocoPhillips Alaska, Inc.'s ambient air and meteorological monitoring program 2011 Data Report at the Alpine CD3 drilling pad. AECOM submitted responses on behalf of ConocoPhillips in the form of a response document and without updating the data report. Due to the unusual nature of the data (less than one full quarter) and format of the report (AECOM did not completely follow the annual or quarterly report guidelines set forth by Alaska Department of Environmental Conservation), AMEC inserted AECOM's response and our reply to each response into our draft findings report in the appropriate location to prepare this final findings report.

It is important to note that the AECOM's original data report and their response document must be kept together to form a final data report document.

If you have any questions or would like additional documentation, please contact me at (919) 768-9904.

SUBMITTAL APPROVAL

James O. Paumier	9/28/12	Clint Tillerson	9/28/12
AMEC Project Manager	Date	AMEC Peer Reviewer	Date

Correspondence:
AMEC Environment & Infrastructure, Inc.
4021 Stirrup Creek Drive, Suite 100
Durham, North Carolina 27703
Tel (919) 381-9900
Fax (919) 381-9901

FINAL
FINDINGS REPORT

CONOCOPHILLIPS ALASKA – WESTERN NORTH SLOPE AMBIENT AIR MONITORING PROGRAM AT CD3 DATA REPORT FEBRUARY 21 – APRIL 16, 2011

Prepared for

State of Alaska
Department of Environmental Conservation
Division of Air Quality

ADEC Contract No. 18-6004-17
NTP No. 50B

AMEC Project No. 6480121134

Prepared by

AMEC Environment & Infrastructure, Inc.
4021 Stirrup Creek Road, Suite 100
Durham, NC 27703

28 September 2012

EXECUTIVE SUMMARY

This report provides AMEC Environment & Infrastructure, Inc.'s (AMEC) recommended findings for the February 21, 2011 through April 16, 2011 ambient air and meteorological monitoring data submitted by ConocoPhillips Alaska, Inc. (CPAI) for the Western North Slope (WNS) Ambient Air Quality Monitoring Program at CD3. On behalf of CPAI, AECOM collected the data and prepared the data report. AMEC reviewed the data under contract to the Alaska Department of Environmental Conservation (Department) to determine whether the data at the site meets the quality assurance requirements of the Prevention of Significant Deterioration (PSD) program. AMEC received AECOM's comments dated July 18, 2012 from the Department on July 27, 2012. This findings report summarizes AECOM's responses to AMEC's comments and AMEC's responses.

Although a Quality Assurance Project Plan (QAPP) was submitted to the Department, it was not reviewed and approved prior to the monitoring program. In the QAPP, CPAI acknowledges that the meteorological data are not PSD-quality due to siting issues with the meteorological tower. AMEC performed a separate review of the QAPP and site selection and agrees with the assessment that the period of meteorological data cannot be used for PSD applications. Table 1 summarizes AMEC's findings for the meteorological parameters. Since there are less than two months of data, assessments for three of the four quarters and annually are not applicable.

Excluding the completeness criterion, the ambient monitoring data for the period February 21, 2011 through April 16, 2011 meet PSD quality requirements. For the 52-day period, the ambient monitoring data meet the 80% capture requirements; however, the ambient data do not meet the quarterly (approximately 90 days) PSD capture requirements.

In addition, several elements of a monitoring report were missing or incomplete. The details of AMEC's review are discussed in the Findings.

AMEC Comment 1:

The report did not follow the recommended format for this type of report, making it more difficult to assess the information that was included in the report. AMEC recommends following the ADEC format in future reports, indicating sections and subsections that are not applicable.

AECOM Response: Comment noted. With the additional information provided in this attachment, the report has been augmented to fulfill the ADEC requirements as closely as possible.

AMEC Response: *We agree the report fulfills the ADEC requirements; however, it does not follow ADEC's recommended format.*

Table 1: Summary of PSD-Quality Determination for Meteorological Parameters – CPAI Western North Slope at CD3

Meteorological Parameters	Passed Audits?	Passed Calibrations?	Data Quality/ Completeness OK? (1)	PSD Quality?(2)				
				QA	QB	QC	QD	ANN
Wind Direction	Y	Y	Y	N	na	na	na	na
Wind Speed	Y	Y	Y	N	na	na	na	na
Air Temperature (2m)	Y	Y	Y	N	na	na	na	na
Air Temperature (10m)	Y	Y	Y	N	na	na	na	na
Air Temperature Difference	Y	Y	Y	N	na	na	na	na
Relative Humidity (as dew point)	Y	Y	Y	N	na	na	na	na
Barometric Pressure	Y	Y	Y	N	na	na	na	na
Solar Radiation	Y	Y	Y	N	na	na	na	na

N – No; Y – Yes; na – Not Applicable

QA – Quarter A; QB – Quarter B; QC – Quarter C; QD – Quarter D; ANN – Annual

(1) – for the 52+ days data were collected, the meteorological data met the 90% completeness criterion for all parameters, but do not meet the quarterly completeness requirement.

(2) – as noted in the QAPP and data report, the meteorological sensors do not meet PSD siting requirements.

Table 2: Pollutants/Concentrations Averaging Periods for Ambient Air Pollutant Data Parameters – CPAI Western North Slope at CD3

Ambient Air Pollutant	NAAQS ppm	Averaging Period	Measured Concentration ppm (µg/m^3)
NO_2	0.100	Max. 1-hour	0.087 (166.370)
	0.053	Period Avg.	0.010 (19.123)
SO_2	0.075	Max. 1-hour	0.004 (10.652)
	0.5	Max. 3-hour	0.002 (5.326)
	0.14	Max. 24-hour	0.001 (2.663)
	0.03	Period Avg.	0.000 (0.000)
	0.075	Max. 8-hour	0.031 (82.551)
O_3	0.075	Max. 8-hour	0.031 (61.845)
CO	35	Max. 1-hr	0.7
	9	Max. 8-hr	0.6
	µg/m^3		**µg/m^3**
PM_{10}	150	Max. 24-hr	10
$PM_{2.5}$	35	Max. 24-hr	20
	15	Period Avg.	6

Table 3: Summary of PSD-Quality Determination for Ambient Air Pollutant Data Parameters – CPAI Western North Slope at CD3

Ambient Air Pollutant	Passed Audits?	Passed Calibrations? (Yes or No)	Data Quality/ Completeness OK? (1)	PSD Quality?
NO_2	Y	Y	Y	N
SO_2	Y	Y	Y	N
O_3	Y	Y	Y	N
CO	Y	Y	Y	N
PM_{10}	Y	Y	N	N
$PM_{2.5}$	Y	Y	Y	N

Y – Yes, N – No

(1) – for the 52+ days data were collected, the ambient air data met the 80% completeness criterion for all pollutants (except for PM_{10}), but do not meet the quarterly completeness requirement.

Table 3: AERMET Support Table

Threshold Wind Speed	0.4 m/s
Anemometer Height	10 m
Temperature Difference Computation Convention	Upper – Lower (10m – 2m)
Tower Location (decimal degrees)	Latitude: 70.4193 Longitude: -150.9095

FINDINGS

ConocoPhillips Alaska, Inc. (CPAI) collected meteorological and ambient pollutant data at the Western North Slope (WNS) monitoring station at the Alpine CD3 drilling site for the period February 21, 2011 through April 16, 2011. The meteorological and ambient monitoring data and report were submitted to the Alaska Department of Environmental Conservation in October 2011. Although a final Quality Assurance Project Plan (QAPP), dated February 2011, was not reviewed prior to the monitoring period, AMEC referenced the QAPP during its review of the data report.

During the monitoring period, CPAI collected the following meteorological parameters:

- Air temperature, two meters above ground level (degrees Celsius [°C])
- Air temperature, ten meters above ground level (degrees Celsius [°C])
- Vertical temperature difference (ΔT, "Delta T" (degrees Celsius [°C]))
- Wind speed standard deviation
- Wind direction (degrees [°])
- Wind direction standard deviation
- Vertical wind speed (meters per second [m/s])
- Relative humidity (percent [%])
- Total solar radiation (Watts per square meter [W/m^2])
- Barometric Pressure (millibar [mb])

The air quality monitoring data consisted of ambient concentrations of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter with aerodynamic diameters less than 10 microns (PM_{10}), and particulate matter with aerodynamic diameters less than 2.5 microns ($PM_{2.5}$).

AMEC notes that the report did not follow the recommended format for this type of report, making it more difficult to assess the information that was included in the report. AMEC recommends following the Department format in future reports, indicating sections and subsections that are not applicable.

COVER LETTER/TRANSMITTAL LETTER TO ADEC AIR PERMITS

AMEC Comment 2:

No signed cover letter/transmittal letter accompanied the submittal.

AECOM Response: The WNS CD3 Monitoring Report and associated data were submitted digitally with a signed cover letter/transmittal letter. The cover letter discussed proposals for ambient monitoring within the Alpine and Kuparuk fields in support of drill rig permitting.

AMEC Response: *AMEC finds this response acceptable.*

TITLE PAGE

AMEC found the Title Page to be acceptable.

TABLE OF CONTENTS

AMEC found the Table of Contents to be acceptable.

DATA REPORT: EXECUTIVE SUMMARY

AMEC Comment 3:

An Executive Summary was not included in the data report.

AECOM Response: Due to the short time period of the project, an executive summary was not deemed critical to presenting the information and dataset.

AMEC Response: *AMEC agrees this is not a critical; however, it does not follow ADEC's recommended format.*

DATA REPORT SECTION 1: INTRODUCTION

AMEC Comment 4:

AMEC did not find a table of measurement methods nor a discussion/table indicating variations from the QAPP.

AECOM Response: Table 1 and **Table 2** included below provides the measurement method details. **Table 3** below contains the variations from the QAPP.

AMEC Response: *AMEC finds AECOM's response acceptable. Note that the tables referenced as 'included below' are in the document submitted by AECOM to the Department and are not presented in this document.*

DATA REPORT SECTION 2: STATION PERFORMANCE SUMMARY

For the ambient monitoring program, AMEC notes the following:

AMEC Comment 5:

- Precision statistics tables were not included in Section 2, but were included in Appendix A; precision criteria are not shown in tables.

AECOM Response: Though the tables were not included in Section 2 of the WNS CD3 Monitoring Report, they were included in Table 3. Please refer to Table 3 of the WNS CD3 Monitoring Report for the missing table which includes a summary of precision results and criteria.

AMEC Response: *AMEC finds this response acceptable. However, note that Table 3 in the original report and Table 3 in the AECOM response document are different tables and should not be confused.*

AMEC Comment 6:

- Accuracy statistics were not summarized in report body, but were included in Appendix C.
- Instrument calibration statistics were not included in report body, but included in Appendix C.
- QC Check/Accuracy Table was not included in Section 2.
- Summaries of calibration statistics were not included in Section 2; Tables 4 and 5 did not include the elements required in these tables, with only pass/fail results reported; audit forms were included in Appendix C.
- Summaries of performance audits were not included in Section 2; Tables 6 and 7 did not include the elements required in these tables, with only pass/fail results reported; audit forms were included in Appendix C.

For the meteorological monitoring program, AMEC notes the following:

- Calibrations are only mentioned in the discussion; Tables 4 and 5 did not include the elements required in these tables, with only pass/fail results reported.
- There is no discussion or mention of the performance audits on the meteorological instrumentation; Tables 6 and 7 did not include the elements required in these tables, with only pass/fail results reported.

AECOM Response: Table 4 through **Table 8** below provide the missing summaries noted above.

AMEC Response: *AMEC finds this response acceptable. Note that the tables referenced as 'below' are in the document submitted by AECOM to the Department and are not presented in this document.*

AMEC Comment 7:

- The data completeness table (Table 2) indicates the data capture goal is on a quarterly basis (footnote 1), but the reported capture rate is based only on the monitoring period

from February 21 through April 16 (approximately 52 days). The meteorological parameters would not meet the 90% capture rate if the full quarter (February-April) were considered.

AECOM Response: The reviewer is correct that the data completeness is evaluated on the basis of the monitoring period rather than an entire quarter.

AMEC Response: *AMEC finds this response acceptable.*

DATA REPORT SECTION 3: MONITORING DATA NETWORK SUMMARY

AMEC found this write-up in Section 2.4 and in Table 8.

AMEC Comment 8:

There was no summary of the meteorological data and no discussion of historical data from a nearby site (National Weather Service or facility-operated tower). This would include discussions and climatology of wind speed, wind direction, temperature, and other measured parameters, and if applicable, stability frequencies.

AECOM Response: The monitoring program lasted less than three months; therefore, a summary of the meteorological data was not considered relevant and not included. A summary of relevant historical data from a nearby site (Kuparuk, Alaska) were presented in the QAPP and were not repeated in the WNS CD3 Monitoring Report.

AMEC Response: *AMEC does not find this response acceptable. Although the information is in the QAPP, AMEC does not agree that it can be omitted from the data report, even in this abbreviated format. It is important for a data report (and in this case the inclusion of AECOM's response document) to stand without necessarily referring to the QAPP for information that is supposed to be in the data report.*

AMEC compared the meteorological data to the screening criteria recommended in EPA's *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA-454/R-99-005). AMEC did not identify any extended periods in which the data were not in compliance with the screening recommendations.

DATA REPORT APPENDICES

AMEC found the appendices did not follow the Department's *PSD Ambient Air Quality & Meteorological Monitoring Annual Data Report Format*. Instead, the data report contained the following appendices:

- Appendix A: Precision Statistics

- Appendix B: Calibration Reports and Documentation
- Appendix C: Quality Assurance Audit Reports
- Appendix D: Monthly Data Summaries
- Appendix E: $PM_{2.5}$ and PM_{10} Zero Air Background Test Results
- Appendix F: Digital Validated Data
- Appendix F: Digital Camera Images

DATA REPORT: APPENDIX A - DATA PROCESSING SPECIFICATIONS AND STATISTICAL FORMULAE

AMEC Comment 9:

An appendix listing the following information was not included in the data report:

- Calculations and criteria used to determine Data Completeness, calculations of meteorological variables, i.e., temperature difference and the standard deviation of wind direction (σ_θ); and
- Specifications on how valid data was corrected for zero/span drift.

AECOM Response: The relevant calculation details were presented in the QAPP and were not repeated in the WNS CD3 Monitoring Report.

AMEC Response: *AMEC disagrees with this response. Relevant calculation details in the report are needed to demonstrate that the calculation details in the QAPP were followed.*

DATA REPORT: APPENDIX B - PRECISION DATA (see Appendix A in Data Report)

The calibration reports were included in Appendix B rather than Appendix C.

AMEC found the Method Precision Calculations in Appendix A of the Data Report acceptable.

AMEC Comment 10:

A different make and model (a Climatronics 102236 GO) for the vertical wind speed anemometer on the tower for both calibrations (February 2011 and April 2011) and performance audits (February 2011 and April 2011) was reported than what was proposed in the QAPP (RM Young 27106). This difference should be reported as a variation to the QAPP.

The February 2011 and April 2011 calibrations reported the upper temperature sensor to be at a height of 9.1 meters. The QAPP proposed that the upper temperature was to be measured at a

height of 10 meters. Correct this discrepancy and report this as a variation to the QAPP if the height is 9.1 meters. The one-meter difference can potentially make a large difference in the calculation of stability parameters for dispersion models.

The temperatures in the February 2011 and April 2011 calibrations did not span the expected range of temperatures. The minimum audit points were -13°C and -2.5°C for February and April, respectively, whereas the minimum observed temperature during the monitoring period was -35°C (at 2 meters). For this monitoring program, this difference is not considered critical. However, for future PSD programs, every attempt should be made to attain lower calibration temperatures.

The certificate of calibration for the reference pyranometer used for the April 2011 calibration was dated January 27, 2010. This date is more than one year prior to the calibration date (April 17-18). Calibrations of the reference equipment should be no more than one year prior to the date used to calibrate field instrumentation. A second certificate, dated May 3, 2011, was included that showed there was essentially no difference between the two calibrations of the reference pyranometer.

> **AECOM Response:** These are all considered variations from the project Quality Assurance Project Plan (QAPP). A summary of (QAPP) variations observed during the monitoring period is presented in **Table 3** below.
>
> Note: (This response also applies to AMEC comments in Appendix C – Accuracy Data).
>
> ***AMEC Response:*** *AMEC finds this response acceptable. Note that Table 3 in the original report and Table 3 in the AECOM response document are different tables and should not be confused.*

AMEC Comment 11:

The model number for the reference thermometer on the calibration form for February 2011 did not match the model number on the certificate of calibration. However, the serial numbers did match, indicating a typographical error on the calibration form.

> **AECOM Response:** Three of four listings in the calibration forms had the correct corresponding model number from the certification form (and four out of four listings of the temperature standard listed the correct corresponding SN from the certification form). As it was one digit different, the model number from the fourth and errant listing is determined to be a transcription error.
>
> ***AMEC Response:*** *AMEC finds this response acceptable.*

DATA REPORT: APPENDIX C - ACCURACY DATA

AMEC reviewed the Accuracy Data in Appendix C and found the data to be sufficient. The results were thoroughly documented in the Quality Assurance Audit Report. The report included complete calibration data, quality control data, and assessment reports. All instrument and calibration gas Certificates-of- Calibration were found to be current.

A different make and model (a Climatronics 102236 GO) for the vertical wind speed anemometer on the tower for both calibrations (February 2011 and April 2011) and performance audits (February 2011 and April 2011) was reported than what was proposed in the QAPP (RM Young 27106). This difference should be reported as a variation to the QAPP.

The February 2011 performance audit reported the upper temperature sensor to be at a height of 9.1 meters (as was the case for the two calibrations). The April 2011 audit reported the height as 10 meters. The QAPP proposed that the upper temperature was to be measured at a height of 10 meters. Correct this discrepancy and report this as a variation to the QAPP if the height is 9.1 meters. The one-meter difference can potentially make a large difference in the calculation of stability parameters for dispersion models.

The temperatures in the February 2011 performance audit did not span the expected range of temperatures. The minimum audit point was -19°C, whereas the minimum observed temperature during the monitoring period was -35°C at 2 meters. For the purposes of this monitoring program, this difference is acceptable. However, for future PSD programs, every attempt should be made to attain lower audit temperatures.

The temperatures in the February 2011 performance audit did not span the expected range of temperatures. The minimum audit point was -19°C, whereas the minimum observed temperature during the monitoring period was -35°C at 2 meters. For the purposes of this monitoring program, this difference is acceptable. However, for future PSD programs, every attempt should be made to attain lower audit temperatures.

> **AECOM Response:** These are all considered variations from the project Quality Assurance Project Plan (QAPP). A summary of (QAPP) variations observed during the monitoring period is presented in **Table 3** below.
>
> ***AMEC Response:*** *AMEC finds this response acceptable. Note that Table 3 in the original report and Table 3 in the AECOM response document are different tables and should not be confused.*

The Technical Systems Audit Report was found to be complete and acceptable.

DATA REPORT: APPENDIX D – VALIDATED CONTINUOUS HOURLY/ DAILY/ MONTHLY DATA SUMMARIES

AMEC did not find deficiencies in Appendix D.

DATA REPORT: APPENDIX E – VALIDATED MANUAL PARTICULATE (FIELD AND LABORATORY) DATA

Not applicable.

The data report contained graphs of PM-2.5 and PM-10 zero air background test results are presented in Appendix E.

DATA REPORT: APPENDIX F – DIGITAL VALIDATED DATA

Not applicable.

A listing and description of the parameters contained in the data file were presented in Appendix F.

DATA REPORT: APPENDIX G – DIGITAL CAMERA IMAGES

Not applicable.

Digital camera images were provided to the Department. Appendix G contained notes pertaining to these images, which were not available for this review.

Attachment E
Response to 'CPAI_GMT1_AQIA_18-OCT-2013_dmh.pdf'
from Deanna Huff (ADEC)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

ATTACHMENT E - Response to Comments:

From:

Deanna Huff (Alaska Department of Environmental Conservation)

Document:

CPAI_GMT1_AQIA_18-OCT-2013_dmh.pdf

Comment 1: *(Page 4-5): OAQPS f(RH) grid that has North Slope coordinates? I attached the spreadsheet to the email. frh national grid.xlsx.*

Response:

The analysis used the 2010 FLAG-recommended values for f(RH) values from the closest PSD Class I area for which those values are provided, Denali National Park. This is a common procedure when analyzing sensitive Class II areas, which were not included in FLAG 2010. The OAQPS f(RH) values were not available to AECOM prior to the analysis and therefore could not be used in the initial analyses. In addition, since they are not part of the recommended FLAG guidance, they would not be used unless specifically requested with recommendations on their implementation.

Comment 2: *(Page 5-2): Additional reference for clarification on on the data set approval. Final Findings Report - CPAI CD3 - REV1.pdf.*

Response:

Thank you very much for providing the findings report associated with the State's review of the CD3 data set.

Comment 3: *(Page 5-18): A) How do you determine this conclusion on 8-week data set? B) Do you have monitoring data from all year round/ or met data with the same maximum emissions for modeling? C) Any other CPAI drilling operations or do you mean with respect to GMT? D) Are all drill rigs on highline power? E) Do all drill rigs emit the same emissions, F) does this broad statement need to be in this Air Quality report which is for GMT? G) An additional reference here is the TDR-monitoring support final findings- JNU053 NTP 18-6004-17-62A..*

Response:

A) What is more important to focus on than the duration of the monitoring program is the fact that during the monitoring program, the monitoring station was directly downwind of a large drilling activity 109 hours under typical North Slope meteorological conditions, and it is these same conditions that the AERMOD dispersion model predicts considerably higher concentrations than what was measured at the monitoring station. Furthermore, during all of these measured events, the drilling activity was consuming more than 4,700 gallons of fuel per day. Therefore, during this 8-week period, there was ample opportunity to monitor under conditions dispersion modeling suggests should result in impacts above the NAAQS/AAAQS.

B) Year-around monitoring data collected in the near-field of a drilling activity does not exist largely because it is highly unlikely for a drilling activity to occupy the same general location for more than a couple of months at a time. Similarly, it would be equally unlikely to monitor in the near-field of a drilling activity with emissions equivalent to what was modeled. A review of over 5 years of drilling activity across the North Slope oil fields shows that it is extremely improbable to find an activity operating near to it's Potential to Emit.

C) We mean, any other CPAI drilling programs including GMT1. As discussed above, considerable data exists documenting the range of drilling activities that occur on the Alaska North Slope. A review of that data shows that the activity monitored at CD3 was among the largest in terms of fuel consumption that is known to occur, and much larger than the single rig highline drilling operation proposed for GMT1.

D) The two drill rigs operating on CD3 were on highline power; however, concurrent hydraulic fracturing operations were not. Regardless, fuel consumption was consistently above 4,700 gallons per day which is larger than most single rig drilling activities operating without highline power.

E) Not all drill rigs emit the same emissions; however, they do emit roughly the same amount of emission per gallon of fuel combusted. Depending on the drilling activity and the drill rig, there is a distribution of daily fuel consumption and therefore emissions. Within that distribution, the fuel combusted per day at the CD3 well site during the monitoring program was on the high end of the distribution and represented a high emissions case.

F) An analysis of multiple years of drilling activity data associated with ConocoPhillips Alaska, Inc. oilfields (Kuparuk and Alpine) shows that the drilling activity during the CD3 monitoring program was atypically large with respect to fuel consumption and monitored concentrations were below the NAAQS/AAAQS. Therefore, the broad statement is supported with the data and shows what can be expected at GMT1 making it relevant to the ambient air quality impact analysis.

G) Thank you very much for providing the findings report associated with the State's review of the TDR-monitoring data review.

Comment 4: *(Page 5-18): The State does not have the CD1 data, can we have access to the data? The QAPP was approved Sept. 2012.*

Response:

At the request of the State, the data is submitted to the State annually for review. The first year of CD1 data is due to be submitted to the State of Alaska the beginning of 2014.

Comment 5: *(Page 5-18): The ADEC response letter details the ambient monitoring approvals and descriptions. TDR Monitoring Support - JNU053 NTP 18-6004-17-62A.*

Response:

Thank you very much for providing a copy of this letter.

Comment 6: *(Page 5-19): The title of the graph is 1hour NO2, and the legend says ozone. Since they are anti-correlated, I am assuming this is just a typo?*

Response:

Your assumption is correct; the legend should say "1-Hour Average NO_2".

Comment 7: *(Page 5-23): Does this conclusion mean that additional control measures need to be added? (if 5.3 "expected that if additional model runs with refined source data were conducted...")*

Response:

No because this statement is made with respect to cumulative impacts. Project-only impacts are well below applicable thresholds. Therefore, application of mitigation to the project sources will have no affect on the cumulative impacts. Mitigation would have to come from existing offsite sources.

Comment 8: *(Page C-1) 1ppb = 1000 ppt, I think this is just a typo?*

Response:

Yes, this is a typo: 1 ppb = 1000 ppt.

Comment 9: *(Page C-1) I believe this is a conservative mixing ratio for NH3. Are there other North Slope Calpuff results using a different mixing ratio?*

Response:

The Western Regional Air Partnership (WRAP) Draft Final Modeling Protocol CALMET/CALPUFF Protocol for BART Exemption Screening Analysis for Class I Areas in the Western United States, dated August 15, 2006, recommends a background NH_3 value of 0.1 ppb (100 ppt) for Alaska. This recommendation was used for the WRAP Regional Modeling Center (RMC) Best Available Retrofit Technology (BART) modeling for Alaska, done for the year 2002.

Comment 10: *(Page C-2) acidity or ion mass balance using the Deadhorse speciation data? The peak is in April (and may include haze) and ammonium is still approx. 2% - more representative than CASTNET currently at Denali. (or 3-4 years old at Kobuk Valley). Reference: Deadhorse and (Wainwright) Annual PM2_5 Speciation Report (2012).*

Response:

At the time this report was drafted, we did not have ready access to the Deadhorse speciation data. An analysis of this data could add perspective to the existing studies. However, it would not alter the conclusions of the long-range modeling analysis given the conservative background ammonia concentration assumed.

Comment 11*: (Page C-4) less than 224, typo.*

Response:

Yes, this is a typo: it should be less than 224 or "< 224."

Comment 12: *(Page C-4) aPV=nRT or n=A(v)P/RT * C*
244 pptv NH3 as a gas?

Response:

All calculations were made assuming values were at standard temperature and pressure (STP) conditions at a temperature of 273.15 K and a pressure of1 atm, unless otherwise stated. Assuming STP conditions, 0.01 µmol/m^3 equals 224 pptv. Under standard ambient temperature and pressure (SATP) conditions, a temperature of 298.15 K and pressure of 1 atm would be assumed. These conditions would result in 0.01 µmol/m^3 equaling 244 pptv. It is not clear in Osada et al. (2011) which conditions this conclusion is based on, nor is there a consensus among the other referenced literature. Therefore, a temperature of 273.15 K and pressure of 1 atm was assumed for the calculation to ensure all calculated values were at the same conditions for the final comparison in Table C-1.

Comment 13: *(Page C-10) I believe this is a conservative mixing ratio for NH3 at 1 ppb.*

Response:

Our findings agree with that conclusion.

Attachment F
Response to 'JW@CPAI_GMT1_AQIA_18-OCT-2013_jw (2).pdf'
from Julie Wroble (R10)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

ATTACHMENT F - Response to Comments:

From:

Julie Wroble (USEPA Region 10)

Document:

JW@CPAI_GMT1_AQIA_18-OCT-2013_jw (2).pdf

Comment 1: *(Section 3.8, page 3-7)**:** No accounting for later air toxics emissions seems like it would underestimate potential long-term exposures from these substances.*

Response:

The air toxics emissions described in Chapter 2 and Section 3.8 represent the maximum short-duration scenario associated with well venting and drilling. These maximum short-duration emissions were annualized based on the frequency and duration of the venting events, coupled with concurrent drilling operations. The short-term and annualized well venting/drilling emissions are higher than the well pad production emissions that occur from year-to-year for the life of the project. When selecting an emissions scenario to input to the AERMOD dispersion model, the worst-case short-term and worst-case annualized emission rates are used. The acute and non-carcinogenic chronic risks are assessed using the maximum model-predicted 1-hour and annual ground level impacts, respectively.

For lifetime cancer risk calculations, the maximum annual ground level impacts from the AERMOD model are multiplied by the exposure adjustment factor, then by the unit risk factor for each air toxic, to determine the predicted incremental increase in cancer risk for each substance. Assuming that the worst-case, short-duration scenario of well venting and drilling occurs concurrently, over the life of the project, yields a very conservative estimate of the long-term (lifetime) exposure and the associated predicted cancer risks. Since the well pad production emissions on a yearly basis are much lower than the annualized well venting/drilling emissions, it is not necessary to model well pad production for long-term risks.

Comment 2: *(Section 5.1.2, page 5-2)**:** In general, I think this section should be expanded slightly so that it's clear what was done for the analyses presented in Tables 5-11 through 5/14. As currently presented, it's not easy to follow the calculations and given the mistakes in the tables, there may be concerns that need to be addressed.*

Response:

With the additional information presented as a response to comments in this document, AECOM believes the section has been adequately expanded.

Comment 3: *(Section 5.1.2, page 5-2)**:** What is the basis for the short list of HAPs included? What other substances were considered but eliminated from this analysis? This list seems pretty short to me.*

Response:

The full list of HAPs calculated for the project was provided in the final Emissions Inventory, submitted in the form of a digital spreadsheet package. The list of HAPs to be modeled (benzene, ethylbenzene, toluene,

xylene, formaldehyde and n-hexane) has been developed over the years and agreed upon by the agency stakeholders involved with NEPA actions for oil and gas development projects as the substances of highest concern. Furthermore, this list of modeled air toxics was selected in BLM's direction for this project during the project planning phase.

Comment 4: *(Section 5.1.2, page 5-2)**:** RfCs are not available for carcinogens, rather Unit risk estimates for inhalation are used to assess potential cancer risk from long-term inhalation of air toxics. However, some substances have both carcinogenic and noncarcinogenic effects and the potential for both should be assessed as done here.*

Response:

Table 5-11 of the air quality impact analysis presents the acute and non-carcinogenic chronic health risks only. Carcinogenic risk is addressed in Table 5-12 by utilizing a unit risk factor. Therefore, mention of carcinogenic effects with respect to RfCs should be removed from the paragraph in question. Please see an updated version of Section 5.1.2 provided after the response to **Comment 11**.

Comment 5: *(Section 5.1.2, page 5-2)**:** The values given in this table are RfCs and Unit Risks for noncarcinogens and carcinogens respectively. You cannot directly compare long-term ambient levels to the unit risk levels as the units for unit risk values are the inverse (1/(ug/m3)) of the modeled concentrations.*

Response:

The predicted incremental increase in cancer risk is shown in Table 5-12. Cancer risk is properly calculated by multiplying the maximum annual ground level impacts by exposure adjustment factor, then by the unit risk factor for each air toxic.

Comment 6: *(Section 5.1.2, page 5-2)**:** Be more clear as to the calculation that is done. Modeled annual ambient concentration is multiplied by the exposure adjustment factor and then the Carcinogenic unit risk to quanitfy cancer risk.*

Response:

The paragraph in question is modified in the updated version of Section 5.1.2 provided after the response to **Comment 11**.

Comment 7: *(Section 5.1.2, page 5-2)**:** 9 years is a reasonable assumption for many sites in the US. It may be not be appropriate for a subsistence community such as Nuiqsut, where people may reside in the community for a longer duration. Is there local data to show that this assumption is reasonable?*

Response:

The risk analysis for the Nuiqsut community has been updated to reflect the following more conservative assumptions for the most likely exposure (MLE) scenario:

- Exposure duration – 30 years (anticipated life of the project), and
- 100% of time spent at home (versus elsewhere).

Based on this comment, for all subsequent analyses, it was conservatively assumed that individuals residing in a remote, subsistence community such as Nuiqsut tend to work close to where they live and remain living in the same community throughout their lives. Therefore, the MLE scenario was conservatively assumed to be equal to the MEI using the bulleted assumptions.

Note that assessment of long-term carcinogenic risk in the near field of the well site, Table 5-12, was previously included in the air quality impact analysis to illustrate a worst-case, long-term risk scenario. However, since there will be no individuals residing within the immediate vicinity of the well site, that analysis should be disregarded so as to avoid any confusion.

Please see an updated version of Section 5.1.2 provided after the response to **Comment 11**.

Comment 8: *(Section 5.1.2, page 5-2)**:** If the life of the project truly is 30 years, then this assumption is reasonable. If it could go on longer, than a longer duration should be used for the MEI.*

Response:

CPAI estimates that the life of the project will be no more than 30 years with 25 years being a more realistic projection.

Comment 9: *(Section 5.1.2, page 5-2)**:** Given the remoteness of Nuiqsut, I'm not sure that the time at home fraction makes sense to include. If it is included, then additional supporting information should be provided. otherwise, delete this adjustment.*

Response:

Please see the response to **Comment 7** regarding the Nuiqsut community analysis. The updated analysis assumed that Nuiqsut residents are at or near home 100% of the time.

Comment 10: *(Section 5.1.2, page 5-2)**:** You need to consider and describe how the standard assumptions might be different for an area like Nuiqsut, where people may reside for their whole lives and may not leave for portions of the day (i.e., communting to work as in an urban area). In fact, residents of Nuiqsut may spend their whole lives there, in which case, an assessment of cancer risk with no adjustmenet for exposure should be performed. If no adjustment is done, then the total cancer risk comes to just over 1E-06.*

Response:

Please see the response to **Comment 7**. The Nuiqsut community analysis has been updated and conservatively assumed that the MEI scenario is equal to the MLE scenario making the use of standard adjustment factors irrelevant.

Furthermore, since there will be no individuals residing within the immediate vicinity of the well site, the near-field long-term carcinogenic assessment (previously Table 5-12) should be disregarded so as to avoid any confusion.

Section 5.1.2 has been modified as shown in the revised text following **Comment 11**. Note that for consistency, table numbers used in the previously submitted AQIA have been preserved and Table 5-12 was simply removed.

Comment 11: *(Section 5.1.2, page 5-2)**:** You need to explain where this receptor is located relative to the receptors modeled in Tables 5-11 and 5-12.*

Response:

The modeled receptors associated with the impacts shown in Tables 5-11 are equivalent to those used for activities on or near the wellsite pad. The figure depicting that receptor grid is reproduced here in **Figure F-1**. The receptor representing the community of Nuiqsut was located at 70.217° N, 150.995° W. **Figure F-2** shows this location relative to the GMT1 pad.

Figure F-1 Receptor Grid – Scenarios for Activities on or Near the GMT1 Project Wellsite

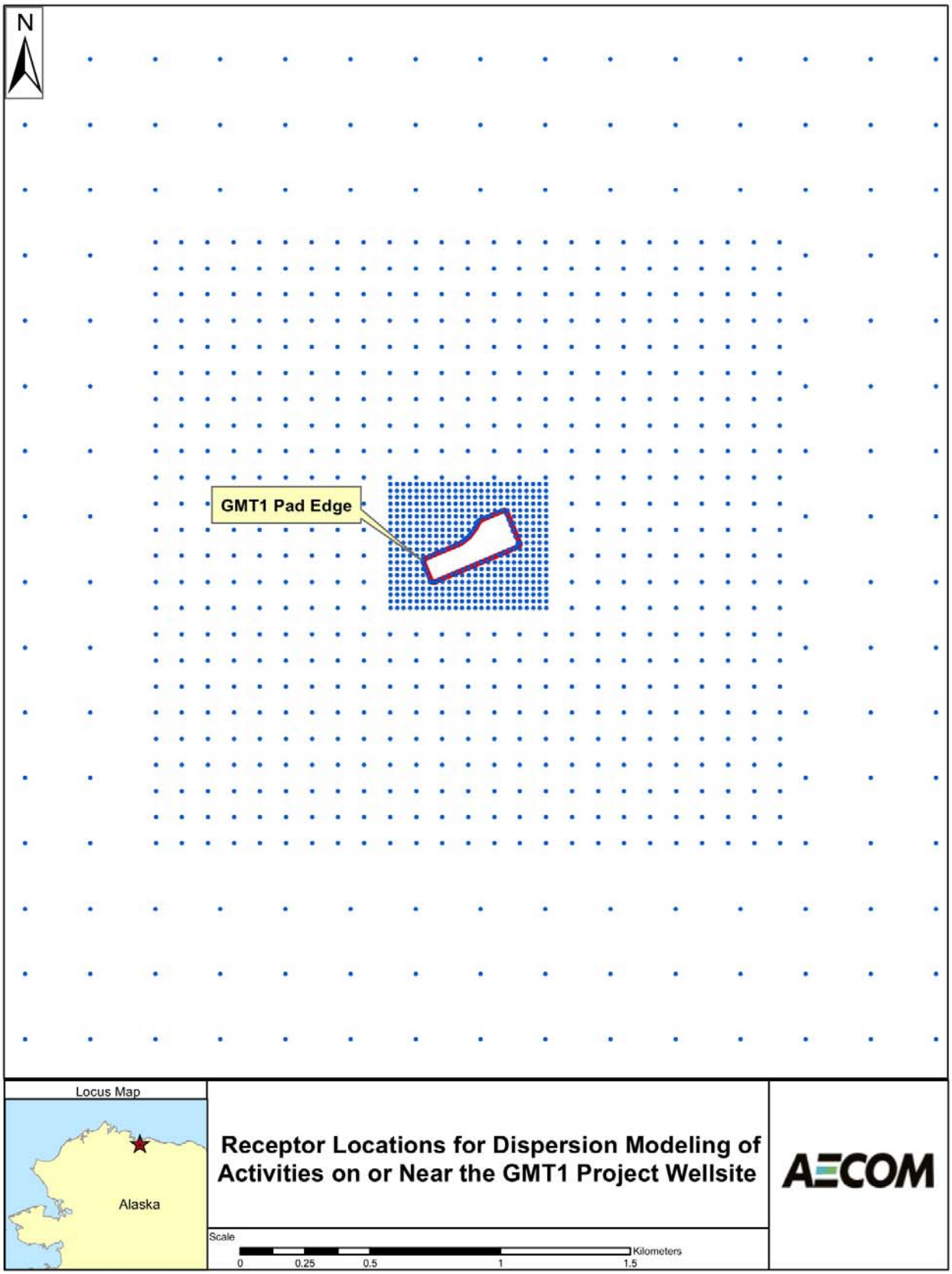
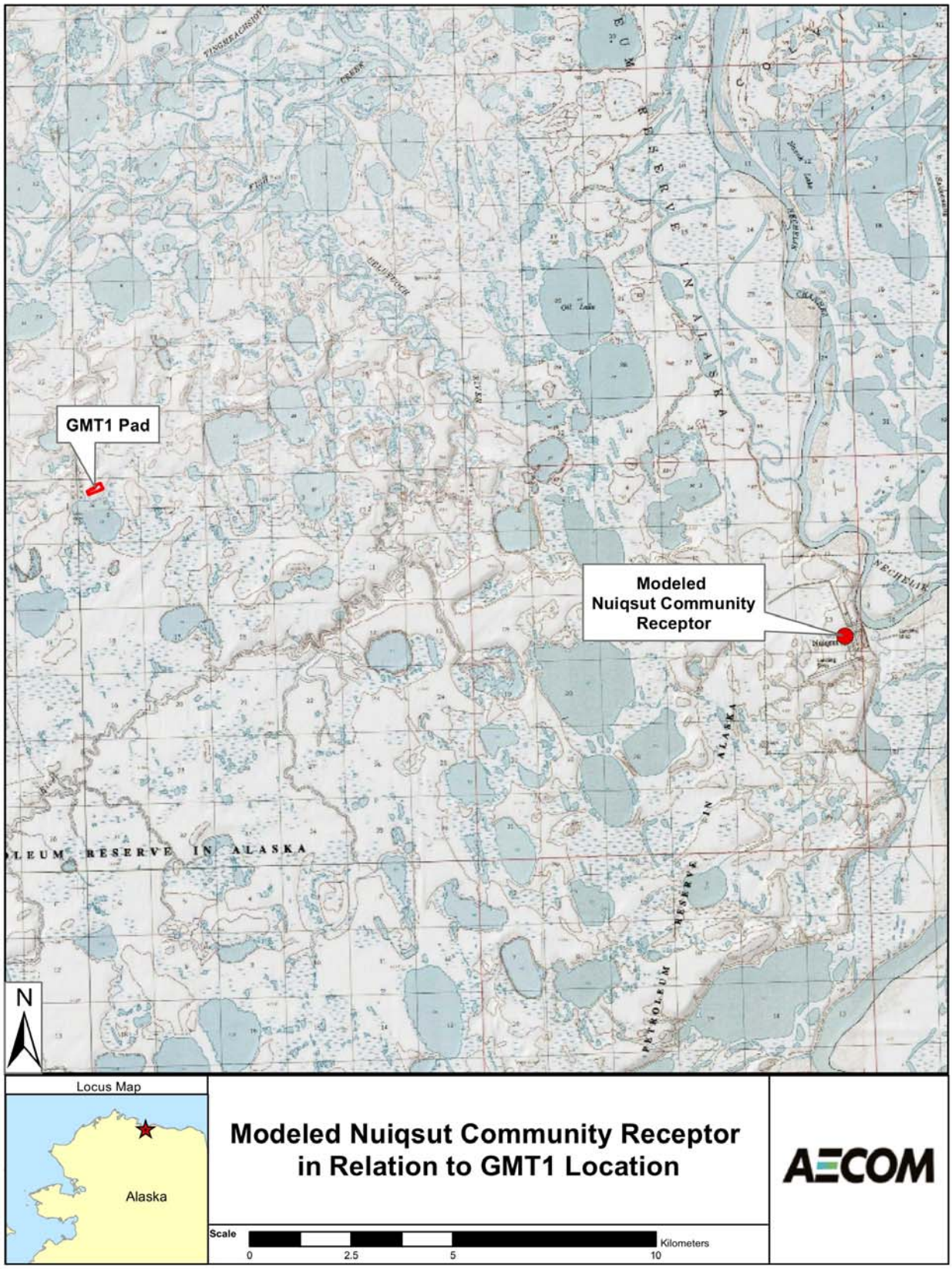


Figure F-2 Receptor Representing the Community of Nuiqsut Relative to GMT1 Wellsite



Revised Version of Section 5.1.2

5.1.2 Air Toxics Impact Analysis (REVISED)

The full list of HAPs calculated for the project activities were provided in the digital version of the project emissions inventory. The list of HAPs to be modeled (benzene, ethylbenzene, toluene, xylene, formaldehyde and n-hexane) has been developed over the years and agreed upon by the agency stakeholders involved with NEPA actions for oil and gas development projects. This list of modeled HAPs contains the substances of highest concern among the agency stakeholders for oil and gas projects, and were therefore, modeled for this project. This list of modeled toxics was also indicated in BLM's direction for this project during the project planning phase.

As described in Chapter 3, AERMOD dispersion modeling was also used to assess short-term (acute) exposure as well as long-term risk from air toxics. Short-term (1-hour) air toxics concentrations were compared to acute Reference Exposure Levels (RELs), as shown in **Table-5 11**. RELs are defined as concentrations at or below which no adverse health effects are expected. No RELs are available for ethyl benzene and n-hexane; instead, the available Immediately Dangerous to Life or Health divided by 10 (IDLH/10) values were used. These IDLH values are determined by the National Institute for Occupational Safety and Health and were obtained from USEPA's Air Toxics Database (USEPA 2011). These values are approximately comparable to mild effects levels for 1-hour exposures. **Table 5-11** provides the acute exposure assessment. Maximum modeled 1-hour concentrations were below the criteria levels for each of the air toxics evaluated. For comparison to acute exposure thresholds, impacts represent those predicted at the GMT1 pad edge since individuals could be near GMT1 for short periods of time.

Table 5-11 also provides the non-carcinogenic long-term exposure assessment, where annual modeled concentrations for each of the air toxics were compared directly to the Reference Concentrations for Chronic Inhalation (RfCs). An RfC is defined by USEPA as the continuous inhalation exposure concentration at which no long-term adverse health effects are expected (USEPA 2012b). Annual modeled concentrations were below the RfCs for each of the air toxics evaluated.

An air toxics impact analysis was also performed for the single receptor representing the Nuiqsut Community. **Table 5-13** shows that maximum modeled 1-hour and annual concentrations were below the criteria levels at the Nuiqsut Community receptor for each of the air toxics evaluated.

Long-term cancer risk was analyzed by applying USEPA's unit risk factors (based on 70-year exposure) and an adjustment factor to the annual modeled concentrations. The adjustment factor represents the ratio of projected exposure time to 70 years. Two exposure scenarios were evaluated: a most likely exposure (MLE) scenario and one reflective of the maximally exposed individual (MEI).

The MLE exposure duration was assumed to be 30 years, which corresponds to the mean duration that a family remains at a residence **and** is exposed to project emissions. Since the life of the project is expected to be 30 years, and shorter than the mean duration a family remains at a residence in Nuiqsut, 30 years was used. This duration corresponds to an adjustment factor of 30/70 = 0.43. The duration of exposure for the MEI is also assumed to be 30 years (i.e., the Life of Project), corresponding to an adjustment factor of 30/70 = 0.43.

A second adjustment was made for time spent at home versus time spent elsewhere. Since individuals in the community of Nuiqsut will typically stay within or near the community nearly all the time, for the MLE scenario, the at-home time fraction is 100%. Therefore, the MLE adjustment factor was (0.43 x 1.0) = 0.43. The MEI scenario also assumed that the individual is at home 100 percent of the time, for a final adjustment factor of (0.43 x 1.0) = 0.43.

The long-term cancer risk assessment and adjustment factors are based on exposure of individuals where they live. Therefore, this assessment has been carried out using annual GMT1 impacts predicted within the community of Nuiqsut. After the unit risk factors and adjustment factors were applied to the annual modeled concentrations, the cancer risk for each constituent was summed to provide an estimate of the total inhalation cancer risk. **Table 5-14** shows that the total cancer risk for both the MLE and MEI scenarios are less than 1.0E-06 in the community of Nuiqsut which represents a less than one-in-one-million cancer risk.

Table 5-11 Air Toxics Acute Exposure Assessment and Long-term Non-carcinogenic Exposure Assessment

Pollutant	REL (1-hour) (µg/m^3)	Maximum Modeled 1-hour Concentration (µg/m^3)	Non-carcinogenic RfC[3] (Annual) (µg/m^3)	Maximum Modeled Annual Concentration (µg/m^3)
Benzene	1300 [1]	3.3	30	0.060
Ethyl benzene	350000 [2]	0.5	1,000	0.0017
Formaldehyde	55 [1]	1.8	9.8	0.050
n-Hexane	390000 [2]	68.9	700	0.49
Toluene	37000 [1]	2.6	5,000	0.031
Xylene	22000 [1]	1.1	100	0.016

[1] USEPA Air Toxics Database, Table 2 (USEPA 2011).
[2] No REL available for these air toxics. Values shown are from (IDLH/10), USEPA Air Toxics Database, Table 2 (USEPA 2011).
[3] USEPA Air Toxics Database, Table 1 (USEPA 2012b).

~~Table 5-12 Air Toxics Long-term Cancer Risk Analysis~~ (REMOVED)

Table 5-13 Air Toxics Acute Exposure Assessment and Long-term Non-carcinogenic Exposure Assessment for Nuiqsut Community Receptor

Pollutant	REL (1-hour) (µg/m^3)	Maximum Modeled 1-hour Concentration (µg/m^3)	Non-carcinogenic RfC[3] (Annual) (µg/m^3)	Maximum Modeled Annual Concentration (µg/m^3)
Benzene	1300 [1]	0.19	30	3.80E-05
Ethyl benzene	350000 [2]	0.029	1,000	1.05E-06
Formaldehyde	55 [1]	0.10	9.8	3.15E-05
n-Hexane	390000 [2]	3.89	700	3.11E-04
Toluene	37000 [1]	0.15	5,000	1.98E-05
Xylene	22000 [1]	0.061	100	1.01E-05

[1] USEPA Air Toxics Database, Table 2 (USEPA 2011).
[2] No REL available for these air toxics. Values shown are from (IDLH/10), USEPA Air Toxics Database, Table 2 (USEPA 2011).
[3] USEPA Air Toxics Database, Table 1 (USEPA 2012b).

Table 5-14 Air Toxics Long-term Cancer Risk Analysis for Nuiqsut Community Receptor

Exposure Scenario[1]	Pollutant	Maximum Modeled Annual Concentration (µg/m^3)	Carcinogenic Unit Risk Factor[2] (1/µg/m^3)	Exposure Adjustment Factor	Cancer Risk
MLE	Benzene	3.80E-05	7.8E-06	0.43	1.28E-10
MLE	Ethyl benzene	1.05E-06	2.5E-06	0.43	1.13E-12
MLE	Formaldehyde	3.15E-05	1.3E-05	0.43	1.76E-10
				Total Inhalation Cancer Risk	**3.05E-10**
MEI	Benzene	3.80E-05	7.8E-06	0.43	1.28E-10
MEI	Ethyl benzene	1.05E-06	2.5E-06	0.43	1.13E-12
MEI	Formaldehyde	3.15E-05	1.3E-05	0.43	1.76E-10
				Total Inhalation Cancer Risk	**3.05E-10**

[1] MLE = most likely exposure; MEI = maximally exposed individual.

[2] USEPA Air Toxics Database, Table 1 (USEPA 2012b).

Attachment G
Response to 'EMAIL: Review of Near Field AERMOD Input Files 17-NOV-2013.pdf' from Herman Wong (R10)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

Response to Comments:

From:

Herman Wong (USEPA Region 10)

Document:

Review of Near Field AERMOD Input Files 17-NOV-2013.pdf

Comment 1: *In the last conference call, you explained that the Conoco Nuiqsut station missing 2- and 10-m temperatures were replaced with Nuiqsut ASOS station cloud cover data and used to calculate atmospheric stability. Was this procedure applied to the five year meteorological data set that have been used in the current modeling analyses?*

Response:

Yes, this procedure was applied to the five year meteorological data set that was used in the current modeling analyses.

Comment 2: *Please confirm that the Access Road and Pad Construction, Mining the Clover Material Source, Infill Drilling, Nuiqsut Man Camps, and Well Intervention scenarios were modeled individually (i.e., no overlap in scenario operations).*

Response:

Each of the five scenarios were modeled individually. The only modeled scenarios that overlap in time are the Pad and Access Road Construction, Clover Material Source activities, and the Nuiqsut Camps. Though they overlap in time, impacts from these activities have very little overlap in space since none of them are closer than 9 kilometers from each other. At this distance, these activities will not create significant concentration gradients in the impact areas of other activities and were not included as part of the offsite inventory following guidance in 40 CFR 51 Appendix W.

Comment 3: *EPA believes that wind entrained dust should be modeled as area sources. Please confirm if wind entrained fugitive dust emissions were modeled and as an area source.*

Response:

Wind entrained fugitive dust was modeled as part of all scenarios; however, this source was modeled as a volume source and not an area source primarily to minimize model execution time. However, all things being equal (i.e., turbulently mixed depth (area source) and initial vertical dispersion (volume source) and source release heights and lateral dimensions), the volume source should result in higher impacts given that the volume source has a plume centerline with higher concentrations; whereas, the area source has a flat cross-plume concentration gradient. Therefore, we believe the volume source approach is conservative and appropriate.

Comment 4: *Please describe the derivation of the "Top of Plume Height" and "Volume Source Release Height" as presented in Table 3-3, Footnote 1 on page 3-9 (and in subsequent tables).*

Response:

The top of the plume and the volume source release height were derived based on the Haul Road Workgroup Guidance[1].

Comment 5: *Please confirm under Footnote 3 of Table 3-3 on page 3-9 (and in subsequent tables) that*

a. *the construction equipment are typically the height of a 1-story structure, and*

b. *the angle of the exhaust pipe of the construction equipment (e.g., vertical or horizontal).*

Response:

The volume source release height was based on both the height of the construction equipment as well as the height structures that will be located on that pad that are expected to influence dispersion.

Figure G-1 provides aerial views of the Alpine Central Processing Facility during construction, which is an example of the types of structures, typically about 1 story, that are found on construction sites such as the GMT1 wellsite.

Figure G-2 provides a picture of a B-70 tractor and trailer, which makes up a large portion of the construction equipment emissions, and has a size typical of most construction equipment that will be used. These are very large pieces of equipment with elevated stack exits and plumes with considerable vertical momentum and thermal buoyancy. Given the size of the equipment and the plume rise that is not being accounted for in the volume source characterization, we believe that sizing vertical dimensions based on a one-story building is appropriate.

The construction equipment that will be used was modeled as a volume source, thus the orientation of the exhaust pipes of the equipment does not factor into the model inputs. However, most stacks are vertical or angled.

Comment 6: *Tables 3-3, 3-4, 3-5, 3-6, and 3-7 present in-stack NO2/NOx ratios which will be confirmed in the EI review.*

Response:

Noted.

Comment 7: *Please update all NAAQS compliance demonstrations in the applicable tables using the Nuiqsut station monitoring station data*.

Response:

Tables presenting NAAQS compliance demonstrations in the AQIA will be updated using ambient background data from the Nuiqsut monitoring station.

Comment 8: *Please provide EPA with spreadsheets containing 2012 air quality and meteorological hourly data from the Conoco Nuiqsut monitoring station*.

Response:

This data will be supplied as a separate electronic submittal to BLM.

[1] Haul Road Workgroup Final Report Submission to EPA-OAQPS (3/3/2012). U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards (OAQPS). (http://www.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf).

Figure G-1 Aerial Views of the Alpine Central Processing Facility During Construction

Figure G-2 Picture of a Typical B-70 Tractor and Belly Dump Trailer

Comment 9: *Some scenarios (e.g. Pad Construction) used a post-processing TRANSVAP program to derive predicted concentration impacts. Please provide documentation and test case(s) demonstrating the applicability of this program*.

Response:

Documentation and a test case providing additional details about the TRANSVAP program have been submitted separately for review[2].

Comment 10: *In the AERMOD PM2.5 24-hour mitigated Pad Construction model run, the TRANSVAP program was utilized. Please explain the comments in the input file, SIMULATION.INP. That is,*

a. *Pad Construction for 12 months and INFIL drilling for 14 months, and*

b. *under "START ITERATION 1", the significance of 1, 167 and 791.*

Response:

Please see the response to **Comment 9**.

Comment 11*: In the Clover Material Source model input file and Table 3-4, the volume source height for blasting is 50 meters.*

a. *Please clarify Footnote 1, that 50 meters equates to the height of a 1-story building.*

b. *Please provide a reference for the blast height of 50 meters.*

Response:

The footnote indicating that the 50-meter volume source height is based on the height of a 1-story building is in error. The blast height of 50 meters was selected based on professional judgment giving the nature of the blasting activity which ejects material high into the air.

Comment 12: *Please describe how missing hourly ozone data in O3_2008-2012.dat were filled in?*

Response:

Hourly ambient ozone concentrations required as input to the NO_2 modeling were developed from hourly data collected at the Nuiqsut monitoring station for calendar years 2008 through 2012, concurrent with the Nuiqsut meteorological data used in the dispersion modeling. Since the data is concurrent, the measured hourly ozone value was simply input to the model for the corresponding day and hour being modeled. If an hourly ozone measurement was missing, the value used to represent a particular hour was the 95th percentile of all values measured across all five years during the month containing the missing hour. **Table G-1** summarizes various metrics characterizing monthly ozone concentrations and the 95th percentile values used for the dispersion modeling.

[2] Letter from Tom Damiana (AECOM) to Bridget Psarianos (BLM) regarding: Additional Details for Hourly Impact Post-Processing used in Near-Field Air Quality Dispersion Modeling of Greater Mooses Tooth 1 (GMT1). Transmitted by email November 25, 2013.

Table G-1 Summary of O_3 Mixing Ratios (ppbv) Measured at Nuiqsut 2008 through 2012

Month	Average	Maximum	95th Percentile
January	31.8	43.9	38.5
February	31.7	59.8	40.2
March	25.5	53.2	45.8
April	17.0	53.7	39.3
May	21.2	59.7	35.1
June	21.2	48.7	29.9
July	16.2	50.7	24.6
August	16.4	36.0	23.9
September	20.9	34.8	30.6
October	27.6	39.4	35.2
November	27.9	52.8	37.0
December	30.4	41.6	36.8

Comment 13: *For the Nuiqsut residence modeling, please discuss why only one engine was modeled and the purpose of the second engine*.

Response:

Two man camps, each with two engines, could be located near the community of Nuiqsut. One of the camps will be electrified from the Nuiqsut power grid and neither of its engines will have emissions. The other camp will be self powered. Of its two engines, one is needed to provide power to the camp and the other is only in place to provide power if the first fails. Since only one engine will operate at a time, only one engine was modeled.

Comment 14: *The Infill Drilling AERMOD input file shows a source CAMP_ENG while Table 3-6 does not include this point source. Please clarify.*

Response:

While the Infill Drilling AERMOD input file shows a source *CAMP_ENG,* the file also shows that the modeled emission rate is zero. The source was included in the AERMOD input file for completeness, but the engine will be electrified by highline power and therefore will not produce emissions. It was not included in Table 3-6 because it does not need to be modeled. While AECOM recognizes there is some inconsistency between the tables in the AQIA report and the model files, there are zero emissions from the camp engine and therefore it has no bearing on the AQIA.

Comment 15: *Similar to Comment 10, please explain the INFILL TRANSVAP and SIMULATIOM.INP for NO2.*

Response:

Please see the response to **Comment 9**.

Comment 16: *Like the previous two comments, please explain the Well Intervention TRANSVAP and SIMULATIOM. INP for NO2.*

Response:

Please see the response to **Comment 9**.

Comment 17*: Please justify the stack parameters used for the modeled point sources. These parameters were not listed in the EI.*

Response:

Table 3-6 in the AQIA report indicate that the stack parameters for the primary power stack were based on vendor data. This data is provided in the digital copy of the emissions inventory, specifically in spreadsheet **GMT1_Drilling_Inventory_Emissions_Ver1-3.xls**. The table also indicates that the stack parameters for the remainder of the rig point sources were based on a DOYON 19 drill rig and parameters used in the CD5 Minor Permit Application[3].

[3] Final ConocoPhillips Alaska, Inc. CD5 Minor Permit Application, Submitted to the Alaska Department of Environmental Conservation. SECOR International Incorporated (SECOR). August 2005.

Attachment H
Response to 'CPAI-GMT AQIA comments-nicholls.docx'
from Craig Nicholls (BLM)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

Response to Comments on AQIA Report:

From:

Craig Nicholls (BLM)

Document:

CPAI-GMT AQIA comments-nicholls.docx

Comment 1: *(Figure 3-10, page 3-23)**:** I do not understand how the locations "representing the nearest Nuiqsut residents" actually represent the Nuiqsut resident.*

Response:

To avoid confusion, the term resident should have been referred to as residence in the ambient air quality impact analysis which is what we had intended.

From that perspective, the nearest Nuiqsut residence (home) is located approximately 250 meters to the southeast from the modeled/anticipated location of the GMT1 man camps. The remainder of the Nuiqsut homes will also be generally located south of the man camps. To estimate the air quality impacts where Nuiqsut homes are located, the modeling used a set of receptors spaced 10 degrees apart along an arc, spanning the area to the south of the man camps, at a distance of 250 meters from the center of the area defined by the ambient air boundary. Modeling with an arc of receptors at the closest distance a Nuiqsut home can be located conservatively captures the maximum modeled impacts.

Comment 2: *(Section 4.2, page 4-1)**:** "The GMT1 Project sources for the Infill Drilling scenario, as well as all RFD sources, were modeled as a single volume source with parameters provided in **Table 4-3** below." This statement and all related text, tables, etc. would be changed per FWS comments on using a single volume source, with which I concur.*

Response:

The GMT1 Project sources were updated to match the refined inventory characterization used in the near-field AERMOD modeling for both Alternative A and D. All impacts provided after the initial October 2013 submittal include this refinement. As for the RFD sources, since these are not project sources, adjusting the way that they are characterized in the long-range modeling will be conducted after the modeling supporting Alternative D is completed.

Comment 3: *(Section 4.6, page 4-4)**:** "For both the PM10 and PM2.5 air quality impacts, the elemental carbon, secondary organic aerosol, secondary nitrates and secondary sulfates were combined to create a total Particulate Matter (PM) species that included both primary and secondary particulates." Please explain why this was done and if this a conservative approach.*

Response:

At the request of the National Park Service, the direct particulate emissions were speciated into elemental carbon and secondary organic aerosol in order to provide conservative visibility impacts as these species efficiently scatter light. In order to also demonstrate compliance with ambient PM_{10} and $PM_{2.5}$ standards, the

speciated pollutants were summed in POSTUTIL to include all particulate-related species including the primary elemental carbon and secondary organic aerosol and the secondarily-formed nitrates and sulfates. This method ensures a complete reconstruction of the PM-related species for comparison to the applicable standards.

Comment 4: *(Section 4.8, page 4-5)**:** In CalPuff post-processing, make sure the "mnitrate" switch is set to one.*

Response:

The final modeling analysis utilized a POSTUTIL model setting of MINTRATE = 0. This is considered a conservative approach intended to demonstrate the insignificant GMT1 Project impacts.

Comment 5: *(Section 5.1.1, page 5-1)**:** We should discuss re-doing the access and construction NO2 AERMOD modeling, if and only if, we have sufficient information as to how the sue of the construction equipment would be staged. Because these impacts are coming from heavy equipment, there are few options for mitigation, we should discuss how to deal with this.*

Response:

Dispersion modeling for the Access Road and Pad Construction scenario has been updated to include refined assumptions regarding construction equipment as well as the use of seasonally-varying hourly background values within AERMOD. Details of the revisions to this modeling scenario are detailed separately in a letter and attachment transmitting the final Alternative A air quality impact analysis[1].

Comment 6: *(Section 5.1.2, page 5-2)**:** Between draft and final, we should consider reviewing the assumptions used in the air toxics analysis (residence time, etc.) since these are from 1993 Superfund guidance (which was updated in 2011). We should also review EPA's Exposure Factors Handbook at this time.*

Response:

Exposure assumptions used in the air toxics analysis have been updated in response to comments from Region 10 (Julie Wroble), included as Attachment F with this document. Please let us know if additional information is needed.

The response to comments on modeling files that follow use the following acronyms:

Scenarios

Access = Pad & Access Road Construction
Clover = Clover Material Source
Intervention = Well Intervention
Infill = Infill Drilling

Alternatives

PA = Proposed Action
RL = Roadless Alternative

[1] Letter from Tom Damiana (AECOM) to Bridget Psarianos (BLM) regarding: Revisions to the Air Quality Impact Analysis for Greater Mooses Tooth 1. Transmitted by email December 24, 2013.

Comment 7: *(Access, PA)**:*** *There are 2 single receptor holes in the middle and outer grids; it appears these receptors should be: 557696, 7795489 and 558646, 7796039 respectively. It is unclear if these missing receptors would change the impacts reported.*

Response:

These two single receptors were originally removed from the modeling because they fell on top of the access road, a modeled emission source. After it was determined that modeled source would include 500 meters of the access road, the receptors were inadvertently left out of the dispersion modeling even though the modeled access road source no longer extends to those two locations.

Maximum modeled impacts for all pollutants and averaging periods occur within the 25-meter spaced receptor grid. These missing receptors would not change the conclusions because they are located within the 100-meter and 250-meter spaced grids and far from maximum impacts. Subsequent modeling conducted has confirmed that impacts at these receptor locations do not impact conclusions made.

Comment 8: *(Clover, PA)**:*** *The NO2/NOx ratio for "TAILPIPE" in table 3-4 is listed as 0.15 but the AERMOD input file uses a value of 0.30.*

Response:

The "TAILIPIPE" source was erroneously modeled with a higher in-stack NO_2/NO_x ratio for both Alternative A (the Proposed Action) and Alternative D (Roadless Alternative) modeling analyses. The correct NO_2/NO_x ratio was used in the Final Alternative D modeling analysis submitted to the BLM[2].

The higher in-stack NO_2/NO_x ratio remains in the Final Alternative A impact analysis[3]. Table 3-4, from that analysis, shows that modeled 1-hour and annual NO_2 impacts are below the NAAQS/AAAQS, despite the use of a more conservative in-stack NO_2/NO_x ratio. Therefore, correcting the analysis to use an in-stack NO_2/NO_x ratio of 0.15 for the TAILPIPE source would not affect the Alternative A conclusions.

Comment 9: *(Infill, PA)**:*** *Same 2 receptors missing per comment #7.*

Response:

Please see the response to **Comment 7**.

Comment 10: *(Infill, PA)**:*** *For the NO2 modeling, the camp engine has an emission rate of 0.00; is this correct?*

Response:

Yes, this is correct. The camp engine was originally included in the dispersion modeling analysis with a non-zero emission rate before it was decided that it would be electrified. Rather than remove the source from the modeling, the emissions were set to zero consistent with the assumption that the source would be electrified.

[2] AECOM Environment 2013. Greater Mooses Tooth 1 Alternative D (Roadless) Air Quality Impact Analysis. Submitted to: the Bureau of Land Managemet (BLM), Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. December 2013.

[3] AECOM Environment 2013. Greater Mooses Tooth 1 Air Quality Impact Analysis. Submitted to: ConocoPhillips Company, Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. October 2013.

Comment 11: *(Infill, PA)**:*** *The following NO2/NOx ratios appear to be incorrect: "D19_BOIL" 1 and 2, "D19_HTR1, 2A and 2B.*

Response:

The boilers and heaters were erroneously modeled with the wrong NO_2/NO_x in-stack ratio. The correct ratios were used in the revisions to the modeling and new modeling subsequently submitted to the BLM.

Comment 12: *(Clover, RL)**:*** *Rows of receptors are missing immediately north and south of the volume source.*

Response:

A review of **Figure H-1**, which illustrates the receptors modeled for the Clover Material Source scenario for the Alternative A (Roadless Alternative), does not indicate any missing rows of receptors outside the defined ambient boundary.

Comment 13: *(Clover, RL)**:*** *The NO2/NOx ratio for the TAILPIPE" source is incorrect (See comment #8).*

Response:

Please see the response to **Comment 8**.

Comment 14: *(Clover, RL)**:*** *The OLM "Group All" option was not selected.*

Response:

The OLMGROUP ALL option was inadvertently left out of the modeling for the Clover Material Source, for the Proposed Action (Alternative A). The OLMGROUP ALL keyword was used for all subsequent revisions to the Proposed Action ambient air quality impact analysis and for the Final Alternative D modeling analysis submitted to the BLM[4].

The Final Alternative A analysis has been submitted without the use of the OLMGROUP ALL keyword for the Clover Material Source scenario. Although it is more conservative to omit the OLMGROUP ALL keyword, Table 3-4 shows that modeled 1-hour and annual NO_2 impacts are below the NAAQS/AAQS. Therefore the OLMGROUP ALL keyword has no bearing on the compliance status of the AQIA.

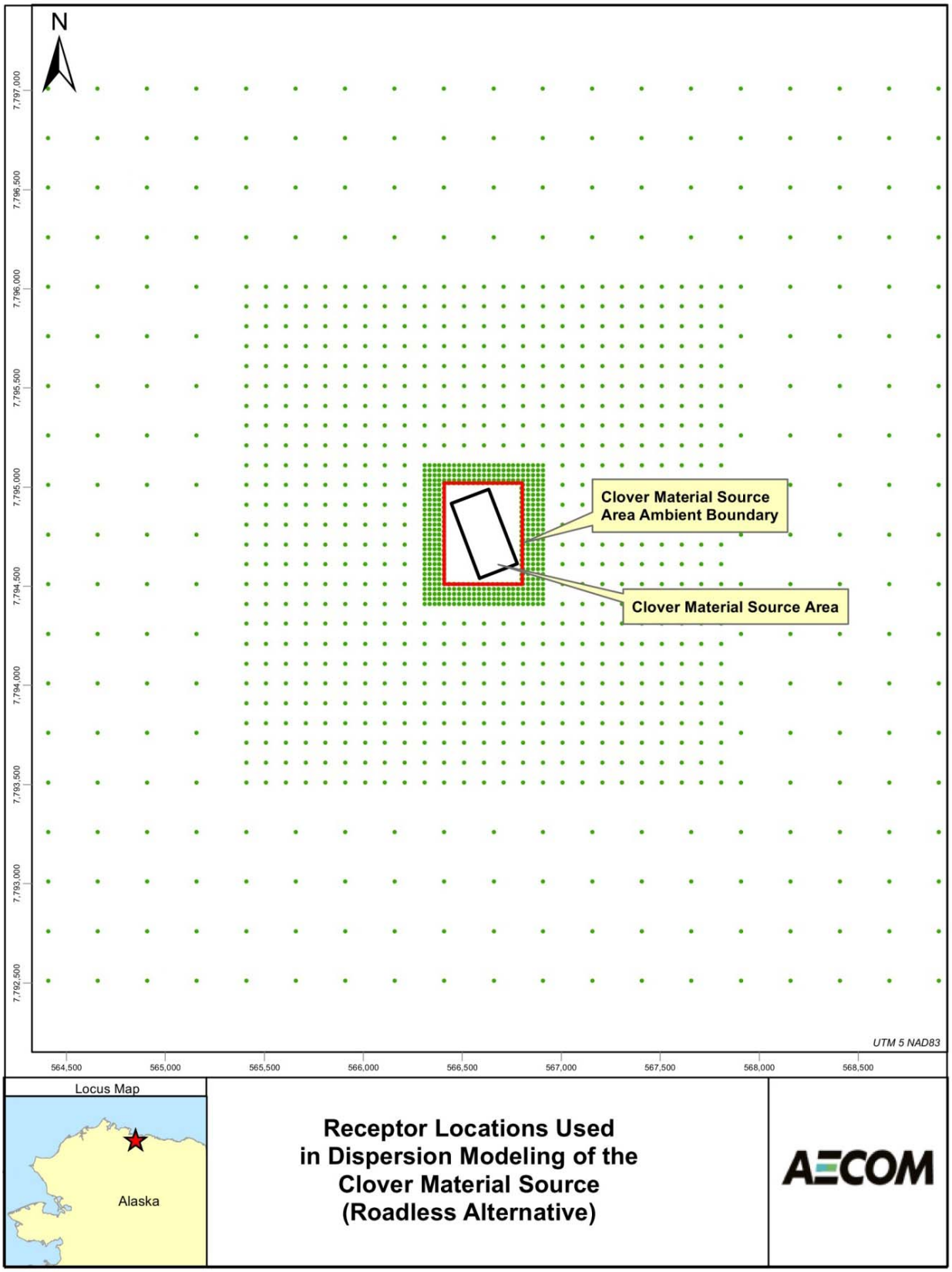
Comment 15: *(Infill, RL)**:*** *For the NO2 modeling, the camp engine has an emission rate of 0.00; is this correct?*

Response:

Please see the response to **Comment 10**.

[4] Ibid 2.

Figure H-1 Receptor Grid for Clover Material Source – Roadless Alternative



Attachment I
Response to 'EMAIL: Preliminary thoughts on GMT1 Far-Field analysis' from Tim Allen (USFWS)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

Response to Comments on Long-Range Transport Modeling:

From:

Tim Allen (FWS)

Document:

Preliminary thoughts on GMT1 Far-Field analysis.pdf

Comment 1: *The F(RH)Large and Rayleigh scatter values did not match Denali. Correct values are in FLAG 2010. (minor)*

Response:

The values have been updated to be consistent with the values for Denali following the FLAG 2010 guidance.

Comment 2: *Values for ozone appeared to represent average monthly values. To ensure conservative results, average values that represent afternoon highs. (minor)*

Response:

The North Slope does not experience strong daily or seasonal ozone peaks found elsewhere[1]. In order to ensure conservatism as requested by the commenter, the maximum hourly value of ozone, from each month, over five years (2008-2012) of data, was used as the model input to represent the monthly ozone concentration (see the "Maximum" column in **Table I-1** below). For example, the value of 43.9 ppb represents the largest hourly value monitored in January for five years and was used as input to the modeling.

Comment 3: *Single year-round value for ammonia background. Due to the climate, we need monthly numbers. Winter values will likely be near .5 (or lower) with summer values likely near 1.5-2. (moderate)*

Response:

AECOM conducted and summarized the results of a literature review regarding the ambient ammonia values for the area of concern (provided as Appendix C of the October 2013 Final GMT Impact Analysis). The studies cover many different aspects of ambient ammonia values in the area including: the use of observations and modeling, different times of the year, and different locations. The findings of the literature review indicate that ambient ammonia (and ammonium) concentrations are frequently well-below the 1 ppb monthly average value used as model input for the GMT modeling.

The CALPUFF model is also known for its over-estimation of the available ammonia for each puff, which can be mitigated with the use of the ammonia-limiting-method (ALM) in the POSTUTIL processor. Since the ALM was not used in this analysis, modeled pollutants had access to excess ammonia as they moved across the domain.

[1] Oltmans, S. and Levy II, H., 1994. Surface Ozone Measurements From A Global Network. Atmospheric Environment Vol. 28, No. 1, pp.9-24.

Table I-1 Monthly Ozone Summary from Data Collected at the Nuiqsut Monitoring Station 2008 through 2012

Month	Average[1] (ppb)	Maximum[2] (ppb)
January	31.8	43.9
February	31.7	59.8
March	25.5	53.2
April	17.0	53.7
May	21.2	59.7
June	21.2	48.7
July	16.2	50.7
August	16.4	36.0
September	20.9	34.8
October	27.6	39.4
November	27.9	52.8
December	30.4	41.6

1 The data in this column was used for the original CALPUFF modeling.

2 The data in this column is used in the updated and final CALPUFF modeling.

Comment 4: *Postutil was processed to better apportion Nitrogen chemistry. Primary switch is "mnitrate=1" to process (significant)*

Response:

The modeling archive submitted as part of the October 2013 Final GMT Air Quality Impact Analysis, as well as all subsequent modeling, did not invoke the better apportionment of the nitrogen chemistry (ALM). MNITRATE was set to the value of 0 for all runs to ensure conservative results.

Comment 5: *All sources inserted as volume sources. Section 4.2 of the write-up suggests this is a conservative approach. (significant)*

Response:

The GMT1 Project sources were updated to match the refined inventory characterization used in the near-field AERMOD modeling for both Alternative A and D and the revised ozone values shown in **Table I-1** above. All impacts provided after the initial October 2013 submittal include these refinements. The results indicate that the prior conclusions remain the same – the far-field, project only impacts are negligible with all impacts below their applicable standards and thresholds at all areas of concern.

As for the Reasonably Foreseeable Development (RFD) sources, since these are not project sources, adjusting the way that they are characterized in the long-range modeling will be conducted after the modeling supporting Alternative D is completed.

Comment 6: *All sources with point source characteristics (drill rigs, large diesel engines, gas fired turbines, etc...) must be inserted in Calpuff as point sources. Full plume characteristics, especially in northern Alaska where plume rise might be large, will transport emissions great distances. The volume source approach is not conservative for these sources.*

Response:

See the response to **Comment 5**.

Comment 7: *The remaining fugitive emissions are best inserted as areas sources.*

Response:

See the response to **Comment 5**.

Attachment J
Response to 'EMAIL: NPS Comments on GMT1 Project 23-NOV-2013.pdf' from John Notar (NPS)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

Response to Comments on Long-Range Transport Modeling:

From:

John Notar (NPS)

Document:

NPS Comments on GMT1 Project 23-NOV-2013.pdf

Comment 1: *The NPS feels that there was insufficient time allowed for it to completely review the modeling protocol, the initial modeling analysis and the most current modeling analysis. The presented Mooses Tooth (GMT) modeling analyses. In the future the NPS would prefer early and often discussion and consultation in accordance with the June 23, 2011 Air Quality Memorandum of Understanding for Oil and Gas on Federal Lands*

Response:

The comment is not specific to the GMT1 ambient air quality impact analysis conducted by AECOM; therefore, the response is deferred to BLM.

Comment 2: *The acid deposition analysis is not complete as it needs to use the following scaling factor multiplier to properly calculate the deposition impacts in kilograms per hectares per year.*

Response:

The conversion of nitrogen and sulfur deposition to kilograms per hectare was performed following the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 guidance in the summary spreadsheet, not in the CALPOST processing. The final deposition impacts provided in the results spreadsheet were in units of kilograms per hectares per period modeled.

Comment 3: *The far field analysis needs to apply in the POSTUTIL model the setting "MNITRATE=1" in order not to overestimate the formation of particulate nitrate which will affect the calculated visibility impacts.*

Response:

The final modeling analysis utilized a POSTUTIL model setting of MINTRATE = 0. As the commenter noted, this is a conservative approach intended to demonstrate the insignificant GMT1 Project impacts.

Comment 4: *The final NEPA analysis should include a description of the "roadless" alternative and the impacts from the associated electrical generation for the possible 32 megawatt*

Response:

At the request of the commenter, an ambient air quality impact analysis for Alternative D (Roadless Alternative) has been submitted as part of the GMT1 project[1].

[1] AECOM Environment 2013. Greater Mooses Tooth 1 Alternative D (Roadless) Air Quality Impact Analysis. Submitted to: the Bureau of Land Managemet (BLM), Anchorage, Alaska. Submitted by: AECOM Environment, Fort Collins, Colorado. December 2013.

Attachment K
Response to 'EMAIL: clarification questions about GMT1 EI spreadsheet calculation details'
from Meredith Bond (USFWS)

ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Air Quality Impact Analysis – Final

Response to Comments on the Emissions Inventory (EI):

From:

Meredith Bond (FWS)

Document:

clarification questions about GMT1 EI spreadsheet calculation details.pdf

Comment 1: *How are the gas and light oil products moved into the pipelines? I don't see any compressors or pumps in the production scenario emission inventories.*

Response:

Produced fluids move from the wells to the Alpine Central Processing Facility (CPF) under the pressure of the reservoir which is maintained by reinjection of produced water, seawater and produced gas. Fluids moving from the Alpine CPF to GMT1 for reinjection move under the pressure from electric pumps and compressors located at the Alpine CPF.

Without expansion, the Alpine CPF has approximately 144,000 barrels of oil per day capacity. ConocoPhillips Alaska, Inc. seeks to limit both unused capacity and throughput to only what the CPF can handle. This is done by bringing new wellsites online only as production naturally wanes at existing wellsites. Just as Alpine CD3 and CD4 were brought online to offset waning CD1 and CD2 production, GMT1 is being brought online to replace reduced production from CD3 and CD4. From this perspective, Alpine CPF production heater load, electrical demand from pumps, and turbine-powered compressor demand should not noticeably increase above historical levels as GMT1 is brought into production. Therefore, there should not be an increase in emissions above historical levels associated with GMT1 fluids handling.

Comment 2: *Please explain which activities will be "electrified" (which in context appears to mean supplied with electrical power from outside sources rather than onsite generators). What are the outside electrical power sources, and has the impact of increased load causing increased air pollutant emissions at those sources been incorporated into this supplemental EIS?*

Response:

The following GMT1 activities will be electrified and constitute the primary power demand:

- Drill Rig Primary Power
- Drill Rig Camp and Shop
- GMT1 Heated Modules (i.e., well houses)
- Heat Trace for Pipes
- Mud/Bulk Plant (Alternative D Only)
- Aircraft Hanger and Runway Lighting (Alternative D Only)

- Wastewater Treatment Facility (Alternative D Only)
- Permanent Camps and Office Space (Alternative D Only)
- Grind and Injection Facility (Alternative D Only)

Power for the Alpine development and connected wellsites is provided centrally from gas-fired turbine-powered electrical generators located at the Alpine CPF. The currently permitted Alpine CPF primary power generation capability in megawatt electrical (MWe) based on ISO[1] conditions is shown in **Table K-1**.

Table K-1 Currently Permitted Alpine CPF Power Generation Capability

Turbine Description	Rating/Size
Nuovo Pignone PG5371 Generator Turbine (Gas Fired)	26.3 MWe (ISO)
Nuovo Pignone PGT10+Generator Turbine (Gas Fired)	11.3 MWe (ISO)
Solar Taurus 60S Generator Turbine (Dual Fired)	5.5 MWe (ISO)
Solar Taurus 60S Generator Turbine (Gas Fired)	5.5 MWe (ISO)
Total =	48.6 MWe (ISO)

Regardless of alternative, the GMT1 wellsite itself is anticipated to increase power demand from between 1 and 2 MWe depending on season. This power demand comes primarily from required lighting, heat trace on piping and heating modules. Because of the added load demands of more infrastructure, the GMT1 Alternative D (Roadless Alternative) is expected to require an additional 2.5 MWe above that required for Alternative A.

Historical power consumption within the Alpine development started in the late 1990's at between 15 and 20 MWe depending on season. Power demand peaked in 2012 to approximately 30 MWe winter demand and 20 MWe summer demand. The current permitted electrical capability of Alpine is 37.6 MWe (ISO), plus an additional 11 MWe (ISO) backup power generation from the solar turbines. It is clear that the planned 2 MWe peak demand (winter) and 1 MWe (summer) by GMT1 Alternative A will not increase Alpine CPF power demand beyond its currently permitted levels, and are well within the typical 3 to 5 MWe summer to winter variation. Moreover, demand from GMT1 Alternative A is small in comparison to demands from other much larger sources at the CPF like the crude oil shipping pumps which require a 5 MW load, and the drill rigs (Doyon 19, Doyon 141, etc.) which each add another 3 to 4 MW, highly variable load. In short, the additional power required by GMT1 Alternative A will hardly be noticeable since it is smaller than the typical seasonal variation seen as a result of power demand from other, larger, sources.

The same cannot be said for the GMT1 Roadless Alternative because of how decisions about GMT1 affect the GMT2 development, and how the two together impact power demand. If the GMT1 Roadless Alternative is selected as the preferred alternative, this will cause the GMT2 project to be developed as a roadless project as well. Together, the two projects could cause as much as a 10 MWe increase in power demand. This additional demand beyond the existing load demand, would put the Alpine power generation system too close to 100% capacity to allow for a sufficient safety margin. For this reason, the two projects together would require the installation of an additional power generation turbine at Alpine, resulting in an increase in emissions. **Table K-2** presents the increase assuming the increased power demand is met by installing a 15 MWe (ISO) Solar Titan 130 turbine.

[1] ISO refers to turbine rating at inlet conditions specified by the International Standards Organization of ambient Temperature = 15 deg C, Relative Humidity = 60 % and Ambient Pressure at Sea Level.

Table K-2 Potential Emissions from a 15 MWe Power Generation Turbine Installed at the Alpine CPF

Pollutant	Emissions (ton/year)
$PM_{10}/PM_{2.5}$	3.8
NO_x	70
CO	85
SO_2	3.1
VOC	1.2
CO_2e	85,000

Regardless of alternative, it has been assumed that drilling will be conducted with an electrified drill rig and associated man camp using electrical power produced at the Alpine CPF. While it seems as though this would cause an increase in demand from the Alpine electrical grid, it will not because historical power demand includes the use of an electrified drilling activities.

As required by the Alpine construction and operating permits, all drilling at Alpine CD1, CD2, CD3 and CD4 is required to be conducted using electrified rigs and camps. Initially, all of Alpine was drilled with a single drill rig (Doyon 19), but more recently operations have included a second rig at times (Doyon 141). Therefore, the historical Alpine power demand includes supporting two electrified drilling operations (i.e. drill rig and associated camp). Since the number of electrified drilling operations being supported by the Alpine electrical system will not increase as a result of the GMT1 project, there will be no emissions increase associated with power generation supporting the electrified GMT1 drill rig and rig camp.

Comment 3: *The Drilling operations (both Developmental Drilling and Infill Drilling) reference that the Doyon 19 drill rig will run on "highline power", and that the primary power engine on the rig will operate in "spinning reserve" to be available should highline power supply be interrupted. (AQIA, section 2-1-2, first paragraph). Have the impacts of additional load on the source of the highline power been addressed in this supplemental EIS?*

Response:

As discussed in the response to **Comment 2** there will be no emissions increase associated with power generation supporting the electrified GMT1 drill rig since that power demand is an existing power demand.

Comment 4a: *In looking at the PM10 emissions, I note that the future year with 12 complete months of infill drilling predicts 958 tpy PM10. In trying to figure out where this figure comes from, I am confused about some items. Specifically, what follows references cells within the GMT1_Emissions_Inventory_Summary_Ver1-0.xlsx workbook, on the "PM10" worksheet:*

a) Cells [BI30..BT30] represent Infill Drilling – Fugitive Dust Emissions.

a. What specifically do these fugitive emissions represent – things like gravel road traffic, or rather material evolved out of the well itself in the drilling process?

b. If it's the road traffic type of emissions, why are they not restricted to the four-month summer period like other such emissions sources?

c. If it's emissions from the well-drilling process itself, where is the correlated emissions points for drilling the initial nine wells (i.e., in the Developmental Drilling activities that happen in years 2 and 3)?

Response:

The confusion stems from errors that were corrected in all EI versions transmitted after October 18, 2013. Specifically:

a) Fugitive dust emissions for Infill Drilling were mistakenly modeled as occurring over the entire year; whereas, they should have only been modeled as occurring during the months when the ground is no longer snow covered and has thawed (June to September).

   These fugitive dust emissions represent fugitive dust from gravel road travel that will occur during developmental drilling, as well as fugitive dust from the GMT1 Facilities and gravel roads disturbed areas during the construction period.

Comment 4b: *In looking at the PM10 emissions, I note that the future year with 12 complete months of infill drilling predicts 958 tpy PM10. In trying to figure out where this figure comes from, I am confused about some items. Specifically, what follows references cells within the GMT1_Emissions_Inventory_Summary_Ver1-0.xlsx workbook, on the "PM10" worksheet:*

b) Cells [AY25..BB25] as compared to cells [BN25..BN28]

These are the Routine Operations – Fugitive Dust Emissions for the Typical Production Year and the Infill Drilling scenarios, respectively. The Typical Production Year has a monthly PM10 emission rate of 59.2 tons in the one month that well interventions occur, and a much lower 11.2 tons for the other three summer season months. But, the same values in the Infill Drilling scenario stay at the 59.2 tons for each of the four months.

a. What is different to cause this?

b. What is the relationship between the Routine Operations-Fugitive Dust Emissions during Infill Drilling and the Infill Drilling – Fugitive Dust Emissions for those four months? i.e., if the latter are about gravel road traffic type emissions, are they perhaps being double counted between cells [BN25..BQ25] and [BN30..BQ30]?

Response:

Typical production year fugitive emissions differ from Infill Drilling in that a typical production year's fugitive dust emissions assume one month of travel on gravel roads for Well Intervention activities (during June), and three months of travel on gravel roads for routine maintenance activities (July-September). Routine maintenance activities assume a smaller set of vehicles and a different frequency of travel than Well Intervention activities, hence the lower emissions.

Infill Drilling involves the drilling of additional wells and is assumed to occur for 12 months in a typical infill drilling year. Therefore, it involves bigger periods of high use of the gravel roads throughout the entire year. For this reason, it was assumed that fugitive dust from travel on gravel roads due to construction activities will occur over the entire June-September summer period.